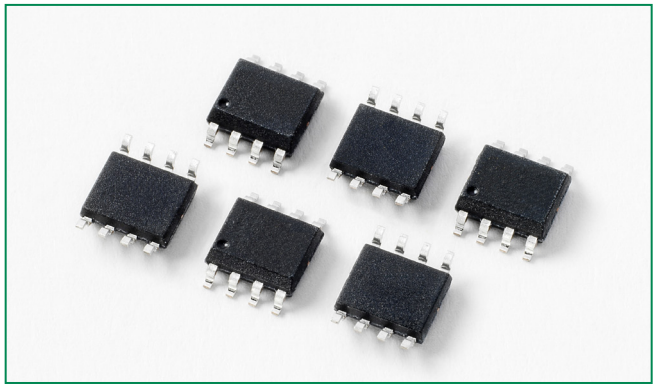
# SP03A-3.3 Series 3.3V 150A Diode Array

RoHS Pb GREEN

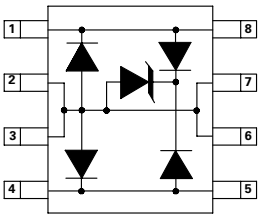
**OBSOLETE** DATE: 2016 PCN/ECN# N/A
REPLACED BY: LC03-3.3BTG TVS Diode Array



## 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.

## Pinout

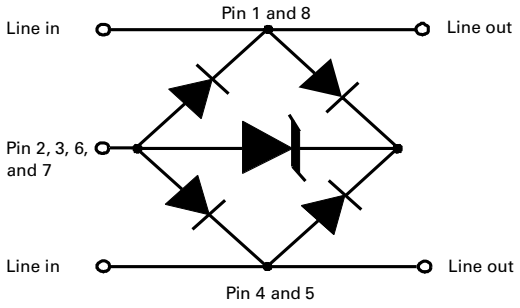



SOIC-8 (Top View)

## Features

- Lightning Protection, IEC 61000-4-5 2nd edition, 150A ($t_P$=8/20µs)
- 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

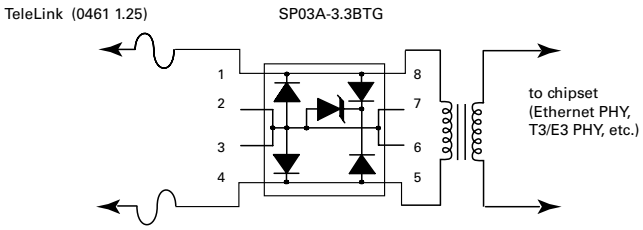
## Functional Block Diagram




## 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.

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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## 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

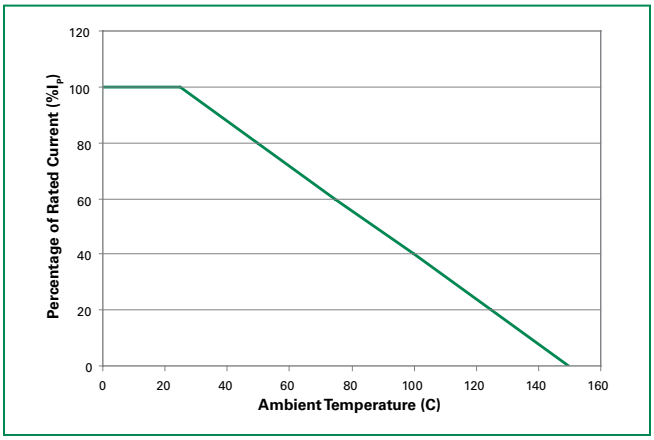
| Parameter | Rating | Units |
|---|---|---|
| SOIC Package | 170 | °C/W |
| Operating Temperature Range | -40 to 125 | °C |
| Storage Temperature Range | -55 to 150 | °C |
| Maximum Junction Temperature | 150 | °C |
| Maximum Lead Temperature (Soldering 20-40s) (SOIC - Lead Tips Only) | 260 | °C |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Stand-Off Voltage | $V_{RWM}$ | $I_T$≤1µA | - | - | 3.3 | V |
| Reverse Breakdown Voltage | $V_{BR}$ | $I_T$= 2µA | 3.3 | - | - | V |
| Snap Back Voltage | $V_{SB}$ | $I_T$= 50mA | 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 | - | - | 13 | V |
| Clamping Voltage, Line-Ground | $V_C$ | $I_{PP}$= 100A, $t_p$=8/20 µs | - | - | 17 | V |
| Dynamic Resistance, Line-Ground | $R_{DYN}$ | $(V_{C2}-V_{C1})/(I_{PP2}-I_{PP1})$ | - | 0.15 | - | Ω |
| Clamping Voltage, Line-Line | $V_C$ | $I_{PP}$= 50A, $t_p$=8/20 µs | - | - | 15 | V |
| Clamping Voltage, Line-Line | $V_C$ | $I_{PP}$= 100A, $t_p$=8/20 µs | - | - | 20 | V |
| Dynamic Resistance , Line-Line | $R_{DYN}$ | $(V_{C2}-V_{C1})/(I_{PP2}-I_{PP1})$ | - | 0.25 | - | Ω |
| Junction Capacitance | $C_j$ | Between I/O Pins and Ground $V_R$=0V, f= 1MHz | - | 9 | 12 | pF |
| | | Between I/O Pins $V_R$=0V, f= 1MHz | - | 4.5 | 6 | pF |

