

## 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>                                                                                                      |

## SMD POWER INDUCTORS (NR SERIES H TYPE/ S TYPE/ V TYPE)

AEC-Q200 Grade 3 (we conduct the evaluation at the test condition of Grade 3.)

\*Operating environment Temp:-40~85°C

REFLOW

AEC-Q200

PART NUMBER

\*Operating Temp. : -40~125°C(Including self-generated heat)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | R | S | 4 | 0 | 1 | 8 | T | △ | 1 | 0 | 0 | M | D | G | V | V |
| ① |   |   | ② |   |   |   | ③ |   | ④ |   |   | ⑤ | ⑥ |   |   | ⑦ |

△=Blank space

## ①Series name

| Code | Series name                 |
|------|-----------------------------|
| NRH  | Coating resin specification |
| NRS  |                             |
| NRV  |                             |

## ②Dimensions (L × W × H)

| Code | Dimensions (L × W × H) [mm] |
|------|-----------------------------|
| 2010 | 2.0 × 2.0 × 1.0             |
| 2012 | 2.0 × 2.0 × 1.2             |
| 2410 | 2.4 × 2.4 × 1.0             |
| 2412 | 2.4 × 2.4 × 1.2             |
| 3010 | 3.0 × 3.0 × 1.0             |
| 3012 | 3.0 × 3.0 × 1.2             |
| 3015 | 3.0 × 3.0 × 1.5             |
| 4010 | 4.0 × 4.0 × 1.0             |
| 4012 | 4.0 × 4.0 × 1.2             |
| 4018 | 4.0 × 4.0 × 1.8             |
| 5010 | 4.9 × 4.9 × 1.0             |
| 5012 | 4.9 × 4.9 × 1.2             |
| 5014 | 4.9 × 4.9 × 1.4             |
| 5020 | 4.9 × 4.9 × 2.0             |
| 5024 | 4.9 × 4.9 × 2.4             |
| 5030 | 4.9 × 4.9 × 3.0             |
| 5040 | 4.9 × 4.9 × 4.0             |
| 6010 | 6.0 × 6.0 × 1.0             |
| 6012 | 6.0 × 6.0 × 1.2             |
| 6014 | 6.0 × 6.0 × 1.4             |
| 6020 | 6.0 × 6.0 × 2.0             |
| 6028 | 6.0 × 6.0 × 2.8             |
| 6045 | 6.0 × 6.0 × 4.5             |
| 8030 | 8.0 × 8.0 × 3.0             |
| 8040 | 8.0 × 8.0 × 4.0             |

## ③Packaging

| Code | Packaging |
|------|-----------|
| T△   | Taping    |

## ④Nominal inductance

| Code (example) | Nominal inductance [μH] |
|----------------|-------------------------|
| 2R2            | 2.2                     |
| 100            | 10                      |
| 101            | 100                     |

※R=Decimal point

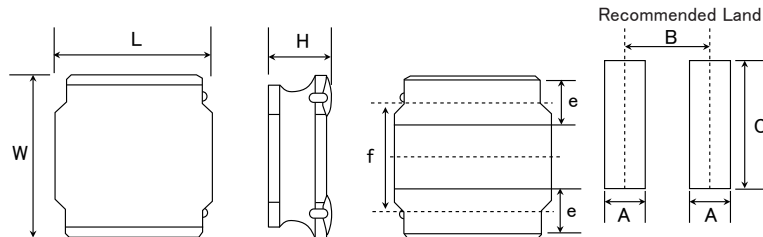
## ⑤Inductance tolerance

| Code | Inductance tolerance |
|------|----------------------|
| M    | ±20%                 |
| N    | ±30%                 |

## ⑥Special code

## ⑦Internal code

| Code | Internal code                                                                             |
|------|-------------------------------------------------------------------------------------------|
| V    | Inductor for Automotive                                                                   |
| 8    | Inductor for Telecommunications infrastructure and Industrial equipment / Medical devices |



Recommended Land Patterns

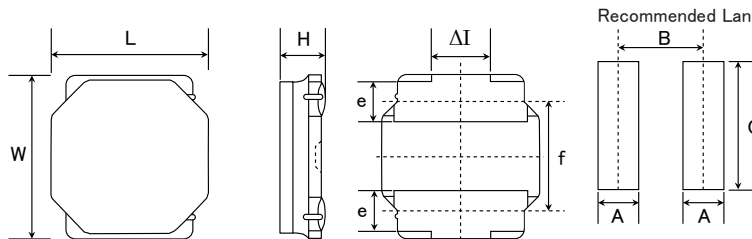
| Type             | A    | B    | C   |
|------------------|------|------|-----|
| NRV2010          | 0.65 | 1.35 | 2.0 |
| NRV2012, NRS2012 |      |      |     |
| NRH2410          |      |      |     |
| NRH2412          | 0.7  | 1.45 | 2.0 |
| NRH3010          |      |      |     |
| NRH3012, NRV3012 |      |      |     |
| NRS3015          | 0.8  | 2.2  | 2.7 |
| NRS4010          |      |      |     |
| NRS4012          |      |      |     |
| NRS4018          | 1.2  | 2.8  | 3.7 |
| NRS8030          |      |      |     |
| NRS8040          |      |      |     |

Unit : mm

| Type               | L                        | W                        | H                                                        | e                         | f                         | Standard quantity<br>[pcs] Taping |
|--------------------|--------------------------|--------------------------|----------------------------------------------------------|---------------------------|---------------------------|-----------------------------------|
| NRV2010            | 2.0±0.1<br>(0.079±0.004) | 2.0±0.1<br>(0.079±0.004) | 1.0 max<br>(0.039 max)                                   | 0.5±0.2<br>(0.020±0.008)  | 1.25±0.2<br>(0.050±0.008) | 2500                              |
| NRV2012<br>NRS2012 | 2.0±0.1<br>(0.079±0.004) | 2.0±0.1<br>(0.079±0.004) | 1.2 max<br>(0.047 max)                                   | 0.5±0.2<br>(0.020±0.008)  | 1.25±0.2<br>(0.050±0.008) | 2500                              |
| NRH2410            | 2.4±0.1<br>(0.095±0.004) | 2.4±0.1<br>(0.095±0.004) | 1.0 max<br>(0.039 max)                                   | 0.6±0.2<br>(0.024±0.008)  | 1.45±0.2<br>(0.057±0.008) | 2500                              |
| NRH2412            | 2.4±0.1<br>(0.095±0.004) | 2.4±0.1<br>(0.095±0.004) | 1.2 max<br>(0.047 max)                                   | 0.6±0.2<br>(0.024±0.008)  | 1.45±0.2<br>(0.057±0.008) | 2500                              |
| NRH3010            | 3.0±0.1<br>(0.118±0.004) | 3.0±0.1<br>(0.118±0.004) | 1.0 max<br>(0.039 max)                                   | 0.9±0.2<br>(0.035±0.008)  | 1.9±0.2<br>(0.075±0.008)  | 2000                              |
| NRH3012<br>NRV3012 | 3.0±0.1<br>(0.118±0.004) | 3.0±0.1<br>(0.118±0.004) | 1.2 max<br>(0.047 max)                                   | 0.9±0.2<br>(0.035±0.008)  | 1.9±0.2<br>(0.075±0.008)  | 2000                              |
| NRS3015            | 3.0±0.1<br>(0.118±0.004) | 3.0±0.1<br>(0.118±0.004) | 1.5 max<br>(0.059 max)                                   | 0.9±0.2<br>(0.035±0.008)  | 1.9±0.2<br>(0.075±0.008)  | 2000                              |
| NRS4010            | 4.0±0.2<br>(0.158±0.008) | 4.0±0.2<br>(0.158±0.008) | 1.0 max<br>(0.039 max)                                   | 1.1±0.2<br>(0.043±0.008)  | 2.5±0.2<br>(0.098±0.008)  | 5000                              |
| NRS4012            | 4.0±0.2<br>(0.158±0.008) | 4.0±0.2<br>(0.158±0.008) | 1.2 max<br>(0.047 max)                                   | 1.1±0.2<br>(0.043±0.008)  | 2.5±0.2<br>(0.098±0.008)  | 4500                              |
| NRS4018            | 4.0±0.2<br>(0.158±0.008) | 4.0±0.2<br>(0.158±0.008) | 1.8 max<br>(0.071 max)                                   | 1.1±0.2<br>(0.043±0.008)  | 2.5±0.2<br>(0.098±0.008)  | 3500                              |
| NRS8030            | 8.0±0.2<br>(0.315±0.008) | 8.0±0.2<br>(0.315±0.008) | 3.0 max<br>(0.118 max)                                   | 1.60±0.3<br>(0.063±0.012) | 5.6±0.3<br>(0.22±0.012)   | 1000                              |
| NRS8040            | 8.0±0.2<br>(0.315±0.008) | 8.0±0.2<br>(0.315±0.008) | *1) 4.2 max<br>(0.165 max)<br>*2) 4.0 max<br>(0.158 max) | 1.60±0.3<br>(0.063±0.012) | 5.6±0.3<br>(0.22±0.012)   | 1000                              |

\*1) 0R9~6R8 type, \*2) 100~101type

Unit : mm (inch)



| Type    | A   | B   | C   |
|---------|-----|-----|-----|
| NRS5010 | 1.5 | 3.6 | 4.0 |
| NRS5012 |     |     |     |
| NRS5014 |     |     |     |
| NRS5020 |     |     |     |
| NRS5024 |     |     |     |
| NRS5030 | 1.6 | 4.7 | 5.7 |
| NRS5040 |     |     |     |
| NRS6010 |     |     |     |
| NRS6012 |     |     |     |
| NRS6014 |     |     |     |
| NRS6020 | 1.6 | 4.7 | 5.7 |
| NRS6028 |     |     |     |
| NRS6045 |     |     |     |

Unit: mm

| Type    | L                        | W                        | H                                                        | e                         | f                        | ΔI                   | Standard quantity<br>[pcs] Taping |
|---------|--------------------------|--------------------------|----------------------------------------------------------|---------------------------|--------------------------|----------------------|-----------------------------------|
| NRS5010 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | 1.0 max<br>(0.039 max)                                   | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 1000                              |
| NRS5012 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | 1.2 max<br>(0.047 max)                                   | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 1000                              |
| NRS5014 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | 1.4 max<br>(0.055 max)                                   | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 1000                              |
| NRS5020 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | 2.0 max<br>(0.079 max)                                   | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 800                               |
| NRS5024 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | *3) 2.5 max<br>(0.098 max)<br>*4) 2.4 max<br>(0.095 max) | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 2500                              |
| NRS5030 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | *5) 3.1 max<br>(0.122 max)<br>*6) 3.0 max<br>(0.118 max) | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 500                               |
| NRS5040 | 4.9±0.2<br>(0.193±0.008) | 4.9±0.2<br>(0.193±0.008) | *7) 4.1 max<br>(0.161 max)<br>*8) 4.0 max<br>(0.158 max) | 1.2±0.2<br>(0.047±0.008)  | 3.3±0.2<br>(0.130±0.008) | 1.3typ<br>(0.051typ) | 1500                              |
| NRS6010 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 1.0 max<br>(0.039 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 1000                              |
| NRS6012 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 1.2 max<br>(0.047 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 1000                              |
| NRS6014 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 1.4 max<br>(0.055 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 1000                              |
| NRS6020 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 2.0 max<br>(0.079 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 2500                              |
| NRS6028 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 2.8 max<br>(0.110 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 2000                              |
| NRS6045 | 6.0±0.2<br>(0.236±0.008) | 6.0±0.2<br>(0.236±0.008) | 4.5 max<br>(0.177 max)                                   | 1.35±0.2<br>(0.053±0.008) | 4.0±0.2<br>(0.158±0.008) | 2.3typ<br>(0.091typ) | 1500                              |

\*3) 1R0~1R5 type, \*4) 2R2~330 type

\*5) R47~100 type, \*6) 150~470 type

\*7) 1R5~100 type, \*8) 150~470 type

Unit: mm (inch)

- All the SMD Power Inductors of the catalog lineup are RoHS compliant.

## 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 SMD Power Inductors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 by family item.

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.

