

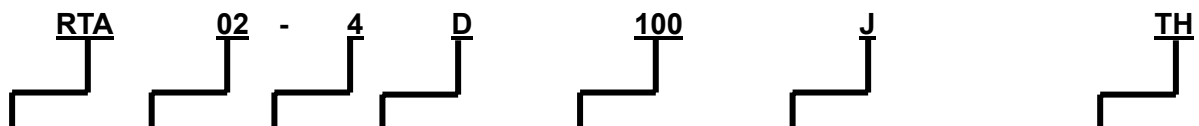
Thick Film Chip Resistors Array Product Specification

1 Scope:

- 1.1 This specification is applicable to lead and halogen free RTA series thick film chip resistors array .
- 1.2 Lead free products mean lead free termination meets RoHS requirement. Pb contained in glass material of resistor element are exempted by RoHS directive.
- 1.3 The product is for general purpose.
- 1.4 The available AEC-Q200 report also can provide by customer request.

2 Explanation Of Part Numbers:

(EX)



Type	Size	Number of Circuits	Terminal Type	Nominal Resistance	Resistance Tolerance	Packaging(Refer to IE-SP-055)
Thick Film Chip Resistors Array	01(0201)	2:2circuits	D:Convex C:Concave	3-Digit EX. 10Ω=100 4.7Ω=4R7 JUMPER=000	D=± 0.5% F=± 1% G=± 2% J=± 5%	TH : 2 mm Pitch Carrier Tape 10000 pcs
	02(0402)	4:4circuits		4-Digit EX. 10.2Ω=10R2 10KΩ=1002 JUMPER=0000		
	03(0603)	8:8circuits				

Written		IE		QA		Sales		Remark		Issue Dep. DATA Center. Series No. 60
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3 General Specifications:

3.1 Resistance Range: $\geq 1\Omega$ & 0Ω

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R. (ppm/°C)	Resistance Range			Number of Terminals	Number of Resistors	JUMPER (0Ω) Rated Current	JUMPER (0Ω) Resistance Value	
					D(±0.5%) E-24、E-96	F(±1%) E-24、E-96	G(±2%) J(±5%) E-24				F (±1%)	J (±5%)
RTA01-2D (0201)	1/32 W	12.5V	25V	±500	-----	-----	$3\Omega \leq R < 10\Omega$	4	2	0.5A	-----	50mΩ MAX.
				±300	-----	-----	$10\Omega \leq R < 1K\Omega$					
				±200	-----	-----	$1K\Omega \leq R \leq 1M\Omega$					
RTA02-2D (0402)	1/16 W	25V	50V	±300	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$	4	2	1A	25mΩ MAX.	50mΩ MAX.
				±200	-----	$10\Omega \leq R \leq 10M\Omega$	$10\Omega \leq R \leq 10M\Omega$					
RTA03-2D (0603)	1/16 W	50V	100V	±200	-----	$10\Omega \leq R \leq 10M\Omega$	$1\Omega \leq R \leq 10M\Omega$	4	2	1A	-----	50mΩ MAX.
RTA02-4D (0402)	1/16 W	25V	50V	±300	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$	8	4	1A	25mΩ MAX.	50mΩ MAX.
				±200	-----	$10\Omega \leq R \leq 10M\Omega$	$10\Omega \leq R \leq 10M\Omega$					
RTA02-4C (0402)	1/16 W	25V	50V	±400	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$	8	4	1A	-----	50mΩ MAX.
				±200	-----	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$					
RTA03-4D (0603)	1/16 W	50V	100V	±200	$22\Omega \leq R \leq 470K\Omega$	$1\Omega \leq R \leq 10M\Omega$	$1\Omega \leq R \leq 10M\Omega$	8	4	1A	25mΩ MAX.	50mΩ MAX.
RTA03-4C (0603)	1/16 W	50V	100V	±200	-----	$1\Omega \leq R \leq 1M\Omega$	$1\Omega \leq R \leq 10M\Omega$	8	4	1A	-----	50mΩ MAX.
RTA02-8D (0402)	1/16 W	25V	50V	±250	-----	$10\Omega \leq R \leq 10M\Omega$	$1\Omega \leq R \leq 10M\Omega$	16	8	1A	-----	50mΩ MAX.
RTA03-8C (0603)	1/16 W	50V	100V	±200	-----	$1\Omega \leq R \leq 1M\Omega$	$1\Omega \leq R \leq 10M\Omega$	16	8	1A	-----	50mΩ MAX.
RTA03-2C (0603)	1/16 W	50V	100V	±200	-----	$1\Omega \leq R \leq 1M\Omega$	$1\Omega \leq R \leq 10M\Omega$	4	2	1A	-----	50mΩ MAX.
RTA02-2C (0402)	1/16 W	25V	50V	±650	-----	$3\Omega \leq R \leq 10\Omega$	$3\Omega \leq R < 10\Omega$	4	2	1A	-----	50mΩ MAX.
				±200		$10\Omega \leq R < 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$					
Operating Temperature Range				-55°C ~ +155°C								

