

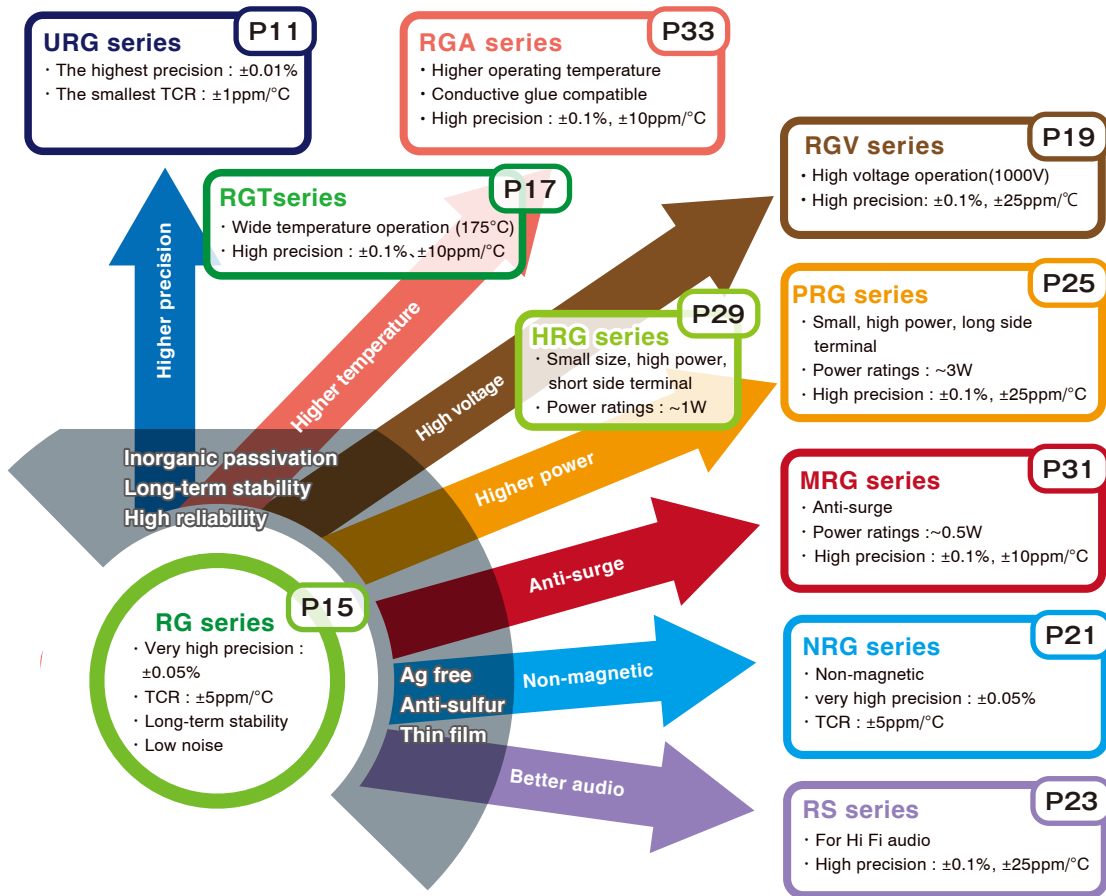
Selection Guide

The RG series, the most popular metal thin film chip resistors because of their high precision, high reliability and long-term stability, is the base of our line-up of new innovative products: a higher precision, higher operating temperature, higher power handling capability, higher anti-surge capability version of the RG series and so on.

