

Series: RC

LEAD FREE
Now Available!



EXPLANATION OF PART NUMBERS:

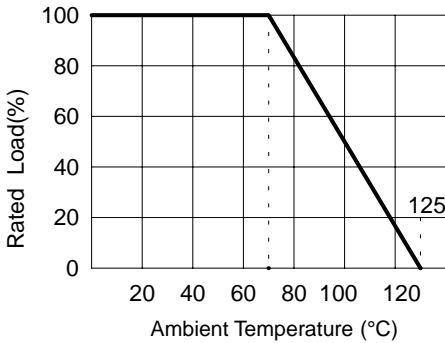
RC Series	110 Size	I Termination	103 Resistance	J Tolerance	I Packaging
RC=Thick Film	110 (0402) 115 (0603) 210 (0805) 315 (1206) 350 (1210) 500 (2010) 1000 (2512)	C=Sn/Pb T=Sn(Ti) New	5% - 3 Digits 1st 2 significant 3rd multiplier (10*) 1% - 4 Digits 1st 3 significant 4th multiplier (10*) OR0 = Jumper "0" ohm	J=5% F=1% B=.1% D=.5%	T=Tape and Reel

GENERAL SPECIFICATIONS:

Size	Rated Power Power at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R. (ppm/°C)	Resistance Range				Jumper Rated Current	Jumper Resistance Value
					D(± 0.5%) E-96	F(± 1%) E-96	G(± 2%) E-24	J(± 5%) E-24		
RC110C RC110T	1/16	50V	100V	+500 -200 ±200	— —	— 10Ω-1MΩ	— —	1Ω-9.1Ω 10Ω-3.3MΩ	1A	50mΩMAX
RC115C RC115T	1/10	50V	100V	± 50 ± 100 ± 200 ± 400	100Ω-100K 10Ω-91Ω, 110K-1M	— 10Ω-1MΩ	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω, 11MΩ-22MΩ	1A	50mΩMAX
RC210C RC210T	1/8W	150V	300V	± 50 ± 100 ± 200 ± 400	100Ω-100K 10Ω-91Ω, 110K-1M	— 10Ω-1MΩ	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω, 11MΩ-22MΩ	2A	50mΩMAX
RC315C RC315T	1/4W	200V	400V	± 50 ± 100 ± 200 ± 400	100Ω-100K 10Ω-91Ω, 110K-1M	— 10Ω-1MΩ	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω, 11MΩ-22MΩ	2A	50mΩMAX
RC350C RC350T	1/3W	200V	400V	± 100 ± 200 ± 400	— —	10Ω-1MΩ —	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω	2A	50mΩMAX
RC500C RC500T	3/4W	200V	400V	± 100 ± 200 ± 400	— —	10Ω-1MΩ —	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω	2A	50mΩMAX
RC1000C RC1000T	1W	200V	400V	± 100 ± 200 ± 400	— —	10Ω-1MΩ —	— 10Ω-1MΩ	— 10Ω-10MΩ 1Ω-9.1Ω	2A	50mΩMAX
Operating Temperature Range		-55°C – +125°C								

POWER DERATING CURVE

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



VOLTAGE RATING

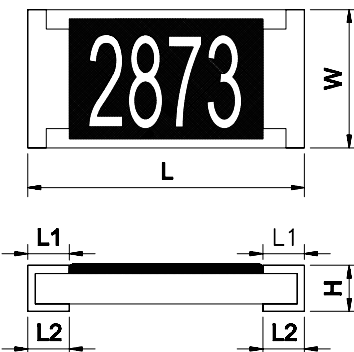
Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined from the following:

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

E = Rated voltage (v)
 P = power rating (w)
 R = Nominal resistance(Ω)

