MLN SurgeArray™ Suppressor

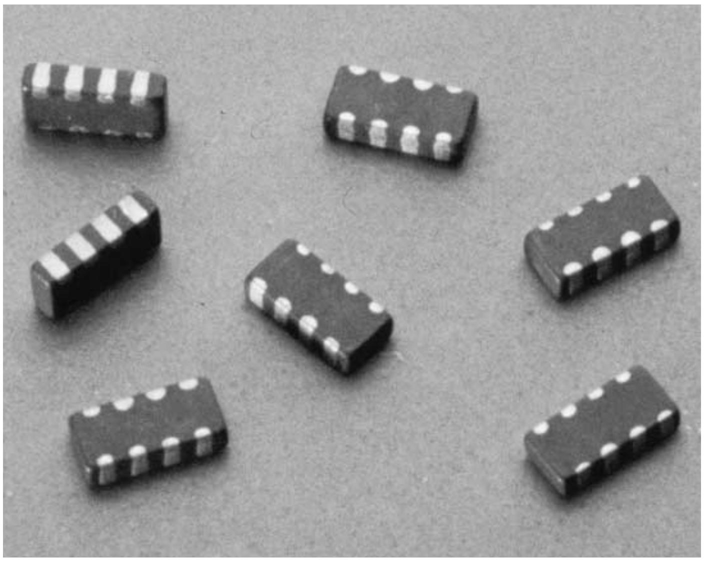
The MLN SurgeArray™ Suppressor is designed to help protect components from transient voltages that exist at the circuit board level. This device provides four independent suppressors in a single “1206” leadless chip in order to reduce part count and placement time as well as save space on printed circuit boards.

SurgeArray™ devices are intended to suppress ESD, EFT and other transients in order to protect integrated circuits or other sensitive components operating at any voltage up to $18V_{DC}$. SurgeArray devices are rated to the IEC 61000-4-2 human body model ESD to help products attain EMC compliance. The array offers excellent isolation and low crosstalk between sections.

The inherent capacitance of the SurgeArray Suppressor permits it to function as a filter/suppressor, thereby replacing separate zener/capacitor combinations.

The MLN array is manufactured using the Littelfuse Multilayer technology process and is similar to the Littelfuse ML and MLE Series of discrete leadless chips.

The MLN can also be provided in a Dual version. Contact Littelfuse for information.



Features

- Four Individual Devices in One 1206 Chip
- ESD Rated to IEC 61000-4-2 (Level 4)
- AC Characterized for Impedance and Capacitance
- Low Adjacent Channel Crosstalk, -55dB at 10MHz (Typ)
- Low Leakage (6nA at 5.5V, 30nA at 15V)
- Operating Voltage up to $18V_{M(DC)}$
- -55°C to 125°C Operating Temperature Range
- Low-Profile, PCMCIA Compatible

Applications

- Data, Diagnostic I/O Ports
- Analog Signal/Sensor Lines
- Portable/Hand-Held Products
- Mobile Communications/Cellular Phones
- Computer/DSP Products
- Industrial Instruments Including Medical

MLN SurgeArray™ Suppressor

Absolute Maximum Ratings For ratings of individual members of a series, see device ratings and specifications table.

Continuous:	MLN ARRAY	UNITS
Steady State Applied Voltage: DC Voltage Range ($V_{M(DC)}$)	18	V
Operating Ambient Temperature Range (T_A)	-55 to 125	°C
Storage Temperature Range (T_{STG})	-55 to 150	°C

