APPROVAL SHEET

WF04P

±1%, ±5%

High Power Chip Resistors

Size 0402, 1/8W

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

FEATURE

1. High Power and stability
2. Reduced size of final equipment
3. Lower assembly costs
4. Higher component and equipment reliability
5. RoHS compliant and Lead free products

APPLICATION

- Consumer electrical equipment
- Automotive application
- EDP, Computer application
- Telecom application

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.

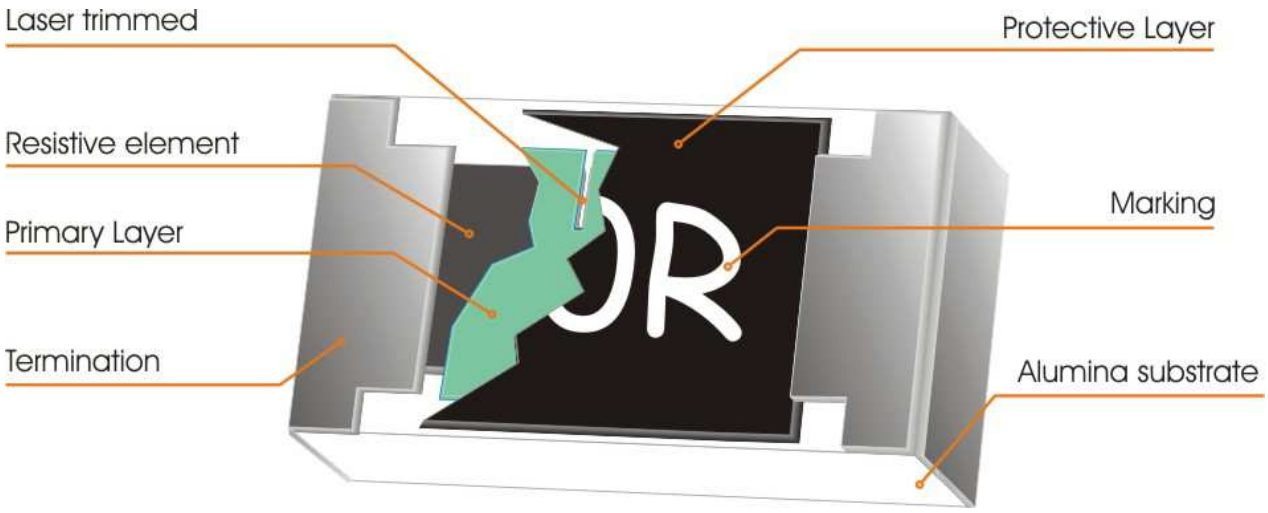


Fig 1. Consctruction of a Chip-R

QUICK REFERENCE DATA

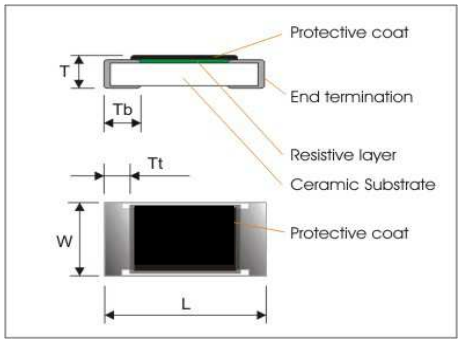
Item	General Specification	
Series No.	WF04P	
Size code	0402 (1005)	
Resistance Range	1Ω~1MΩ (±5%, ±1%), Jumper	
Resistance Tolerance	±1% E96/E24	±5% E24
TCR (ppm/°C) R = 1MΩ 10Ω < R < 1MΩ R ≦ 10Ω	 ≤ ± 200 ≤ ± 100 ≤ -200 ~ + 400	 ≤ ± 200 ≤ ± 200 ≤ -200 ~ +400
Max. dissipation @ T_{amb}=70°C	1/8 W	
Max. Operation Voltage (DC or RMS)	50V	
Max. Overload Voltage (DC or RMS)	100V	
Climatic category	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
3. $RCWV = \sqrt{Rated\,Power \times Resistance\,Value}$ or Max. RCWV listed above, whichever is lower.
4. The resistance of Jumper is defined <0.05Ω.

