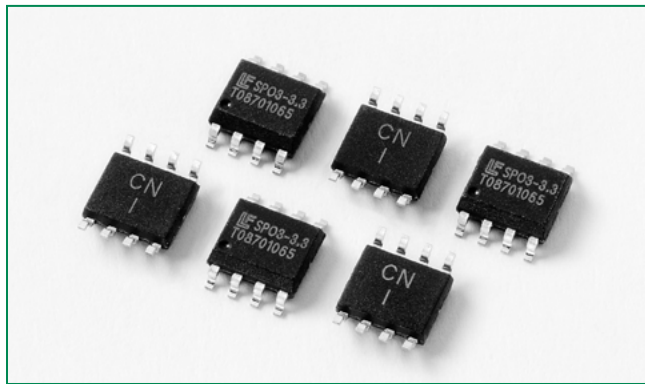


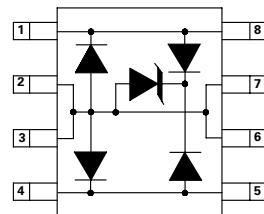
## SP03-3.3 Series 3.3V 150A Diode Array



### Agency Approvals - Pending

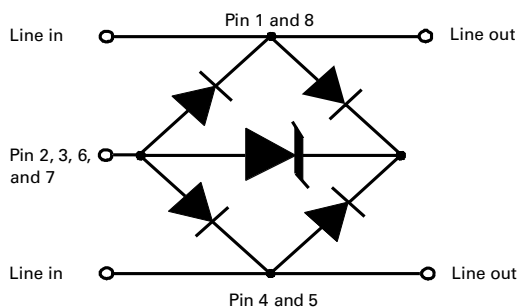
| Agency | Agency File Number |
|--------|--------------------|
|        | E128662            |

### Pinout



SOIC-8 (Top View)

### Functional Block Diagram



### 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.

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Specifications are subject to change without notice.  
Revised: 04/24/13

### Description

This new broadband protection device 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.

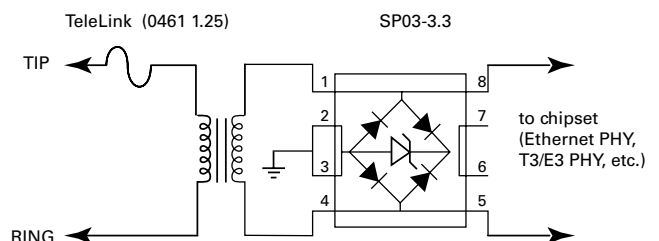
### Features

- RoHS compliant
- SOIC-8 surface mount package (JEDEC MS-012)
- Low insertion loss, log-linear capacitance
- Combined longitudinal and metallic protection
- Lightning Protection, IEC61000-4-5, 100A (8/20μs)
- Clamping speed of nanoseconds
- UL 94V-0 epoxy molding
- Pending UL recognized component
- Low clamping voltage

### Applications

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

### 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 device 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.

### Absolute Maximum Ratings

| Parameter                                   | Rating | Units |
|---------------------------------------------|--------|-------|
| Peak Pulse Current (8/20μs)                 | 150    | A     |
| Peak Pulse Power (8/20μs)                   | 3300   | W     |
| IEC 61000-4-2, Direct Discharge, (Level 4)  | 30     | kV    |
| IEC 61000-4-2, Air Discharge, (Level 4)     | 30     | kV    |
| IEC 61000-4-5 (8/20μs)                      | 100    | 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    |

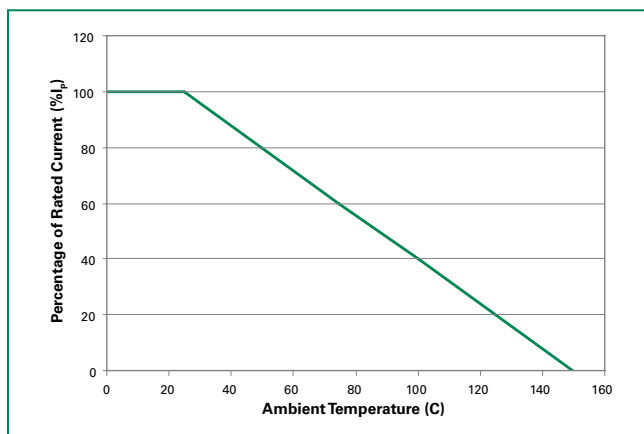
### Electrical Characteristics (T<sub>OP</sub> = 25°C)

