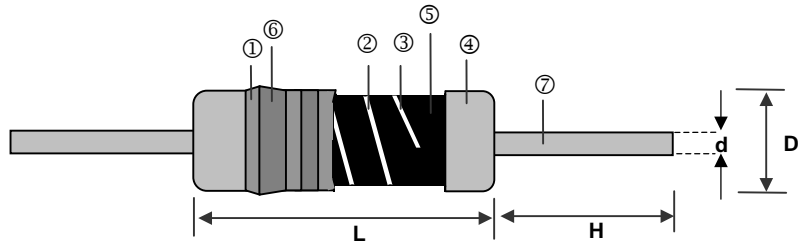


Metal Film Ledged Precision Resistor – MFR Series

Construction



① Insulation Coating (Expose resin)	⑤ Resistor Layer (Nickel alloy)
② Trimming Line	⑥ Marking (Expose)
③ Ceramic Rod (Alumina ceramic)	⑦ Lead Wire (Tinned annealed copper wire)
④ Electrode Cap (Tinned iron cap)	

Features

- Excellent overall stability
- Very tight tolerance down to $\pm 0.05\%$
- Extremely low TCR down to $\pm 5 \text{ PPM}/^\circ\text{C}$
- High power rating up to 3 Watts
- Excellent ohmic contact

Applications

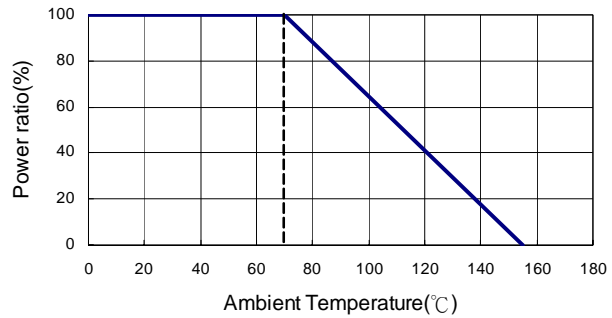
- Automotive
- Telecommunication
- Medical Equipment

Dimensions

Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MFR0318	3.3 \pm 0.7/-0.2	1.8 \pm 0.30	29 \pm 2.0	0.45 \pm 0.03	90
MFR0623	6.3 \pm 0.5	2.3 \pm 0.30	28 \pm 2.0	0.55 \pm 0.03	150
MFR0932	9.0 \pm 0.5	3.2 \pm 0.50	26 \pm 2.0	0.65 \pm 0.03	350
MFR1145	11.5 \pm 1.0	4.5 \pm 0.50	35 \pm 2.0	0.78 \pm 0.03	770
MFR1550	15.5 \pm 1.0	5.0 \pm 0.50	32 \pm 2.0	0.78 \pm 0.03	1040

Derating Curve



Part Numbering

MFR	0318	B	T	N		1001	MA
Product Type	Dimensions (LxD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0318: 3.3x1.8 0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	A: Ammo B: Bulk T: Taping Reel	S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100	: Standard R: 3W S: 2W T: 1W U: 1/2W V: 1/4W	R100: 0.1 Ω 0010: 1 Ω 1000: 100 Ω 2201: 2200 Ω 1001: 1K Ω 1004: 1M Ω	: Standard MA: MA-type MB: MB-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type PA: PA-type PB: PB-type PC: PC-type

■ Electrical Characteristics

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0318	1/8W	-55 ~ +155°C	200V	400V	-	100Ω - 100KΩ	10Ω - 1MΩ			±15 ±25 ±50 ±100
0623	1/4W	-55 ~ +155°C	250V	500V	10Ω - 1MΩ					±5 ±10 ±15 ±25
0932	1/2W		350V	700V						
1145	1W	-55 ~ +155°C	450V	1000V	-	100Ω - 100KΩ	10Ω - 1MΩ			±15 ±25 ±50 ±100
1550	2W		500V	1000V						

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0318	1/4W	-55 ~ +155°C	200V	400V	-	100Ω - 100KΩ	10Ω - 1MΩ			±15 ±25 ±50 ±100
0623	1/2W	-55 ~ +155°C	300V	600V	10Ω - 1MΩ					±5 ±10 ±15 ±25
0932	1W		400V	800V						
1145	2W	-55 ~ +155°C	500V	1000V	-	100Ω - 100KΩ	10Ω - 1MΩ			±15 ±25 ±50 ±100
1550	3W		500V	1000V						

