



**UNI-ROYAL**  
厚聲集團

# DATA SHEET

**Product Name** Metal Film Leadless Fixed Resistors

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**Part Name** M24、M27 Series

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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 12<sup>th</sup> 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:

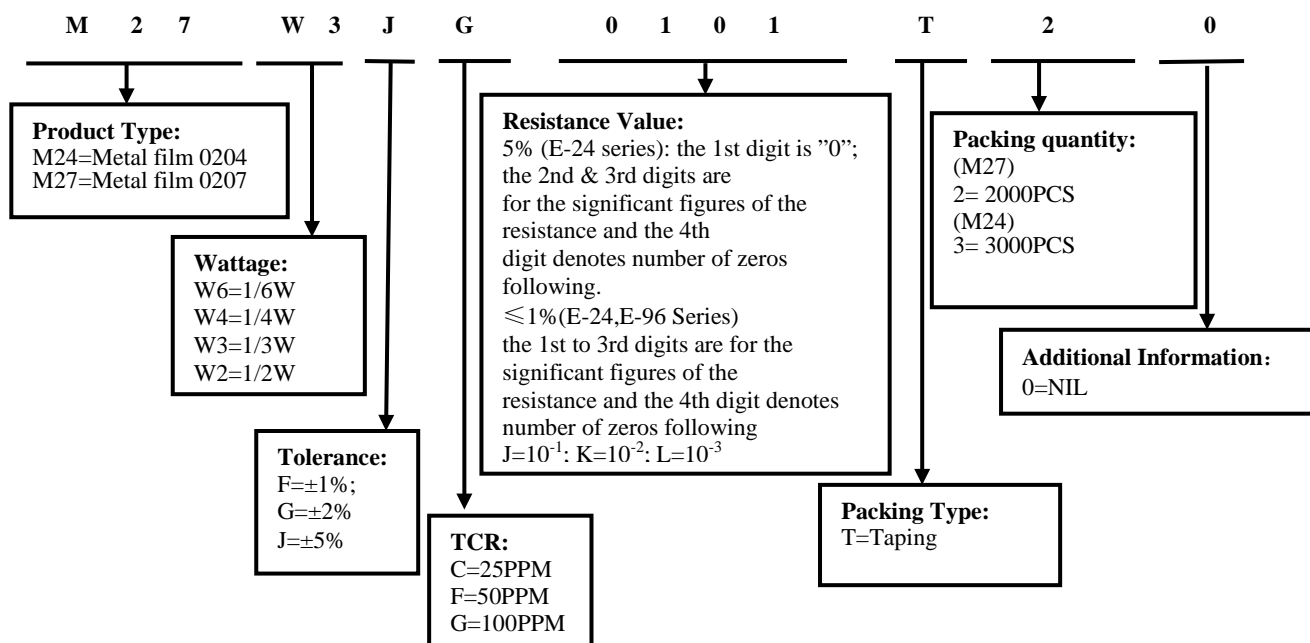
2=2000pcs    A=500pcs    B=2500pcs    C=10000pcs

D=20000pcs    G=25000pcs    H=50000pcs

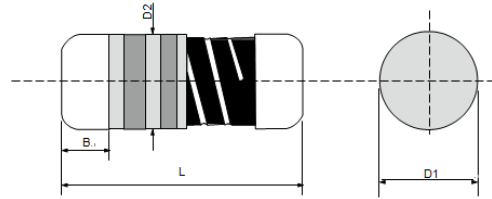
2.7 For some items, the 14<sup>th</sup> digit alone can use to denote special features of additional information with the following codes: 0=NIL

## 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

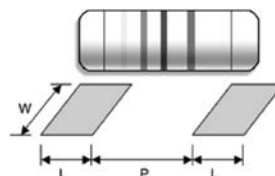
Type	Power Rating At 70°C	Max. Working Voltage	Max. Overload Voltage	Resistance Range	Resistance Tolerance
M24	1/6W	200V	400V	0.51Ω~10MΩ	±1%, ±2%, ±5%
	1/4W				
M27	1/3W	250V	500V	0.51Ω~10MΩ	
	1/2W				

#### 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	$>10^4$	
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

