

Data Sheet

Customer:

Product: Metal Film Leaded Precision Resistor—MFR Series

Sizes.: 0318/0623/0932/1145/1550

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Metal Film Leaded Precision Resistor

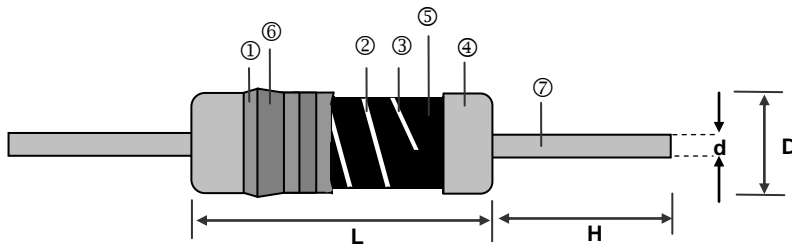
■ Features

- Excellent overall stability
- Very tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to ± 10 PPM/ $^{\circ}\text{C}$
- High power rating up to 3 Watts
- Excellent ohmic contact

■ Applications

- Telecommunication
- Medical Equipment

■ Construction



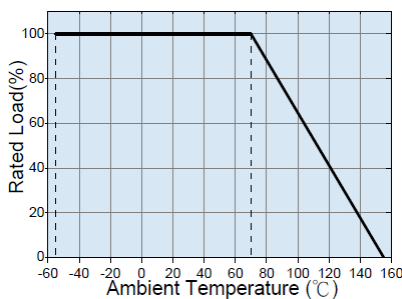
① Insulation Coating	⑤ Resistor Layer
② Trimming Line	⑥ Marking
③ Ceramic Core	⑦ Lead Wire
④ Electrode Cap	

■ Dimensions

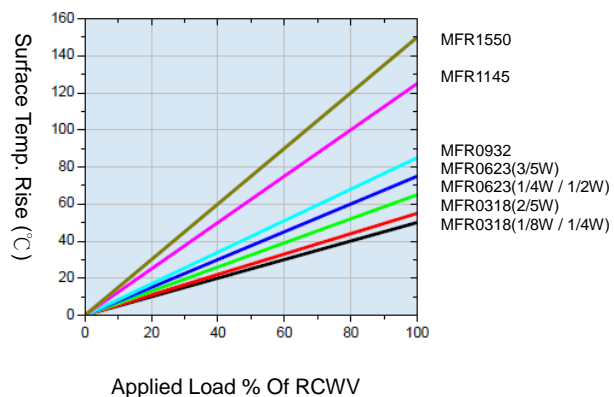
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MFR0318 (1/8W)	3.3+0.4/-0.2	1.8±0.3	29±3.0	0.45±0.03	90
MFR0318 (1/4W 2/5W)	3.3+0.7/-0.2	1.8±0.3	29±3.0	0.45±0.03	90
MFR0623	6.3±0.5	2.3±0.3	28±3.0	0.55±0.03	150
MFR0932	9.0±0.5	3.2±0.5	26±3.0	0.65±0.03	350
MFR1145	11.5±1.0	4.5±0.5	35±3.0	0.78±0.03	770
MFR1550	15.5±1.0	5.0±0.5	32±3.0	0.78±0.03	1040

■ Derating Curve



■ Hot-Spot Temperature



Part Numbering

MFR	0318	B	T	C	W	1001	
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	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	A: Ammo B: Bulk T: Taping Reel	B: ±10 N: ±15 C: ±25 D: ±50 E: ±100	R: 3W S: 2W T: 1W F: 3/5W G: 2/5W V: 1/4W W: 1/8W	R100: 0.1Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MB: MB-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type FD: FD-type

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range				TCR (PPM/°C)
						±0.1%	±0.25%	±0.5%	±1%	
0318	1/8W	-55 ~ +155°C	150V	300V	300V	10Ω-1MΩ				±25
						10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	±50	
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
0623	1/4W	-55 ~ +155°C	250V	500V	500V	100Ω-22KΩ				±10
						10Ω-499KΩ				±15
						10Ω-1MΩ				±25
						10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	±50	
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
0932	1/2W	-55 ~ +155°C	350V	500V	500V	10Ω-1MΩ				±25
						10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	±50	
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1145	1W	-55 ~ +155°C	500V	700V	700V	10Ω-1MΩ				±25
						10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	±50	
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1550	2W	-55 ~ +155°C	500V	1000V	1000V	10Ω-1MΩ				±25
						10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	±50	
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.
 Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.
 Value Range for standard resistance : below or over this resistance on request.

