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REV.No	01

APPROVAL

CUSTOMER'S NAME : _____

PART TYPE : Metal Oxide Film Resistors (MOR)

MODEL NAME : MOR SERIES

Customer Approve	
Examination	Approve
/	/



REVISIONS HISTORY			
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	Drawing up	Examination	Approve
알 피 전자			



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1. Application scope

This specification is concerned about Metal Oxide Film Resistors for use in television, communication equipments and other industrial equipments.

2. Definition

Metal Oxide Film Resistors are plated with Metal Oxide Film on ceramic rod and then is coated with silicon paint.

3. Characteristics

- 3.1 Highly stable against environmental conditions and overload.
- 3.2 Suitable to pulse circuit. (Power type resistors)
- 3.3 Excellent mechanical and thermal shock at a high temperature
- 3.4 Flame proof overload owing to the flame resistant coating.

4. Type designation

The type designation is specified as the following form

Ex)	MORS	1W	J	360K	TC
	Type	Rated Power	Resistance Tolerance	Nominal Resistance(Ω)	Shape

4.1 Type

The name of product is MOR(S)

4.1.1 Standard (normal size) Type : **MOR**

4.1.2 Mini (small size) Type : **MORS**

4.1.3 Super Mini (small size) Type : **MORSS**

4.2 Rated Power

The rated power is represented in composition of some numeral and 'W' which means rated power (wattage)

4.3 Appearance

The shape appear manufactured shape, is represented as the following in table.

Symbol	Type	Symbol	Type
TC	Axial Taping Type (63mm)	TB	Axial Taping Type (52mm)
RT	Radial Taping Type	RF	Radial Bulk Type
PS	Axial Bulk Type	MF	M-Forming Bulk Type
MN	MN-Forming Bulk Type	MD	MD-Forming Bulk Type

4.4 Resistance

The resistance represented in numeral, and the decimal point is represented capital letters M, K, R instead of MΩ, KΩ, Ω.

Ex) 1M8 : 1.8MΩ, 2K4 : 2.4KΩ, 0R1 : 0.1Ω

4.5 Resistance Tolerance

Initial	Tolerance	Initial	Tolerance
M	± 20 %	L	± 15 %
K	± 10 %	J	± 5 %
G	± 2 %	F	± 1 %
B	± 0.1 %		

5. Rating

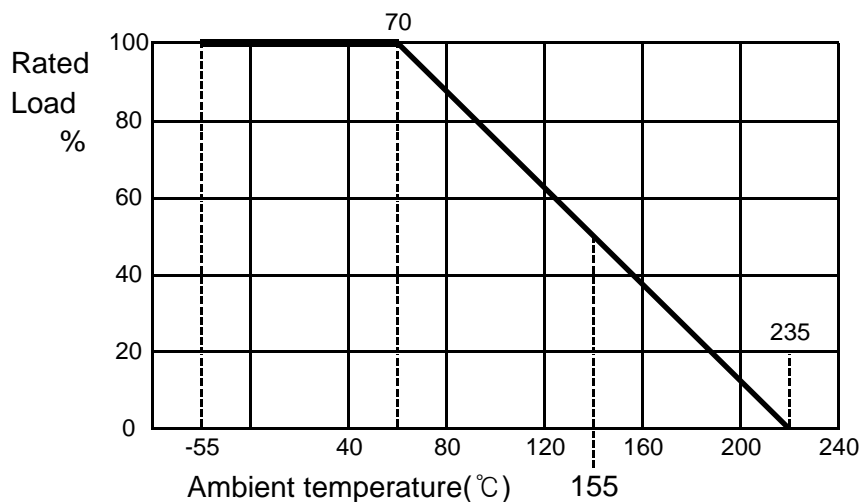
5.1 Rated Condition

Type	Power Rating	Operating Temp.(℃)	Max Working Voltage(V)	Max Overload Voltage(V)	Withstanding Voltage(V)	Resistance Range
MORSS 1W	1W	-55 ~ 155℃	300	500	500	1Ω ~ 100KΩ
MORS 1W	1W		350	600		1Ω ~ 1.5MΩ
MOR 1W	1W		350	600		
MORS 2W	2W		350	600		
MOR 2W	2W	155℃	350	600	1000	
MORS 3W	3W		550	800		

* If test voltage exceeds the max overload voltage as following table, the max overload voltage will be the test voltage.
(except for the Surge test.)

