



**UNI-ROYAL**  
厚聲集團

# DATA SHEET

**Product Name**    **Metal Film Leadless Fixed Resistors**

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**Part Name**    **M24、 M27 Series**

## **Uniroyal Electronics Global Co., Ltd.**

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## 1. Scope

- 1.1 This specification for approve relates Metal Film Leadless Fixed Resistors manufactured by URNI-ROYAL.  
 1.2 SMD enabled structure  
 1.3 Excellent solderability termination  
 1.4 Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

## 2. Part No. System

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

2.1 Coated type, the 1<sup>st</sup> to 3<sup>rd</sup> digits are to indicate the product type.

Example: M27=Metal Film Fixed Resistors;

2.2 The 4<sup>th</sup>~5<sup>th</sup> digits:

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

Wattage	1/6	1/4	1/3	1/2
Normal Size	W6	W4	W3	W2

2.3 The 6<sup>th</sup> digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.

F=±1%    G=±2%    J=±5%

2.4 The 7<sup>th</sup> digit is to denote the Resistance Temperature Coefficient

2.5 The 8<sup>th</sup> to 11<sup>th</sup> digits is to denote the Resistance Value.

2.5.1 For the standard resistance values of E-24 series, the 8<sup>th</sup> & 10<sup>th</sup> digits are to denote the significant figures of the resistance and the 11<sup>th</sup> digit is the number of zeros following;

2.5.2 The following numbers and the letter codes are to be used to indicate the number of zeros in the 11<sup>th</sup> digit:

0=10<sup>0</sup>    1=10<sup>1</sup>    2=10<sup>2</sup>    3=10<sup>3</sup>    4=10<sup>4</sup>    5=10<sup>5</sup>    6=10<sup>6</sup>    J=10<sup>-1</sup>    K=10<sup>-2</sup>    L=10<sup>-3</sup>    M=10<sup>-4</sup>

2.5.3 The 12<sup>th</sup>, 13<sup>th</sup> & 14<sup>th</sup> digits.

The 12th digit is to denote the Packaging Type with the following codes:

