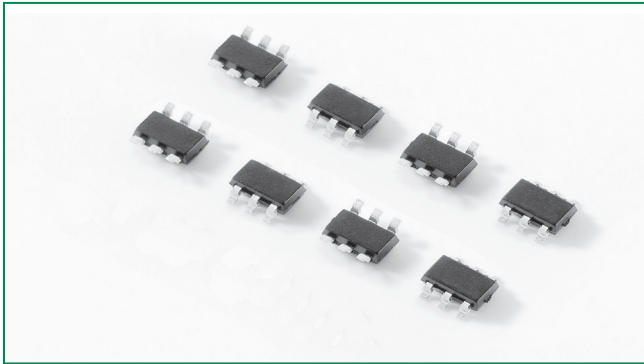


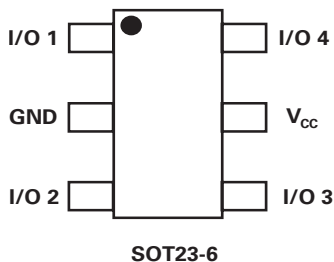
SP0504S Series 0.85pF Diode Array



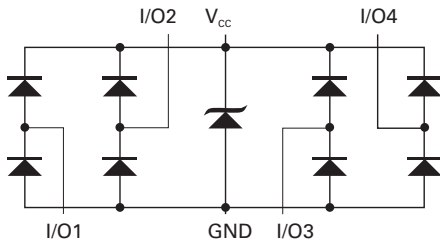
**Description**

The SP0504S integrates low capacitance rail-to-rail diodes with an integrated proprietary avalanche breakdown diode that protects applications against ESD, EFT and low surge events. This component is rated for the maximum IEC 61000-4-2 ESD (level 4) contact and air discharge events. Their very low off-state capacitance also makes them ideal for protecting high speed signal pins such as HDMI, DVI, USB2.0, and IEEE 1394.

**Pinout**



**Functional Block Diagram**



**Additional Information**



Datasheet



Resources



Samples

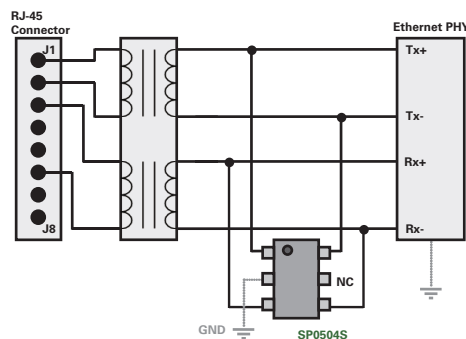
**Features**

- RoHS compliant and lead-free
- Low off-state capacitance of 0.85 pF (TYP) per I/O
- ESD rating of ±12kV contact discharge, ±15kV air discharge, (IEC 61000-4-2)
- EFT protection, IEC 61000-4-4, 40A
- (5/50ns)
- Low leakage current of 0.5µA (MAX) at 5V
- Small packaging options saves board space
- Lightning, 4.5A (8/20µs as defined in IEC 61000-4-5 2<sup>nd</sup> edition)
- AEC-Q101 qualified

**Applications**

- Computer Peripherals
- Mobile Phones
- PDA's
- Digital Cameras
- Network Hardware/Ports
- Test Equipment
- Medical Equipment
- Automotive Network

**Application Example**



A single 4 channel SP0504S component can be used to protect four of the data lines in a HDMI/DVI interface. Two (2) SP0504S components provide protection for the main data lines. Low voltage ASIC HDMI/DVI drivers can also be protected with the SP0504S, the +V<sub>CC</sub> pins on the SP0504S can be substituted with a suitable bypass capacitor or in some backdrive applications the +V<sub>CC</sub> of the SP0504S can be floated or NC.

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 ( $t_p=8/20\mu s$ )	4.5	A
$T_{OP}$	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.*