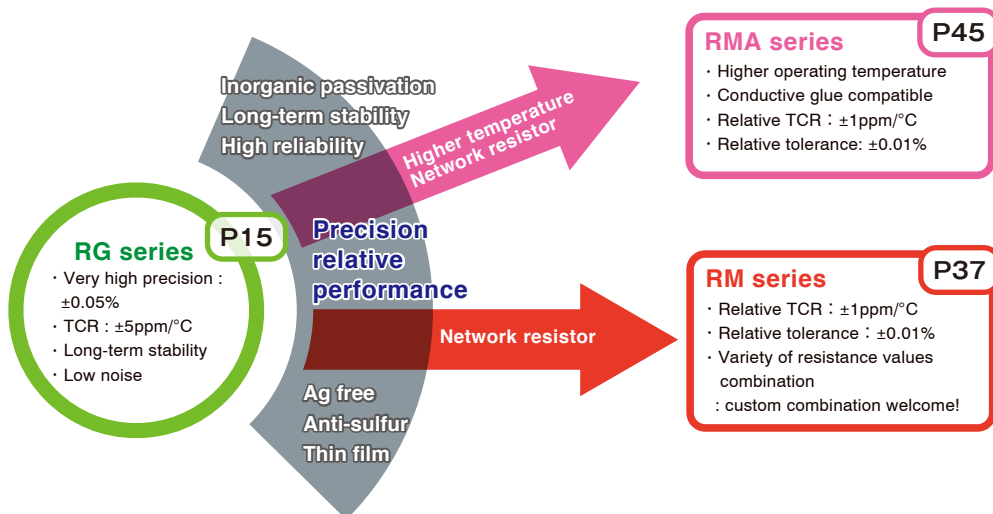
All of these products employ the inorganic passivation technology that enables high precision and high reliability. In addition, our thin film based terminal technology does not involve any Ag (silver) and they are sulfur impervious. The following diagram shows distinctive characteristics of these products and their relationships.

- Higher precision : URG series
- Higher operating temperature : RGT series, RGA series, RMA series (resistive networks)
- High voltage: RGV series
- High power : PRG series (long side terminal), HRG series (short side terminal)
- Anti-surge : MRG series
- Non-magnetic : NRG series
- Audio grade : RS series

Relation map of thin film chip resistors



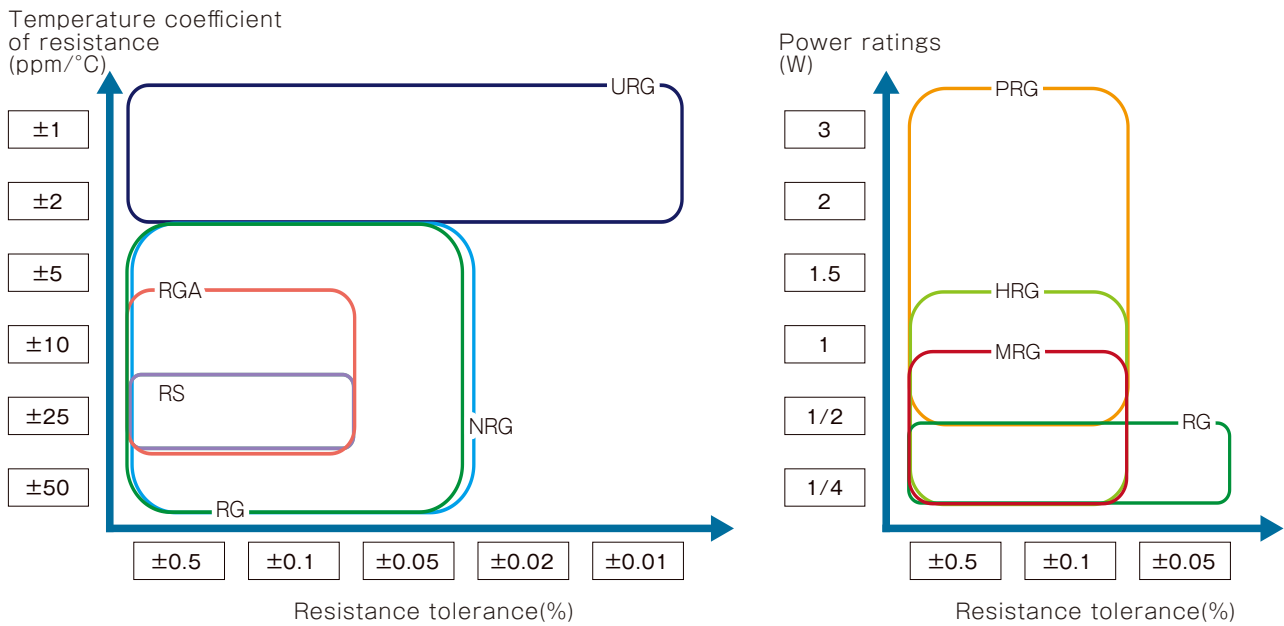
Map from discreet RG series to resistor networks



