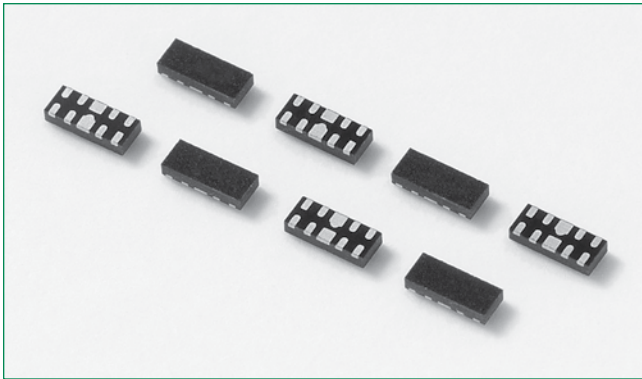
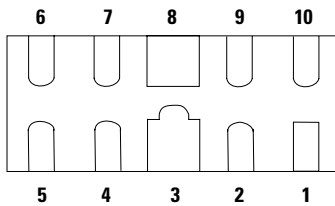


SP3010 Series 0.45pF Diode Array

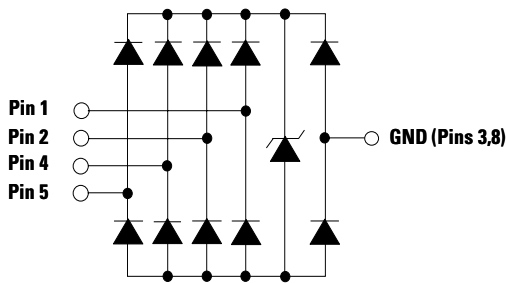


**Pinout**



\*Pins 6, 7, 9, 10 are not internally connected but should be connected to the trace.

**Functional Block Diagram**



**Additional Information**



Datasheet



Resources



Samples

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 SP3010 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 at the maximum level specified in the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation. The extremely low loading capacitance also makes it ideal for protecting high speed signal pins such as HDMI, USB3.0, USB2.0, and IEEE 1394.

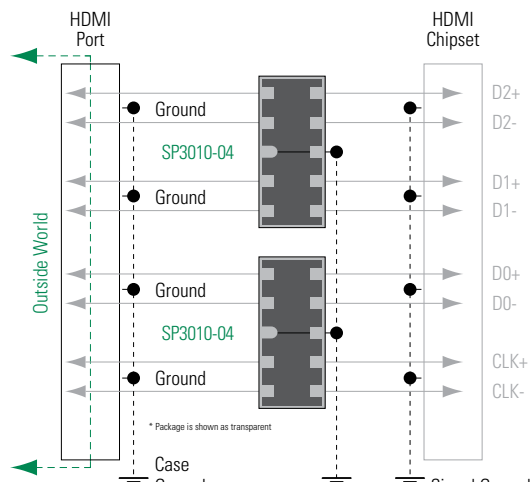
**Features**

- ESD, IEC 61000-4-2, ±8kV contact, ±15kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 3A (t<sub>p</sub>=8/20µs)
- Low capacitance of 0.45pF (TYP) per I/O
- Low leakage current of 0.1µA (TYP) at 5V
- Small form factor µDFN( JEDEC MO-229) package saves board space
- RoHS compliant and lead-free
- AEC-Q101 qualified

**Applications**

- LCD/PDP TVs
- DVD Players
- Desktops
- MP3/PMP
- Set Top Boxes
- Mobile Phones
- Notebooks
- Digital Cameras

**Application Example**



**Absolute Maximum Ratings**

| Symbol     | Parameter                        | Value      | Units |
|------------|----------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) | 3.0        | A     |
| $T_{OP}$   | Operating Temperature            | -40 to 125 | °C    |
| $T_{STOR}$ | Storage Temperature              | -55 to 150 | °C    |