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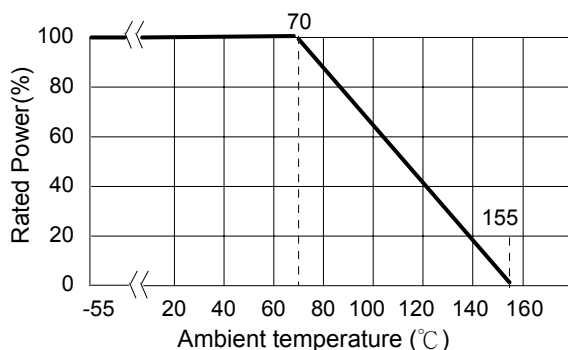
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3.2 Power Derating Curve:

Operating Temperature Range : - 55~155 °C

For resistors operated in ambient temperatures above 70°C, power rating shall be derated in accordance with figure below .



3.3 Voltage Rating or Current Rating:

3.3.1 Resistance Range: ≥ 1Ω

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 from the following:

$$E = \sqrt{R \times P}$$

E= Rated voltage (V)
P= power rating (W)
R= Nominal resistance(Ω)

3.3.2 Resistance Range:(0Ω)

Rated Current: The resistor shall have a DC continuous working current or a rms.AC continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined from the following:

$$I = \sqrt{P/R}$$

I= Rated current (A)
P= Power rating (w)
R= Nominal resistance(Ω)

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4 Dimensions: (mm)

RTA03-2D	RTA03-2C	Circuits
		<p>Circuits</p> <p>R1=R2</p>
RTA02-4C / RTA03-4C		
		<p>Circuits</p> <p>R1=R2=R3=R4</p>
RTA02-4D / RTA03-4D		
		<p>Circuits</p> <p>R1=R2=R3=R4</p>

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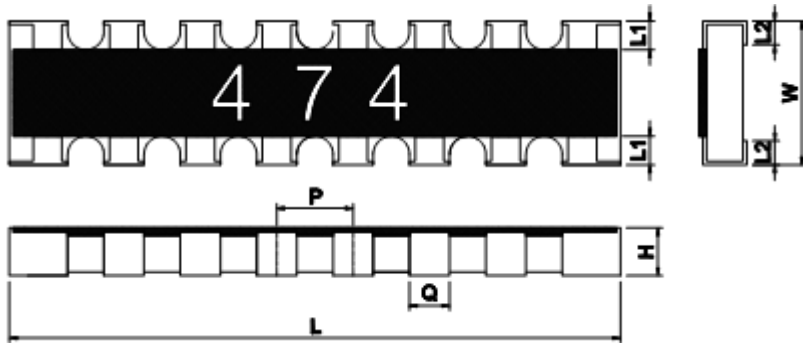
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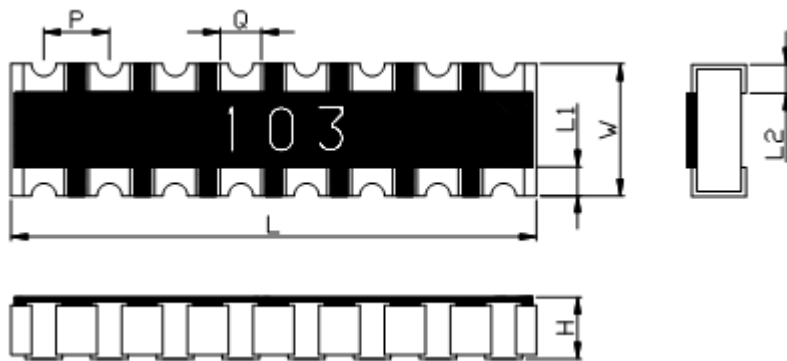
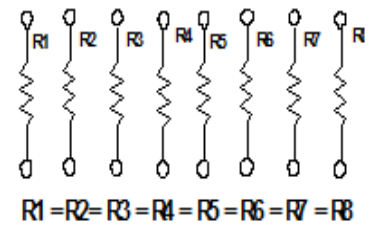
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RTA02-8D / RTA03-8C