| Parameter                     | Symbol           | Test Conditions                                              | Min | Typ | Max  | Units |
|-------------------------------|------------------|--------------------------------------------------------------|-----|-----|------|-------|
| Reverse Stand-Off Voltage     | V <sub>RWM</sub> | -                                                            | -   | -   | 3.3  | V     |
| Reverse Breakdown Voltage     | V <sub>BR</sub>  | I <sub>T</sub> = 2μA                                         | 3.3 | -   | -    | V     |
| Reverse Breakdown Voltage     | V <sub>BR</sub>  | I <sub>T</sub> = 50μA                                        | 3.3 | -   | -    | V     |
| Reverse Leakage Current       | I <sub>R</sub>   | V <sub>RWM</sub> = 3.3V, T = 25°C                            | -   | -   | 1    | μA    |
| Clamping Voltage, Line-Ground | V <sub>C</sub>   | I <sub>pp</sub> = 50A, t <sub>p</sub> = 8/20 μs              | -   | -   | 11.5 | V     |
| Clamping Voltage, Line-Ground | V <sub>C</sub>   | I <sub>pp</sub> = 100A, t <sub>p</sub> = 8/20 μs             | -   | -   | 15   | V     |
| Clamping Voltage, Line-Line   | V <sub>C</sub>   | I <sub>pp</sub> = 50A, t <sub>p</sub> = 8/20 μs              | -   | -   | 13.5 | V     |
| Clamping Voltage, Line-Line   | V <sub>C</sub>   | I <sub>pp</sub> = 100A, t <sub>p</sub> = 8/20 μs             | -   | -   | 18   | V     |
| Junction Capacitance          | C <sub>j</sub>   | Between I/O Pins and Ground<br>V <sub>R</sub> = 0V, f = 1MHz | -   | 16  | 25   | pF    |
|                               |                  | Between I/O Pins<br>V <sub>R</sub> = 0V, f = 1MHz            | -   | 8   | 12   | pF    |

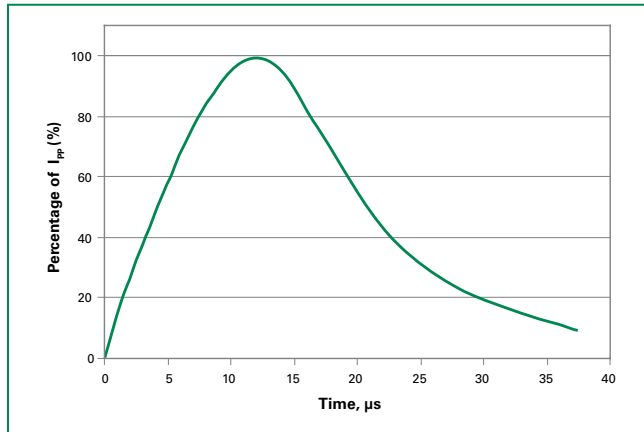
Figure 1: Non-repetitive Peak Pulse Current vs. Pulse Time



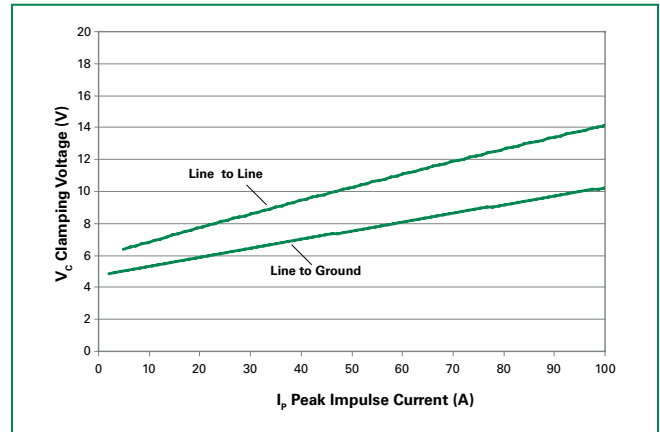
Figure 2: Current Derating Curve



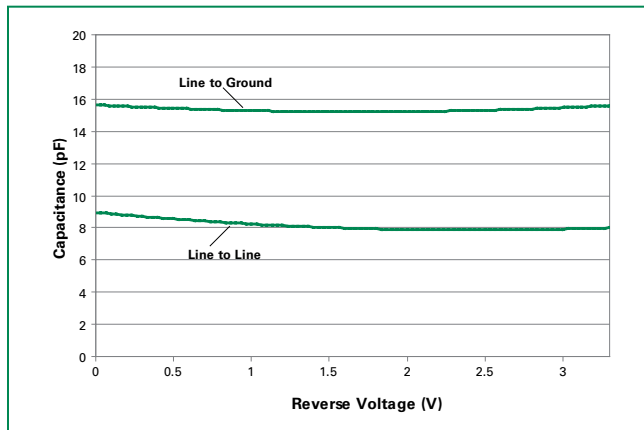
**Figure 3: Pulse Waveform**



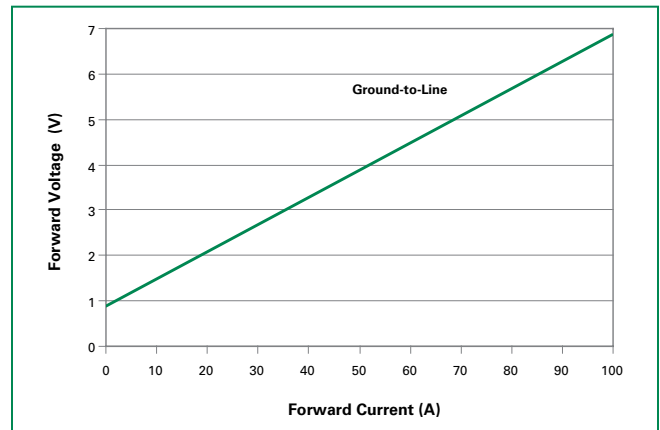
**Figure 4: Clamping Voltage vs. Peak Pulse Current**



