Automotive Surge Proof Chip Resistor

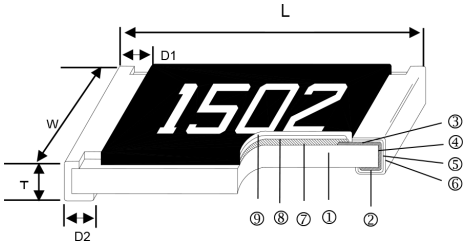
RoHS Compliant

Features

- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402 2512
- Special construction to prevent sulfuration in a sulfur containing environment
- AEC Q200 Qualified
- 100% CCD inspection

Applications

- Metering (Testing/Measurement)
- Medical Devices
- Power supply
- Charger
- Inverter
- LCD Video Monitors



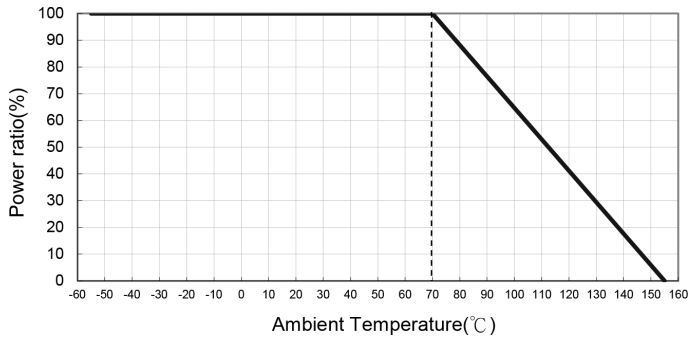
1	Alumina Substrate	4	Edge Electrode	7	Resistor Layer
2	Bottom Electrode	5	Barrier Layer	8	Primary Overcoat
3	Top Electrode	6	External Electrode	9	Secondary Overcoat

Dimensions : Millimetres

Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
MCSWR03	0603	1.6±0.1	0.8±0.1	0.45±0.1	0.3±0.2	0.3±0.2	2.042
MCSWR05	0805	2±0.1	1.25±0.1	0.5±0.1	0.35±0.2	0.4±0.2	4.368
MCSWR06	1206	3.1±0.1	1.55±0.1	0.55±0.1	0.5±0.25	0.5±0.2	8.9479

Derating Curve



Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±10%	±20%	
MCSWR03 (0603)	1/8W	-55 to +155°C	50V	100V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
MCSWR05 (0805)	1/4W	-55 to +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 20MΩ			±100
MCSWR06 (1206)	1/3W	-55 to +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100

High Power Ultra High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±10%	±20%	
MCSWR03 (0603)	1/4W 1/3W	-55 to +155°C	75V	150V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
MCSWR05 (0805)	2/5W	-55 to +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
MCSWR06 (1206)	3/4W *	-55 to +155°C	500V	1000V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100

*: Ultra High Power : double side printed resistor element

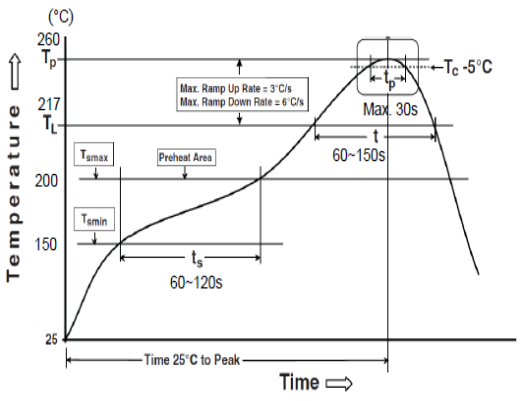
Operating Voltage=

Voltage=$\sqrt{(P*R}$) or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{(P*R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155°C

Soldering Condition Ref. IPC/JEDEC J STD 020 & J STD 002



Reflow Profiles	
Profile Feature	**Pb-Free Assembly**
Preheat Min. Temperature (Tsmin) Max Temperature (Tsmax) Preheating time (ts) from (Tsmin to Tsmax)	 150°C 200°C 60-120 seconds
Ramp-up rate (T_L to Tp)	3°C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217°C 60-150 seconds
Min. Peak temperature (Tp min)	235°C
Max. Peak temperature (Tp max)	260°C
Time (tp) within 5°C of the specified classification temperature (Tc)	30 seconds max.
Ramp-down rate (Tp to T_L)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