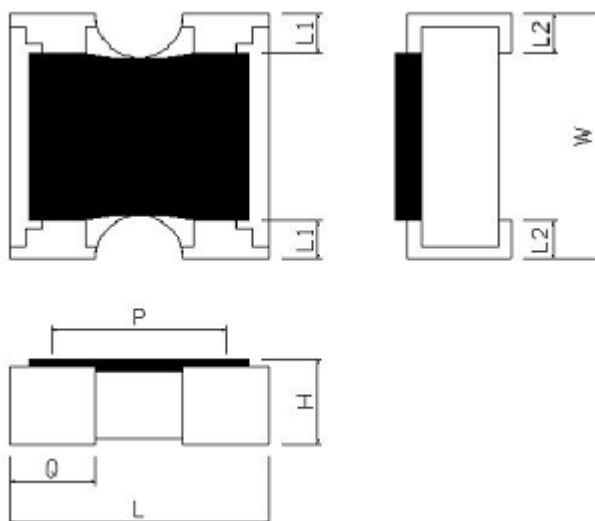
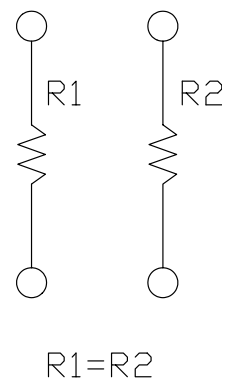


Circuits



RTA01-2D / RTA02-2D

Circuits



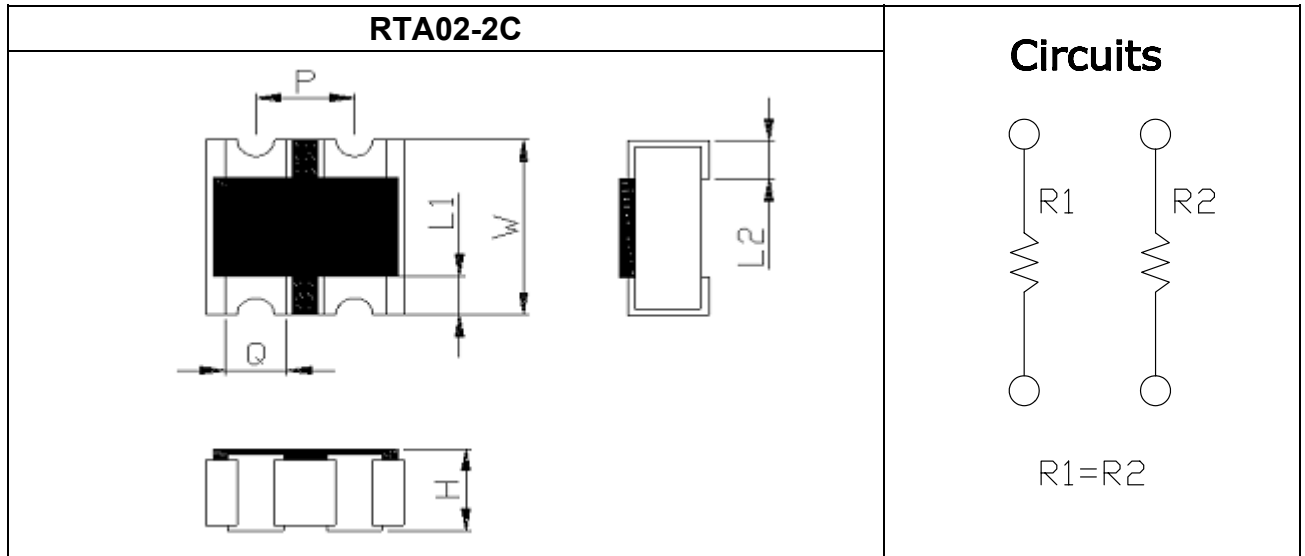
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Type \ Dim	L	W	H	L1	L2	P	Q
RTA01-2D (0201)	0.80±0.10	0.60±0.10	0.30±0.05	0.15±0.10	0.15±0.05	(0.50)	0.35±0.10
RTA02-2D (0402)	1.00±0.10	1.00±0.10	0.30±0.05	0.15±0.10	0.25±0.10	(0.67)	0.33±0.10
RTA03-2D (0603)	1.60±0.15	1.60±0.15	0.45±0.10	0.30±0.15	0.30±0.15	(0.80)	0.60±0.10
RTA02-4D (0402)	2.00±0.10	1.00±0.10	0.40±0.10	0.20±0.10	0.25±0.10	(0.50)	0.30±0.10
RTA02-4C (0402)	2.00±0.10	1.00±0.10	0.40±0.10	0.15±0.10	0.25±0.10	(0.50)	0.30±0.10
RTA03-4D (0603)	3.20±0.20	1.60±0.15	0.50±0.10	0.30±0.15	0.30±0.15	(0.80)	0.50±0.10
RTA03-4C (0603)	3.20±0.15	1.60±0.15	0.55±0.10	0.35±0.15	0.45±0.15	(0.80)	0.50±0.10
RTA02-8D (0402)	4.00±0.20	1.60±0.10	0.40±0.10	0.30±0.15	0.30±0.10	(0.50)	0.25±0.10
RTA03-8C (0603)	6.40±0.20	1.60±0.20	0.55±0.10	0.30±0.15	0.40±0.15	(0.80)	0.50±0.10
RTA03-2C (0603)	1.60±0.15	1.60±0.15	0.55±0.10	0.30±0.15	0.40±0.15	(0.80)	0.50±0.10
RTA02-2C (0402)	1.00±0.10	1.00±0.10	0.30±0.10	0.18±0.10	0.25±0.10	(0.50)	0.30±0.10

