

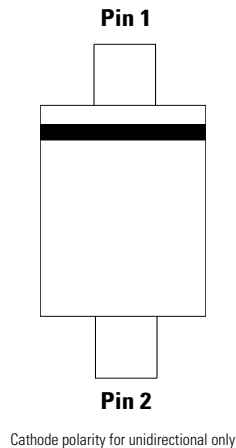
## AQ4024 Series 1.3pF, 7A Discrete TVS Diode



### Description

The AQ4024 series integrates low capacitance steering diodes with one or two avalanche breakdown diodes for unidirectional or bidirectional protection, respectively, to protect against ESD and lightning induced surge events. These components can safely absorb up to 7A per IEC 61000-4-5 2<sup>nd</sup> edition ( $t_p=8/20\mu s$ ) without performance degradation and a minimum  $\pm 30kV$  ESD per IEC 61000-4-2 International Standard. The low loading capacitance and high surge capability make it ideal for protecting telecommunication ports such as xDSL and other high voltage, high speed legacy interfaces.

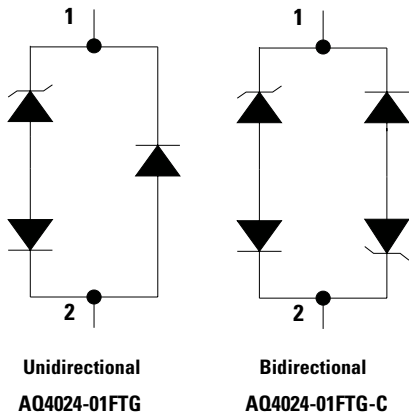
### Pinout



### Features

- ESD, IEC 61000-4-2,  $\pm 30kV$  contact,  $\pm 30kV$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2<sup>nd</sup> edition, 7A ( $t_p=8/20\mu s$ )
- Low capacitance of 1.3pF (@  $V_R=0V$ )
- Low leakage current
- Unidirectional and bidirectional configuration
- Small SOD323 package fits 0805 footprints
- AEC-Q101 qualified
- Moisture Sensitivity Level(MSL -1)
- Halogen free, lead free and RoHS compliant

### Functional Block Diagram



### Applications

- xDSL Interfaces
- RS-232
- RS-485
- Power Ports
- Security Equipment
- Instrumentation
- Medical Equipment
- Computers and Peripherals
- CAN Bus protection
- Automotive applications

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 ( $t_p=8/20\mu s$ )     | 7          | A     |
| $P_{PK}$   | Peak Pulse Power ( $t_p=8/20\mu s$ ) | 350        | W     |
| $T_{OP}$   | Operating Temperature                | -40 to 150 | °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.

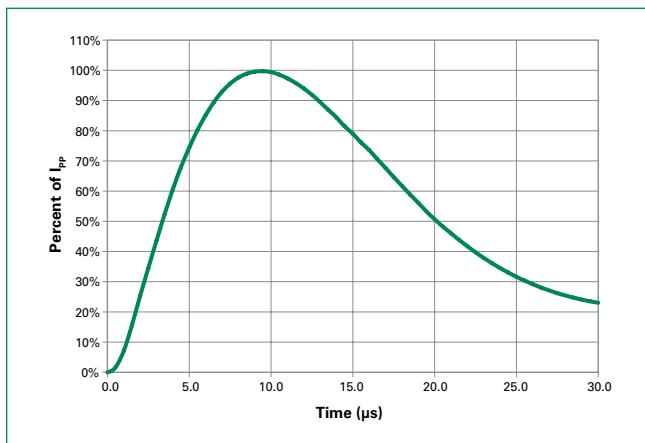
### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

| Parameter                          | Symbol     | Test Conditions                            | Min      | Typ | Max | Units    |
|------------------------------------|------------|--|----------|-----|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$  | $I_R \leq 1\mu A$ with Pin 1 to Pin 2      |          |     | 24  | V        |
| Breakdown Voltage                  | $V_{BD}$   | $I_T=1mA$ with Pin 1 to Pin 2              | 26       |     |     | V        |
| Leakage Current                    | $I_{LEAK}$ | $V_R=24V$ with Pin 1 to Pin 2              |          |     | 0.5 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$      | $I_{PP}=1A, t_p=8/20\mu s, Fwd$            |          | 34  |     | V        |
|                                    |            | $I_{PP}=2A, t_p=8/20\mu s, Fwd$            |          | 36  |     | V        |
|                                    |            | $I_{PP}=5A, t_p=8/20\mu s, Fwd$            |          | 43  |     | V        |
|                                    |            | $I_{PP}=7A, t_p=8/20\mu s, Fwd$            |          | 48  |     | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$  | TLP $t_p=100ns$ , Pin 1 to Pin 2           |          | 0.7 |     | $\Omega$ |
| 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, $f=1MHz$ , Pin 1 to Pin 2 |          | 1.3 | 2   | pF       |

