0603 Series Thin Film Chip Resistor

1. Scope

This specification applies to 0.8mm x 1.6mm (0603) size, fixed metal chip resistors rectangular type for use in electronic equipment.

2. Type Designation

RR0816 X – XXX – X
(1) (2) (3) (4)

Where (1) Series No.

(2) Tolerance of TCR :
P = ± 25ppm/℃
Q = ± 50ppm/℃
R = ± 100ppm/℃

(3) Nominal resistance value :
For example –-
Three digits of number (E-24 Series)
100 = 10Ω
102 = 1kΩ
Four digits of number (E-96 Series)
11R3 = 11.3Ω
1131 = 1.13kΩ

(4) Resistance tolerance :
B = ± 0.1%
D = ± 0.5%

3. Electrical Specifications

Power Rating*	1/16 W		
Resistance Values	E-24 series,E-96 series		
Resistance Tolerance	± 0.5%(D)	± 0.1%(B) , ± 0.5%(D)	
Resistance Range	10Ω～91Ω	100Ω～33kΩ	36kΩ～360kΩ
T.C.R. (Temperature Coefficient of Resistance)	± 50ppm / ℃	± 25ppm / ℃	± 25ppm / ℃ ± 100ppm / ℃
Operating Temperature Range	-55℃ to 125℃		
Max. Operating Voltage**	75V		

Note: *Package Power Temperature Derating Curve

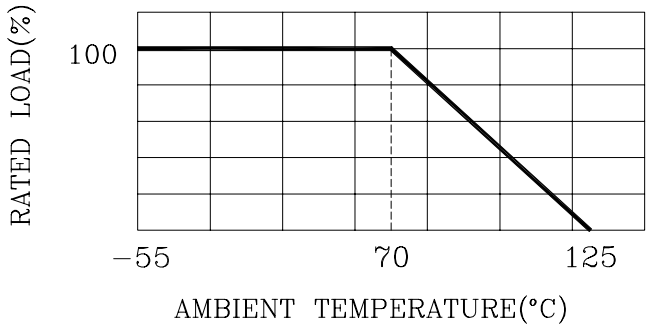


Figure 1 : Power Temperature Derating Curve

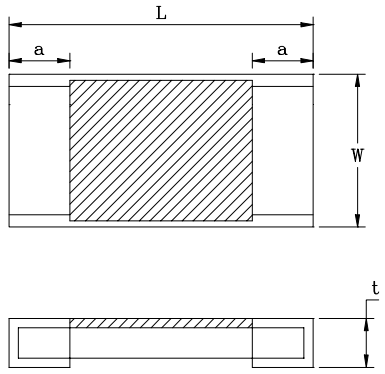
Note: **Resistors shall have a rated DC or AC(rms) continuous operating voltage corresponding to the power rating, as calculated from the following formula

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

Where V : Rated voltage (V)
P : Rated power (W)
R : Nominal resistance (Ω)

If the voltage so obtained exceeds the maximum operating voltage, this maximum voltage shall be the rated voltage.

4. Outline dimensions



Code Letter	Dimension
L	1.6 ± 0.2
W	0.8 ± 0.2
t	0.4 ± 0.1
a	0.3 ± 0.2

Unit : mm

5. Marking

A rated resistance shall be marked on the protecting coat with three digits of number.

(1)Resistance in E-24 Series :

Example :

3.9kΩ→39 X 10^2→392

(2) Resistance in E-96 Series :

code	R value	code	R value	code	R value	code	R value	code	R value	code	R value	code	R value	code	R value
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

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

S=10^{-2} R=10^{-1} A=10^0 H=10^1 C=10^2 D=10^3 E=10^4 F=10^5

Example :

10.2kΩ→102 X 10^2→02C

6. Life Tests

6-1 Electrical

Item	Specification and Requirement	Test Method
Short Time Overload	△R: ± (0.5%+ 0.05)Ω Without damage by flashover, spark, arcing, burning or breakdown	(1) Applied voltage: 2.5 x rated voltage or 2 x maximum operating voltage which ever is less (2)Test time : 5 seconds
Insulation Resistance	Over 100 MΩ on Overcoat layer face up Over 1,000 MΩ on Substrate side face up	(1)Setup as figure 2 (2)Test voltage: 100 V DC (3)Test time: 60 + 10 / -0 seconds
Voltage Proof	△R: ± (0.5%+ 0.05)Ω Without damage by flashover, spark, arcing, burning or breakdown	(1)Setup as figure 2 (2)Test voltage: 100 V AC(rms) (3)Test time: 60 +10 / -0 seconds

