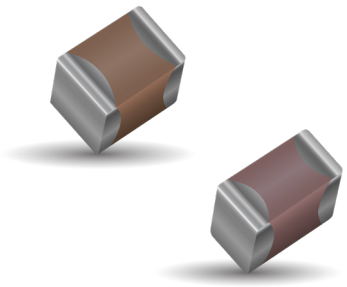
01005 MLCC Ultra Miniature Capacitors

General Specifications



GENERAL DESCRIPTION

Offered in a complete range of products for both general and specialized applications and designed to meet a wide variety of needs. We have a worldwide network in order to supply our global customer bases quickly and efficiently. All of our products are highly reliable due to their monolithic structure of high-purity and superfine uniform ceramics and their integral internal electrodes.

Using Kyocera's latest manufacturing technology and materials with high dielectric constants, we produce extremely compact components with exceptional specifications. Our stringent quality control if every phase of production from material procurement to shipping ensures consistent manufacturing and superior quality.

HOW TO ORDER

RoHS COMPLIANT

CM	02	X5R	225	M	06	A	H	□□□

Series
CM = General
CU = High-Q

Case Size
02 = 01005

Dielectric
X5R = X5R
X7R = X7R
C0G = CG

Capacitance Code (pF)
2 Sig. Digits + Number of Zeros or "R" for decimal place.

Tolerance

C0G	X7R/ X5R
A*= ±0.05pF	J*= ±5%
B= ±0.1pF	K= ±10%
C= ±0.25pF	M= ±20%
J= ±5%	

*: Option

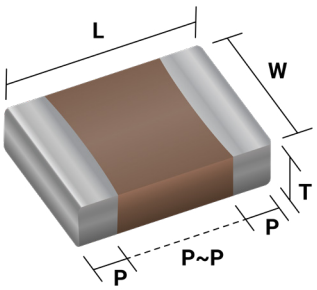
Voltage
6.3V= 06
10V= 10
16V= 16
25V= 25

Termination
A= Nickel/ Tin
**Contact Factory for Au termination

Packaging
H= 2mm ϕ180

Option
Above digits are used to track individual specification or thickness

DIMENSIONS



PACKAGING CODE

20kp	P		8		2	
100Pcs	Taping Material		Taping Width		Pitch	
	Code	Material	Code	Width	Code	Width
	P	Paper	8	8 mm	2	2 mm

Size	Code		Dimension Code	Dimension (mm)						Quantity per reel
	EIA	JIS		L	W	T	P min.	P max.	P to P min.	ϕ180 Reel
02	01005	0402	A	0.4±0.02	0.2±0.02	0.2±0.02	0.07	0.14	0.13	20kp(P8/2)

01005 MLCC Ultra Miniature Capacitors

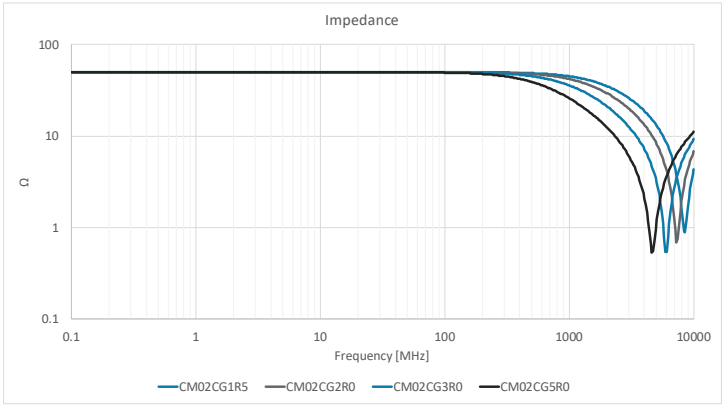
General Specifications

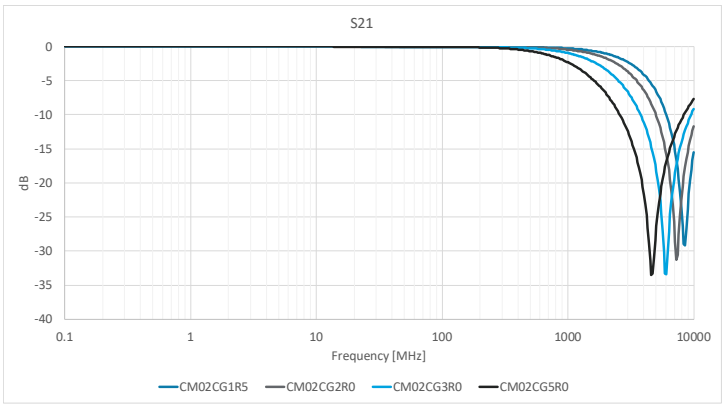
C0G / NP0 DIELECTRIC

Size (EIA Code)		CM02 (01005)					
Rated Voltage (Vdc)		16			25		
Tolerance		B	C	J	B	C	J
Capacitance (pF)		±0.1pF	±0.25pF	±5%	±0.1pF	±0.25pF	±5%
R20	0.2	A	A				
R50	0.5					A	
1R0	1.0				A	A	
1R5	1.5						
2R0	2.0						
3R0	3.0						
4R0	4.0						
5R0	5.0						
6R0	6.0						
7R0	7.0						
8R0	8.0						
9R0	9.0						
100	10			A			A
120	12						
150	15			A			A
180	18						
220	22						
270	27			A			
330	33						
390	39						
470	47						
560	56						
680	68						
820	82						
101	100						
121	120						
151	150						
181	180						
221	220			A			

< Standard Capacitor Value: E12 Series>
*Please Contact for capacitance values other than standard

CU Series CM Series CM & CU Series





C0G / NP0 CAP CHART: Alphabets denotes dimensions.

Please refer to the below table for details.

