

CF CARBON FILM FIXED RESISTOR

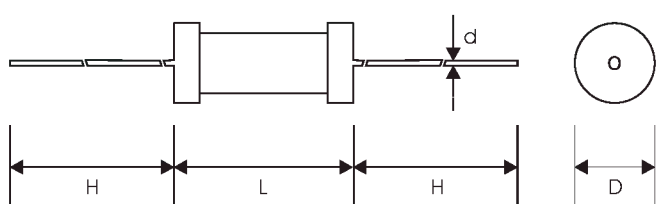
CF Series

INTRODUCTION :

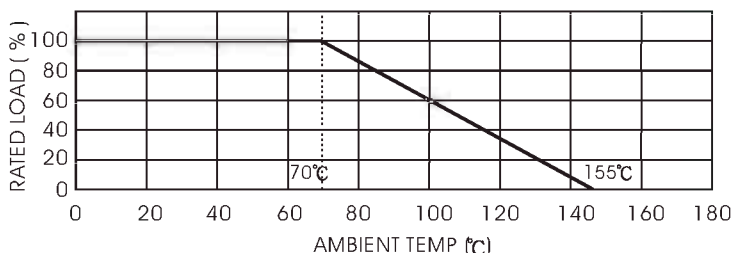
Developed for use in various kinds of transistor instrument, radio, TV and consumer products.

- ◆ High stability, accuracy and reliability.
- ◆ Low temperature coefficient and noise figure.
- ◆ Quality and reliability from automated production.
- ◆ Rigid control of raw materials.
- ◆ Light brown color on body.
- ◆ Meeting or exceeding the applicable requirements of EIA-RS-196-A, JIS-C-6402. and IEC-115.
- ◆ Wide application in audio systems, digital and analog computerized system, high frequency systems, precision bridge instruments.

OUTLINE DRAWING



DERATING CURVE



SPECIFICATIONS

TYPE RD	DIMENSION (mm)				POWER RATING	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	RESISTANCE RANGE	
	L	D	H	D ± 0.02				± 2 % (G)	± 5 % (J)
CR-12	3.2 ± 0.2	1.8 ± 0.2	28 ± 1	0.48	1/8W, 1/6W	200	400	10 Ω ~ 470K	1 Ω ~ 4.7M
CR-25	6.5 ± 0.5	2.3 ± 0.3	28 ± 1	0.60	1/4W	250	500	1 Ω ~ 10M	0.5 Ω ~ 22M
CR-50	9.0 ± 0.5	3.2 ± 0.5	28 ± 1	0.60	1/2W	350	700	1 Ω ~ 10M	0.5 Ω ~ 22M
CR-100	12 ± 1.0	4.5 ± 0.5	35 ± 3	0.80	1W	500	1000	1 Ω ~ 10M	0.5 Ω ~ 22M
CR-200	16 ± 1.0	5.0 ± 0.5	35 ± 3	0.80	2W	500	1000	1 Ω ~ 10M	0.5 Ω ~ 22M

