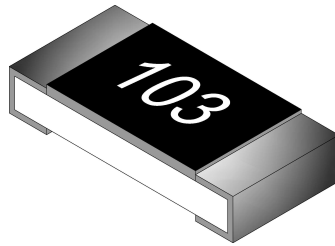


## ■ AEC-Q200 Chip Resistor — QR Series



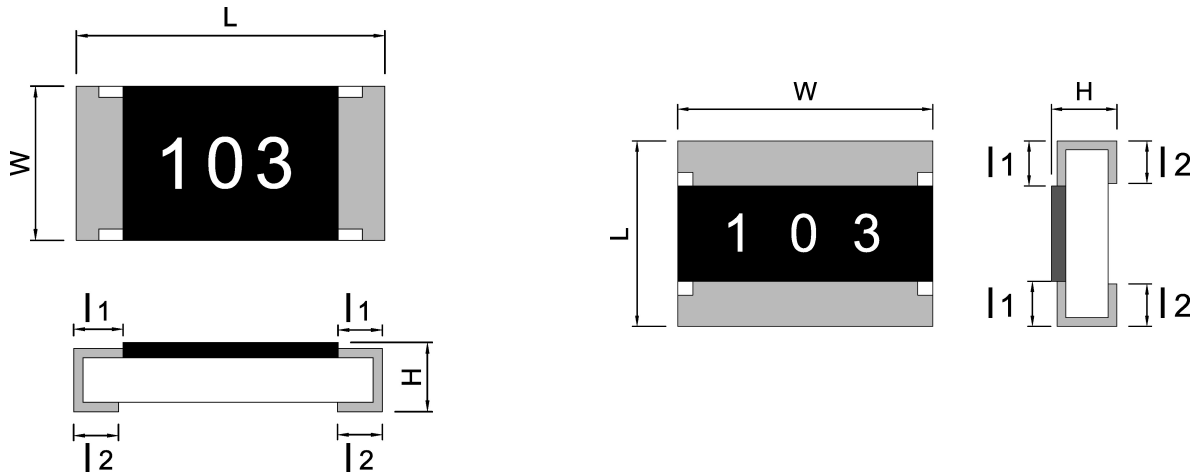
### ■ Application

- Entertainment: Stereo, TV tuners, Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply, Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment
- Automotive

### ■ Features

- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality and fast delivery
- AEC-Q200 rev.D compliant

■ Type Dimension



QR0402 / QR0603 / QR0805 / QR1206 /  
QR1210 / QR1812 / QR2010 / QR2512

QR1218

■ Dimension

Unit: mm

| TYPE   | L               | W               | H               | $l_1$           | $l_2$           |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| QR0402 | $1.00 \pm 0.10$ | $0.50 \pm 0.05$ | $0.30 \pm 0.05$ | $0.15 \pm 0.10$ | $0.20 \pm 0.10$ |
| QR0603 | $1.60 \pm 0.20$ | $0.80 \pm 0.15$ | $0.40 \pm 0.10$ | $0.30 \pm 0.20$ | $0.30 \pm 0.10$ |
| QR0805 | $2.00 \pm 0.20$ | $1.25 \pm 0.15$ | $0.50 \pm 0.15$ | $0.30 \pm 0.15$ | $0.40 \pm 0.15$ |
| QR1206 | $3.05 \pm 0.10$ | $1.60 \pm 0.20$ | $0.55 \pm 0.15$ | $0.40 \pm 0.20$ | $0.50 \pm 0.20$ |
| QR1210 | $3.05 \pm 0.10$ | $2.50 \pm 0.20$ | $0.55 \pm 0.15$ | $0.50 \pm 0.20$ | $0.50 \pm 0.20$ |
| QR1812 | $4.50 \pm 0.10$ | $3.10 \pm 0.20$ | $0.55 \pm 0.05$ | $0.55 \pm 0.20$ | $0.70 \pm 0.20$ |
| QR2010 | $5.00 \pm 0.20$ | $2.50 \pm 0.20$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.60 \pm 0.20$ |
| QR1218 | $3.10 \pm 0.10$ | $4.60 \pm 0.10$ | $0.55 \pm 0.05$ | $0.40 \pm 0.20$ | $0.50 \pm 0.20$ |
| QR2512 | $6.30 \pm 0.20$ | $3.20 \pm 0.20$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.60 \pm 0.20$ |

