



UNI-ROYAL
厚聲集團

DATA SHEET

Product Name Metal Foil Chip Resistors

Part Name MS Series

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1. Scope

- 1.1 This datasheet is the characteristics of Metal Foil Chip Resistors manufactured by UNI-ROYAL.
- 1.2 High power rating.
- 1.3 Ultra low resistance value.
- 1.4 Excellent frequency response.
- 1.5 Excellent temperature coefficient characteristics.
- 1.6 RoHS compliant

2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: MS05 , MS06

2.2 5th~6th codes: Power rating.

E.g.: W=Normal Size “1~G” = “1~16”

Wattage	1/2	1	1.5	2	3
Normal Size	W2	1W	1A	2W	3W

If power rating is equal or lower than 1 watt, 5th code would be “W” and 6th code would be a number or letter.

E.g.: WA=1/10W W4=1/4W

2.3 7th code: Tolerance. E.g.: D=±0.5% F=±1% G=±2% J=±5% K= ±10%

2.4 8th~11th codes: Resistance Value.

2.4.1 If value belongs to standard value of E-24 series, the 8th code is zero, 9th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.

2.4.2 If value belongs to standard value of E-96 series, the 8th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.

2.4.3 11th codes listed as following:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

2.5 12th~14th codes.

2.5.1 12th code: Packaging Type. E.g.: C=Bulk T=Tape/Reel

2.5.2 13th code: Standard Packing Quantity.

4=4,000pcs 5=5,000pcs C=10,000pcs D=20,000pcs E=15,000pcs

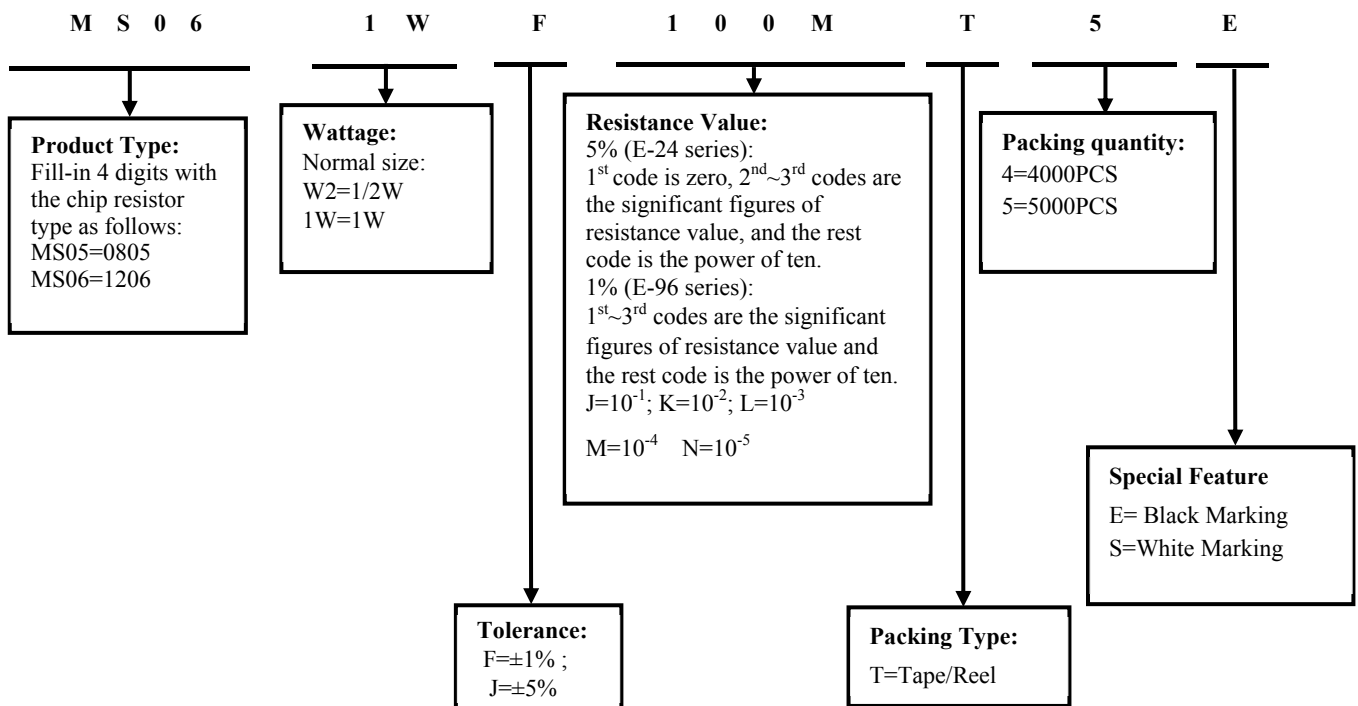
Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

