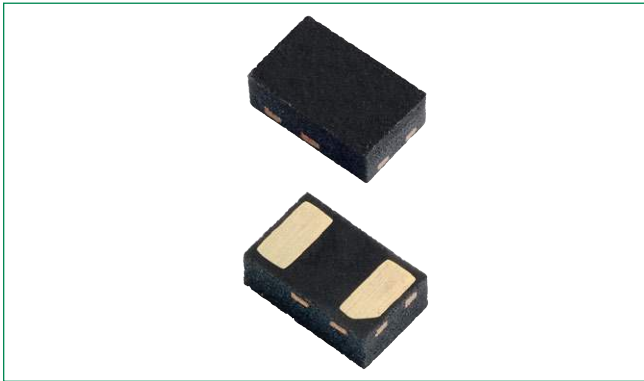


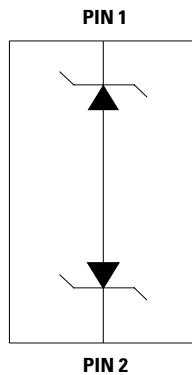
## SP1103C 80A Discrete Bidirectional TVS Diode



### Description

The SP1103C includes TVS diodes fabricated in a proprietary silicon avalanche technology protect each I/O pin to provide a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at  $\pm 30\text{kV}$  (contact discharge, IEC 61000-4-2) without performance degradation. Additionally, each diode can safely dissipate 80A of 8/20ms surge current (IEC 61000-4-5, 2nd edition) with very low clamping voltages.

### Pinout and Functional Block Diagram



### Features

- ESD, IEC 61000-4-2,  $\pm 30\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 80A ( $t_p=8/20\mu\text{s}$ )
- Low clamping voltage
- Low leakage current
- AEC-Q101 qualified
- Moisture Sensitivity Level(MSL -1)
- Halogen free, Lead free and RoHS compliant

### Applications

- Switches / Buttons
- Test Equipment / Instrumentation
- Point-of-Sale Terminals
- Medical Equipment
- Notebooks / Desktops / Servers
- Computer Peripherals
- Automotive Electronics

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 |
|------------|--------------------------------------|------------|-------|
| $P_{pk}$   | Peak Pulse Power ( $t_p=8/20\mu s$ ) | 720        | W     |
| $T_{OP}$   | 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.

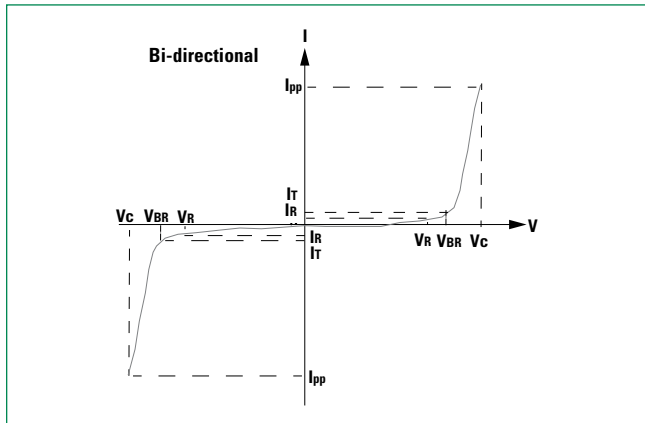
### SP1103C Electrical Characteristics ( $T_{OP}=25^\circ C$ )

