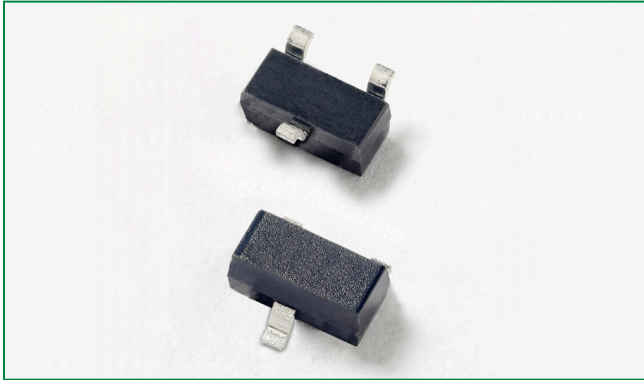
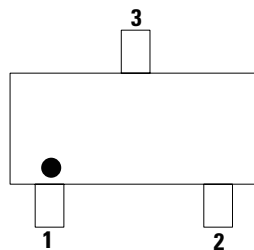


# AQ24ETH-02HTG

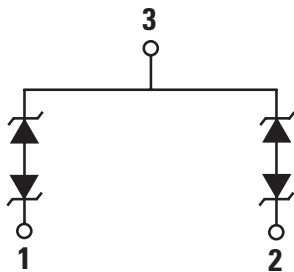
## 24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection



Pinout



Functional Block Diagram



### Description

The AQ24ETH-02HTG bidirectional TVS is fabricated in a proprietary silicon avalanche technology to protect sensitive automotive electronics against ESD (electrostatic discharge) for compliance to OPEN Alliance 100/1000 BASE-T1 Ethernet and other high speed data networks applications.

This robust device can safely absorb repetitive 1000 times ESD strikes (OPEN Alliance specification) with  $\pm 30$  kV contact discharge as defined in ISO10605 (discharge storage capacitor  $C = 150$  pF and discharge resistor  $R = 330 \Omega$ ) without any performance degradation.

### Features

- ESD, IEC 61000-4-2,  $\pm 30$  kV contact/air
- ESD, ISO10605 150 pF 330  $\Omega$ ,  $\pm 15$  kV contact discharge at 1000 times (OPEN Alliance specification)
- ESD, ISO10605 330 pF 330  $\Omega$ ,  $\pm 30$  kV contact/air
- EFT, IEC 61000-4-4, 40 A (5/50 ns)
- Maximum surge tolerance, IEC 61000-4-5 2<sup>nd</sup> edition, 3 A (8/20  $\mu$ s)
- Low leakage current of 0.1  $\mu$ A (Max) at 24 V
- High trigger voltage of 100 V (Min) at  $V_{t1}$
- Halogen free, lead free and RoHS compliant
- Moisture sensitivity level (MSL-1)
- AEC-Q101 qualified and PPAP capable

### Applications

- OPEN Alliance 100/1000 BASE-T1 Ethernet
- High Speed Data Networks
- Low-Voltage Differential Signaling (LVDS)

#### 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.

# AQ24ETH-02HTG

## 24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection

### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p = 8/20 \mu s$ )	3	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.

