

# Multi Layer Varistor for ESD Protection

## MLV0402-120-E120

### GENERAL DESCRIPTION

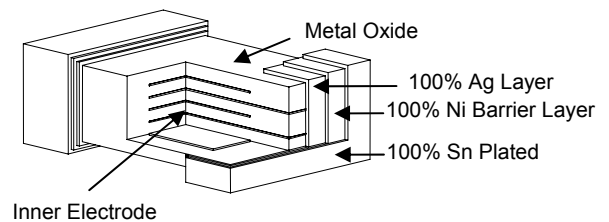
These Multi Layer Varistors are small, leadless, surface mount packages made of multiple layers of Zinc Oxide, with electrodes between them. They are used to help protect integrated circuits and other sensitive equipment. Their small size is ideal for high density printed circuit boards. The "E" series is a family of low capacitance parts, specifically designed for ESD protection of high data rate applications.

### BENEFITS

- Minimal signal distortion
- Help to protect sensitive equipment against typical ESD events
- Cost efficient assembly and protection
- Resistance to standard wave solder fluxes, provides excellent solderability
- Space savings
- Longer battery life due to low leakage current

### FEATURES

- Low capacitance
- Bidirectional clamping
- Compatible with standard surface mount methods
- Low and stable leakage current
- Low clamping voltage
- Quick response time (<1ns)
- High transient current capability
- Capable of withstanding over 1000 pulses of IEC 61000-4-2, level 4
- Lead Free



### APPLICATIONS

ESD protection of:

- High speed computer I/O ports and interfaces (USB, IEEE 1394, etc...)
- Portable devices
- Telecom equipment

### SYMBOL



### MATERIALS INFORMATION

ROHS Compliant

Directive 2002/95/EC  
Compliant

ELV Compliant

Directive 2000/53/EC  
Compliant

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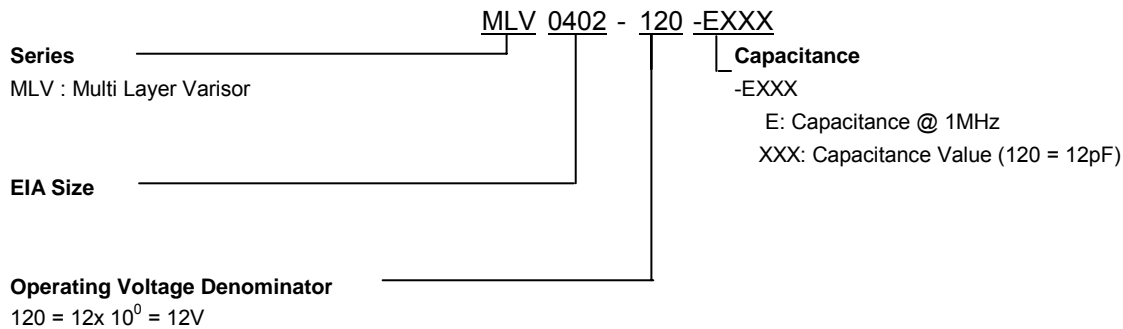
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Rev. B Date: September 21, 2006

### Ratings @ (25± 5°C)

	Maximum Working Voltage	Clamping Voltage <sup>1</sup>	Leakage Current	Typical Capacitance
<b>Symbol</b>	V <sub>DC</sub>	V <sub>c</sub>	I <sub>L</sub>	C <sub>p</sub>
<b>Units</b>	V (Max)	V	μA (Max)	pF
<b>Test Conditions</b>	< 10μA	IEC Pulse	@12V	@ 1MHz
MLV0402-120-E120	12	100	<1	12

**Note 1:** Measured during IEC61000-4-2, 8kV contact discharge, 30 ns after initiation of the ESD pulse.

### PART NUMBERING



### GENERAL CHARACTERISTICS

Operating Temperature: -40 to +85°C

Storage Temperature: -40 to +85°C

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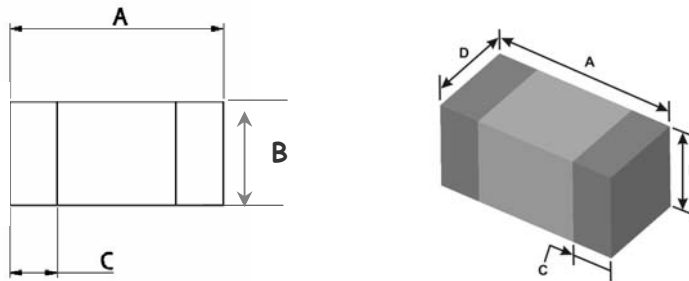
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## ENVIRONMENTAL CHARACTERISTICS

Characteristics	Specifications	Test Conditions
Bias Humidity	$\Delta Vv / Vv \leq \pm 10\%$	90%RH, 40°C, maximum working Voltage $V_{DC}$ , 1000 hours
Thermal Shock	$\Delta Vv / Vv \leq \pm 10\%$	-40°C to 85°C, 30 min. cycle, 5 cycles
Vibration	$\Delta Vv / Vv \leq \pm 10\%$	10 to 50 Hz, 1 min cycle, 2 hours each in X-Y-Z
Full Load Voltage	$\Delta Vv / Vv \leq \pm 10\%$	Maximum working Voltage $V_{DC}$ , 85°C, 1000 hours
Solderability	95% Coverage	230°C, 3s
Solder Heat Resistance	90% Coverage	260°C, 10s

