

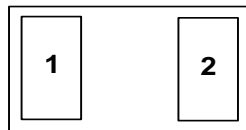
# AQ3045 Series

## Low Capacitance ESD Protection



### Pinout

SOD882



### Functional Block Diagram



### Description

The AQ3045 includes back-to-back TVS 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 up to the maximum level specified in IEC 61000-4-2 international standard ( $\pm 30\text{kV}$  contact discharge) without performance degradation. The back-to-back configuration provides symmetrical ESD protection for data lines when AC signals are present and the low loading capacitance makes it ideal for protecting high speed data lines such as HDMI, USB2.0, USB3.0 and eSATA.

### Features & Benefits

- ESD protection of  $\pm 30\text{kV}$  contact discharge,  $\pm 30\text{kV}$  air discharge, (IEC 61000-4-2)
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 3A (8/20 $\mu\text{s}$  as defined in IEC 61000-4-5 2nd edition)
- Low capacitance of 0.35pF @ VR=0V (TYP)
- PPAP capable
- Low leakage current of 100nA at 5.3V (MAX)
- Small SOD882 packaging helps save board space
- Extremely low dynamic resistance (0.55  $\Omega$  TYP)
- AEC-Q101 qualified
- Halogen free, lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)

### Applications

- USB 3.0/USB 2.0/MHL
- MIPI Camera and Display
- HDMI 2.0, DisplayPort 1.3, eSATA
- Set Top Boxes, Game Consoles
- Smart Phones
- External Storage
- Ultrabooks, Notebooks
- Tablets, eReaders
- High Speed Serial Interfaces
- 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.

# AQ3045 Series

## Low Capacitance ESD Protection

### Absolute Maximum Ratings

| Symbol     | Parameter                            | Value      | Units |
|------------|--------------------------------------|------------|-------|
| $P_{PK}$   | Peak Pulse Power ( $t_p=8/20\mu s$ ) | 40         | W     |
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ )     | 3.0        | 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 ( $T_{OP}=25^{\circ}C$ )

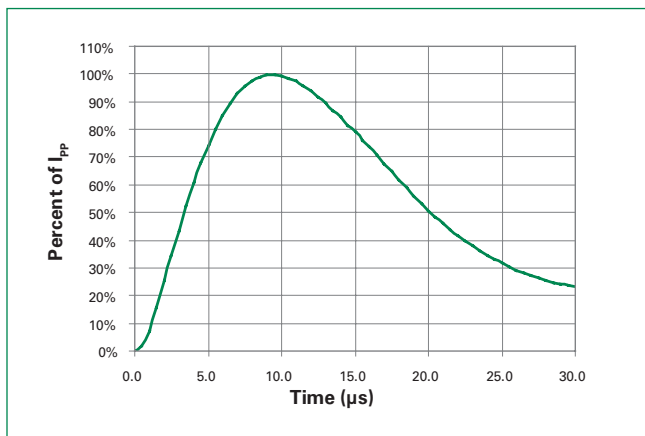
| Parameter                          | Symbol        | Test Conditions                     | Min      | Typ  | Max  | Units    |
|------------------------------------|---------------|-------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R=1\mu A$                        | -        | -    | 5.3  | V        |
| Breakdown Voltage                  | $V_{BR}$      | $I_R=1mA$                           | 6.8      | 7.8  | 9.0  | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=5.3V$                          | -        | <10  | 100  | nA       |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd | -        | -    | 12.0 | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$     | TLP, $t_p=100ns$ , I/O to GND       | -        | 0.55 | -    | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC 61000-4-2 (Contact)             | $\pm 30$ | -    | -    | kV       |
|                                    |               | IEC 61000-4-2 (Air)                 | $\pm 30$ | -    | -    | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-I/O}$ | Reverse Bias=0V, $f=1MHz$           | -        | 0.35 | 0.5  | pF       |