5.2 Rated Power

Resistors shall have a power rating as specified (see Table) based on continuous full load operating at the ambient temperature of 70℃ for resistors operated at an ambient temperature in excess of 70℃ the load shall be derated in accordance with as the following graph (reduction curve)



5.3 Rated Voltage

Rated Voltage is calculated to have a rated direct current (DC), continuous working voltage at commercial line frequency corresponding to the power rating, as determined from the following formula :

$$E = \sqrt{P \cdot R}$$

E : Rated Voltage (V)
P : Rated Power (W)
R : Nominal Resistance (Ω)

6. Efficiency

6.1 Test Method

KS C 6429 (The test method for electromagnetic fixed resistors) is applied for our test method.

(It could be changeable according to the client's needs)

6.2 Efficiency

No.	Characteristics	Test Method	Specification
1	Resistance	Measure Resistance	Within regulated tolerance. Refer to no. 4.5
2	Temperature Coefficient Resistance (T.C.R) (PPM/°C)	1)T1 : 25°C 2)T2 : 125°C 3)R1 : Resistance value at base temperature. (T1) 4)R2 : Resistance value at test temperature. (T2) 5)Test time : 30min $\frac{R2-R1}{R1} \times \frac{1}{T2-T1} \times 10^6$	less than 10 Ω : ± 600 PPM/°C more than 10 Ω : ± 350 PPM/°C
3	Short Time Over Load (S.T.O.L)	Permanent resistance change after the application of a potential of 2.5 times Rated voltage. 5 sec "ON", 45 sec "OFF" 5 cycle.	R MAX : $\pm 1\%$

No.	Characteristics	Test Method	Specification
4	Insulation Resistance	500±50V DC during 1 min Metallic "V" block method	Min more than 1,000 MΩ
5	Directric Withstanding Voltage	Test Voltage : 500VAC / 1000VAC Test Time : 1min Metallic "V" block method	Resistance range must be within max $\pm(0.1\% + 0.1\Omega)$ with no evidence of flashover, arcing, mechanical damage or insulation break down.
6	Load Life	1)Temperature : $70 \pm 2^{\circ}\text{C}$ 2)Test Voltage : Rated Voltage (DC) 3)Cycle : 1.5hr "ON", 0.5hr "OFF" 60 Cycles (120hr) After the test, measure resistance at base temperature. 1hr later. (If test voltage exceed max working voltage, max working voltage will be test voltage.)	No deterioration of protective coating and marking R MAX : $\pm 5\%$
7	Temperature Cycling	1)Low test temp ($-55 \pm 3^{\circ}\text{C}$) : 30min 2)Base temp (25°C) : 10min 3)High test temp ($125 \pm 2^{\circ}\text{C}$) : 30min 4)Base temp (25°C) : 10min 1 cycle holding, after 5 cycles, measure resistance.	No deterioration of protective coating and marking R MAX : $\pm 1\%$
8	Load life in PCT	1)Test temperature : $121 \pm 2^{\circ}\text{C}$ 2)Test humidity : 100% 3)Atmospheric pressure : 2atm 4)Test time : 1hr after the test, measure resistance.	 R MAX : $\pm 5\%$

No.	Characteristics	Test Method	Specification
9	Resistance against Soldering	1) Solder bath temperature : $350 \pm 10^{\circ}\text{C}$ 2) Dipping time : 3 ± 1 sec 3) Dipping length : 3~5mm from body edge. After 30 min, measure resistance. (Pb free solder)	No deterioration of protective coating and marking R MAX : $\pm 1\%$
10	Solder ability	1) Solder bath temperature : $235 \pm 3^{\circ}\text{C}$ 2) Dipping time : 5 sec 3) Dipping length : 1.5~2.5mm from body edge. (Pb free solder)	Good tinning, No damage Over 95% coverage on dipping surface with leads in the circular direction.
11	Terminal strength	1) Strength Check snap time through strength check machine. 2) Twist Strength Twist wire 2 times.	1) more than 6Kg 2) With no snap and loose wire

7. Dimensions & Specification

7.1 External Apperearance

Seeing appearance, there must be no matter.

