

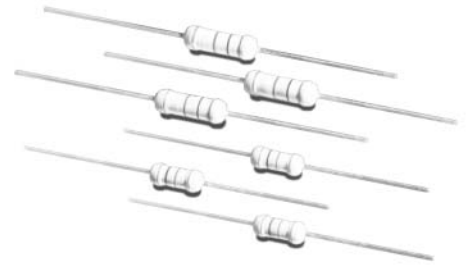


# Metal Oxide Power Resistors

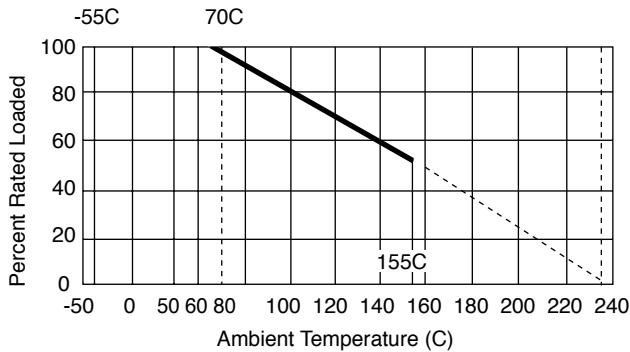
# MO Series

## FEATURES

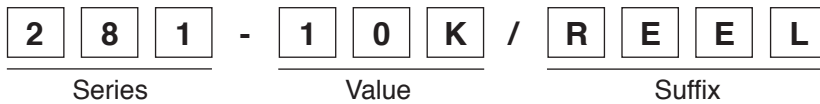
- Temperature Range: -55°C ~ +235°C (derated over 70°C)
- ±5% tolerance
- Excellent flame retardant coating
- Stable performance in diverse environments
- High purity ceramic core
- Other values may be available on request



## DERATING CURVE

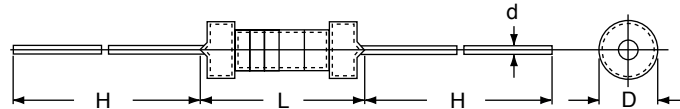


## PART NUMBERING SYSTEM



Suffix Code:	Package:
(blank)	Bulk
REEL	Tape and Reel

## SERIES, SIZE, WATTAGE, RANGE OF VALUES, VOLTAGE, AND DIMENSIONS



Series	Case Size	Watts (W)	Standard Range of Values	Voltage (V) (max.) @ 70°C			Dimensions (mm)			
				Working	Overload	Withstanding	L (max.)	D (max.)	H ±3	d +.02, -.05
281	Small	1	0.1 ~ 1.0M	350	600	350	10	4	28	0.7
282	Small	2	0.1 ~ 1.0M	350	600	350	12	5	28	0.7
283	Small	3	0.1 ~ 1.0M	350	600	350	16	5.5	28	0.8
286	Small	5	0.22 ~ 560K	500	800	500	25	8	28	0.8
261	Standard	1	0.1 ~ 1.0M	350	600	350	12	5	28	0.7
262	Standard	2	0.1 ~ 1.0M	350	600	350	16	5.5	28	0.8

## STANDARD STOCKED VALUES (Ω)

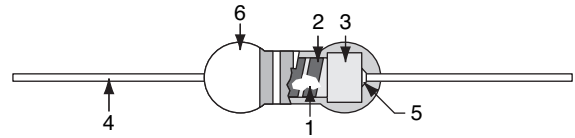
0.47	0.82	1.6	3.3	6.2	12	24	47	91	180	360	680	1.3K	2.7K	5.1K	10K	20K	39K	75K	150K	300K	560K
0.5	0.91	1.8	3.6	6.8	13	27	51	100	200	390	750	1.5K	3.0K	5.6K	11K	22K	43K	82K	160K	330K	620K
0.51	1.0	2.0	3.9	7.5	15	30	56	110	220	430	820	1.6K	3.3K	6.2K	12K	24K	47K	91K	180K	360K	680K
0.56	1.1	2.2	4.3	8.2	16	33	62	120	240	470	910	1.8K	3.6K	6.8K	13K	27K	51K	100K	200K	390K	750K
0.62	1.2	2.4	4.7	9.1	18	36	68	130	270	510	1.0K	2.0K	3.9K	7.5K	15K	30K	56K	110K	220K	430K	820K
0.68	1.3	2.7	5.1	10	20	39	75	150	300	560	1.1K	2.2K	4.3K	8.2K	16K	33K	62K	120K	240K	470K	910K
0.75	1.5	3.0	5.6	11	22	43	82	160	330	620	1.2K	2.4K	4.7K	9.1K	18K	36K	68K	130K	270K	510K	1.0M



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## ■ CONSTRUCTION

No.	Name	Material
1	Basic	BodyRod Type Ceramics
2	Resistance Film	Metal Oxide Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire (Electrosolder plated surface) Pb Free
5	Joint	By welding
6	Coating	Insulated & Non-Flame Paint (Color : Sea-Blue )
7	Color Code	Non-Flame epoxy resin



## ■ 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 5% of resistance tolerance
Temperature coefficient	Within the temperature coefficient specified below $\pm 350$ PPM / °C	5.2 Natural resistance change per temp. degree centigrade. $R_2 - R_1$ $\frac{\quad}{R_1(t_2 - t_1)} \times 10^6$ (PPM/°C) R1: Resistance value at room temperature (t <sub>1</sub> ) R2: Resistance value at room temp.plus 100°C (t <sub>2</sub> )
Short time overload	Resistance change rate is $\pm (2\% + 0.05\Omega)$ Max. with no evidence of mechanical damage	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV or the max overload voltage respectively specified in the above list, whichever less 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 for 60 + 10/-0 seconds.
Pulse overload	Resistance change rate is $\pm (5\% + 0.05\Omega)$ 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 or the max. pulse overload voltage
Terminal strength	With no evidence of mechanical damage.	6.1 <b>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 °C $\pm$ 10°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°C $\pm$ 3°C Dwell time in solder : 2 ~ 3 seconds



# Metal Oxide Power Resistors

# MO Series

## CHARACTERISTICS (Cont.)

Characteristics	Limits		Test Methods ( JIS C 5201-1 )		
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 $\pm (2\% + 0.05\Omega)$ 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°C $\pm 3^\circ\text{C}$	30 mins
			2	Room temp.	10~15 mins
			3	+155°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°C $\pm 2^\circ\text{C}$ and 90 to 95 % relative humidity		
	< than 100K $\Omega$ >100K $\Omega$	$\pm 5\%$ $\pm 10\%$			
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°C $\pm 2^\circ\text{C}$ ambient		
	< than 100K $\Omega$ > 100K $\Omega$	$\pm 5\%$ $\pm 10\%$			
Non-Flame	No evidence of flaming or arcing		7.12 Resistors shall resist flaming or arcing when overloaded up to 16 times RCWV		