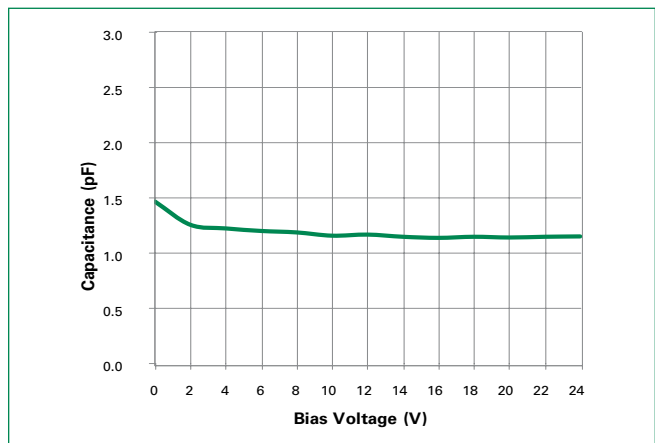
**Note:**

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) test setting : Std. TDR(50 $\Omega$ ),  $t_p=100ns$ ,  $t_r=0.2ns$  ITLP and VTLP averaging window: start  $t_1=70ns$  to end  $t_2=80ns$

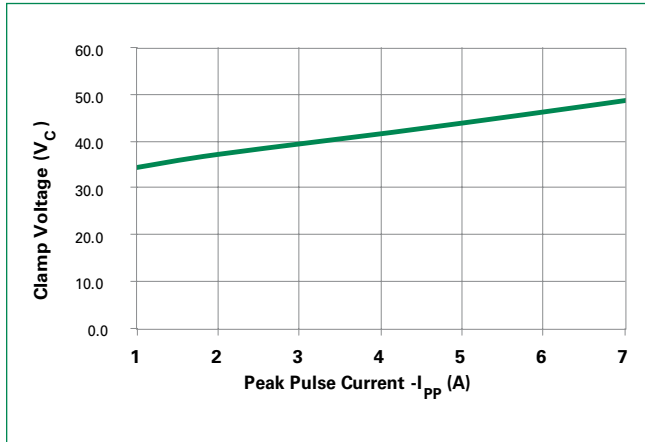
### 8/20 $\mu s$ Pulse Waveform



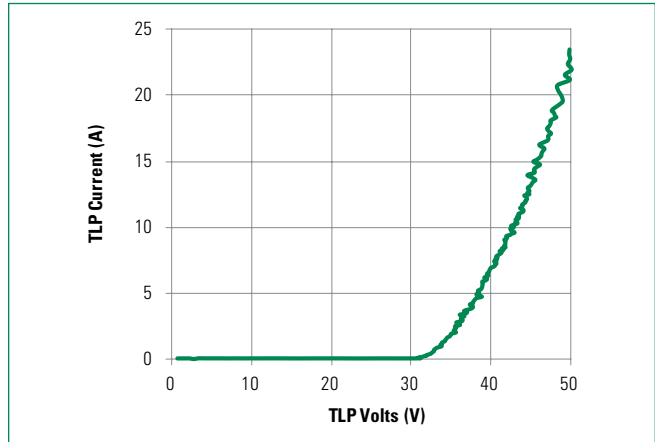
### Capacitance vs. Reverse Bias (Pin 1 to Pin 2)



**Clamping Voltage vs. Peak Pulse Current (Pin 1 to Pin 2)**

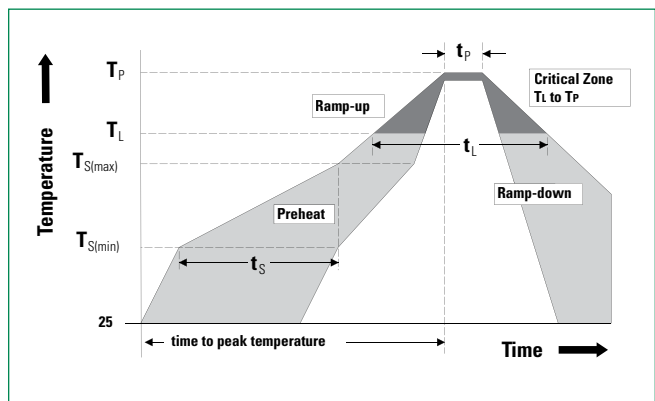


**Transmission Line Pulsing (TLP) Plot (Pin 1 to Pin2)**

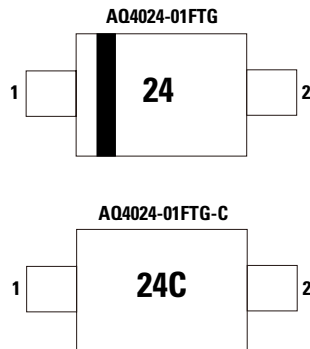


**Soldering Parameters**

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <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**



**Product Characteristics**

|                           |  |
|---------------------------|--|
| <b>Lead Plating</b>       | Matte tin  |
| <b>Lead Material</b>      | Copper Alloy   |
| <b>Lead Coplanarity</b>   | 0.0004 inches (0.102mm)                                |
| <b>Substrate material</b> | Silicon  |
| <b>Body Material</b>      | Molded Compound  |
| <b>Flammability</b>       | UL Recognized compound meeting flammability rating V-0 |

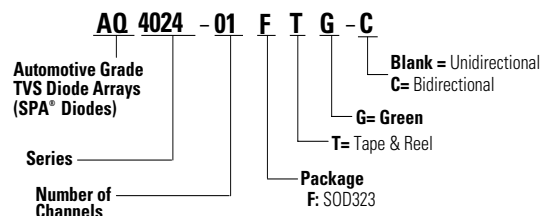
**Notes:**

- All dimensions are in millimeters
- Dimensions include solder plating.
- Dimensions are exclusive of mold flash & metal burr.

