

# APPROVAL SHEET

**WF25S, WF20S, WF12S, WF08S, WF06S**

**±5%, ±10%, ±20%**

Power Surge Chip Resistors

Size 2512 , 2010 , 1206 , 0805 , 0603

## FEATURE

1. Power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. Surge protection

## APPLICATION

- Power supply
- Measurement instrument
- Automotive industry
- Medical or Military equipment

## DESCRIPTION

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal 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 request resistance to nominal value within tolerance which controlled by printing process in 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 (Pb free) alloy.

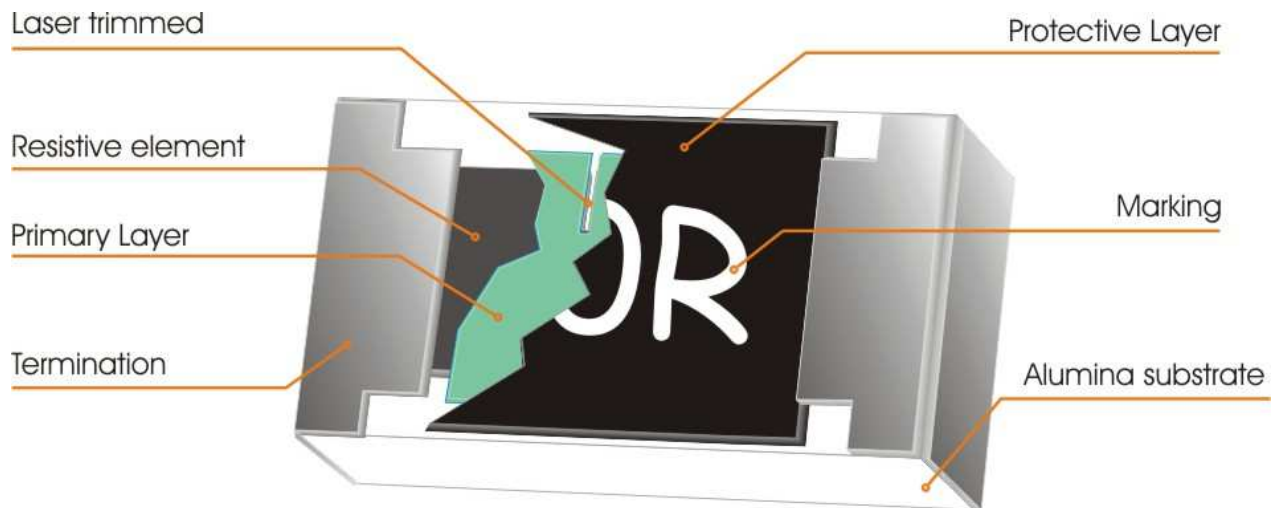


Fig 1. Consctruction of Chip-R

### QUICK REFERENCE DATA

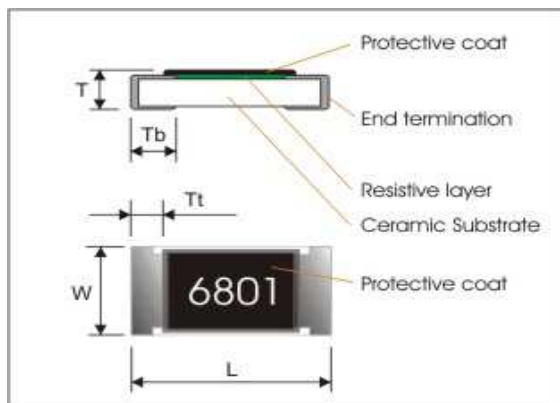
Item	General Specification				
Series No.	WF25S	WF20S	WF12S	WF08S	WF06S
Size code	2512(6432)	2010 (5025)	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Tolerance	±5% ±10% ±20% (E24)				
Resistance Range	1Ω ~ 1MΩ				
TCR (ppm/°C)	± 100 ppm /°C				
Max. dissipation at T <sub>amb</sub> =70°C	1 W	1/2W	1/4W	1/8W	1/10 W
Max. Operation Voltage (DC or RMS)	200V	200V	200V	150V	50V
Max. Overload Voltage (DC or RMS)	400V	400V	400V	300V	100V
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

