APPROVAL SHEET

WW25D, WW12D, WW08D, WW06D, WW04D

±0.5%, ±1%, ±5%

Metal Foil Low Ohm Power Chip Resistor

Size 2512, 1206, 0805, 0603, 0402

Sensing Type

Anti-Sulfur ASTM B-809 105°C 1000hrs

RoHS Exemption free and Lead free products

Halogen free

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FEATURES

1. Ultra low and stable TCR performance
2. High power rating and compact size
3. High reliability and stability
4. Reduced size of final equipment
5. RoHS exemption free & Lead free
6. ASTM B-809 105°C 1000hrs compliant

APPLICATIONS

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

DESCRIPTION

The resistors are constructed in a high grade low resistive metal foil which adhere on top of ceramic substrate body. The resistive layer is covered with a protective coat and printed a resistance marking code over it. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Lead free terminations.

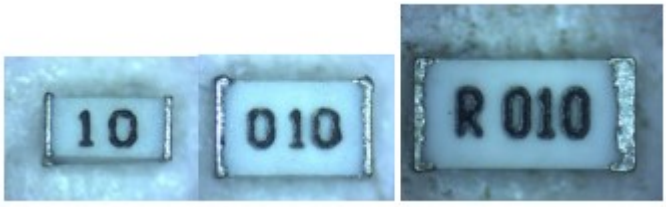


Fig 1. Construction of 0603/0805/1206

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QUICK REFERENCE DATA

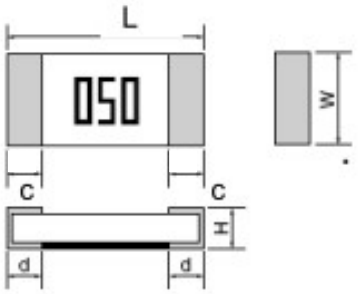
Item	General Specification				
Series No.	WW25D	WW12D	WW08D	WW06D	WW04D
Size code	2512 (6432)	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	±5% , ±1%, ±0.5% (only for TC50)				
Resistance Range	2~450mΩ, 700 mΩ	3~700mΩ	3~500mΩ	5~75mΩ	2, 3, 5 ~ 25 mΩ
TCR (ppm/°C)	2~9mΩ: ±100 10~700mΩ: ±50	3~9mΩ: ±100 10~700mΩ: ±50	3~9mΩ: ±100 10~500mΩ: ±50	5~9mΩ: ±100 10~75mΩ: ±50	2~3mΩ: ±150 5~25mΩ: ±100
Max. power at T_{amb}=70°C	2W	1W	3/4W	1/2W	1/3W
Operation Temperature	-55 ~ +155°C				

Note : Max. Operation Current : So called RCWC (Rated Continuous Working Current) is determined by

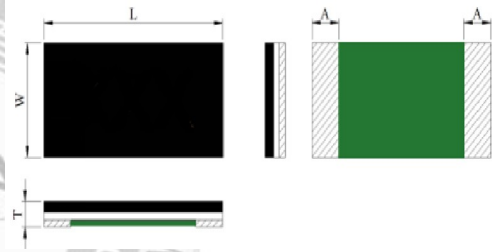
$$RCWC = \sqrt{\text{Rated Power} / \text{Resistance Value}}$$ listed above.