Device Ratings and Specifications Any Single Section

PART NUMBER	MAX RATINGS (125 °C)			PERFORMANCE SPECIFICATIONS (25 °C)							
	MAXIMUM CONTINUOUS WORKING VOLTAGE	MAXIMUM NON-REPETITIVE SURGE CURRENT (8/20µs)	MAXIMUM CLAMPING VOLTAGE (AT NOTED 8/20µs) CURRENT	MAXIMUM NON-REPETITIVE SURGE ENERGY (10/1000µs)	TYPICAL ESD SUPPRESSION VOLTAGE (NOTE 1)			NOMINAL VOLTAGE AT 1mA DC CURRENT		CAPACITANCE AT 1MHz (1V p-p)	
	$V_{M(DC)}$	I_{TM}	V_C (See Fig. 3)	W_{TM}	(NOTE 2) 8kV CONTACT		(NOTE 3) 15kV AIR	$V_{N(DC)}$ MIN	$V_{N(DC)}$ MAX	(NOTE 4) C	
					Peak	Clamp	Peak			TYP	MAX
	(V)	(A)	(V)	(J)	(V)	(V)	(V)	(V)	(V)	(pF)	(pF)
V5.5MLN41206	5.5	30	15.5 at 2A	0.1	60	35	45	7.1	9.3	430	520
V9MLN41206	9	30	23 at 2A	0.1	95	50	75	11.0	16.0	250	300
V14MLN41206	14	30	30 at 2A	0.1	110	55	85	15.9	20.3	140	175
V18MLN41206	18	30	40 at 2A	0.1	165	60	100	22.0	28.0	100	125
V18MLN41206L	18	20	50 at 1A	0.05	200	95	130	25.0	35.0	45	75

NOTES:

1. Tested to IEC61000-4-2 Human Body Model (HBM) discharge test circuit. See explanation of Terms on page 7.
2. Direct discharge to device terminals (IEC preffered test method). See figure 2.
3. Corona discharge through air (represents actual ESD event)
4. Capacitance may be customized, contact Sales.

Temperature Derating

For applications exceeding 125°C ambient temperature, the peak surge current and energy ratings must be reduced as shown in Figure 1.

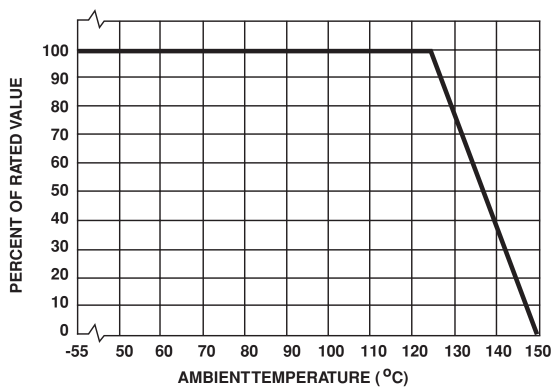
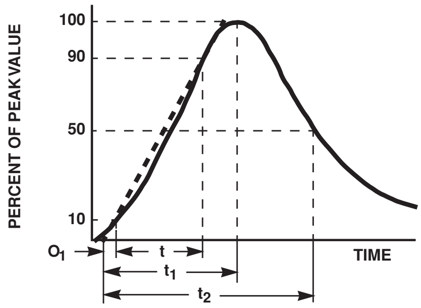


FIGURE 1. PEAK CURRENT AND ENERGY DERATING CURVE



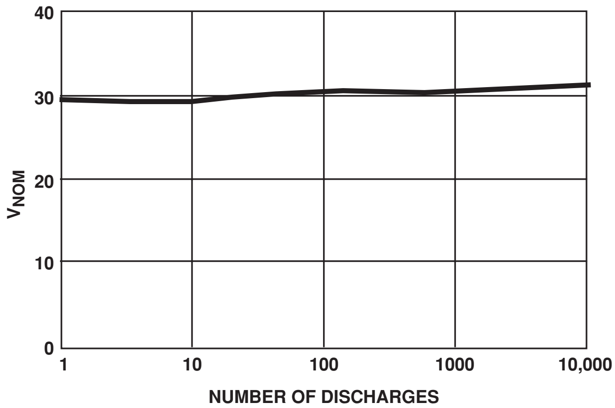
O_1 = VIRTUAL ORIGIN OF WAVE
t = TIME FROM 10% TO 90% OF PEAK
t_1 = VIRTUAL FRONT TIME = 1.25 x t
t_2 = VIRTUAL TIME TO HALF VALUE (IMPULSE DURATION)

