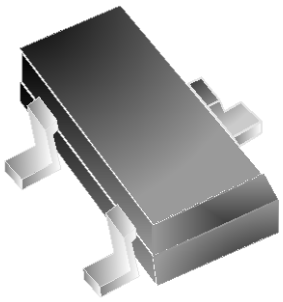
WS2.8LUC through WS12LUC

Transient Voltage Suppressor

Features

- 500 watts peak pulse power (t_p = 8/20μs)
- Small package for use in portable electronics
- Two devices will protect one line
- Ultra Low capacitance for high-speed data lines
- Working Voltages: 2.8V, 5V and 12V
- Solid-state silicon avalanche technology



SOT23-3L

IEC COMPATIBILITY (EN61000-4)

- **IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact)**
- **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- **IEC 61000-4-5 (Lightning) 20A (8/20μs)**

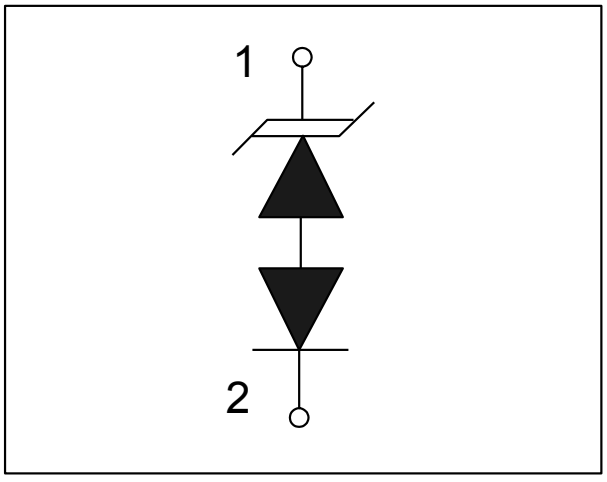
Mechanical Characteristics

- JEDEC SOT23-3L package
- Molding compound flammability rating: UL 94V-0
- Marking : Marking Code
- Packaging : Tape and Reel per EIA 481
- RoHS/WEEE Compliant

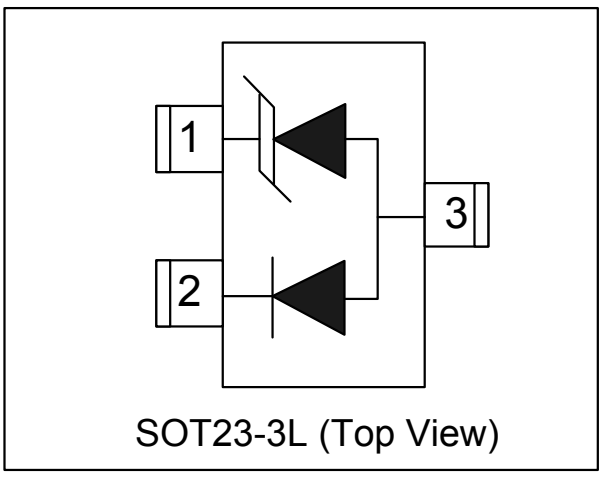
Applications

- High-speed data lines
- Cellular Handsets And Accessories
- Universal Serial Bus (USB) port protection
- Portable Electronics
- LAN/WAN equipment
- Desktop PC and Peripherals

Circuit Diagram



Schematic & PIN Configuration

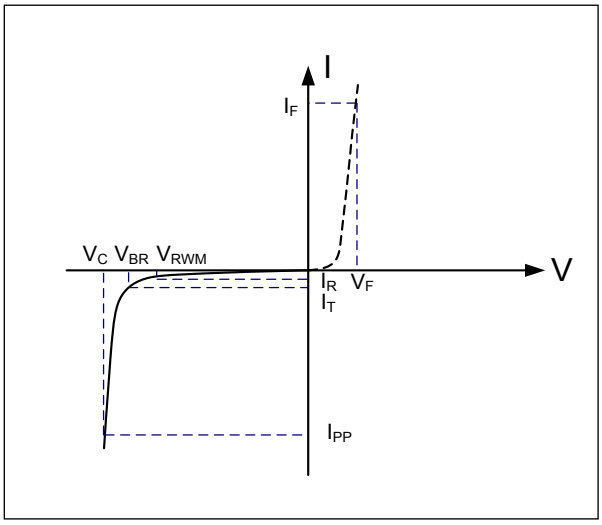


SOT23-3L (Top View)

