

## Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.



### REMINDERS

#### Product Information in this Catalog

Product information in this catalog is as of January 2021. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

#### Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

#### Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

#### Limited Application

##### 1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets.

TAIYO YUDEN has the line-up of the products intended for use in automotive electronic equipment, telecommunications infrastructure and industrial equipment, or medical devices classified as GHTF Classes A to C (Japan Classes I to III). Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

##### 2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

##### 3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment <sup>\*1</sup>
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices <sup>\*2</sup>

- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, underwater work equipment, etc.)
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

#### \*Notes:

1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.
2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

#### 4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

#### Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

#### Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

#### Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement.

#### TAIYO YUDEN's Official Sales Channel

The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

#### Caution for Export

Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our product specification sheets. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (<http://www.ty-top.com/>).

## Automotive Application Guide

We classify automotive electronic equipment into the following four application categories and set usable application categories for each of our products. When using our products for automotive electronic equipment, please be sure to check such application categories and use our products accordingly. Should you have any questions on this matter, please contact us.

| Category       | Automotive Electronic Equipment (Typical Example)                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWERTRAIN     | <ul style="list-style-type: none"> <li>• Engine ECU (Electronically Controlled Fuel Injector)</li> <li>• Cruise Control Unit</li> <li>• 4WS (4 Wheel Steering)</li> <li>• Transmission</li> <li>• Power Steering</li> <li>• HEV/PHV/EV Core Control (Battery, Inverter, DC-DC)</li> <li>• Automotive Locator (Car location information providing device), etc.</li> </ul>                                               |
| SAFETY         | <ul style="list-style-type: none"> <li>• ABS (Anti-Lock Brake System)</li> <li>• ESC (Electronic Stability Control)</li> <li>• Airbag</li> <li>• ADAS (Equipment that directly controls running, turning and stopping), etc.</li> </ul>                                                                                                                                                                                 |
| BODY & CHASSIS | <ul style="list-style-type: none"> <li>• Wiper</li> <li>• Automatic Door</li> <li>• Power Window</li> <li>• Keyless Entry System</li> <li>• Electric Door Mirror</li> <li>• Automobile Digital Mirror</li> <li>• Interior Lighting</li> <li>• Automobile Air Conditioning System</li> <li>• LED Headlight</li> <li>• TPMS (Tire Pressure Monitoring System)</li> <li>• Anti-Theft Device (Immobilizer), etc.</li> </ul> |
| INFOTAINMENT   | <ul style="list-style-type: none"> <li>• Car Infotainment System</li> <li>• ITS/Telematics System</li> <li>• Instrument Cluster</li> <li>• ADAS (Sensor, Equipment that is not interlocked with safety equipment or powertrain)</li> <li>• Dashcam (genuine products for automotive manufacturer), etc.</li> </ul>                                                                                                      |

## MULTILAYER CERAMIC CAPACITORS

REFLOW

AEC-Q200

## PART NUMBER

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J | M | K | 3 | 1 | 6 | △ | B | J | 1 | 0 | 6 | M | L | H | T | △ |
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ | ⑪ | ⑫ |   |   |   |   |   |

△=Blank space

## ①Rated voltage

| Code | Rated voltage[VDC] |
|------|--------------------|
| A    | 4                  |
| J    | 6.3                |
| L    | 10                 |
| E    | 16                 |
| T    | 25                 |
| G    | 35                 |
| U    | 50                 |
| H    | 100                |
| Q    | 250                |
| S    | 630                |

## ②Series name

| Code | Series name                                     |
|------|-------------------------------------------------|
| M    | Multilayer ceramic capacitor                    |
| V    | Multilayer ceramic capacitor for high frequency |
| W    | LW reverse type multilayer capacitor            |

## ③End termination

| Code | End termination                                          |
|------|----------------------------------------------------------|
| K    | Plated                                                   |
| J    | Soft Termination                                         |
| S    | Cu Internal Electrodes (For High Frequency)              |
| F    | High Reliability Application                             |
| R    | High Reliability Application<br>(Cu External Electrodes) |

## ④Dimension (L × W)

| Type | Dimensions<br>(L × W) [mm] | EIA (inch) |
|------|----------------------------|------------|
| 063  | 0.6 × 0.3                  | 0201       |
| 105  | 1.0 × 0.5                  | 0402       |
|      | 0.52 × 1.0 ※               | 0204       |
| 107  | 1.6 × 0.8                  | 0603       |
|      | 0.8 × 1.6 ※                | 0306       |
| 212  | 2.0 × 1.25                 | 0805       |
|      | 1.25 × 2.0 ※               | 0508       |
| 316  | 3.2 × 1.6                  | 1206       |
| 325  | 3.2 × 2.5                  | 1210       |
| 432  | 4.5 × 3.2                  | 1812       |

Note : ※LW reverse type (□WK) only

## ⑤Dimension tolerance

| Code | Type | L[mm]          | W[mm]           | T[mm]                        |
|------|------|----------------|-----------------|------------------------------|
| △    | ALL  | Standard       | Standard        | Standard                     |
| A    | 063  | 0.6±0.05       | 0.3±0.05        | 0.3±0.05                     |
|      | 105  | 1.0±0.10       | 0.5±0.10        | 0.5±0.10                     |
|      | 107  | 1.6+0.15/-0.05 | 0.8+0.15/-0.05  | 0.8+0.15/-0.05               |
|      | 212  | 2.0+0.15/-0.05 | 1.25+0.15/-0.05 | 0.85±0.10<br>1.25+0.15/-0.05 |
|      | 316  | 3.2±0.20       | 1.6±0.20        | 1.6±0.20                     |
|      | 325  | 3.2±0.30       | 2.5±0.30        | 2.5±0.30                     |
| B    | 105  | 1.0+0.15/-0.05 | 0.5+0.15/-0.05  | 0.5+0.15/-0.05               |
|      | 107  | 1.6+0.20/-0    | 0.8+0.20/-0     | 0.8+0.20/-0                  |
|      | 212  | 2.0+0.20/-0    | 1.25+0.20/-0    | 0.85±0.10<br>1.25+0.20/-0    |
|      | 316  | 3.2±0.30       | 1.6±0.30        | 1.6±0.30                     |
| C    | 105  | 1.0+0.20/-0    | 0.5+0.20/-0     | 0.5+0.20/-0                  |
|      | 107  | 1.6+0.25/-0    | 0.8+0.25/-0     | 0.8+0.25/-0                  |
|      | 212  | 2.0+0.25/-0    | 1.25+0.25/-0    | 1.25+0.25/-0                 |
| K    | 212  | 2.0±0.15       | 1.25±0.15       | 0.85±0.15                    |
|      | 316  | 3.2±0.20       | 1.6±0.20        | 1.15±0.20<br>1.6±0.20        |
|      | 325  | 3.2±0.50       | 2.5±0.30        | 2.5±0.30                     |

Note: cf. STANDARD EXTERNAL DIMENSIONS

△= Blank space

## ⑥Temperature characteristics code

## ■High dielectric type

| Code | Applicable standard | Temperature range[°C] | Ref. Temp.[°C] | Capacitance change | Capacitance tolerance | Tolerance code |
|------|---------------------|-----------------------|----------------|--------------------|-----------------------|----------------|
| BJ   | EIA                 | X5R                   | 25             | ±15%               | ±10%                  | K              |
|      |                     |                       |                |                    | ±20%                  | M              |
| C6   | EIA                 | X6S                   | 25             | ±22%               | ±10%                  | K              |
|      |                     |                       |                |                    | ±20%                  | M              |
| B7   | EIA                 | X7R                   | 25             | ±15%               | ±10%                  | K              |
|      |                     |                       |                |                    | ±20%                  | M              |
| C7   | EIA                 | X7S                   | 25             | ±22%               | ±10%                  | K              |
|      |                     |                       |                |                    | ±20%                  | M              |
| D7   | EIA                 | X7T                   | 25             | +22%/-33%          | ±10%                  | K              |
|      |                     |                       |                |                    | ±20%                  | M              |

## ■ Temperature compensating type

| ■ Temperature compensating type |                     |     |                       |                |                    |                       |                |
|---------------------------------|---------------------|-----|-----------------------|----------------|--------------------|-----------------------|----------------|
| Code                            | Applicable standard |     | Temperature range[°C] | Ref. Temp.[°C] | Capacitance change | Capacitance tolerance | Tolerance code |
| CG                              | JIS                 | CG  | -55~+125              | 20             | 0±30ppm/°C         | ±0.1pF                | B              |
|                                 |                     |     |                       |                |                    | ±0.25pF               | C              |
|                                 |                     |     |                       |                |                    | ±0.5pF                | D              |
|                                 | EIA                 | COG |                       | 25             |                    | ±1pF                  | F              |
|                                 |                     |     |                       |                |                    | ±2%                   | G              |
|                                 |                     |     |                       |                |                    | ±5%                   | J              |

## ⑦ Nominal capacitance

| Code (example) | Nominal capacitance |
|----------------|---------------------|
| 0R5            | 0.5 pF              |
| 010            | 1 pF                |
| 100            | 10 pF               |
| 101            | 100 pF              |
| 102            | 1,000 pF            |
| 103            | 0.01 μF             |
| 104            | 0.1 μF              |
| 105            | 1.0 μF              |
| 106            | 10 μF               |
| 107            | 100 μF              |

Note : R=Decimal point

## ⑧ Capacitance tolerance

| Code | Capacitance tolerance |
|------|-----------------------|
| A    | ± 0.05 pF             |
| B    | ± 0.1 pF              |
| C    | ± 0.25 pF             |
| D    | ± 0.5 pF              |
| G    | ± 2%                  |
| J    | ± 5%                  |
| K    | ± 10%                 |
| M    | ± 20%                 |

## ⑨ Thickness

| Code | Thickness [mm]          |
|------|-------------------------|
| P    | 0.3                     |
| T    |                         |
| V    | 0.5                     |
| C    | 0.7 (107 type or more)  |
| A    | 0.8                     |
| D    | 0.85 (212 type or more) |
| F    | 1.15                    |
| G    | 1.25                    |
| L    | 1.6                     |
| N    | 1.9                     |
| M    | 2.5                     |

## ⑩ Special code

| Code | Special code                                                                          |
|------|---------------------------------------------------------------------------------------|
| -    | Standard                                                                              |
| H    | MLCC for Automotive                                                                   |
| 8    | MLCC for Telecommunications infrastructure and Industrial equipment / Medical devices |

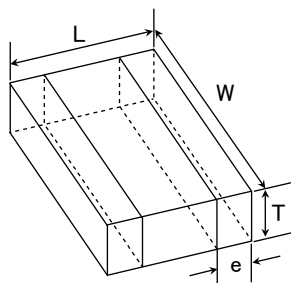
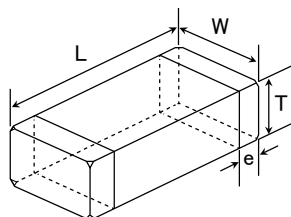
## ⑪ Packaging

| Code | Packaging                                                                |
|------|--------------------------------------------------------------------------|
| F    | φ 178mm Taping (2mm pitch)                                               |
| R    | φ 178mm Embossed Taping (4mm pitch)                                      |
| T    | φ 178mm Taping (4mm pitch)                                               |
| P    | φ 178mm Taping (4mm pitch, 1000 pcs/reel)<br>325 type (Thickness code M) |

## ⑫ Internal code

| Code | Internal code |
|------|---------------|
| Δ    | Standard      |

## STANDARD EXTERNAL DIMENSIONS



※ LW reverse type

| Type( EIA )                  | Dimension [mm] (inch)      |                            |                            |    |                                        |
|------------------------------|----------------------------|----------------------------|----------------------------|----|----------------------------------------|
|                              | L                          | W                          | T                          | *1 | e                                      |
| □MK063(0201)                 | 0.6±0.03<br>(0.024±0.001)  | 0.3±0.03<br>(0.012±0.001)  | 0.3±0.03<br>(0.012±0.001)  | T  | 0.15±0.05<br>(0.006±0.002)             |
| □MK105(0402)                 | 1.0±0.05<br>(0.039±0.002)  | 0.5±0.05<br>(0.020±0.002)  | 0.5±0.05<br>(0.020±0.002)  | V  | 0.25±0.10<br>(0.010±0.004)             |
| □WK105(0204)※                | 0.52±0.05<br>(0.020±0.002) | 1.0±0.05<br>(0.039±0.002)  | 0.3±0.05<br>(0.012±0.002)  | P  | 0.18±0.08<br>(0.007±0.003)             |
| □MK107(0603)                 | 1.6±0.10<br>(0.063±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 0.8±0.10<br>(0.031±0.004)  | A  | 0.35±0.25<br>(0.014±0.010)             |
| □MJ107(0603)                 | 1.6±0.10<br>(0.063±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 0.8±0.10<br>(0.031±0.004)  | A  | 0.35+0.3/-0.25<br>(0.014+0.012/-0.010) |
| □VS107(0603)                 | 1.6±0.10<br>(0.063±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 0.7±0.10<br>(0.028±0.004)  | C  | 0.35±0.25<br>(0.014±0.010)             |
| □WK107(0306)※                | 0.8±0.10<br>(0.031±0.004)  | 1.6±0.10<br>(0.063±0.004)  | 0.5±0.05<br>(0.020±0.002)  | V  | 0.25±0.15<br>(0.010±0.006)             |
| □MK212(0805)<br>□MF212(0805) | 2.0±0.10<br>(0.079±0.004)  | 1.25±0.10<br>(0.049±0.004) | 0.85±0.10<br>(0.033±0.004) | D  | 0.5±0.25<br>(0.020±0.010)              |
|                              |                            |                            | 1.25±0.10<br>(0.049±0.004) | G  |                                        |
| □MJ212(0805)                 | 2.0±0.10<br>(0.079±0.004)  | 1.25±0.10<br>(0.049±0.004) | 0.85±0.10<br>(0.033±0.004) | D  | 0.5+0.35/-0.25<br>(0.020+0.014/-0.010) |
|                              |                            |                            | 1.25±0.10<br>(0.049±0.004) | G  |                                        |
| □VS212(0805)                 | 2.0±0.10<br>(0.079±0.004)  | 1.25±0.10<br>(0.049±0.004) | 0.85±0.10<br>(0.033±0.004) | D  | 0.5±0.25<br>(0.020±0.010)              |
| □WK212(0508)※                | 1.25±0.15<br>(0.049±0.006) | 2.0±0.15<br>(0.079±0.006)  | 0.85±0.10<br>(0.033±0.004) | D  | 0.3±0.2<br>(0.012±0.008)               |
| □MK316(1206)<br>□MF316(1206) | 3.2±0.15<br>(0.126±0.006)  | 1.6±0.15<br>(0.063±0.006)  | 1.15±0.10<br>(0.045±0.004) | F  | 0.5+0.35/-0.25<br>(0.020+0.014/-0.010) |
|                              |                            |                            | 1.6±0.20<br>(0.063±0.008)  | L  |                                        |
| □MJ316(1206)                 | 3.2±0.15<br>(0.126±0.006)  | 1.6±0.15<br>(0.063±0.006)  | 1.15±0.10<br>(0.045±0.004) | F  | 0.6+0.4/-0.3<br>(0.024+0.016/-0.012)   |
|                              |                            |                            | 1.6±0.20<br>(0.063±0.008)  | L  |                                        |
| □MK325(1210)<br>□MF325(1210) | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | 1.15±0.10<br>(0.045±0.004) | F  | 0.6±0.3<br>(0.024±0.012)               |
|                              |                            |                            | 1.9±0.20<br>(0.075±0.008)  | N  |                                        |
|                              |                            |                            | 2.5±0.20<br>(0.098±0.008)  | M  |                                        |
| □MJ325(1210)                 | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | 1.9±0.20<br>(0.075±0.008)  | N  | 0.6+0.4/-0.3<br>(0.024+0.016/-0.012)   |
|                              |                            |                            | 2.5±0.20<br>(0.098±0.008)  | M  |                                        |
| □MK432(1812)                 | 4.5±0.40<br>(0.177±0.016)  | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | M  | 0.9±0.6<br>(0.035±0.024)               |

Note : ※. LW reverse type, \*1.Thickness code

CERAMIC  
CAPACITORS

AUTO

For Automotive Electronic Equipment  
MULTILAYER CERAMIC CAPACITORS

## STANDARD QUANTITY

| Type | EIA (inch) | Dimension |      | Standard quantity [pcs]    |                            |
|------|------------|-----------|------|----------------------------|----------------------------|
|      |            | [mm]      | Code | Paper tape                 | Embossed tape              |
| 063  | 0201       | 0.3       | T    | 15000                      | —                          |
| 105  | 0402       | 0.5       | V    | 10000                      | —                          |
|      | 0204 ※     | 0.30      | P    |                            |                            |
| 107  | 0603       | 0.7       | C    | 4000                       | —                          |
|      |            | 0.8       | A    |                            |                            |
|      |            | 0.8       | A    | 3000<br>(Soft Termination) | —                          |
|      |            | 0.8       | A    | —                          | 3000<br>(Soft Termination) |
|      | 0306 ※     | 0.50      | V    | —                          | 4000                       |
| 212  | 0805       | 0.85      | D    | 4000                       | —                          |
|      |            | 1.25      | G    | —                          | 3000                       |
|      |            | 1.25      | G    | —                          | 2000<br>(Soft Termination) |
|      | 0508 ※     | 0.85      | D    | 4000                       | —                          |
| 316  | 1206       | 1.15      | F    | —                          | 3000                       |
|      |            | 1.6       | L    | —                          | 2000                       |
| 325  | 1210       | 1.15      | F    | —                          | 2000                       |
|      |            | 1.9       | N    |                            |                            |
|      |            | 2.5       | M    | —                          | 500(T), 1000(P)            |
| 432  | 1812       | 2.5       | M    | —                          | 500                        |

Note : ※ LW Reverse type (□WK)

## PART NUMBER

- All the Multilayer Ceramic Capacitors of the catalog lineup are RoHS compliant.
- Capacitance tolerance code is applied to □ of part number.
- All the Multilayer Ceramic Capacitors in the catalog lineup are applicable for reflow-soldering.

## Notes)

- The exchange of individual specifications is necessary depending on your application and/or circuit condition. Please contact TAIYO YUDEN's official sales channel.
- For Automotive (AEC-Q200 Qualified) products for BODY & CHASSIS, and INFOTAINMENT. Please check "Automotive Application Guide" for further details before using the products.

< AEC-Q200 : AEC-Q200 qualified >

All the Multilayer Ceramic Capacitors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 by family item.

125°C products: AEC-Q200 Grade1 (we conduct the evaluation at the test condition of Grade1.)

105°C products: AEC-Q200 Grade2 (we conduct the evaluation at the test condition of Grade2.)

85°C products: AEC-Q200 Grade3 (we conduct the evaluation at the test condition of Grade3.)

Please consult with TAIYO YUDEN's official sales channel for the details of the product specifications and AEC-Q200 test results, etc.,

and please review and approve the product specifications before ordering.

- \*1: For standard case size, please kindly refer to ④Dimension, ⑤Dimension tolerance, ⑨Thickness and STANDARD EXTERNAL DIMENSIONS.

## Multilayer Ceramic Capacitors (High dielectric type)

● 063TYPE (Dimension: 0.6 × 0.3mm JIS:1005 EIA:0402)

【Temperature Characteristic B7 : X7R (−55~+125°C)】 0.3mm thickness(T)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| TMK063 B7101□PHFE |               | 25                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7151□PHFE |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7221□PHFE |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7331□PHFE |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7471□PHFE |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7102□PHFE |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMK063 B7152□PHFE |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| TMK063 B7222□PHFE |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| TMK063 B7332□PHFE |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMK063 B7101□PHFE |               | 16                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7151□PHFE |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7221□PHFE |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7331□PHFE |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7471□PHFE |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7102□PHFE |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMK063 B7152□PHFE |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMK063 B7222□PHFE |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMK063 B7332□PHFE |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7101□PHFE |               | 10                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7151□PHFE |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7221□PHFE |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7331□PHFE |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7471□PHFE |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7102□PHFE |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMK063 B7152□PHFE |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7222□PHFE |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7332□PHFE |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7472□PHFE |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7682□PHFE |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMK063 B7103□PHFE |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |

► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our product specification sheets. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (<http://www.ty-top.com/>).

● 105TYPE (Dimension:1.0×0.5mm JIS:1005 EIA:0402)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.5mm thickness (V)

| Part number      |   | Rated voltage<br>[V] | Temperature characteristics |        | Capacitance<br>[F] | Capacitance tolerance [%] | tan δ<br>[%] | HTLT              | Thickness*1 [mm] | Note     |
|------------------|---|----------------------|-----------------------------|--------|--------------------|---------------------------|--------------|-------------------|------------------|----------|
| 1                | 2 |                      |                             |        |                    |                           |              | Rated voltage x % |                  |          |
| UMK105 BJ471□VHF |   | 50                   |                             | X5R    | 470 p              | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ102□VHF |   |                      |                             | X5R    | 1000 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ152□VHF |   |                      |                             | X5R    | 1500 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ222□VHF |   |                      |                             | X5R    | 2200 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ332□VHF |   |                      |                             | X5R    | 3300 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ472□VHF |   |                      |                             | X5R    | 4700 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ682□VHF |   |                      |                             | X5R    | 6800 p             | ±10, ±20                  | 2.5          | 150               | 0.5±0.05         |          |
| UMK105 BJ103□VHF |   |                      |                             | X5R    | 0.01 μ             | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| UMK105 BJ223□VHF |   |                      |                             | X5R    | 0.022 μ            | ±10, ±20                  | 5            | 200               | 0.5±0.05         |          |
| UMK105 BJ473□VHF |   |                      |                             | X5R    | 0.047 μ            | ±10, ±20                  | 5            | 200               | 0.5±0.05         |          |
| UMK105 BJ104□VHF |   | 25                   |                             | X5R    | 0.1 μ              | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| TMK105 BJ472□VHF |   |                      |                             | X5R    | 4700 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| TMK105 BJ682□VHF |   |                      |                             | X5R    | 6800 p             | ±10, ±20                  | 2.5          | 200               | 0.5±0.05         |          |
| TMK105 BJ103□VHF |   |                      |                             | X5R    | 0.01 μ             | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| TMK105 BJ153□VHF |   |                      |                             | X5R    | 0.015 μ            | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| TMK105 BJ223□VHF |   |                      |                             | X5R    | 0.022 μ            | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| TMK105 BJ333□VHF |   |                      |                             | X5R    | 0.033 μ            | ±10, ±20                  | 3.5          | 150               | 0.5±0.05         |          |
| TMK105 BJ473□VHF |   |                      |                             | X5R    | 0.047 μ            | ±10, ±20                  | 3.5          | 150               | 0.5±0.05         |          |
| TMK105 BJ104□VHF |   |                      |                             | X5R    | 0.1 μ              | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| TMK105 BJ224□VHF |   |                      |                             | X5R    | 0.22 μ             | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| TMK105ABJ474□VHF |   |                      | X5R                         | 0.47 μ | ±10, ±20           | 10                        | 150          | 0.5±0.10          |                  |          |
| EMK105 BJ103□VHF |   | 16                   |                             | X5R    | 0.01 μ             | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| EMK105 BJ153□VHF |   |                      |                             | X5R    | 0.015 μ            | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| EMK105 BJ223□VHF |   |                      |                             | X5R    | 0.022 μ            | ±10, ±20                  | 3.5          | 200               | 0.5±0.05         |          |
| EMK105 BJ333□VHF |   |                      |                             | X5R    | 0.033 μ            | ±10, ±20                  | 3.5          | 150               | 0.5±0.05         |          |
| EMK105 BJ473□VHF |   |                      |                             | X5R    | 0.047 μ            | ±10, ±20                  | 3.5          | 150               | 0.5±0.05         |          |
| EMK105 BJ104□VHF |   |                      |                             | X5R    | 0.1 μ              | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| EMK105 BJ224□VHF |   |                      |                             | X5R    | 0.22 μ             | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| EMK105ABJ474□VHF |   |                      |                             | X5R    | 0.47 μ             | ±10, ±20                  | 10           | 150               | 0.5±0.10         |          |
| EMK105 BJ105□VHF |   |                      |                             | X5R    | 1 μ                | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| LМК105 BJ333□VHF |   |                      | 10                          |        | X5R                | 0.033 μ                   | ±10, ±20     | 3.5               | 150              | 0.5±0.05 |
| LМК105 BJ473□VHF |   |                      |                             | X5R    | 0.047 μ            | ±10, ±20                  | 3.5          | 150               | 0.5±0.05         |          |
| LМК105 BJ104□VHF |   |                      |                             | X5R    | 0.1 μ              | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| LМК105 BJ224□VHF |   |                      |                             | X5R    | 0.22 μ             | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| LМК105ABJ474□VHF |   |                      |                             | X5R    | 0.47 μ             | ±10, ±20                  | 10           | 150               | 0.5±0.10         |          |
| LМК105 BJ105□VHF |   |                      |                             | X5R    | 1 μ                | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| LМК105ABJ225□VHF |   |                      |                             | X5R    | 2.2 μ              | ±10, ±20                  | 10           | 150               | 0.5±0.10         |          |
| JMK105 BJ104□VHF |   | 6.3                  |                             | X5R    | 0.1 μ              | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| JMK105 BJ224□VHF |   |                      |                             | X5R    | 0.22 μ             | ±10, ±20                  | 5            | 150               | 0.5±0.05         |          |
| JMK105 BJ474□VHF |   |                      |                             | X5R    | 0.47 μ             | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| JMK105 BJ105□VHF |   |                      |                             | X5R    | 1 μ                | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| JMK105 BJ225□VHF |   |                      |                             | X5R    | 2.2 μ              | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| JMK105BBJ475MVHF |   | 4                    |                             | X5R    | 4.7 μ              | ±20                       | 10           | 150               | 0.5+0.15/-0.05   |          |
| AMK105 BJ225□VHF |   |                      |                             | X5R    | 2.2 μ              | ±10, ±20                  | 10           | 150               | 0.5±0.05         |          |
| AMK105BBJ475MVHF |   |                      |                             | X5R    | 4.7 μ              | ±20                       | 10           | 150               | 0.5+0.15/-0.05   |          |