| Parameter                          | Symbol     | Test Conditions                      | Min      | Typ  | Max | Units    |
|------------------------------------|------------|--------------------------------------|----------|------|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$  | $I_R \leq 1\mu A$                    | -        | -    | 3.3 | V        |
| Breakdown Voltage                  | $V_{BR}$   | $I_R = 1mA$                          | 3.4      | 3.8  | 5.0 | V        |
| Leakage Current                    | $I_{LEAK}$ | $V_R = 3.3V$                         | -        | -    | 1.0 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$      | $I_{PP} = 40A, t_p = 8/20\mu s, Fwd$ | -        | 6    | -   | V        |
|                                    |            | $I_{PP} = 80A, t_p = 8/20\mu s, Fwd$ | -        | 9    | -   | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$  | TLP, $t_p = 100ns, I/O$ to GND       | -        | 0.01 | -   | $\Omega$ |
| Peak Pulse Current                 | $I_{PP}$   | $t_p = 8/20\mu s$                    | -        | -    | 80  | A        |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$  | IEC 61000-4-2 (Contact Discharge)    | $\pm 30$ | -    | -   | kV       |
|                                    |            | IEC 61000-4-2 (Air Discharge)        | $\pm 30$ | -    | -   | kV       |
| Diode Capacitance <sup>1</sup>     | $C_D$      | Reverse Bias=0V, $f=1MHz$            | -        | 130  | -   | pF       |

**Note:**

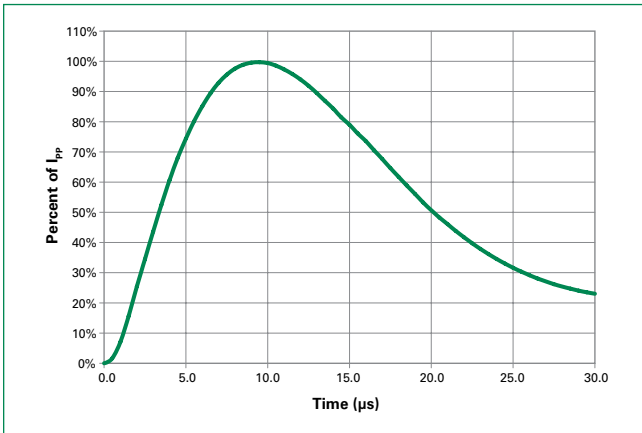
- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

### I-V Curve Characteristics

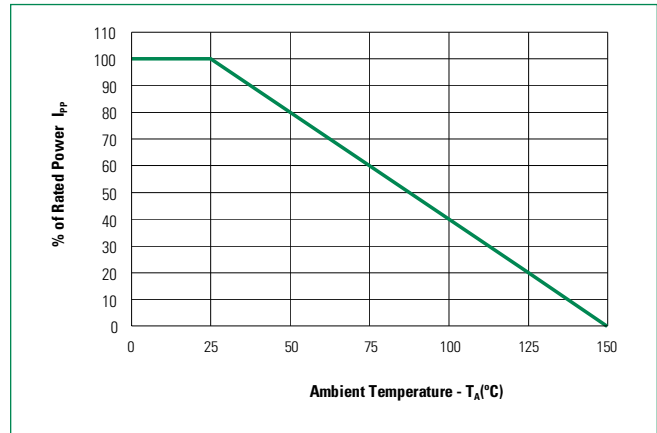


- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_R$ )
- $V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{PP}$  (peak impulse current)
- $I_R$  Reverse Leakage Current** – Current measured at  $V_R$

