

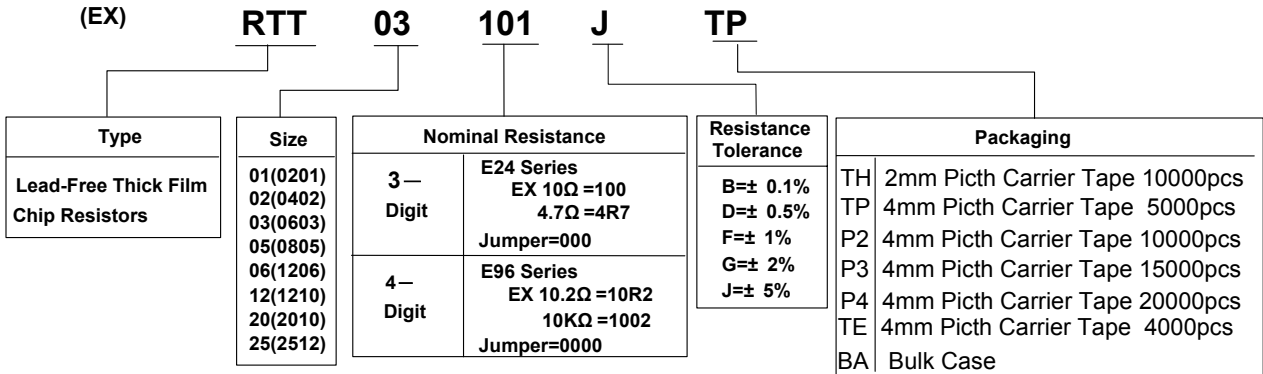
Thick Film Chip Resistors

Product Specification

1 Scope

This specification is applicable to lead and halogen free RTT series thick film chip resistors.

2 Explanation Of Part Numbers



3 General Specifications

3.1 Resistance Range: $\geq 1\Omega$

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R. (ppm/°C)	Resistance Range				Jumper Rated Current		Jumper Resistance Value	
					B(± 0.1%) E-24、E-96	D(± 0.5%) E-24、E-96	F(± 1%) E-24、E-96	G(± 2%)、J(± 5%) E-24	J (± 5%)	F (± 1%)	J (± 5%)	F (± 1%)
RTT01 (0201)	$\frac{1}{20}$ w	25V	50V	-200 +400	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$	0.5A	0.5A	50mΩ MAX.	35mΩ MAX.
				± 200	-----	$10\Omega \leq R \leq 10M\Omega$	$10\Omega \leq R \leq 10M\Omega$	$10\Omega \leq R \leq 10M\Omega$				
RTT02 (0402)	$\frac{1}{16}$ w	50V	100V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	1A	1.5A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	-----	$1\Omega \leq R < 10\Omega$ $1M < R \leq 10M\Omega$	$1\Omega \leq R < 10\Omega$ $1M < R \leq 20M\Omega$				
RTT03 (0603)	$\frac{1}{10}$ w	75V	150V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	1A	2A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$ $1M < R \leq 10M\Omega$	$1\Omega \leq R \leq 20M\Omega$				
RTT05 (0805)	$\frac{1}{8}$ w	150V	300V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	2A	2.5A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$ $1M < R \leq 10M\Omega$	$1\Omega \leq R \leq 20M\Omega$				
RTT06 (1206)	$\frac{1}{4}$ w	200V	400V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	2A	3.5A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$ $1M < R \leq 10M\Omega$	$1\Omega \leq R \leq 20M\Omega$				
RTT12 (1210)	$\frac{1}{2}$ w	200V	400V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	2A	4A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	-----	$1M < R \leq 10M\Omega$	$10\Omega \leq R \leq 20M\Omega$				
				± 400	-----	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$				
RTT20 (2010)	$\frac{3}{4}$ w	200V	400V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	2A	5A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	-----	-----	$10\Omega \leq R \leq 10M\Omega$				
				± 400	-----	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$				
RTT25 (2512)	1W	200V	400V	± 100	$100\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 1M\Omega$	-----	2A	7A	50mΩ MAX.	20mΩ MAX.
				± 200	-----	-----	-----	$10\Omega \leq R \leq 10M\Omega$				
				± 400	-----	-----	$1\Omega \leq R < 10\Omega$	$1\Omega \leq R < 10\Omega$				

Operating Temperature Range: $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$ (0201: $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$)

Approved

Checked

Written

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Thick Film Chip Resistors Product Specification

3.2 Resistance Range: $< 1 \Omega$

Type	Rated Power at 70°C	Max. Rated Current	Max. Overload Current	T.C.R (ppm / °C)	Resistance Range
					F(± 1%)、G(± 2%)、J((± 5%) E-24、E-96
RTT02 (0402)	1/16W	0.88A	2.2A	± 600	$80 \leq R < 200 \text{ m}\Omega$
				± 300	$200 \leq R < 400 \text{ m}\Omega$
				± 250	$400 \leq R < 600 \text{ m}\Omega$
				± 200	$600 \leq R < 1000 \text{ m}\Omega$
RTT03 (0603)	1/10W	3.16A	7.91A	± 1500	$10 \leq R < 37 \text{ m}\Omega$
				± 1200	$37 \leq R < 60 \text{ m}\Omega$
				± 600	$60 \leq R < 100 \text{ m}\Omega$
				± 300	$100 \leq R < 200 \text{ m}\Omega$
				± 600	$200 \leq R < 500 \text{ m}\Omega$
RTT05 (0805)	1/8W	3.53A	8.82A	± 400	$500 \leq R < 1000 \text{ m}\Omega$
				± 1500	$10 \leq R < 19 \text{ m}\Omega$
				± 1200	$19 \leq R < 33 \text{ m}\Omega$
				± 800	$33 \leq R < 50 \text{ m}\Omega$
				± 600	$50 \leq R < 100 \text{ m}\Omega$
RTT06 (1206)	1/3W	5.77A	14.42A	± 200	$100 \leq R < 1000 \text{ m}\Omega$
				± 1500	$10 \leq R < 19 \text{ m}\Omega$
				± 1200	$19 \leq R < 25 \text{ m}\Omega$
				± 1000	$25 \leq R < 50 \text{ m}\Omega$
				± 600	$50 \leq R < 100 \text{ m}\Omega$
RTT12 (1210)	1/2W	7.07A	17.67A	± 200	$100 \leq R < 1000 \text{ m}\Omega$
				± 1500	$10 \leq R < 19 \text{ m}\Omega$
				± 1000	$19 \leq R < 25 \text{ m}\Omega$
				± 700	$25 \leq R < 50 \text{ m}\Omega$
				± 400	$50 \leq R < 100 \text{ m}\Omega$
RTT20 (2010)	3/4W	8.66A	21.65A	± 200	$100 \leq R < 1000 \text{ m}\Omega$
				± 1500	$10 \leq R < 19 \text{ m}\Omega$
				± 1200	$19 \leq R < 25 \text{ m}\Omega$
				± 900	$25 \leq R < 50 \text{ m}\Omega$
				± 500	$50 \leq R < 100 \text{ m}\Omega$
RTT25 (2512)	1 W	10A	25A	± 200	$100 \leq R < 1000 \text{ m}\Omega$
				± 1500	$10 \leq R < 19 \text{ m}\Omega$
				± 1200	$19 \leq R < 25 \text{ m}\Omega$
				± 900	$25 \leq R < 50 \text{ m}\Omega$
				± 500	$50 \leq R < 100 \text{ m}\Omega$
Operating Temperature Range				-55°C ~ +155°C	