CHARACTERISTIC

REQUIREMENTS	PERFORMANCE				TEST METHOD		
					JIS-C-5202	MIL-R-226848	
Operating Temp. Range	-55°C ~ +155°C				—	—	
Temp. Coefficient (ppm/°C)	T.C.R. TYPE	± 350	-150~-160	-150~-1000	-150~-1300	5.2	4.6.11
	0.125 W Ω	under 1KΩ	1.1KΩ ~ 47KΩ	51KΩ ~ 510KΩ	560KΩ ~ 1MΩ		
	0.25 W	under 10KΩ	1.1KΩ ~ 150KΩ	160KΩ ~ 2.2MΩ	2.4MΩ ~ 5.1MΩ		
Noise (μ V/V)	0.5 W & OVER	under 22KΩ	24KΩ ~ 470KΩ	510KΩ ~ 2.2MΩ	2.4MΩ ~ 10MΩ	5.9 ~ 11	—
	NOISE TYPE	0.1	0.3	0.6	1.0		
	0.125 W & 0.16	—	under 10KΩ	11KΩ ~ 100KΩ	over 110 KΩ		
0.25 W & OVER	under 100KΩ	110KΩ ~ 510KΩ	560KΩ ~ 2.2MΩ	over 2.4 MΩ			
Dielectric Withstanding Voltage	No evidence of flashover or breakdown.				5.7 ~ A	4.6.7	
Resistance to solvents	Permanent Marking No physical or electrical damage or deterioration				—	MIL-STD-202F215	
Short Time Overload	ΔRmax ≤ ± 1% + 0.05Ω				5.5 ~ A	4.6.5	
Resistance to Soldering Heat	ΔRmax ≤ ± 1% + 0.05Ω				6.4 350°C 3sec.	4.6.9	
Temperature Cycling	ΔRmax ≤ ± 0.5% + 0.05Ω				7.4 - 55°C 85	4.6.3	
Vibration	ΔRmax ≤ ± 0.5% + 0.05Ω				6.3.3 ~ A	4.6.14	
Moisture Resistance	R > 100 K	ΔRmax ≤ ± 5%			7.9, 40°C 90-90% RH, 1000 hrs.	4.6.10	
	R ≤ 100 K	ΔRmax ≤ ± 3% + 0.05Ω					
Load Life	R > 100 K	ΔRmax ≤ ± 3%			7.10, 70°C 1000 hrs.	4.6.12	
	R ≤ 100 K	ΔRmax ≤ ± 2% + 0.05Ω					

FB FERRITE BEAD

FB Series

INTRODUCTION :

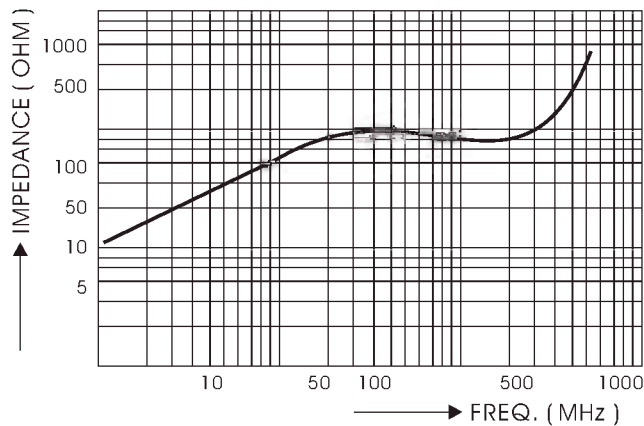
- ◆ Shielding signal noise suppression and transient frequency damping for VGA cards, EGA card, PC boards, TV game and more.

ORDERING CODE

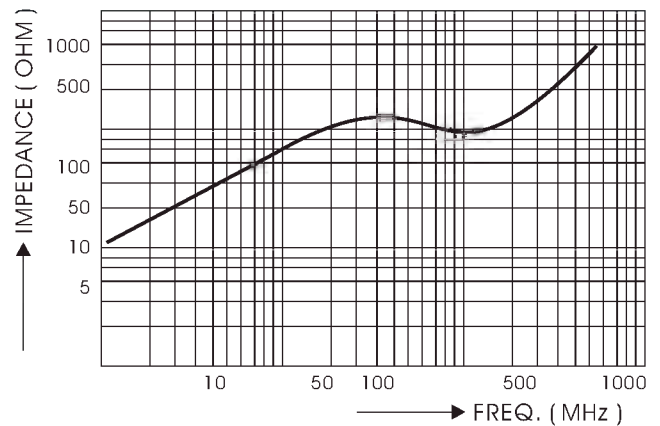
FB **3.5** **X** **6.0** **X** **0.8**
 Type Dia (A) Length (B) Dia (C)

