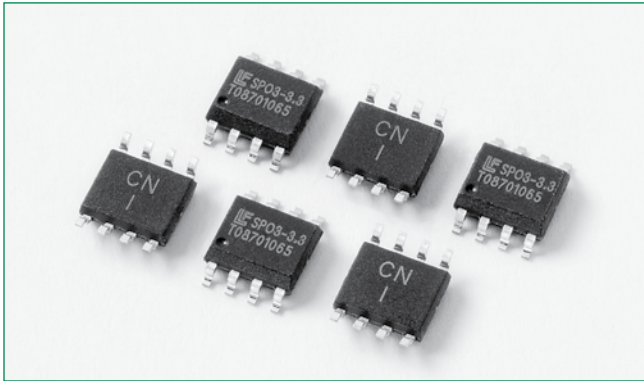## SP03-3.3 Series 3.3V 150A Diode Array

UL RoHS Pb GREEN

Description

This new broadband protection component from Littelfuse provides overvoltage protection for applications such as 10/100/1000 BaseT Ethernet, T3/E3 DS3 interfaces, ADSL2+, and VDSL2+. This new protector combines the TVS diode element with a diode rectifier bridge to provide both longitudinal and differential protection in one package. This design innovation results in a capacitive loading characteristic that is log-linear with respect to the signal voltage across the device. This reduces intermodulation (IM) distortion caused by a typical solid-state protection solution. The application schematic provides the connection information.

Agency Approvals

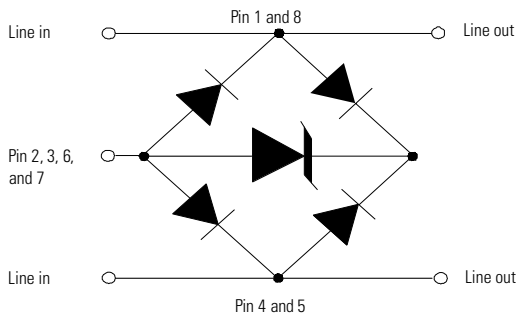| Agency	Agency File Number
UL	E128662
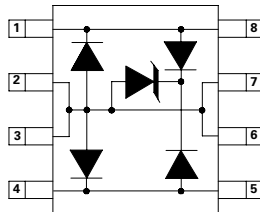
Features

- RoHS compliant
- SOIC-8 surface mount package (JEDEC MS-012)
- Low insertion loss, log-linear capacitance
- Combined longitudinal and metallic protection
- IEC 61000-4-5, 2nd edition: 8/20 surge, 150A surge immunity
- Clamping speed of nanoseconds
- UL 94V-0 epoxy molding
- UL Recognized epoxy meeting flammability rating V-0
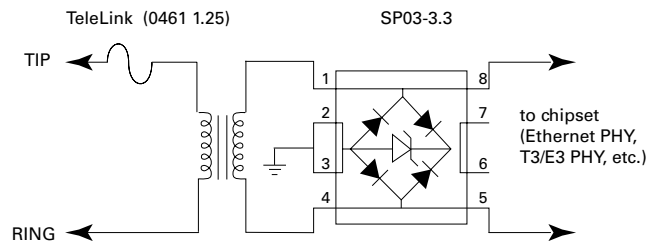- Low clamping voltage
- Lead-free

Pinout

SOIC-8 (Top View)

Applications

- T1/E1 Line cards
- T3/E3 and DS3 Interfaces
- STS-1 Interfaces
- 10/100/1000 BaseT Ethernet

Functional Block Diagram

Application Example

This schematic shows a high-speed data interface protection solution. The SP03-3.3 provides both metallic (differential) and longitudinal (common mode) protection from lightning induced surge events. Its surge rating is compatible with the intra-building surge requirements of Telcordia's GR-1089-CORE, and the Basic Level Recommendations of ITU K.20 and .21. This component protects against both positive and negative induced surge events. The TeleLink fuse provides overcurrent protection for the long term 50/60 Hz power fault events.

