

APPROVAL SHEET

WW12M_J, WW12N_J

±1%, ±5%

Metal low ohm current sensing chip resistors

Size 1206 (3216) 1/2W, 1W

Automotive AEC Q200 Compliant

Anti-Sulfuration ASTM B-809 105°C 1000hrs

RoHS Exemption free and Lead free products

Halogen free

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

FEATURE

1. Metal low ohm and stable TCR performance
2. Automotive grade AEC Q-200 compliant
3. 100% CCD inspection
4. RoHS exemption free and Lead free products
5. ASTM B-809 105°C 1000hrs compliant

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 solder.



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

Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

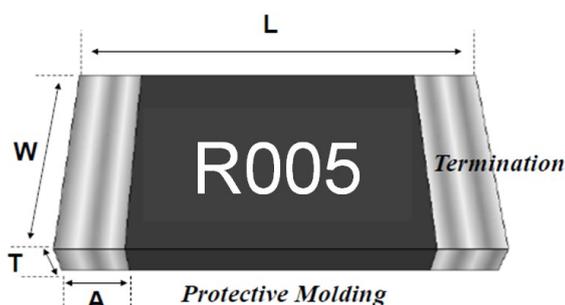
Item	General Specification	
	WW12M	WW12N
Series No.	WW12M	WW12N
Size code	1206 (3216)	
Resistance Tolerance	±5%; ±1%	
Resistance Value	0.001Ω, 0.002Ω, 0.003Ω, 0.004Ω, 0.005Ω, 0.006Ω, 0.007Ω, 0.008Ω, 0.009Ω, 0.010Ω, 0.012Ω, 0.015Ω, 0.018Ω, 0.020Ω, 0.025Ω, 0.030Ω	
TCR (ppm/°C)	0.001, 0.002 Ω ≤ 75 ppm/°C 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

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$$
 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

CATALOGUE NUMBERS

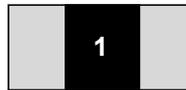
The resistors have a catalogue number starting with:

WW12	N	R010	J	T	L	J
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)	Special code J = Automotive grade AEC Q200 compliant ASTM B-809 Compliant

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)

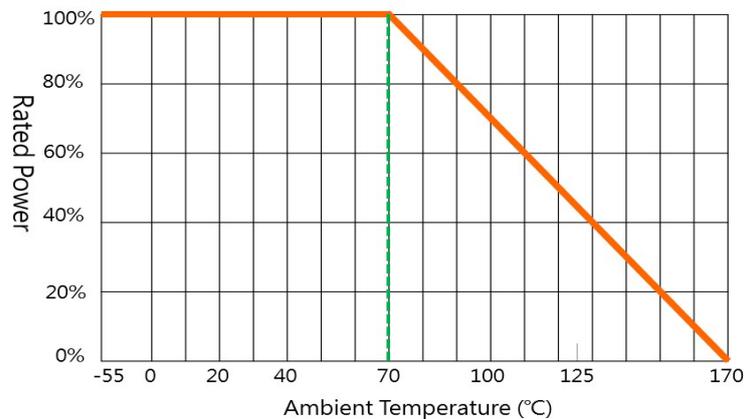


R005 = 5mΩ ; R020 = 20mΩ

FUNCTIONAL DESCRIPTION

Derating curve

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

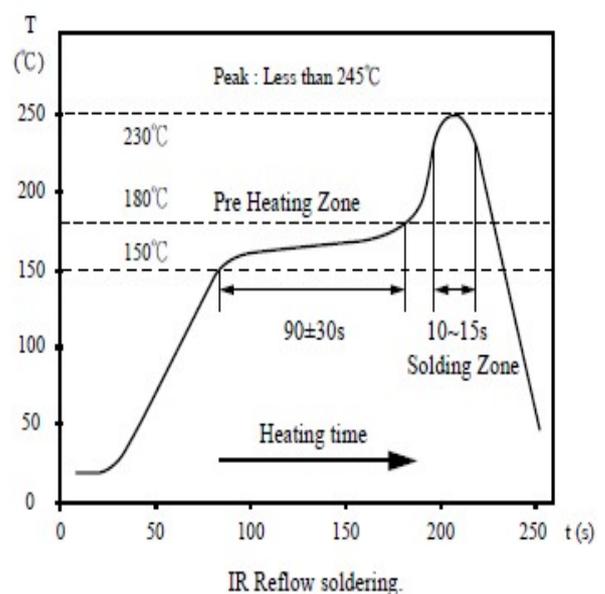
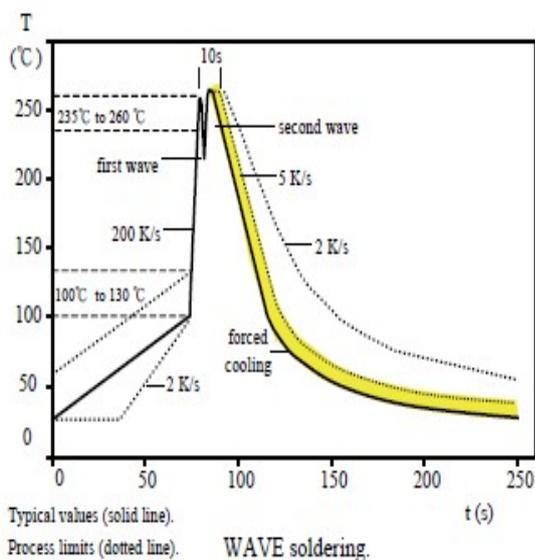
Storage and Handling Conditions:

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 oxidation 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.



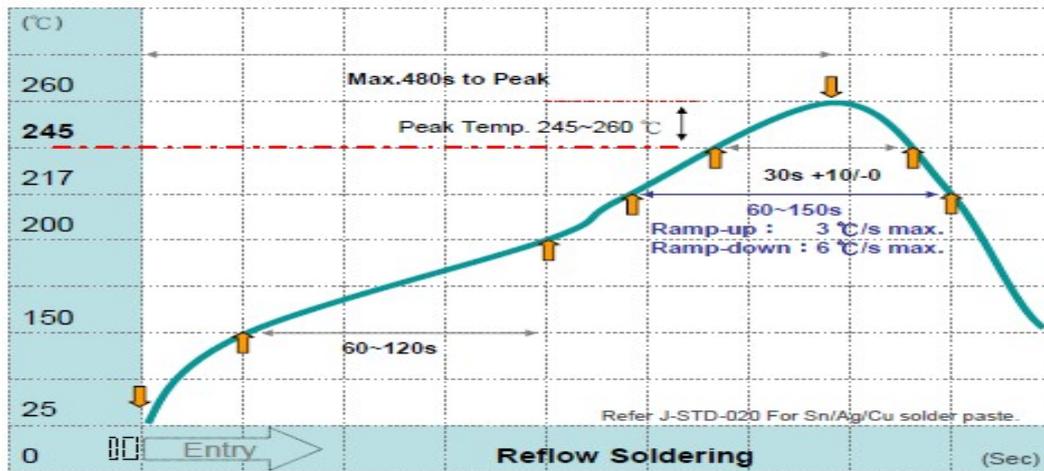
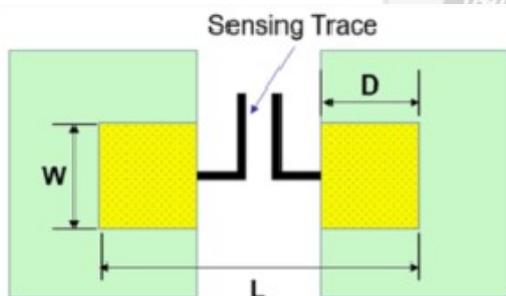


Fig 3. Infrared soldering profile for Chip Resistors WW12

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

TEST AND REQUIREMENTS

Essentially all tests are carried out according to the schedule of IEC publication 115-8, category **LCT/UCT/56**(rated temperature range : **Lower Category Temperature, Upper Category Temperature**; 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).

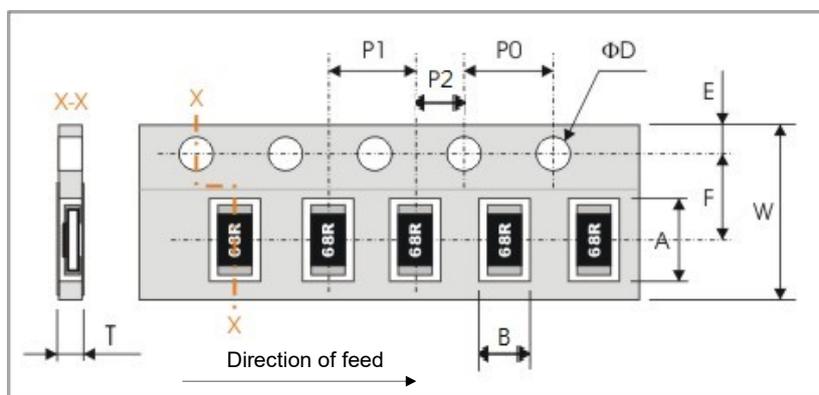
All soldering tests are performed with midly activated flux.