CHARACTERISTICS

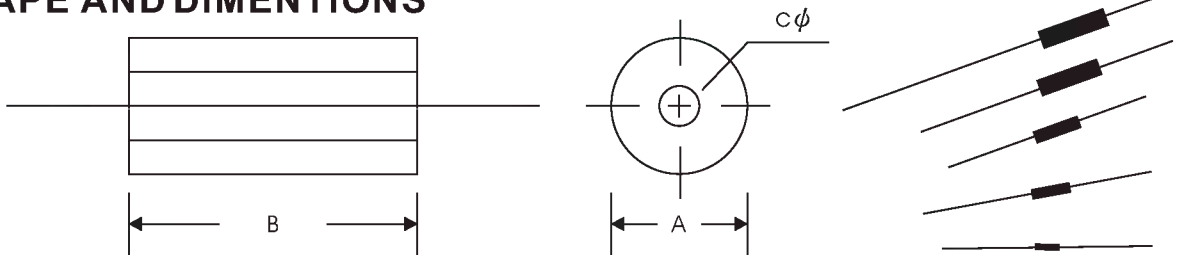
FB 3.5 x 6 x 0.8



FB 3.5 x 9 x 0.8



SHAPE AND DIMENSIONS

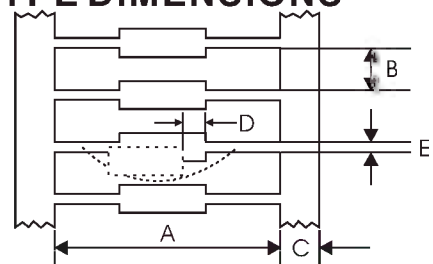


STANDARD PACKING

- ◆ **Bulk Packing** 500, 1000 Pcs. per PE Bag.
- ◆ **Tape Packing** 1000, 1500 Pcs. per Box.
- ◆ **Tape reeled packing** 4000, 5000 Pcs. per reel.

SIZE TYPE	A ± 1	B ± 0.5	C ± 1	D	E
T-52	52	5	6	0.6	1.2

TAPE TYPE DIMENSIONS



SIZE AFTER COATED (mm)	TOLERANCE (mm)		
	A (OD)	B (HT)	C (ID)
FB 3.5 x 4.5 x 0.8	3.5 ± 0.15	4.5 ± 0.3	0.8 ± 0.15
FB 3.5 x 4.7 x 0.8	3.5 ± 0.15	4.7 ± 0.3	0.8 ± 0.15
FB 3.5 x 6.0 x 0.8	3.5 ± 0.15	6.0 ± 0.3	0.8 ± 0.15
FB 3.5 x 7.5 x 0.8	3.5 ± 0.15	7.5 ± 0.3	0.8 ± 0.15
FB 3.5 x 8.0 x 0.8	3.5 ± 0.15	8.0 ± 0.3	0.8 ± 0.15
FB 3.5 x 9.0 x 0.8	3.5 ± 0.15	9.0 ± 0.3	0.8 ± 0.15
FB 3.5 x 3.0 x 1.2	3.5 ± 0.15	3.0 ± 0.2	1.2 ± 0.15
FB 3.5 x 4.0 x 1.2	3.5 ± 0.15	4.0 ± 0.3	1.2 ± 0.15
FB 3.5 x 6.0 x 1.2	3.5 ± 0.15	6.0 ± 0.3	1.2 ± 0.15

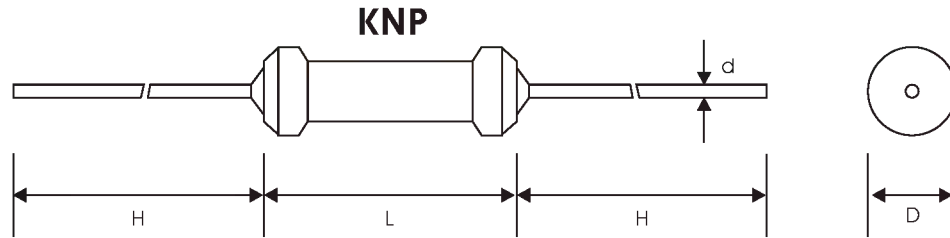
KN NONFLAME WIRE-WOUND RESISTOR

KN Series

INTRODUCTION :

- ◆ Excellent flame resistance.
- ◆ Non-inductive types available.
- ◆ Colorcoating is in "Green".
- ◆ Deal for use in computers, communication equipments.

- ◆ Ideal for use in Power suppliers, Process control instrumentation, Tool low or too high ohmic value supplier only case by case.