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


## Figure 2: Current Derating Curve



Littelfuse
Expertise Applied | Answers Delivered

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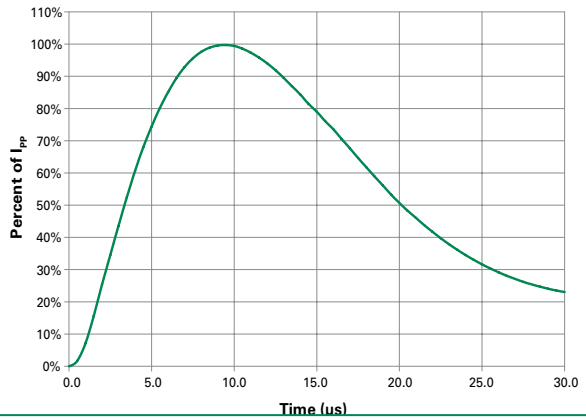
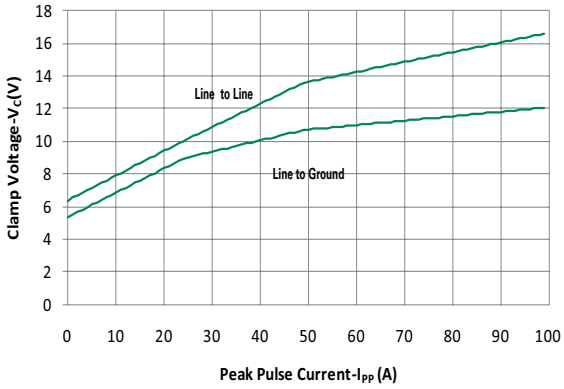
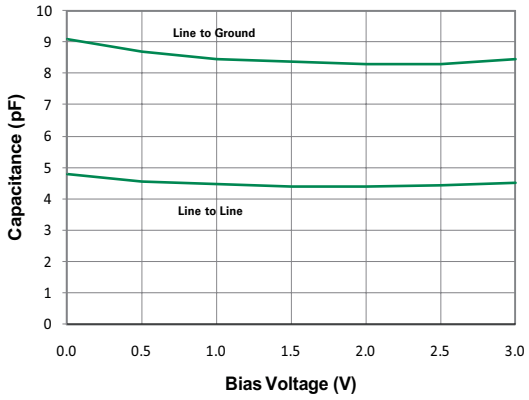
## Figure 3: 8/20µS Pulse Waveform