2.5.3 14th code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

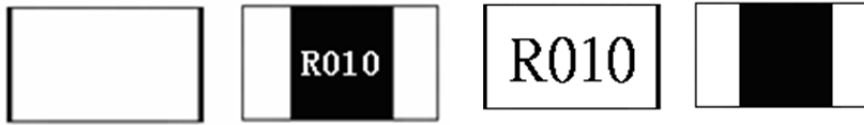
3. Ordering Procedure

(Example: MS06 1W ±1% 10mΩ T/R-5000)



4. Marking

The first digit . Is “R” which as decimal point.

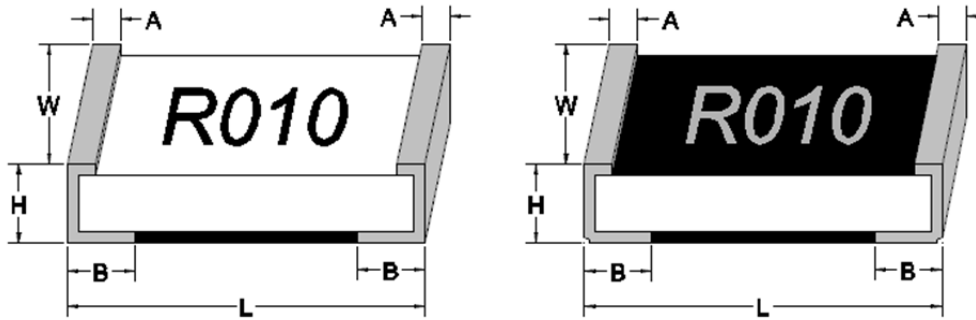


R010 → 10mΩ

5. Dimension

E = Black Marking

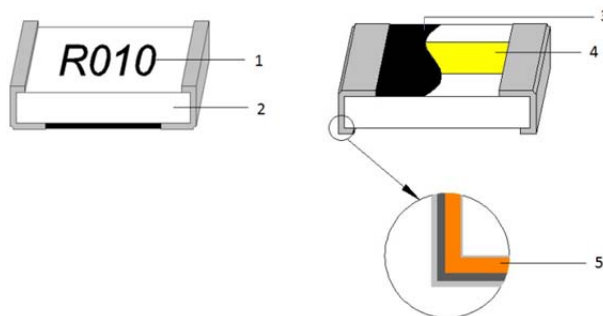
S=White Marking



Type	70°C Power	Dimension(mm)					Resistance Range	T.C.R PPM/°C
		L	W	H	A	B		
MS05	1/2W	2.00±0.30	1.20±0.30	0.60±0.20	≤1.0	0.65±0.15	5 mΩ~9mΩ	±150
						0.57±0.15	12 mΩ~13mΩ	
						0.42±0.15	10mΩ、15mΩ~27mΩ	
	1W	2.00±0.30	1.20±0.30	0.60±0.20	≤1.0	0.42±0.15	10mΩ	±50
MS06	1W	3.10±0.20	1.60±0.30	0.70±0.20	≤1.0	0.86±0.25	7mΩ	±100
						0.76±0.25	5mΩ~6mΩ, 8mΩ	±100
						0.46±0.25	10mΩ~25mΩ	±100

*Please contact factory for other sizes

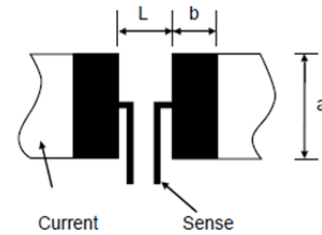
6. Structure



1	Marking	4	Resistance layer
2	Alumina Substrate	5	Terminal (Cu/Ni/ Sn)
3	Protective layer		

7. Soldering pad size recommended

Type	Dimension(mm)		
	L	b	a
MS05	1.20±0.05	1.20±0.05	1.2±0.05
MS06	1.40±0.10	1.90±0.10	1.80±0.10



8. Derating Curve

Power rating will change based on continuous load at ambient temperature from -55 to 155°C. It is constant between -55 to 70°C, and derate to zero when temperature rise from 70 to 155°C.

Voltage rating:

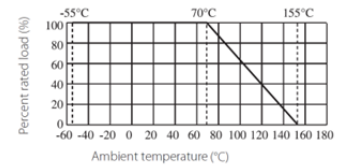
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

Remark: RCWV: Rating Continuous Working Voltage (Volt.) P: power rating (Watt) R: nominal resistance (Ω)

In no case, the rated DC or RMS AC continuous working voltage must be greater than the applicable maximum value.