**Figure 5: Capacitance vs. Reverse Voltage**

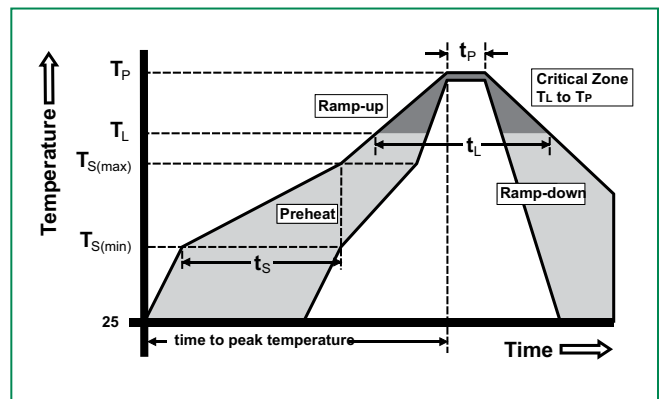


**Figure 6: Forward Voltage vs. Forward Current**

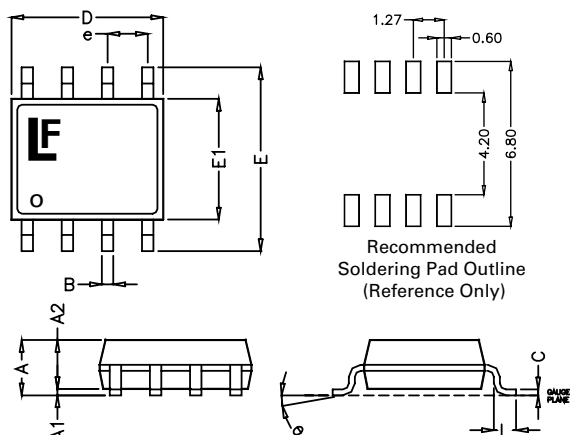


## Soldering Parameters

|                                                        |                                    |                    |
|--------------------------------------------------------|------------------------------------|--------------------|
| 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              |

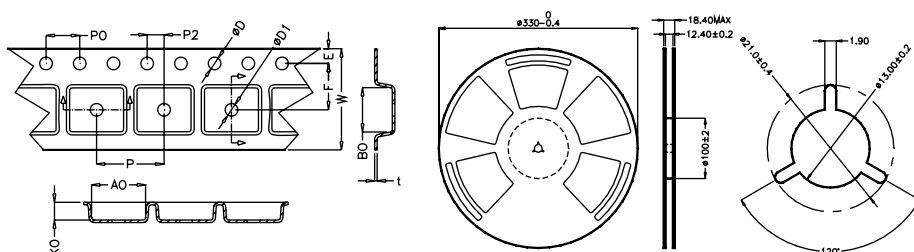


## Package Dimensions — Mechanical Drawings and Recommended Solder Pad Outline



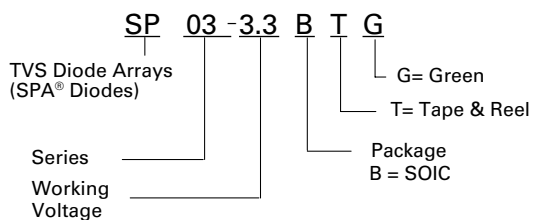
| Package   | SOIC-8      |      |           |       |
|-----------|-------------|------|-----------|-------|
| Pins      | 8           |      |           |       |
| JEDEC     | MS-012      |      |           |       |
|           | Millimetres |      | Inches    |       |
|           | Min        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

## Embossed Carrier Tape & Reel Specification – SOIC Package

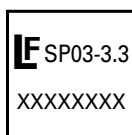


|             | Millimetres |      | Inches        |       |
|-------------|-------------|------|---------------|-------|
|             | Min         | Max  | Min           | Max   |
| <b>E</b>    | 1.65        | 1.85 | 0.065         | 0.073 |
| <b>F</b>    | 5.4         | 5.6  | 0.213         | 0.22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

## Part Numbering System



## Part Marking System



First Line: Part number  
Second Line: Date code

## Ordering Information

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

## Product Characteristics

|                            |                        |
|----------------------------|------------------------|
| <b>Lead Plating</b>        | Matte Tin              |
| <b>Lead Material</b>       | Copper Alloy           |
| <b>Lead Coplanarity</b>    | 0.004 inches (0.102mm) |
| <b>Substitute Material</b> | Silicon                |
| <b>Body Material</b>       | Molded Epoxy           |
| <b>Flammability</b>        | UL 94 V-0              |

Notes :

1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.