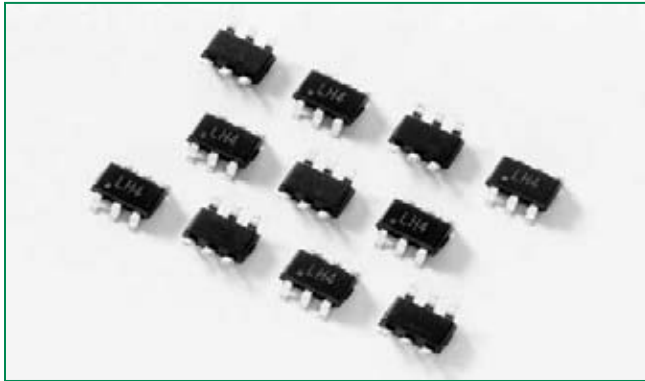


**NOT RECOMMENDED FOR NEW DESIGNS**

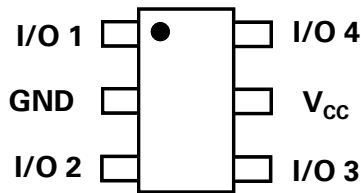
SP3050-04HTG is eventually going to be replaced by the SRV05-4HTG TVS Diode Array with identical form, fit, and function. Please use this device for new or future designs and more detail can be found on [Littelfuse.com](http://Littelfuse.com)  
**Description**



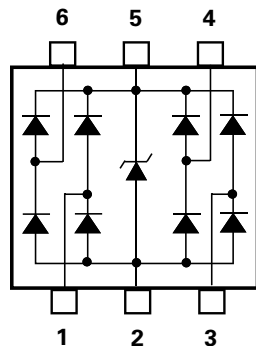
## SP3050 Series 6V 10A Rail Clamp Array



### Pinout



### Functional Block Diagram



The SP3050 integrates low capacitance rail-to-rail diodes with an additional zener diode to protect each I/O pin against ESD and high surge events. This robust device can safely absorb surge current per IEC61000-4-5 ( $t_p=8/20\mu s$ ) without performance degradation and a minimum  $\pm 20kV$  ESD per IEC61000-4-2. Their very low loading capacitance also makes them ideal for protecting high speed signal pins.

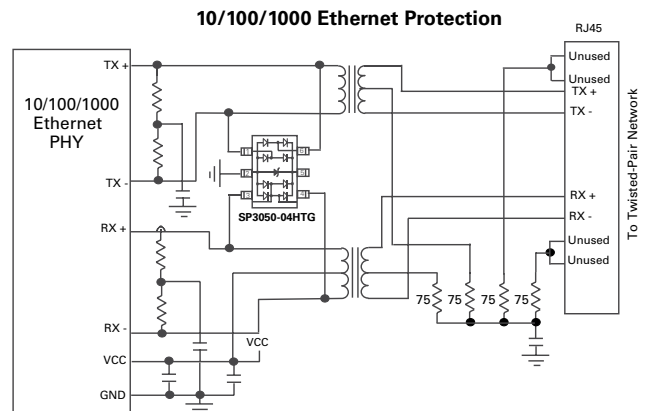
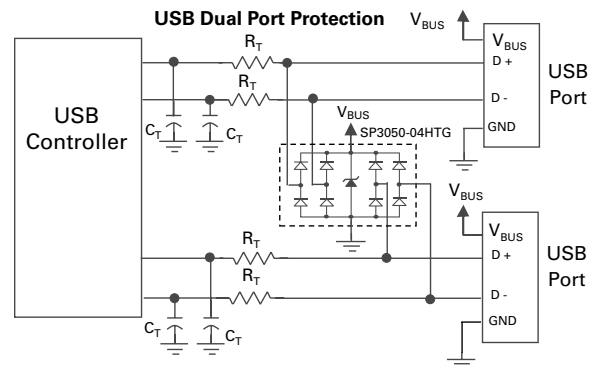
### Features

- ESD, IEC61000-4-2,  $\pm 20kV$  contact,  $\pm 30kV$  air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning, IEC61000-4-5, 10A (8/20 $\mu s$ )
- Low capacitance of 2pF (TYP) per I/O
- Low leakage current of 0.5 $\mu A$  (MAX) at 5V
- Small SOT23-6 packaging

### Applications

- LCD/PDP TVs
- Monitors
- Notebooks
- 10/100/1000 Ethernet
- Firewire
- Set Top Boxes
- Flat Panel Displays
- Portable Medical

### Application Examples



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.