EXAMPLE:
FOR AN 8/20µs CURRENT WAVEFORM:
8µs = t_1 = VIRTUAL FRONT TIME
20µs = t_2 = VIRTUAL TIME TO HALF VALUE

FIGURE 2. PEAK PULSE CURRENT TEST WAVEFORM FOR CLAMPING VOLTAGE

MLN SurgeArray™ Suppressor

Typical Performance Curves Any Single Section



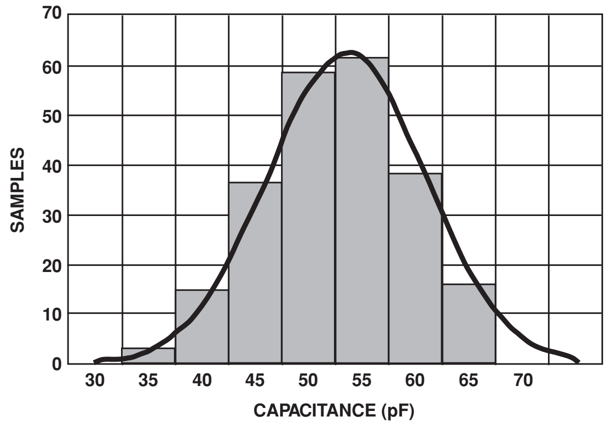


FIGURE 4. PRODUCT DISTRIBUTION OF CAPACITANCE (1MHz)