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

### MECHANICAL DATA(unit : mm)

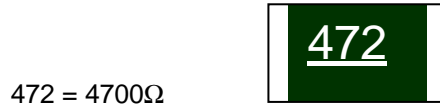


Symbol	WF25S	WF20S	WF12S	WF08S	WF06S
L	6.30±0.20	5.00±0.20	3.10±0.15	2.00±0.15	1.60 ± 0.10
W	3.10±0.20	2.50±0.20	1.60±0.15	1.20±0.15	0.80 ± 0.10
T	0.60±0.15	0.60±0.10	0.55±0.10	0.50±0.10	0.45 ± 0.15
Tt	0.60±0.25	0.60±0.25	0.50±0.25	0.40±0.20	0.30 ± 0.15
Tb	0.60±0.25	0.60±0.25	0.50±0.25	0.40±0.20	0.30 ± 0.10

## MARKING

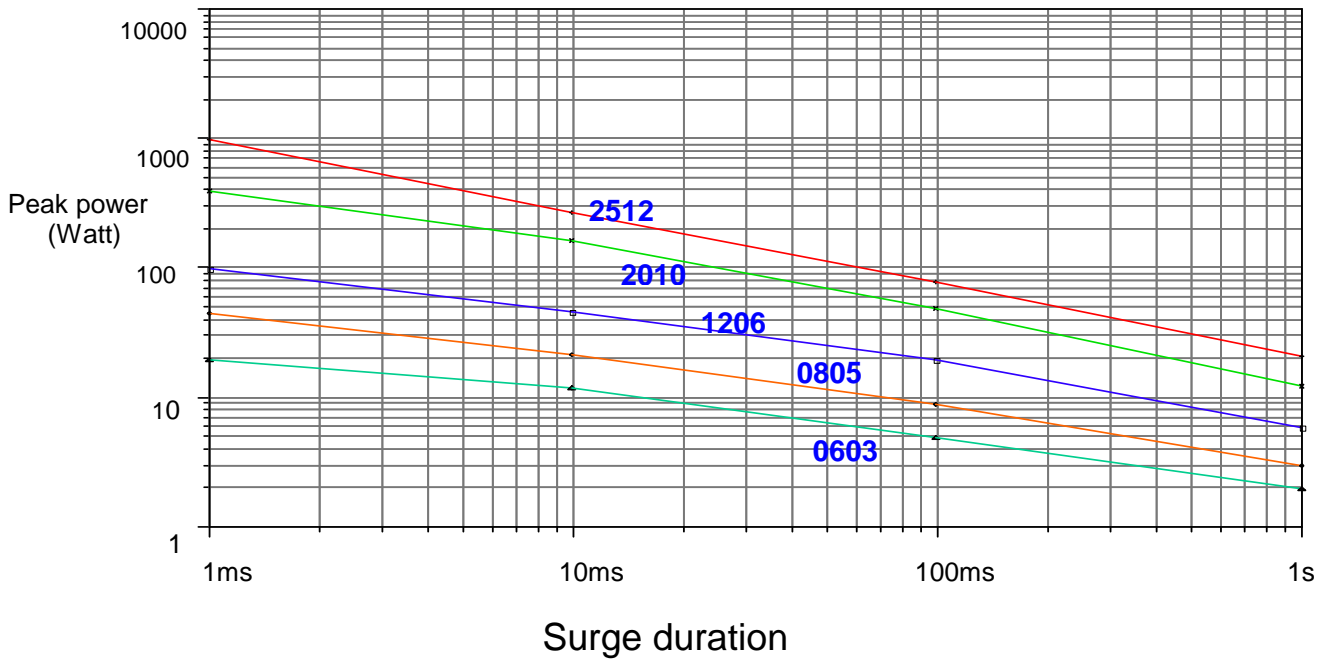
1. Each resistor is marked with a three-digit code on the protective coating to designate the nominal resistance value.
2. Surge Resistor is prints underline on three-digit code for identification

