

## PROTECTION PRODUCTS

### Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{pk}$	300	Watts
ESD Voltage (HBM per IEC 61000-4-2)	$V_{ESD}$	>25	kV
Lead Soldering Temperature	$T_L$	260 (10 sec.)	°C
Operating Temperature	$T_J$	-55 to +125	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

### Electrical Characteristics

#### SL05

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$	6			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V, T=25^\circ C$			20	$\mu A$
Clamping Voltage	$V_C$	$I_{PP} = 1A,$ $t_p = 8/20\mu s$			9.8	V
Clamping Voltage	$V_C$	$I_{PP} = 5A,$ $t_p = 8/20\mu s$			11	V
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu s$			17	A
Junction Capacitance	$C_J$	Pin 1 to 2 $V_R = 0V, f = 1MHz$			5	pF

#### SL12

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				12	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$	13.3			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 12V, T=25^\circ C$			1	$\mu A$
Clamping Voltage	$V_C$	$I_{PP} = 1A,$ $t_p = 8/20\mu s$			19	V
Clamping Voltage	$V_C$	$I_{PP} = 5A,$ $t_p = 8/20\mu s$			24	V
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu s$			12	A
Junction Capacitance	$C_J$	Pin 1 to 2 $V_R = 0V, f = 1MHz$			5	pF

**PROTECTION PRODUCTS**
**Electrical Characteristics (Continued)**
**SL15**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				15	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1\text{mA}$	16.7			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 15\text{V}$ , $T=25^\circ\text{C}$			1	$\mu\text{A}$
Clamping Voltage	$V_C$	$I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$			24	V
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$			30	V
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu\text{s}$			10	A
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R = 0\text{V}$ , $f = 1\text{MHz}$			5	pF

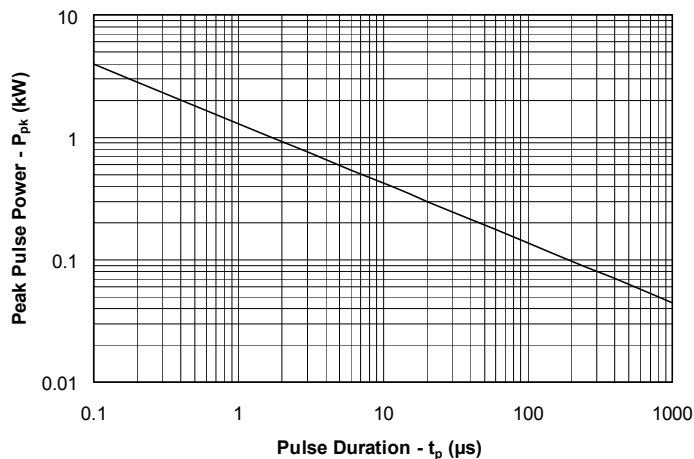
**SL24**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				24	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1\text{mA}$	26.7			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 24\text{V}$ , $T=25^\circ\text{C}$			1	$\mu\text{A}$
Clamping Voltage	$V_C$	$I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$			43	V
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$			55	V
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu\text{s}$			5	A
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R = 0\text{V}$ , $f = 1\text{MHz}$			5	pF

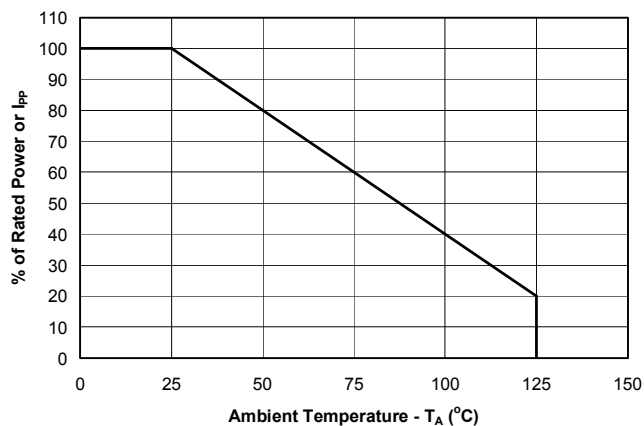
# PROTECTION PRODUCTS

## Typical Characteristics

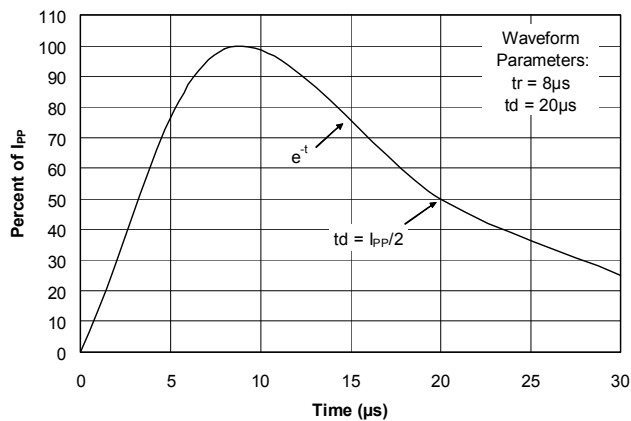
### Non-Repetitive Peak Pulse Power vs. Pulse Time