Additional Information

Datasheet   **Resources**   **Samples**

Life Support Note:
Not Intended for Use in Life Support or Life Saving Applications
The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

Absolute Maximum Ratings

Parameter	Rating	Units
Peak Pulse Current (8/20μs)	150	A
Peak Pulse Power (8/20μs)	3300	W
IEC 61000-4-2, Contact Discharge, (Level 4)	30	kV
IEC 61000-4-2, Air Discharge, (Level 4)	30	kV
IEC 61000-4-5, 2nd edition (8/20μs)	150	A
Telcordia GR 1089 (Intra-Building) (2/10μs)	100	A
ITU K.20 (5/310μs)	40	A

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Thermal Information

Parameter	Rating	Units
SOIC Package	170	°C/W
Operating Temperature Range	–40 to 125	°C
Storage Temperature Range	–55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s) (SOIC - Lead Tips Only)	260	°C

Electrical Characteristics (T_{OP} = 25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Stand-Off Voltage	V_{RWM}	-	-	-	3.3	V
Reverse Breakdown Voltage	V_{BR}	I_T= 2μA	3.3	-	-	V
Reverse Breakdown Voltage	V_{BR}	I_T= 50μA	3.3	-	-	V
Reverse Leakage Current	I_R	V_{RWM}= 3.3V, T= 25°C	-	-	1	μA
Clamping Voltage, Line-Ground	V_C	I_{PP}= 50A, t_p=8/20 μs	-	-	11.5	V
Clamping Voltage, Line-Ground	V_C	I_{PP}= 100A, t_p=8/20 μs	-	-	15	V
Clamping Voltage, Line-Line	V_C	I_{PP}= 50A, t_p=8/20 μs	-	-	13.5	V
Clamping Voltage, Line-Line	V_C	I_{PP}= 100A, t_p=8/20 μs	-	-	18	V
Junction Capacitance	C_j	Between I/O Pins and Ground V_R=0V, f= 1MHz	-	16	25	pF
		Between I/O Pins V_R=0V, f= 1MHz	-	8	12	pF

Figure 1: Non-repetitive Peak Pulse Current vs. Pulse Time
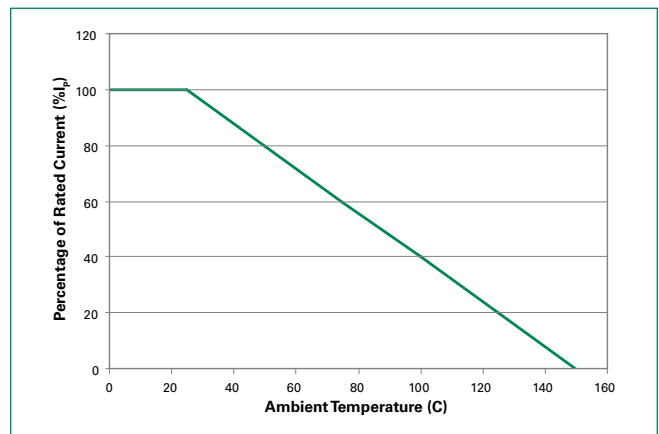

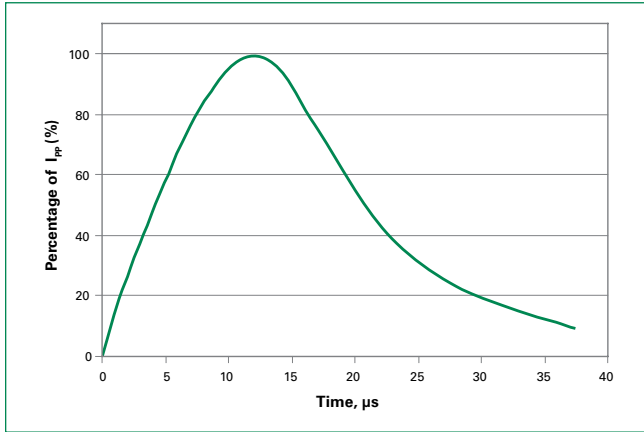### Figure 2: Current Derating Curve

Figure 3: Pulse Waveform

Percentage of I_{PP} (%) vs. Time, µs

Figure 4: Clamping Voltage vs. Peak Pulse Current

V_C Clamping Voltage (V) vs. I_P Peak Impulse Current (A)