Example:



## Surge Performance

WFxxS series



## De-rating curve

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

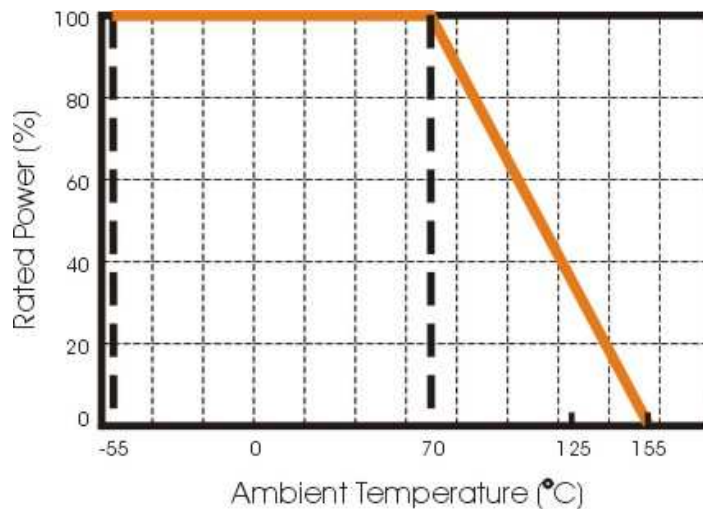


Fig.2 Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## MOUNTING

Due to their rectangular shapes and small tolerances, Surface Mountable Resistors are suitable for handling by automatic placement systems.

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs).

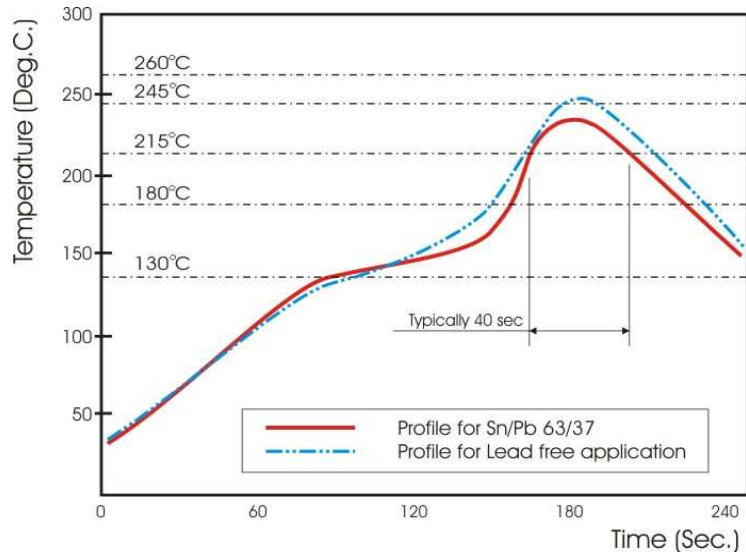
Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

## 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 WFxxS**

## CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

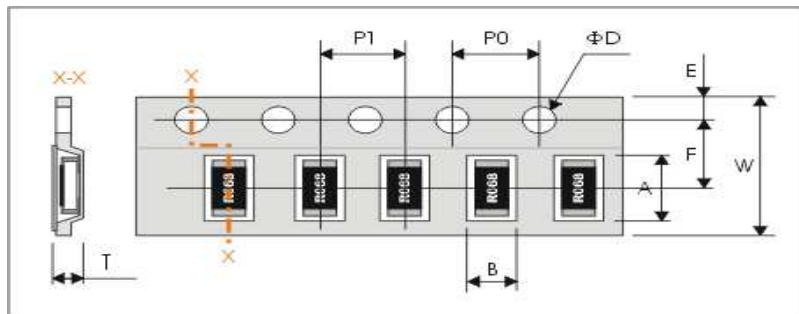
WF20	S	472_	J	T	L
<b>Size code</b>	<b>Type code</b>	<b>Resistance code</b>	<b>Tolerance</b>	<b>Packaging code</b>	<b>Termination code</b>
WF25 : 2512 WF20 : 2010 WF12 : 1206 WF08 : 0805 WF06 : 0603	<b>S</b> : surge	E24 : 3 significant digits followed by no. of zeros and a blank  472 = 4K7	J: ±5% K: ±10% M: ±20%	T : 7" Reeled taping	L = Sn base (lead free)

