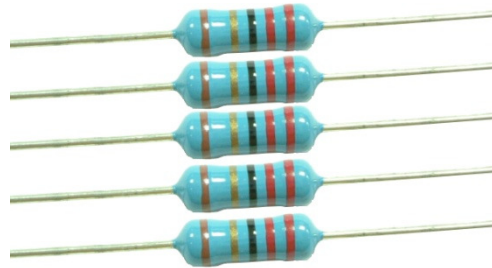


Leaded Metalfilm - Resistors

Product Type: Leaded Metal Film Resistors

Part No.: LMF Series



official distributor of



Leaded Metalfilm - Resistors

Leaded Metal Film Resistors

(LMF Series)

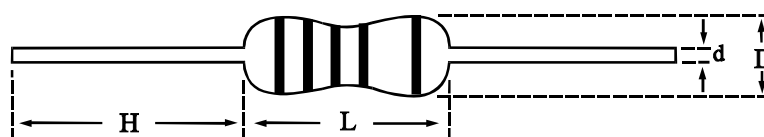
▶ 1. Features

- Excellent overall stability
- Very Tight Tolerance from $\pm 0.05\%$ ~ 1%
- Extremely Low TCR from ± 5 ~ 100 PPM/ $^{\circ}\text{C}$
- Usually broad selection of Power Rating 1/8W, 1/4W, 1/2W, 1W, 2W,3W at 70 $^{\circ}\text{C}$
- Lead (Pb)-free and RoHS compliant .

▶ 2. Applications

- Military
- Automotive
- Telecommunication
- Medical equipment.
- Avionics
- Space

▶ 3. Dimensions



Unit : mm

Codes	L	D	H	d
0318	3.3+0.7/-0.2	1.8 \pm 0.3	29 \pm 2.0	0.45 \pm 0.03
0623	6.3 \pm 0.5	2.3 \pm 0.3	28 \pm 2.0	0.55 \pm 0.03
0932	9.0 \pm 0.5	3.2 \pm 0.5	26 \pm 2.0	0.65 \pm 0.03
1145	11.5 \pm 1.0	4.5 \pm 0.5	35 \pm 2.0	0.78 \pm 0.03
1550	15.5 \pm 1.0	5.0 \pm 0.5	32 \pm 2.0	0.78 \pm 0.03

Leaded Metalfilm - Resistors

► 4. Product Identification

LMF	0318	B	T	C	V	1001	MA
1	2	3	4	5	6	7	8

① Product Type

Product Type	
LMF	Leaded Metal Film Resistors

② Dimensions (L×W)

Codes	Dimensions (L×W)
0318	3.30×1.80mm
0623	6.30×2.30mm
0932	9.00×3.20mm
1145	11.5×4.50mm
1550	15.5×5.00mm

③ Resistance Tolerance

Codes	Resistance Tolerance
A	±0.05%
B	±0.10%
C	±0.25%
D	±0.50%
F	±1.00%

④ Packaging

Codes	Type
A	Ammo
B	Bulk
T	Taping Reel

⑤ TCR

Codes	Type
S	±5 PPM/°C
B	±10 PPM/°C
N	±15 PPM/°C
C	±25 PPM/°C
D	±50 PPM/°C
E	±100 PPM/°C

⑥ Power Rating

Codes	Type
	Standard
R	3W
S	2W
T	1W
U	1/2W
V	1/4W
F	3/5W
G	2/5
W	1/8W

⑦ Resistance

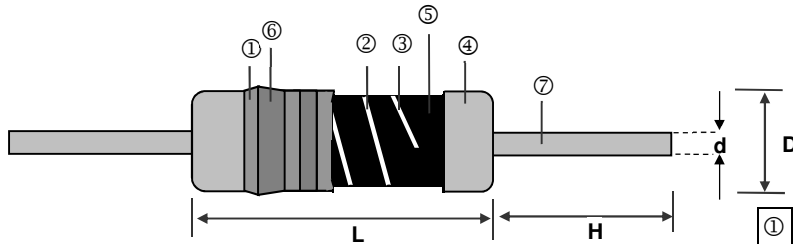
Codes	Type
R100	0.10Ω
0100	10.0Ω
2201	2200Ω
1002	10000Ω
4992	49900Ω
1003	100000Ω
1004	1000000Ω

⑧ Special

Codes	Type
	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

Leaded Metalfilm - Resistors

► 5. Construction



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

► 6. Electrical Characteristics

6-1. 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	10Ω-1MΩ		10Ω-4.99MΩ			±15
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
0623	1/4W	-55 ~ +155°C	250V	500V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ		10Ω-10MΩ			±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-	1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
0932	1/2W	-55 ~ +155°C	350V	700V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ		10Ω-10MΩ			±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-	1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
1145	1W	-55 ~ +155°C	450V	1000V	10Ω-1MΩ		10Ω-4.99MΩ			±15
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
1550	2W	-55 ~ +155°C	500V	1000V	10Ω-1MΩ		10Ω-4.99MΩ			±15
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100

