

APPROVAL SHEET

WW12R_V

±1%, ±5%

Metal low ohm power chip resistors

Size 1206 (1W)

Automotive grade AEC Q200 compliant

Anti-sulfuration H₂S 10ppm x 1000hrs compliant

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

FEATURE

1. Metal ultra low and stable TCR performance
2. High power rating and compact size
3. High reliability and stability
4. 100% CCD visual inspection
5. RoHS compliant & complete Lead free
6. Automotive grade AEC Q200 compliant
7. Anti-sulfuration H2S 10ppm x 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 terminations.



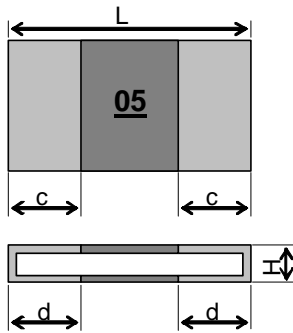
Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

Item	General Specification
Series No.	WW12R
Size code	1206 (3216)
Resistance Tolerance	±5% , ±1%
Resistance Range	1 ~ 15 mΩ
TCR (ppm/°C)	1 mohm: ±100 ppm/°C; 2 ~ 15mohm: ±70 ppm/°C
Max. power at T _{amb} =70°C	1W
Max. Operation Current	31.6A ~ 8.2A
Operation temperature	- 55 ~ +155C

Note : Max. Operation Current : So called RCWC (Rated Continuous Working Current) is determined by

$$RCWC = \sqrt{\text{Rated Power} / \text{Resistance Value}} \text{ listed above.}$$

MECHANICAL DATA

Unit: mm

Type	Size (inch)	Resistance	L (mm)	W (mm)	H (mm)	c (mm)	d (mm)
WW12R	1206	1mΩ	3.2±0.15	1.6±0.15	0.32±0.15	1.1±0.25	
		2mΩ			0.32±0.15	0.5±0.25	
		3mΩ			0.35±0.1	0.7±0.25	1.3±0.25
		4mΩ			0.35±0.1	0.85±0.25	
		5mΩ			0.35±0.1	1.0±0.25	
		6mΩ			0.35±0.1	1.1±0.25	
		7mΩ			0.35±0.1	0.70±0.25	
		8mΩ			0.35±0.1	0.60±0.25	
		9mΩ			0.30±0.1	0.75±0.25	
		10mΩ			0.28±0.1	0.50±0.25	
		12mΩ			0.22±0.1	0.65±0.25	
		13mΩ			0.22±0.1	0.65±0.25	

	15mΩ	0.22±0.1	0.50±0.25
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MARKING

WW12R each resistor is marked with a 2-digit code with underline on the protective coating to designate the nominal resistance value.

Example:

$$\underline{05} = 0.005\Omega$$

$$\underline{10} = 0.010\Omega$$

FUNCTIONAL DESCRIPTION

Derating curve

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

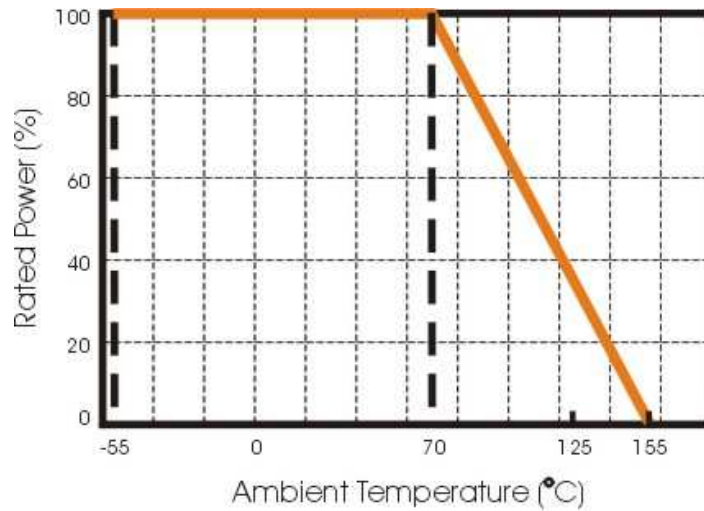


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

SOLDERING CONDITIONS

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 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 Fig