## ●NRV2010 type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRV2010T R47N GFV | 0.47                             | $\pm 30\%$           | —                                          | 0.052                                        | 2,100                      | 2,000                            | 100                         |      |
| NRV2010T R68N GFV | 0.68                             | $\pm 30\%$           | —                                          | 0.060                                        | 1,850                      | 1,850                            | 100                         |      |
| NRV2010T 1R0N GFV | 1.0                              | $\pm 30\%$           | —                                          | 0.080                                        | 1,550                      | 1,600                            | 100                         |      |
| NRV2010T 1R5M GFV | 1.5                              | $\pm 20\%$           | —                                          | 0.100                                        | 1,350                      | 1,450                            | 100                         |      |
| NRV2010T 2R2M GFV | 2.2                              | $\pm 20\%$           | —                                          | 0.175                                        | 1,100                      | 1,100                            | 100                         |      |
| NRV2010T 3R3M GFV | 3.3                              | $\pm 20\%$           | —                                          | 0.250                                        | 880                        | 1,000                            | 100                         |      |
| NRV2010T 4R7M GFV | 4.7                              | $\pm 20\%$           | —                                          | 0.320                                        | 760                        | 820                              | 100                         |      |

## ●NRV2012 type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRV2012T 1R0N GFV | 1.0                              | $\pm 30\%$           | —                                          | 0.073                                        | 2,200                      | 1,650                            | 100                         |      |
| NRV2012T 1R5N GFV | 1.5                              | $\pm 30\%$           | —                                          | 0.100                                        | 1,800                      | 1,400                            | 100                         |      |
| NRV2012T 2R2M GFV | 2.2                              | $\pm 20\%$           | —                                          | 0.129                                        | 1,600                      | 1,200                            | 100                         |      |
| NRV2012T 3R3M GFV | 3.3                              | $\pm 20\%$           | —                                          | 0.227                                        | 1,250                      | 900                              | 100                         |      |
| NRV2012T 4R7M GFV | 4.7                              | $\pm 20\%$           | —                                          | 0.325                                        | 1,100                      | 750                              | 100                         |      |

## ●NRS2012 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS2012T 1R0N GJV | 1.0                              | $\pm 30\%$           | —                                          | 0.070                                        | 1,900                      | 1,700                            | 100                         |      |
| NRS2012T 1R5N GJV | 1.5                              | $\pm 30\%$           | —                                          | 0.090                                        | 1,650                      | 1,500                            | 100                         |      |
| NRS2012T 2R2M GJV | 2.2                              | $\pm 20\%$           | —                                          | 0.107                                        | 1,350                      | 1,370                            | 100                         |      |
| NRS2012T 3R3M GJV | 3.3                              | $\pm 20\%$           | —                                          | 0.190                                        | 1,000                      | 1,020                            | 100                         |      |
| NRS2012T 4R7M GJV | 4.7                              | $\pm 20\%$           | —                                          | 0.241                                        | 900                        | 910                              | 100                         |      |

## ●NRH2410 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRH2410T R68NN 4V | 0.68                             | $\pm 30\%$           | 120                                        | 0.060                                        | 2,200                      | 1,570                            | 100                         |      |
| NRH2410T 1R0NN 4V | 1.0                              | $\pm 30\%$           | 106                                        | 0.070                                        | 1,800                      | 1,410                            | 100                         |      |
| NRH2410T 1R5MN V  | 1.5                              | $\pm 20\%$           | 94                                         | 0.110                                        | 1,550                      | 1,160                            | 100                         |      |
| NRH2410T 2R2MN V  | 2.2                              | $\pm 20\%$           | 77                                         | 0.150                                        | 1,290                      | 970                              | 100                         |      |
| NRH2410T 3R3MN V  | 3.3                              | $\pm 20\%$           | 56                                         | 0.220                                        | 1,000                      | 770                              | 100                         |      |
| NRH2410T 4R7MN V  | 4.7                              | $\pm 20\%$           | 50                                         | 0.290                                        | 880                        | 670                              | 100                         |      |
| NRH2410T 6R8MN V  | 6.8                              | $\pm 20\%$           | 43                                         | 0.410                                        | 750                        | 570                              | 100                         |      |
| NRH2410T 100MN V  | 10                               | $\pm 20\%$           | 32                                         | 0.690                                        | 550                        | 450                              | 100                         |      |
| NRH2410T 150MN V  | 15                               | $\pm 20\%$           | 27                                         | 1.02                                         | 470                        | 370                              | 100                         |      |
| NRH2410T 220MN V  | 22                               | $\pm 20\%$           | 22                                         | 1.47                                         | 390                        | 300                              | 100                         |      |

## ●NRH2412 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRH2412T R47NNGJV | 0.47                             | $\pm 30\%$           | 180                                        | 0.050                                        | 2,900                      | 2,100                            | 100                         |      |
| NRH2412T 1R0NNGHV | 1.0                              | $\pm 30\%$           | 101                                        | 0.077                                        | 2,350                      | 1,300                            | 100                         |      |
| NRH2412T 1R5NNGHV | 1.5                              | $\pm 30\%$           | 89                                         | 0.100                                        | 2,100                      | 1,150                            | 100                         |      |
| NRH2412T 2R2MNGHV | 2.2                              | $\pm 20\%$           | 72                                         | 0.140                                        | 1,700                      | 1,000                            | 100                         |      |
| NRH2412T 3R3MNGHV | 3.3                              | $\pm 20\%$           | 56                                         | 0.225                                        | 1,400                      | 750                              | 100                         |      |
| NRH2412T 4R7MNGHV | 4.7                              | $\pm 20\%$           | 45                                         | 0.300                                        | 1,150                      | 650                              | 100                         |      |
| NRH2412T 6R8MNGHV | 6.8                              | $\pm 20\%$           | 34                                         | 0.420                                        | 950                        | 550                              | 100                         |      |
| NRH2412T 100MNGHV | 10                               | $\pm 20\%$           | 29                                         | 0.600                                        | 810                        | 450                              | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

## PART NUMBER

## ●NRH3010 Shielded type

| Part number      | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                  |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRH3010T 1R2NN V | 1.2                              | $\pm 30\%$           | 120                                        | 0.065                                        | 1,700                      | 1,480                            | 100                         |      |
| NRH3010T 1R5NN V | 1.5                              | $\pm 30\%$           | 99                                         | 0.075                                        | 1,440                      | 1,370                            | 100                         |      |
| NRH3010T 2R2MN V | 2.2                              | $\pm 20\%$           | 86                                         | 0.083                                        | 1,300                      | 1,300                            | 100                         |      |
| NRH3010T 3R3MN V | 3.3                              | $\pm 20\%$           | 64                                         | 0.130                                        | 1,000                      | 1,030                            | 100                         |      |
| NRH3010T 4R7MN V | 4.7                              | $\pm 20\%$           | 50                                         | 0.170                                        | 850                        | 900                              | 100                         |      |
| NRH3010T 6R8MN V | 6.8                              | $\pm 20\%$           | 44                                         | 0.250                                        | 700                        | 745                              | 100                         |      |
| NRH3010T 100MN V | 10                               | $\pm 20\%$           | 34                                         | 0.350                                        | 600                        | 620                              | 100                         |      |
| NRH3010T 150MN V | 15                               | $\pm 20\%$           | 25                                         | 0.550                                        | 450                        | 480                              | 100                         |      |
| NRH3010T 220MN V | 22                               | $\pm 20\%$           | 22                                         | 0.770                                        | 380                        | 410                              | 100                         |      |
| NRH3010T 470MN V | 47                               | $\pm 20\%$           | 17                                         | 2.05                                         | 250                        | 285                              | 100                         |      |

## ●NRH3012 Shielded type

| Part number      | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                  |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRH3012T R47NN V | 0.47                             | $\pm 30\%$           | 160                                        | 0.033                                        | 2,600                      | 1,900                            | 100                         |      |
| NRH3012T 1R0NN V | 1.0                              | $\pm 30\%$           | 111                                        | 0.048                                        | 2,200                      | 1,710                            | 100                         |      |
| NRH3012T 1R5NN V | 1.5                              | $\pm 30\%$           | 95                                         | 0.055                                        | 1,700                      | 1,600                            | 100                         |      |
| NRH3012T 2R2MN V | 2.2                              | $\pm 20\%$           | 78                                         | 0.075                                        | 1,500                      | 1,370                            | 100                         |      |
| NRH3012T 3R3MN V | 3.3                              | $\pm 20\%$           | 61                                         | 0.100                                        | 1,200                      | 1,210                            | 100                         |      |
| NRH3012T 4R7MN V | 4.7                              | $\pm 20\%$           | 50                                         | 0.130                                        | 1,000                      | 1,060                            | 100                         |      |
| NRH3012T 6R8MN V | 6.8                              | $\pm 20\%$           | 43                                         | 0.190                                        | 850                        | 890                              | 100                         |      |
| NRH3012T 100MN V | 10                               | $\pm 20\%$           | 32                                         | 0.270                                        | 730                        | 720                              | 100                         |      |
| NRH3012T 150MN V | 15                               | $\pm 20\%$           | 26                                         | 0.450                                        | 530                        | 570                              | 100                         |      |
| NRH3012T 220MN V | 22                               | $\pm 20\%$           | 22                                         | 0.630                                        | 500                        | 500                              | 100                         |      |

## ●NRV3012 Shielded type

| Part number     | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-----------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                 |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRV3012T 1R0N V | 1.0                              | $\pm 30\%$           | 110                                        | 0.065                                        | 2,500                      | 1,600                            | 100                         |      |
| NRV3012T 1R5N V | 1.5                              | $\pm 30\%$           | 92                                         | 0.075                                        | 2,100                      | 1,400                            | 100                         |      |
| NRV3012T 2R2M V | 2.2                              | $\pm 20\%$           | 70                                         | 0.120                                        | 1,800                      | 1,100                            | 100                         |      |
| NRV3012T 3R3M V | 3.3                              | $\pm 20\%$           | 55                                         | 0.150                                        | 1,600                      | 1,000                            | 100                         |      |
| NRV3012T 4R7M V | 4.7                              | $\pm 20\%$           | 48                                         | 0.190                                        | 1,250                      | 850                              | 100                         |      |
| NRV3012T 6R8M V | 6.8                              | $\pm 20\%$           | 40                                         | 0.300                                        | 950                        | 650                              | 100                         |      |
| NRV3012T 100M V | 10                               | $\pm 20\%$           | 32                                         | 0.470                                        | 800                        | 550                              | 100                         |      |

## ●NRS3015 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS3015T 1R0NNGHV | 1.0                              | $\pm 30\%$           | 100                                        | 0.030                                        | 2,100                      | 2,100                            | 100                         |      |
| NRS3015T 1R5NNGHV | 1.5                              | $\pm 30\%$           | 87                                         | 0.038                                        | 1,800                      | 1,820                            | 100                         |      |
| NRS3015T 2R2MNGHV | 2.2                              | $\pm 20\%$           | 64                                         | 0.058                                        | 1,480                      | 1,500                            | 100                         |      |
| NRS3015T 3R3MNGHV | 3.3                              | $\pm 20\%$           | 49                                         | 0.078                                        | 1,210                      | 1,230                            | 100                         |      |
| NRS3015T 4R7MNGHV | 4.7                              | $\pm 20\%$           | 40                                         | 0.120                                        | 1,020                      | 1,040                            | 100                         |      |
| NRS3015T 6R8MNGHV | 6.8                              | $\pm 20\%$           | 36                                         | 0.160                                        | 870                        | 880                              | 100                         |      |
| NRS3015T 100MNGHV | 10                               | $\pm 20\%$           | 28                                         | 0.220                                        | 700                        | 710                              | 100                         |      |
| NRS3015T 220MNGHV | 22                               | $\pm 20\%$           | 20                                         | 0.520                                        | 470                        | 470                              | 100                         |      |
| NRS3015T 330MNGHV | 33                               | $\pm 20\%$           | 18                                         | 0.780                                        | 400                        | 440                              | 100                         |      |

## ●NRS4010 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS4010T 1R0NDGGV | 1.0                              | $\pm 30\%$           | 116                                        | 0.056                                        | 2,000                      | 1,900                            | 100                         |      |
| NRS4010T 2R2MDGGV | 2.2                              | $\pm 20\%$           | 73                                         | 0.085                                        | 1,200                      | 1,500                            | 100                         |      |
| NRS4010T 3R3MDGGV | 3.3                              | $\pm 20\%$           | 58                                         | 0.100                                        | 1,100                      | 1,400                            | 100                         |      |
| NRS4010T 4R7MDGGV | 4.7                              | $\pm 20\%$           | 47                                         | 0.140                                        | 950                        | 1,200                            | 100                         |      |
| NRS4010T 6R8MDGGV | 6.8                              | $\pm 20\%$           | 38                                         | 0.200                                        | 800                        | 1,000                            | 100                         |      |
| NRS4010T 100MDGGV | 10                               | $\pm 20\%$           | 31                                         | 0.300                                        | 620                        | 750                              | 100                         |      |
| NRS4010T 150MDGGV | 15                               | $\pm 20\%$           | 24                                         | 0.430                                        | 540                        | 600                              | 100                         |      |
| NRS4010T 220MDGGV | 22                               | $\pm 20\%$           | 19                                         | 0.570                                        | 450                        | 500                              | 100                         |      |

## ●NRS4012 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS4012T 1R0NDGGV | 1.0                              | $\pm 30\%$           | 100                                        | 0.042                                        | 2,800                      | 2,200                            | 100                         |      |
| NRS4012T 2R2MDGJV | 2.2                              | $\pm 20\%$           | 70                                         | 0.060                                        | 1,650                      | 1,900                            | 100                         |      |
| NRS4012T 3R3MDGJV | 3.3                              | $\pm 20\%$           | 60                                         | 0.070                                        | 1,400                      | 1,700                            | 100                         |      |
| NRS4012T 4R7MDGJV | 4.7                              | $\pm 20\%$           | 45                                         | 0.095                                        | 1,200                      | 1,500                            | 100                         |      |
| NRS4012T 6R8MDGJV | 6.8                              | $\pm 20\%$           | 35                                         | 0.125                                        | 900                        | 1,300                            | 100                         |      |
| NRS4012T 100MDGJV | 10                               | $\pm 20\%$           | 30                                         | 0.170                                        | 800                        | 1,100                            | 100                         |      |
| NRS4012T 150MDGJV | 15                               | $\pm 20\%$           | 24                                         | 0.260                                        | 650                        | 750                              | 100                         |      |
| NRS4012T 220MDGJV | 22                               | $\pm 20\%$           | 18                                         | 0.400                                        | 500                        | 620                              | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