**NOT RECOMMENDED FOR NEW DESIGNS**

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**Absolute Maximum Ratings**

| Symbol     | Parameter                                     | Value      | Units |
|------------|---|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) <sup>1</sup> | 10         | A     |
| $P_{PK}$   | Peak Pulse Power ( $t_p=8/20\mu s$ )          | 150        | W     |
| $T_{OP}$   | Operating Temperature                         | -40 to 85  | °C    |
| $T_{STOR}$ | Storage Temperature                           | -50 to 150 | °C    |

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.

<sup>1</sup>Non-repetitive pulse per waveform on page 3

**Thermal Information**

| Parameter                                   | Rating     | Units |
|---|------------|-------|
| Storage Temperature Range                   | -65 to 150 | °C    |
| Maximum Junction Temperature                | 150        | °C    |
| Maximum Lead Temperature (Soldering 20-40s) | 260        | °C    |

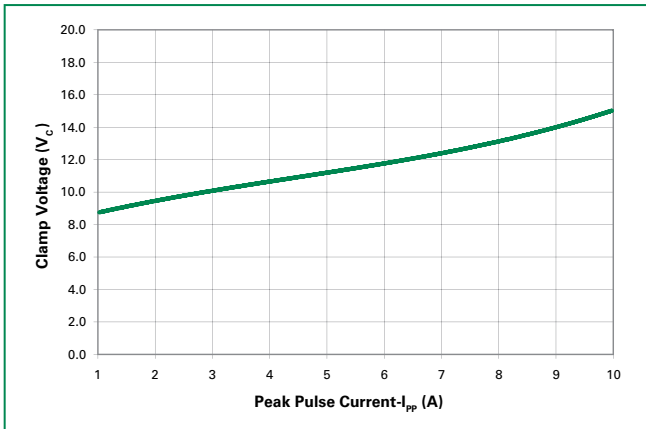
**Electrical Characteristics ( $T_{OP}=25^\circ C$ )**

| Parameter                          | Symbol        | Test Conditions                                     | Min      | Typ  | Max  | Units    |
|------------------------------------|---------------|---|----------|------|------|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R \leq 1\mu A$                                   |          |      | 6.0  | V        |
| Reverse Voltage Drop               | $V_R$         | $I_R = 1mA$   |          | 8.0  |      | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=5V$  |          | 0.1  | 0.5  | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND <sup>2</sup> |          | 8.8  | 10.0 | V        |
|                                    |               | $I_{PP}=5A, t_p=8/20\mu s, I/O$ to GND <sup>2</sup> |          | 11.5 | 13.0 | V        |
|                                    |               | $I_{PP}=8A, t_p=8/20\mu s, I/O$ to GND <sup>2</sup> |          | 13.2 | 15.0 | V        |
| Dynamic Resistance                 | $R_{DYN}$     | $(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$           |          | 0.7  |      | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC61000-4-2 (Contact)                              | $\pm 20$ |      |      | kV       |
|                                    |               | IEC61000-4-2 (Air)                                  | $\pm 30$ |      |      | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V                                     |          | 2.4  | 3.0  | pF       |
|                                    |               | Reverse Bias=1.65V                                  |          | 2.0  |      | pF       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-I/O}$ | Reverse Bias=0V                                     |          | 1.2  |      | pF       |

Notes: <sup>1</sup> Parameter is guaranteed by design and/or device characterization.

<sup>2</sup> Repetitive pulse per waveform on page 3.

**Clamping Voltage vs.  $I_{PP}$**



**Product Characteristics**

|                            |                         |
|----------------------------|-------------------------|
| <b>Lead Plating</b>        | Matte Tin               |
| <b>Lead Material</b>       | Copper Alloy            |
| <b>Lead Coplanarity</b>    | 0.0004 inches (0.102mm) |
| <b>Substitute Material</b> | Silicon                 |
| <b>Body Material</b>       | Molded Epoxy            |
| <b>Flammability</b>        | UL94-V-0                |

