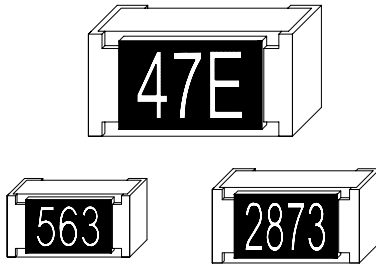


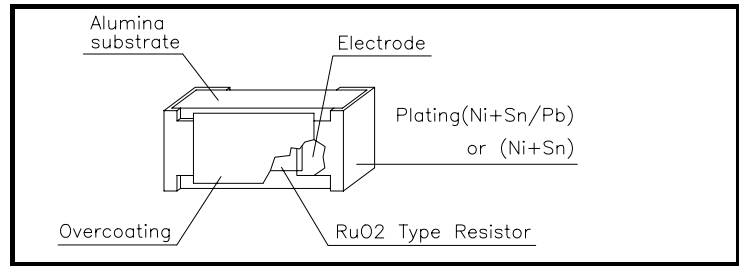
Thick Film Chip Resistors

RCT&RTT 01,02,03,05,06,12,20,25

RALEC



■ Construction



■ Feature

- 1.Small size and light weight.
- 2.High reliability and stability.
- 3.Lower assembly cost.

■ Application

- 1.Computer application, NB, MB, add-on card harddisk....
- 2.Mobile phone, Telecom....
- 3.Consumer electrical equipment, PDA, Digital Camera....
- 4.Battery changer, DC-DC power converter
- 5.Automotive

■ Explanation of Part Numbers

(EX)

Type	Size	Nominal Resistance		Resistance Tolerance	Packaging
Thick Film Chip Resistors	01(0201) 02(0402) 03(0603) 05(0805) 06(1206) 12(1210) 20(2010) 25(2512)	Resistors	3-Digit E24 Series EX $2.2\Omega=2R2$ $100\Omega=101$	$D=\pm 0.5\%$ $F=\pm 1\%$ $G=\pm 2\%$ $J=\pm 5\%$	TH 2 mm Pitch Paper(Taping) 10000 pcs TP 4 mm Pitch Paper(Taping) 5000 pcs P2 4 mm Pitch Paper(Taping) 10000 pcs P3 4 mm Pitch Paper(Taping) 15000 pcs P4 4 mm Pitch Paper(Taping) 20000 pcs TE 4 mm Pitch Emboss(Taping) 4000 pcs BA Bulk Case
RCT:Sn/Pb Process RTT:Sn (Tin) Process		Jumper	000		

■ Dimensions

Unit:mm

Type	Dimensions					
	L	W	H	L1	L2	
RCT01 (0201)	0.60± 0.03	0.30± 0.03	0.23± 0.03	0.12± 0.05	0.15± 0.05	
RCT&RTT02 (0402)	1.00± 0.10	0.50± 0.05	0.30± 0.05	0.20± 0.10	0.25± 0.10	
RCT&RTT03 (0603)	1.55± 0.10	0.80 ^{+0.15} _{-0.05}	0.45± 0.10	0.30± 0.15	0.30± 0.15	
RCT&RTT05 (0805)	2.00± 0.10	1.25± 0.10	0.50± 0.10	0.35± 0.20	0.35± 0.15	
RCT&RTT06 (1206)	3.05± 0.10	1.55± 0.10	0.55 ^{+0.10} _{-0.05}	0.45± 0.20	0.35± 0.15	
RCT&RTT12 (1210)	3.05± 0.10	2.55± 0.10	0.55± 0.10	0.50± 0.20	0.50± 0.20	
RCT&RTT20 (2010)	5.00± 0.20	2.50± 0.20	0.55± 0.10	0.60± 0.20	0.60± 0.20	
RCT&RTT25 (2512)	6.30± 0.20	3.20± 0.20	0.55± 0.10	0.60± 0.20	0.60± 0.20	

Thick Film Chip Resistors

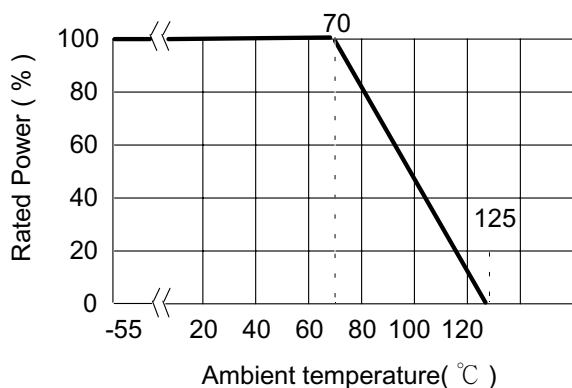
RCT&RTT 01,02,03,05,06,12,20,25

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■ Standard electrical specifications