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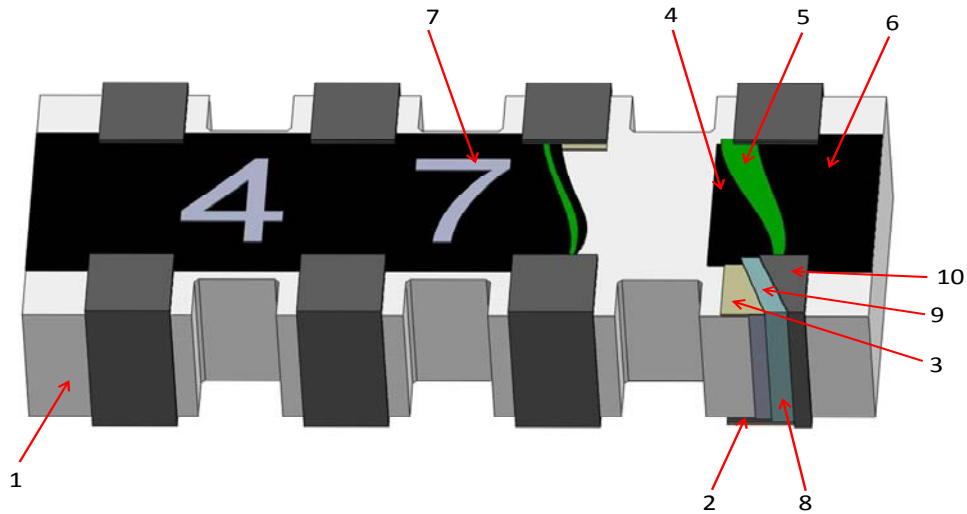
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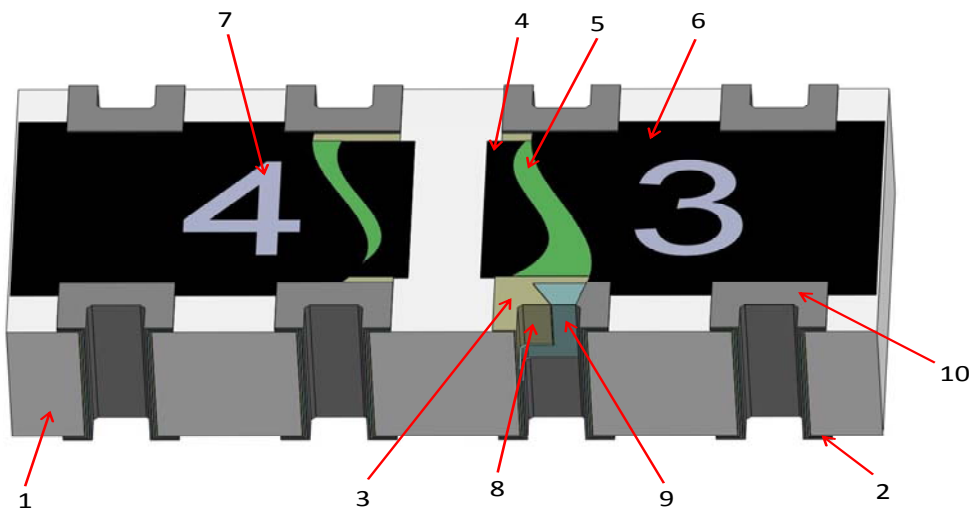
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5 Structure Graph:
D(Convex) Type



