**Description**

The SP3420 includes four channel ultra low capacitance and high-level ESD protection diodes to protect high-speed data rate such as USB 3.1, DisplayPort, Thunderbolt, and e-SATA. The typical capacitance of 0.32pF helps ensure signal integrity and 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 safely dissipate 6A of 8/20μs surge current (IEC 61000-4-5 2nd edition).

**Features**

- ESD, IEC 61000-4-2, ±12kV contact, ±15kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 6A (t<sub>P</sub>=8/20μs)
- Low capacitance of 0.32pF@1.5V (TYP)
- Low leakage current of 0.02μA (TYP) at 3.3V
- Low operating and clamping voltage
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)

**Applications**

- Ultra-high speed data lines
- USB 3.1, 3.0, 2.0
- DisplayPort(TM)
- Thunderbolt (Light Peak)
- V-by-One®
- LVDS interfaces
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces

**Pinout**

1 2 3.G 4 5
10 9 8.G 7 6

**Functional Block Diagram**

1 2 4 5
G, 3, 8

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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.

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Specifications are subject to change without notice.
Revision: 07/16/19
### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{PP}$</td>
<td>Peak Current ($t_p=8/20\mu s$)</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>$T_{OP}$</td>
<td>Operating Temperature</td>
<td>-40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{STOR}$</td>
<td>Storage Temperature</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notes:

**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 ($T_{OP}=25°C$)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Standoff Voltage</td>
<td>$V_{RWM}$</td>
<td>$I_R = 1\mu A$</td>
<td>3.3</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>$V_{BR}$</td>
<td>$I_B = 1mA$</td>
<td>6.5</td>
<td>8.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>$I_{LEAK}$</td>
<td>$V_R =3.3V$</td>
<td>0.02</td>
<td>0.1</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Holding Voltage</td>
<td>$V_{HOLD}$</td>
<td>I/O to GND</td>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamp Voltage&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$V_C$</td>
<td>$I_{pp}=1A$, $t_p=8/20\mu s$</td>
<td>2.7</td>
<td>3.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{pp}=6A$, $t_p=8/20\mu s$</td>
<td>4</td>
<td>6</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Dynamic Resistance&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$R_{DYN}$</td>
<td>TLP, $t_p=100\text{ns}$</td>
<td>0.3</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>ESD Withstand Voltage&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>$V_{ESD}$</td>
<td>IEC 61000-4-2 (Contact Discharge)</td>
<td>±12</td>
<td></td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (Air Discharge)</td>
<td>±15</td>
<td></td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td>Diode Capacitance&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$C_{I/O-GND}$</td>
<td>Reverse Bias=1.5V, $f=1\text{MHz}$</td>
<td>0.32</td>
<td>0.35</td>
<td></td>
<td>pF</td>
</tr>
</tbody>
</table>

Notes:

1. Parameter is guaranteed by design and/or component characterization.
2. Transmission Line Pulse (TLP) test setting: Std.TDR(50Ω), $t_p=100\text{ns}$, $t_r=0.2\text{ns}$ ITLP and VTLP averaging window: start $t_1=70\text{ns}$ to end $t_2=90\text{ns}$
3. Device stressed with ten non-repetitive ESD pulses.

### 8/20µs Pulse Waveform

### Capacitance vs. Reverse Bias
TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP3420-04UTG

Positive Transmission Line Pulsing (TLP) Plot

Negative Transmission Line Pulsing (TLP) Plot

Clamping Voltage vs. Peak Pulse Current

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

IEC 61000−4−2 -8 kV Contact ESD Clamping Voltage
### Soldering Parameters

<table>
<thead>
<tr>
<th>Reflow Condition</th>
<th>Pb – Free assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Heat</td>
<td></td>
</tr>
<tr>
<td>- Temperature Min (T_{s\text{min}})</td>
<td>150°C</td>
</tr>
<tr>
<td>- Temperature Max (T_{s\text{max}})</td>
<td>200°C</td>
</tr>
<tr>
<td>- Time (min to max) (t_s)</td>
<td>60 – 180 secs</td>
</tr>
<tr>
<td>Average ramp up rate (Liquidus) Temp (T_s) to peak</td>
<td>3°C/second max</td>
</tr>
<tr>
<td>(T_{s\text{max}}) to (T_s) - Ramp-up Rate</td>
<td>3°C/second max</td>
</tr>
<tr>
<td>Reflow</td>
<td></td>
</tr>
<tr>
<td>- Temperature (T_L) (Liquidus)</td>
<td>217°C</td>
</tr>
<tr>
<td>- Temperature (t_L)</td>
<td>60 – 150 seconds</td>
</tr>
<tr>
<td>Peak Temperature (T_p)</td>
<td>260°C</td>
</tr>
<tr>
<td>Time within 5°C of actual peak Temperature (t_p)</td>
<td>20 – 40 seconds</td>
</tr>
<tr>
<td>Ramp-down Rate</td>
<td>6°C/second max</td>
</tr>
<tr>
<td>Time 25°C to peak Temperature (T_25)</td>
<td>8 minutes Max.</td>
</tr>
<tr>
<td>Do not exceed</td>
<td>260°C</td>
</tr>
</tbody>
</table>

### Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>Min. Order Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP3420-04UTG</td>
<td>µDFN-10 (2.5x1.0mm)</td>
<td>3000</td>
</tr>
</tbody>
</table>

### Product Characteristics

- **Lead Plating**: PPF
- **Lead Material**: Copper Alloy
- **Substrate Material**: Silicon
- **Body Material**: Molded Compound
- **Flammability**: UL Recognized compound meeting flammability rating V-0

### Part Marking System

- AN **
- Date code
- Assembly site
- Product series

### Part Numbering System

- SP 3420-04 U T G
- G = Green
- T = Tape & Reel

- **Series**: TVS Diode Arrays (SPA® Diodes)
- **Number of Channels**:
- **Package**: µDFN-10 (2.5x1.0mm)
### Package Dimensions - μDFN-10 (2.5x1.0mm)

**Symbol** | **Millimeters** | **Inches**
---|---|---
| | Min | Max | Min | Max |
A | 0.40 | 0.60 | 0.013 | 0.024 |
A1 | 0.00 | 0.05 | 0.000 | 0.002 |
A3 | 0.127 REF | | 0.005 REF | |
b1 | 0.15 | 0.25 | 0.006 | 0.010 |
b2 | 0.35 | 0.45 | 0.014 | 0.018 |
D | 2.40 | 2.60 | 0.094 | 0.102 |
E | 0.90 | 1.10 | 0.035 | 0.043 |
e | 0.50 BSC | | 0.020 BSC | |
L | 0.28 | 0.48 | 0.011 | 0.019 |
L1 | 0.00 | 0.15 | 0.000 | 0.006 |
R | 0.125 REF | | 0.005 REF | |

### Tape & Reel Specification — μDFN-10 (2.5x1.0mm)

**Symbol** | **Millimeters**
---|---
A0 | 1.15 min/1.30 max |
B0 | 2.70+/-0.05 |
D0 | φ 1.50 min/1.65 max |
D1 | φ 0.50 min/1.05 max |
E1 | 1.75+/-0.10 |
F | 3.50+/-0.10 |
K0 | 0.46 min/0.75 max |
P0 | 4.00+/-0.10 |
P1 | 4.00+/-0.10 |
P2 | 2.00+/-0.05 |
W | 8.00+0.30/-0.10 |
T | 0.17 min/0.30 max |

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