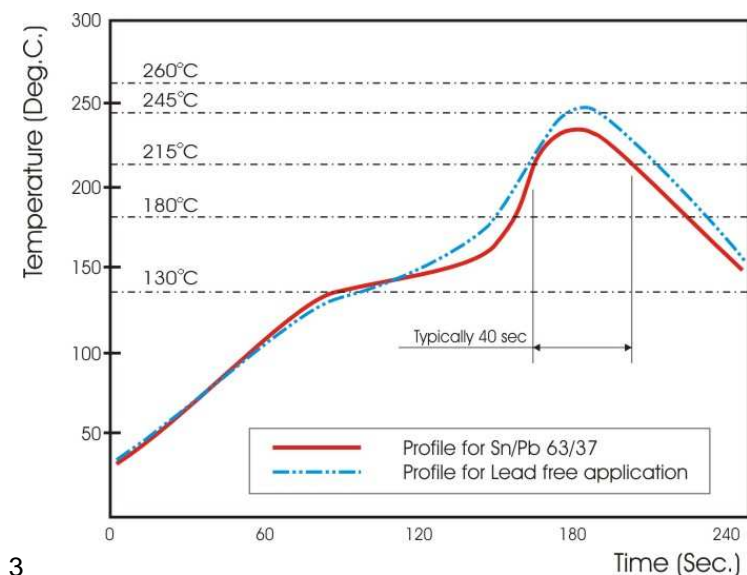


Fig 3. Infrared soldering profile for Chip Resistors WW12R

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW12	R	R005	J	T	L	V
Size code WW12 :1206	Type code R : 1W, 1206	Resistance code R is first digit followed by 3 significant digits. 0.010Ω = R010 0.005Ω = R005	Tolerance J : ±5% F : ±1%	Packaging code T : 7" reeled in tape	Termination code L = Sn base (lead free)	Visual code V = AEC Q200 compliant with 100% CCD inspection + Anti-sulfur H2S 10ppm x 1000hrs compliant

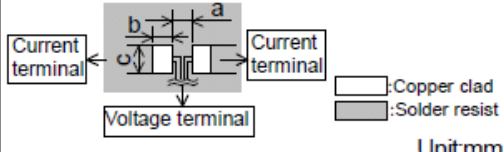
Reeled tape packaging : 8mm width paper taping 5,000pcs per reel.

TEST & REQUIREMENTS

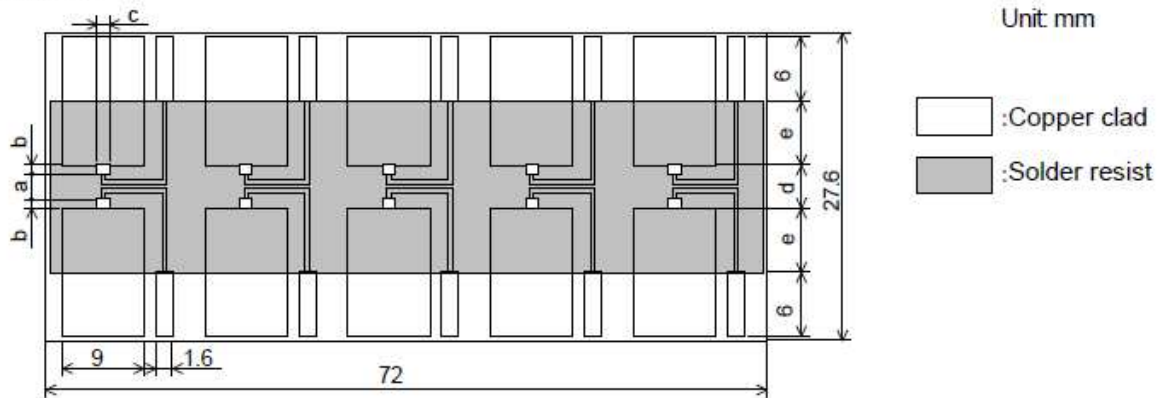
Table- 4(1)

No.	Test items	Condition of test	Performance requirements
1	High temperature exposure AEC Q200 - No.3	MIL-STD-202 Method 108 Ambient temperature: 155±2°C, Condition: Without load, Duration: 1000 $^{+48}_0$ h Interval measurements: 250 h and 500 h	ΔR/R: Within ±3% No visible damage
2	Temperature cycling AEC Q200 - No.4	JESD22 Method JA-104 Temperature: -55±3°C / 125±2°C, Dwell time: 30min maximum at each temp. Transition time: 1 min. max. Number of cycles: 1000 cycles. Interval measurements: 250 cy and 500 cy	ΔR/R: Within ±1% No visible damage
3	Bias humidity AEC Q200 – No.7	MIL-STD-202 Method 103 Condition: 85°C & 85% R.H. Test power: 10% of rated power shall be applied for continuously. Duration: 1,000 $^{+48}_0$ h Interval measurements: 250 h and 500 h	ΔR/R: Within ±3% No visible damage
4	Operational life AEC Q200 – No.8	MIL-STD-202 Method 108 Ambient temperature: 125±2°C The applied voltage shall be the voltage to be calculated at 35% of rated dissipation or the limiting element voltage whichever is the smaller. Condition: The voltage shall be applied for continuously. Duration: 1000 $^{+48}_0$ h Interval measurements: 250 h and 500 h	ΔR/R: Within ±3% No visible damage
5	Dimensions AEC Q200 – No.10	JESD22 Method JB-100	As in Table-3
6	Resistance to Solvents AEC Q200 – No.12	MIL-STD-202 Method 215 Solvent: 2-propanol at 25°C Immersion time: 3 min Brush: 10 times brushing Immersion and brush cycle: 3cycle	ΔR/R: Within ±1% No visible damage
7	Mechanical Shock AEC Q200 – No.13	MIL-STD-202 Method 213 Waveform: half sine, Peak value 100G, Normal duration 6ms Condition: XX'YY'ZZ', 10times each	ΔR/R: Within ±1% No visible damage
8	Vibration AEC Q200 – No.14	MIL-STD-202 Method 204 Peak acceleration and Sweep time: 5 g's for 20 min , Frequency 10Hz to 2000Hz, Condition: 12 cycles each of 3 orientations	ΔR/R: Within ±1% No visible damage