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

TEST	PROCEDURE	REQUIREMENT
Temperature Coefficient of Resistance(T.C.R) <b>Clause 4.8</b>	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ $t_1 : 20^\circ\text{C}+5^\circ\text{C}-1^\circ\text{C}$ R <sub>1</sub> : Resistance at reference temperature R <sub>2</sub> : Resistance at test temperature	Refer to "QUICK REFERENCE DATA"
Short time overload (S.T.O.L) <b>Clause 4.13</b>	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%+0.1Ω)
Resistance to soldering heat(R.S.H) <b>Clause 4.18</b>	Un-mounted chips completely immersed for 10±1second in a solder bath at 260°C ±5°C	no visible damage Δ R/R max. ±(1%+0.05Ω)
Solderability <b>Clause 4.17</b>	Un-mounted chips completely immersed for 2±0.5second in a solder bath at 235°C ±5°C	good tinning (>95% covered) no visible damage
Temperature cycling <b>Clause 4.19</b>	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 cycles	no visible damage ΔR/R max. ±(1%+0.05Ω)
Load life (endurance) <b>Clause 4.25</b>	70±2°C, 1000 hours, loaded with RCWV or Vmax,1.5 hours on and 0.5 hours off	ΔR/R max. ±(3%+0.1Ω)
Load life in Humidity <b>Clause 4.24</b>	1000 hours, at rated continuous working voltage 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 <b>Clause 4.33</b>	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 2 mm, once for 10 seconds	ΔR/R max. ±(1%+0.05Ω)
Adhesion <b>Clause 4.32</b>	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations
Insulation Resistance <b>Clause 4.6</b>	Apply the maximum overload voltage (DC) for 1minute	R ≥ 10GΩ
Dielectric Withstand Voltage <b>Clause 4.7</b>	Apply the maximum overload voltage (AC) for 1 minute	No breakdown or flashover

## PACKAGING

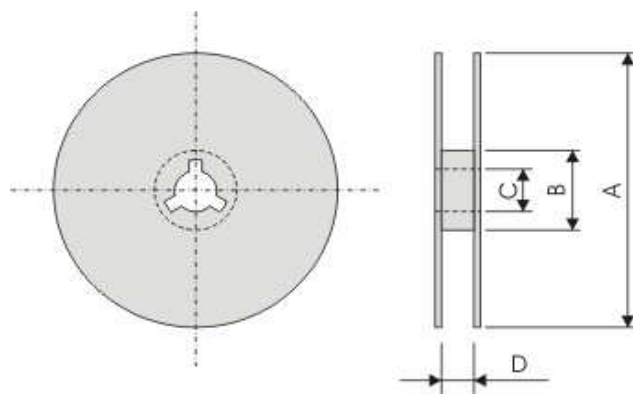
Plastic Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WF25S	6.70±0.20	3.50±0.20	12.00±0.30	5.50±0.05	1.75±0.10
WF20S	5.50±0.20	2.80±0.20			
WF12S	3.57±0.20	2.00±0.20	8.00±0.30	3.50±0.05	1.75±0.10
WF08S	2.40±0.20	1.65±0.20			
WF06S	1.90±0.20	1.10±0.20			

Series No.	P1	P0	ΦD	T
WF25S	4.00±0.10	4.00±0.10	Φ1.50 <sup>+0.1</sup> <sub>-0.0</sub>	Max. 1.2
WF20S				
WF12S				Max. 1.0
WF08S				
WF06S				0.65±0.05

### Reel dimensions



Reel / Tape	A	B	C	D
7" reel for 8mm tape	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	9.00±0.50
7" reel for 12mm tape				12.4±1.00

### Taping quantity

- 1206 0805 0603 Chip resistors 5,000 pcs per reel.
- 2010 2512 Chip resistors 4,000 pcs per reel.

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