## ■ Standard & High Power Electrical Specifications

| Item<br>Type | Rated Power at 70°C |         | Max Working Voltage | Max Overload Voltage | T.C.R. (PPM/°C) | Resistance Range     |                  |                   | Operating Temperature Range |
|--------------|---------------------|---------|---------------------|----------------------|-----------------|----------------------|------------------|-------------------|-----------------------------|
|              | Standard            | High    |                     |                      |                 | B(±0.1%)<br>D(±0.5%) | F(±1%)<br>G(±2%) | J(±5%)<br>K(±10%) |                             |
|              |                     |         |                     |                      |                 |                      |                  |                   |                             |
| QR0402       | 0.063 W             | -       | 50V                 | 100V                 | 0~+400          | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           | -55°C<br>~<br>+155°C        |
|              |                     |         |                     |                      | ±300            | -                    | 10Ω~990Ω         | 10Ω~990Ω          |                             |
|              |                     |         |                     |                      | ±200            | 10Ω~1MΩ              | 1KΩ~10MΩ         | 1KΩ~10MΩ          |                             |
| QR0603       | 0.1 W               | 0.125 W | 50V                 | 100V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR0805       | 0.125 W             | 0.25 W  | 150V                | 300V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR1206       | 0.25 W              | 0.5 W   | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR1210       | 0.5 W               | 0.66 W  | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR1812       | 0.5 W               | 1 W     | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR2010       | 0.75 W              | 1 W     | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR1218       | 1 W                 | -       | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |
| QR2512       | 1 W                 | 2 W     | 200V                | 400V                 | ±400            | -                    | 1Ω~9.9Ω          | 1Ω~9.9Ω           |                             |
|              |                     |         |                     |                      | ±200            | -                    | -                | 10Ω~10MΩ          |                             |
|              |                     |         |                     |                      | ±100            | 10Ω~1MΩ              | 10Ω~10MΩ         | -                 |                             |

● For non-standard parts, please contact our sales dept.

● Operating Temperature Range : -55°C ~ +155°C.

| Type                 | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2010 | 1218 | 2512 |
|----------------------|------|------|------|------|------|------|------|------|------|
| Jumper Rated Current | 1A   |      |      |      | 2A   |      |      |      |      |