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【Temperature Characteristic B7 : X7R (−55~+125°C), D7 : X7T (−55~+125°C)】 0.5mm thickness (V)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK105 B7221□VHF  |               | 50                | X7R                         | 220 p           | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7331□VHF  |               |                   | X7R                         | 330 p           | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7471□VHF  |               |                   | X7R                         | 470 p           | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7681□VHF  |               |                   | X7R                         | 680 p           | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7102□VHF  |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7152□VHF  |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7222□VHF  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7332□VHF  |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMK105 B7472□VHF  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 150               | 0.5±0.05         |      |
| UMK105 B7682□VHF  |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 2.5       | 150               | 0.5±0.05         |      |
| UMK105 B7103□VHF  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| UMK105 B7153□VHFE |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMK105 B7223□VHF  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 10        | 200               | 0.5±0.05         |      |
| UMK105 B7333□VHFE |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| UMK105 B7473□VHF  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 10        | 200               | 0.5±0.05         |      |
| UMK105 B7104□VHF  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| TMK105 B7472□VHF  |               | 25                | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| TMK105 B7682□VHF  |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| TMK105 B7103□VHF  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| TMK105 B7153□VHF  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| TMK105 B7223□VHF  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| TMK105 B7333□VHF  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| TMK105 B7473□VHF  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| TMK105 B7104□VHF  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| EMK105 B7103□VHF  |               | 16                | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| EMK105 B7153□VHF  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| EMK105 B7223□VHF  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| EMK105 B7333□VHF  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| EMK105 B7473□VHF  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| EMK105 B7104□VHF  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 5         | 150               | 0.5±0.05         |      |
| EMK105 B7224□VHF  |               | 10                | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| LMK105 B7473□VHF  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| LMK105 B7104□VHF  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 5         | 150               | 0.5±0.05         |      |
| LMK105 B7224□VHF  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| JMK105 B7104□VHF  |               | 6.3               | X7R                         | 0.1 μ           | ±10, ±20                  | 5         | 150               | 0.5±0.05         |      |
| JMK105 B7224□VHF  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| JMK105 B7474□VHF  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |
| JMK105CD7105□VHF  |               | 4                 | X7T                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.5+0.20/-0      |      |
| AMK105 B7474□VHF  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.5±0.05         |      |

● 107TYPE (Dimension:1.6×0.8mm JIS:1608 EIA:0603)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.8mm thickness(A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK107 BJ104□AHT |               | 50                | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| UMK107 BJ224□AHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| UMK107 BJ474□AHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| UMK107ABJ105□AHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| GMK107 BJ223□AHT |               |                   | X5R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 200               | 0.8±0.10         |      |
| GMK107 BJ473□AHT |               | 35                | X5R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| GMK107 BJ104□AHT |               |                   | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| GMK107 BJ224□AHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| GMK107ABJ474□AHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| GMK107 BJ105□AHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| TMK107 BJ223□AHT |               | 25                | X5R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 200               | 0.8±0.10         |      |
| TMK107 BJ473□AHT |               |                   | X5R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMK107 BJ104□AHT |               |                   | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| TMK107 BJ224□AHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| TMK107 BJ474□AHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| TMK107 BJ105□AHT |               | 16                | X5R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| TMK107BBJ225□AHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| EMK107 BJ104□AHT |               |                   | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| EMK107 BJ224□AHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| EMK107 BJ474□AHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| EMK107 BJ105□AHT |               | 10                | X5R                         | 1 μ             | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| EMK107ABJ225□AHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| EMK107BBJ475□AHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| LMK107 BJ474□AHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| LMK107 BJ105□AHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| LMK107 BJ225□AHT |               | 6.3               | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMK107 BJ475□AHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMK107BBJ106MAHT |               |                   | X5R                         | 10 μ            | ±20                       | 10        | 150               | 0.8+0.20/-0      |      |
| JMK107 BJ105□AHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| JMK107 BJ225□AHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| JMK107 BJ475□AHT |               | 4                 | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| JMK107ABJ106□AHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| AMK107ABJ106□AHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| AMK107BBJ226MAHT |               |                   | X5R                         | 22 μ            | ±20                       | 10        | 150               | 0.8+0.20/-0      |      |

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C), D7 : X7T(−55~+125°C)】 0.8mm thickness(A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK107 B7102□AHT |               | 50                | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7152□AHT |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7222□AHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7332□AHT |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7472□AHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7682□AHT |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7103□AHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7153□AHT |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7333□AHT |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107 B7683□AHT |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| UMK107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMK107AC7154□AHT |               |                   | X7S                         | 0.15 μ          | ±10, ±20                  | 3.5       | 150               | 0.8+0.15/-0.05   |      |
| UMK107 C7224□AHT |               |                   | X7S                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| GMK107 B7473□AHT |               | 35                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| GMK107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| GMK107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| GMK107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| GMK107AB7105□AHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| TMK107 B7223□AHT |               | 25                | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 200               | 0.8±0.10         |      |
| TMK107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMK107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| TMK107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| TMK107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| TMK107AB7105□AHT |               | 16                | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8+0.15/-0.05   |      |
| EMK107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| EMK107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| EMK107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| EMK107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| EMK107 B7105□AHT |               | 10                | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMK107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 5         | 150               | 0.8±0.10         |      |
| LMK107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |
| LMK107 B7105□AHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMK107BD7225□AHT |               |                   | X7T                         | 2.2 μ           | ±10, ±20                  | 10        | 200               | 0.8+0.20/-0      |      |
| JMK107 B7105□AHT |               | 6.3               | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| JMK107 B7225□AHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |

● 212TYPE (Dimension:2.0×1.25mm JIS:2012 EIA:0805)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 1.25mm thickness (G)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK212 BJ104□GHT |               | 50                | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 BJ224□GHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 BJ474□GHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| UMK212 BJ105□GHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 5         | 150               | 1.25±0.10        |      |
| GMK212 BJ104□GHT |               | 35                | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| GMK212 BJ224□GHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| GMK212 BJ474□GHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| GMK212 BJ105□GHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 5         | 150               | 1.25±0.10        |      |
| GMK212BBJ225□GHT |               | 25                | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| TMK212 BJ104□GHT |               |                   | X5R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMK212 BJ224□GHT |               |                   | X5R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| TMK212 BJ474□GHT |               |                   | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMK212 BJ105□GHT |               | 16                | X5R                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| TMK212 BJ225□GHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 5         | 150               | 1.25±0.10        |      |
| TMK212BBJ475□GHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.20/-0     |      |
| TMK212BBJ106□GHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.20/-0     |      |
| EMK212 BJ105□GHT |               | 10                | X5R                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| EMK212 BJ225□GHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 5         | 150               | 1.25±0.10        |      |
| EMK212ABJ475□GHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| EMK212BBJ106□GHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.20/-0     |      |
| LMK212 BJ225□GHT |               | 6.3               | X5R                         | 2.2 μ           | ±10, ±20                  | 5         | 200               | 1.25±0.10        |      |
| LMK212ABJ475□GHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| LMK212ABJ106□GHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| JMK212ABJ106□GHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| JMK212BBJ226MGHT |               | 4                 | X5R                         | 22 μ            | ±20                       | 10        | 150               | 1.25±0.20/-0     |      |
| AMK212ABJ226MGHT |               |                   | X5R                         | 22 μ            | ±20                       | 10        | 150               | 1.25±0.15/-0.05  |      |
| AMK212BBJ476MGHT |               |                   | X5R                         | 47 μ            | ±20                       | 10        | 150               | 1.25±0.20/-0     |      |

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.85mm thickness (D)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| EMK212 BJ105□DHT |               | 16                | X5R                         | 1 μ             | ±10, ±20                  | 5         | 200               | 0.85±0.10        |      |
| EMK212ABJ225□DHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 5         | 150               | 0.85±0.10        |      |
| EMK212BBJ475□DHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.85±0.10        |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.25mm thickness (G)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK212 B7103□GHT  |               | 50                | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 B7153□GHT  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 2.5       | 200               | 1.25±0.10        |      |
| UMK212 B7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 B7333□GHT  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 B7473□GHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 B7683□GHT  |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212 B7104□GHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMK212BB7154□GHTE |               |                   | X7R                         | 0.15 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.2/-0      |      |
| UMK212 B7224□GHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| UMK212BC7334□GHTE |               |                   | X7S                         | 0.33 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.2/-0      |      |
| UMK212 C7474□GHTE |               |                   | X7S                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| UMK212CC7684□GHTE |               |                   | X7S                         | 0.68 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.25/-0     |      |
| UMK212 B7105□GHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| GMK212 B7224□GHT  |               | 35                | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| GMK212 B7105□GHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| TMK212 B7224□GHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| TMK212 B7334□GHT  |               | 25                | X7R                         | 0.33 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMK212 B7474□GHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| TMK212 B7105□GHTR |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| TMK212 B7225□GHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| EMK212 B7224□GHT  |               | 16                | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMK212 B7334□GHT  |               |                   | X7R                         | 0.33 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMK212 B7474□GHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMK212 B7105□GHTR |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| EMK212 B7225□GHT  |               | 10                | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| EMK212AB7475□GHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| LMK212 B7105□GHTR |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| LMK212 B7225□GHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| LMK212 B7475□GHT  |               | 6.3               | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| JMK212 B7475□GHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| JMK212AB7106□GHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |

## PART NUMBER

● 316TYPE (Dimension:3.2×1.6mm JIS:3216 EIA:1206)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 1.6mm thickness(L)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK316 BJ474□LHT |               | 50                | X5R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 BJ105□LHT |               |                   | X5R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 BJ225□LHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| UMK316ABJ475□LHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| GMK316 BJ105□LHT |               | 35                | X5R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| GMK316 BJ225□LHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| GMK316 BJ475□LHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| GMK316BBJ106□LHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| TMK316 BJ225□LHT |               | 25                | X5R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMK316 BJ475□LHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| TMK316 BJ106□LHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| EMK316 BJ225□LHT |               |                   | X5R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMK316 BJ475□LHT |               | 16                | X5R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| EMK316 BJ106□LHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| EMK316BBJ226MLHT |               |                   | X5R                         | 22 μ            | ±20                       | 10        | 150               | 1.6±0.30         |      |
| LMK316 BJ475□LHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| LMK316 BJ106□LHT |               | 10                | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| LMK316ABJ226□LHT |               |                   | X5R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| JMK316 BJ106□LHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 5         | 200               | 1.6±0.20         |      |
| JMK316ABJ226□LHT |               |                   | X5R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| JMK316ABJ476MLHT |               | 6.3               | X5R                         | 47 μ            | ±20                       | 10        | 150               | 1.6±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 1.6mm thickness(L)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK316 B7473□LHT  |               | 50                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7683□LHT  |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 2.5       | 200               | 1.6±0.20         |      |
| UMK316 B7104□LHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7154□LHT  |               |                   | X7R                         | 0.15 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7224□LHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7334□LHT  |               |                   | X7R                         | 0.33 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7474□LHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316 B7105□LHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMK316BC7155□LHTE |               |                   | X7S                         | 1.5 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |
| UMK316 B7225□LHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| UMK316AC7475□LHTE |               |                   | X7S                         | 4.7 μ           | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| GMK316 B7105□LHT  |               | 35                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| GMK316 B7225□LHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| GMK316AB7475□LHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| TMK316 B7105□LHT  |               | 25                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMK316 B7225□LHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMK316AB7475□LHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| TMK316AB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| EMK316 B7225□LHT  |               | 16                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMK316AB7475□LHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| EMK316AB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| LMK316 B7475□LHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 1.6±0.20         |      |
| LMK316AB7106□LHT  |               | 10                | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| JMK316AB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| JMK316AB7226□LHT  |               | 6.3               | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| AMK316AB7226□LHT  |               |                   | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| AMK316AC7476MLHT  |               | 4                 | X7S                         | 47 μ            | ±20                       | 10        | 150               | 1.6±0.20         |      |

▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our product specification sheets. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (<http://www.ty-top.com/>) .

● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 2.5mm thickness(M)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK325 BJ106□MHP |               | 50                | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| GMK325 BJ106□MHP |               | 35                | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| TMK325 BJ106□MHP |               | 25                | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| EMK325 BJ226□MHP |               | 16                | X5R                         | 22 μ            | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| EMK325ABJ476□MHP |               |                   | X5R                         | 47 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| LMK325 BJ226□MHP |               | 10                | X5R                         | 22 μ            | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| LMK325 BJ476□MHP |               |                   | X5R                         | 47 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| JMK325 BJ476□MHP |               | 6.3               | X5R                         | 47 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |

【Temperature Characteristic BJ : X5R(−55~+85°C)】 1.9mm thickness(N)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK325 BJ475□NHT |               | 50                | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |
| GMK325 BJ225MNHT |               | 35                | X5R                         | 2.2 μ           | ±20                       | 3.5       | 200               | 1.9±0.20         |      |
| GMK325 BJ475□NHT |               |                   | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |
| TMK325 BJ475□NHT |               | 25                | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |
| EMK325 BJ475MNHT |               | 16                | X5R                         | 4.7 μ           | ±20                       | 3.5       | 200               | 1.9±0.20         |      |
| EMK325 BJ106□NHT |               |                   | X5R                         | 10 μ            | ±10, ±20                  | 5         | 150               | 1.9±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 2.5mm thickness(M)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK325 B7225□MHP  |               | 50                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| UMK325 B7335□MHP  |               |                   | X7R                         | 3.3 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| UMK325 B7475□MHP  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| UMK325AB7106□MHP  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| GMK325AB7106□MHP  |               | 35                | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| TMK325 B7335□MHP  |               | 25                | X7R                         | 3.3 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| TMK325AB7106□MHPR |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| TMK325 B7226□MHP  |               |                   | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| EMK325 B7226□MHP  |               | 16                | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| LMK325 B7226□MHP  |               | 10                | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| JMK325 B7226□MHPR |               | 6.3               | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| JMK325 B7476□MHPR |               |                   | X7R                         | 47 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.9mm thickness(N)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMK325 B7105□NHT  |               | 50                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| GMK325 B7225□NHT  |               | 35                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| GMK325 B7475□NHTR |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |
| TMK325 B7475□NHT  |               | 25                | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |
| EMK325 B7475□NHT  |               | 16                | X7R                         | 4.7 μ           | ±10, ±20                  | 3.5       | 150               | 1.9±0.20         |      |
| EMK325 B7106□NHTR |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.9±0.20         |      |

**Multilayer Ceramic Capacitors (Temperature compensating type)**

● 063TYPE (Dimension:0.6×0.3mm JIS:0603 EIA:0201)

【Temperature Characteristic CG : CG/C0G(−55~+125°C)】 0.3mm thickness(T)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics |     | Capacitance [F] | Capacitance tolerance | Q [at 1MHz] (Min) | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----|-----------------|-----------------------|-------------------|-------------------|------------------|------|
|                  |               |                   |                             |     |                 |                       |                   | Rated voltage x % |                  |      |
| UMK063 CG0R5CTHF |               | 50                | CG                          | C0G | 0.5 p           | ±0.25pF               | 410               | 200               | 0.3±0.03         |      |
| UMK063 CG010CTHF |               |                   | CG                          | C0G | 1 p             | ±0.25pF               | 420               | 200               | 0.3±0.03         |      |
| UMK063 CG1R5CTHF |               |                   | CG                          | C0G | 1.5 p           | ±0.25pF               | 430               | 200               | 0.3±0.03         |      |
| UMK063 CG020CTHF |               |                   | CG                          | C0G | 2 p             | ±0.25pF               | 440               | 200               | 0.3±0.03         |      |
| UMK063 CG030CTHF |               |                   | CG                          | C0G | 3 p             | ±0.25pF               | 460               | 200               | 0.3±0.03         |      |
| UMK063 CG040CTHF |               |                   | CG                          | C0G | 4 p             | ±0.25pF               | 480               | 200               | 0.3±0.03         |      |
| UMK063 CG050CTHF |               |                   | CG                          | C0G | 5 p             | ±0.25pF               | 500               | 200               | 0.3±0.03         |      |
| UMK063 CG060DTHF |               |                   | CG                          | C0G | 6 p             | ±0.5pF                | 520               | 200               | 0.3±0.03         |      |
| UMK063 CG070DTHF |               |                   | CG                          | C0G | 7 p             | ±0.5pF                | 540               | 200               | 0.3±0.03         |      |
| UMK063 CG080DTHF |               |                   | CG                          | C0G | 8 p             | ±0.5pF                | 560               | 200               | 0.3±0.03         |      |
| UMK063 CG090DTHF |               |                   | CG                          | C0G | 9 p             | ±0.5pF                | 580               | 200               | 0.3±0.03         |      |
| UMK063 CG100DTHF |               |                   | CG                          | C0G | 10 p            | ±0.5pF                | 600               | 200               | 0.3±0.03         |      |
| UMK063 CG120JTHF |               |                   | CG                          | C0G | 12 p            | ±5%                   | 640               | 200               | 0.3±0.03         |      |
| UMK063 CG150JTHF |               |                   | CG                          | C0G | 15 p            | ±5%                   | 700               | 200               | 0.3±0.03         |      |
| UMK063 CG180JTHF |               |                   | CG                          | C0G | 18 p            | ±5%                   | 760               | 200               | 0.3±0.03         |      |
| UMK063 CG220JTHF |               |                   | CG                          | C0G | 22 p            | ±5%                   | 840               | 200               | 0.3±0.03         |      |
| UMK063 CG270JTHF |               |                   | CG                          | C0G | 27 p            | ±5%                   | 940               | 200               | 0.3±0.03         |      |
| UMK063 CG330JTHF |               |                   | CG                          | C0G | 33 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG390JTHF |               |                   | CG                          | C0G | 39 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG470JTHF |               |                   | CG                          | C0G | 47 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG560JTHF |               |                   | CG                          | C0G | 56 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG680JTHF |               |                   | CG                          | C0G | 68 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG820JTHF |               |                   | CG                          | C0G | 82 p            | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG101JTHF |               |                   | CG                          | C0G | 100 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG121JTHF |               |                   | CG                          | C0G | 120 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG151JTHF |               |                   | CG                          | C0G | 150 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG181JTHF |               |                   | CG                          | C0G | 180 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| UMK063 CG221JTHF |               |                   | CG                          | C0G | 220 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| TMK063 CG121JTHF |               | 25                | CG                          | C0G | 120 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| TMK063 CG151JTHF |               |                   | CG                          | C0G | 150 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| TMK063 CG181JTHF |               |                   | CG                          | C0G | 180 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |
| TMK063 CG221JTHF |               |                   | CG                          | C0G | 220 p           | ±5%                   | 1000              | 200               | 0.3±0.03         |      |

● 105TYPE (Dimension:1.0×0.5mm JIS:1005 EIA:0402)

【Temperature Characteristic CG : CG/C0G(−55~+125°C)】 0.5mm thickness(V)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics |     | Capacitance [F] | Capacitance tolerance | Q [at 1MHz] (Min) | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----|-----------------|-----------------------|-------------------|-------------------|------------------|------|
|                  |               |                   |                             |     |                 |                       |                   | Rated voltage x % |                  |      |
| UMK105 CG0R5CVHF |               | 50                | CG                          | C0G | 0.5 p           | ±0.25pF               | 410               | 200               | 0.5±0.05         |      |
| UMK105 CG010CVHF |               |                   | CG                          | C0G | 1 p             | ±0.25pF               | 420               | 200               | 0.5±0.05         |      |
| UMK105 CG1R5CVHF |               |                   | CG                          | C0G | 1.5 p           | ±0.25pF               | 430               | 200               | 0.5±0.05         |      |
| UMK105 CG020CVHF |               |                   | CG                          | C0G | 2 p             | ±0.25pF               | 440               | 200               | 0.5±0.05         |      |
| UMK105 CG030CVHF |               |                   | CG                          | C0G | 3 p             | ±0.25pF               | 460               | 200               | 0.5±0.05         |      |
| UMK105 CG040CVHF |               |                   | CG                          | C0G | 4 p             | ±0.25pF               | 480               | 200               | 0.5±0.05         |      |
| UMK105 CG050CVHF |               |                   | CG                          | C0G | 5 p             | ±0.25pF               | 500               | 200               | 0.5±0.05         |      |
| UMK105 CG060DVHF |               |                   | CG                          | C0G | 6 p             | ±0.5pF                | 520               | 200               | 0.5±0.05         |      |
| UMK105 CG070DVHF |               |                   | CG                          | C0G | 7 p             | ±0.5pF                | 540               | 200               | 0.5±0.05         |      |
| UMK105 CG080DVHF |               |                   | CG                          | C0G | 8 p             | ±0.5pF                | 560               | 200               | 0.5±0.05         |      |
| UMK105 CG090DVHF |               |                   | CG                          | C0G | 9 p             | ±0.5pF                | 580               | 200               | 0.5±0.05         |      |
| UMK105 CG100DVHF |               |                   | CG                          | C0G | 10 p            | ±0.5pF                | 600               | 200               | 0.5±0.05         |      |
| UMK105 CG120JVHF |               |                   | CG                          | C0G | 12 p            | ±5%                   | 640               | 200               | 0.5±0.05         |      |
| UMK105 CG150JVHF |               |                   | CG                          | C0G | 15 p            | ±5%                   | 700               | 200               | 0.5±0.05         |      |
| UMK105 CG180JVHF |               |                   | CG                          | C0G | 18 p            | ±5%                   | 760               | 200               | 0.5±0.05         |      |
| UMK105 CG220JVHF |               |                   | CG                          | C0G | 22 p            | ±5%                   | 840               | 200               | 0.5±0.05         |      |
| UMK105 CG270JVHF |               |                   | CG                          | C0G | 27 p            | ±5%                   | 940               | 200               | 0.5±0.05         |      |
| UMK105 CG330JVHF |               |                   | CG                          | C0G | 33 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG390JVHF |               |                   | CG                          | C0G | 39 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG470JVHF |               |                   | CG                          | C0G | 47 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG560JVHF |               |                   | CG                          | C0G | 56 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG680JVHF |               |                   | CG                          | C0G | 68 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG820JVHF |               |                   | CG                          | C0G | 82 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG101JVHF |               |                   | CG                          | C0G | 100 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG121JVHF |               |                   | CG                          | C0G | 120 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG151JVHF |               |                   | CG                          | C0G | 150 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG181JVHF |               |                   | CG                          | C0G | 180 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG221JVHF |               |                   | CG                          | C0G | 220 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG271JVHF |               |                   | CG                          | C0G | 270 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG331JVHF |               |                   | CG                          | C0G | 330 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG391JVHF |               |                   | CG                          | C0G | 390 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG471JVHF |               |                   | CG                          | C0G | 470 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG561JVHF |               |                   | CG                          | C0G | 560 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG681JVHF |               |                   | CG                          | C0G | 680 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG821JVHF |               |                   | CG                          | C0G | 820 p           | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| UMK105 CG102JVHF |               |                   | CG                          | C0G | 1000 p          | ±5%                   | 1000              | 200               | 0.5±0.05         |      |

## PART NUMBER

## Medium-High Voltage Multilayer Ceramic Capacitors

● 105TYPE (Dimension:1.0×0.5mm JIS:1005 EIA:0402)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 0.5mm thickness (V)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK105 B7221□VHFE |               | 100               | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7331□VHFE |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7471□VHFE |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7681□VHFE |               |                   | X7R                         | 680 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7102□VHFE |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7152□VHFE |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7222□VHFE |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7332□VHFE |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7472□VHFE |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7682□VHFE |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMK105 B7103□VHFE |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |

● 107TYPE (Dimension:1.6×0.8mm JIS:1608 EIA:0603)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 0.8mm thickness (A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK107 B7102□AHT |               | 100               | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7152□AHT |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7222□AHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7332□AHT |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7472□AHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7682□AHT |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7103□AHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7153□AHT |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7333□AHT |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107AB7683□AHT |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.15/-0.05   |      |
| HMK107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMK107AC7154□AHT |               |                   | X7S                         | 0.15 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.15/-0.05   |      |
| HMK107 C7224□AHT |               |                   | X7S                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 0.8±0.10         |      |

● 212TYPE (Dimension:2.0×1.25mm JIS:2012 EIA:0805)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 1.25mm thickness (G)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK212 B7472□GHT  |               | 100               | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 1.25±0.10        |      |
| HMK212 B7682□GHT  |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 2.5       | 200               | 1.25±0.10        |      |
| HMK212 B7103□GHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7153□GHT  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7333□GHT  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7473□GHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7683□GHT  |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212 B7104□GHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212BB7154□GHTE |               |                   | X7R                         | 0.15 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.20/-0     |      |
| HMK212 B7224□GHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMK212BC7334□GHTE |               |                   | X7S                         | 0.33 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.20/-0     |      |
| HMK212 C7474□GHTE |               |                   | X7S                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.10        |      |
| HMK212CC7684□GHTE |               |                   | X7S                         | 0.68 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.25/-0     |      |
| HMK212BC7105□GHTE |               |                   | X7S                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.25±0.20/-0     |      |
| QMK212 B7472□GHT  |               | 250               | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 150               | 1.25±0.10        |      |
| QMK212 B7682□GHT  |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 2.5       | 150               | 1.25±0.10        |      |
| QMK212 B7103□GHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 150               | 1.25±0.10        |      |
| QMK212 B7153□GHT  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 2.5       | 150               | 1.25±0.10        |      |
| QMK212 B7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 150               | 1.25±0.10        |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.85mm thickness (D)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK212 B7102□DHT |               | 100               | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.85±0.10        |      |
| HMK212 B7152□DHT |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 2.5       | 200               | 0.85±0.10        |      |
| HMK212 B7222□DHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.85±0.10        |      |
| HMK212 B7332□DHT |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 2.5       | 200               | 0.85±0.10        |      |
| QMK212 B7102□DHT |               | 250               | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.10        |      |
| QMK212 B7152□DHT |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.10        |      |
| QMK212 B7222□DHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.10        |      |
| QMK212 B7332□DHT |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.10        |      |



● 316TYPE (Dimension:3.2×1.6mm JIS:3216 EIA:1206)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 1.6mm thickness(L)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK316 B7473□LHT  |               | 100               | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7683□LHT  |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7104□LHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7154□LHT  |               |                   | X7R                         | 0.15 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7224□LHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7334□LHT  |               |                   | X7R                         | 0.33 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7474□LHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316 B7105□LHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMK316BC7155□LHTE |               |                   | X7S                         | 1.5 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |
| HMK316AC7225□LHTE |               |                   | X7S                         | 2.2 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.20         |      |
| QMK316 B7223□LHT  |               | 250               | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| QMK316 B7333□LHT  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| QMK316 B7473□LHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| QMK316 B7683□LHT  |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| QMK316 B7104□LHT  |               | 630               | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 150               | 1.6±0.20         |      |
| SMK316 B7153□LHT  |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 2.5       | 120               | 1.6±0.20         |      |
| SMK316 B7223□LHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 120               | 1.6±0.20         |      |
| SMK316AB7333□LHT  |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 2.5       | 120               | 1.6±0.20         |      |
| SMK316AB7473□LHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 120               | 1.6±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.15mm thickness(F)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| SMK316 B7102□FHT |               | 630               | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7152□FHT |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7222□FHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7332□FHT |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7472□FHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7682□FHT |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMK316 B7103□FHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |

● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 2.5mm thickness(M)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK325 B7225□MHP  |               | 100               | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| HMK325 C7475□MHPE |               |                   | X7S                         | 4.7 μ           | ±10, ±20                  | 3.5       | 150               | 2.5±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.9mm thickness(N)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK325 B7224□NHT |               | 100               | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMK325 B7474□NHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMK325 B7684□NHT |               |                   | X7R                         | 0.68 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMK325 B7105□NHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| QMK325 B7473□NHT |               | 250               | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMK325 B7104□NHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMK325 B7154□NHT |               |                   | X7R                         | 0.15 μ          | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMK325 B7224□NHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| SMK325 B7223□NHT |               | 630               | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 120               | 1.9±0.20         |      |
| SMK325 B7333□NHT |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 2.5       | 120               | 1.9±0.20         |      |
| SMK325 B7473□NHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 120               | 1.9±0.20         |      |

● 432TYPE (Dimension:4.5×3.2mm JIS:4532 EIA:1812)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 2.5mm thickness(M)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMK432 B7474□MHT |               | 100               | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| HMK432 B7105□MHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| HMK432 B7155□MHT |               |                   | X7R                         | 1.5 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| HMK432 B7225□MHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| QMK432 B7104□MHT |               | 250               | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 150               | 2.5±0.20         |      |
| QMK432 B7224□MHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 2.5       | 150               | 2.5±0.20         |      |
| QMK432 B7334□MHT |               |                   | X7R                         | 0.33 μ          | ±10, ±20                  | 2.5       | 150               | 2.5±0.20         |      |
| QMK432 B7474□MHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 2.5       | 150               | 2.5±0.20         |      |
| SMK432 B7473□MHT |               | 630               | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 120               | 2.5±0.20         |      |
| SMK432 B7683□MHT |               |                   | X7R                         | 0.068 μ         | ±10, ±20                  | 2.5       | 120               | 2.5±0.20         |      |
| SMK432 B7104□MHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 120               | 2.5±0.20         |      |



**Medium-High Voltage Multilayer Ceramic Capacitors for High Frequency Applications**

● 105TYPE (Dimension:1.0×0.5mm JIS:1608 EIA:0603)

【Temperature Characteristic CG : CG/C0G (−55~+125°C)】 0.5mm thickness(V)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics |     | Capacitance [F] | Capacitance tolerance | Q [at 1MHz] (Min) | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----|-----------------|-----------------------|-------------------|-------------------|------------------|------|
|                   |               |                   |                             |     |                 |                       |                   | Rated voltage x % |                  |      |
| QVS105 CG0R5[VHF] |               | 250               | CG                          | C0G | 0.5 p           | ±0.1pF, ±0.25pF       | 810               | 200               | 0.5±0.05         |      |
| QVS105 CG0R6[VHF] |               |                   | CG                          | C0G | 0.6 p           | ±0.1pF, ±0.25pF       | 812               | 200               | 0.5±0.05         |      |
| QVS105 CG0R7[VHF] |               |                   | CG                          | C0G | 0.7 p           | ±0.1pF, ±0.25pF       | 814               | 200               | 0.5±0.05         |      |
| QVS105 CGR75[VHF] |               |                   | CG                          | C0G | 0.75 p          | ±0.1pF, ±0.25pF       | 815               | 200               | 0.5±0.05         |      |
| QVS105 CG0R8[VHF] |               |                   | CG                          | C0G | 0.8 p           | ±0.1pF, ±0.25pF       | 816               | 200               | 0.5±0.05         |      |
| QVS105 CG0R9[VHF] |               |                   | CG                          | C0G | 0.9 p           | ±0.1pF, ±0.25pF       | 818               | 200               | 0.5±0.05         |      |
| QVS105 CG010[VHF] |               |                   | CG                          | C0G | 1 p             | ±0.1pF, ±0.25pF       | 820               | 200               | 0.5±0.05         |      |
| QVS105 CG1R1[VHF] |               |                   | CG                          | C0G | 1.1 p           | ±0.1pF, ±0.25pF       | 822               | 200               | 0.5±0.05         |      |
| QVS105 CG1R2[VHF] |               |                   | CG                          | C0G | 1.2 p           | ±0.1pF, ±0.25pF       | 824               | 200               | 0.5±0.05         |      |
| QVS105 CG1R3[VHF] |               |                   | CG                          | C0G | 1.3 p           | ±0.1pF, ±0.25pF       | 826               | 200               | 0.5±0.05         |      |
| QVS105 CG1R5[VHF] |               |                   | CG                          | C0G | 1.5 p           | ±0.1pF, ±0.25pF       | 830               | 200               | 0.5±0.05         |      |
| QVS105 CG1R6[VHF] |               |                   | CG                          | C0G | 1.6 p           | ±0.1pF, ±0.25pF       | 832               | 200               | 0.5±0.05         |      |
| QVS105 CG1R8[VHF] |               |                   | CG                          | C0G | 1.8 p           | ±0.1pF, ±0.25pF       | 836               | 200               | 0.5±0.05         |      |
| QVS105 CG020[VHF] |               |                   | CG                          | C0G | 2 p             | ±0.1pF, ±0.25pF       | 840               | 200               | 0.5±0.05         |      |
| QVS105 CG2R2[VHF] |               |                   | CG                          | C0G | 2.2 p           | ±0.1pF, ±0.25pF       | 844               | 200               | 0.5±0.05         |      |
| QVS105 CG2R4[VHF] |               |                   | CG                          | C0G | 2.4 p           | ±0.1pF, ±0.25pF       | 848               | 200               | 0.5±0.05         |      |
| QVS105 CG2R7[VHF] |               |                   | CG                          | C0G | 2.7 p           | ±0.1pF, ±0.25pF       | 854               | 200               | 0.5±0.05         |      |
| QVS105 CG030[VHF] |               |                   | CG                          | C0G | 3 p             | ±0.1pF, ±0.25pF       | 860               | 200               | 0.5±0.05         |      |
| QVS105 CG3R3[VHF] |               |                   | CG                          | C0G | 3.3 p           | ±0.1pF, ±0.25pF       | 866               | 200               | 0.5±0.05         |      |
| QVS105 CG3R6[VHF] |               |                   | CG                          | C0G | 3.6 p           | ±0.1pF, ±0.25pF       | 872               | 200               | 0.5±0.05         |      |
| QVS105 CG3R9[VHF] |               |                   | CG                          | C0G | 3.9 p           | ±0.1pF, ±0.25pF       | 878               | 200               | 0.5±0.05         |      |
| QVS105 CG4R3[VHF] |               |                   | CG                          | C0G | 4.3 p           | ±0.1pF, ±0.25pF       | 886               | 200               | 0.5±0.05         |      |
| QVS105 CG4R7[VHF] |               |                   | CG                          | C0G | 4.7 p           | ±0.1pF, ±0.25pF       | 894               | 200               | 0.5±0.05         |      |
| QVS105 CG5R1[VHF] |               |                   | CG                          | C0G | 5.1 p           | ±0.25pF, ±0.5pF       | 902               | 200               | 0.5±0.05         |      |
| QVS105 CG5R6[VHF] |               |                   | CG                          | C0G | 5.6 p           | ±0.25pF, ±0.5pF       | 912               | 200               | 0.5±0.05         |      |
| QVS105 CG6R2[VHF] |               |                   | CG                          | C0G | 6.2 p           | ±0.25pF, ±0.5pF       | 924               | 200               | 0.5±0.05         |      |
| QVS105 CG6R8[VHF] |               |                   | CG                          | C0G | 6.8 p           | ±0.25pF, ±0.5pF       | 936               | 200               | 0.5±0.05         |      |
| QVS105 CG7R5[VHF] |               |                   | CG                          | C0G | 7.5 p           | ±0.25pF, ±0.5pF       | 950               | 200               | 0.5±0.05         |      |
| QVS105 CG8R2[VHF] |               |                   | CG                          | C0G | 8.2 p           | ±0.25pF, ±0.5pF       | 964               | 200               | 0.5±0.05         |      |
| QVS105 CG9R1[VHF] |               |                   | CG                          | C0G | 9.1 p           | ±0.25pF, ±0.5pF       | 982               | 200               | 0.5±0.05         |      |
| QVS105 CG100JVHF  |               |                   | CG                          | C0G | 10 p            | ±5%                   | 1000              | 200               | 0.5±0.05         |      |
| QVS105 CG110JVHF  |               |                   | CG                          | C0G | 11 p            | ±5%                   | 1020              | 200               | 0.5±0.05         |      |
| QVS105 CG120JVHF  |               |                   | CG                          | C0G | 12 p            | ±5%                   | 1040              | 200               | 0.5±0.05         |      |
| QVS105 CG130JVHF  |               |                   | CG                          | C0G | 13 p            | ±5%                   | 1060              | 200               | 0.5±0.05         |      |
| QVS105 CG150JVHF  |               |                   | CG                          | C0G | 15 p            | ±5%                   | 1100              | 200               | 0.5±0.05         |      |
| QVS105 CG160JVHF  |               |                   | CG                          | C0G | 16 p            | ±5%                   | 1120              | 200               | 0.5±0.05         |      |
| QVS105 CG180JVHF  |               |                   | CG                          | C0G | 18 p            | ±5%                   | 1160              | 200               | 0.5±0.05         |      |
| QVS105 CG200JVHF  |               |                   | CG                          | C0G | 20 p            | ±5%                   | 1200              | 200               | 0.5±0.05         |      |
| QVS105 CG220JVHF  |               |                   | CG                          | C0G | 22 p            | ±5%                   | 1240              | 200               | 0.5±0.05         |      |
| QVS105 CG240JVHF  |               |                   | CG                          | C0G | 24 p            | ±5%                   | 1280              | 200               | 0.5±0.05         |      |
| QVS105 CG270JVHF  |               |                   | CG                          | C0G | 27 p            | ±5%                   | 1340              | 200               | 0.5±0.05         |      |
| QVS105 CG300JVHF  |               |                   | CG                          | C0G | 30 p            | ±5%                   | 1400              | 200               | 0.5±0.05         |      |
| QVS105 CG330JVHF  |               |                   | CG                          | C0G | 33 p            | ±5%                   | 1400              | 200               | 0.5±0.05         |      |

● 107TYPE (Dimension:1.6×0.8mm JIS:1608 EIA:0603)

【Temperature Characteristic CG : CG/C0G(−55~+125°C)】 0.7mm thickness(C)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance | Q [at 1MHz] (Min) | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|-----------------------|-------------------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                       |                   | Rated voltage x % |                  |      |
| QVS107 CG0R2□CHT |               | 250               | CG C0G                      | 0.2 p           | ±0.05pF, ±0.1pF       | 804               | 200               | 0.7±0.10         |      |
| QVS107 CG0R3□CHT |               |                   | CG C0G                      | 0.3 p           | ±0.05pF, ±0.1pF       | 806               | 200               | 0.7±0.10         |      |
| QVS107 CG0R4□CHT |               |                   | CG C0G                      | 0.4 p           | ±0.05pF, ±0.1pF       | 808               | 200               | 0.7±0.10         |      |
| QVS107 CG0R5□CHT |               |                   | CG C0G                      | 0.5 p           | ±0.1pF, ±0.25pF       | 810               | 200               | 0.7±0.10         |      |
| QVS107 CG0R6□CHT |               |                   | CG C0G                      | 0.6 p           | ±0.1pF, ±0.25pF       | 812               | 200               | 0.7±0.10         |      |
| QVS107 CG0R7□CHT |               |                   | CG C0G                      | 0.7 p           | ±0.1pF, ±0.25pF       | 814               | 200               | 0.7±0.10         |      |
| QVS107 CGR75□CHT |               |                   | CG C0G                      | 0.75 p          | ±0.1pF, ±0.25pF       | 815               | 200               | 0.7±0.10         |      |
| QVS107 CG0R8□CHT |               |                   | CG C0G                      | 0.8 p           | ±0.1pF, ±0.25pF       | 816               | 200               | 0.7±0.10         |      |
| QVS107 CG0R9□CHT |               |                   | CG C0G                      | 0.9 p           | ±0.1pF, ±0.25pF       | 818               | 200               | 0.7±0.10         |      |
| QVS107 CG010□CHT |               |                   | CG C0G                      | 1 p             | ±0.1pF, ±0.25pF       | 820               | 200               | 0.7±0.10         |      |
| QVS107 CG1R1□CHT |               |                   | CG C0G                      | 1.1 p           | ±0.1pF, ±0.25pF       | 822               | 200               | 0.7±0.10         |      |
| QVS107 CG1R2□CHT |               |                   | CG C0G                      | 1.2 p           | ±0.1pF, ±0.25pF       | 824               | 200               | 0.7±0.10         |      |
| QVS107 CG1R3□CHT |               |                   | CG C0G                      | 1.3 p           | ±0.1pF, ±0.25pF       | 826               | 200               | 0.7±0.10         |      |
| QVS107 CG1R5□CHT |               |                   | CG C0G                      | 1.5 p           | ±0.1pF, ±0.25pF       | 830               | 200               | 0.7±0.10         |      |
| QVS107 CG1R6□CHT |               |                   | CG C0G                      | 1.6 p           | ±0.1pF, ±0.25pF       | 832               | 200               | 0.7±0.10         |      |
| QVS107 CG1R8□CHT |               |                   | CG C0G                      | 1.8 p           | ±0.1pF, ±0.25pF       | 836               | 200               | 0.7±0.10         |      |
| QVS107 CG020□CHT |               |                   | CG C0G                      | 2 p             | ±0.1pF, ±0.25pF       | 840               | 200               | 0.7±0.10         |      |
| QVS107 CG2R2□CHT |               |                   | CG C0G                      | 2.2 p           | ±0.1pF, ±0.25pF       | 844               | 200               | 0.7±0.10         |      |
| QVS107 CG2R4□CHT |               |                   | CG C0G                      | 2.4 p           | ±0.1pF, ±0.25pF       | 848               | 200               | 0.7±0.10         |      |
| QVS107 CG2R7□CHT |               |                   | CG C0G                      | 2.7 p           | ±0.1pF, ±0.25pF       | 854               | 200               | 0.7±0.10         |      |
| QVS107 CG030□CHT |               |                   | CG C0G                      | 3 p             | ±0.1pF, ±0.25pF       | 860               | 200               | 0.7±0.10         |      |
| QVS107 CG3R3□CHT |               |                   | CG C0G                      | 3.3 p           | ±0.1pF, ±0.25pF       | 866               | 200               | 0.7±0.10         |      |
| QVS107 CG3R6□CHT |               |                   | CG C0G                      | 3.6 p           | ±0.1pF, ±0.25pF       | 872               | 200               | 0.7±0.10         |      |
| QVS107 CG3R9□CHT |               |                   | CG C0G                      | 3.9 p           | ±0.1pF, ±0.25pF       | 878               | 200               | 0.7±0.10         |      |
| QVS107 CG4R3□CHT |               |                   | CG C0G                      | 4.3 p           | ±0.1pF, ±0.25pF       | 886               | 200               | 0.7±0.10         |      |
| QVS107 CG4R7□CHT |               |                   | CG C0G                      | 4.7 p           | ±0.1pF, ±0.25pF       | 894               | 200               | 0.7±0.10         |      |
| QVS107 CG5R1□CHT |               |                   | CG C0G                      | 5.1 p           | ±0.25pF, ±0.5pF       | 902               | 200               | 0.7±0.10         |      |
| QVS107 CG5R6□CHT |               |                   | CG C0G                      | 5.6 p           | ±0.25pF, ±0.5pF       | 912               | 200               | 0.7±0.10         |      |
| QVS107 CG6R2□CHT |               |                   | CG C0G                      | 6.2 p           | ±0.25pF, ±0.5pF       | 924               | 200               | 0.7±0.10         |      |
| QVS107 CG6R8□CHT |               |                   | CG C0G                      | 6.8 p           | ±0.25pF, ±0.5pF       | 936               | 200               | 0.7±0.10         |      |
| QVS107 CG7R5□CHT |               |                   | CG C0G                      | 7.5 p           | ±0.25pF, ±0.5pF       | 950               | 200               | 0.7±0.10         |      |
| QVS107 CG8R2□CHT |               |                   | CG C0G                      | 8.2 p           | ±0.25pF, ±0.5pF       | 964               | 200               | 0.7±0.10         |      |
| QVS107 CG9R1□CHT |               |                   | CG C0G                      | 9.1 p           | ±0.25pF, ±0.5pF       | 982               | 200               | 0.7±0.10         |      |
| QVS107 CG100□CHT |               |                   | CG C0G                      | 10 p            | ±2%, ±5%              | 1000              | 200               | 0.7±0.10         |      |
| QVS107 CG110JCHT |               |                   | CG C0G                      | 11 p            | ±5%                   | 1020              | 200               | 0.7±0.10         |      |
| QVS107 CG120JCHT |               |                   | CG C0G                      | 12 p            | ±5%                   | 1040              | 200               | 0.7±0.10         |      |
| QVS107 CG130JCHT |               |                   | CG C0G                      | 13 p            | ±5%                   | 1060              | 200               | 0.7±0.10         |      |
| QVS107 CG150JCHT |               |                   | CG C0G                      | 15 p            | ±5%                   | 1100              | 200               | 0.7±0.10         |      |
| QVS107 CG160JCHT |               |                   | CG C0G                      | 16 p            | ±5%                   | 1120              | 200               | 0.7±0.10         |      |
| QVS107 CG180JCHT |               |                   | CG C0G                      | 18 p            | ±5%                   | 1160              | 200               | 0.7±0.10         |      |
| QVS107 CG200JCHT |               |                   | CG C0G                      | 20 p            | ±5%                   | 1200              | 200               | 0.7±0.10         |      |
| QVS107 CG220JCHT |               |                   | CG C0G                      | 22 p            | ±5%                   | 1240              | 200               | 0.7±0.10         |      |
| QVS107 CG240JCHT |               |                   | CG C0G                      | 24 p            | ±5%                   | 1280              | 200               | 0.7±0.10         |      |
| QVS107 CG270JCHT |               |                   | CG C0G                      | 27 p            | ±5%                   | 1340              | 200               | 0.7±0.10         |      |
| QVS107 CG300JCHT |               |                   | CG C0G                      | 30 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG330JCHT |               |                   | CG C0G                      | 33 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG360JCHT |               |                   | CG C0G                      | 36 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG390JCHT |               |                   | CG C0G                      | 39 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG430JCHT |               |                   | CG C0G                      | 43 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG470JCHT |               |                   | CG C0G                      | 47 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG510JCHT |               |                   | CG C0G                      | 51 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG560JCHT |               |                   | CG C0G                      | 56 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG620JCHT |               |                   | CG C0G                      | 62 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG680JCHT |               |                   | CG C0G                      | 68 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG750JCHT |               |                   | CG C0G                      | 75 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG820JCHT |               |                   | CG C0G                      | 82 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG910JCHT |               |                   | CG C0G                      | 91 p            | ±5%                   | 1400              | 200               | 0.7±0.10         |      |
| QVS107 CG101JCHT |               |                   | CG C0G                      | 100 p           | ±5%                   | 1400              | 200               | 0.7±0.10         |      |

● 212TYPE (Dimension:2.0×1.25mm JIS:2012 EIA:0805)

【Temperature Characteristic CG : CG/C0G(−55~+125°C)】 0.85mm thickness(D)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance | Q [at 1MHz] (Min) | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|-----------------------|-------------------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                       |                   | Rated voltage x % |                  |      |
| QVS212 CG0R3[DHT] |               | 250               | CG C0G                      | 0.3 p           | ±0.1pF, ±0.25pF       | 806               | 200               | 0.85±0.10        |      |
| QVS212 CG0R4[DHT] |               |                   | CG C0G                      | 0.4 p           | ±0.1pF, ±0.25pF       | 808               | 200               | 0.85±0.10        |      |
| QVS212 CG0R5[DHT] |               |                   | CG C0G                      | 0.5 p           | ±0.1pF, ±0.25pF       | 810               | 200               | 0.85±0.10        |      |
| QVS212 CG0R6[DHT] |               |                   | CG C0G                      | 0.6 p           | ±0.1pF, ±0.25pF       | 812               | 200               | 0.85±0.10        |      |
| QVS212 CG0R7[DHT] |               |                   | CG C0G                      | 0.7 p           | ±0.1pF, ±0.25pF       | 814               | 200               | 0.85±0.10        |      |
| QVS212 CGR75[DHT] |               |                   | CG C0G                      | 0.75 p          | ±0.1pF, ±0.25pF       | 815               | 200               | 0.85±0.10        |      |
| QVS212 CG0R8[DHT] |               |                   | CG C0G                      | 0.8 p           | ±0.1pF, ±0.25pF       | 816               | 200               | 0.85±0.10        |      |
| QVS212 CG0R9[DHT] |               |                   | CG C0G                      | 0.9 p           | ±0.1pF, ±0.25pF       | 818               | 200               | 0.85±0.10        |      |
| QVS212 CG010[DHT] |               |                   | CG C0G                      | 1 p             | ±0.1pF, ±0.25pF       | 820               | 200               | 0.85±0.10        |      |
| QVS212 CG1R1[DHT] |               |                   | CG C0G                      | 1.1 p           | ±0.1pF, ±0.25pF       | 822               | 200               | 0.85±0.10        |      |
| QVS212 CG1R2[DHT] |               |                   | CG C0G                      | 1.2 p           | ±0.1pF, ±0.25pF       | 824               | 200               | 0.85±0.10        |      |
| QVS212 CG1R3[DHT] |               |                   | CG C0G                      | 1.3 p           | ±0.1pF, ±0.25pF       | 826               | 200               | 0.85±0.10        |      |
| QVS212 CG1R5[DHT] |               |                   | CG C0G                      | 1.5 p           | ±0.1pF, ±0.25pF       | 830               | 200               | 0.85±0.10        |      |
| QVS212 CG1R6[DHT] |               |                   | CG C0G                      | 1.6 p           | ±0.1pF, ±0.25pF       | 832               | 200               | 0.85±0.10        |      |
| QVS212 CG1R8[DHT] |               |                   | CG C0G                      | 1.8 p           | ±0.1pF, ±0.25pF       | 836               | 200               | 0.85±0.10        |      |
| QVS212 CG020[DHT] |               |                   | CG C0G                      | 2 p             | ±0.1pF, ±0.25pF       | 840               | 200               | 0.85±0.10        |      |
| QVS212 CG2R2[DHT] |               |                   | CG C0G                      | 2.2 p           | ±0.1pF, ±0.25pF       | 844               | 200               | 0.85±0.10        |      |
| QVS212 CG2R4[DHT] |               |                   | CG C0G                      | 2.4 p           | ±0.1pF, ±0.25pF       | 848               | 200               | 0.85±0.10        |      |
| QVS212 CG2R7[DHT] |               |                   | CG C0G                      | 2.7 p           | ±0.1pF, ±0.25pF       | 854               | 200               | 0.85±0.10        |      |
| QVS212 CG030[DHT] |               |                   | CG C0G                      | 3 p             | ±0.1pF, ±0.25pF       | 860               | 200               | 0.85±0.10        |      |
| QVS212 CG3R3[DHT] |               |                   | CG C0G                      | 3.3 p           | ±0.1pF, ±0.25pF       | 866               | 200               | 0.85±0.10        |      |
| QVS212 CG3R6[DHT] |               |                   | CG C0G                      | 3.6 p           | ±0.1pF, ±0.25pF       | 872               | 200               | 0.85±0.10        |      |
| QVS212 CG3R9[DHT] |               |                   | CG C0G                      | 3.9 p           | ±0.1pF, ±0.25pF       | 878               | 200               | 0.85±0.10        |      |
| QVS212 CG4R3[DHT] |               |                   | CG C0G                      | 4.3 p           | ±0.1pF, ±0.25pF       | 886               | 200               | 0.85±0.10        |      |
| QVS212 CG4R7[DHT] |               |                   | CG C0G                      | 4.7 p           | ±0.1pF, ±0.25pF       | 894               | 200               | 0.85±0.10        |      |
| QVS212 CG5R1[DHT] |               |                   | CG C0G                      | 5.1 p           | ±0.25pF, ±0.5pF       | 902               | 200               | 0.85±0.10        |      |
| QVS212 CG5R6[DHT] |               |                   | CG C0G                      | 5.6 p           | ±0.25pF, ±0.5pF       | 912               | 200               | 0.85±0.10        |      |
| QVS212 CG6R2[DHT] |               |                   | CG C0G                      | 6.2 p           | ±0.25pF, ±0.5pF       | 924               | 200               | 0.85±0.10        |      |
| QVS212 CG6R8[DHT] |               |                   | CG C0G                      | 6.8 p           | ±0.25pF, ±0.5pF       | 936               | 200               | 0.85±0.10        |      |
| QVS212 CG7R5[DHT] |               |                   | CG C0G                      | 7.5 p           | ±0.25pF, ±0.5pF       | 950               | 200               | 0.85±0.10        |      |
| QVS212 CG8R2[DHT] |               |                   | CG C0G                      | 8.2 p           | ±0.25pF, ±0.5pF       | 964               | 200               | 0.85±0.10        |      |
| QVS212 CG9R1[DHT] |               |                   | CG C0G                      | 9.1 p           | ±0.25pF, ±0.5pF       | 982               | 200               | 0.85±0.10        |      |
| QVS212 CG100JDHT  |               |                   | CG C0G                      | 10 p            | ±5%                   | 1000              | 200               | 0.85±0.10        |      |
| QVS212 CG110JDHT  |               |                   | CG C0G                      | 11 p            | ±5%                   | 1020              | 200               | 0.85±0.10        |      |
| QVS212 CG120JDHT  |               |                   | CG C0G                      | 12 p            | ±5%                   | 1040              | 200               | 0.85±0.10        |      |
| QVS212 CG130JDHT  |               |                   | CG C0G                      | 13 p            | ±5%                   | 1060              | 200               | 0.85±0.10        |      |
| QVS212 CG150JDHT  |               |                   | CG C0G                      | 15 p            | ±5%                   | 1100              | 200               | 0.85±0.10        |      |
| QVS212 CG160JDHT  |               |                   | CG C0G                      | 16 p            | ±5%                   | 1120              | 200               | 0.85±0.10        |      |
| QVS212 CG180JDHT  |               |                   | CG C0G                      | 18 p            | ±5%                   | 1160              | 200               | 0.85±0.10        |      |
| QVS212 CG200JDHT  |               |                   | CG C0G                      | 20 p            | ±5%                   | 1200              | 200               | 0.85±0.10        |      |
| QVS212 CG220JDHT  |               |                   | CG C0G                      | 22 p            | ±5%                   | 1240              | 200               | 0.85±0.10        |      |
| QVS212 CG240JDHT  |               |                   | CG C0G                      | 24 p            | ±5%                   | 1280              | 200               | 0.85±0.10        |      |
| QVS212 CG270JDHT  |               |                   | CG C0G                      | 27 p            | ±5%                   | 1340              | 200               | 0.85±0.10        |      |
| QVS212 CG300JDHT  |               |                   | CG C0G                      | 30 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG330JDHT  |               |                   | CG C0G                      | 33 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG360JDHT  |               |                   | CG C0G                      | 36 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG390JDHT  |               |                   | CG C0G                      | 39 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG430JDHT  |               |                   | CG C0G                      | 43 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG470JDHT  |               |                   | CG C0G                      | 47 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG510JDHT  |               |                   | CG C0G                      | 51 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG560JDHT  |               |                   | CG C0G                      | 56 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG620JDHT  |               |                   | CG C0G                      | 62 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG680JDHT  |               |                   | CG C0G                      | 68 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG750JDHT  |               |                   | CG C0G                      | 75 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG820JDHT  |               |                   | CG C0G                      | 82 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG910JDHT  |               |                   | CG C0G                      | 91 p            | ±5%                   | 1400              | 200               | 0.85±0.10        |      |
| QVS212 CG101JDHT  |               |                   | CG C0G                      | 100 p           | ±5%                   | 1400              | 200               | 0.85±0.10        |      |

