

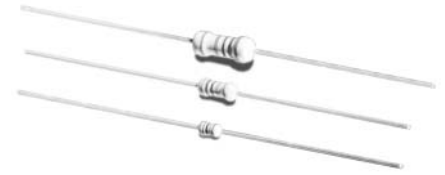


# Metal Film Fixed Resistors

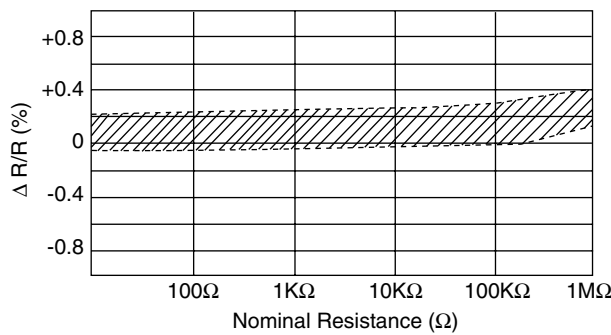
# MF Series

## FEATURES

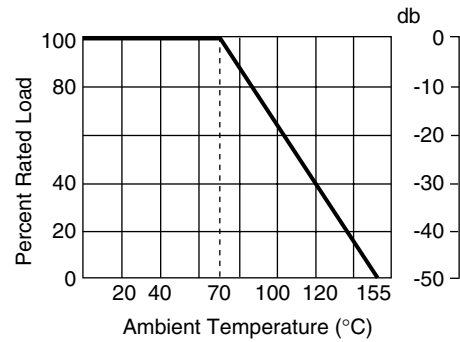
- Temperature Range: -55°C ~ +155°C
- ±1% tolerance
- Epoxy coated miniature resistors
- Nickel chromium ceramic substrate
- Alloy coated leads
- Welded end caps
- EIA standard color coding



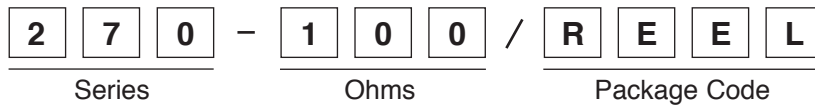
## LOAD LIFE



## DERATING CURVE

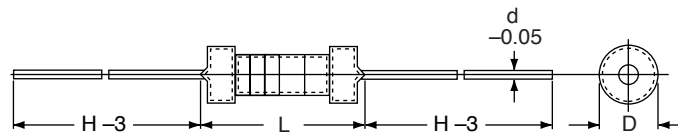


## PART NUMBERING SYSTEM



<b>Code:</b>	<b>Package:</b>
	Bulk
<b>REEL</b>	Tape and Reel
<b>AP</b>	Ammo Pack

## SERIES, WATTAGE, SIZE, VOLTAGE, DIMENSIONS, AND AVAILABLE PACKAGING



Series	Watts	Standard Range of Values (Ω)	Voltage (max.)		Dimensions (mm)				Standard Quantities Available		
			W.V.	O.V.	L max.	D max.	H	d	Bulk	Tape and Reel	Ammo Pack
270	1/8	1~10M	200	400	3.5	1.85	28	0.45	1,000	5,000	2,000
271	1/4	1~10M	250	500	6.8	2.5	28	0.54	1,000	5,000	1,000
273	1/2	1~10M	350	700	10	3.5	28	0.54	1,000	3,000	1,000



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# Metal Film Fixed Resistors