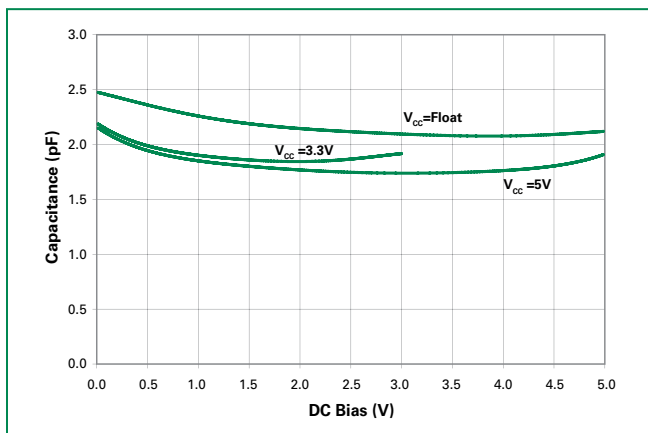
Notes :

1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. All specifications comply to JEDEC SPEC MO-223 Issue A
5. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
6. Package surface matte finish VDI 11-13.

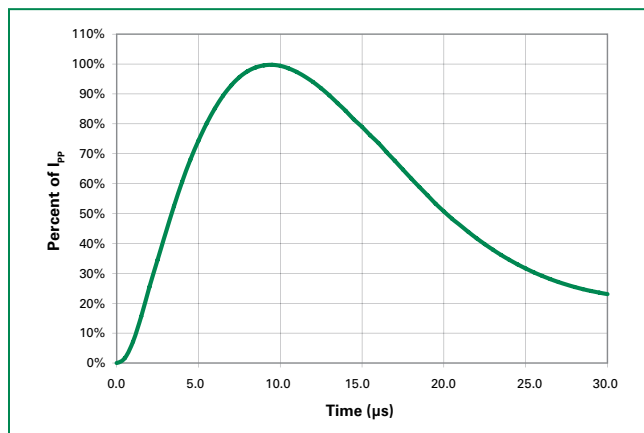
**NOT RECOMMENDED FOR NEW DESIGNS**  
 Expertise Applied | Answers Delivered

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### Capacitance vs. Reverse Bias

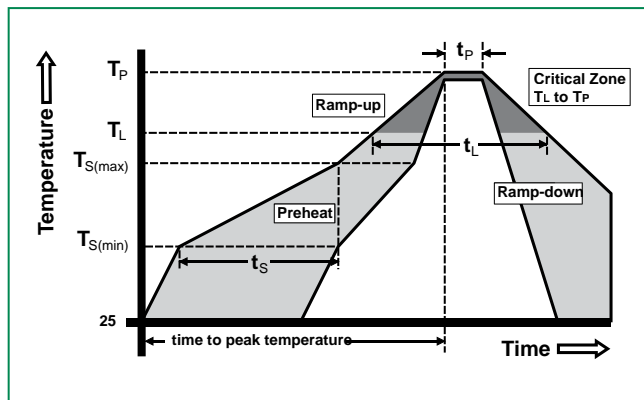


### Pulse Waveform

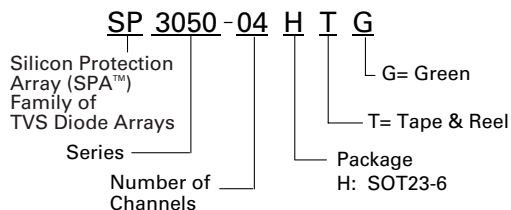


### Soldering Parameters

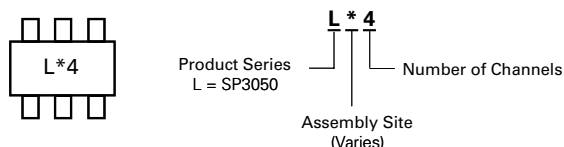
|  |                                    |                         |
|--|------------------------------------|-------------------------|
| Reflow Condition                                       |                                    | Pb – Free assembly      |
| Pre Heat   | - Temperature Min ( $T_{s(min)}$ ) | 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 <sup>+0/-5</sup> °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                   |



### Part Numbering System



### Part Marking System



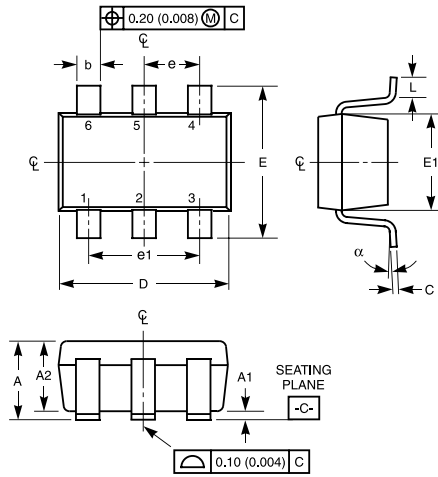
### Ordering Information

| Part Number  | Package | Marking | Min. Order Qty. |
|--------------|---------|---------|-----------------|
| SP3050-04HTG | SOT23-6 | L*4     | 3000            |