MECHANICAL DATA

2512,1210,1206,0805.0603 size



0402 size



Type	Size (inch)	R-value	L (mm)	W (mm)	H/T (mm)	d/A (mm)
WW25D	2512	R002	6.4±0.30	3.2±0.30	0.65±0.20	2.8±0.30
		R003	6.4±0.30	3.2±0.30	0.65±0.20	2.6±0.30
		R004-R009	6.4±0.30	3.2±0.30	0.65±0.20	1.05±0.30
		R010-R049	6.4±0.30	3.2±0.30	0.65±0.20	1.05±0.30
		R050-R700	6.4±0.30	3.2±0.30	0.65±0.20	1.05±0.30
WW12D	1206	R003	3.3±0.20	1.7±0.20	0.65±0.20	1.20±0.30
		R004-R008	3.3±0.20	1.7±0.20	0.65±0.20	0.68±0.30
		R009-R049	3.3±0.20	1.7±0.20	0.65±0.20	0.68±0.30
		R050-R700	3.3±0.20	1.7±0.20	0.65±0.20	0.68±0.30
WW08D	0805	R003	2.10±0.20	1.35±0.20	0.65±0.20	0.65±0.20
		R004	2.10±0.20	1.35±0.20	0.65±0.20	0.50±0.20
		R005-R007	2.10±0.20	1.35±0.20	0.65±0.20	0.50±0.20
		R008-R049	2.10±0.20	1.35±0.20	0.65±0.20	0.50±0.20
		R050-R500	2.10±0.20	1.35±0.20	0.65±0.20	0.5±0.20
WW06D	0603	R005	1.7±0.20	0.9±0.20	0.65±0.20	0.50±0.20
		R006-R009	1.7±0.20	0.9±0.20	0.65±0.20	0.40±0.20
		R010-R049	1.7±0.20	0.9±0.20	0.65±0.20	0.40±0.20
		R050-R100	1.7±0.20	0.9±0.20	0.65±0.20	0.40±0.20
WW04D	0402	R002~R003	1.0±0.10	0.55±0.10	0.30±0.05	0.30±0.10
		R005-R025	1.0±0.10	0.55±0.10	0.30±0.05	0.23±0.10

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CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW12	D	R020	F	T	L
Size code WW25 : 2512 WW20 : 2010 WW12 : 1206 WW08 : 0805 WW06 : 0603 WW04 : 0402	**Type code** **D : Metal foil**	**Resistance code** R is first digit followed by 3 significant digits. 0.020Ω = R020 0.040Ω = R040	**Tolerance** J : ±5% F : ±1% D : ±0.5%	**Packaging code** T : 7" reeled in tape	**Termination code** L = Sn base (lead free)

0402 Reeled tape packaging : 8mm width paper taping 10,000pcs per reel.

1206/ 0805/ 0603 Reeled tape packaging : 8mm width paper taping 5,000pcs per reel.

2512 Reeled tape packaging : 8mm width PC taping 4,000pcs per reel.

MARKING

Each resistor is marked with a four-digit code on 2512/1206 & three-digit code on 0805 & two-digit on 0603 protective coating to designate the nominal resistance value.0402 has no marking.

Example:

R020 = 0.02Ω (WW25D/WW12D)
020 = 0.02Ω (WW08D)
20 = 0.02 Ω (WW06D)

FUNCTIONAL DESCRIPTION

Derating curve

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

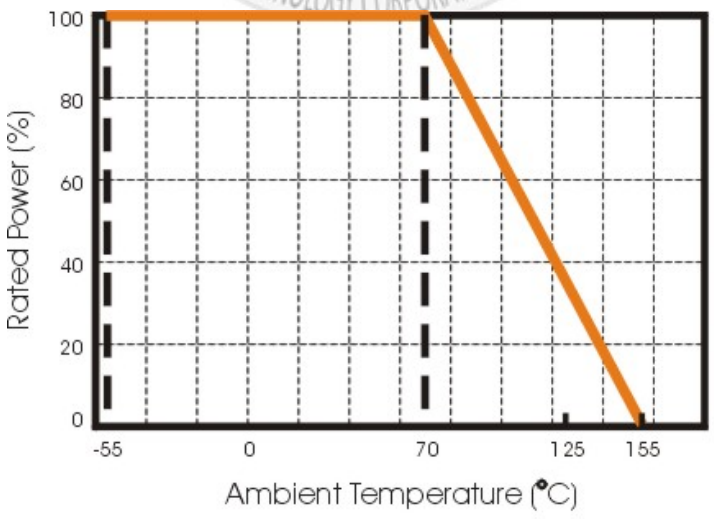


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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STORAGE CONDITIONS

Under airtight in temperature+10°C～40°C、relative humidity ≦75% can store 2 years.

Without dew in temperature+10°C～60°C、relative humidity be 95% maximum value for 30days.

SOLDERING CONDITIONS

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for max.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).

Typical examples of soldering processes that provide reliable joints without any damage are given in Fig3 as below.