Size	Dimension Code	Dimension (mm)			Packaging				
					ϕ 180 Reel				
		L	W	T	Code	Quantity	Taping Material	Taping Width	Cavity Pitch
02	A	0.4±0.02	0.2±0.02	0.2±0.02	H	20,000	Paper	8mm	2mm

01005 MLCC Ultra Miniature Capacitors

General Specifications

X5R DIELECTRIC

Size (EIA Code)		CM02 (01005)				
Rated Voltage (Vdc)		6.3		10	16	
Tolerance		K	M	M	K	M
Capacitace		±10%	±20%	±20%	±10%	±20%
101	100 pF				A8	A8
151	150 pF					
221	220 pF					
331	330 pF					
471	470 pF					
681	680 pF					
102	1000 pF					
152	1500 pF					
222	2200 pF					
472	4700 pF					
682	6800 pF					
103	10000 pF					
153	15000 pF	A8	A8			
223	22000 pF					
333	33000 pF					
473	47000 pF					
104	0.10 µF			A8		
224	0.22 µF	A8	A8			
474	0.47 µF					
105	1.0 µF					
225	2.2 µF					
475	4.7 µF					
106	10 µF					
156	15 µF					
226	22 µF					

< Standard Capacitor Value>
Cap Value < 0.1µF: E6 Series
Cap value ≥ 0.1µF: E3 Series

CM Standard Spec. 1

CM Standard Spec. 2

X5R Tan δ Code	Tan δ
3	5.0% max.
4	7.0% max.
5	7.5 % max.
7	10.0% max.
8	12.5% max.
9	15.0% max.
10	20.0% max.

X7R DIELECTRIC

Size (EIA Code)		CM02 (01005)
Rated Voltage (Vdc)		16
Capacitace		
101	100 pF	
151	150 pF	
221	220 pF	
331	330 pF	
471	470 pF	
681	680 pF	
102	1000 pF	
152	1500 pF	
222	2200 pF	A8

< Standard Capacitor Value>
Cap Value < 0.1µF: E6 Series

CM Standard Spec. 1

X7R Tan δ Code	Tan δ
2	3.5% max.
3	5.0% max.
5	7.5% max.
8	12.5% max.

X7R/ X5R CAP CHART: Two digit denotes dimensions and tan δ code

Please refer to the below table for detail.

Size	Dimension Code	Dimension (mm)			Packaging				
					ϕ 180 Reel				
		L	W	T	Code	Quantity	Taping Material	Taping Width	Cavity Pitch
02	A	0.4±0.02	0.2±0.02	0.2±0.02	H	20,000	Paper	8mm	2mm

01005 MLCC Ultra Miniature Capacitors

CM/CU (Standard Spec. 1) Specifications and Test Methods

<table>
<tr><th colspan="2">Test Items</th><th colspan="3">Test Conditions</th><th>Specifications</th></tr>
<tr><td colspan="2">Capacitance Value (C)</td><td>Capacitance</td><td>Frequency</td><td>Volt</td><td>Within Tolerance</td></tr>
<tr><td colspan="2" rowspan="2">Q</td><td>C≤1000pF</td><td>1 MHz ±10%</td><td rowspan="2">0.5 to 5 Vrms</td><td rowspan="2">"C≥30pF : Q≥1000
C<30pF : Q≥400+20C"</td></tr>
<tr><td>C≤1000pF</td><td>1 kHz ±10%</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td colspan="3">Apply the rated voltage for 1 minute, and measure it in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA.</td><td>Over 10000MΩ or 500MΩnμF, whichever is less.</td></tr>
<tr><td colspan="2">Dielectric Resistance</td><td colspan="3">Apply *3 times the rated voltage for 1 to 5 seconds twice. The charge and discharge current of the capacitor must not exceed 50mA.
*CU02C△R20-120/25V: twice</td><td>No defect</td></tr>
<tr><td colspan="2">Appearance</td><td colspan="3">Microscope</td><td>No defect</td></tr>
<tr><td colspan="2">Termination Strength</td><td colspan="3">Apply a sideward force of 100g (1N) to PCB-mounted sample.</td><td>No defect</td></tr>
<tr><td colspan="2">Bending Strength</td><td colspan="3">Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 Seconds.</td><td>No Significant damage with 1mm bending.</td></tr>
<tr><td rowspan="3">Vibration Test</td><td>Appearance</td><td colspan="3" rowspan="3">"Vibration Frequency: 10-55 (Hz)
Amplitude: 1.5mm
Sweeping Condition: 10 → 55 → 10 Hz/ 1 minute in X, Y and Z
Directions: 2 hours each, 6 hours total"</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within Tolerance</td></tr>
<tr><td>Q</td><td>"C≥30pF : Q≥1000
C<30pF : Q≥400+20C"</td></tr>
<tr><td rowspan="4">Soldering Heat Resistant</td><td>Appearance</td><td colspan="3" rowspan="4">"Soak the Sample in 260°C ± 5°C solder for 10±0.5 seconds and place in normal temperature and humidity. Measure the sample after 24± 2 hours. (Pre-heating conditions)
Order | Temperature | Time
1 | 80-100°C | 2 min
2 | 150-200°C | 2 min
The charge and discharge current of the capacitor must not exceed 50mA for IR and Withstanding Voltage measurement."</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 2.5% or ± 0.25 pF, whichever is larger</td></tr>
<tr><td>Q</td><td>"C≥30pF : Q≥1000
C<30pF : Q≥400+20C"</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩnμF, whichever is less.</td></tr>
<tr><td>Withstanding Voltage</td><td colspan="3">The charge and discharge current of the capacitor must not exceed 50mA for IR and Withstanding Voltage measurement."</td><td>Resist without problem</td></tr>
<tr><td colspan="2">Solderability</td><td colspan="3">Soak Condition:
Sn-3AG-0.5Cu | 245 ±5°C | 3 ±0.5 sec.
Sn63 Solder | 235 ±5°C | 2 ±0.5 sec.</td><td>Solder Coverage : 95% min.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td colspan="3" rowspan="5">(Cycle)
Room Temperature (3min.) →
Lowest Operating Temperature (30 min.)→
Room Temperature (3 min.)→
Highest Operating Temperature (30 min.)
After 5 cycles, measure after 24 ± 2 hours.
The charge and discharge current of the capacitor must not exceed 50mA for IR and Withstanding Voltage measurement."</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 2.5% or ± 0.25 pF, whichever is larger</td></tr>
<tr><td>Q</td><td>"C≥30pF : Q≥1000
C<30pF : Q≥400+20C"</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩnμF, whichever is less.</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td></tr>
<tr><td rowspan="4">Moisture Resistant Load</td><td>Appearance</td><td colspan="3" rowspan="4">After applying the rated voltage for 500-512 hours in the condition of 40°C± 2°C and 90 to 95% RH, allow the parts to stabilize in normal temperature and humidity for 24 ± 2 hours, before measurement.
The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 7.5% or ± 0.75 pF, whichever is larger</td></tr>
<tr><td>Q</td><td>"C≥30pF : Q≥200
C<30pF : Q≥100+10C/3"</td></tr>
<tr><td>IR</td><td>Over 500MΩ or 25MΩnμF, whichever is less.</td></tr>
<tr><td rowspan="4">High-Temperature Load</td><td>Appearance</td><td colspan="3" rowspan="4">After applying *twice the rated voltage in the condition of 125±3°C for 1000-1012 hours, measure the sample after 24 ± 2 hours in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
** Applied voltages for respective products are indicated in the chart below.</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 3% or ± 0.3 pF,
whichever is larger</td></tr>
<tr><td>Q</td><td>C≥30pF : Q≥350
10pF<C<30pf : Q≥275+5C/2
C<10pF : Q≥200+10C</td></tr>
<tr><td>IR</td><td>Over 1000MΩ or 50MΩnμF,
whichever is less.</td></tr>
</table>

