

# APPROVAL SHEET

**WW12R, WW08R, WW06R**

**±1%, ±5%**

Metal Low Ohm Power Chip Resistors

Size 1206 (1W), 0805 (0.5W), 0603 (0.33W)

RoHS Exemption free and Lead free

Sensing Type

\*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. Reduced size of final equipment
5. RoHS exemption free & Halogen free & Lead free
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 terminations.

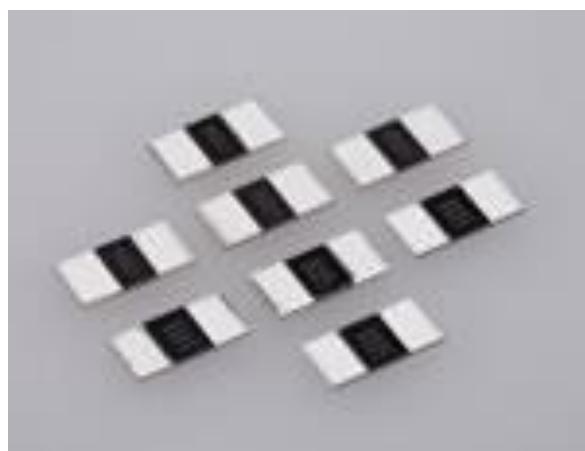


Fig 1. Construction of Chip-R

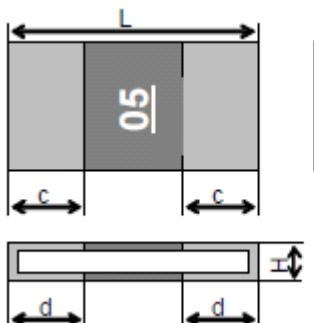
## QUICK REFERENCE DATA

Item	General Specification		
Series No.	WW06R	WW08R	WW12R
Size code	0603 ( 1608 )	0805 ( 2012 )	1206 ( 3216 )
Resistance Tolerance	$\pm 5\%$ , $\pm 1\%$		
Resistance Range	5, 10m $\Omega$	2, 3, 4, 5, 6, 7, 8, 9 10m $\Omega$ ,	1 ~ 15 m $\Omega$
TCR (ppm/ $^{\circ}$ C)	$\pm 70$ ppm/ $^{\circ}$ C		
Max. power at $T_{amb}=70^{\circ}$ C	1/3 W	1/2 W	1W
Max. Operation Current (DC or RMS)	8.1A, 5.7A	7A ~ 15.8A	31.6A ~ 8.2A
Operation temperature	-55 ~ +155 $^{\circ}$ C		

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

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

## MECHANICAL DATA



Unit: mm

Type	Size (inch)	Resistance	L (mm)	W (mm)	H (mm)	c (mm)	d (mm)
WW06R	0603	5m $\Omega$	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.33 $\pm$ 0.10	0.20 $\pm$ 0.10	0.50 $\pm$ 0.10
		10m $\Omega$			0.30 $\pm$ 0.10	0.20 $\pm$ 0.10	0.30 $\pm$ 0.10
WW08R	0805	2m $\Omega$	2.0 $\pm$ 0.15	1.25 $\pm$ 0.15	0.22 $\pm$ 0.10	0.35 $\pm$ 0.10	0.55 $\pm$ 0.20
		3m $\Omega$			0.45 $\pm$ 0.10	0.35 $\pm$ 0.10	0.75 $\pm$ 0.20
		4m $\Omega$			0.35 $\pm$ 0.10	0.35 $\pm$ 0.10	0.75 $\pm$ 0.20
		5m $\Omega$			0.35 $\pm$ 0.10	0.35 $\pm$ 0.10	0.60 $\pm$ 0.20
		6m $\Omega$			0.35 $\pm$ 0.10	0.35 $\pm$ 0.10	0.47 $\pm$ 0.20
		7m $\Omega$			0.22 $\pm$ 0.10	0.35 $\pm$ 0.10	0.75 $\pm$ 0.20
		8m $\Omega$			0.22 $\pm$ 0.10	0.35 $\pm$ 0.10	0.60 $\pm$ 0.20
		9m $\Omega$			0.22 $\pm$ 0.10	0.35 $\pm$ 0.10	0.52 $\pm$ 0.20
		10m $\Omega$			0.22 $\pm$ 0.10	0.30 $\pm$ 0.10	0.47 $\pm$ 0.20
WW12R	1206	1m $\Omega$	3.2 $\pm$ 0.15	1.60 $\pm$ 0.15	0.32 $\pm$ 0.10	1.10 $\pm$ 0.25	