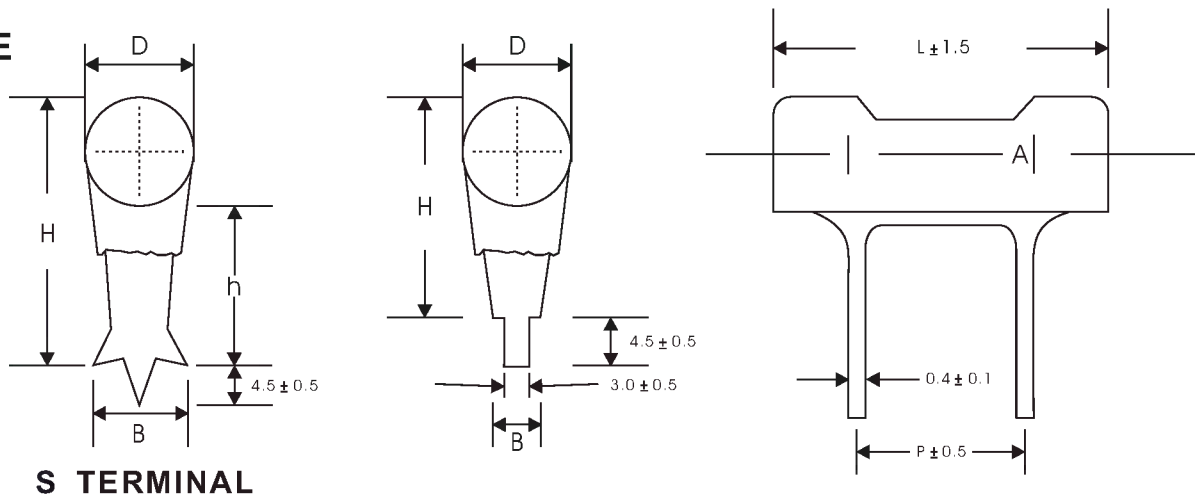
KNP TYPE

STYLE	NORMAL SIZE			
	D max.	L max.	H \pm 3	d ^{+0.02} _{-0.05}
KNP - 1W	5	12	28	0.7
KNP - 2W	5.5	16	28	0.8
KNP - 3W	6.5	17.5	28	0.8
KNP - 5W	8	25	38	0.8
KNP - 7W	8	30	38	0.8
KNP - 8W	8	40	38	0.8
KNP - 9W	8	53	38	0.8
KNP - 10W				

KNS TYPE

STYLE	SMALL SIZE				RESISTANCE RANGE
	D max.	L max.	H \pm 3	d ^{+0.02} _{-0.05}	
KNS - 1W	4	10	28	0.6	0.1 Ω ~ 50 Ω
KNS - 2W	5	12	28	0.7	0.1 Ω ~ 120 Ω
KNS - 3W	5.5	16	28	0.8	0.1 Ω ~ 200 Ω
KNS - 5W	6.5	17.5	28	0.8	0.1 Ω ~ 470 Ω
KNS - 7W	8	25	38	0.8	0.5 Ω ~ 560 Ω
KNS - 8W	8	30	38	0.8	1 Ω ~ 1 K Ω
KNS - 9W	8	40	38	0.8	1 Ω ~ 1.5 K Ω
KNS - 10W	8	53	38	0.8	1 Ω ~ 2 K Ω

KNY TYPE



S TERMINAL

STYLE	DIMENSION (mm)						RESISTANCE RANGE
	D max.	L \pm 1.5	P \pm 0.5	H \pm 1.0	H \pm 1.0	B \pm 0.5	
KNY - 2W	5.5	16	8	19	12	4.5	0.1 Ω ~ 50 Ω
KNY - 3W	6.5	16	10	19	13	4.5	0.1 Ω ~ 200 Ω
KNY - 5W	8.5	24	15	21.5	13	6	0.5 Ω ~ 560 Ω
KNY - 7W	8.5	30	20	21.5	13	6	1 Ω ~ 1 K Ω
KNY - 8W	8.5	40	30	21.5	13	6	1 Ω ~ 1.5 K Ω
KNY - 10W	8.5	53	43	21.5	13	6	1 Ω ~ 2 K Ω