## PART NUMBER

## ● NRS4018 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS4018T 1R0NDGJV | 1.0                              | $\pm 30\%$           | 90                                         | 0.027                                        | 4,000                      | 3,200                            | 100                         |      |
| NRS4018T 1R5NDGJV | 1.5                              | $\pm 30\%$           | 75                                         | 0.037                                        | 3,300                      | 2,400                            | 100                         |      |
| NRS4018T 2R2MDGJV | 2.2                              | $\pm 20\%$           | 60                                         | 0.042                                        | 3,000                      | 2,200                            | 100                         |      |
| NRS4018T 3R3MDGJV | 3.3                              | $\pm 20\%$           | 45                                         | 0.055                                        | 2,300                      | 2,000                            | 100                         |      |
| NRS4018T 4R7MDGJV | 4.7                              | $\pm 20\%$           | 35                                         | 0.070                                        | 2,000                      | 1,700                            | 100                         |      |
| NRS4018T 6R8MDGJV | 6.8                              | $\pm 20\%$           | 30                                         | 0.098                                        | 1,600                      | 1,450                            | 100                         |      |
| NRS4018T 100MDGJV | 10                               | $\pm 20\%$           | 25                                         | 0.150                                        | 1,300                      | 1,200                            | 100                         |      |
| NRS4018T 150MDGJV | 15                               | $\pm 20\%$           | 18                                         | 0.210                                        | 1,100                      | 850                              | 100                         |      |
| NRS4018T 220MDGJV | 22                               | $\pm 20\%$           | 15                                         | 0.290                                        | 900                        | 720                              | 100                         |      |
| NRS4018T 330MDGJV | 33                               | $\pm 20\%$           | 12                                         | 0.460                                        | 700                        | 550                              | 100                         |      |
| NRS4018T 470MDGJV | 47                               | $\pm 20\%$           | 10                                         | 0.650                                        | 600                        | 440                              | 100                         |      |
| NRS4018T 680MDGJV | 68                               | $\pm 20\%$           | 8.3                                        | 1.00                                         | 520                        | 320                              | 100                         |      |
| NRS4018T 101MDGJV | 100                              | $\pm 20\%$           | 6.5                                        | 1.45                                         | 420                        | 280                              | 100                         |      |
| NRS4018T 151MDGJV | 150                              | $\pm 20\%$           | 5.5                                        | 2.30                                         | 340                        | 220                              | 100                         |      |
| NRS4018T 221MDGJV | 220                              | $\pm 20\%$           | 4.0                                        | 3.80                                         | 275                        | 170                              | 100                         |      |

## ● NRS5010 type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5010T 1R0NMGFV | 1.0                              | $\pm 30\%$           | 95                                         | 0.070                                        | 2,350                      | 1,750                            | 100                         |      |
| NRS5010T 2R2NMGFV | 2.2                              | $\pm 30\%$           | 65                                         | 0.105                                        | 1,500                      | 1,400                            | 100                         |      |
| NRS5010T 3R3MMGFV | 3.3                              | $\pm 20\%$           | 42                                         | 0.125                                        | 1,400                      | 1,250                            | 100                         |      |
| NRS5010T 4R7MMGFV | 4.7                              | $\pm 20\%$           | 37                                         | 0.145                                        | 1,200                      | 1,150                            | 100                         |      |
| NRS5010T 6R8MMGFV | 6.8                              | $\pm 20\%$           | 33                                         | 0.185                                        | 1,000                      | 1,000                            | 100                         |      |
| NRS5010T 100MMGFV | 10                               | $\pm 20\%$           | 23                                         | 0.250                                        | 850                        | 900                              | 100                         |      |
| NRS5010T 150MMGFV | 15                               | $\pm 20\%$           | 19                                         | 0.400                                        | 680                        | 650                              | 100                         |      |
| NRS5010T 220MMGFV | 22                               | $\pm 20\%$           | 15                                         | 0.600                                        | 550                        | 450                              | 100                         |      |

## ● NRS5012 type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5012T 1R0NMGFV | 1.0                              | $\pm 30\%$           | 100                                        | 0.053                                        | 4,500                      | 2,300                            | 100                         |      |
| NRS5012T 1R5NMGFV | 1.5                              | $\pm 30\%$           | 86                                         | 0.070                                        | 3,800                      | 2,200                            | 100                         |      |
| NRS5012T 2R2MMGFV | 2.2                              | $\pm 20\%$           | 70                                         | 0.085                                        | 3,100                      | 2,000                            | 100                         |      |
| NRS5012T 3R3MMGFV | 3.3                              | $\pm 20\%$           | 48                                         | 0.160                                        | 2,400                      | 1,450                            | 100                         |      |
| NRS5012T 4R7MMGFV | 4.7                              | $\pm 20\%$           | 40                                         | 0.180                                        | 2,200                      | 1,400                            | 100                         |      |
| NRS5012T 6R8MMGFV | 6.8                              | $\pm 20\%$           | 36                                         | 0.260                                        | 1,700                      | 1,100                            | 100                         |      |
| NRS5012T 100MMGFV | 10                               | $\pm 20\%$           | 26                                         | 0.420                                        | 1,400                      | 850                              | 100                         |      |
| NRS5012T 150MMGFV | 15                               | $\pm 20\%$           | 22                                         | 0.670                                        | 1,200                      | 640                              | 100                         |      |

## ● NRS5014 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5014T R47NMGGV | 0.47                             | $\pm 30\%$           | 185                                        | 0.025                                        | 5,800                      | 3,300                            | 100                         |      |
| NRS5014T 1R2NMGGV | 1.2                              | $\pm 30\%$           | 86                                         | 0.045                                        | 3,800                      | 2,400                            | 100                         |      |
| NRS5014T 2R2NMGGV | 2.2                              | $\pm 30\%$           | 56                                         | 0.065                                        | 2,800                      | 2,000                            | 100                         |      |
| NRS5014T 3R3NMGGV | 3.3                              | $\pm 30\%$           | 48                                         | 0.080                                        | 2,350                      | 1,700                            | 100                         |      |
| NRS5014T 4R7NMGGV | 4.7                              | $\pm 30\%$           | 41                                         | 0.100                                        | 2,050                      | 1,400                            | 100                         |      |
| NRS5014T 6R8NMGGV | 6.8                              | $\pm 20\%$           | 33                                         | 0.150                                        | 1,600                      | 1,200                            | 100                         |      |
| NRS5014T 100MMGGV | 10                               | $\pm 20\%$           | 27                                         | 0.200                                        | 1,400                      | 1,050                            | 100                         |      |
| NRS5014T 150MMGGV | 15                               | $\pm 20\%$           | 20                                         | 0.320                                        | 1,100                      | 650                              | 100                         |      |
| NRS5014T 220MMGGV | 22                               | $\pm 20\%$           | 16                                         | 0.450                                        | 900                        | 550                              | 100                         |      |

## ● NRS5020 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5020T R47NMGGV | 0.47                             | $\pm 30\%$           | 230                                        | 0.012                                        | 6,100                      | 5,000                            | 100                         |      |
| NRS5020T 1R0NMGGV | 1.0                              | $\pm 30\%$           | 81                                         | 0.021                                        | 4,000                      | 3,600                            | 100                         |      |
| NRS5020T 1R5NMGGV | 1.5                              | $\pm 30\%$           | 68                                         | 0.026                                        | 3,350                      | 3,200                            | 100                         |      |
| NRS5020T 2R2NMGGV | 2.2                              | $\pm 30\%$           | 57                                         | 0.035                                        | 2,900                      | 2,900                            | 100                         |      |
| NRS5020T 3R3NMGGV | 3.3                              | $\pm 30\%$           | 46                                         | 0.048                                        | 2,400                      | 2,400                            | 100                         |      |
| NRS5020T 4R7NMGGV | 4.7                              | $\pm 20\%$           | 37                                         | 0.060                                        | 2,000                      | 2,000                            | 100                         |      |
| NRS5020T 6R8NMGGV | 6.8                              | $\pm 20\%$           | 30                                         | 0.090                                        | 1,600                      | 1,650                            | 100                         |      |
| NRS5020T 100MMGGV | 10                               | $\pm 20\%$           | 24                                         | 0.120                                        | 1,300                      | 1,450                            | 100                         |      |
| NRS5020T 150MMGGV | 15                               | $\pm 20\%$           | 20                                         | 0.165                                        | 1,100                      | 1,200                            | 100                         |      |
| NRS5020T 220MMGGV | 22                               | $\pm 20\%$           | 17                                         | 0.260                                        | 900                        | 1,000                            | 100                         |      |
| NRS5020T 470MMGGV | 47                               | $\pm 20\%$           | 12                                         | 0.435                                        | 630                        | 560                              | 100                         |      |
| NRS5020T 101MMGGV | 100                              | $\pm 20\%$           | 7                                          | 0.850                                        | 420                        | 400                              | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

► 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/>).

## PART NUMBER

## ● NRS5024 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5024T 1R0NMGJV | 1.0                              | $\pm 30\%$           | 85                                         | 0.016                                        | 5,800                      | 4,400                            | 100                         |      |
| NRS5024T 1R5NMGJV | 1.5                              | $\pm 30\%$           | 67                                         | 0.022                                        | 5,200                      | 3,600                            | 100                         |      |
| NRS5024T 2R2NMGJV | 2.2                              | $\pm 30\%$           | 51                                         | 0.029                                        | 4,100                      | 3,100                            | 100                         |      |
| NRS5024T 3R3NMGJV | 3.3                              | $\pm 30\%$           | 41                                         | 0.043                                        | 3,100                      | 2,400                            | 100                         |      |
| NRS5024T 4R7MMGJV | 4.7                              | $\pm 20\%$           | 37                                         | 0.055                                        | 2,700                      | 2,000                            | 100                         |      |
| NRS5024T 6R8MMGJV | 6.8                              | $\pm 20\%$           | 28                                         | 0.080                                        | 2,200                      | 1,600                            | 100                         |      |
| NRS5024T 100MMGJV | 10                               | $\pm 20\%$           | 21                                         | 0.125                                        | 1,700                      | 1,200                            | 100                         |      |
| NRS5024T 150MMGJV | 15                               | $\pm 20\%$           | 18                                         | 0.170                                        | 1,400                      | 1,000                            | 100                         |      |
| NRS5024T 220MMGJV | 22                               | $\pm 20\%$           | 15                                         | 0.230                                        | 1,200                      | 820                              | 100                         |      |
| NRS5024T 330MMGJV | 33                               | $\pm 20\%$           | 11                                         | 0.370                                        | 1,000                      | 630                              | 100                         |      |

## ● NRS5030 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 30\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5030T R47NMGJV | 0.47                             | $\pm 30\%$           | 185                                        | 0.010                                        | 9,000                      | 5,000                            | 100                         |      |
| NRS5030T 1R0NMGJV | 1.0                              | $\pm 30\%$           | 110                                        | 0.015                                        | 6,600                      | 4,000                            | 100                         |      |
| NRS5030T 2R2NMGJV | 2.2                              | $\pm 30\%$           | 46                                         | 0.023                                        | 4,200                      | 3,500                            | 100                         |      |
| NRS5030T 3R3MMGJV | 3.3                              | $\pm 20\%$           | 36                                         | 0.030                                        | 3,600                      | 3,000                            | 100                         |      |
| NRS5030T 4R7MMGJV | 4.7                              | $\pm 20\%$           | 31                                         | 0.035                                        | 3,100                      | 2,600                            | 100                         |      |
| NRS5030T 6R8MMGJV | 6.8                              | $\pm 20\%$           | 22                                         | 0.052                                        | 2,500                      | 2,300                            | 100                         |      |
| NRS5030T 100MMGJV | 10                               | $\pm 20\%$           | 20                                         | 0.070                                        | 2,100                      | 1,700                            | 100                         |      |
| NRS5030T 150MMGJV | 15                               | $\pm 20\%$           | 14                                         | 0.125                                        | 1,600                      | 1,400                            | 100                         |      |
| NRS5030T 220MMGJV | 22                               | $\pm 20\%$           | 13                                         | 0.180                                        | 1,400                      | 1,050                            | 100                         |      |
| NRS5030T 330MMGJV | 33                               | $\pm 20\%$           | 10                                         | 0.225                                        | 1,150                      | 800                              | 100                         |      |
| NRS5030T 470MMGJV | 47                               | $\pm 20\%$           | 9                                          | 0.325                                        | 950                        | 700                              | 100                         |      |