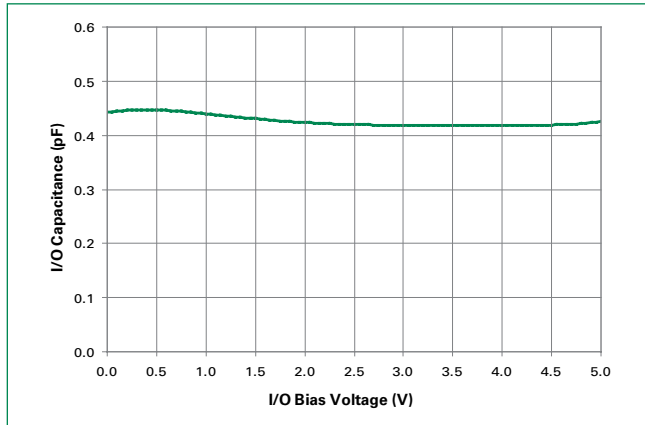
**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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

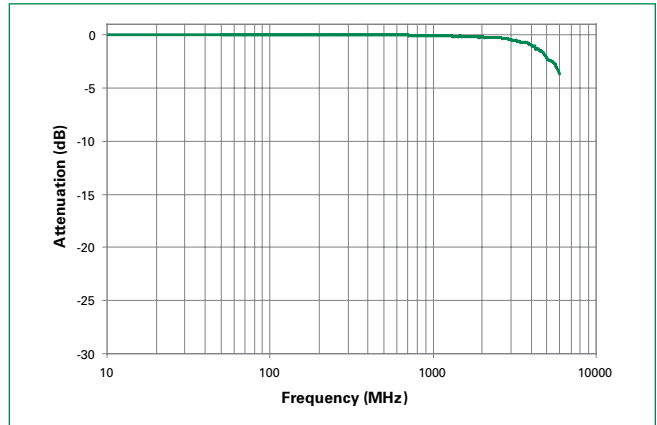
| Parameter                          | Symbol        | Test Conditions                           | Min      | Typ  | Max | Units    |
|------------------------------------|---------------|---|----------|------|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R \leq 1\mu A$                         |          |      | 6.0 | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=5V$ , Any I/O to GND                 |          | 0.1  | 0.5 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd       |          | 10.8 |     | V        |
|                                    |               | $I_{PP}=2A$ , $t_p=8/20\mu s$ , Fwd       |          | 12.3 |     | V        |
| Dynamic Resistance                 | $R_{DYN}$     | $(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$ |          | 1.5  |     | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC61000-4-2 (Contact)                    | $\pm 8$  |      |     | kV       |
|                                    |               | IEC61000-4-2 (Air)                        | $\pm 15$ |      |     | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V                           |          | 0.45 |     | pF       |