Typical Performance Curves Any Single Section

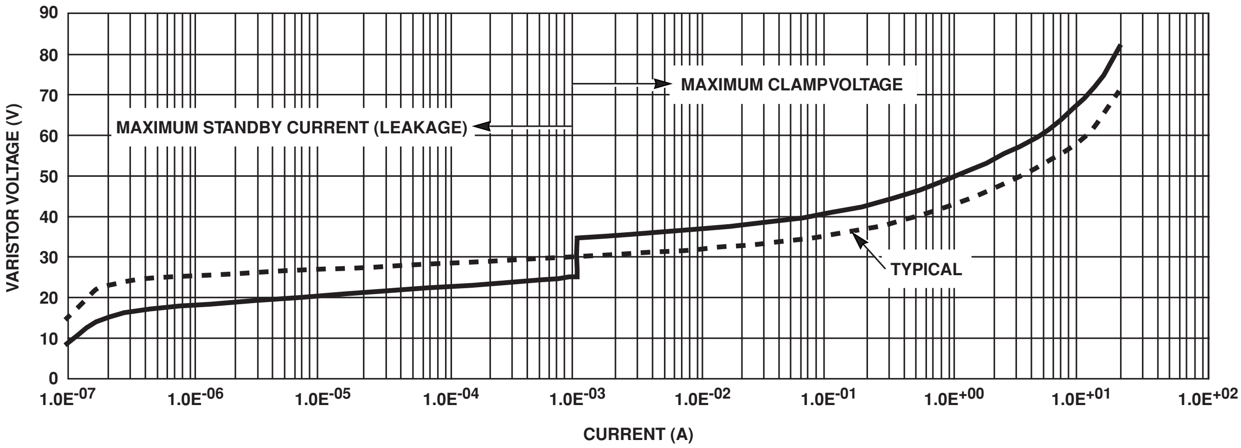


FIGURE 5. V-I CHARACTERISTICS

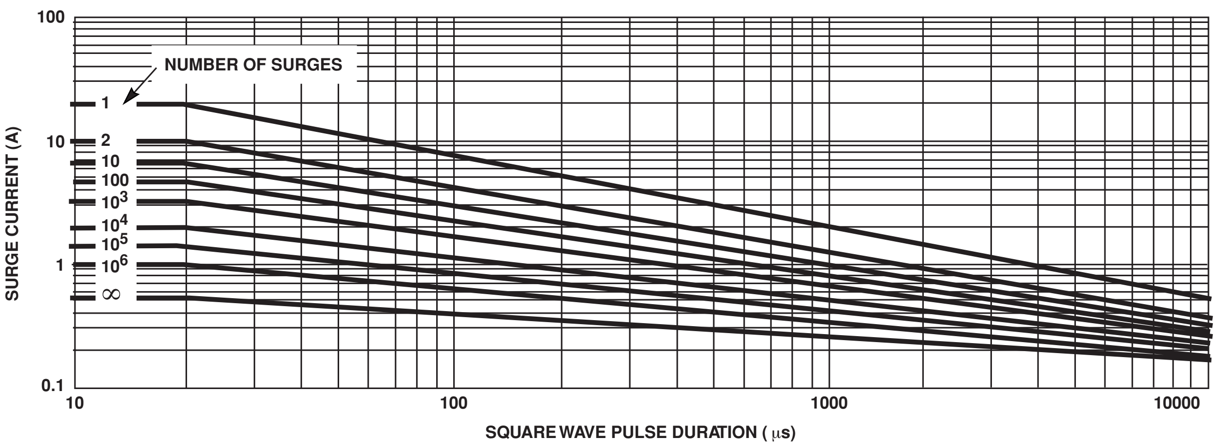


FIGURE 6. PULSE RATING FOR LONG DURATION SURGES (ANY SINGLE SECTION)

MLN SurgeArray™ Suppressor

Typical Performance Curves Any Single Section (Continued)

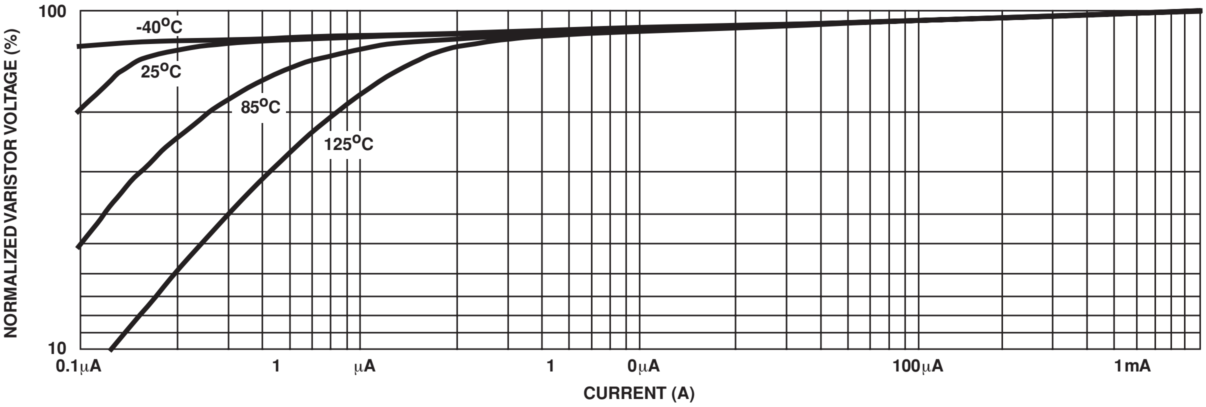


FIGURE 7. STANDBY CURRENT AT NORMALIZED VARISTOR VOLTAGE AND TEMPERATURE (ANY SINGLE SECTION)

