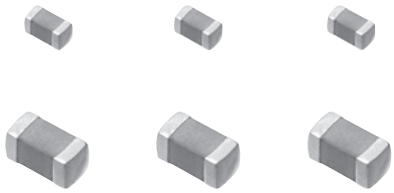
Multilayer Varistor (Automotive Grade)

Series: **EZJZ-M, EZJP-M**



Features

- Excellent ESD suppression due to original advanced material technology
- Having large electrostatic resistance meeting IEC61000-4-2, ISO10605
- Having no polarity (bipolar) facilitated replacing Zener Diodes. Capable of replacing 2 Zener Diodes and 1 Capacitor.
- Lead-free plating terminal electrodes enabling great solderability
- Wide range of products is available by adopting multilayer structure, meeting various needs.
- AEC-Q200 qualified
- RoHS compliant

■ As for Packaging Methods, Handling Precautions

Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	
E	Z	J	P	0	V	2	7	0	E	M	(Example)
Product Code									Automotive grade		

Series Code	
Z	EZJZ series
P	EZJP series

Size Code	
0	0402/EIA
1	0603/EIA

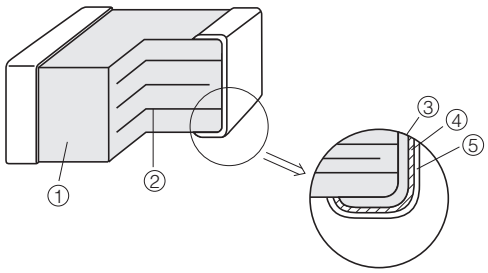
Packaging Style Code	
V	0402,0603 Paper Taping

Nominal Varitor Voltage

The first and second digits denote the first 2 numbers of the varistor voltage and the third digit indicates the number of zeros following.
The decimal point denotes in R.

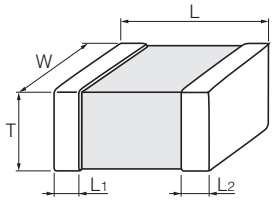
Capacitance Code			
B	10 pF	F	68 pF
R	20 pF	G	100 pF
D	27 pF	H	150 pF
E	47 pF	J	220 pF
W	56 pF		

Construction



No.	Name	
①	Zinc oxide-based ceramics	
②	Internal electrode	
③	Terminal electrode	Substrate electrode
④		Intermediate electrode
⑤		External electrode

Dimensions in mm (not to scale)

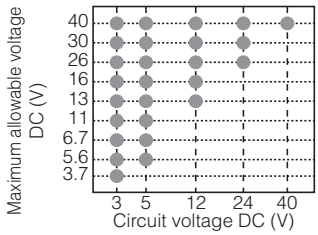


Size Code	Size(inch)	L	W	T	L_1, L_2
0	0402/EIA	1.00±0.05	0.50±0.05	0.50±0.05	0.2±0.1
1	0603/EIA	1.6±0.1	0.8±0.1	0.8±0.1	0.3±0.2

Features

Wide variety of products is available by adopting multilayer construction, which achieved wide range of usage, such as application to DC voltage lines and signal lines.

- Circuit voltage



- Varistor voltage : 18 to 65 V [at 1m A]
- Capacitance : 10 to 220 pF max. [at 1M Hz]

Recommended Applications

- Engine ECU
- Various body ECU
- Communication line, such as CAN, LIN
- Audio,Navigation
- LED Light
- Control SW

