

APPROVAL SHEET

WW25, WW20, WW12, WW08, WW06, WW04
 $\pm 1\%$, $\pm 0.5\%$

Low Ohmic Thin Film Current Sensor Resistors

Size 2512, 2010, 1206, 0805, 0603, 0402



FEATURES

1. SMD metal film resistor
2. High reliability and stability
3. High performance of TCR
4. Low current noise

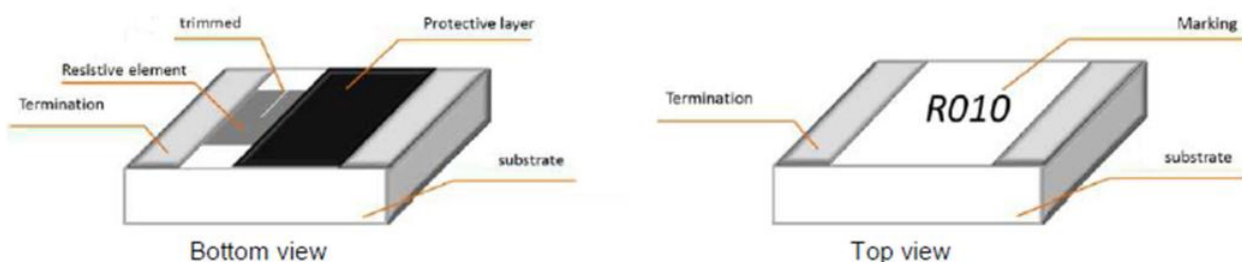
APPLICATIONS

- Current sensor
- Medical equipment
- Measuring instrument
- Communication device
- Computer
- Printer

DESCRIPTION

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes (Cu) are plated at each end and connected by a resistive layer that is applied to the bottom surface of the substrate. The composition of the resistive layer is adjusted to give the approximate resistance required and the value is trimmed to nominated value within tolerance which controlled by laser trimming of this resistive layer.

The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For environmental soldering issue, the outer layer of these end terminations is a Lead-free solder.



Quick Reference Data

Series No.	Size Code	Power Rating and TCR			Resistance Range	Resistance Tolerance
		F	G	H		
WW04	0402 (1005)	1/10W			101mΩ ~ 900mΩ	±0.5% ±1%
		±75 ppm/°C				
					21mΩ ~ 900mΩ	
WW06	0603 (1608)	1/8W			101mΩ ~ 900mΩ	
		±75 ppm/°C				
					21mΩ ~ 900mΩ	
WW08	0805 (2012)	1/4W			101mΩ ~ 900mΩ	
		±75 ppm/°C				
					21mΩ ~ 900mΩ	
WW12	1206 (3216)	1/2W		1W	101mΩ ~ 900mΩ	
		±75 ppm/°C		±75 ppm/°C		
					21mΩ ~ 900mΩ	
WW20	2010 (5025)	1W			101mΩ ~ 900mΩ	
		±75 ppm/°C				
					21mΩ ~ 900mΩ	
WW25	2512 (6342)	2W			101mΩ ~ 900mΩ	
		±75 ppm/°C				
					21mΩ ~ 900mΩ	

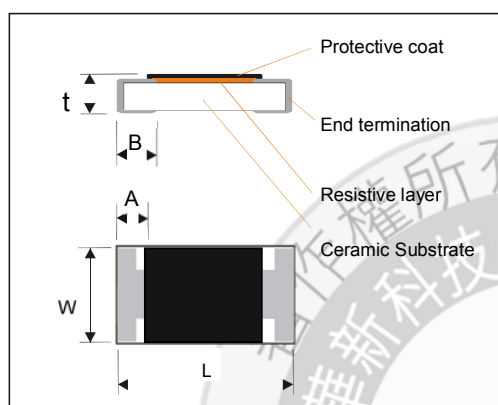
Note :

1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$$
3. Operating Temperature Range : -55 °C to +125 °C

DIMENSIONS:(unit:mm)

Type	WW25	WW20	WW12	WW08	WW06	WW04
L	6.30 ± 0.20	5.00 ± 0.20	3.10 ± 0.15	2.00 ± 0.15	1.60 ± 0.15	1.00 ± 0.15
W	3.10 ± 0.20	2.50 ± 0.20	1.60 ± 0.15	1.25 ± 0.15	0.80 ± 0.15	0.50 ± 0.15
A	0.60 ± 0.25	0.60 ± 0.25	0.50 ± 0.25	0.40 ± 0.20	0.30 ± 0.20	0.25 ± 0.10
B	1.80 ± 0.25	0.60 ± 0.25	0.50 ± 0.25	0.40 ± 0.20	0.30 ± 0.20	0.25 ± 0.10
t	0.60 ± 0.25	0.50 ± 0.25	0.55 ± 0.25	0.50 ± 0.20	0.45 ± 0.20	0.30 ± 0.20