1	Ceramic substrate	6	2nd Protective coating
2	Bottom inner electrode	7	Marking
3	Top inner electrode	8	Terminal inner electrode
4	Resistive layer	9	Ni plating
5	1st Protective coating	10	Sn plating

C(Concave) Type



1	Ceramic substrate	6	2nd Protective coating
2	Bottom inner electrode	7	Marking
3	Top inner electrode	8	Terminal inner electrode
4	Resistive layer	9	Ni plating
5	1st Protective coating	10	Sn plating

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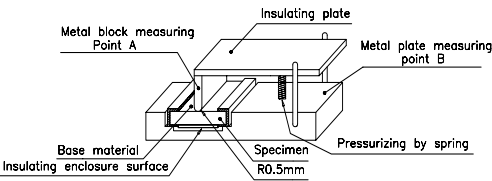
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6 Reliability Test:

6.1 Electrical Performance Test

Item	Conditions	Specifications															
		Resistors	Jumper														
Temperature Coefficient of Resistance	$TCR (ppm/^{\circ}C) = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10^6$ R1: Resistance at room temperature R2: Resistance at -55^{\circ}C or +125^{\circ}C T1: Room temperature T2: Temperature -55^{\circ}C or +125^{\circ}C Refer to JIS-C5201-1 4.8	Refer item 3. General Specifications	NA.														
Short Time Overload	Applied 2.5 times rated voltage for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated voltage refer to item 3. general specifications) Refer to JIS-C5201-1 4.13	0.5%、1%:±(1.0%+0.05Ω) 2%、5% :±(2.0%+0.10Ω)	Refer to item 3. General Specifications														
Insulation Resistance	Put the resistor in the fixture, add 100 VDC in +,- terminal for 60 sec then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material. Refer to JIS-C5201-1 4.6 	≥ 10 ⁹ Ω															
Dielectric Withstand Voltage	Put the resistor in the fixture, add 300 VAC in +,- terminal for 60 sec. Refer to JIS-C5201-1 4.7	No short or burned on the appearance.															
Intermittent Overload	Put the tested resistor in chamber under temperature 25±2^{\circ}C and load 2.5 times rated DC voltage for 1 sec on , 25 sec off , 10000 ⁺⁴⁰⁰ ₀ test cycles, then it be left at no-load for 1 hour , then measure its resistance variance rate. Refer to JIS-C5201-1 4.13	±(5.0%+0.10Ω)	Refer to item 3. General Specifications														
Noise Level	Refer to JIS-C5201-1 4.12	<table border="1"> <thead> <tr> <th>Resistance</th> <th>Noise</th> </tr> </thead> <tbody> <tr> <td>R < 100Ω</td> <td>≤ -10db (0.32 uV/V)</td> </tr> <tr> <td>100Ω ≤ R < 1KΩ</td> <td>≤ 0db (1.0 uV/V)</td> </tr> <tr> <td>1KΩ ≤ R < 10KΩ</td> <td>≤ 10db (3.2 uV/V)</td> </tr> <tr> <td>10KΩ ≤ R < 100KΩ</td> <td>≤ 15db (5.6 uV/V)</td> </tr> <tr> <td>100KΩ ≤ R < 1MΩ</td> <td>≤ 20db (10 uV/V)</td> </tr> <tr> <td>1MΩ ≤ R</td> <td>≤ 30db (32 uV/V)</td> </tr> </tbody> </table>		Resistance	Noise	R < 100Ω	≤ -10db (0.32 uV/V)	100Ω ≤ R < 1KΩ	≤ 0db (1.0 uV/V)	1KΩ ≤ R < 10KΩ	≤ 10db (3.2 uV/V)	10KΩ ≤ R < 100KΩ	≤ 15db (5.6 uV/V)	100KΩ ≤ R < 1MΩ	≤ 20db (10 uV/V)	1MΩ ≤ R	≤ 30db (32 uV/V)
Resistance	Noise																
R < 100Ω	≤ -10db (0.32 uV/V)																
100Ω ≤ R < 1KΩ	≤ 0db (1.0 uV/V)																
1KΩ ≤ R < 10KΩ	≤ 10db (3.2 uV/V)																
10KΩ ≤ R < 100KΩ	≤ 15db (5.6 uV/V)																
100KΩ ≤ R < 1MΩ	≤ 20db (10 uV/V)																
1MΩ ≤ R	≤ 30db (32 uV/V)																