## Soft Termination Multilayer Ceramic Capacitors

● 107TYPE (Dimension:1.6×0.8mm JIS:1608 EIA:0603)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.8mm thickness(A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| TMJ107BB7473□AHT |               | 25                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| TMJ107BB7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| TMJ107BB7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| TMJ107BB7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| TMJ107CB7105□AHR |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8+0.25/-0      |      |
| GMJ107BB7473□AHT |               | 35                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| GMJ107BB7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| GMJ107BB7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| GMJ107BB7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8+0.20/-0      |      |
| GMJ107CB7105□AHR |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8+0.25/-0      |      |
| UMJ107AB7102□AHT |               | 50                | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.15/-0.05   |      |
| UMJ107AB7222□AHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.15/-0.05   |      |
| UMJ107BB7472□AHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| UMJ107BB7103□AHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| UMJ107BB7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| UMJ107BB7473□AHT |               | 100               | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| UMJ107BB7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| HMJ107AB7102□AHT |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.15/-0.05   |      |
| HMJ107AB7222□AHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.15/-0.05   |      |
| HMJ107BB7472□AHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| HMJ107BB7103□AHT |               | 100               | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| HMJ107BB7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| HMJ107BB7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |
| HMJ107BB7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8+0.20/-0      |      |

● 212TYPE (Dimension:2.0×1.25mm JIS:2012 EIA:0805)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 0.85mm thickness(D)、1.25mm thickness(G)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| JMJ212CB7106□GHT  |               | 6.3               | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| EMJ212CB7225□GHT  |               | 16                | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| EMJ212CB7475□GHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| TMJ212CB7225□GHT  |               | 25                | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| GMJ212CB7105□GHT  |               | 35                | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| UMJ212BB7103□GHT  |               | 50                | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| UMJ212BB7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| UMJ212BB7473□GHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| UMJ212BB7104□GHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| UMJ212BB7224□GHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| UMJ212CC7474□GHTE |               | 50                | X7S                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25+0.25/-0     |      |
| UMJ212CB7105□GHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25+0.25/-0     |      |
| HMJ212KB7102□DHT  |               | 100               | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.85±0.15        |      |
| HMJ212KB7222□DHT  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.85±0.15        |      |
| HMJ212BB7472□GHT  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212BB7103□GHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212BB7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212BB7473□GHT  |               | 100               | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212BB7104□GHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212BB7224□GHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25+0.20/-0     |      |
| HMJ212CC7474□GHTE |               |                   | X7S                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25+0.25/-0     |      |
| HMJ212DC7105□GHTE |               |                   | X7S                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.25+0.30/-0     |      |
| QMJ212KB7102□DHT  |               | 250               | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.15        |      |
| QMJ212KB7222□DHT  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 150               | 0.85±0.15        |      |
| QMJ212BB7472□GHT  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 150               | 1.25+0.20/-0     |      |
| QMJ212BB7103□GHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 150               | 1.25+0.20/-0     |      |
| QMJ212BB7223□GHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 150               | 1.25+0.20/-0     |      |

## PART NUMBER

● 316TYPE (Dimension:3.2×1.6mm JIS:3216 EIA:1206)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 1.15mm thickness(F)、1.6mm thickness(L)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| LMJ316BB7226□LHT  |               | 10                | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| EMJ316BB7475□LHT  |               | 16                | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| EMJ316BB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| TMJ316BB7474□LHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| TMJ316BB7475□LHT  |               | 25                | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| TMJ316BB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| GMJ316BB7474□LHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| GMJ316AB7225□LHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| GMJ316BB7475□LHT  |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| GMJ316BB7106□LHT  |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.30         |      |
| UMJ316BB7473□LHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| UMJ316BB7104□LHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| UMJ316BB7224□LHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| UMJ316BB7474□LHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| UMJ316BB7105□LHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| UMJ316AB7225□LHT  |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| UMJ316BC7475□LHTE |               |                   | X7S                         | 4.7 μ           | ±10, ±20                  | 2.5       | 150               | 1.6±0.30         |      |
| HMJ316 B7102□FHT  |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 1.15±0.10        |      |
| HMJ316 B7222□FHT  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 1.15±0.10        |      |
| HMJ316 B7472□FHT  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 1.15±0.10        |      |
| HMJ316KB7103□FHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.15±0.20        |      |
| HMJ316BB7223□LHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| HMJ316BB7473□LHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| HMJ316BB7104□LHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.30         |      |
| HMJ316BC7225□LHTE |               |                   | X7S                         | 2.2 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |
| QMJ316 B7102□FHT  |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 150               | 1.15±0.10        |      |
| QMJ316 B7222□FHT  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 150               | 1.15±0.10        |      |
| QMJ316 B7472□FHT  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 150               | 1.15±0.10        |      |
| QMJ316KB7103□FHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 150               | 1.15±0.20        |      |
| QMJ316BB7223□LHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.30         |      |
| QMJ316BB7473□LHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 150               | 1.6±0.30         |      |
| QMJ316BB7104□LHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 150               | 1.6±0.30         |      |
| SMJ316 B7102□FHT  |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMJ316 B7222□FHT  |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMJ316 B7472□FHT  |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 120               | 1.15±0.10        |      |
| SMJ316KB7103□FHT  |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 120               | 1.15±0.20        |      |
| SMJ316BB7223□LHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 120               | 1.6±0.30         |      |

● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic B7 : X7R(−55~+125°C), C7 : X7S(−55~+125°C)】 1.9mm thickness(N)、2.5mm thickness(M)

| Part number 1     | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|-------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                   |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| JMJ325KB7476□MHHP |               | 6.3               | X7R                         | 47 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| EMJ325KB7226□MHHP |               | 16                | X7R                         | 22 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| TMJ325AB7475□MHHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 2.5±0.30         |      |
| TMJ325KB7106□MHHP |               | 25                | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| GMJ325AB7475□MHHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 2.5±0.30         |      |
| GMJ325KB7106□MHHP |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| UMJ325AB7225□MHHP |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.30         |      |
| UMJ325AB7475□MHHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 2.5±0.30         |      |
| UMJ325KB7106□MHHP |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.30         |      |
| HMJ325 B7223□NHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325 B7473□NHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325 B7104□NHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325 B7224□NHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325 B7474□NHT  |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325 B7105□NHT  |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMJ325AB7225□MHHP |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.30         |      |
| HMJ325KC7475□MHPE |               |                   | X7S                         | 4.7 μ           | ±10, ±20                  | 3.5       | 150               | 2.5±0.30         |      |
| QMJ325 B7223□NHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMJ325 B7473□NHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMJ325 B7104□NHT  |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| QMJ325 B7224□NHT  |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 2.5       | 150               | 1.9±0.20         |      |
| SMJ325 B7223□NHT  |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 120               | 1.9±0.20         |      |
| SMJ325 B7473□NHT  |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 120               | 1.9±0.20         |      |

**LW Reversal Decoupling Capacitors (LWDC™)**

● 105TYPE (Dimension:0.52×1.0mm JIS:0510 EIA:0204)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.3mm thickness(P)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| TWK105 BJ104MPHF |               | 25                | X5R                         | 0.1 μ           | ±20                       | 5         | 150               | 0.3±0.05         |      |
| EWK105 BJ224MPHF |               | 16                | X5R                         | 0.22 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| LWK105 BJ474MPHF |               | 10                | X5R                         | 0.47 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| AWK105 BJ105MPHF |               | 4                 | X5R                         | 1 μ             | ±20                       | 10        | 150               | 0.3±0.05         |      |

【Temperature Characteristic C6 : X6S(−55~+105°C), C7 : X7S(−55~+125°C)】 0.3mm thickness(P)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| EWK105 C6104MPHF |               | 16                | X6S                         | 0.1 μ           | ±20                       | 5         | 150               | 0.3±0.05         |      |
| LWK105 C7104MPHF |               | 10                | X7S                         | 0.1 μ           | ±20                       | 5         | 150               | 0.3±0.05         |      |
| LWK105 C6224MPHF |               |                   | X6S                         | 0.22 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| JWK105 C7104MPHF |               |                   | X7S                         | 0.1 μ           | ±20                       | 5         | 150               | 0.3±0.05         |      |
| JWK105 C7224MPHF |               | 6.3               | X7S                         | 0.22 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| JWK105 C6474MPHF |               |                   | X6S                         | 0.47 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| AWK105 C7224MPHF |               | 4                 | X7S                         | 0.22 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |
| AWK105 C6474MPHF |               |                   | X6S                         | 0.47 μ          | ±20                       | 10        | 150               | 0.3±0.05         |      |

● 107TYPE (Dimension:0.8×1.6mm JIS:0816 EIA:0306)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.5mm thickness(V)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| LWK107 BJ105MVHT |               | 10                | X5R                         | 1 μ             | ±20                       | 10        | 150               | 0.5±0.05         |      |
| JWK107 BJ225MVHT |               | 6.3               | X5R                         | 2.2 μ           | ±20                       | 10        | 150               | 0.5±0.05         |      |
| JWK107 BJ475MVHT |               |                   | X5R                         | 4.7 μ           | ±20                       | 10        | 150               | 0.5±0.05         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C), C6 : X6S(−55~+105°C), C7 : X7S(−55~+125°C)】 0.5mm thickness(V)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| TWK107 B7104MVHT |               | 25                | X7R                         | 0.1 μ           | ±20                       | 5         | 150               | 0.5±0.05         |      |
| EWK107 B7224MVHT |               | 16                | X7R                         | 0.22 μ          | ±20                       | 5         | 150               | 0.5±0.05         |      |
| EWK107 B7474MVHT |               |                   | X7R                         | 0.47 μ          | ±20                       | 5         | 150               | 0.5±0.05         |      |
| LWK107 B7474MVHT |               | 10                | X7R                         | 0.47 μ          | ±20                       | 5         | 150               | 0.5±0.05         |      |
| JWK107 C7105MVHT |               | 6.3               | X7S                         | 1 μ             | ±20                       | 10        | 150               | 0.5±0.05         |      |
| AWK107 C6225MVHT |               | 4                 | X6S                         | 2.2 μ           | ±20                       | 10        | 150               | 0.5±0.05         |      |
| AWK107 C6475MVHT |               |                   | X6S                         | 4.7 μ           | ±20                       | 10        | 150               | 0.5±0.05         |      |

● 212TYPE (Dimension:1.25×2.0mm JIS:1220 EIA:0508)

【Temperature Characteristic BJ : X5R(−55~+85°C)】 0.85mm thickness(D)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| LWK212 BJ475□DHT |               | 10                | X5R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.85±0.10        |      |
| JWK212 BJ106MDHT |               | 6.3               | X5R                         | 10 μ            | ±20                       | 10        | 150               | 0.85±0.10        |      |
| AWK212 BJ226MDHT |               | 4                 | X5R                         | 22 μ            | ±20                       | 10        | 150               | 0.85±0.10        |      |

【Temperature Characteristic C6 : X6S(−55~+105°C)】 0.85mm thickness(D)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| JWK212 C6475□DHT |               | 6.3               | X6S                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 0.85±0.10        |      |

## PART NUMBER

- All the Multilayer Ceramic Capacitors of the catalog lineup are RoHS compliant.
- Capacitance tolerance code is applied to □ of part number.
- All the Multilayer Ceramic Capacitors in the catalog lineup are applicable for reflow-soldering.

## Notes)

- The exchange of individual specifications is necessary depending on your application and/or circuit condition. Please contact TAIYO YUDEN's official sales channel.
- For Automotive (AEC-Q200 Qualified) products for POWERTRAIN, and SAFETY. Please check "Automotive Application Guide" for further details before using the products.  
 < AEC-Q200 :AEC-Q200 qualified>  
 All the Multilayer Ceramic Capacitors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 family item.  
 125°C products: AEC-Q200 Grade1 (we conduct the evaluation at the test condition of Grade1.)  
 Please consult with TAIYO YUDEN's official sales channel for the details of the product specifications and AEC-Q200 test results, etc.,  
 and please review and approve the product specifications before ordering.
- \*: For standard case size, please kindly refer to ④Dimension, ⑤Dimension tolerance, ⑨Thickness and STANDARD EXTERNAL DIMENSIONS.

## High Reliability Application Multilayer Ceramic Capacitors

● 105TYPE (Dimension:1.0×0.5mm JIS:1005 EIA:0402)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.5mm thickness(V)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMF105 B7102□VHF |               | 50                | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMF105 B7222□VHF |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| UMF105 B7472□VHF |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 150               | 0.5±0.05         |      |
| UMF105 B7103□VHF |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| TMF105 B7102□VHF |               | 25                | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| TMF105 B7222□VHF |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| TMF105 B7472□VHF |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| TMF105 B7103□VHF |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| TMF105 B7223□VHF |               | 16                | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| TMF105 B7473□VHF |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| EMF105 B7102□VHF |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| EMF105 B7222□VHF |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| EMF105 B7472□VHF |               | 10                | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| EMF105 B7103□VHF |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| EMF105 B7223□VHF |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| EMF105 B7473□VHF |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| EMF105 B7104□VHF |               | 10                | X7R                         | 0.1 μ           | ±10, ±20                  | 5         | 150               | 0.5±0.05         |      |
| LMF105 B7102□VHF |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| LMF105 B7222□VHF |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| LMF105 B7472□VHF |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 0.5±0.05         |      |
| LMF105 B7103□VHF |               | 10                | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| LMF105 B7223□VHF |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| LMF105 B7473□VHF |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| LMF105 B7104□VHF |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 5         | 200               | 0.5±0.05         |      |

● 107TYPE (Dimension:1.6×0.8mm JIS:1608 EIA:0603)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.8mm thickness(A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| UMF107 B7223□AHT |               | 50                | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMF107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMF107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMF107 B7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMF107 B7473□AHT |               | 25                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMF107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| TMF107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| TMF107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| EMF107 B7223□AHT |               | 16                | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| EMF107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| EMF107 B7104□AHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| EMF107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 5         | 200               | 0.8±0.10         |      |
| EMF107 B7474□AHT |               | 10                | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| EMF107 B7105□AHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMF107 B7223□AHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| LMF107 B7473□AHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| LMF107 B7104□AHT |               | 10                | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| LMF107 B7224□AHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 5         | 200               | 0.8±0.10         |      |
| LMF107 B7474□AHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |
| LMF107 B7105□AHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.8±0.10         |      |

► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our product specification sheets. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (<http://www.ty-top.com/>).



● 212TYPE (Dimension:2.0×1.25mm JIS:2012 EIA:0805)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.25mm thickness(G)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMF212 B7103□GHT |               | 100               | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMF212 B7223□GHT |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMF212 B7473□GHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMF212 B7104□GHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| HMF212 B7224□GHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7103□GHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7223□GHT |               | 50                | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7473□GHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7104□GHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7224□GHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| UMF212 B7105□GHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| TMF212 B7103□GHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7223□GHT |               | 25                | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7473□GHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7104□GHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7224□GHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7474□GHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| TMF212 B7105□GHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 200               | 1.25±0.10        |      |
| TMF212 B7225□GHT |               | 16                | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| EMF212 B7473□GHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMF212 B7104□GHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMF212 B7224□GHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMF212 B7474□GHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| EMF212 B7105□GHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 10        | 200               | 1.25±0.10        |      |
| EMF212 B7225□GHT |               | 10                | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 200               | 1.25±0.10        |      |
| EMF212AB7475□GHT |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |
| LMF212 B7473□GHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| LMF212 B7104□GHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| LMF212 B7224□GHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| LMF212 B7474□GHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.25±0.10        |      |
| LMF212 B7105□GHT |               | 6.3               | X7R                         | 1 μ             | ±10, ±20                  | 10        | 200               | 1.25±0.10        |      |
| LMF212 B7225□GHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 10        | 200               | 1.25±0.10        |      |
| LMF212 B7475□GHT |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.25±0.10        |      |
| JMF212AB7106□GHT |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.25±0.15/-0.05  |      |

● 316TYPE (Dimension:3.2×1.6mm JIS:3216 EIA:1206)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.15mm thickness(F)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMF316 B7102□FHT |               | 100               | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| HMF316 B7222□FHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| HMF316 B7472□FHT |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| HMF316 B7103□FHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| UMF316 B7102□FHT |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| UMF316 B7222□FHT |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| UMF316 B7472□FHT |               | 50                | X7R                         | 4700 p          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |
| UMF316 B7103□FHT |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 2.5       | 200               | 1.15±0.10        |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.6mm thickness(L)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMF316 B7104□LHT |               | 100               | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| HMF316 B7224□LHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 150               | 1.6±0.20         |      |
| HMF316 B7474□LHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.6±0.20         |      |
| UMF316 B7104□LHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMF316 B7224□LHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMF316 B7474□LHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| UMF316 B7105□LHT |               | 50                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.6±0.20         |      |
| TMF316 B7104□LHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMF316 B7224□LHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMF316 B7474□LHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMF316 B7105□LHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMF316 B7225□LHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| TMF316AB7475□LHT |               | 25                | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| EMF316 B7224□LHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMF316 B7474□LHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMF316 B7105□LHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMF316 B7225□LHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| EMF316AB7475□LHT |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 200               | 1.6±0.20         |      |
| EMF316AB7106□LHT |               | 16                | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| LMF316 B7224□LHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| LMF316 B7474□LHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| LMF316 B7105□LHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| LMF316 B7225□LHT |               |                   | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 1.6±0.20         |      |
| LMF316AB7475□LHT |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 10        | 200               | 1.6±0.20         |      |
| LMF316AB7106□LHT |               | 10                | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 1.6±0.20         |      |
| JMF316AB7106□LHT |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 200               | 1.6±0.20         |      |



● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 2.5mm thickness (M)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMF325 B7225□MHP |               | 100               | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 150               | 2.5±0.20         |      |
| UMF325 B7225□MHP |               | 50                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| UMF325 B7475□MHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 150               | 2.5±0.20         |      |
| TMF325 B7225□MHP |               | 25                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| TMF325 B7475□MHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 200               | 2.5±0.20         |      |
| TMF325 B7106□MHP |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 150               | 2.5±0.20         |      |
| EMF325 B7225□MHP |               | 16                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| EMF325 B7475□MHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 200               | 2.5±0.20         |      |
| EMF325 B7106□MHP |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 200               | 2.5±0.20         |      |
| LMF325 B7225□MHP |               | 10                | X7R                         | 2.2 μ           | ±10, ±20                  | 3.5       | 200               | 2.5±0.20         |      |
| LMF325 B7475□MHP |               |                   | X7R                         | 4.7 μ           | ±10, ±20                  | 5         | 200               | 2.5±0.20         |      |
| LMF325 B7106□MHP |               |                   | X7R                         | 10 μ            | ±10, ±20                  | 10        | 200               | 2.5±0.20         |      |

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.9mm thickness (N)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMF325 B7223□NHT |               | 100               | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 200               | 1.9±0.20         |      |
| HMF325 B7473□NHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 200               | 1.9±0.20         |      |
| HMF325 B7104□NHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| HMF325 B7224□NHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| UMF325 B7223□NHT |               | 50                | X7R                         | 0.022 μ         | ±10, ±20                  | 2.5       | 200               | 1.9±0.20         |      |
| UMF325 B7473□NHT |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 2.5       | 200               | 1.9±0.20         |      |
| UMF325 B7104□NHT |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| UMF325 B7224□NHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| UMF325 B7474□NHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| UMF325 B7105□NHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| TMF325 B7224□NHT |               | 25                | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| TMF325 B7474□NHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| TMF325 B7105□NHT |               | 16                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| EMF325 B7224□NHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| EMF325 B7474□NHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| EMF325 B7105□NHT |               | 10                | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| LMF325 B7224□NHT |               |                   | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| LMF325 B7474□NHT |               |                   | X7R                         | 0.47 μ          | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |
| LMF325 B7105□NHT |               |                   | X7R                         | 1 μ             | ±10, ±20                  | 3.5       | 200               | 1.9±0.20         |      |

## High Reliability Application Multilayer Ceramic Capacitors (Cu external electrode products)

● 063TYPE (Dimension:0.6×0.3mm JIS:1005 EIA:0402)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.3mm thickness(P)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| TMR063 B7101□P-F |               | 25                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7151□P-F |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7221□P-F |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7331□P-F |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7471□P-F |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7102□P-F |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| TMR063 B7152□P-F |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| TMR063 B7222□P-F |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| TMR063 B7332□P-F |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMR063 B7101□P-F |               | 16                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7151□P-F |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7221□P-F |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7331□P-F |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7471□P-F |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7102□P-F |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| EMR063 B7152□P-F |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMR063 B7222□P-F |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| EMR063 B7332□P-F |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7101□P-F |               | 10                | X7R                         | 100 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7151□P-F |               |                   | X7R                         | 150 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7221□P-F |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7331□P-F |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7471□P-F |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7102□P-F |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.3±0.03         |      |
| LMR063 B7152□P-F |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7222□P-F |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7332□P-F |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7472□P-F |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7682□P-F |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |
| LMR063 B7103□P-F |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 5         | 200               | 0.3±0.03         |      |

● 105TYPE (Dimension:1.0×0.5mm JIS:1608 EIA:0603)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.5mm thickness(V)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMR105 B7221□V-F |               | 100               | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7331□V-F |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7471□V-F |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7681□V-F |               |                   | X7R                         | 680 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7102□V-F |               |                   | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7152□V-F |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7222□V-F |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7332□V-F |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7472□V-F |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7682□V-F |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| HMR105 B7103□V-F |               | 50                | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7221□V-F |               |                   | X7R                         | 220 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7331□V-F |               |                   | X7R                         | 330 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7471□V-F |               |                   | X7R                         | 470 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7681□V-F |               |                   | X7R                         | 680 p           | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7153□V-F |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7223□V-F |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.5±0.05         |      |
| UMR105 B7333□V-F |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| UMR105 B7473□V-F |               |                   | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 150               | 0.5±0.05         |      |
| JMR105CD7105□V-F |               | 6.3               | X7R                         | 1 μ             | ±10, ±20                  | 10        | 150               | 0.5+0.2/-0       |      |

● 107TYPE (Dimension:1.6×0.8mm JIS:2012 EIA:0805)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 0.8mm thickness(A)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMR107 B7102□A-T |               | 100               | X7R                         | 1000 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7152□A-T |               |                   | X7R                         | 1500 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7222□A-T |               |                   | X7R                         | 2200 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7332□A-T |               |                   | X7R                         | 3300 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7472□A-T |               |                   | X7R                         | 4700 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7682□A-T |               |                   | X7R                         | 6800 p          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7103□A-T |               |                   | X7R                         | 0.01 μ          | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7153□A-T |               |                   | X7R                         | 0.015 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7223□A-T |               |                   | X7R                         | 0.022 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7333□A-T |               |                   | X7R                         | 0.033 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107 B7473□A-T |               | 50                | X7R                         | 0.047 μ         | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| HMR107AB7104□A-T |               |                   | X7R                         | 0.1 μ           | ±10, ±20                  | 3.5       | 200               | 0.8±0.10         |      |
| UMR107AC7224□A-T |               | 50                | X7R                         | 0.22 μ          | ±10, ±20                  | 3.5       | 200               | 0.8+0.15/-0.05   |      |

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## PART NUMBER

● 212TYPE (Dimension:3.2×1.6mm JIS:3216 EIA:1206)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.15mm thickness(F)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMR212AC7474□G-T |               | 100               | X7S                         | 0.47 μ          | ±10, ±20                  | 3.5       | 150               | 1.25±0.15/-0.05  |      |
| HMR212CC7105□G-T |               |                   | X7S                         | 1 μ             | ±10, ±20                  | 3.5       | 150               | 1.25±0.25/-0     |      |

● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 1.6mm thickness(L)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMR316BC7225□L-T |               | 100               | X7S                         | 2.2 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |
| UMR316BC7225□L-T |               | 50                | X7S                         | 2.2 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |
| UMR316BC7475□L-T |               |                   | X7S                         | 4.7 μ           | ±10, ±20                  | 3.5       | 150               | 1.6±0.30         |      |

● 325TYPE (Dimension:3.2×2.5mm JIS:3225 EIA:1210)

【Temperature Characteristic B7 : X7R(−55~+125°C)】 2.5mm thickness(M)

| Part number 1    | Part number 2 | Rated voltage [V] | Temperature characteristics | Capacitance [F] | Capacitance tolerance [%] | tan δ [%] | HTLT              | Thickness*1 [mm] | Note |
|------------------|---------------|-------------------|-----------------------------|-----------------|---------------------------|-----------|-------------------|------------------|------|
|                  |               |                   |                             |                 |                           |           | Rated voltage x % |                  |      |
| HMR325AC7475□M-P |               | 100               | X7S                         | 4.7 μ           | ±10, ±20                  | 3.5       | 150               | 2.5±0.30         |      |
| UMR325AC7106□M-P |               | 50                | X7S                         | 10 μ            | ±10, ±20                  | 3.5       | 150               | 2.5±0.30         |      |

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# Multilayer Ceramic Capacitors

## PACKAGING

### ① Minimum Quantity

#### ● Taped package

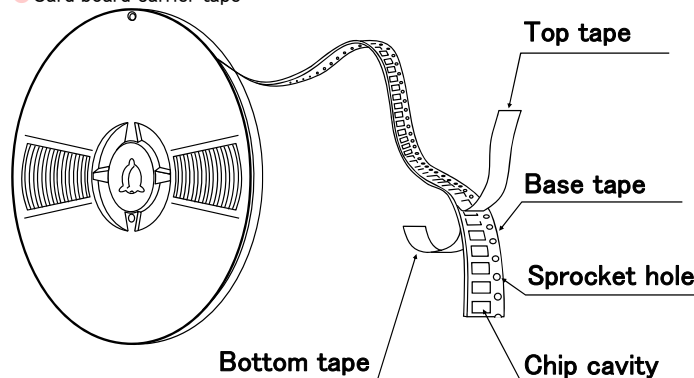
| Type(EIA)                    | Thickness |      | Standard quantity [pcs] |                 |
|------------------------------|-----------|------|-------------------------|-----------------|
|                              | mm        | code | Paper tape              | Embossed tape   |
| □MK021(008004)               | 0.125     | K    | —                       | 50000           |
| □VS021(008004)               |           |      |                         |                 |
| □MK042(01005)                | 0.2       | C, D | —                       | 40000           |
| □VS042(01005)                | 0.2       | C    |                         |                 |
| □MK063(0201)                 | 0.3       | P, T | 15000                   | —               |
| □WK105(0204) ※               | 0.3       | P    | 10000                   | —               |
| □MK105(0402)<br>□MF105(0402) | 0.13      | H    | —                       | 20000           |
|                              | 0.18      | E    | —                       | 15000           |
|                              | 0.2       | C    | 20000                   | —               |
|                              | 0.3       | P    | 15000                   | —               |
|                              | 0.5       | V    | 10000                   | —               |
| □VK105(0402)                 | 0.5       | W    | 10000                   | —               |
| □MK107(0603)                 | 0.45      | K    | 4000                    | —               |
| □WK107(0306) ※               | 0.5       | V    | —                       | 4000            |
| □MF107(0603)                 | 0.8       | A    | 4000                    | —               |
| □VS107(0603)                 | 0.7       | C    | 4000                    | —               |
| □MJ107(0603)                 | 0.8       | A    | 3000                    | 3000            |
| □MK212(0805)                 | 0.45      | K    | 4000                    | —               |
| □WK212(0508) ※               | 0.85      | D    |                         |                 |
| □MF212(0805)                 | 1.25      | G    | —                       | 3000            |
| □VS212(0805)                 | 0.85      | D    | 4000                    | —               |
| □MJ212(0805)                 | 0.85      | D    | 4000                    | —               |
|                              | 1.25      | G    | —                       | 2000            |
| □MK316(1206)<br>□MF316(1206) | 0.85      | D    | 4000                    | —               |
|                              | 1.15      | F    | —                       | 3000            |
|                              | 1.6       | L    | —                       | 2000            |
| □MJ316(1206)                 | 1.15      | F    | —                       | 3000            |
|                              | 1.6       | L    | —                       | 2000            |
| □MK325(1210)<br>□MF325(1210) | 0.85      | D    | —                       | 2000            |
|                              | 1.15      | F    |                         |                 |
|                              | 1.9       | N    |                         |                 |
|                              | 2.0max.   | Y    |                         |                 |
| □MJ325(1210)                 | 2.5       | M    | —                       | 1000            |
|                              | 1.9       | N    | —                       | 2000            |
|                              | 2.5       | M    | —                       | 500(T), 1000(P) |
| □MK432(1812)                 | 2.5       | M    | —                       | 500             |

Note : ※ LW Reverse type.

