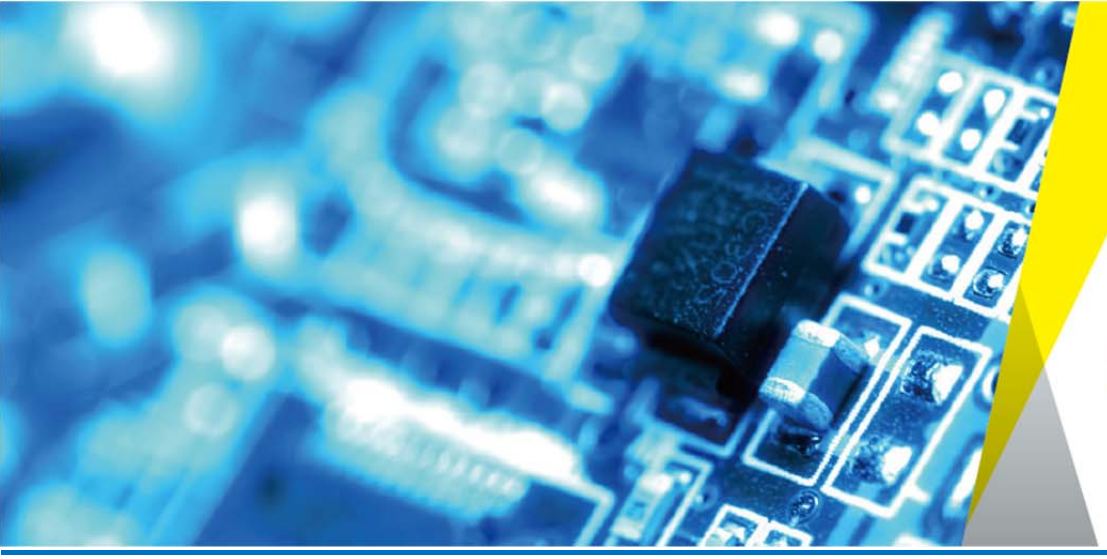

DATASHEET

Product Name	**Terminal Type Metal Oxide Film Resistors**
Part Name	**TMOV、TMOR、TMOL Series**
File No.	**DIP-SP-005**

Uniroyal Electronics Global Co., Ltd.

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	Aeon Technology Corporation
	Royal Electronic Factory (Thailand) Co., Ltd.
	Royal Technology (Thailand) Co., Ltd.

1. Scope

1.1 This specification for approve relates to the Terminal Type Metal Oxide Film Resistors manufactured by UNI-ROYAL
1.2 Excellent flame retardant coating.
1.3 High stability even bad environment.
1.4 High safety standard.
1.5 Meet EIAJ-RC2655A requirements .
1.6 Too low or too high ohmic value can be provided on a case to case basis
1.7 Compliant with RoHS directive.
1.8 Halogen free requirement.

2. Part No. System

The standard Part No. includes 14 digits with the following explanation:

2.1 1th ~4th digits
This is to indicate the Chip Resistor. Example: TMOV=Terminal MOR-Vertical ; TMOR=Terminal MOR-Radial ; TMOL= Terminal MOR-L type terminal

2.2 5th~6th digits:

2.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers,
The following codes are used; and please refer to the following chart for detail:
W=Normal Size; 1"~"G"to denote"1"~"16"as Hexadecimal:

1/16W~1W: (＜1W)

Wattage	1/2	1/3	1/4	1/5	1/6	1/8	1/10	1/16
Normal Size	W2	W3	W4	W5	W6	W8	WA	WG
Small Size	S2	S3	S4	S5	S6	S8	SA	SG
Extra Small Size	U2	U3	U4	U5	U6	U8	UA	UG

1W~16W (≧1W)

Wattage	1	2	3	5	7	8	9	10	15
Normal Size	1W	2W	3W	5W	7W	8W	9W	AW	FW
Small Size	1S	2S	3S	5S	7S	8S	9S	AS	FS
Extra Small Size	1U	2U	3U	5U	7U	8U	9U	AU	FU

2.2.2 For power rating less or equal to 1 watt, the 5th digit will be the letters W to represent the size required & the 6th digit will be a number or a letter code. Example: WA=1/10W; W4=1/4W

2.2 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance. D=±0.5% F=±1% G=±2% J=±5% K= ±10%

2.3 The 8th to 11th digits is to denote the Resistance Value.

2.4.1 For the standard resistance values of 5%&10% series, the 8th digit is "0",the 9th & 10th digits are to denote the significant figures of the resistance and the 11th digit is the number of zeros following;
For the standard resistance values of ≤2% series in, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.