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6.2 Mechanical Performance Test

Item	Conditions	Specifications	
		Resistors	Jumper
Resistance to Solvent	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 5 minutes, then the resistor is left in the room for 48 hrs , then measure its resistance variance rate. Refer to JIS-C5201-1 4.29	01-2D:±(1.0%+0.05Ω) Other:±(0.5%+0.05Ω)	Refer to item 3. General Specifications
Solderability	Preconditioning: Put the tested resistor in the apparatus of PCT, at a temperature of 105℃, humidity of 100% RH, and pressure of 1.22×10 ⁵ Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature 235±5℃ for 2 sec, then the resistor is left as placed under microscope to observed its solder area. Refer to JIS-C5201-1 4.17	Solder coverage over 95%	
Resistance to Soldering Heat	◎Test method 1 (solder pot test): The tested resistor be immersed into molten solder of 260+5/-0℃ for 10 seconds. Then the resistor is left in the room for 1 hour. ◎Test method 2 (solder pot test): The tested resistor be immersed into molten solder of 260+5/-0℃ for 30 seconds. Then the resistor is left as placed under microscope to observe its solder area. Refer to JIS-C5201-1 4.18	Test item 1: (1).Variance rate on resistance ΔR%=±(1.0%+0.05Ω) (2).No evidence of electrode damage. No side conductive peeling off. Test item 2: (1).Solder coverage over 95%. (2).The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode.	Refer to item 3. General Specifications

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Item	Conditions	Specifications	
		Resistors	Jumper
<p>Joint Strength of Solder</p>	<p>Preconditioning: Put the tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10⁵ Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method:</p> <p>◎Test item 1 (Adhesion): A static load using a R0.5 scratch tool shall be applied on the core of the component and in the direction of the arrow and held for 10 seconds and under load measure its resistance variance rate. 1.02-2C=10N load 2.Other=20N load 3.01-2D=5Nload</p> <div style="text-align: center;"> </div> <p>Refer to JIS-C5201-1 4.32</p> <p>◎Test item 2 (Bending Strength): Solder tested resistor on the PC board, add force in the middle down, and under load measure its resistance variance rate D=(1)01-2D=3mm (2)Other=5mm</p> <div style="text-align: center;"> </div> <p>Refer to JIS-C5201-1 4.33</p>	<p>Test item 1: (1).Variance rate on resistance $\Delta R\% = \pm(1.0\% + 0.05\Omega)$ (2).No evidence of mechanical damage. No terminal peeling off.</p> <p>Test item 2: (1).Variance rate on resistance $\Delta R\% = \pm(1.0\% + 0.05\Omega)$ (2).No evidence of mechanical damage. No terminal peeling off and core body cracked.</p>	<p>Refer to item 3. general specifications</p>

