APPROVAL SHEET

MR02X(W)

±5%, ±1%

Thick Film General Purpose Chip Resistors
Automotive compliant AEC Q-200 qualified
Anti-Sulfuration
Size 0201

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

FEATURE

1. Automotive grade AEC Q200 qualified with 100% CCD visual inspection
2. High reliability and stability 1%
3. Reduced size of final equipment
4. Suitable for high density print circuit board assembly
5. Higher component and equipment reliability
6. Anti-Sulfuration under H_2S 10ppm 60'C x 1000hrs

APPLICATION

- Mobile phone
- PDA
- Camcorders
- Palmtop computers
- Hybrid module

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 nominated value within tolerance which controlled by laser trimming 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 pure Tin.

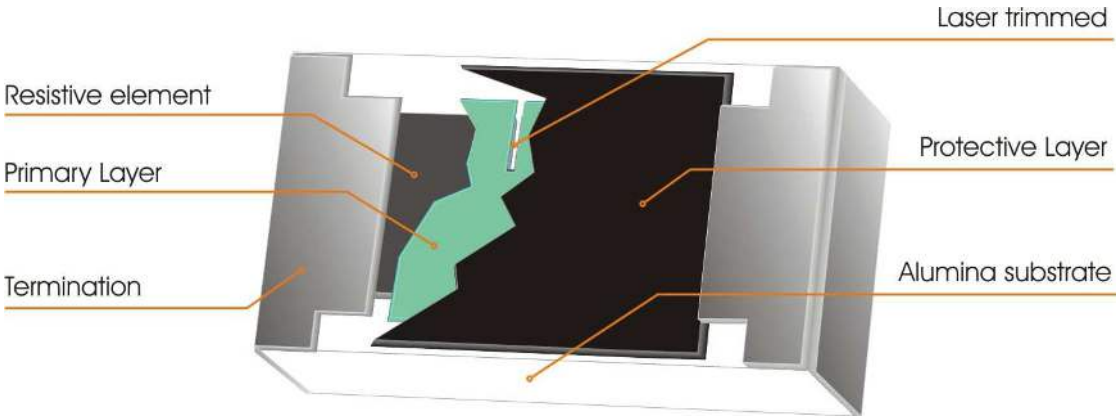


Fig 1. Construction of Chip-R MR02X

QUICK REFERENCE DATA

Item	General Specification	
Series No.	MR02X	
Size code	0201(0603)	
Resistance Range	1Ω~10MΩ (±5% tolerance), Jumper 1Ω~ 10MΩ (±1% tolerance)	
Resistance Tolerance	±1% E96+E24	±5% E24
TCR (ppm/°C)	1.02MΩ - 10MΩ, ≤±200ppm 51Ω - 1MΩ, ≤±100ppm 10Ω - 49.9Ω, ≤±200ppm 1 - 9.76Ω, +600 ~ -200ppm	
Max. dissipation @ T_{amb}=70°C	1/20 W	
Max. Operation Voltage	25V	
Max. Overload Voltage	50V	
Operation temperature	-55 ~ +155'C	

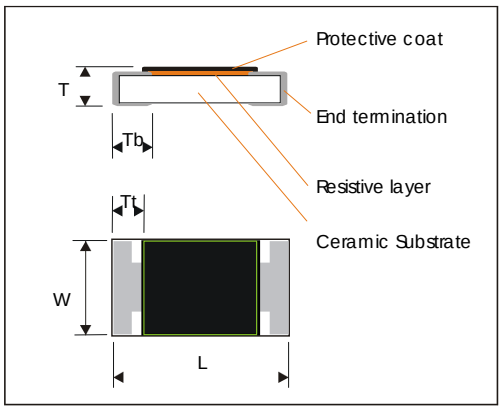
Note :

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. Jumper max. 50mohm, rated current 1A, peak current 2.5A

DIMENSION(unit : mm)

	MR02X
L	0.60 ± 0.03
W	0.30 ± 0.03
T	0.23 ± 0.03
Tb	0.15 ± 0.05
Tt	0.10 ± 0.05



MARKING

MR02X(W) has no marking.

