APPROVAL SHEET

WW12M, WW12N

±1%, ±5%, 1/2W, 1W

Ultra low ohm power chip resistors
Size 1206 (3216)
Metal Current Sensing Type
RoHS Exemption free and Lead free products
Halogen free

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FEATURE

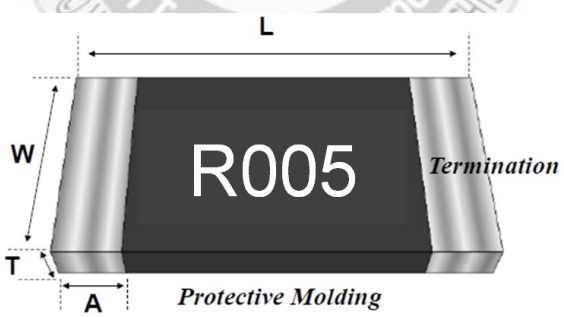
1. Ultra low and stable TCR performance
2. High power rating and compact size
3. High reliability and stability
4. Reduced size of final equipment
5. RoHS exemption free and Lead free products
6. Inductance below 1nH

APPLICATION

- Power supply
- PDA
- Digital meter
- Computer
- Automotives
- Battery charger
- DC-DC power converter

DESCRIPTION

The resistors are constructed in a high grade low resistive metal body. The resistive layer is covered with a protective coat and printed a resistance marking code over it. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a lead-free soder.



Item	Protective Molding	Resistive Element	Internal Terminal	External Terminal
Material	Resin	Alloy Metal	Copper	Solder

Fig 1. Construction of Chip-R

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QUICK REFERENCE DATA

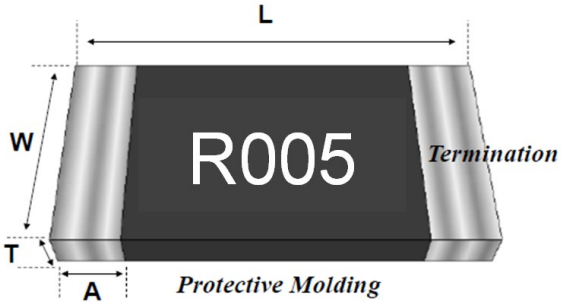
Item	General Specification	
Series No.	WW12M	WW12N
Size code	1206 (3216)	
Resistance Tolerance	±5%; ±1%	
Resistance Value	0.001Ω,0.002Ω, 0.003Ω, 0.004Ω, 0.005Ω, 0.006Ω, 0.007Ω, 0.008Ω, 0.009Ω,0.010Ω, 0.012Ω, 0.015Ω, 0.018Ω, 0.020Ω, 0.025Ω, 0.030Ω	
TCR (ppm/°C) **	0.001,0.002 Ω ≤ 75 ppm/°C 0.003,0.004 Ω ≤ 70 ppm/°C 0.005~0.030 Ω ≤ 50 ppm/°C	
Max. dissipation at T_{amb}=70°C	1/2 W	1 W
Max.Working Current (Voltage)*	22.4A (111mV)	31.6A (158mV)
Max.Overload Current (Voltage)*	50.0A (250mV)	70.7A (354mV)
Operation Temperature	-55 ~ +170°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

   $RCWV = \sqrt{Rated\,Power \times Resistance\,Value}$ or Max. RCWV listed above, whichever is lower.
3. Please keep the surface temperature do not exceed 105°C when operating.
4. ** : TCR Hot (+25~+155°C)
5. R-value might be variance depend on soldering conditions and please consider this influence before use milli-ohm resistors, and strongly suggest use the recommend solder pad to design your circuits
6. *Max. working &. Max. overload current details please refer Annex. 1

MECHANICAL DATA



Unit：mm

Symbol	R001, R002	R003~R030
L	3.20±0.20	3.10±0.20
W	1.70±0.20	1.65±0.20
T	0.70±0.20	0.60±0.20
A	1.10±0.25	0.60±0.20

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CATALOGUE NUMBERS

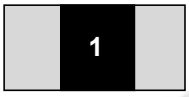
The resistors have a catalogue number starting with .