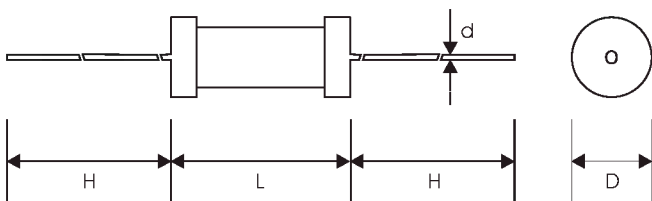
MF METAL FILM FIXED RESISTOR

MF Series

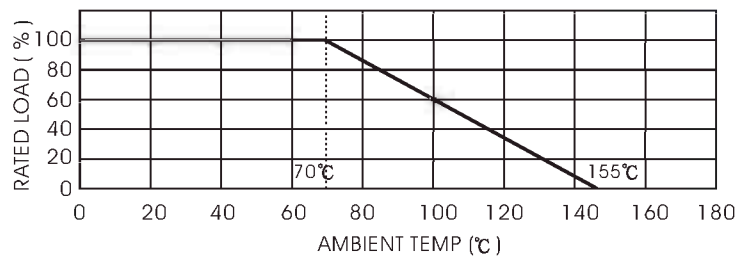
INTRODUCTION :

- ◆ Miniature, Replacements for composition, carbon film and wire wound resistors.
- ◆ High stability, accuracy and reliability.
- ◆ Low current noise.
- ◆ Low temperature coefficient 25 ppm, 1000 ppm.
- ◆ Meets requirements of MIL-R-22684B, 10509F, 39017C, DIN-44061
- ◆ Low cost..

OUTLINE DRAWING



DERATING CURVE



SPECIFICATIONS

STYLE	MIL STYLE	DIMENSION (mm)				POWER RATING (W)		MAX WORKING VOLTAGE		MAX OVERLOAD VOLTAGE	
		L	D	H	d	70°C	125°C	70°C	125°C	70°C	125°C
MF-1/6	RN-50	3.2 ± 0.2	1.8 ± 0.2	28 ± 2.0	0.48	0.166	0.05	200	150	400	300
MF-1/4	RN-55	6.5 ± 0.5	2.3 ± 0.3	28 ± 2.0	0.60	0.25	0.1	250	200	500	400
MF-1/2	RN-60	9.0 ± 0.5	3.0 ± 0.5	28 ± 2.0	0.60	0.5	0.25	350	250	700	500
MF-1W	RN-65	12 ± 1.0	4.5 ± 0.5	35 ± 3.0	0.80	1	0.25	500	300	1000	600
MF-2W	RN-70	16 ± 1.0	5.0 ± 0.5	35 ± 3.0	0.80	2	0.5	500	350	1000	700

RESISTANCE RANGE

STYLE	MIL STYLE	TOLERANCE	TC ± 15 PPM 25 PPM	TC ± 50 PPM	TC ± 100 PPM	REMARK
MF-12	RN-50	± 1%	100 Ω ~ 100KΩ	51.1Ω ~ 200KΩ	51.1Ω ~ 511KΩ	* Standard resistance is 10 Ω~ 1 MΩ below or over this resistance on request
		± 0.5%	100 Ω ~ 100KΩ	51.1Ω ~ 200KΩ	51.1Ω ~ 511KΩ	
		± 0.25%	100 Ω ~ 100KΩ	51.1Ω ~ 200KΩ	51.1Ω ~ 511KΩ	
MF-25	RN-55	± 1%	51.1Ω ~ 511KΩ	10 Ω ~ 1 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.5%	51.1Ω ~ 511KΩ	10 Ω ~ 1 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.25%	100Ω ~ 330KΩ	51.1Ω ~ 330KΩ		
		± 0.1%	100Ω ~ 100KΩ	100Ω ~ 100KΩ		
MF-50	RN-60	± 1%	51.1Ω ~ 1 MΩ	10 Ω ~ 2.2 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.5%	51.1Ω ~ 1 MΩ	10 Ω ~ 1 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.25%	100Ω ~ 511MΩ	51.1Ω ~ 511KΩ		
		± 0.1%	100Ω ~ 330KΩ	100Ω ~ 330KΩ		
MF-100	RN-65	± 1%	51.1Ω ~ 1 MΩ	51.1Ω ~ 1 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.5%	51.1Ω ~ 1 MΩ	51.1Ω ~ 1 MΩ	51.1Ω ~ 2.4 MΩ	
		± 0.25%	100 Ω ~ 511KΩ	51.1Ω ~ 511KΩ		
		± 0.1%	100Ω ~ 330KΩ	100 Ω ~ 330KΩ		
MF-200	RN-70	± 1%	51.1Ω ~ 1 MΩ	10Ω ~ 2.2 MΩ	51.1Ω ~ 5.11 MΩ	
		± 0.5%	51.1Ω ~ 1 MΩ	10 Ω ~ 1 MΩ	51.1Ω ~ 5.11 MΩ	
		± 0.25%	100 Ω ~ 511MΩ	51.1Ω ~ 511KΩ		
		± 0.1%	100Ω ~ 330KΩ	100Ω ~ 330KΩ		

