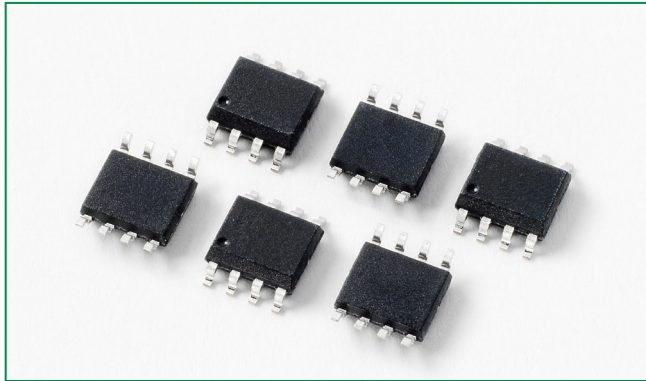
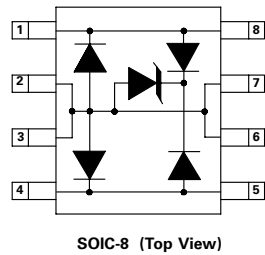


# SP03A-3.3 Series 3.3V 150A Diode Array

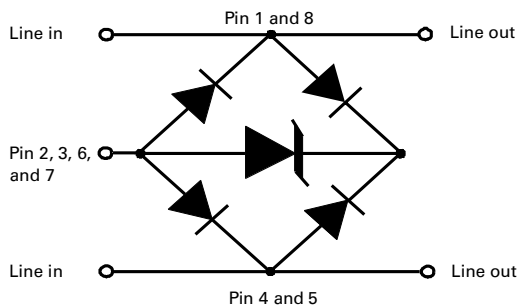
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## Pinout



## Functional Block Diagram



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.

## Description

This SP03A provides overvoltage protection for applications such as 10/100/1000 BaseT Ethernet, and T3/E3 interfaces. 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 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 and the SP03A is rated for GR-1089, intra-building transient immunity requirements for telecommunication installations.

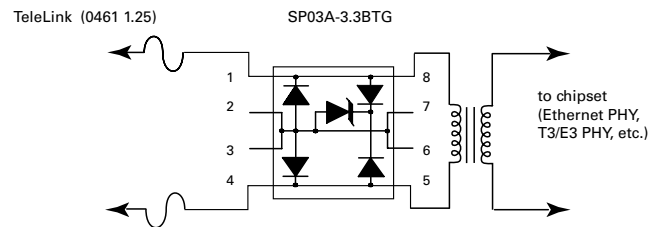
## Features

- Lightning Protection, IEC 61000-4-5 2nd edition, 150A ( $t_P=8/20\mu s$ )
- EFT, IEC 61000-4-4, 40A ( $t_P=5/50ns$ )
- Low insertion loss, log-linear capacitance
- Low clamping voltage
- SOIC-8 surface mount package (JEDEC MS-012)
- Combined longitudinal and metallic protection
- Clamping speed of nanoseconds
- UL V-0 Flammability epoxy molding
- RoHS compliant and lead-free

## 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 SP03A-3.3BTG is compatible with the intra-building surge requirements of Telcordia's GR-1089-CORE, and the Basic Level Recommendations of ITU K.20 and K.21. The TeleLink fuse provides overcurrent protection for the long term 50/60 Hz power fault events.

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**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)                      | 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    |

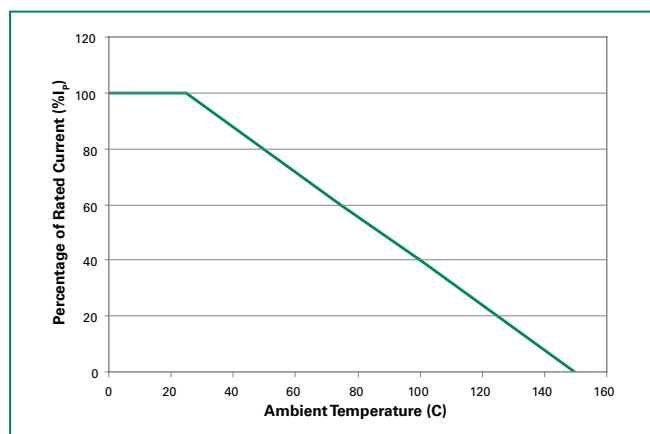
**Electrical Characteristics (T<sub>OP</sub> = 25°C)**