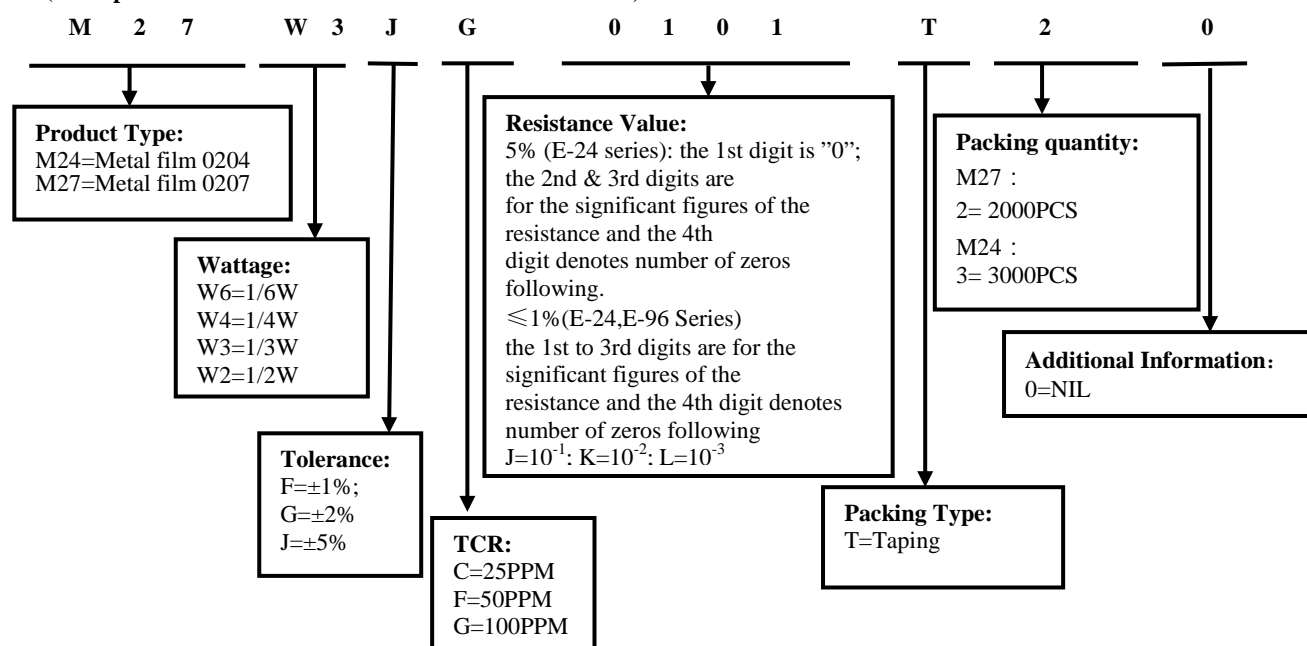
B=Bulk    T=Taping

2.6 The 13<sup>th</sup> digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. The following letter code is to be used for some packing quantities: 2=2000pcs    3=3000pcs

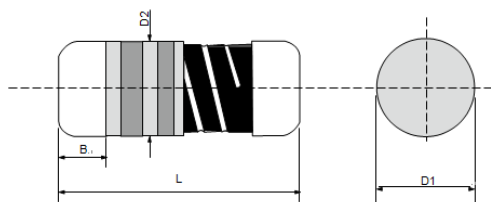
2.7 For some items, the 14<sup>th</sup> digit alone can use to denote special features of additional information with the following codes: 0=NIL

## 3. Ordering Procedure

(Example: M27 1/3W ±5% 100Ω 100PPM/°C T/R-2000 )



### 3. Dimension



Type	Dimension (mm)			
	L	D1	D2	B
M24	$3.52 \pm 0.15$	$1.35 \pm 0.1$	$D1+0.02/-0.15$	0.6 Min.
M27	$5.90 \pm 0.20$	$2.20 \pm 0.1$	$D1+0.02/-0.2$	1.0 Min.

### 4. Electrical Specifications

#### 4.1 Ratings

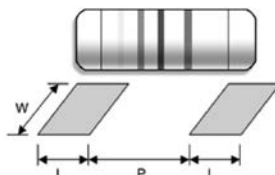
Type	Power Rating At 70°C	Max. Working Voltage	Max. Overload Voltage	Resistance Range	Resistance Tolerance
M24	1/6W	200V	400V	0.51Ω~10MΩ	±1%,±2%,±5%
	1/4W				
M27	1/3W	250V	500V	0.51Ω~10MΩ	
	1/2W				

#### 4.2 Characteristics

Characteristics	Ranges & Limits	
Operating Temperature Range, °C	-55 ~ +125	
Temperature Coefficient, PPM / °C*	±1%, ±2%	±25, ±50, ±100
	±5%	±100
Dielectric Withstanding Voltage, VAC or DC	M24	200V
	M27	500V
Insulation Resistance, MΩ	>10 <sup>4</sup>	
Film Temperature, °C	M24 1/6W 1/4W ; M27 1/3W	125
	M27 1/2W	140
Failure Rate, pcs/10 <sup>9</sup> device hours	<0.1	
Thermal Resistance, K/W	<220	
Tin Whisker (JESD201 Temperature Cycling & High Temp. / Humidity Storage), μm	<5	

\* Not applicable to all resistance values. Please check with us regarding the PPM of specific resistance value(s).

### 5. Soldering pad size recommended

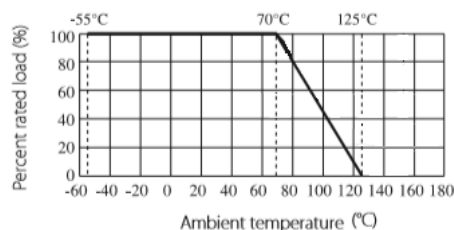


Type	Soldering Mode	L (Min.)	P	W (Min.)
M24	Reflow	1.3	$1.6 \pm 0.1$	1.6
	Wave	1.5	$1.5 \pm 0.1$	1.8
M27	Reflow	2.0	$3.0 \pm 0.1$	3.0
	Wave	2.5	$3.0 \pm 0.1$	3.0

Unit: mm

For better heat dissipation / lower heat resistance, increase W & L.

