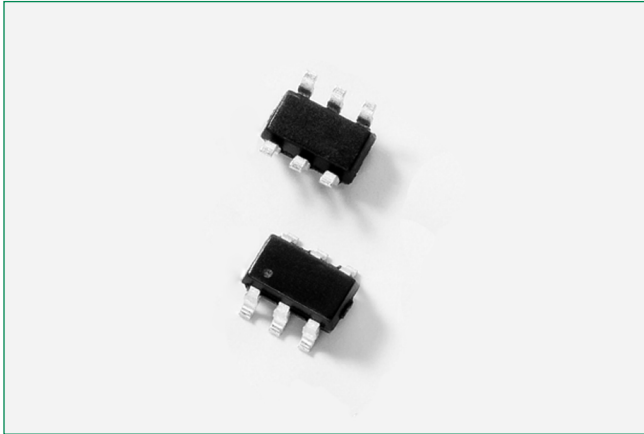


# SP3051 Series

## 6V 20A Diode Array



### Additional Information



Resources

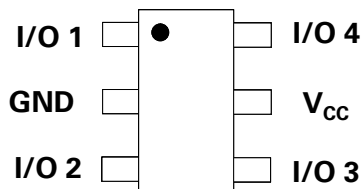


Accessories

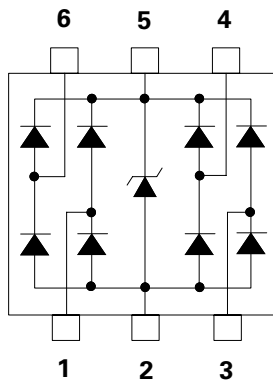


Samples

### 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

The SP3051 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 component can safely absorb 20A of current per IEC 61000-4-5 ( $t_P=8/20\mu s$ ) without performance degradation and a minimum  $\pm 30kV$  ESD rating per IEC 61000-4-2 2nd edition. Their very low off-state capacitance is compatible with high speed circuits.

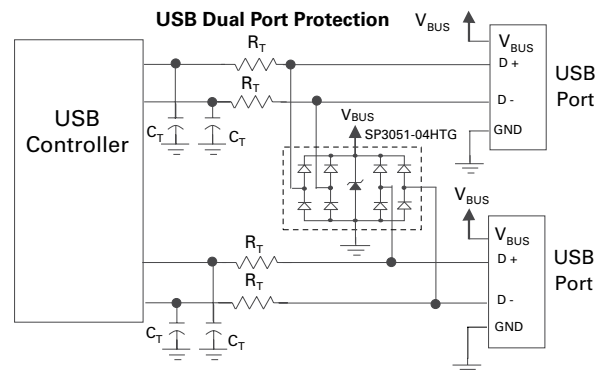
### Features and Benefits

- ESD, IEC 61000-4-2,  $\pm 30kV$  contact,  $\pm 30kV$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 20A (8/20 $\mu s$  as defined in IEC 61000-4-5 2<sup>nd</sup> edition)
- Low off-state capacitance of 3.8pF (TYP) per I/O
- Low leakage current of 0.5 $\mu A$  (MAX) at 5V
- Small SOT23-6 (JEDEC MO-178AB) packaging

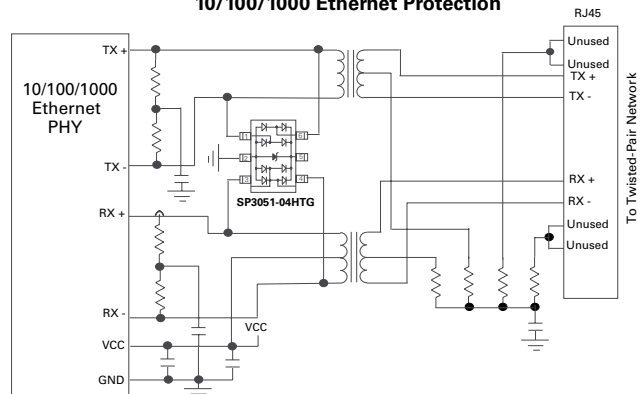
### Applications

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

### Application Examples



### 10/100/1000 Ethernet Protection



**\*Note:** 1000Mbps Ethernet, or 1GbE, will require 8 channels of protection (4 differential pair) so the solution above should be replicated for the additional 2 differential pair.