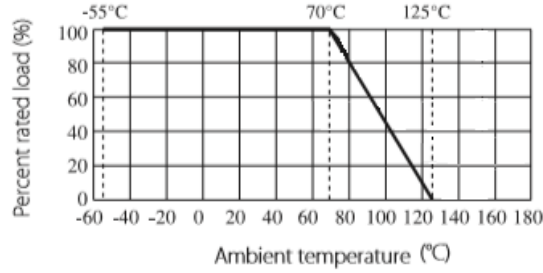


Unit: mm

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

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

**6. Derating Curve**



**6.1 Voltage rating:**

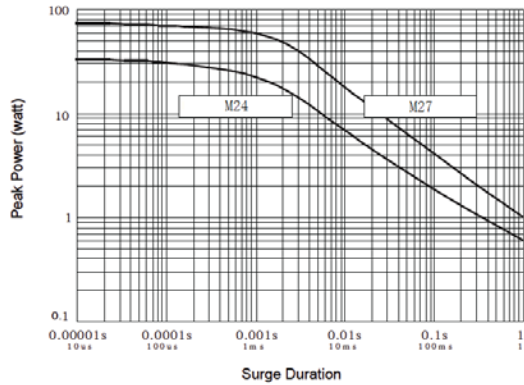
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

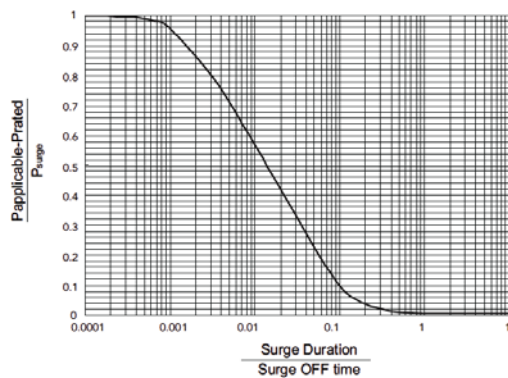
Where: RCWV = rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (VOLT.)

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<sub>surge</sub> of single surge;
2. Determine ratio of surge duration/surge OFF time in application;
3. Calculate P<sub>applicable</sub> backwardly according to Y-axis of SURGE POWER DERATING CURVE.

**9. 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)	0.51Ω to 332KΩ	±0.05%	
		>332KΩ	±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±2)°C	±0.5%		
Load Life In Humidity	<b>IEC 60115-1 4.24</b> 56 days rated load (not over max. working voltage) at (40±2)°C and (93±3)% relative humidity	±0.35%		
Load Life In Humidity (accelerated mode)	<b>IEC 60115-1 4.37</b> 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	<10Ω	±1.0%	
		10Ω to <10KΩ	±0.5%	
		10KΩ to 332KΩ	±0.75%	
		>332KΩ	±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	±0.5%		
Resistance To Soldering Heat	<b>IEC 60115-1 4.18.2</b> Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	<1Ω	±0.25%	
		1Ω to 332KΩ	±0.1%	
		>332KΩ	±0.25%	
Thermal Endurance	<b>IEC 60115-1 4.25.3</b> 1,000 hours without load	85°C	<1Ω	±0.25%
			1Ω to 100Ω	±0.2%
			>100Ω to 332KΩ	±0.2%
		125°C	> 332KΩ	±0.25%
			<1Ω	±0.5%
			1Ω to 100Ω	±0.25%
Thermal Shock	<b>IEC 60115-1 4.19</b> -55°C 30minutes, +125°C 30minutes	5 cycles	>100Ω to 332KΩ	±0.25%
			> 332KΩ	±0.5%
			<1Ω	±0.15%
		1,000 cycles	1Ω to 332KΩ	±0.05%
			> 332KΩ	±0.15%
			<1Ω	±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	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		



**10. Note**

10.1 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.

10.2 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.

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

- a. Storage in high Electrostatic.
- b. Storage in direct sunshine、rain and snow or condensation.
- c. Where the products are exposed to sea winds or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S<sub>3</sub> NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>.

**11. 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	3	Sep.07, 2020	Haiyan Chen	Yuhua Xu
	2.Modify the Performance Specification	5			

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