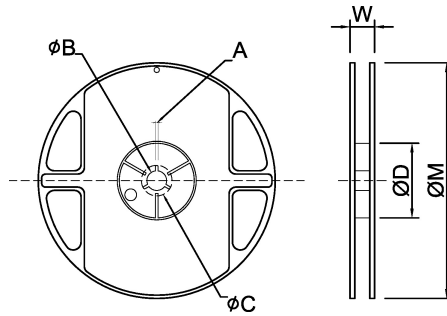
## ■ Parts Number Explanation

### ■ Example:

| QR           | 0603        | J                  | 10R             | P                   | 05            |          |
|--------------|-------------|--------------------|-----------------|---------------------|---------------|----------|
| Product Type | Size (Inch) | Resistor Tolerance | Resistors Value | Package             | Quantity      | Optional |
|              | 0402        | B : $\pm 0.1\%$    |                 | P、Q : Paper Taping  | 01 : 1000PCS  | 0.125W   |
|              | 0603        | C : $\pm 0.25\%$   |                 | E : Embossed Taping | 02 : 2000PCS  | 0.25W    |
|              | 0805        | D : $\pm 0.5\%$    |                 | D : Packed in a Bag | 04 : 4000PCS  | 0.5W     |
|              | 1206        | F : $\pm 1\%$      |                 |                     | 05 : 5000PCS  | 0.66W    |
|              | 1210        | G : $\pm 2\%$      |                 |                     | 10 : 10000PCS | 1W       |
|              | 1812        | J : $\pm 5\%$      |                 |                     | 20 : 20000PCS | 2W       |
|              | 2010        | K : $\pm 10\%$     |                 |                     | 40 : 40000PCS |          |
|              | 1218        | L : $\pm 15\%$     |                 |                     | 50 : 50000PCS |          |
|              | 2512        | M : $\pm 20\%$     |                 |                     |               |          |
|              |             | N : $\pm 30\%$     |                 |                     |               |          |

## Appendix For SMD Chip Resistor

### ● Packaging Information

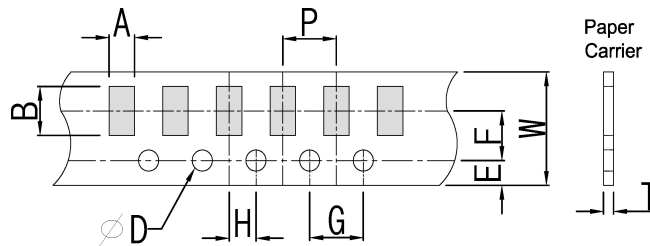


#### Dimension

Unit: mm

| TYPE                   | SIZE |          | A       | $\phi B$ | $\phi C$ | $\phi D$ | W        | $\phi M$ |
|------------------------|------|----------|---------|----------|----------|----------|----------|----------|
| 0402                   | 7"   | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
|                        | 13"  | 40K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
|                        | 13"  | 50K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
| 0603<br>0805<br>1206   | 7"   | 5K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
|                        | 10"  | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 254±2.0  |
|                        | 13"  | 20K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
| 1210                   | 7"   | 5K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
| 2010/2512<br>1812/1218 | 7"   | 4K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 16.0±2.0 | 178±2.0  |

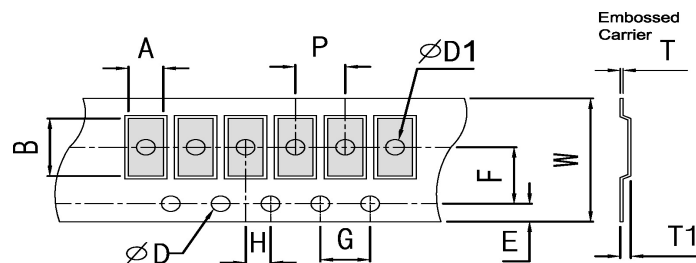
### ■ Tapping Specification



#### Dimension

Unit: mm

| Packaging  | Type | A         | B         | W        | E         | F        | G        | H        | T         | $\phi D$ | P       |
|------------|------|-----------|-----------|----------|-----------|----------|----------|----------|-----------|----------|---------|
| Paper Type | 0402 | 0.70±0.10 | 1.20±0.10 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.45±0.10 | 1.50     | 2.0±0.1 |
|            | 0603 | 1.05±0.20 | 1.80±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.60±0.10 |          | 4.0±0.1 |
|            | 0805 | 1.55±0.20 | 2.30±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |          |         |
|            | 1206 | 1.90±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |          |         |
|            | 1210 | 2.85±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |          |         |