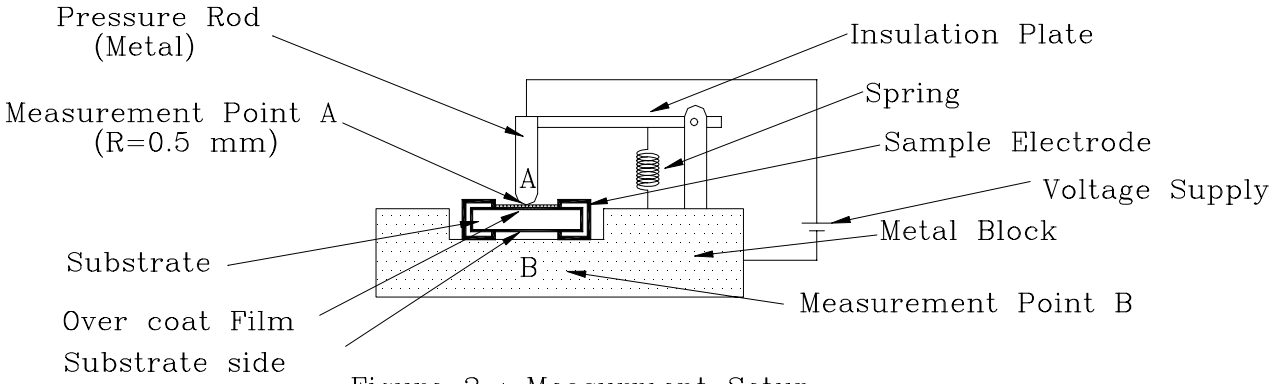


Figure 2 : Measurment Setup

6-2 Mechanical

Item	Specification and Requirement	Test Method
Solderability	The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder	Solder bath: After immersing in flux, dip in 235 ± 5℃ molten solder bath for 2 ± 0.5 seconds
Resistance to Solder Heat	△R: ± (0.5%+ 0.05)Ω Without distinct deformation in appearance	(1) Pre-heat: 100~110℃ for 30 seconds (2) Immersed at solder bath of 260 ± 5℃ for 10 ± 1 seconds (3) Measuring resistance 1 hour after test
Vibration	△R: ± (0.5%+ 0.05)Ω Without mechanical damage such as break	(1) Vibration frequency: 10Hz to 55Hz to10Hz in 60 seconds as a period (2) Vibration time: period cycled for 2 hours in each of 3 mutual perpendicular directions (3) Amplitude: 1.5mm
Shock	△R: ± (0.25%+ 0.05)Ω Without mechanical damage such as break	(1) Peak value: 490N (2) Duration of pulse: 11ms (3) 3 times in each positive and negative direction of 3 mutual perpendicular directions

6-2 Mechanical

Item	Specification and Requirement	Test Method
Bending Test	△R: ± (0.5%+ 0.05)Ω Without mechanical damage such as break	Bending value: 3 mm for 30 ± 1 seconds
Solvent Resistance	Marking should be legible Without mechanical and distinct damage in appearance	(1)Solvent: Trichloroethane or Isopropyl alcohol (2)Immersed in solvent at room temperature for 90 seconds

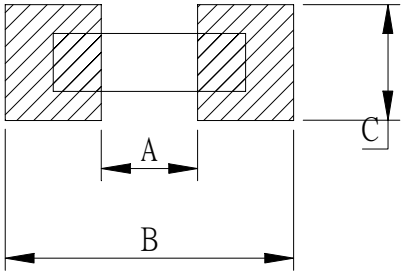
6-3 Endurance

Item	Specification and Requirement	Test Method
Rapid change of Temperature	△R: ± (0.5%+ 0.05)Ω Without distinct damage in appearance	(1)Repeat 5 cycle as follow: (-55 ± 3℃,30minutes) →(Room temperature, 2~3 minutes) → (+125 ± 2℃,30minutes) →(Room temperature, 2~3 minutes) (2)Measuring resistance 1 hour after test
Moisture with Load	△R: ± (1.0%+ 0.05)Ω Without distinct damage in appearance Marking should be legible	(1) Environment condition: 40 ± 2℃,90~95% RH (2)Applied Voltage: rated voltage (3)Test period: (1.5 hour ON)→(0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (4)Measuring resistance 1 hour after test

6-3 Endurance

Item	Specification and Requirement	Test Method
Load Life	△R: ± (1.0%+ 0.05)Ω Without distinct damage in appearance	(1)Test temperature: 70 ± 2℃ (2)Applied Voltage: rated voltage (3)Test period: (1.5 hour ON)→(0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (4)Measuring resistance 1 hour after test
Low Temperature Store	△R: ± (1.0%+ 0.05)Ω Without distinct damage in appearance	(1)Store temperature: -55 ± 3℃ for total 1,000 + 48 / - 0 hours (2)Measuring resistance 1 hour after test
High Temperature Store	△R: ± (1.0%+ 0.05)Ω Without distinct damage in appearance	(1)Store temperature: +125 ± 2℃ for total 1,000 + 48 / - 0 hours (2)Measuring resistance 1 hour after test

