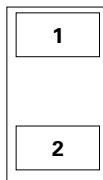


# AQ1005 Series

## General Purpose ESD Protection



**Pinout**



**Functional Block Diagram**



### Description

The AQ1005 TVS includes back-to-back breakdown diodes fabricated in a proprietary silicon avalanche technology to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes above the maximum level specified in IEC 61000-4-2 international standard (Level 4,  $\pm 8$  kV contact discharge and  $\pm 15$  kV air discharge) without performance degradation. The back-to-back configuration provides symmetrical ESD protection for data lines.

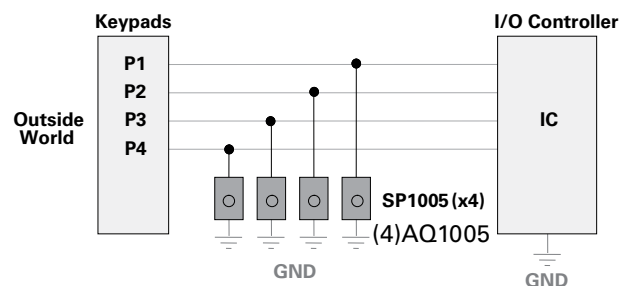
### Features

- ESD, IEC 61000-4-2,  $\pm 30$  kV contact,  $\pm 30$  kV air
- ESD, ISO 10605, 330 pF 330  $\Omega$ ,  $\pm 30$  kV contact,  $\pm 30$  kV air
- EFT, IEC 61000-4-4, 40 A (5/50 ns)
- Lightning, 8 A (8/20 as defined in IEC 61000-4-5 2nd edition)
- Low capacitance of 30 pF (@ VR=0V)
- Low leakage current of 0.1  $\mu$ A at 5V
- SOD882 footprint compatible to 0402 footprint
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant
- PPAP capable

### Applications

- Mobile Phones
- Smart Phones
- Camcorders
- Portable Medical
- Digital Cameras
- MP3/PMP
- Portable Navigation Components
- Tablets
- Point of Sale Terminals
- Automotive Applications

### Application Example



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.

# AQ1005 Series

## General Purpose ESD Protection

### Absolute Maximum Ratings

| Symbol     | Parameter                        | Value      | Units |
|------------|----------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) | 8.0        | A     |
| $T_{OP}$   | 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.

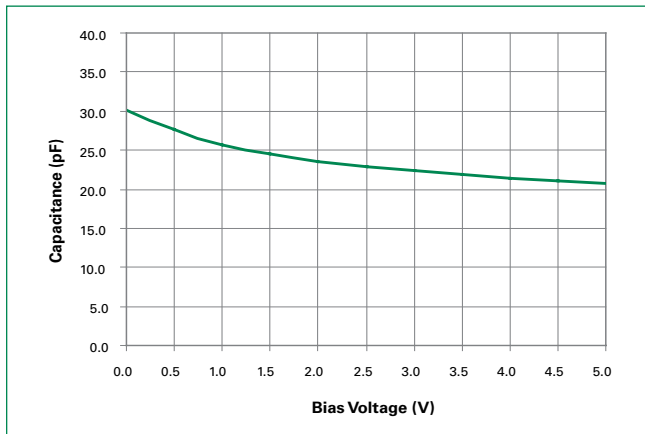
### Electrical Characteristics (TOP=25°C)

| Parameter                          | Symbol        | Test Conditions                          | Min      | Typ  | Max | Units    |
|------------------------------------|---------------|------------------------------------------|----------|------|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R=1\mu A$                             | -        | -    | 6.0 | V        |
| Breakdown Voltage                  | $V_{BR}$      | $I_R=1mA$                                | -        | 8.5  | 9.5 | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=5V$                                 | -        | 0.1  | 0.5 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A, t_p=8/20\mu s, I/O$ to $I/O$ | -        | 9.3  | -   | V        |
|                                    |               | $I_{PP}=2A, t_p=8/20\mu s, I/O$ to $I/O$ | -        | 10.0 | -   | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$     | TLP, $t_p=100ns, I/O$ to $I/O$           | -        | 0.25 | -   | $\Omega$ |
| 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>     | $C_{I/O-I/O}$ | Reverse Bias=0V $f=1MHz$                 | -        | 30   | -   | pF       |
|                                    |               | Reverse Bias=2.5V $f=1MHz$               | -        | 23   | -   | pF       |