Thin film resistor map by performance

Thin film resistors are highly reliable and stable over long periods of time. The diagrams below show the matrix of Susumu's thin film resistors based on tolerance with TCR, and tolerance with power ratings.

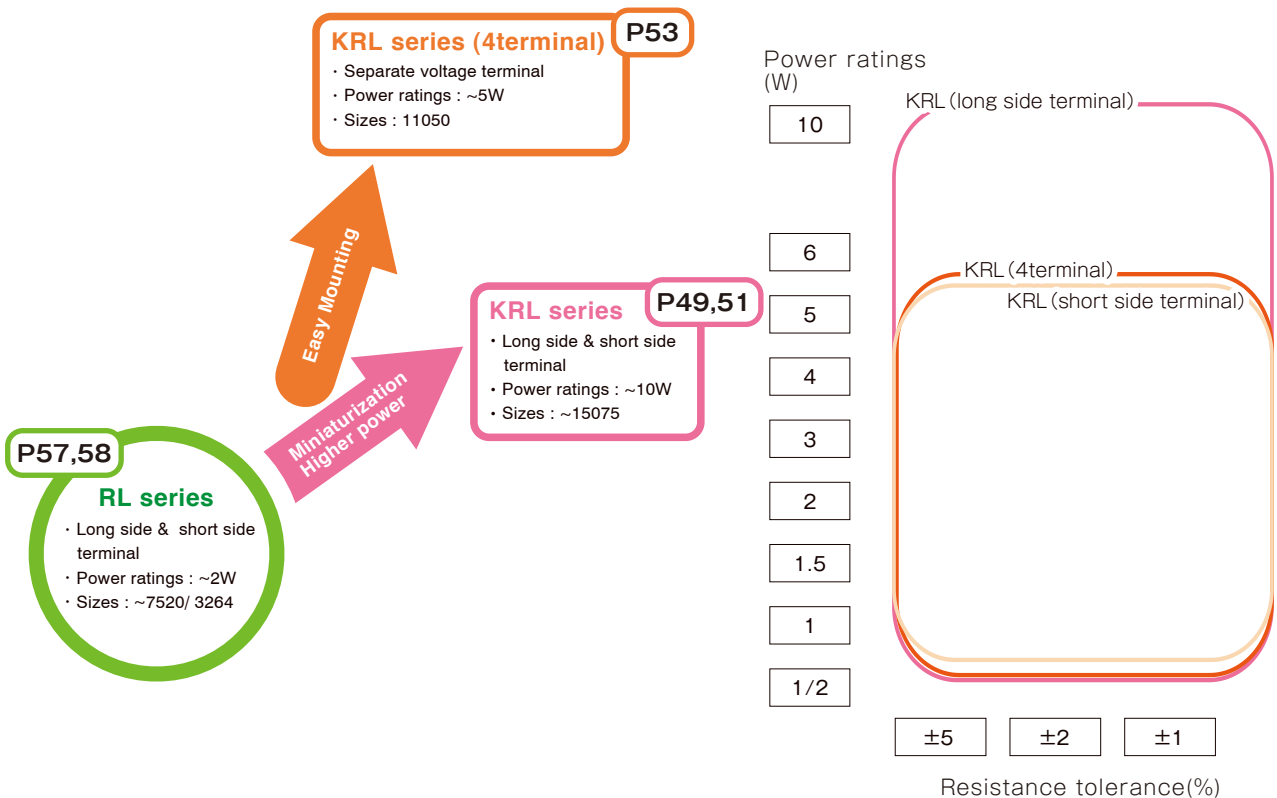
The high power resistors are offered in two different terminal configurations; PRG series -long side terminal and HRG series - short side terminal, to meet your need for miniaturization using same power.