Ratings and Characteristics

Size	Part No.	Maximum allowable voltage DC (V)	Nominal varistor voltage at 1m A (V)	Capacitance (pF)		Maximum peak current at 8/20μs, 2 times (A)	Maximum ESD	
				at 1M Hz	at 1k Hz		IEC61000-4-2 150p F/ 330 Ω	ISO10605 330p F/ 2k Ω
0402 /EIA	EZJP0V180HM	11	18	150 max. [120 typ.]	140 typ.	10	Contact discharge 8k V	Contact discharge 25k V
	EZJP0V220HM	13	22	150 max. [100 typ.]	116 typ.	10		
	EZJP0V270GM	18	27	100 max. [85 typ.]	100 typ.	10		
	EZJP0V270EM	18	27	47 max. [33 typ.]	37 typ.	4		
	EZJP0V270RM	18	27	20 max. [15 typ.]	16.5 typ.	2		
	EZJP0V270BM	18	27	10 max. [8 typ.]	10 typ.	–		
	EZJP0V330GM	25	33	100 max. [85 typ.]	100 typ.	10		
	EZJP0V420WM	30	42	56 max. [40 typ.]	45 typ.	6		
	EZJP0V650DM	40	65	27 max. [22 typ.]	33 typ.	2		
0603 /EIA	EZJP1V180JM	11	18	220 max. [180 typ.]	210 typ.	20		
	EZJP1V220JM	13	22	220 max. [160 typ.]	185 typ.	10		
	EZJP1V270GM	18	27	100 max. [85 typ.]	100 typ.	10		
	EZJP1V270EM	18	27	47 max. [33 typ.]	37 typ.	5		
	EZJP1V270RM	18	27	20 max. [15 typ.]	16.5 typ.	2		
	EZJP1V330GM	25	33	100 max. [85 typ.]	100 typ.	10		
	EZJP1V420FM	30	42	68 max. [55 typ.]	63 typ.	8		
	EZJP1V650DM	40	65	27 max. [22 typ.]	33 typ.	2		
	EZJZ1V180JM	11	18	220 max. [180 typ.]	210 typ.	20		
	EZJZ1V220JM	13	22	220 max. [160 typ.]	185 typ.	20		
	EZJZ1V270GM	16	27	100 max. [85 typ.]	100 typ.	20		
	EZJZ1V330GM	26	33	100 max. [85 typ.]	100 typ.	20		
	EZJZ1V420FM	30	42	68 max. [55 typ.]	63 typ.	15		
	EZJZ1V650DM	40	65	27 max. [22 typ.]	33 typ.	5		

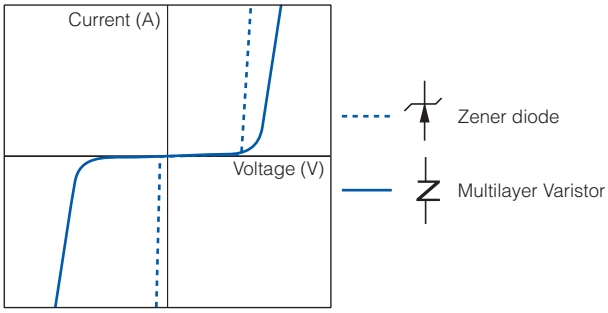
- Operating Temperature Range : EZJP serie –55 to 150 °C
  EZJZ serie –55 to 125 °C

✻ Recommend soldering method : Reflow soldering

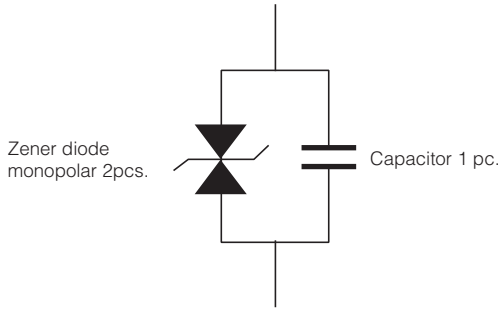
Maximum Allowable Voltage	Maximum DC Voltage that can be applied continuously within the operating temperature range
Varistor Voltage	Varistor starting voltage between terminals at DC 1 mA, also known as Breakdown voltage
Maximum Peak Current	Maximum current that can be withstood under the standard pulse 8/20 μs, 2 times based
Maximum ESD	Maximum voltage that can be withstood under ESD

Varistor Characteristics and Equivalent Circuit

A Multilayer Varistor does not have an electrical polarity like zener diodes and is equivalent to total 3 pcs. of 2 zener diodes and 1 capacitor.