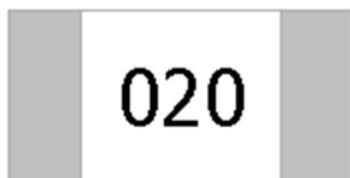


Marking

0402(No Marking)

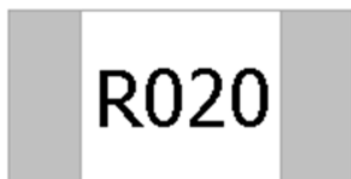


0603/0805(3 digits)



020=20mR,270=270mR

1206/2010/2512(4 digits)



R020=20mR,R270=270mR

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E96 & E24 series for resistors with a tolerance of $\pm 0.5\%$, $\pm 1.0\%$. The values of the E24/E96 series are in accordance with "IEC publication 60063".

DERATING

The power that the resistor can dissipate depends on the operating temperature; see Fig.1

0402 to 2512 Range: -55°C to $+125^{\circ}\text{C}$ (Fig.1)

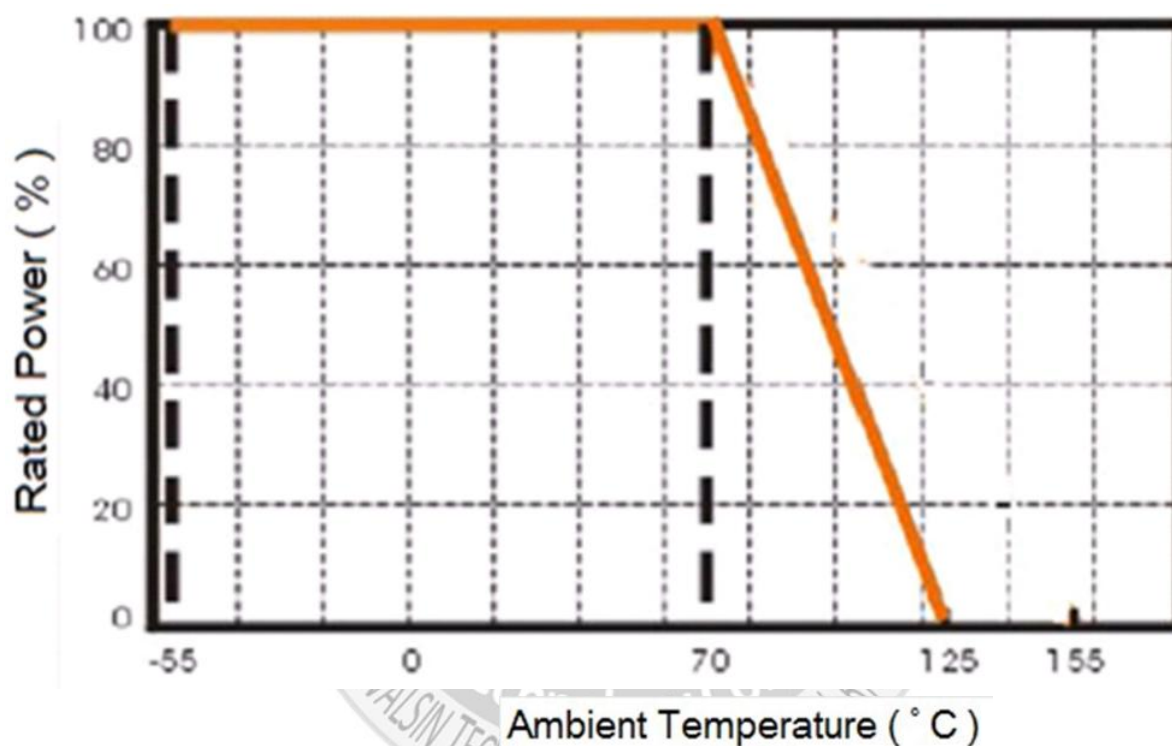


Fig.1 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

MOUNTING

Due to their rectangular shapes and small tolerances, Surface Mountable Resistors are suitable for handling by automatic placement systems.

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs).

Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

SOLDERING CONDITION

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for 10 seconds. Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).

Surface Mount Resistors are tested for solderability at 235°C during 2 seconds within lead-free solder bath. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering profile and condition that provide reliable joints without any damage are given in Fig 3. and Table 1.

