

DATA SHEET

Product Name Metal Foil Current Sensing Chip Resistors

Part Name MS Series

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Uniroyal Electronics Global Co.,Ltd Shenzhen Branch
Aeon Technology Corporation
Uniroyal Electronics Global Co.,Ltd Xiamen Branch
Kunshan Foss Electronic material Co., Ltd.

Brands *RoyalOhm* *UniOhm*



1. Scope

- 1.1 This specification for approve relates to the Metal Foil Current Sensing Chip Resistors manufactured by UNI-ROYAL.
- 1.2 Able to withstand high power.
- 1.3 Ultra low sensing resistance.
- 1.4 Excellent frequency response.
- 1.5 Excellent temperature coefficient characteristics.
- 1.6 AEC-Q200 qualified .

2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: MS03,MS05 , MS06 ,MS07, MS10,MS11, MS12 , MS28 , MS17 , MS20, MS27

2.2 5th~6th codes: Power rating.

E.g.: W=Normal Size "1~G" = "1~16"

Wattage	1/32	3/4	1/2	1/3	1/4	1/8	1/10	1/16	1/20	1
Normal Size	WH	07	W2	W3	W4	W8	WA	WG	WM	1W

If power rating is lower or equal 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 ≥5% series, 8th code would be zero,9th~10th codes are significant figures of the resistance and 11th code is the power of ten.

2.4.2 If value belongs to standard value of ≤2% series, 8th~10th codes are significant figures of the resistance, and 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 N=10⁻⁵ P=10⁻⁶

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=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

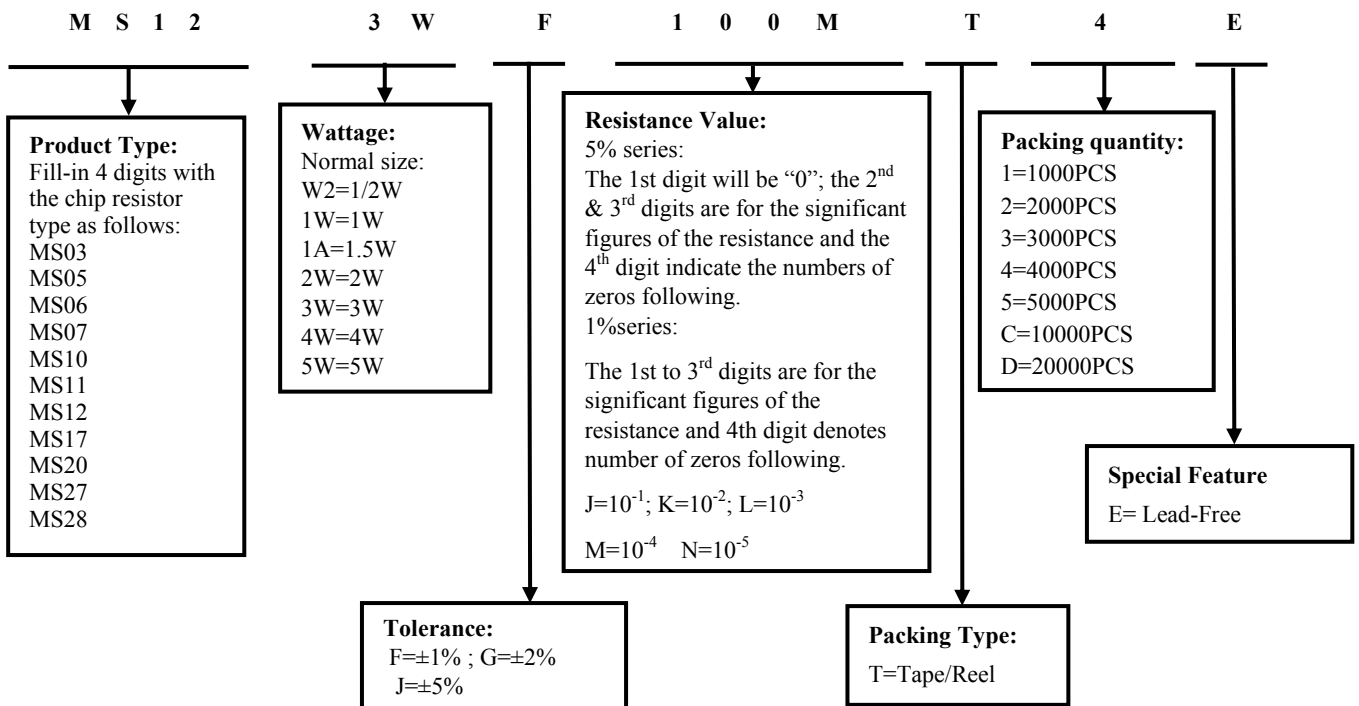
Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

2.5.3 14th code: Special features.