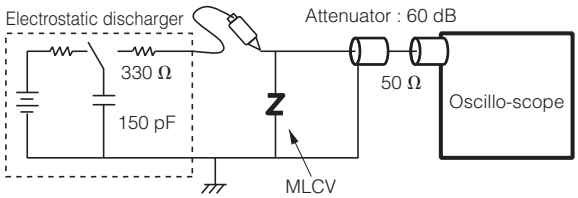


[Equivalent Circuit]

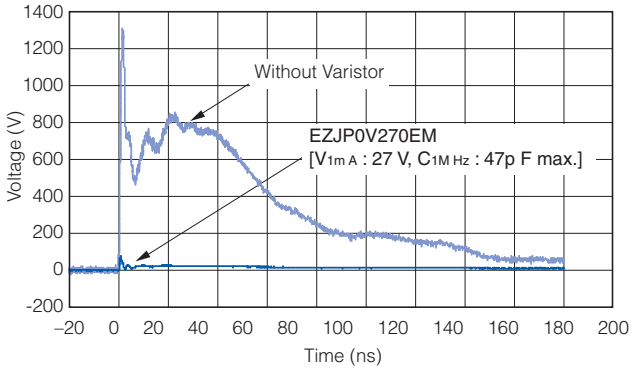


ESD Suppressive Effects

Typical effects of ESD suppression
Test conditions: IEC61000-4-2* Level 4 Contact discharge, 8k V



[ESD suppressed waveform]

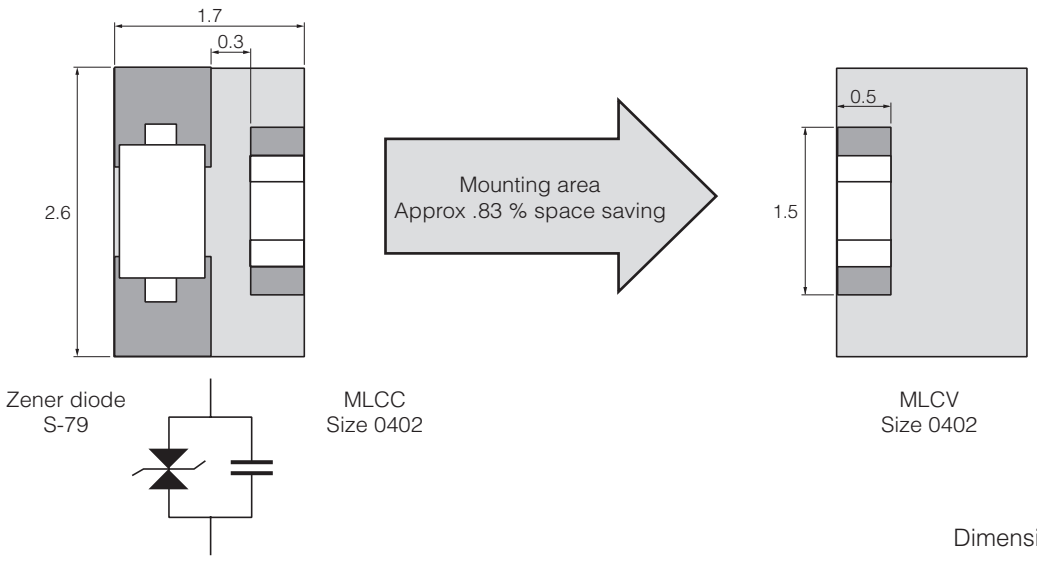


✻ IEC61000-4-2 ··· International Standard of the ESD testing method (HBM) for electronic equipment ability to withstand ESD generated from a human body. It sets 4 levels of severity

Severity	Level 1	Level 2	Level 3	Level 4
Contact discharge	2k V	4k V	6k V	8k V
Air discharge	2k V	4k V	8k V	15k V

Replacement of Zener diode

Replacing “Zener diode and Capacitor” with Multilayer Varistor saves both the mounting area and number of components used.