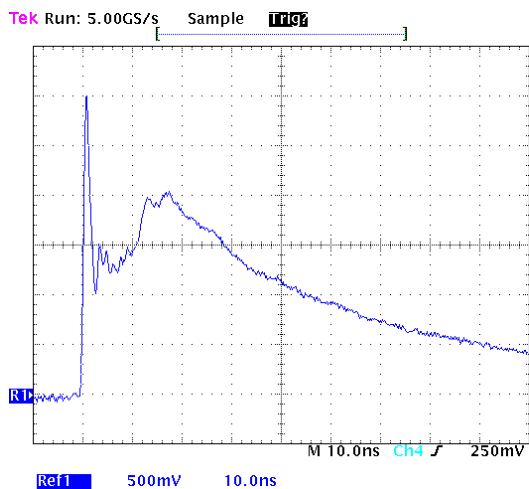
### Power Derating Curve



### Pulse Waveform



### ESD Pulse Waveform (Per IEC 61000-4-2)



### IEC 61000-4-2 Discharge Parameters

Level	First Peak Current (A)	Peak Current at 30 ns (A)	Peak Current at 60 ns (A)	Test Voltage (Contact Discharge) (kV)	Test Voltage (Air Discharge) (kV)
1	7.5	4	8	2	2
2	15	8	4	4	4
3	22.5	12	6	6	8
4	30	16	8	8	15

## PROTECTION PRODUCTS

### Applications Information

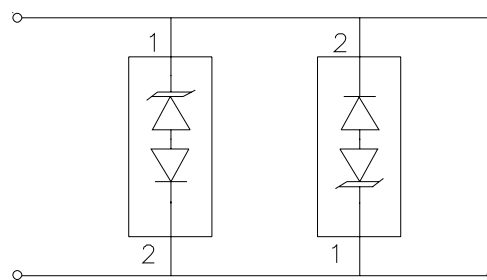
#### Device Connection for Protection of One High-Speed Data Line

The SL series devices are designed to protect high-speed data lines. The SLxx utilizes a low capacitance compensation diode in series with, but in opposite polarity to a TVS diode in each line to achieve an effective capacitance of less than 5pF per device. During a transient event, the internal rectifier must be forward biased (TVS is reversed biased). Therefore, each device will only suppress transient events in one polarity. To achieve protection in both positive and negative polarity, a second device is connected in anti-parallel to the first. On unidirectional lines, a fast switching steering diode may be used as an alternative to using two SL devices.

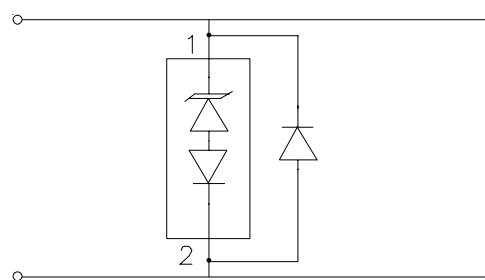
The options for connecting the devices are as follows:

- Low capacitance protection of one high-speed line:** Protection of one unidirectional or bidirectional high-speed line is achieved by connecting two devices in anti-parallel. Pin 1 of the first device is connected to the line and pin 2 is connected to ground (or to a second line for differential protection). Pin 2 of the second device is connected to line 1 and pin 1 is connected to ground (or line 2) as shown. Pin 3 is not connected. During positive duration transients, the first device will conduct from pin 1 to 2. The steering diode conducts in the forward direction while the TVS will avalanche and conduct in the reverse direction. During negative transients, the second device will conduct in the same manner. For optimum protection, the ground connections should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of parasitic inductance in the board traces. The path length between the TVS and the protected line should also be minimized.
- Connection Option for Unidirectional Lines Only:** An optional method for protecting unidirectional (normal signal polarities above ground) lines is to add a fast switching steering diode in parallel to the SL TVS. Input/outputs are connected to pin 1 of the SL device and the cathode of the rectifier. The anode of the diode and pin 2 of the SL TVS are connected to ground.