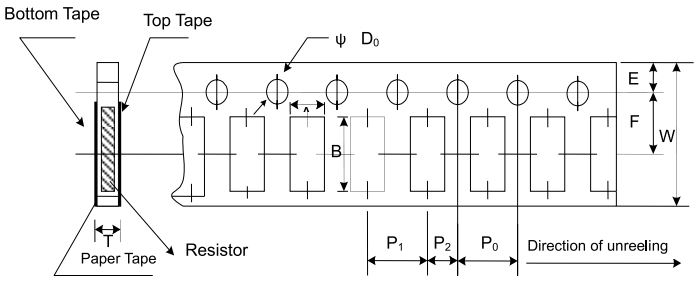
Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/ -55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Operational Life	±(3%+0.05Ω)	MIL-STD-202 Method 108 Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(3%+0.05Ω)	MIL-STD-202 Method 103 1000 hrs 85°C/85%RH 10% of operating power (≤100V)
High Temperature Exposure	±(1%+0.05Ω)	MIL-STD-202 Method 108 at +155°C for 1000 hrs
Board Flex	±(1%+0.05Ω)	AEC-Q200-005 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. Coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	±(1%+0.05Ω)	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Temperature Cycling	±(1%+0.05Ω)	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Mechanical Shock	±(1%+0.05Ω)	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1%+0.05Ω)	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz

Item	Requirement	Test Method
ESD	±(3%+0.05Ω)	AEC-Q200-002 Human body model 0603: 1KV 0805 and above: 2KV
Resistance to solvents	No visible damage on appearance and marking.	MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	AEC-Q200-006 Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94 V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	ΔR±5%	EIA-977 (Condition A) 60±2°C, no power rating for 500 hrs.

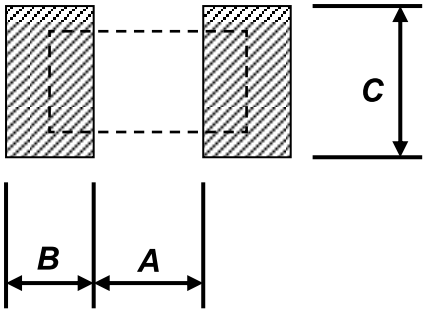
RCWV(Rated continuous working voltage)= √(P*R) or Max. Operating voltage whichever is lower
Storage Temperature: 15°C to 28°C; Humidity < 80%RH
Shelf Life: 2 years from production date.

Paper Tape Specifications



Dimensions : Millimetres

Type	A mm	B mm	W mm	E mm	F mm	P_0 mm	P_1 mm	P_2 mm	ΦD_0 mm	T mm
MCSWR03	1.1±0.1	1.9±0.1	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.7±0.1
MCSWR05	1.6±0.1	2.4±0.2	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.85±0.1
MCSWR06	1.9±0.1	3.5±0.2	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.85±0.1

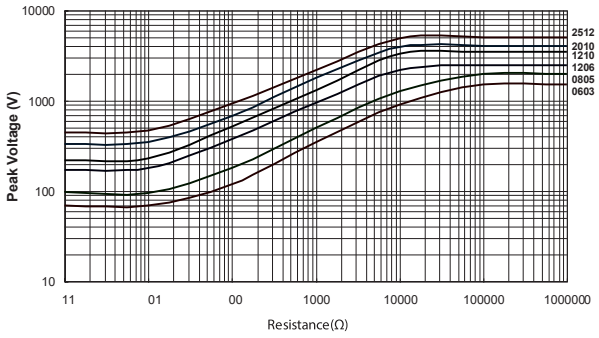


Type	A (mm)	B (mm)	C (mm)
MCSWR03	0.9	0.6	0.9
MCSWR05	1.2	0.7	1.3
MCSWR06	2	0.9	1.6

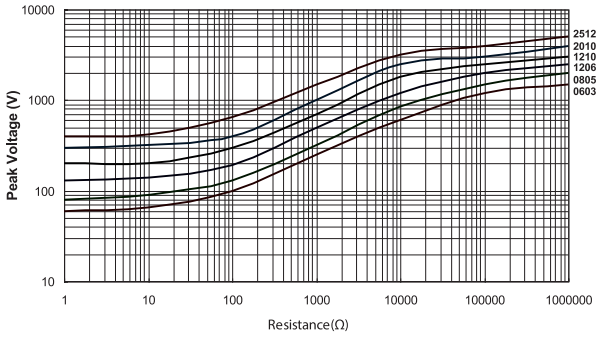
Lightning Surge

Resistors are tested in accordance with IEC 60115-1 using both 1.2/50us and 10/700 pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.

