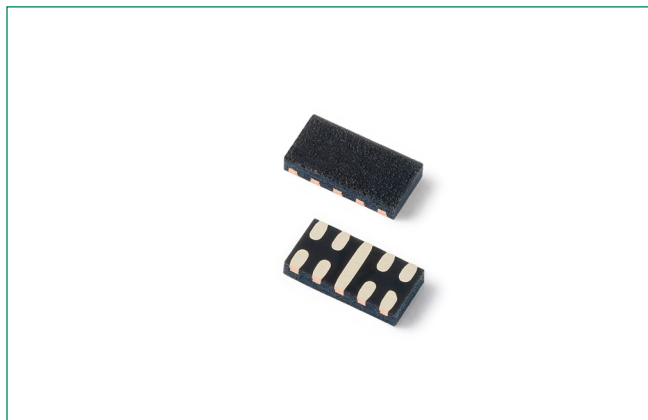


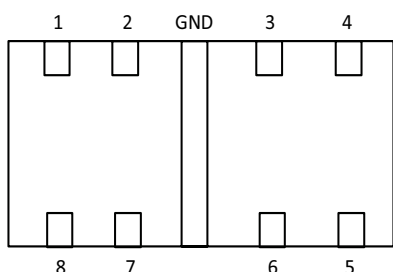
## SP0544T Series 0.5pF 12KV Diode Array



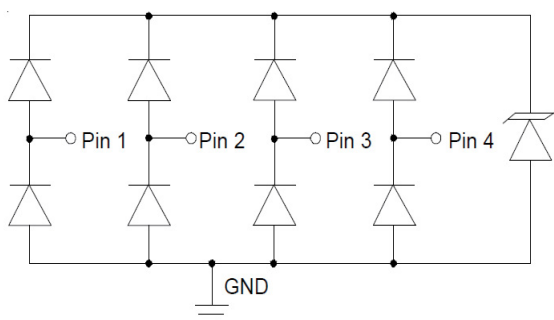
**OBSOLETE** DATE: 06/10th/2020 PCN/ECN# ESU270-51  
REPLACED BY: -



### Pinout



### Functional Block Diagram



Note: Pins 5-8 not internally connected

### Description

The SP0544T integrates 4 channels of ultra low capacitance rail-to-rail diodes and an additional zener diode to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). This robust device can safely absorb repetitive ESD strikes above the maximum level specified in the IEC61000-4-2 international standard ( $\pm 8\text{kV}$  contact discharge) without performance degradation. The extremely low loading capacitance also makes it ideal for protecting high speed signal pins such as V-By-One, HDMI, USB3.0, USB2.0, and IEEE 1394.

### Features

- ESD, IEC61000-4-2,  $\pm 12\text{kV}$  contact,  $\pm 25\text{kV}$  air
- EFT, IEC61000-4-4, 40A ( $t_p=5/50\text{ns}$ )
- Lightning, IEC61000-4-5 2<sup>nd</sup> edition, 4A ( $t_p=8/20\mu\text{s}$ )
- Low capacitance of 0.5pF (TYP) per I/O
- Low leakage current of 1.5 $\mu\text{A}$  (MAX) at 5V
- Halogen free, Lead free and RoHS compliant

### Applications

- V-By-One
- Embedded DisplayPort
- USB 2.0/3.0 Ports
- HDMI
- Flat Panel Displays
- LCD/LED TVs
- Smartphones
- Mobile Computing

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 ( $t_p=8/20\mu s$ ) | 4.0        | A     |
| $T_{OP}$   | Operating Temperature            | -40 to 150 | °C    |
| $T_{STOR}$ | Storage Temperature              | -55 to 150 | °C    |

**Note:** 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.

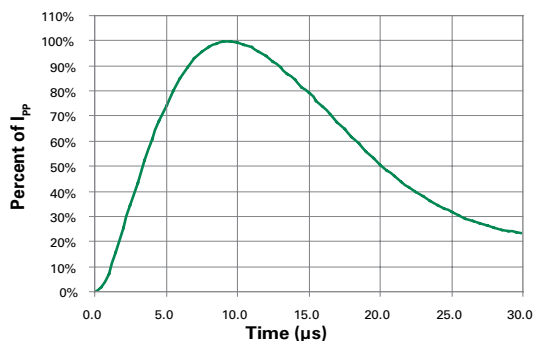
## Electrical Characteristics ( $T_{OP}=25^{\circ}C$ )