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24/E96 series for resistors with a tolerance of ±5% & ±1%. The values of the E24/E96 series are in accordance with "IEC publication 60063"

Derating

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

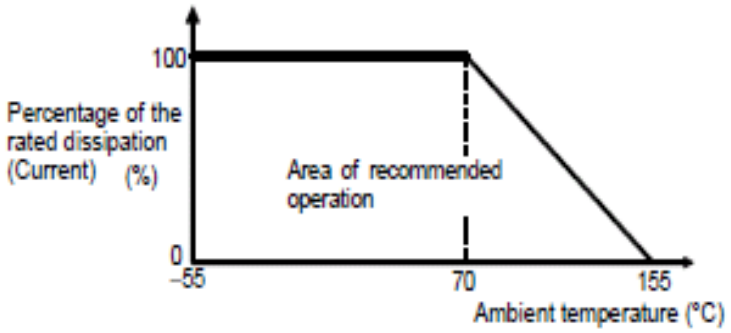


Figure 2. Maximum dissipation in percentage of rated power

As a function of the ambient temperature

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.

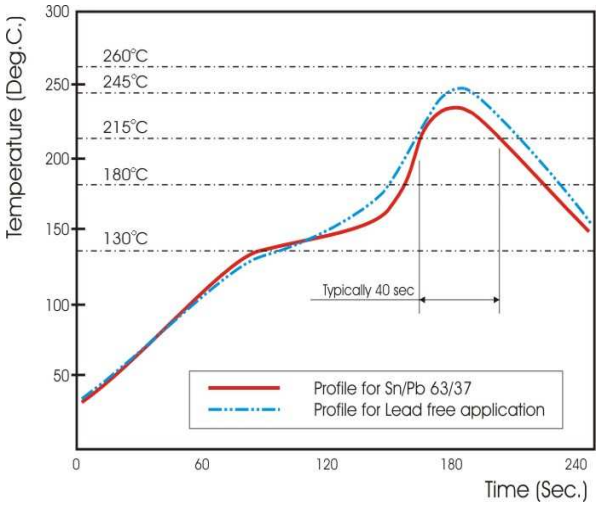


Fig 3. Infrared soldering profile for Chip Resistors MR02X(W)

CATALOGUE NUMBERS

The resistors have a catalogue number starting with :

MR02	X	472_	J	A	L
Size code MR02 : 0201	**Type code** X : Normal W : 1% For <10Ω or >1MΩ	**Resistance code** 5%, E24: 2 significant digits followed by no. of zeros 100Ω = 101_ 10KΩ = 103 1%, E24+E96: 3 significant digits followed by no. of zeros 100Ω =1000 37.4KΩ =3742	**Tolerance** J : ±5% F : ±1% P : Jumper	**Packaging code** A : 7" Reeled (15Kpcs/Reel) G : 13" Reeled (70Kpcs/Reel)	**Termination code** L = Sn base (lead free)

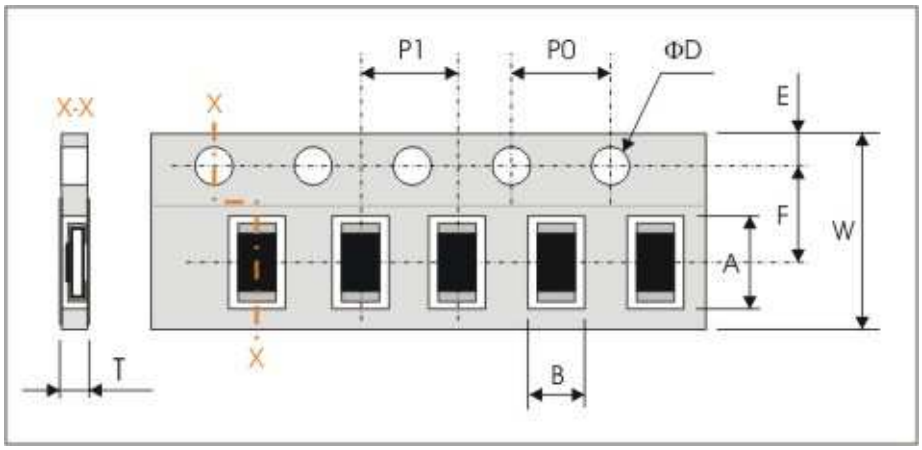
Standard taping quantity 15,000pcs per 7" reel! 70,000pcs per 13" reel!

