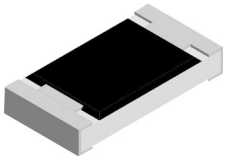
High Precision Thin Film Chip Resistors
WF12W, WF08W, WF06W, WF04W

multicomp PRO

RoHS Compliant



Description

The resistors are constructed in a high grade ceramic body (aluminium oxide). Internal metal electrodes are added at each end and connected by a resistive layer that is applied to the top surface of the substrate. The composition of the resistive layer 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 environmental soldering issue, the outer layer of these end terminations is a Lead-free solder

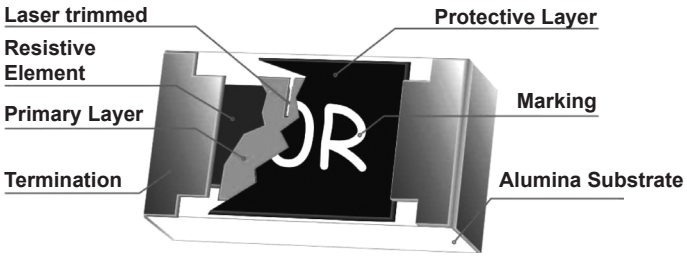
Features

- SMD metal film resistor
- High reliability and stability of 0.25%
- High performance of TCR: 10 ppm/K
- Low current noise

Application

- Medical equipment
- Measuring instrument
- Communication device
- Computer and Printer

Construction of Chip-R



Quick Reference Data

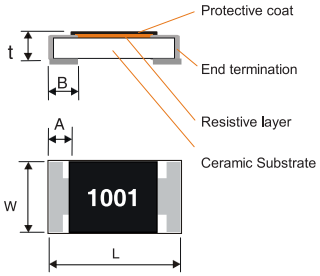
Item	General Specification			
Series No.	WF12W	WF08W	WF06W	WF04W
Size code	1206(3216)	0805(2012)	0603(1608)	0402(1005)
Resistance Range	±0.5%, ±0.25%, ±0.1%, ±0.05%			
Resistance Tolerance	25Ω ~ 300kΩ (E24 +E192)	25Ω ~ 200kΩ (E24 +E192)	25Ω ~ 100kΩ (E24 +E192)	25Ω ~ 20kΩ (E24 +E192)
TCR (ppm/°C)	±10ppm/°C			
Max. dissipation at T_{amb}=70°C	1/8W	1/8W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	150V	100V	50V	25V
Max. Overload Voltage (DC or RMS)	300V	200V	100V	50V
Operation Temperature	-55°C ~ +155°C			

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

Mechanical Data



Type	WF12W	WF08W	WF06W	WF04W
L	3.05 ±0.15	2 ±0.1	1.55 ±0.1	1 ±0.1
W	1.55 ±0.15	1.25 ±0.1	0.8 ±0.1	0.5 ±0.05
A	0.4 ±0.2	0.25 ±0.2	0.25 ±0.15	0.15 ±0.1
B	0.40 ±0.2	0.4 ±0.2	0.3 ±0.15	0.25 ±0.1
t	0.55 ±0.15	0.5 ±0.15	0.45 ±0.15	0.3 ±0.05

Dimensions : Millimetres

Marking

3-digits marking for 0603 size

WFxxW has same marking rule as WRxx ±1%.

4-digits marking for 1206, 0805 size

For E24+E96, each resistor is marked with a four digits code on the protective coating to designate the nominal resistance value. For values below 97W6 the R is used as a digit. For values of 100W or greater, the first 3 digits are significant, the fourth digit indicates the number of multiple to follow.

Example

Resistance	100Ω	6800Ω	47000Ω
4-digits marking	1000	6801	4702

No marking code for 0402 size

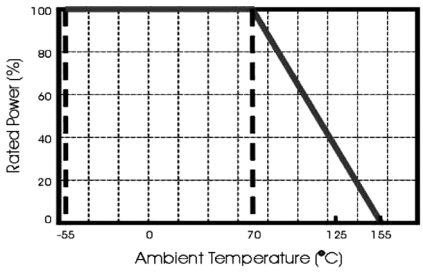
Functional Description

Product characterization

Standard values of nominal resistance are taken from the E192 & E24 series for resistors with a tolerance of ±1%, ±0.5%, ±0.25%, ±0.1%, ±0.05%. The values of the E24/E192 series are in accordance with “IEC publication 60063”.

Derating

The power that the resistor can dissipate depends on the operating temperature.



Max. 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).

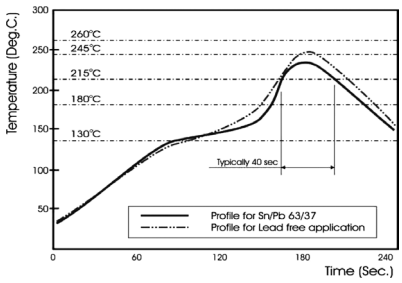
Electrical connection to the circuit is by individual soldering condition.

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 within lead-free solder bath. 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 below figure.



