APPROVAL SHEET

WW25D, WW20D, WW12D, WW08D, WW06D

±0.5%, ±1%, ±5%

Metal Foil Low Ohm Power Chip Resistor

Size 2512, 2010, 1206, 0805, 0603

Automotive AEC-Q200 Qualified

Anti-Sulfur ASTM B-809 105°C 1000hrs

RoHS Exemption free and Lead free products

Halogen free

FEATURES

1. Ultra low and stable TCR performance
2. High power rating and compact size
3. High reliability and stability
4. Automotive qualified
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.

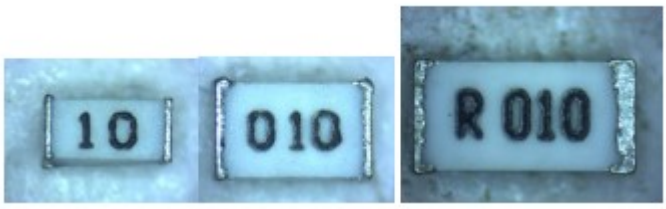


Fig 1. Construction of 0603/0805/1206

QUICK REFERENCE DATA

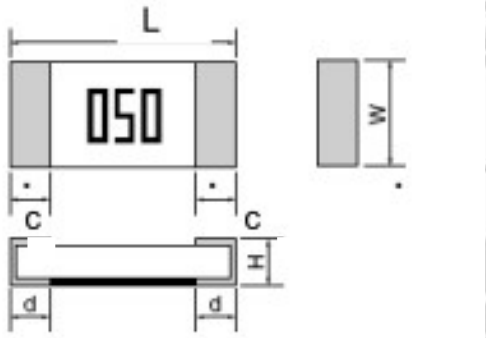
Item	General Specification*1				
Series No.	WW25D	WW20D	WW12D	WW08D	WW06D
Size code	2512 (6432)	2010 (5025)	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Tolerance	±5% , ±1%, ±0.5% (only for TC50)				
Resistance Range	50~350mΩ	5~300mΩ	3~570mΩ	5~200mΩ	5~20mΩ
TCR (ppm/°C)	50~350mΩ: ±50	5~9mΩ: ±100 10~300mΩ: ±50	3~9mΩ: ±100 10~570mΩ: ±50	5~9mΩ: ±100 10~200mΩ: ±50	5~9mΩ: ±100 10~20mΩ: ±50
Max. power at T_{amb}=70°C	2W	1.5W	1W	3/4W	1/2W
Operation Temperature	-55 ~ +155°C				

***1 Range extension and add 2512, 2010, 0603**

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



Type	Size	R-value	L (mm)	W (mm)	H (mm)	d (mm)
WW25D	2512	R050-R350	6.4±0.30	3.2±0.30	0.65±0.20	1.05±0.30
WW20D	2010	R005	5.1±0.20	2.6±0.20	0.65±0.20	1.70±0.30
		R006-R300	5.1±0.20	2.6±0.20	0.65±0.20	0.70±0.30
WW12D	1206	R003	3.3±0.20	1.7±0.20	0.65±0.20	1.20±0.30
		R004-R570	3.3±0.20	1.7±0.20	0.65±0.20	0.68±0.30
WW08D	0805	R005-R200	2.10±0.20	1.35±0.20	0.65±0.20	0.50±0.20
WW06D	0603	R005	1.7±0.20	0.9±0.20	0.65±0.20	0.50±0.20
		R006-R020	1.7±0.20	0.9±0.20	0.65±0.20	0.40±0.20

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW12	D	R020	F	T	L	J
Size code WW25 : 2512 WW20 : 2010 WW12 : 1206 WW08 : 0805 WW06 : 0603	**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)	**Special code** **J** = Automotive qualified ASTM B-809 105°C 1000hrs compliant

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

2512/2010 Reeled tape packaging : 8mm width PC taping 4,000pcs per reel.

MARKING

Each resistor is marked with a four-digit code on 2512/2010/1206 & three-digit code on 0805 & two-digit on 0603 protective coating to designate the nominal resistance value.

