

DATASHEET

Product Name **Anti-Surge Wire Wound MELF Resistors**

Part Name **WM39、WM41、WM42、WM55 Series**

File No. **DIP-SP-105**

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1. Scope

- 1.1 This datasheet is the characteristics of Anti-Surge Wire Wound MELF Resistors manufactured by UNI-ROYAL.
- 1.2 SMD enabled structure.
- 1.3 Flameproof multi-layer coating equivalent to UL 94 V-0.
- 1.4 Flameproof feature equivalent to overload test UL 1412
- 1.5 Enhanced weld spot is reliable against surge.
- 1.6 Do not contain substances of very high concern identified by European Chemicals Agency.
- 1.7 WM series is applied in high surge applications such as high rush current protection for power capacitor, motor start-up protection, car & motorcycle engine ignition, etc. to absorb harmful surge energy, so to prevent hazard of circuit damage caused by surge energy.
- 1.8 Compliant with RoHS directive.
- 1.9 Halogen free requirement.

2. Part No. System

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

2.1 The 1st to 4th digits are to indicate the product type.

Example: WM41= Anti-Surge Wire Wound MELF Resistors;

2.2 The 5th~6th digits:

This is to indicate the wattage or power rating. To distinguish the size and the numbers,

The following codes are used; and please refer to the following chart for detail:

W=Normal Size

Wattage	1	2	3	4
Normal Size	1W	2W	3W	4W

2.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance: J=±5%

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

2.4.1 If value belongs to standard value of E-24 series, the 8th code is zero, 9th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.

2.4.2 If value belongs to standard value of E-96 series, the 8th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.

2.4.3 The following numbers and the letter codes are to be used to indicate the number of zeros in the 11th digit:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

2.5 The 12th, 13th & 14th digits.

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

T=Taping B=Bulk

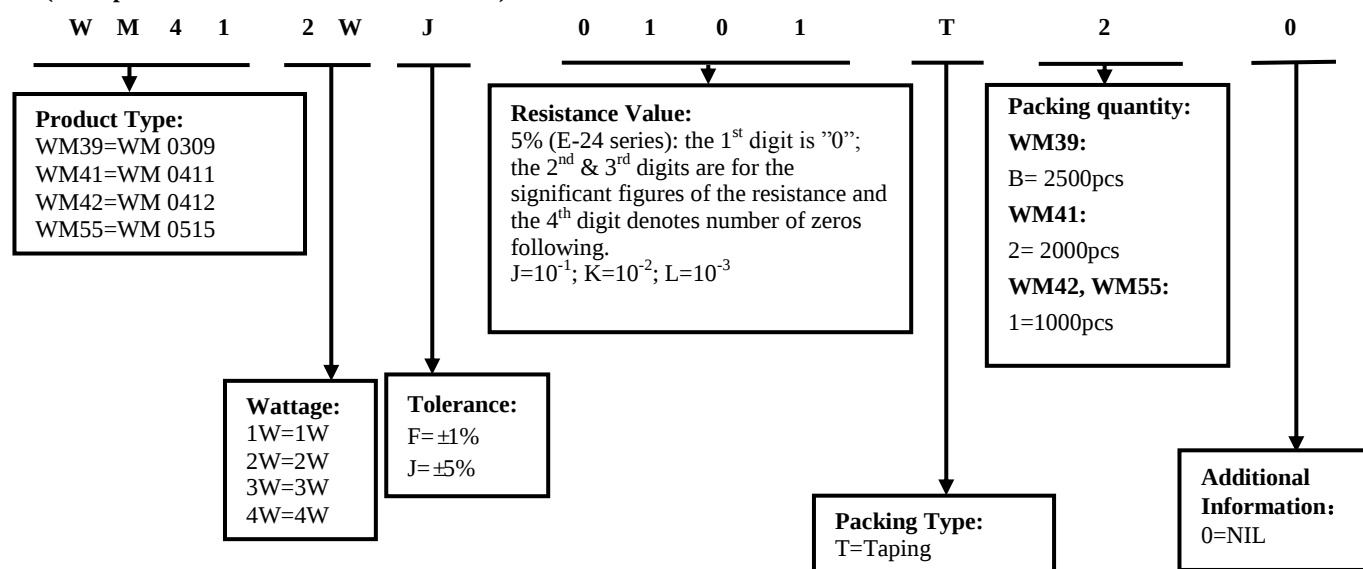
2.5.2 The 13th digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. The following letter code is to be used for some packing quantities:

1=1000pcs 2=2000pcs B=2500pcs

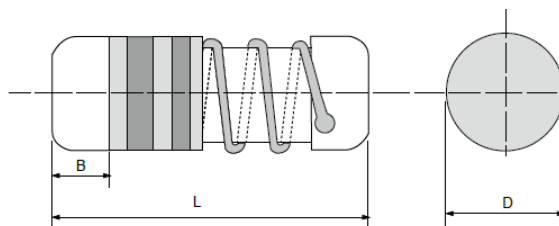
2.6 For some items, the 14th digit alone can use to denote special features of additional information with the following codes: 0=NIL

