

SL05T1 Series

300 Watt, SOT-23 Low Capacitance TVS for High Speed Line Protections

This new family of TVS offers transient overvoltage protection with significantly reduced capacitance. The capacitance is lowered by integrating a compensating diode in series. This integrated solution offers ESD protection for high speed interfaces such as communication systems, computers, and computer peripherals.

Specification Features:

- TVS Diode in Series with a Compensating Diode Offers <5 pF Capacitance
- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5
- Peak Power Rating of 300 Watts, $8 \times 20 \mu s$
- Bi-Direction Protection Can Be Achieved By Using Two Devices
- Flammability Rating UL 94 V-0

Mechanical Characteristics:

CASE: Void-free, transfer-molded, thermosetting plastic case

FINISH: Corrosion resistant finish, easily solderable

MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES: 260°C for 10 Seconds

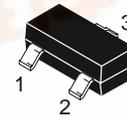
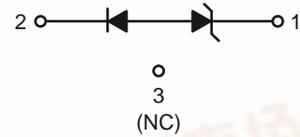
Package designed for optimal automated board assembly
Small package size for high density applications
Available in 8 mm Tape and Reel

Use the Device Number to order the 7 inch/3,000 unit reel.
Replace the "T1" with "T3" in the Device Number to order the 13 inch/10,000 unit reel.



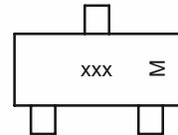
ON Semiconductor®

<http://onsemi.com>



SOT-23
CASE 318
STYLE 26

MARKING DIAGRAM



xxx = Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping
SL05T1	SOT-23	3000/Tape & Reel
SL15T1	SOT-23	3000/Tape & Reel
SL24T1	SOT-23	3000/Tape & Reel
SL05T3	SOT-23	10,000/Tape & Reel
SL15T3	SOT-23	10,000/Tape & Reel
SL24T3	SOT-23	10,000/Tape & Reel

DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the table on page 3 of this data sheet.



SL05T1 Series

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 8x20 usec (Note 1) @ $T_L \leq 25^\circ\text{C}$	P_{pk}	300	W
IEC 61000-4-2 Level 4 Contact Discharge Air Discharge IEC 61000-4-4 EFT IEC 61000-4-5 Lightning	V_{pp}	± 8 ± 16 40 12	kV kV Amps Amps
Total Power Dissipation on FR-5 Board (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Power Dissipation on Alumina Substrate (Note 3) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to +150	$^\circ\text{C}$
Lead Solder Temperature – Maximum (10 Second Duration)	T_L	260	$^\circ\text{C}$

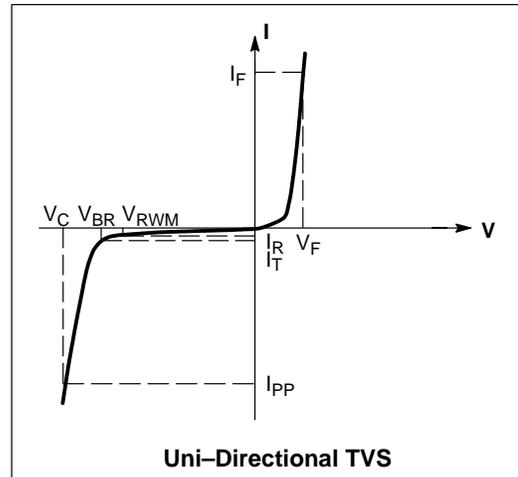
1. Non-repetitive current pulse per Figure 2
2. FR-5 = 1.0 x 0.75 x 0.62 in.
3. Alumina = 0.4 x 0.3 x 0.024 in., 99.5% alumina

ELECTRICAL CHARACTERISTICS

($T_A = 25^\circ\text{C}$ unless otherwise noted)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or 2 and 3)

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
ΘV_{BR}	Maximum Temperature Coefficient of V_{BR}
I_F	Forward Current
V_F	Forward Voltage @ I_F
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{ZK}	Reverse Current
Z_{ZK}	Maximum Zener Impedance @ I_{ZK}



SL05T1 Series

ELECTRICAL CHARACTERISTICS

Device	Device Marking	V_{RWM} (Volts)	$I_R @ V_{RWM}$ (μA)	Breakdown Voltage (Note 4)		V_C , Clamping Voltage (Note 5)		Max I_{PP} (Amps)	Capacitance	
				$V_{BR} @ 1 \text{ mA}$ (Volts)		@ 1 Amp	@ 5 Amp		@ $V_R = 0 \text{ V}$, 1 MHz (pF)	
				Min	Max	(Volts)	(Volts)		Typ	Max
SL05	L05	5.0	20	6.0	8.0	9.8	11	17	3.5	5.0
SL15	L15	15	1.0	16.7	18.5	24	30	10	3.5	5.0
SL24	L24	24	1.0	26.7	29	43	55	5.0	3.5	5.0

