APPROVAL SHEET

WR25F_JN, WR20F_HN, WR12F_FN

±1%, ±5%

Thick Film General Purpose Low TCR Power Chip Resistors

Size 2512, 2010, 1206

RoHS Exemption free and Lead free products
Halogen free

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

FEATURE

1. Low TCR and high precision
2. Excellent reliability and suitable cost
3. Suitable for lead free soldering
4. RoHS compliant & Halogen free
5. RoHS exemption free and Lead free products

APPLICATION

- Consumer electronics, M/B
- Battery pack, BTC
- Notebook, Tablet PC
- Portable Device, Electronic Equipment

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 within tolerance by laser cutting 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 a Tin (lead free) alloy.

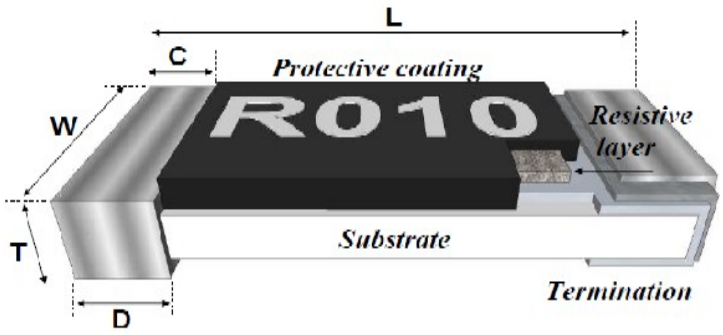


Fig 1. Construction of Chip-R

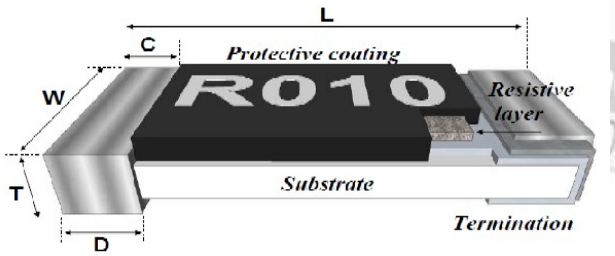
QUICK REFERENCE DATA

Type	Size	Power Rating at 70℃	Max. RCWV (V)	Max. Overload Voltage (V)	Resistance Tolerance	Temperature Coefficient (ppm/℃)	Resistance Range		Standard Resistance Values
							Min.	Max.	
WR12F	1206	1/2W (F code)	2.24	5.00	±1%(F) ±5%(J)	±100 (N code)	1Ω	10Ω	E24 & E96
WR20F	2010	1W (H code)	3.16	7.07	±1%(F) ±5%(J)	±100 (N code)	1Ω	10Ω	E24 & E96
WR25F	2512	2W (J code)	4.17	10.00	±1%(F) ±5%(J)	±100 (N code)	1Ω	10Ω	E24 & E96

Note :

1. RCWV (Rated Continuous Working Voltage) is Rated Voltage, determined by
   $RCWV = \sqrt{Rated\,Power \times Resistance\,Value}$ or Max. Working Voltage whichever is lower.
2. V: Working Voltage (V), P: Rated Power (W), R: Resistance Value (Ω)
3. Before use low ohm resistors, please consider the resistance variance from soldering pad/trace/amount, and keep the surface temperature do not exceed 105℃ when working.

DIMENSIONS (unit : mm)



Size	L	W	C	D	T
1206	3.10 ± 0.10	1.60 ± 0.10	0.50 ± 0.25	0.50 ± 0.25	0.55 ± 0.10
2010	5.00 ± 0.20	2.50 ± 0.20	0.60 ± 0.25	0.60 ± 0.25	0.60 ± 0.10
2512	6.30 ± 0.20	3.10 ± 0.20	0.60 ± 0.25	0.90 ± 0.25	0.60 ± 0.15

MARKING

Size \ Nr. Of digit of code\tolerance	±5%	±1%
1206	3 digits marking	4 digits marking
2010	3 digits marking	4 digits marking
2512	3 digits marking	4 digits marking

E24 ±5%: 3 Digits marking to identify the resistance value

1R0 → 1R x 10^0 = 1 Ω

E24/E96 ±1%: 4 Digits marking to identify the resistance value

3R90 → 3R9 x 10^0 = 3.9 Ω

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of ±5%, and E96 series for resistors with a tolerance of ±1%. 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.2