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is lower.



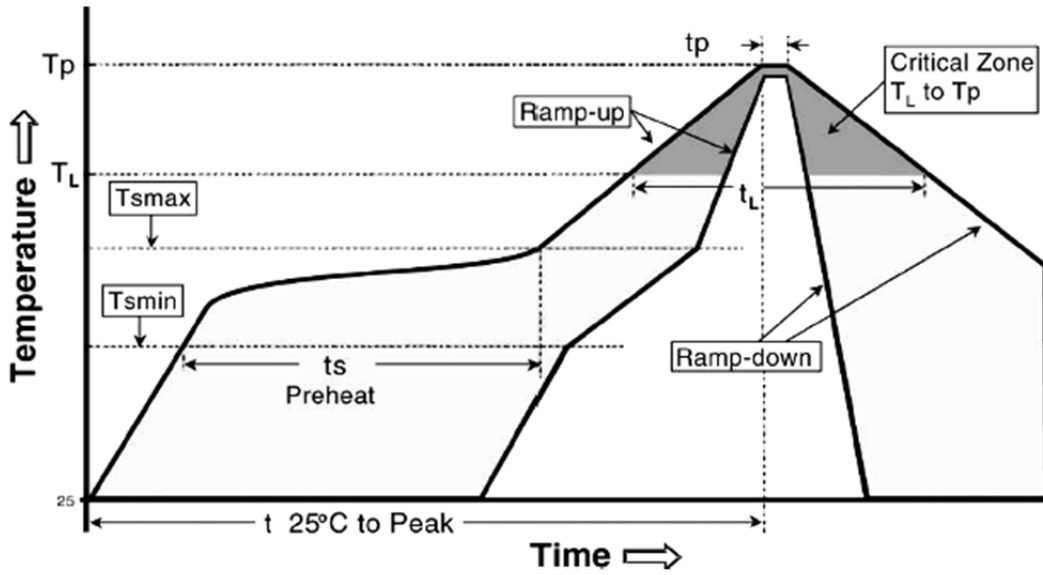
9. Performance Specification

Characteristic	Limits		Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	Refer to item 5.0		4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R ₁ : Resistance Value at room temperature (t ₁) ; R ₂ : Resistance at test temperature (Upper limit temperature or Lower limit temperature) t ₁ : +25°C or specified room temperature t ₂ : Upper limit temperature or Lower limit temperature test temperature
Short-time overload	1%	±(1.0%+0.001Ω)	4.13 Permanent resistance change after the application of a potential of 5 times rated power for 5 seconds.
	5%	±(2.0%+0.001Ω)	
Low Temperature Storage	±(1.0%+0.001Ω)		4.23.4 Lower limit temperature , for 1000H
High Temperature Exposure	±(1.0%+0.001Ω)		4.23.2 Upper limit temperature , for 1000H
Solderability	More than 95% coverage rate		4.17 The surface of solder must be new, smooth, clean, shiny and continuous, and without concentrated pinholes. The solder's temperature must be within 245±3°C.Hold in hot solder 2~3seconds.
soldering heat	±(0.5%+0.005Ω)		4.18 Dipped into solder at 260°C for 10 seconds.
Load life	1%	± (1%+0.001Ω)	4.25.1 Permanent resistance change after 1,000 hours operating at rated power at 70±2°C, 1.5hrs ON ,0.5hrs OFF.
	5%	± (3%+0.001Ω)	
Load life in humidity	1%	± (1.0%+0.001Ω)	7.9 40±2°C,1000hrs at rated power,90~95%RH , 1.5hrs ON,0.5hrs OFF
	5%	± (3.0%+0.001Ω)	

11. Soldering Condition

(This is for recommendation, please customer perform adjustment according to actual application)