DIMENSIONS

Dimensions		L	W	H	L1	L2	
Type	Size Code						
RC110C	0402	1.0 ^{+0.10} _{-0.05}	0.5±0.05	0.30±0.05	0.2±0.10	0.25±0.10	
RC110T							
RC115C	0603	1.6±0.10	0.80 ^{+0.15} _{-0.05}	0.45±0.10	0.30±0.15	0.30±0.15	
RC115T							
RC210C	0805	2.05±0.10	1.25 ^{+0.10} _{-0.05}	0.50±0.10	0.35±0.20	0.35±0.15	
RC210T							
RC315C	1206	3.10±0.10	1.55±0.10	0.55 ^{+0.10} _{-0.05}	0.45±0.20	0.35±0.15	
RC315T							
RC350C	1210	3.10±0.10	2.55±0.10	0.55±0.10	0.50±0.20	0.60±0.20	
RC350T							
RC500C	2010	5.00±0.20	2.60±0.20	0.55±0.10	0.60±0.20	0.60±0.20	
RC500T							
RC1000C	2512	6.30±0.20	3.20±0.20	0.55±0.10	0.6±0.20	0.60±0.20	
RC1000T							



RELIABILITY TEST

ELECTRICAL PERFORMANCE TEST

Temperature Coefficient (T.C.R)

Test method:

$$TCR \text{ (ppm/}^\circ\text{C)} = \frac{(R2-R1)}{R1(T2-T1)} \times 10$$

R1: Resistance at room temperature

R2: Resistance at -55°C or +125°C

T1: Room temperature

T2: Temperature -55°C or +125°C

Requirement: Refer item 3. General Specifications

Follow: 1995 JIS-C5202-5.2

SHORT TIME OVER LOAD

Test method: Applied 2.5 times rated voltage for 5 seconds and released to load for about 30 minutes, then measure the resistance.

Requirement: 0.5% - 1%: $\pm(1.0\%+0.05\Omega)$

2% - 5%: $\pm(2.0\%+0.10\Omega)$

Chip jumper: 50m Ω Lower

Applied Maximum overload current RC115C/RC115T, RC210C/RC210T, RC315C/RC315T

No evidence of mechanical damage.

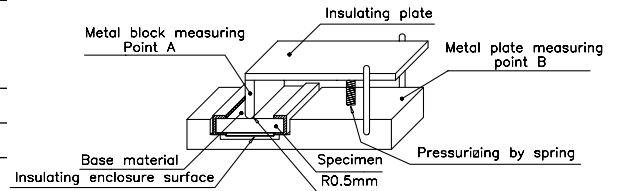
Follow: 1995 JIS-C5202-5.5

INSULATION RESISTANCE

Test method: 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.

Requirement: $\geq 10^9 \Omega$

Follow: 1995 JIS-C5202-5.6



DIELECTRIC WITHSTANDING VOLTAGE

Test method: Put the resistor in the fixture, add VAC (see SPEC below) in +, - terminal
 RC210C/RC210T, RC315C/RC315T, RC350C/RC350T, RC500C/RC500T, RC1000C/RC1000T apply 500 VAC 1 minute
 RC110C/RC110T, RC115C/RC115T apply 300 VAC 1 minute

Requirement: No short or burned on the appearance

Follow: 1995 JIS-C5202-5.7

INTERMITTENT OVERLOAD

Test method: Put tested resistors in chamber under temperature $25 \pm 2^\circ\text{C}$ for 1 sec on, 25 sec off under this condition the 2.5 times rated DC Voltage is applied for test cycles then they be left at 10000 +400 test cycles then they be left at no-load for 1 hr.

Requirement: $\pm(5.0\%+0.10\Omega)$

Chip jumper: 50m Ω Lower

Applied Maximum overload current RC115C/RC115T, RC210C/RC210T, RC315C/RC315T

Follow: 1995 JIS-C5202-5.8

NOISE LEVEL

Requirement:

Resistance	Noise
$R < 100\Omega$	$\leq -10\text{db}(0.32 \text{ uV/V})$
$100\Omega \leq R < 1\text{K}\Omega$	$\leq 0\text{db}(1.0 \text{ uV/V})$
$1\text{K}\Omega \leq R < 10\text{K}\Omega$	$\leq 10\text{db}(3.2 \text{ uV/V})$
$10\text{K}\Omega \leq R < 100\text{K}\Omega$	$\leq 15\text{db}(5.6 \text{ uV/V})$
$100\text{K}\Omega \leq R < 1\text{M}\Omega$	$\leq 20\text{db}(10 \text{ uV/V})$
$1\text{M}\Omega \leq R$	$\leq 30\text{db}(32 \text{ uV/V})$