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3.3 Power Derating Curve:

Type	RTT01 (0201)	Other
Operating Temperature Range	-55°C ~ +125°C	-55°C ~ +155°C
Explain	For resistors operated in ambient temperatures above 70°C, power rating shall be derated in accordance with figure below.	For resistors operated in ambient temperatures above 70°C, power rating shall be derated in accordance with figure below.
Figure		

3.4 Voltage Rating or Current Rating:

3.4.1 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 from the following:

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

E= Rated voltage (v)

P= Power rating (w)

R= Nominal resistance(Ω)

3.4.2 Resistance Range: $< 1 \Omega$

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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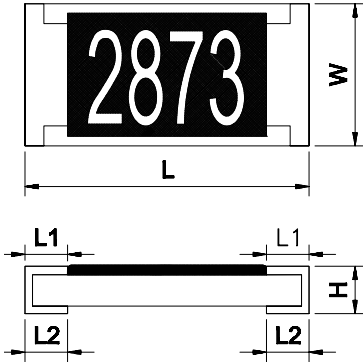
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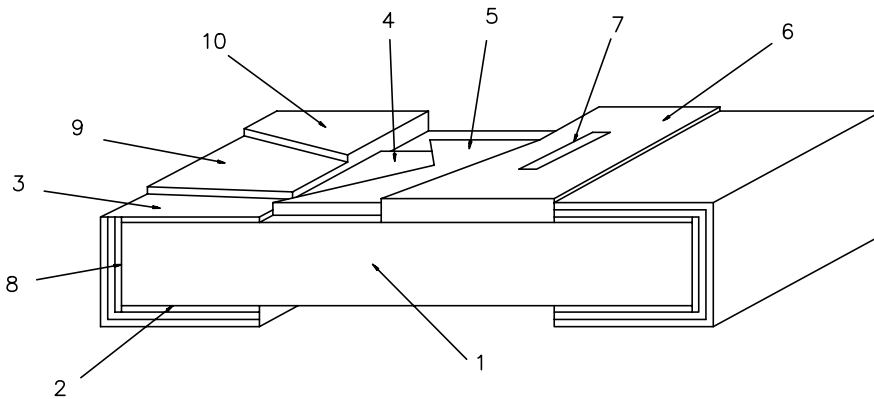
4 Dimensions

Unit : mm



Dimensions		L	W	H	L1	L2
TYPE	Size Code					
RTT01	0201	0.60± 0.03	0.30± 0.03	0.23± 0.03	0.15± 0.05	0.15± 0.05
RTT02	0402	1.00± 0.10	0.50± 0.05	0.30± 0.05	0.20± 0.10	0.25± 0.10
RTT03	0603	1.60± 0.10	0.80± 0.10	0.45± 0.10	0.30± 0.15	0.30± 0.15
RTT05	0805	2.00± 0.10	1.25± 0.10	0.50± 0.10	0.35± 0.20	0.35± 0.15
RTT06	1206	3.05± 0.10	1.55± 0.10	0.55 ^{+0.10} _{-0.05}	0.45± 0.20	0.35± 0.15
RTT12	1210	3.05± 0.10	2.55± 0.10	0.55± 0.10	0.50± 0.20	0.50± 0.20
RTT20	2010	5.00± 0.20	2.50± 0.20	0.55± 0.10	0.60± 0.20	0.60± 0.20
RTT25	2512	6.30± 0.20	3.20± 0.20	0.55± 0.10	0.60± 0.20	0.60± 0.20

5 Structure Graph



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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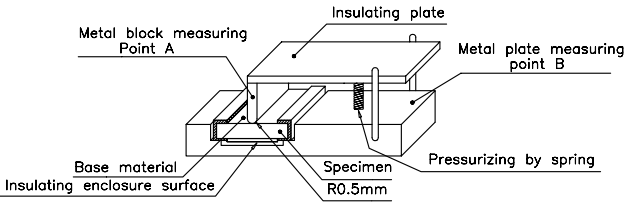
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6 Reliability Test

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°C or +125°C T1: Room temperature T2: Temperature -55°C or +125°C Refer to JIS-C5201-1 4.8	Refer to 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) Jumper : Applied Maximum overload current <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th>Type</th> <th>RTT01 (0201)</th> <th>RTT02 (0402)</th> <th>RTT03 (0603)</th> <th>RTT05 (0805)</th> <th>RTT06 (1206)</th> <th>RTT12 (1210)</th> <th>RTT20 (2010)</th> <th>RTT25 (2512)</th> </tr> </thead> <tbody> <tr> <td>± 5%</td> <td>1.25A</td> <td>2.5A</td> <td>2.5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> </tr> <tr> <td>± 1%</td> <td>1.25A</td> <td>3.75A</td> <td>5A</td> <td>6.25A</td> <td>8.75A</td> <td>10A</td> <td>12.5A</td> <td>17.5A</td> </tr> </tbody> </table> Refer to JIS-C5201-1 4.13	Type	RTT01 (0201)	RTT02 (0402)	RTT03 (0603)	RTT05 (0805)	RTT06 (1206)	RTT12 (1210)	RTT20 (2010)	RTT25 (2512)	± 5%	1.25A	2.5A	2.5A	5A	5A	5A	5A	5A	± 1%	1.25A	3.75A	5A	6.25A	8.75A	10A	12.5A	17.5A	1. Resistance Range: $\geq 1 \Omega$ 0.1%、0.5%、1%: $\pm (1.0\% + 0.05 \Omega)$ 2%、5%: $\pm (2.0\% + 0.10 \Omega)$ 2. Resistance Range: $< 1 \Omega$ 1%、2%、5%: $\pm (2.0\% + 0.001 \Omega)$	Refer to item 3. general specifications No evidence of mechanical damage.
Type	RTT01 (0201)	RTT02 (0402)	RTT03 (0603)	RTT05 (0805)	RTT06 (1206)	RTT12 (1210)	RTT20 (2010)	RTT25 (2512)																						
± 5%	1.25A	2.5A	2.5A	5A	5A	5A	5A	5A																						
± 1%	1.25A	3.75A	5A	6.25A	8.75A	10A	12.5A	17.5A																						
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 	$\geq 10^9 \Omega$																												
Dielectric Withstand Voltage	Put the resistor in the fixture, add VAC (see SPEC below) in +, - terminal for. RTT05、06、12、20、25 apply 500 VAC 1 minute. RTT01、02、03 apply 300 VAC 1 minute. Refer to JIS-C5201-1 4.7	No short or burned on the appearance.																												
Intermittent Overload	Put the tested resistor in chamber under temperature $25 \pm 2^\circ C$ 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. Jumper : Applied Maximum overload current <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th>Type</th> <th>RTT01 (0201)</th> <th>RTT02 (0402)</th> <th>RTT03 (0603)</th> <th>RTT05 (0805)</th> <th>RTT06 (1206)</th> <th>RTT12 (1210)</th> <th>RTT20 (2010)</th> <th>RTT25 (2512)</th> </tr> </thead> <tbody> <tr> <td>± 5%</td> <td>1.25A</td> <td>2.5A</td> <td>2.5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> </tr> <tr> <td>± 1%</td> <td>1.25A</td> <td>3.75A</td> <td>5A</td> <td>6.25A</td> <td>8.75A</td> <td>10A</td> <td>12.5A</td> <td>17.5A</td> </tr> </tbody> </table> Refer to JIS-C5201-1 4.13	Type	RTT01 (0201)	RTT02 (0402)	RTT03 (0603)	RTT05 (0805)	RTT06 (1206)	RTT12 (1210)	RTT20 (2010)	RTT25 (2512)	± 5%	1.25A	2.5A	2.5A	5A	5A	5A	5A	5A	± 1%	1.25A	3.75A	5A	6.25A	8.75A	10A	12.5A	17.5A	1. Resistance Range: $\geq 1 \Omega$ $\pm (5.0\% + 0.10 \Omega)$ 2. Resistance Range: $< 1 \Omega$ $\pm (5.0\% + 0.001 \Omega)$	Refer to item 3. general specifications
Type	RTT01 (0201)	RTT02 (0402)	RTT03 (0603)	RTT05 (0805)	RTT06 (1206)	RTT12 (1210)	RTT20 (2010)	RTT25 (2512)																						
± 5%	1.25A	2.5A	2.5A	5A	5A	5A	5A	5A																						
± 1%	1.25A	3.75A	5A	6.25A	8.75A	10A	12.5A	17.5A																						
Noise Level	Refer to JIS-C5201-1 4.12	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Resistance</th> <th>Noise</th> </tr> </thead> <tbody> <tr> <td>$R < 100 \Omega$</td> <td>$\leq -10db(0.32 \mu V/V)$</td> </tr> <tr> <td>$100 \Omega \leq R < 1K \Omega$</td> <td>$\leq 0db(1.0 \mu V/V)$</td> </tr> <tr> <td>$1K \Omega \leq R < 10K \Omega$</td> <td>$\leq 10db(3.2 \mu V/V)$</td> </tr> <tr> <td>$10K \Omega \leq R < 100K \Omega$</td> <td>$\leq 15db(5.6 \mu V/V)$</td> </tr> <tr> <td>$100K \Omega \leq R < 1M \Omega$</td> <td>$\leq 20db(10 \mu V/V)$</td> </tr> <tr> <td>$1M \Omega \leq R$</td> <td>$\leq 30db(32 \mu V/V)$</td> </tr> </tbody> </table>	Resistance	Noise	$R < 100 \Omega$	$\leq -10db(0.32 \mu V/V)$	$100 \Omega \leq R < 1K \Omega$	$\leq 0db(1.0 \mu V/V)$	$1K \Omega \leq R < 10K \Omega$	$\leq 10db(3.2 \mu V/V)$	$10K \Omega \leq R < 100K \Omega$	$\leq 15db(5.6 \mu V/V)$	$100K \Omega \leq R < 1M \Omega$	$\leq 20db(10 \mu V/V)$	$1M \Omega \leq R$	$\leq 30db(32 \mu V/V)$	NA													
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6.2 Mechanical Performance Test

