APPROVAL SHEET

WF25H, WF20H

±0.1%, ±0.5%

Thick Film Power High Precision Resistors

Size 2512, 2010

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

FEATURE

1. High power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. High precision of resistance

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.

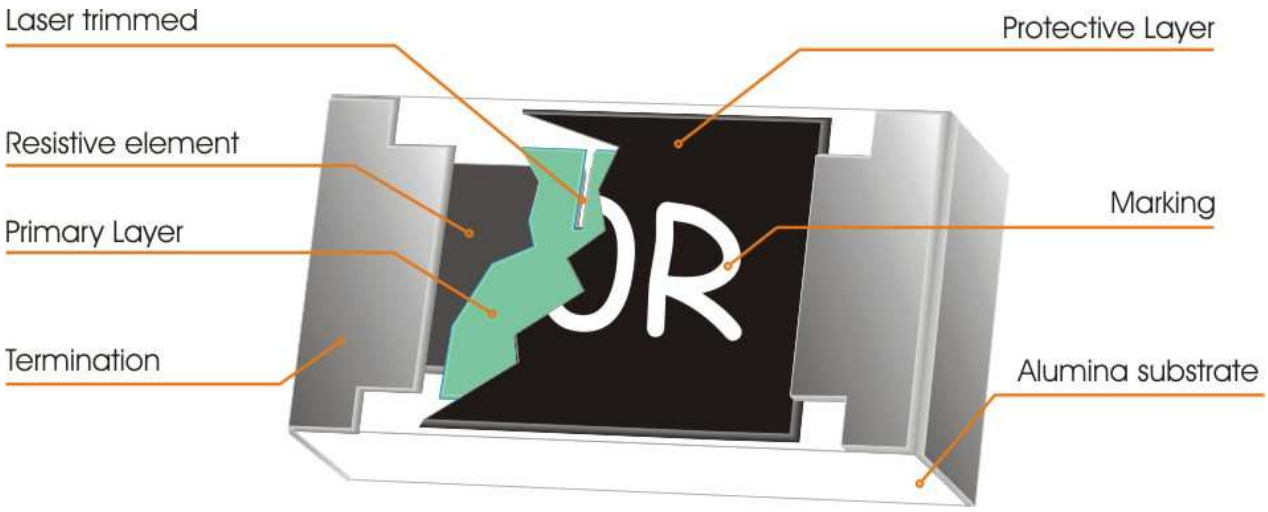


Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

Item	General Specification	
Series No.	WF25H	WF20H
Size code	2512 (6432)	2010 (5025)
Resistance Tolerance	±0.5% ; ±0.1% (E24+E96)	
Resistance Range	1Ω ~ 10MΩ,	
TCR (ppm/°C) 1Ω ≤ Rn ≤ 10Ω	± 200 ppm/°C	
10Ω < Rn ≤ 10MΩ	± 100 ppm/°C	
Max. dissipation at T_{amb}=70°C	1 W	0.5W
Max. Operation Voltage (DC or RMS)	250V	200V
Max. Overload Voltage (DC or RMS)	500V	400V
Climatic category (IEC 60068)	55/155/56	

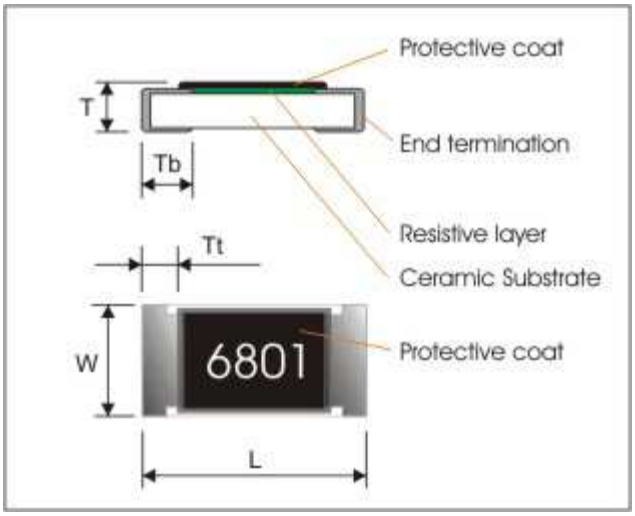
Note :

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

$$RCWV = \sqrt{Rated\,Power \times Resistance\,Value}$$ or Max. RCWV listed above, whichever is lower.