Absolute Maximum Rating			
Rating	**Symbol**	**Value**	**Units**
Peak Pulse Power（t_p=8/20μs）	P_{PP}	500	Watts
Lead Soldering Temperature	T_L	260(10sec)	℃
Operating Temperature	T_J	-55 to + 125	℃
Storage Temperature	T_{STG}	-55 to +150	℃

Electrical Parameters (T=25℃)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current
I_F	Forward Current
V_F	Forward Voltage @ I_F



Electrical Characteristics

WS2.8LUC						
Parameter	**Symbol**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Units**
Reverse Stand-Off Voltage	V_{RWM}				2.8	V
Reverse Breakdown Voltage	V_{BR}	I_T=1mA	3			V
Reverse Leakage Current	I_R	V_{RWM}=5V, T=25℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			20	A
Clamping Voltage	V_C	I_{PP}=2A, tp=8/20μs			3.9	V
Maximum Clamping Voltage	V_C	I_{PP}=20A, tp=8/20μs			23	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		1		pF

Electrical Characteristics (Continued)

WS05LUC

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}=12V, T=25℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			20	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			9.8	V
Maximum Clamping Voltage	V_C	I_{PP}=20A, tp=8/20μs			28.8	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		0.5		pF

WS12LUC

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}=15V, T=25℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			10	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			19	V
Maximum Clamping Voltage	V_C	I_{PP}=10A, tp=8/20μs			32	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		0.5		pF