## ● NRS5040 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 30\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS5040T 1R5NMGJV | 1.5                              | $\pm 30\%$           | 60                                         | 0.017                                        | 6,400                      | 4,500                            | 100                         |      |
| NRS5040T 2R2NMGJV | 2.2                              | $\pm 30\%$           | 42                                         | 0.022                                        | 5,000                      | 3,700                            | 100                         |      |
| NRS5040T 3R3NMGJV | 3.3                              | $\pm 30\%$           | 32                                         | 0.027                                        | 4,000                      | 3,300                            | 100                         |      |
| NRS5040T 4R7NMGJV | 4.7                              | $\pm 30\%$           | 28                                         | 0.029                                        | 3,300                      | 3,100                            | 100                         |      |
| NRS5040T 6R8MMGJV | 6.8                              | $\pm 20\%$           | 21                                         | 0.049                                        | 2,800                      | 2,400                            | 100                         |      |
| NRS5040T 100MMGJV | 10                               | $\pm 20\%$           | 18                                         | 0.056                                        | 2,300                      | 2,100                            | 100                         |      |
| NRS5040T 150MMGJV | 15                               | $\pm 20\%$           | 13                                         | 0.080                                        | 2,000                      | 1,800                            | 100                         |      |
| NRS5040T 220MMGJV | 22                               | $\pm 20\%$           | 9                                          | 0.126                                        | 1,500                      | 1,400                            | 100                         |      |
| NRS5040T 330MMGJV | 33                               | $\pm 20\%$           | 7                                          | 0.180                                        | 1,300                      | 1,200                            | 100                         |      |
| NRS5040T 470MMGJV | 47                               | $\pm 20\%$           | 6                                          | 0.310                                        | 1,100                      | 900                              | 100                         |      |

## ● NRS6010 type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6010T 1R5MMGFV | 1.5                              | $\pm 20\%$           | 77                                         | 0.090                                        | 2,400                      | 1,900                            | 100                         |      |
| NRS6010T 2R2MMGFV | 2.2                              | $\pm 20\%$           | 56                                         | 0.110                                        | 1,900                      | 1,700                            | 100                         |      |
| NRS6010T 3R3MMGFV | 3.3                              | $\pm 20\%$           | 42                                         | 0.135                                        | 1,600                      | 1,500                            | 100                         |      |
| NRS6010T 4R7MMGFV | 4.7                              | $\pm 20\%$           | 36                                         | 0.165                                        | 1,300                      | 1,400                            | 100                         |      |
| NRS6010T 6R8MMGFV | 6.8                              | $\pm 20\%$           | 30                                         | 0.220                                        | 1,200                      | 1,200                            | 100                         |      |
| NRS6010T 100MMGFV | 10                               | $\pm 20\%$           | 25                                         | 0.270                                        | 1,000                      | 1,100                            | 100                         |      |
| NRS6010T 220MMGFV | 22                               | $\pm 20\%$           | 12                                         | 0.580                                        | 650                        | 700                              | 100                         |      |

## ● NRS6012 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 20\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6012T 1R0NMGJV | 1.0                              | $\pm 30\%$           | 95                                         | 0.050                                        | 3,000                      | 2,400                            | 100                         |      |
| NRS6012T 1R5NMGJV | 1.5                              | $\pm 30\%$           | 69                                         | 0.067                                        | 2,600                      | 2,100                            | 100                         |      |
| NRS6012T 2R5NMGJV | 2.5                              | $\pm 30\%$           | 45                                         | 0.090                                        | 2,100                      | 1,800                            | 100                         |      |
| NRS6012T 3R3NMGJV | 3.3                              | $\pm 30\%$           | 42                                         | 0.105                                        | 1,800                      | 1,700                            | 100                         |      |
| NRS6012T 4R7MMGJV | 4.7                              | $\pm 20\%$           | 36                                         | 0.125                                        | 1,600                      | 1,550                            | 100                         |      |
| NRS6012T 5R3MMGJV | 5.3                              | $\pm 20\%$           | 34                                         | 0.125                                        | 1,500                      | 1,550                            | 100                         |      |
| NRS6012T 6R8MMGJV | 6.8                              | $\pm 20\%$           | 30                                         | 0.165                                        | 1,300                      | 1,350                            | 100                         |      |
| NRS6012T 100MMGJV | 10                               | $\pm 20\%$           | 22                                         | 0.200                                        | 1,000                      | 1,200                            | 100                         |      |
| NRS6012T 150MMGJV | 15                               | $\pm 20\%$           | 18                                         | 0.295                                        | 800                        | 800                              | 100                         |      |
| NRS6012T 220MMGJV | 22                               | $\pm 20\%$           | 12                                         | 0.465                                        | 760                        | 650                              | 100                         |      |
| NRS6012T 330MMGJV | 33                               | $\pm 20\%$           | 8                                          | 0.580                                        | 590                        | 550                              | 100                         |      |
| NRS6012T 470MMGJV | 47                               | $\pm 20\%$           | 6                                          | 0.965                                        | 520                        | 460                              | 100                         |      |
| NRS6012T 680MMGJV | 68                               | $\pm 20\%$           | 3                                          | 1.16                                         | 440                        | 410                              | 100                         |      |
| NRS6012T 101MMGJV | 100                              | $\pm 20\%$           | 1                                          | 1.67                                         | 350                        | 320                              | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

## PART NUMBER

## ● NRS6014 Shielded type

| Part number       | Nominal inductance<br>[μH] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[Ω] (±20%) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------|----------------------|--------------------------------------------|-----------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                            |                      |                                            |                             | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6014T 1R2NMGGV | 1.2                        | ±30%                 | 77                                         | 0.042                       | 4,000                      | 2,750                            | 100                         |      |
| NRS6014T 2R2NMGGV | 2.2                        | ±30%                 | 61                                         | 0.055                       | 3,000                      | 2,300                            | 100                         |      |
| NRS6014T 3R3NMGGV | 3.3                        | ±30%                 | 41                                         | 0.075                       | 2,500                      | 2,000                            | 100                         |      |
| NRS6014T 4R7MMGGV | 4.7                        | ±20%                 | 36                                         | 0.090                       | 2,000                      | 1,900                            | 100                         |      |
| NRS6014T 6R8MMGGV | 6.8                        | ±20%                 | 30                                         | 0.115                       | 1,700                      | 1,650                            | 100                         |      |
| NRS6014T 100MMGGV | 10                         | ±20%                 | 24                                         | 0.140                       | 1,400                      | 1,400                            | 100                         |      |
| NRS6014T 150MMGGV | 15                         | ±20%                 | 20                                         | 0.210                       | 1,150                      | 1,200                            | 100                         |      |
| NRS6014T 220MMGGV | 22                         | ±20%                 | 16                                         | 0.300                       | 950                        | 1,000                            | 100                         |      |

## ● NRS6020 Shielded type

| Part number       | Nominal inductance<br>[μH] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[Ω] (±20%) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------|----------------------|--------------------------------------------|-----------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                            |                      |                                            |                             | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6020T 0R8NMGGV | 0.8                        | ±30%                 | 110                                        | 0.020                       | 6,400                      | 4,100                            | 100                         |      |
| NRS6020T 1R5NMGGV | 1.5                        | ±30%                 | 93                                         | 0.026                       | 4,300                      | 3,600                            | 100                         |      |
| NRS6020T 2R2NMGGV | 2.2                        | ±30%                 | 73                                         | 0.034                       | 3,200                      | 2,900                            | 100                         |      |
| NRS6020T 3R3NMGGV | 3.3                        | ±30%                 | 55                                         | 0.040                       | 2,800                      | 2,750                            | 100                         |      |
| NRS6020T 4R7NMGGV | 4.7                        | ±30%                 | 43                                         | 0.058                       | 2,400                      | 2,150                            | 100                         |      |
| NRS6020T 6R8NMGGV | 6.8                        | ±30%                 | 30                                         | 0.085                       | 2,000                      | 1,800                            | 100                         |      |
| NRS6020T 100MMGGV | 10                         | ±20%                 | 18                                         | 0.125                       | 1,900                      | 1,500                            | 100                         |      |
| NRS6020T 220MMGGV | 22                         | ±20%                 | 11                                         | 0.290                       | 1,250                      | 950                              | 100                         |      |

## ● NRS6028 Shielded type

| Part number       | Nominal inductance<br>[μH] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[Ω] (±30%) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------|----------------------|--------------------------------------------|-----------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                            |                      |                                            |                             | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6028T 0R9NMGGV | 0.9                        | ±30%                 | 90                                         | 0.013                       | 6,700                      | 4,600                            | 100                         |      |
| NRS6028T 1R5NMGGV | 1.5                        | ±30%                 | 78                                         | 0.016                       | 5,100                      | 4,200                            | 100                         |      |
| NRS6028T 2R2NMGGV | 2.2                        | ±30%                 | 68                                         | 0.020                       | 4,200                      | 3,700                            | 100                         |      |
| NRS6028T 3R0NMGGV | 3.0                        | ±30%                 | 55                                         | 0.023                       | 3,600                      | 3,400                            | 100                         |      |
| NRS6028T 4R7MMGGV | 4.7                        | ±20%                 | 39                                         | 0.031                       | 2,700                      | 3,000                            | 100                         |      |
| NRS6028T 6R8MMGGV | 6.8                        | ±20%                 | 25                                         | 0.043                       | 2,600                      | 2,500                            | 100                         |      |
| NRS6028T 100MMGGV | 10                         | ±20%                 | 20                                         | 0.065                       | 1,900                      | 1,900                            | 100                         |      |
| NRS6028T 150MMGGV | 15                         | ±20%                 | 17                                         | 0.095                       | 1,600                      | 1,800                            | 100                         |      |
| NRS6028T 220MMGGV | 22                         | ±20%                 | 12                                         | 0.135                       | 1,300                      | 1,400                            | 100                         |      |
| NRS6028T 330MMGGV | 33                         | ±20%                 | 10                                         | 0.220                       | 1,100                      | 1,100                            | 100                         |      |
| NRS6028T 470MMGGV | 47                         | ±20%                 | 8                                          | 0.300                       | 1,000                      | 920                              | 100                         |      |
| NRS6028T 680MMGGV | 68                         | ±20%                 | 5                                          | 0.420                       | 800                        | 770                              | 100                         |      |
| NRS6028T 101MMGGV | 100                        | ±20%                 | 3                                          | 0.600                       | 650                        | 660                              | 100                         |      |

## ● NRS6045 Shielded type

| Part number       | Nominal inductance<br>[μH] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[Ω] (±30%) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------|----------------------|--------------------------------------------|-----------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                            |                      |                                            |                             | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS6045T 1R0NMGGV | 1.0                        | ±30%                 | 110                                        | 0.014                       | 9,800                      | 4,500                            | 100                         |      |
| NRS6045T 1R3NMGGV | 1.3                        | ±30%                 | 95                                         | 0.016                       | 8,200                      | 4,200                            | 100                         |      |
| NRS6045T 1R8NMGGV | 1.8                        | ±30%                 | 80                                         | 0.019                       | 7,200                      | 3,900                            | 100                         |      |
| NRS6045T 2R3NMGGV | 2.3                        | ±30%                 | 60                                         | 0.022                       | 6,400                      | 3,600                            | 100                         |      |
| NRS6045T 3R0NMGGV | 3.0                        | ±30%                 | 45                                         | 0.024                       | 5,600                      | 3,300                            | 100                         |      |
| NRS6045T 4R5MMGGV | 4.5                        | ±20%                 | 25                                         | 0.030                       | 4,400                      | 3,100                            | 100                         |      |
| NRS6045T 6R3MMGGV | 6.3                        | ±20%                 | 15                                         | 0.036                       | 3,600                      | 3,000                            | 100                         |      |
| NRS6045T 100MMGGV | 10                         | ±20%                 | 12                                         | 0.046                       | 3,100                      | 2,400                            | 100                         |      |
| NRS6045T 150MMGGV | 15                         | ±20%                 | 10                                         | 0.070                       | 2,500                      | 1,900                            | 100                         |      |
| NRS6045T 220MMGGV | 22                         | ±20%                 | 7                                          | 0.107                       | 2,000                      | 1,600                            | 100                         |      |
| NRS6045T 330MMGGV | 33                         | ±20%                 | 6                                          | 0.141                       | 1,650                      | 1,400                            | 100                         |      |
| NRS6045T 470MMGGV | 47                         | ±20%                 | 5                                          | 0.211                       | 1,400                      | 1,150                            | 100                         |      |
| NRS6045T 680MMGGV | 68                         | ±20%                 | 4                                          | 0.304                       | 1,100                      | 950                              | 100                         |      |
| NRS6045T 101MMGGV | 100                        | ±20%                 | 3                                          | 0.466                       | 900                        | 750                              | 100                         |      |

