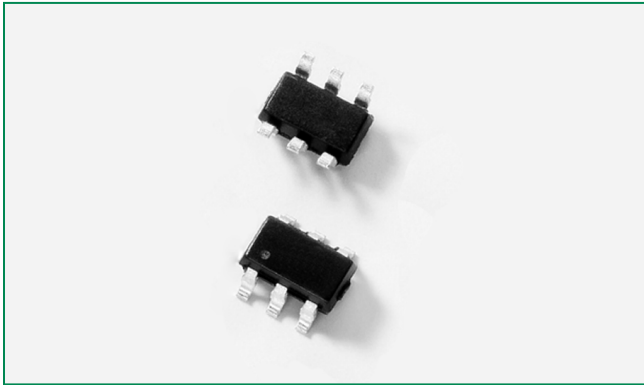
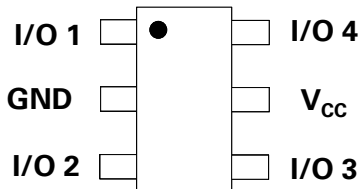


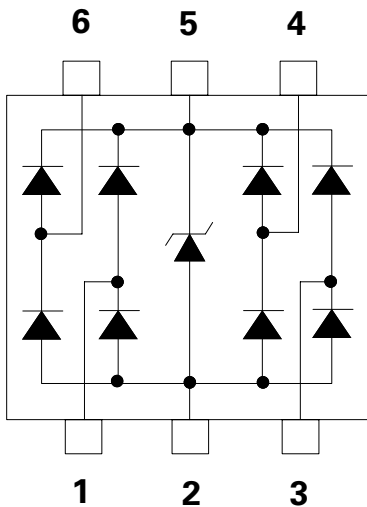
# SP3051 Series 6V 20A Diode Array



## Pinout



## Functional Block Diagram



## 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 2<sup>nd</sup> edition. Their very low off-state capacitance is compatible with high speed circuits.

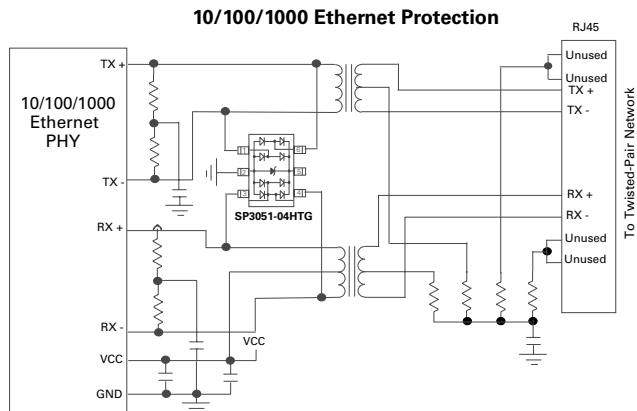
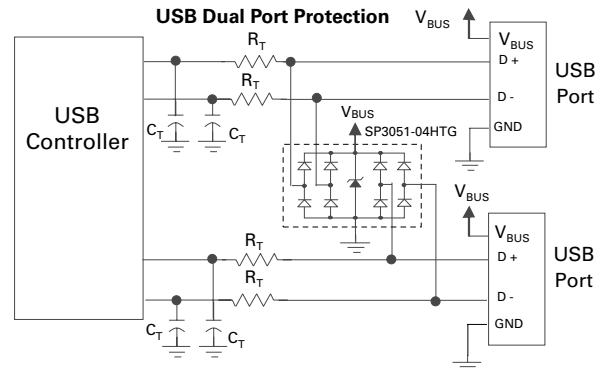
## Features

- 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



\*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.

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.

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

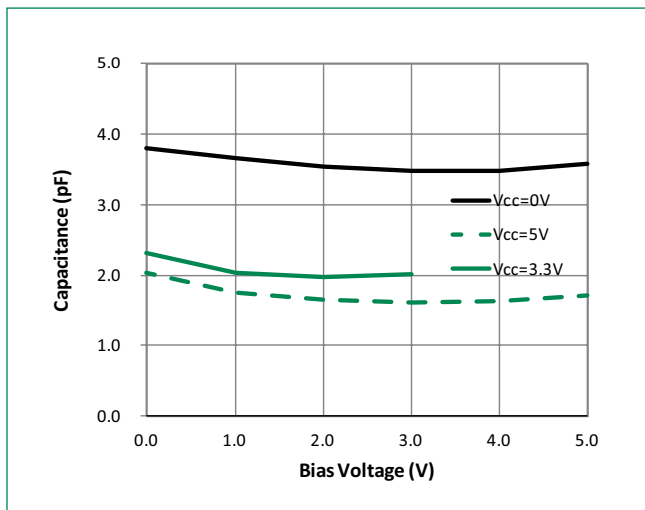
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R = 1\mu A$			6.0	V
Breakdown Voltage	$V_R$	$I_R = 1mA$		8.0		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5V$		0.1	0.5	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND <sup>3</sup>		9.0	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
		Vcc=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.