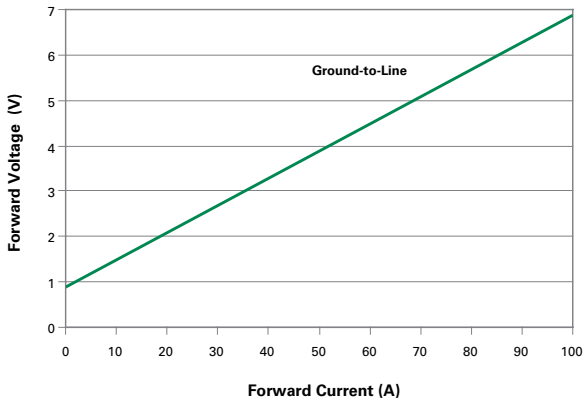

## Figure 4: Clamping Voltage vs. Peak Pulse Current




## Figure 5: Capacitance vs. Reverse Voltage

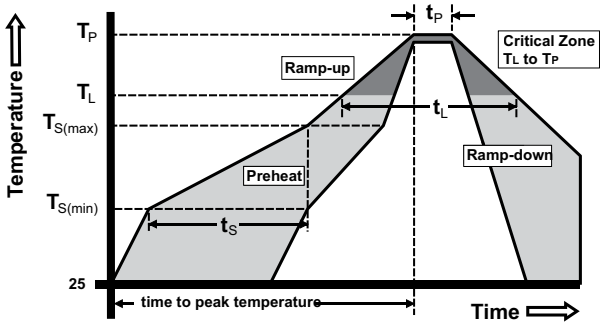



## Figure 6: Forward Voltage vs. Forward Current




## Soldering Parameters

| | | |
|---|---|---|
| Reflow Condition | | Pb – Free assembly |
| Pre Heat | -Temperature Min ($T_{s(min)}$) | 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 |





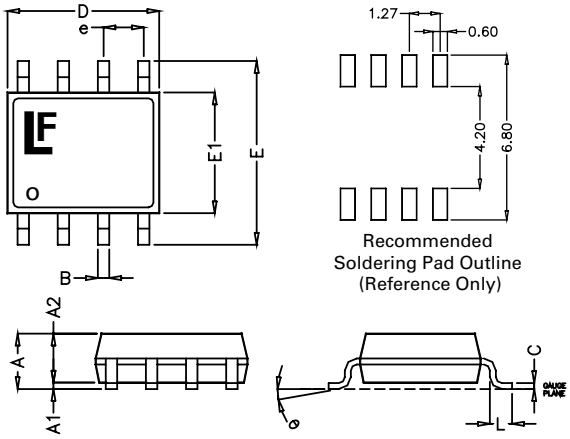

Revision: 06/09/17

# TVS Diode Arrays (SPA® Diodes)

## Lightning Surge Protection - SP03A-3.3 Series

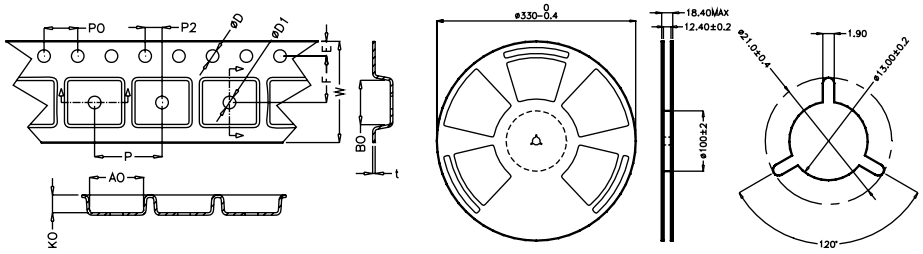
**OBSOLETE** DATE: 2016 PCN/ECN# N/A
REPLACED BY: LC03-3.3BTG TVS Diode Array

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




| Package | SOIC | | | |
|---|---|---|---|---|
| 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 03A-3.3 B T G

- SP: TVS Diode Arrays (SPA® Diodes)
- 03A-3.3: Series / Working Voltage
- B: Package B = SOIC
- T: T= Tape & Reel
- G: G= Green

## Part Marking System


First Line: Part number
Second Line: Date code

## Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|---|---|---|---|
| SP03A-3.3BTG | SOIC Tape & Reel | SP03A-3.3 | 2500 |

## Product Characteristics

| | |
|---|---|
| **Lead Plating** | Matte Tin |
| **Lead Material** | Copper Alloy |
| **Lead Coplanarity** | 0.004 inches (0.102mm) |
| **Substrate material** | Silicon |
| **Body Material** | Molded Epoxy |
| **Flammability** | 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.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