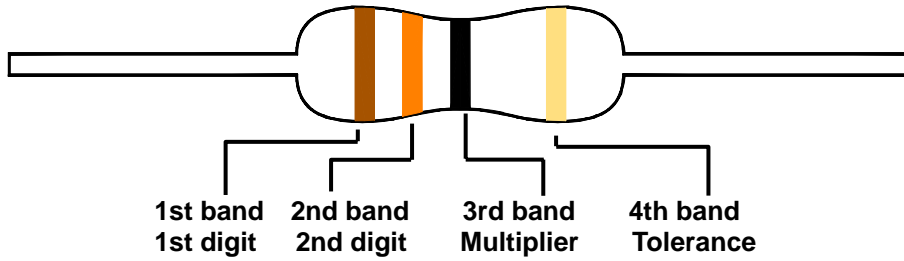
■ Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	±0.25%	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	> 1000MΩ	Apply 100V _{DC} for 1 minute
Endurance	±0.2%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±0.3%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	90% min. Coverage	245±5°C for 3 seconds
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100°C
Pulse Overload	±0.75%	4 times RCWV for 10000 cycles with 1 second "ON" and 25 seconds "OFF"
Resistance To Solvent	No deterioration of coatings and markings	Trichroethane for 1 min. with ultrasonic
Terminal Strength	Tensile: ≥ 2.5kg	Direct Load for 10 sec. In the direction off the terminal leads
Shelf life	△R=±0.1%	12 months at room temperature 25±3°C, 80%RH Max.

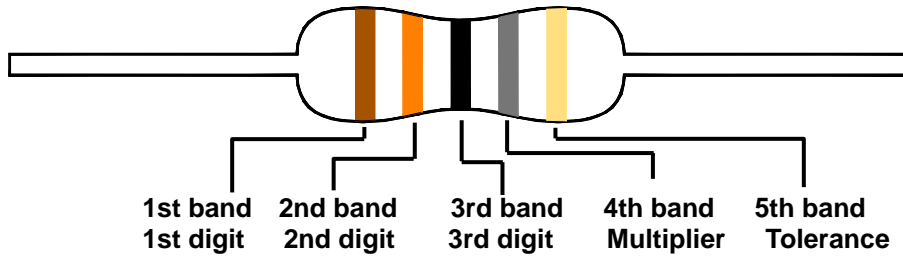
■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 25±3°C; Humidity < 80%RH

■ Marking & Resistance Tolerance



±5.00%	E-24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
±2.00%																									



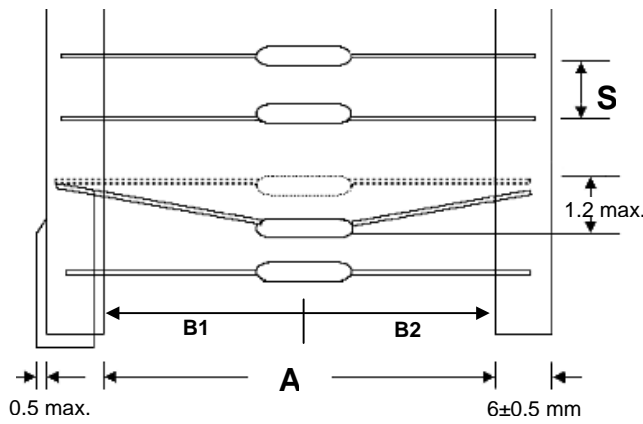
±1.00%	E-96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74
		1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.10	2.15	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87	2.94	3.01	3.09
		3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49
		5.62	5.76	5.90	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45	8.66	8.87	9.09	9.31	9.53	9.76

Color	Digit	Multiplier	Tolerance	
Without	-	-	±20%	M
Silver	-	10 ⁻²	±10%	K
Gold	-	10 ⁻¹	±5%	J
Black	0	10 ⁰	-	-
Brown	1	10 ¹	±1%	F
Red	2	10 ²	±2%	G
Orange	3	10 ³	-	-
Yellow	4	10 ⁴	-	-
Green	5	10 ⁵	±0.5%	D
Blue	6	10 ⁶	±0.25%	C
Violet	7	10 ⁷	±0.1%	B
Grey	8	10 ⁸	±0.05%	A
White	9	10 ⁹	-	-