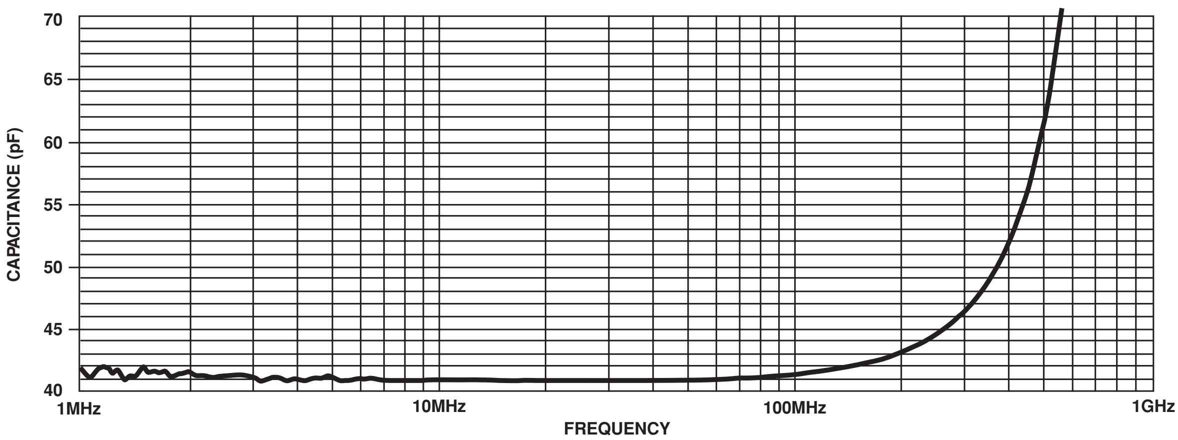


FIGURE 8. CAPACITANCE vs FREQUENCY

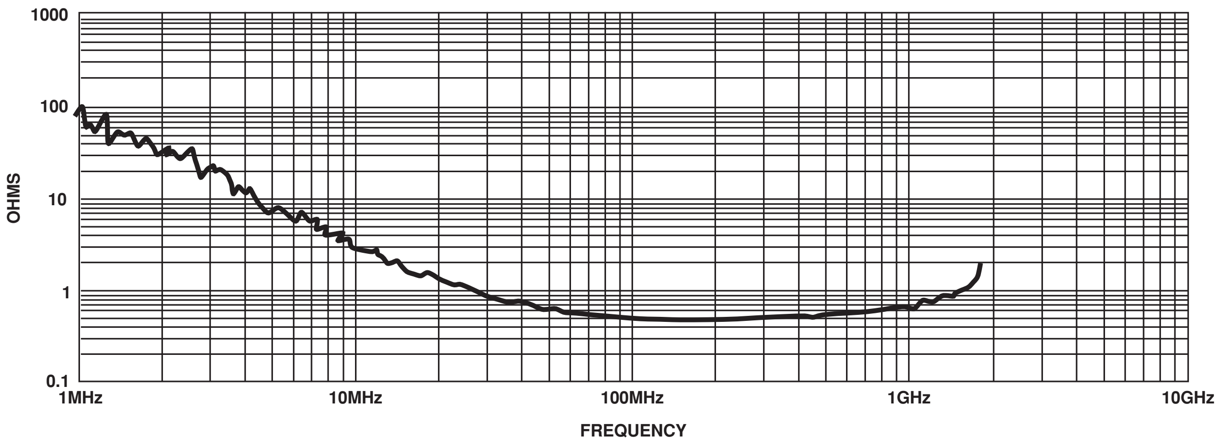


FIGURE 9. EQUIVALENT SERIES RESISTANCE

MLN SurgeArray™ Suppressor

Typical Performance Curves Any Single Section (Continued)