## ● NRS8030 Shielded type

| Part number       | Nominal inductance<br>[μH] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[Ω] (±30%) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------|----------------------|--------------------------------------------|-----------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                            |                      |                                            |                             | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS8030T 1R0NJGJV | 1.0                        | ±30%                 | 120                                        | 0.009                       | 7,800                      | 6,200                            | 100                         |      |
| NRS8030T 1R5NJGJV | 1.5                        | ±30%                 | 80                                         | 0.012                       | 6,200                      | 5,300                            | 100                         |      |
| NRS8030T 2R2NJGJV | 2.2                        | ±30%                 | 60                                         | 0.015                       | 4,900                      | 4,800                            | 100                         |      |
| NRS8030T 3R3MJGJV | 3.3                        | ±20%                 | 50                                         | 0.019                       | 4,200                      | 4,300                            | 100                         |      |
| NRS8030T 4R7MJGJV | 4.7                        | ±20%                 | 40                                         | 0.022                       | 3,600                      | 4,000                            | 100                         |      |
| NRS8030T 6R8MJGJV | 6.8                        | ±20%                 | 32                                         | 0.029                       | 3,000                      | 3,400                            | 100                         |      |
| NRS8030T 100MJGJV | 10                         | ±20%                 | 27                                         | 0.033                       | 2,400                      | 3,000                            | 100                         |      |
| NRS8030T 150MJGJV | 15                         | ±20%                 | 20                                         | 0.060                       | 2,000                      | 2,200                            | 100                         |      |
| NRS8030T 220MJGJV | 22                         | ±20%                 | 16                                         | 0.070                       | 1,750                      | 1,900                            | 100                         |      |
| NRS8030T 330MJGJV | 33                         | ±20%                 | 13                                         | 0.120                       | 1,300                      | 1,500                            | 100                         |      |
| NRS8030T 470MJGJV | 47                         | ±20%                 | 11                                         | 0.170                       | 1,100                      | 1,300                            | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

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## PART NUMBER

## ● NRS8040 Shielded type

| Part number       | Nominal inductance<br>[ $\mu$ H] | Inductance tolerance | Self-resonant<br>frequency<br>[MHz] (min.) | DC Resistance<br>[ $\Omega$ ] ( $\pm 30\%$ ) | Rated current ※) [mA]      |                                  | Measuring<br>frequency[kHz] | Note |
|-------------------|----------------------------------|----------------------|--------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-----------------------------|------|
|                   |                                  |                      |                                            |                                              | Saturation current<br>Idc1 | Temperature rise current<br>Idc2 |                             |      |
| NRS8040T 0R9NJGJV | 0.9                              | $\pm 30\%$           | 85                                         | 0.006                                        | 13,000                     | 7,800                            | 100                         |      |
| NRS8040T 1R4NJGJV | 1.4                              | $\pm 30\%$           | 63                                         | 0.007                                        | 10,000                     | 7,000                            | 100                         |      |
| NRS8040T 2R0NJGJV | 2.0                              | $\pm 30\%$           | 50                                         | 0.009                                        | 8,100                      | 6,300                            | 100                         |      |
| NRS8040T 3R6NJGJV | 3.6                              | $\pm 30\%$           | 34                                         | 0.015                                        | 6,400                      | 4,900                            | 100                         |      |
| NRS8040T 4R7NJGJV | 4.7                              | $\pm 30\%$           | 30                                         | 0.018                                        | 5,400                      | 4,100                            | 100                         |      |
| NRS8040T 6R8NJGJV | 6.8                              | $\pm 30\%$           | 24                                         | 0.025                                        | 4,400                      | 3,700                            | 100                         |      |
| NRS8040T 100MJGJV | 10                               | $\pm 20\%$           | 22                                         | 0.034                                        | 3,800                      | 3,100                            | 100                         |      |
| NRS8040T 150MJGJV | 15                               | $\pm 20\%$           | 16                                         | 0.050                                        | 2,900                      | 2,400                            | 100                         |      |
| NRS8040T 220MJGJV | 22                               | $\pm 20\%$           | 13                                         | 0.066                                        | 2,400                      | 2,200                            | 100                         |      |
| NRS8040T 330MJGKV | 33                               | $\pm 20\%$           | 12                                         | 0.100                                        | 2,000                      | 1,700                            | 100                         |      |
| NRS8040T 470MJGKV | 47                               | $\pm 20\%$           | 8                                          | 0.140                                        | 1,500                      | 1,500                            | 100                         |      |
| NRS8040T 680MJGKV | 68                               | $\pm 20\%$           | 7                                          | 0.210                                        | 1,300                      | 1,200                            | 100                         |      |
| NRS8040T 101MJGKV | 100                              | $\pm 20\%$           | 6                                          | 0.280                                        | 1,100                      | 1,000                            | 100                         |      |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

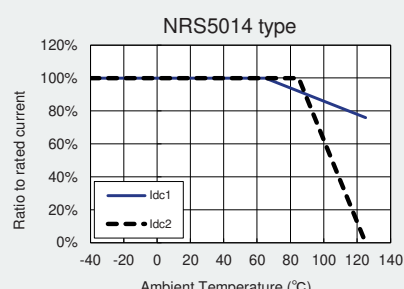
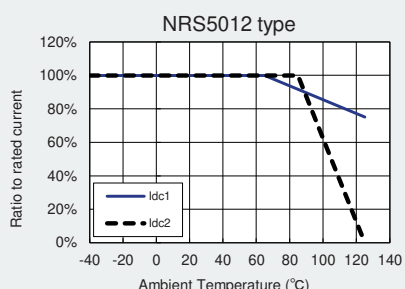
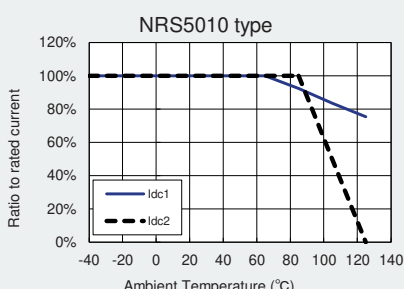
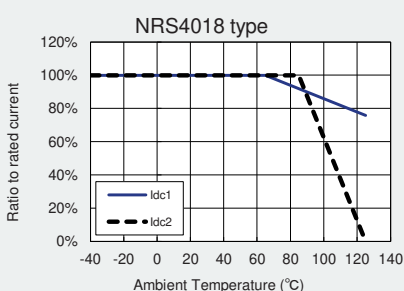
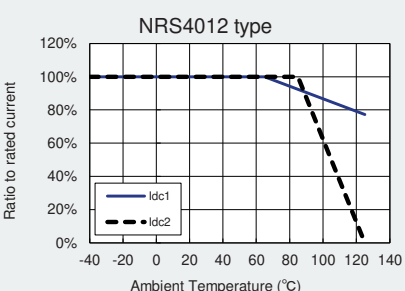
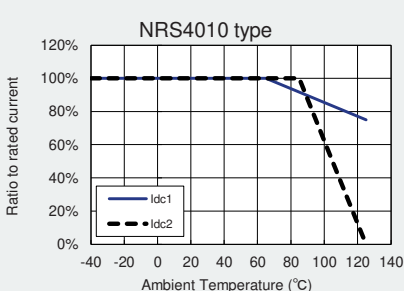
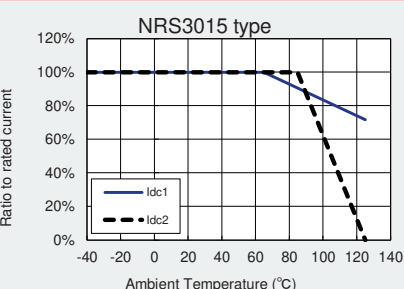
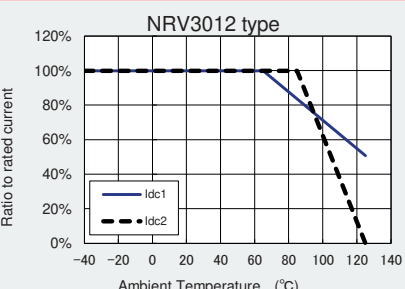
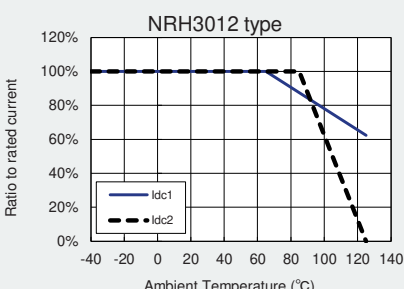
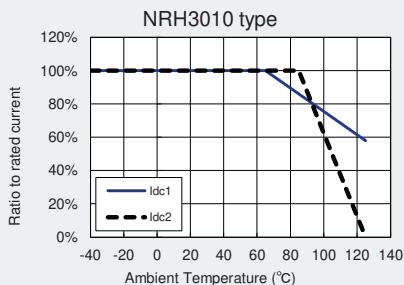
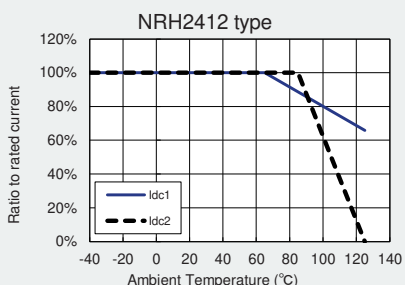
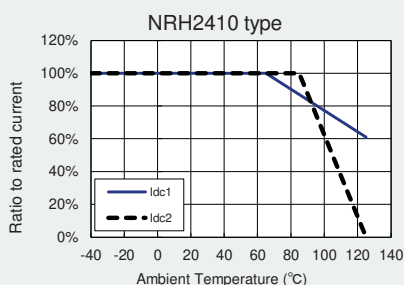
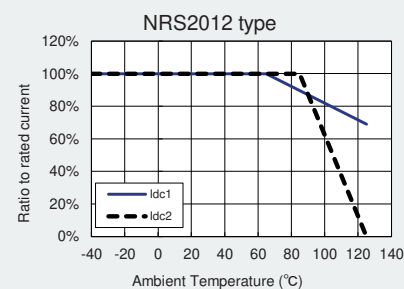
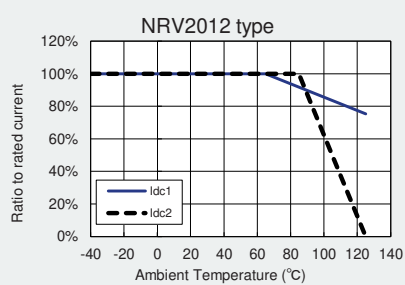
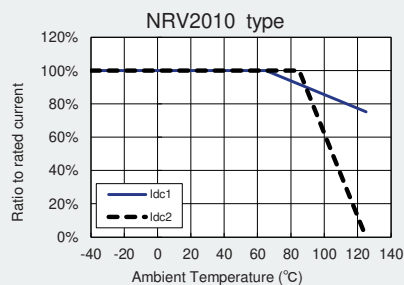
※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

## Derating of Rated Current

### NR series H type/S type/V type

Derating of current is necessary for NR series H type/S type/V type depending on ambient temperature. Please refer to the chart shown below for appropriate derating of current.

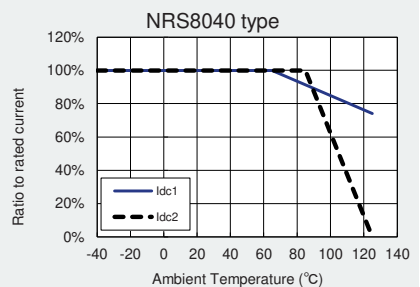
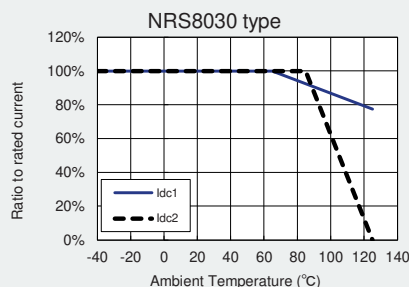
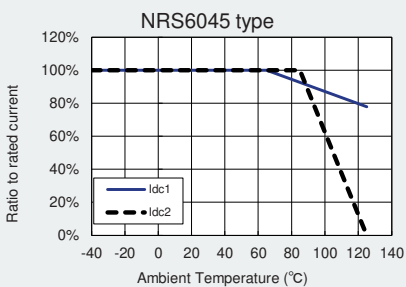
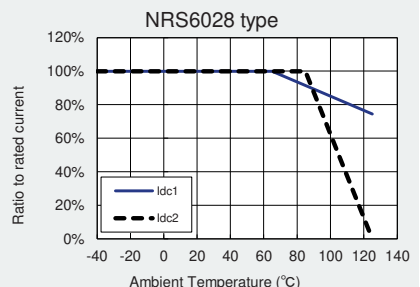
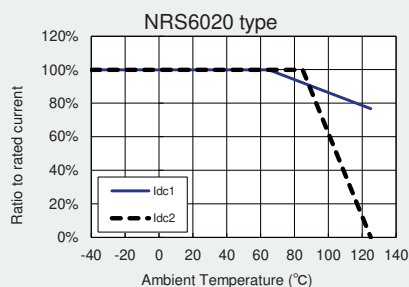
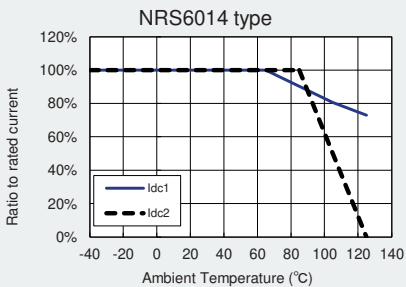
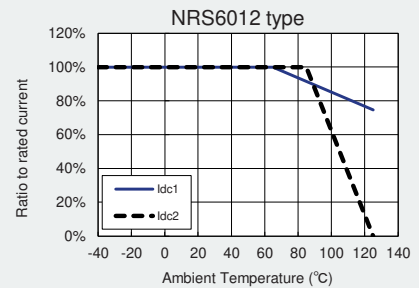
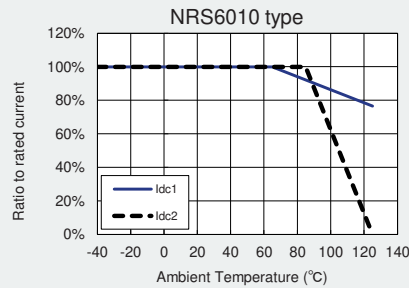
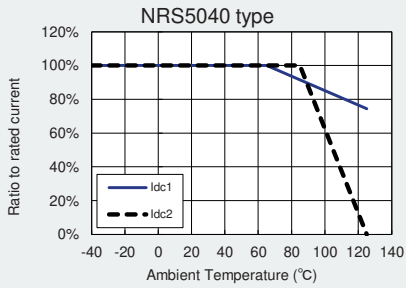
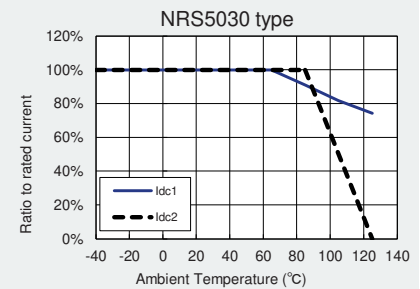
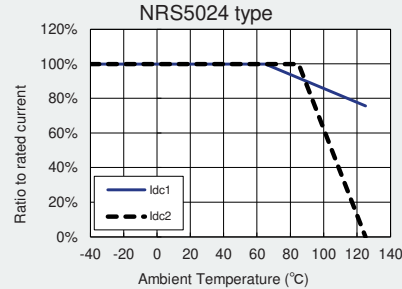
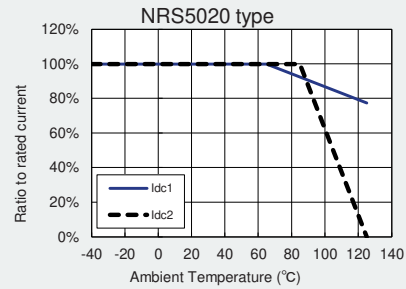


► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our product specification sheets. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website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

## Derating of Rated Current

## NR series H type/S type/V type

Derating of current is necessary for NR series H type/S type/V type depending on ambient temperature.  
Please refer to the chart shown below for appropriate derating of current.



# SMD POWER INDUCTORS (NR SERIES/NR SERIES H TYPE/M TYPE/S TYPE/V TYPE)

## PACKAGING

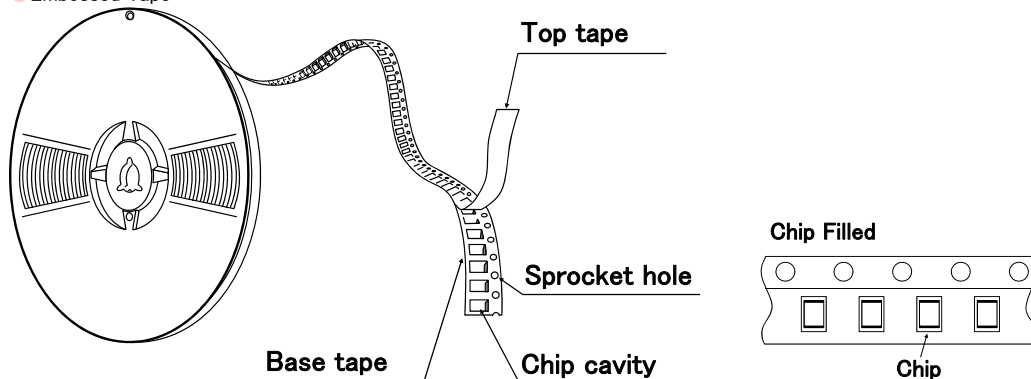
### ① Minimum Quantity

| Type    | Standard Quantity [pcs] |
|---------|-------------------------|
|         | Tape & Reel             |
| NRV2010 | 2500                    |
| NRS2012 | 2500                    |
| NRH2410 | 2500                    |
| NRH2412 | 2500                    |
| NR 3010 | 2000                    |
| NRH3010 | 2000                    |
| NR 3012 | 2000                    |
| NRH3012 | 2000                    |
| NRV3012 | 2000                    |
| NR 3015 | 2000                    |
| NRS3015 | 2000                    |
| NR 4010 | 5000                    |
| NRS4010 | 5000                    |
| NR 4012 | 4500                    |
| NRS4012 | 4500                    |
| NR 4018 | 3500                    |
| NRS4018 | 3500                    |

| Type    | Standard Quantity [pcs] |
|---------|-------------------------|
|         | Tape & Reel             |
| NRS5010 | 1000                    |
| NRS5012 | 1000                    |
| NRS5014 | 1000                    |
| NRS5020 | 800                     |
| NRS5024 | 2500                    |
| NRS5030 | 500                     |
| NR 5040 | 1500                    |
| NRS5040 | 1500                    |
| NRS6010 | 1000                    |
| NR 6012 | 1000                    |
| NRS6012 | 1000                    |
| NRS6014 | 1000                    |
| NR 6020 | 2500                    |
| NRS6020 | 2500                    |
| NR 6028 | 2000                    |
| NRS6028 | 2000                    |
| NR 6045 | 1500                    |
| NRM6045 | 1500                    |
| NRS6045 | 1500                    |
| NRS8030 | 1000                    |
| NR 8040 | 1000                    |
| NRS8040 | 1000                    |

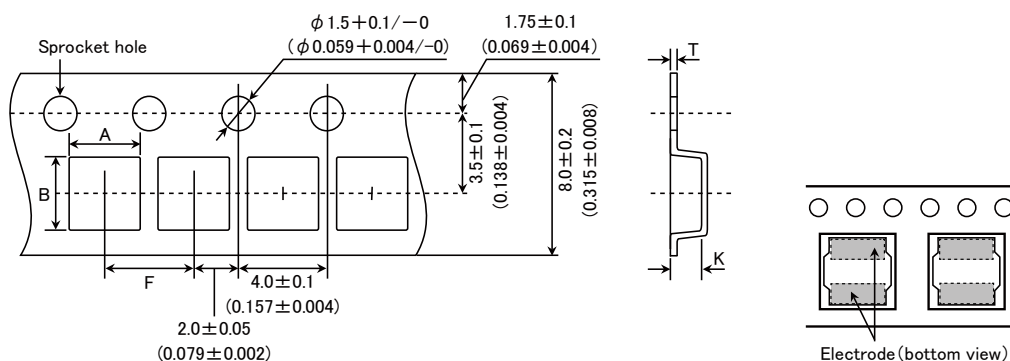
### ② Tape Material

#### ● Embossed Tape



### ③ Taping dimensions

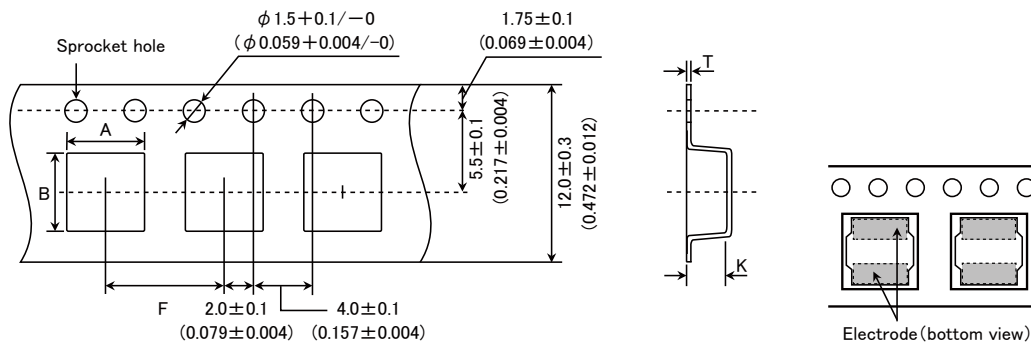
#### ● Embossed tape 8mm wide (0.315 inches wide)



| Type    | Chip cavity              |                          | Insertion pitch          | Tape thickness             |                          |  |
|---------|--------------------------|--------------------------|--------------------------|----------------------------|--------------------------|--|
|         | A                        | B                        | F                        | T                          | K                        |  |
| NRV2010 | 2.2±0.1<br>(0.102±0.004) | 2.2±0.1<br>(0.102±0.004) | 4.0±0.1<br>(0.157±0.004) | 0.25±0.05<br>(0.009±0.002) | 1.3±0.1<br>(0.051±0.004) |  |
| NRS2012 |                          |                          |                          |                            |                          |  |
| NRV2012 |                          |                          |                          |                            |                          |  |
| NRH2410 | 2.6±0.1<br>(0.087±0.004) | 2.6±0.1<br>(0.102±0.004) |                          | 0.25±0.05<br>(0.009±0.002) | 1.3±0.1<br>(0.051±0.004) |  |
| NRH2412 |                          |                          |                          |                            |                          |  |
| NR 3010 | 3.2±0.1<br>(0.126±0.004) | 3.2±0.1<br>(0.126±0.004) |                          | 0.3±0.05<br>(0.012±0.002)  | 1.4±0.1<br>(0.055±0.004) |  |
| NRH3010 |                          |                          |                          |                            | 1.6±0.1<br>(0.063±0.004) |  |
| NR 3012 |                          |                          |                          |                            | 1.9±0.1<br>(0.075±0.004) |  |
| NRH3012 |                          |                          |                          |                            |                          |  |
| NRV3012 |                          |                          |                          |                            |                          |  |
| NR 3015 |                          |                          |                          |                            |                          |  |
| NRS3015 |                          |                          |                          |                            |                          |  |

Unit : mm (inch)

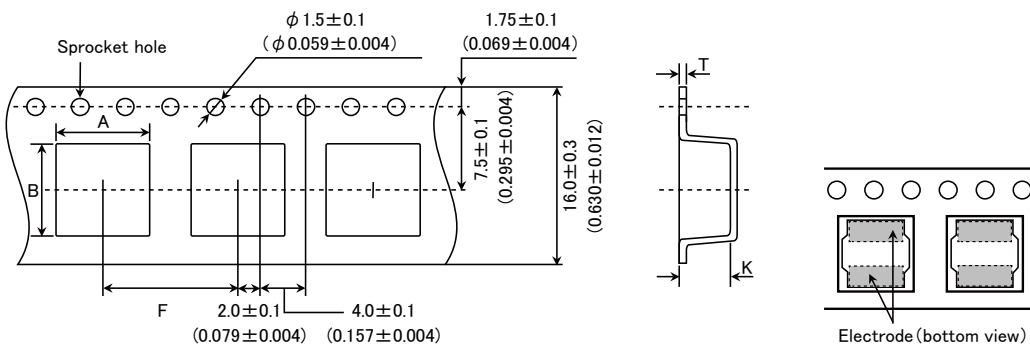
● Embossed tape 12mm wide (0.47 inches wide)



| Type    | Chip cavity               |                           | Insertion pitch          | Tape thickness           |                          |
|---------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
|         | A                         | B                         |                          | T                        | K                        |
| NR 4010 | 4.3±0.1<br>(0.169±0.004)  | 4.3±0.1<br>(0.169±0.004)  | 8.0±0.1<br>(0.315±0.004) | 0.3±0.1<br>(0.012±0.004) | 1.4±0.1<br>(0.055±0.004) |
| NRS4010 |                           |                           |                          |                          | 1.6±0.1<br>(0.063±0.004) |
| NR 4012 |                           |                           |                          |                          | 2.1±0.1<br>(0.083±0.004) |
| NRS4012 |                           |                           |                          |                          | 1.4±0.1<br>(0.055±0.004) |
| NR 4018 | 5.25±0.1<br>(0.207±0.004) | 5.25±0.1<br>(0.207±0.004) |                          |                          | 1.6±0.1<br>(0.063±0.004) |
| NRS4018 |                           |                           |                          |                          | 2.3±0.1<br>(0.091±0.004) |
| NRS5010 |                           |                           |                          |                          | 2.7±0.1<br>(0.106±0.004) |
| NRS5012 |                           |                           |                          |                          | 3.2±0.1<br>(0.126±0.004) |
| NRS5014 |                           |                           |                          |                          | 4.2±0.1<br>(0.165±0.004) |
| NRS5020 |                           |                           |                          |                          | 1.4±0.1<br>(0.055±0.004) |
| NRS5024 |                           |                           |                          | 1.6±0.1<br>(0.063±0.004) |                          |
| NRS5030 | 5.15±0.1<br>(0.203±0.004) | 5.15±0.1<br>(0.203±0.004) |                          | 0.4±0.1<br>(0.016±0.004) | 1.4±0.1<br>(0.055±0.004) |
| NR 5040 | 5.15±0.1<br>(0.203±0.004) | 5.15±0.1<br>(0.203±0.004) |                          |                          | 1.6±0.1<br>(0.063±0.004) |
| NRS5040 | 6.3±0.1<br>(0.248±0.004)  | 6.3±0.1<br>(0.248±0.004)  |                          |                          | 1.6±0.1<br>(0.063±0.004) |
| NRS6010 |                           |                           |                          |                          | 2.3±0.1<br>(0.090±0.004) |
| NR 6012 |                           |                           |                          |                          | 3.1±0.1<br>(0.122±0.004) |
| NRS6012 |                           |                           |                          |                          | 4.7±0.1<br>(0.185±0.004) |
| NRS6014 |                           |                           |                          |                          |                          |
| NR 6020 |                           |                           |                          |                          |                          |
| NRS6020 |                           |                           |                          |                          |                          |
| NR 6028 |                           |                           |                          |                          |                          |
| NRS6028 |                           |                           |                          |                          |                          |
| NR 6045 |                           |                           |                          |                          |                          |
| NRM6045 |                           |                           |                          |                          |                          |
| NRS6045 |                           |                           |                          |                          |                          |