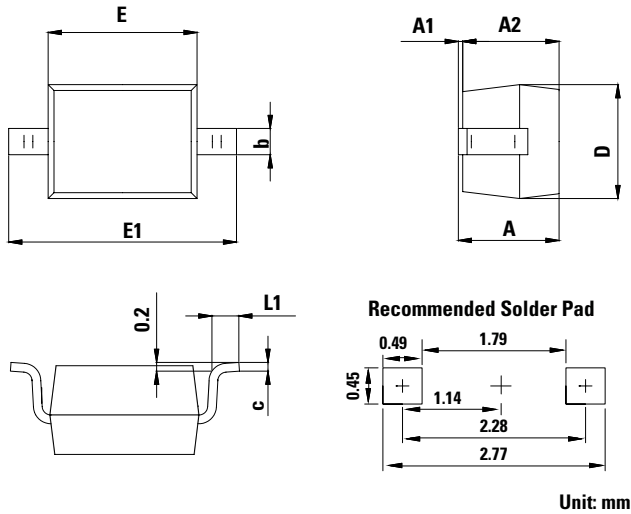
**Ordering Information**

| Part Number    | Package | Marking | Min. Order Qty. |
|----------------|---------|---------|-----------------|
| AQ4024-01FTG   | SOD323  | 24      | 3000            |
| AQ4024-01FTG-C | SOD323  | 24C     | 3000            |

**Part Numbering System**

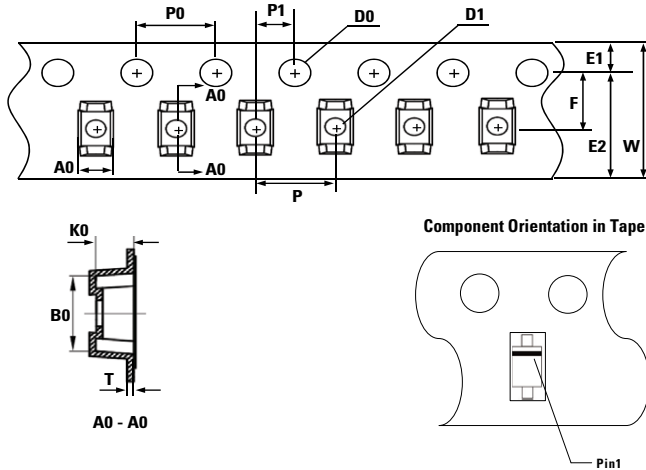


**Package Dimensions -SOD323**

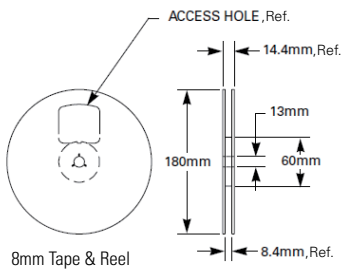


| Symbol    | SOD323      |      |        |       |
|-----------|-------------|------|--------|-------|
|           | Millimeters |      | Inches |       |
|           | Min         | Max  | Min    | Max   |
| <b>A</b>  | 0.80        | 1.00 | 0.031  | 0.039 |
| <b>A1</b> | 0.00        | 0.10 | 0.000  | 0.004 |
| <b>A2</b> | 0.80        | 0.90 | 0.031  | 0.035 |
| <b>b</b>  | 0.25        | 0.35 | 0.010  | 0.014 |
| <b>c</b>  | 0.08        | 0.15 | 0.003  | 0.006 |
| <b>D</b>  | 1.20        | 1.40 | 0.047  | 0.055 |
| <b>E</b>  | 1.60        | 1.80 | 0.063  | 0.071 |
| <b>E1</b> | 2.50        | 2.70 | 0.098  | 0.106 |
| <b>L1</b> | 0.25        | 0.40 | 0.010  | 0.016 |

**Embossed Carrier Tape & Reel Specification – SOD323**



| Symbol    | Millimeters     |
|-----------|-----------------|
| <b>A0</b> | 1.46+/-0.10     |
| <b>B0</b> | 2.90+/-0.10     |
| <b>W</b>  | 8.0+0.3/-0.10   |
| <b>D0</b> | 1.50+0.10       |
| <b>D1</b> | 0.45min/1.15max |
| <b>E1</b> | 1.75+/-0.10     |
| <b>E2</b> | -               |
| <b>F</b>  | 3.50+/-0.10     |
| <b>P0</b> | 4.00+/-0.10     |
| <b>P</b>  | 4.00+/-0.10     |
| <b>P1</b> | 2.00+/-0.05     |
| <b>K0</b> | 1.25+/-0.10     |
| <b>T</b>  | 0.254+/-0.02    |



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