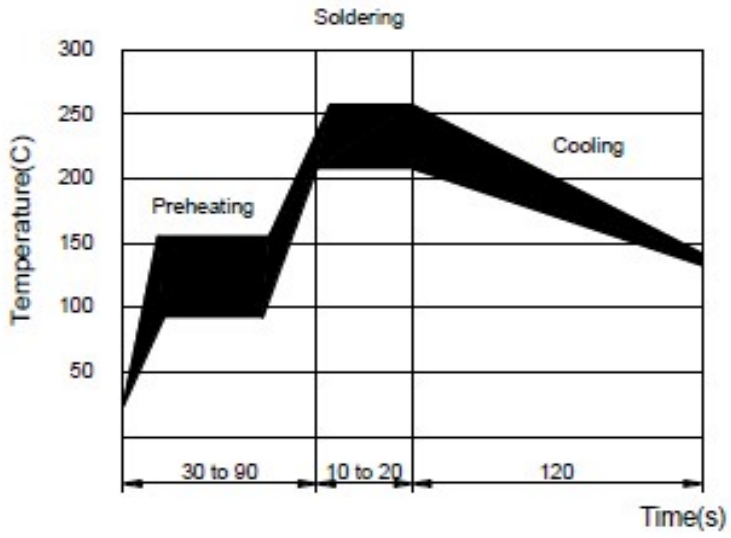
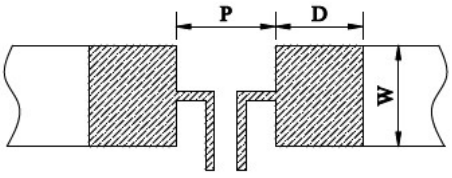


Fig 3. Infrared soldering profile for Chip Resistors

RECOMMENDED SOLDER LAND PATTERN

Type	R-value	P (mm)	W (mm)	D (mm)
WW25D	R002	0.60	3.57	4.35
	R003	0.90	3.57	4.20
	R004-R009	3.10	3.57	3.10
	R010-R700	3.10	3.57	3.10
WW12D	R003	0.60	1.84	2.10
	R004-R008	1.20	1.84	1.80
	R009-R700	1.20	1.84	1.80
WW08D	R003	0.50	1.44	1.55
	R004-R007	0.80	1.44	1.40
	R008-R500	0.80	1.44	1.40
WW06D	R005	0.50	0.92	1.35
	R006-R009	0.60	0.92	1.30
	R010-R075	0.60	0.92	1.30
WW04D	R002	0.30	0.60	0.60
	R003	0.35	0.60	0.60
	R005-R025	0.40	0.60	0.60



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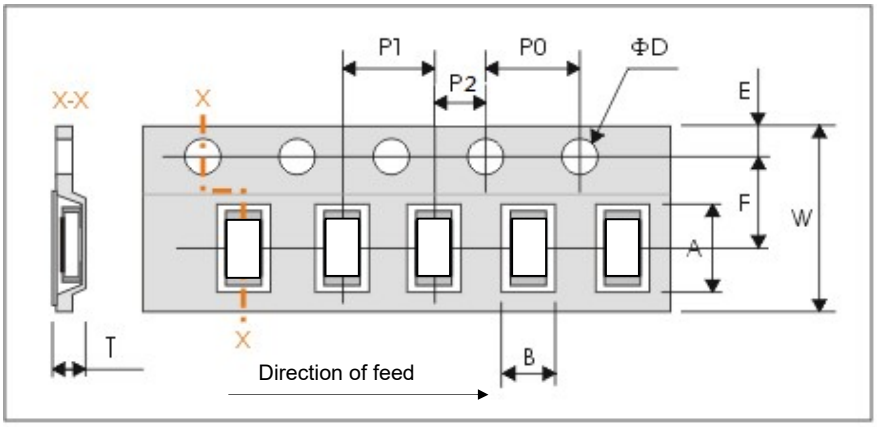
TEST AND REQUIREMENTS (IEC60115)