Please Ask for individual specification for the hatched range in previous chart.
Voltage to be applied in the High Temperature Load (Applied Voltage is the multiple of the rated voltage)

Applied Voltage	Rated Voltage	Products
✕1.0	16V	CM02CΔ221
✕1.2	24V	CM02CΔR20-120

01005 MLCC Ultra Miniature Capacitors

CM Series (Standard Spec. 1 & 2) Specifications and Test Methods

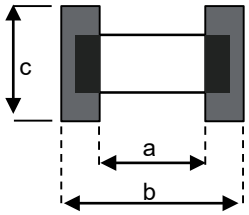
<table>
<tr><th colspan="2">Test Items</th><th>Test Conditions</th><th>Specifications
Standard Spec. 1</th><th>Specifications
Standard Spec. 2</th></tr>
<tr><td colspan="2">Capacitance Value (C)</td><td>Measure after heat treatment</td><td>Within Tolerance</td><td>Within Tolerance</td></tr>
<tr><td colspan="2">Tan δ</td><td>Spec. 1
<table><tr><th>Capacitance</th><th>Frequency</th><th>Volt</th></tr><tr><td>C≤10 µF</td><td>1 kHz ± 10%</td><td>1.0 ± 0.2 V_{rms}</td></tr><tr><td>C≤10 µF</td><td>120 Hz ± 10%</td><td>0.5 ± 0.2 V_{rms}</td></tr></table>Spec. 2
<table><tr><th>Capacitance</th><th>Frequency</th><th>Volt</th></tr><tr><td rowspan="2">C≤10 µF</td><td rowspan="2">1 kHz ± 10%</td><td>1.0 ± 0.2 V_{rms}</td></tr><tr><td>0.5 ± 0.2 V_{rms}</td></tr><tr><td>C>10 µF</td><td>120 Hz ± 10%</td><td>0.5 ± 0.2 V_{rms}</td></tr></table>The charge and discharge current of the capacitor must not exceed 50mA.</td><td>Refer to
capacitance chart</td><td>Refer to capacitance chart</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td>Apply the rated voltage for 1 minute, and measure it in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA.</td><td>Over 10000MΩ or 500MΩ-µF,
whichever is less.</td><td>Over 50MΩ-µf</td></tr>
<tr><td colspan="2">Dielectric Resistance</td><td>Apply 2.5 times the rated voltage for 1-5 seconds. The charge and discharge current of the capacitor must not exceed 50mA.</td><td>No defect</td><td>No defect</td></tr>
<tr><td colspan="2">Appearance</td><td>Microscope</td><td>No defect</td><td>No defect</td></tr>
<tr><td colspan="2">Termination Strength</td><td>Apply a sidewards force of 100g (1N) to
PCB-mounted sample.</td><td>No defect</td><td>No defect</td></tr>
<tr><td colspan="2">Bending Strength</td><td>Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.</td><td>No Significant
damage with 1mm bending.</td><td>No Significant
damage with 1mm bending.</td></tr>
<tr><td rowspan="3">Vibration Test</td><td>Appearance</td><td rowspan="3">Take the initial value after heat treatment.
Vibration Frequency: 10-55 (Hz)
Amplitude: 1.5mm
Sweeping Condition: 10→55→10 Hz/ 1 minute in X, Y and Z
Directions: 2 hours each, 6 hours total, and place in normal temperature and humidity.
Measure the sample after heat treatment.</td><td>No defect</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within Tolerance</td><td>Within Tolerance</td></tr>
<tr><td>Tan δ</td><td>Within Tolerance</td><td>Within Tolerance</td></tr>
<tr><td rowspan="5">Soldering Heat Resistant</td><td>Appearance</td><td rowspan="5">Take the initial value after heat treatment.
Soak the Sample in 260°C ± 5°C solder for 10±0.5 seconds and place in normal temperature and humidity.
Measure after heat treatment.
(Pre-heating conditions)
<table><tr><th>Order</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>80-100°C</td><td>2 min</td></tr><tr><td>2</td><td>150-200°C</td><td>2 min</td></tr></table>The charge and discharge current of the capacitor must not exceed 50mA for IR and Withstanding Voltage measurement.</td><td>No defect</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 7.5%</td><td>Within ± 7.5%</td></tr>
<tr><td>Tan δ</td><td>Within Tolerance</td><td>Within Tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ-µF,
whichever is less.</td><td>Over 50MΩ-µF</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td><td>Resist without problem</td></tr>
<tr><td colspan="2">Solderability</td><td>Soak Condition:
<table><tr><td>Sn-3AG-0.5Cu</td><td>245 ± 5°C</td><td>3 ± 0.5 sec.</td></tr><tr><td>Sn63 Solder</td><td>235 ± 5°C</td><td>3 ± 0.5 sec.</td></tr></table></td><td>Solder Coverage : 90% min.</td><td>Solder Coverage : 90% min.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td rowspan="5">Take initial value after heat treatment.
(Cycle)
Room Temperature (3min.)→
Lowest Operating Temperature (30 min.)→
Room Temperature (3 min.)→
Highest Operating Temperature (30 min.)
After 5 cycles, measure after heat treatment.
The charge and discharge current of the capacitor must not exceed 50mA for IR and Withstanding Voltage measurement.</td><td>No defect</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 7.5%</td><td>Within ± 7.5%</td></tr>
<tr><td>Tan δ</td><td>Within Tolerance</td><td>Within Tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ-µF,
whichever is less.</td><td>Over 50MΩ-µF</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td><td>Resist without problem</td></tr>
<tr><td rowspan="4">Moisture Resistant Load</td><td>Appearance</td><td rowspan="4">Take the initial value after heat treatment. After applying the rated voltage for 500-512 hours in the condition of 40°C± 2°C and 90 to 95% RH, place in normal temperature and humidity, then measure the sample after heat treatment. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.</td><td>No defect</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 12.5%</td><td>Within ± 12.5%</td></tr>
<tr><td>Tan δ</td><td>200% max. of initial value</td><td>200% max. of initial value</td></tr>
<tr><td>IR</td><td>Over 500MΩ or 25MΩ-µF,
whichever is less.</td><td>Over 10MΩ-µF</td></tr>
<tr><td rowspan="4">High-Temperature Load</td><td>Appearance</td><td rowspan="4">Take the initial value after heat treatment. After applying *twice the rated voltage in the highest operating temperature for 1000-1012 hours, measure the sample after heat treatment in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
*X5R Spec 2:Apply 1.0 times when the rated voltage is 4V or less.
X7R/X7R Spec 1: Apply 1.5 times when the rated Voltage is 10V or less.
Applied Voltages for respective products are indicated in the chart below.</td><td>No defect</td><td>No defect</td></tr>
<tr><td>Δ C</td><td>Within ± 12.5%</td><td>Within ± 12.5%</td></tr>
<tr><td>Tan δ</td><td>200% max. of initial value</td><td>200% max. of initial value</td></tr>
<tr><td>IR</td><td>Over 1000MΩ or 50MΩ-µF,
whichever is less.</td><td>Over 10MΩ-µF</td></tr>
<tr><td colspan="2">Heat Treatment</td><td colspan="3">Expose sample to temperature of 140-150°C for 1 hour and leave the sample in normal temperature and humidity for 24 ± 2 hours.</td></tr>
</table>