Follow: 1995 JIS-C5202-5.9

MECHANICAL PERFORMANCE TEST

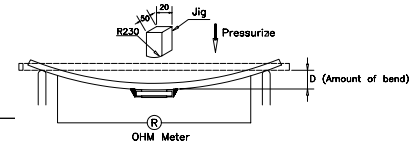
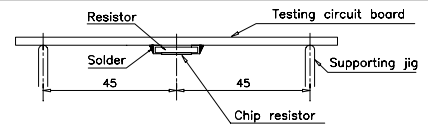
BENDING STRENGTH

Test method: Solder tested resistors on to PC board. add force in the middle down.
As diagram meter measure the resistance.
D: RC110C, RC110T, RC115C, RC115T, RC210C, RC210T = 5mm
& RC315C, RC315T, RC350C, RC350T, RC500C, RC500T, RC1000C, RC1000T = 3mm

Requirement: $\pm(1.0\%+0.05\Omega)$

Chip jumper: 50m Ω Lower

Follow: 1995 JIS-C5202-6.1.4



TERMINAL STRENGTH

Test method:

Test 1: The resistors mounted on the board applied 5N pushing force on the sample rear for 10 sec.

Test 2: The resistors mounted on the board slowly add force on the sample rear until the sample termination is breakdown.

REQUIREMENT

Test 1: No evidence of mechanical damage.

Test 2: $\geq 5N$.

Follow: 1995 JIS-C5202-6.1.4

RESISTANCE TO SOLVENT

Test method: The tested resistor be immersed into isopropyl alcohol of 23-25°C for 60 sec, then the resistor is left in the room for 48 hrs.

Requirement: $\pm(0.5\%+0.05\Omega)$

Chip jumper: 50m Ω Lower

Follow: 1995 JIS-C5202-6.9

RESISTANCE TO SOLDERING HEAT

Test method: The tested resistor be immersed into molten solder of 260 \pm 5°C for 10 seconds. Then the resistor is left in the room for 1 hour.

Requirement: 0.5% - 1%: $\pm(0.5\%+0.05\Omega)$
2% - 5%: $\pm(1.0\%+0.05\Omega)$

Chip jumper: 50m Ω Lower
No evidence of mechanical damage.

Follow: 1995 JIS-C5202-6.10

SOLDERABILITY

Test method: Add flux into tested resistors, immersion into solder bath in temperature 215 \pm 3°C for 3 seconds.

Requirement: Solder coverage over 95%

Follow: 1995 JIS-C5202-6.11

STEAM AGING

Test method: Put test resistors in the vessel of temperature 100 °C relative humidity 100% for 4 hrs then immersion into flux and solder bath in temperature 215°C for 3 sec.

Requirement: Solder coverage over 95%

Follow: 1995 JIS-C5202-6.11.4

ENVIRONMENTAL TEST

RESISTANCE TO DRY HEAT

Test method: Put tested resistors in chamber under temperature 125 \pm 5°C for 96 \pm 4 hours, leaving in room temperature for 60 minutes, measure the resistance.

Requirement: 0.5% - 1%: $\pm(1.0\%+0.05\Omega)$
2% - 5%: $\pm(2.0\%+0.10\Omega)$

Chip jumper: 50m Ω Lower
No evidence of mechanical damage.

Follow: 1995 JIS-C5202-7.2

TEMPERATURE CYCLING

Test method: The temperature cycle shown in the following table shall be repeated 5 times consecutively, the measurement of the resistance value is done before the first cycle and after ending the fifth cycle - leaving in the room temperature for about 1 hour.