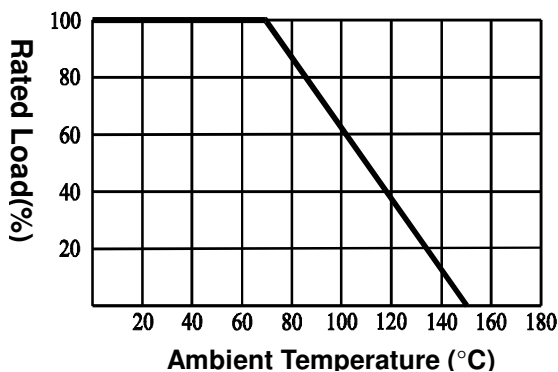
better Tolerances and better TC upon request

Leaded Metalfilm - Resistors

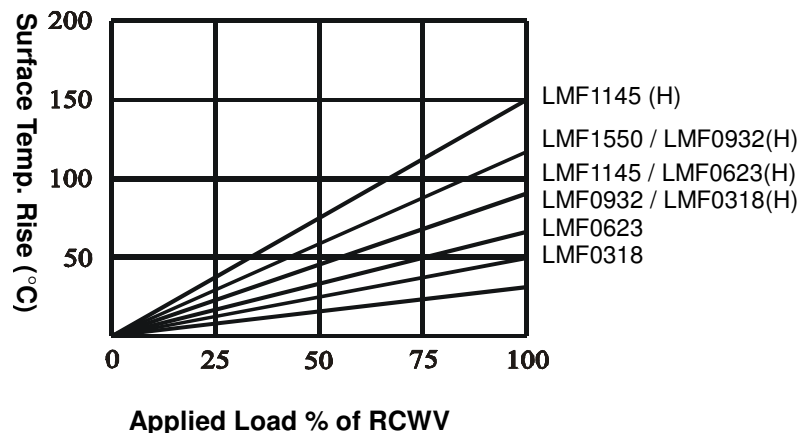
6-2. High Power & Ultra High Power Rating Electrical Specifications

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	10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50	
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
	2/5W		250V	500V	10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50	
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
0623	1/2W	-55 ~ +155 °C	300V	600V	10Ω-1MΩ					±5 ±10	
					10Ω-1MΩ		10Ω-10MΩ			±15 ±25	
					-		10Ω-1MΩ	10Ω-10MΩ			±50
	3/5W		350V	700V	-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25	
-		10Ω-1MΩ	10Ω-10MΩ	1Ω-10MΩ	±50						
-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100						
0932	1W	-55 ~ +155 °C	400V	800V	10Ω-1MΩ					±5 ±10	
					10Ω-1MΩ		10Ω-10MΩ			±15 ±25	
					-		10Ω-1MΩ	10Ω-10MΩ			±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25	
1145	2W	-55 ~ +155 °C	500V	1000V	-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50	
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25	
1550	3W	-55 ~ +155 °C	500V	1000V	-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25 ±50	
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100	
					10Ω-1MΩ		10Ω-4.99MΩ			±15	
					10Ω-1MΩ		10Ω-10MΩ			±25	

6.3 Power Graph



6.4 Hot-spot Temperature



Leaded Metalfilm - Resistors

► 7. Test Procedures and Requirements

Item	Requirement	Test Method
Short Time Overload	±0.25%	JIS-C-5201-1 5.5 RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	> 1000MΩ	MIL-STD-202F Method 302 Apply 100V _{DC} for 1 minute
Endurance	±0.2%	MIL-STD-202F Method 108A 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%	MIL-STD-202F Method 103B 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	MIL-STD-202F Method 208H 245±5°C for 3 seconds
Dielectric Withstanding Voltage	By Type	MIL-STD-202F Method 301 Apply Max. Overload Voltage for 1 minute
Temperature Coefficient	By Type	Resistance value at room temperature and room Temperature+100°C
Pulse Overload	±0.75%	JIS-C-5201-1 5.8 4 times RCWV for 10000 cycles with 1sec "ON" and 25 sec "OFF"
Resistance To Solvent	No deterioration of coatings and markings	JIS-C-5201-1 6.9 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	ΔR=±0.1%	12 months at room temperature 25±3°C, 80%RH Max.