# MF Series

## STANDARD VALUES (Ω)

10	18	30.1	51	84.5	154	267	432	715	1.27K	2.26K	3.83K	6.49K	11.3K	20K	33.6K	56K	95.3K	174K	294K	487K	845K
10.2	18.2	30.9	51.1	86.6	158	270	442	732	1.3K	2.32K	3.9K	6.65K	11.5K	20.5K	34K	56.2K	97.6K	178K	300K	499K	866K
10.5	18.7	31.6	52.3	88.7	160	274	453	750	1.33K	2.37K	3.92K	6.8K	11.8K	21K	34.8K	57.6K	100K	180K	301K	511K	887K
10.7	19.1	32.4	53.6	90.9	162	280	464	768	1.37K	2.4K	4.02K	6.81K	12K	21.5K	35.7K	59K	102K	182K	309K	523K	909K
11	19.6	33	54.9	91	165	287	470	787	1.4K	2.43K	4.12K	6.98K	12.1K	22K	36K	60.4K	105K	187K	316K	536K	910K
11.3	20	33.2	56	93.1	169	294	475	806	1.43K	2.49K	4.22K	7.15K	12.4K	22.1K	36.5K	61.9K	107K	191K	324K	549K	931K
11.5	20.5	34	56.2	95.3	174	300	487	820	1.47K	2.55K	4.32K	7.32K	12.7K	22.6K	37.4K	62K	110K	192K	330K	560K	953K
11.8	21	34.8	57.6	97.6	178	301	499	825	1.5K	2.61K	4.42K	7.5K	13K	23.2K	38.3K	63.4K	113K	196K	332K	562K	976K
12	21.5	35.7	59	100	180	309	510	845	1.54K	2.67K	4.53K	7.68K	13.3K	23.7K	39K	64.9K	115K	200K	340K	576K	1.0M
12.1	22	36	60.4	102	182	316	511	866	1.58K	2.7K	4.64K	7.87K	13.7K	24K	39.2K	66.5K	118K	205K	348K	590K	1.5M
12.4	22.1	36.5	61.9	105	187	324	523	887	1.6K	2.74K	4.7K	8.06K	14K	24.3K	40.2K	68K	120K	210K	357K	604K	2.2M
12.7	22.6	37.4	62	107	191	330	536	909	1.62K	2.8K	4.75K	8.2K	14.3K	24.9K	41.2K	68.1K	121K	215K	360K	619K	
13	23.2	38.3	63.4	110	196	332	549	910	1.65K	2.87K	4.87K	8.25K	14.7K	25.5K	42.2K	69.8K	124K	220K	365K	620K	
13.3	23.7	39	64.9	113	200	340	560	931	1.69K	2.94K	4.99K	8.45K	15K	26.1K	43K	71.5K	127K	221K	374K	634K	
13.7	24	39.2	66.5	115	205	348	562	953	1.74K	3.0K	5.1K	8.66K	15.4K	26.7K	43.2K	73.2K	130K	226K	383K	649K	
14	24.3	40.2	68	118	210	350	565	976	1.78K	3.01K	5.11K	8.8K	15.8K	27K	44.2K	75K	133K	232K	390K	665K	
14.3	24.7	41.2	68.1	120	215	357	576	1K	1.8K	3.09K	5.23K	8.87K	16K	27.4K	45.3K	76.8K	137K	237K	392K	680K	
14.7	24.9	42.2	69.8	121	220	360	590	1.02K	1.82K	3.16K	5.36K	9.09K	16.2K	28K	46.4K	78.7K	140K	240K	402K	681K	
15	25.5	43	71.5	124	221	365	604	1.05K	1.87K	3.24K	5.49K	9.1K	16.5K	28.7K	47K	80.6K	143K	243K	412K	698K	
15.4	26.1	43.2	73.2	127	226	374	619	1.07K	1.91K	3.3K	5.6K	9.31K	16.9K	29.4K	47.5K	82K	147K	249K	422K	715K	
15.8	26.7	44.2	75	130	232	383	620	1.1K	1.96K	3.32K	5.62K	9.53K	17.4K	30K	48.7K	82.5K	150K	255K	430K	732K	
16	27	45.3	75.5	133	237	390	634	1.13K	2K	3.4K	5.76K	9.76K	17.8K	30.1K	49.9K	84.5K	154K	261K	432K	750K	
16.2	27.4	46.4	76.8	137	240	392	649	1.15K	2.05K	3.48K	5.9K	10K	18K	30.9K	51K	86.6K	158K	267K	442K	768K	
16.5	28	47	78.7	140	243	402	665	1.18K	2.1K	3.57K	6.04K	10.2K	18.2K	31.6K	51.1K	88.7K	160K	270K	453K	787K	
16.9	28.7	47.5	80.6	143	249	412	680	1.2K	2.15K	3.6K	6.19K	10.5K	18.7K	32.4K	52.3K	90.9K	162K	274K	464K	806K	
17.4	29.4	48.7	82	147	255	422	681	1.21K	2.2K	3.65K	6.2K	10.7K	19.1K	33K	53.6K	91K	165K	280K	470K	820K	
17.8	30	49.9	82.5	150	261	430	698	1.24K	2.21K	3.74K	6.34K	11K	19.6K	33.2K	54.9K	93.1K	169K	287K	475K	825K	

## CHARACTERISTICS

Characteristics	Limits	Test Methods ( JIS C 5201-1 )
DC. Resistance	Must be within the specified tolerance.	5.1 The limit of error of measuring apparatus shall not exceed allowable range or 1% of resistance tolerance
Temperature coefficient	Within the temperature coefficient specified below ±50 PPM / °C	5.2 Natural resistance change per temp. degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R1: Resistance value at room temperature (t1) R2: Resistance value at room temp.plus 100°C (t2)
Short time overload	Resistance change rate is ± (5 % + 0.05Ω) Max. with no evidence of mechanical damage	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds.
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down.	5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the table 1
Pulse overload	Resistance change rate is ±(1% + 0.05Ω) Max. with no evidence of mechanical damage	5.8 Resistance change after 10,000 cycles (1 second "on", 25 seconds "off") at 4 times RCWV





# Metal Film Fixed Resistors

# MF Series

## CHARACTERISTICS (Cont.)

Characteristics	Limits		Test Methods ( JIS C 5201-1 )		
Terminal strength	With no evidence of mechanical damage.		<b>6.1 Direct load</b> Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads. <b>Twist test :</b> Terminal leads shall be bent through 90° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.		
Resistance to soldering heat	Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage.		6.4 Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in $350\text{ }^{\circ}\text{C} \pm 10^{\circ}\text{C}$ solder for $3 \pm 0.5$ seconds		
Solderability	95 % coverage Min.		6.5 The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : $245^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Dwell time in solder : 2 ~ 3 seconds		
Resistance to solvent	No deterioration of protective coatings and markings.		6.9 Specimens shall be immersed in a bath of trichroethane completely for 3 minutes with ultrasonic.		
Temperature cycling	Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage.		7.4 Resistance change after continuous 5 cycles for duty shown below:		
			<b>Step</b>	<b>Temperature</b>	<b>Time</b>
			1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30 mins
			2	Room temp.	10~15 mins
			3	$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 mins
4	Room temp.	10~15 mins			
Load life in humidity	Resistance value	$\Delta R/R$	7.9 Resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") in a humidity test chamber controlled at $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 90 to 95 % relative humidity		
	Normal type	$\pm 1.5\%$			
Load life	Resistance value	$\Delta R/R$	7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of ( 1.5 hours "on", 0.5 hour "off" ) at $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ambient		
	Normal type	$\pm 1.5\%$			



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