# SP3051 Series

## 6V 20A Diode Array

### Absolute Maximum Ratings

| Symbol     | Parameter                            | Value      | Units |
|------------|--------------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ )     | 20         | A     |
| $P_{PK}$   | Peak Pulse Power ( $t_p=8/20\mu s$ ) | 400        | W     |
| $T_{OP}$   | Operating Temperature                | -40 to 125 | °C    |
| $T_{STOR}$ | Storage Temperature                  | -55 to 150 | °C    |

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

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

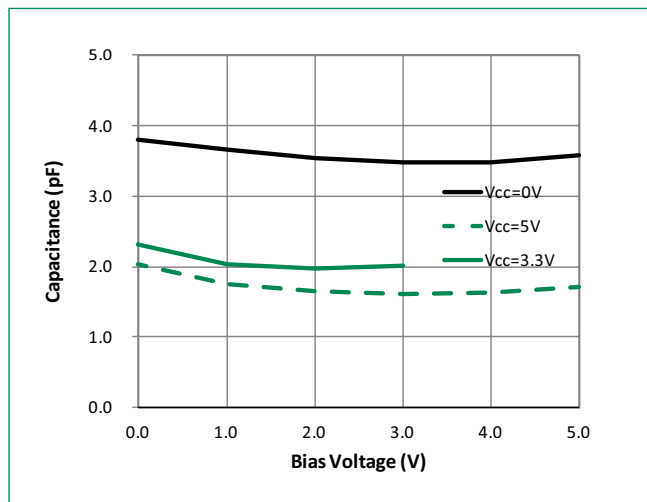
| Parameter                          | Symbol        | Test Conditions                                      | Min      | Typ  | Max  | Units    |
|------------------------------------|---------------|------------------------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R = 1\mu A$                                       |          |      | 6.0  | V        |
| Breakdown Voltage                  | $V_R$         | $I_R = 1mA$                                          |          | 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>3</sup>  |          | 9.0  | 10.5 | V        |
|                                    |               | $I_{PP}=10A, t_p=8/20\mu s, I/O$ to GND <sup>3</sup> |          | 11.5 | 15.0 | V        |
|                                    |               | $I_{PP}=20A, t_p=8/20\mu s, I/O$ to GND <sup>3</sup> |          | 14.3 | 17.0 | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$     | TLP, $t_p=100ns, I/O$ to GND                         |          | 0.2  |      | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC 61000-4-2 (Contact)                              | $\pm 30$ |      |      | kV       |
|                                    |               | IEC 61000-4-2 (Air)                                  | $\pm 30$ |      |      | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V, $f=1MHz$                            |          | 3.8  | 4.2  | pF       |
|                                    |               | $V_{CC}=5V$ , Reverse Bias=2.5V, $f=1MHz$            |          | 1.7  | 2.0  | pF       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-I/O}$ | Reverse Bias=0V                                      |          | 2.0  |      | pF       |

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

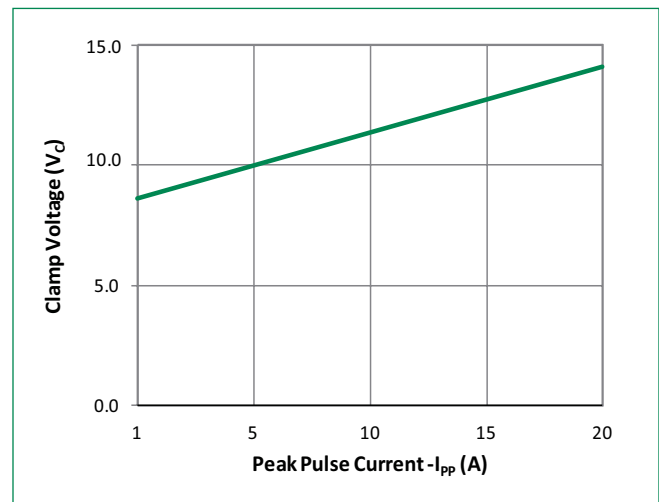
<sup>2</sup> Repetitive pulse per waveform shown on page 3.