4. V_{BR} measured at pulse test current of 1 mA at an ambient temperature of 25°C

5. Surge current waveform per Figure 2

TYPICAL CHARACTERISTICS

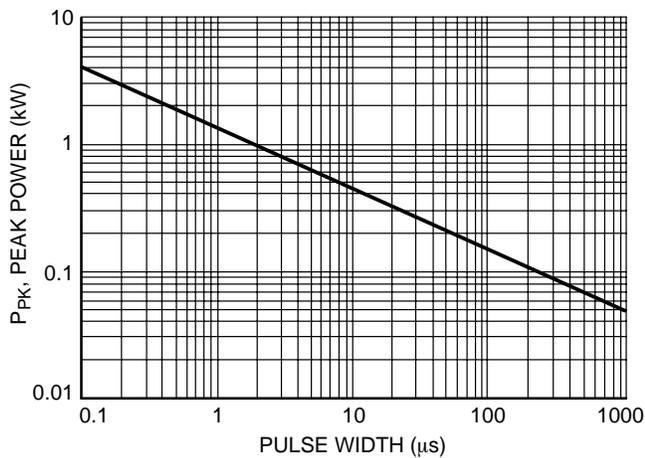


Figure 1. Maximum Peak Power Rating

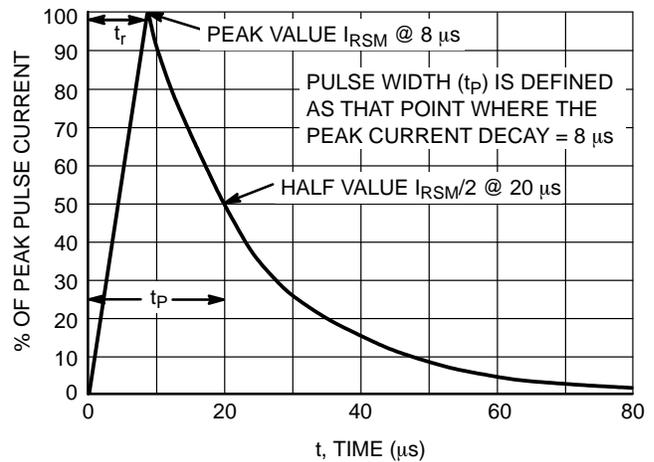


Figure 2. $8 \times 20 \mu s$ Pulse Waveform

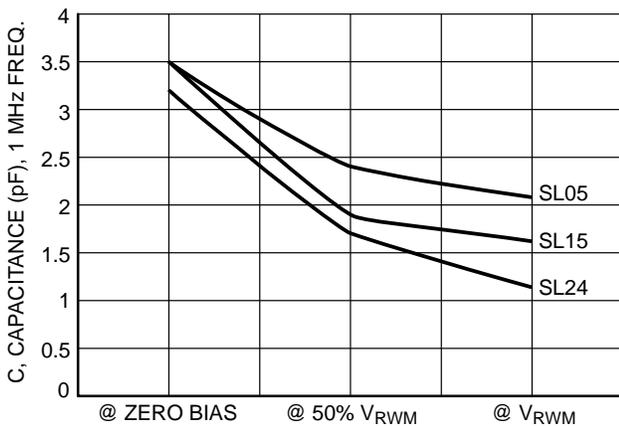


Figure 3. Typical Junction Capacitance

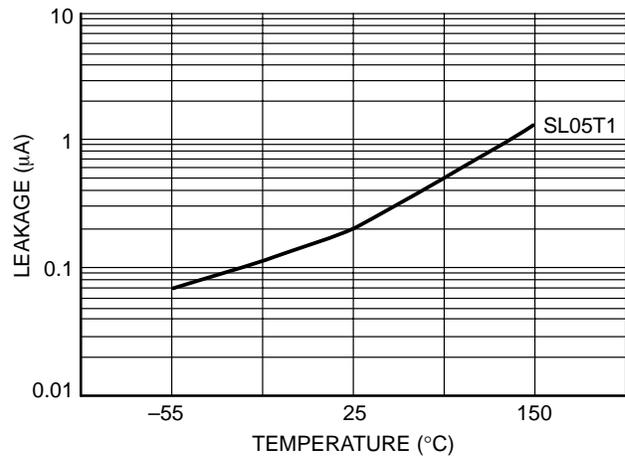


Figure 4. Typical Leakage Over Temperature

SL05T1 Series

Applications Background

This new family of TVS devices (SL05T1 series) are designed to protect sensitive electronics such as communications systems, computers, and computer peripherals against damage due to ESD conditions or transient voltage conditions. Because of their low capacitance value (less than 5 pF), they can be used in high speed I/O data lines. Low capacitance is achieved by integrating a compensating diode in series with the TVS which is basically based in the below theoretical principle:

- Capacitance in parallel: $C_T = C_1 + C_2 + \dots + C_n$
- Capacitance in series: $1/C_T = (1/C_1) + (1/C_2) + \dots + (1/C_n)$

The Figure 5 shows the integrated solution of the SL05T1 series device:



Figure 5.