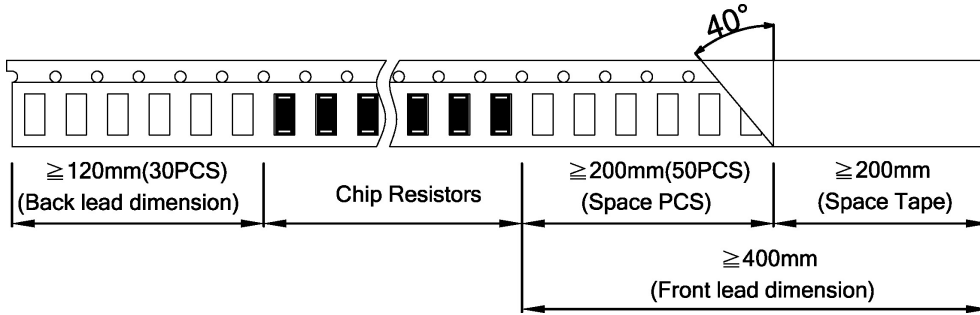
#### Dimension

Unit: mm

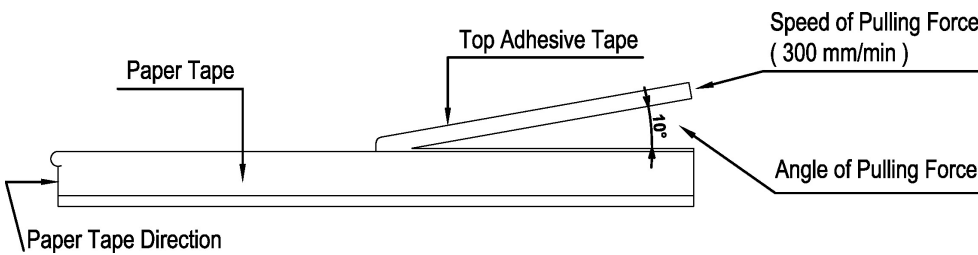
| Packaging     | Type | A         | B         | W       | E         | F        | G        | H        | T         | $\phi D$  | $\psi D1$ | T1        | P       |
|---------------|------|-----------|-----------|---------|-----------|----------|----------|----------|-----------|-----------|-----------|-----------|---------|
| Embossed Type | 2010 | 2.80±0.20 | 5.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | 1.50      | 1.50±0.10 | 0.85±0.15 | 4.0±0.1 |
|               | 2512 | 3.40±0.20 | 6.70±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 |           | 1.50±0.10 | 0.85±0.15 |         |
|               | 1812 | 3.30±0.20 | 4.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | 1.50      | 1.50±0.10 | 0.85±0.15 |         |
|               | 1218 | 3.30±0.20 | 4.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 |           | 1.50±0.10 | 0.85±0.15 |         |
|               | 2030 | 5.50±0.20 | 7.90±0.20 | 16±0.10 | 1.75±0.10 | 7.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.25±0.10 | 1.50±0.10 | 0.85±0.15 | 8.0±0.2   |         |

■ Packing Material Data/Storage Data

■ Front & Back Lead Dimension

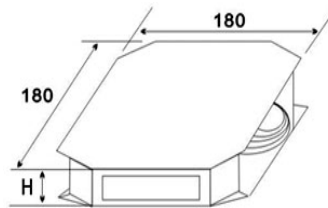


■ Top Adhesive Peel Off Strength : 10~70g

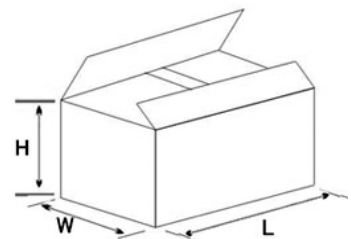


■ Package

| Inner Box Size |            |
|----------------|------------|
| Reel           | Size H(mm) |
| 1              | 13         |
| 2              | 24         |
| 3              | 36         |
| 5              | 60         |
| 10             | 113        |



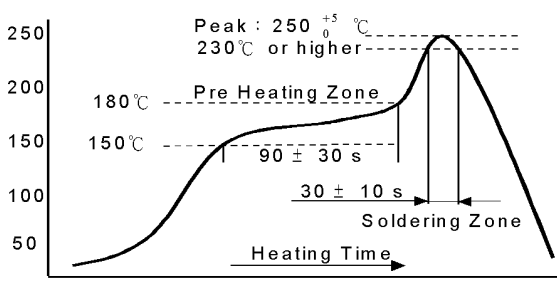
| External Box Size |             |            |             |
|-------------------|-------------|------------|-------------|
| Contain (Kpcs)    | Length (mm) | Width (mm) | Height (mm) |
| 25K               | 180         | 180        | 60          |
| 50K               | 180         | 180        | 110         |
| 150K              | 430         | 200        | 200         |
| 300K              | 400         | 400        | 200         |



■ Storage Data :

Storage time at the environment temp:  $25\pm 5^\circ\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.