ITEM	Conditions	Specifications																	
		Resistors	Jumper																
Core Body Strength	Applied R0.5 test probe at its central part then pushing 10N { 1.02 Kgf } force on the sample for 10 sec. 1.RTT02、RTT03：probe R0.2 2.RTT05、06、12、20、25：probe R0.5 Refer to JIS-C5201-1 4.15	1. Resistance Range: $\geq 1\Omega$ $\pm (1.0\% + 0.05\Omega)$ 2. Resistance Range: $< 1\Omega$ $\pm (1.0\% + 0.001\Omega)$	Refer to item 3. general specifications																
Terminal Strength	Test 1 : The resistor mounted on the board applied 5N pushing force on the sample rear for 10 sec. (RTT01:3N) Test 2 : The resistor mounted on the board slowly add force on the sample rear until the sample termination is breakdown. Refer to JIS-C5201-1 4.16	Test 1 : No evidence of mechanical damage. Test 2 : RTT01 $\geq 3N$ Other Type $\geq 5N$																	
Resistance to Solvent	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 5 minutes, then the resistor is left in the room for 48 hr, and measured its resistance variance rate. Refer to JIS-C5201-1 4.29	1. Resistance Range: $\geq 1\Omega$ <table border="1" style="font-size: small; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Type</td> <td style="padding: 2px;">RTT01</td> <td style="padding: 2px;">Other</td> </tr> <tr> <td style="padding: 2px;">$\Delta R\%$</td> <td style="padding: 2px;">$\pm (1.0\% + 0.05\Omega)$</td> <td style="padding: 2px;">$\pm (0.5\% + 0.05\Omega)$</td> </tr> </table> 2. Resistance Range: $< 1\Omega$ $\pm (1.0\% + 0.001\Omega)$	Type	RTT01	Other	$\Delta R\%$	$\pm (1.0\% + 0.05\Omega)$	$\pm (0.5\% + 0.05\Omega)$	Refer to item 3. general specifications										
Type	RTT01	Other																	
$\Delta R\%$	$\pm (1.0\% + 0.05\Omega)$	$\pm (0.5\% + 0.05\Omega)$																	
Solderability	Preconditioning Put the tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: ◎ Test item 1 (solder pot test): The resistor be immersed into solder pot in temperature $235 \pm 5^\circ\text{C}$ for 2 sec, then the resistor is left as placed under microscope to observed its solder area. ◎ Test item 2 (wetting balance method): Add flux into resistors, then put resistor into wetting balance machine, refer to condition as below, then must be measured and recorded its time changed. <table border="1" style="font-size: x-small; border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="text-align: center;">Testing conditions for wetting balance method with solder pot</td> </tr> <tr> <td style="width: 30%;"></td> <td style="text-align: center;">Condition</td> </tr> <tr> <td>Solder temperature</td> <td style="text-align: center;">$235 \pm 2^\circ\text{C}$</td> </tr> <tr> <td>Immersion speed</td> <td style="text-align: center;">1 to 5 mm/s</td> </tr> <tr> <td>Immersion depth</td> <td style="text-align: center;">0.10 mm</td> </tr> <tr> <td>Immersion angle</td> <td style="text-align: center;">Horizontal</td> </tr> <tr> <td rowspan="3">Mass of solder ball</td> <td style="text-align: center;">5mg → 0201</td> </tr> <tr> <td style="text-align: center;">25mg → 0402、0603</td> </tr> <tr> <td style="text-align: center;">200mg → 0805、1206、1210、2010、2512</td> </tr> </table> By SONY (SS-00254-2) Refer to JIS-C5201-1 4.17	Testing conditions for wetting balance method with solder pot			Condition	Solder temperature	$235 \pm 2^\circ\text{C}$	Immersion speed	1 to 5 mm/s	Immersion depth	0.10 mm	Immersion angle	Horizontal	Mass of solder ball	5mg → 0201	25mg → 0402、0603	200mg → 0805、1206、1210、2010、2512	1. Test item 1: Solder coverage over 95% 2. Test item 2: Zero cross time within 3 seconds.	
Testing conditions for wetting balance method with solder pot																			
	Condition																		
Solder temperature	$235 \pm 2^\circ\text{C}$																		
Immersion speed	1 to 5 mm/s																		
Immersion depth	0.10 mm																		
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ITEM	Conditions	Specifications																																	
		Resistors	Jumper																																
Resistance to Soldering Heat	<p>◎Test method 1 (Reflow test): The tested resistor should be subject in the following procedure, and after finish each step, it should be left for a duration of 2 hours or longer at a temperature of 30°C or lower and a humidity of 70% RH or lower.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>Step</th> <th>Procedure</th> <th>Environmental test condition</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Resistance measuring</td> <td style="text-align: center;">Room temperature</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Baking</td> <td style="text-align: center;">125°C , 24 hours</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Humidification</td> <td style="text-align: center;">85°C , 85% , 168 hours</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Reflow (1)</td> <td>Reflow temperature curve and component surface temperature Table 1</td> </tr> <tr> <td style="text-align: center;">5</td> <td>Humidification</td> <td style="text-align: center;">85°C , 65% , 24 hours</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Reflow (2)</td> <td>Reflow temperature curve and component surface temperature Table 2</td> </tr> <tr> <td style="text-align: center;">7</td> <td>Resistance measuring</td> <td style="text-align: center;">Room temperature</td> </tr> </tbody> </table> <p>◎Reflow temperature curve</p> <p>◎Component surface temperature</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th colspan="3" style="text-align: center;">Table 1 Description example in specification document (1)</th> </tr> <tr> <th style="width: 30%;">Temperature -retaining time :230°C or higher</th> <th style="width: 20%;">Peak temperature</th> <th style="width: 50%;">Temperature measured at the component body surface during preheating</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">30 seconds</td> <td style="text-align: center;">240°C</td> <td style="text-align: center;">150 to 160 °C</td> </tr> </tbody> </table>	Step	Procedure	Environmental test condition	1	Resistance measuring	Room temperature	2	Baking	125°C , 24 hours	3	Humidification	85°C , 85% , 168 hours	4	Reflow (1)	Reflow temperature curve and component surface temperature Table 1	5	Humidification	85°C , 65% , 24 hours	6	Reflow (2)	Reflow temperature curve and component surface temperature Table 2	7	Resistance measuring	Room temperature	Table 1 Description example in specification document (1)			Temperature -retaining time :230°C or higher	Peak temperature	Temperature measured at the component body surface during preheating	30 seconds	240°C	150 to 160 °C	<p>1. Resistance Range: $\geq 1 \Omega$ $\Delta R\% = \pm (1.0\% + 0.05 \Omega)$</p> <p>2. Resistance Range: $< 1 \Omega$ $\Delta R\% = \pm (1.0\% + 0.001 \Omega)$</p> <p>Refer to item 3. general specifications</p> <p>No evidence of electrode damage. No side conductive peel off.</p>
Step	Procedure	Environmental test condition																																	
1	Resistance measuring	Room temperature																																	
2	Baking	125°C , 24 hours																																	
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Series No. **60**