In the case that an over-voltage condition occurs in the I/O line protected by the SL05T1 series device, the TVS is reversed-biased while the compensation diode is forward-biased so the resulting current due to the transient voltage is drained to ground.

If protection in both polarities is required, an additional device is connected in inverse-parallel with reference to the first one, the Figure 6 illustrates the inverse-parallel connection for bi-directional or unidirectional lines:

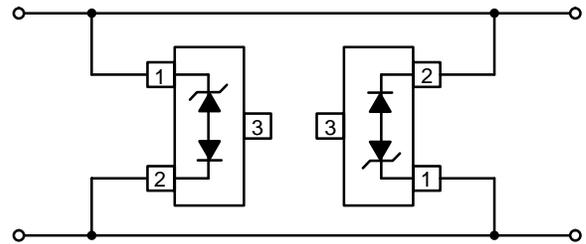


Figure 6.

An alternative solution to protect unidirectional lines, is to connect a fast switching steering diode in parallel with the SL05T1 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. The Figure 7 shows the connection between the steering diode and the SL05T1 series device:

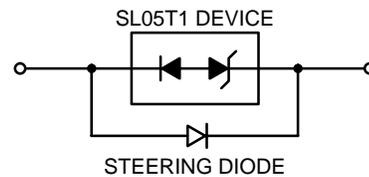


Figure 7.

Another typical application in which the SL05T1 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 in inverse-parallel. The Figure 8 illustrates how multiple I/O line protection is achieved:

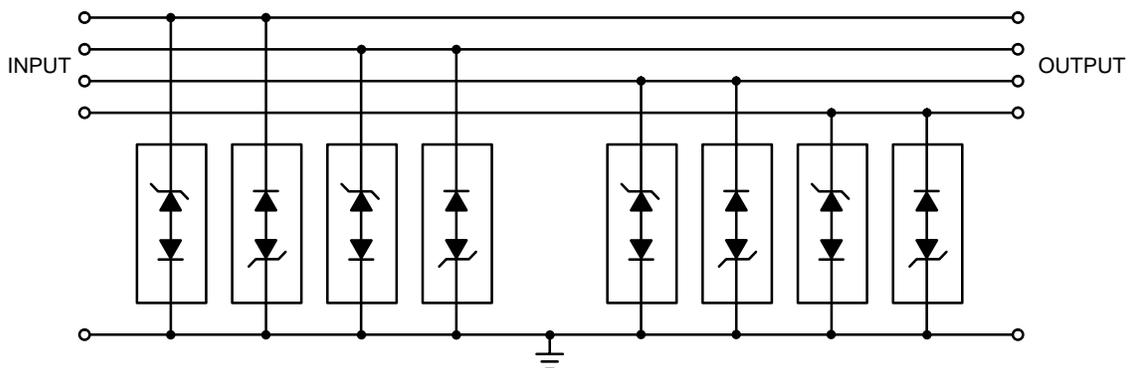


Figure 8.

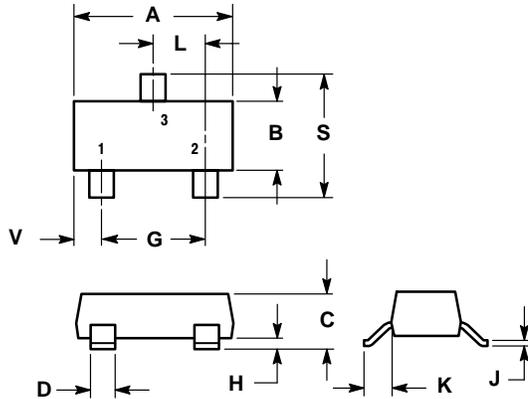
For optimizing the protection, it is recommended to use ground planes and short path lengths to minimize the PCB's ground inductance.

SL05T1 Series

Transient Voltage Suppressors – Surface Mount

300 Watts Peak Power

SOT-23
TO-236AB
CASE 318-09
ISSUE AH



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01, -02, AND -06 OBSOLETE, NEW STANDARD 318-09.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0385	0.0498	0.99	1.26
D	0.0140	0.0200	0.36	0.50
G	0.0670	0.0826	1.70	2.10
H	0.0040	0.0098	0.10	0.25
J	0.0034	0.0070	0.085	0.177
K	0.0180	0.0236	0.45	0.60
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.0984	2.10	2.50
V	0.0177	0.0236	0.45	0.60

STYLE 26:

- PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

SL05T1 Series

Notes

SL05T1 Series

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