* **Rated Continuous Working Voltage (RCWV)** = $\sqrt{\text{Power.Rating} \times \text{Resisance.Value}}$

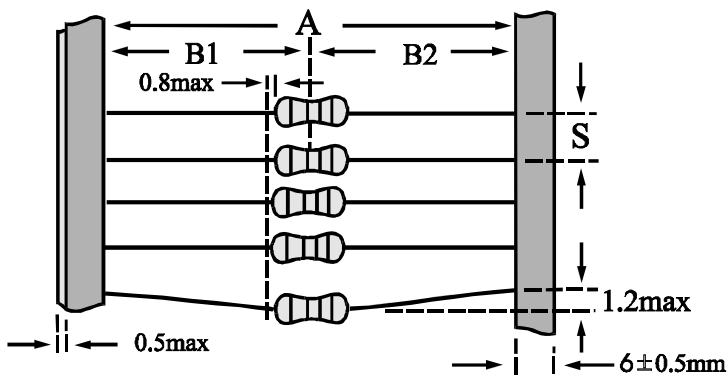
* **Storage Temperature :25±3 °C; Humidity <80%RH**

Leaded Metalfilm - Resistors

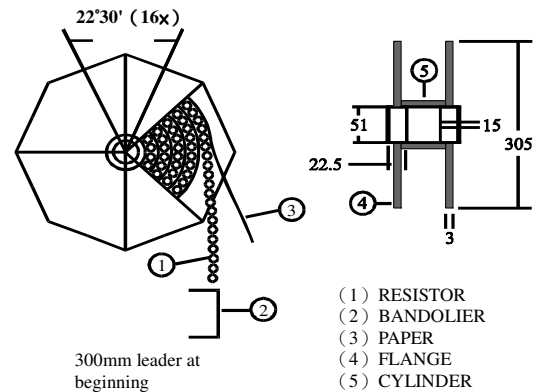
► 8. Taping/Packing Specifications

8.1 Standard Type (Reel & Ammo)

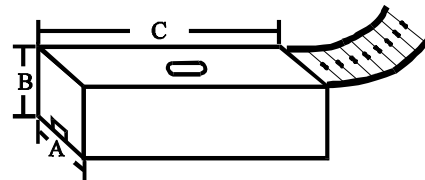
8.1.1 Packing Methods



8.1.2 Reel Packing



7.1.3 Ammo Packing

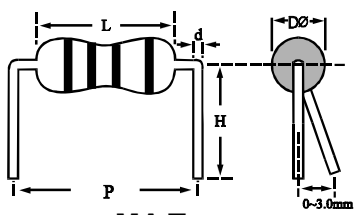


Unit: mm

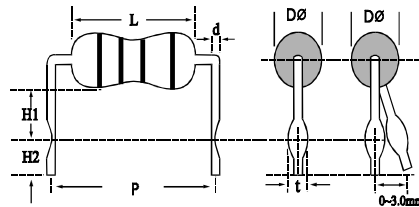
Packaging Codes	Packing Methods			Reel Packing		Ammo Packing			
	A	B1-B2	S	Across Flange (A)	Qty	A	B	C	Qty
0318	52+1/-0	1.2	5	72	5,000	-	-	-	-
0623	52+1/-0	1.2	5	72	5,000	-	-	-	-
0932	52+1/-0	1.2	5	72	2,500	-	-	-	-
1145	52+1/-0	1.5	5	95	2,000	-	-	-	-
1550	52+1/-0	1.5	10	95	1,000	-	-	-	-
0318	26+1/-0	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

Leaded Metalfilm - Resistors

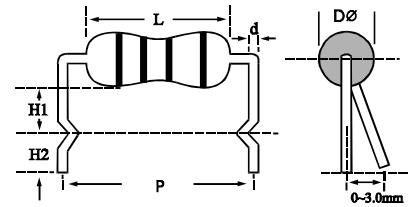
8.2 Special Type (Bulk)