## ● Reliability Test and Requirement

| Test Item                                     | Test Method              | Procedure  | Requirements   |
|---|--------------------------|--|--|
| Temperature Coefficient of Resistance (T.C.R) | JIS C 5201-1 clause 4.8  | -55°C or +155°C, 25°C is the reference temperature   | Refer to Ratings   |
| Short Time Overload                           | JIS C 5201-1 clause 4.13 | General : 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.<br>High Power : 2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds.  | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(2.0%+0.10Ω)   |
| IR Reflow                                     | Sony SS-00254            |  <p>The graph shows a temperature profile for IR reflow. The y-axis is temperature in °C (50 to 250) and the x-axis is Heating Time. Key points include: Pre Heating Zone at 180°C, a 90 ± 30 s dwell at 150°C, a peak at 250<sup>+5</sup><sub>0</sub>°C (230°C or higher), and a Soldering Zone with a 30 ± 10 s dwell.</p> | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)   |
| Leaching                                      | Sony SS-00254-9          | 260±5°C for 30 seconds.  | >95% Coverage  |
| Soldering Heat                                | JIS C 5201-1 clause 4.18 | 260±5°C for 10 seconds.  | ±1 : ±(0.5%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)   |
| Temperature Cycling                           | JIS C 5201-1 clause 4.19 | -55°C to +155°C, 5 cycles  | 0.1%、0.5%、1% : ±(0.5%+0.05Ω)<br>2%、5% : ±(1.0%+0.10Ω)                              |
| Electric Iron                                 | Sony SS-00254-5          | Preheating temperature : 350±10°C<br>Electric iron preheating time : 3+1/-0 sec  | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)   |
| Resistance to Solvent                         | JIS C 5201-1 clause 4.29 | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs. Then the resistor is left in the room for 48 hrs.   | ±1 : ±(0.5%+0.05Ω)<br>±5 : ±(0.5%+0.05Ω)   |
| Load Life in Humidity                         | JIS C 5201-1 clause 4.24 | 40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .   | 0.1%、0.5%、1% : ±(1.0%+0.05Ω)<br>2%、5% : ±(2.0%+0.05Ω)<br>Value <1Ω : ±(2.0%+0.05Ω) |
| Load Life (Endurance)                         | JIS C 5201-1 clause 4.25 | 70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .   | 0.1%、0.5%、1% : ±(1.0%+0.05Ω)<br>2%、5% : ±(3.0%+0.10Ω)<br>Value <1Ω : ±(3.0%+0.10Ω) |
| Insulation Resistance                         | JIS C 5201-1 clause 4.6  | 100V for 1 minute.   | ≥10GΩ  |
| Terminal Bending Strength                     | JIS C 5201-1 clause 4.33 | Bending once for 5 seconds<br>D : 0402、0603、0805=5mm<br>1206、1210、1812=3mm<br>1218、2010、2512、2030=2mm  | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)   |