<sup>3</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

### Capacitance vs. Reverse Voltage

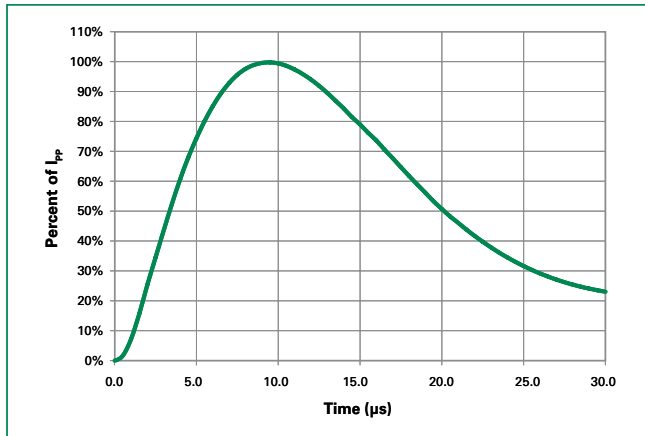


### Clamping Voltage vs. Peak Pulse Current

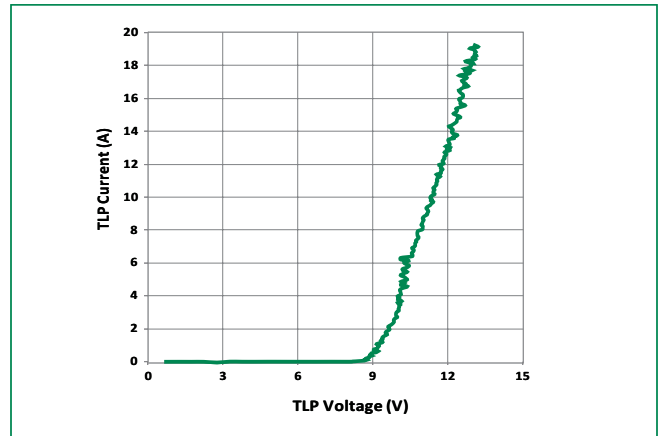


# SP3051 Series

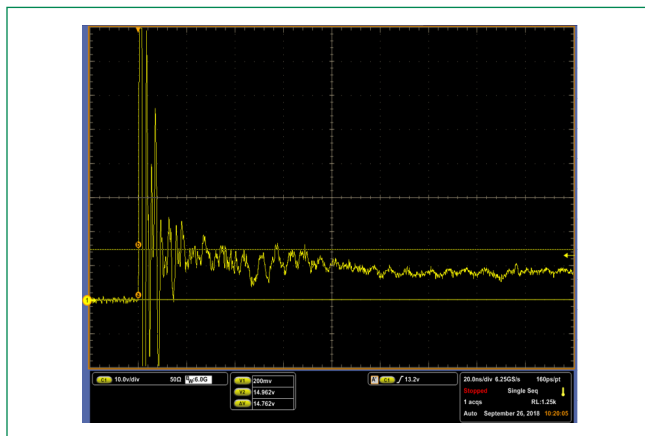
## 6V 20A Diode Array

8/20 $\mu$ s Pulse Waveform

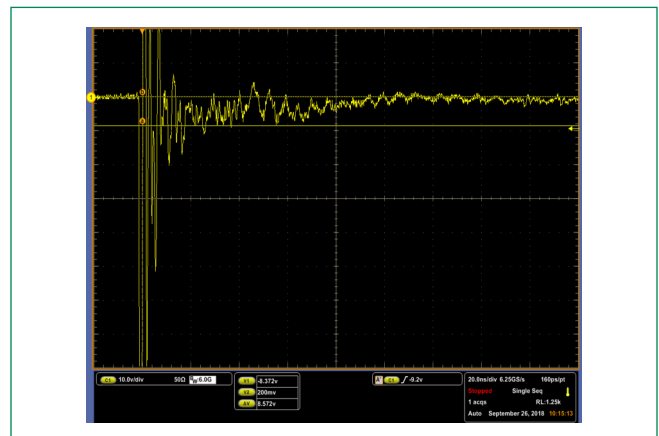
Transmission Line Pulsing(TLP) Plot



IEC 61000 -4-2 +8 kV Contact ESD Clamping Voltage



IEC 61000 -4-2 -8 kV Contact ESD Clamping Voltage

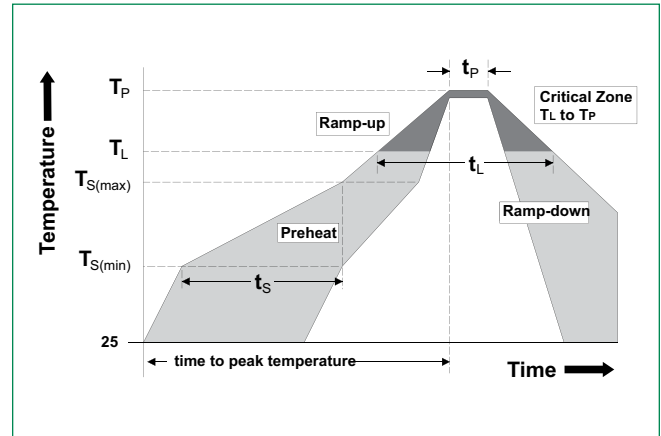


# SP3051 Series

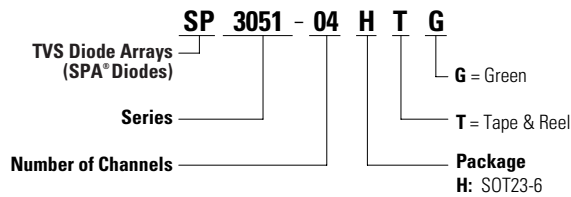
## 6V 20A Diode Array

### Soldering Parameters

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



### Part Numbering System



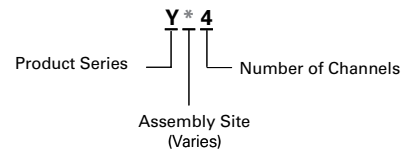
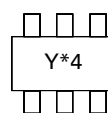
### Product Characteristics

|                           |                                                        |
|---------------------------|--------------------------------------------------------|
| <b>Lead Plating</b>       | 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 Compound                                        |
| <b>Flammability</b>       | UL Recognized compound meeting flammability rating V-0 |

