Tyco Electronics

308 Constitution Drive
Menlo Park, CA 94025-1164
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www.circuitprotection.com

Multi Layer Varistor
Overvoltage Protection Device

Raychem Circuit Protection Products

PRODUCT: MLV0402

DOCUMENT: SCD 26385
PCN : RF0107, RF0545
REV LETTER: D
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PAGE NO.: 1 OF 5

GENERAL DESCRIPTION

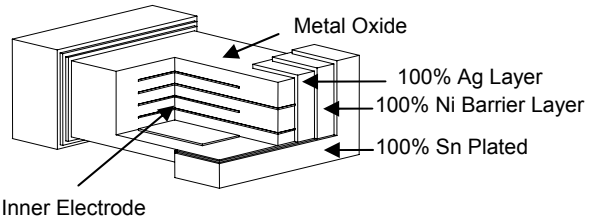
These Multi Layer Varistors are small, leadless, surface mount packages made of multiple layers of Zinc Oxide, with electrodes between them. They are used to help protect integrated circuits and other sensitive equipment. Their small size is ideal for high density printed circuit boards.

BENEFITS

- Help to protect sensitive equipment against typical ESD, EMC and EOS (Electrical Over Stress) events and transients
- 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

- Bidirectional clamping
- Compatible with standard surface mount methods
- Low and stable leakage current
- Low clamping voltage
- Quick response time (<1ns)
- High transient current capability
- RoHS Compliant



APPLICATIONS

ESD, EMC and EOS protection of:

- Computer I/O ports and interfaces (USB, IEEE 1394, etc…)
- Portable devices
- Automotive electronic circuits
- Telecom equipment
- Medical instruments

SYMBOL

MATERIALS INFORMATION

ROHS Compliant

Directive 2002/95/EC Compliant

ELV Compliant

Directive 2000/53/EC Compliant

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Ratings @ (25± 5°C)

	Varistor Voltage	Maximum Working Voltage		Clamping Voltage	Typical Resistance	Peak Current	Transient Energy	Typical Capacitance[1]	
Symbol	Vv	V_{RMS}	V_{DC}	Vc	IR	I_{max}	W_{max}	Cp	
Units	V	V	V (Max)	V	$X10^6$ Ohm (Min)	A (Min)	J (Max)	pF	
Test Conditions	@ 1mA DC	<10µA	< 10µA	@ 1A 8/20µs	@ 5 V_{DC}	8/20µs	10/1000µs	@ 1KHz	@ 1MHz
MLV0402-080M-C221	8 ± 20%	4	5.5	20	10	20	0.05	230	220
MLV0402-250K-C400	25 ± 10%	14	18	50	10	20	0.05	45	40

Note 1: Cp – Device capacitance measured with zero volt bias and 1 Vrms signal

PART NUMBERING

MLV 0402 - 080 M -CXXX

Series
MLV : Multi Layer Varisor

EIA Size

Varistor Voltage (Vv) Denominator
080 = 8 x 10^0 = 8V
…
220 = 22 x 10^0 = 22V

Capacitance
-CXXX
C: Capacitance
XXX: Capacitance Value
(500 = 50 x 10^0 = 50pF)
…
(221 = 2200 x 10^1 = 220pF)

Tolerance
K : ± 10 %
L : ± 15 %
M : ± 20 %

GENERAL CHARACTERISTICS

Operating Temperature: -40 to +85°C

Storage Temperature: -40 to +85°C

ENVIRONMENTAL CHARACTERISTICS

Characteristics	Specifications	Test Conditions
Bias Humidity	Δ Vv / Vv ≤ ± 10%	90%RH, 40ºC, maximum working Voltage V_{DC}, 1000 hours
Thermal Shock	Δ Vv / Vv ≤ ± 10%	-40ºC to 85ºC, 30 min. cycle, 5 cycles
Full Load Voltage	Δ Vv / Vv ≤ ± 10%	Maximum working Voltage V_{DC}, 85ºC, 1000 hours
Solderability	95% Coverage	230ºC, 3s
Solder Heat Resistance	90% Coverage	260ºC, 10s

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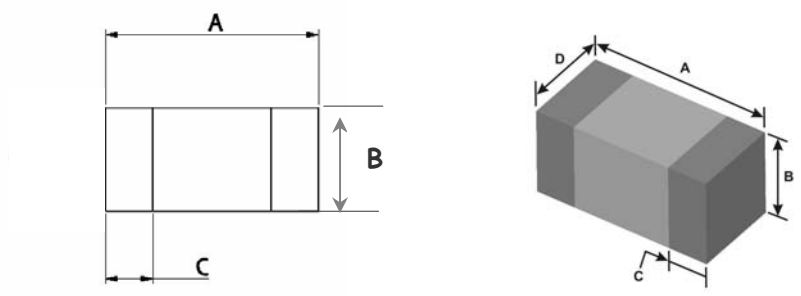
DIMENSIONS