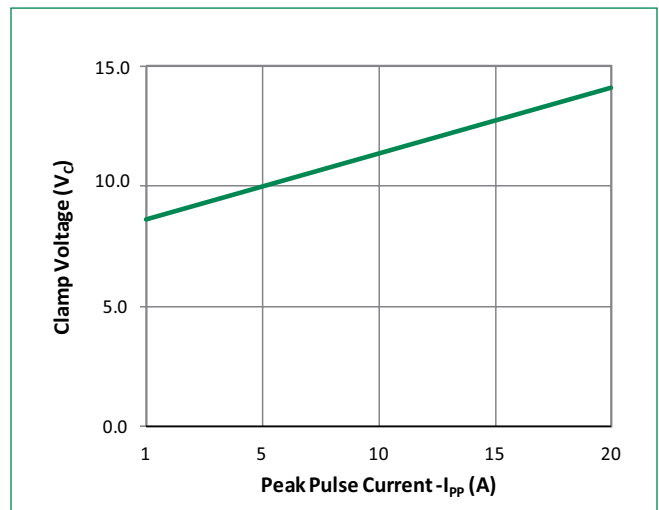
<sup>2</sup> Repetitive pulse per waveform shown on page 3.

<sup>3</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t1=70ns$  to  $t2=90ns$

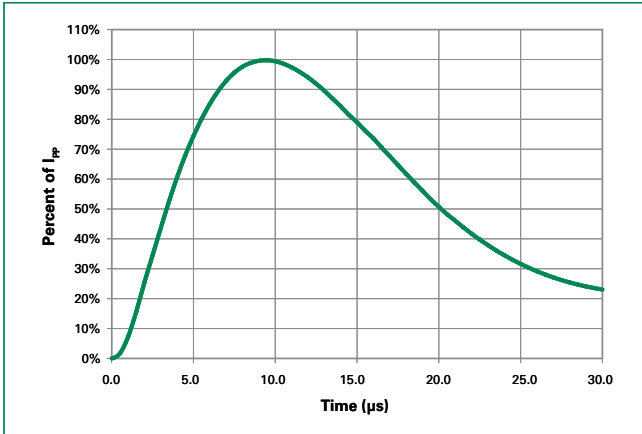
### Capacitance vs. Reverse Voltage



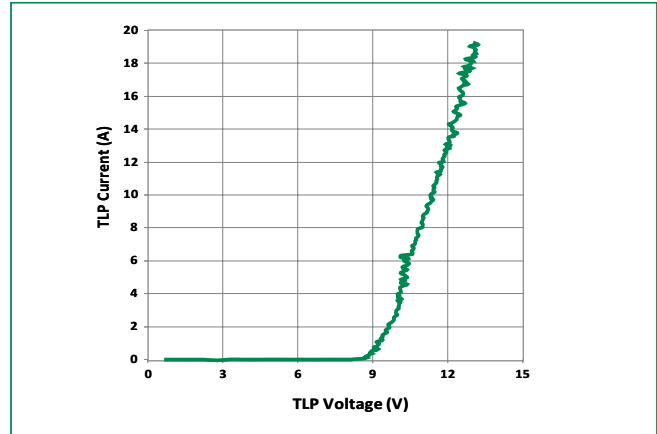
### Clamping Voltage vs. Peak Pulse Current



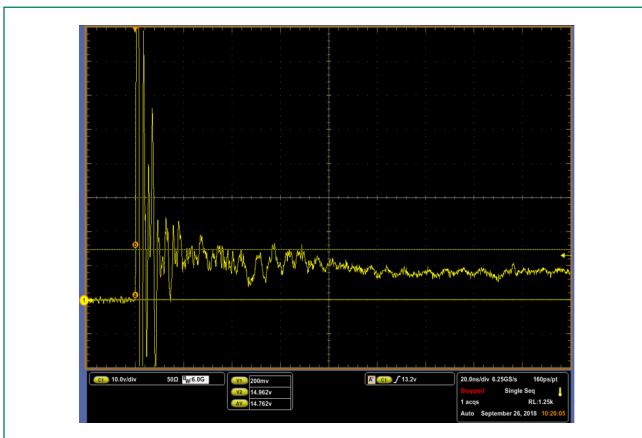
**8/20 $\mu$ s Pulse Waveform**



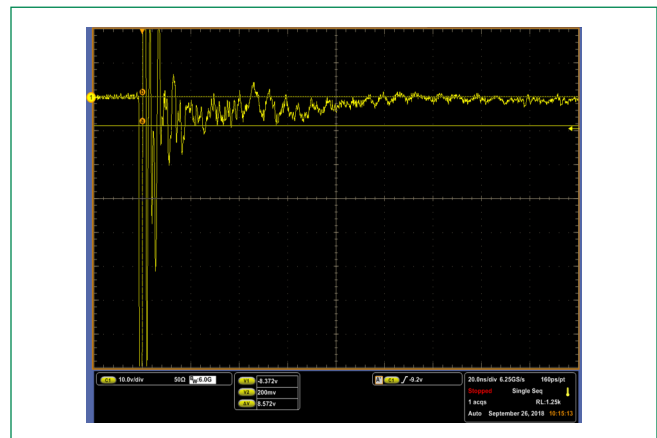
**Transmission Line Pulsing (TLP) Plot**