Thick Film Chip Resistors

Product Specification

ITEM	Conditions	Specifications																																					
		Resistors	Jumper																																				
	<p style="text-align: center;">Table 2 Description example in specification document (2)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">Temperature</th> <th style="width: 25%;">Temperature-retaining time</th> <th style="width: 50%;">Temperature measured at the component body surface during preheating</th> </tr> <tr> <td>220°C or higher</td> <td>90 seconds</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">150 to 160°C</td> </tr> <tr> <td>230°C or higher</td> <td>60 seconds</td> </tr> <tr> <td>240°C or higher</td> <td>5 seconds</td> </tr> <tr> <td>Peak</td> <td>245°C</td> </tr> </table> <p>◎Test method 2 (solder pot test): The tested resistor should be subject in the following procedure, and after finish each step, it should be left for a duration of 2 hours or lower at a temperature of 30°C or lower and a humidity of 70% RH or lower.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>Procedure</th> <th>Environmental test condition</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Resistance measuring</td> <td>Room temperature</td> </tr> <tr> <td>2</td> <td>Baking</td> <td>125°C , 24 hours</td> </tr> <tr> <td>3</td> <td>Humidification</td> <td>85°C , 85% , 168 hours</td> </tr> <tr> <td>4</td> <td>Solder pot test</td> <td>260± 3°C , 10 sec</td> </tr> <tr> <td>5</td> <td>Placed</td> <td>85°C , 65% , 24 hours</td> </tr> <tr> <td>6</td> <td>Solder pot test</td> <td>260± 3°C , 10 sec</td> </tr> <tr> <td>7</td> <td>Resistance measuring</td> <td>Room temperature</td> </tr> </tbody> </table> <p>◎Test method 3 (Electric iron test): Preheating temperature : 350± 10°C Electric iron preheating time : 3+1/-0 sec Preheating the electric iron on electrode termination, as after that step placed the iron over 60 min. and measured its resistance variance rate. By Sony (SS-00254-5) Refer to JIS-C5201-1 4.18</p>	Temperature	Temperature-retaining time	Temperature measured at the component body surface during preheating	220°C or higher	90 seconds	150 to 160°C	230°C or higher	60 seconds	240°C or higher	5 seconds	Peak	245°C	Step	Procedure	Environmental test condition	1	Resistance measuring	Room temperature	2	Baking	125°C , 24 hours	3	Humidification	85°C , 85% , 168 hours	4	Solder pot test	260± 3°C , 10 sec	5	Placed	85°C , 65% , 24 hours	6	Solder pot test	260± 3°C , 10 sec	7	Resistance measuring	Room temperature		
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7	Resistance measuring	Room temperature																																					
Joint Strength of Solder	<p>Preconditioning Put 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 specimen in a temperature for 2 hours or more. Test method: ◎Test item 1 (Adhesion): A static load using a R0.5 (0201:R0.1) scratch tool shall be applied on the core of the component and in the direction of the arrow and held for 10</p>	<p>Test item 1: (1).Variance rate on resistance 1. Resistance Range: ≥ 1 Ω ΔR%=± (1.0%+0.05 Ω) 2. Resistance Range: <1 Ω ΔR%=± (1.0%+0.001 Ω) (2). No evidence of mechanical damage No terminal peel off.</p>	Refer to item 3. general specifications																																				

Remark

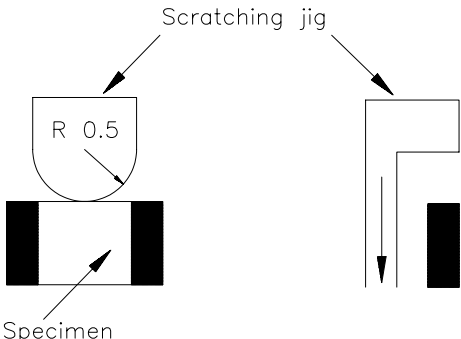
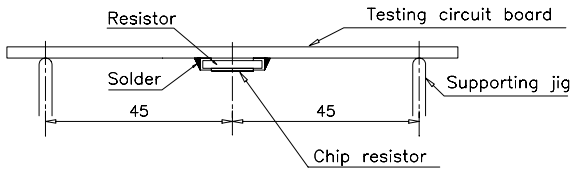
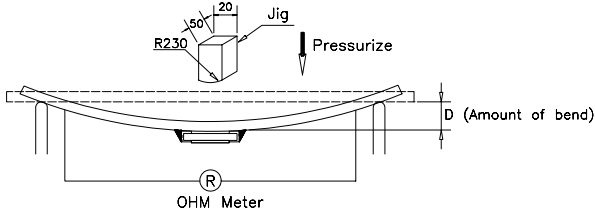
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Series No. **60**