## 6. Derating Curve



### 6.1 Voltage rating:

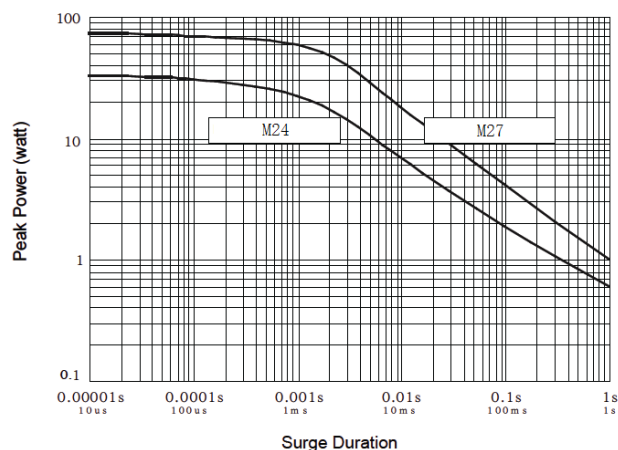
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

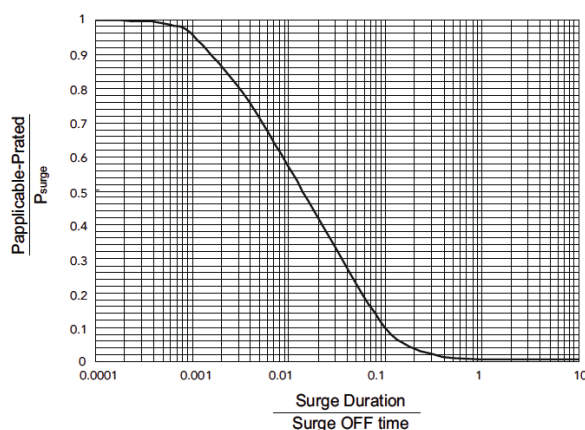
Where: RCWV = rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (VOLT.)

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

## 7. Single surge performance



## 8. Surge power derating curve



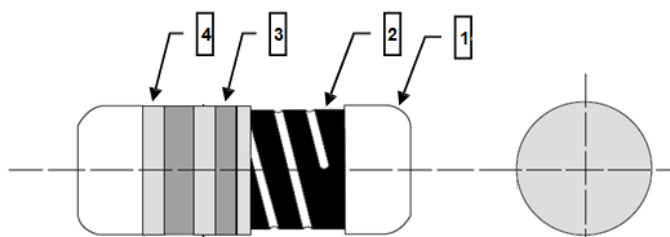
### Notes:

Single Surge Performance graph is good for non repetitive applications operating in an ambient temperature of 70°C or less. For temperatures above 70°C, the graph power must be derated further linearly down to zero at 125°C.

To determine applicable surge power in continuous-surge applications:

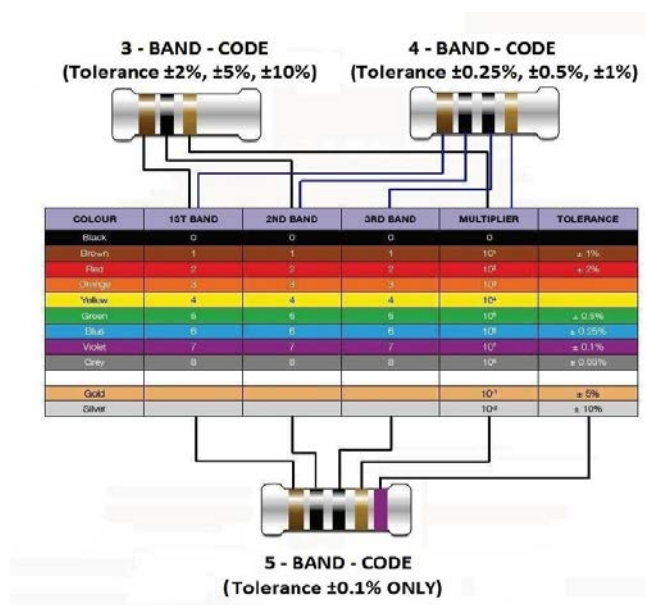
1. Identify allowable duration and peak power  $P_{\text{surge}}$  of single surge;
2. Determine ratio of surge duration/surge off time in application;
3. Calculate  $P_{\text{applicable}}$  backwardly according to Y-axis of Surge power Derating Curve.