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

3. Ordering Procedure

(Example: MS12 3W ±1% 10mΩ T/R-4000)

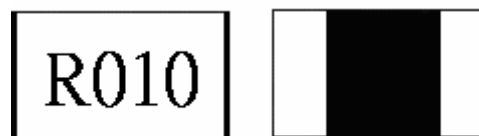


4. Marking

(1) For MS03 size . there is no marking on the body.

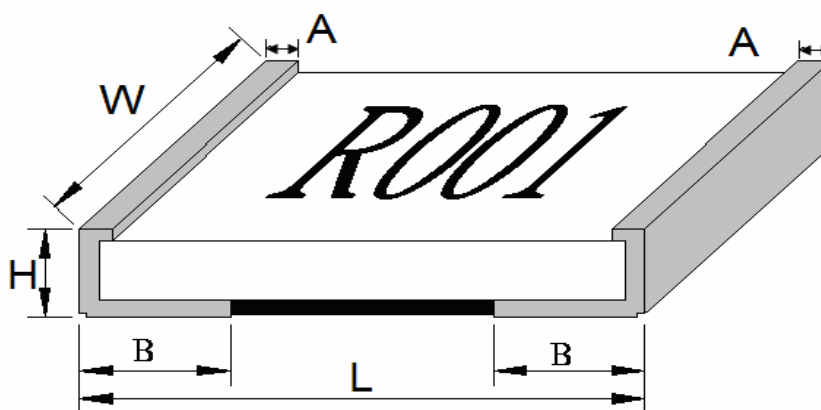


(2) Other specs, Product below 1Ω, show as following, the first digit . Is “R” which as decimal point.



R010 → 10mΩ

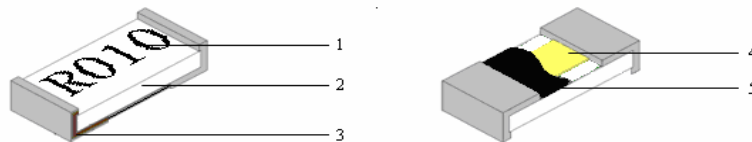
5. Dimension



Type	70°C Power	Dimension(mm)					Resistance Range ±1%&±5%	T.C.R PPM/°C	
		L	W	H	A	B			
MS03	1/3W	1.60±0.20	0.80±0.25	0.60±0.20	≤1.0	0.40±0.20	10 mΩ	±200	
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	10 mΩ、15mΩ~30mΩ		
	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	1.00±0.25	3mΩ~4mΩ	±100	
						0.86±0.25	7mΩ 7.5mΩ		
						0.76±0.25	5mΩ~6mΩ 8mΩ~8.2mΩ		±100
							27mΩ~35mΩ		±50
						0.46±0.25	10mΩ~25mΩ		±100
37mΩ~51mΩ	±50								
MS07	1.5W	3.10±0.20	2.50±0.25	0.70±0.20	≤1.0	0.65±0.25	3mΩ~10mΩ	±30	
						0.50±0.25	15mΩ~150mΩ		
MS11	2W	4.40±0.20	3.20±0.25	0.70±0.20	≤1.0	1.60±0.30	1mΩ	±30	
						1.45±0.30	2mΩ		
						0.75±0.30	4mΩ~100mΩ		
MS10	1.5W	5.00±0.20	2.50±0.25	0.70±0.20	≤1.0	1.45±0.30	2mΩ 6mΩ 6.2mΩ	±50	
						1.25±0.30	3.9mΩ 4mΩ 7mΩ		
						1.00±0.30	5mΩ 8mΩ 10mΩ	±50	
							11mΩ~25mΩ 150mΩ	±30	
						0.65±0.30	30mΩ~100mΩ	±30	