High Power & Ultra High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range				TCR (PPM/°C)			
						±0.1%	±0.25%	±0.5%	±1%				
0318	1/4W	-55 ~ +155°C	200V	400V	300V	10Ω-1MΩ				±25			
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50			
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100			
	2/5W		10Ω-1MΩ				±25						
			10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50						
			-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100						
0623	1/2W	-55 ~ +155°C	300V	500V	500V	100Ω-22KΩ				±10			
						10Ω-499KΩ				±15			
						10Ω-1MΩ				±25			
			10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50						
			-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100						
			3/5W	350V	500V	500V	100Ω-22KΩ				±10		
	10Ω-499KΩ						±15						
	10Ω-1MΩ						±25						
	10Ω-1MΩ			10Ω-4.99MΩ	10Ω-10MΩ	±50							
	-	10Ω-1MΩ		10Ω-4.99MΩ	0.1Ω-10MΩ	±100							
	0932	1W		-55 ~ +155°C	400V	600V	500V	10Ω-1MΩ				±25	
			10Ω-1MΩ					10Ω-4.99MΩ	10Ω-10MΩ	±50			
-			10Ω-1MΩ					10Ω-4.99MΩ	0.1Ω-10MΩ	±100			
1145			2W		-55 ~ +155°C	500V	700V	700V	10Ω-1MΩ				±25
									10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
									-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1550	3W	-55 ~ +155°C	500V	1000V	1000V	10Ω-1MΩ				±25			
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50			
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100			

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.
 Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.
 Value Range for standard resistance · below or over this resistance on request.

Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	±(0.25%+0.05Ω)	IEC-60115-1 4.13 2.5 times RCWV for 5 seconds
Insulation Resistance	> 10000MΩ	IEC-60115-1 4.6 In V-Block
Endurance	±(1.5%+0.05Ω)	IEC-60115-1 4.25 70°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(1.5%+0.05Ω)	IEC-60115-1 4.24 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. Coverage	IEC-60115-1 4.17 260±5°C for 2±0.5 seconds
Voltage Proof	By Type	IEC-60115-1 4.7 In V-Block for 60 seconds
Temperature Coefficient	By Type	IEC-60115-1 4.8 Resistance value at room temperature(+25°C) and room Temperature(+125°C)
Pulse Overload	±(0.75%+0.05Ω)	IEC-60115-1 4.39 4 times RCWV for 10000 cycles with 1sec "ON" and 25 sec "OFF"
Resistance To Solvent	No deterioration of coatings and markings	IEC-60115-1 4.30 IPA for 5±0.5 min. with ultrasonic
Terminal Strength	Tensile: ≥ 2.5kg	IEC-60115-1 4.16 Direct Load for 10 sec. In the direction off the terminal leads
Resistance to Soldering Heat	0318: ±(0.75%+0.05Ω) 0623&0932: ±(0.5%+0.05Ω) 1145&1550: ±(0.25%+0.05Ω)	IEC-60115-1 4.18 The solder iron heated to 260°C±5°C and applied to the termination for a duration of 10±1 seconds
Temperature Cycling	±(0.75%+0.05Ω)	IEC-60115-1 4.19 -55°C/125°C with 5 cycles. (30min for both low and high temperature, transfer time less 30s)

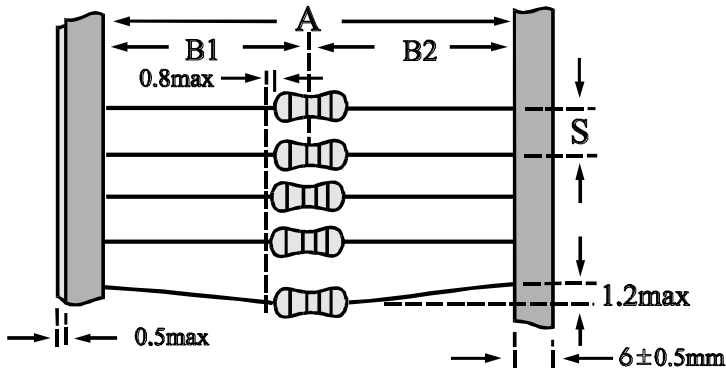
RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