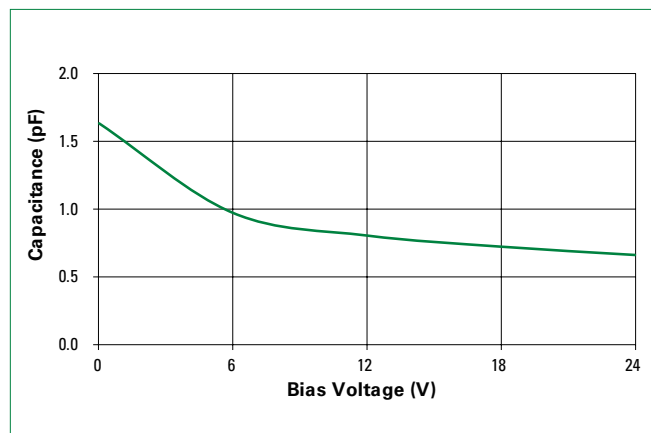
### Electrical Characteristics ( $T_{OP} = 25 \text{ }^\circ\text{C}$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$		-	-	24	V
Trigger Voltage <sup>2</sup>	$V_{t1}$		100	160	-	V
Holding Voltage <sup>2</sup>	$V_h$		28	-	-	V
Reverse Leakage Current	$I_{LEAK}$	$V_R = 24 \text{ V}$ , I/O to GND	-	-	100	nA
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p = 100 \text{ ns}$ , I/O to GND	-	0.5	-	$\Omega$
ESD Withstand Voltage	$V_{ESD}^{1,3}$	IEC 61000-4-2 (Contact Discharge)	$\pm 30$	-	-	kV
		IEC 61000-4-2 (Air Discharge)	$\pm 30$	-	-	kV
		ISO 10605 (Contact Discharge)	$\pm 30$	-	-	kV
		ISO 10605 (Air Discharge)	$\pm 30$	-	-	kV
	$V_{ESD}^{1,4}$	ISO10605 (Contact Discharge)	$\pm 15$	-	-	kV
Diode Capacitance <sup>1</sup>	$C_{IO-GND}$	Reverse Bias = 0 V, $f = 1 \text{ MHz}$ , I/O to GND	-	1.6	-	pF

**Note:**

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100 ns width, 0.2 ns rise time, and average window  $t_1 = 70 \text{ ns}$  to  $t_2 = 90 \text{ ns}$
- Device stressed with ten non-repetitive ESD pulses.
- Device stressed minimum number with >1000 contact discharges ESD pulses (OPEN Alliance specification)

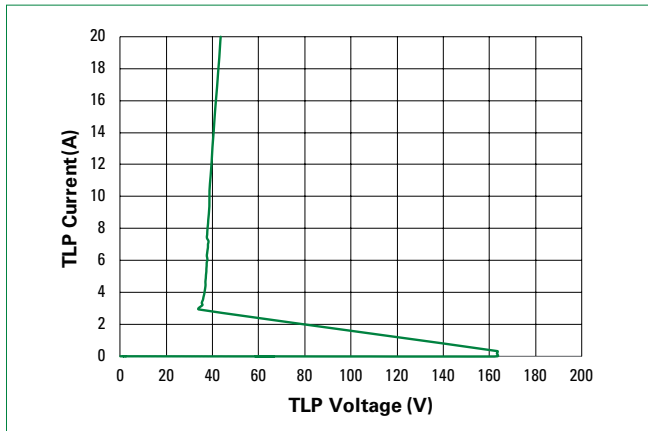
### Capacitance vs. Reverse Bias



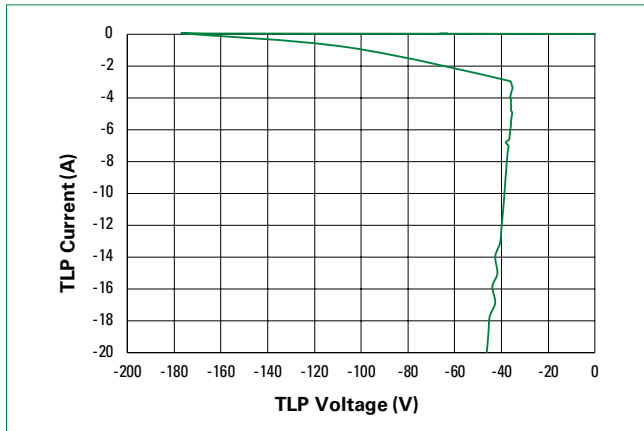
# AQ24ETH-02HTG

24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection

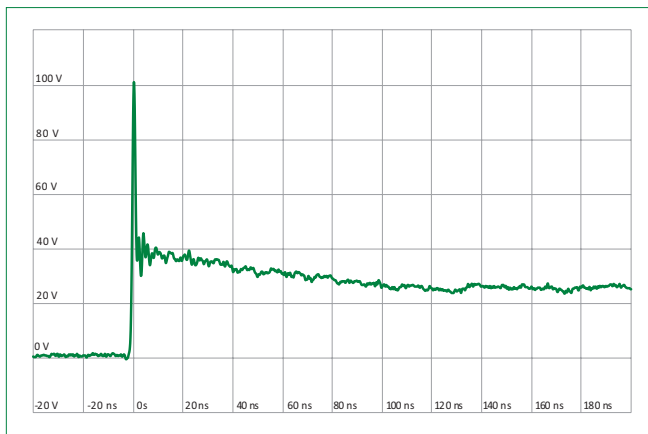
Positive Transmission Line Pulsing (TLP) Plot