Line to Line

Line to Ground
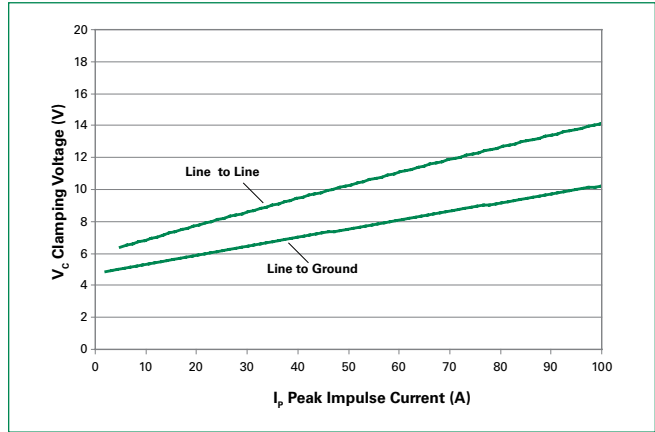
Figure 5: Capacitance vs. Reverse Voltage

Capacitance (pF) vs. Reverse Voltage (V)

Line to Ground

Line to Line
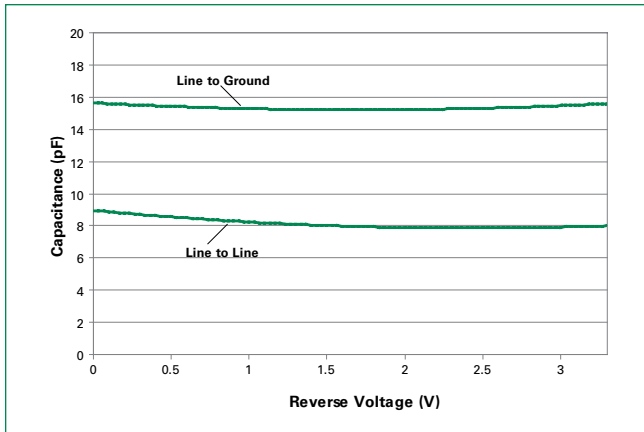
Figure 6: Forward Voltage vs. Forward Current

Forward Voltage (V) vs. Forward Current (A)

Ground-to-Line
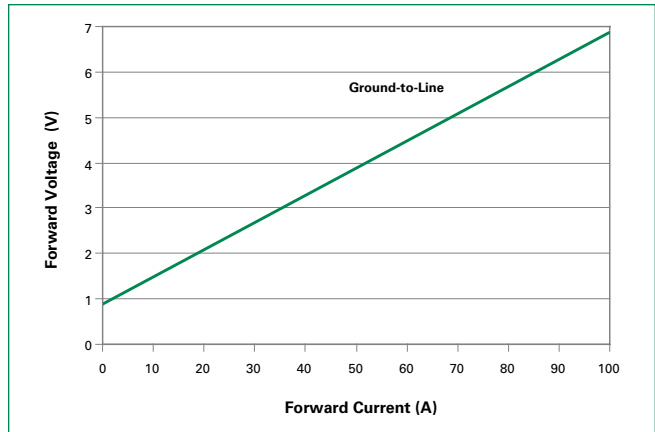
Soldering Parameters

Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 180 secs
Average ramp up rate (Liquidus) Temp (T_L) to peak		3°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Temperature (t_L)	60 – 150 seconds
Peak Temperature (T_P)		260$^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		260°C

Temperature vs. Time diagram:
T_P, T_L, $T_{S(max)}$, $T_{S(min)}$, 25
t_P, Critical Zone T_L to T_P, Ramp-up, t_L, Ramp-down, Preheat, t_S, time to peak temperature
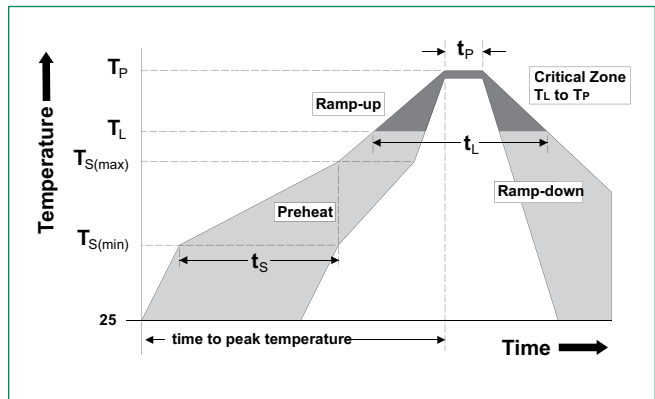
Package Dimensions — Mechanical Drawings and Recommended Solder Pad Outline