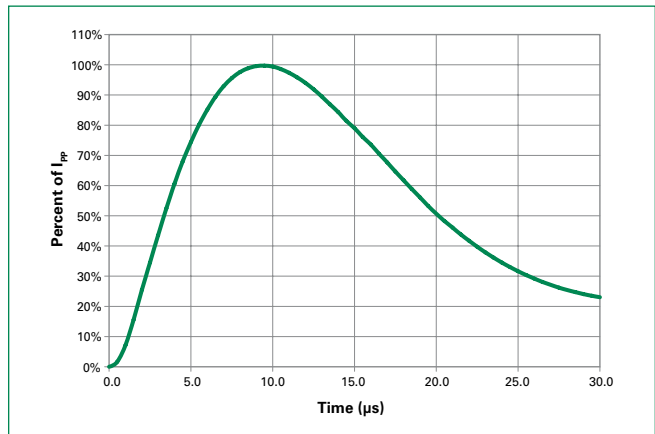
**Note:**

- 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  $t_2=90ns$

### Capacitance vs. Reverse Bias



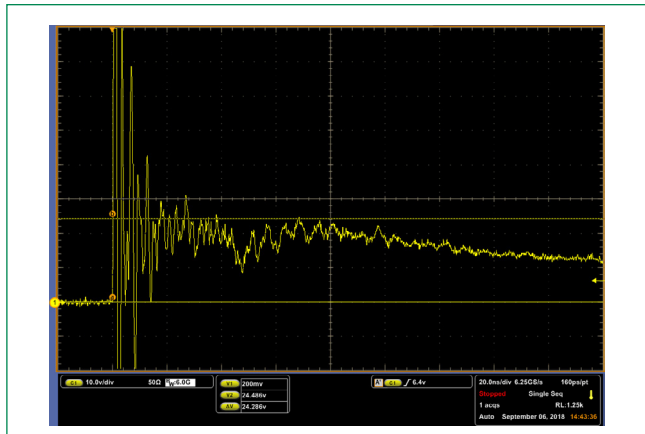
### 8/20 $\mu s$ Pulse Waveform



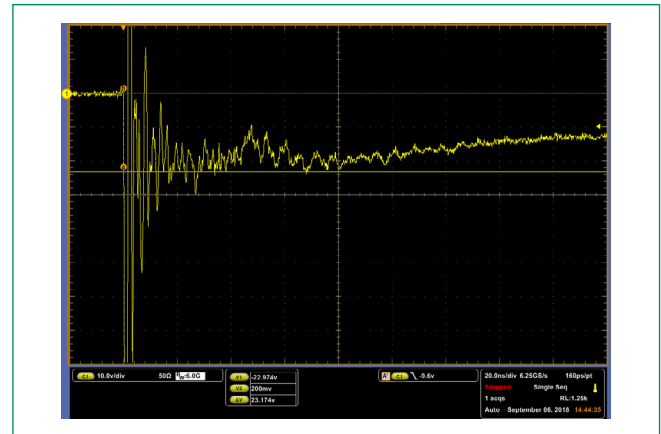
# AQ1005 Series

## General Purpose ESD Protection

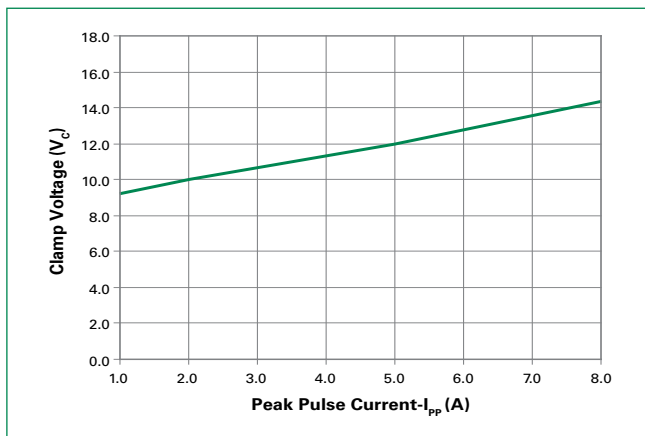
ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV



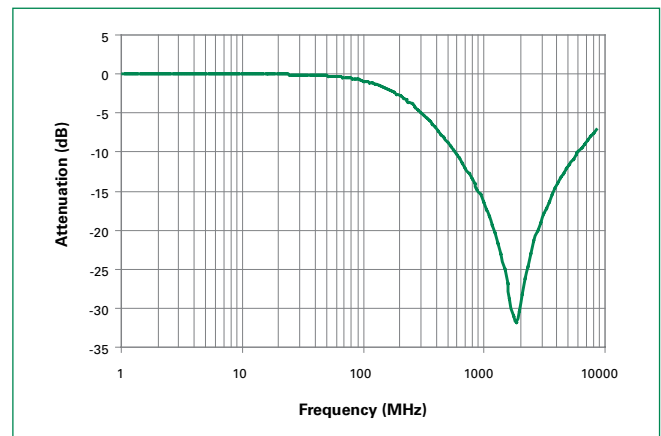
ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



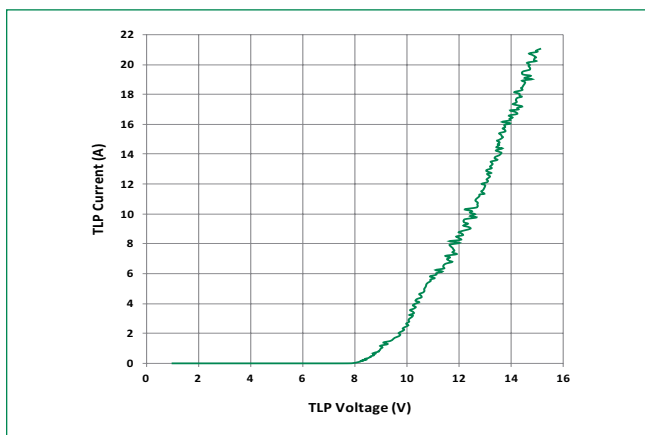
Clamping Voltage vs. IPP



Insertion Loss (S21) I/O to GND



Transmission Line Pulsing(TLP) Plot

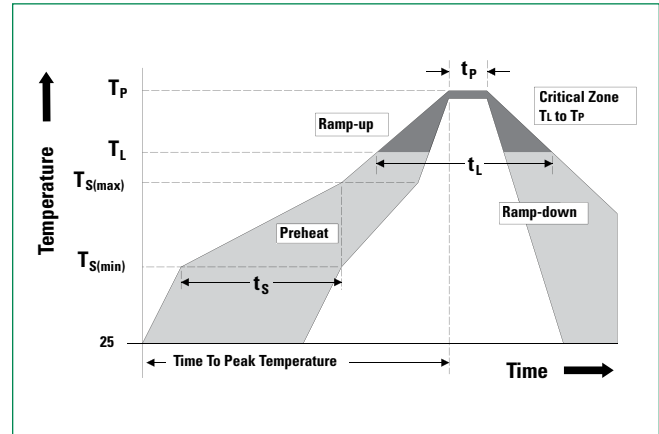


# AQ1005 Series

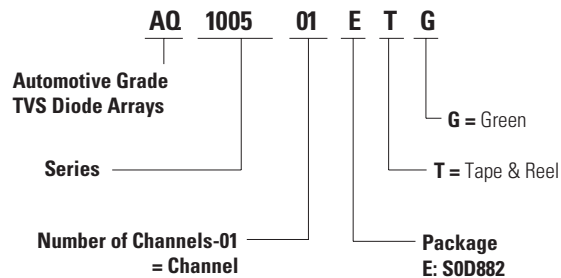
## General Purpose ESD Protection

### 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 – 120 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>   |                                    | 30 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                   |



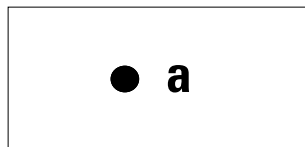
### Part Numbering System



### Product Characteristics

|                           |                                                        |
|---------------------------|--------------------------------------------------------|
| <b>Lead Plating</b>       | Pre-Plated Frame                                       |
| <b>Lead Material</b>      | Copper Alloy                                           |
| <b>Substrate material</b> | Silicon                                                |
| <b>Body Material</b>      | Molded Compound                                        |
| <b>Flammability</b>       | UL Recognized compound meeting flammability rating V-0 |