Step	Temperature (°C)	Time (minute)
1	-55±5	30
2	25±5	3
3	125±5	30
4	25±5	3

Requirement: 0.5% - 1%: $\pm(0.5\%+0.05\Omega)$

2% - 5%: $\pm(1.0\%+0.05\Omega)$

Chip jumper: 50m Ω Lower

No evidence of mechanical damage.

Follow: 1995 JIS-C5202-7.4

LOADING LIFE IN MOISTURE

Test method: Put tested resistors in the chamber under temperature 40 ± 2 °C, relative humidity 90-95% with rated load 90 minutes and free load 30 minutes, total 1000 hours. Leaving the tested resistor in room temperature for 60 minutes, measure the resistance.

Requirement: 0.5% - 1%: $\pm(0.5\%+0.05\Omega)$

2% - 5%: $\pm(2.0\%+0.05\Omega)$

Chip jumper: 50m Ω Lower

Follow: 1995 JIS-C5202-7.9

LOAD LIFE

Test method: Put tested resistors in chamber under temperature 70 ± 2 °C for 90 minutes on, 30 minutes off under this condition the rated DC voltage is applied continuously for 1000 hours then they be left at no-load for 1 hour.

Requirement: 0.5% - 1%: $\pm(1.0\%+0.05\Omega)$

2% - 5% : $\pm(3.0\%+0.10\Omega)$

Chip jumper: 50m Ω Lower

No evidence of mechanical damage.

Follow: 1995 JIS-C5202-7.10

LOW TEMPERATURE OPERATION

Test method: Resistor put in the chamber at room temperature 25°C. Decreasing the temperature to -55 °C and keep the temperature -55 °C with 1 hour. Then with the rated load in 45 minutes. Then 15 minutes off load. Leave in room temperature 8 ± 1 hours.

Requirement: 0.5% - 1%: $\pm(0.5\%+0.05\Omega)$

2% - 5%: $\pm(1.0\%+0.05\Omega)$

Chip jumper: 50m Ω Lower

No evidence of mechanical damage.

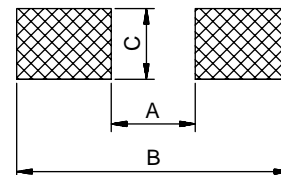
Follow: By JARO

RECOMMENDED SOLDERING METHOD

Soldering Iron: temperature 270°C ± 10°C, dwell time shall be less than 3 sec.

RECOMMENDED LAND PATTERN METHOD (FOR REFLOW SOLDERING) Unit: mm

TYPE / DIM	A	B	C
RC110C, RC110T	0.5	1.6	0.5
RC115C, RC115T	0.8	2.2	0.8
RC210C, RC210T	1.0	3.0	1.2
RC315C, RC315T	2.0	4.0	1.5
RC350C, RC350T	2.0	4.5	2.5
RC500C, RC500T	3.5	6.0	2.5
RC1000C, RC1000T	4.0	8.0	3.0



MARKING DIAGRAMS

8.1±2% - ±5% TOLERANCE:

3 digits, first two digits are significant figures, third digit is number of zeros.

(EX) Marking → 473

473=47x10³ =47000Ω=47KΩ

8.2 ±0.5% - ±1% TOLERANCE:

4 digits, first three digits are significant figures, fourth digit is number of zeros.

(EX) Marking → 3742

3742=374x10² = 37400Ω=37.4KΩ

RC115C & RC115T ±0.5% - ±1% TOLERANCE:

For EIAJ-96 Marking.

(EX) Marking → 47B

47B=301x10¹ =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.

RC110C & RC110T NO MARKING

EIA-96 MARKING: 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	57	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

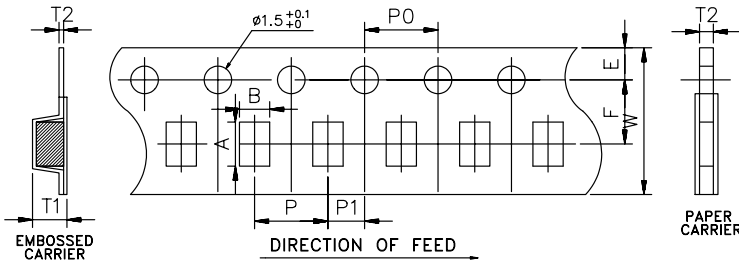
Y=10⁻² X=10⁻¹ A=10⁰ B=10¹ C=10² D=10³ E=10⁴ F=10⁵