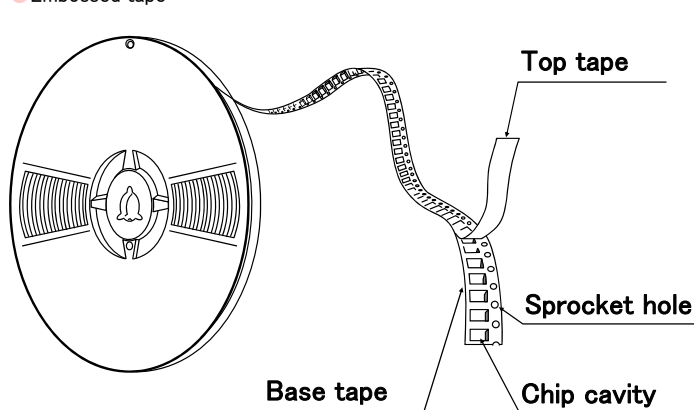
### ② Taping material

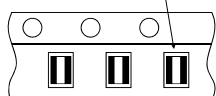
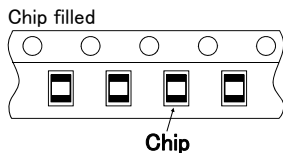
※No bottom tape for pressed carrier tape

#### ● Card board carrier tape



#### ● Embossed tape





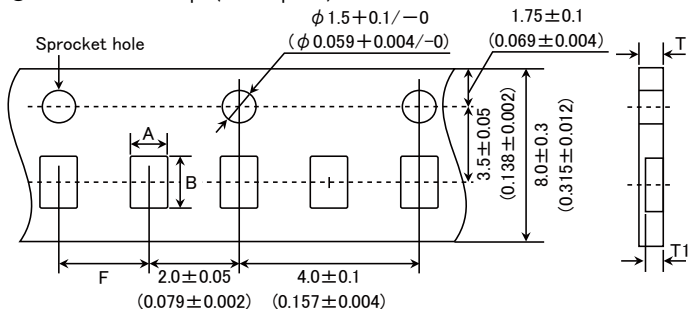
※ LW Reverse type.

### ③ Representative taping dimensions

● Paper Tape (8mm wide)

● Pressed carrier tape ( 2mm pitch)

Unit: mm (inch)



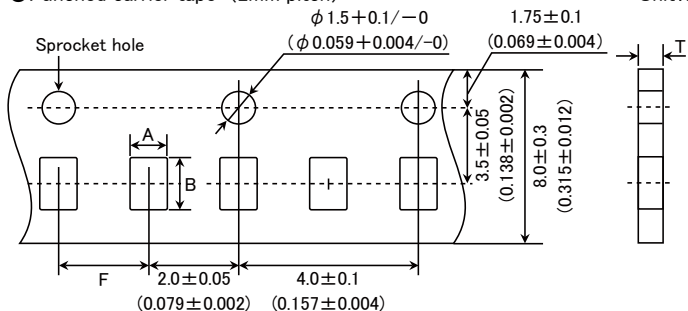
| Type(EIA)           | Chip Cavity |      | Insertion Pitch | Tape Thickness |          |
|---------------------|-------------|------|-----------------|----------------|----------|
|                     | A           | B    | F               | T              | T1       |
| □MK063(0201)        | 0.37        | 0.67 | 2.0±0.05        | 0.45max.       | 0.42max. |
| □WK105(0204) ※      | 0.65        | 1.15 |                 | 0.4max.        | 0.3max.  |
| □MK105(0402) (*1 C) |             |      |                 | 0.45max.       | 0.42max. |
| □MK105(0402) (*1 P) |             |      |                 |                |          |

Note \*1 Thickness, C: 0.2mm ,P: 0.3mm. ※ LW Reverse type.

Unit: mm

● Punched carrier tape (2mm pitch)

Unit: mm (inch)

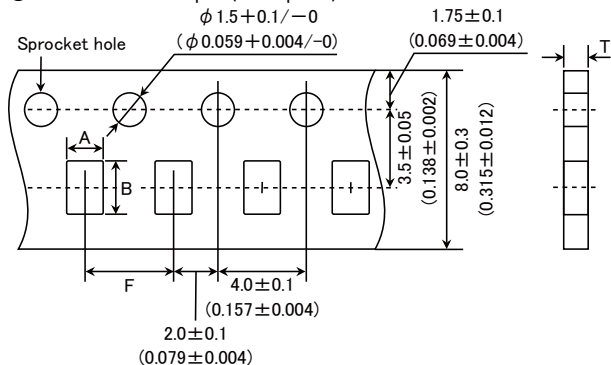


| Type(EIA)     | Chip Cavity |      | Insertion Pitch<br>F | Tape Thickness<br>T |
|---------------|-------------|------|----------------------|---------------------|
|               | A           | B    |                      |                     |
| □MK105 (0402) | 0.65        | 1.15 | 2.0±0.05             | 0.8max.             |
| □MF105 (0402) |             |      |                      |                     |
| □VK105 (0402) |             |      |                      |                     |

Unit: mm

● Punched carrier tape (4mm pitch)

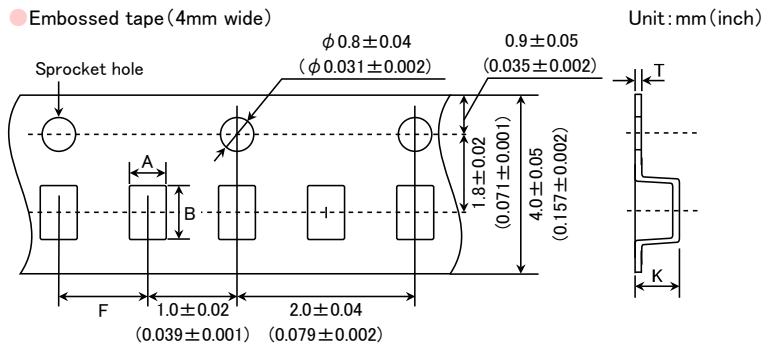
Unit: mm (inch)



| Type(EIA)                                      | Chip Cavity |     | Insertion Pitch | Tape Thickness |
|------------------------------------------------|-------------|-----|-----------------|----------------|
|                                                | A           | B   | F               | T              |
| □MK107(0603)<br>□WK107(0306) ※<br>□MF107(0603) | 1.0         | 1.8 | 4.0±0.1         | 1.1max.        |
| □MK212(0805)<br>□WK212(0508) ※                 | 1.65        | 2.4 |                 | 1.1max.        |
| □MK316(1206)                                   | 2.0         | 3.6 |                 |                |

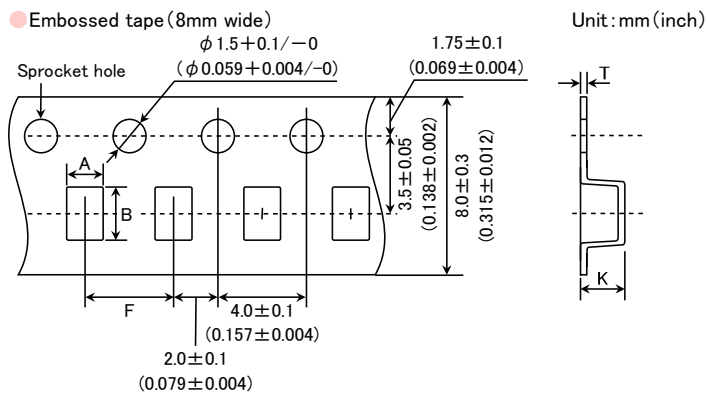
Note: Taping size might be different depending on the size of the product. ※ LW Reverse type.

Unit: mm



| Type(EIA)                        | Chip Cavity |      | Insertion Pitch | Tape Thickness |          |
|----------------------------------|-------------|------|-----------------|----------------|----------|
|                                  | A           | B    | F               | K              | T        |
| □MK021(008004)<br>□VS021(008004) | 0.135       | 0.27 | 1.0±0.02        | 0.5max.        | 0.25max. |
| □MK042(01005)<br>□VS042(01005)   | 0.23        | 0.43 |                 |                |          |

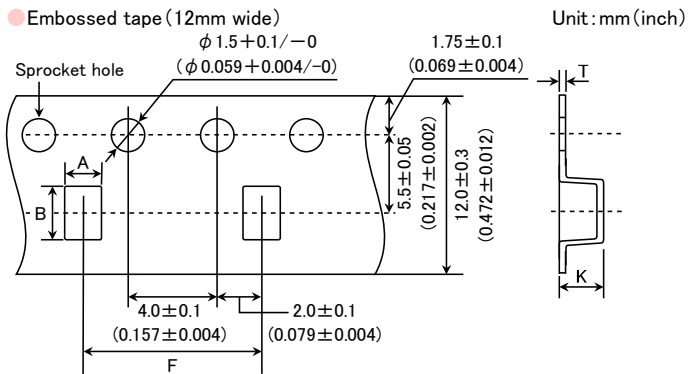
Unit: mm



| Type(EIA)                                                      | Chip Cavity |     | Insertion Pitch | Tape Thickness |          |
|----------------------------------------------------------------|-------------|-----|-----------------|----------------|----------|
|                                                                | A           | B   | F               | K              | T        |
| □MK105(0402)<br>□WK107(0306) ※<br>□MK212(0805)<br>□MF212(0805) | 0.6         | 1.1 | 2.0±0.1         | 0.6max         | 0.2±0.1  |
| □MK316(1206)<br>□MF316(1206)                                   | 2.0         | 3.6 | 4.0±0.1         | 1.3max.        | 0.25±0.1 |
| □MK325(1210)<br>□MF325(1210)                                   | 2.8         | 3.6 |                 | 3.4max.        | 0.6max.  |

Note: ※ LW Reverse type.

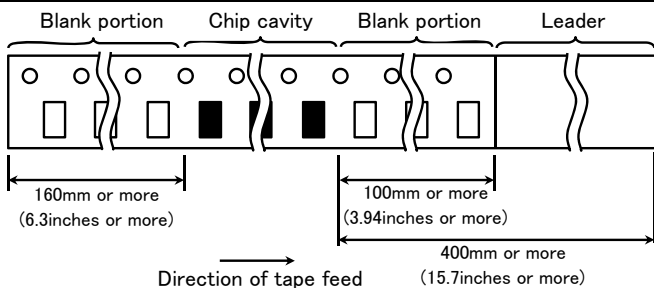
Unit: mm



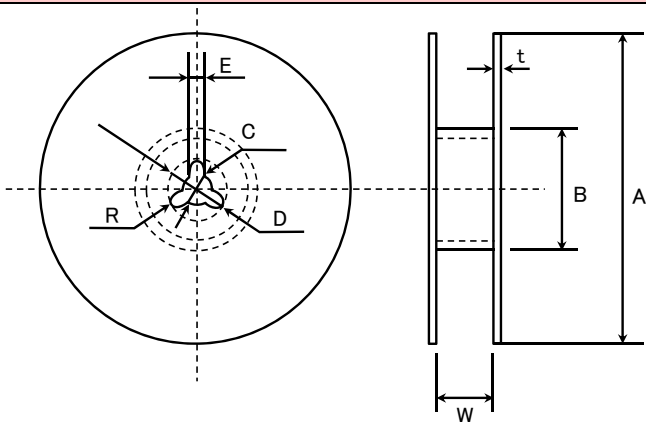
| Type(EIA)    | Chip Cavity |     | Insertion Pitch | Tape Thickness |         |
|--------------|-------------|-----|-----------------|----------------|---------|
|              | A           | B   | F               | K              | T       |
| □MK325(1210) | 3.1         | 4.0 | $8.0 \pm 0.1$   | 4.0max.        | 0.6max. |
| □MK432(1812) | 3.7         | 4.9 | $8.0 \pm 0.1$   | 4.0max.        | 0.6max. |

Unit: mm

#### ④Trailer and Leader



#### ⑤Reel size



| A                  | B                      | C                   | D                   | E             | R   |
|--------------------|------------------------|---------------------|---------------------|---------------|-----|
| $\phi 178 \pm 2.0$ | $\phi 50 \text{ min.}$ | $\phi 13.0 \pm 0.2$ | $\phi 21.0 \pm 0.8$ | $2.0 \pm 0.5$ | 1.0 |

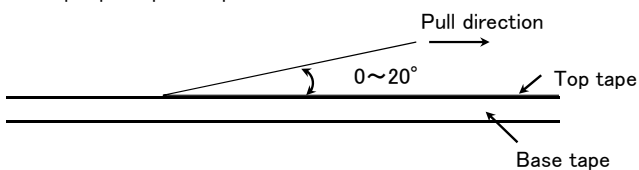
  

|                | T       | W            |
|----------------|---------|--------------|
| 4mm wide tape  | 1.5max. | $5 \pm 1.0$  |
| 8mm wide tape  | 2.5max. | $10 \pm 1.5$ |
| 12mm wide tape | 2.5max. | $14 \pm 1.5$ |

Unit: mm

#### ⑥Top Tape Strength

The top tape requires a peel-off force of 0.1 to 0.7N in the direction of the arrow as illustrated below.



# Multilayer Ceramic Capacitors

## RELIABILITY DATA

| 1.Operating Temperature Range                                    |                                  |                     |               |                   |
|------------------------------------------------------------------|----------------------------------|---------------------|---------------|-------------------|
| Specified Value                                                  | Temperature Compensating(Class1) | Standard            | −55 to +125℃  |                   |
|                                                                  |                                  | High Frequency Type |               |                   |
|                                                                  | High Permittivity (Class2)       |                     |               |                   |
|                                                                  |                                  | BJ                  | Specification | Temperature Range |
| B                                                                |                                  |                     | −25 to +85℃   |                   |
| X5R                                                              |                                  |                     | −55 to +85℃   |                   |
| B7                                                               |                                  |                     | −55 to +125℃  |                   |
| C6                                                               |                                  |                     | −55 to +105℃  |                   |
| C7                                                               |                                  |                     | −55 to +125℃  |                   |
| D7                                                               | −55 to +125℃                     |                     |               |                   |
| LD(※)                                                            | X5R                              | −55 to +85℃         |               |                   |
| Note: ※LD Low distortion high value multilayer ceramic capacitor |                                  |                     |               |                   |

| 2. Storage Conditions                                            |                                  |                     |               |  |
|------------------------------------------------------------------|----------------------------------|---------------------|---------------|--|
| Specified Value                                                  | Temperature Compensating(Class1) | Standard            | −55 to +125°C |  |
|                                                                  |                                  | High Frequency Type |               |  |
|                                                                  | High Permittivity (Class2)       |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
|                                                                  |                                  |                     |               |  |
| Note: ※LD Low distortion high value multilayer ceramic capacitor |                                  |                     |               |  |

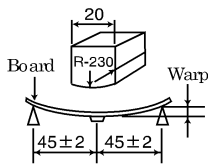
| 3. Rated Voltage |                                  |                     |                                                         |
|------------------|----------------------------------|---------------------|---------------------------------------------------------|
| Specified Value  | Temperature Compensating(Class1) | Standard            | 50VDC, 25VDC                                            |
|                  |                                  | High Frequency Type | 50VDC, 25VDC                                            |
|                  | High Permittivity (Class2)       |                     | 50VDC, 35VDC, 25VDC, 16VDC, 10VDC, 6.3VDC, 4VDC, 2.5VDC |

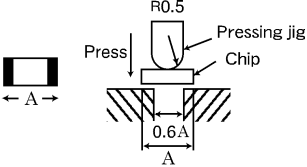
| 4. Withstanding Voltage (Between terminals) |                                  |                     |                        |
|---------------------------------------------|----------------------------------|---------------------|------------------------|
| Specified Value                             | Temperature Compensating(Class1) | Standard            | No breakdown or damage |
|                                             |                                  | High Frequency Type |                        |
|                                             | High Permittivity (Class2)       |                     |                        |
| Test Methods and Remarks                    |                                  | Class 1             | Class 2                |
|                                             | Applied voltage                  | Rated volta × 3     | Rated voltage × 2.5    |
|                                             | Duration                         | 1 to 5 sec.         |                        |
|                                             | Charge/discharge current         | 50mA max.           |                        |
|                                             |                                  |                     |                        |

| 5. Insulation Resistance |                                   |                     |                                                           |
|--------------------------|-----------------------------------|---------------------|-----------------------------------------------------------|
| Specified Value          | Temperature Compensating(Class1)  | Standard            | 10000 MΩ min.                                             |
|                          |                                   | High Frequency Type |                                                           |
| Test Methods and Remarks | High Permittivity (Class2) Note 1 |                     | C ≤ 0.047 μF : 10000 MΩ min.<br>C > 0.047 μF : 500MΩ · μF |
|                          | Applied voltage                   | : Rated voltage     |                                                           |
| Test Methods and Remarks | Duration                          | : 60±5 sec.         |                                                           |
|                          | Charge/discharge current          | : 50mA max.         |                                                           |



| 6. Capacitance (Tolerance)                                                       |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------|--------------------|-----------------------|-------------------|
| Specified Value                                                                  | Temperature Compensating(Class1)                                                                                                                                                                                                                                                   | Standard                           | C□                                                                                                          | 0.2pF≦C≦5pF : ±0.25pF                      |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    | U□                                                                                                          | 0.2pF≦C≦10pF : ±0.5pF                      |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | SL                                 | C>10pF : ±5% or ±10%                                                                                        |                                            |                                                                 |                    |                       |                   |
|                                                                                  | High Frequency Type                                                                                                                                                                                                                                                                | CH                                 | 0.3pF≦C≦2pF : ±0.1pF                                                                                        |                                            |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | C>2pF : ±5%                        |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| High Permittivity (Class2)                                                       |                                                                                                                                                                                                                                                                                    |                                    | BJ, B7, C6, C7, D7, LD(※): ±10% or ±20%<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                                            |                                                                 |                    |                       |                   |
| Test Methods and Remarks                                                         |                                                                                                                                                                                                                                                                                    | Class 1                            |                                                                                                             | Class 2                                    |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | Standard                           | High Frequency Type                                                                                         | C≦10μF                                     | C>10μF                                                          |                    |                       |                   |
|                                                                                  | Preconditioning                                                                                                                                                                                                                                                                    | None                               |                                                                                                             | Thermal treatment (at 150℃ for 1hr) Note 2 |                                                                 |                    |                       |                   |
|                                                                                  | Measuring frequency                                                                                                                                                                                                                                                                | 1MHz±10%                           |                                                                                                             | 1kHz±10%                                   | 120±10Hz                                                        |                    |                       |                   |
|                                                                                  | Measuring voltage Note                                                                                                                                                                                                                                                             | 0.5 to 5Vrms                       |                                                                                                             | 1±0.2Vrms                                  | 0.5±0.1rms                                                      |                    |                       |                   |
|                                                                                  | Bias application                                                                                                                                                                                                                                                                   | None                               |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| 7. Q or Dissipation Factor                                                       |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| Specified Value                                                                  | Temperature Compensating(Class1)                                                                                                                                                                                                                                                   | Standard                           | C<30pF : Q≧400+20C<br>C≧30pF : Q≧1000 (C:Nominal capacitance)                                               |                                            |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | High Frequency Type                | Refer to detailed specification                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | High Permittivity (Class2) Note 1                                                                                                                                                                                                                                                  |                                    | BJ, B7, C6, C7, D7:2.5% max.                                                                                |                                            |                                                                 |                    |                       |                   |
| Test Methods and Remarks                                                         |                                                                                                                                                                                                                                                                                    | Class 1                            |                                                                                                             | Class 2                                    |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | Standard                           | High Frequency Type                                                                                         | C≦10μF                                     | C>10μF                                                          |                    |                       |                   |
|                                                                                  | Preconditioning                                                                                                                                                                                                                                                                    | None                               |                                                                                                             | Thermal treatment (at 150℃ for 1hr) Note 2 |                                                                 |                    |                       |                   |
|                                                                                  | Measuring frequency                                                                                                                                                                                                                                                                | 1MHz±10%                           | 1GHz                                                                                                        | 1kHz±10%                                   | 120±10Hz                                                        |                    |                       |                   |
|                                                                                  | Measuring voltage Note 1                                                                                                                                                                                                                                                           | 0.5 to 5Vrms                       |                                                                                                             | 1±0.2Vrms                                  | 0.5±0.1Vrms                                                     |                    |                       |                   |
|                                                                                  | Bias application                                                                                                                                                                                                                                                                   | None                               |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| High Frequency Type<br>Measuring equipment : HP4291A<br>Measuring jig : HP16192A |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| 8. Temperature Characteristic (Without voltage application)                      |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| Specified Value                                                                  | Temperature Compensating(Class1)                                                                                                                                                                                                                                                   | Standard                           | Temperature Characteristic [ppm/℃]                                                                          |                                            | Tolerance [ppm/℃]<br>G : ±30<br>H : ±60<br>J : ±120<br>K : ±250 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    | C□ : 0 CG,CH, CJ, CK                                                                                        |                                            |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    | U□ : -750 UJ, UK                                                                                            |                                            |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    | SL : +350 to -1000                                                                                          |                                            |                                                                 |                    |                       |                   |
|                                                                                  | High Frequency Type                                                                                                                                                                                                                                                                | Temperature Characteristic [ppm/℃] |                                                                                                             | Tolerance [ppm/℃]                          |                                                                 |                    |                       |                   |
|                                                                                  |                                                                                                                                                                                                                                                                                    | C□ : 0 CH                          |                                                                                                             | H : ±60                                    |                                                                 |                    |                       |                   |
|                                                                                  | High Permittivity (Class2)                                                                                                                                                                                                                                                         |                                    |                                                                                                             |                                            | Specification                                                   | Capacitance change | Reference temperature | Temperature Range |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | BJ                                         | B                                                               | ±10%               | 20℃                   | -25 to +85℃       |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            | X5R                                                             | ±15%               | 25℃                   | -55 to +85℃       |
|                                                                                  |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | B7                                         | X7R                                                             | ±15%               | 25℃                   | -55 to +125℃      |
| C6                                                                               |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | X6S                                        | ±22%                                                            | 25℃                | -55 to +105℃          |                   |
| C7                                                                               |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | X7S                                        | ±22%                                                            | 25℃                | -55 to +125℃          |                   |
| D7                                                                               |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | X7S                                        | +22/-33%                                                        | 25℃                | -55 to +125℃          |                   |
| LD(※)                                                                            |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             | X5R                                        | ±15%                                                            | 25℃                | -55 to +85℃           |                   |
| Note : ※LD Low distortion high value multilayer ceramic capacitor                |                                                                                                                                                                                                                                                                                    |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
| Test Methods and Remarks                                                         | Class 1 : Capacitance at 20℃ and 85℃ shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.<br>$\frac{(C_{85}-C_{20})}{C_{20} \times \Delta T} \times 10^6 (\text{ppm}/^{\circ}\text{C}) \quad \Delta T=65$ |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | Class 2 : Capacitance at each step shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.                                                                                                                   |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | Step                                                                                                                                                                                                                                                                               | B                                  | X5R、X7R、X6S、X7S、X7T                                                                                         |                                            |                                                                 |                    |                       |                   |
|                                                                                  | 1                                                                                                                                                                                                                                                                                  | Minimum operating temperature      |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | 2                                                                                                                                                                                                                                                                                  | 20℃                                | 25℃                                                                                                         |                                            |                                                                 |                    |                       |                   |
|                                                                                  | 3                                                                                                                                                                                                                                                                                  | Maximum operating temperature      |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | $\frac{(C-C_2)}{C_2} \times 100 (\%)$                                                                                                                                                                                                                                              |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |
|                                                                                  | C : Capacitance in Step 1 or Step 3<br>C2 :Capacitance in Step 2                                                                                                                                                                                                                   |                                    |                                                                                                             |                                            |                                                                 |                    |                       |                   |

