



# Metal thin film chip resistors

(the highest precision)

■RG series

AEC-Q200 Compliant

### Features

- Long term stability with inorganic passivation
- Less than  $\pm 0.1\%$  drift after 10000 hours of reliability test
- High precision resistance tolerance:  $\pm 0.05\%$ , very small TCR:  $\pm 5\text{ppm}/^\circ\text{C}$
- Thin film structure enabling low noise and anti-sulfur

### Applications

- Automotive electronics
- Industrial measurement instrumentation, industrial machines
- Various sensors, medical electronics



### ◆Part numbering system

RG 1608 N - 102 - B - T5

Series code

Size: RG0603, RG1005, RG1608, RG2012, RG3216

Temperature coefficient of resistance

Packaging quantity:  
T5(5,000pcs), T10(10,000pcs)

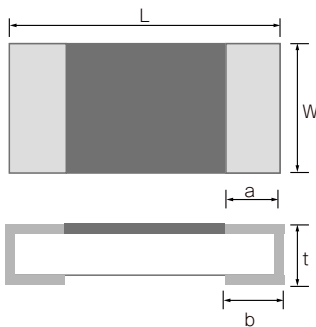
Resistance tolerance

Nominal resistance value  
(E-24: 3 digit, E-96: 4 digit, RG3216: all 4 digit)

### ◆Electrical Specification

| Type   | Power ratings |         |      | Temperature coefficient of resistance | Resistance range (Ω) Resistance tolerance (%) |           |          | Maximum voltage | Resistance value series | Operating temperature | Pakaging quantity |  |     |  |
|--------|---------------|---------|------|---------------------------------------|-----------------------------------------------|-----------|----------|-----------------|-------------------------|-----------------------|-------------------|--|-----|--|
|        | Low           | Regular | High | (ppm/°C)                              | ±0.05% (W)                                    | ±0.1% (B) | ±0.5%(D) |                 |                         |                       |                   |  |     |  |
| RG0603 | 1/20W         | 1/16W   | —    | ±10(N)                                | —                                             | 100≤R≤22k |          | 30V             | E-24, E-96              | -55℃ ~ 155℃           | T10               |  |     |  |
|        |               |         |      | ±25(P)                                |                                               |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±50(Q)                                |                                               | —         | 47≤R≤56k |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±100(R)                               |                                               |           | 10≤R<47  |                 |                         |                       |                   |  |     |  |
| RG1005 | 1/32W         | 1/16W   | 1/8W | ±5(V)                                 | 100≤R<3k                                      |           |          | 75V             |                         |                       |                   |  | T5  |  |
|        |               |         |      | ±10(N)                                | 47≤R≤100k                                     |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±25(P)                                | 47≤R≤150k                                     |           |          |                 |                         |                       |                   |  | T10 |  |
|        |               |         |      | ±100(R)                               | —                                             | —         | 10≤R<47  |                 |                         |                       |                   |  |     |  |
| RG1608 | 1/16W         | 1/10W   | 1/6W | ±5(V)                                 | 100≤R<5.1k                                    |           |          | 100V            |                         |                       |                   |  | T5  |  |
|        |               |         |      | ±10(N)                                | 47≤R≤274k                                     |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±25(P)                                | 47≤R≤274k                                     | 47≤R≤1M   |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±50(Q)                                | —                                             | —         | 10≤R<47  |                 |                         |                       |                   |  |     |  |
| RG2012 | 1/10W         | 1/8W    | 1/4W | ±5(V)                                 | 100≤R<10.2k                                   |           |          | 150V            |                         |                       |                   |  |     |  |
|        |               |         |      | ±10(N)                                | 47≤R≤475k                                     |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±25(P)                                | 47≤R≤475k                                     | 47≤R≤2.7M |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±50(Q)                                | —                                             | —         | 10≤R<47  |                 |                         |                       |                   |  |     |  |
| RG3216 | 1/8W          | 1/4W    | —    | ±5(V)                                 | 100≤R≤33.2k                                   |           |          | 200V            |                         |                       |                   |  |     |  |
|        |               |         |      | ±10(N)                                | 47≤R≤1M                                       |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±25(P)                                | 47≤R≤5.1M                                     |           |          |                 |                         |                       |                   |  |     |  |
|        |               |         |      | ±50(Q)                                | —                                             | —         | 10≤R<47  |                 |                         |                       |                   |  |     |  |