| Parameter                          | Symbol        | Test Conditions                     | Min      | Typ | Max | Units    |
|------------------------------------|---------------|-------------------------------------|----------|-----|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R \leq 1\mu A$                   |          |     | 5.0 | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=5V$ , Any I/O to GND           |          |     | 1.5 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd |          | 6.6 |     | V        |
|                                    |               | $I_{PP}=2A$ , $t_p=8/20\mu s$ , Fwd |          | 7.0 |     | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$     | TLP, $t_p=100ns$ , I/O to GND       |          | 0.3 |     | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC61000-4-2 (Contact)              | $\pm 12$ |     |     | kV       |
|                                    |               | IEC61000-4-2 (Air)                  | $\pm 25$ |     |     | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V, f=1 MHz            |          | 0.5 |     | pF       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-I/O}$ | Reverse Bias=0V, f=1 MHz            |          | 0.3 |     | pF       |

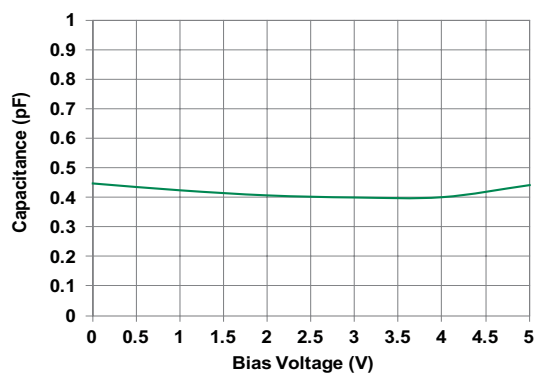
**Note:** <sup>1</sup> Parameter is guaranteed by design and/or device characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width and 2ns rise time.

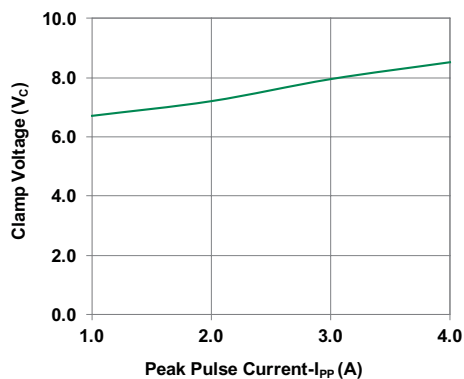
## 8/20 $\mu s$ Pulse Waveform



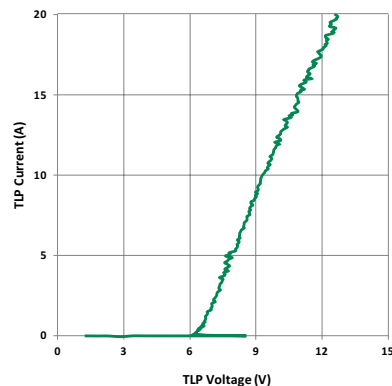
## Capacitance vs. Reverse Bias



## Clamping Voltage vs $I_{PP}$

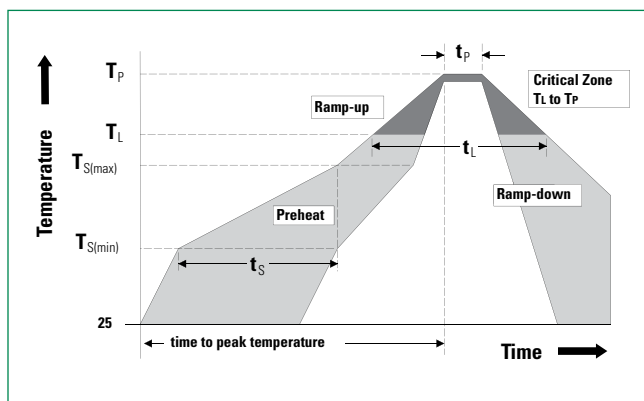


## Transmission Line Pulsing(TLP) Plot

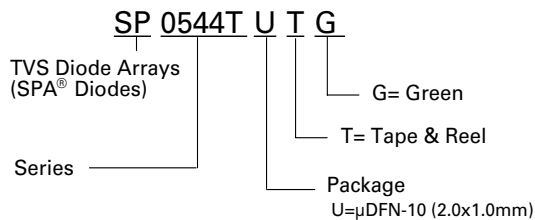


### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <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      |
| <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 Epoxy          |
| <b>Flammability</b>       | UL 94 V-0             |

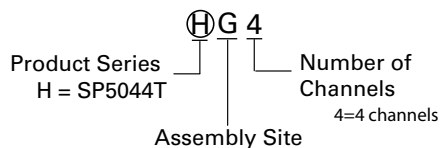
#### Notes :

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.

