Data Sheet

Customer:	
Product:	**Automotive Grade Metal Foil Chip Fixed Resistor –MF..A Series**
Sizes:	**0603/0805/1206/2010/2512**
Issued Date:	**31-Mar-25**
Edition:	**REV.A4**

RoHS Compliant

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31-Mar-25	31-Mar-25	31-Mar-25	31-Mar-25	
Mandy Chang	***Ben Chang***	***Ben Chang***		

Automotive Grade Metal Foil Chip Fixed Resistor



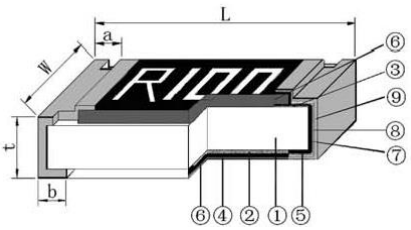
■Features

- AEC-Q200 Compliance
- High power rating up to 2 Watts
- Low TCR down to ±50 PPM/°C
- Current detecting resistors for power supply, etc
- Superior mechanical and frequency characteristics
- Compliant with RoHS directive
- Halogen free requirement

■Applications

- Switching Power Supply, Over Current Protection
- Voltage Regulation Module(VRM)
- DC-DC Converter, Charger
- Automotive Engine Control, Portable Devices etc.

■Construction



①	Ceramic Substrate	④	Primary Overcoat	⑦	Edge Electrode
②	Alloy Plate	⑤	Cu Plating	⑧	Barrier Layer
③	Top Electrode	⑥	Secondary Overcoat	⑨	External Electrode

■Dimensions

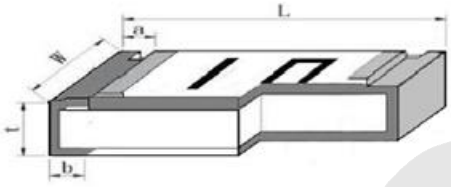


Figure1

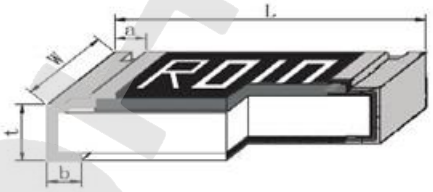


Figure2

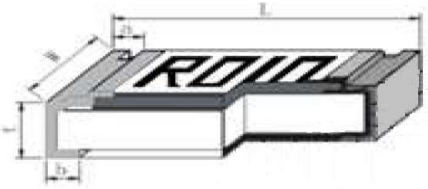


Figure3

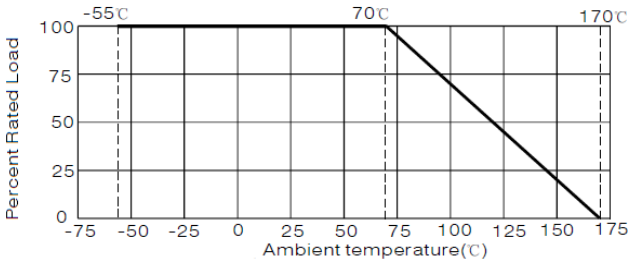
Type	Size (Inch)	Resistance (mΩ)	L mm	W mm	t mm	a mm	b mm
MF03	0603	5-20	1.60±0.20	0.80±0.20	0.70±0.15	0.35±0.25	0.35±0.20
MF05	0805	3-4	2.00±0.20	1.25±0.20	0.70±0.15	0.40±0.25	0.70±0.30
		5-47					0.40±0.30
MF06	1206	3-4	3.20±0.20	1.60±0.20	0.75±0.15	0.50±0.30	0.90±0.30
		5-56					0.50±0.30
MF10	2010	3	5.00±0.20	2.50±0.20	0.75±0.20	0.60±0.30	1.60±0.30
		4-5					1.30±0.30
		6-100					0.80±0.30
MF12	2512	2	6.40±0.20	3.20±0.20	0.75±0.20	0.90±0.30	2.30±0.30
		3					1.90±0.30
		4					1.70±0.30
		5-6					1.20±0.30
		7					1.10±0.30
		8-200					0.90±0.30

■Figure 1 for MF03 type；Figure 2 for MF05≥10mΩ / MF06 type / MF12 type ；Figure 3 for MF05<10mΩ / MF10 type

■Part Numbering

MF	06	J	T	E	U	R005	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Function Code
	03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 E: ±100 F: ±200	V: 1/4W O: 1/3W U: 1/2W T: 1W S: 2W	R005: 0.005Ω R010: 0.01Ω R100: 0.1Ω	A: Automotive Grade

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Limiting Element Current(A)	Max. Overload Current (A)	Resistance Range(mΩ) ±1%	±2%	±5%	TCR (PPM/°C)
MF03	1/4W	-55 ~ +170°C	5.0	11.2	11-20			±100
	1/3W, 1/2W		10.0	22.4	5-9			±200
					10			±100
MF05	1/4W	-55 ~ +170°C	3.5	7.9	21-47			±50
	1/3W, 1/2W		12.9	28.9	3-9			±100
					10-20			±50
MF06	1/2W	-55 ~ +170°C	5.0	11.2	21-56			±50
	1/2W, 1W		18.3	40.8	3-9			±100
					10-20			±50
MF10	1W	-55 ~ +170°C	18.3	40.8	3-9			±100
					10-100			±50
MF12	1W	-55 ~ +170°C	3.2	7.1	101-200			±50
	1W, 2W		31.6	63.3	2			±200
					3-9			±100
					10-100			±50

Current of DC or AC RMS value.
Rated current=√(P/R) or Limiting element voltage whichever is lower.