7.2 Marking

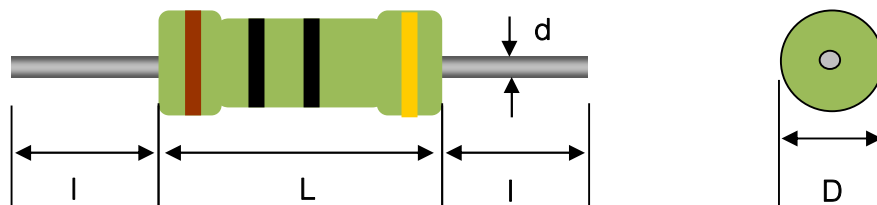
7.2.1 Marking method : Color code, 4 colors or 5 colors



7.2.2 Coating Color (Body) : MOR (Green), MORS (Green,5 band)

7.2.3 Marking of packaging : Model, Resistance, Tolerance, Quantity, Part No,
Manufacture date, Company name, Lot no.

7.3 Dimensions



(Unit : mm)

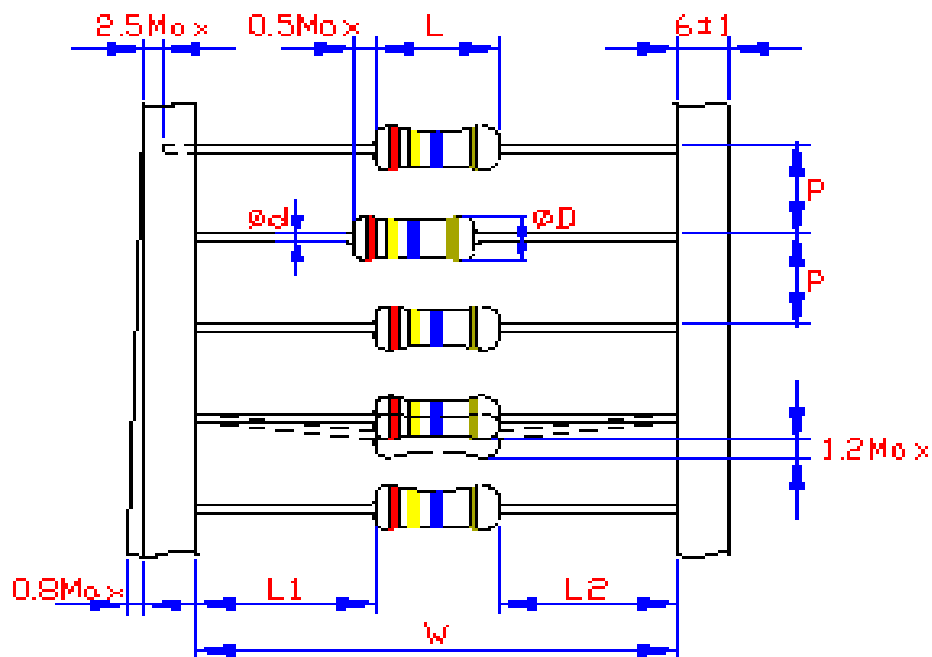
ITEM		$D \pm 0.5$	$L \pm 1.0$	$d \pm 0.05$	$l \pm 2.0$
MORSS 1W		2.4	6	0.55	23
MORS 1W		3.5	9	0.67	31.5
MOR 1W	MORS 2W	4	11	0.67	31
MOR 2W	MORS 3W	5.5	15	0.77	28.5

