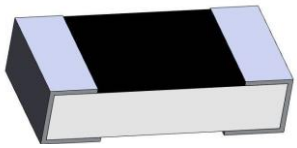
The history of revision change for the specification

Date	Revision	Changes
2021/09/02	A0	New approval
2021/12/07	A1	Add type designation note
2022/02/18	A2	Update TCR specifications

1/10W, 0603, Thick Film Chip Resistor

Features / Applications :

- Lead free meet RoHS compliant, Halogen free
- AEC-Q200 qualified
- Automotive applications



Electrical Specifications :

Power Rating*	Resistance Values Series	Resistance Tolerance	Resistance Range (Ω)	Temperature Coefficient of Resistance (ppm /℃)	Operating Temperature Range	Max. Operating Voltage**
1/10W	E24 series & E96 series	± 0.5% (D) ± 1.0% (F) ± 2.0% (G) ± 5.0% (J)	1.0～9.76	± 200	-55℃ to 155℃	75V
			10～10M	± 100		
Jumper	Resistance		Rated current		Operating Temperature Range	
	Below 50 mΩ		1A		-55℃ to 155℃	

Note: *Package Power Temperature Derating Curve

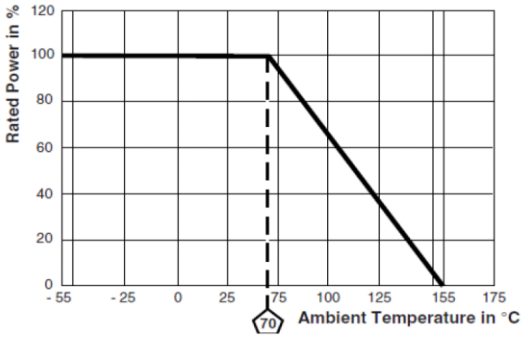


Figure 1.：Power Temperature Derating Curve

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)

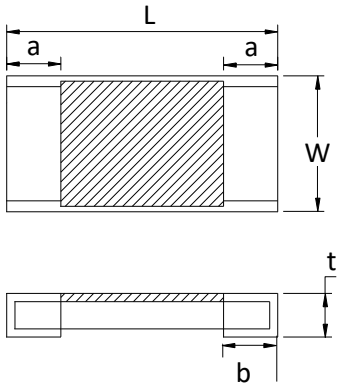
P : Rated power (W)

R : Nominal resistance (Ω)

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

Outline Drawing :

Dimension



Code Letter	Dimension
L	1.6 ± 0.15
W	0.8 ± 0.15
t	0.45 ± 0.10
a	0.30 ± 0.15
b	0.30 ± 0.15

Unit : mm

Type Designation :

VRNS	I	N	-	XXXX	-	X
(1)	(2)	(3)		(4)		(5)

Note :

(1) Series No. = Automotive

(2) Size : I = 0603

(3) Power Rating : N = 1/10W

(4) Resistance value : 000 = Jumper ; 103 = 10 kΩ (E24) ; 1131 =1.13kΩ (E96)

(5) Tolerance : D = ±0.5% ; F = ±1% ; G= ±2% ; J = ±5% ; X = Jumper

Note: If the resistance value of E24 and E96 coincide,E24 shall prevail.

Characteristics :

Electrical

Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Temperature Coefficient (TCR)	As follow specification		JIS-C-5201 +25℃/ +125℃.
Short Time Overload	△R: ±(1.0% + 0.05Ω) Without damage by flashover, spark, arcing, burning or breakdown	Max. 50mΩ	JIS-C-5201-1 4.13 2.5 x rated voltage for 5 seconds.
ESD	△R: ±(3.0% + 0.10Ω)	Max. 50mΩ	AEC-Q200-002 Human body, 1KV.

Mechanical

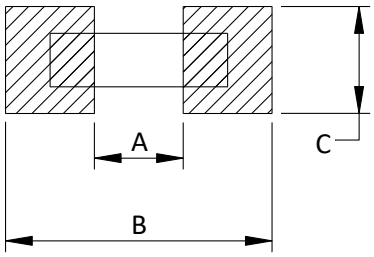
Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Solderability	The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder		J-STD-002 1.155℃/4hr→245±5℃ for 3sec 2.SA 4hr→245±5℃ for 3sec 3.SA 4hr→260±5℃ for 30sec
Resistance to Solder Heat	△R: ±(1.0% + 0.05Ω)	Max. 50mΩ	MIL-STD-202 Method 210 Temperature: 270°C, Dipping time: 10sec.
Vibration	△R: ±(0.5% + 0.05Ω) Without distinct damage in appearance	Max. 50mΩ	MIL-STD-202 Method 204 5G's for 20 minutes, 12 cycles each of 3 orientations. Test from 10-2000Hz.
Mechanical Shock	△R: ±(0.5% + 0.05Ω) Without distinct damage in appearance	Max. 50mΩ	MIL-STD-202 Method 213 100G's peak value, 6ms, Half-sine waveform, 12.3ft/sec.
Board flex	△R: ±(1.0% + 0.05Ω) Without mechanical damage such as break	Max. 50mΩ	AEC-Q200-005 Flexure holding time:60sec, 2mm
Terminal strength	a. Without mechanical damage such as break b. Judgement standard : Ac/Re= 0/1		AEC-Q200-006 Shear force:17.7N, duration:60sec

Endurance

Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Temperature Cycling	△R: ±(1.0% + 0.05Ω)	Max. 50mΩ	JESD22 Method JA-104 1000 cycles, (-55℃~125℃) 30 min maximum dwell time at each temperature.
Biased Humidity	△R: ±(3.0% + 0.05Ω)	Max. 50mΩ	MIL-STD-202 Method 103 1000 hours, 85℃/85%R.H, applied for 10% rated power.
Damp heat, steady state	△R: ±(3.0% + 0.05Ω)	Max. 50mΩ	IEC 60068-2 (40 ± 2) °C; (93 ± 3) % RH; 56 days.
Operational Life	△R: ±(3.0% + 0.05Ω)	Max. 50mΩ	MIL-STD-202 Method 108 Temperature:70°C, duration:1000hrs, 1.5Hour ON, 0.5Hour OFF Load condition: Rated power.
High temperature exposure	△R: ±(1.0% + 0.05Ω)	Max. 50mΩ	MIL-STD-202 Method 108 Temperature:155°C(Refer to spec) Duration:1000hrs
Resistance to solvents	Without mechanical and distinct damage in appearance		MIL-STD-202 method 215 Type of solvents: Aqueous wash chemical. OKEM clean or equivalent. Do not use banned solvents.