Current sensing chip resistors' relation map

The diagram below illustrates how we expanded our current sensing chip resistors in order to meet the need for miniaturization and high power ratings.

We also offer 4 terminal current sensor isolating voltage terminals, making it easier to mount on the board. We will continue to expand current sensing chip resistor series corresponding the needs of the market.



E series resistance values (IEC designated series of resistance values)

| series | Values | | | | | | | | | | | | | | | |
|--------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| E-6 | 1.0 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8 | | | | | | | | | | |
| E-12 | 1.0 | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 | | | | |
| E-24 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | |
| | 4.3 | 4.7 | 5.1 | 5.6 | 6.2 | 6.8 | 7.5 | 8.2 | 9.1 | | | | | | | |
| E-96 | 1.00 | 1.02 | 1.05 | 1.07 | 1.10 | 1.13 | 1.15 | 1.18 | 1.21 | 1.24 | 1.27 | 1.30 | 1.33 | 1.37 | 1.40 | |
| | 1.43 | 1.47 | 1.50 | 1.54 | 1.58 | 1.62 | 1.65 | 1.69 | 1.74 | 1.78 | 1.82 | 1.87 | 1.91 | 1.96 | 2.00 | |
| | 2.05 | 2.10 | 2.15 | 2.21 | 2.26 | 2.32 | 2.37 | 2.43 | 2.49 | 2.55 | 2.61 | 2.67 | 2.74 | 2.80 | 2.87 | |
| | 2.94 | 3.01 | 3.09 | 3.16 | 3.24 | 3.32 | 3.40 | 3.48 | 3.57 | 3.65 | 3.74 | 3.83 | 3.92 | 4.02 | 4.12 | |
| | 4.22 | 4.32 | 4.42 | 4.53 | 4.64 | 4.75 | 4.87 | 4.99 | 5.11 | 5.23 | 5.36 | 5.49 | 5.62 | 5.76 | 5.90 | |
| | 6.04 | 6.19 | 6.34 | 6.49 | 6.65 | 6.81 | 6.98 | 7.15 | 7.32 | 7.50 | 7.68 | 7.87 | 8.06 | 8.25 | 8.45 | |
| | 8.66 | 8.87 | 9.09 | 9.31 | 9.53 | 9.76 | | | | | | | | | | |

Three-letter codes for resistance value (Codes for Marking in E96 series)

- (1) A manufacturing date code: Refer to JIS C 5201-1.
- (2) Three digits of number shall be marked on the protective coating. In this case, the three digits of code number shall be added at the end of type designation.

(Example) 4.99KΩ = 499 × 10¹

Marking: 68H
Type designation: RR0816P-4991-D-68H

code for power of 10

| code | E96 value | code | E96 value | code | E96 value | code | E96 value | code | E96 value | code | E96 value | code | E96 value | code | E96 value |
|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|
| 01 | 100* | 13 | 133 | 25 | 178 | 37 | 237 | 49 | 316 | 61 | 422 | 73 | 562 | 85 | 750* |
| 02 | 102 | 14 | 137 | 26 | 182 | 38 | 243 | 50 | 324 | 62 | 432 | 74 | 576 | 86 | 768 |
| 03 | 105 | 15 | 140 | 27 | 187 | 39 | 249 | 51 | 332 | 63 | 442 | 75 | 590 | 87 | 787 |
| 04 | 107 | 16 | 143 | 28 | 191 | 40 | 255 | 52 | 340 | 64 | 453 | 76 | 604 | 88 | 806 |
| 05 | 110* | 17 | 147 | 29 | 196 | 41 | 261 | 53 | 348 | 65 | 464 | 77 | 619 | 89 | 825 |
| 06 | 113 | 18 | 150* | 30 | 200* | 42 | 267 | 54 | 357 | 66 | 475 | 78 | 634 | 90 | 845 |
| 07 | 115 | 19 | 154 | 31 | 205 | 43 | 274 | 55 | 365 | 67 | 487 | 79 | 649 | 91 | 866 |
| 08 | 118 | 20 | 158 | 32 | 210 | 44 | 280 | 56 | 374 | 68 | 499 | 80 | 665 | 92 | 887 |
| 09 | 121 | 21 | 162 | 33 | 215 | 45 | 287 | 57 | 383 | 69 | 511 | 81 | 681 | 93 | 909 |
| 10 | 124 | 22 | 165 | 34 | 221 | 46 | 294 | 58 | 392 | 70 | 523 | 82 | 698 | 94 | 931 |
| 11 | 127 | 23 | 169 | 35 | 226 | 47 | 301 | 59 | 402 | 71 | 536 | 83 | 715 | 95 | 953 |
| 12 | 130* | 24 | 174 | 36 | 232 | 48 | 309 | 60 | 412 | 72 | 549 | 84 | 732 | 96 | 976 |