WW12	N	R010	F	T	L
Size code WW12 : 1206	**Type code** **M : 1/2W** **N : 1W** Sensing type	**Resistance code** R is first digit followed by 3 significant digits. 0.010Ω = R010	**Tolerance** J : ±5% F : ±1%	**Packaging code** **T** : 7" reeled in tape, 4,000pcs **G:** 13" reeled in tape, 16,000pcs	**Termination code** L = Sn base (lead free)

MARKING

TOP：Marking. (1 digit marking to identify the resistance value.1mΩ, 2mΩ)

1=1mΩ；2=2 mΩ



TOP：Marking. (4 digits marking to identify the resistance value.3mΩ ~ 30mΩ)



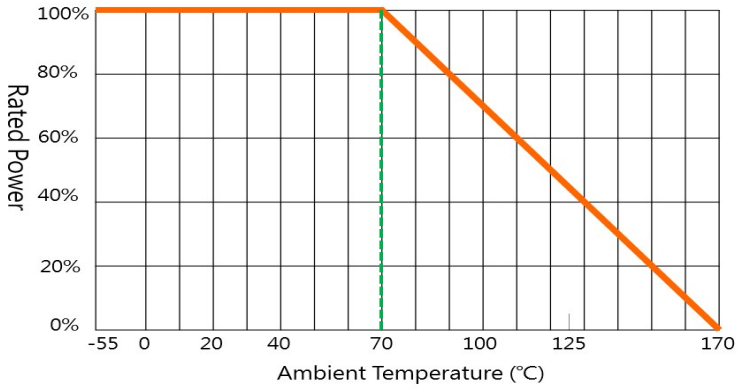
R005 = 5mΩ； R020 = 20mΩ

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FUNCTIONAL DESCRIPTION

Derating curve

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



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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.

Storage and Handling Conditions:

1. Products are recommended to be used up within two years since operation date as ensured shelf life. Check solderability in case shelf life extension is needed.
2. To store products with following condition:

   Temperature :5 to 40°C

   Humidity :20 to 70% relative humidity
3. Caution:

   a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid.

   It may cause oxdization of electrode, which easily be resulted in poor soldering.

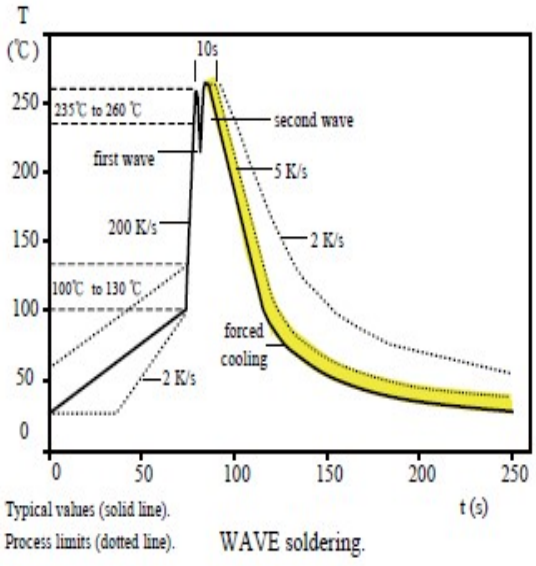
   b. To store products on the shelf and avoid exposure to moisture.

   c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

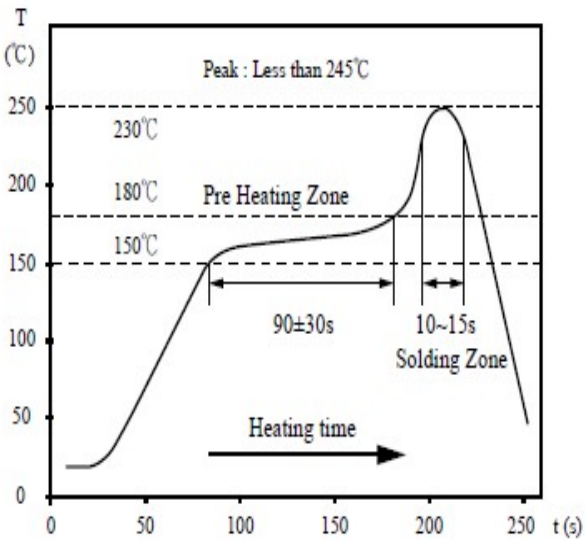
SOLDERING CONDITION

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.



WAVE soldering.



IR Reflow soldering.