Voltage to be applied in the High Temperature Load (Applied Voltage is the multiple of the rated voltage)

Applied Voltage	Rated Voltage	Products
✕1.0	10V	CM02X5R104
✕1.3	6.3V	CM02X5R153-104
✕1.5	16V	CM02X5R101-103, CM02X7R222

Applied Voltage	Rated Voltage	Products
✕1.0	6.3V	CM02X5R224,CM02X5R474

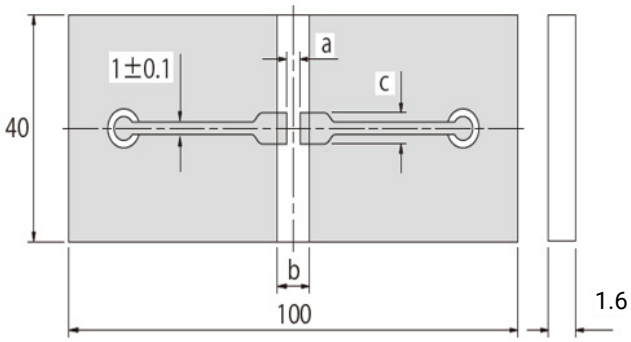
Substrate for Adhesion Strength Test, Vibration Test, Soldering Heat Resistance Test, Temperature Cycle Test, Load Humidity Test, High-Temperature with Loading Test.