Dimensions in mm

Performance and Testing Methods

<table>
<tr><th>Characteristics</th><th>Specifications</th><th>Testing Method</th></tr>
<tr><td>Standard test conditions</td><td></td><td>Electrical characteristics shall be measured under the following conditions.
Temp. : 5 to 35 °C, Relative humidity : 85 % or less</td></tr>
<tr><td>Varistor voltage</td><td>To meet the specified value.</td><td>The Varistor voltage is the voltage (V_c,or V_{cmA}) between both end terminals of a Varistor when specified current (CmA) is applied to it. The measurement shall be made as quickly as possible to avoid heating effects.</td></tr>
<tr><td>Maximum allowable voltage</td><td>To meet the specified value.</td><td>The maximum DC voltage that can be applied continuously to a varistor.</td></tr>
<tr><td>Capacitance</td><td>To meet the specified value.</td><td>Capacitance shall be measured at the specified frequency, bias voltage 0 V, and measuring voltage 0.2 to 2 Vrms.</td></tr>
<tr><td>Maximum peak current</td><td>To meet the specified value.</td><td>The maximum current measured (Varistor voltage tolerance is within ±10 %) when a standard impulse current of
8/20 μ seconds is applied twice with an interval of 5 minutes.</td></tr>
<tr><td>Maximum ESD</td><td>To meet the specified value.</td><td>The maximum ESD measured (while the varistor voltage is within blow ranges of its nominal value) when exposed to ESD 10 times (five times for each positive negative polarity) based on IEC61000-4-2, ISO10605.
EZJP□□□□□□M : within±10 %, EZJZ□□□□□□M : within±30 %</td></tr>
<tr><td>Solder ability</td><td>To meet the specified value.</td><td>The part shall be immersed into a soldering bath under the conditions below.
Solder : Sn-Ag-Cu
Soldering flux : Ethanol solution of rosin (Concentration approx. 25 wt%)
Soldering temp. : 230±5 °C
Period : 4±1 s
Soldering position : Immerse both terminal electrodes until they are completely into the soldering bath.</td></tr>
<tr><td>Resistance to soldering heat</td><td>ΔVc / Vc : within ±10 %</td><td>After the immersion, leave the part for 24 ±2 hours under the standard condition, then evaluate its characteristics.Soldering conditions are specified below:
Soldering conditions : 270 °C, 3 s / 260 °C, 10 s
Soldering position : Immerse both terminal electrodes until they are completely into the soldering bath.</td></tr>
<tr><td>Temperature cycling</td><td>ΔVc / Vc : within ±10 %</td><td>After repeating the cycles stated below for specified number of times, leave the part for 24±2 hours, then evaluate its characteristics.

Cycle : 2000 cycle
<table>
<tr><th>Step</th><th>Temperature</th><th>Period</th></tr>
<tr><td>1</td><td>Max. Operating Temp.</td><td>30±3 min</td></tr>
<tr><td>2</td><td>Ordinary temp.</td><td>3 min max.</td></tr>
<tr><td>3</td><td>Min. Operating Temp.</td><td>30±3 min</td></tr>
<tr><td>4</td><td>Ordinary temp.</td><td>3 min max.</td></tr>
</table></td></tr>
<tr><td>Vibration</td><td>ΔVc / Vc : within ±10 %</td><td>The varistor shall be soldered on the testing board shown in Fig.3.
G force : 5 G
Vibration frequency range : 10 to 2000 Hz
Sweet time : 20 min.
Sweet direction : 12 cycles for 3 courses perpendicular each other</td></tr>
<tr><td>Mechanical Shock</td><td>ΔVc / Vc : within ±10 %</td><td>The varistor shall be soldered on the testing board shown in Fig.3.
Shock-wave formation : Half sine
G force : 50 G
Shock direction : 6 directions of X, Y, Z, for each three times</td></tr>
<tr><td>Biased Humidity</td><td>ΔVc / Vc : within ±10 %</td><td>After conducting the test under the conditions specified below, leave the part 24±2 hours, then evaluate its characteristics.
Temp. : 85±2 °C
Humidity : 80 to 85 %RH
Applied voltage : Maximum allowable voltage (Individually specified)
Period : 2000+24 / 0 h</td></tr>
<tr><td>High temperature exposure (dry heat)</td><td>ΔVc / Vc : within ±10 %</td><td>After conducting the test under the conditions specified below, leave the part 24 ±2 hours, then evaluate its characteristics.
Temp. : Maximum operating temperature ±3 °C (Individually specified)
Applied voltage : Maximum allowable voltage (Individually specified)
Period : 2000+24 / 0h</td></tr>
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