

**RoHS  
Compliant**



### 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.

### Features:

- High reliability and stability
- Reduced size of final equipment
- Lower assembly costs
- Higher component and equipment reliability

### Application:

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

### Quick Reference Data

Item	General Specification			
Series No.	MCWR12	MCWR08	MCWR06	MCWR04
Size code	1206(3216)	0805(2012)	0603(1608)	0402(1005)
Resistance Range	1Ω to 10MΩ 1% tolerance			
Resistance Tolerance	1% E96/E24			
TCR (ppm/°C) 10MΩ ≥ R > 10 R ≤ 10Ω	≤ ± 100 -200 to +400			
Max. dissipation @ T <sub>amb</sub> = 70°C	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	150V	75V	50V
Max. Overload Voltage (DC or RMS)	400V	300V	150V	100V
Climatic category	55/155/56			

Note :

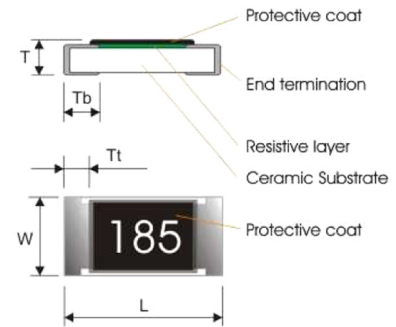
1. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by  
 $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$  or Max. RCWV listed above, whichever is lower.
2. The resistance of Jumper is defined <0.05Ω.

# Thick Film Chip Resistors



	MCWR12	MCWR08	MCWR06	MCWR04
<b>L</b>	3.1 ± 0.1	2 ± 0.1	1.6 ± 0.1	1 ± 0.05
<b>W</b>	1.6 ± 0.1	1.25 ± 0.1	0.8 ± 0.1	0.50 ± 0.05
<b>T</b>	0.6 ± 0.15	0.5 ± 0.15	0.45 ± 0.15	0.35 ± 0.05
<b>Tb</b>	0.45 ± 0.2	0.4 ± 0.2	0.3 ± 0.15	0.25 ± 0.1
<b>Tt</b>	0.5 ± 0.2	0.4 ± 0.2	0.3 ± 0.1	0.2 ± 0.1

Dimensions : Millimetres



## Functional Description:

### Product characterization

Standard values of nominal resistance is E96 series for resistors with a tolerance of ±1%.

### Derating

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

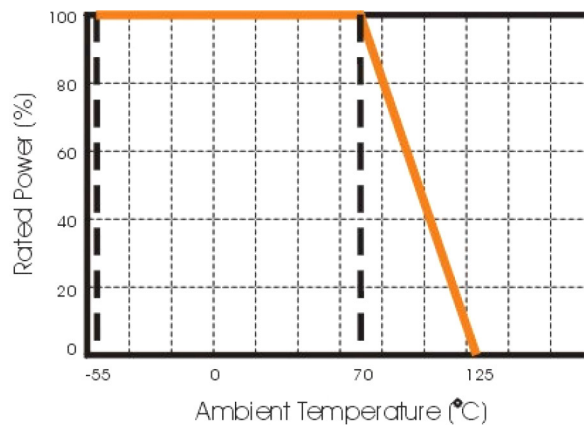


Figure 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature for MCWR12, MCWR08, MCWR06, MCWR04