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

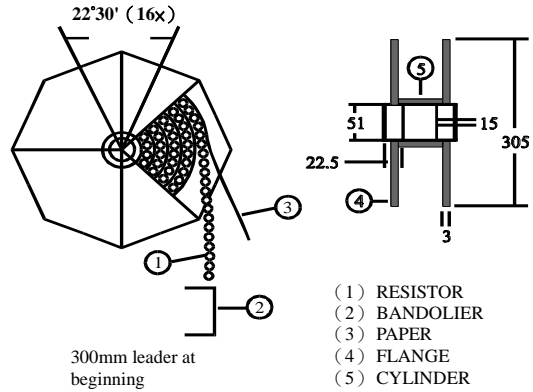
Taping/Packing Specifications

1. Standard Type (Reel & Ammo)

Packing Methods



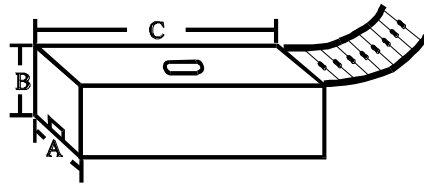
Reel Packing



Unit: mm

Packaging Type	Packing Methods			Reel Packing	
	A	B1-B2 Max	S	Across Flange (A)	Qty
0318	52+1/-0	1.2	5±0.3	72	5,000
	26+0.5/-0	1.0			
0623	52+1/-0	1.2	5±0.3	72	5,000
	26+0.5/-0	1.0			
0932	52+1/-0	1.2	5±0.3	72	2,500
1145	73+1/-0	1.5	5±0.3	95	2,000
	52+1/-0				
1550	73+1/-0	1.5	10±0.8	95	1,000
	52+1/-0				

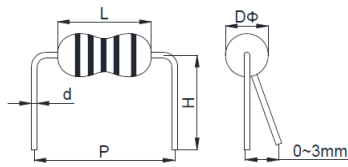
Ammo Packing



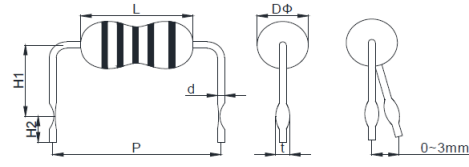
Unit: mm

Packaging Type	Packing Methods			Ammo Packing			
	A	B1-B2 Max	S	A	B	C	Qty
0318	52+1/-0	1.2	5±0.3	79±2	73±3	257±5	5,000
	26+0.5/-0	1.0		52±2	74±3	252±5	
0623	52+1/-0	1.2	5±0.3	79±2	100±3	257±5	5,000
	26+0.5/-0	1.0		52±2	109±3	252±5	
0932	52+1/-0	1.2	5±0.3	79±2	58±3	257±5	1,000
1145	73+1/-0	1.5	5±0.3	103±2	82±3	262±5	1,000
	52+1/-0			81±2	85±3	256±5	
1550	73+1/-0	1.5	10±0.8	103±2	96±3	265±5	1,000
	52+1/-0			82±2	108±3	258±5	

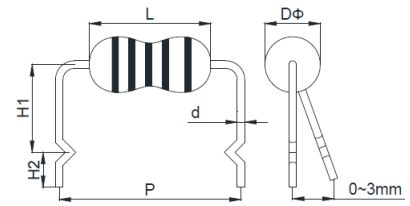
2. Special Type (Bulk)