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6.3 Environmental Test

Item	Conditions	Specifications											
		Resistors	Jumper										
Resistance to Dry Heat	Put tested resistors in chamber under temperature 155±5 °C for 1,000±4 hours. Then leaving in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	0.5%、1%:±(1.0%+0.05Ω) 2%、5% :±(2.0%+0.10Ω)	Refer to item 3. general specifications										
Thermal Shock	Put the tested resistor in the thermal shock chamber under the temperature cycle which shown in the following table shall be repeated 300 times consecutively. Then leaving the tested resistor in the room temperature for 1 hours, and measure its resistance variance rate. <table border="1" style="margin: 5px auto; width: 80%;"><thead><tr><th colspan="2">Testing Condition</th></tr></thead><tbody><tr><td>Lowest Temperature</td><td>-55±5°C</td></tr><tr><td>Highest Temperature</td><td>125±5°C</td></tr><tr><td>Temperature-retaining time</td><td>15 minutes each</td></tr></tbody></table> Refer to MIL-STD 202 Method 107	Testing Condition		Lowest Temperature	-55±5°C	Highest Temperature	125±5°C	Temperature-retaining time	15 minutes each	±(1.0%+0.05Ω)	Refer to item 3. general specifications		
		Testing Condition											
Lowest Temperature	-55±5°C												
Highest Temperature	125±5°C												
Temperature-retaining time	15 minutes each												
No evidence of mechanical damage. No short or burned on the appearance.													
Loading Life in Moisture	Put the tested resistor in the chamber under temperature 40±2°C, relative humidity 90~95% and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.24	0.5%、1%:±(2.0%+0.10Ω) 2%、5% :±(3.0%+0.10Ω)	Refer to item 3. general specifications										
Load Life	Put the tested resistor in chamber under temperature 70±2°C and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	0.5%、1%:±(2.0%+0.10Ω) 2%、5% :±(3.0%+0.10Ω)	Refer to item 3. general specifications										
				No evidence of mechanical damage. No short or burned on the appearance									
Low Temperature Operation	Put the tested resistor in the chamber at room temperature 25°C. Decreasing the temperature to -55°C and keep the temperature at -55°C for 1 hour. Then load the rated voltage for 45 minutes on, and 15 minutes off. Then leaving the tested resistor in room temperature for 8±1 hours, and measure its resistance variance rate. Refer to MIL-R-55342D 4.7.4	0.5%、1%:±(0.5%+0.05Ω) 2%、5% :±(1.0%+0.05Ω)	Refer to item 3. general specifications										
				No evidence of mechanical damage. No short or burned on the appearance.									
Whisker Test	◎Test item (Thermal Shock test): <table border="1" style="margin: 5px auto; width: 80%;"><thead><tr><th colspan="2">Testing Condition</th></tr></thead><tbody><tr><td>Minimum storage temperature</td><td>-55+0/-10°C</td></tr><tr><td>Maximum storage temperature</td><td>85+10/-0°C</td></tr><tr><td>Temperature-retaining time</td><td>10 min.</td></tr><tr><td>Number of temperature cycles</td><td>1,500</td></tr></tbody></table> ◎Inspection: Inspect for whisker formation on specimens that underwent the acceleration test specified in subclause 4.2, with a magnifier (stereo microscope) of about 40 or higher magnification. If judgment is hard in this method, use a scanning electron microscope (SEM) of about 1,000 or higher magnification. By JEDEC Standard NO.22A121 class 2.	Testing Condition		Minimum storage temperature	-55+0/-10°C	Maximum storage temperature	85+10/-0°C	Temperature-retaining time	10 min.	Number of temperature cycles	1,500	Max. 50µm	
		Testing Condition											
Minimum storage temperature	-55+0/-10°C												
Maximum storage temperature	85+10/-0°C												
Temperature-retaining time	10 min.												
Number of temperature cycles	1,500												

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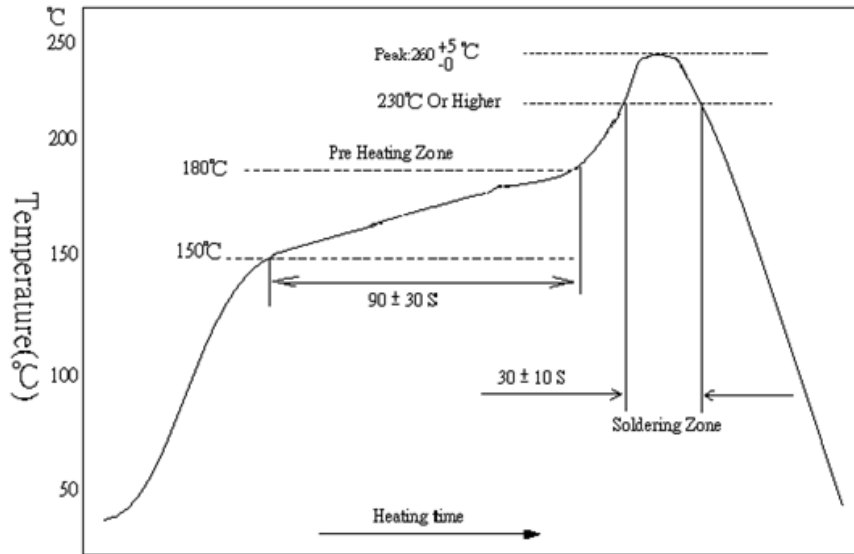
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7 Recommend Soldering Method:

