APPROVAL SHEET

WW25W, WW20W, WW10W, WW12W, WW08W, WW06W

±1%, ±5%

Thick Film Power Low Ohm Chip Resistors

Size 2512, 2010, 1210, 1206, 0805, 0603

Anti-Sulfuration FOS 105'C 750hrs compliant

RoHS Exemption free and Lead free products
Halogen free

*Contents in this sheet are subject to change without prior notice.

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FEATURE

1. High power rating and low TCR
2. High reliability and stability
3. Reduced size of final equipment
4. RoHS exemption free and Lead free products
5. Anti-Sulfuration FOS 105'C 750hrs compliant

APPLICATION

- Power supply
- PDA
- Digital meter
- Computer
- Battery charger
- DC-DC power converter

DESCRIPTION

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the substrate. The composition of the paste 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 ease of soldering the outer layer of these end terminations is Tin (lead free) alloy.

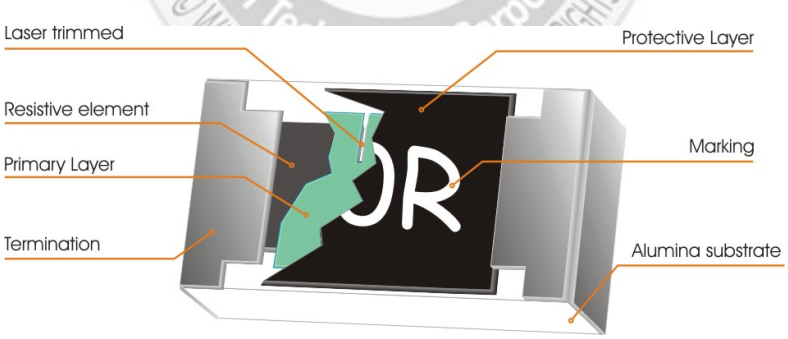
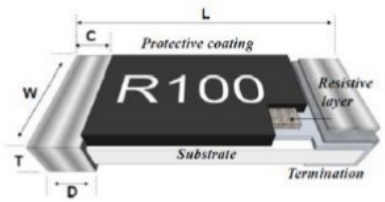


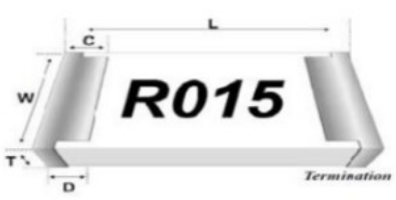
Fig 1. Construction of Chip-R

CONSTRUCTION

※ R value ≧ 40mohm



※ R value ≦ 39mΩ

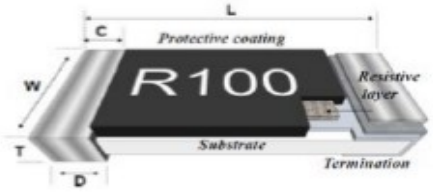


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QUICK REFERENCE DATA

Item	General Specification					
Series No.	WW25W	WW20W	WW10W	WW12W	WW08W	WW06W
Size code	2512 (6432)	2010 (5025)	1210 (3225)	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Tolerance	±5%, ±1%					
Resistance Range	0.010Ω ~ 0.910Ω, E24					0.050Ω ~ 0.910Ω, E24
TCR (ppm/°C)	10 - 20mΩ: ±1000 22 - 39mΩ: ±600 40 - 47mΩ: ±200 50 - 910mΩ: ±100	10 - 20mΩ: ±1000 22 - 39mΩ: ±600 40 - 47mΩ: ±200 50 - 910mΩ: ±100	10 - 20mΩ: ±600 22 - 39mΩ: ±400 40 - 47mΩ: ±200 50 - 910mΩ: ±100	10 - 20mΩ: ±1000 22 - 39mΩ: ±600 40 - 47mΩ: ±200 50 - 910mΩ: ±100	10 - 20mΩ: ±1000 22 - 39mΩ: ±600 40 - 47mΩ: ±400 50 - 91mΩ: ±200 100 - 910mΩ: ±100	50 - 91mΩ: ±400 100 - 910mΩ: ±200
Max. dissipation at T_{amb}=70°C	2 W	1W	3/4 W	3/4 W	1/2 W	1/4 W
Rated current	SQRT (Power / Resistance)					
Overload current	SQRT (5 x Power / Resistance)					
Operation temperature	-55 ~ +155'C					