1) Standard type

1/2W(1S), 1W(2S) R-Forming Radial Taping type, 'd' is 0.67

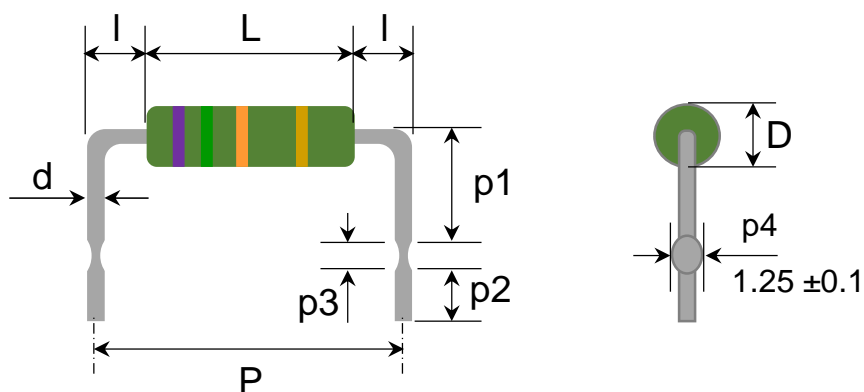
2) 1/2W,1S Axial Taping type 52mm, 'd' is 0.67

3) Taping Type



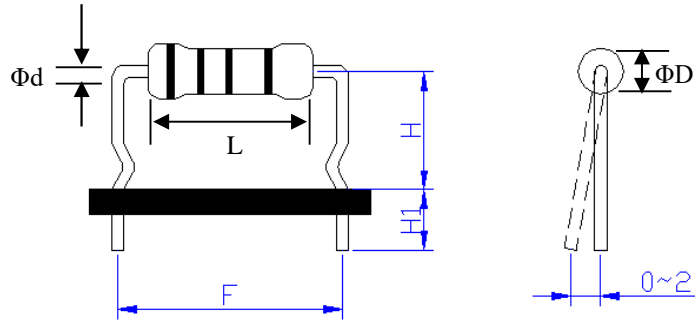
구 분 Division		치수 Dimension (mm)					
		L	ΦD	Φd	P	W	[L1 - L2]
MORSS 1W		6.0 ± 1.0	2.4 ± 0.5	0.55 ± 0.05	5.0 ± 0.5	$52 +2/-1$	1.0MAX
MORS 1W		9.0 ± 1.0	3.5 ± 0.5	0.67 ± 0.05	5.0 ± 0.5	$52 +2/-1$	1.0MAX
MOR 1W	MORS 2W	11 ± 1.0	4.0 ± 0.5	0.67 ± 0.05	5.0 ± 0.5	$63 +2/-1$	1.5MAX
MOR 2W	MORS 3W	15.0 ± 1.0	5.5 ± 0.5	0.77 ± 0.05	10.0 ± 0.5	$63 +2/-1$	1.5MAX

4) MD-Punching Type



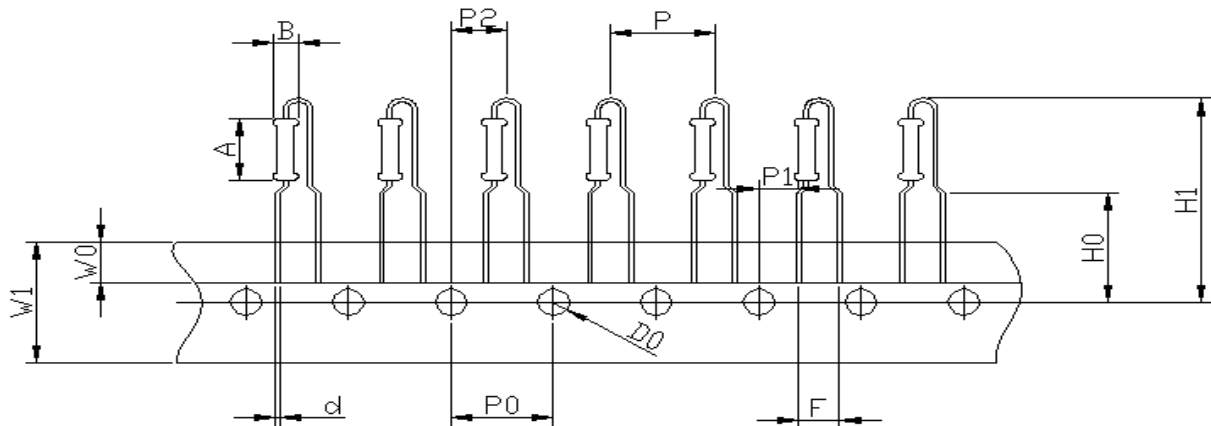
구 분 Division	치수 Dimension (mm)							
	$D \pm 0.5$	$L \pm 1.0$	$l \pm 0.5$	$P \pm 1.0$	$d \pm 0.03$	$p1 \pm 0.5$	$p2 \pm 0.5$	$p3 \pm 0.5$
MORS 3W	5.5	15	2.6	20	0.77	7	3	2