## 9. Structure



NO	Parts	Materials
1	Cap	Base Metal: Fe, Plating: Sn/Cu
2	Resistive element	Metal Alloy Film
3	Marking	Silicone Resin
4	Coating	Epoxy Resin: Blue

## 10. Standard Color Code



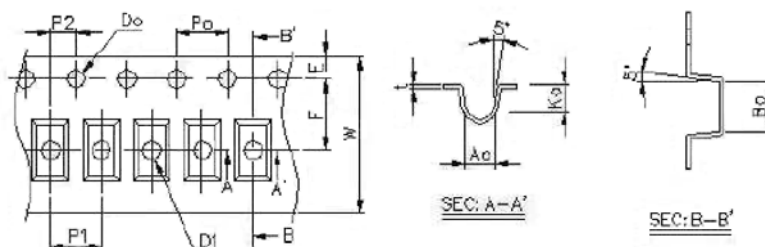
## 11. Performance Specification

Characteristics	Test Conditions	Limits	
Short Time Overload	<b>IEC 60115-1 4.13</b> 5 seconds 2.5x rated voltage (not over max. overload voltage)	0.51 $\Omega$ ~332K $\Omega$	$\pm 0.05\%$
		>332K $\Omega$	$\pm 0.15\%$
Load Life	<b>IEC 60115-1 4.25.1</b> Rated load (not over max. working voltage) 1000 hrs with 1.5 hours ON, 0.5 hours OFF, at (70 $\pm$ 2) $^{\circ}$ C	$\pm 0.5\%$	
Load Life In Humidity	<b>IEC 60115-1 4.24</b> 56 days rated load (not over max. working voltage) at (40 $\pm$ 2) $^{\circ}$ C and (93 $\pm$ 3)% relative humidity	$\pm 0.35\%$	
Load Life In Humidity (accelerated mode)	<b>IEC 60115-1 4.37</b> 1,000 hours at 85 $^{\circ}$ C and 85% relative humidity with 0.1x rated voltage (not over 100V)	<10 $\Omega$	$\pm 1.0\%$
		10 $\Omega$ $\leq$ R < 10K $\Omega$	$\pm 0.5\%$
		10K $\Omega$ $\leq$ R < 332K $\Omega$	$\pm 0.75\%$
		>332K $\Omega$	$\pm 1.0\%$
Periodic Electric Overload	<b>IEC 60115-1 4.39</b> 3.9x rated voltage (not over max. overload voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	$\pm 0.5\%$	
Resistance To Soldering Heat	<b>IEC 60115-1 4.18.2</b> Dip the resistor into a solder bath measured (260 $\pm$ 5) $^{\circ}$ C and hold it for a 10 $\pm$ 1 seconds	<1 $\Omega$	$\pm 0.25\%$
		1 $\Omega$ $\leq$ R $\leq$ 332K $\Omega$	$\pm 0.1\%$
		>332K $\Omega$	$\pm 0.25\%$