| Parameter                       | Symbol           | Test Conditions                                                               | Min | Typ  | Max | Units |
|---------------------------------|------------------|-------------------------------------------------------------------------------|-----|------|-----|-------|
| Reverse Stand-Off Voltage       | V <sub>RWM</sub> | I <sub>T</sub> ≤ 1μA                                                          | -   | -    | 3.3 | V     |
| Reverse Breakdown Voltage       | V <sub>BR</sub>  | I <sub>T</sub> = 2μA                                                          | 3.3 | -    | -   | V     |
| Snap Back Voltage               | V <sub>SB</sub>  | I <sub>T</sub> = 50mA                                                         | 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                               | -   | -    | 13  | V     |
| Clamping Voltage, Line-Ground   | V <sub>C</sub>   | I <sub>PP</sub> = 100A, t <sub>p</sub> = 8/20 μs                              | -   | -    | 17  | V     |
| Dynamic Resistance, Line-Ground | R <sub>DYN</sub> | (V <sub>C2</sub> - V <sub>C1</sub> ) / (I <sub>PP2</sub> - I <sub>PP1</sub> ) | -   | 0.15 | -   | Ω     |
| Clamping Voltage, Line-Line     | V <sub>C</sub>   | I <sub>PP</sub> = 50A, t <sub>p</sub> = 8/20 μs                               | -   | -    | 15  | V     |
| Clamping Voltage, Line-Line     | V <sub>C</sub>   | I <sub>PP</sub> = 100A, t <sub>p</sub> = 8/20 μs                              | -   | -    | 20  | V     |
| Dynamic Resistance, Line-Line   | R <sub>DYN</sub> | (V <sub>C2</sub> - V <sub>C1</sub> ) / (I <sub>PP2</sub> - I <sub>PP1</sub> ) | -   | 0.25 | -   | Ω     |
| Junction Capacitance            | C <sub>j</sub>   | Between I/O Pins and Ground<br>V <sub>R</sub> = 0V, f = 1MHz                  | -   | 9    | 12  | pF    |
|                                 |                  | Between I/O Pins<br>V <sub>R</sub> = 0V, f = 1MHz                             | -   | 4.5  | 6   | pF    |