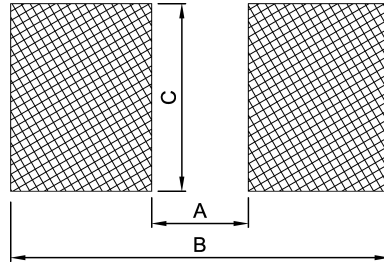
## AEC-Q200 test

| Test Item                           | Test Method                    | Procedure   | Requirements  |
|-------------------------------------|--------------------------------|---|---|
| Temperature Cycling                 | JESD22 Method JA-104           | 1000 Cycles (-55°C to +125°C) Measurement at 24± 4 hours after test conclusion.                               | 0.1%、0.5%、1% : ±(0.5%+0.05Ω)<br>2%、5% : ±(1.0%+0.10Ω) |
| Resistance to Solvent               | MIL-STD-202 Method 215         | Add Aqueous wash chemical-OKEM clean or equivalent.   | ±1 : ±(0.5%+0.05Ω)<br>±5 : ±(0.5%+0.05Ω)              |
| Biased Humidity                     | MIL-STD-202 Method 103         | 1000 hours 85°C/85%RH. 10% of operation power.  | 0.1%、0.5%、1% : ±(1.0%+0.05Ω)<br>2%、5% : ±(3.0%+0.05Ω) |
| High Temperature Exposure (Storage) | MIL-STD-202 Method 108         | 1000 hrs. T=125°C.  | 0.1%、0.5%、1% : ±(1.0%+0.05Ω)<br>2%、5% : ±(2.0%+0.05Ω) |
| Operation Life                      | MIL-STD-202 Method 108         | 125°C , or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs"ON" and 0.5hr "OFF"                | 0.1%、0.5%、1% : ±(1.0%+0.05Ω)<br>2%、5% : ±(3.0%+0.10Ω) |
| External Visual                     | MIL-STD-883 Method 2009        | Electrical test not required.<br>Inspect device construction, marking and workmanship.                        | —   |
| Mechanical Shock                    | MIL-STD-202 Method 213         | Impact acceleration : 1500g<br>Pulse duration : 0.5ms<br>Number of shocks : 30 shocks(5 shocks for each face) | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(2.0%+0.1Ω)               |
| Vibration                           | MIL-STD-202 Method 204         | 5 g's for 20min., 12 cycles each of 3 orientations.   | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(2.0%+0.1Ω)               |
| ESD                                 | ACE-Q200- 002 or ISO/DIS 10605 | 0402 / 0603 : 1KV<br>0805 and above : 2KV   | For the product %                                     |
| Solderability                       | J-STD-002                      | (1) 4 hrs 155°C dry heat<br>(2) 260±5°C 10 sec.   | ±1 : ±(0.5%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)              |
| Terminal Strength (SMD)             | AEC Q200-006                   | 0402 / 0603 : 8N<br>0805 and above : 17.7N  | No broken   |
| Board Flex                          | AEC Q200-005                   | Beading once for 60 seconds   | ±1 : ±(1.0%+0.05Ω)<br>±5 : ±(1.0%+0.05Ω)              |



## ● General Information

### ■ Recommend Land Pattern Design ( For Reflow Soldering )



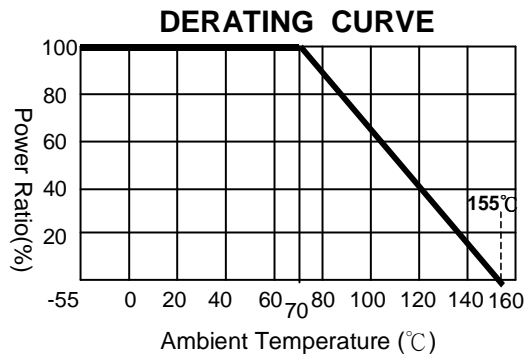
#### ■ Dimension

Unit: mm

| Type<br>Item | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2010 | 1218 | 2512 |
|--------------|------|------|------|------|------|------|------|------|------|
| A            | 0.60 | 0.80 | 1.30 | 2.20 | 2.00 | 3.11 | 3.80 | 2.04 | 4.90 |
| B            | 1.60 | 2.40 | 2.90 | 4.20 | 4.40 | 5.91 | 6.60 | 4.24 | 8.10 |
| C            | 0.70 | 1.00 | 1.40 | 1.70 | 2.70 | 3.00 | 2.70 | 4.50 | 3.40 |