2.4.2 The following number s and the letter codes are to be used to indicate the number of zeros in the 11th digit:0=10^0 1=10^1 2=10^2 3=10^3 4=10^4 5=10^5 6=10^6 J=10^{-1} K=10^{-2} L=10^{-3} M=10^{-4}

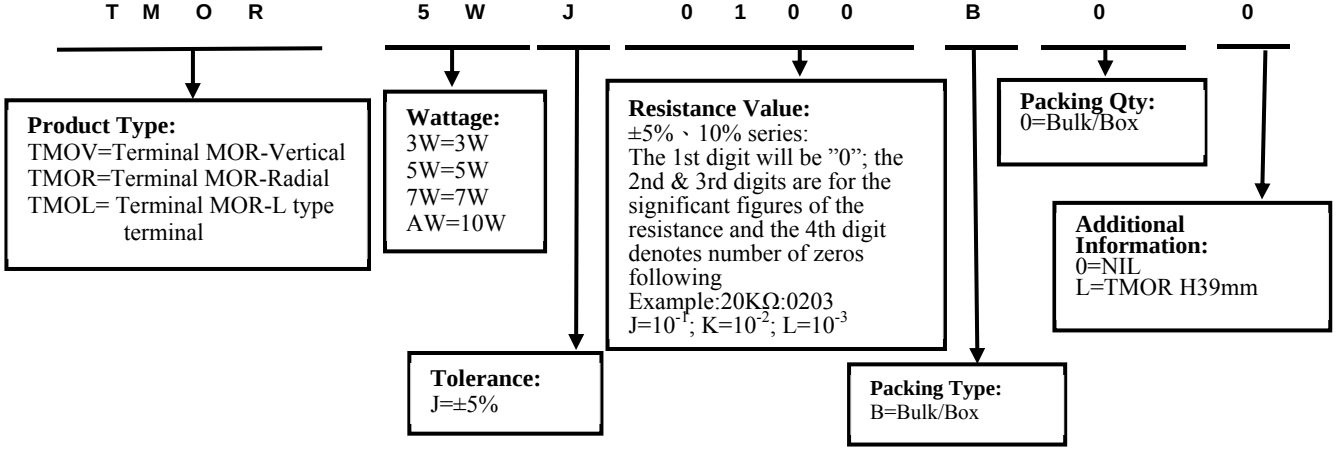
2.4.3 The 12th, 13th & 14th digits.
The 12th digit is to denote the Packaging Type with the following codes:
C=Bulk in (Chip Product) T=Tape/Reel

2.4.4 The 13th digit is normally to indicate the Packing Quantity of Tape/Reel packaging types. The following letter code is to be used for some packing quantities:
4=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

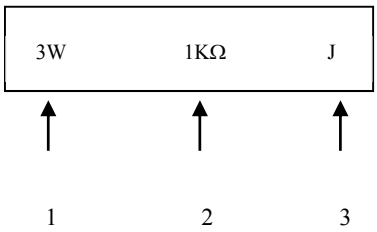
2.4.5 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:
0=NIL

3. Ordering Procedure

(Example: TMOR 5W ±5% 10Ω B/B)



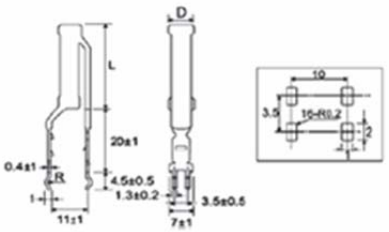
4. Marking



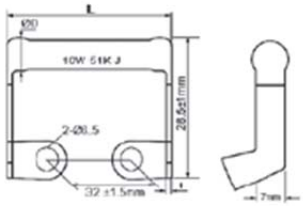
Code description and regulation:
1. Wattage Rating
2. Nominal Resistance Value
3. Resistance Tolerance.
   F: ±1%
   G: ±2%
   J: ±5%
   K: ±10%