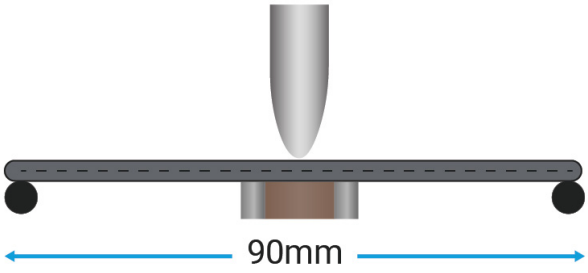


Unit: mm

Size (EIA Code)	A	B	C
02 (01005)	0.15	0.5	0.20

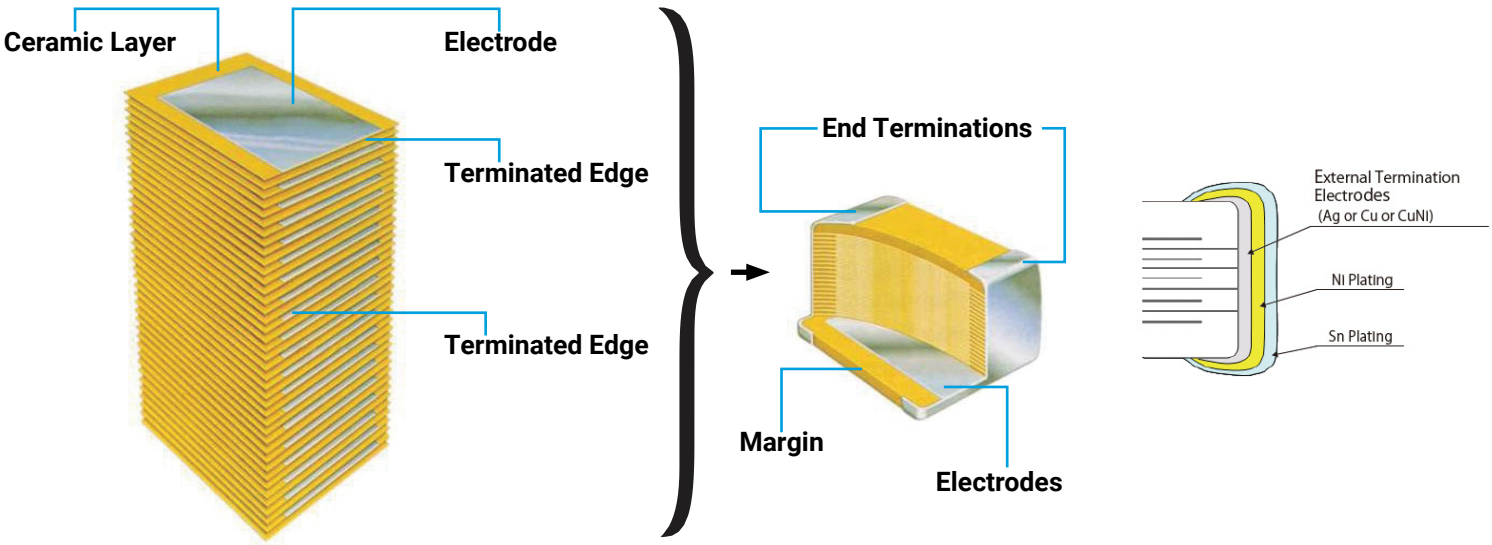
SUBSTRATE FOR BENDING TEST





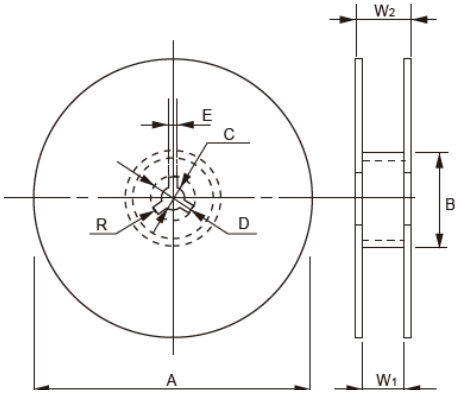
Testing Board:	Glass Epoxy Board (CE4 or FR4)
Testing Board Thickness:	1.6 ± 0.2mm*
Circuit Thickness:	0.04 ± 0.01mm

STRUCTURE



- Please contact your local AVX Sales office or distributor for specifications not covered in this catalog.
- Capacitance range is subject to change without notice
- Please contact sales representative to confirm compatibility with your application.

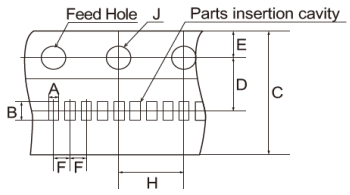
TAPE & REEL QUANTITIES

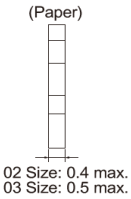


Code Reel	A	B	C	D
7- inch Reel (Code: H)	180 +0 -2.0	ϕ 60 min.	13 ±0.5	21 ±0.8
Code Reel	**E**	**W_1**	**W_2**	**R**
7- inch Reel (Code: H)	2.0 ±0.5	10.5 ±1.5	16.5 max.	1.0

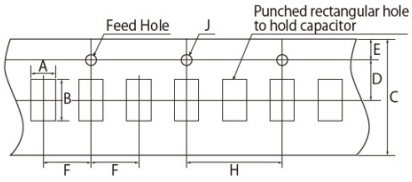
CARRIER TAPE

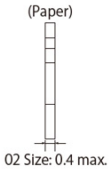
F = 1mm





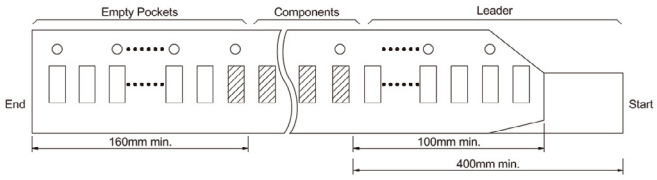
F = 2mm





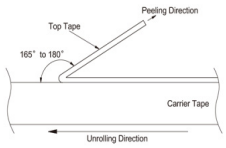
Size (EIA Code)	A	B	C	D	E	F	G	H	J	Carrier Tape	
										Width	Material
02 (01005)*	0.25 ± 0.03	0.45 ± 0.03	8.0 ± 0.3	3.5 ± 0.05	1.75 ± 0.1	2.0 ± 0.05	-	4.0 ± 0.1	1.5 + 0.1	8mm	Paper

DETAIL OF LEADER AND TRAILER



ADHESIVE TAPE

1. The exfoliative strength when peeling off the top tape from the carrier tape by the method of the following figure shall be *0.1 to 0.5N.
2. When the top tape is peeled off, the adhesive stays on the top tape.
3. Chip capacitors will be in a state free without being stuck on the thermal adhesive tape.2



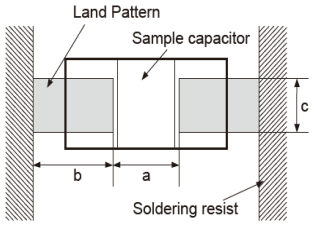
CARRIER TAPE

1. Chip will not fall off from carrier tape or carrier tape will not be damaged by bending than within a radius of 25mm.
2. The chip are inserted continuously without any empty pocket.
3. Chip will not be mis-mounted because of too big clearance between components and cavity. Also the waste of carrier tape will not fill a nozzle hole of mounting machine.

DIMENSIONS FOR RECOMMENDED TYPICAL LAND

Since the amount of solder (size of fillet) to be used has direct influence on the capacitor after mounting, the sufficient consideration is necessary. When the amounts of solder is too much, the stress that a capacitor receives becomes larger. It may become the cause of a crack in the capacitor. When the land design of printed wiring board is considered, it is necessary to set up the form and size of land pattern so that the amount of solder is suitable.

(General)



GENERAL

"Size (EIA Code)"	Dimension		Recommended Land Dimensions		
	L	W	a	b	c
02 (01005)	0.4± 0.02	0.2± 0.02	0.13 to 0.20	0.12 to 0.18	0.20 to 0.23

* Recommended land dimensions may differ depending on dimensional tolerance.