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

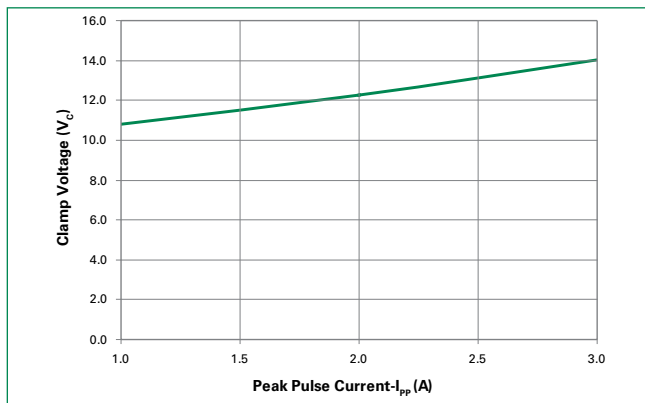
**Capacitance vs. Bias Voltage**



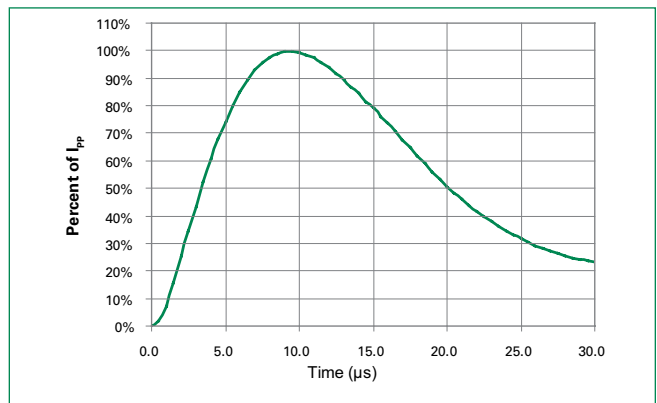
**Insertion Loss (S21) I/O to GND**



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

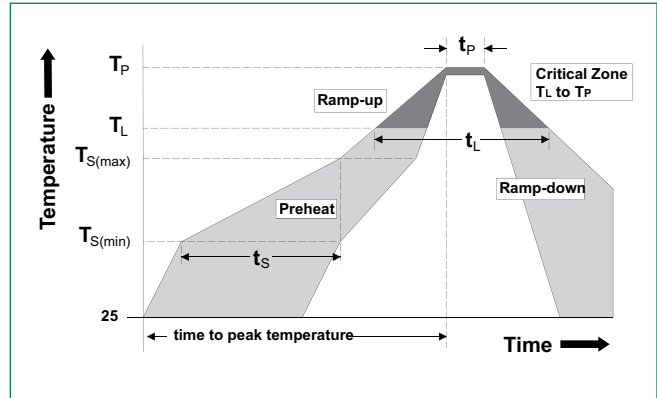


**Pulse Waveform**

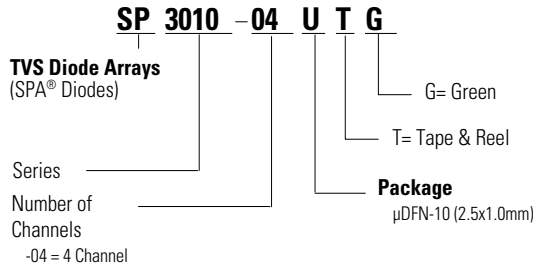


**Soldering Parameters**

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <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) ( $t_p$ )      | 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                   |



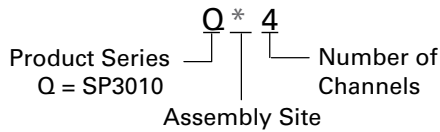
**Part Numbering System**



**Product Characteristics**

|                            |                         |
|----------------------------|-------------------------|
| <b>Lead Plating</b>        | Pre-Plated Frame        |
| <b>Lead Material</b>       | Copper Alloy            |
| <b>Lead Coplanarity</b>    | 0.0004 inches (0.102mm) |
| <b>Substitute Material</b> | Silicon                 |
| <b>Body Material</b>       | Molded Epoxy            |
| <b>Flammability</b>        | UL 94 V-0               |