TEST	PROCEDURE	REQUIREMENT
DC Resistance AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5	Measure the resistance Value.	J: $\pm 5\%$ F: $\pm 1\%$
High temperature exposure (Storage) AEC-Q200 TABLE 7.3	Test 1000 hrs./ @T=170°C / Un-powered. Measurement at 24 \pm 2 hours after test conclusion.	J: $\Delta R/R \leq \pm 3\%$ F: $\Delta R/R \leq \pm 1\%$
Temperature Cycling AEC-Q200 TABLE 7.4	Test 1000 cycles (-55°C to +125°C). Measurement at 24 \pm 2 hours after test conclusion	J: $\Delta R/R \leq \pm 1\%$ F: $\Delta R/R \leq \pm 0.5\%$ No mechanical damage
Moisture Resistance AEC-Q200 TABLE 7.6	Test 65°C / 80~100%RH/ 10Cycles(t=24hrs/cycle). Measurement at 24 \pm 2 hours after test conclusion.	J: $\Delta R/R \leq \pm 1\%$ F: $\Delta R/R \leq \pm 0.5\%$
Biased Humidity AEC-Q200 TABLE 7.7	Test 1000 hours/ @85°C /85% RH. 10% of operation power. Measurement at 24 \pm 2 hours after test conclusion.	J: $\Delta R/R \leq \pm 3\%$ F: $\Delta R/R \leq \pm 1\%$
Operational Life AEC-Q200 TABLE 7.8	Test 1000 hrs @ T=125°C at specified rated power. Measurement at 24 \pm 2 hours after test conclusion	J: $\Delta R/R \leq \pm 3\%$ F: $\Delta R/R \leq \pm 1\%$
External Visual AEC-Q200 TABLE 7.9	Electrical test not required. Inspect device construction, marking and workmanship	No visual damage and refer WTC marking code.
Physical Dimensions AEC-Q200 TABLE 7.10	Verify physical dimensions to the applicable device detail specification.	Within the specified tolerance
Mechanical Shock AEC-Q200 TABLE 7.13	Test Peak value:100g's / Wave:Hail-sine / Duration:6ms / Velocity:12.3ft/sec.	Within product specification tolerance and no visible damage
Vibration AEC-Q200 TABLE 7.14	Test 5g's for 20min., 12 cycles each of 3 orientations. Test from 10-2000 Hz.	No mechanical damage.

TEST	PROCEDURE	REQUIREMENT
Resistance to Soldering Heat AEC-Q200 TABLE 7.15	Solder dipping @ 270 °C±5 °C for 10sec.±1sec.	J: ΔR/R ≤ ±1% F: ΔR/R ≤ ±0.5%
Thermal Shock AEC-Q200 TABLE 7.16	Test -55 to 155 °C / dwell time 15min/ Max transfer time 20sec/ 300cycles.	J: ΔR/R ≤ ±1% F: ΔR/R ≤ ±0.5% No mechanical damage
ESD AEC-Q200-002	Test contact min. 1KV	ΔR/R ≤ ±1% No mechanical damage
Solderability AEC-Q200 TABLE 7.18	a) Bake for 155 °C dwell time 4 hours / solder dipping 235 °C / 5sec. b) Steam the sample dwell time 1 hour/ solder dipping 215 °C / 5sec. c) Steam the sample dwell time 1 hour/ solder dipping 260 °C / 7sec.	Over 95% of termination must be covered with Solder
Flammability AEC-Q200 TABLE 7.20	UL-94 V-0 or V-1 are acceptable	Refer UL-94.
Board flex AEC-Q200 TABLE 7.21	Bending 2mm	J: ΔR/R ≤ ±1% F: ΔR/R ≤ ±0.5% No mechanical damage
Termination strength AEC-Q200 TABLE 7.22	Force: 1.8kg for 60sec.	No mechanical damage
Temperature Coefficient of Resistance(T.C.R) IEC 60115-1, Clause 4.8	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ 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"
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%
Anti-Sulfur	STM-B-809-95(Modified) Sulfur 1000 hours, 105±2°C EIA-977(Test B) Sulfur 750 hours, 105±2°C	ΔR/R ≤ ±1%

PACKAGING

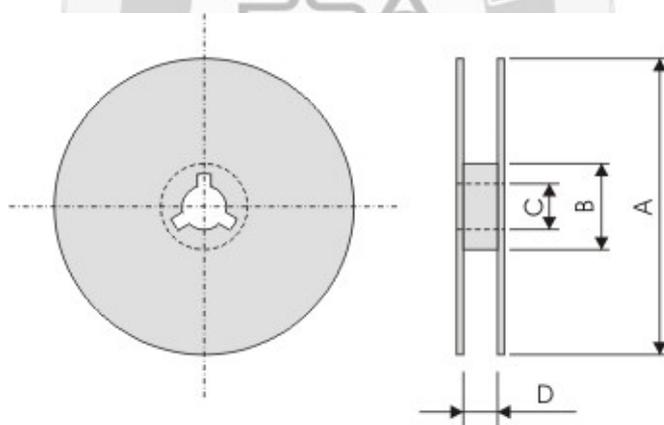
Paper Tape specifications (unit :mm)



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	Φ1.50 ^{+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.

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