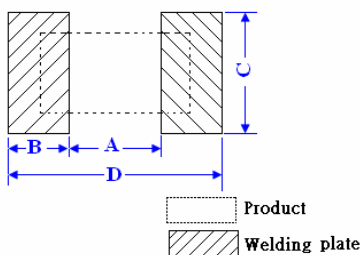
MS12	3W	6.35±0.20	3.20±0.25	1.00±0.20	≤1.0	2.55±0.30	1mΩ	±50
						2.15±0.30	1.5mΩ	
						1.75±0.30	2mΩ	
				2.25±0.30	2.5mΩ			
				2.15±0.30	3mΩ 3.3mΩ			
	0.70±0.20	≤1.0	1.75±0.30	3.5mΩ~4.5mΩ 7mΩ~8mΩ	±30			
			1.35±0.30	5mΩ				
			1.15±0.30	6mΩ 9mΩ~15mΩ				
			0.90±0.30	16mΩ~100mΩ				
			0.90±0.30	101mΩ~250mΩ				
2W	6.35±0.20	3.20±0.25	0.70±0.20	≤1.0	0.90±0.30	101mΩ~250mΩ		
MS17	3W	7.10±0.20	4.20±0.20	0.70±0.20	≤1.0	2.90±0.30	5mΩ 6.8mΩ 9.1mΩ	±30
						1.55±0.30	4mΩ	
						1.10±0.30	2mΩ~3mΩ 5mΩ~150mΩ	
MS20	3W	11.00±0.30	5.00±0.25	0.65±0.20	≤1.0	3.50±0.30	4mΩ	±30
						2.40±0.30	5mΩ~9mΩ	
	5W	11.00±0.30	5.00±0.25	0.65±0.20	≤1.0	2.25±0.30	10mΩ~20mΩ	
	3W	11.00±0.30	5.00±0.25	0.65±0.20	≤1.0	2.25±0.30	21mΩ~50mΩ	
MS27	5W	11.60±0.30	6.70±0.25	0.60±0.20	≤1.0	2.50±0.30	10mΩ~30mΩ	±30
	3W	11.60±0.30	6.70±0.25	0.60±0.20	≤1.0	2.50±0.30	2mΩ~9mΩ 31mΩ~100mΩ	
MS28	4W	6.70±0.20	7.20±0.25	0.70±0.20	≤1.0	0.80±0.30	5mΩ~100mΩ	±50

6. Structure



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

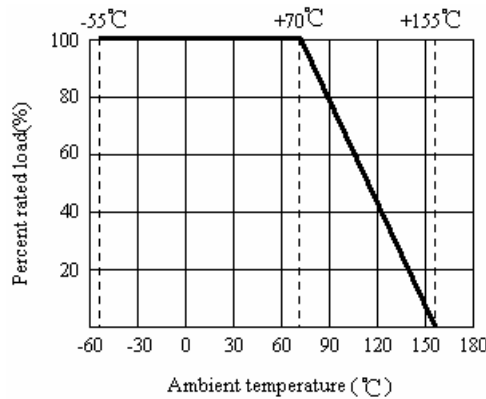
7. Recommend the size of welding plate



Type	Dimension(mm)			
	A	B	C	D
MS03	0.6±0.05	1.00±0.05	0.90±0.05	2.6±0.10
MS05	1.20±0.05	1.20±0.05	1.2±0.05	3.6±0.10
MS06	1.40±0.10	1.90±0.10	1.80±0.10	5.20±0.10
MS07	2.00±0.10	1.20±0.10	2.70±0.10	5.90±0.10
MS11	2.90±0.10	1.50±0.10	3.10±0.10	7.50±0.10
MS10	3.60±0.10	1.40±0.10	3.00±0.10	8.00±0.10
MS12	2.20±0.10	3.40±0.10	4.00±0.10	9.00±0.10
MS28	3.51±0.10	2.75±0.10	7.82±0.10	9.01±0.10
MS17	0.60±0.10	3.90±0.10	4.60±0.10	8.40±0.10
	4.60±0.10	1.90±0.10	4.60±0.10	8.40±0.10
MS20	5.21±0.10	3.94±0.10	5.84±0.10	13.08±0.10
MS27	5.21±0.10	3.94±0.10	5.84±0.10	13.08±0.10

8. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derated as shown in figure 1



8.1 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:

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

Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

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

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

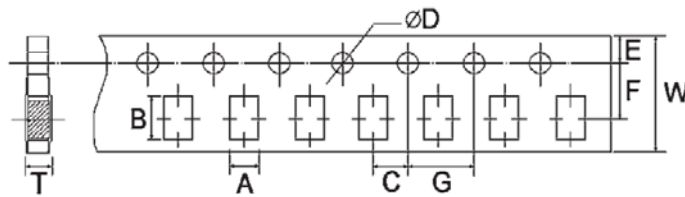
9. Performance Specification

Characteristic	Limits		Test Method (GB/T5729&JIS-C-5201&IEC60115)
Temperature Coefficient	Refer to item 5.0		4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)}$ $\frac{R_3 - R_1}{R_1(t_3 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R ₁ : Resistance Value at room temperature (t ₁) ; R ₂ : Resistance Value at upper limit temperature ± 2°C (t ₂) R ₃ : Resistance Value at lower limit temperature ± 3°C (t ₃) Test pattern : Room temperature : (t ₁) Upper limit temperature : (t ₂) Lower limit temperature : (t ₃)
Short-time overload	1%	±(1.0%+0.001Ω)ΔR _{Max}	4.13 Permanent resistance change after the application of a potential of 5 times rated power for 5 seconds.
	5%	±(2.0%+0.001Ω)ΔR _{Max}	
Low Temperature Storage	±(1.0%+0.001Ω)ΔR _{Max}		4.23.4 Lower limit temperature , for 1000H
High Temperature Exposure	±(1.0%+0.001Ω)ΔR _{Max}		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)ΔR _{Max}		4.18 Dipped into solder at 260°C for 10 seconds.
Load life	1%	± (1%+0.001Ω)ΔR _{Max}	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)ΔR _{Max}	

Rapid change of temperature	1%	$\pm (1\%+0.001\Omega)\Delta R_{Max}$	4.19 30 min at lower limit temperature and 30 min at upper limit temperature , 5 cycles.
	5%	$\pm (3\%+0.001\Omega)\Delta R_{Max}$	
Load life in humidity	1%	$\pm (1.0\%+0.001\Omega)\Delta R_{Max}$	7.9 40±2°C,1000hrs at rated power,90~95%RH , 1.5hrs ON,0.5hrs OFF
	5%	$\pm (3.0\%+0.001\Omega)\Delta R_{Max}$	
Biased Humidity	1%	$\pm (1.0\%+0.001\Omega)\Delta R_{Max}$	1000 hours 85°C,85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±2 hours after test conclusion.
	5%	$\pm (3.0\%+0.001\Omega)\Delta R_{Max}$	
Leaching	No visible damage		J-STD-002 Test D Samples completely immersed for 30 sec in solder bath at 260°C

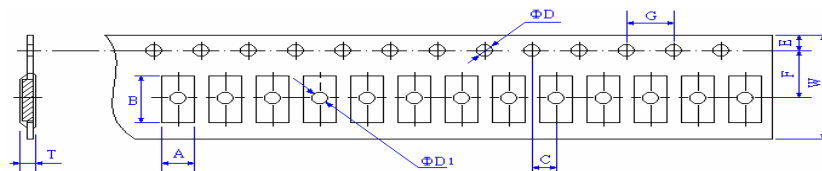
10. Packing of Surface Mount Resistors

10.1 Dimension of Paper Taping :(Unit: mm)

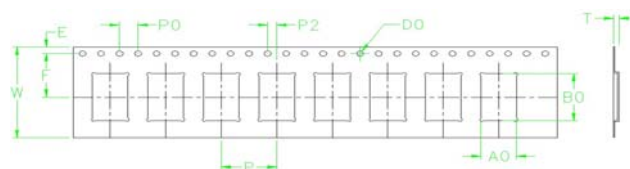


Type	A ±0.2	B ±0.2	C ±0.05	+0.1Φ D -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
MS03	1.10	1.90	2.00	1.50	1.75	3.50	4.00	8.00	0.75
MS05	1.65	2.40	2.00	1.50	1.75	3.50	4.00	8.00	0.81
MS06	2.00	3.60	2.00	1.50	1.75	3.50	4.00	8.00	0.81
MS07	2.80	3.50	2.00	1.50	1.75	3.50	4.00	8.00	0.75

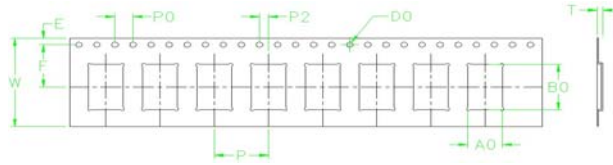
10.2 Dimension of Embossed Taping: (Unit: mm)