Thick Film Chip Resistors Product Specification

ITEM	Conditions	Specifications	
		Resistors	Jumper
	<p>seconds and under load measured its resistance variance rate.</p> <p>1.RTT02=10N load 2.Other type=20N load 3.RTT01=5N load</p> <p style="text-align: center;">Cross-sectional view</p>  <p style="text-align: center;">Specimen</p> <p>Refer to JIS-C5201-1 4.32</p> <p>◎Test item 2 (Bending Strength): Solder tested resistor on to PC board. add force in the middle down , and under load measured its resistance variance rate . D:RTT02、03、05=5mm RTT01、06、12=3mm RTT20、25=2mm</p>   <p style="text-align: center;">OHM Meter</p> <p>Refer to JIS-C5201-1 4.33</p> <p>◎Test item 3 (Endurance measurement): Put the tested resistor in the chamber under the temperature cycle which shown in table 1 shall be repeated 1000± 4 times consecutively. Then separate follow test item 1 and test item 2 50% condition to test, measured its resistance variance rate.</p>	<p>Test item 2:</p> <p>(1).Vaviance rate on resistance</p> <p>1.Resistance Range: $\geq 1 \Omega$ $\Delta R\% = \pm (1.0\% + 0.05 \Omega)$</p> <p>2.Resistance Range: $< 1 \Omega$ $\Delta R\% = \pm (1.0\% + 0.001 \Omega)$</p> <p>(2).No evidence of mechanical damage.</p> <p>No terminal peel off and core body cracked.</p> <p>Test item 3:</p> <p>(1).Adhesion: After application of temperature cycle, adhesion should be 50% or more of initial strength.</p> <p>(2).Bending Strength: After application of temperature cycle, bending load should be 50% or more of initial strength.</p>	

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Series No. **60**

ITEM	Conditions	Specifications									
		Resistors	Jumper								
	<p style="text-align: center;">Table 1 Temperature cycle test condition</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="width:40%;">Testing condition</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lowest temperature</td> <td style="text-align: center;">-35± 5°C</td> </tr> <tr> <td style="text-align: center;">Highest temperature</td> <td style="text-align: center;">105± 5°C</td> </tr> <tr> <td style="text-align: center;">Temperature-retaining time</td> <td style="text-align: center;">15 minutes each</td> </tr> </tbody> </table> <p>By SONY (SS-00254-7)</p>		Testing condition	Lowest temperature	-35± 5°C	Highest temperature	105± 5°C	Temperature-retaining time	15 minutes each		
	Testing condition										
Lowest temperature	-35± 5°C										
Highest temperature	105± 5°C										
Temperature-retaining time	15 minutes each										
Leaching Test	<p>The tested resistor be immersed into molten solder of 260± 5°C for 30 seconds. Then the resistor is left as placed under microscope to observed its solder area.</p> <p>By SONY (SS-00254-9)</p>	<p>1.Solder coverage over 95%. 2.The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode.</p>									
Vibration	<p>The resistor shall be mounted by its terminal leads to the supporting terminals on the solid table. The entire frequency range :from 10 Hz to 55 Hz and return to 10 Hz, shall be transferred in 1 min. Amplitude :1.5 mm This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (a total of 6 hr) Refer to JIS-C5201-1 4.22</p>	<p>1.Resistance Range : ≥ 1 Ω 0.1%、0.5%、1%:± (0.5%+0.05Ω) 2%、5%:± (1.0%+0.05Ω) 2. :Resistance Range : <1 Ω 1%、2%、5%:± (1.0%+0.001Ω)</p>	<p>Refer to item 3. general specifications</p>								
		<p>No evidence of mechanical damage.</p>									

Thick Film Chip Resistors Product Specification

6.3 Environmental Test

ITEM	Conditions	Specifications									
		Resistors	Jumper								
Resistance to Dry Heat	Put tested resistor in chamber under temperature 155± 5°C for 1000 +48/-0 hours. Then leaving the tested resistor in room temperature for 60 minutes , and measure its resistance variance rate. P.S RTT01 for 125± 3°C Refer to JIS-C5201-1 4.25	1. Resistance Range: ≥ 1Ω 0.1%、0.5%、1%:± (1.0%+0.05Ω) 2%、5%:± (2.0%+0.10Ω) 2. Resistance Range: <1Ω 1%、2%、5%:± (1.0%+0.001Ω)	Refer to item 3. general specifications								
Thermal Shock	Put the tested resistor in the chamber under the Thermal Shock 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; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 50%;">Testing Condition</th> </tr> <tr> <td>Lowest Temperature</td> <td style="text-align: center;">-55± 5°C</td> </tr> <tr> <td>Highest Temperature</td> <td style="text-align: center;">125± 5°C</td> </tr> <tr> <td>Temperature-retaining time</td> <td style="text-align: center;">15 minutes each</td> </tr> </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. Resistance Range: ≥ 1Ω 0.1%、0.5%、1%:± (0.5%+0.05Ω) 2%、5%:± (1.0%+0.05Ω) 2. Resistance Range: <1Ω 1%、2%、5%:± (1.0%+0.001Ω)	Refer to item 3. general specifications
	Testing Condition										
Lowest Temperature	-55± 5°C										
Highest Temperature	125± 5°C										
Temperature-retaining time	15 minutes each										
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	1. Resistance Range: ≥ 1Ω <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <th style="width: 10%;">Type</th> <th style="width: 40%;">RTT01</th> <th style="width: 50%;">其它</th> </tr> <tr> <td rowspan="2">Range</td> <td>1%:± (1.0%+0.05Ω) 5%:± (3.0%+0.1Ω)</td> <td>0.1%、0.5%、1%: ± (0.5%+0.05Ω) 2%、5%: ± (2.0%+0.10Ω)</td> </tr> </table> 2. Resistance Range: <1Ω 1%、2%、5%:± (2.0%+0.001Ω)	Type	RTT01	其它	Range	1%:± (1.0%+0.05Ω) 5%:± (3.0%+0.1Ω)	0.1%、0.5%、1%: ± (0.5%+0.05Ω) 2%、5%: ± (2.0%+0.10Ω)	Refer to item 3. general specifications		
Type	RTT01	其它									
Range	1%:± (1.0%+0.05Ω) 5%:± (3.0%+0.1Ω)	0.1%、0.5%、1%: ± (0.5%+0.05Ω) 2%、5%: ± (2.0%+0.10Ω)									
	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	1. Resistance Range: ≥ 1Ω 0.1%、0.5%、1%:± (1.0%+0.05Ω) 2%、5%:± (3.0%+0.10Ω) 2. Resistance Range: <1Ω 1%、2%、5%:± (2.0%+0.001Ω)	Refer to item 3. general specifications							
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	1. Resistance Range: ≥ 1Ω 0.1%、0.5%、1%:± (0.5%+0.05Ω) 2%、5%:± (1.0%+0.05Ω) 2. Resistance Range: <1Ω 1%、2%、5%:± (1.0%+0.001Ω)	Refer to item 3. general specifications								
Whisker Test	◎Test item 1 (Thermal Shock test): <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <td>Minimum storage temperature</td> <td style="text-align: center;">-40± 2°C</td> </tr> <tr> <td>Maximum storage temperature</td> <td style="text-align: center;">85± 2°C</td> </tr> <tr> <td>Temperature-retaining time</td> <td style="text-align: center;">7 min.</td> </tr> <tr> <td>Number of temperature cycles</td> <td style="text-align: center;">1,500</td> </tr> </table>	Minimum storage temperature	-40± 2°C	Maximum storage temperature	85± 2°C	Temperature-retaining time	7 min.	Number of temperature cycles	1,500	Max. 50 μm	
Minimum storage temperature	-40± 2°C										
Maximum storage temperature	85± 2°C										
Temperature-retaining time	7 min.										
Number of temperature cycles	1,500										