MECHANICAL DATA



R value ≧ 40mohm

Symbol	WW25W	WW20W	WW10W	WW12W	WW08W	WW06W
L	6.30 ± 0.20	5.00 ± 0.20	3.10 ± 0.10	3.10 ± 0.10	2.00 ± 0.10	1.60 ± 0.10
W	3.10 ± 0.20	2.50 ± 0.20	2.60 ± 0.10	1.60 ± 0.10	1.25 ± 0.10	0.80 ± 0.10
T	0.60 ± 0.15	0.60 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.10	0.45 ± 0.10
C	0.60 ± 0.25	0.60 ± 0.25	0.50 ± 0.25	0.50 ± 0.25	0.40 ± 0.20	0.30 ± 0.20
D	0.90 ± 0.25	0.60 ± 0.25	0.50 ± 0.25	0.50 ± 0.25	0.40 ± 0.20	0.30 ± 0.20

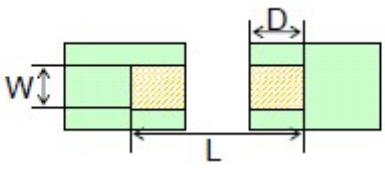


R value ≦ 39mΩ

Symbol	WW25W	WW20W	WW10W	WW12W	WW08W
L	6.40 ± 0.20	5.00 ± 0.20	3.10 ± 0.15	3.10 ± 0.15	2.00 ± 0.10
W	3.10 ± 0.20	2.50 ± 0.20	2.60 ± 0.10	1.60 ± 0.10	1.25 ± 0.10
T	0.60 ± 0.15	0.60 ± 0.10	0.60 ± 0.10	0.55 ± 0.10	0.60 ± 0.10
C	0.25 ± 0.25	0.25 ± 0.25	0.25 ± 0.25	0.25 ± 0.20	0.25 ± 0.20
D	1.80 ± 0.30	1.10 ± 0.25	0.90 ± 0.25	0.90 ± 0.25	0.65 ± 0.20

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RECOMMENDED SOLDERING PAD



Unit(mm)

Symbol	WW25W	WW20W	WW10W	WW12W	WW08W	WW06W
W	3.70	3.00	3.00	1.80	1.30	0.90
D	1.60	1.50	1.30	1.30	1.15	1.00
L	7.60	6.80	4.70	4.70	3.50	3.00

MARKING

- ***4-digits marking for 2512, 2010, 1210, 1206, 0805 size***

Each resistor is marked with a four-digit code on the protective coating to designate the nominal resistance value.

- ***3-digits marking for 0603 size***
- Each resistor is marked with a three -digit code on the protective coating to designate the nominal resistance value.

Resistance Marking (E-24 Series)

R150	4 digit marking for ±1%,±5% 0805 , 1206 , 1210,2010 , 2512 Examples. **R150 = 150 mΩ, R020 = 20 mΩ**
R50	3 digit marking for ±1%,±5% 0603 Examples. **R12 = 120 mΩ, R50 = 500 mΩ**
47M	3 digit marking for ±1%,±5% 0603 (47mΩ~91mΩ) Examples. **20M = 20 mΩ**

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FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of ±5% & ±1%. The values of the E24 series are in accordance with “IEC publication 60063”.

Derating curve

The power that the resistor can dissipate depends on the operating temperature; see Fig.2

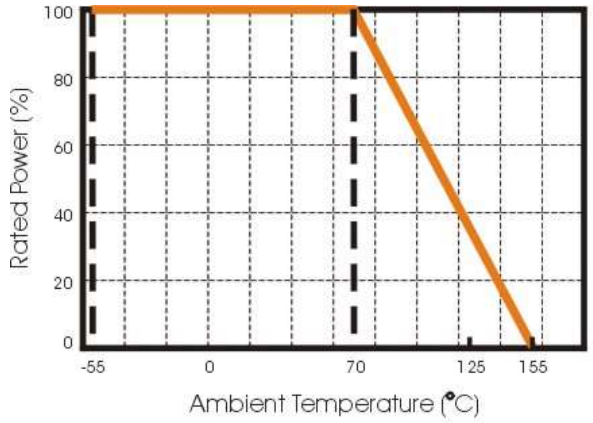


Figure 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature

SOLDERING CONDITION follows J-STD-020D

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. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in Fig 3.