MECHANICAL DATA(unit : mm)

Symbol	2512	2010
L	6.40±0.20	5.00±0.20
W	3.20±0.20	2.50±0.20
T	0.60±0.10	0.55±0.10
Tt	0.65±0.25	0.65±0.25
Tb	0.90±0.25	0.60±0.25



MARKING

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

1R00 = 1Ω
1001 = 1000Ω

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E96 & E24 series for resistors with a tolerance of ±0.5% & ±0.1%. The values of the E24/E96 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

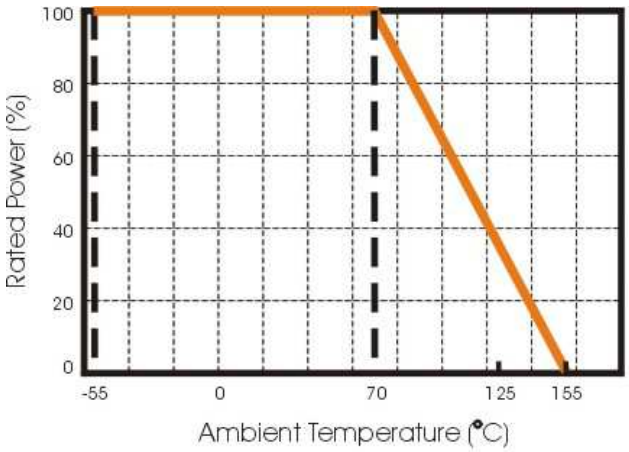


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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.

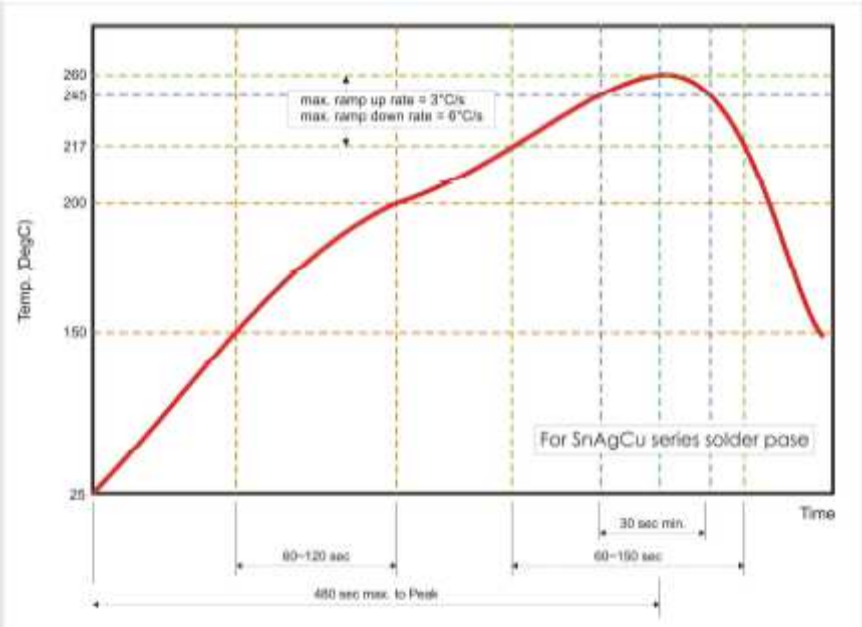


Fig 3. Infrared soldering profile for Chip Resistors

CATALOGUE NUMBERS

The resistors have a catalogue number starting with :

WF25	H	1000	B	T	L
Size code WF25 : 2512 WF20 : 2010	**Type code** H : Thick film, High precision	**Resistance code** E24+E96 : 3 significant digits followed by no. of zeros 102Ω =1020 37.4KΩ =3742	**Tolerance** B : ±0.1% D : ±0.5%	**Packaging code** T : 7" Reel taping	**Termination code** L = Sn base (lead free)

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

Essentially all tests are carried out according to the schedule of IEC publication 115-8, category **LCT**/**UCT**/56 (rated temperature range : **L**ower **C**ategory **T**emperature, **U**pper **C**ategory **T**emperature; damp heat, long term, 56 days). The testing also meets the requirements specified by EIA, EIAJ and JIS.

The tests are carried out in accordance with IEC publication 68, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions according to IEC 60068-1, subclause 5.3. Unless otherwise specified, the following value supplied :

Temperature: 15°C to 35°C.

Relative humidity: 45% to 75%.

Air pressure: 86kPa to 106 kPa (860 mbar to 1060 mbar).