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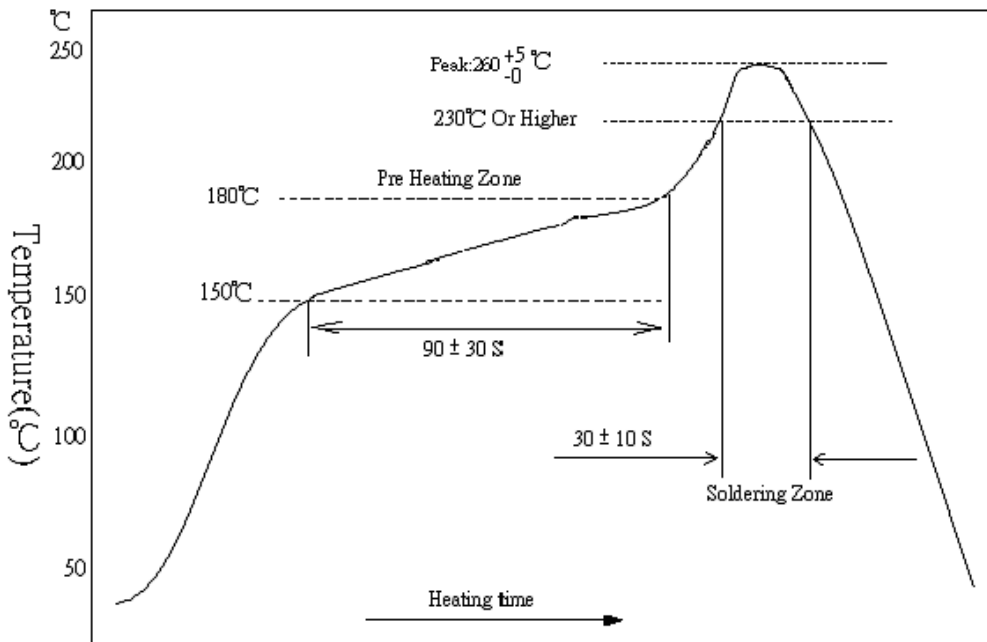
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Series No. **60**

ITEM	Conditions	Specifications							
		Resistors	Jumper						
	<p>◎Test item 2 (Constant temperature/humidity test):</p> <table border="1"> <tr> <td>Temperature</td> <td>85°C</td> </tr> <tr> <td>Humidity</td> <td>85%</td> </tr> <tr> <td>Testing duration</td> <td>500± 4 hours</td> </tr> </table> <p>◎Inspection: Inspect for whisker formation on specimens that underwent the acceleration test specified in subclause 4.2, with a magnifier (stere omicroscope) 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 SONY (SS-00254-8)</p>	Temperature	85°C	Humidity	85%	Testing duration	500± 4 hours		
Temperature	85°C								
Humidity	85%								
Testing duration	500± 4 hours								

7 Recommend Soldering Method

7.1 Lead Free 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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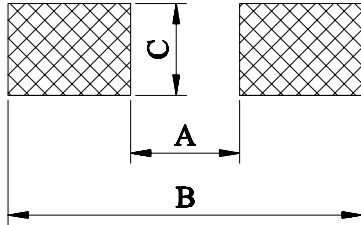
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Series No. **60**

8 Recommend Land Pattern Design (For Reflow Soldering)

Unit : mm



DIM TYPE	A	B	C
RTT01	0.3	1.0	0.4
RTT02	0.5	1.5	0.6
RTT03	0.8	2.1	0.9
RTT05	1.2	3.0	1.3
RTT06	2.2	4.2	1.6
RTT12	2.2	4.2	2.8
RTT20	3.5	6.1	2.8
RTT25	3.8	8.0	3.5

9 Marking Diagrams

9.1 Resistance Range: $\geq 1 \Omega$

9.1.1 RTT03、05、06、12、20、25 $\pm 2\%$ 、 $\pm 5\%$ Tolerance:

9.1.1.1 Resistance Range $\geq 10 \Omega$: 3 digits in E-24 series, first two digits are significant figures, third digit is multiplier (10^x).

《EX》 Marking $\rightarrow 100$
 $100 = 10 \times 10^0 = 10 \Omega$

9.1.1.2 Resistance Range $< 10 \Omega$: 3 digits in E-24 series, first and third digits are significant figures, second digit is multiplier (10^{-1}).

《EX》 Marking $\rightarrow 4R7$
 $4R7 = 47 \times 10^{-1} = 4.7 \Omega$

9.1.2 RTT05、06、12、20、25 $\pm 0.1\%$ 、 $\pm 0.5\%$ 、 $\pm 1\%$ Tolerance:

9.1.2.1 Resistance Range $\geq 100 \Omega$: 4 digits in E-24 series or E-96 series, first three digits are significant figures, fourth digit is multiplier (10^x).

《EX》 Marking $\rightarrow 1002$
 $1002 = 100 \times 10^2 = 10000 \Omega = 10K \Omega$

9.1.2.2 Resistance Range $< 100 \Omega$: 4 digits in E-24 series or E-96 series, three digits are significant figures, R digit is multiplier (10^x).

《EX》 Marking $\rightarrow 10R2$, R digit is multiplier (10^{-1}).
 $10R2 = 102 \times 10^{-1} = 10.2 \Omega$
 Marking $\rightarrow 1R02$, R digit is multiplier (10^{-2}).
 $1R02 = 102 \times 10^{-2} = 1.02 \Omega$

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Series No. **60**

Thick Film Chip Resistors
Product Specification

9.1.3 RTT03 ± 0.1%、± 0.5%、± 1% Tolerance:
For EIAJ-96 Marking.

《EX》 Marking→47B
47B=301x 10¹ = 3010Ω = 3.01KΩ

If the resistance is not in E-96 series and in E-24 series, the marking is expressed by E-24 series and one short bar under marking letter.

R value > 100Ω: marking 391 391=39 x10¹=390Ω
R value < 100Ω: marking 390 390=39 x10⁰=39Ω

9.2 Resistance Range: < 1Ω

9.2.1 RTT03、05、06、12、20、25 ± 1%、± 2%、± 5% Tolerance:

9.2.1.1 Resistance Range ≥ 100 mΩ: 4 digits in E-24 series or E-96 series, later three digits are significant figures, first digit is multiplier (10⁻³).

《EX》 Marking→R220 (E-24 series)
R220=220x 10⁻³ = 0.22Ω = 220mΩ
Marking→R102 (E-96 series)
R102=102x 10⁻³ = 0.102Ω = 102mΩ

9.2.1.2 Resistance Range < 100 mΩ: 4 digits in E-24 series, later two digits are significant figures, first digit is multiplier (10⁻³).

《EX》 Marking→R022
R022=22x 10⁻³ = 0.022Ω = 22mΩ

9.3 RTT 0R:

9.3.1 RTT03、05、06、12、20、25 ± 1% Tolerance : The marking is expressed by "000".

9.3.2 RTT03、05、06、12、20、25 ± 5% Tolerance : The marking is expressed by "0".

9.4 RTT01、RTT02 No Marking

9.5 Marking

9.5.1 E-24 series

10	11	12	13	15	16	18	20	22	24	27	30
33	36	39	43	47	51	56	62	68	75	82	91

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Series No. **60**

Thick Film Chip Resistors Product Specification

9.5.2 E-96 series

100	102	105	107	110	113	115	118	121	124	127	130
133	137	140	143	147	150	154	158	162	165	169	174
178	182	187	191	196	200	205	210	215	221	226	232
237	243	249	255	261	267	274	280	287	294	301	309
316	324	332	340	348	357	365	374	383	392	402	412
422	432	442	453	464	475	487	499	511	523	536	549
562	576	590	604	619	634	649	665	681	698	715	732
750	768	787	806	825	845	866	887	909	931	953	976

9.5.3 EIAJ-96

This table shows the first two digits for the three-digits EIAJ-96 part marking scheme.
The third character is a letter multiplier:

Code	Ω	Code	Ω	Code	Ω	Code	Ω	Code	Ω	Code	Ω	Code	Ω	Code	Ω
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