### Part Marking System



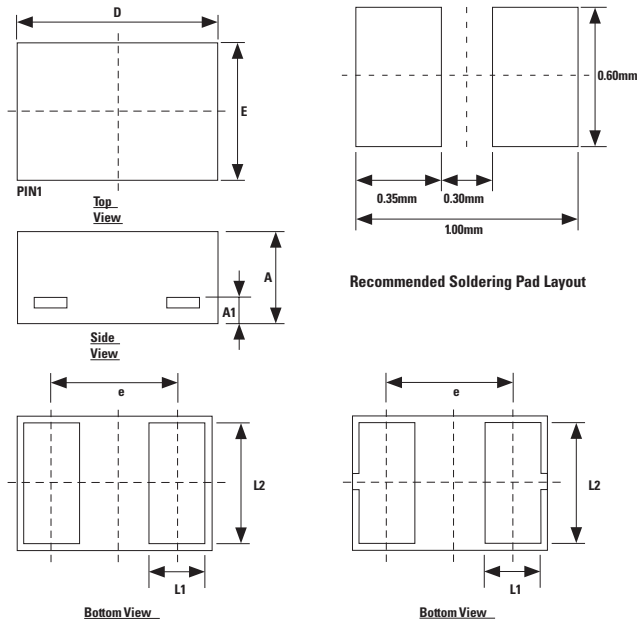
### Ordering Information

| Part Number  | Package | Min. Order Qty. |
|--------------|---------|-----------------|
| AQ1005-01ETG | SOD882  | 10000           |

# AQ1005 Series

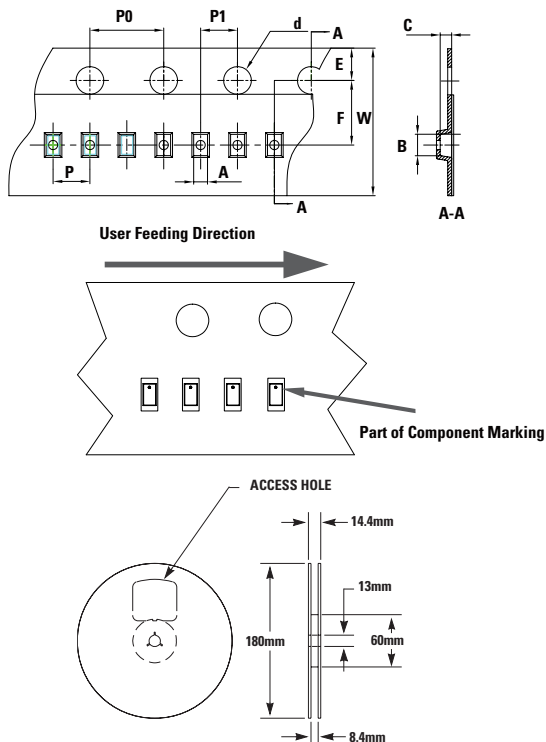
## General Purpose ESD Protection

### Package Dimensions — SOD882



| Symbol    | Dimensions (mm) |      |      | Dimensions (In) |       |       |
|-----------|-----------------|------|------|-----------------|-------|-------|
|           | Min.            | Nor. | Max. | Min.            | Nor.  | Max.  |
| <b>A</b>  | 0.36            | 0.45 | 0.55 | 0.014           | 0.018 | 0.022 |
| <b>A1</b> | 0.127 REF       |      |      | 0.005 REF       |       |       |
| <b>L1</b> | 0.20            | 0.25 | 0.30 | 0.008           | 0.01  | 0.012 |
| <b>L2</b> | 0.45            | 0.50 | 0.55 | 0.018           | 0.020 | 0.023 |
| <b>D</b>  | 0.93            | 1.00 | 1.07 | 0.037           | 0.039 | 0.067 |
| <b>E</b>  | 0.53            | 0.60 | 0.67 | 0.021           | 0.024 | 0.026 |
| <b>e</b>  | 0.65 BSC        |      |      | 0.026 BSC       |       |       |

### Embossed Carrier Tape & Reel Specification — SOD882



| Symbol    | Millimetres |      | Inches |       |
|-----------|-------------|------|--------|-------|
|           | Min         | Max  | Min    | Max   |
| <b>A</b>  | 0.65        | 0.70 | 0.026  | 0.028 |
| <b>B</b>  | 1.10        | 1.20 | 0.043  | 0.047 |
| <b>C</b>  | 0.50        | 0.60 | 0.020  | 0.024 |
| <b>dØ</b> | 1.40        | 1.60 | 0.055  | 0.063 |
| <b>E</b>  | 1.65        | 1.85 | 0.065  | 0.073 |
| <b>F</b>  | 3.40        | 3.60 | 0.134  | 0.142 |
| <b>P0</b> | 3.90        | 4.10 | 0.154  | 0.161 |
| <b>P</b>  | 1.90        | 2.10 | 0.075  | 0.083 |
| <b>P1</b> | 1.90        | 2.10 | 0.075  | 0.083 |
| <b>W</b>  | 7.90        | 8.10 | 0.311  | 0.319 |

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