Table-4(2)

No	Test items	Condition of test	Performance requirements																									
9	Resistance to soldering heat AEC Q200 - No.15	MIL-STD-202 Method 210 Solder bath temp: 260±5°C Immersed time: 10±1s	ΔR/R: Within ±1% No visible damage																									
10	ESD test AEC Q200 – No.17	AEC-Q200-002 Human body model, 2 Kohm, 150 pF, Test voltage: 8KV	ΔR/R: Within ±1% No visible damage																									
11	Solderability AEC Q200 – No.18	J-STD-002 a) Bake the sample for 155 °C dwell time 4h / solder dipping 235°C/ 5s. Solder: Sn96.5-Ag3-Cu0.5 b) Category 3, Solder dipping 215°C/ 5s. Solder: Sn63Pb37 c) Category 3, Solder dipping 260°C/ 7s.	The surface of terminal immersed shall be min. of 95% covered with a new coating of solder.																									
12	Electrical Characterization AEC Q200 - No.19	<p>1. D.C. Resistance Resistance value shall be measured by mounting the substrate of the following condition.</p>  <p style="text-align: right;">Unit:mm</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Style</th> <th>Resistance value(mΩ)</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td rowspan="6">RLP32</td> <td>1</td> <td>1.0</td> <td>1.45</td> <td rowspan="6">1.7</td> </tr> <tr> <td>2</td> <td>2.1</td> <td>0.9</td> </tr> <tr> <td>3</td> <td>0.8</td> <td>1.4</td> </tr> <tr> <td>4</td> <td>1.0</td> <td>1.45</td> </tr> <tr> <td>5 and 6</td> <td>1.4</td> <td>1.25</td> </tr> <tr> <td>7 to 15</td> <td>2.1</td> <td>0.9</td> </tr> </tbody> </table> <p>Thickness of copper clad: 0.035mm 4-Terminal method Measurement current: 1(A) Note: The measuring apparatus corresponding to DC Low-ohm Meter (1A) of AX-1152D for ADEX CORPORATION.</p> <p>2. Temperature Coefficient of Resistance -55 °C / +20 °C +20 °C / +155°C</p>	Style	Resistance value(mΩ)	a	b	c	RLP32	1	1.0	1.45	1.7	2	2.1	0.9	3	0.8	1.4	4	1.0	1.45	5 and 6	1.4	1.25	7 to 15	2.1	0.9	<p>1. The resistance value shall correspond with the rated resistance taking into account the specified tolerance.</p> <p>2. As in Table-1</p>
Style	Resistance value(mΩ)	a	b	c																								
RLP32	1	1.0	1.45	1.7																								
	2	2.1	0.9																									
	3	0.8	1.4																									
	4	1.0	1.45																									
	5 and 6	1.4	1.25																									
	7 to 15	2.1	0.9																									
13	Bending strength AEC Q200 – No.21	AEC-Q200-005 Bending value2mm Holding time: 60sec.	ΔR/R: Within ±1% No visible damage																									
14	Adhesion AEC Q200 – No.22	AEC-Q200-006 Pressurizing force: 17.7N, Test time: 60±1s.	ΔR/R: Within ±1% No remarkable damage or removal of the terminations																									
15	Hydrogen sulphide test	H2S concentration: 10ppm Test temp.: 57°C Relative humidity: 95% Test period: 1000h	ΔR/R: Within ±1%																									