5) F-Punching Type



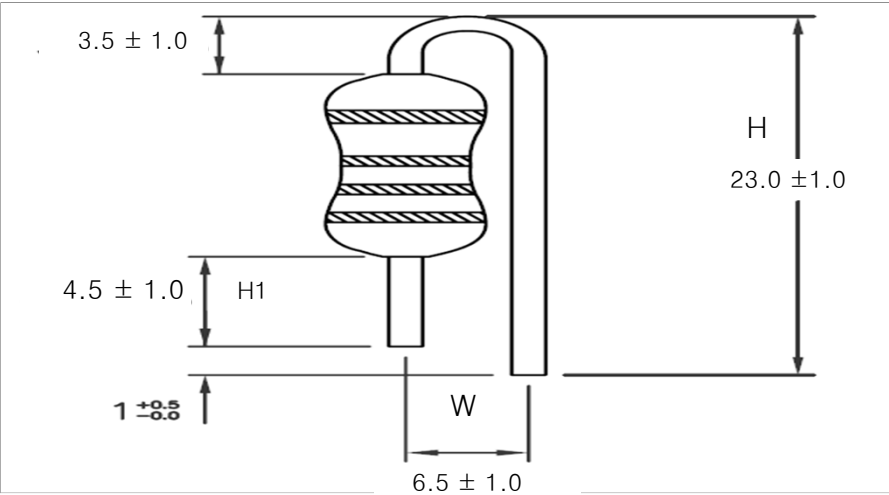
구 분 Division		Punching Type	치수 Dimension (mm)				
			L	ΦD	$F \pm 1.0$	$H \pm 1.0$	$H1 \pm 0.5$
MOR1/2W	MORS 1W	MF	9.0 ± 1.0	3.5 ± 0.5	15	10	4.5
MOR 1W	MORS 2W	MF	11.0 ± 1.0	4.0 ± 0.5	15	9	4.5

6) Radial Forming Taping Type



Description	Symbol	Requirement		Unit
		MORS 1W R0	MORS 2W R1	
Feed hole pitch	P_0	12.5 ± 1.0	12.5 ± 1.0	mm
Lead wire diameter	d	0.67 ± 0.05	0.67 ± 0.05	mm
Pitch of components	P	12.7 ± 1.0	12.7 ± 1.0	mm
Body length	A	9.0 ± 1.0	11 ± 1.0	mm
Body diameter	B	3.5 ± 0.5	4.0 ± 0.5	mm
Hole down tape width	W_0	6.0 ± 0.5	6.0 ± 0.5	mm
Tape width	W_1	17.85 ± 0.5	17.85 ± 0.5	mm
Length of snapped lead	L	MAX 10.0	MAX. 10.0	mm
Feed hole diameter	D_0	4.0 ± 0.3	4.0 ± 0.3	mm
Lead to lead distance	F	5.0 ± 0.5	5.0 ± 0.5	mm
Feed hole center to a near lead wire at down tape	P_1	3.85 ± 0.5	3.85 ± 0.5	mm
Feed hole center to pitch hole center	P_2	6.35 ± 1.0	6.35 ± 1.0	mm
Lead wire clinch height	H_0	15.0 ± 0.5	16.0 ± 0.5	mm
Component height	H_1	MAX 32.0	MAX 32.0	mm

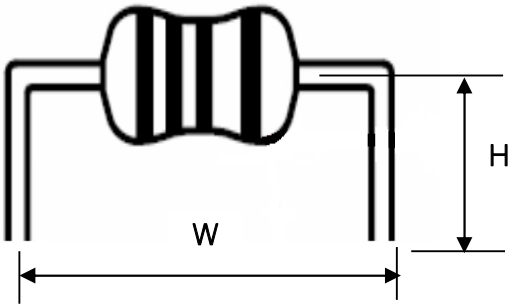
7) RF-Forming



(Unit : mm)