Y=10⁻² X=10⁻¹ A=10⁰ B=10¹ C=10² D=10³ E=10⁴ F=10⁵

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Series No. **60**

9.6 Marking Standard

Making Type	A	B	C	D	E	F	X	Y			
0603											
Making Type	1	2	3	4	5	6	7	8	9	0	R
0603											
0805											
1206											
1210											
2010 2512											

10 Plating Thickness

10.1 Ni : $\geq 1 \mu m$

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

10.3 Sn (Tin) : Matte Sn

Remark

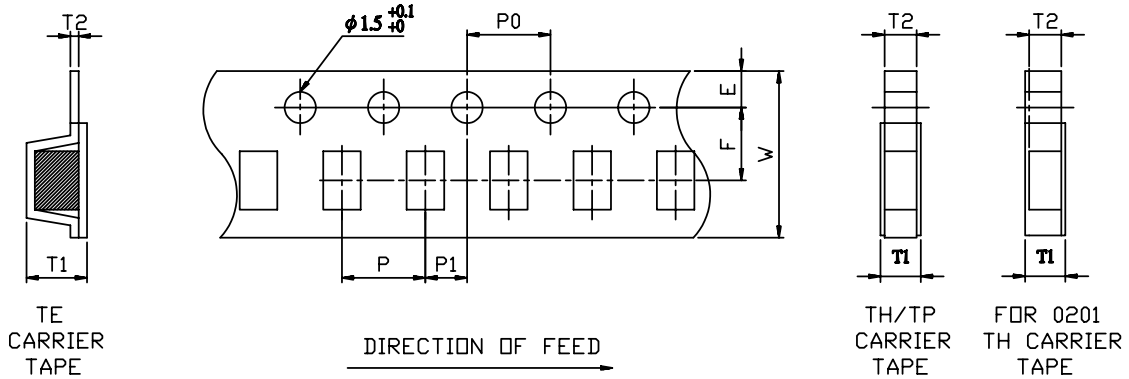
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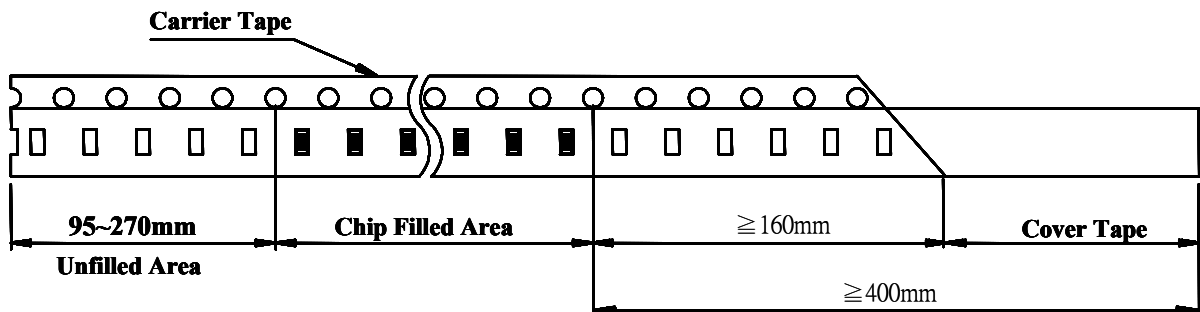
11 Taping Specifications
11.1 Tape Dimensions



Unit: mm

Packaging	DIM TYPE	A	B	W	E	F	T1	T2	P	P0	10x P0	P1
		TH Carrier Tape	RTT01	0.68± 0.03	0.38± 0.03	8.0± 0.1	1.75± 0.1	3.5± 0.05	0.45+0.1/-0	0.28± 0.02	2.0± 0.05	4.0± 0.05
	RTT02	1.15± 0.05	0.65± 0.05	8.0± 0.2	1.75± 0.1	3.5± 0.05	0.45+0.2/-0	0.45± 0.05	2.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
TP Carrier Tape	RTT03	1.80± 0.1	1.00± 0.1	8.0± 0.2	1.75± 0.1	3.5± 0.05	0.60+0.2/-0	0.60± 0.1	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
	RTT05	2.30± 0.1	1.55± 0.1	8.0± 0.2	1.75± 0.1	3.5± 0.05	0.75+0.2/-0	0.75± 0.1	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
	RTT06	3.50± 0.2	1.90± 0.2	8.0± 0.2	1.75± 0.1	3.5± 0.05	0.75+0.2/-0	0.75± 0.1	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
	RTT12	3.50± 0.2	2.80± 0.2	8.0± 0.2	1.75± 0.1	3.5± 0.05	0.75+0.2/-0	0.75± 0.1	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
	RTT20	5.50± 0.2	2.80± 0.2	12.0± 0.2	1.75± 0.1	5.5± 0.05	0.75+0.2/-0	0.75± 0.1	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
TE Carrier Tape	RTT20	5.50± 0.2	2.80± 0.2	12.0± 0.2	1.75± 0.1	5.5± 0.05	0.85± 0.15	0.23± 0.15	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05
	RTT25	6.70± 0.2	3.40± 0.2	12.0± 0.2	1.75± 0.1	5.5± 0.05	0.85± 0.15	0.23± 0.15	4.0± 0.1	4.0± 0.05	40.0± 0.20	2.0± 0.05

11.2 Lead Dimensions:



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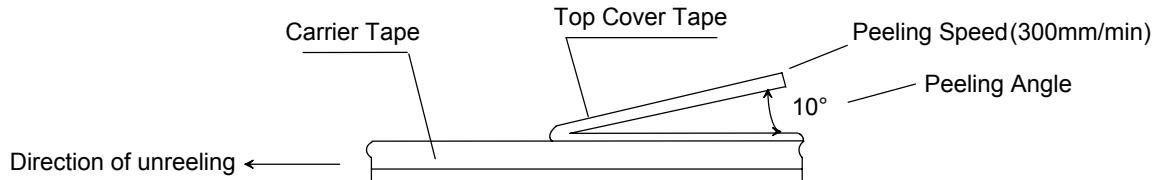
Series No. **60**

Thick Film Chip Resistors Product Specification

11.3 Cover Tape Peel off Strength

Specifications: 0201、0402 => 0.07~0.5 N (7.1~51 gf)

0603、0805、1206、1210、2010、2512 => 0.07~0.7N (7.1~71.4gf)



11.4 Packaging QTY:

TYPE	Tape Width	Packaging QTY (pcs / reel)													
		TH						TP				TE			
		2 mm Pitch						4 mm Pitch				4 mm Pitch			
		TH	H0	H2	H3	H4	H5	TP	P2	P3	P4	TE	E2	E3	E4
RTT01	8 mm	10,000	15,000	--	--	--	50,000	--	--	--	--	--	--	--	--
RTT02	8 mm	10,000	--	20,000	30,000	40,000	50,000	--	--	--	--	--	--	--	--
RTT03	8 mm	--	--	--	--	--	--	5,000	10,000	15,000	20,000	--	--	--	--
RTT05	8 mm														
RTT06	8 mm														
RTT12	8 mm														
RTT20	12 mm	--	--	--	--	--	--	--	--	--	--	4,000	8,000	12,000	16,000
RTT25	12 mm	--	--	--	--	--	--	--	--	--	--	4,000	8,000	12,000	16,000
Reel Type		7"	7"	10"	13"	13"	13"	7"	10"	13"	13"	7"	10"	13"	13"

TYPE	Tape Width	Bulk Case (pcs / case)	
RTT02	8 mm		50,000
RTT03	8 mm		25,000
RTT05	8 mm		10,000
RTT06	8 mm		5,000
RTT12	8 mm		--
RTT20	12 mm		--
RTT25	12 mm		--