### ◆Dimensions



| Type   | Size (inch) | L               | W               | a               | b               | t               |
|--------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| RG0603 | 0201        | $0.60 \pm 0.05$ | $0.30 \pm 0.05$ | $0.13 \pm 0.05$ | $0.15 \pm 0.05$ | $0.23 \pm 0.03$ |
| RG1005 | 0402        | $1.0 \pm 0.05$  | $0.50 \pm 0.05$ | $0.20 \pm 0.10$ | $0.25 \pm 0.05$ | $0.35 \pm 0.05$ |
| RG1608 | 0603        | $1.60 \pm 0.20$ | $0.80 \pm 0.20$ | $0.30 \pm 0.20$ | $0.30 \pm 0.20$ | $0.40 \pm 0.10$ |
| RG2012 | 0805        | $2.00 \pm 0.20$ | $1.25 \pm 0.20$ | $0.40 \pm 0.20$ | $0.40 \pm 0.20$ | $0.40 \pm 0.10$ |
| RG3216 | 1206        | $3.20 \pm 0.20$ | $1.60 \pm 0.20$ | $0.50 \pm 0.25$ | $0.50 \pm 0.20$ | $0.40 \pm 0.10$ |

(unit : mm)

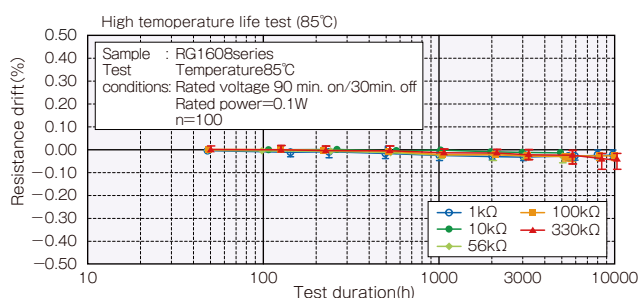
## ◆ Reliability specification

| Test Items                     | Condition (test methods)                                         | Low                      |                          | Regular                  |                          | High            |                          | Typical       |
|--------------------------------|------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------|--------------------------|---------------|
|                                |                                                                  | $\leq 47\Omega$          | $\geq 47\Omega$          | $\leq 47\Omega$          | $\geq 47\Omega$          | $\leq 47\Omega$ | $\geq 47\Omega$          | Low           |
| Short time overload            | 2.5 x rated voltage, <sup>*1</sup> 5 seconds                     | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | —               | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.01\%)$ |
| Life (biased)                  | 70°C, rated voltage, <sup>*1</sup> 90min on 30min off, 1000hours | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.5\%+0.05\Omega)$  | $\pm(0.25\%+0.05\Omega)$ | —               | $\pm(0.5\%+0.01\Omega)$  | $\pm(0.01\%)$ |
| High temperature high humidity | 85°C, 85%RH, 1/10 of rated power, 90min on 30min off, 1000hours  | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.5\%+0.05\Omega)$  | $\pm(0.25\%+0.05\Omega)$ | —               | $\pm(0.5\%+0.01\Omega)$  | $\pm(0.05\%)$ |
| Temperature shock              | -55°C (30min) ~ 125°C (30min) 1000cycles                         | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | —               | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.01\%)$ |
| High temperature exposure      | 155°C, no bias, 1000hours                                        | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.25\%+0.05\Omega)$ | $\pm(0.1\%+0.01\Omega)$  | —               | $\pm(0.1\%+0.01\Omega)$  | $\pm(0.01\%)$ |
| Resistance to soldering heat   | 260 $\pm$ 5°C, 10 seconds (reflow)                               | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.05\%+0.01\Omega)$ | —               | $\pm(0.05\%+0.01\Omega)$ | $\pm(0.01\%)$ |