Note : Measurement at 24±4 hours after test conclusion for all reliability tests-parts.

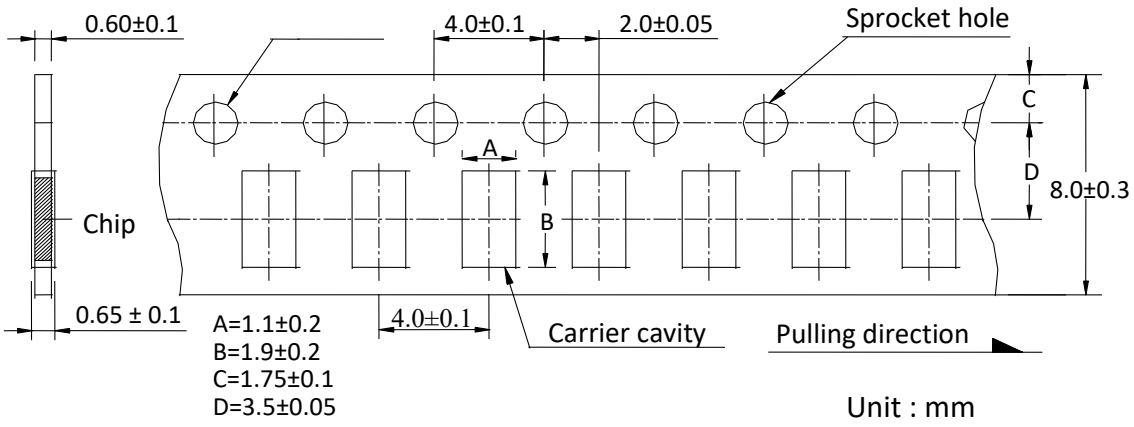
Recommend Land Pattern Dimensions :



A	0.5~0.8
B	2.5~2.7
C	0.9~1.1

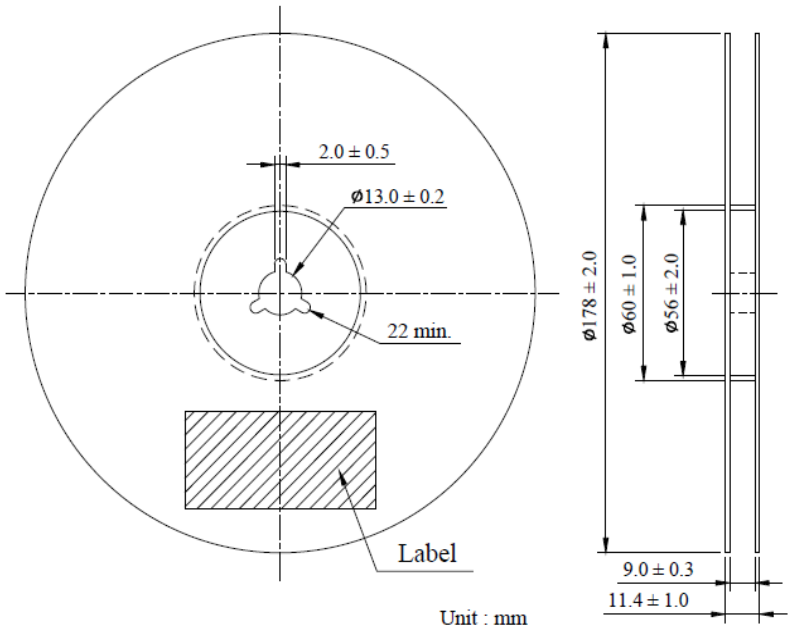
Unit : mm

TAPE PACKAGING DIMENSIONS:



Unit : mm

REEL DIMENSIONS:



Numbers of Taping: 5,000 pieces/reel

The following items shall be marked on the reel.

(1) Type designation.

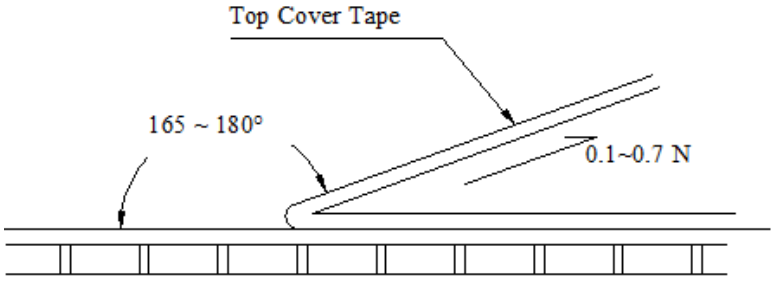
(2) Quantity

(3) Manufacturing date code

(4) Manufacturer's name

Peel force of top cover tape

The peel speed shall be about 300 mm/min. The peel force of top cover tape shall be between 0.1 to 0.7 N.



Care Note :

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 30% to 80% 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 (Hydrogen chloride, sulfurous acid gas, and Hydrogen sulfide)

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.