Description
The SP0115-01UTG features low breakdown/turn on voltages, making them more ideal protectors of low voltage -1.0 to +1.0 V data lines. These robust diodes can safely absorb repetitive ESD strikes above the maximum level specified in IEC 61000-4-2 international standard (Level 4, ±8 kV contact discharge) without performance degradation.

Features
- ESD, IEC 61000-4-2, ±30 kV contact/air
- EFT, IEC 61000-4-4, 40 A (5/50 ns)
- Maximum surge tolerance, IEC 61000-4-5 2nd edition, 12 A (8/20 μs)
- Halogen free, lead free and RoHS compliant
- Moisture sensitivity level (MSL-1)

Applications
- Low voltage GPIO for MCU
- Consumer
- Industry
- Medical

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.

Specifications are subject to change without notice.
Revised: FW/03/29/23
SP0115-01UTG
1 V Bidirectional Discrete TVS in DFN1610, General Purpose ESD Protection

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 μs)</td>
<td>12 A</td>
<td></td>
</tr>
<tr>
<td>T_{OP}</td>
<td>Operating Temperature</td>
<td>-40 to 125 °C</td>
<td></td>
</tr>
<tr>
<td>T_{ST OR}</td>
<td>Storage Temperature</td>
<td>-55 to 150 °C</td>
<td></td>
</tr>
</tbody>
</table>

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></td>
<td></td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>V_{BR}</td>
<td>I_{R} = 1 mA</td>
<td>1.4</td>
<td>1.6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>I_{LEAK}</td>
<td>V_{R} = 1 V</td>
<td>0.1</td>
<td></td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td>Clamp Voltage(^1)</td>
<td>V_{C}</td>
<td>I_{PP} = 1 A, t_{p} = 8/20 μs, I/O to GND</td>
<td>2.8</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PP} = 12 A, t_{p} = 8/20 μs, I/O to GND</td>
<td>8.9</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Dynamic Resistance(^2)</td>
<td>R_{DYN}</td>
<td>TLP, t_{p} = 100 ns, I/O to GND</td>
<td>0.26</td>
<td></td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>ESD Withstand Voltage(^1,3)</td>
<td>V_{ESD}</td>
<td>IEC 61000-4-2 (Contct Discharge)</td>
<td>±30</td>
<td></td>
<td>kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (Air Discharge)</td>
<td>±30</td>
<td></td>
<td>kV</td>
<td></td>
</tr>
<tr>
<td>Diode Capacitance(^1)</td>
<td>C_{IO-GND}</td>
<td>Reverse Bias = 0 V, f = 1MHz, I/O to GND</td>
<td>1</td>
<td></td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. Parameter is guaranteed by design and/or component characterization.
2. Transmission Line Pulse (TLP) with 100 ns width, 0.2 ns rise time, and average window t1 = 70 ns to t2 = 90 ns.
3. Device stressed with ten non-repetitive ESD pulses.

![Capacitance vs. Reverse Bias](chart1.png)

![Clamping Voltage vs I_{PP}](chart2.png)
## Soldering Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Heat</td>
<td>- Temperature min ($T_{S_{\text{min}}}$) 150 °C - Temperature max ($T_{S_{\text{max}}}$) 200 °C - Time (min to max) ($t_{S}$) 60 – 120 secs</td>
</tr>
<tr>
<td>Average ramp up rate (Liquidus) temp ($T_{L}$) to peak</td>
<td>3 °C/second max</td>
</tr>
<tr>
<td>$T_{S_{\text{max}}}$ to $T_{L}$ - Ramp-up rate</td>
<td>3 °C/second max</td>
</tr>
<tr>
<td>Reflow</td>
<td>- Temperature ($T_{L}$) (Liquidus) 217 °C - Temperature ($t_{L}$) 60 – 150 seconds</td>
</tr>
<tr>
<td>Peak temperature ($T_{P}$)</td>
<td>260° ± 5 °C</td>
</tr>
<tr>
<td>Time within 5 °C of actual peak temperature ($t_{p}$)</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Ramp-down rate</td>
<td>6 °C/second max</td>
</tr>
<tr>
<td>Time 25 °C to peak temperature ($T_{P}$)</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>SP0115-01UTG</td>
<td>1.6x1.0 mm DFN</td>
<td>3000</td>
</tr>
</tbody>
</table>

## Part Marking System

- **AZxx**
  - **Pin 1**
  - **Part code**
  - **Date code**
  - **Assembly site**

## Product Characteristics

- **Lead plating**: Matte tin
- **Lead material**: Copper alloy
- **Body material**: Molded compound
- **Flammability**: UL recognized compound meeting flammability rating V-0

## Part Numbering System

- **SP 0115 - 01 U TG**
  - **SP**: TVS Diode Arrays (SPA® Diodes)
  - **0115**: Series
  - **01**: Number of Channels
  - **U**: Package
  - **TG**: Tape & Reel
  - **Package U: 1.6x1.0 mm DFN**
Package Dimensions — 1610DFN

**Symbol**

<table>
<thead>
<tr>
<th><strong>1.6x1.0 mm DFN</strong></th>
<th><strong>Millimeters</strong></th>
<th><strong>Inches</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Min</strong></td>
<td><strong>Typ</strong></td>
<td><strong>Max</strong></td>
</tr>
<tr>
<td>A</td>
<td>0.45</td>
<td>0.50</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>0.02</td>
</tr>
<tr>
<td>D</td>
<td>1.55</td>
<td>1.60</td>
</tr>
<tr>
<td>E</td>
<td>0.95</td>
<td>1.00</td>
</tr>
<tr>
<td>b</td>
<td>0.75</td>
<td>0.80</td>
</tr>
<tr>
<td>L</td>
<td>0.35</td>
<td>0.40</td>
</tr>
<tr>
<td>e</td>
<td>1.10 BSC</td>
<td>0.043 BSC</td>
</tr>
<tr>
<td>h</td>
<td>0.15</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**Recommended Soldering pad layout (mm)**

Embossed Carrier Tape & Reel Specification — 1610DFN

**Symbol**

<table>
<thead>
<tr>
<th><strong>Millimeters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
</tr>
<tr>
<td>B0</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>D1</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>K0</td>
</tr>
<tr>
<td>P</td>
</tr>
<tr>
<td>P0</td>
</tr>
<tr>
<td>P2</td>
</tr>
<tr>
<td>T</td>
</tr>
<tr>
<td>W</td>
</tr>
</tbody>
</table>

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