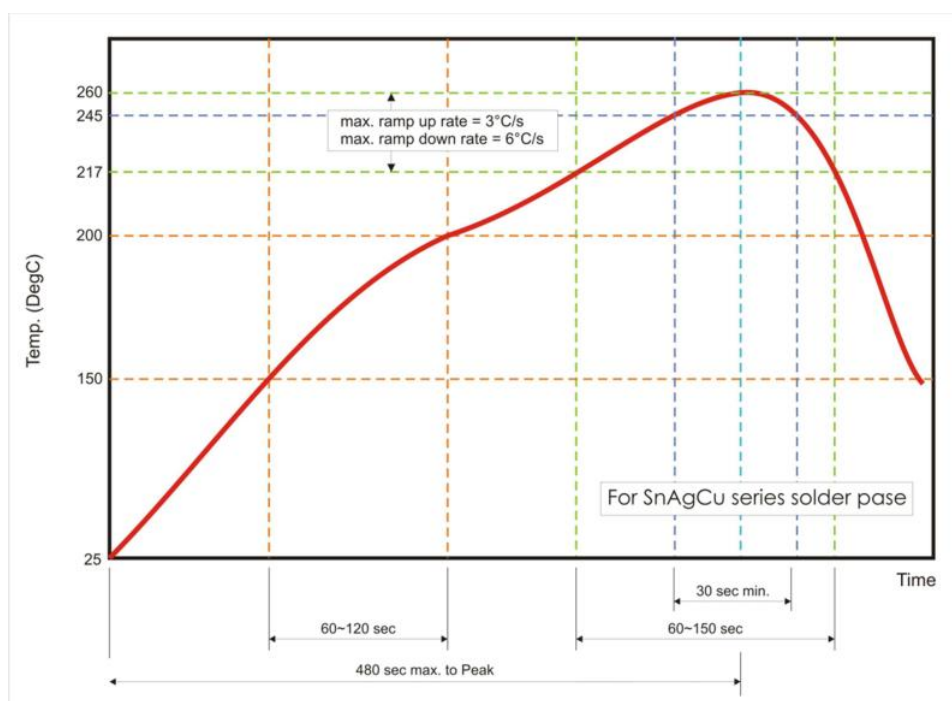


Fig. 3 Infrared soldering profile for Chip Resistors

Table 1. Infrared soldering condition for Chip Resistors

Temperature Condition	Exposure Time
Average ramp-up rate (217°C to 260°C)	Less than 3°C/second
Between 150 and 200°C	Between 60-120 seconds
> 217°C	Between 60-150 seconds
Peak Temperature	260°C +0/-5°C
Time within 245°C	Min. 30 seconds
Ramp-down rate (Peak to 217°C)	Less than 6°C/second
Time from 25°C to Peak	No greater than 480 seconds

CATALOGUE NUMBERS

WW25	F	xxxx	F	T	L
Size code	TCR & Power	Resistance	Tolerance	Packaging code	Termination code
WW25: 2512	F: 75 ppm	R followed by 3 significant digits	D : $\pm 0.5\%$	T: 7" Taped & Reeled	L : Sn base (lead free)
WW20: 2010	G:100 ppm	e.g. :	F : $\pm 1\%$	G: 13" Taped & Reeled	
WW12: 1206	H: 75 ppm High Power	R100 = 100m Ω			
WW08: 0805		R050 = 50m Ω			
WW06: 0603					
WW04: 0402					