2mΩ	0.32±0.10	0.50±0.25
3mΩ	0.35±0.10	0.70±0.25   1.30±0.25
4mΩ	0.35±0.10	1.10±0.25
5mΩ	0.35±0.10	1.00±0.25
6mΩ	0.35±0.1	0.80±0.25
7mΩ	0.35±0.1	0.70±0.25
8mΩ	0.35±0.1	0.50±0.25
9mΩ	0.28±0.1	0.55±0.25
10mΩ	0.28±0.1	0.50±0.25
11mΩ	0.22±0.1	0.80±0.25
12mΩ	0.22±0.1	0.70±0.25
13mΩ	0.22±0.1	0.60±0.25
14mΩ	0.22±0.1	0.55±0.25
15mΩ	0.22±0.1	0.50±0.25

## MARKING

WW12R/WW08R each resistor is marked with a 2-digit code with underline on the protective coating to designate the nominal resistance value. WW06R has no marking!

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

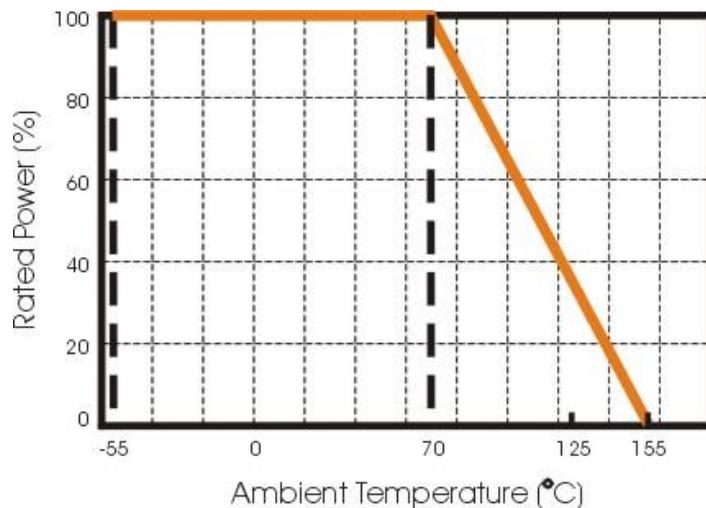


Fig.2 Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## 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