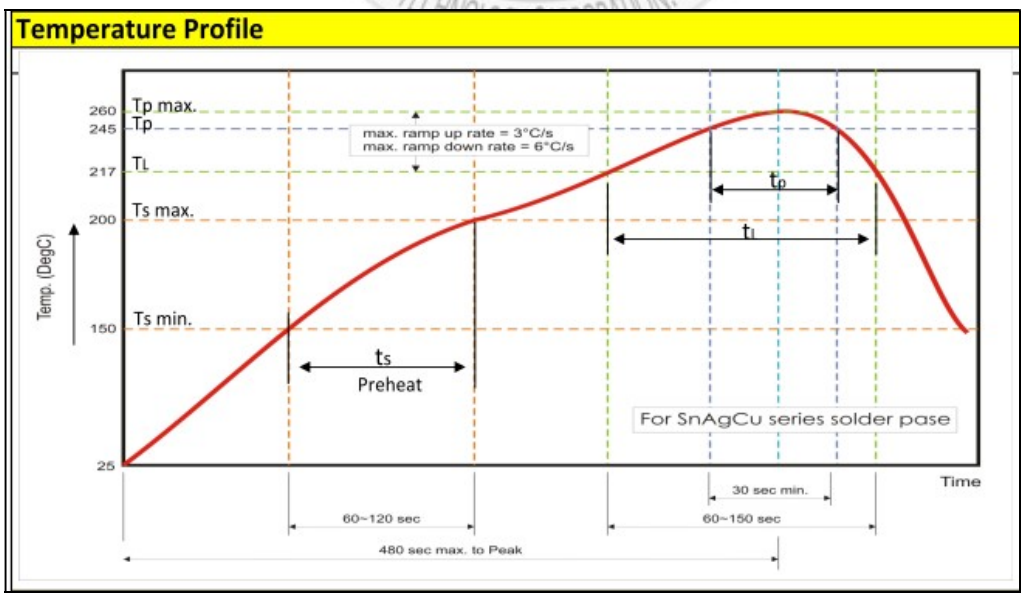


Fig 3. Infrared soldering profile

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CATALOGUE NUMBERS

The resistors have a catalogue number starting with:

WW12	W	R020	F	T	L		G	H
Size code WW25 : 2512 WW20 : 2010 WW10 : 1210 WW12 : 1206 WW08 : 0805 WW06 : 0603	**Type code** W : Thick film Power low ohm low TCR	**Resistance code** 0.020Ω = R020 0.510Ω = R510 0.025Ω = R025	**Tolerance** J : ±5% F : ±1%	**Packaging code** T : 7" Reel taping Q : 10" Reel taping G : 13" Reel taping	**Termination code** L = Sn base (lead free)	(means a blank)	**Power code** G = 3/4W	**TCR code** H = 1000

■ #14 Power Code

代碼	Power	代碼	Power
T	1/20W	Q	2/3W
A	1/16W	G	3/4W
B	1/10W	H	1W
C	1/8W	I	1.5W
U	0.15W	J	2W
S	1/5W	K	3W
R	2/5W	L	4W
D	1/4W	M	5W
E	1/3W	N	10W
F	1/2W		

■ #15 TCR Code

代碼	TCR	代碼	TCR
G	1200	X	70
H	1000	P	50
I	800	Q	25
J	600	S	15
K	400	V	10
M	350	W	5
Z	250	A	1
L	200	B	2
Y	150	C	3
N	100		

Tape packaging WW10, WW12,WW08, WW06 : 8mm width paper taping
5,000pcs per 7" reel;
10,000pcs per 10" reel;
20,000pcs per 13" reel.

WW25, WW20: 12mm width emboss taping
4,000pcs per 7" reel;
8,000pcs per 10" reel;
16,000pcs per 13" reel.

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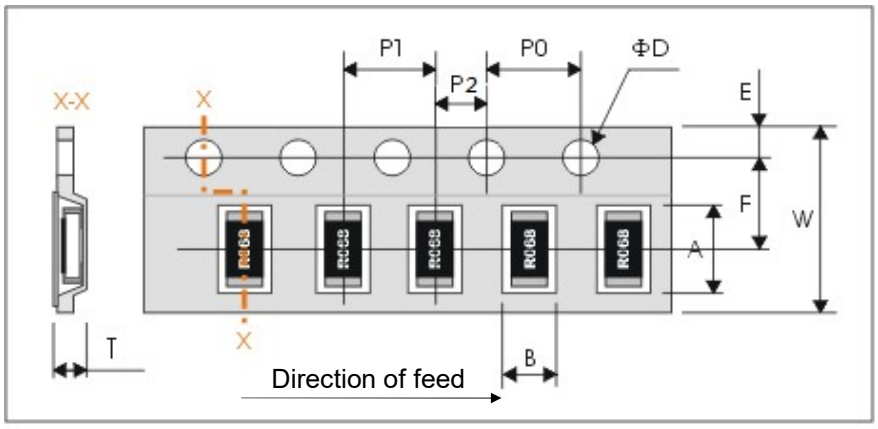
TEST AND REQUIREMENTS(JIS C 5201-1 : 1998)