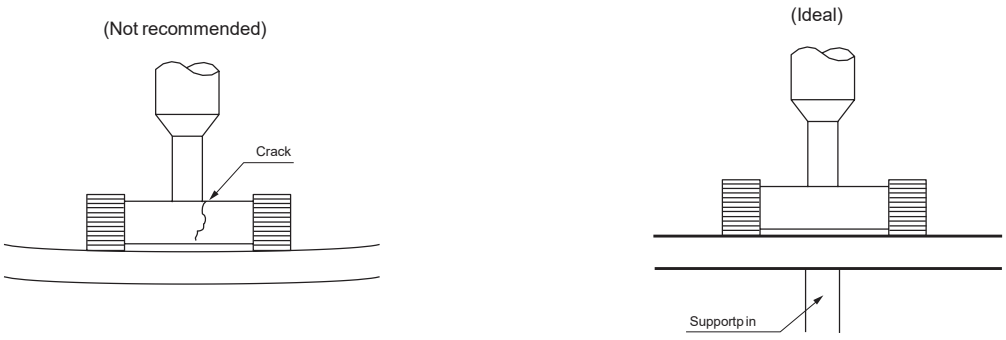
MOUNTING DESIGN

The chip could crack if the PCB warps during processing after the chip has been soldered.

RECOMMENDED CHIP POSITION ON PCB TO MINIMIZE STRESS FROM PCB WARPAGE

MOUNTING

1. If the position of the vacuum nozzle is too low, a large force may be applied to the chip capacitor during mounting, resulting in cracking.
2. During mounting, set the nozzle pressure to a static load of 1 to 3 N.
3. To minimize the shock of the vacuum nozzle, provide a support pin on the back of the PCB to minimize PCB flexure.



4. Bottom position of pick up nozzle should be adjusted to the top surface of a substrate when camber is corrected.

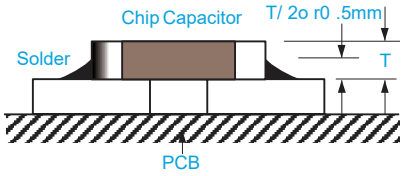
RESIN MOLD

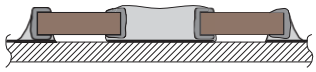
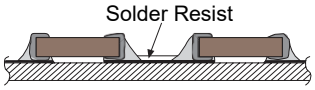
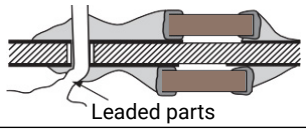
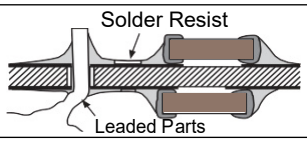
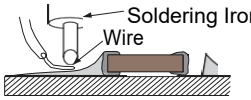
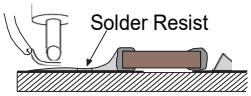
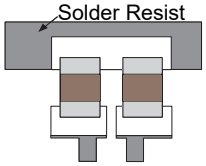
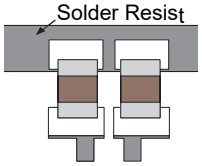
1. If a large amount of resin is used for molding the chip, cracks may occur due to contraction stress during curing. To avoid such cracks, use a low shrinkage resin.
2. The insulation resistance of the chip will degrade due to moisture absorption. Use a low moisture absorption resin.
3. Check carefully that the resin does not generate a decomposition gas or reaction gas during the curing process or during normal storage. Such gases may crack the chip capacitor or damage the device itself.

SOLDERING METHOD

The recommended fillet height shall be 1/2 of the thickness of capacitors or 0.5mm. When mounting two or more capacitors in the common land, it is necessary to separate the land with the solder resist strike so that it may become the exclusive land of each capacitor.

IDEAL SOLDER HEIGHT



Item	Prohibited	Recommended example : Separation by solder resist
Multiple parts mount		
Mount with leaded parts		
Wire soldering after mounting		
Side by side layout		

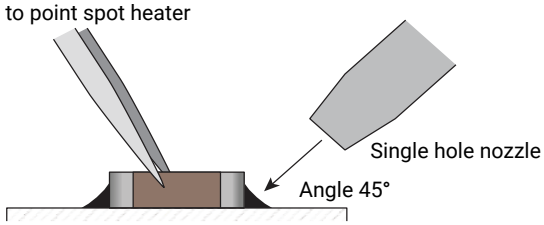
DESIGN OF PRINTED CIRCUIT AND SOLDERING

1. Ceramic is easily damaged by rapid heating or cooling. If some heat shock is unavoidable, preheat enough to limit the temperature difference (Delta T) to within 150 degree Celsius.
2. The product size 1.6×0.8mm to 3.2×1.6mm can be used in reflow and wave soldering, and the product size of bigger than 3.2×1.6mm, or smaller than 1.6 ×0.8mm can be used in reflow. Circuit shortage and smoking can be created by using capacitors which are used neglecting the above caution.
3. Please see our recommended soldering conditions.
4. In case of using Sn-Zn Solder, please contact us in advance.
5. The following condition is recommended for spot heater application.

RECOMMENDED SPOT HEATER CONDITION

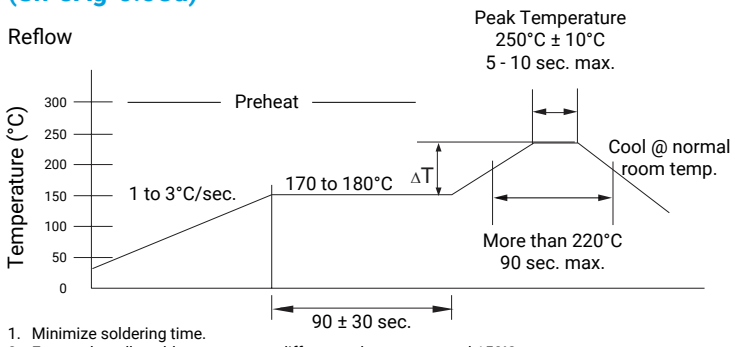
Item	Condition
Distance	5mm min.
Angle	45°
Projection Temp.	400℃ max.
Flow Rate	Set at the minimum
Nozzle Diameter	2φ to 4φ (Single hole type)
Application time	10 sec max.