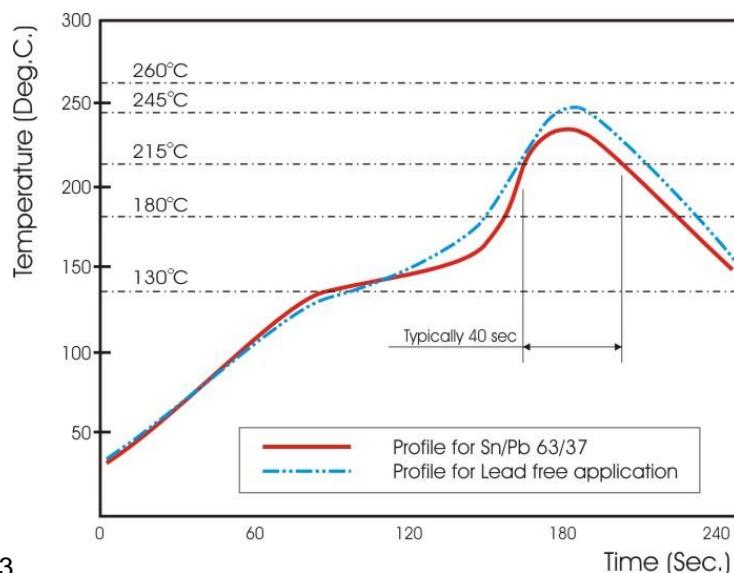


Fig 3. Infrared soldering profile for Chip Resistors WWxxR

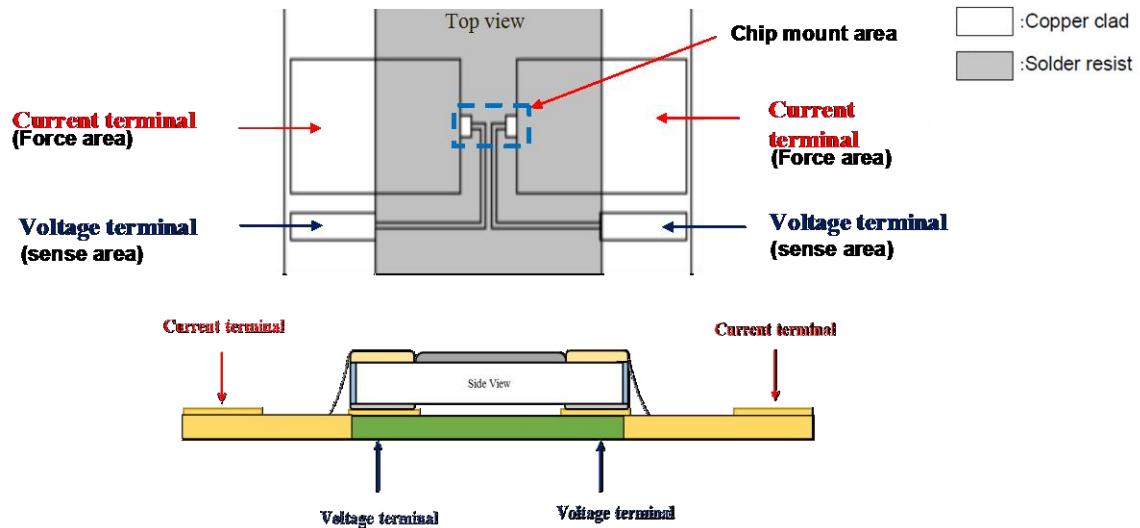
## CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW06	R	R005	J	T	L
<b>Size code</b> WW06 : 0603 WW08 : 0805 WW12 : 1206	<b>Type code</b> R : 1/3W, 0603 1/2W, 0805 1W, 1206	<b>Resistance code</b> R is first digit followed by 3 significant digits. 0.010Ω = R010 0.005Ω = R005	<b>Tolerance</b> J : ±5% F : ±1%	<b>Packaging code</b> T : 7" reel Q : 10" reel	<b>Termination code</b> L = Sn base (lead free)

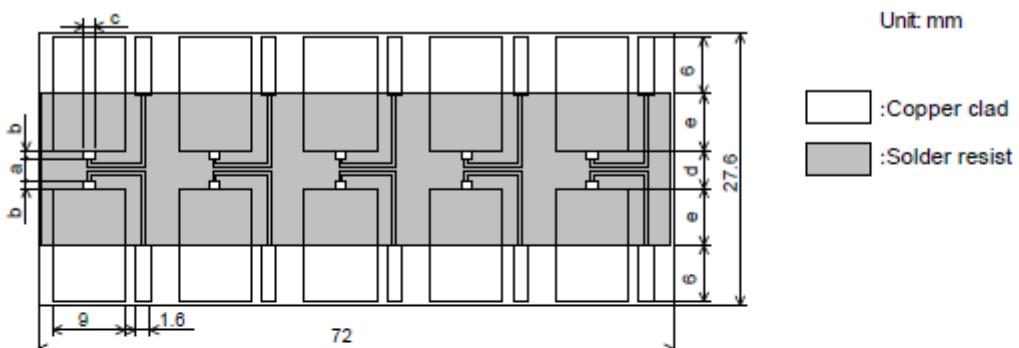
Reeled tape packaging : 8mm width paper taping 5,000pcs per 7" reel. 10,000pcs per 10" reel.

## RESISTANCE MEASUREMENT SCHEMATIC DIAGRAM



The resistance measured is based on mounted on PCB to match with customer field application.