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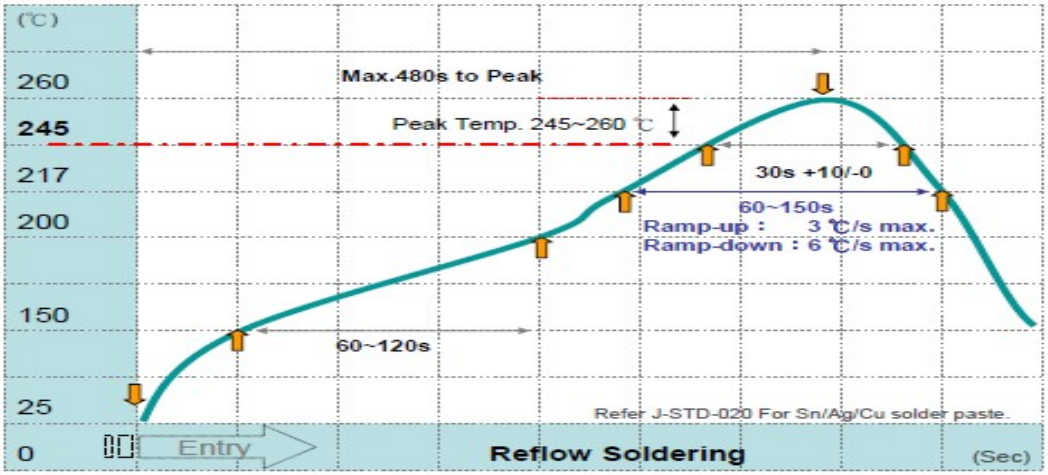
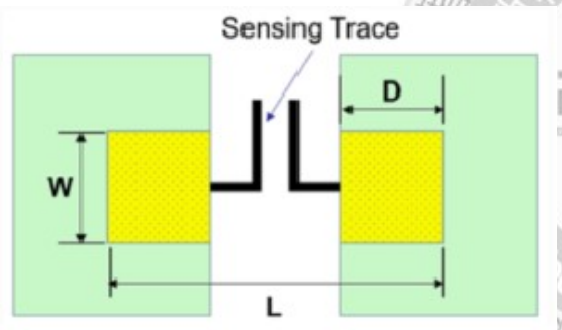


Fig 3. Infrared soldering profile for Chip Resistors WW12

Recommend Solder Pad Dimensions:

Strongly suggest use recommend solder pad to design your circuits



Symbol	R001, R002	R003~R030
W	1.8mm	1.8mm
D	2.3mm	1.3mm
L	5.6mm	4.7mm

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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.

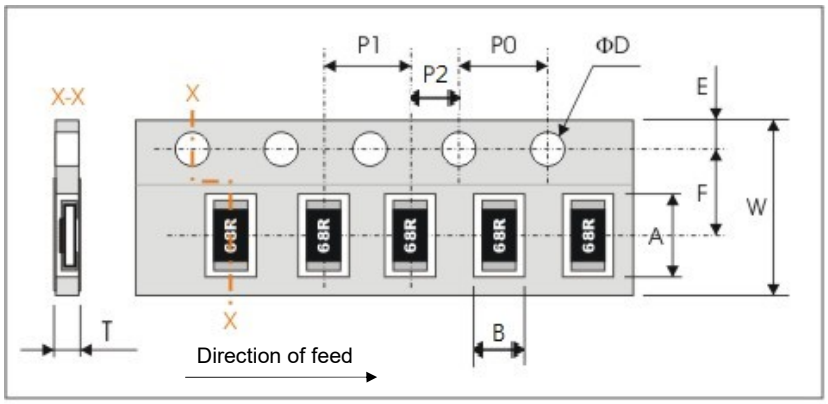
TEST	PROCEDURE	REQUIREMENT
DC Resistance **IEC 60115-1 / JIS C 5201-1 , Clause 4.5**	Measure the resistance Value.	J: ±5% F: ±1%
Short time overload (S.T.O.L) **IEC 60115-1 / JIS C 5201-1 , Clause 4.13**	Permanent resistance change after a 5 second application of a voltage 5 times RCWV or the maximum overload voltage specified in the above list, whichever is less.	J: ΔR/R ≤ ±2% F: ΔR/R ≤ ±1%
Solderability **IEC 60115-1 / JIS C 5201-1 , Clause 4.17**	Un-mounted chips completely immersed for 3±0.5 second in a SAC solder bath at 235°C±5°C	Over 95% of termination must be covered with Solder
Resistance to soldering heat (R.S.H) **IEC 60115-1/JIS C 5201-1 , Clause 4.18**	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C ±5°C	ΔR/R max. ±(1%+0.1mΩ) No mechanical damage
Temperature cycling **IEC 60115-1/JIS C 5201-1 Clause 4.19**	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 continuous cycles	J: ΔR/R ≤ ±1% F: ΔR/R ≤ ±0.5% No mechanical damage
Load life in Humidity **IEC 60115-1 / JIS C 5201-1 , Clause 4.24**	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	J: ΔR/R ≤ ±3% F: ΔR/R ≤ ±1%
Temperature Coefficient of Resistance(T.C.R) **IEC 60115-1, 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°C+5°C-1°C R_1 : Resistance at reference temperature R_2 : Resistance at test temperature	Refer to "QUICK REFERENCE DATA"
Load life (endurance) **IEC 60115-1, Clause 4.25**	70±2°C, 1000 hours, loaded with RCWV or Vmax,1.5 hours on and 0.5 hours off	J: ΔR/R ≤ ±3% F: ΔR/R ≤ ±1%
Insulation Resistance **IEC 60115-1, Clause 4.6**	Between termination and coating must over 1000MΩ	Test voltage：100±15V
Bending strength **IEC 60115-1 / JIS C 5201-1 , Clause 4.33**	Resistance change after bended on the 90mm PCB. Bending :2mm	J: ΔR/R ≤ ±1% F: ΔR/R ≤ ±0.5% No mechanical damage