## ■ Performance Characteristics

### ■ Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

### ■ Voltage Rating or Current Rating

Resistance Range:  $\geq 1 \Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)  
 P=Power rating(W)  
 R=Nominal resistance( $\Omega$ )

**■ Operation and Storage Temperature**

|                       | MIN   | MAX  |
|-----------------------|-------|------|
| Operation temperature | -55°C | 70°C |
| Storage temperature   | 20°C  | 30°C |
| Storage humidity      | 40%   | 80%  |

**■ Equipments Applicable:**

Our company's products are produced under low temperature processing applicable to IR reflow surface mounting devices. It is comparatively not applicable to wave soldering which will possibly cause the risk ablating the element protection layer and the front conductor and cause the drift of the resistance value and ablation of the markings.

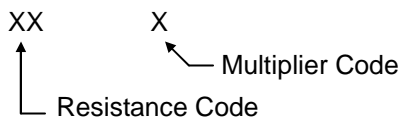
**■ Product Testing Method:**

Our products are tested with our company's tapping & testing equipments by using four-foot probe to touch at the back of both electrodes. Supposed different testing points or methods are requested, please advise beforehand and customized-made production is available.

**■ 0603 E-96 Multiplier Code**

| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

**CODING FORMULA**



Example: 10.2KΩ =  $\frac{102}{02} \times \frac{10^2}{C} \Omega = 02C$

33.2Ω =  $\frac{332}{51} \times \frac{10^{-1}}{X} \Omega = 51X$

**■ 0603 Standard E-96 Values and 0603 Resistance Codes**

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

## Standard Resistance Values in a Decade

Marking code:

- 1%: marking code, please refer to E96 and E24 data form as below  
 Ex: 120K, The marking code is 1203 in E24  
 121K, The marking code is 1213 in E96
- 5%: marking code, please refer to E24 data form as below  
 Ex: 120K, The marking code is 124 in E24
- Note: 0402 series resistor has no marking code.
- Type: 0603 1% marking code, please refer to E-96 multiplier code.