TEST	MF Series % Change In Resistance / R _i					MIL-R-22684 Style RL Requirement	MIL-R-10509 Chart C, E Requirement
	MF-12	MF-25	MF-50	MF-100	MF-200		
Temperature Cycling, -60°C to +150°C (%)	± 0.25	± 0.25	± 0.25	± 0.25	± 0.25	≤ 10	≤ 5
Low Temperature Operation, -65°C (%)	± 0.25	± 0.25	± 0.25	± 0.25	± 0.25	≤ 0.50	≤ 0.25
Short Time C (hrs) (%)	± 0.5	± 0	± 0	± 0.5	± 0	≤ 0.50	≤ 0.25
Terminal Strength, 5 lb. pull (%)	± 0.20	± 0.20	± 0.20	± 0.15	± 0.15	≤ 0.50	≤ 0.20
Re (hrs) @ 350°C (%)	± 0.10	± 0	± 0	± 0	± 0	≤ 0.50	≤ 0
Moisture Resistance, Mil Std 202 (%)	± 0.50	± 0.50	± 0.50	± 0.50	± 0.50	≤ 1.50	≤ 0.50
Life 1 (hrs. @ Rated Power) (%)	± 0.50	± 0.50	± 0.50	± 0	± 0	≤ 10	≤ 0.50
Shock, 50 G, 11 ms (%)	± 0.25	± 0.20	± 0.20	± 0.15	± 0.15	≤ 0.50	≤ 0.25
V (hrs) @ 10-2000 Hz (%)	± 0.5	± 0	± 0	± 0	± 0	≤ 0.50	≤ 0.25
Insulation Resistance	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω	≥ 10 ¹⁰ Ω
Failure-Rate	< 10 ⁹ /h	< 10 ⁹ /h	< 10 ⁹ /h	< 10 ⁹ /h	< 10 ⁹ /h	< 10 ⁹ /h	< 10 ⁹ /h

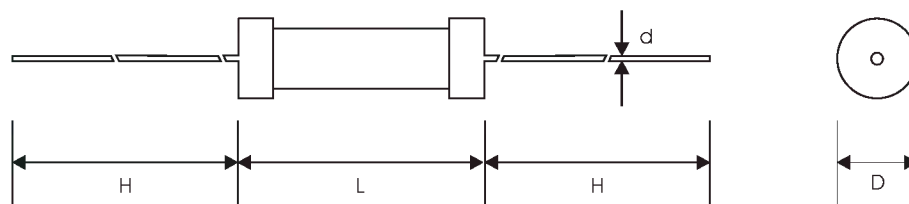
MO METAL OXIDE FILM RESISTOR (NONFLAMMABLE)

MO Series

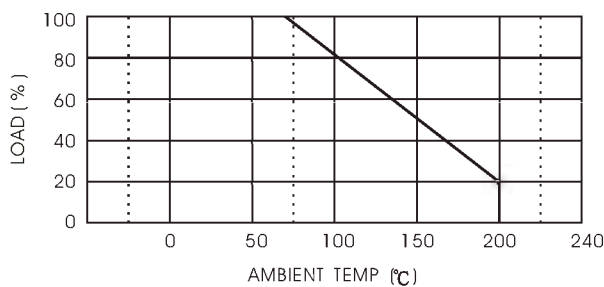
INTRODUCTION :

- ◆ Low cost, prompt delivery.
- ◆ High power-to-size ratio for significant space savings.
- ◆ Excellent long-term stability.
- ◆ Complete flameproof construction.
- ◆ High surge / overload capability.
- ◆ Controlled temperature coefficient.
- ◆ Non-inductive design.
- ◆ Wide resistance range : 0.5Ω to 1 MΩ .
- ◆ Standard tolerance : ±2%, ±5% (consult factory for 1 %)
- ◆ Coating and marking resist Trichlorethylene, Freon and other cleaning agents.
- ◆ Improved stability, dissipation, TCR available. Consult factory.