TYPE	A ± 0.2	B ± 0.2	C ± 0.05	+0.1 ΦD -0	+0.25 ΦD1 -0	E ± 0.1	F ± 0.05	W ± 0.2	T ±0.10	G ±0.1
MS10	2.90	5.60	2.00	1.50	1.50	1.75	5.50	12.00	1.00	4.00
MS11	3.50	4.80	2.00	1.50	1.50	1.75	5.50	12.00	1.00	4.00
MS12	3.50	6.70	2.00	1.50	1.50	1.75	5.50	12.00	1.00	4.00

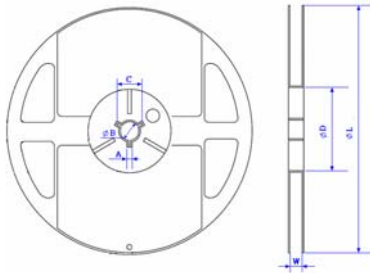


TYPE	W ±0.3	A0 ±0.1	B0 ±0.1	P ±0.1	F ±0.1	E ±0.1	+0.1 D0 -0.0	P0 ±0.1	P2 ±0.1	T ±0.05
MS17	12.0	4.50	7.40	8.00	5.50	1.75	1.50	4.00	2.00	1.10
MS20	24.0	5.40	11.5	8.00	11.50	1.75	1.50	4.00	2.00	1.20
MS28	12.0	7.50	7.00	12.00	5.50	1.75	1.50	4.00	2.00	1.10

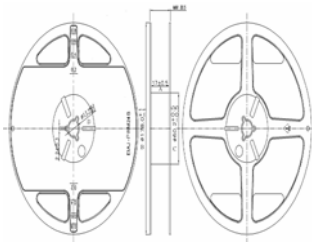


TYPE	W ±0.5	A0 ±0.2	B0 ±0.2	P ±0.2	F ±0.3	E ±0.2	D0 ±0.2	P0 ±0.2	P2 ±0.3	T ±0.2
MS27	24.0	7.2	11.9	12.0	11.5	1.75	1.5	4.0	2.0	1.2

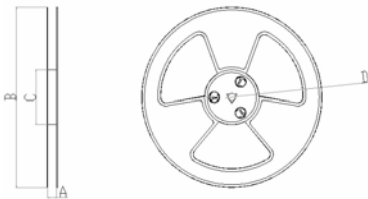
10.3 Dimension of Reel : (Unit: mm)



TYPE	TAPING	Qty/Reel	A±0.5	B±0.5	C±0.5	ΦD±1	ΦL±2	W±1
MS03	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
MS05	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
MS06	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
MS07	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
MS10	Embossed	4,000pcs	2.0	13.0	21.0	60.0	178.0	13.8
MS11	Embossed	4,000pcs	2.0	13.0	21.0	60.0	178.0	13.8
MS12	Embossed	4,000pcs	2.0	13.0	21.0	60.0	178.0	13.8



TYPE	TAPING	Qty/Reel	A±0.5	B±1.0	C±0.5	D +0.3/ -0.2
MS17	Embossed	MAX : 1000pcs	17.0	178.0	60.2	13.2
MS28	Embossed	MAX : 1000pcs	17.0	178.0	60.2	13.2



TYPE	TAPING	Qty/Reel	A±1.0	B±2.0	C±1.0	D±0.2
MS20	Embossed	1000pcs	25.4	330.0	100.0	13.0

TYPE	TAPING	Qty/Reel	A±0.5	B±1.5	C±1.5	D±0.5
MS27	Embossed	MAX : 1000pcs	24.5	330.0	100.0	13.0

11. Note

- 11.1. UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.
 (Put condition for individual product).Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old.
 (Put condition for each product) may be degraded.
- 11.2. Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
 Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 11.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:
 - a. Storage in high Electrostatic.
 - b. Storage in direct sunshine 、rain and snow or condensation.
 - c. Where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, NO₂.

12. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~7	Mar.20, 2018	Chen Haiyan	Chen Nana
2	1. Add MS03 specifications 2. Modify dimension resistance detail	1~7 3~4	July.12, 2018	Chen Haiyan	Chen Nana

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