

ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

COMPOLINK LTD

Description : Metal Oxide Film Fixed Resistors

Royalohm Part no.:

MOR01SJ0xxxA10 (MOR 1W-S +/- 5% T/B-1,000 PT-52mm.)

MOR01WJ0xxxA10 (MOR 1W +/- 5% T/B-1,000 PT-52mm.)

Approved by

RoHS V3 Compliant (EU) 2015/863

REACH Compliant

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Issued Date: 2020/04/16

Metal Oxide Film Fixed Resistors

1. Scope:

This specification for approval relates to Metal Oxide Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	<u>MOR</u>	<u>1W</u>	<u>J</u>	<u>10 Ω</u>
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Type		Rated Power at 70	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Operating Temp. Range
Normal size	MO-100	1 W	350 V	600 V	350 V	0.3Ω--50KΩ	-55°C -- +155°C
Small size	MO-100-S	1 W	350 V	600 V	350 V	0.3Ω--50KΩ	

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 °C. For temperature in excess of 70 °C , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

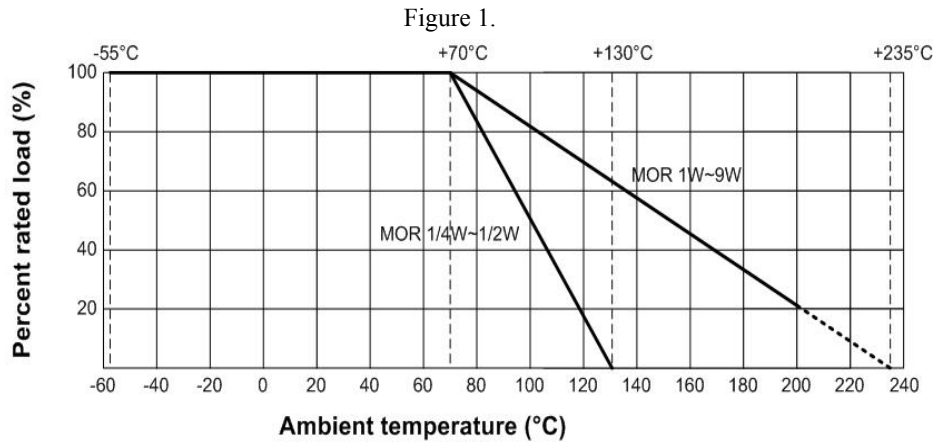
Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

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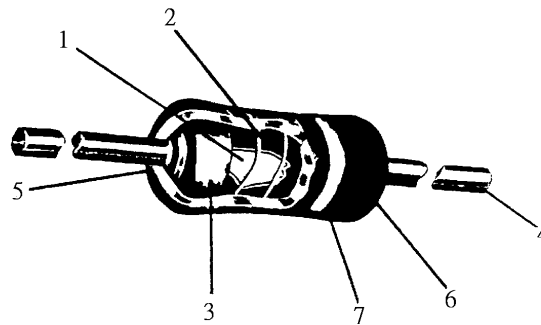
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-24 series, and resistance tolerance shall be shown by table 1.

4. Construction :



No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	0.1Ω ≤ R ≤ 12Ω : CNP film 10Ω ≤ R ≤ 100kΩ : Metal oxide film R > 100kΩ : Carbon film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By welding
6	Coating	Normal size: --Insulated & Non-Flame Paint (Color : Gray) Small size: --Insulated & Non-Flame Paint (Color : Sea-Blue)
7	Color Code	Non-Flame epoxy resin

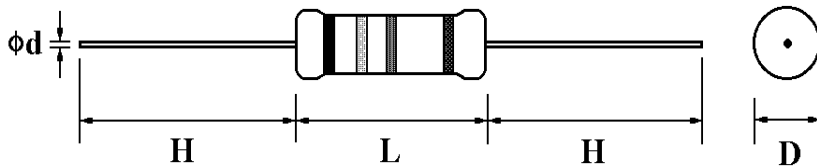
Metal Oxide Film Fixed Resistors		
5. Characteristics :		
Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. Resistance	Must be within the specified tolerance	5.1 The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance
Temperature coefficient	T.C.R. (PPM/°C) : ±350 PPM/°C	5.2 Natural resistance change per temp. degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \quad (\text{PPM}/^\circ\text{C})$ R1: Resistance value at room temperature (t1) R2: Resistance value at room temp. plus 100 °C (t2)
Short time overload	Resistance change rate is Normal Size : ± (1% + 0.05 Ω) Max. Small Size : ± (2% + 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 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 Normal Size : ± (2% + 0.05Ω) Max. Small Size : ± (5% + 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 or the max. pulse overload voltage
Terminal strength	With no evidence of mechanical damage	6.1 Direct load : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads Twist test : Terminal leads shall be bent through 90 ° at 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