| 9. Deflection            |                                                                                                                                                                                                                                                                                                                                                                                                                         |                               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--|--|---------------------|-----------------|-------|-----------------------------|--|-----------|-------|-------|------|---------------------------------|--|----------|---------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value          | Temperature Compensating(Class1)                                                                                                                                                                                                                                                                                                                                                                                        | Standard                      | Appearance : No abnormality<br>Capacitance change : Within $\pm 5\%$ or $\pm 0.5$ pF, whichever is larger.                                                              |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                         | High Frequency Type           | Appearance : No abnormality<br>Capaitance change : Within $\pm 0.5$ pF                                                                                                  |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
|                          | High Permittivity (Class2)                                                                                                                                                                                                                                                                                                                                                                                              |                               | Appearance : No abnormality<br>Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
| Test Methods and Remarks | <table><tr><td></td><td colspan="2">Multilayer Ceramic Capacitors</td></tr><tr><td></td><td>042, 063, ※105 Type</td><td>The other types</td></tr><tr><td>Board</td><td colspan="2">Glass epoxy-resin substrate</td></tr><tr><td>Thickness</td><td>0.8mm</td><td>1.6mm</td></tr><tr><td>Warp</td><td colspan="2">1mm (Soft Termination type:3mm)</td></tr><tr><td>Duration</td><td colspan="2">10 sec.</td></tr></table> |                               |                                                                                                                                                                         | Multilayer Ceramic Capacitors |  |  | 042, 063, ※105 Type | The other types | Board | Glass epoxy-resin substrate |  | Thickness | 0.8mm | 1.6mm | Warp | 1mm (Soft Termination type:3mm) |  | Duration | 10 sec. |  |  <p>(Unit: mm)</p> <p>Capacitance measurement shall be conducted with the board bent</p> |
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                         | Multilayer Ceramic Capacitors |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
|                          | 042, 063, ※105 Type                                                                                                                                                                                                                                                                                                                                                                                                     | The other types               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
| Board                    | Glass epoxy-resin substrate                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
| Thickness                | 0.8mm                                                                                                                                                                                                                                                                                                                                                                                                                   | 1.6mm                         |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
| Warp                     | 1mm (Soft Termination type:3mm)                                                                                                                                                                                                                                                                                                                                                                                         |                               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
| Duration                 | 10 sec.                                                                                                                                                                                                                                                                                                                                                                                                                 |                               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |
|                          | ※1: 105 Type thickness, C: 0.2mm ,P: 0.3mm.                                                                                                                                                                                                                                                                                                                                                                             |                               |                                                                                                                                                                         |                               |  |  |                     |                 |       |                             |  |           |       |       |      |                                 |  |          |         |  |                                                                                                                                                                             |

| 10. Body Strength        |                                                                                                                                                            |                     |                       |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|
| Specified Value          | Temperature Compensating(Class1)                                                                                                                           | Standard            | —                     |
|                          |                                                                                                                                                            | High Frequency Type | No mechanical damage. |
|                          | High Permittivity (Class2)                                                                                                                                 |                     | —                     |
| Test Methods and Remarks | <p>High Frequency Type<br/>Applied force : 5N<br/>Duration : 10 sec.</p>  |                     |                       |
|                          |                                                                                                                                                            |                     |                       |

| 11. Adhesive Strength of Terminal Electrodes |                                  |                               |                                           |
|----------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|
| Specified Value                              | Temperature Compensating(Class1) | Standard                      | No terminal separation or its indication. |
|                                              |                                  | High Frequency Type           |                                           |
|                                              | High Permittivity (Class2)       |                               |                                           |
| Test Methods and Remarks                     |                                  | Multilayer Ceramic Capacitors |                                           |
|                                              |                                  | 042, 063 Type                 | 105 Type or more                          |
|                                              | Applied force                    | 2N                            | 5N                                        |
|                                              | Duration                         | 30±5 sec.                     |                                           |

| 12. Solderability        |                                  |                     |                                                              |
|--------------------------|----------------------------------|---------------------|--------------------------------------------------------------|
| Specified Value          | Temperature Compensating(Class1) | Standard            | At least 95% of terminal electrode is covered by new solder. |
|                          |                                  | High Frequency Type |                                                              |
|                          | High Permittivity (Class2)       |                     |                                                              |
| Test Methods and Remarks |                                  | Eutectic solder     | Lead-free solder                                             |
|                          | Solder type                      | H60A or H63A        | Sn-3.0Ag-0.5Cu                                               |
|                          | Solder temperature               | 230±5℃              | 245±3℃                                                       |
|                          | Duration                         | 4±1 sec.            |                                                              |
|                          |                                  |                     |                                                              |

| 13. Resistance to Soldering |                                   |                                              |                                                                                                                                                                                                                                                                                                                   |                                                         |
|-----------------------------|-----------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Specified Value             | Temperature Compensating(Class1)  | Standard                                     | Appearance : No abnormality<br>Capacitance change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ , whichever is larger.<br>Q : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality                                                                   |                                                         |
|                             |                                   | High Frequency Type                          | Appearance : No abnormality<br>Capacitance change : Within $\pm 2.5\%$<br>Q : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality                                                                                                                 |                                                         |
|                             | High Permittivity (Class2) Note 1 |                                              | Appearance : No abnormality<br>Capacitance change : Within $\pm 7.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Dissipation factor : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals): No abnormality<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                                                         |
| Test Methods and Remarks    |                                   | Class 1                                      |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             |                                   | 042, 063 Type                                | 105 Type                                                                                                                                                                                                                                                                                                          |                                                         |
|                             | Preconditioning                   | None                                         |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Preheating                        | 150°C, 1 to 2 min.                           | 80 to 100°C, 2 to 5 min.<br>150 to 200°C, 2 to 5 min.                                                                                                                                                                                                                                                             |                                                         |
|                             | Solder temp.                      | 270 $\pm$ 5°C                                |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Duration                          | 3 $\pm$ 0.5 sec.                             |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Recovery                          | 6 to 24 hrs (Standard condition) Note 5      |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             |                                   | Class 2                                      |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             |                                   | 042, 063 Type                                | 105, 107, 212 Type                                                                                                                                                                                                                                                                                                | 316, 325 Type                                           |
|                             | Preconditioning                   | Thermal treatment (at 150°C for 1 hr) Note 2 |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Preheating                        | 150°C, 1 to 2 min.                           | 80 to 100°C, 2 to 5 min.<br>150 to 200°C, 2 to 5 min.                                                                                                                                                                                                                                                             | 80 to 100°C, 5 to 10 min.<br>150 to 200°C, 5 to 10 min. |
|                             | Solder temp.                      | 270 $\pm$ 5°C                                |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Duration                          | 3 $\pm$ 0.5 sec.                             |                                                                                                                                                                                                                                                                                                                   |                                                         |
|                             | Recovery                          | 24 $\pm$ 2 hrs (Standard condition) Note 5   |                                                                                                                                                                                                                                                                                                                   |                                                         |

| 14. Temperature Cycle (Thermal Shock) |                                   |                                         |                                                                                                                                                                                                                                                                                                                    |                                              |
|---------------------------------------|-----------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Specified Value                       | Temperature Compensating(Class1)  | Standard                                | Appearance : No abnormality<br>Capacitance change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ , whichever is larger.<br>Q : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality                                                                    |                                              |
|                                       |                                   | High Frequency Type                     | Appearance : No abnormality<br>Capacitance change : Within $\pm 0.25\text{pF}$<br>Q : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality                                                                                                          |                                              |
|                                       | High Permittivity (Class2) Note 1 |                                         | Appearance : No abnormality<br>Capacitance change : Within $\pm 7.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Dissipation factor : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                                              |
| Test Methods and Remarks              | Class 1                           |                                         | Class 2                                                                                                                                                                                                                                                                                                            |                                              |
|                                       | Preconditioning                   | None                                    |                                                                                                                                                                                                                                                                                                                    | Thermal treatment (at 150°C for 1 hr) Note 2 |
|                                       | 1 cycle                           | Step                                    | Temperature (°C)                                                                                                                                                                                                                                                                                                   | Time (min.)                                  |
|                                       |                                   | 1                                       | Minimum operating temperature                                                                                                                                                                                                                                                                                      | 30 $\pm$ 3                                   |
|                                       |                                   | 2                                       | Normal temperature                                                                                                                                                                                                                                                                                                 | 2 to 3                                       |
|                                       |                                   | 3                                       | Maximum operating temperature                                                                                                                                                                                                                                                                                      | 30 $\pm$ 3                                   |
|                                       |                                   | 4                                       | Normal temperature                                                                                                                                                                                                                                                                                                 | 2 to 3                                       |
|                                       | Number of cycles                  | 5 times                                 |                                                                                                                                                                                                                                                                                                                    |                                              |
|                                       | Recovery                          | 6 to 24 hrs (Standard condition) Note 5 |                                                                                                                                                                                                                                                                                                                    | 24 $\pm$ 2 hrs (Standard condition) Note 5   |

| 15. Humidity (Steady State) |                                   |                     |                                                                                                                                                                                                                                                                                                                                                      |                                                            |
|-----------------------------|-----------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Specified Value             | Temperature Compensating(Class1)  | Standard            | Appearance : No abnormality<br>Capacitance change : Within $\pm 5\%$ or $\pm 0.5\text{pF}$ , whichever is larger.<br>Q : $C < 10\text{pF} : Q \geq 200 + 10C$<br>$10 \leq C < 30\text{pF} : Q \geq 275 + 2.5C$<br>$C \geq 30\text{pF} : Q \geq 350 (C : \text{Nominal capacitance})$<br>Insulation resistance : $1000 \text{ M}\Omega \text{ min.}$  |                                                            |
|                             |                                   | High Frequency Type | Appearance : No abnormality<br>Capacitance change : Within $\pm 0.5\text{pF}$ ,<br>Insulation resistance : $1000 \text{ M}\Omega \text{ min.}$                                                                                                                                                                                                       |                                                            |
|                             | High Permittivity (Class2) Note 1 |                     | Appearance : No abnormality<br>Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Dissipation factor : $5.0\%$ max. (BJ, B7, C6, C7, D7, LD(※))<br>Insulation resistance : $50 \text{ M}\Omega \mu\text{F}$ or $1000 \text{ M}\Omega$ whichever is smaller.<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                                                            |
| Test Methods and Remarks    |                                   | Class 1             |                                                                                                                                                                                                                                                                                                                                                      | Class 2                                                    |
|                             |                                   | Standard            | High Frequency Type                                                                                                                                                                                                                                                                                                                                  | All items                                                  |
|                             |                                   | Preconditioning     | None                                                                                                                                                                                                                                                                                                                                                 | Thermal treatment (at $150^\circ\text{C}$ for 1 hr) Note 2 |
|                             |                                   | Temperature         | $40 \pm 2^\circ\text{C}$                                                                                                                                                                                                                                                                                                                             | $40 \pm 2^\circ\text{C}$                                   |
|                             |                                   | Humidity            | 90 to 95%RH                                                                                                                                                                                                                                                                                                                                          | 90 to 95%RH                                                |
|                             |                                   | Duration            | $500 + 24 / - 0 \text{ hrs}$                                                                                                                                                                                                                                                                                                                         | $500 + 24 / - 0 \text{ hrs}$                               |
|                             |                                   | Recovery            | 6 to 24 hrs (Standard condition) Note 5                                                                                                                                                                                                                                                                                                              | $24 \pm 2 \text{ hrs}$ (Standard condition) Note 5         |

| 16. Humidity Loading     |                                   |                          |                                                                                                                                                                                                                                                                                                                                                       |                                                                                           |
|--------------------------|-----------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Specified Value          | Temperature Compensating(Class1)  | Standard                 | Appearance : No abnormality<br>Capacitance change : Within $\pm 7.5\%$ or $\pm 0.75\text{pF}$ , whichever is larger.<br>Q : $C < 30\text{pF} : Q \geq 100 + 10C/3$<br>$C \geq 30\text{pF} : Q \geq 200 (C : \text{Nominal capacitance})$<br>Insulation resistance : $500 \text{ M}\Omega \text{ min.}$                                                |                                                                                           |
|                          |                                   | High Frequency Type      | Appearance : No abnormality<br>Capacitance change : $C \leq 2\text{pF} : \text{Within } \pm 0.4 \text{ pF}$<br>$C > 2\text{pF} : \text{Within } \pm 0.75 \text{ pF} (C : \text{Nominal capacitance})$<br>Insulation resistance : $500 \text{ M}\Omega \text{ min.}$                                                                                   |                                                                                           |
|                          | High Permittivity (Class2) Note 1 |                          | Appearance : No abnormality<br>Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Dissipation factor : $5.0\%$ max. (BJ, B7, C6, C7, D7, LD(※))<br>Insulation resistance : $25 \text{ M}\Omega \mu\text{F}$ or $500 \text{ M}\Omega$ , whichever is smaller.<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |                                                                                           |
| Test Methods and Remarks |                                   | Class 1                  |                                                                                                                                                                                                                                                                                                                                                       | Class 2                                                                                   |
|                          |                                   | Standard                 | High Frequency Type                                                                                                                                                                                                                                                                                                                                   | All items                                                                                 |
|                          |                                   | Preconditioning          | None                                                                                                                                                                                                                                                                                                                                                  | Voltage treatment<br>(Rated voltage are applied for 1 hour at $40^\circ\text{C}$ ) Note 3 |
|                          |                                   | Temperature              | $40 \pm 2^\circ\text{C}$                                                                                                                                                                                                                                                                                                                              | $40 \pm 2^\circ\text{C}$                                                                  |
|                          |                                   | Humidity                 | 90 to 95%RH                                                                                                                                                                                                                                                                                                                                           | 90 to 95%RH                                                                               |
|                          |                                   | Duration                 | $500 + 24 / - 0 \text{ hrs}$                                                                                                                                                                                                                                                                                                                          | $500 + 24 / - 0 \text{ hrs}$                                                              |
|                          |                                   | Applied voltage          | Rated voltage                                                                                                                                                                                                                                                                                                                                         | Rated voltage                                                                             |
|                          |                                   | Charge/discharge current | 50mA max.                                                                                                                                                                                                                                                                                                                                             | 50mA max.                                                                                 |
|                          |                                   | Recovery                 | 6 to 24 hrs (Standard condition) Note 5                                                                                                                                                                                                                                                                                                               | $24 \pm 2 \text{ hrs}$ (Standard condition) Note 5                                        |

## 17. High Temperature Loading

► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification.  
 For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

|                 |                                   |                     |                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|-----------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value | Temperature Compensating(Class1)  | Standard            | Appearance : No abnormality<br>Capacitance change : Within $\pm 3\%$ or $\pm 0.3\text{pF}$ , whichever is larger.<br>Q : $C < 10\text{pF}$ : $Q \geq 200 + 10C$<br>$10 \leq C < 30\text{pF}$ : $Q \geq 275 + 2.5C$<br>$C \geq 30\text{pF}$ : $Q \geq 350$ (C: Nominal capacitance)<br>Insulation resistance : $1000 \text{ M}\Omega \text{ min.}$   |
|                 |                                   | High Frequency Type | Appearance : No abnormality<br>Capacitance change : Within $\pm 3\%$ or $\pm 0.3\text{pF}$ , whichever is larger.<br>Insulation resistance : $1000 \text{ M}\Omega \text{ min.}$                                                                                                                                                                    |
|                 | High Permittivity (Class2) Note 1 |                     | Appearance : No abnormality<br>Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※))<br>Dissipation factor : 5.0% max. (BJ, B7, C6, C7, D7, LD(※))<br>Insulation resistance : $50 \text{ M}\Omega \mu\text{F}$ or $1000 \text{ M}\Omega$ , whichever is smaller.<br>Note: ※LD Low distortion high value multilayer ceramic capacitor |

|                                |                                                                  |                                       |                     |                                                                                                           |    |            |
|--------------------------------|------------------------------------------------------------------|---------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------|----|------------|
| Test<br>Methods and<br>Remarks |                                                                  | Class 1                               |                     | Class 2                                                                                                   |    |            |
|                                |                                                                  | Standard                              | High Frequency Type | BJ, LD(※)                                                                                                 | C6 | B7, C7, D7 |
|                                | Preconditioning                                                  | None                                  |                     | Voltage treatment (Twice the rated voltage shall be applied for 1 hour at 85°C, 105°C or 125°C) Note 3, 4 |    |            |
|                                | Temperature                                                      | Maximum operating temperature         |                     | Maximum operating temperature                                                                             |    |            |
|                                | Duration                                                         | 1000+48/—0 hrs                        |                     | 1000+48/—0 hrs                                                                                            |    |            |
|                                | Applied voltage                                                  | Rated voltage × 2                     |                     | Rated voltage × 2 Note 4                                                                                  |    |            |
|                                | Charge/discharge current                                         | 50mA max.                             |                     | 50mA max.                                                                                                 |    |            |
|                                | Recovery                                                         | 6 to 24hr (Standard condition) Note 5 |                     | 24±2 hrs (Standard condition) Note 5                                                                      |    |            |
|                                | Note: ※LD Low distortion high value multilayer ceramic capacitor |                                       |                     |                                                                                                           |    |            |

Note 1 The figures indicate typical specifications. Please refer to individual specifications in detail.

Note 2 Thermal treatment : Initial value shall be measured after test sample is heat-treated at  $150 \pm 0 / -10^\circ\text{C}$  for an hour and kept at room temperature for  $24 \pm 2$  hours.

Note 3 Voltage treatment : Initial value shall be measured after test sample is voltage-treated for an hour at both the temperature and voltage specified in the test conditions, and kept at room temperature for  $24 \pm 2$  hours.

Note 4 150% of rated voltage is applicable to some items. Please refer to their specifications for further information.

Note 5 Standard condition: Temperature: 5 to 35°C, Relative humidity: 45 to 85 % RH, Air pressure: 86 to 106kPa When there are questions concerning measurement results, in order to provide correlation data, the test shall be conducted under the following condition.

Temperature:  $20 \pm 2^\circ\text{C}$ , Relative humidity: 60 to 70 % RH, Air pressure: 86 to 106kPa Unless otherwise specified, all the tests are conducted under the "standard condition".

# Medium-High Voltage Multilayer Ceramic Capacitor

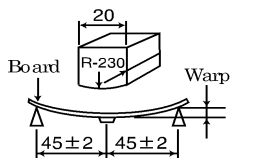
## RELIABILITY DATA

| 1. Operating Temperature Range              |                                                                                                                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value                             | Temperature Compensating(High Frequency type)<br>CG(C0G) : -55 to +125°C                                                                                                         |
|                                             | High permittivity<br>X7R, X7S : -55 to +125°C<br>X5 : -55 to +85°C<br>B : -25 to +85°C                                                                                           |
| 2. Storage Temperature Range                |                                                                                                                                                                                  |
| Specified Value                             | Temperature Compensating(High Frequency type)<br>CG(C0G) : -55 to +125°C                                                                                                         |
|                                             | High permittivity<br>X7R, X7S : -55 to +125°C<br>X5R : -55 to +85°C<br>B : -25 to +85°C                                                                                          |
| 3. Rated Voltage                            |                                                                                                                                                                                  |
| Specified Value                             | 100VDC(HMK,HMJ), 250VDC(QMK,QMJ,QVS), 630VDC(SMK,SMJ)                                                                                                                            |
| 4. Withstanding Voltage (Between terminals) |                                                                                                                                                                                  |
| Specified Value                             | No breakdown or damage                                                                                                                                                           |
| Test Methods and Remarks                    | Applied voltage : Rated voltage × 2.5 (HMK,HMJ), Rated voltage × 2 (QMK,QMJ,QVS), Rated voltage × 1.2 (SMK,SMJ)<br>Duration : 1 to 5sec.<br>Charge/discharge current : 50mA max. |
| 5. Insulation Resistance                    |                                                                                                                                                                                  |
| Specified Value                             | Temperature Compensating(High Frequency type)<br>10000MΩ min                                                                                                                     |
|                                             | High permittivity<br>100MΩ μF or 10GΩ, whichever is smaller.                                                                                                                     |
| Test Methods and Remarks                    | Applied voltage : Rated voltage (HMK,HMJ, QMK,QMJ,QVS), 500V (SMK,SMJ)<br>Duration : 60±5sec.<br>Charge/discharge current : 50mA max.                                            |
| 6. Capacitance (Tolerance)                  |                                                                                                                                                                                  |
| Specified Value                             | Temperature Compensating(High Frequency type)<br>±0.1pF (C<5pF) ±0.25pF (C<10pF) ±0.5pF (5pF≤C<10pF) ±2%(C=10pF) ±5%(C≥10pF)                                                     |
|                                             | High permittivity<br>±10%, ±20%                                                                                                                                                  |
| Test Methods and Remarks                    | Temperature Compensating(High Frequency type)<br>Measuring frequency : 1MHz±10%<br>Measuring voltage : 0.5 to 5Vrms<br>Bias application : None                                   |
|                                             | High permittivity<br>Measuring frequency : 1kHz±10%<br>Measuring voltage : 1±0.2Vrms<br>Bias application : None                                                                  |

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For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

| 7. Q or Dissipation Factor |                                                                                                                                                                                                                                                                     |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value            | Temperature Compensating(High Frequency type)<br>$C < 30\text{pF} : Q \geq 800 + 20C$<br>$C \geq 30\text{pF} : Q \geq 1400$ C:Normal Capacitance(/pF)<br><br>High permittivity<br>3.5%max (HMK,HMJ)<br>2.5%max (QMK,QMJ, SMK,SMJ)                                   |
| Test Methods and Remarks   | Temperature Compensating(High Frequency type)<br>Measuring frequency : 1MHz±10%<br>Measuring voltage : 0.5 to 5Vrms<br>Bas application : None<br><br>High permittivity<br>Measuring frequency : 1kHz±10%<br>Measuring voltage : 1±0.2Vrms<br>Bas application : None |

| 8. Temperature Characteristic of Capacitance |                                                                                                                                                              |                              |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Specified Value                              | Temperature Compensating(High Frequency type)                                                                                                                |                              |
|                                              | C0G : ±30ppm(25 to +125°C)                                                                                                                                   |                              |
|                                              | High permittivity                                                                                                                                            |                              |
|                                              | B : ±10%(−25 to +85°C)                                                                                                                                       |                              |
|                                              | X5R : ±15%(−55 to +85°C)                                                                                                                                     |                              |
| Test Methods and Remarks                     | X7R : ±15%(−55 to +125°C)                                                                                                                                    |                              |
|                                              | X7S : ±22%(−55 to +125°C)                                                                                                                                    |                              |
|                                              | Temperature Compensating(High Frequency type)                                                                                                                |                              |
|                                              | Capacitance at 25°C and 85°C shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.   |                              |
|                                              | $\frac{(C_{85}-C_{25})}{C_{25} \times \Delta T} \times 10^6 \times [\text{ppm}/^{\circ}\text{C}]$                                                            |                              |
|                                              | High permittivity                                                                                                                                            |                              |
|                                              | Capacitance value at each step shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation. |                              |
|                                              | Step                                                                                                                                                         | B X5R、X7R、X7S                |
|                                              | 1                                                                                                                                                            | Minimum operating tempeature |
|                                              | 2                                                                                                                                                            | 20°C 25°C                    |
| 3                                            | Maximum operating temperature                                                                                                                                |                              |
|                                              | $\frac{(C-C_2)}{C_2} \times 100(\%)$                                                                                                                         |                              |
|                                              | C : Capacitance value in Step 1 or Step 3                                                                                                                    |                              |
|                                              | C2 : Capacitance value in Step 2                                                                                                                             |                              |

| 9. Deflection            |                                                                                                                                                                                                                                                                                                              |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value          | Temperature Compensating(High Frequency type)<br>Appearance : No abnormality<br>Capacitance change : ±5% or ±0.5pF, whichever is larger.<br><br>High permittivity<br>Appearance : No abnormality<br>Capacitance change : Within ±10%                                                                         |
| Test Methods and Remarks | Warp : 1mm (Soft Termination type:3mm)<br>Duration : 10sec.<br>Test board : Glass epoxy-resin substrate<br>Thicknss : 1.6mm<br><br><br>(Unit: mm)<br><br>Capacitance measurement shall be conducted with the board bent. |

| 10. Adhesive Strength of Terminal Electrodes          |                                                                                                                                                                                                                                                                   |                                                                     |                  |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------|
| Specified Value                                       | No terminal separation or its indication.                                                                                                                                                                                                                         |                                                                     |                  |
| Test Methods and Remarks                              | Temperature Compensating(High Frequency type)<br>Applied force : 2N<br>Duration : 10±1sec.                                                                                                                                                                        |                                                                     |                  |
|                                                       | High permittivity<br>Applied force : 5N<br>Duration : 30±5sec.                                                                                                                                                                                                    |                                                                     |                  |
|                                                       |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| 11. Solderability                                     |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| Specified Value                                       | At least 95% of terminal electrode is covered by new solder                                                                                                                                                                                                       |                                                                     |                  |
| Test Methods and Remarks                              |                                                                                                                                                                                                                                                                   | Eutectic solder                                                     | Lead-free solder |
|                                                       | Solder type                                                                                                                                                                                                                                                       | H60A or H63A                                                        | Sn-3.0Ag-0.5Cu   |
|                                                       | Solder temperature                                                                                                                                                                                                                                                | 230±5℃                                                              | 245±3℃           |
|                                                       | Duration                                                                                                                                                                                                                                                          | 4±1 sec.                                                            |                  |
|                                                       |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| 12. Resistance to Soldering                           |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| Specified Value                                       | Temperature Compensating(High Frequency type)<br>Appearance : No abnormality<br>Capacitance change : C※≤10pF :±0.25pF C※>10pF :±2.5% ※Normal capacitance<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality    |                                                                     |                  |
|                                                       | High permittivity<br>Appearance : No abnormality<br>Capacitance change : Within±15%(HMK,HMJ), ±10%(QMK,QMJ, SMK,SMJ)<br>Dissipation factor : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality  |                                                                     |                  |
| Test Methods and Remarks                              | Preconditioning                                                                                                                                                                                                                                                   | : Thermal treatment(at 150℃ for 1hr) Note1 (Only High permittivity) |                  |
|                                                       | Solder temperature                                                                                                                                                                                                                                                | : 270±5℃                                                            |                  |
|                                                       | Duration                                                                                                                                                                                                                                                          | : 3±0.5sec.                                                         |                  |
|                                                       | Preheating conditions                                                                                                                                                                                                                                             | : 80 to 100℃, 2 to 5 min. 150 to 200℃, 2 to 5min.                   |                  |
|                                                       | Recovery                                                                                                                                                                                                                                                          | : 24±2hrs under the stadard condition Note3                         |                  |
|                                                       |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| 13. Temperature Cycle (Thermal Shock)                 |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| Specified Value                                       | Temperature Compensating(High Frequency type)<br>Appearance : No abnormality<br>Capacitance change : C※≤10pF :±0.25% C※>10pF :±2.5%<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality                         |                                                                     |                  |
|                                                       | High permittivity<br>Appearance : No abnormality<br>Capacitance change : Within±15%(HMK,HMJ), ±7.5%(QMK,QMJ, SMK,SMJ)<br>Dissipation factor : Initial value<br>Insulation resistance : Initial value<br>Withstanding voltage (between terminals) : No abnormality |                                                                     |                  |
| Test Methods and Remarks                              | Preconditioning : Thermal treatment (at 150℃ for 1hr) Note1                                                                                                                                                                                                       |                                                                     |                  |
|                                                       | Conditions for 1 cycle                                                                                                                                                                                                                                            |                                                                     |                  |
|                                                       | Step                                                                                                                                                                                                                                                              | temperature(℃)                                                      | Time (min.)      |
|                                                       | 1                                                                                                                                                                                                                                                                 | Minimum operating temperature                                       | 30±3min.         |
|                                                       | 2                                                                                                                                                                                                                                                                 | Normal temperature                                                  | 2 to 3min.       |
|                                                       | 3                                                                                                                                                                                                                                                                 | Maximum operating temperature                                       | 30±3min.         |
|                                                       | 4                                                                                                                                                                                                                                                                 | Normal temperature                                                  | 2 to 3min.       |
| Number of cycles : 5 times                            |                                                                                                                                                                                                                                                                   |                                                                     |                  |
| Recovery : 24±2hrs under the standard condition Note3 |                                                                                                                                                                                                                                                                   |                                                                     |                  |