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

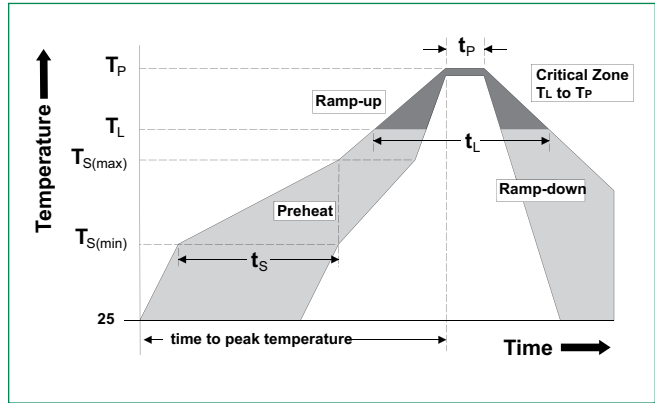


**IEC 61000 -4-2 -8 kV Contact ESD Clamping Voltage**

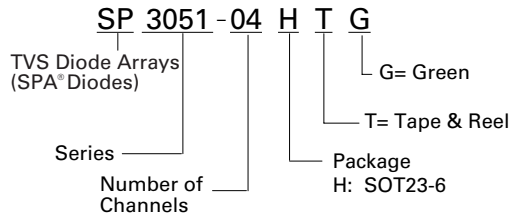


**Soldering Parameters**

<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**



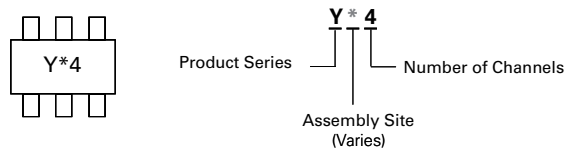
**Product Characteristics**

<b>Lead Plating</b>	Pre-Plated Frame or 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

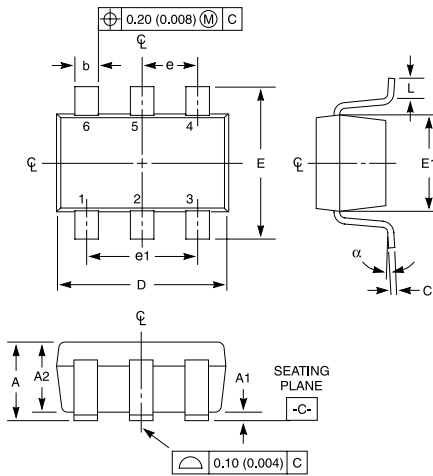
**Ordering Information**

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

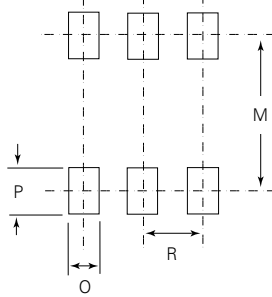
**Part Marking System**



**Package Dimensions — SOT23-6**



**Recommended Solder Pad Layout**



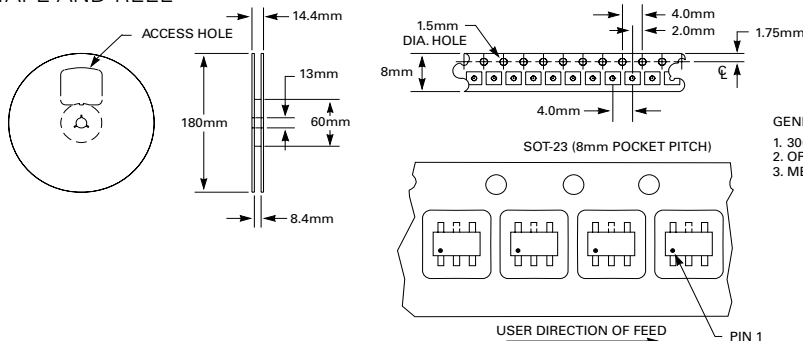
Package	SOT23				Notes
Pins	6				
JEDEC	MO-178AB				
	Millimeters		Inches		
	Min	Max	Min	Max	
<b>A</b>	0.900	1.450	0.035	0.057	-
<b>A1</b>	0.000	0.150	0.000	0.006	-
<b>A2</b>	0.900	1.300	0.035	0.051	-
<b>b</b>	0.350	0.500	0.0138	0.0196	-
<b>C</b>	0.080	0.220	0.0031	0.009	-
<b>D</b>	2.800	3.000	0.11	0.118	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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