Type	Rated Power at 70℃	Max. Working Voltage	Max. Overload Voltage	T.C.R. (ppm/℃)	Resistance Range					Jumper Rated Current	Jumper Resistance Value
					B(± 0.1%) E-96	D(± 0.5%) E-96	F(± 1%) E-96	G(± 2%) E-24	J(± 5%) E-24		
RCT01	$\frac{1}{20}$ W	25V	50V	± 250	-----	-----	10Ω~1MΩ	-----	10Ω~1MΩ	0.5A	100mΩ MAX
RCT RTT 02	$\frac{1}{16}$ W	50V	100V	+500 -200	-----	-----	1Ω~9.9Ω	1Ω~9.9Ω	1Ω~9.9Ω	1A	50mΩ MAX
				± 200	-----	100Ω~990Ω	10Ω~990Ω	10Ω~990Ω	10Ω~990Ω		
				± 300	-----	1K~1MΩ	1K~4M7Ω	1K~4M7Ω	1K~10MΩ		
RCT RTT 03	$\frac{1}{10}$ W	50V	100V	± 100	100Ω~1MΩ	100Ω~1MΩ	33Ω~1MΩ	-----	-----	1A	50mΩ MAX
				± 200	-----	10Ω~99Ω	10Ω~32Ω 1.1M~10MΩ	10Ω~10MΩ	10Ω~10MΩ		
				± 400	-----	-----	1Ω~9.9Ω	1Ω~9.9Ω	1Ω~9.9Ω 11MΩ-26MΩ		
RCT RTT 05	$\frac{1}{8}$ W	150V	300V	± 100	100Ω~1MΩ	100Ω~1MΩ	33Ω~1MΩ	-----	-----	2A	50mΩ MAX
				± 200	-----	-----	10Ω~32Ω 1.1M~10M	10Ω~10MΩ	10Ω~10MΩ		
				± 400	-----	-----	1Ω~9.9Ω	1Ω~9.9Ω	1Ω~9.9Ω 11MΩ-26MΩ		
RCT RTT 06	$\frac{1}{4}$ W	200V	400V	± 100	100Ω~1MΩ	100Ω~1MΩ	33Ω~1MΩ	-----	-----	2A	50mΩ MAX
				± 200	-----	-----	10Ω~32Ω 1.1M~10MΩ	10Ω~10MΩ	10Ω~10MΩ		
				± 400	-----	-----	1Ω~9.9Ω	1Ω~9.9Ω	1Ω~9.9Ω 11MΩ-26MΩ		
RCT RTT 12	$\frac{1}{3}$ W	200V	400V	± 100	100Ω~ 1MΩ	100Ω~ 1MΩ	33Ω~1MΩ	-----	-----	2A	50mΩ MAX
				± 200	-----	-----	10Ω~32Ω 1.1M~10M	10Ω~10M	10Ω~20MΩ		
				± 400	-----	-----	1Ω~9.9Ω	1Ω~9.9Ω	1Ω~9.9Ω		
RCT RTT 20	$\frac{3}{4}$ W	200V	400V	± 100	-----	-----	10Ω~1MΩ	-----	-----	2A	50mΩ MAX
				± 200	-----	-----	-----	10Ω~1MΩ	10Ω~1MΩ		
				± 400	-----	-----	-----	-----	1Ω~9.9Ω		
RCT RTT 25	1W	200V	400V	± 100	-----	-----	10Ω~1MΩ	-----	-----	2A	50mΩ MAX
				± 200	-----	-----	-----	10Ω~1MΩ	10Ω~10MΩ		
				± 400	-----	-----	-----	-----	1Ω~9.9Ω		
Operating Temperature Range					- 55℃ ~ +125℃						

■ Power Derating Curve



■ Marking



FOR E-24&E-96

◎2%,5% 3 digits indication

first 2 digits are significant figures
3rd digit is multiplier(10^x)

EX. Marking --> 563

$$56 \times 10^3 = 56000 \Omega = 56K \Omega$$

◎1% 4 digits indication

first 3 digits are significant figures
4th digit is multiplier(10^x)

EX. Marking --> 3922

$$392 \times 10^2 = 39200 \Omega = 39.2K \Omega$$

FOR RCT03 1%(E-96)

◎3 digit indication

first 2 digits are significant for E-96 Part marking scheme.
3rd digit is multiplier:

$$Y=10^{-2}$$

$$X=10^{-1}$$

$$A=10^0$$

$$B=10^1$$

$$C=10^2$$

$$D=10^3$$

$$E=10^4$$

$$F=10^5$$

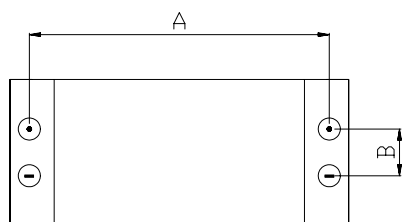
Type RCT01,02:No marking Code

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■ Measurement Point For Low-Ohmic Chip Resistors