### 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 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.

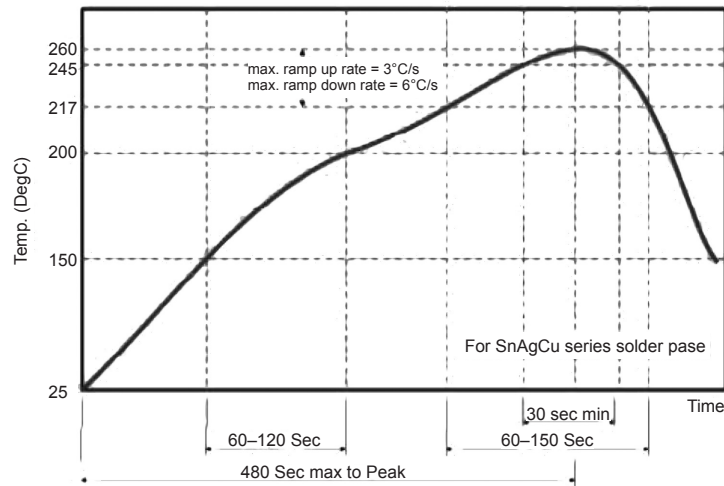


Fig 3. Infrared soldering profile for Chip Resistors

## Catalogue Numbers:

The resistors have a catalogue number starting with

MCWR12	X	472_	J	T	L
<b>Size code</b>	<b>Type code</b>	<b>Resistance code</b>	<b>Tolerance</b>	<b>Packaging code</b>	<b>Termination code</b>
MCWR12 : 1206	<b>X :</b>	4.7Ω =4R7_	F : ±1%	T : 7" Reeled taping	L = Sn base (lead free)
MCWR08 : 0805	±1%, 10Ω to 1MΩ	10Ω =100_	P : Jumper	Q : 10" Reeled taping	
MCWR06 : 0603	<b>W :</b>	220Ω =221_		G : 13" Reeled taping	
MCWR04 : 0402	±1%, < 10Ω; >1MΩ	Jumper =000_		H : 13" reel 50Kpcs only for 0402	
		("_" means a blank)		B : Bulk	
		±1%, E24+E96: 3 significant digits followed by no. of zeros		D : 7" reel 20Kpcs only for 0402	
		102Ω =1020		A : 7" reel 15Kpcs only for 0402	
		37.4KΩ =3742			

MCWR12, MCWR08, MCWR06:

1. Reeled tape packaging : 8mm width paper taping 5,000pcs per 7" reel, 10kpcs per 10" reel, 20kpcs per 13" reel.
2. Bulk packaging : 5,000pcs per poly-bag

MCWR04:

1. Reeled tape packaging : 8mm width paper taping 10,000pcs per 7" reel, 20,000pcs per 10" reel. 70,000pcs per 13" reel.
2. Bulk packaging : 10,000pcs per poly-bag

## 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 mildly activated flux.

Test	Procedure / Test Method	Requirement	
		Resistor	0Ω
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) 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; $t_2$ : -55°C or +155°C $R_1$ : Resistance at reference temperature (20°C +5°C / -1 °C) $R_2$ : Resistance at test temperature (-55°C or +155°C)	Within the specified tolerance Refer to "QUICK REFERENCE DATA"	<50mΩ
Resistance to soldering heat(R.S.H) JISC5201-1:1998 Clause 4.18	Un-mounted chips completely immersed for 10 ±1second in a SAC solder bath at 260°C ±5°C	±1%: ΔR/Rmax. ±(0.5%+0.05Ω ) no visible damage	<50mΩ
Solderability JISC5201-1: 1998 Clause 4.17	Un-mounted chips completely immersed for 10 ±1second in a SAC solder bath at 235°C ±5°C	95% coverage min., good tinning and no visible damage	
Temperature cycling JISC5201-1: 1998 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	±1%: ΔR/Rmax. ±(0.5%+0.05Ω) No visible damage	<50mΩ
High Temperature Exposure MIL-STD-202 method 108	1,000 +48/-0 hours; without load in a temperature chamber controlled 155 ±3°C	±1%:ΔR/ Rmax.±(1%+0.1Ω) No visible damage	<50mΩ
Bending strength JISC5201-1: 1998 Clause 4.33	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec, 5mm for MCWR04	±1%:ΔR/ Rmax.±(1%+0.05Ω) No visual damaged	<50mΩ
Adhesion JISC5201-1: 1998 Clause 4.32	Pressurizing force: 5N, Test time: 10 ±1sec.	No remarkable damage or removal of the terminations	
Short Time Overload (STOL) JISC5201-1: 1998 Clause 4.13	2.5 times RCWV or max. overload voltage, for 5seconds	±1%: ΔR/R max. ±(1%+0.05Ω) No visible damage	<50mΩ