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

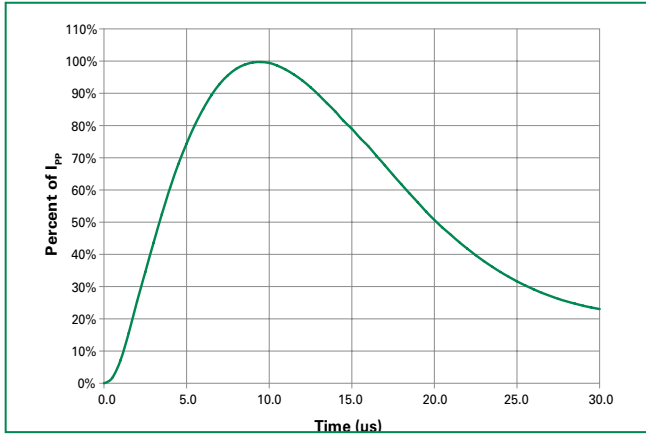


**Figure 2: Current Derating Curve**

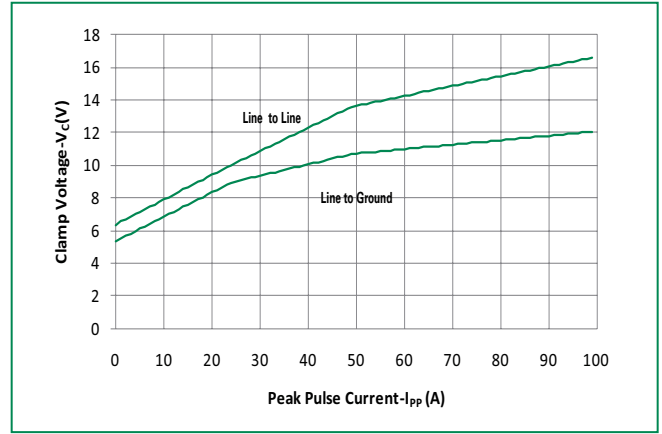


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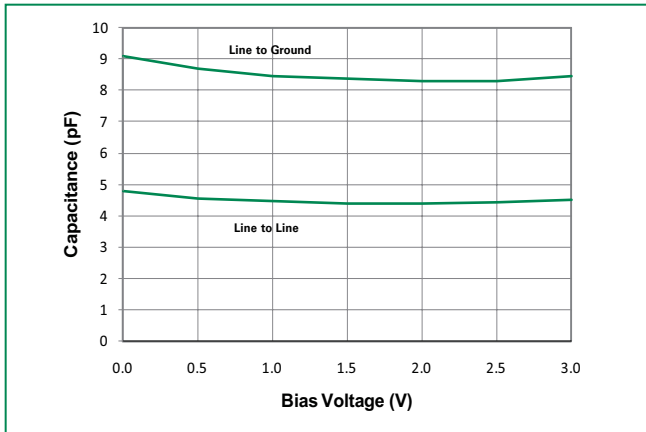
**Figure 3: 8/20µS Pulse Waveform**



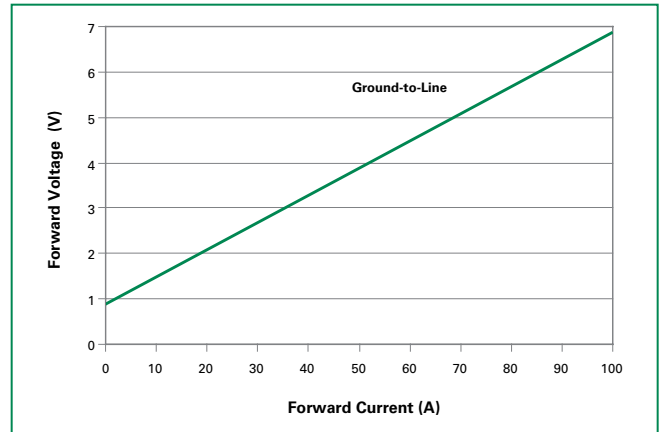
**Figure 4: Clamping Voltage vs. Peak Pulse Current**