SWR Series 1.2/50us Lightning Surge

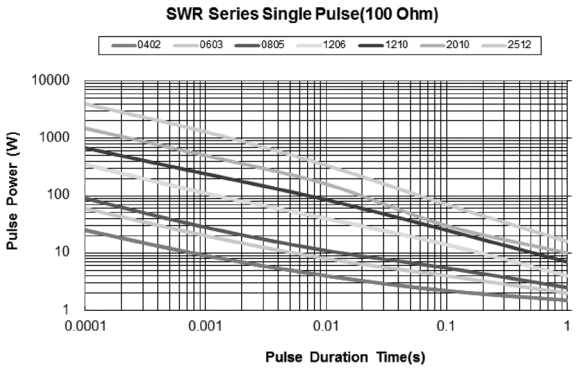


SWR Series 10/700us Lightning Surge



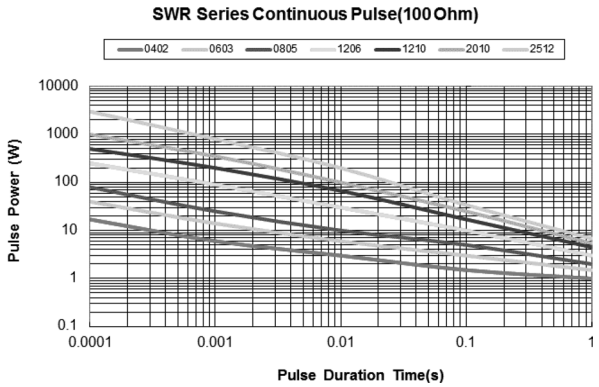
Pulse withstanding capacity

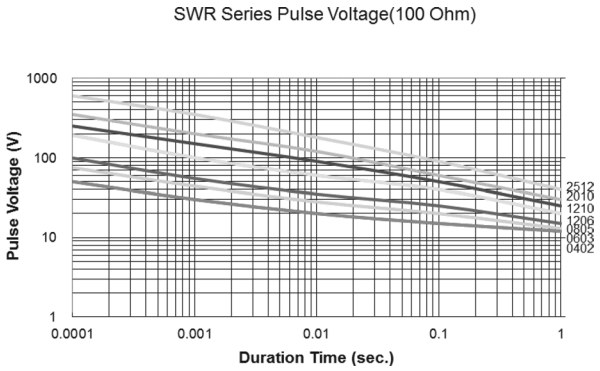
The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Continuous Pulse

The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70°C Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.





Part Number Table

Description	Part Number
Chip Resistor, 0603, 5%, TCR200, 1/8W, 10 Ω	MCSWR03JTFW0100A
Chip Resistor, 0603, 5%, TCR200, 1/8W, 100 Ω	MCSWR03JTFW1000A
Chip Resistor, 0603, 5%, TCR100, 1/8W, 10K Ω	MCSWR03JTEW1002A
Chip Resistor, 0805, 5%, TCR100, 1/4W, 10K Ω	MCSWR05JTEV1002A
Chip Resistor, 1206, 5%, TCR200, 1/3W, 10 Ω	MCSWR06JTFO0100A
Chip Resistor, 1206, 5%, TCR100, 1/3W, 47 Ω	MCSWR06JTEO0470A
Chip Resistor, 1206, 5%, TCR100, 1/3W, 100 Ω	MCSWR06JTEO1000A
Chip Resistor, 1206, 5%, TCR100, 1/3W, 1K Ω	MCSWR06JTEO1001A
Chip Resistor, 1206, 5%, TCR100, 1/3W, 2.2K Ω	MCSWR06JTEO2201A
Chip Resistor, 0805, 5%, TCR200, 1/4W, 1 Ω	MCSWR05JTFV0010A
Chip Resistor, 1206, 5% ,TCR200, 1/3W, 1.5 Ω	MCSWR06JTFO1R50A
Chip Resistor, 1206, 5%, TCR200, 1/3W, 2.7 Ω	MCSWR06JTFO2R70A
Chip Resistor, 1206, 5%, TCR200, 1/3W, 6.8 Ω	MCSWR06JTFO6R80A