## RECOMMENDED PCB LAND PATTERN



Style	Rated resistance (mΩ)	a	b	c	d	e
WW06R	5	0.6	0.9	0.9	2.2	6.2
	10	1.0	0.6			
WW08R	2,3	0.5	1.1	1.36	2.7	5.95
	4 to 10	0.8	0.95			
WW12R	1	1.0	1.45	1.7	3.9	5.35
	2	2.1	0.9			
	3	0.8	1.55			
	4	1.0	1.45			
	5 and 6	1.4	1.25			
	7 to 15	2.1	0.9			

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

Thickness: 1.6mm      Thickness of copper clad: 0.035mm

## **TEST & REQUIREMENTS**

Table- 4(1)

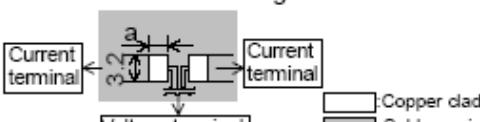
No.	Test items	Condition of test (JIS C 5201-1)	Performance requirements
1	Visual examination	Sub-clause 4.4.1 Checked by visual examination.	As in 4.4.1 The marking shall be legible, as checked by visual examination.
2	Dimension  Resistance	Sub-clause 4.4.2  Resistance value shall be measured by mounting the substrate of the following condition.   a: 2.9mm (2mΩ, 3mΩ, 4mΩ), 1.8mm (5mΩ) Thickness of copper clad: 0.035mm 4-Terminal method Measurement current: 1(A) Note: The measuring apparatus corresponding to DC Low-ohm Mater (1A) of AX-1152D for ADEX CORPORATION.	As specified in Table-3 of this specification. As in 4.5.2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance.
3	Voltage proof	Sub-clause 4.7  Method: 4.6.1.4(See Figure-5) Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage. Duration: 60 s±5 s Insulation resistance Test voltage: Insulation voltage Duration: 1 min.	No breakdown or flash over  $R \geq 1 \text{ G}\Omega$
4	Solderability	Sub-clause 4.17  Without aging Flux: The resistors shall be immersed in a non-activated soldering flux for 2 s. Bath temperature: 235 °C±5 °C Immersion time: 2 s±0.5 s	As in 4.17.4.5 The terminations shall be covered with a smooth and bright solder coating.
5	Mounting  Overload (in the mounted state)  Solvent resistance of the marking	Sub-clause 4.31  Substrate material: Epoxide woven glass Test substrate: Figure-3 Sub-clause 4.13 The applied voltage shall be 2.5 times the rated voltage or the current corresponding to. Duration: 2 s Visual examination Resistance Sub-clause 4.30 Solvent: 2-propanol Solvent temperature: 23 °C±5 °C Method 1 Rubbing material: cotton wool Without recovery	No visible damage $\Delta R \leq \pm 1\%$ Legible marking

Table-4(2)

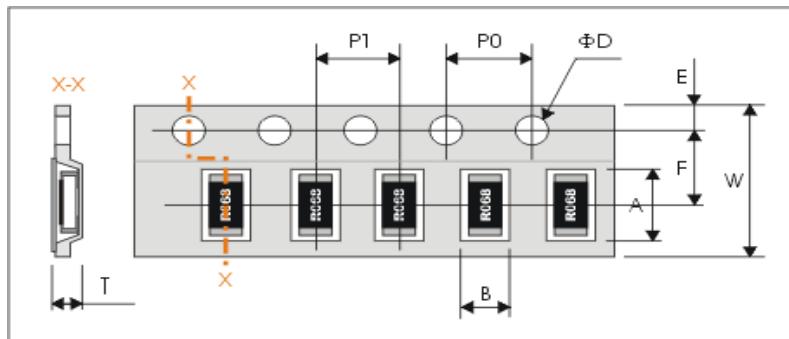
No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
6	Mounting  Bound strength of the end face plating  Final measurements	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-4 Sub-clause 4.33 Bent value: 1 mm Resistance Sub-clause 4.33.6 Visual examination	$\Delta R \leq \pm 1\%$  No visible damage
7	Resistance to soldering heat  Component resistance solvent	Sub-clause 4.18 Solder temperature: $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Immersion time: $10\text{ s} \pm 0.5\text{ s}$ Visual examination  Resistance Sub-clause 4.29 Solvent: 2-propanol Solvent temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Method 2 Recovery: 48 h Visual examination Resistance	As in 4.18.3.4 No sign of damage such as cracks. $\Delta R \leq \pm 1\%$  No visible damage $\Delta R \leq \pm 1\%$
8	Mounting  Adhesion  Rapid change temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3 Sub-clause 4.32 Force: 5 N Duration: $10\text{ s} \pm 1\text{ s}$ Visual examination Sub-clause 4.19 Lower category temperature: $-55^{\circ}\text{C}$ Upper category temperature: $+155^{\circ}\text{C}$ Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles. Visual examination Resistance	No visible damage  No visible damage $\Delta R \leq \pm 1\%$