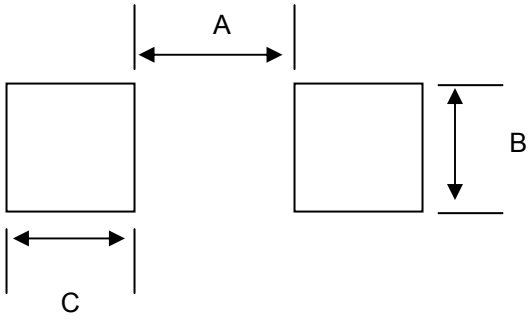
Drawing Not To Scale

	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

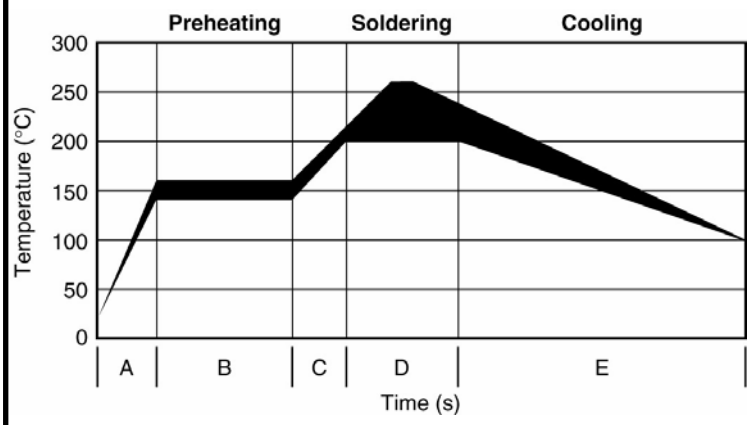
Print solder with a thickness of 150 to 200µm



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

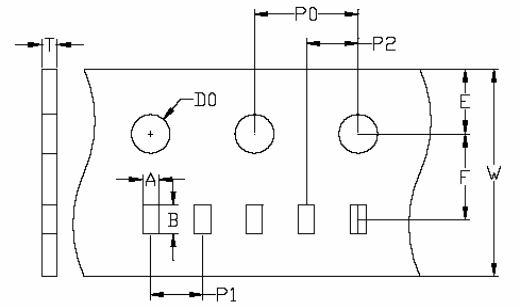
* Rounded off approximation

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 at 220°C at 240°C at 260°C	60s ~ 70s 50s ~ 60s 30s ~ 40s 5s ~ 10s
E	Cooling	From main heating temperature to 100°C	max 4°C/s

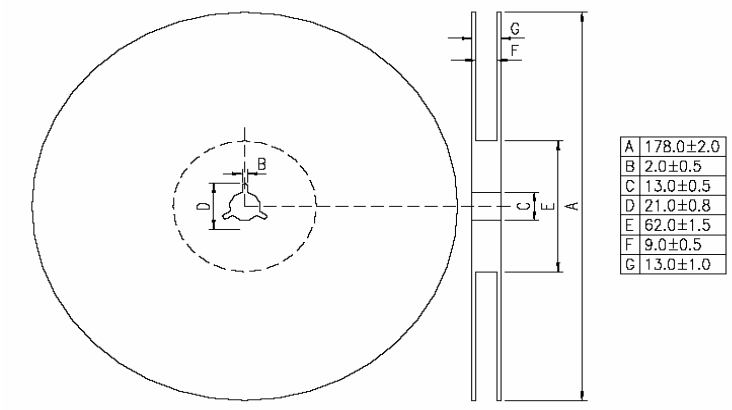
PACKAGING



	A		B		W		E		F		P0		P1		P2		D0		T	
mm	0.59	0.65	1.09	1.15	7.7	8.3	1.7	1.8	3.45	3.55	3.9	4.1	1.95	2.05	1.95	2.05	1.4	1.6	0.55	0.65
inch*	(0.023)	(0.025)	(0.042)	(0.045)	(0.303)	(0.326)	(0.066)	(0.070)	(0.135)	(0.139)	(0.153)	(0.161)	(0.076)	(0.080)	(0.076)	(0.080)	(0.055)	(0.062)	(0.021)	(0.025)

*Rounded off approximation

Leader & Trailer: The leader is 180mm in length & consists of empty cavities with sealed cover tape.
The trailer is 350mm in length & consists of empty cavities with sealed cover tape.



A	178.0±2.0
B	2.0±0.5
C	13.0±0.5
D	21.0±0.8
E	62.0±1.5
F	9.0±0.5
G	13.0±1.0

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% saponofier combined with water during wash.

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

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