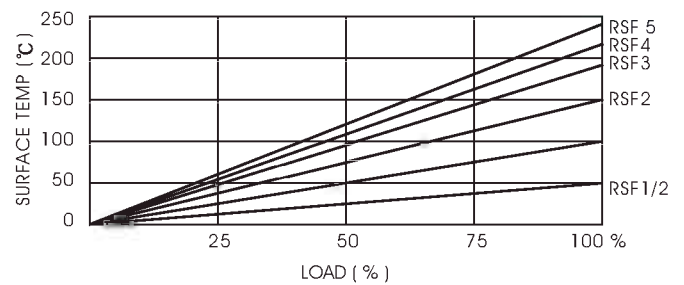
OUTLINE DRAWING



DERATING CURVE



SURFACE TEMP RISE



SPECIFICATIONS

STYLE	DIMENSION (mm)				POWER RATING	MAX WORKING VOLTAGE	MAX OVERLOAD VOLTAGE	RESISTANCE RANGE	
	L	D	d	H				± 2 % (G)	± 5 % (J)
MO 50S	9±0.5	3.5±0.5	0.7	30+3	0.5W	250 V	400 V	5.1Ω~100KΩ	1Ω~100KΩ
MO 100S	11.5±0.5	4.5±0.5	0.8 (0.7)	30±3	1WS	350 V	600 V	5.1Ω~100KΩ	1Ω~100KΩ
MO 100	13.0±0.5	5.5±0.5	0.8	35±3	1W	350 V	600 V	5.1Ω~100KΩ	1Ω~100KΩ
MO 200S	15.5±0.5	5.5±0.5	0.8	35±3	2WS	350 V	600 V	5.1Ω~120KΩ	1Ω~120KΩ
MO 200	18±1.0	6.5±1.0	0.8	35±3	2W(3WS)	350 V	600 V	5.1Ω~150KΩ	1Ω~150KΩ
MO 3NS	24.5±1.0	9.0±1.0	0.8	38±3	3W(4WS)	500 V	800 V	5.1Ω~150KΩ	1Ω~150KΩ
MO 4NS	34±1.0	9.0±1.0	0.8	38±3	4W(5WS)	500 V	800 V	5.1Ω~240KΩ	1Ω~240KΩ
MO 5S	41±1.0	9.0±1.0	0.8	38±3	5W	750 V	1000 V	5.1Ω~270KΩ	1Ω~270KΩ
MO 7S	51±1.0	9.0±1.0	0.8	38±3	7W	750 V		5.1Ω~270KΩ	1Ω~270KΩ

CHARACTERISTICS

REQUIREMENTS	PERFORMANCE	TEST METHOD	
		JIS-C-5202	MIR-R-226848
Operating Temp. Range	-55°C ~ +155°C		
Temp. Coefficient (ppm/°C)	±300	5.2	4.6.11
Stability under Load	$\Delta R_{max} \leq +2\% + 0.05\Omega$	5.5 - A	4.6.5
Resistance to Soldering Heat	$\Delta R_{max} \leq \pm 1\% + 0.05\Omega$	6.4. 350°C 3sec.	4.6.9
Temperature Cycling	$\Delta R_{max} \leq \pm 1\% + 0.05\Omega$	7.4. -55°C / 85°C, 5cycles	4.6.3
Moisture Resistance	$\Delta R_{max} \leq \pm 5\%$	7.9 95% RH on-off 1,000 hrs	4.6.10
Load Life	$\Delta R_{max} \leq \pm 5\%$	7.10 70°C on-off 1,000 hrs	4.6.12
Dielectric Withstanding Voltage	$\Delta R_{max} \leq \pm 0.5\% + 0.05\Omega$	5.7 - A	4.6.7
Insulation Resistance	$> 1000\Omega$	5.6 - A	4.6.8
Non-Combustibility	The resistor shall withstand overload test in accordance with Artical UL 492.2.13 without producing a fire hazard.		