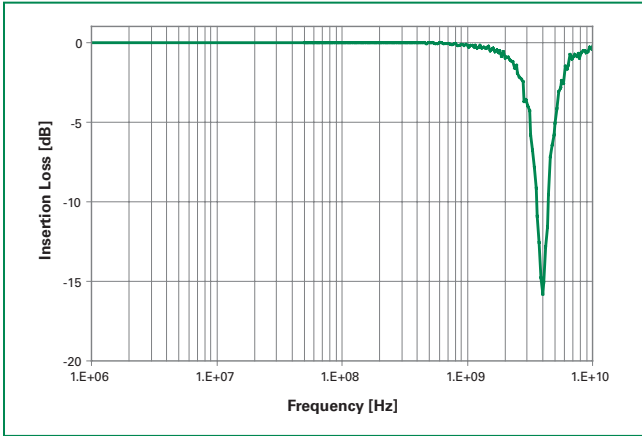
### Electrical Characteristics ( $T_{OP}=25^{\circ}C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R = 1\mu A$	-	-	6.0	V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5V$	-	-	0.5	$\mu A$
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	6.3	8	8.8	V
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND	-	9.5	11.0	V
		$I_{PP}=2A, t_p=8/20\mu s, I/O$ to GND	-	10.6	13.0	V
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact)	$\pm 12$	-	-	kV
		IEC 61000-4-2 (Air)	$\pm 15$	-	-	kV
Diode Capacitance <sup>1</sup>	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz	0.95	1.1	1.25	pF
		Reverse Bias=1.65V, f=1MHz	0.7	0.85	1.0	pF
Diode Capacitance <sup>1</sup>	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz	-	0.5	-	pF

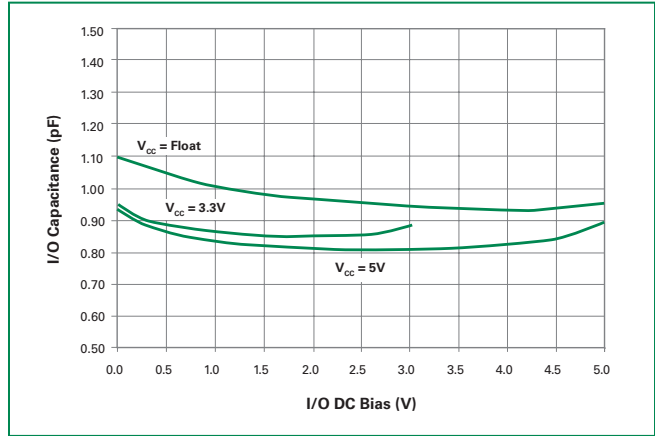
Note: 1. Parameter is guaranteed by design and/or component characterization.