How to point spot heater



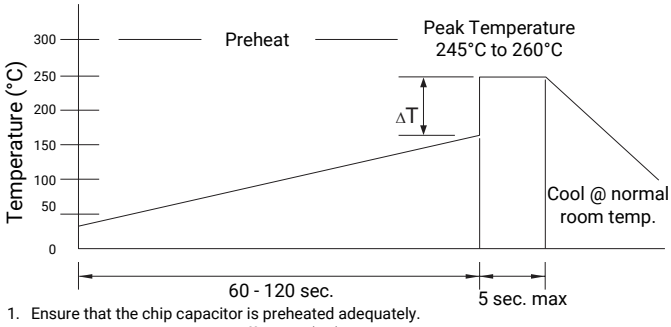
RECOMMENDED TEMPERATURE PROFILE (Sn-3Ag-0.5Cu)

Reflow



1. Minimize soldering time.
2. Ensure that allowable temperature difference does not exceed 150℃.
3. Ensure that allowable temperature difference does not exceed 130℃ for 3.2×2.5mm size or larger.
4. MLCC can withstand the above reflow conditions up to 3times.
5. N_2atmosphere is recommended for reflow of products of 0.4mm×0.2mm size or smaller.

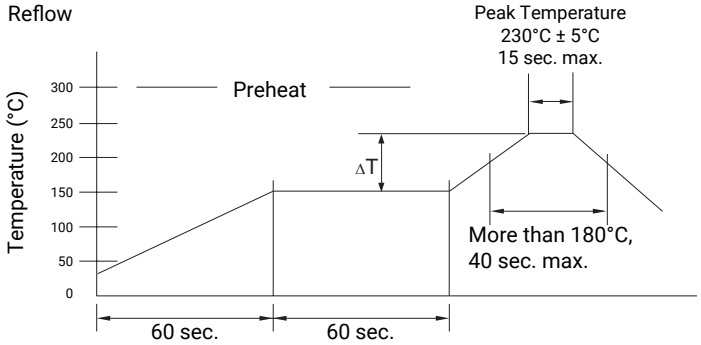
Wave



1. Ensure that the chip capacitor is preheated adequately.
2. Ensure that the temperature difference (ΔT) does not exceed 150℃.
3. Cool naturally after soldering.MLCC can withstand the above reflow conditions up to 3times.
4. Wave soldering is not applicable for chips with size of 3.2×2.5mm or larger of 1.0×0.5mm or smaller and capacitor arrays.

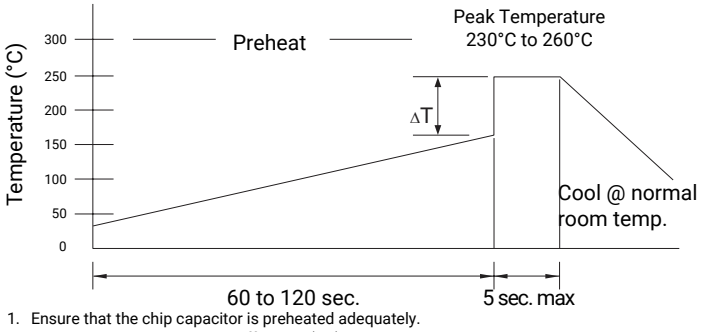
RECOMMENDED TEMPERATURE PROFILE (63n Solder)

Reflow



1. Minimize soldering time.
2. Ensure that the temperature difference (ΔT) does not exceed 150℃.
3. Ensure that the temperature difference (ΔT) does not exceed 130℃ for 3.2×2.5mm size or larger.
4. MLCC can withstand the above reflow conditions up to 3times.

Wave



1. Ensure that the chip capacitor is preheated adequately.
2. Ensure that the temperature difference (ΔT) does not exceed 150℃.
3. Cool naturally after soldering.
4. Wave soldering is not applicable for chips with size of 3.2×2.5mm or larger of 1.0×0.5mm or smaller and capacitor arrays.

CIRCUIT DESIGN

1. Once application and assembly environments have been checked, the capacitor may be used in conformance with the rating and performance which are provided in both the catalog and the specifications. Use exceeding that which is specified may result in inferior performance or cause a short, open, smoking, or flaming to occur, etc.
2. Please consult the manufacturer in advance when the capacitor is used in devices such as: devices which deal with human life, i.e. medical devices; which are highly public orientated; and devices which demand a high standard of liability. Accident or malfunction of devices such as medical devices, space equipment and devices having to do with atomic power could generate grave consequence with respect to human lives or, possibly, a portion of the public. Capacitors used in these devices may require high reliability design different from that of general-purpose capacitors.
3. Please use the capacitors in conformance with the operating temperature provided in both the catalog and the specifications. Be especially cautious not to exceed the maximum temperature. In the situation the maximum temperature set forth in both the catalog and specifications is exceeded, the capacitor's insulation resistance may deteriorate, power may suddenly surge and short-circuit may occur. The capacitor has a loss and may self-heat due to equivalent series resistance when alternating electric current is passed there through. As this effect becomes especially pronounced in high frequency circuits, please exercise caution. When using the capacitor in a (self-heating) circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rises remain below 20℃.
4. Please keep voltage under the rated voltage which is applied to the capacitor. Also, please make certain the peak voltage remains below the rated voltage when AC voltage is super-imposed to the DC voltage. In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the rated voltage. Exceeding the rated voltage provided in both catalog and specifications may lead to defective withstanding voltage or, in worst case situations, may cause the capacitor to smoke or flame.
5. When the capacitor is to be employed in a circuit in which there is continuous application of a high frequency voltage or a steep pulse voltage, even though it is within the rated voltage, please inquire to the manufacturer. In the situation the capacitor is to be employed using a high frequency AC voltage or an extremely fast rising pulse voltage, even though it is within the rated voltage, it is possible capacitor reliability will deteriorate.
6. It is a common phenomenon of high-dielectric products to have a deteriorated amount of static electricity due to the application of DC voltage. Due caution is necessary as the degree of deterioration varies depending on the quality of capacitor materials, capacity, as well as the load voltage at the time of operation.
7. Do not use the capacitor in an environment where it might easily exceed the respective provisions concerning shock and vibration specified in the catalog and specifications. In addition, it is a common piezo phenomenon of high dielectric products to have some voltage due to vibration or to have noise due to voltage change. Please contact sales in such case.
8. If the electrostatic capacity value of the delivered capacitor is within the specified tolerance, please consider this when designing the respective product in order that the assembled product function appropriately.
9. Please contact us upon using conductive adhesives.