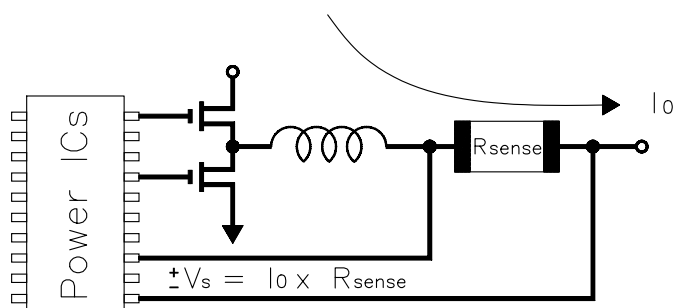


⊙ Current Terminal

⊖ Voltage Terminal

DIM TYPE	A	B
RCT&RTT03	1.35 ± 0.05	0.35 ± 0.05
RCT&RTT05	1.80 ± 0.05	0.35 ± 0.05
RCT&RTT06	2.90 ± 0.05	0.35 ± 0.05
RCT&RTT12	2.90 ± 0.05	0.35 ± 0.05
RCT&RTT20	4.50 ± 0.05	1.15 ± 0.05
RCT&RTT25	5.90 ± 0.05	1.60 ± 0.05

■ Function For Low-Ohmic Chip Resistors



Selection of R sense:

On general case, the feedback voltage is set around 100 mV.

$$100 \text{ mV} = I_o \times R \text{ sense}$$

where I_o means the maximum average output current.

■ Standard Resistance Values

For 2%,5%(E-24)

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

For 1%(E-96)

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

■ Alternate Marking Method

For RCT03 1%(E-96)

Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value
1	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750		
2	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768		
3	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787		
4	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806		
5	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825		
6	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845		
7	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866		
8	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887		
9	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		

Thick Film Chip Resistors

RCT 01,02,03,05,06,12,20,25

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■ Reliability Test

Item	Specification			Test Method
	R: $\geq 1\Omega$		R: $< 1\Omega$	
	0.5%、1%	2%、5%	1%、2%、5%	
Temperature Coefficient of Resistance	Within the specification of TCR			JIS-C5202-5.2 $TCR \text{ (ppm/}^{\circ}\text{C)} = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10$ 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
Short Time Overload	$\pm (1.0\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-5.5 Apply 2.5 times rated voltage or Max. Overload Voltage for 5 seconds.
	RCT01 : $\pm (2.0\% + 0.10\Omega)$			
Insulation Resistance	$\geq 10^9\Omega$			JIS-C5202-5.6 Put the resistor in the fixture, add 100 VDC in +,- terminal for 60 seconds then measured the insulation resistance. (RCT01 N/A)
Dielectric Withstand Voltage	No short or burned on the appearance			JIS-C5202-5.7 Apply 500VAC for 1min.(RCT02,03 300VAC). (RCT01 N/A)
Intermittent Overload	$\pm (5.0\% + 0.10\Omega)$		$\pm (5.0\% + 0.001\Omega)$	JIS-C5202-5.8 Apply rated voltage 2.5 times, 1sec ON, 25sec OFF, 10000 test cycle. (RCT01 N/A)
Bending Strength	$\pm (1.0\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.1.4 RCT02 ,03 ,05=5 mm ; RCT01,06,12,=3 mm ; RCT20,25=2 mm deflection in either direction.
Terminal Strength	No evidence of mechanical damage			JIS-C5202-6.1.4 Apply 5N pushing force for 10sec. (RCT01 N/A)
Resistance to Solvent	$\pm (0.5\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.9 Immersed into isopropyl alcohol of 23 ~ 25 $^{\circ}$ C for 60 seconds.
Resistance to Soldering Heat	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.10 Immerse for 10 sec. in solder at 260 $\pm$ 5 $^{\circ}$ C .
	RCT01 : $\pm (2.0\% + 0.10\Omega)$			
Solderability	Coverage $\geq$ 95%			JIS-C5202-6.11 Immerse for 3 sec. in solder at 230 $\pm$ 3 $^{\circ}$ C .
Steam aging	Coverage $\geq$ 95%			JIS-C5202-6.11.4 Put the resistor in the vessel of temperature 100 $^{\circ}$ C relative humidity 100% for 4 hrs then Immerse for 3 sec. in solder at 230 $\pm$ 3 $^{\circ}$ C . (RCT01 N/A)
Vibration	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.3 Frequency range:10 Hz to 55Hz to 10Hz/1min. 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 hrs). (RCT01 N/A)
Resistance to dry heat	$\pm (1.0\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-7.2 96 Hrs at 125 $^{\circ}$ C
	RCT01 : $\pm (5.0\% + 0.10\Omega)$			
Temperature Cycling	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-7.4 Cycle between -55 $^{\circ}$ C and +125 $^{\circ}$ C 30 minute for 5 cycles.
	RCT01 : $\pm (5.0\% + 0.10\Omega)$			
Loading Life in Moisture	$\pm (0.5\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-7.9 40 $\pm$ 2 $^{\circ}$ C ,90~95 %RH 1000Hrs at RCWV, 1.5Hrs ON, 0.5Hrs OFF.
	RCT01 : $\pm (5.0\% + 0.10\Omega)$			
Load Life	$\pm (1.0\% + 0.05\Omega)$	$\pm (3.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-7.10 70 $^{\circ}$ C , 1000Hrs at RCWV, 1.5Hr ON, 0.5Hr OFF.
	RCT01 : $\pm (5.0\% + 0.10\Omega)$			
Low Temperature Operation	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	MIL-R-5532D 4.7.4 1 Hrs, -55 $^{\circ}$ C ,Followed by 45 minutes of RCWV. (RCT01 N/A)