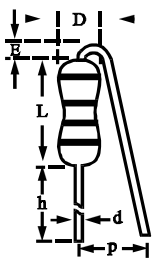
MA Type



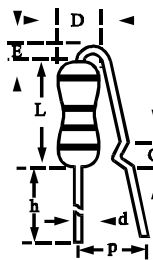
MB Type



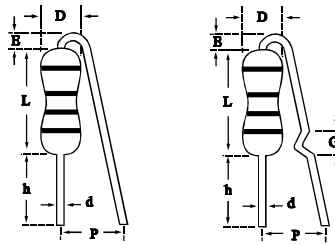
MC Type



FA Type



FB Type



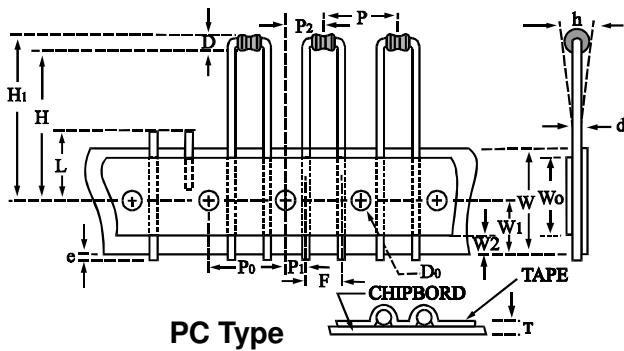
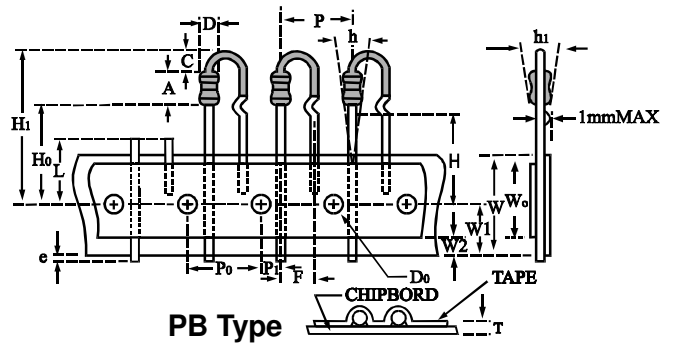
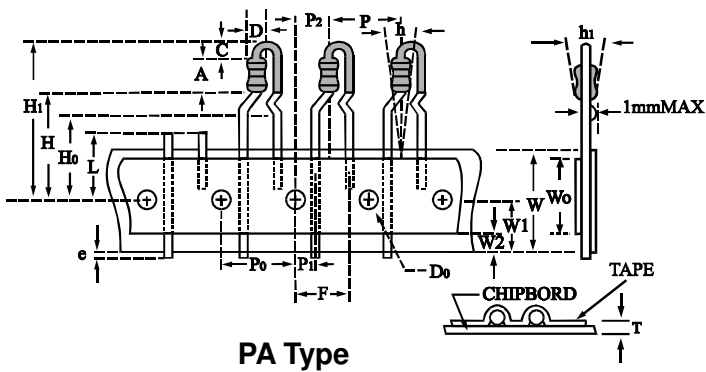
FC Type

Unit: mm

Codes	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
0932	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
	MA	12.5±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
1145	FC	6.00±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
	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	-
1550	FC	6.00±1	10.0±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	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	-

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8.3 Special Type (Reel & Ammo)



Type	PA type 0623	PB type 0623	PC type 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

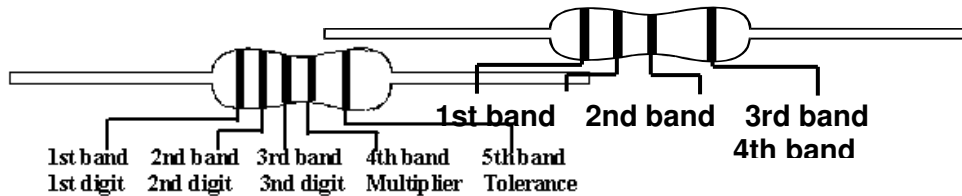
Dimension	AMMO			REEL				
	A	B	C	A	B	C	W1	W2
Unit: mm	53	120	32 5	31	76	312	44	50
Qty: EA	2000 / 3000			2500 / 3000				

Unit: mm

Cumulative Pitch Tolerances Not to Exceed ±1.0mm (±0.039 In) Over 20 Consecutive Pitches

Leaded Metalfilm - Resistors

► 9. Marking



Colour	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	-	-

► 10. Resistance Tolerance

±10%	E-6	1.0	-	-	-	1.5	-	-	-	2.2	-	-	-	3.3	-	-	-	4.7	-	-	-	6.8	-	-	-
±5.0%	E-12	1.0	-	1.2	-	1.5	-	1.8	-	2.2	-	2.7	-	3.3	-	3.9	-	4.7	-	5.6	-	6.8	-	8.2	-
±2.0%	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
±2.0%	E-48	1.00	1.05	1.10	1.15	1.21	1.27	1.33	1.40	1.47	1.54	1.62	1.69	1.78	1.87	1.96	2.05	2.15	2.26	2.37	2.37	2.61	2.74	2.87	3.01
		3.16	3.32	3.48	3.65	3.83	4.02	4.22	4.22	4.64	4.87	5.11	5.36	5.62	5.90	6.19	6.49	6.81	7.15	7.50	7.87	8.25	8.66	9.09	9.53
	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
±1.0%	E-192	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
		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
		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
±0.50%	E-192	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
±0.25%	E-192	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
±0.10%	E-192	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