Parameter	Conditions	Requirements
瞬間過載測試 / Short Time Over Load IEC60115-1 4.13	P=2.5Pr, T=25±2 ºC, t=5sec Applied power : 2.5X rated power, Test duration : 5 seconds.	ΔR≤±(1.0%+0.5mΩ)
高溫測試 / High Temp. Exposure IEC60115-1 4.25	WW25D/WW12D/WW08D/WW06D : Test temperature : +170 ºC±2ºC, Test period : 1000hrs	ΔR≤±(1.0%+0.5mΩ)
	WW04D : Test temperature : +155 ºC±2ºC, Test period : 1000hrs	
低溫測試 / Low Temp. Storage IEC60115-1 4.25	WW25D/WW12D/WW08D/WW06D : T=-55±2 ºC, ,t=1000h	WW25D/WW12D/WW08D/WW06D : ΔR≤±(1.0%+0.5mΩ)
		WW04D : NA
濕度負載壽命測試 / Moisture Load Life IEC60115-1 4.25	WW25D/WW12D/WW08D/WW06D : Vtest=Vmax,T=60±2 ºC. RH=95%, t=90min ON, 30min OFF, 1000hrs	ΔR≤±(2.0%+0.5mΩ)
	WW04D : Test temperature : 60ºC±2ºC, Humidity :95% Applied power : 10% rated power Test period : 1000hrs with power cycling as follows :90min power ON/30min OFF.	
冷熱衝擊測試 / Thermal Shock IEC60115-1 4.19	【-55ºC 30min →R.T.3min →+155ºC 30min →R,T. 3min】 Repet 100Cycles	ΔR≤±(1.0%+0.5mΩ)
在 70ºC 下負載壽命測試 / Load Life IEC60115-1 4.25	Vtest=Vmax, T=70±2 ºC. t=90min ON, 30min OFF, 1000hrs Test temperature : 70ºC±2ºC Applied power : rated power Test period : 1000hrs with power cycling as follows :90min power ON/30min OFF.	ΔR≤±(2.0%+0.5mΩ)
可焊性測試 / Solderability IEC60115-1 4.17	Dip into solder at T=245±5ºC, t=3±0.5sec	New solder covered of 95% area minimum
抗焊接熱性測試 / Resistance to Solder Heat IEC60115-1 4.18	WW25D/WW12D/WW08D/WW06D : Through Relfow T=275±2 ºC. T=20±1sec	ΔR≤±(1.0%+0.5mΩ)
	WW04D : Parts are subjected to 3 reflow cycles.	
機械衝擊測試 / Mechanical Shock IEC60115-1 4.21	WW25D/WW12D/WW08D/WW06D : 加速度 a=100G, 震幅時間 t=11ms, 5 times shock	ΔR≤±(1.0%+0.5mΩ)
	WW04D: Force : 100G Test period : 6±1ms	
基板彎曲測試 / Substrate Bending IEC60115-1 4.33	90mm span between fulcrums, 2mm bend, Glass-Epoxy Board Thickness :1.6mm	ΔR≤±(1.0%+0.5mΩ)
電阻溫度係數/ Temperature Coefficient of Resistance (T.C.R) IEC 60115-1,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, t_2 : +125°C R_1 : Resistance at reference temperature 25°C R_2 : Resistance at test temperature +125°C	Within specification

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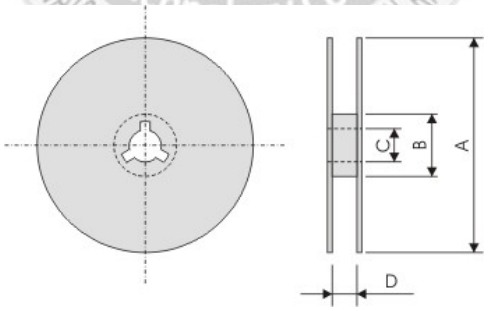
PACKAGING

Tape Specifications (unit :mm)



Symbol	A	B	W	F	E
WW25D	6.75±0.20	3.40±0.20	8.00±0.20	3.50±0.05	1.75±0.10
WW12D	3.65±0.20	2.05±0.20	8.00±0.20	3.50±0.05	1.75±0.10
WW08D	2.38±0.20	1.68±0.20	8.00±0.20	3.50±0.05	1.75±0.10
WW06D	1.98±0.20	1.18±0.20	8.00±0.20	3.50±0.05	1.75±0.10
WW04D	1.25±0.20	0.75±0.20	8.00±0.20	3.50±0.05	1.75±0.10
Symbol	P1	P0	P2	ΦD	T
WW25D	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	1.00±0.20
WW12D	4.00±0.10				0.87±0.20
WW08D	4.00±0.10				0.87±0.20
WW06D	4.00±0.10				0.65±0.20
WW04D	2.00±0.10				0.50±0.10

Reel Dimensions



Symbol	A	B	C	D
(unit : mm)	Φ180.0 -1.5	Φ60.0±1.0	13.0±0.2	9.0 ±1.0

Taping Quantity

- 1206/0805/0603 chip resistors 5,000 pcs per reel.
- 2512 chip resistors 4,000 pcs per reel.
- 0402 chip resistors 10,000 pcs per reel.

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