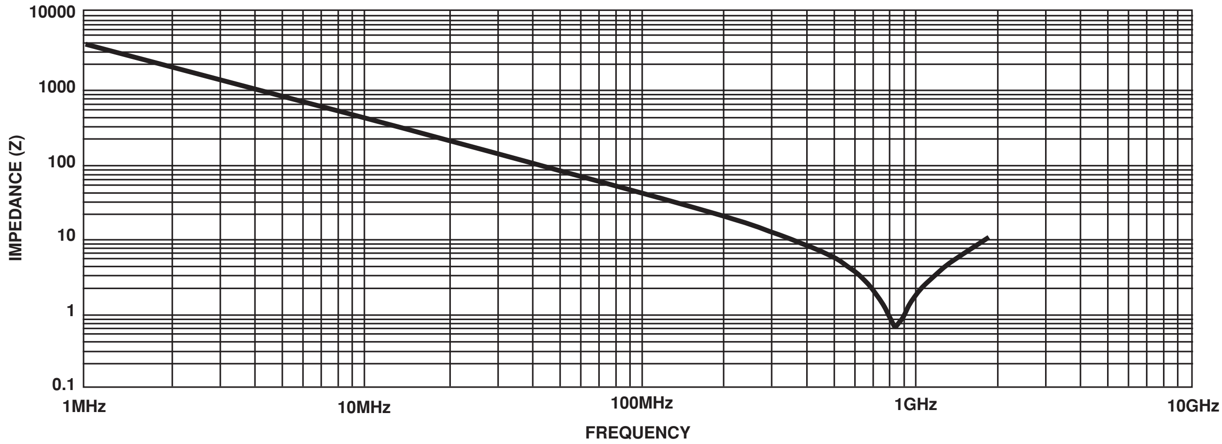


FIGURE 10. IMPEDANCE vs FREQUENCY

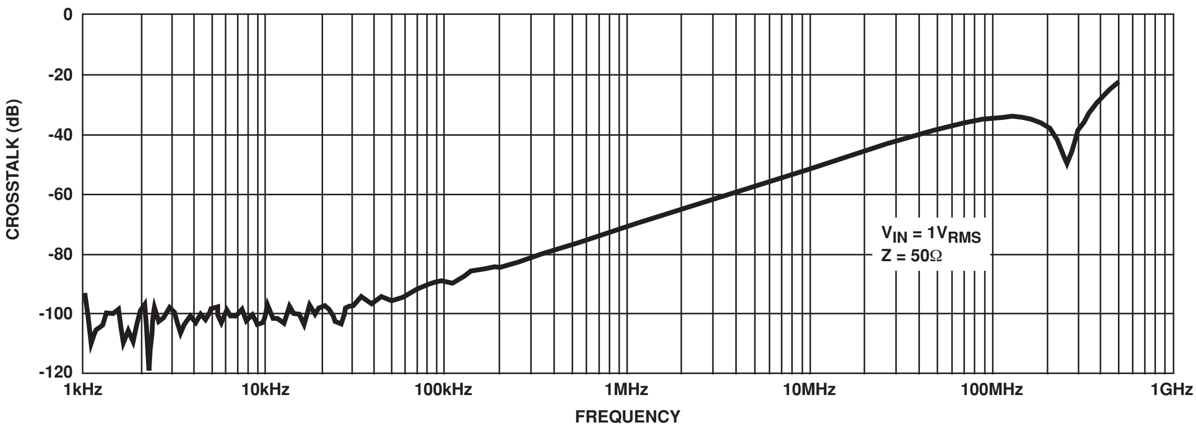


FIGURE 11. ADJACENT CHANNEL CROSSTALK

Soldering Recommendations

The principal techniques used for the soldering of components in surface mount technology are Infrared (IR) Reflow, Vapour Phase Reflow, and Wave Soldering. Typical profiles are shown in Figures 12, 13 and 14. When wave soldering, the MLN suppressor is attached to the circuit board by means of an adhesive. The assembly is then placed on a conveyor and run through the soldering process to contact the wave. With IR and Vapour Phase Reflow, the device is placed in a solder paste on the substrate. As the solder paste is heated, it reflows and solders the unit to the board.

The recommended solder for the MLN suppressor is a 62/36/2 (Sn/Pb/Ag), 60/40 (Sn/Pb), or 63/37 (Sn/Pb). Littelfuse also recommends an RMA solder flux.

Wave soldering is the most strenuous of the processes. To avoid the possibility of generating stresses due to thermal shock, a preheat stage in the soldering process is recommended, and the peak temperature of the solder process should be rigidly controlled.

When using a reflow process, care should be taken to ensure that the MLN chip is not subjected to a thermal gradient steeper than 4 degrees per second; the ideal gradient being 2 degrees per second. During the soldering process, preheating to within 100 degrees of the solders peak temperature is essential to minimize thermal shock. Examples of the soldering conditions for the MLN array of suppressors are given in the tables below.

Once the soldering process has been completed, it is still necessary to ensure that any further thermal shocks are avoided. One possible cause of thermal shock is hot printed circuit boards being removed from the solder process and subjected to cleaning solvents at room temperature. The boards must be allowed to gradually cool to less than 50°C before cleaning.