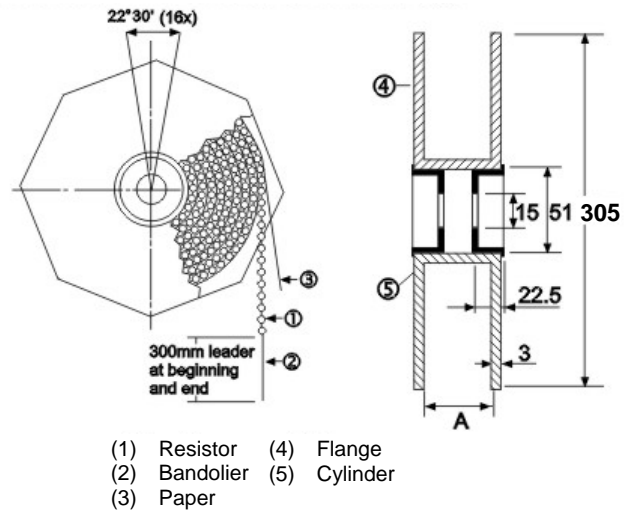
■ Taping/Packing Specifications

1. Standard Type (Reel & Ammo)

Packing Methods



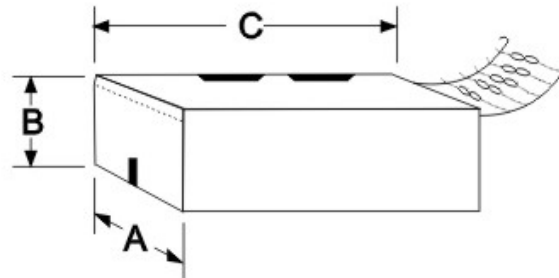
Reel Packing



Unit: mm

Type	Packing Methods			Reel Packing	
	A	B1-B2	S	Across Flange (A)	Qty
0318	52+1/-0	1.2	5	72	5,000
0623	52+1/-0	1.2	5	72	5,000
0932	52+1/-0	1.2	5	72	2,500
1145	52+1/-0	1.5	5	95	2,000
1550	52+1/-0	1.5	10	95	1,000

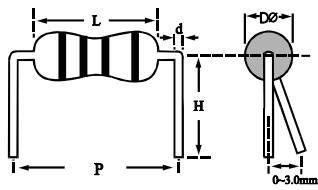
Ammo Packing



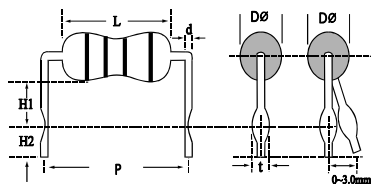
Unit: mm

Type	Packing Methods			Ammo Packing			
	A	B1-B2	S	A	B	C	Qty
0318	26+1/-0	1.0	5	80	75	264	5,000
0623	26+1/-0	1.0	5	80	105	264	5,000
0932	52+1/-0	1.2	5	80	46	264	1,000
1145	73+1/-0	1.5	5	103	82	265	1,000
1550	73+1/-0	1.5	10	103	96	265	1,000

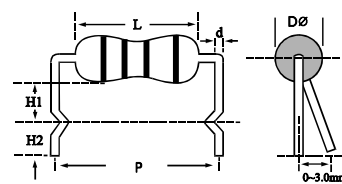
2. Special Type (Bulk)



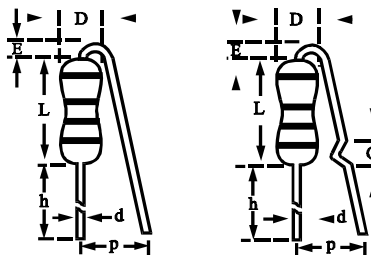
MA Type



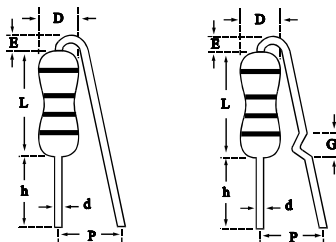
MB Type



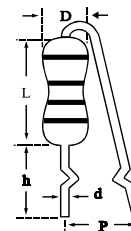
MC Type



FA Type



FB Type

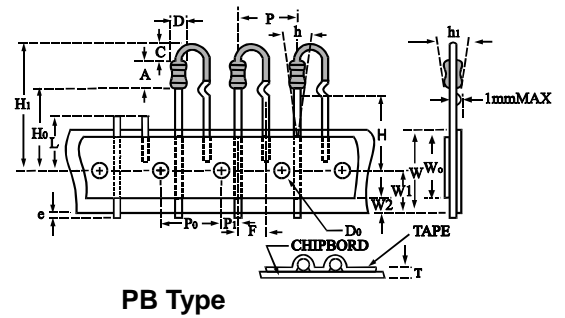
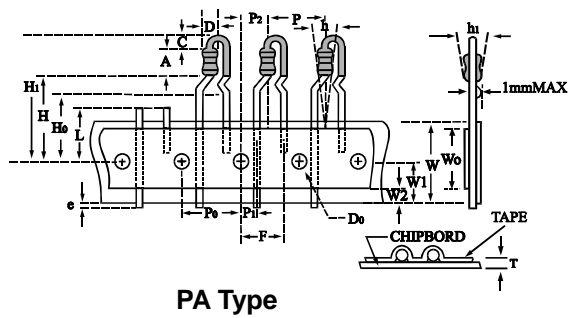