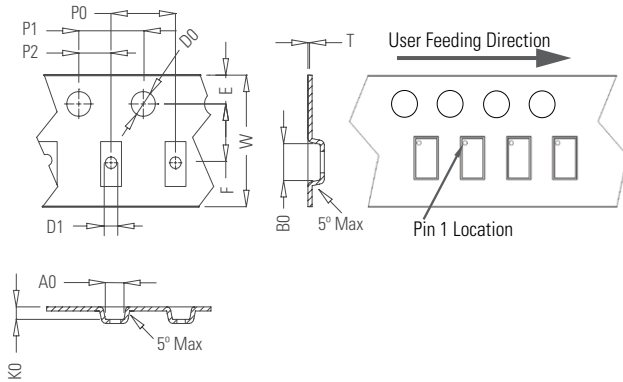
**Part Marking System**



**Ordering Information**

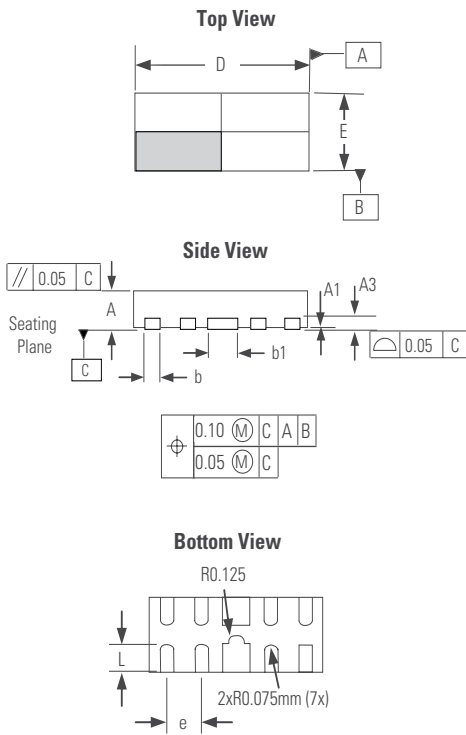
| Part Number  | Package      | Min. Order Qty. |
|--------------|--------------|-----------------|
| SP3010-04UTG | $\mu$ DFN-10 | 3000            |

**Embossed Carrier Tape & Reel Specification – μDFN-10**



| Package | μDFN-10 (2.5x1.0x0.5mm) |
|---------|-------------------------|
| Symbol  | Millimeters             |
| A0      | 1.30 ± 0.10             |
| B0      | 2.83 ± 0.10             |
| D0      | ∅ 1.50 + 0.10           |
| D1      | ∅ 1.00 + 0.25           |
| E       | 1.75 ± 0.10             |
| F       | 3.50 ± 0.05             |
| K0      | 0.65 ± 0.10             |
| P0      | 4.00 ± 0.10             |
| P1      | 4.00 ± 0.10             |
| P2      | 2.00 ± 0.05             |
| T       | 0.254 ± 0.02            |
| W       | 8.00 + 0.30 /- 0.10     |

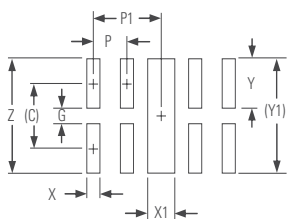
**Package Dimensions – μDFN-10 (2.5x1.0x0.5mm)**



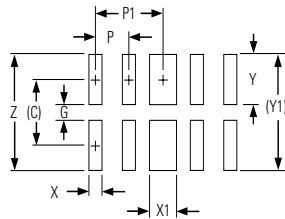
| Package | μDFN-10 (2.5x1.0x0.5mm) |       |      |           |       |       |
|---------|-------------------------|-------|------|-----------|-------|-------|
| JEDEC   | MO-229                  |       |      |           |       |       |
| Symbol  | Millimeters             |       |      | Inches    |       |       |
|         | Min                     | Nom   | Max  | Min       | Nom   | Max   |
| A       | 0.48                    | 0.515 | 0.55 | 0.019     | 0.020 | 0.021 |
| A1      | 0.00                    | --    | 0.05 | 0.000     |       | 0.022 |
| A3      | 0.125 Ref               |       |      | 0.005 Ref |       |       |
| b       | 0.15                    | 0.20  | 0.25 | 0.006     | 0.008 | 0.012 |
| b1      | 0.35                    | 0.40  | 0.45 | 0.014     | 0.016 | 0.018 |
| D       | 2.40                    | 2.50  | 2.60 | 0.094     | 0.098 | 0.102 |
| E       | 0.90                    | 1.00  | 1.10 | 0.035     | 0.039 | 0.043 |
| e       | 0.50 BSC                |       |      | 0.020 BSC |       |       |
| L       | 0.30                    | 0.365 | 0.43 | 0.012     | 0.014 | 0.016 |

| Soldering Pad Layout Dimensions |         |            |
|---------------------------------|---------|------------|
| Symbol                          | Inch    | Millimeter |
| C                               | (0.034) | (0.875)    |
| G                               | 0.008   | 0.20       |
| P                               | 0.020   | 0.50       |
| P1                              | 0.039   | 1.00       |
| X                               | 0.008   | 0.20       |
| X1                              | 0.016   | 0.40       |
| Y                               | 0.027   | 0.675      |
| Y1                              | (0.061) | (1.55)     |
| Z                               | 0.061   | 1.55       |

**Recommended Soldering Pad Layout**



**Alternative Soldering Pad Layout**



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