### Ordering Information

| Part Number  | Package | Min. Order Qty. |
|--------------|---------|-----------------|
| SP3051-04HTG | SOT23-6 | 3000            |

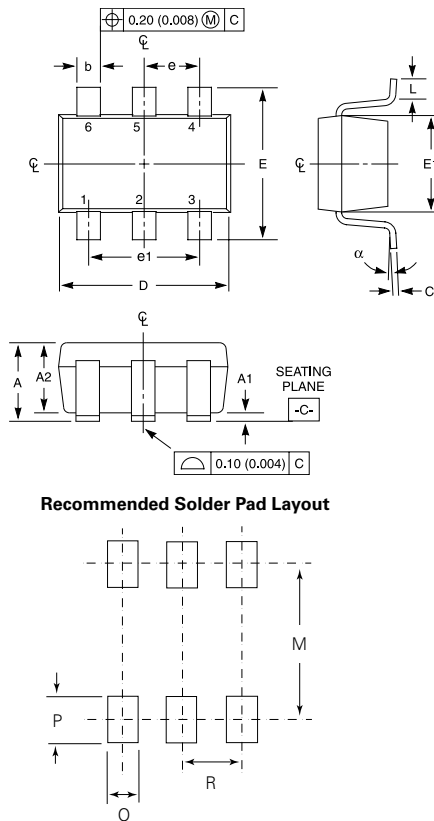
### Part Marking System



# SP3051 Series

## 6V 20A Diode Array

## Package Dimensions – SOT23-6



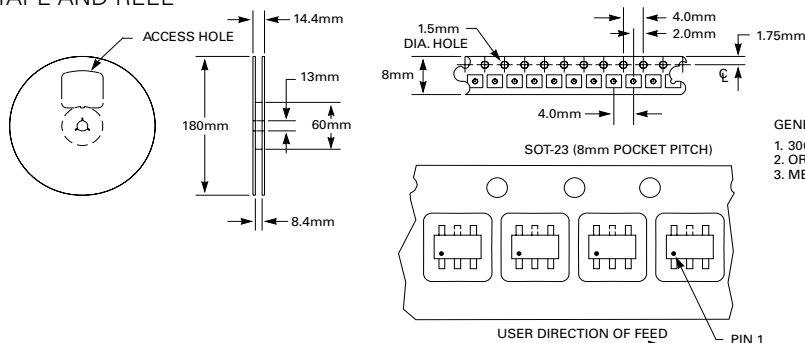
| Package   | SOT23       |       |            |          |       |
|-----------|-------------|-------|------------|----------|-------|
| Pins      | 6           |       |            |          |       |
| JEDEC     | MO-178AB    |       |            |          |       |
|           | Millimeters |       | 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>  | 0.30        | 0.600 | 0.012      | 0.023    | 4,5   |
| <b>N</b>  | 6           |       | 6          |          | 6     |
| <b>a</b>  | 0°          | 8°    | 0°         | 8°       | -     |
| <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 tolerancing Per ASME Y14.5M-1994.
2. Package conforms to EIAJ SC-74 (1992).
3. Dimensions D and E1 are exclusive of mold flash, protrusions, or gate burrs.
4. Foot length 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.

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