TEST	PROCEDURE	REQUIREMENT
Temperature Coefficient of Resistance(T.C.R) **Clause 4.8**	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) t_1 : 25°C R_1 : Resistance at reference temperature 25°C R_2 : Resistance at test temperature 155°C	Refer to "QUICK REFERENCE DATA"
Short time overload (S.T.O.L) **Clause 4.13**	Permanent resistance change after a 5second application of a 5 times rated power.	J: ΔR/R max. ±(2%+0.5mΩ) F: ΔR/R max. ±(1%+0.5mΩ)
Solderability **Clause 4.17**	Un-mounted chips completely immersed for 3±0.5 second in a SAC solder bath at 245℃±2℃	good tinning (>95% covered) no visible damage
Resistance to soldering heat(R.S.H) **Clause 4.18**	Un-mounted chips completely immersed for 10±1 second in a SAC solder bath at 260℃±5°C	no visible damage J: ΔR/R max. ±(1%+0.5mΩ) F: ΔR/R max. ±(0.5%+0.5mΩ)
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 J: ΔR/R max. ±(1%+0.5mΩ) F: ΔR/R max. ±(0.5%+0.5mΩ)
Load life (endurance) **Clause 4.25**	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off	J: ΔR/R max. ±(3%+0.5mΩ) F: ΔR/R max. ±(1%+0.5mΩ)
Load life in Humidity **Clause 4.24**	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5hours on and 0.5 hours off	J: ΔR/R max. ±(3%+0.5mΩ) F: ΔR/R max. ±(1%+0.5mΩ)
Bending strength **Clause 4.33**	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3mm for 0603/0805, 2mm for 1206 and above sizes, once for 10 seconds	no visible damage J: ΔR/R max. ±(1%+0.5mΩ) F: ΔR/R max. ±(0.5%+0.5mΩ)
Adhesion **Clause 4.32**	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations
Insulation Resistance **Clause 4.6**	Test voltage: 100+/-15V	I.R≧1GΩ
Sulfuration test ASTM B-809-95	ASTM B-809-95 105'C 750hrs	ΔR/R max. ±(2%+0.5mΩ)

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PACKAGING

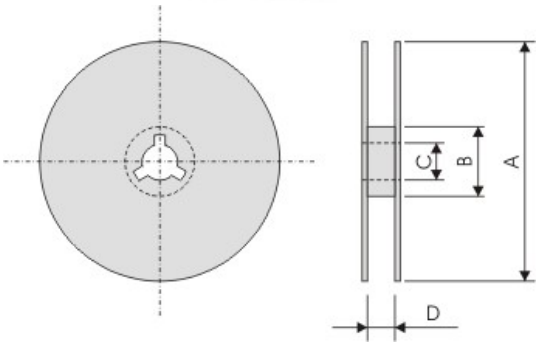
Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WW25W	6.70±0.20	3.50±0.20	12.00±0.30	3.50±0.20	1.75±0.10
WW20W	5.50±0.20	2.80±0.20	12.00±0.30		
WW10W	3.60±0.20	3.00±0.20	8.00±0.30		
WW12W	3.60±0.20	2.00±0.20			
WW08W	2.40±0.20	1.65±0.20			
WW06W	1.90±0.20	1.10±0.20			

Series No.	P1	P0	P2	ΦD	T
WW25W	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	0.81±0.2
WW20W					0.81±0.1
WW10W					0.80±0.1
WW12W					0.80±0.1
WW08W					0.80±0.1
WW06W					0.70±0.05

Reel dimensions



Symbol	A	B	C	D
7” reel	Φ178.0±2.0	Φ60.0±1.0	13.0±0.5	10.0±1.5 (8mm tape) 13.8±1.5 (12mm tape)
10” reel	Φ254.0±2.0	Φ100.0±1.0		
13: reel	Φ330.0±2.0	Φ100.0±1.0		

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