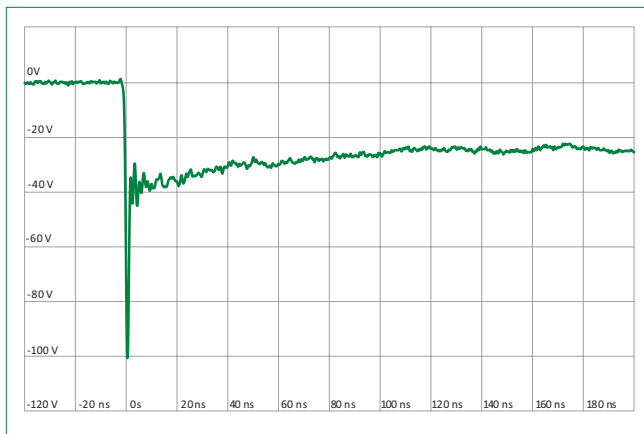
Negative Transmission Line Pulsing (TLP) Plot



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



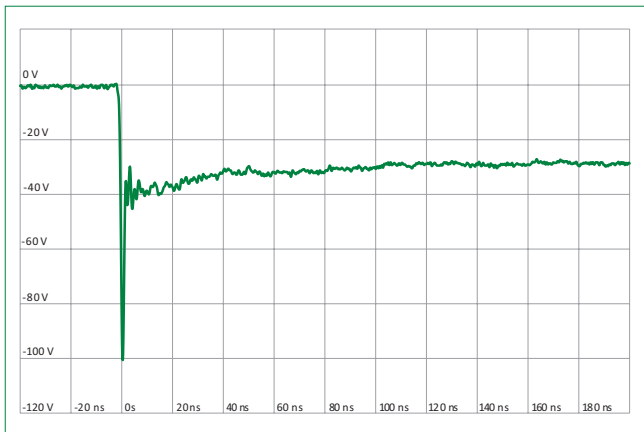
IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage



ISO10605 Contact Discharge Plot at +8 kV



ISO10605 Contact Discharge Plot at -8 kV

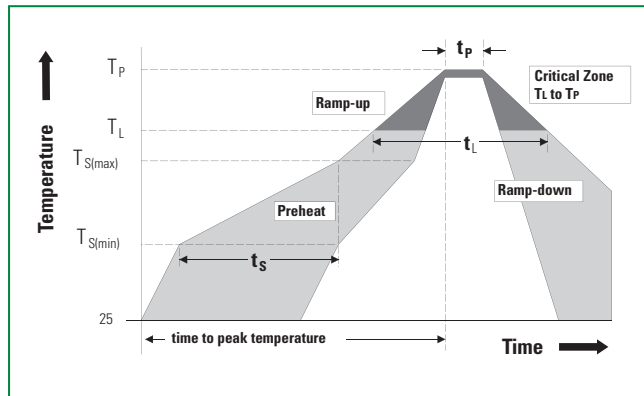


**AQ24ETH-02HTG**

24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection

**Soldering Parameters**

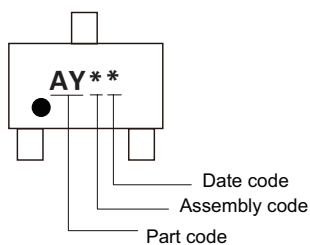
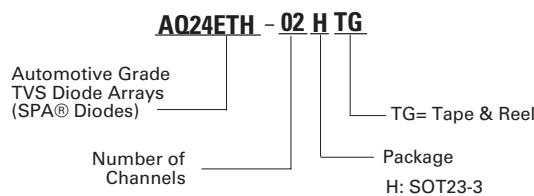
<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150 °C
	- Temperature Max ( $T_{s(max)}$ )	200 °C
	- Time (min to max) ( $t_s$ )	60 – 120 seconds
<b>Average Ramp up Rate (Liquidus) Temp (<math>T_L</math>) to Peak</b>		3 °C/second max
<b><math>T_{s(max)}</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