PLATING THICKNESS

Ni: $\geq 1 \mu m$

Sn/Pb: $\geq 3 \mu m$

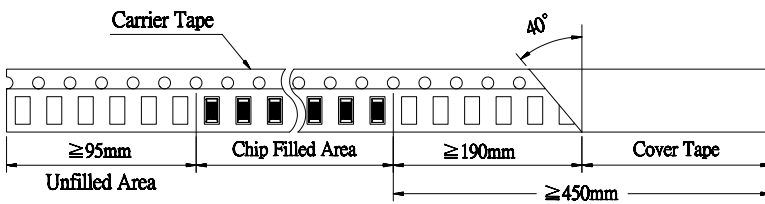
TAPING SPECIFICATIONS



TAPE DIMENSION:

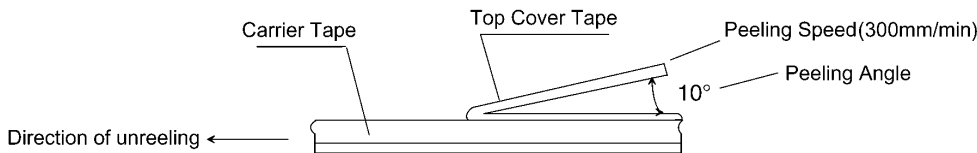
Packaging	TYPE / DIM	A	B	W	E	F	T1	T2	P	P0	10 x P0	P1
Paper Tape	RC110C, RC110T	1.2±0.1	0.7±0.05	8.0±0.2	1.75±0.1	3.5±0.05	—	0.45±0.05	2.0±0.1	4.0±0.05	40.0±0.2	2.0±0.05
	RC115C, RC115T	1.85±0.1	1.1±0.1	8.0±0.2	1.75±0.1	3.5±0.05	—	0.6±0.1	2.0±0.1 or 4.0±0.1	4.0±0.05	40.0±0.20	2.0±0.05
	RC210C, RC210T	2.35±0.1	1.65±0.1	8.0±0.2	1.75±0.1	3.5±0.05	—	0.75±0.1	4.0±0.1	4.0±0.05	40.0±0.20	2.0±0.05
	RC315C, RC315T	3.5±0.2	1.9±0.2	8.0±0.2	1.75±0.1	3.5±0.05	—	0.75±0.1	4.0±0.1	4.0±0.05	40.0±0.20	2.0±0.05
	RC350C, RC350T	3.5±0.2	2.8±0.2	8.0±0.2	1.75±0.1	3.5±0.05	—	0.75±0.1	4.0±0.1	4.0±0.05	40.0±0.20	2.0±0.05
Embossed	RC500C, RC500T	5.5±0.2	2.8±0.2	12±0.2	1.75±0.1	5.5±0.05	0.85±0.15	0.75±0.1	4.0±0.1	4.0±0.05	40.0±0.20	2.0±0.05
	RC500C, RC500T	5.5±0.2	2.8±0.2	12±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
	RC1000C, RC1000T	6.7±0.2	3.4±0.2	12±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

LEAD DIMENSIONS:



COVER TAPE PEEL OFF STRENGTH

Specifications: 0.1-0.7N (10.2-71.4gf)



CARRIER TAPE QTY

TYPE / DIM	Taping Package (pcs./reel)			Bulk Case (pcs./case)
	Paper Carrier		Plastic Carrier	
	HR 2mm Pitch	PR 4mm Pitch	ER	
RC110C, RC110T	10,000	—	—	50,000
RC115C, RC115T	10,000	5,000	—	25,000
RC210C, RC210T	—	5,000	—	10,000
RC315C, RC315T	—	5,000	—	5,000
RC350C, RC350T	—	5,000	—	—
RC500C, RC500T	—	5,000	4,000	—
RC1000C, RC1000T	—	—	4,000	—