MLN SurgeArray™ Suppressor

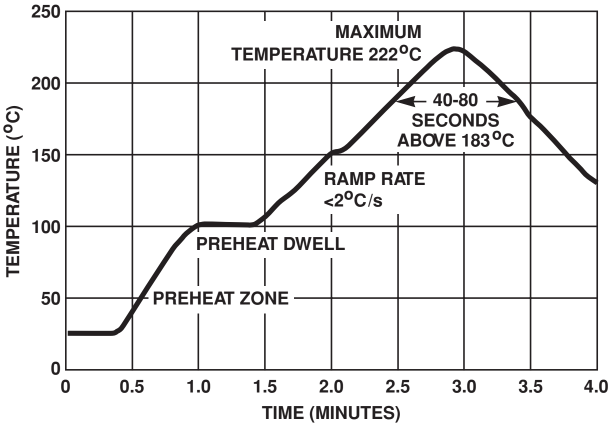


FIGURE 12. IR REFLOW SOLDER PROFILE

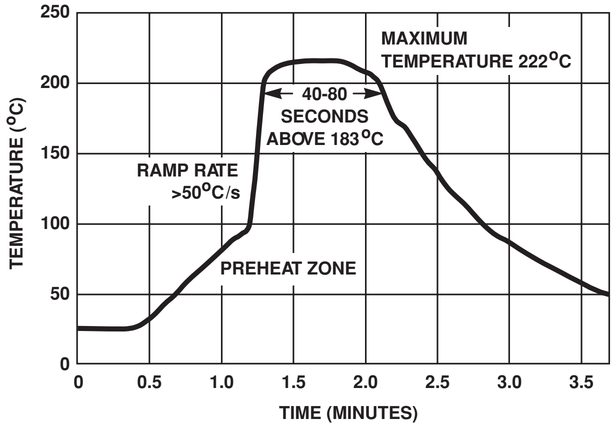


FIGURE 14. VAPOR PHASE SOLDER PROFILE

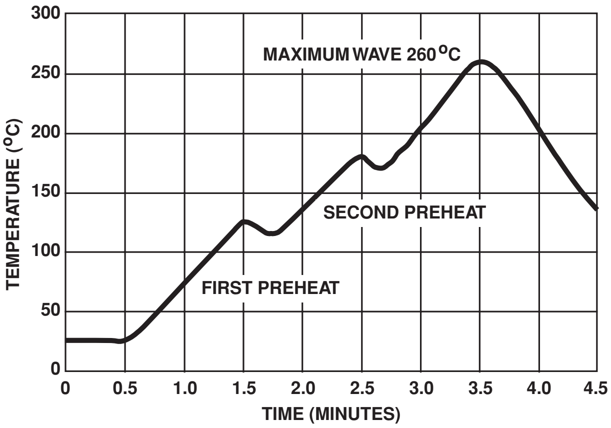


FIGURE 13. WAVE SOLDER PROFILE

Recommended Pad Outline

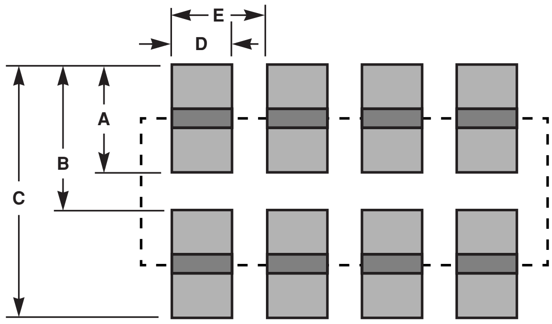
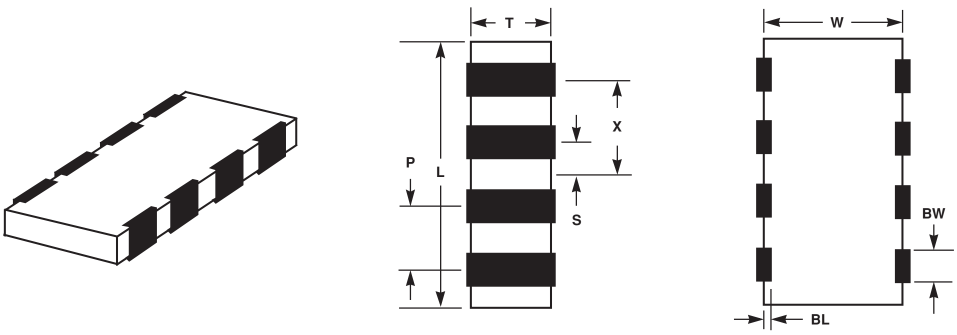