RCWV=Rated Continuous Working Voltage

■ Reliability Test

Item	Specification			Test Method
	R: $\geq 1\Omega$		R: $< 1\Omega$	
	0.5%、1%	2%、5%	1%、2%、5%	
Temperature Coefficient of Resistance	Within the specification of TCR			JIS-C5202-5.2 $TCR \text{ (ppm/}^{\circ}\text{C)} = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10$ R1: Resistance at room temperature R2: Resistance at -55℃ or +125℃ T1: Room temperature T2:Temperature -55℃ or +125℃
Short Time Overload	$\pm (1.0\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-5.5 Apply 2.5 times rated voltage or Max. Overload Voltage for 5 seconds.
Insulation Resistance	$\geq 10^9\Omega$			JIS-C5202-5.6 Put the resistor in the fixture, add 100 VDC in +,- terminal for 60 seconds then measured the insulation resistance.
Dielectric Withstand Voltage	No short or burned on the appearance			JIS-C5202-5.7 Apply 500VAC for 1min.(RCT02,03 300VAC).
Intermittent Overload	$\pm (5.0\% + 0.10\Omega)$		$\pm (5.0\% + 0.001\Omega)$	JIS-C5202-5.8 Apply rated voltage 2.5 times, 1sec ON, 25sec OFF, 10000 test cycle.
Core Body Strength	$\pm (1.0\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.1.4 Applied R0.5 test probe at its central part then pushing 1Kgf force on the sample for 10 sec.
Terminal Strength	No evidence of mechanical damage			JIS-C5202-6.1.4 Apply 5N pushing force for 10sec.
Resistance to Solvent	$\pm (0.5\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.9 Immersed into isopropyl alcohol of 23 ~ 25℃ for 60 seconds.
Resistance to Soldering Heat	$\pm (1.0\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	By SONY SS-00254-5, JIS-C5202-6.10
Solderability	Coverage $\geq 95\%$			By SONY SS-00254-2, JIS-C5202-6.11
Joint strength of solder	$\pm (1.0\% + 0.05\Omega)$		$\pm (1.0\% + 0.001\Omega)$	By SONY SS-00254-7, JIS-C5202-6.1.4
	Average change ratio of robustness after temperature cycle :50% or less			
Leaching Test	Coverage $\geq 95\%$			By SONY SS-00254-9
Vibration	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-6.3 Frequency range:10 Hz to 55Hz to 10Hz/1min. 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 hrs).
Resistance to dry heat	$\pm (1.0\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-7.2 96 Hrs at 125℃
Temperature Cycling	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	JIS-C5202-7.4 Cycle between -55℃ and +125℃ 30 minute for 5 cycles.
Loading Life in Moisture	$\pm (0.5\% + 0.05\Omega)$	$\pm (2.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-7.9 40 $\pm$ 2℃,90~95 %RH ,1000Hrs at RCWV, 1.5Hrs ON, 0.5Hrs OFF.
Load Life	$\pm (1.0\% + 0.05\Omega)$	$\pm (3.0\% + 0.10\Omega)$	$\pm (2.0\% + 0.001\Omega)$	JIS-C5202-7.10 70℃, 1000Hrs at RCWV, 1.5Hr ON, 0.5Hr OFF
Low Temperature Operation	$\pm (0.5\% + 0.05\Omega)$	$\pm (1.0\% + 0.05\Omega)$	$\pm (1.0\% + 0.001\Omega)$	MIL-R-5532D 4.7.4 1 Hrs, -55℃ ,Followed by 45 minutes of RCWV.
Whisker Test	Max 50 μ m			By SONY SS-00254-8, JIS-C5202

RCWV=Rated Continuous Working Voltage