Test substrate

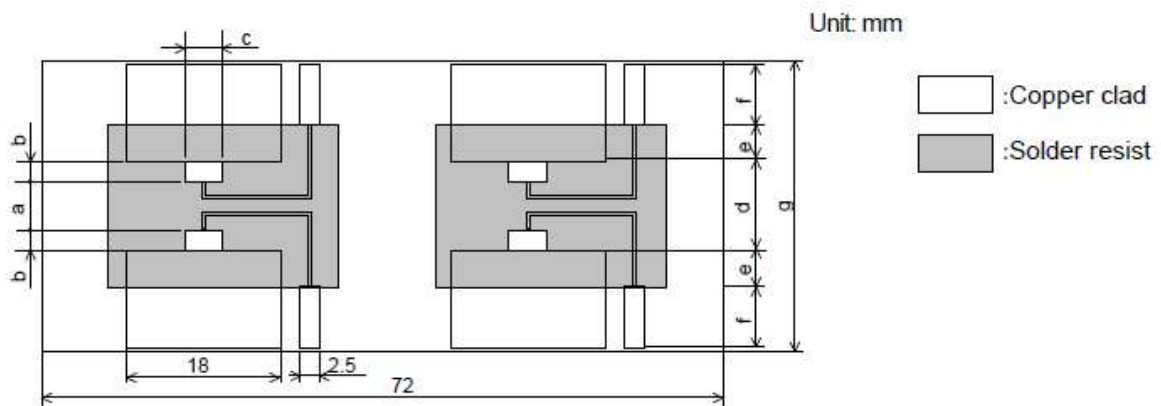


Style	Rated resistance (mΩ)	a	b	c	d	e
WW12R	1	1.0	1.45	1.7	3.9	5.35
	2	2.1	0.9			
	3	0.8	1.4			
	4	1.0	1.45			
	5 and 6	1.4	1.25			
	7 to 15	2.1	0.9			

Figure-3-1 TEST SUBSTRATE (Without load)

Remark: Material: Epoxy resin based as glass fabric(Specified in JIS C 6484).

Thickness: 1.6mm Thickness of copper clad: 0.035mm



Style	Rated resistance (mΩ)	a	b	C	d	e	f	g
WW12R	1	1.0	1.45	1.7	3.9	5.35	11.68	39
	2	2.1	0.9				6.0	27.6
	3	0.8	1.4				11.68	39
	4	1.0	1.45				6.0	27.6
	5 and 6	1.4	1.25					
	7 to 15	2.1	0.9					

Figure-3-2 TEST SUBSTRATE (With load)

Remark: Material: Epoxy resin based as glass fabric(Specified in JIS C 6484).

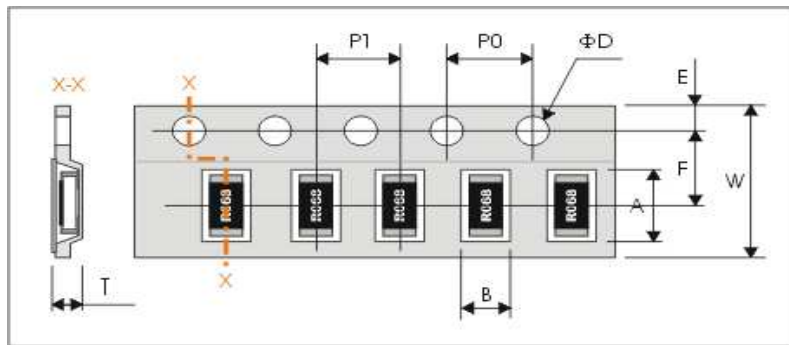
Thickness: 1.6mm Thickness of copper clad: 0.07mm

Remark: In the case of connection by connector, the connecting terminals are gold plated.

However, the plating is not necessary when the connection is made by soldering.

PACKAGING

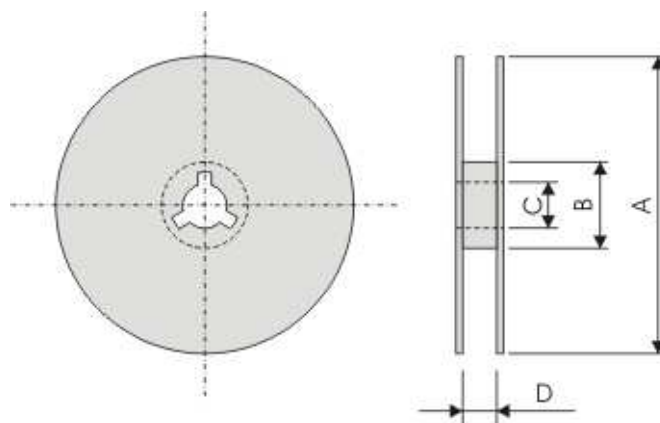
Plastic Tape specifications (unit :mm)



Symbol	A	B	W	F	E
WW12R	3.60±0.20	2.00±0.15	8.00±0.20	3.50±0.05	1.75±0.10

Symbol	P1	P0	ΦD	T
WW12R	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	1.0 max.

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ180.0 -1.5	Φ60.0±1.0	13.0±0.2	9.0 +1.0

Taping quantity

- Chip resistors 5,000 pcs per reel.