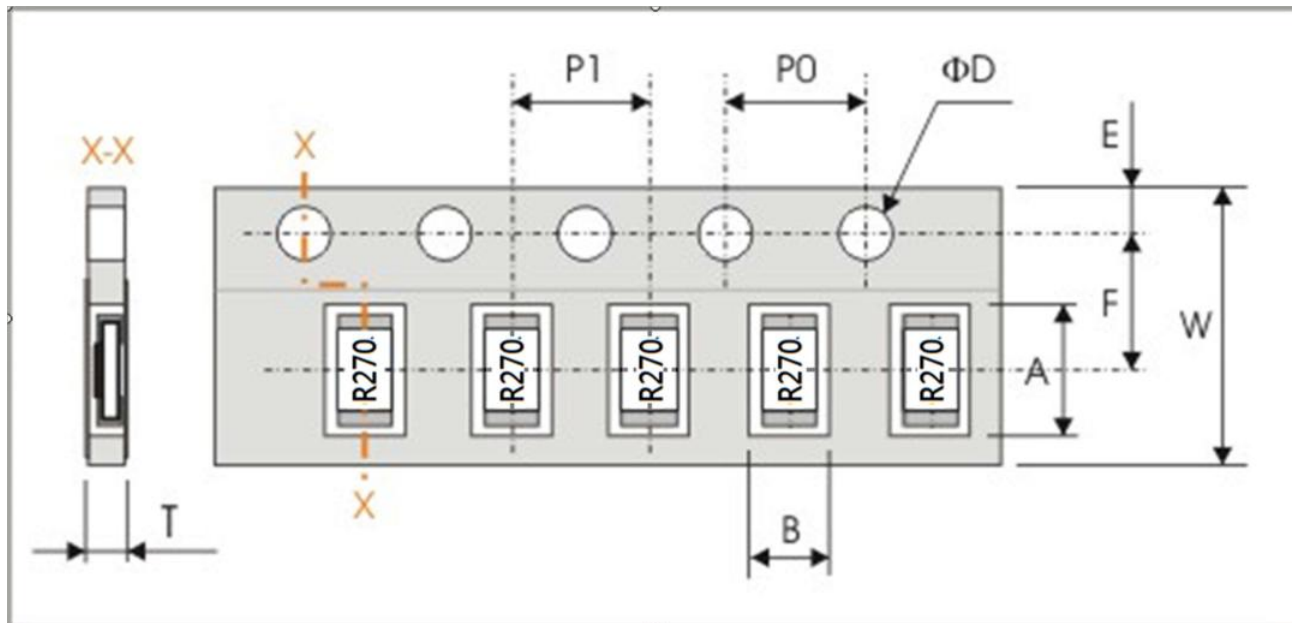


TEST AND REQUIREMENTS(JIS C 5201-1 : 1998)

TEST	PROCEDURE	REQUIREMENT
		Resistor
DC resistance Clause 4.5	DC resistance values measured <10Ω@0.1V,	Within the specified tolerance
Temperature Coefficient of Resistance(T.C.R) Clause 4.8	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ R ₁ : Resistance at reference temperature R ₂ : Resistance at test temperature t ₁ : 20°C+5°C-1°C t ₂ : 125°C+5°C-1°C	Refer to “ QUICK REFERENCE DATA “
Short time overload (S.T.O.L) Clause 4.13	5 times of rated power for 5 seconds at room temperature	ΔR/R max. ±(1.0%+0.0005Ω)
Resistance to soldering heat(R.S.H) IEC 60068-2-58:2004	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C	no visible damage Δ R/R max. ±(1.0%+0.0005Ω)
Solderability IEC 60068-2-58:2004	Un-mounted chips completely immersed for 2±0.5 second in a SAC solder bath at 235°C±5°C	good tinning (>95% covered) no visible damage
Temperature cycling Clause 4.19	30 minutes at -55°C±3°C, 2~3 minutes at 20°C+5°C-1°C, 30 minutes at +155°C±3°C, 2~3 minutes at 20°C+5°C-1°C, total 5 continuous cycles	no visible damage ΔR/R max. ±(1.0%+0.0005Ω)
Load life (endurance) Clause 4.25	70±2°C, 1000 hours, loaded with RCWV or Vmax, 1.5 hours on and 0.5 hours off	ΔR/R max. ±(1.0%+0.0005Ω)
Load life in Humidity Clause 4.24	1000 hours, at rated continuous working voltage in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5hours on and 0.5 hours off	ΔR/R max. ±(1.0%+0.0005Ω)
Bending strength Clause 4.33	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3 mm, once for 10 seconds.	ΔR/R max. ±(1.0%+0.0005Ω)
Adhesion Clause 4.32	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations.

PACKAGING

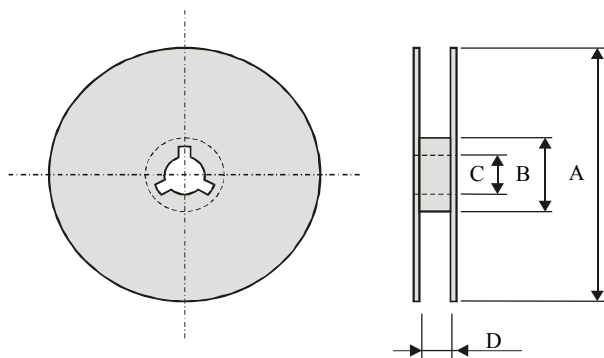
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WW25	6.90±0.20	3.60±0.20	12.00±0.30	5.50±0.10	1.75±0.10
WW20	5.50±0.20	2.80±0.20	12.00±0.30	5.50±0.10	1.75±0.10
WW12	3.60±0.20	2.00±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WW08	2.40±0.20	1.65±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WW06	1.90±0.20	1.10±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WW04	1.20±0.10	0.7±0.10	8.00±0.30	3.50±0.05	1.75±0.10

Series No.	P1	P0	ΦD	T
WW25	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max 1.2
WW20	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max 1.2
WW12	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max. 1.0
WW08	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max. 1.0
WW06	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	0.65±0.05
WW04	2.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	0.40±0.05

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	$\Phi 178.0 \pm 2.0$	$\Phi 60.0 \pm 1.0$	13.0 ± 0.2	9.0 ± 0.5

Taping quantity

- Chip resistors 4,000 pcs per reel (WW25, WW20)
- Chip resistors 5,000 pcs per reel (WW12, WW08, WW06)
- Chip resistors 10,000 pcs per reel (WW04)