3. Ordering Procedure

(Example: WM41 1W ±5% 100 Ω T/R-2000)



4. Dimension



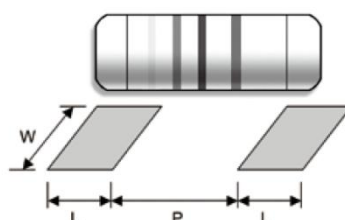
Type	Dimension (mm)		
	L	D	B
WM39	8.5 ±0.5	3.0 ±0.2	1.3 Min.
WM41	10.5 ±0.5	4.0 ±0.5	1.6 Min.
WM42	12.6 ±0.6	4.6 ±0.5	1.8 Min.
WM55	14.6 ±0.6	5.1 ±0.5	2.0 Min.

5. Ratings

Type	Power Rating	Max Working Voltage	Max Overload Voltage	Maximum Permissible Surge Voltage	Resistance range (E-24)	Resistance Tolerance	Temperature Coefficient, PPM / °C*	Operating Temperature Range, °C
WM39	1W	$\sqrt{P \times R}$	$2.5 \times \sqrt{P \times R}$	7.5KV	1 Ω~2KΩ	±1%; ±5%	±100, ±200	-55°C~+200°C
WM41	2W	$\sqrt{P \times R}$	$2.5 \times \sqrt{P \times R}$	8.5KV	1 Ω~2KΩ			
WM42	3W	$\sqrt{P \times R}$	$2.5 \times \sqrt{P \times R}$	9KV	1 Ω~3KΩ			
WM55	4W	$\sqrt{P \times R}$	$2.5 \times \sqrt{P \times R}$	10KV	1 Ω~3KΩ			

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

6. Soldering pad size recommended

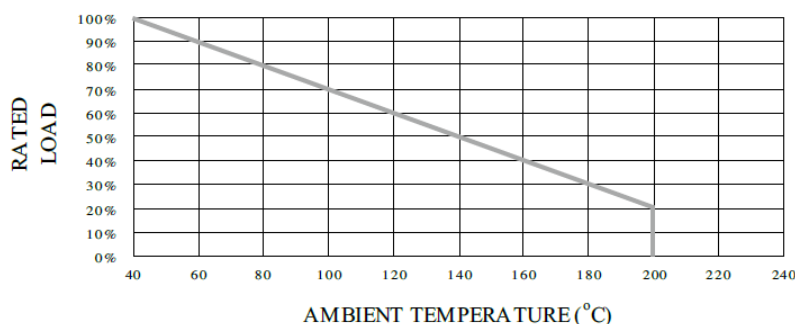


Type	Dimension (mm)			
	Soldering Mode	L(Min)	P	W(Min)
WM39	Reflow (Solder thickness recommended)	3.0	4.9 ±0.3	3.7
	Wave	3.5	4.8 ±0.3	4.0
WM41	Reflow (Solder thickness recommended)	4.0	6.2 ±0.4	5.0
	Wave	4.5	6.0 ±0.4	5.0
WM42	Reflow (Solder thickness recommended)	4.5	8.0 ±0.4	5.5
	Wave	5.0	7.7 ±0.4	5.5
WM55	Reflow (Solder thickness recommended)	5.0	9.3 ±0.4	6.5
	Wave	5.0	9.0 ±0.4	6.0

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

*Wave soldering is highly recommended for all WM types.

7. Derating Curve



7.1 Voltage rating:

Power rating will change based on continuous load at ambient temperature from -55 to 200°C.

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 = Rating Continuous Working Voltage (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.

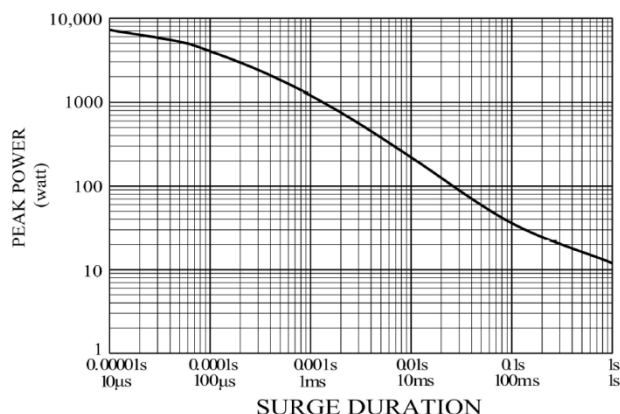
The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is lower.