14. Humidity (Steady state)

|                      |
|----------------------|
| 15. Humidity Loading |
|----------------------|

|  |                                               |
|--|-----------------------------------------------|
|  | Temperature Compensating(High Frequency type) |
|--|-----------------------------------------------|

|                              |
|------------------------------|
| 16. High Temperature Loading |
|------------------------------|

|                                               |
|-----------------------------------------------|
| Temperature Compensating(High Frequency type) |
|-----------------------------------------------|

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Note1 Thermal treatment  | : Initial value shall be measured after test sample is heat-treated at $150 \pm 0/-10^{\circ}\text{C}$ for an hour and kept at room temperature for $24 \pm 2$ hours.                                                                                                                                                                                                                                                                                                                                     |
| Note2 Voltage treatment  | : Initial value shall be measured after test sample is voltage-treated for an hour at both the temperature and voltage specified in the test conditions, and kept at room temperature for $24 \pm 2$ hours.                                                                                                                                                                                                                                                                                               |
| Note3 Standard condition | : Temperature: $5$ to $35^{\circ}\text{C}$ , Relative humidity: $45$ to $85\%$ RH, Air pressure: $86$ to $106\text{kPa}$<br>When there are questions concerning measurement results, in order to provide correlation data, the test shall be conducted under the following condition.<br>Temperature: $20 \pm 2^{\circ}\text{C}$ , Relative humidity: $60$ to $70\%$ RH, Air pressure: $86$ to $106\text{kPa}$<br>Unless otherwise specified, all the tests are conducted under the "standard condition". |

Temperature:  $20 \pm 2^{\circ}\text{C}$ , Relative humidity: 60 to 70 % RH, Air pressure: 86 to 106kPa  
Unless otherwise specified, all the tests are conducted under the "standard condition".

# Precautions on the use of Multilayer Ceramic Capacitors

## PRECAUTIONS

### 1. Circuit Design

#### Precautions

- ◆Verification of operating environment, electrical rating and performance
  1. A malfunction of equipment in fields such as medical, aerospace, nuclear control, etc. may cause serious harm to human life or have severe social ramifications.  
Therefore, any capacitors to be used in such equipment may require higher safety and reliability, and shall be clearly differentiated from them used in general purpose applications.
- ◆Operating Voltage (Verification of Rated voltage)
  1. The operating voltage for capacitors must always be their rated voltage or less.  
If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages shall be the rated voltage or less.  
For a circuit where an AC or a pulse voltage may be used, the sum of their peak voltages shall also be the rated voltage or less.
  2. Even if an applied voltage is the rated voltage or less reliability of capacitors may be deteriorated in case that either a high frequency AC voltage or a pulse voltage having rapid rise time is used in a circuit.

### 2. PCB Design

#### Precautions

- ◆Pattern configurations (Design of Land-patterns)
  1. When capacitors are mounted on PCBs, the amount of solder used (size of fillet) can directly affect the capacitor performance.  
Therefore, the following items must be carefully considered in the design of land patterns:
    - (1) Excessive solder applied can cause mechanical stresses which lead to chip breaking or cracking. Therefore, please consider appropriate land-patterns for proper amount of solder.
    - (2) When more than one component are jointly soldered onto the same land, each component's soldering point shall be separated by solder-resist.
- ◆Pattern configurations (Capacitor layout on PCBs)
 

After capacitors are mounted on boards, they can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering of the boards, etc.). For this reason, land pattern configurations and positions of capacitors shall be carefully considered to minimize stresses.

#### Technical considerations

- ◆Pattern configurations (Design of Land-patterns)
 

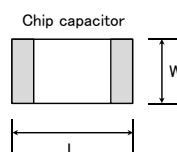
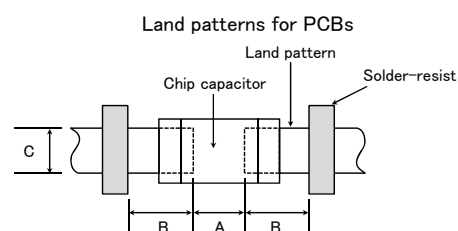
The following diagrams and tables show some examples of recommended land patterns to prevent excessive solder amounts.

(1) Recommended land dimensions for typical chip capacitors

#### ●Multilayer Ceramic Capacitors : Recommended land dimensions (unit: mm)

##### Wave-soldering

| Type |   | 107        | 212        | 316        | 325        |
|------|---|------------|------------|------------|------------|
| Size | L | 1.6        | 2.0        | 3.2        | 3.2        |
|      | W | 0.8        | 1.25       | 1.6        | 2.5        |
| A    |   | 0.8 to 1.0 | 1.0 to 1.4 | 1.8 to 2.5 | 1.8 to 2.5 |
| B    |   | 0.5 to 0.8 | 0.8 to 1.5 | 0.8 to 1.7 | 0.8 to 1.7 |
| C    |   | 0.6 to 0.8 | 0.9 to 1.2 | 1.2 to 1.6 | 1.8 to 2.5 |



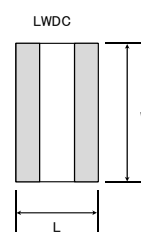
##### Reflow-soldering

| Type | 042          | 063          | 105          | 107        | 212        | 316        | 325        | 432        |
|------|--------------|--------------|--------------|------------|------------|------------|------------|------------|
| Size | L            | 0.4          | 0.6          | 1.0        | 1.6        | 2.0        | 3.2        | 4.5        |
|      | W            | 0.2          | 0.3          | 0.5        | 0.8        | 1.25       | 1.6        | 3.2        |
| A    | 0.15 to 0.25 | 0.20 to 0.30 | 0.45 to 0.55 | 0.8 to 1.0 | 0.8 to 1.2 | 1.8 to 2.5 | 1.8 to 2.5 | 2.5 to 3.5 |
| B    | 0.15 to 0.20 | 0.20 to 0.30 | 0.40 to 0.50 | 0.6 to 0.8 | 0.8 to 1.2 | 1.0 to 1.5 | 1.0 to 1.5 | 1.5 to 1.8 |
| C    | 0.15 to 0.30 | 0.25 to 0.40 | 0.45 to 0.55 | 0.6 to 0.8 | 0.9 to 1.6 | 1.2 to 2.0 | 1.8 to 3.2 | 2.3 to 3.5 |

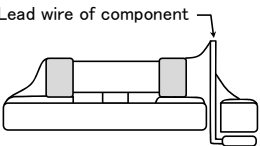
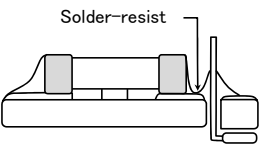
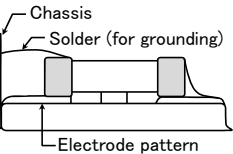
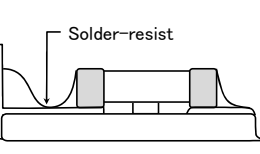
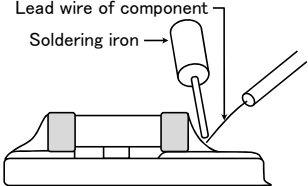
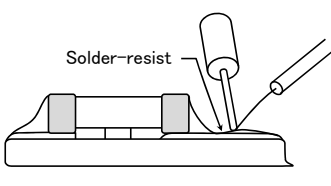
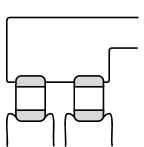
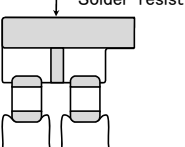
Note: Recommended land size might be different according to the allowance of the size of the product.

#### ●LWDC: Recommended land dimensions for reflow-soldering (unit: mm)

| Type |   | 105          | 107         | 212        |
|------|---|--------------|-------------|------------|
| Size | L | 0.52         | 0.8         | 1.25       |
|      | W | 1.0          | 1.6         | 2.0        |
| A    |   | 0.18 to 0.22 | 0.25 to 0.3 | 0.5 to 0.7 |
| B    |   | 0.2 to 0.25  | 0.3 to 0.4  | 0.4 to 0.5 |
| C    |   | 0.9 to 1.1   | 1.5 to 1.7  | 1.9 to 2.1 |

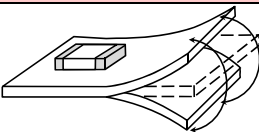
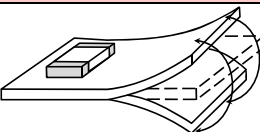


## (2) Examples of good and bad solder application

| Items                                                       | Not recommended                                                                   | Recommended                                                                         |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Mixed mounting of SMD and leaded components                 |  |  |
| Component placement close to the chassis                    |  |  |
| Hand-soldering of leaded components near mounted components |  |  |
| Horizontal component placement                              |  |  |

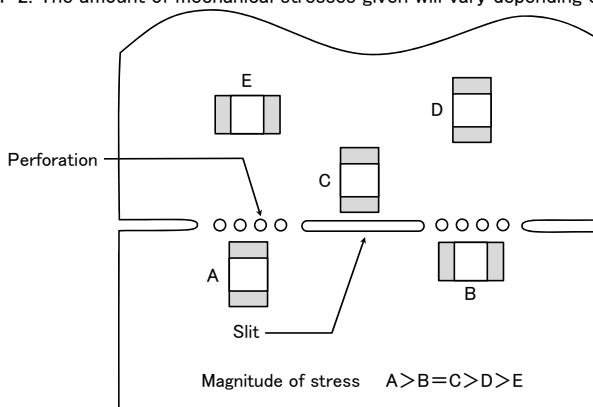
### ◆ Pattern configurations (Capacitor layout on PCBs)

1-1. The following is examples of good and bad capacitor layouts ; capacitors shall be located to minimize any possible mechanical stresses from board warp or deflection.

| Items               | Not recommended                                                                    | Recommended                                                                         |
|---------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Deflection of board |  |  |

Place the product at a right angle to the direction of the anticipated mechanical stress.

1-2. The amount of mechanical stresses given will vary depending on capacitor layout. Please refer to diagram below.



1-3. When PCB is split, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, please consider the PCB, split methods as well as chip location.

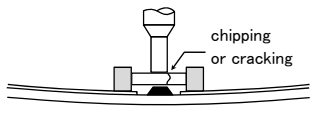
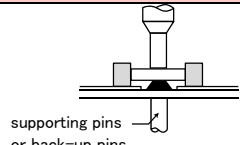
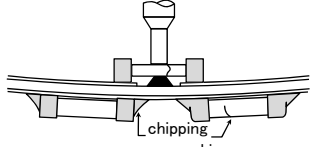
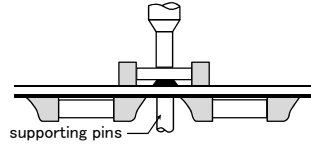
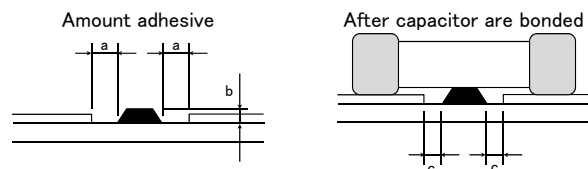
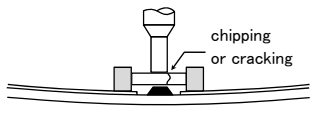
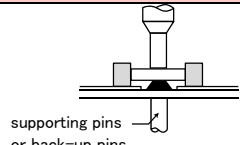
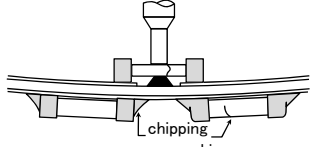
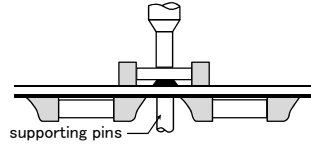
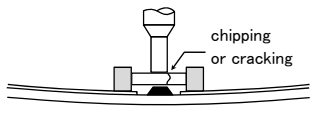
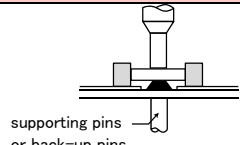
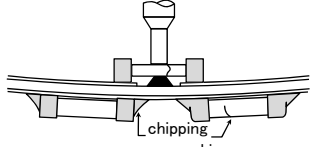
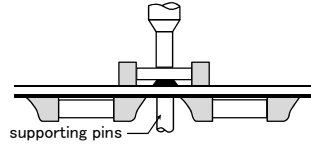
## 3. Mounting

### ◆ Adjustment of mounting machine

- When capacitors are mounted on PCB, excessive impact load shall not be imposed on them.
- Maintenance and inspection of mounting machines shall be conducted periodically.

### ◆ Selection of Adhesives

- When chips are attached on PCBs with adhesives prior to soldering, it may cause capacitor characteristics degradation unless the following factors are appropriately checked : size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, please contact us for further information.

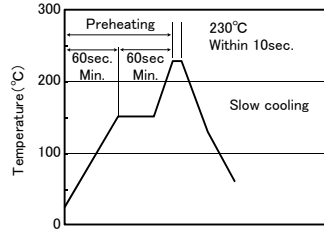
| Technical considerations | <p>◆Adjustment of mounting machine</p> <p>1. When the bottom dead center of a pick-up nozzle is too low, excessive force is imposed on capacitors and causes damages. To avoid this, the following points shall be considerable.</p> <p>(1) The bottom dead center of the pick-up nozzle shall be adjusted to the surface level of PCB without the board deflection.</p> <p>(2) The pressure of nozzle shall be adjusted between 1 and 3 N static loads.</p> <p>(3) To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins shall be used on the other side of the PCB. The following diagrams show some typical examples of good and bad pick-up nozzle placement:</p> <table><tr><th>Items</th><th>Not recommended</th><th>Recommended</th></tr><tr><td>Single-sided mounting</td><td></td><td></td></tr><tr><td>Double-sided mounting</td><td></td><td></td></tr></table> <p>2. As the alignment pin is worn out, adjustment of the nozzle height can cause chipping or cracking of capacitors because of mechanical impact on the capacitors.</p> <p>To avoid this, the monitoring of the width between the alignment pins in the stopped position, maintenance, check and replacement of the pin shall be conducted periodically.</p> <p>◆Selection of Adhesives</p> <p>Some adhesives may cause IR deterioration. The different shrinkage percentage of between the adhesive and the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect components. Therefore, the following precautions shall be noted in the application of adhesives.</p> <p>(1) Required adhesive characteristics</p> <ol style="list-style-type: none"><li>The adhesive shall be strong enough to hold parts on the board during the mounting &amp; solder process.</li><li>The adhesive shall have sufficient strength at high temperatures.</li><li>The adhesive shall have good coating and thickness consistency.</li><li>The adhesive shall be used during its prescribed shelf life.</li><li>The adhesive shall harden rapidly.</li><li>The adhesive shall have corrosion resistance.</li><li>The adhesive shall have excellent insulation characteristics.</li><li>The adhesive shall have no emission of toxic gasses and no effect on the human body.</li></ol> <p>(2) The recommended amount of adhesives is as follows;</p> <p>[Recommended condition]</p> <table><tr><th>Figure</th><th>212/316 case sizes as examples</th></tr><tr><td>a</td><td>0.3mm min</td></tr><tr><td>b</td><td>100 to 120 μm</td></tr><tr><td>c</td><td>Adhesives shall not contact land</td></tr></table> <div></div> | Items                                                                               | Not recommended                                                                     | Recommended | Single-sided mounting |  |  | Double-sided mounting |  |  | Figure | 212/316 case sizes as examples | a | 0.3mm min | b | 100 to 120 μm | c | Adhesives shall not contact land |  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------|-----------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|--------------------------------|---|-----------|---|---------------|---|----------------------------------|--|
|                          | Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Not recommended                                                                     | Recommended                                                                         |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
|                          | Single-sided mounting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |  |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| Double-sided mounting    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| Figure                   | 212/316 case sizes as examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| a                        | 0.3mm min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| b                        | 100 to 120 μm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| c                        | Adhesives shall not contact land                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| 4. Soldering             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| Precautions              | <p>◆Selection of Flux</p> <p>Since flux may have a significant effect on the performance of capacitors, it is necessary to verify the following conditions prior to use;</p> <p>(1) Flux used shall be less than or equal to 0.1 wt% ( in Cl equivalent) of halogenated content. Flux having a strong acidity content shall not be applied.</p> <p>(2) When shall capacitors are soldered on boards, the amount of flux applied shall be controlled at the optimum level.</p> <p>(3) When water-soluble flux is used, special care shall be taken to properly clean the boards.</p> <p>◆Soldering</p> <p>Temperature, time, amount of solder, etc. shall be set in accordance with their recommended conditions.</p> <p>Sn-Zn solder paste can adversely affect MLCC reliability.</p> <p>Please contact us prior to usage of Sn-Zn solder.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |
| Technical considerations | <p>◆Selection of Flux</p> <p>1-1. When too much halogenated substance (Chlorine, etc.) content is used to activate flux, or highly acidic flux is used, it may lead to corrosion of terminal electrodes or degradation of insulation resistance on the surfaces of the capacitors.</p> <p>1-2. Flux is used to increase solderability in wave soldering. However if too much flux is applied, a large amount of flux gas may be emitted and may adversely affect the solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.</p> <p>1-3. Since the residue of water-soluble flux is easily dissolved in moisture in the air, the residues on the surfaces of capacitors in high humidity conditions may cause a degradation of insulation resistance and reliability of the capacitors. Therefore, the cleaning methods and the capability of the machines used shall also be considered carefully when water-soluble flux is used.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                     |                                                                                     |             |                       |                                                                                   |                                                                                     |                       |                                                                                   |                                                                                     |        |                                |   |           |   |               |   |                                  |  |

# ◆Soldering

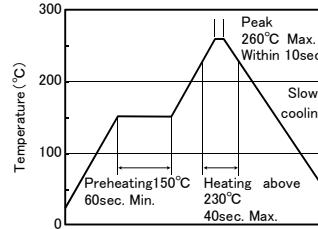
- Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling.
- Therefore, the soldering must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
- Preheating : Capacitors shall be preheated sufficiently, and the temperature difference between the capacitors and solder shall be within 100 to 130°C.
- Cooling : The temperature difference between the capacitors and cleaning process shall not be greater than 100°C.

## [Reflow soldering]

### 【Recommended conditions for eutectic soldering】

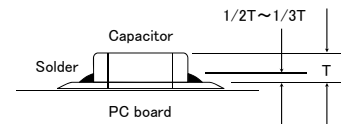


### 【Recommended condition for Pb-free soldering】



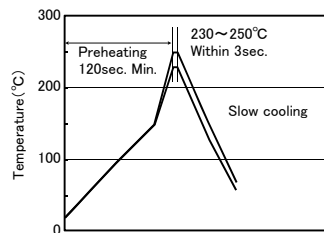
## Caution

- ①The ideal condition is to have solder mass(fillet) controlled to 1/2 to 1/3 of the thickness of a capacitor.
- ②Because excessive dwell times can adversely affect solderability, soldering duration shall be kept as close to recommended times as possible.
- ③Allowable number of reflow soldering : 2 times max.

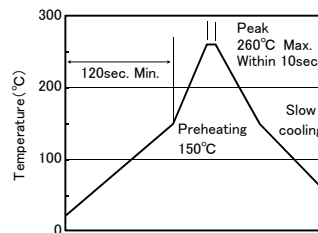


## [Wave soldering]

### 【Recommended conditions for eutectic soldering】



### 【Recommended condition for Pb-free soldering】

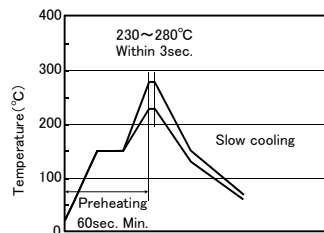


## Caution

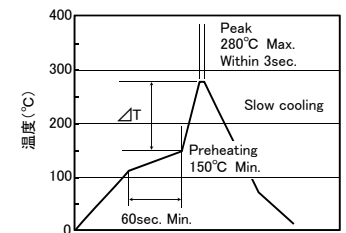
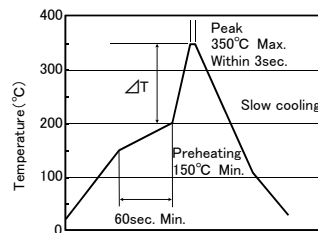
- ①Wave soldering must not be applied to capacitors designated as for reflow soldering only.
- ②Allowable number of wave soldering : 1 times max.

## [Hand soldering]

### 【Recommended conditions for eutectic soldering】



### 【Recommended condition for Pb-free soldering】



|                 | $\Delta T$                          |
|-----------------|-------------------------------------|
| 316type or less | $\Delta T \leq 150^{\circ}\text{C}$ |

|                 | $\Delta T$                          |
|-----------------|-------------------------------------|
| 325type or more | $\Delta T \leq 130^{\circ}\text{C}$ |

## Caution

- ①Use a 50W soldering iron with a maximum tip diameter of 1.0 mm.
- ②The soldering iron shall not directly touch capacitors.
- ③Allowable number of hand soldering : 1 times max.