| code | power |
|------|------------------|
| A | 10 ⁰ |
| H | 10 ¹ |
| C | 10 ² |
| D | 10 ³ |
| E | 10 ⁴ |
| F | 10 ⁵ |
| | |
| | |
| | |
| | |
| | |
| | |
| R | 10 ⁻¹ |
| S | 10 ⁻² |

* The resistance value duplicated in E24 series and in E96 series shall be manufactured in E24 series only.

Disclaimer and handling care of our products

Disclaimer

1. The contents of this catalogue are only for reference purposes and its contents may be changed without prior notification. Official specifications will be submitted to each customer. For ordering, please contact our sales representatives
2. The products listed in this catalogue are for general purpose electronic equipment. Please consult with us if you require specific qualities or reliability as in nuclear or aerospace applications.
3. When you incorporate our products in your design, please utilize them within their specified operating conditions such as rated power and recommended operating temperature. We cannot guarantee our products and cannot take responsibility for the failure of our products if they are used under improper conditions or outside of the parameters of our specified conditions.
4. No part of this publication may be reproduced by any means without the permission of Susumu Co. Ltd.

Handling and care

< Consideration during mounting >

- (1) Before, during and after mounting, take care not to damage the protective coating of the products. Damage to the protective coating may result in weakening the humidity tolerance.
- (2) When using a soldering iron, the heat should be applied to the land pattern not directly to the component. The tip of the soldering iron should not touch the resistors directly. In addition, when the tip of the soldering iron is hot, please do soldering as quick as possible (Below 350°C within 3 seconds).
- (3) Flux residue can cause corrosion and electro-migration resulting in the deterioration of humidity tolerance. If you utilize highly activated flux, such as flux containing chlorine, please consult with us prior to usage.
- (4) Ionized foreign material contamination or residue can also cause corrosion and electro-migration resulting in the deterioration of humidity tolerance. Do not touch the components with bare hands prior to or after mounting.
- (5) If the soldering operation takes place at very high temperatures and for a prolonged period of time, the terminal may dissolve into the solder.
- (6) When mounted components are embedded into resin or polymer, the resin/polymer selection must consider heat tolerance, humidity tolerance, mechanical properties, and chemical or ion composition.

< Operating environment; condition >

- (1) If these components are utilized for unusual conditions, the reliability and characteristics should be verified in advance. Such conditions include:
 - ① Exposure of the component to water, salt water, oils, acids, alkaline, or solvents
 - ② Exposure of the component to direct sunlight, outdoor weather conditions, or heavy dust
 - ③ Exposure to frost
 - ④ Possible exposure to corrosive air or gas such as a marine atmosphere, HCl, Cl₂, H₂S, NH₃, SO₂, and NO_x.
- (2) Usage under high temperatures and high humidity
 - ① When components are used under high temperature conditions, assess the potential temperatures surrounding the components considering the other heat-producing neighboring components, and regulate your power usage following the specified derating curve.
 - ② If the components are used under high humidity conditions or at temperatures below the dew point, the products can experience positive resistance drift or even an open circuit.
- (3) Use our products under the rated power when the pulse current or voltage is applied. The peak voltage of the pulse should remain under the rated voltage.