DIMENSIONS (unit : mm)

	WF04P
L	1.00 ± 0.05
W	0.50 ± 0.05
T	0.35 ± 0.05
Tb	0.25 ± 0.10
Tt	0.20 ± 0.10



MARKING

No marking for WF04P

FUNCTIONAL DESCRIPTION

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

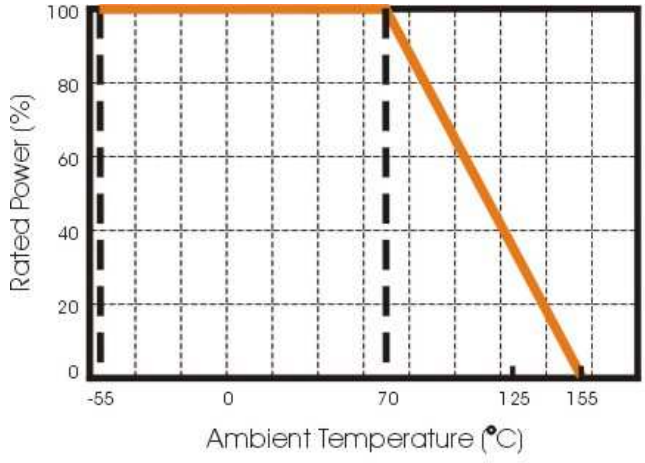


Figure 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature for WR04X

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 245°C during 3 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.

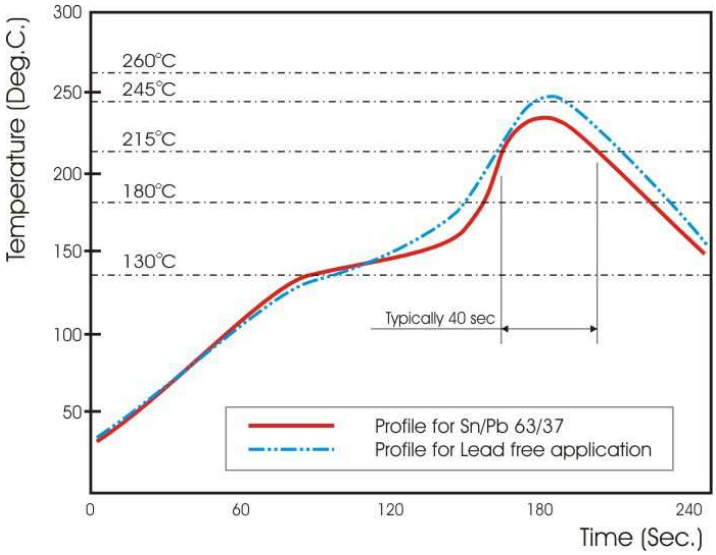


Fig 3. Infrared soldering profile for Chip Resistors

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WF04	P	472_	J	T	L
Size code WF04 : 0402	**Type code** P : 0402 1/8W	**Resistance code** ±5%, E24: 2 significant digits followed by no. of zeros and a blank 4.7Ω =4R7_ 10Ω =100_ 220Ω =221_ Jumper =000_ ("_" means a blank) ±1%, E96: 3 significant digits followed by no. of zeros 102Ω =1020 37.4KΩ =3742	**Tolerance** F : ±1% J : ±5% P : Jumper	**Packaging code** T : 7" Reeled taping Q : 10" Reeled taping G : 13" Reeled taping B : Bulk	**Termination code** L = Sn base (lead free)

1. Reeled tape packaging : 8mm width paper taping 10000pcs per 7" reel.
2. Bulk packaging : 10,000pcs per poly-bag

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).