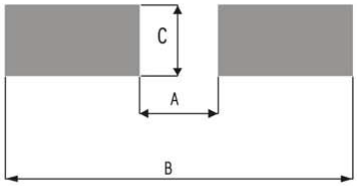
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	**IEC 60115-1 4.8** +20/+125/+20°C
Short Time Overload	No mechanical damage ΔR≦±1%	**IEC 60115-1 4.13** 1/4W&1/3W&1/2W&1W: 5xrated power for 5s; 2W: 4xrated power for 5s
High Temperature Exposure	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 108** 1000 hrs.@T=170±2°C .Unpowered.
Temperature Cycling	No mechanical damage ΔR≦±1%	**JESD22 Method JA-104** -55°C(30min)~ normal temperature(≤ 1min)~ 155°C (30min), 1000 cycles.
Biased Humidity	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 103** 85 C/85%RH. 1000 hours, Apply 10% of operating power or limiting element current whichever is lower
Component Solvent Resistance	Clearly marked No mechanical damage	**MIL-STD-202 Method 215** Immersed in three solvents after 3min immersion, brush wipe 10 times, a total of 3 times, washing with washing and cleaning agent, room temperature on the surface of the ventilation drying
Solderability	95% min. coverage	**IEC 60115-1 4.17** 245±5°C for 3±0.3 seconds
Resistance to Soldering Heat	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 210** 270±5°C for 10±1 seconds
Mechanical shock	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 213** Positive half wave, peak acceleration:100g's, pulse duration:6ms, three axis six to each 3 times, a total of 18 times
Insulation Resistance	>1000MΩ	**IEC 60115-1 4.6** Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance
Voltage Proof	No breakdown or flashover	**IEC 60115-1 4.7** Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60±5 seconds
Vibration	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 204** Frequency:10Hz~2000Hz,acceleration:5g S, a loop 20 min, X,Y,Z three directions, each direction 12 cycles,36 cycles
Thermal Shock	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 107** -55°C(15min)~ normal temperature(≤20sec)~ 155°C (30min), 300 cycles
Operational Life	No mechanical damage ΔR≦±1%	**MIL-STD-202 Method 108** 70± 2°C, 1000hrs, rated current or limiting element current whichever is lower for 1.5 hrs "ON" and 0.5hrs "OFF" 125± 2°C, 1000hrs, de-rated current for 1.5 hrs "ON" and 0.5hrs "OFF"
Operation at Low Temperature	No mechanical damage ΔR≦±1%	**IEC 60115-1 4.36** -55±5°C , 1h without load rated voltage or limiting element voltage whichever is lower for 45min, 15min without load.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	**UL-94** V-0 or V-1 are acceptable. Electrical test not required.
Substrate Bending Test	No mechanical damage ΔR≦±1%	**AEC-Q200-005** Bending distance: 2mm Duration: 60±5s.
Terminal Strength	No mechanical damage ΔR≦±1%	**AEC-Q200-006** Appling force 17.7N for 60±1s

■Storage Temperature: 5~30°C; Humidity 30~70%RH

■Shelf life: 6 months max

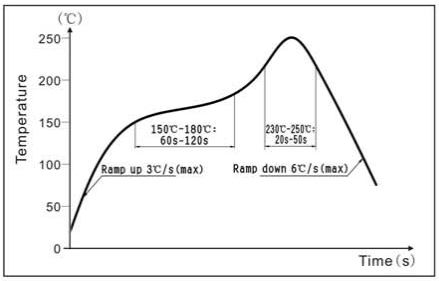
■Recommend Land Pattern



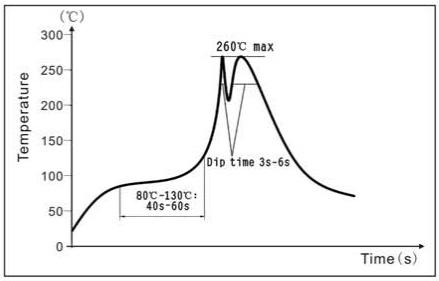
Type	Resistance	A mm	B mm	C mm
MF03	5mΩ - 20mΩ	0.6	2.8	1.0
MF05	3mΩ - 4mΩ	0.5	3.2	1.4
	5mΩ - 47mΩ	0.8		
MF06	3mΩ - 4mΩ	0.8	4.4	1.8
	5mΩ - 56mΩ	1.8		
MF10	3mΩ - 9mΩ	1.6	6.3	2.9
	10mΩ - 100mΩ	2.7		
MF12	2mΩ - 4mΩ	1.0	8.0	3.4
	5mΩ - 200mΩ	3.8		