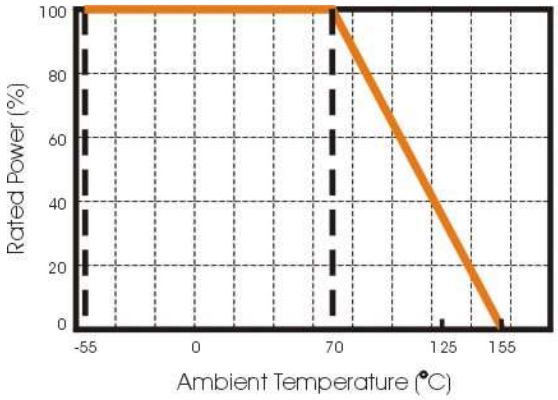


Fig. 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature

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. 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.

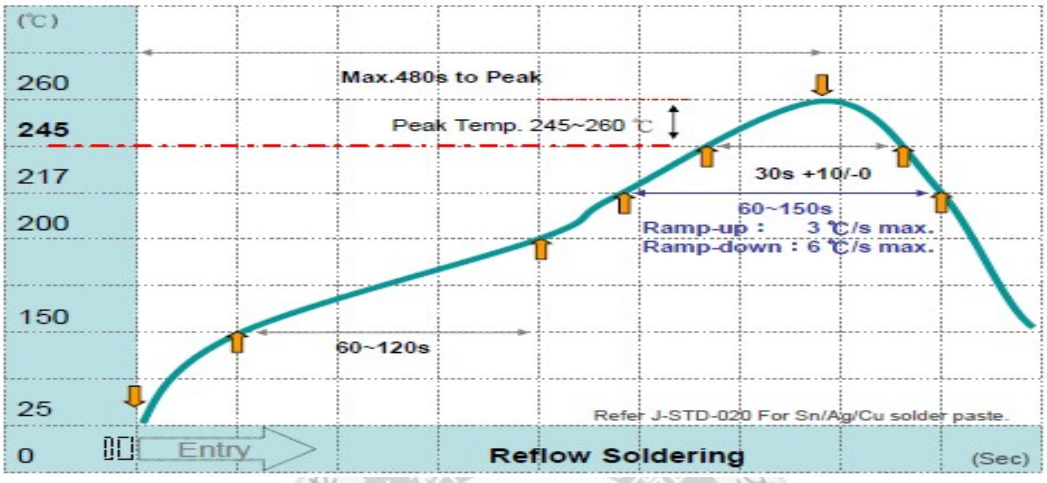
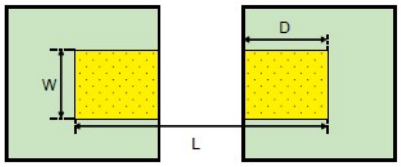


Fig 3. Infrared soldering profile for Chip Resistors

Recommend Solder Pad Dimensions：

Size	W	D	L
1206	1.80	1.30	4.70
2010	3.00	1.50	6.80
2512	3.70	1.60	7.60



CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WR12	F	1R0_	J	T	L		F	N
Size code WR25 : 2512 WR20 : 2010 WR12 : 1206	**Type code** F : Low TCR for 1~10Ω	**Resistance code** ±5%, E24: 2 significant digits followed by no. of zeros and a blank 1Ω =1R0_ 10Ω =100_ ("_" means a blank) ±1%: E24+E96: 3 significant digits followed by no. of zeros 1Ω =1R00 10Ω =10R0	**Tolerance** F : ±1% J : ±5%	**Packaging code** T : 7" Reeled taping Q : 10" Reeled taping G : 13" Reeled taping	**Termination code** L= Sn base (lead free)	(means a blank)	**Power code** J=2W H=1W F=1/2W	**TCR code** N=100ppm

Tape packaging:

1206 : 8mm width paper taping:

5,000pcs per 7" reel

10,000pcs per 10" reel

20,000pcs per 13" reel

2010/2512: 12mm width emboss taping:

4,000pcs per 7" reel

8,000pcs per 10" reel

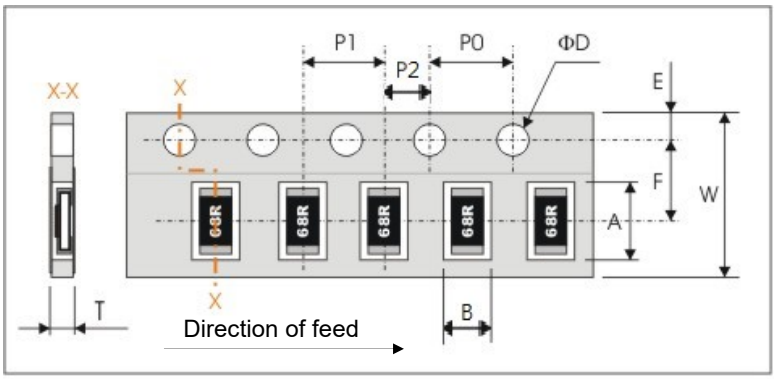
16,000pcs per 13" reel

TEST AND REQUIREMENTS

Test Item	Specification	Test Method
DC Resistance	J：±5% F：±1%	IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
Resistance to Solder Heat	J：ΔR≦±1% F：ΔR≦±0.5% No mechanical damage	IEC 60115-1 , Clause 4.18 Solder dipping @ 260±5℃ for 10±1sec.
Solderability	Over 95% of termination must be covered with Solder	IEC 60115-1 , Clause 4.17 After immersing flux, dip in the 245±2℃ molten solder bath for 3±0.5 sec.
Short Time Overload	J：ΔR≦±2% F：ΔR≦±1%	IEC 60115-1 , Clause 4.13 5 × Rated power for 5 seconds Measure resistance after 30 minutes
Temperature Coefficient of Resistance (TCR)	TCR with the spec, refer QUICK REFERENCE DATA	IEC 60115-1, Clause 4.8 Temperature：(T1. +25℃) ~ (T2. +155℃) TCR(ppm/℃) = $(R_2-R_1)/R_1\times1/(T_2-T_1)\times10^6$
Load Life	J：ΔR≦±3% F：ΔR≦±1%	IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hours at 70±2℃. Cycle repeated 1000 hours.
Bending strength	J：ΔR≦ ±1% F：ΔR≦ ±0.5% No mechanical damage.	IEC 60115-1 , Clause 4.33 Resistance variance after bended on 90mm PCB. Bending :2mm for 2512, 2010,1206
Insulation Resistance	Between termination and coating must over 1000MΩ	IEC 60115-1, Clause 4.6 Test voltage：100±15V

PACKAGING

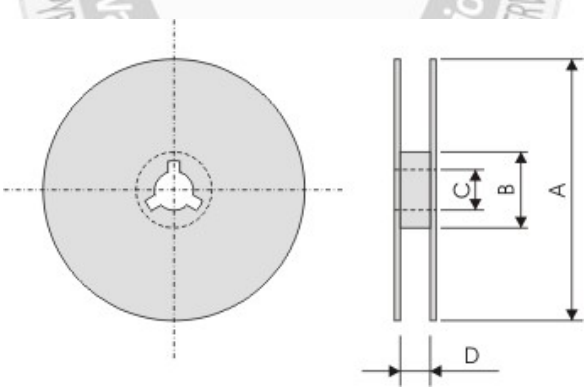
Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WR12	3.60±0.20	2.00±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WR20	5.50±0.20	2.80±0.20	12.00±0.30	5.50±0.10	1.75±0.10
WR25	6.90±0.20	3.60±0.20	12.00±0.30	5.50±0.10	1.75±0.10

Series No.	P1	P0	P2	ΦD	T
WR12	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.0
WR20	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.2
WR25	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.2

Reel dimensions (unit :mm)



Size	Reel	Packaging Q'ty	A	B	C	D
1206	7" Reel for 8mm tape	5Kpcs/reel	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	9.00±0.5
	10"reel for 8mm tape	10Kpcs/reel	Φ254.0±2.0	Φ100.0±1.0	13.0±0.2	9.00±0.5
	13"reel for 8mm tape	20Kpcs/reel	Φ330.0±2.0	Φ100.0±1.0	13.0±0.2	9.00±0.5
2512/2010	7" Reel for 12mm tape	4Kpcs/reel	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	12.4±1.0
	10" Reel for12mm tape	8Kpcs/reel	Φ254.0±2.0	Φ100.0±1.0	13.0±0.2	14.0±0.2
	13" Reel for 2mm tape	16Kpcs/reel	Φ330.0±2.0	Φ100.0±1.0	13.0±0.2	14.0±0.2