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

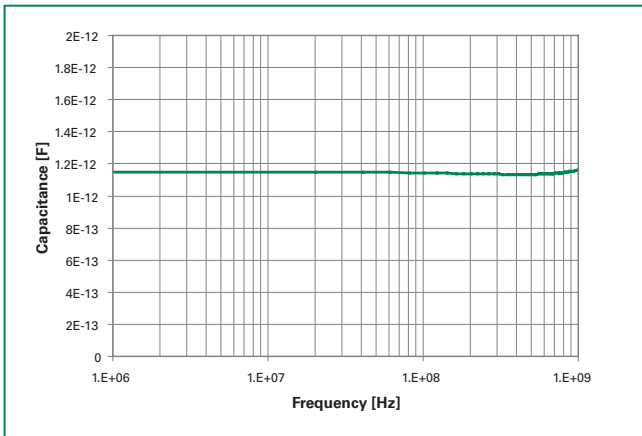
**Insertion Loss (S21) I/O to GND**



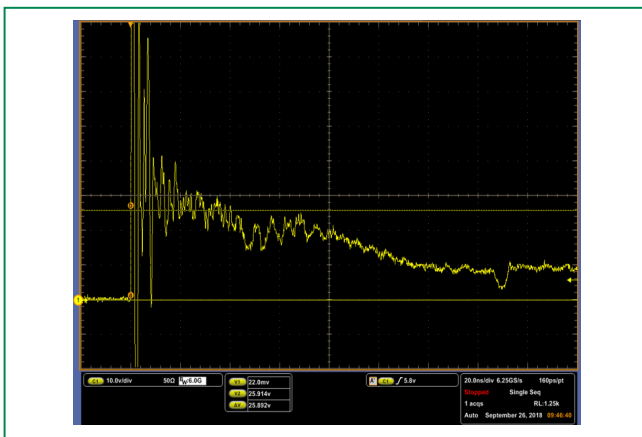
**Capacitance vs. Bias Voltage**



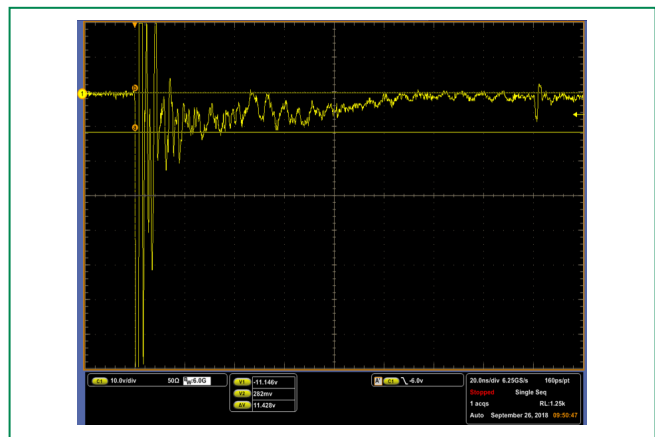
**Capacitance vs. Frequency**



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

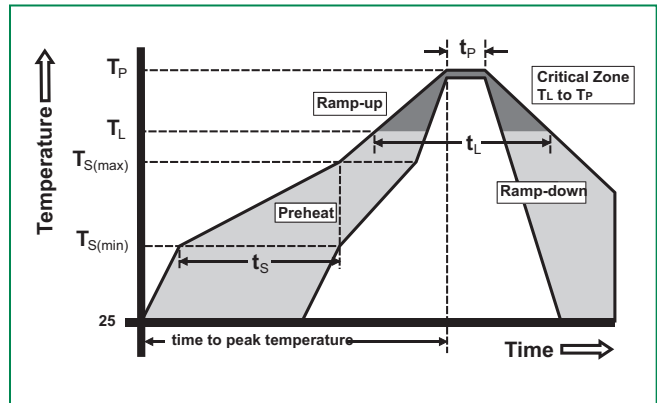


**IEC 61000 -4-2 -8 kV Contact ESD Clamping Voltage**

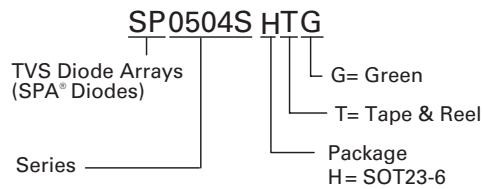


**Soldering Parameters**

<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



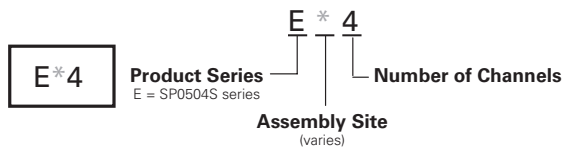
**Part Numbering System**



**Product Characteristics**

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

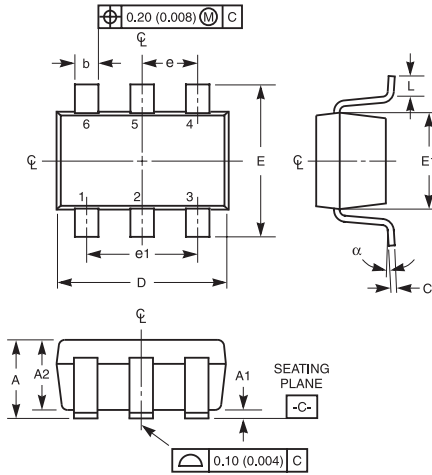
**Part Marking System**



**Ordering Information**

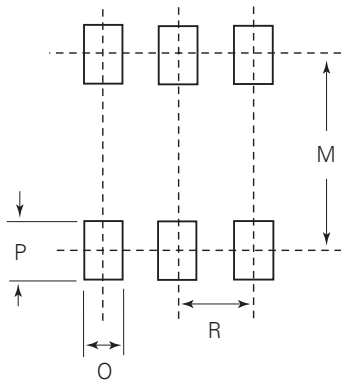
Part Number	Package	Min. Order Qty.
SP0504SHTG	SOT23-6	3000

**Package Dimensions — SOT23-6**



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
$\alpha$	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		-

**Recommended Solder Pad Layout**

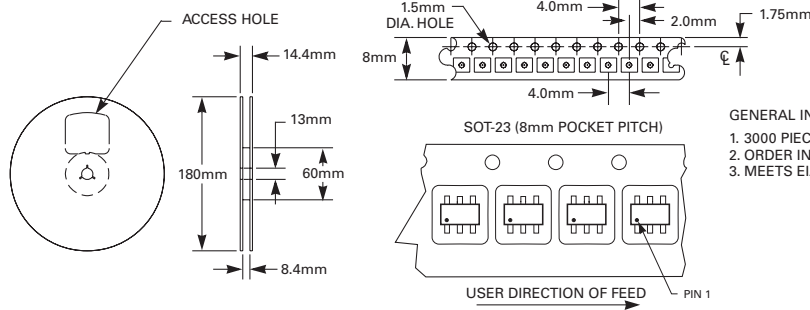


**Notes:**

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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