7.1 Lead Free IR-Reflow Soldering Profile



Remark: The peak temperature of soldering heat is 260 +5/-0 °C for 10 seconds

7.2 Soldering Iron: temperature 350°C±10°C , dwell time shall be less than 3 sec °

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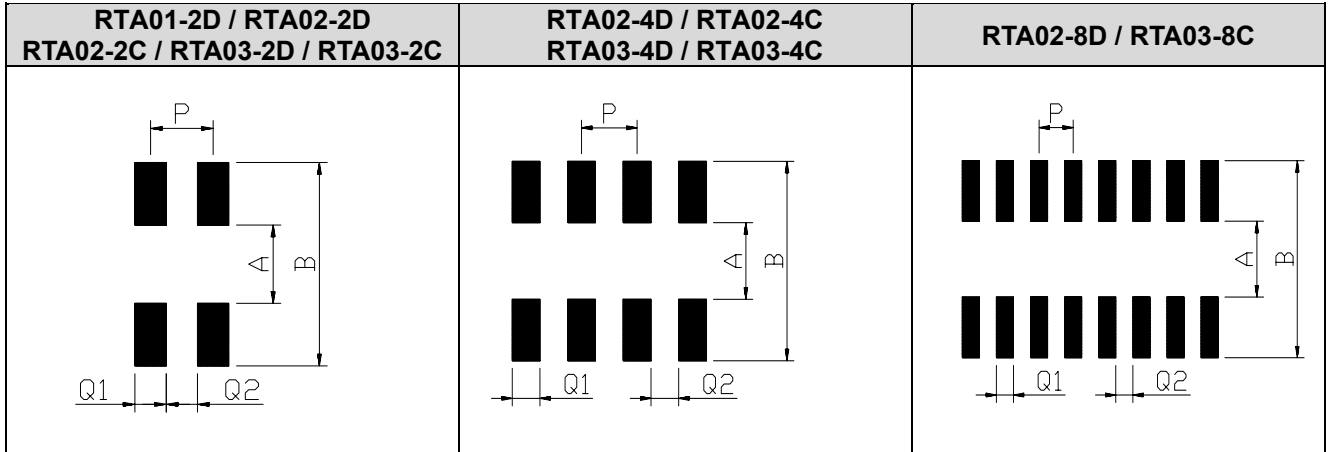
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8 Recommend Land Pattern Design (For Reflow Soldering) :

Unit:mm



TYPE \ DIM	A	B	P	Q1	Q2
RTA01-2D	0.30	0.90	0.50	0.30	0.20
RTA02-2D	0.50	2.00	0.67	0.33	0.34
RTA03-2D	1.00	2.60	0.80	0.40	0.40
RTA02-4D RTA02-4C	0.50	2.00	0.50	0.28	0.22
RTA03-4D RTA03-4C RTA03-2C	1.00	2.60	0.80	0.40	0.40
RTA03-8C	1.00	2.60	0.80	0.40	0.40
RTA02-8D	1.00	2.60	0.50	0.25	0.25
RTA02-2C	0.50	2.00	0.50	0.28	0.22

9 Plating Thickness:

9.1 Ni: $\geq 2 \mu m$

9.2 Sn(Tin): $\geq 3 \mu m$

9.3 Sn(Tin): Matte Sn

Remark

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10 Stock period:

10.1 The temperature condition must be controlled at $25\pm 5^{\circ}\text{C}$, the R.H. must be controlled at $60\pm 15\%$. The stock can maintain quality level in two years .

11 The carton packaged for electronic-information products is made by the symbol as follows: (For china)

	
Marking for control of pollution cause by electronic-information products	Marking for package recovery

12 Attachments:

12.1 Document Revise Record Paper (QA-QR-027)

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