Typical Characteristics

Figure 1: Peak Pulse Power Vs Pulse Time

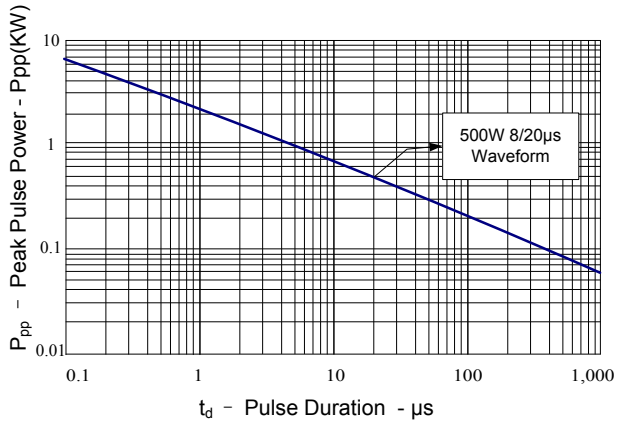


Figure 2: Power Derating Curve

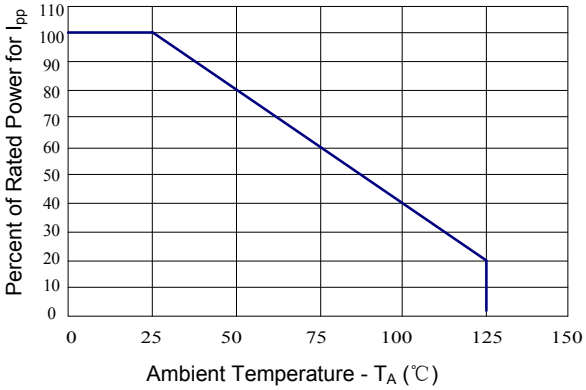


Figure 3: Clamping Voltage vs. Peak Pulse Current

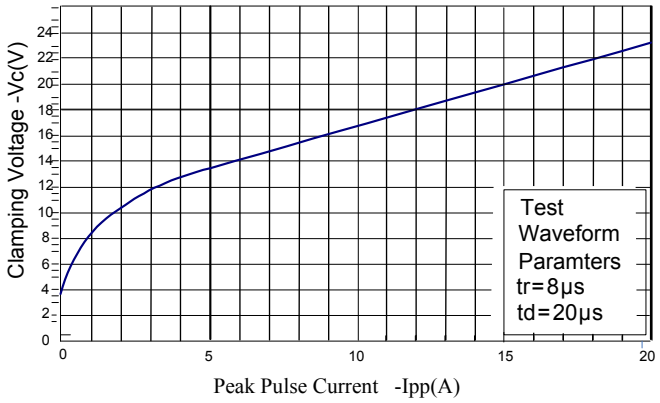


Figure 4: IEC 61000-4-2 Discharge Parameters

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	2	2	2
2	15	8	4	4	4
3	22.5	12	6	6	8
4	30	16	8	8	15

Figure 5: Pulse Waveform

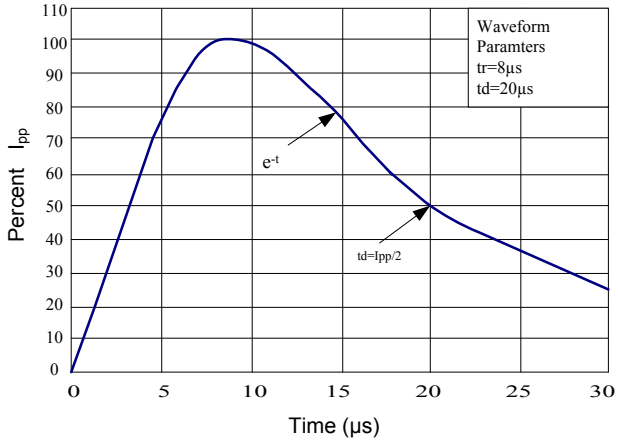
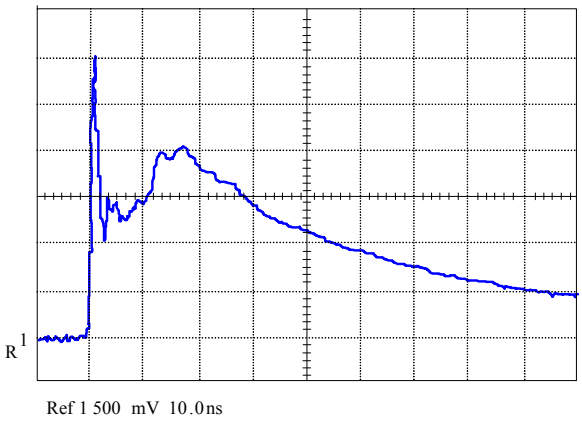


Figure 6: ESD Clamping(8kV Contact per IEC 61000-4-2)

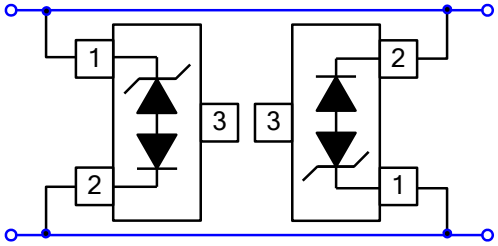


Application Information

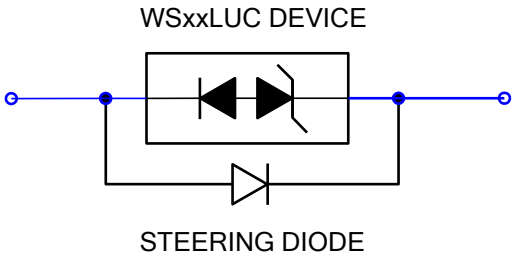
The WSxxLUC series devices are designed to protect high speed data lines. The WSxxLUC utilizes a low capacitance compensation diode in series with, but in opposite polarity to a TVS diode in each line to achieve an effective capacitance of less than 1.0pF per device. During a transient event, the internal 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 WSxxLUC devices.

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.