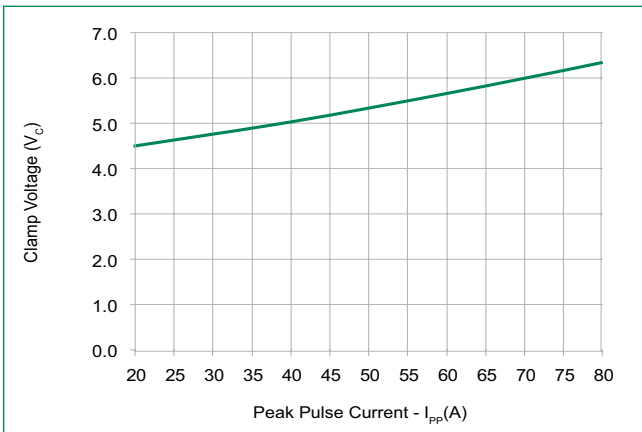
**8/20μs Pulse Waveform**



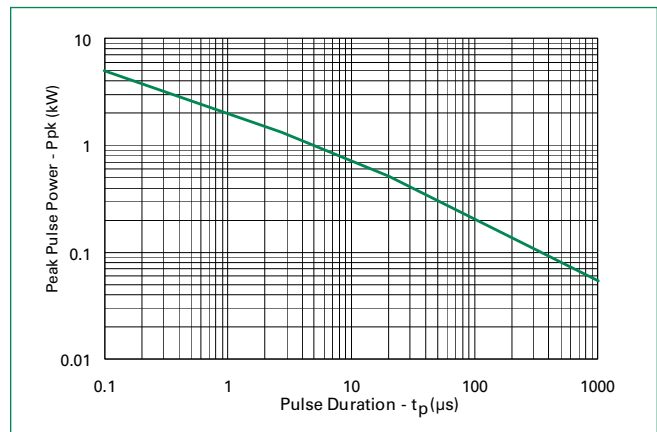
**Power Derating Curve**



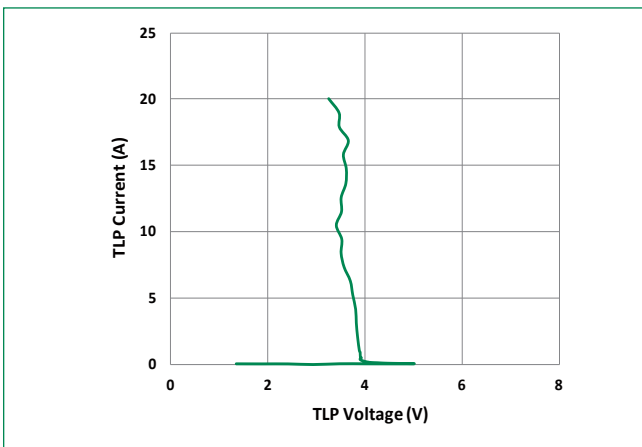
**Clamping Voltage vs I<sub>pp</sub>**



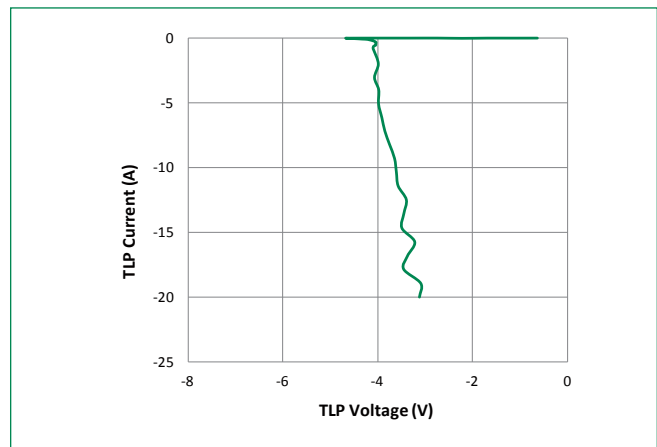
**Non-Repetitive Peak Pulse Power vs. Pulse Time**



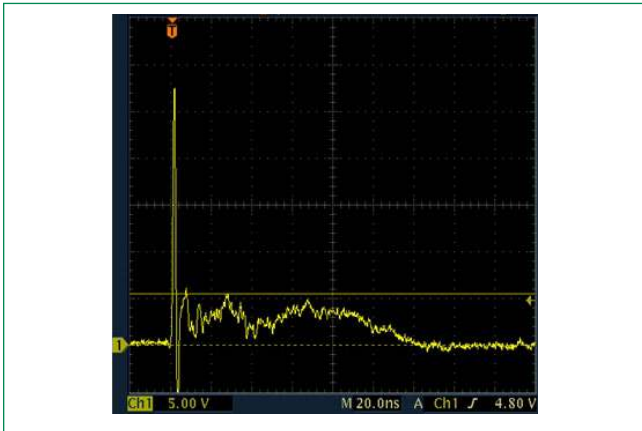
**Positive Transmission Line Pulsing (TLP) Plot**