## DIMENSIONS



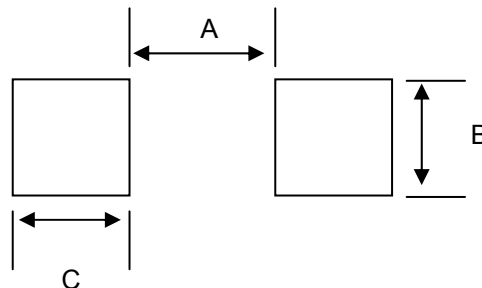
Drawing Not To Scale

	length A		Height B		Terminal Width C		Width D	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
mm:	0.85	1.15	0.4	0.6	0.1	0.4	0.4	0.6
in*:	(0.033)	(0.045)	(0.016)	(0.024)	(0.004)	(0.016)	(0.016)	(0.024)

\* Rounded off approximation

## RECOMMENDED PAD LAYOUT

Print solder with a thickness of 150 to 200µm



	A	B	C
mm:	0.35	0.75	0.85
in.*	(0.014)	(0.030)	(0.033)

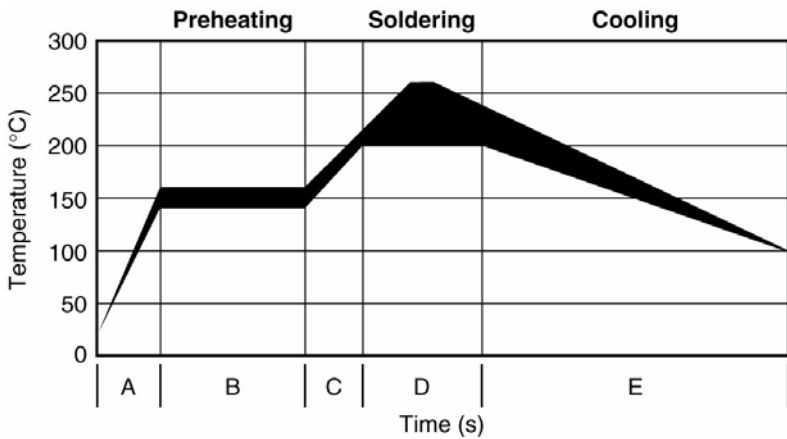
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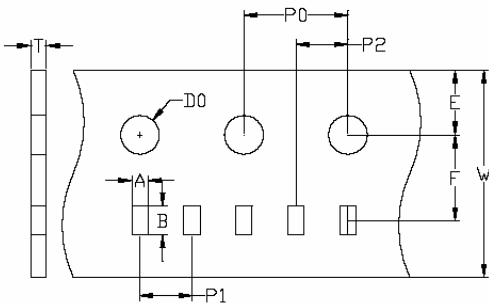
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## SOLDER REFLOW RECOMMENDATIONS

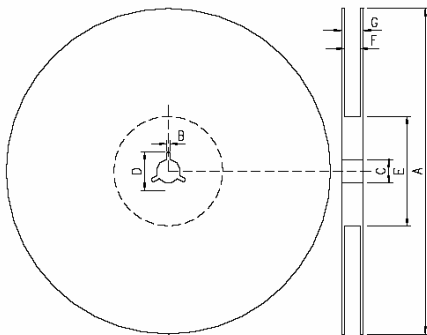


A	Temperature ramp up 1	From ambient to Preheating temperature	30s to 60s
B	Preheating	140°C - 160°C	60s to 120s
C	Temperature ramp up 2	From Preheating to Main heating temperature	20s to 40s
D	Main heating	at 200°C	60s ~ 70s
		at 210°C	55s ~ 65s
		at 220°C	50s ~ 60s
		at 230°C	40s ~ 50s
		at 240°C	30s ~ 40s
E	Cooling	From main heating temperature to 100°C	max 4°C/s

## PACKAGING



	A		B		W		E		F		P0		P1		P2		D0		T	
mm:	0.59	0.65	1.09	1.15	7.8	8.2	7.7	1.8	3.45	3.55	3.9	4.1	1.5	2.5	1.8	2.2	1.4	1.6	0.55	0.65
in:*	(0.023)	(0.026)	(0.043)	(0.045)	(0.307)	(0.323)	(0.303)	(0.071)	(0.136)	(0.140)	(0.154)	(0.161)	(0.059)	(0.098)	(0.071)	(0.087)	(0.055)	(0.063)	(0.022)	(0.026)



	A		B		C		D		E		F		G	
mm:	176.0	198.0	1.5	2.5	12.5	13.5	20.2	21.8	60.5	63.5	8.5	9.5	12.0	14.0
in:*	(6.929)	(7.795)	(0.059)	(0.098)	(0.492)	(0.531)	(0.795)	(0.858)	(2.382)	(2.500)	(0.335)	(0.374)	(0.472)	(0.551)

\*Rounded off approximation

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### RECOMMENDED STORAGE CONDITIONS

Storage time: 12 months max  
Storage temperature: 5 to 40°C  
Storage Relative humidity: 65% max

### POST REFLOW, CLEANING CONDITIONS

A 5% saponifier combined with water during wash.

For Ultrasonic process water temperature should be at 50°C and board should be submerged for a minimum of one minute in the solutions, then rinse and dry.

For in-line washing, the temperature of the water sprayed should be at 110°C, rinse and drying is done in-line.

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