**Note:**

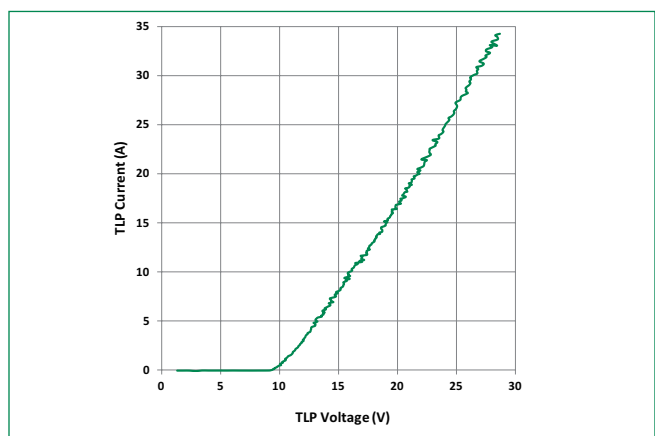
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

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



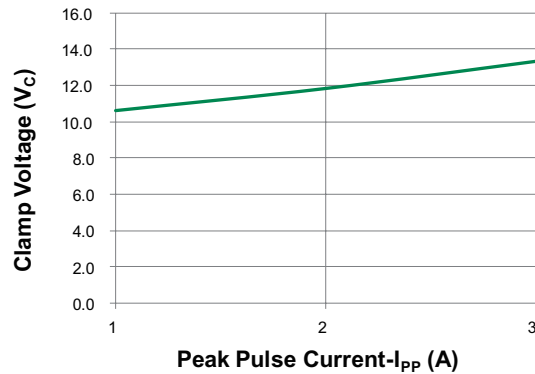
### Transmission Line Pulsing (TLP) Plot



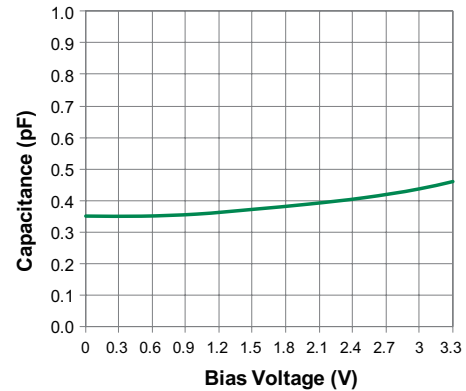
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## Low Capacitance ESD Protection

Clamping Voltage vs IPP

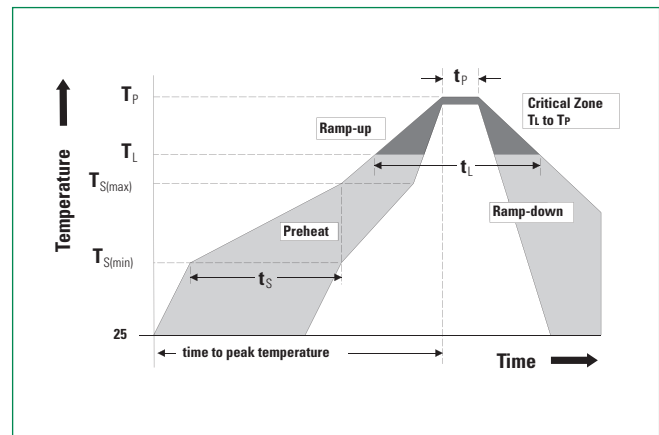


Capacitance vs. Reverse Bias



Soldering Parameters

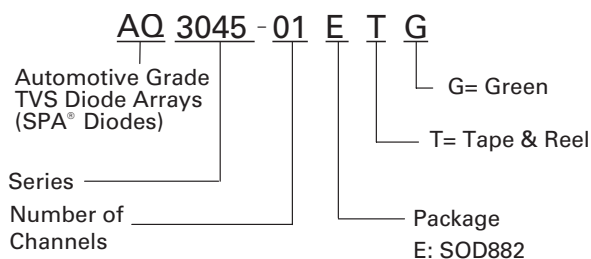
|                                                        |                                   |                         |
|--------------------------------------------------------|-----------------------------------|-------------------------|
| Reflow Condition                                       |                                   | Pb – Free assembly      |
| Pre Heat                                               | -Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                        | -Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                        | -Time (min to max) ( $t_s$ )      | 60 – 120 secs           |
| Average ramp up rate (Liquidus) Temp ( $T_L$ ) to peak |                                   | 3°C/second max          |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                   | 3°C/second max          |
| Reflow                                                 | -Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|                                                        | -Temperature ( $t_L$ )            | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                   | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                   | 30 seconds              |
| Ramp-down Rate                                         |                                   | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )                |                                   | 8 minutes Max.          |
| Do not exceed                                          |                                   | 260°C                   |