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PACKAGING

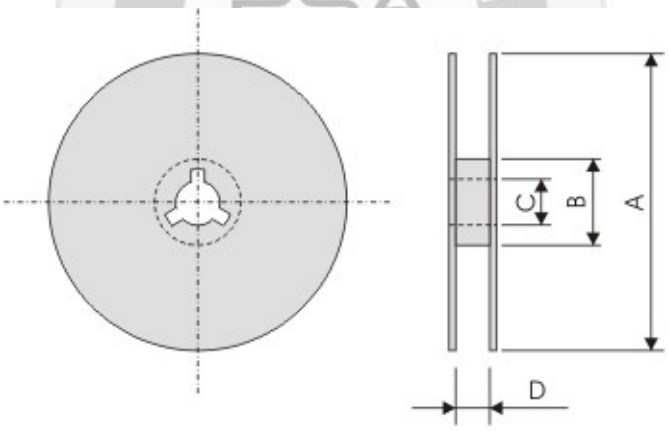
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WW12M, WW12N	3.60±0.20	2.00±0.20	8.00±0.30	3.50±0.05	1.75±0.10

Series No.	P1	P0	P2	ΦD	T
WW12M, WW12N	4.00±0.10	4.00±0.10	2.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.2

Reel dimensions



Symbol (unit : mm)	A	B	C	D
7” reel	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	10.0±1.5
13” reel	Φ330.0±2.0	Φ100.0±1.0	13.0±0.2	10.0±1.5

Taping quantity

- 4,000pcs per 7”reel, 16,000pcs per 13” reel.

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Annex. 1 Max. working &. Max. overload current

1206 Rating Power 0.5W			1206 Rating Power 1.0W		
R_Value (mΩ)	Max. Working (A)	Max. Overload (A)	R_Value (mΩ)	Max. Working (A)	Max. Overload (A)
1	22.4	50.0	1	31.6	70.7
2	15.8	35.4	2	22.4	50.0
3	12.9	28.9	3	18.3	40.8
4	11.2	25.0	4	15.8	35.4
5	10.0	22.4	5	14.1	31.6
6	9.1	20.4	6	12.9	28.9
7	8.5	18.9	7	12.0	26.7
8	7.9	17.7	8	11.2	25.0
9	7.5	16.7	9	10.5	23.6
10	7.1	15.8	10	10.0	22.4
12	6.5	14.4	12	9.1	20.4
15	5.8	12.9	15	8.2	18.3
18	5.3	11.8	18	7.5	16.7
20	5.0	11.2	20	7.1	15.8
25	4.5	10.0	25	6.3	14.1
30	4.1	9.1	30	5.8	12.9

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