ITEM		H	H1	W
MOR 2W	MORS 3W	23.0±1.0	4.5±1.0	6.5±3.0

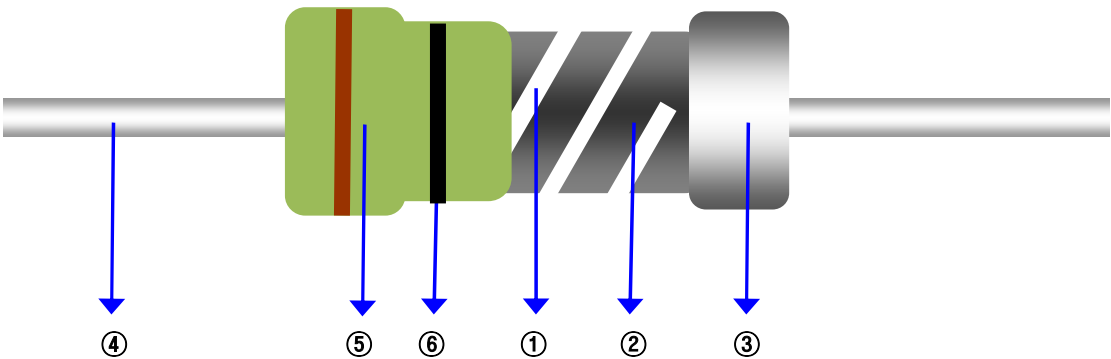
8) MN-Forming ('ㄷ' Type)



(Unit : mm)

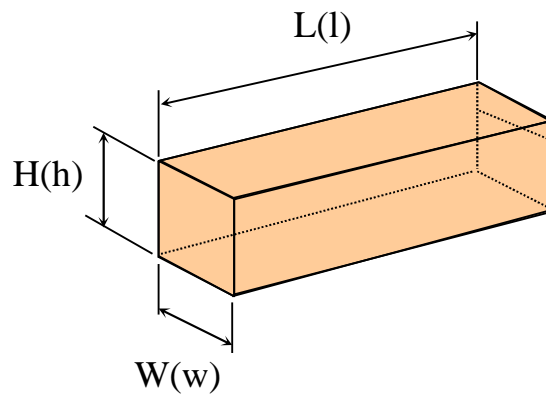
구분		H	W
MOR 1/2W	MORS 1W	8.0±0.5	15.0±1.0
MOR 1W	MORS 2W	8.0±0.5	15.0±1.0
MOR 2W	MORS 3W	8.0±0.5	20.0±1.0

8. Construction & Materials



NO	Material	Component
1	Ceramic Rod	Al ₂ O ₃ , SiO ₂
2	Film	SnCl ₂ , Antimon
3	CAP	Fe, Sn
4	LEAD WIRE	Cu, Sn
5	Silicon paint	Silicon Resin, SiO ₂
6	Color ink	Epoxy Resin

9. Packing



■ Remarks

1W : Standard (normal size) Type

1S : MINI (small size) Type

TYPE	ITEM	Quantity (pcs)		Dimension (mm)
		Inner box	Out box	Inner box
BULK	1/2W, 1WS	2,000	20,000	260*87*100
	1W, 2WS			
	2W, 3WS	1,000	10,000	
Taping type (Axial)	1/2W, 1WS	2,000	20,000	64mm 260*87*100 52mm 260*72*105
	1W, 2WS	1,500	15,000	
	2W, 3WS	800	8,000	
R-Forming (Radial)	1/2W, 1WS	2,000	16,000	330*50*127
	1W, 2WS	1,500	12,000	
M-Forming	1/2W, 1WS	3,000	30,000	260*87*100
	1W, 2WS	2,000	20,000	
	2W, 3WS	2,000	20,000	
MN-Forming (\sqsubset Form))	1/2W, 1WS	3,000	30,000	260*87*100
	1W, 2WS	2,000	20,000	
	2W, 3WS	2,000	20,000	
RF-Forming	2W, 3WS	2,000	20,000	260*87*100