Example:

R020 = 0.02Ω (WW25D/WW20D/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

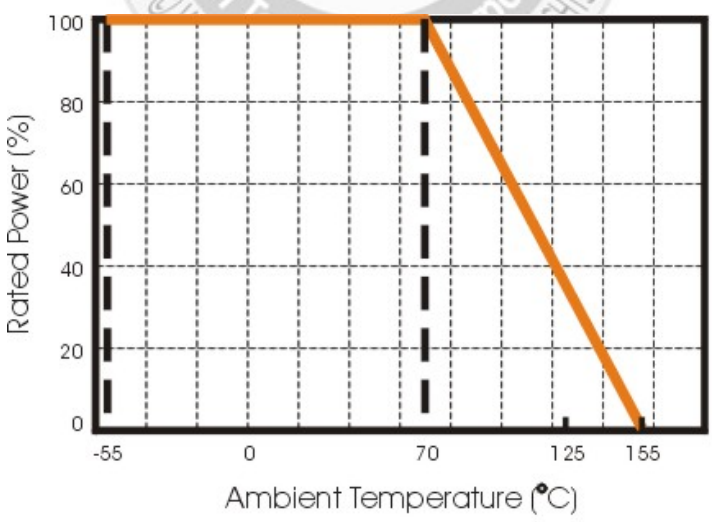


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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.

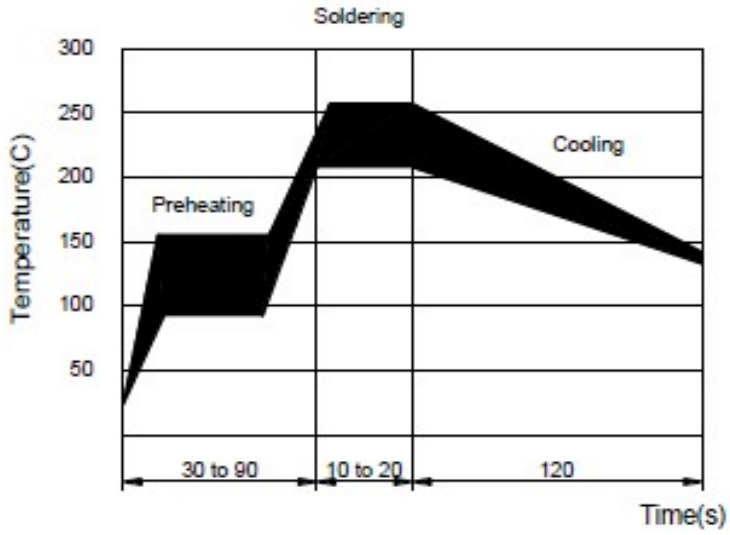
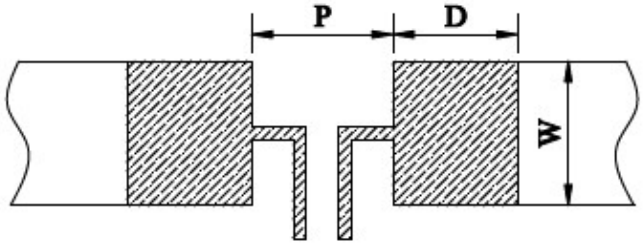


Fig 3. Infrared soldering profile for Chip Resistors

RECOMMENDED SOLDER LAND PATTERN



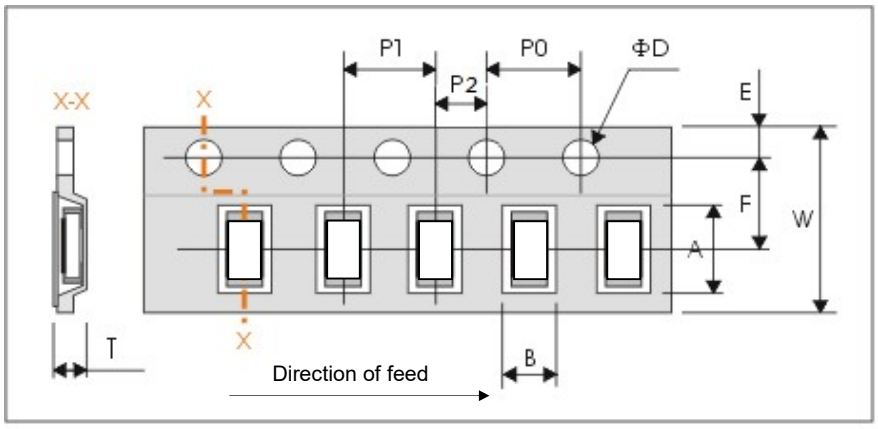
Type	R-value	P (mm)	W (mm)	D (mm)
WW25D	R050-R350	3.10	3.57	3.10
WW20D	R005	1.40	2.88	3.30
	R006-R300	2.70	2.88	2.65
WW12D	R003	0.60	1.84	2.10
	R004-R570	1.20	1.84	1.80
WW08D	R005-R200	0.80	1.44	1.40
WW06D	R005	0.50	0.92	1.35
	R006-R020	0.60	0.92	1.30