TABLE 1. PAD LAYOUT DIMENSIONS

DIMENSION	A	B	C	D	E
Millimeters	0.89	1.65	2.54	0.46	0.79
Inches	0.035	0.065	0.100	0.018	0.030

Mechanical Dimensions



	L	W	T	BW	BL	P	X	S
Inch	0.126 ±0.008	0.063 ±0.008	0.053 Max	0.016 ±0.004	0.007 +0.01/- 0.002	0.030 Ref	0.045 ±0.004	0.015 ±0.004
Millimeter	3.2 ±0.2	1.6 ±0.2	1.35 Max	0.41 ±0.1	0.18 +0.25/-0.05	0.76 Ref	1.14 ±0.1	0.38 ±0.1

MLN SurgeArray™ Suppressor

Ordering Information

VXXMLN TYPES

V 18 ML N 4 1206 W T

- **V – DEVICE FAMILY**: TVSS Device
- **18 – MAXIMUM DC WORKING VOLTAGE**
- **ML – MULTILAYER DESIGNATOR**
- **N – SERIES DESIGNATOR**: N: Array
- **4 – NUMBER OF SECTIONS**
- **1206 – DEVICE SIZE:** i.e., 120 mil x 60 mil
- **W – END TERMINATION OPTION**: W: $Ag/P_d/P_t$
- **T – PACKING OPTIONS**
  - A: 2500 Piece Bulk Pack
  - H: 7in (178mm) Diameter Reel (Note)
  - T: 13in (330mm) Diameter Reel (Note)

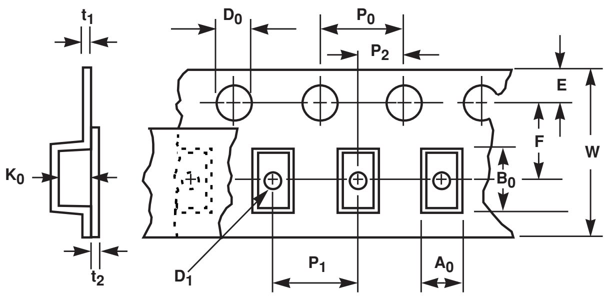
NOTE: See Standard Shipping Quantities table.

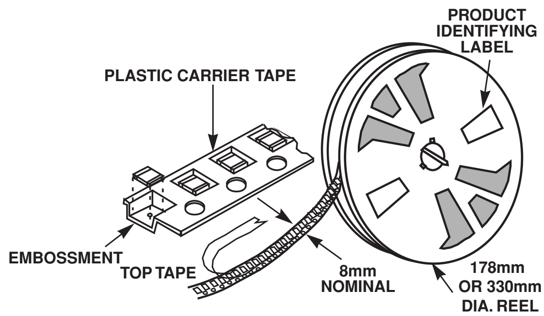
Tape and Reel Specifications

- Conforms to EIA - 481, Revision A
- Can be Supplied to IEC Publication 286 - 3

SYMBOL	DESCRIPTION	MILLIMETERS
A_0	Width of Cavity	Dependent on Chip Size to Minimize Rotation.
B_0	Length of Cavity	Dependent on Chip Size to Minimize Rotation.
K_0	Depth of Cavity	Dependent on Chip Size to Minimize Rotation.
W	Width of Tape	8 ±0.2
F	Distance Between Drive Hole Centers and Cavity Centers	3.5 ±0.5
E	Distance Between Drive Hole Centers and Tape Edge	1.75 ±0.1
P_1	Distance Between Cavity Center	4 ±0.1
P_2	Axial Distance Between Drive Hole Centers and Cavity Centers	2 ±0.1
P_0	Axial Distance Between Drive Hole Centers	4 ±0.1
D_0	Drive Hole Diameter	1.55 ±0.05
D_1	Diameter of Cavity Piercing	1.05 ±0.05
t_1	Embossed Tape Thickness	0.3 Max
t_2	Top Tape Thickness	0.1 Max

NOTE: Dimensions in millimeters.





Standard Shipping Quantities

DEVICE SIZE	"13" INCH REEL ("T" OPTION)	"7" INCH REEL ("H" OPTION)	BULK PACK ("A" OPTION)
1206	10,000	2,500	2,500