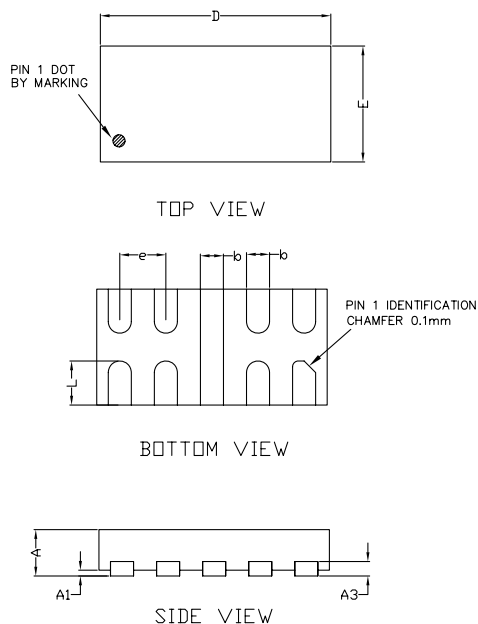
### Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|-------------|---------|---------|-----------------|
| SP0544TUTG  | μDFN-10 | ⊕G4     | 3000            |

### Part Marking System

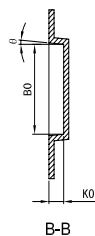
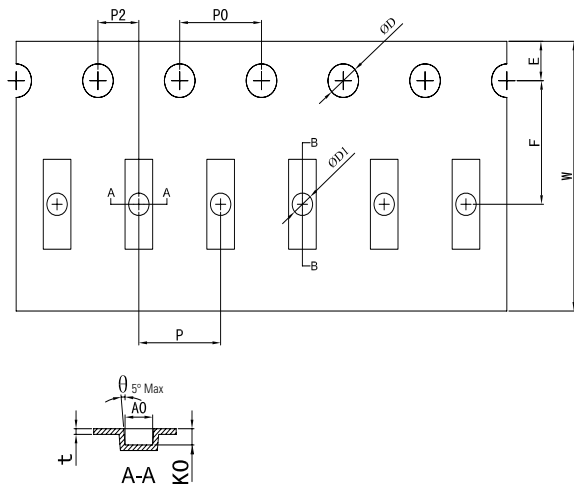


## Package Dimensions



| μDFN-10 (2.0x1.0mm) |             |      |      |           |       |       |
|---------------------|-------------|------|------|-----------|-------|-------|
| JEDEC MO-229        |             |      |      |           |       |       |
| Symbol              | Millimeters |      |      | Inches    |       |       |
|                     | Min         | Nom  | Max  | Min       | Nom   | Max   |
| <b>A</b>            | 0.3         | -    | 0.4  | 0.012     | -     | 0.016 |
| <b>A1</b>           | 0           | -    | 0.05 | 0         | -     | 0.002 |
| <b>A3</b>           | 0.125 REF   |      |      | 0.049 REF |       |       |
| <b>D</b>            | 1.95        | 2.00 | 2.05 | 0.077     | 0.079 | 0.081 |
| <b>E</b>            | 0.95        | 1.00 | 1.05 | 0.037     | 0.039 | 0.041 |
| <b>b</b>            | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 |
| <b>L</b>            | 0.28        | 0.38 | 0.48 | 0.011     | 0.015 | 0.019 |
| <b>e</b>            | 0.40 BSC    |      |      | 0.016 BSC |       |       |

## Embossed Carrier Tape & Reel Specification



| Symbol    | Millimeters         |
|-----------|---------------------|
| <b>A0</b> | 1.15 +/- 0.05       |
| <b>B0</b> | 2.15 +/- 0.05       |
| <b>D</b>  | Ø 1.55 + 0.1/- 0    |
| <b>D1</b> | Ø 0.80 + 0.25/- 0   |
| <b>E</b>  | 1.75 +/- 0.10       |
| <b>F</b>  | 3.50 +/- 0.05       |
| <b>K0</b> | 0.48 +/- 0.05       |
| <b>P</b>  | 4.00 +/- 0.10       |
| <b>P0</b> | 4.00 +/- 0.10       |
| <b>P2</b> | 2.00 +/- 0.05       |
| <b>T</b>  | 0.20 +/- 0.03       |
| <b>W</b>  | 8.00 + 0.30 /- 0.10 |