STORAGE

1. If the component is stored in minimal packaging (a heat-sealed or zippered plastic bag), the bag should be kept closed. Once the bag has been opened, reseal it or store it in a desiccator.
2. Keep storage place temperature +5 to +40 ℃, humidity 20 to 70% RH. See JIS C 6 0721-3-1, class 1K2 for other climatic conditions.
3. The storage atmosphere must be free of corrosive gas such as sulfur dioxide and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminals will oxidize and solderability will be effected.
4. Precautions 1) to 3) apply to chip capacitors packaged in carrier tapes.
5. The solderability is assured for 6 months from our shipping date if the above storage precautions are followed.

01005 MLCC Ultra Miniature Capacitors

Part Number List

General CM02 SeriesSize (JIS Code): 01005(0402)# Packaging Code (Packaging quantity): H(20,000pcs.)

Dielectric code CΔ	Capacitance	□:Tolerance	Voltage [V]	Part Number	Q	Dimension			# Packaging Code (quantity)
						L [mm]	W [mm]	T [mm]	
CG	1.0pF	B: ± 0.1pF C: ± 0.25pF	25	CM02C Δ 1R0 □ 25A#	420	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	1.5pF			CM02C Δ 1R5 □ 25A#	430	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	2.0pF			CM02C Δ 2R0 □ 25A#	440	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	3.0pF			CM02C Δ 3R0 □ 25A#	460	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	4.0pF			CM02C Δ 4R0 □ 25A#	480	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	5.0pF			CM02C Δ 5R0 □ 25A#	500	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	6.0pF	C: ± 0.25pF	25	CM02C Δ 6R0 □ 25A#	520	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	7.0pF			CM02C Δ 7R0 □ 25A#	540	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	8.0pF			CM02C Δ 8R0 □ 25A#	560	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	9.0pF			CM02C Δ 9R0 □ 25A#	580	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	10pF	J: ± 5%	25	CM02C Δ 100 □ 25A#	600	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	12pF			CM02C Δ 120 □ 25A#	640	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	15pF			CM02C Δ 150 □ 25A#	700	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	18pF			CM02C Δ 180 □ 25A#	760	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	22pF			CM02C Δ 220 □ 25A#	840	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	27pF	J: ± 5%	16	CM02C Δ 270 □ 16A#	940	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	33pF			CM02C Δ 330 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	39pF			CM02C Δ 390 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	47pF			CM02C Δ 470 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	56pF			CM02C Δ 560 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	68pF			CM02C Δ 680 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	82pF			CM02C Δ 820 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	100pF			CM02C Δ 101 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	220pF			CM02C Δ 221 □ 16A#	1000	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
X5R	100pF	K: ± 10% M: ± 20%	16	CM02X5R101 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	150pF			CM02X5R151 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	220pF			CM02X5R221 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	330pF			CM02X5R331 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	470pF			CM02X5R471 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	680pF			CM02X5R681 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	1000pF			CM02X5R102 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	1500pF			CM02X5R152 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	2200pF			CM02X5R222 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	4700pF			CM02X5R472 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	6800pF			CM02X5R682 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	10000pF			CM02X5R103 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	15000pF	K: ± 10% M: ± 20%	6.3	CM02X5R153 □ 06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	22000pF			CM02X5R223 □ 06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	33000pF			CM02X5R333 □ 06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	47000pF			CM02X5R473 □ 06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	0.10µF	M: ± 20%	10	CM02X5R104 □ 10A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	0.10µF	K: ± 10% M: ± 20%	6.3	CM02X5R104 □ 06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	0.22µF	M: ± 20%	6.3	CM02X5R224M06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
	0.47µF			CM02X5R474M06A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H
X7R	2200µF	K: ± 10% M: ± 20%	16	CM02X7R222 □ 16A#	12.5	0.4 ± 0.02	0.2 ± 0.02	0.2 ± 0.02	H

01005 MLCC Ultra Miniature Capacitors

Part Number List

General CM02 SeriesSize (JIS Code): 01005(0402)# Packaging Code (Packaging quantity): H(20,000pcs.)

Dielectric code CΔ	Capacitance	□:Tolerance	Voltage [V]	Part Number	Dimension			# Packaging Code (quantity)
					L [mm]	W [mm]	T [mm]	
CG	R50	C: ± 0.25pF	25	CU02C Δ R50 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	1.0pF			CU02C Δ 1R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	1.5pF			CU02C Δ 1R5 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	2.0pF			CU02C Δ 2R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	3.0pF			CU02C Δ 3R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	4.0pF			CU02C Δ 4R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	5.0pF			CU02C Δ 5R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	6.0pF			CU02C Δ 6R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	7.0pF			CU02C Δ 7R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	8.0pF			CU02C Δ 8R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	9.0pF			CU02C Δ 9R0 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	10pF	J: ± 5%	25	CU02C Δ 100 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	12pF			CU02C Δ 120 □ 25AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	R20	"B: ± 0.1pF C: ± 0.25pF "	16	CU02C Δ R20 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	R50			CU02C Δ R50 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	1R0			CU02C Δ 1R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	1R5			CU02C Δ 1R5 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	2R0			CU02C Δ 2R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	3R0			CU02C Δ 3R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	4R0			CU02C Δ 4R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	5R0			CU02C Δ 5R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	6R0	C: ± 0.25pF	16	CU02C Δ 6R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	7R0			CU02C Δ 7R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	8R0			CU02C Δ 8R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	9R0			CU02C Δ 9R0 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
X5R	10pF	J: ± 5%	16	CU02C Δ 100 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	12pF			CU02C Δ 120 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	15pF			CU02C Δ 150 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	18pF			CU02C Δ 180 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H
	22pF			CU02C Δ 220 □ 16AH	0.4± 0.02	0.2± 0.02	0.2± 0.02	H

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