Recommended Soldering Pad Outline (Reference Only)
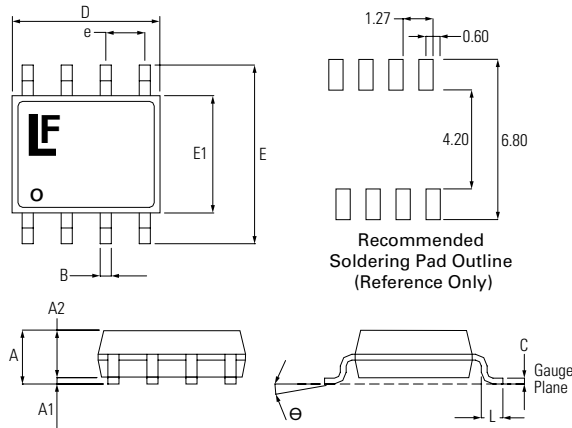
Package	SOIC-8			
Pins	8			
JEDEC	MS-012			
	Millimetres		Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.050	0.065
B	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.40	1.27	0.016	0.050

Embossed Carrier Tape & Reel Specification — SOIC Package
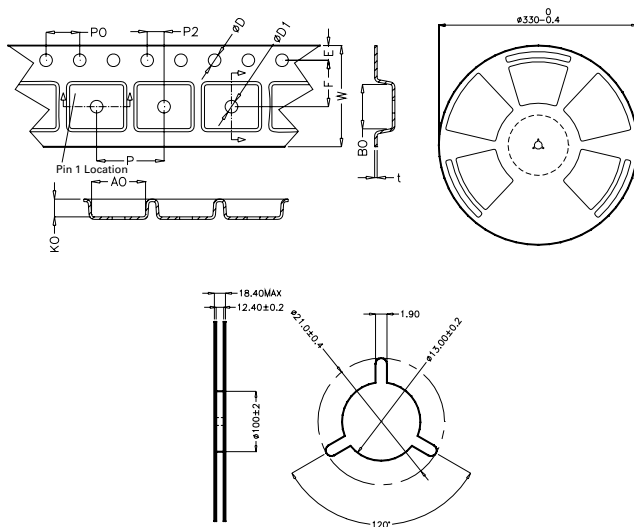
	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	5.4	5.6	0.213	0.22
P2	1.95	2.05	0.077	0.081
D	1.5	1.6	0.059	0.063
D1	1.50 Min		0.059 Min	
P0	3.9	4.1	0.154	0.161
10P0	40.0 ± 0.20		1.574 ± 0.008	
W	11.9	12.1	0.468	0.476
P	7.9	8.1	0.311	0.319
A0	6.3	6.5	0.248	0.256
B0	5.1	5.3	0.2	0.209
K0	2	2.2	0.079	0.087
t	0.30 ± 0.05		0.012 ± 0.002	

Part Numbering System

SP 03 -3.3 B T G

G= Green

T= Tape & Reel

Package
B = SOIC

TVS Diode Arrays
(SPA® Diodes)

Series

Working Voltage

Part Marking System

LF SP03-3.3

XXXXXXXX

First Line: Part number
Second Line: Date code
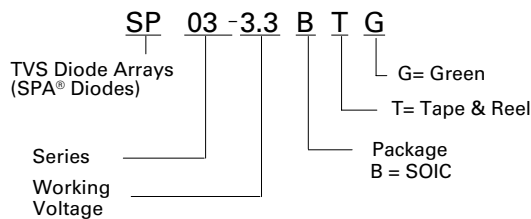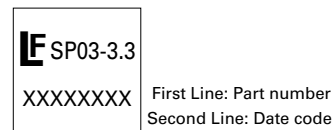
Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP03-3.3BTG	SOIC-8 Tape & Reel	SP03-3.3	2500