TEST & REQUIREMENTS

測試方法 Parameter	條件 Conditions	允收標準 Requirements
高溫測試 High Temp. Exposure	T = +155±2ºC ; t = 1000h	±(1.0%+0.5mΩ) MIL-STD-202 Method 108
冷熱衝擊測試 Thermal Shock	-55±3°C to 155±3°C with 30 minute dwell at each temperature and 1 min maximum transition time.1000 cycles. -55±3°C至155±3°C, 每個溫度值的停留時間為 30分鐘, 每個溫度之間的切換必須在1分鐘內完成 .進行1000 個循環	±(1.0%+0.5mΩ) JESD22-A-104
偏高湿度測試 Biased Humidity	85ºC / 85%RH;10% of operating power,1000h	±(1.0%+0.5mΩ) MIL-STD-202 Method 103
負載壽命測試 Operational Life	35% rated power ; T=125±2ºC ;t= 90minON , 30min OFF,1000h	±(1.0%+0.5mΩ) MIL-STD-202 Method 108
可焊性測試 Solderability	浸入錫爐/ Dip into solder at T = 245±5ºC ,t = 3±1sec.	錫涵蓋面積/The coveredarea >95% J-STD-002
抗焊接热測試 Resistance to Solder Heat	Condition B，260±5ºC	±(1.0%+0.5mΩ) MIL-STD-202 Method 210 Condition B
機械衝擊測試 Mechanical Shock	加速度a =100G , 振幅時間t = 6 msa =100G , t = 6 ms	±(1.0%+0.5mΩ) MIL-STD-202 Method 213 Condition C
基板彎曲測試 Substrate Bending	兩支撐點間距/ Span between fulcrums ：90mm ； 振幅 / Bend Width：2mm ； 时间 /Time：60s 測試板/Test board：玻璃纖維板/Glass-Epoxy Board ； 厚度/Thickness=1.6mm	±(1.0%+0.5mΩ)AEC Q200-005
溶剂抵抗 Resistance to Solvents	Add Aqueous wash chemical-OKEM Clean or equivalent, at normal temperature 300 sec in isopropyl.	Without mechanical damage and distinct damage in appearance MIL-STD-202 Method 215
振动测试 Vibration	5g's for 20 min.,12 cycles each of 3 orientation Test from 10-2000Hz.	±(1.0%+0.5mΩ) MIL-STD-202 Method 204
静电放电 ESD	Subjected to ESD pulses at 22 ºC±5ºC.	±1.0% AEC Q200-002
推力测试 Terminal Strength	Force of 1.8kg for 60 Second.	±(1.0%+0.5mΩ)AEC Q200-006
可燃性 Flammability	UL94 V-0 or V-1	UL94
電阻溫度係數 Temperature Coefficient of Resistance (T.C.R)	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 IEC 60115-1,Clause 4.8

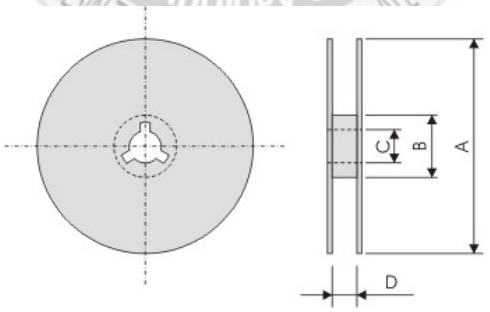
PACKAGING

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
WW20D	5.40±0.20	2.90±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
Symbol	**P1**	**P0**	**P2**	**ΦD**	**T**
WW25D	4.00±0.10	4.00±0.10	P2=1/2 P0	$\Phi 1.50^{+0.1}_{-0.0}$	1.00±0.20
WW20D	4.00±0.10				0.80±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

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 /2010 chip resistors 4,000 pcs per reel.