An alternative solution to protect unidirectional lines, is to connect a fast switching steering diode in parallel with the WSxxLUC series device. When the steering diode is forward-biased, the TVS will avalanche and conduct in reverse direction. It is important to note that by adding a steering diode, the effective capacitance in the circuit will be increased, therefore the impact of adding a steering diode must be taken in consideration to establish whether the incremental capacitance will affect the circuit functionality or not.

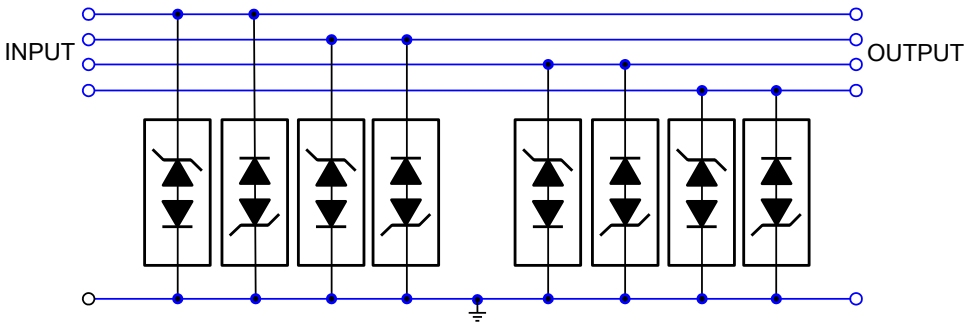


Two Devices: Bidirectional or Unidirectional Line



One Device: Unidirectional Line

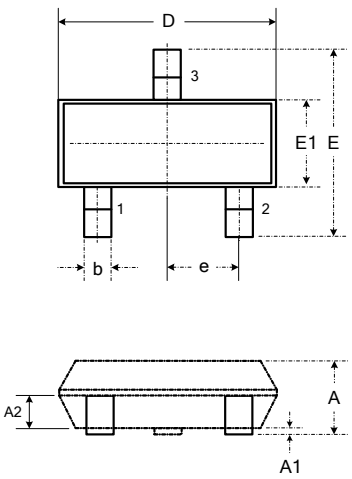
Another typical application, in which the WSxxLUC series device can be utilized, is to protect multiple I/O lines. The protection in each of the I/O lines is achieved by connecting two devices inverse-parallel

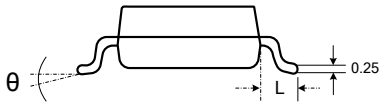


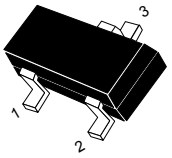
I/O Line Protection

Outline Drawing – SOT23-3L

PACKAGE OUTLINE



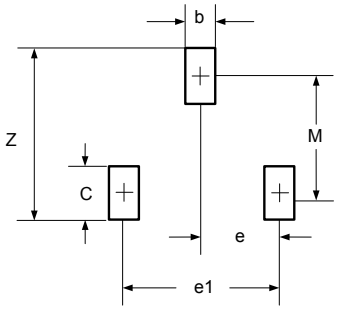




SOT23-3L

DIMENSIONS

SYMBOL	MILLIMETER		INCHES	
	MIN	MAX	MIN	MAX
A	0.89	1.13	0.035	0.044
A1	0.015	0.11	0.0006	0.0043
A2	0.60	0.70	0.0236	0.0275
D	2.72	3.12	0.1070	0.1228
E	2.60	3.00	0.1024	0.118
E1	1.40	1.80	0.0551	0.0709
e	0.95BSC		0.0374	
L	0.30	0.60	0.0118	0.0236
θ	0	8°	0	8°



DIMENSIONS		
DIM	INCHES	MILLIMETERS
M	0.101	2.60
C	0.0058	0.15
Z	0.109	2.80
e	0.037 BSC	0.95 BSC
e1	0.074 BSC	1.90 BSC
b	0.0389	0.35

Notes

1. Dimensioning and tolerances per ANSI Y14.5M, 1985.
2. Controlling Dimension: Millimeter
3. Dimensions are exclusive of mold flash and metal burrs.

Marking Codes

Part Number	WS2.8LUC	WS05LUC	WS12LUC
Marking Code	2.8L	05L	12L