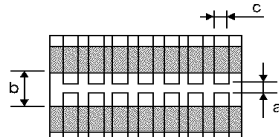
| 5. Cleaning                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions                                                                                                                                                                                                                               | <p>◆Cleaning conditions</p> <ol style="list-style-type: none"> <li>When PCBs are cleaned after capacitors mounting, please select the appropriate cleaning solution in accordance with the intended use of the cleaning. (e.g. to remove soldering flux or other materials from the production process.)</li> <li>Cleaning condition shall be determined after it is verified by using actual cleaning machine that the cleaning process does not affect capacitor's characteristics.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Technical considerations                                                                                                                                                                                                                  | <ol style="list-style-type: none"> <li>The use of inappropriate cleaning solutions can cause foreign substances such as flux residue to adhere to capacitors or deteriorate their outer coating, resulting in a degradation of the capacitor's electrical properties (especially insulation resistance).</li> <li>Inappropriate cleaning conditions (insufficient or excessive cleaning) may adversely affect the performance of the capacitors. In the case of ultrasonic cleaning, too much power output can cause excessive vibration of PCBs which may lead to the cracking of capacitors or the soldered portion, or decrease the terminal electrodes' strength. Therefore, the following conditions shall be carefully checked:<br/>           Ultrasonic output : 20 W/l or less<br/>           Ultrasonic frequency : 40 kHz or less<br/>           Ultrasonic washing period : 5 min. or less</li> </ol>                                                                                                                                                                                     |
| 6. Resin coating and mold                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Precautions                                                                                                                                                                                                                               | <ol style="list-style-type: none"> <li>With some type of resins, decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the capacitor's performance.</li> <li>When a resin's hardening temperature is higher than capacitor's operating temperature, the stresses generated by the excessive heat may lead to damage or destruction of capacitors.<br/>The use of such resins, molding materials etc. is not recommended.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 7. Handling                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Precautions                                                                                                                                                                                                                               | <p>◆Splitting of PCB</p> <ol style="list-style-type: none"> <li>When PCBs are split after components mounting, care shall be taken so as not to give any stresses of deflection or twisting to the board.</li> <li>Board separation shall not be done manually, but by using the appropriate devices.</li> </ol> <p>◆Mechanical considerations</p> <p>Be careful not to subject capacitors to excessive mechanical shocks.</p> <p>(1) If ceramic capacitors are dropped onto a floor or a hard surface, they shall not be used.</p> <p>(2) Please be careful that the mounted components do not come in contact with or bump against other boards or components.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 8. Storage conditions                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Precautions                                                                                                                                                                                                                               | <p>◆Storage</p> <ol style="list-style-type: none"> <li>To maintain the solderability of terminal electrodes and to keep packaging materials in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible.<br/>           •Recommended conditions<br/>               Ambient temperature : Below 30°C<br/>               Humidity : Below 70% RH<br/>           The ambient temperature must be kept below 40°C. Even under ideal storage conditions, solderability of capacitor is deteriorated as time passes, so capacitors shall be used within 6 months from the time of delivery.<br/>           •Ceramic chip capacitors shall be kept where no chlorine or sulfur exists in the air.</li> <li>The capacitance values of high dielectric constant capacitors will gradually decrease with the passage of time, so care shall be taken to design circuits. Even if capacitance value decreases as time passes, it will get back to the initial value by a heat treatment at 150°C for 1 hour.</li> </ol> |
| Technical considerations                                                                                                                                                                                                                  | <p>If capacitors are stored in a high temperature and humidity environment, it might rapidly cause poor solderability due to terminal oxidation and quality loss of taping/packaging materials. For this reason, capacitors shall be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the capacitors.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>※RCR-2335B (Safety Application Guide for fixed ceramic capacitors for use in electronic equipment) is published by JEITA.<br/>Please check the guide regarding precautions for deflection test, soldering by spot heat, and so on.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

# High Reliability Application Multilayer Ceramic Capacitors

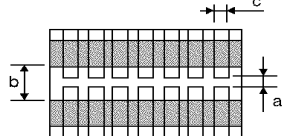
## RELIABILITY DATA

|                                                        |                                                                                                                                                                                                    |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Operating Temperature Range                         |                                                                                                                                                                                                    |
| Specified Value                                        | X7R(−55°C to +125°C)                                                                                                                                                                               |
| Test Methods and Remarks                               | Continuous use is available in this range. (reference temperature : 25°C)                                                                                                                          |
| 2. Highest Operating temperature Range                 |                                                                                                                                                                                                    |
| Specified Value                                        | X7R(−55°C to +125°C)                                                                                                                                                                               |
| Test Methods and Remarks                               | Maximum operating temperature at which capacitors can be continuously used with rated voltage applied.                                                                                             |
| 3. Rated Voltage                                       |                                                                                                                                                                                                    |
| Specified Value                                        | Please refer to the page of the "PART NUMBERS".                                                                                                                                                    |
| Test Methods and Remarks                               | Continuous maximum applied voltage. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated voltage of the capacitor.                          |
| 4. Shape and Dimensions                                |                                                                                                                                                                                                    |
| Specified Value                                        | Please refer to the page of the "EXTERNAL DIMENSIONS".                                                                                                                                             |
| 5. Heat Treatment (Class II)                           |                                                                                                                                                                                                    |
| Test Methods and Remarks                               | Initial value shall be measured after test sample is heat-treated at 150+0/−10°C for an hour and kept at room temperature for 24 ± 2 hours.                                                        |
| 6. Voltage Treatment (Class II)                        |                                                                                                                                                                                                    |
| Test Methods and Remarks                               | Initial value shall be measured after test sample is voltage-treated for an hour at temperature and voltage which are specified as test conditions, and kept at room temperature for 24 ± 2 hours. |
| 7. Dielectric Withstanding Voltage (between terminals) |                                                                                                                                                                                                    |
| Specified Value                                        | No abnormality.                                                                                                                                                                                    |
| Test Methods and Remarks                               | Applied voltage : Rated voltage × 2.5<br>Duration : 1 to 5 seconds.<br>Charging and discharging current shall be 50mA max.                                                                         |
| 8. Insulation Resistance                               |                                                                                                                                                                                                    |
| Specified Value                                        | Larger than whichever smaller of 500 MΩ · μF or 10 <sup>4</sup> MΩ                                                                                                                                 |
| Test Methods and Remarks                               | Applied voltage : Rated voltage<br>Duration : 60±5 seconds.<br>Charging and discharging current shall be 50mA max.                                                                                 |
| 9. Capacitance and Tolerance                           |                                                                                                                                                                                                    |
| Specified Value                                        | Please refer to the page of the "PART NUMBERS".                                                                                                                                                    |
| Test Methods and Remarks                               | Measurement frequency : 1kHz±10% (C≤10 μF)<br>Measurement voltage : 1±0.2Vrms (C≤10 μF)<br>0.5±0.1V (6.3V rated voltage)                                                                           |
| 10. Q or Dissipation factor (tan δ)                    |                                                                                                                                                                                                    |
| Specified Value                                        | Please refer to the page of the "PART NUMBERS".                                                                                                                                                    |
| Test Methods and Remarks                               | Measurement frequency : 1kHz±10% (C≤10 μF)<br>Measurement voltage : 1±0.2Vrms (C≤10 μF)<br>0.5±0.1V (6.3V rated voltage)                                                                           |

▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

|                                                  |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|
| 11. Temperature Characteristic (without DC bias) |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
| Specified Value                                  | X7R(−55℃ to +125℃) : ±15%                                                                                                                                                      |                                                                                                                          |                       |      |      |
| Test Methods and Remarks                         | Heat treatment specified in No.5 of the specification shall be conducted prior to measurement.<br>Change of the maximum capacitance deviation in step 1 to 5.                  |                                                                                                                          |                       |      |      |
|                                                  | step                                                                                                                                                                           | Temperature(℃)                                                                                                           |                       |      |      |
|                                                  | 1                                                                                                                                                                              | +25                                                                                                                      |                       |      |      |
|                                                  | 2                                                                                                                                                                              | Minimum operating temperature                                                                                            |                       |      |      |
|                                                  | 3                                                                                                                                                                              | +25                                                                                                                      |                       |      |      |
|                                                  | 4                                                                                                                                                                              | Maximum operating temperature                                                                                            |                       |      |      |
|                                                  | 5                                                                                                                                                                              | +25                                                                                                                      |                       |      |      |
| 12. Adhesive Force of Terminal Electrodes        |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
| Specified Value                                  | Appearance: Terminal electrodes shall be no exfoliation or a sign of exfoliation.                                                                                              |                                                                                                                          |                       |      |      |
| Test Methods and Remarks                         |                                                                                                                                                                                | 1608 size                                                                                                                | larger than 2012 size |      |      |
|                                                  | Applying force                                                                                                                                                                 | 5N                                                                                                                       | 10N                   |      |      |
|                                                  | Duration                                                                                                                                                                       | 30±5 seconds.                                                                                                            |                       |      |      |
|                                                  | Board                                                                                                                                                                          | Glass epoxy-resin substrate                                                                                              |                       |      |      |
|                                                  | Thickness                                                                                                                                                                      | 1.6mm                                                                                                                    |                       |      |      |
|                                                  | Solder lands refer to fig.1.                                                                                                                                                   |                                                                                                                          |                       |      |      |
|                                                  |                                                                                               |                                                                                                                          |                       |      |      |
|                                                  | Fig.1                                                                                                                                                                          |                                                                                                                          |                       |      |      |
|                                                  |                                                                                                                                                                                | Dimension                                                                                                                | Case size             |      |      |
|                                                  |                                                                                                                                                                                |                                                                                                                          | 1608                  | 2012 | 3216 |
|                                                  | a                                                                                                                                                                              | 1.0                                                                                                                      | 1.2                   | 2.2  | 2.2  |
|                                                  | b                                                                                                                                                                              | 3.0                                                                                                                      | 4.0                   | 5.0  | 5.0  |
|                                                  | c                                                                                                                                                                              | 1.2                                                                                                                      | 1.65                  | 2.0  | 2.9  |
| 13. Vibration                                    |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
| Specified Value                                  | Appearance                                                                                                                                                                     | : No abnormality                                                                                                         |                       |      |      |
|                                                  | Capacitance change                                                                                                                                                             | : Initial value shall be satisfied.                                                                                      |                       |      |      |
|                                                  | Dissipation factor                                                                                                                                                             | : Initial value shall be satisfied.                                                                                      |                       |      |      |
|                                                  | Insulation resistance                                                                                                                                                          | : Initial value shall be satisfied.                                                                                      |                       |      |      |
| Test Methods and Remarks                         | Heat treatment specified in No.5 of the specification shall be conducted prior to test. Measurement shall be conducted after test sample is heat treated as specified in No.5. |                                                                                                                          |                       |      |      |
|                                                  | Solder lands refer to figure 1.                                                                                                                                                |                                                                                                                          |                       |      |      |
|                                                  | Direction of the vibration test                                                                                                                                                | : X, Y, Z each of 3 orientations for 2 hours respectively (total 6 hours)                                                |                       |      |      |
|                                                  | Vibration frequency                                                                                                                                                            | : 10 to 55 to 10Hz (1 minutes each)                                                                                      |                       |      |      |
|                                                  | Total amplitude                                                                                                                                                                | : 1.5 mm                                                                                                                 |                       |      |      |
|                                                  | Measurement after the test shall be made after test sample is kept at room temperature for 24 ±2 hours.                                                                        |                                                                                                                          |                       |      |      |
| 14. Resistance to Soldering Heat                 |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
| Specified Value                                  | Appearance                                                                                                                                                                     | : No abnormality                                                                                                         |                       |      |      |
|                                                  | Capacitance change                                                                                                                                                             | : ≤ ±7.5%                                                                                                                |                       |      |      |
|                                                  | Dissipation factor                                                                                                                                                             | : Initial value shall be satisfied.                                                                                      |                       |      |      |
|                                                  | Insulation resistance                                                                                                                                                          | : Initial value shall be satisfied.                                                                                      |                       |      |      |
|                                                  | Dielectric withstanding voltage                                                                                                                                                | (between terminals) : No abnormality                                                                                     |                       |      |      |
| Test Methods and Remarks                         | Heat treatment specified in No.5 of the specification shall be conducted prior to test.                                                                                        |                                                                                                                          |                       |      |      |
|                                                  | Immerse test sample in an solder solution (Sn-3Ag-0.5Cu).                                                                                                                      |                                                                                                                          |                       |      |      |
|                                                  | Soldering temperature                                                                                                                                                          | : 270℃±5℃                                                                                                                |                       |      |      |
|                                                  | Duration                                                                                                                                                                       | : 3±0.5 seconds                                                                                                          |                       |      |      |
|                                                  | Soaking position                                                                                                                                                               | : Test sample is soaked until the terminal electrode is covered in solder solution.                                      |                       |      |      |
|                                                  | Preheating condition                                                                                                                                                           | : 3216 size or smaller size: 120 to 150℃ for 1 minute,<br>3225 size: 100 to 120℃ for 1 minute, 170 to 200℃ for 1 minute. |                       |      |      |
|                                                  | Measurement after the test shall be made after test sample is kept at room temperature for 24 ±2 hours.                                                                        |                                                                                                                          |                       |      |      |
| 15. Solderability                                |                                                                                                                                                                                |                                                                                                                          |                       |      |      |
| Specified Value                                  | More than 95% of terminal electrode shall be covered with fresh solder.                                                                                                        |                                                                                                                          |                       |      |      |
| Test Methods and Remarks                         | Heat treatment specified in No.5 of the specification shall be conducted prior to test.                                                                                        |                                                                                                                          |                       |      |      |
|                                                  | Immerse test sample in an solder solution(Sn-3Ag-0.5Cu).                                                                                                                       |                                                                                                                          |                       |      |      |
|                                                  | Soldering temperature                                                                                                                                                          | : 245℃±3℃                                                                                                                |                       |      |      |
|                                                  | Duration                                                                                                                                                                       | : 4±1 seconds                                                                                                            |                       |      |      |
|                                                  | Dipping position                                                                                                                                                               | : Test sample is immersed until the terminal electrode is covered in solder solution.                                    |                       |      |      |

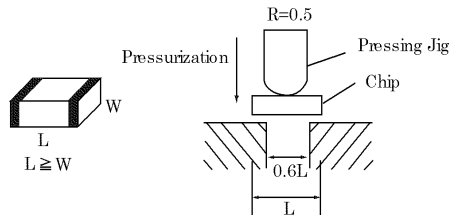


| 16. Thermal shock                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |                   |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|---------------|---------------|---|---------------------------|------|-------------------|------|---------------------------|-----|-------------------|-----|-----|---|-----|-----|-----|-----|---|-----|-----|-----|-----|
| Specified Value                                                                                                                     | Appearance : No abnormality<br>Capacitance change : $\leq \pm 7.5\%$<br>Dissipation factor : Initial value shall be satisfied.<br>Insulation resistance : Initial value shall be satisfied.<br>Dielectric withstanding voltage (between terminals) : No abnormality                                                                                                                                                                                                 |                 |                   |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| Test Methods and Remarks                                                                                                            | Heat treatment specified in No.5 of the specification shall be conducted prior to test.<br>Measurement shall be conducted after test sample is heat treated as specified in No.5.<br>condition of the one cycle (Air—Air)                                                                                                                                                                                                                                           |                 |                   |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
|                                                                                                                                     | <table><tr><th>Step</th><th>Temperature(°C)</th><th>Time(min.)</th><th>Transfer time</th></tr><tr><td>1</td><td>Minimum usage temperature</td><td>15</td><td>within 20 seconds</td></tr><tr><td>2</td><td>Maximum usage temperature</td><td>15</td><td>within 20 seconds</td></tr></table>                                                                                                                                                                          | Step            | Temperature(°C)   | Time(min.)    | Transfer time | 1 | Minimum usage temperature | 15   | within 20 seconds | 2    | Maximum usage temperature | 15  | within 20 seconds |     |     |   |     |     |     |     |   |     |     |     |     |
|                                                                                                                                     | Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Temperature(°C) | Time(min.)        | Transfer time |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| 1                                                                                                                                   | Minimum usage temperature                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15              | within 20 seconds |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| 2                                                                                                                                   | Maximum usage temperature                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15              | within 20 seconds |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| Test cycles: 100 times.<br>Measurement after the test shall be made after test sample is kept at room temperature for 24 ± 2 hours. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |                   |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
|                                                                                                                                     | <div><table><tr><th rowspan="2">Dimension</th><th colspan="4">Case size</th></tr><tr><th>1608</th><th>2012</th><th>3216</th><th>3225</th></tr><tr><td>a</td><td>0.6</td><td>0.8</td><td>2.0</td><td>2.0</td></tr><tr><td>b</td><td>2.2</td><td>3.0</td><td>4.4</td><td>4.4</td></tr><tr><td>c</td><td>0.9</td><td>1.3</td><td>1.7</td><td>2.6</td></tr></table></div> <p>Fig.2</p> | Dimension       | Case size         |               |               |   | 1608                      | 2012 | 3216              | 3225 | a                         | 0.6 | 0.8               | 2.0 | 2.0 | b | 2.2 | 3.0 | 4.4 | 4.4 | c | 0.9 | 1.3 | 1.7 | 2.6 |
| Dimension                                                                                                                           | Case size                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                   |               |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
|                                                                                                                                     | 1608                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2012            | 3216              | 3225          |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| a                                                                                                                                   | 0.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.8             | 2.0               | 2.0           |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| b                                                                                                                                   | 2.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3.0             | 4.4               | 4.4           |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |
| c                                                                                                                                   | 0.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1.3             | 1.7               | 2.6           |               |   |                           |      |                   |      |                           |     |                   |     |     |   |     |     |     |     |   |     |     |     |     |

| 17. Humidity Loading | |
| Specified Value Note1 | Appearance : No abnormality Capacitance change :  $\leq \pm 12.5\%$  Dissipation factor : 5.0%max. Insulation resistance : Larger than whichever smaller of 25MΩ・μF or 500MΩ |
| Test Methods and Remarks | Test condition : 85°C/85%RH. Duration : 1000 +48/—0 hours. DC bias : Applied rated voltage. Voltage treatment specified in No.6 of the specification shall be conducted prior to test. Measurement after the test shall be made after test sample is kept at room temperature for 24 ± 2 hours. |
| 18. High Temperature Loading | |
| Specified Value Note1 | Appearance : No abnormality Capacitance change :  $\leq \pm 12.5\%$  Dissipation factor : 5.0%max. Insulation resistance : Larger than whichever smaller of 50MΩ・μF or 1000MΩ |
| Test Methods and Remarks | Voltage treatment specified in No.6 of the specification shall be conducted prior to test. Test sample shall be put in thermostatic oven with maximum temperature. Applied voltage : Rated voltage x 2 Duration : 1000 +48/—0 hours. Charging and discharging current shall be 50mA or less. Measurement after the test shall be made after test sample is kept at room temperature for 24 ± 2 hours. |
| 19. Resistance to Flexure of substrate | |
| Specified Value | Appearance : No abnormality Capacitance change :  $\leq \pm 12.5\%$  Dissipation factor : 5.0%max. Insulation resistance : Initial value shall be satisfied. |
| Test Methods and Remarks | Warp : 1mm Testing board : Grass epoxy - resin substrate Thickness : 1.6mm Test board and solder lands : Refer to fig. 3. |
| | Dimension | Case size |      |      |      | |-----------|-----------|------|------|------| |           | 1608      | 2012 | 3216 | 3225 | | a         | 0.6       | 0.8  | 2.0  | 2.0  | | b         | 2.2       | 3.0  | 4.4  | 4.4  | | c         | 0.9       | 1.3  | 1.7  | 2.6  |  Fig.3 |
|  | Fig.4  Capacitance measurement shall be conducted with the board bent. (fig.4) |

| 20. High Temperature Exposure |                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Specified Value<br>Note1      | Appearance : No abnormality<br>Capacitance change : $\leq \pm 12.5\%$<br>Dissipation factor : 5.0%max.<br>Insulation resistance : Larger than whichever smaller of $500\text{M}\Omega \cdot \mu\text{F}$ or $10000\text{M}\Omega$                                                                                                                                                                        |  |
| Test Methods and<br>Remarks   | Heat treatment specified in No.5 of the specification shall be conducted prior to test.<br>Test sample shall be put in thermostatic oven with maximum temperature.<br>Duration : 1000 +48/—0 hours.<br>Initial value shall be measured after test sample is heat—treated specified No.5.<br>Measurement after the test shall be made after test sample is kept at room temperature for $24 \pm 2$ hours. |  |

| 21. Temperature Cycling     |                                                                                                                                                                                                                 |                           |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Specified Value<br>Note1    | Appearance : No abnormality<br>Capacitance change : $\leq \pm 7.5\%$<br>Dissipation factor : Initial value shall be satisfied<br>Insulation resistance : Initial value shall be satisfied                       |                           |
| Test Methods and<br>Remarks | Heat treatment specified in No.5 of the specification shall be conducted prior to test.<br>Measurement shall be conducted after test sample is heat treated as specified in No.5.<br>condition of the one cycle |                           |
|                             | Step                                                                                                                                                                                                            | Temperature(°C)           |
|                             | 1                                                                                                                                                                                                               | Minimum usage temperature |
|                             | 2                                                                                                                                                                                                               | +25                       |
|                             | 3                                                                                                                                                                                                               | Maximum usage temperature |
|                             | 4                                                                                                                                                                                                               | +25                       |
|                             | Time(min.)                                                                                                                                                                                                      |                           |
|                             |                                                                                                                                                                                                                 | $30 \pm 3$                |
|                             |                                                                                                                                                                                                                 | 2 to 3                    |
|                             |                                                                                                                                                                                                                 | $30 \pm 3$                |
|                             |                                                                                                                                                                                                                 | 2 to 3                    |
|                             | Test cycles:200 times<br>Solder lands refer to fig. 2.<br>Measurement after the test shall be made after test sample is kept at room temperature for $24 \pm 2$ hours.                                          |                           |

| 22. Body strength           |                                                                                                                                          |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value             | No mechanical damage                                                                                                                     |
| Test Methods and<br>Remarks | Applying force : 5N<br>Applying time : 10 seconds<br> |

Note 1 The figures indicate typical specifications. Please refer to individual specifications in detail.

Note 1 The figures indicate typical specifications. Please refer to individual specifications in detail.

# Precautions on the use of High Reliability Application Multilayer Ceramic Capacitors

## ■ PRECAUTIONS

### 1. Circuit Design

- Precautions**
- ◆ Verification of operating environment, electrical rating and performance
    1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications.  
As such, any capacitors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications.
  - ◆ Operating Voltage (Verification of Rated voltage)
    1. The operating voltage for capacitors must always be lower than their rated values.  
If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage.
    2. Even if the applied voltage is lower than the rated value, the reliability of capacitors might be reduced if either a high frequency AC voltage or a pulse voltage having rapid rise time is present in the circuit.

### 2. PCB Design

- Precautions**
- ◆ Pattern configurations (Design of Land-patterns)
    1. When capacitors are mounted on a PCB, the amount of solder used (size of fillet) can directly affect capacitor performance. Therefore, the following items must be carefully considered in the design of solder land patterns:
      - (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.
      - (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.
  - ◆ Pattern configurations (Capacitor layout on panelized [breakaway] PC boards)
    1. After capacitors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow soldered boards etc.) For this reason, planning pattern configurations and the position of SMD capacitors should be carefully performed to minimize stress.

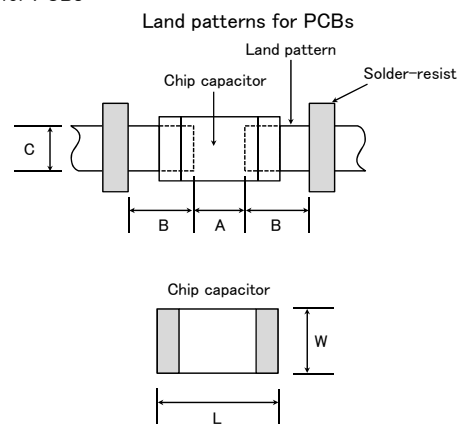
### Technical considerations

- ◆ Pattern configurations (Design of Land-patterns)
  1. The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts. (larger fillets which extend above the component end terminations) Examples of improper pattern designs are also shown.

(1) Recommended land dimensions for a typical chip capacitor land patterns for PCBs

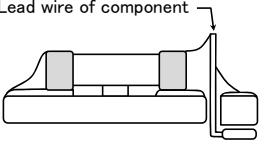
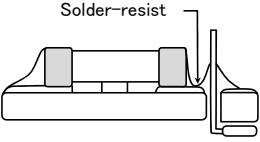
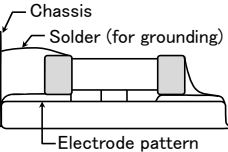
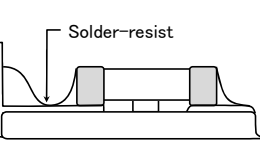
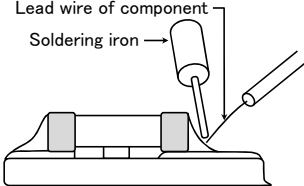
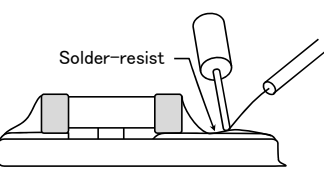
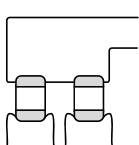
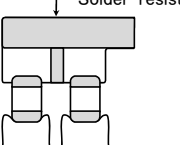
Recommended land dimensions for reflow-soldering (unit: mm)

| Type |   | 107     | 212     | 316     | 325     |
|------|---|---------|---------|---------|---------|
| Size | L | 1.6     | 2.0     | 3.2     | 3.2     |
|      | W | 0.8     | 1.25    | 1.6     | 2.5     |
| A    |   | 0.8~1.0 | 0.8~1.2 | 1.8~2.5 | 1.8~2.5 |
| B    |   | 0.6~0.8 | 0.8~1.2 | 1.0~1.5 | 1.0~1.5 |
| C    |   | 0.6~0.8 | 0.9~1.6 | 1.2~2.0 | 1.8~3.2 |



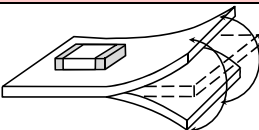
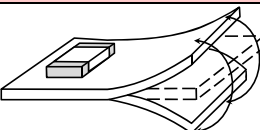
Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

(2) Examples of good and bad solder application

| Items                                                       | Not recommended                                                                   | Recommended                                                                         |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Mixed mounting of SMD and leaded components                 |  |  |
| Component placement close to the chassis                    |  |  |
| Hand-soldering of leaded components near mounted components |  |  |
| Horizontal component placement                              |  |  |

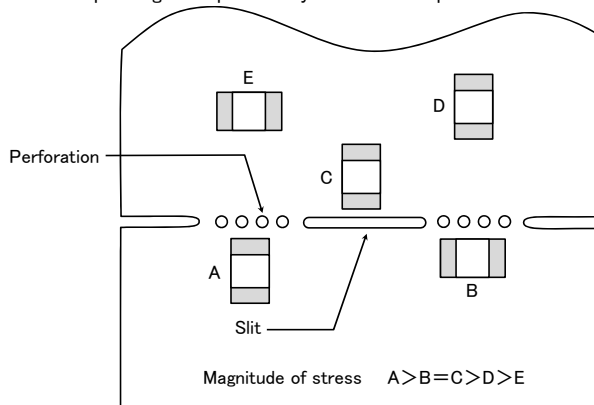
◆Pattern configurations (Capacitor layout on panelized [breakaway] PC boards)

1-1. The following is examples of good and bad capacitor layout; SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection.

| Items               | Not recommended                                                                    | Recommended                                                                         |
|---------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Deflection of board |  |  |

Place the product at a right angle to the direction of the anticipated mechanical stress.

1-2. To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on capacitor layout. The example below shows recommendations for better design.



1-3. When breaking PC boards along their perforations, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD capacitor layout must also consider the PCB splitting procedure.

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions              | <p>◆ Selection of Flux</p> <p>1. Since flux may have a significant effect on the performance of capacitors, it is necessary to verify the following conditions prior to use;</p> <p>(1) Flux used should be with less than or equal to 0.1 wt% (equivalent to chlorine) of halogenated content. Flux having strong acidity content should not be applied.</p> <p>(2) When soldering capacitors on the board, the amount of flux applied should be controlled at the optimum level.</p> <p>(3) When using water-soluble flux, special care should be taken to properly clean the boards.</p> <p>◆ Soldering</p> <p>1. Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions.</p> <p>Sn-Zn solder paste can affect MLCC reliability performance.</p> <p>Please contact us prior to usage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Technical considerations | <p>◆ Selection of Flux</p> <p>1-1. When too much halogenated substance (Chlorine, etc.) content is used to activate the flux, or highly acidic flux is used, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors.</p> <p>1-2. Flux is used to increase solderability in flow soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.</p> <p>1-3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux.</p> <p>◆ Soldering</p> <p>1-1. Preheating when soldering</p> <p>Heating: Ceramic chip components should be preheated to within 100 to 130°C of the soldering.</p> <p>Cooling: The temperature difference between the components and cleaning process should not be greater than 100°C.</p> <p>Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling. Therefore, the soldering process must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="309 871 738 1245"> <p>【Recommended conditions for soldering】</p> <p>[Reflow soldering]</p> <p>Temperature profile</p> </div> <div data-bbox="917 871 1347 1245"> <p>【Recommended conditions for Pd Free soldering】</p> </div> </div> <p>※Ceramic chip components should be preheated to within 100 to 130°C of the soldering.</p> <p>※Assured to be reflow soldering for 2 times.</p> <p>Caution</p> <p>①The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of the capacitor, as shown below:</p> <p>②Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible.</p> |

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