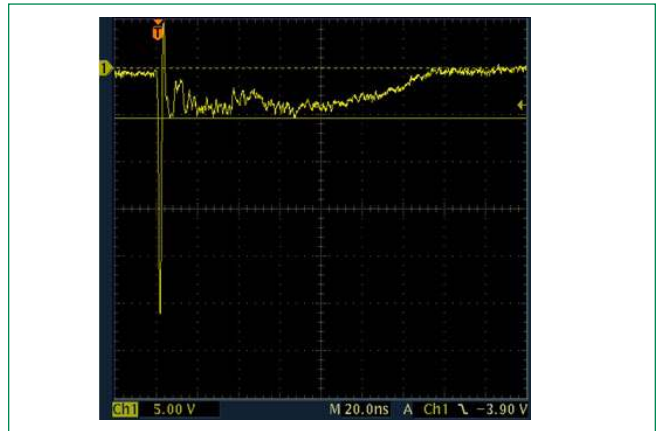
**Negative Transmission Line Pulsing (TLP) Plot**



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

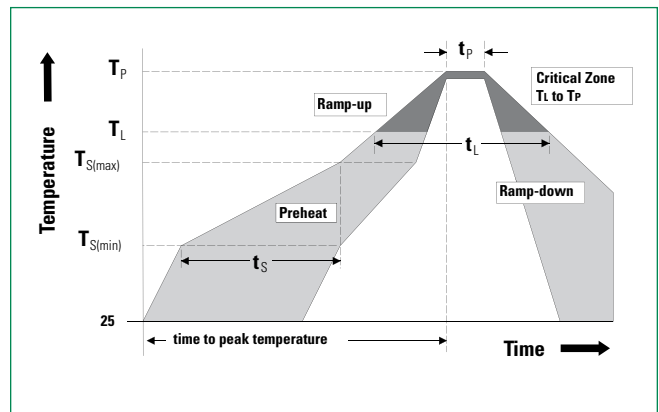


**IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage**

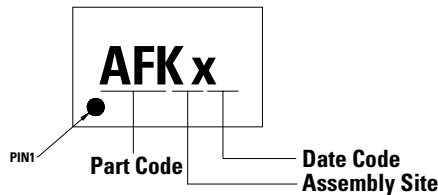


**Soldering Parameters**

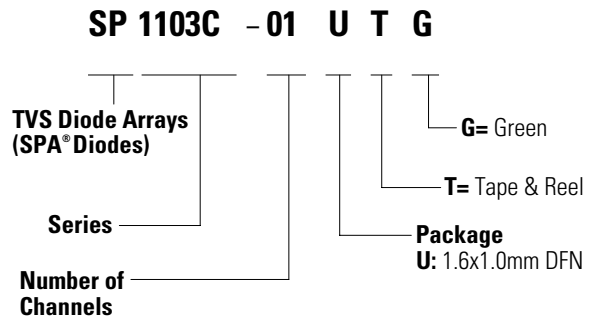
|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <b>Reflow Condition</b>                                                |                                    | 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 Marking System**