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

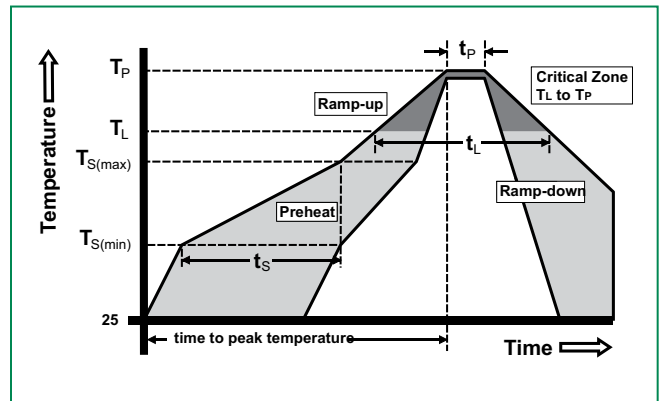


**Figure 6: Forward Voltage vs. Forward Current**



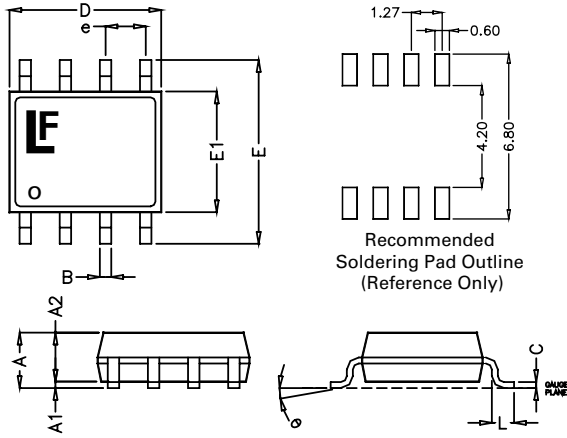
**Soldering Parameters**

|                                                                |                                            |                  |
|----------------------------------------------------------------|--------------------------------------------|------------------|
| Reflow Condition                                               | Pb – Free assembly                         |                  |
| Pre Heat                                                       | - Temperature Min (T <sub>s(min)</sub> )   | 150°C            |
|                                                                | - Temperature Max (T <sub>s(max)</sub> )   | 200°C            |
|                                                                | - Time (min to max) (t <sub>s</sub> )      | 60 – 180 secs    |
| Average ramp up rate (Liquidus) Temp (T <sub>L</sub> ) to peak | 3°C/second max                             |                  |
| T <sub>S(max)</sub> to T <sub>L</sub> - Ramp-up Rate           | 3°C/second max                             |                  |
| Reflow                                                         | - Temperature (T <sub>L</sub> ) (Liquidus) | 217°C            |
|                                                                | - Temperature (t <sub>L</sub> )            | 60 – 150 seconds |
| Peak Temperature (T <sub>p</sub> )                             | 260 <sup>+0/-5</sup> °C                    |                  |
| Time within 5°C of actual peak Temperature (t <sub>p</sub> )   | 20 – 40 seconds                            |                  |
| Ramp-down Rate                                                 | 6°C/second max                             |                  |
| Time 25°C to peak Temperature (T <sub>p</sub> )                | 8 minutes Max.                             |                  |
| Do not exceed                                                  | 260°C                                      |                  |



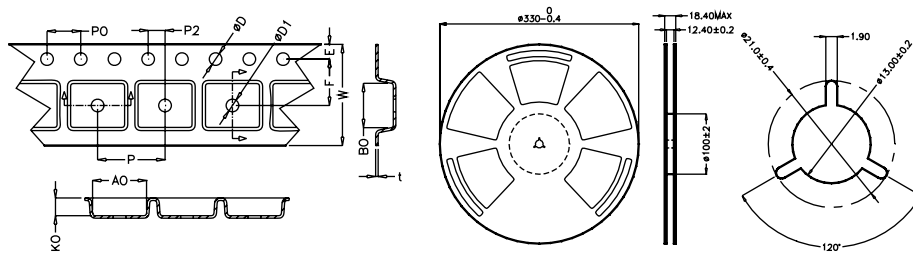
**OBSOLETE** DATE: 2016 PCN/ECN# N/A  
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**Package Dimensions – Mechanical Drawings and Recommended Solder Pad Outline**



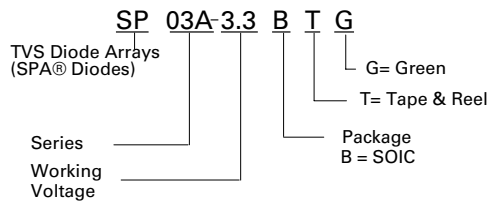
| Package   | SOIC        |      |           |       |
|-----------|-------------|------|-----------|-------|
| Pins      | 8           |      |           |       |
| JEDEC     | MS-012      |      |           |       |
|           | Millimetres |      | Inches    |       |
|           | Min         | 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**

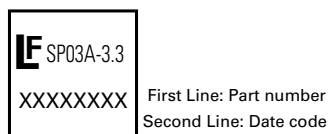


|             | Millimetres   |      | Inches          |       |
|-------------|---------------|------|-----------------|-------|
|             | Min           | Max  | Min             | Max   |
| <b>E</b>    | 1.65          | 1.85 | 0.065           | 0.073 |
| <b>F</b>    | 5.4           | 5.6  | 0.213           | 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**



**Ordering Information**

| Part Number  | Package          | Marking   | Min. Order Qty. |
|--------------|------------------|-----------|-----------------|
| SP03A-3.3BTG | SOIC Tape & Reel | SP03A-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>Substrate material</b> | Silicon                |
| <b>Body Material</b>      | Molded Epoxy           |
| <b>Flammability</b>       | UL 94 V-0              |

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