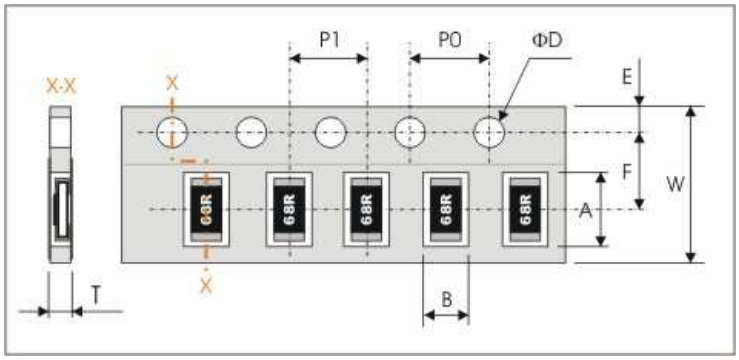
All soldering tests are performed with midly activated flux.

TEST	PROCEDURE / TEST METHOD	REQUIREMENT	
		Resistor	0Ω
DC resistance **Clause 4.5**	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	<50mΩ
Temperature Coefficient of Resistance(T.C.R) **Clause 4.8**	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 R_2 : Resistance at test temperature	Refer to "QUICK REFERENCE DATA"	N/a
Short time overload (S.T.O.L) **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. ±(2%+0.10Ω)	<50mΩ
Resistance to soldering heat(R.S.H) **IEC 60068-2-58:2004**	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 255℃±5°C	ΔR/R max. ±(1%+0.05Ω) no visible damage	<50mΩ
Solderability **IEC 60068-2-58:2004**	Un-mounted chips completely immersed for 3±0.3 second in a SAC solder bath at 245℃±5℃	95% coverage min., good tinning and no visible damage	
Temperature cycling **Clause 4.19**	30 minutes at -55°C±3°C, 2~3 minutes at 20℃+5℃-1℃, 30 minutes at +155°C±3°C, 2~3 minutes at 20℃+5℃-1℃, total 5 continuous cycles	ΔR/R max. ±(1%+0.05Ω)	<50mΩ
Damp Heat (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	10Ω ~ 1MΩ : ΔR/R max. ±(3%+0.10Ω) R<10Ω,: ΔR/R max. ±(5%+0.10Ω)	<50mΩ
Load Life(Endurance) **Clause 4.25**	1000 +48/-0 hours; loaded with RCWV or V_{max} in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off	10Ω ~ 1MΩ : ΔR/R max. ±(3%+0.10Ω) R<10Ω,: ΔR/R max. ±(5%+0.10Ω)	<50mΩ
Bending strength **Clause 4.33**	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec, 5mm for WR04	No visual damaged, ΔR/R max. ±(1%+0.05Ω)	<50mΩ
Adhesion **Clause 4.32**	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations	

TEST	PROCEDURE / TEST METHOD	REQUIREMENT	
		Resistor	0Ω
Insulation Resistance **JISC5201-1:1998** **Clause 4.6**	Apply the maximum overload voltage (DC) for 1minute	R≧10GΩ	
Dielectric Withstand Voltage **JISC5201-1:1998** **Clause 4.7**	Apply the maximum overload voltage (AC) for 1 minute	No breakdown or flashover	

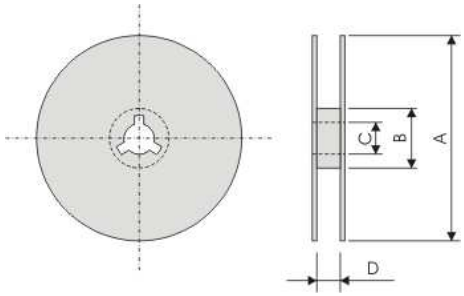
PACKAGING

Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WF04P	1.20±0.10	0.70±0.10	8.00±0.30	3.50±0.20	1.75±0.10
Series No.	P1	P0	ΦD	T	
WF04P	2.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	0.40±0.05	

7" Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	9.0±0.5

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