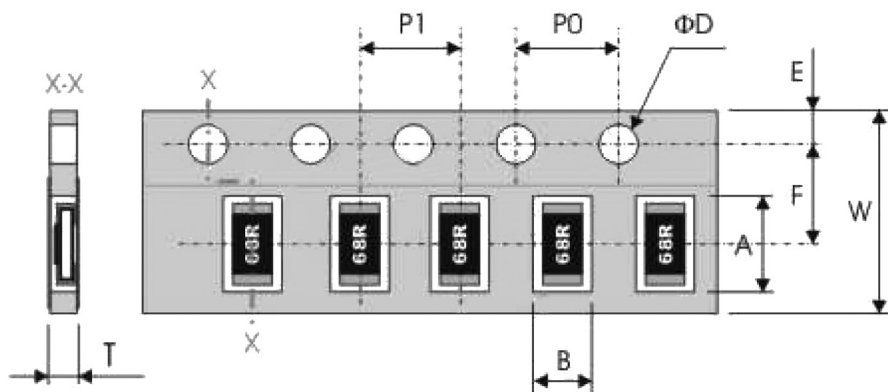
Test	Procedure / Test Method	Requirement	
		Resistor	0Ω
Load life in Humidity JISC5201-1: 1998 Clause 4.24	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C± 2°C and 90 to 95% relative humidity, 1.5hours on and 0.5 hours off	±1%: ΔR/R max. ±(1%+0.1Ω) No visible damage	<50mΩ
Load life (endurance) JISC5201-1: 1998 Clause 4.25	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off	±1%: ΔR/R max. ±(1%+0.1Ω) No visible damage	<50mΩ
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	

## Test Condition For Jumper (0 Ω)

Item	MCWR12	MCWR08	MCWR06	MCWR04
Power Rating At 70°C	1/4W	1/8W	1/10W	1/16W
Resistance	MAX. 50mΩ			
Rated Current	2A	1.5A	1A	1A
Peak Current	5A	3.5A	3A	2A
Operating Temperature	-55°C to +155° C			

## Packaging:

### Paper Tape specifications



Dimensions : Millimetres

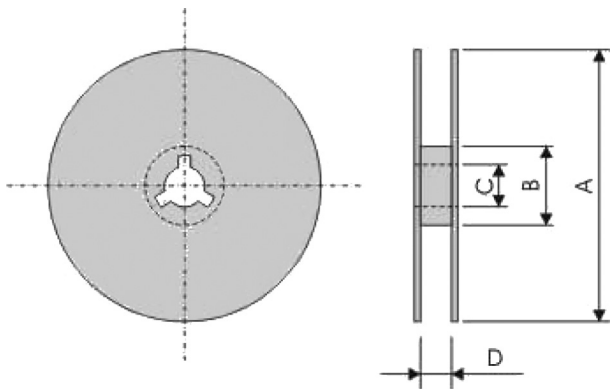
# Thick Film Chip Resistors



Series No.	A	B	W	F	E
MCWR12	3.6 ±0.2	2 ±0.2	8 ±0.3	3.5 ±0.2	1.75 ±0.1
MCWR08	2.4 ±0.2	1.65 ±0.2			
MCWR06	1.9 ±0.2	1.1 ±0.2			
MCWR04	1.2 ±0.1	0.7 ±0.1			

Series No.	P1	P0	D	T
MCWR12/WR08	4 ±0.1	4 ±0.1	Φ1.5 <sup>+0.1</sup> <sub>-0.0</sub>	Max. 1
MCWR06				0.65 ±0.05
MCWR04	2 ±0.1			0.4 ±0.05

## 7" Reel dimensions:



Symbol	A	B	C	D
7" reel	Φ178 ±2	Φ60 ±1	13 ±0.2	9 ±0.5
10" reel	Φ254 ±2	Φ100 ±1	13 ±0.2	9 ±0.5
13" reel	Φ330 ±2	Φ100 ±1	13 ±0.2	9 ±0.5

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