#### SL Connection Options

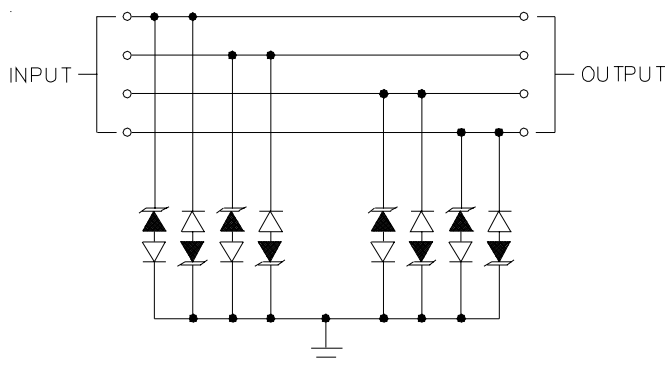


Two Devices : Bidirectional or Unidirectional Line



One Devices with Steering Diode : Unidirectional Line

#### I/O Line Protection

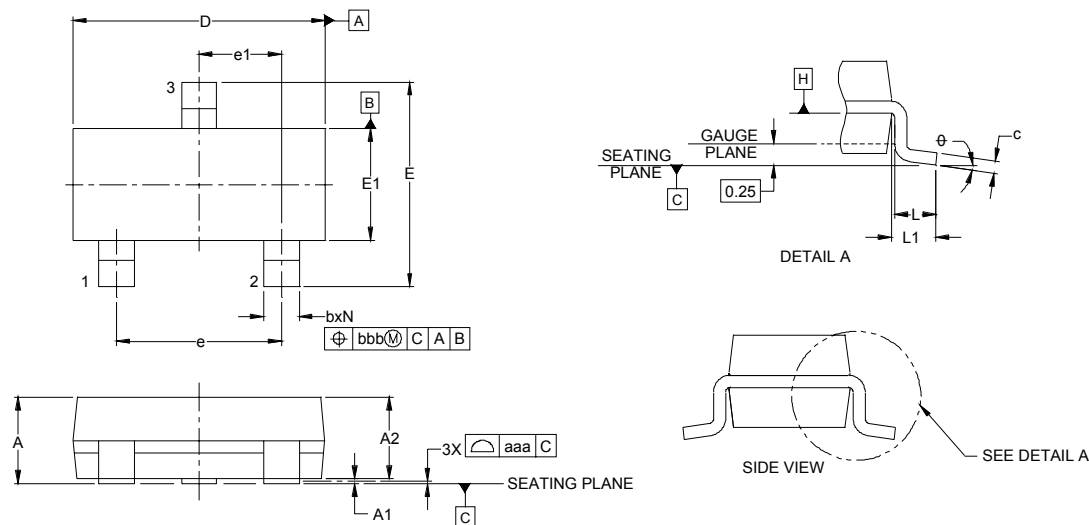


#### Matte Tin Lead Finish

Matte tin has become the industry standard lead-free replacement for SnPb lead finishes. A matte tin finish is composed of 100% tin solder with large grains. Since the solder volume on the leads is small compared to the solder paste volume that is placed on the land pattern of the PCB, the reflow profile will be determined by the requirements of the solder paste. Therefore, these devices are compatible with both lead-free and SnPb assembly techniques. In addition, unlike other lead-free compositions, matte tin does not have any added alloys that can cause degradation of the solder joint.

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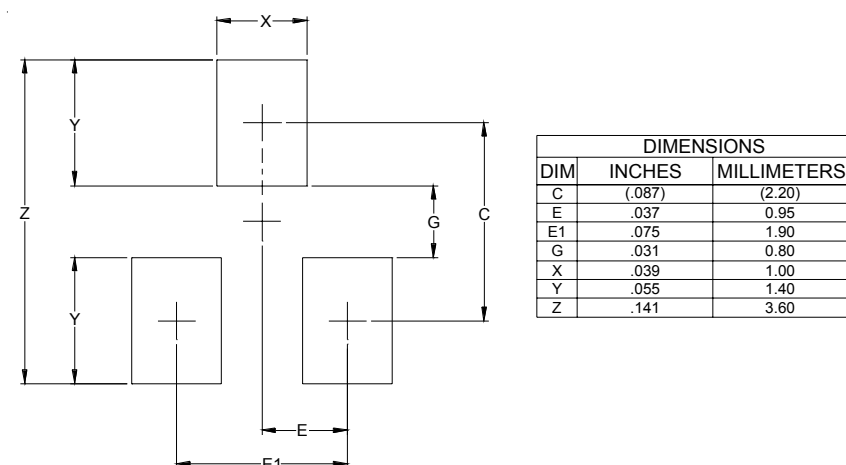
## Outline Drawing - SOT23 3L



### NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DATUMS  $\square$ A $\square$  AND  $\square$ B $\square$  TO BE DETERMINED AT DATUM PLANE  $\square$ H $\square$ .
3. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

## Land Pattern - SOT23 3L



### NOTES:

1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY  
CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR  
COMPANY'S MANUFACTURING GUIDELINES ARE MET.
2. REFERENCE IPC-SM-782A.

**PROTECTION PRODUCTS****Marking Codes**

Part Number	Marking Code
SL05	L05
SL12	L12
SL15	L15
SL24	L24

**Ordering Information**

Part Number	Lead Finish	Qty per Reel	Reel Size
SL05.TC	SnPb	3,000	7 Inch
SL12.TC	SnPb	3,000	7 Inch
SL15.TC	SnPb	3,000	7 Inch
SL24.TC	SnPb	3,000	7 Inch
SL05.TCT	Pb Free	3,000	7 Inch
SL12.TCT	Pb Free	3,000	7 Inch
SL15.TCT	Pb Free	3,000	7 Inch
SL24.TCT	Pb Free	3,000	7 Inch

**Contact Information**

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