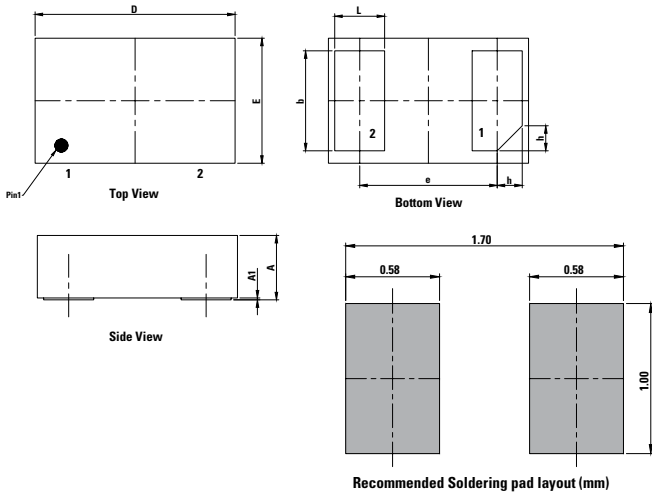
**Part Numbering System**



**Ordering Information**

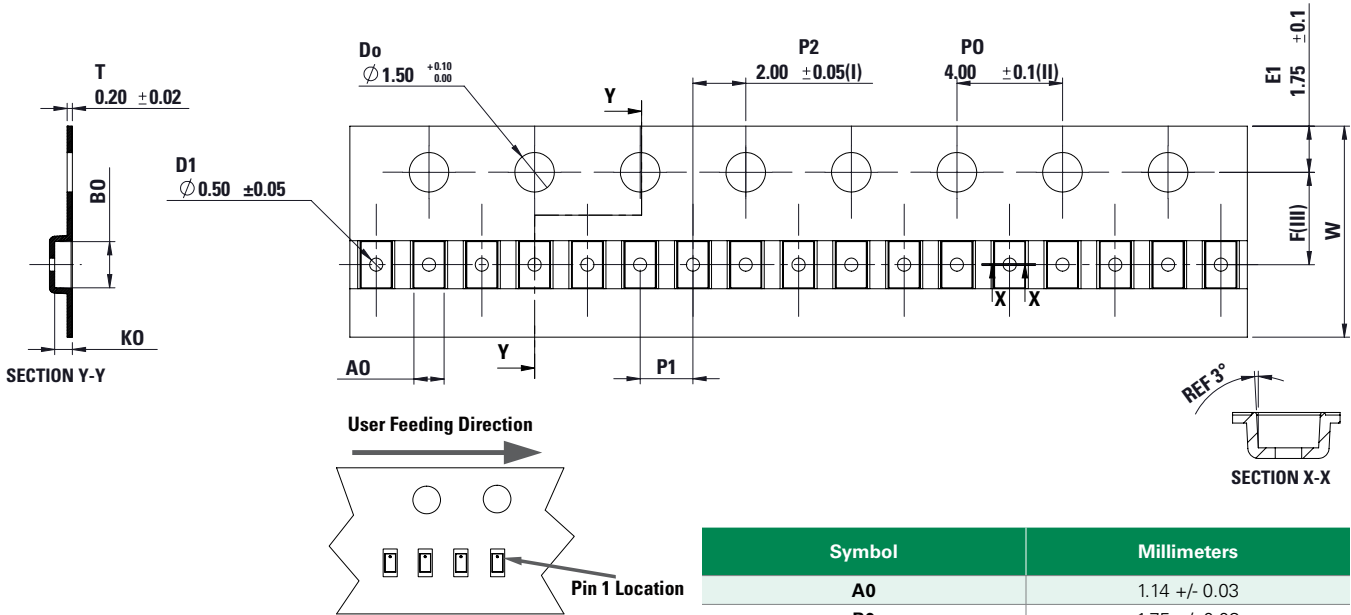
| Part Number   | Package       | Marking | Min. Order Qty. |
|---------------|---------------|---------|-----------------|
| SP1103C-01UTG | 1.6x1.0mm DFN | AFKx    | 3000            |

**Package Dimensions**



| Symbol | 1.6x1.0mm DFN |      |      |
|--------|---------------|------|------|
|        | Millimeters   |      |      |
|        | Min           | Nor  | Max  |
| A      | 0.45          | 0.50 | 0.55 |
| A1     | -             | 0.02 | 0.05 |
| D      | 1.55          | 1.60 | 1.65 |
| E      | 0.95          | 1.00 | 1.05 |
| b      | 0.75          | 0.80 | 0.85 |
| L      | 0.35          | 0.40 | 0.45 |
| e      | 1.10 BSC      |      |      |
| h      | 0.15          | 0.20 | 0.25 |

**Embossed Carrier Tape & Reel Specification**



| Symbol | Millimeters   |
|--------|---------------|
| A0     | 1.14 +/- 0.03 |
| B0     | 1.75 +/- 0.03 |
| K0     | 0.67 +/- 0.05 |
| F      | 3.50 +/- 0.05 |
| P1     | 2.00 +/- 0.10 |
| W      | 8.00 +/- 0.10 |