Metal Oxide Film Fixed Resistors																	
Characteristics	Limits	Test Methods (JIS C 5201-1)															
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 mm to 4.8 mm from the body in $350^{\circ}\text{C} \pm 10^{\circ}\text{C}$ solder for 3 ± 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 $\pm (2\% + 0.05\Omega)$ Max. with no evidence of mechanical damage	7.4 Resistance change after continuous 5 cycles for duty shown below:															
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Step</th> <th style="text-align: center;">Temperature</th> <th style="text-align: center;">Time</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$</td> <td style="text-align: center;">30 mins</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Room temp.</td> <td style="text-align: center;">10~15 mins</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$</td> <td style="text-align: center;">30 mins</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">Room temp.</td> <td style="text-align: center;">10~15 mins</td> </tr> </tbody> </table>	Step	Temperature	Time	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
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		2	Room temp.	10~15 mins													
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4	Room temp.	10~15 mins															
Load life in humidity	Resistance value	$\Delta R/R$															
	Less than 100K Ω	$\pm 5\%$															
	100K Ω or more	$\pm 10\%$															
		7.9 Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity chamber controlled at $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 90 to 95 % relative humidity															
Load life	Resistance value	$\Delta R/R$															
	Less than 100K Ω	$\pm 5\%$															
	100K Ω or more	$\pm 10\%$															
		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															

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6. Dimension :

Unit: mm

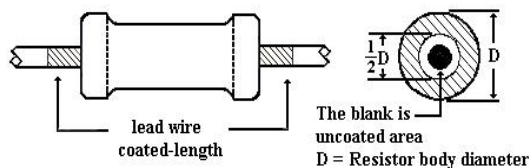


Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
MOR-1WS	1W	3.5 mm	10.0 mm	0.54 mm	28 mm
MOR-1W	1W	5.0 mm	12.0 mm	0.70 mm	25 mm

7. Marking :

7.1 Resistor :

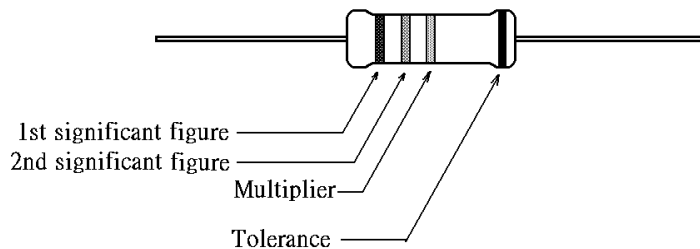
Resistors shall be marked with color coding colors shall be in accordance with JIS C 0802



7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding colors shall be in accordance with JIS C 0802



7.2 Label :

Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

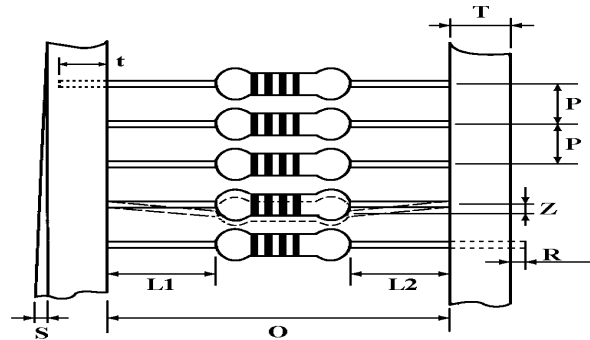
Example :

Metal Oxide Film Fixed Resistors	
Watt : 1W	Val : 12 Ω
Q'TY : 1,000	Tol : 5%
Lot : 702312	PPM :
ROYALOHM	Pb-Free

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8. Packing specification :

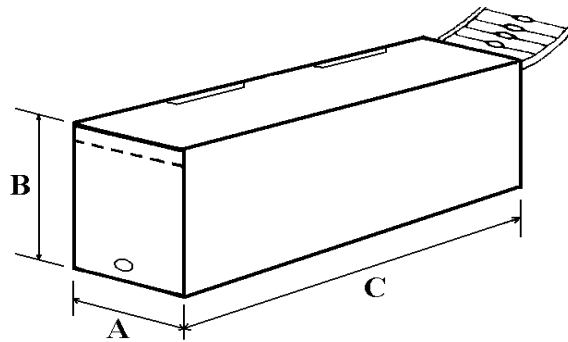
8.1 Taping dimension :



Dimensions (mm)

Type	Style	O	P	L1-L2	T	Z	R	t	S
MOR-100-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
MOR-100	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.