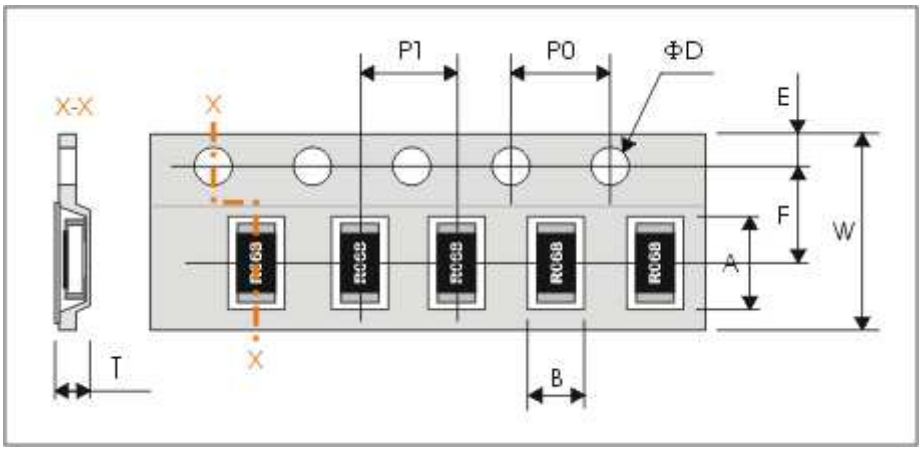
All soldering tests are performed with midly activated flux.

TEST	PROCEDURE	REQUIREMENT
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	▪ DC resistance values measurement ▪ 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 : 20℃+5℃-1℃ R_1 : Resistance at reference temperature (20℃+5℃/-1 ℃) R_2 : Resistance at test temperature (-55℃ or +155℃)	Within the specified tolerance Refer to "QUICK REFERENCE DATA"
Short time overload (STOL) **Clause 4.13**	Permanent resistance change after a 5second application of a voltage 2.5 times RCWV or the maximum overload voltage specified in the above list, whichever is less.	ΔR/R max. ±(1%+0.05Ω)
Resistance to soldering heat **Clause 4.17**	Un-mounted chips 10±1 seconds, in a SAC solder bath at 260±5°C	no visible damage Δ R/R max. ±(1%+0.05Ω)
Solderability **Clause 4.18**	Un-mounted chips completely immersed for 2±0.5 sec. in a SAC solder bath at 235±5°C	good tinning (>95% covered) no visible damage
Temperature cycling **Clause 4.19**	1. 30 minutes at -55°C±3°C, 2. 2~3 minutes at 20℃+5℃-1℃, 3. 30 minutes at +155°±3°C, 4. 2~3 minutes at 20℃+5℃-1℃, Total 5 continuous cycles	no visible damage ΔR/R max. ±(1%+0.05Ω)
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	ΔR/R max. ±(3%+0.1Ω)

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	ΔR/R max. ±(3%+0.1Ω)
Bending strength JISC5201-1: 1998 **Clause 4.33**	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 2mm for 10sec,	ΔR/R max. ±(1%+0.05Ω)
Adhesion JISC5201-1: 1998 **Clause 4.32**	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations
Insulation Resistance **Clause 4.6**	Apply the maximum overload voltage (DC) for 1minutes	R≧10GΩ
Dielectric Withstand Voltage **Clause 4.7**	Apply the maximum overload voltage (AC) for 1 minutes	No breakdown or flashover

PACKAGING

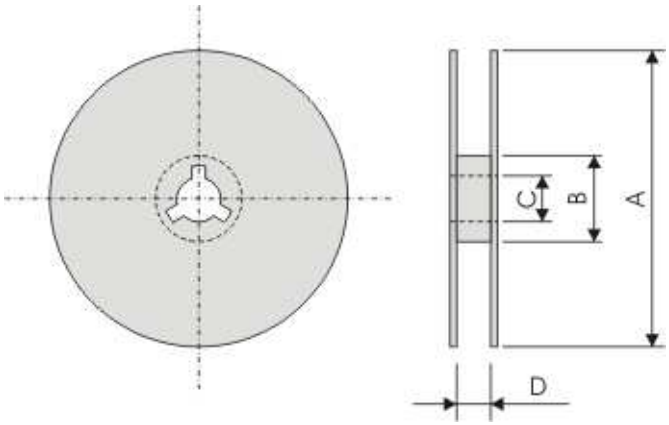
Plastic tape specifications (unit :mm)



Type	A	B	W	F	E
2512	6.90±0.20	3.60±0.20	12.00±0.30	5.50±0.1	1.75±0.10
2010	5.50±0.20	2.80±0.20	12.00±0.30	5.50±0.1	1.75±0.10

Type	P1	P0	ΦD	T
2512	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.2
2010	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.2

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	14.0±0.2

Taping quantity

- Chip resistors 4,000 pcs per reel.