TEST AND REQUIREMENTS (JIS C 5201-1 : 1998)

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℃+5℃-1℃ R_1 : Resistance at reference temperature (20℃+5℃/-1℃) R_2 : Resistance at test temperature (-55℃ or +125℃)	Within the specified tolerance Refer to "QUICK REFERENCE DATA"	<50mΩ
Short time overload (S.T.O.L) **Clause 4.13**	Permanent resistance change after a 5second application of a voltage 2.5 times RCWV or the maximum overload voltage specified in the above list, whichever is less.	ΔR/R max. ±(1%+0.10Ω)	<50mΩ
Resistance to soldering heat(R.S.H) **AEC Q200-15**	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260℃±5°C	ΔR/R max. ±(0.5%+0.05Ω) no visible damage	<50mΩ
Solderability **Clause 4.17**	Baked 155'C for dwell time 4hrs, Un-mounted chips completely immersed for 5 second in a SAC solder bath at 235℃±5℃	95% coverage min., good tinning and no visible damage	
Temperature cycling **AEC Q200-4**	30 minutes at -55°C±3°C, 2~3 minutes at 20℃+5℃-1℃, 30 minutes at +155°C±3°C, 2~3 minutes at 20℃+5℃-1℃, total 1000 continuous cycles	ΔR/R max. ±(0.5%+0.05Ω)	< 50mΩ
Bias Humidity **AEC Q200-7**	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at +85℃/85%RH, 10% rated power applied continuously,	ΔR/R max. ±(1%+0.10Ω)	< 50mΩ
Operational Life **MIL-STD-202 method 108**	1000+48/-0 hours; 35% of operation power, 125±2°C	ΔR/R max. ±(1%+0.10Ω)	< 50mΩ
High Temperature Exposure **AEC Q200-3**	1000 hrs @ 155℃, un-powered	ΔR/R max. ±(1%+0.10Ω)	< 50mΩ
Bending strength **AEC Q200 -21**	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 2mm for 60sec.	No visual damaged, ΔR/R max. ±(0.5%+0.05Ω)	< 50mΩ
Adhesion **AEC Q200-22**	Pressurizing force: 3N, Test time: 60±1sec.	No remarkable damage or removal of the terminations	
Vibration **AEC Q200-14**	5 g's for 20 min , 12 cycles each of 3 orientations	△R/R max≦±(0.5%+0.05Ω) and no visible damage	< 50mΩ
Mechanical Shock **AEC Q200-13**	Shock machine, half sine, 100G, 6msec, XX'YY'ZZ', 10times each	△R/R max≦±(0.5%+0.05Ω) and no visible damage	< 50mΩ
ESD (HBM)	Human body model, 2Kohm, 150 pF, test 0.3KV	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ

PACKAGING

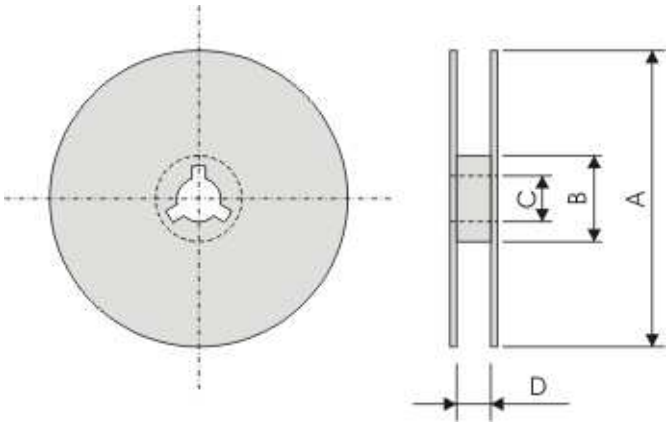
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
MR02X	0.67±0.05	0.37±0.05	8.00±0.20	3.50±0.05	1.75±0.10

Series No.	P1	P0	ΦD	T
MR02X	2.00±0.05	4.00±0.05	$\Phi 1.50^{+0.1}_{-0.0}$	0.45±0.05

Reel dimensions



Symbol	A	B	C	D
7” Reel	Φ178.0±0.2	Φ60.0±1.0	13.0±0.2	9.0±0.5
13” Reel	Φ330.0±2.0	Φ100.0±1.0	13.0±0.2	9.0±0.5

Taping quantity and Tape material

- Chip resistors 15,000 pcs 7” Reel, Paper tape.
- Chip resistors 70,000 pcs 13” Reel, Paper tape.