Table-4(3)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
9	Climatic sequence –Dry heat  –Damp heat, cycle (12+12hour cycle) First cycle  –Cold  –Damp heat, cycle (12+12hour cycle) Remaining cycle  –D.C. load	Sub-clause 4.23 Sub-clause 4.23.2 Test temperature: +155 °C Duration: 16 h Sub-clause 4.23.3 Test method: 2 Test temperature: 55 °C [Severity(2)] Sub-clause 4.23.4 Test temperature –55 °C Duration: 2h Sub-clause 4.23.6 Test method: 2 Test temperature: 55 °C [Severity (2)] Number of cycles: 5 cycles Sub-clause 4.23.7 The applied current shall be the rated current. Duration: 1 min. Visual examination Resistance	No visible damage $\Delta R \leq (1\% + 0.0005\text{ohm})$
10	Mounting  Endurance at 70 °C	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4.25.1 Ambient temperature: 70 °C $\pm 2$ °C Duration: 1000 h The current shall be applied in cycles of 1.5 h on and 0.5 h. The applied current shall be the rated current Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	No visible damage $\Delta R \leq (1\% + 0.0005\text{ohm})$

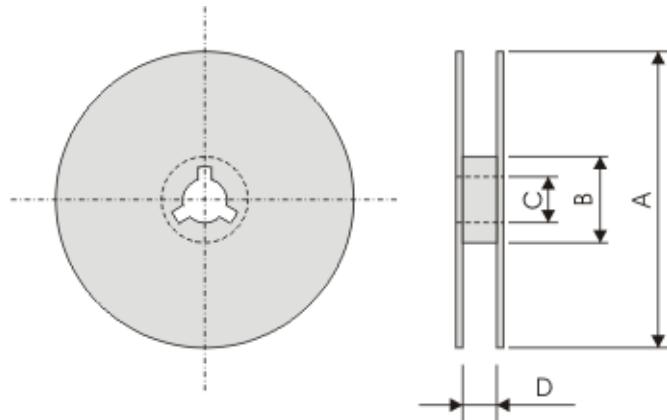
Table-4(4)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
11	Mounting  Variation of resistance with temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4.8 +20 °C / +155 °C	As in Table-1
12	Mounting  Damp heat, steady state	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4.24 Ambient temperature: 40 °C±2 °C Relative humidity: 93 $\pm 2$ % Without current applied. Visual examination  Resistance	No visible damage Legible marking $\Delta R \leq \pm (1\% + 0.0005\text{ohm})$
13	Dimensions (detail)  Mounting  Endurance at upper category temperature	Sub-clause 4.4.3  Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4.25.3 Ambient temperature: 155 °C±2 °C Duration: 1000 h Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	As in Table-4  No visible damage $\Delta R \leq \pm (1\% + 0.0005\text{ohm})$

**PACKAGING****Paper Tape specifications (unit :mm)**

Symbol	A	B	W	F	E
WW06R	1.90±0.20	1.15±0.15	8.00±0.20	3.50±0.05	1.75±0.10
WW08R	2.50±0.20	1.65±0.15			
WW12R	3.60±0.20	2.00±0.15			

Symbol	P1	P0	ΦD	T
WW06R	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	0.8 max.
WW08R				1.0 max.
WW12R				1.0 max.

**Reel dimensions**

Symbol	A	B	C	D
7"	Φ180.0 -1.5	Φ60.0±1.0	13.0±0.2	9.0 +1.0
10"	Φ254.0 ±2.0	Φ100.0±1.0	13.0±0.2	9.0 +1.0

**Taping quantity**

- Chip resistors 5,000 pcs per 7" reel; 10,000pcs per 10" reel.



# OCEAN CHIPS

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