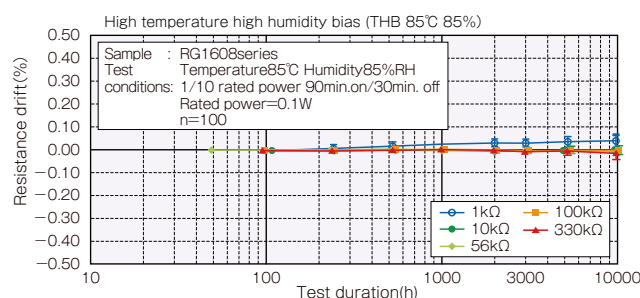
\*1 Rated voltage is given by  $E = \sqrt{R \times P}$  E= rated voltage (V), R=nominal resistance value( $\Omega$ ), P=rated power(W)  
If rated voltage exceeds maximum voltage /element, maximum voltage/element is the rated voltage.

## ◆ 10000 hour reliability test data

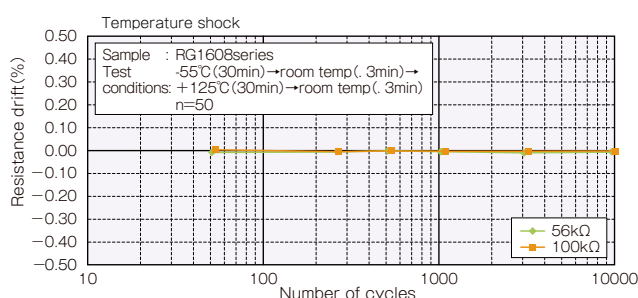
## ○ Biased life test



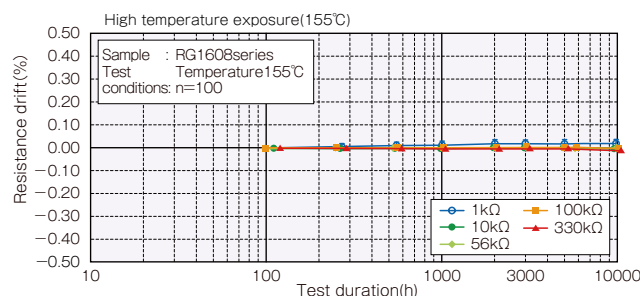
## ○ High temperature high humidity (biased)



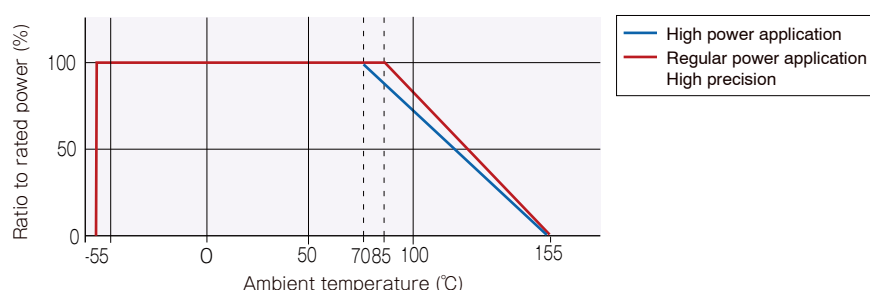
## ○ Temperature shock



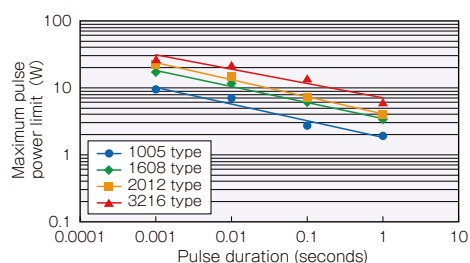
## ○ High temperature exposure



## ◆ Derating Curve



## ◆ Maximum pulse power limit



## Test procedure

Voltage pulse is applied to the test samples mounted on the test board.

After each pulse, resistance drift is measured. Pulse voltage is increased until the drift exceeds  $\pm 0.5\%$ .

The power at that voltage is defined as the maximum pulse power.