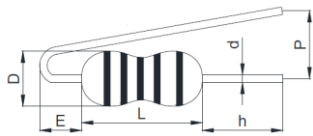
MA Type



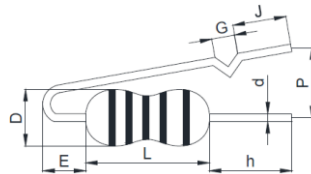
MB Type



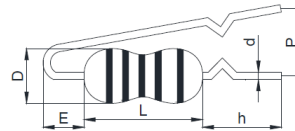
MC Type



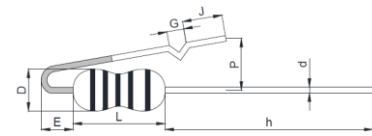
FA Type



FB Type



FC Type



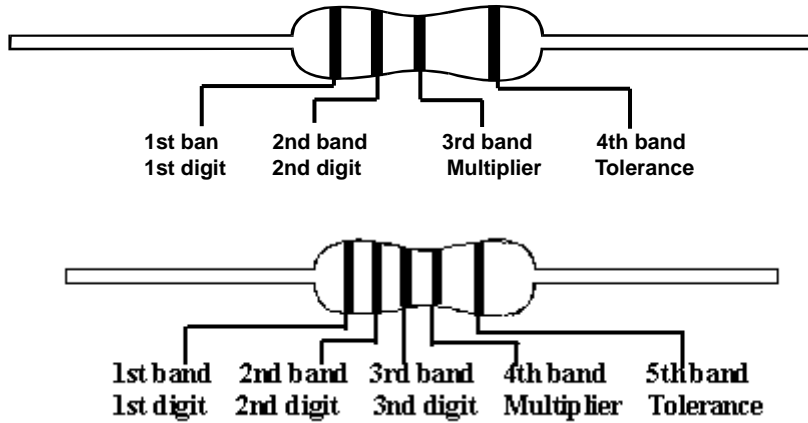
FD Type

Unit: mm

Codes	Type	P	H /H1/h	H2/G	J	t	D	L	d	E
0623	MA	10±1	10.0±1	-	-	-	2.3±0.3	6.3±0.5	0.55±0.03	-
	MC	10±1	6.0±1	5.0±2	-	-	2.3±0.3	6.3±0.5	0.55±0.03	-
	FA	5~15	5.0±2	-	-	-	2.3±0.3	6.3±0.5	0.55±0.03	3±1
	FB	5~15	4.0±2	3.0±1	3±2	-	2.3±0.3	6.3±0.5	0.55±0.03	3±1
	FD	5~15	27.0±2	3.0±1	12±2	-	2.3±0.3	6.3±0.5	0.55±0.03	3±1
0932	MA	12.5±1	10.0±1	-	-	-	3.2±0.5	9.0±0.5	0.65±0.03	-
	MC	12.5±1	5.0±1	4.0±2	-	-	3.2±0.5	9.0±0.5	0.65±0.03	-
	FA	5~15	5.0±2	-	-	-	3.2±0.5	9.0±0.5	0.65±0.03	3±1
	FB	5~15	4.0±2	3.0±1	3±2	-	3.2±0.5	9.0±0.5	0.65±0.03	3±1
	FC	5~15	10.0±3	-	-	-	3.2±0.5	9.0±0.5	0.65±0.03	-
1145	MA	15±1	12.5±1	-	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	MC	15±1	8.0±1	6.0±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	FA	5~15	5.0±2	-	-	-	4.5±0.5	11.5±1.0	0.78±0.03	3±1
	FB	5~15	4.0±2	3.0±1	3±2	-	4.5±0.5	11.5±1.0	0.78±0.03	3±1
	FC	5~15	10.0±3	-	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
1550	MA	20±1	15.0±1	-	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	MC	20±1	12.0±1	5.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	FA	5~15	5.0±2	-	-	-	5.0±0.5	15.5±1.0	0.78±0.03	3±1
	FB	5~15	4.0±2	3.0±1	3±2	-	5.0±0.5	15.5±1.0	0.78±0.03	3±1
	FC	5~15	10.0±3	-	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-

Metal Film Leaded Precision Resistor

■ Marking & Resistance Tolerance



Cold	Digit	Multiplier	Tolerance	
Without	-	-	±20%	M
Silver	-	10 ⁻²	±10%	K
Gold	-	10 ⁻¹	±5.0%	J
Black	0	10 ⁰	-	-
Brown	1	10 ¹	±1.0%	F
Red	2	10 ²	±2.0%	G
Orange	3	10 ³	-	-
Yellow	4	10 ⁴	-	-
Green	5	10 ⁵	±0.50%	D
Blue	6	10 ⁶	±0.25%	C
Violet	7	10 ⁷	±0.10%	B
Grey	8	10 ⁸	±0.05%	A
White	9	10 ⁹	-	-

±1.00%	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
±0.50%		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
±0.25%	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
±0.10%	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
±0.25%	E-192	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	13.0	13.2
±0.10%		13.3	13.5	13.7	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.2	17.4	17.6
±0.05%		17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.1	22.3	22.6	22.9	23.2	23.4
		23.7	24.0	24.3	24.6	24.9	25.2	25.5	25.8	26.1	26.4	26.7	27.1	27.4	27.7	28.0	28.4	28.7	29.1	29.4	29.8	30.1	30.5	30.9	31.2
		31.6	32.0	32.4	32.8	33.2	33.6	34.0	34.4	34.8	35.2	35.7	36.1	36.5	37.0	37.4	37.9	38.3	38.8	39.2	39.7	40.2	40.7	41.2	41.7
		42.2	42.7	43.2	43.7	44.2	44.8	45.3	45.9	46.4	47.0	47.5	48.1	48.7	49.3	49.9	50.5	51.1	51.7	52.3	53.0	53.6	54.2	54.9	55.6
		56.2	56.9	57.6	58.3	59.0	59.7	60.4	61.2	61.9	62.6	63.4	64.2	64.9	65.7	66.5	67.3	68.1	69.0	69.8	70.6	71.5	72.3	73.2	74.1
		75.0	75.9	76.8	77.7	78.7	79.6	80.6	81.6	82.5	83.5	84.5	85.6	86.6	87.6	88.7	89.8	90.9	92.0	93.1	94.2	95.3	96.5	97.6	98.8

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