11.1 Recommend Reflow Soldering Profile : (solder : Sn96.5 / Ag3 / Cu0.5)

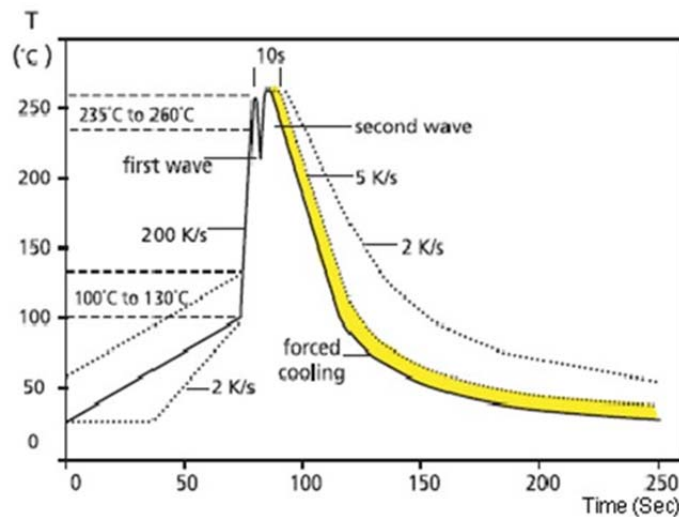


Profile Feature	Lead (Pb)-Free solder
Preheat: Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	150°C 200°C 60 -120seconds
Average ramp-up rate: (T_s max to T_p)	3°C / second max.
Time maintained above : Temperature (T_L) Time (t_L)	217°C 60-150 seconds
Peak Temperature (T_p)	260°C
Time within $+0^{\circ}\text{C}$ to -5°C of actual peak Temperature (t_p) ²	10 seconds
Ramp-own Rate	6°C/second max.
Time 25°C to Peak Temperature	8minutes max.

Allowed Re-flow times : 2 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace .

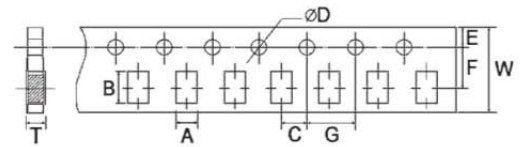
11.2 Recommend Wave Soldering Profile : (Apply to 0603 and above size)



10. Packing

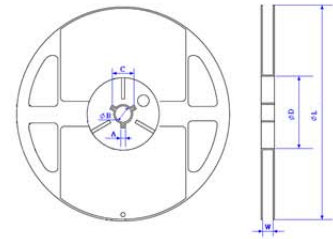
10.1 Dimension of Paper Taping :(Unit: mm)

Type	A ±0.2	B ±0.2	C ±0.05	$\Phi D_{-0.1}^{+0.1}$	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
MS05	1.65	2.40	2.00	1.50	1.75	3.50	4.00	8.00	0.81
MS06	2.00	3.60	2.00	1.50	1.75	3.50	4.00	8.00	0.81



10.3 Dimension of Reel : (Unit: mm)

Type	TAPING	Qty/Reel	A±0.5	B±0.5	C±0.5	$\Phi D \pm 1$	$\Phi L \pm 2$	W±1	Wt. (mg)
MS05	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0	5.9
MS06	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0	13.6



11. Note

12.1. UNI-ROYAL recommend products store in warehouse with temperature between 15 to 35°C under humidity between 25 to 75%RH.

Even under storage conditions recommended above, solder ability of products will be degraded stored over 1 year old.

11.2. Cartons must be placed in correct direction which indicated on carton, otherwise the reel or wire will be deformed.

11.3. Storage conditions as below are inappropriate:

- Stored in high electrostatic environment
- Stored in direct sunshine, rain, snow or condensation.
- Exposed to sea wind or corrosive gases, such as Cl₂, H₂S, NH₃, SO₂, NO₂, etc.

12. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~7	Mar.20, 2018	Haiyan Chen	Nana Chen
2	1. Add MS03 specifications 2. Modify dimension resistance detail	1~7 3~4	July.12, 2018	Haiyan Chen	Nana Chen
3	1. Delete unrecommended specifications and blocks 2. Add 1.6 items and modify 2.51, 2.52, 2.53, 3 3. Add 5.0 item white code diagram 4. Add 10.3 items of 1000-grain weight data 5. Delete the 9.0 performance item Rapid change of temperature、Biased Humidity、Leaching	1~7 2 3 3 6 5	Dec.4, 2018	Dongmei Liao	Shuai Wu
4	Change the resistance range	3	Jan.24,2019	Shuai Wu	Qingfeng Song
5	Modify the product name	1~7	Feb.16, 2019	Haiyan Chen	Yuhua Xu
6	Change the resistance range and temperature coefficient	3	Apr.24, 2019	Haiyan Chen	Yuhua Xu
7	Add the MS12 2W power	3	Sep.11, 2019	Haiyan Chen	Yuhua Xu
8	Delete unrecommended specifications and blocks	1~5	Apr.13, 2020	Haiyan Chen	Yuhua Xu
9	Modify the reflow curve and add the wave soldering curve	5	Apr.29, 2020	Haiyan Chen	Yuhua Xu

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