Thermal Endurance	<b>IEC 60115-1 4.25.3</b> 1,000 hours without load	85°C	<1Ω	±0.25%
			$1\Omega \leq R \leq 100\Omega$	±0.2%
			$100\Omega < R \leq 332K\Omega$	±0.2%
			> 332KΩ	±0.25%
		125°C	<1Ω	±0.5%
			$1\Omega \leq R \leq 100\Omega$	±0.25%
			$100\Omega < R \leq 332K\Omega$	±0.25%
Thermal Shock	<b>IEC 60115-1 4.19</b> -55°C 30minutes, +125°C 30minutes	5 cycles	<1Ω	±0.15%
			$1\Omega \leq R \leq 332K\Omega$	±0.05%
			> 332KΩ	±0.15%
		1,000 cycles	<1Ω	±0.5%
			$1\Omega \leq R \leq 332K\Omega$	±0.2%
			> 332KΩ	±0.5%
Single pulse high voltage overload	<b>IEC 60115-1 4.27</b> • 5 pulses of 1.2/50μs at 10x rated voltage (not over 400V for M24 ; not over 500V for M27) with interval of 12 sec. • 10 pulses of 10/700μs at 10x rated voltage (not over 400V for M24; not over 500V for M27) with interval of 60 sec.	±0.15%		
Electrostatic discharge (Human body model)	<b>IEC 60115-1 4.38</b> 3 positive & 3 negative discharges with 2KV for M24 or 4KV for M27 (For continuous surge application please see Surge Performance paragraph)	±0.5%		
Climatic test	<b>IEC 60115-1 4.23</b> 4.23.2 - dry heat: 16 hours 125°C 4.23.3 - damp heat: 24 hours 55°C with 95% relative humidity 4.23.4 - cold: 2 hours -55°C 4.23.5 - negative air pressure: 2 hour 8.5KPa at (25±10)°C 4.23.6 - damp heat cyclic: 5 days 55°C with 95% relative humidity 4.23.7 - DC load: rated voltage at -55°C and 125°C each for 1 min.	±0.5%		
Solderability	<b>IEC 60115-1 4.17.2</b> Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min.coverage		
Vibration	<b>IEC 60115-1 4.22</b> Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 1.52mm and 10 to 2,000 Hz.	±0.15%		
Bending test	<b>IEC 60115-1 4.33</b> Pressing depth 2mm, 3 times	±0.15%		
Flammability	<b>IEC 60115-1 4.35</b> Needle flame test 10s	No burning after 30s		

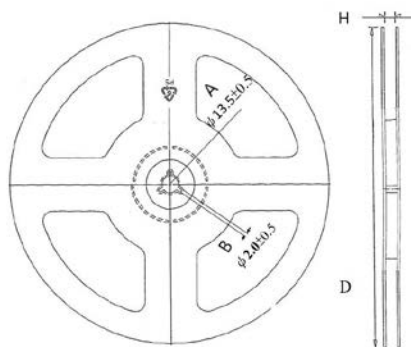
**12. Packing**

Carrier Dimensions:(Unit: mm)



Type	W	E	F	D0	D1	P0	P1	P2	T	A0	B0	K0
M24	8.00±0.20	1.75±0.10	3.50±0.05	1.50±0.10/-0	1.00±0.10	4.00±0.05	4.00±0.10	2.00±0.05	0.23±0.05	1.55±0.10	3.60±0.10	1.45±0.10
M27	12.00±0.20	1.75±0.10	5.50±0.05	1.50±0.10/-0	1.50±0.10	4.00±0.05	4.00±0.10	2.00±0.05	0.25±0.05	2.40±0.10	6.20±0.10	2.35±0.10

## 12.2 Dimension of Reel: (Unit: mm)



Type	Pieces/Reel	$A \pm 0.5$	$B \pm 0.5$	$\Phi D \pm 1$	$W \pm 0.5$
M24	3,000pcs	2.0	13.5	178.0	9.0
M27	2,000pcs	2.0	13.5	178.0	13.6

**13. Note**

13.1 UNI-ROYAL recommend products store in warehouse with temperature between 15 to 35°C 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.

13.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.

Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

13.3 Product performance and soldered connections may deteriorate if the products are stored in the following places:

- Storage in high Electrostatic.
- Storage in direct sunshine、rain and snow or condensation.
- Where the products are exposed to sea winds or corrosive gases, including  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$ ,  $\text{NO}_2$ .

**14. Record**

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~6	May.09, 2020	Song Nie	Yuhua Xu
2	1.Modify the M27 Max.Working Voltage 2.Modify the Performance Specification	3 5	Sep.07, 2020	Haiyan Chen	Yuhua Xu
3	Add the Structure & Standard Color Code & Packing	5 7	Nov.16,2020	Song Nie	Yuhua Xu
4	Add the Carrier Dimensions	7	Nov.23,2020	Song Nie	Yuhua Xu

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