Product Characteristics

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

Part Numbering System



Part Marking System



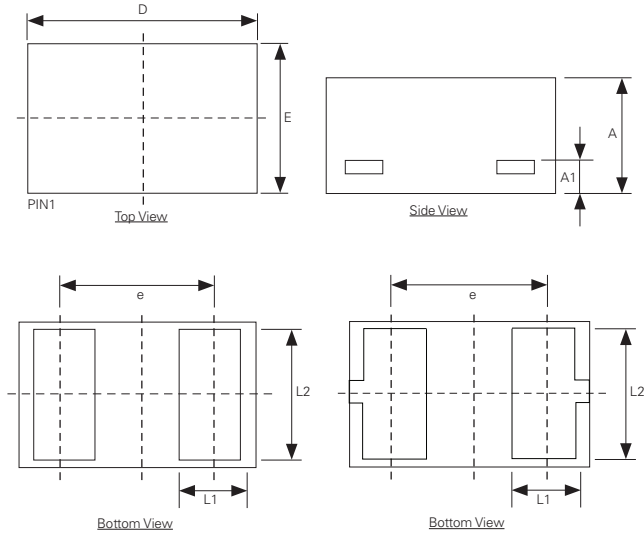
Ordering Information

| Part Number  | Package | Min. Order Qty. |
|--------------|---------|-----------------|
| AQ3045-01ETG | SOD882  | 10000           |

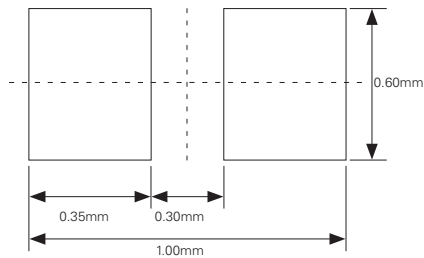
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## Low Capacitance ESD Protection

### Package Dimensions — SOD882

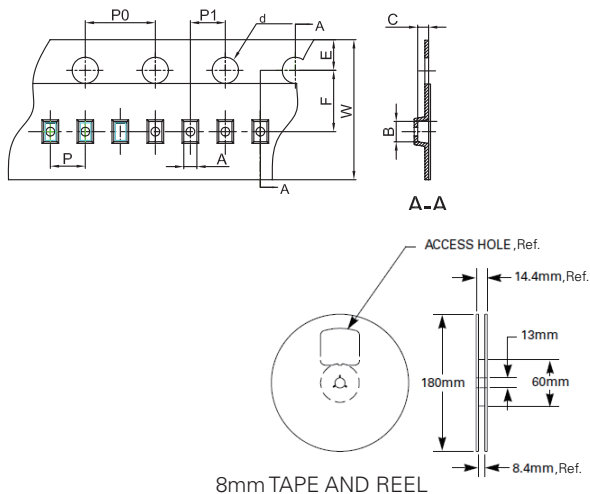


| Symbol    | DIMENSIONS (mm) |      |      |
|-----------|-----------------|------|------|
|           | Min.            | Nor. | Max. |
| <b>A</b>  | 0.36            | 0.45 | 0.55 |
| <b>A1</b> | 0.127 REF       |      |      |
| <b>L1</b> | 0.20            | 0.25 | 0.30 |
| <b>L2</b> | 0.45            | 0.50 | 0.55 |
| <b>D</b>  | 0.93            | 1.00 | 1.07 |
| <b>E</b>  | 0.53            | 0.60 | 0.67 |
| <b>e</b>  | 0.65 BSC        |      |      |



Recommended Soldering Pad Layout

### 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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