11.4.1 Typical taping type : TH、TP、TE

11.4.2 Other taping type are upon customer's request.

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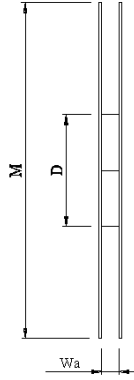
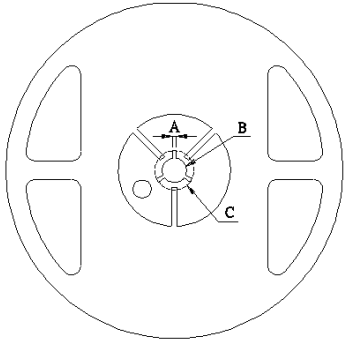
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Series No. **60**

Thick Film Chip Resistors Product Specification

11.5 Reel Dimensions:

Unit: mm



Reel Type/ Tape	Wa	M	A	B	C	D
7" reel for 8 mm tape	9.0 ± 0.5	178 ± 2.0	2.0 ± 0.5	13.5 ± 0.5	21.0 ± 0.5	60.0 ± 1.0
7" reel for 12 mm tape	13.8 ± 0.5	178 ± 2.0				80.0 ± 1.0
10" reel for 8 mm tape	10.0 ± 0.5	254 ± 2.0				100.0 ± 1.0
13" reel for 8 mm tape	10.0 ± 0.5	330 ± 2.0				100.0 ± 1.0

11.6 Label:

Computer No. Type Tolerance R Value Quantity

↑ ↑ ↑ ↑ ↑

0805T **5%** **10K** **Pb-free**

504J103 5000 PCS 001

R09010001 RTT05103JTP

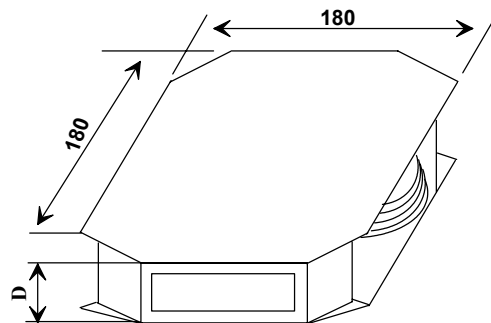
Lot No. Running Number

→ RALEC → Year(2009) → Week → Running Number

R 0 9 0 1 0 0 0 1

11.7 Inner Box

Reel Number	D Dimension (mm)
1	12
2	24
3	36
4	48
5	60
6	72
7	84
8	96
9	108
10	120



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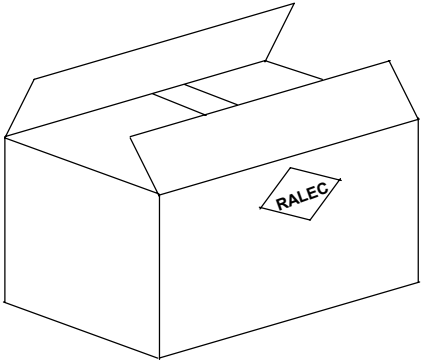
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Thick Film Chip Resistors Product Specification

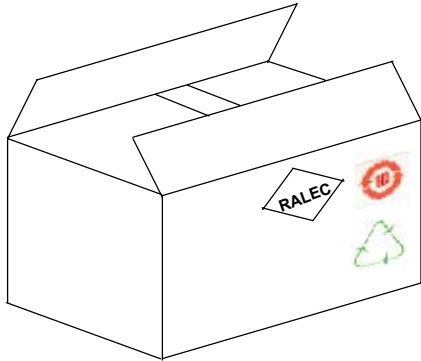
11.8Box

10R Inner Box Number	L(mm)	W(mm)	D(mm)
2	272	205	210
4	375	280	210
8	544	380	210



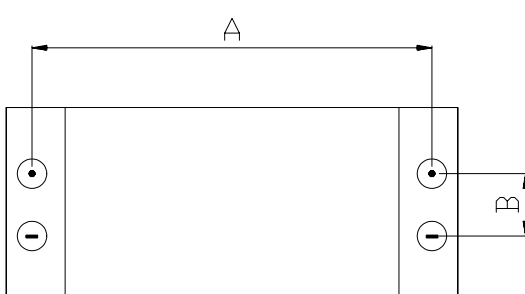
11.9Box (For China)

10R Inner Box Number	L(mm)	W(mm)	D(mm)
2	272	205	210
4	375	280	210
8	544	380	210



12 Measurement Point

Bottom electrode		Unit : mm	
TYPE	DIM	A	B
	RTT01		0.44± 0.05
RTT02		0.80± 0.05	0.24 ± 0.05
RTT03		1.35± 0.05	0.35 ± 0.05
RTT05		1.80 ± 0.05	0.35 ± 0.05
RTT06		2.90 ± 0.05	0.35 ± 0.05
RTT12		2.90 ± 0.05	0.35 ± 0.05
RTT20		4.50 ± 0.05	1.15 ± 0.05
RTT25		5.90 ± 0.05	1.60 ± 0.05



● Current Terminal
 ⊖ Voltage Terminal

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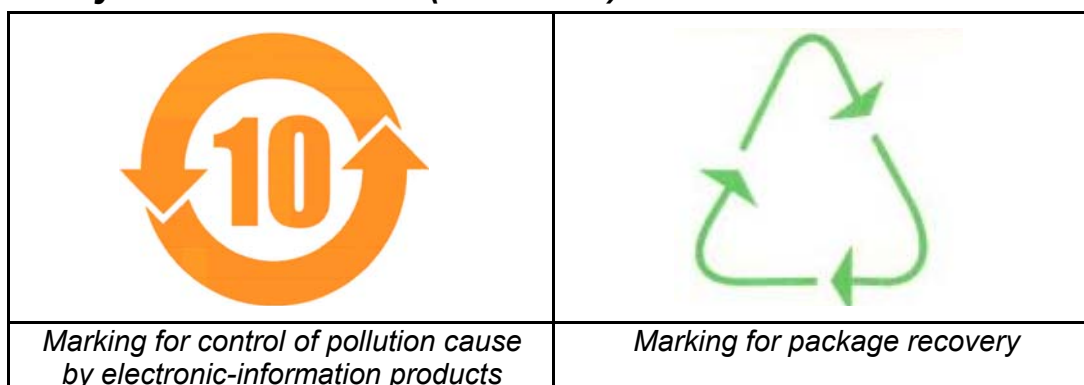
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Series No. **60**

13 Stock period

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

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



15 For this part. It does not use the materials that include the substances specified in RoHS , the detail refer to the part of prohibition or exclusion items in RoHS(2002/95/EC).

15.1 Cadmium and cadmium compounds (permissive content <100 ppm)

15.2 Lead and lead compounds (permissive content <1000 ppm)

15.2.1 Exceptions specified:

15.2.1.1 Lead contained in the glass of cathode ray tubes, electronic components and fluorescent tubes.

15.2.1.2 The glass material used in the electronic components, which includes resistor elements, conductive pastes (silver or copper ones), adhesives, glass frit and sealing materials.

15.3 Mercury and its mercury compounds (permissive content <100 ppm)

15.4 Hexavalent chromium compounds (permissive content <100 ppm)

15.5 Polybrominated biphenyls(PBB)(permissive content <100 ppm)

15.6 Polybrominated diphenylethers(PBDE)(permissive content <100 ppm)

16 Attachments

16.1 Document Revise Record Paper

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