FC Type

Unit: mm

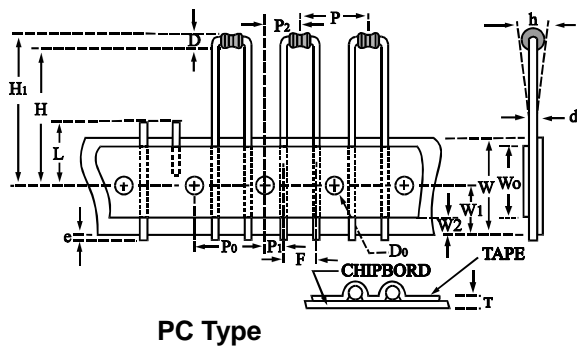
Product Type	Type	P	H /H1/h	H2/G	t	D	L	d	E
0318	MA	5.00±1	5.00±1	-	-	1.8±0.3	3.30±0.4	0.45±0.03	-
0623	MA	10.0±1	10.0±1	-	-	2.3±0.3	6.30±0.5	0.55±0.03	-
	FA	10.0±1	28.0±2	2.00±0.5	-	2.3±0.3	6.30±0.5	0.55±0.03	2.00±0.5
	FB	10.0±1	8.00±1	2.00±0.5	-	2.3±0.3	6.30±0.5	0.55±0.03	2.00±0.5
0932	MA	12.5±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
	FC	6.00±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
1145	MA	15.0±1	12.5±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	MB	15.0±1	6.00±1	5.00±1.0	1.4±0.2	4.5±0.5	11.5±1.0	0.78±0.03	-
	MC	15.0±1	6.00±1	5.00±1.0	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	FC	6.00±1	10.0±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
1550	MA	20.0±1	15.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	MB	20.0±1	10.0±1	5.00±1.0	1.4±0.2	5.0±0.5	15.5±1.0	0.78±0.03	-
	MC	20.0±1	10.0±1	5.00±1.0	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	FC	6.00±1	10.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-

3.Special Type (Reel & Ammo)



Packing Specification

Unit: mm



Dimension	AMMO			REEL				
	A	B	C	A	B	C	W1	W2
Dimension								
Qty: EA	53	120	325	31	76	312	44	50
	2,000 / 3,000			2,500 / 3,000				

Unit: mm

Dimension	PA type	PB type	PC type
	0623	0623	0318
D	2.3±0.2	2.3±0.2	1.8±0.4
A	6.5±0.5	6.5±0.5	—
P	12.7±1.0	12.7±1.0	12.7±1.0
PO	12.7±0.3	12.7±0.3	12.7±0.5
P1	3.85±0.7	3.85±0.7	3.85±0.7
P2	6.35±1.0	6.35±1.3	6.35±1.0
F	5.0±1.0	5.0+0.8/-0.2	5.0±0.8
h	0±2.0 (0±5°)	0±2.0 (0±5°)	0±1.0
W	18±1.0/-0.5	18.0±1.0/-0.5	18.0±1.0
Wo	12.5 min.	15.0±1.0	12.0±1.0
W1	9.0+0.75/-0.5	9.0+0.75/-0.5	9.0±0.5
W2	3.0 max.	2.75 max.	3.0 max.
H	19.0±1.0	16.0+1.0/-0.3	21.0 max.
HO	16.0±0.5	16.0±0.5	—
e	2.0 max.	1.0 max.	2.0 max.
DO	4.0±0.3	4.0±0.3	4.0±0.3
T	0.7±0.2	0.7±0.2	0.7±0.2
L	11.0 max.	2.0 max.	2.0 max.
H1	28.5 max.	27 max.	32.25 max.
C	2.5±0.5	3.0+0/-0.039	—
h1 / d	0±2.0 (0±5°)	0±2.0 (0±5°)	0.45±0.03

■ Cumulative Pitch Tolerances Not to Exceed±1.0mm (±0.039 In) over 20 consecutive pitches