| E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192       | E96        | E48       |           |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------------|------------|-----------|-----------|
| 100  | 100 | 100 | 169  | 169 | 169 | 287  | 287 | 287 | 487  | 487 | 487 | 825        | 825        | 825       |           |
| 101  |     |     | 172  |     |     | 291  |     |     | 493  |     |     | 835        |            |           |           |
| 102  | 102 |     | 174  | 174 |     | 294  | 294 |     | 499  | 499 |     | 845        | 845        |           |           |
| 104  |     |     | 176  |     |     | 298  |     |     | 505  |     |     | 856        |            |           |           |
| 105  | 105 | 105 | 178  | 178 | 178 | 301  | 301 | 301 | 511  | 511 | 511 | 866        | 866        | 866       |           |
| 106  |     |     | 180  |     |     | 305  |     |     | 517  |     |     | 876        |            |           |           |
| 107  | 107 |     | 182  | 182 |     | 309  | 309 |     | 523  | 523 |     | 887        | 887        |           |           |
| 109  |     |     | 184  |     |     | 312  |     |     | 530  |     |     | 898        |            |           |           |
| 110  | 110 | 110 | 187  | 187 | 187 | 316  | 316 | 316 | 536  | 536 | 536 | 909        | 909        | 909       |           |
| 111  |     |     | 189  |     |     | 320  |     |     | 542  |     |     | 920        |            |           |           |
| 113  | 113 |     | 191  | 191 |     | 324  | 324 |     | 549  | 549 |     | 931        | 931        |           |           |
| 114  |     |     | 193  |     |     | 328  |     |     | 556  |     |     | 942        |            |           |           |
| 115  | 115 | 115 | 196  | 196 | 196 | 332  | 332 | 332 | 562  | 562 | 562 | 953        | 953        | 953       |           |
| 117  |     |     | 198  |     |     | 336  |     |     | 569  |     |     | 965        |            |           |           |
| 118  | 118 |     | 200  | 200 |     | 340  | 340 |     | 576  | 576 |     | 976        | 976        |           |           |
| 120  |     |     | 203  |     |     | 344  |     |     | 583  |     |     | 988        |            |           |           |
| 121  | 121 | 121 | 205  | 205 | 205 | 348  | 348 | 348 | 590  | 590 | 590 |            |            |           |           |
| 123  |     |     | 208  |     |     | 352  |     |     | 597  |     |     |            |            |           |           |
| 124  | 124 |     | 210  | 210 |     | 357  | 357 |     | 604  | 604 |     | <b>E24</b> | <b>E12</b> | <b>E6</b> | <b>E3</b> |
| 126  |     |     | 213  |     |     | 361  |     |     | 612  |     |     | 10         | 10         | 10        | 10        |
| 127  | 127 | 127 | 215  | 215 | 215 | 365  | 365 | 365 | 619  | 619 | 619 | 11         |            |           |           |
| 129  |     |     | 218  |     |     | 370  |     |     | 626  |     |     | 12         | 12         |           |           |
| 130  | 130 |     | 221  | 221 |     | 374  | 374 |     | 634  | 634 |     | 13         |            |           |           |
| 132  |     |     | 223  |     |     | 379  |     |     | 642  |     |     | 15         | 15         | 15        |           |
| 133  | 133 | 133 | 226  | 226 | 226 | 383  | 383 | 383 | 649  | 649 | 649 | 16         |            |           |           |
| 135  |     |     | 229  |     |     | 388  |     |     | 657  |     |     | 18         | 18         |           |           |
| 137  | 137 |     | 232  | 232 |     | 392  | 392 |     | 665  | 665 |     | 20         |            |           |           |
| 138  |     |     | 234  |     |     | 397  |     |     | 673  |     |     | 22         | 22         | 22        | 22        |
| 140  | 140 | 140 | 237  | 237 | 237 | 402  | 402 | 402 | 681  | 681 | 681 | 24         |            |           |           |
| 142  |     |     | 240  |     |     | 407  |     |     | 690  |     |     | 27         | 27         |           |           |
| 143  | 143 |     | 243  | 243 |     | 412  | 412 |     | 698  | 698 |     | 30         |            |           |           |
| 145  |     |     | 246  |     |     | 417  |     |     | 706  |     |     | 33         | 33         | 33        |           |
| 147  | 147 | 147 | 249  | 249 | 249 | 422  | 422 | 422 | 715  | 715 | 715 | 36         |            |           |           |
| 149  |     |     | 252  |     |     | 427  |     |     | 723  |     |     | 39         | 39         |           |           |
| 150  | 150 |     | 255  | 255 |     | 432  | 432 |     | 732  | 732 |     | 43         |            |           |           |
| 152  |     |     | 258  |     |     | 437  |     |     | 741  |     |     | 47         | 47         | 47        | 47        |
| 154  | 154 | 154 | 261  | 261 | 261 | 442  | 442 | 442 | 750  | 750 | 750 | 51         |            |           |           |
| 156  |     |     | 264  |     |     | 448  |     |     | 759  |     |     | 56         | 56         |           |           |
| 158  | 158 |     | 267  | 267 |     | 453  | 453 |     | 768  | 768 |     | 62         |            |           |           |
| 160  |     |     | 271  |     |     | 459  |     |     | 777  |     |     | 68         | 68         | 68        |           |
| 162  | 162 | 162 | 274  | 274 | 274 | 464  | 464 | 464 | 787  | 787 | 787 | 75         |            |           |           |
| 164  |     |     | 277  |     |     | 470  |     |     | 796  |     |     | 82         | 82         |           |           |
| 165  | 165 |     | 280  | 280 |     | 475  | 475 |     | 806  | 806 |     | 91         |            |           |           |
| 167  |     |     | 284  |     |     | 481  |     |     | 816  |     |     |            |            |           |           |

According to IEC publication 63

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