■Soldering Condition

Recommended reflow profile



Recommended wave solder profile

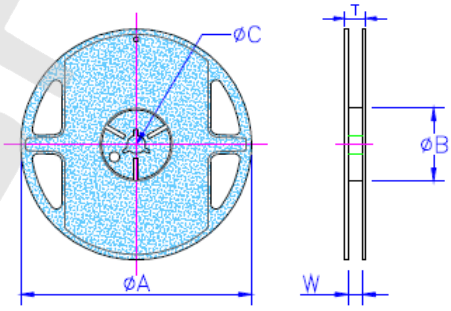


■Packaging

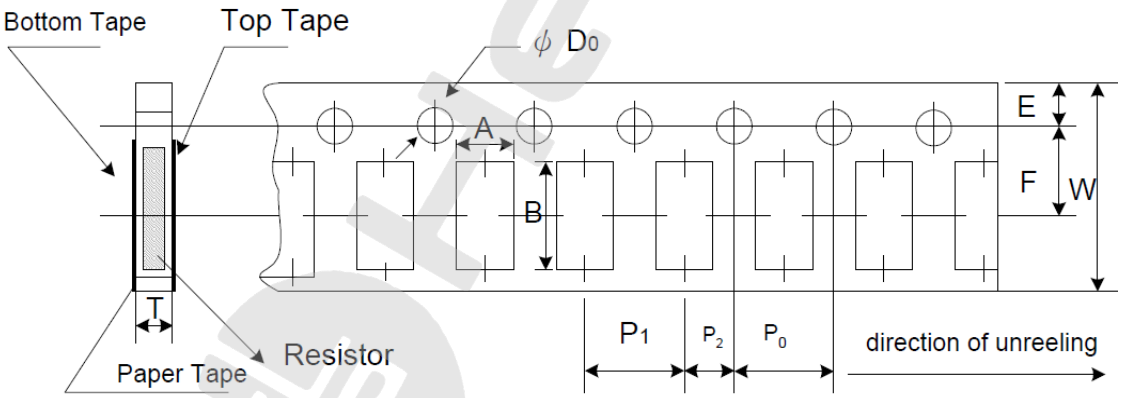
Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
MF03	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF05	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF06	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF10	178.0±2.0	57.0±2.0	13.0±0.5	13.0±0.5	15.5±1.5	-	4,000
MF12	178.0±2.0	57.0±2.0	13.0±0.5	13.0±0.5	15.5±1.5	-	4,000



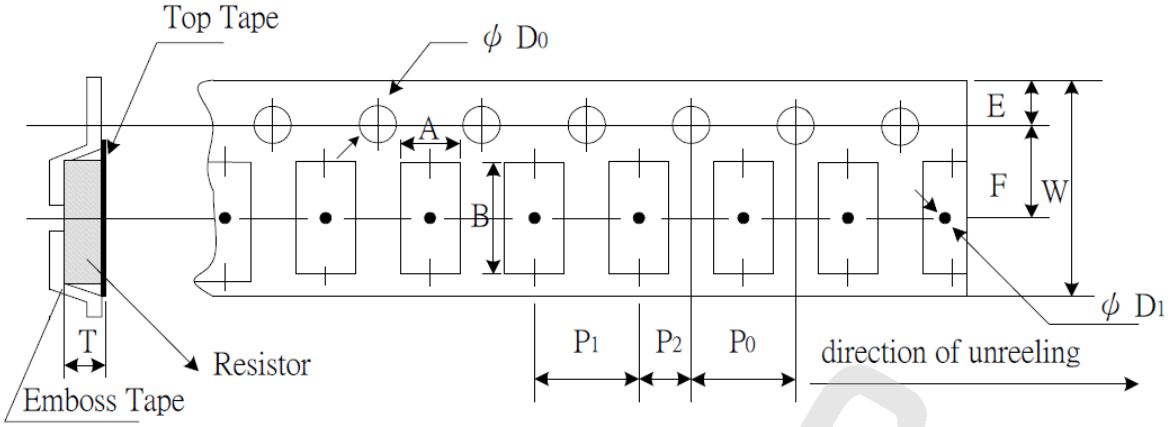
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ØD_0	T
MF03	1.05±0.10	1.80±0.10	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
MF05	1.50±0.10	2.30±0.10	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.95±0.10
MF06	1.90±0.20	3.50±0.20	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.95±0.10

Emboss Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ØD_0	ØD_1	T
MF10	2.82±0.15	5.50±0.15	12.0±0.10	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50 +0.10/-0	1.50±0.10	0.84±0.10
MF12	3.45±0.15	6.78±0.15	12.0±0.10	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50 +0.10/-0	1.50±0.10	1.00±0.10

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A4	Mar 31,2025		-Add Storage conditions and Shelf life.