7. Recommend Land Pattern Dimensions



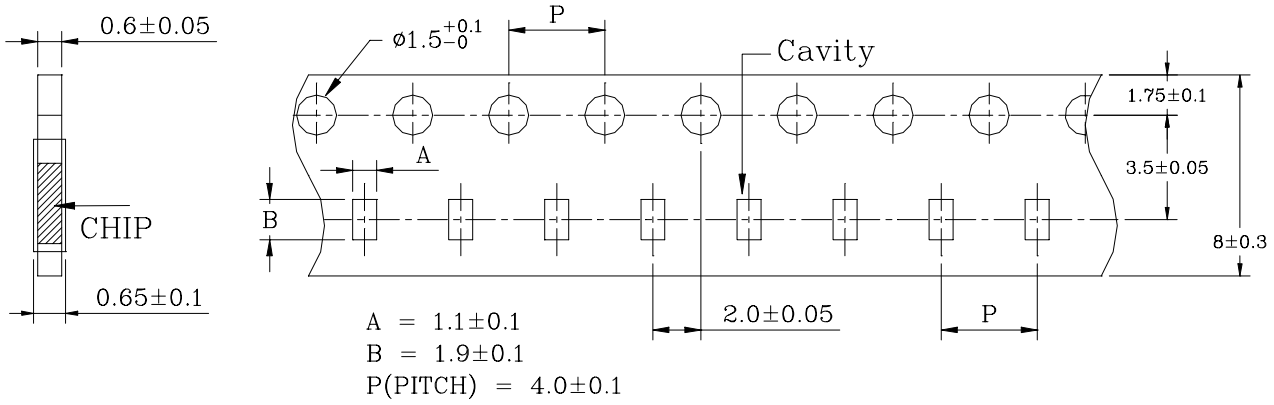
A	0.8
B	2.2
C	0.6~1.0

Unit : mm

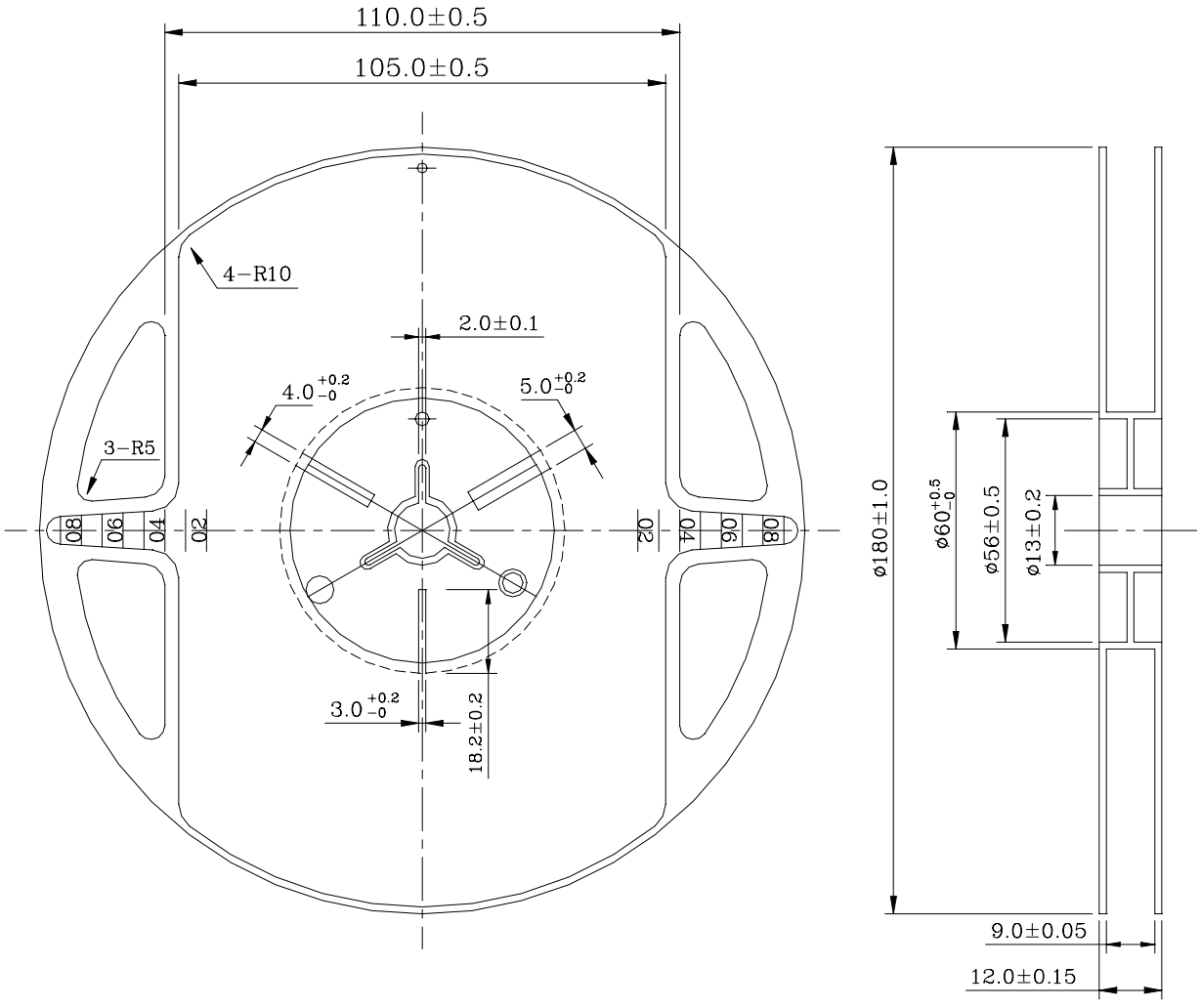
8. Packaging

8-1 Dimensions

8-1-1 Tape packaging dimensions



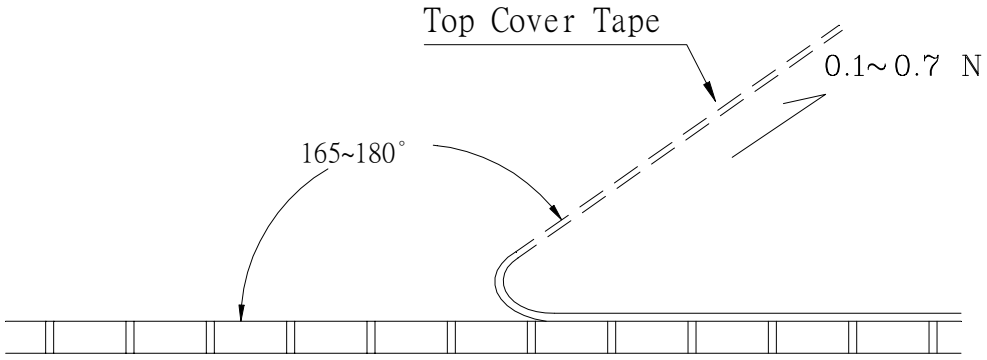
8-1-2 Reel dimensions



8-2 Peel force of top cover tape

The peel speed shall be about 300 mm/minute

The peel force of top cover tape shall be between 0.1 to 0.7 N



8-3 Numbers of taping

5,000 pieces/reel

8-4 Label marking

The following items shall be marked on the production and shipping Label on the reel.

8-4-1 production Label

(1) Part No.
(2) Description
(3) Quantity
(4) Taping No.

8-4-2 Shipping Label

(1) *Customer's name
(2) *Customer's part No.
(3) Manufacturer's part No.
(4) Manufacturer's name
(5) Manufacturer's country

*Note : Item (1) and (2) are listed by request

9. Care note

9-1 Care note for storage

(1) Chip resistor shall be stored in a room where temperature and humidity must be controlled. (temperature 5 to 35℃, humidity 45 to 85℃ RH) However, a humidity keep it low, as it is possible.

(2) Chip resistor shall be stored as direct sunshine doesn't hit on it.

(3) Chip resistor shall be stored with no moisture, dust, a Material that will make solderability inferior, and a harmful gas (Chloridation hydrogen, sulfurous acid gas, and sulfuration hydrogen)

9-2 Care note for operating and handling

(1) It is necessary to protect the edge and protection coat of resistors from mechanical stress.

(2) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.

(3) Resistors shall be used with in rated range shown in specification. Especially, if voltage more than specified value will be loaded to resistor, there is a case it will make damage for machine because of temperature rise depending on generating of heat, and increase resistance value or breaks.

(4) In case that resistor is loaded a rated voltage, it is necessary to confirms temperature of a resistor and to reduce a load power according to load reduction curve, because a temperature rise of a resistor depends on influence of heat from mounting density and neighboring element.

(5) Observe Limiting element voltage and maximum overload voltage specified in each specification

(6) If there is possibility that a large voltage (pulse voltage, shock voltage) charge to resistor, it is necessary that operating condition shall be set up before use.