Infrared soldering profile for Chip Resistors

Catalogue Numbers

The resistors have a catalogue number starting with

WF06	U	XXXX	D	T	L
Size code WF12: 1206 WF08: 0805 WF06: 0603 WF04: 0402	**Type code** U : TCR 10ppm	**Resistance code** E192+E24: 3 significant digits followed by No. of zeros e.g.: 100Ω = 1000 37.4kΩ = 3742	**Tolerance** A : ±0.05% B : ±0.1% C : ±0.25% D : ±0.5%	**Packaging code** T : Reeled	**Termination code** L = lead free

Reeled tape packaging: 8mm width paper taping.
5,000pcs/reel for WF12W, WF08W, WF06W;
10,000pcs/reel for WF04W.

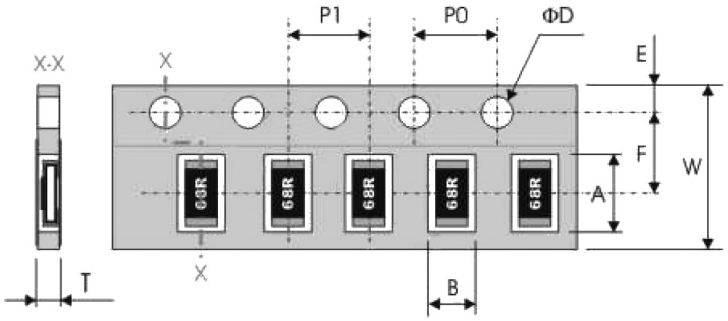
Test And Requirements

Basic specification : JIS C 5201-1 : 1998

Test	Procedure	Requirement
DC resistance	DC resistance values measured at the test voltages specified below : <10Ω@0.1V, <100Ω@0.3V, <1kΩ@1.0V, <10kΩ@3V, <100kΩ@10V,<1MΩ@25V, <10MΩ@30V	Within the specified tolerance
Temperature Coefficient of Resistance (TCR)	Natural resistance change per change in degree Centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) R_1 : Resistance at reference temperature R_2 : Resistance at test temperature t_1 : 20°C +5°C -1°C. t_2 : 125°C +5°C -1°C.	Refer to “Quick Reference Data”
Short time overload (S.T.O.L)	Permanent resistance change after a 5 second application of a voltage 2.5 times RCWV or the maximum overload voltage specified in the above list, whichever is less.	ΔR/R max. ±(0.1% +0.05Ω)
Resistance to soldering heat (R.S.H)	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C ±5°C.	No visible damage ΔR/R max. ±(0.1% +0.05Ω)
Solderability	Un-mounted chips completely immersed for 2 ±0.5 second in a SAC solder bath at 235°C ±5°C.	Good tinning (>95% covered) No visible damage
Temperature cycling	1. 30 minutes at -55°C ±3°C, 2. 2~3 minutes at 20°C +5°C-1°C, 3. 30 minutes at +155° ±3°C, 4. 2~3 minutes at 20°C +5°C-1°C, Total 5 continuous cycles.	No visible damage ΔR/R max. ±(0.25% +0.05Ω)
Load life (endurance)	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2ºC, 1.5 hours on and 0.5 hours off.	ΔR/R max. ±(0.25%+0.05Ω)
Load life in Humidity	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5 hours on and 0.5 hours off.	ΔR/R max. ±(0.25%+0.05Ω)
Bending strength	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3mm, once for 10 seconds.	ΔR/R max. ±(0.1%+0.05Ω)
Adhesion	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations

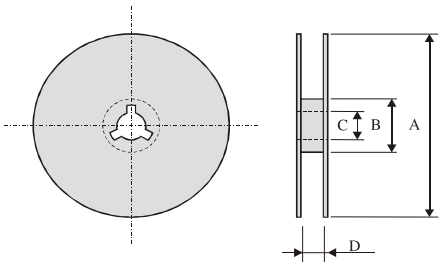
Packaging

Paper Tape Specifications



Series No.	A	B	W	F	E	P1	P0	ØD	T
WF12	3.6 ±0.2	2 ±0.2	8 ±0.3	3.5 ±0.2	1.75 ±0.1	4 ±0.1	4 ±0.1	$1.5^{+0.1}_{-0}$	Max. 1
WF08	2.4 ±0.2	1.65 ±0.2	8 ±0.3	3.5 ±0.2	1.75 ±0.1	4 ±0.1	4 ±0.1		
WF06	1.9 ±0.2	1.1 ±0.2	8 ±0.3	3.5 ±0.2	1.75 ±0.1	4 ±0.1	4 ±0.1		0.65 ±0.05
WF04	1.2 ±0.1	0.7 ±0.1	8 ±0.3	3.5 ±0.05	1.75 ±0.1	2 ±0.1	4 ±0.1		0.4 ±0.05

Reel Dimensions



A	B	C	D
Ø178 ±2	Ø60 ±1	13 ±0.2	9 ±0.5

Taping quantity

Chip resistors 5,000 pcs per reel (WF12W, WF08W, WF06W)
Chip resistors 10,000 pcs per reel (WF04W)

Dimensions : Millimetres