Unit : mm (inch)

● Embossed tape 16mm wide (0.63 inches wide)

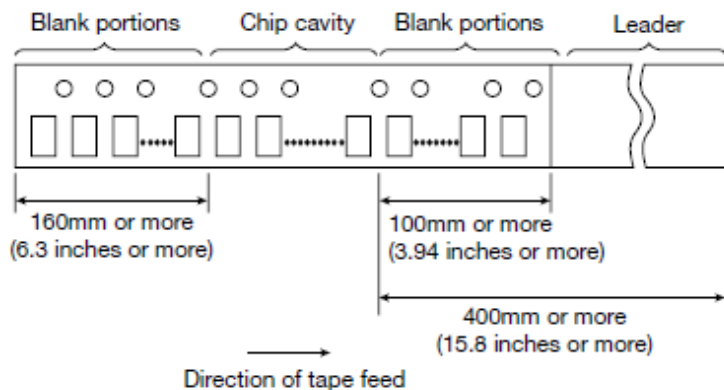


| Type    | Chip cavity                            |                                        | Insertion pitch                         | Tape thickness                         |                                        |
|---------|----------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------|----------------------------------------|
|         | A                                      | B                                      |                                         | T                                      | K                                      |
| NRS8030 | $8.3 \pm 0.1$<br>( $0.327 \pm 0.004$ ) | $8.3 \pm 0.1$<br>( $0.327 \pm 0.004$ ) | $12.0 \pm 0.1$<br>( $0.472 \pm 0.004$ ) | $0.5 \pm 0.1$<br>( $0.020 \pm 0.004$ ) | $3.4 \pm 0.1$<br>( $0.134 \pm 0.004$ ) |
| NR 8040 |                                        |                                        |                                         |                                        | $4.5 \pm 0.1$<br>( $0.177 \pm 0.004$ ) |
| NRS8040 |                                        |                                        |                                         |                                        | $4.5 \pm 0.1$<br>( $0.177 \pm 0.004$ ) |

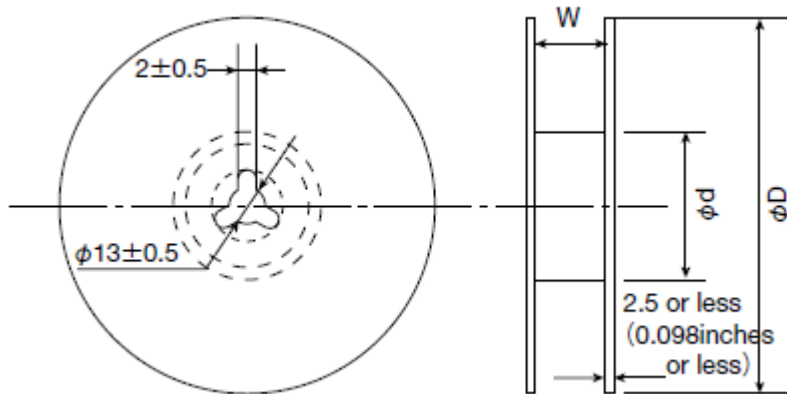
Unit : mm (inch)

#### ④ Leader and Blank portion

● NR, NRH, NRS, NRV



#### ⑤ Reel size

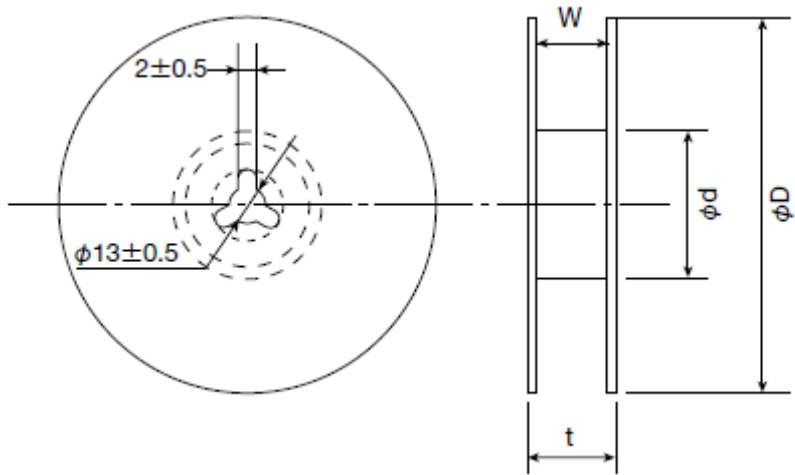


| Type    | Reel size (Reference values)           |                                     |                                         |
|---------|----------------------------------------|-------------------------------------|-----------------------------------------|
|         | $\phi D$                               | $\phi d$                            | W                                       |
| NRV2010 | $180 \pm 0.5$<br>( $7.087 \pm 0.019$ ) | $60 \pm 1.0$<br>( $2.36 \pm 0.04$ ) | $10.0 \pm 1.5$<br>( $0.394 \pm 0.059$ ) |
| NRS2012 |                                        |                                     |                                         |
| NRV2012 |                                        |                                     |                                         |
| NRH2410 |                                        |                                     |                                         |
| NRH2412 |                                        |                                     |                                         |
| NR 3010 |                                        |                                     |                                         |
| NRH3010 |                                        |                                     |                                         |
| NR 3012 |                                        |                                     |                                         |
| NRH3012 |                                        |                                     |                                         |
| NRV3012 |                                        |                                     |                                         |
| NR 3015 |                                        |                                     |                                         |
| NRS3015 |                                        |                                     |                                         |

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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/>) .

|         |                          |                       |                           |
|---------|--------------------------|-----------------------|---------------------------|
| NRS5010 | 180±3.0<br>(7.087±0.118) | 60±2.0<br>(2.36±0.08) | 14.0±1.5<br>(0.551±0.059) |
| NRS5012 |                          |                       |                           |
| NRS5014 |                          |                       |                           |
| NRS5020 |                          |                       |                           |
| NRS5030 |                          |                       |                           |
| NRS6010 |                          |                       |                           |
| NR 6012 |                          |                       |                           |
| NRS6012 |                          |                       |                           |
| NRS6014 |                          |                       |                           |

Unit: mm (inch)

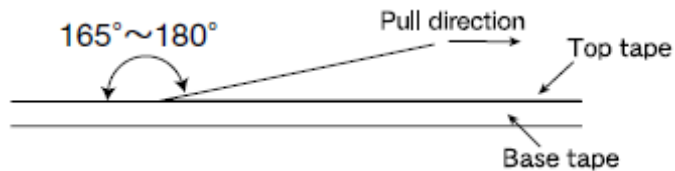


| Type    | Reel size (Reference values) |                        |                |                          |
|---------|------------------------------|------------------------|----------------|--------------------------|
|         | ϕD                           | ϕd                     | t (max.)       | W                        |
| NR 4010 | 330±3.0<br>(12.99±0.118)     | 80±2.0<br>(3.15±0.078) | 18.5<br>(0.72) | 13.5±1.0<br>(0.531±0.04) |
| NRS4010 |                              |                        |                |                          |
| NR 4012 |                              |                        |                |                          |
| NRS4012 |                              |                        |                |                          |
| NR 4018 |                              |                        |                |                          |
| NRS4018 |                              |                        |                |                          |
| NRS5024 |                              |                        |                |                          |
| NR 5040 |                              |                        |                |                          |
| NRS5040 |                              |                        |                |                          |
| NR 6020 |                              |                        |                |                          |
| NRS6020 |                              |                        |                |                          |
| NR 6028 |                              |                        |                |                          |
| NRS6028 |                              |                        |                |                          |
| NR 6045 |                              |                        |                |                          |
| NRM6045 |                              |                        |                |                          |
| NRS6045 |                              |                        |                |                          |
| NRS8030 |                              |                        | 22.5<br>(0.89) | 17.5±1.0<br>(0.689±0.04) |
| NR 8040 |                              |                        |                |                          |
| NRS8040 |                              |                        |                |                          |

Unit: mm (inch)

#### ⑥ Top Tape Strength

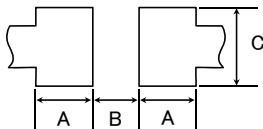
The top tape requires a peel-off force of 0.1 to 1.3N in the direction of the arrow as illustrated below.



# SMD POWER INDUCTORS (NR SERIES)

## RELIABILITY DATA

| 1. Operating Temperature Range |                                                                                                                                                                                                                                  |                                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | －40～＋125℃(Including self-generated heat) |
| Test Methods and Remarks       | Including self-generated heat                                                                                                                                                                                                    |                                          |
|                                |                                                                                                                                                                                                                                  |                                          |
| 2. Storage Temperature Range   |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | －40～＋85℃                                 |
| Test Methods and Remarks       | －5 to 40℃ for the product with taping.                                                                                                                                                                                           |                                          |
|                                |                                                                                                                                                                                                                                  |                                          |
| 3. Rated current               |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | Within the specified tolerance           |
|                                |                                                                                                                                                                                                                                  |                                          |
| 4. Inductance                  |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | Within the specified tolerance           |
| Test Methods and Remarks       | Measuring equipment : LCR Meter (HP 4285A or equivalent)<br>Measuring frequency : 100kHz, 1V                                                                                                                                     |                                          |
|                                |                                                                                                                                                                                                                                  |                                          |
| 5. DC Resistance               |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | Within the specified tolerance           |
| Test Methods and Remarks       | Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)                                                                                                                                                                     |                                          |
|                                |                                                                                                                                                                                                                                  |                                          |
| 6. Self resonance frequency    |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV30Type,NRH24/30Type<br>NRS30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                     | Within the specified tolerance           |
|                                | NRV20,NRS20                                                                                                                                                                                                                      | －                                        |
| Test Methods and Remarks       | NRV30,NRH24/30,NRS30/40/50/60/80Type、NRM50/60Type<br>Measuring equipment : Impedance analyzer/material analyzer(HP4291A or equivalent HP4191A, 4192A or equivalent)                                                              |                                          |
|                                |                                                                                                                                                                                                                                  |                                          |
| 7. Temperature characteristic  |                                                                                                                                                                                                                                  |                                          |
| Specified Value                | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                               | Inductance change : Within ±20%          |
| Test Methods and Remarks       | NRV20/30, NRH24/30, NRS20/30/40/50/60/80 Type、NRM50/60Type :<br>Measurement of inductance shall be taken at temperature range within －40℃～＋85℃.<br>With reference to inductance value at ＋20℃., change rate shall be calculated. |                                          |
|                                | Change of maximum inductance deviation in step 1 to 5                                                                                                                                                                            |                                          |
|                                | Step                                                                                                                                                                                                                             | Temperature(℃)                           |
|                                | 1                                                                                                                                                                                                                                | 20                                       |
|                                | 2                                                                                                                                                                                                                                | Minimum operating temperature            |
|                                | 3                                                                                                                                                                                                                                | 20 (Standard temperature)                |
|                                | 4                                                                                                                                                                                                                                | Maximum operating temperature            |
|                                | 5                                                                                                                                                                                                                                | 20                                       |