8.2 Tape in box packing :



Bandoliers may also be contained in a cardboard box ("Ammopack")

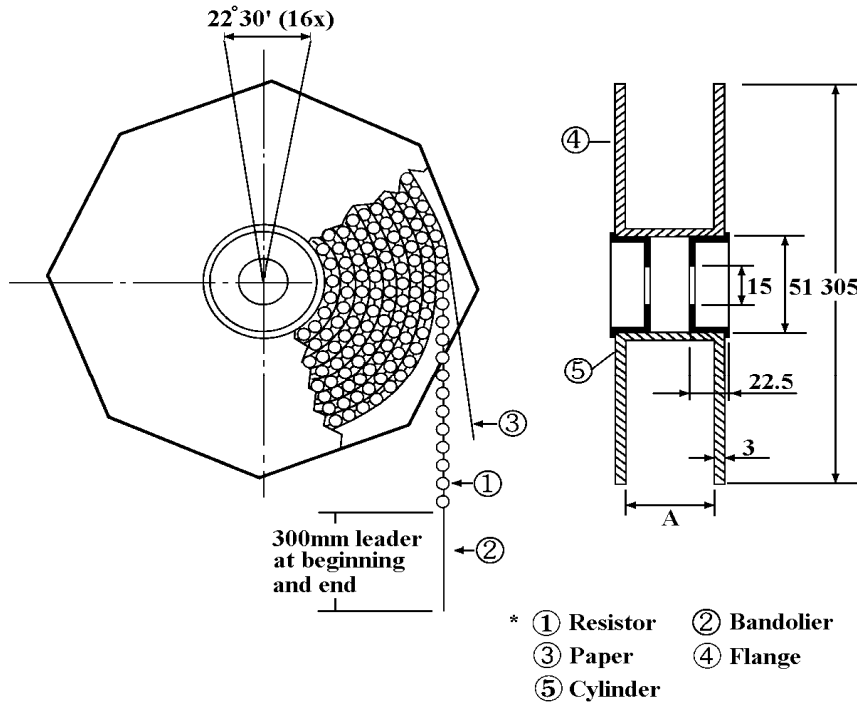
Dimension (mm)

Type	Style	L (C) ± 5	W (A) ± 5	H (B) ± 5	Quantity Per Box (pcs.)
MOR-100-S	PT-52	260	85	70	1,000
MOR-100	PT-52	262	86	80	1,000

"Ammopack" is an abbreviation of "ammunition pack"

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8.3 Tape on reel packing :



Dimension (mm) :

Type	Style	Across Flange (A)	Quantity Per Reel
MOR-100	PT-52	73 ± 2	2,500
MOR-100-S	PT-52	73 ± 2	2,500

Part Number System

Explanation of Part Number System (Metal Oxide Film Fixed Resistors)

1 2 3 4 5 6 7 8 9 10 11 12 13 14
M O R 0 1 W J 0 1 0 0 A 1 0

Resistor Type:
MOR = Metal Oxide Film Fixed Resistor

Special Feature:
0 = Standard Product
I = Non-Inductive Product

Tolerance:
F ~ ± 1%
G ~ ± 2%
J ~ ± 5%
K ~ ± 10%

Resistance Value:
E-24 series: the 1st digit is "0", the 2nd & 3rd digits are for the significant figures of the resistance and the 4th indicate the number of zeros following:
 "J" ~ 0.1, "K" ~ 0.01
 Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
E--96 Series: the 1st to 3rd digits are significant figures of resistance and the fourth one denotes number of zeros following:
 Ex.: 1.33KΩ = 1331

Packing Quantity:
 1 = 1,000pcs
 2 = 2,000pcs
 3 = 3,000pcs
 4 = 4,000pcs
 5 = 5,000pcs
 A = 500pcs
 B = 2,500pcs
 0 = for Bulk/Box packing

Packing Type:
 A = Tape/Box
 T = Tape/Reel
 B = Bulk/Box
 P = Tape/Box of PT-26mm

Wattage:

<p>Normal size: W4 = 1/4W W2 = 1/2W 1W = 1W 2W = 2W 3W = 3W 5W = 5W 7W = 7W 8W = 8W 9W = 9W</p>	<p>Small size: S2 = 1/2W-S 1S = 1W-S 2S = 2W-S 3S = 3W-S 5S = 5W-S</p>
<p>Extra Small size: 5U = 5W-SS</p>	

Addition Information:
 0 = PT-52mm, NIL for PT-26mm
 8 = PT-58mm
 9 = PT-64mm
 7 = Lead wire(H) 38mm
 A = PT-83mm
 C = PT-73mm
 D = PT-71mm

Sample: MOR 1W-S +/- 5% 10Ω PT-52mm T/B-1,000 → MOR01SJ0100A10
 MOR 1W +/- 5% 10Ω PT-52mm T/B-1,000 → MOR01WJ0100A10

Metal Oxide Film Fixed Resistors

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.

This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and a relative humidity of $60\%RH \pm 10\%RH$, chemical and dust free atmosphere

Even within the above guarantee periods, do not store these products in the following conditions.

Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2 , H_2S , NH_3 , SO_2 , or NO_2
2. In direct sunlight