5. Dimension

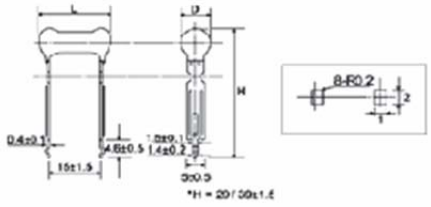
Vertical type-TMOV



"L" type terminal-TMOL

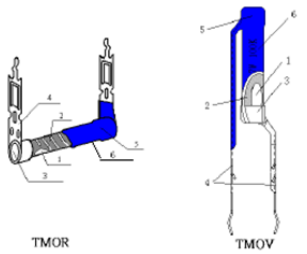


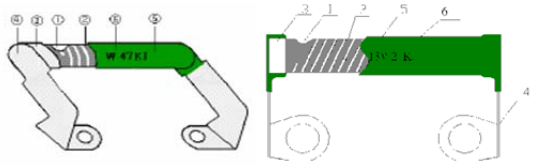
Radial type-TMOR



Type	Power Rating	Dimension(mm)		Max. Working Voltage	Max. Overload Voltage	Resistance Range	Tolerance
		L±1	D±1				
TMOV	5W	20	7	500V	800V	≤10Ω	±10%
						10Ω~10KΩ	±5%
TMOV	7W	30	7	500V	800V	≤10Ω	±10%
						10Ω~10KΩ	±5%
TMOL	10W	46 Max.	10Max.	500V	800V	100Ω~82KΩ	±5%
TMOL	13W	47	10	750V	1000V	100Ω~82KΩ	±5%
TMOR	3W	16	6	350V	600V	≤10Ω	±10%
						10Ω~43KΩ	±5%
TMOR	5W	18	7	500V	800V	≤10Ω	±10%
						10Ω~43KΩ	±5%

6. Structure





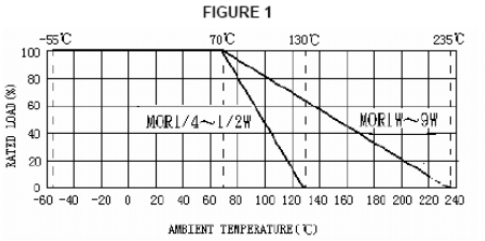
TMO

No.	Name	Material
1	Basic body	Rod type ceramics
2	Resistor	Metal Oxide Film
3	Cap	Tin plated iron
4	Terminal lug	Steel
5	Coating	Insulated and non-flame paint Color: TMOR、TMOV (Sea Blue) TMOL (Deep Green)
6	Marking	Epoxy resin

7. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, the load shall be derated as shown in figure 1

Figure 1



7.1 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:

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

Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

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

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less

8. Performance Specification

Characteristic	Limits	Test Methods (JIS-C-5201& JIS-C-5202-1)
Temperature Coefficient	±350PPM/℃Max..	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance Value at room temperature （t_1）; R_2: Resistance at test temperature （t_2） t_1: +25°C or specified room temperature t_2: Test temperature（-55℃or 125℃）
Short-time overload	Resistance change rate must be in ±(2%+0.05Ω) ,and no mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max.Overload Voltage whichever less for 5 seconds.
Terminal strength	No evidence of mechanical damage	4.16 Direct load: Resistance to a 2.5Kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. Twist test: 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.
Load life in humidity	ΔR/R: ±5%	7.9 resistance change after 1,000 hours (1.5 hours “ON”,0.5 hour “OFF”) at RCWV or Max. Overload Voltage whichever less in a humidity test chamber controlled at 40℃±2℃ and 90 to 95% relative humidity.
Load life	ΔR/R: ±5%	4.25.1 permanent resistance change after 1,000 hours operating at RCWV or Max. Overload Voltage whichever less with duty cycle of 1.5 hours “ON”, 0.5 hour “OFF” at 70℃±2℃ ambient.
Low Temperature Storage	ΔR/R: ±5%	IEC 60068-2-1 (Aa) Lower limit temperature，for 2H.

High Temperature Exposure	ΔR/R: ±5%	MIL-STD-202 108A Upper limit temperature ，for 16H.
Rapid change of temperature	Resistance change rate must be in ±(2.0%+0.05Ω) ,and no mechanical damage.	4.19 30 min at -55 °C and 30 min at 155°C; 100 cycles.

9. Precaution for storage/Transportation

9.1. UNI-ROYAL recommend products store in warehouse with temperature between 15 to 35℃ under humidity between 25 to 75%RH.
Even under storage conditions recommended above, solder ability of products will be degraded stored over 1 year old.

9.2. Cartons must be placed in correct direction which indicated on carton, otherwise the reel or wire will be deformed.

9.3. Storage conditions as below are inappropriate:

a. Stored in high electrostatic environment

b. Stored in direct sunshine, rain, snow or condensation.

c. Exposed to sea wind or corrosive gases, such as Cl_2, H_2S, NH_3, SO_2, NO_2, Br etc.

10. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~5	Mar.20, 2018	Haiyan Chen	Nana Chen
2	Modify characteristic	5~6	Feb.19, 2019	Haiyan Chen	Yuhua Xu
3	Modify the temperature coefficient test conditions	4	Oct.28, 2022	Haiyan Chen	Yuhua Xu