| 8. Resistance to flexure of substrate |                                                                                                                                                                                                    |                   |           |      |     |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|------|-----|
| Specified Value                       | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                 |                   | No damage |      |     |
| Test Methods and Remarks              | The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm. |                   |           |      |     |
|                                       | Test board size : 100 × 40 × 1.6 mm                                                                                                                                                                |                   |           |      |     |
|                                       | Test board material : glass epoxy-resin                                                                                                                                                            |                   |           |      |     |
|                                       | Solder cream thickness : 0.10mm ( NRS20/30, NRH24/30, NRV20/30, NRM50Type)                                                                                                                         |                   |           |      |     |
|                                       | : 0.15mm ( NRS40/50/60/80Type,NRM60Type)                                                                                                                                                           |                   |           |      |     |
|                                       | Land dimension                                                                                                                                                                                     |                   |           |      |     |
|                                       |                                                                                                                   |                   |           |      |     |
|                                       |                                                                                                                                                                                                    | Type              | A         | B    | C   |
|                                       |                                                                                                                                                                                                    | NRS20, NRV20      | 0.65      | 0.7  | 2.0 |
|                                       |                                                                                                                                                                                                    | NRH24             | 0.7       | 0.75 | 2.0 |
|                                       |                                                                                                                                                                                                    | NRV30,NRH30,NRS30 | 0.8       | 1.4  | 2.7 |
|                                       |                                                                                                                                                                                                    | NRS40             | 1.2       | 1.6  | 3.7 |
|                                       |                                                                                                                                                                                                    | NRS50             | 1.5       | 2.1  | 4.0 |
|                                       |                                                                                                                                                                                                    | NRM50             | 1.9       | 2.3  | 3.8 |
|                                       |                                                                                                                                                                                                    | NRS60             | 1.6       | 3.1  | 5.7 |
|                                       |                                                                                                                                                                                                    | NRM60             | 2.4       | 2.6  | 4.8 |
|                                       |                                                                                                                                                                                                    | NRS80             | 1.8       | 3.8  | 7.5 |
|                                       |                                                                                                                                                                                                    |                   |           |      |     |
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| 14. Solderability                                                    |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | At least 90% of surface of terminal electrode is covered by new solder.      |
| Test Methods and Remarks                                             | The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table.<br>Flux : Methanol solution containing rosin 25%.                                                                                                        |                                                                              |
|                                                                      | Solder Temperature                                                                                                                                                                                                                                             | 245±5°C                                                                      |
|                                                                      | Time                                                                                                                                                                                                                                                           | 5±1.0 sec.                                                                   |
| ※Immersion depth : All sides of mounting terminal shall be immersed. |                                                                                                                                                                                                                                                                |                                                                              |
| 15. Resistance to soldering heat                                     |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | Inductance change : Within ±10%<br>No significant abnormality in appearance. |
| Test Methods and Remarks                                             | The test sample shall be exposed to reflow oven at 230±5°C for 40 seconds, with peak temperature at 260±5°C for 5 seconds, 2 times.                                                                                                                            |                                                                              |
|                                                                      | Test board material                                                                                                                                                                                                                                            | : glass epoxy-resin                                                          |
|                                                                      | Test board thickness                                                                                                                                                                                                                                           | : 1.0mm                                                                      |
| 16. Thermal shock                                                    |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | Inductance change : Within ±10%<br>No significant abnormality in appearance. |
| Test Methods and Remarks                                             | The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 1000 cycles. |                                                                              |
|                                                                      | Conditions of 1 cycle                                                                                                                                                                                                                                          |                                                                              |
|                                                                      | Step                                                                                                                                                                                                                                                           | Temperature (°C)                                                             |
|                                                                      | 1                                                                                                                                                                                                                                                              | -40±3                                                                        |
|                                                                      | 2                                                                                                                                                                                                                                                              | Room temperature                                                             |
|                                                                      | 3                                                                                                                                                                                                                                                              | +85±2                                                                        |
|                                                                      | 4                                                                                                                                                                                                                                                              | Room temperature                                                             |
| 17. Damp heat                                                        |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | Inductance change : Within ±10%<br>No significant abnormality in appearance. |
| Test Methods and Remarks                                             | The test samples shall be soldered to the test board by the reflow.<br>The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.                                                                |                                                                              |
|                                                                      | Temperature                                                                                                                                                                                                                                                    | 60±2°C                                                                       |
|                                                                      | Humidity                                                                                                                                                                                                                                                       | 90~95%RH                                                                     |
|                                                                      | Time                                                                                                                                                                                                                                                           | 1000+24/-0 hour                                                              |
| 18. Loading under damp heat                                          |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | Inductance change : Within ±10%<br>No significant abnormality in appearance. |
| Test Methods and Remarks                                             | The test samples shall be soldered to the test board by the reflow.<br>The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table.                     |                                                                              |
|                                                                      | Temperature                                                                                                                                                                                                                                                    | 60±2°C                                                                       |
|                                                                      | Humidity                                                                                                                                                                                                                                                       | 90~95%RH                                                                     |
|                                                                      | Applied current                                                                                                                                                                                                                                                | Rated current                                                                |
|                                                                      | Time                                                                                                                                                                                                                                                           | 1000+24/-0 hour                                                              |
| 19. Low temperature life test                                        |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | Inductance change : Within ±10%<br>No significant abnormality in appearance. |
| Test Methods and Remarks                                             | The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table.                                                                                                   |                                                                              |
|                                                                      | Temperature                                                                                                                                                                                                                                                    | -40±2°C                                                                      |
|                                                                      | Time                                                                                                                                                                                                                                                           | 1000+24/-0 hour                                                              |
| 20. High temperature life test                                       |                                                                                                                                                                                                                                                                |                                                                              |
| Specified Value                                                      | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type                                                                                                                                                                                             | —                                                                            |

| 21. Loading at high temperature life test |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specified Value                           | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type、NRM50/60Type            | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance.                                                                                                                                                                                                                                                                                                                               |
| Test Methods and Remarks                  | The test samples shall be soldered to the test board by the reflow soldering. |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                           | Temperature                                                                   | $85 \pm 2^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                       |
|                                           | Applied current                                                               | Rated current                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                           | Time                                                                          | $1000 + 24 / - 0$ hour                                                                                                                                                                                                                                                                                                                                                                                           |
| 22. Standard condition                    |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Specified Value                           | NRV20/30Type,NRH24/30Type<br>NRS20/30/40/50/60/80Type<br>NRM50/60Type         | Standard test condition :<br>Unless otherwise specified, temperature is $20 \pm 15^{\circ}\text{C}$ and $65 \pm 20\%$ of relative humidity.<br>When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^{\circ}\text{C}$ of temperature, $65 \pm 5\%$ relative humidity.<br>Inductance is in accordance with our measured value. |

# SMD POWER INDUCTORS (NR, NS, ES SERIES)

## PRECAUTIONS

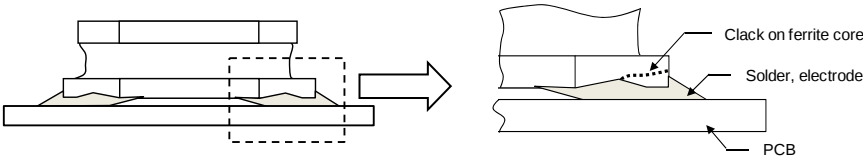
### 1. Circuit Design

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions | ◆Operating environment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|             | 1. The products listed in this catalogue are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment), general medical equipment, industrial equipment, and automotive interior applications, etc.<br>Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., specially controlled medical equipment, transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment).<br>Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, nuclear control equipment, undersea equipment, military equipment, etc.). |

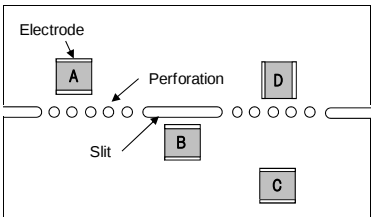
### 2. PCB Design

|             |                                                                                                                                                                                                                                                                                                             |
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| Precautions | ◆Land pattern design                                                                                                                                                                                                                                                                                        |
|             | 1. Please refer to a recommended land pattern.<br>2. There is stress, which has been caused by distortion of a PCB, to the inductor. (NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type)<br>3. Please consider the arrangement of parts on a PCB. (NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type) |

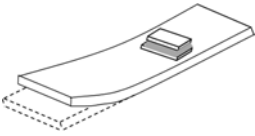
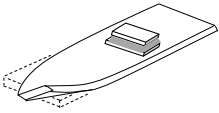
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|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technical considerations | ◆Land pattern design                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                          | Surface Mounting<br>1. Mounting and soldering conditions should be checked beforehand.<br>2. Applicable soldering process to this products is reflow soldering only.<br>3. Please use the recommended land pattern shown as below. Electrical characteristics and the mounting ability of the product are being considered in the recommended land pattern. If a PCB is designed with other dimensions, defective soldering and stress to a product may occur due to misalignment. The performance of the product may not be brought out. If an adopted land pattern is different from the recommended land pattern, stress to the product will increase. It may cause cracks or defective electrical characteristics of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type)<br>4. As coefficients of thermal expansion between an inductor and a PCB differs, cracks may occur on a ferrite core when thermal stress is applied to them after mounting an inductor. (Please refer to the drawings below.) Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type) |

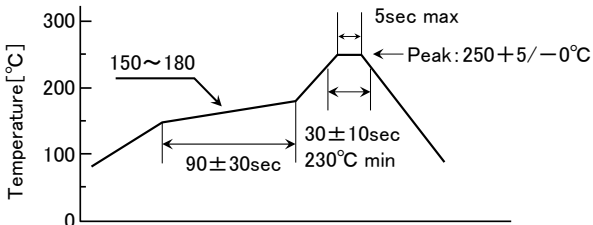
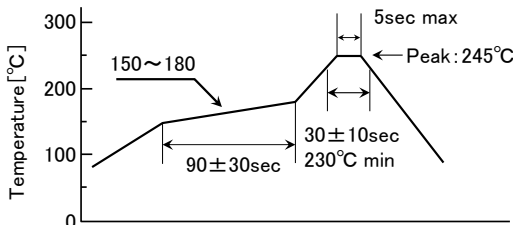


5. SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board. (NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type)



A product tends to undergo stress in order “A>C>B≡D”.  
Please consider the layouts of a product to minimize any stresses.

| 3. Considerations for automatic placement |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions                               | <p>◆Adjustment of mounting machine</p> <ol style="list-style-type: none"> <li>Excessive impact load should not be imposed on the products when mounting onto the PC boards.</li> <li>Mounting and soldering conditions should be checked beforehand.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Technical considerations                  | <p>◆Adjustment of mounting machine</p> <ol style="list-style-type: none"> <li>When installing products, care should be taken not to apply distortion stress as it may deform the products.</li> <li>Stress may be applied to a product with a warp or a twist in handling of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility.<br/>(NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type)</li> </ol> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>&lt;Wrap&gt;</p>  </div> <div style="text-align: center;"> <p>&lt;Twist&gt;</p>  </div> </div> |

| 4. Soldering             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Precautions              | <p>◆Reflow soldering</p> <ol style="list-style-type: none"> <li>Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.</li> <li>The product shall be used reflow soldering only.</li> <li>Please do not add any stress to a product until it returns in normal temperature after reflow soldering.</li> </ol> <p>◆Lead free soldering</p> <ol style="list-style-type: none"> <li>When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.</li> </ol> <p>◆Recommended conditions for using a soldering iron</p> <ul style="list-style-type: none"> <li>Put the soldering iron on the land-pattern.</li> <li>Soldering iron's temperature – Below 350°C</li> <li>Duration – 3 seconds or less</li> <li>The soldering iron should not directly touch the inductor.</li> </ul> |
| Technical considerations | <p>◆Reflow soldering</p> <ol style="list-style-type: none"> <li>If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products. <ul style="list-style-type: none"> <li>NRV20/30, NRH24/30, NRS20/30/40/50/60/80, NRM60 Type, NS101/125 Type, EST0645/1040/1060 Type</li> </ul> </li> </ol> <p>Recommended reflow condition (Pb free solder)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><u>NR, NS Series</u></p>  <p>Heating Time[sec]</p> </div> <div style="text-align: center;"> <p><u>ES Series</u></p>  <p>Heating Time[sec]</p> </div> </div>                                                       |

| 5. Cleaning              |                                                                                                                                            |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions              | <p>◆Cleaning conditions</p> <ol style="list-style-type: none"> <li>Washing by supersonic waves shall be avoided.</li> </ol>                |
| Technical considerations | <p>◆Cleaning conditions</p> <ol style="list-style-type: none"> <li>If washed by supersonic waves, the products might be broken.</li> </ol> |

| 6. Handling |
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► 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/>)

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|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautions              | <ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. Keep the product away from all magnets and magnetic objects.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>1. When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board.</li> <li>2. Board separation should not be done manually, but by using the appropriate devices.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. Please do not give the product any excessive mechanical shocks.</li> <li>2. Please do not add any shock and power to a product in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>1. Please do not push to add any pressure to a winding part. Please do not give any shock and push into a ferrite core exposure part.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. Please avoid accumulation of a packing box as much as possible.</li> </ol> </li> </ul> |
| Technical considerations | <ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. There is a case that a characteristic varies with magnetic influence.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. There is a case to be damaged by a mechanical shock.</li> <li>2. There is a case to be broken by the handling in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>1. Damage and a characteristic can vary with an excessive shock or stress.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.</li> </ol> </li> </ul>                                                                                                                                   |
| 7. Storage conditions    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Precautions              | <ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <li>1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.                   <ul style="list-style-type: none"> <li>▪ Recommended conditions                       <div style="margin-left: 20px;">Ambient temperature : <math>-5\sim 40^{\circ}\text{C}</math></div> <div style="margin-left: 20px;">Humidity : Below 70% RH</div> </li> <li>▪ The ambient temperature must be kept below <math>30^{\circ}\text{C}</math>. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes.<br/>For this reason, product should be used within 6 months from the time of delivery.<br/>In case of storage over 6 months, solderability shall be checked before actual usage.</li> </ul> </li> </ol> </li> </ul>                                                                                                                                                                                                                                               |
| Technical considerations | <ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <li>1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.</li> </ol> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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