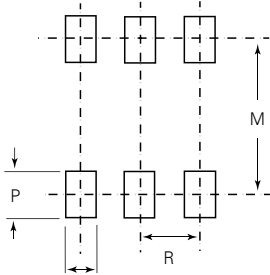
**NOT RECOMMENDED FOR NEW DESIGNS**

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**Package Dimensions – SOT23-6**



**Recommended Solder Pad Layout**



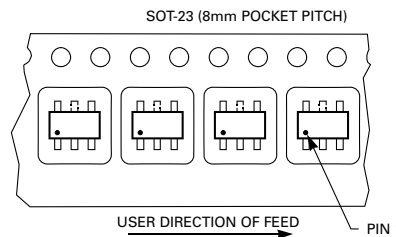
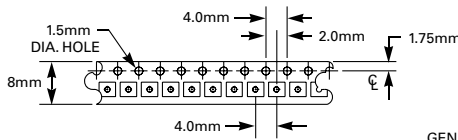
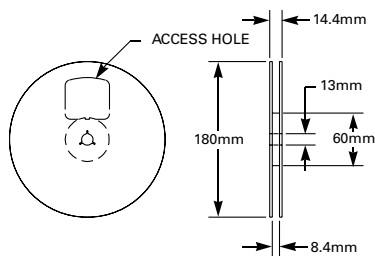
| Package   | SOT23-6        |       |            |        |       |
|-----------|----------------|-------|------------|--------|-------|
| Pins      | 6              |       |            |        |       |
| JEDEC     | MO-203 Issue A |       |            |        |       |
|           | Millimeters    |       | Inches     |        | Notes |
|           | Min            | Max   | Min        | Max    |       |
| <b>A</b>  | 0.900          | 1.450 | 0.035      | 0.057  | -     |
| <b>A1</b> | 0.000          | 0.150 | 0.000      | 0.006  | -     |
| <b>A2</b> | 0.900          | 1.300 | 0.035      | 0.051  | -     |
| <b>b</b>  | 0.350          | 0.500 | 0.0138     | 0.0196 | -     |
| <b>C</b>  | 0.080          | 0.220 | 0.0031     | 0.009  | -     |
| <b>D</b>  | 2.800          | 3.000 | 0.11       | 0.118  | 3     |
| <b>E</b>  | 2.600          | 3.000 | 0.102      | 0.118  | -     |
| <b>E1</b> | 1.500          | 1.750 | 0.06       | 0.069  | 3     |
| <b>e</b>  | 0.95 Ref       |       | 0.0374 ref |        | -     |
| <b>e1</b> | 1.9 Ref        |       | 0.0748 Ref |        | -     |
| <b>L</b>  | 0.100          | 0.600 | 0.004      | 0.023  | 4,5   |
| <b>N</b>  | 6              |       | 6          |        | 6     |
| <b>a</b>  | 0°             | 10°   | 0°         | 10°    | -     |
| <b>M</b>  | 2.590          |       | 0.102      |        | -     |
| <b>O</b>  | 0.690          |       | .027 TYP   |        | -     |
| <b>P</b>  | 0.990          |       | .039 TYP   |        | -     |
| <b>R</b>  | 0.950          |       | 0.038      |        | -     |

Notes:

1. Dimensioning and tolerances per ANSI 14.5M-1982.
2. Package conforms to EIAJ SC-74 (1992).
3. Dimensions D and E1 are exclusive of mold flash, protrusions, or gate burrs.
4. Footlength L measured at reference to seating plane.
5. "L" is the length of flat foot surface for soldering to substrate.
6. "N" is the number of terminal positions.
7. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

**Embossed Carrier Tape & Reel Specification – SOT23-6**

8mm TAPE AND REEL



GENERAL INFORMATION

1. 3000 PIECES PER REEL.
2. ORDER IN MULTIPLES OF FULL REELS ONLY.
3. MEETS EIA-481 REVISION "A" SPECIFICATIONS.