8. Performance Specification

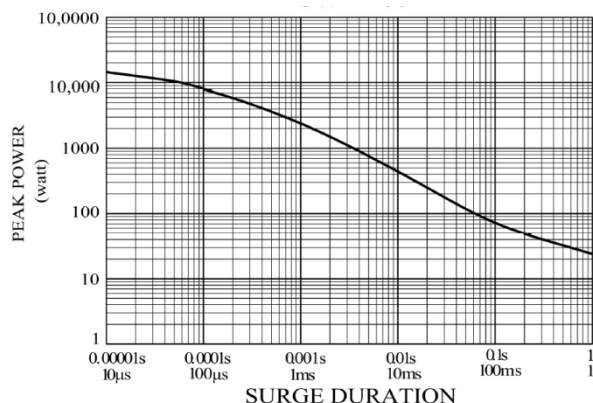
Characteristics	Test Conditions	Limits
Short Time Overload	IEC 60115-1 4.13 5 seconds 2.5x rated voltage (not over max. overload voltage)	±(2%+0.01Ω)
Load Life In Humidity	IEC 60115-1 4.24 56 days rated load (not over max. working voltage) at (40±2) °C and (93±3)% relative humidity	±(5%+0.01Ω)
Load Life	IEC 60115-1 4.25.1 Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at (40±2) °C	±(5%+0.01Ω)
Resistance To Soldering Heat	IEC 60115-1 4.18.2 Dip the resistor into a solder bath measured (260±5) °C and hold it for a 10±1 seconds	±(1.5%+0.01Ω)
Solderability	IEC 60115-1 4.17.2 Solder area covered after (230±3) °C/(2±0.2) seconds with flux applied	95% min. coverage
Vibration	IEC 60115 4.22 Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 0.75mm and 10 to 500 Hz.	±(0.25%+0.01Ω)
Thermal Endurance	IEC 60115-1 4.25.3 1000 hours at 200 °C without load	±(3%+0.01Ω)
Thermal Shock	IEC 60115-1 4.19 -55 °C 30minutes, +155 °C 30minutes, 5 cycles	±(3%+0.01Ω)
Surge Test	Surge voltage = $\sqrt{(10000PR)}$ DC P is power rating, R is resistance value, surge voltage is not more than listed at right. Surge spec = 1.2/50μs Period = 60 sec Number of surges = 50	±(5%+0.01Ω)

9. Single surge performance

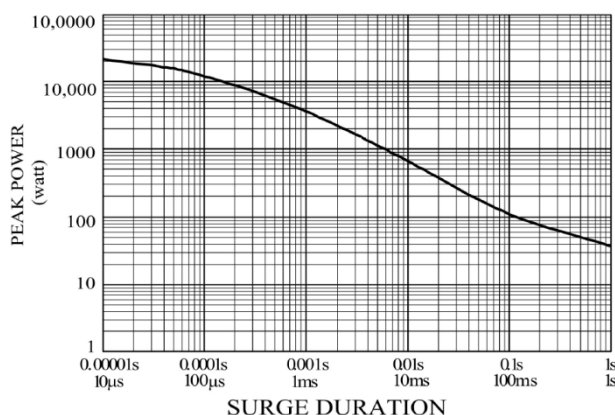
WM39



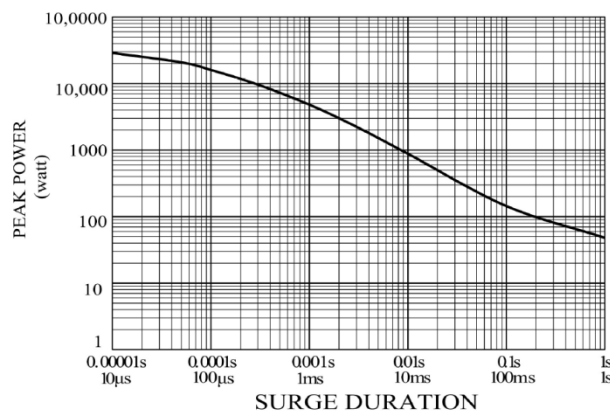
WM41



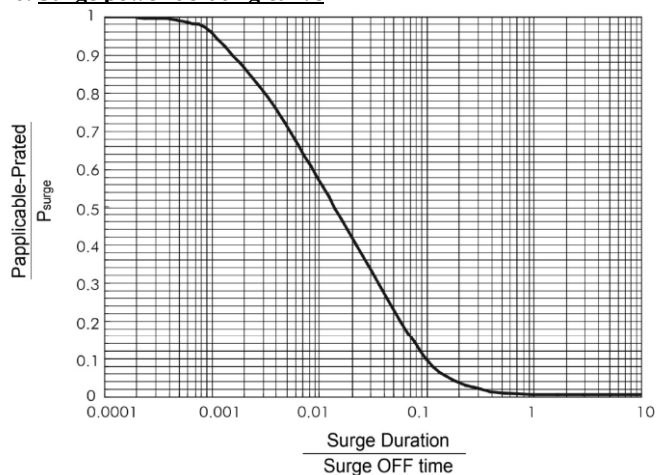
WM42



WM55



10. 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 150 °C.
- To determine applicable surge power in continuous-surge applications:
 1. Identify allowable duration and peak power P_{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.

11. Note

- 11.1 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.
- 11.2 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.
- 11.3 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 Cl₂, H₂S, NH₃, SO₂, NO₂.

12. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~5	Jun.16,2020	Song Nie	Yuhua Xu
2	1. Add the ±1% tolerance	3	Aug.01,2025	Haiyan Chen	Yuhua Xu
	2. Modify the resistance value range	3			
	3. Modify the power reduction curve	4			
	4. Modify performance	4			

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