**Ordering Information**

Part Number	Package	Min. Order Qty.
AQ24ETH-02HTG	SOT23-3L	3000

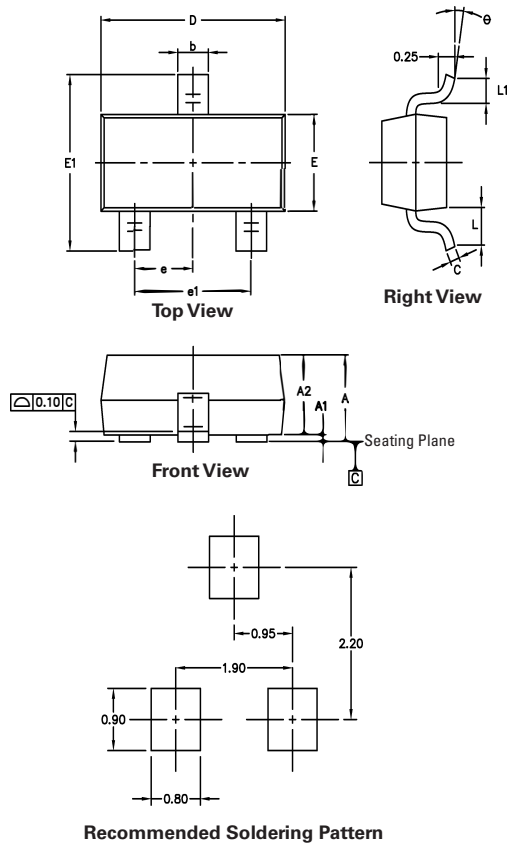
**Product Characteristics**

<b>Lead Plating</b>	Matte tin
<b>Lead Material</b>	Copper alloy
<b>Lead Coplanarity</b>	0.004 inches (0.102 mm)
<b>Body Material</b>	Molded compound
<b>Flammability</b>	UL recognized compound meeting flammability rating V-0

**Part Marking System****Part Numbering System**

**AQ24ETH-02HTG**

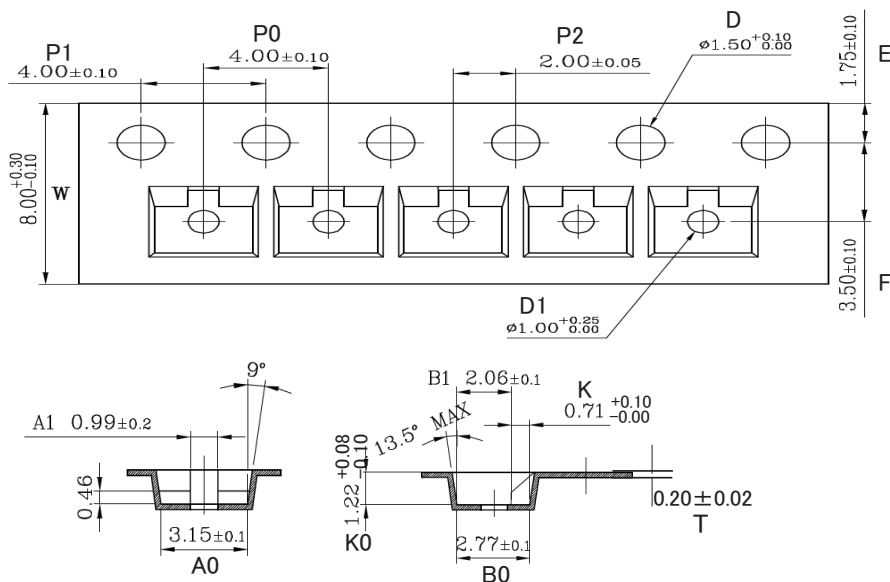
24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection

**Package Dimensions - SOT23-3**

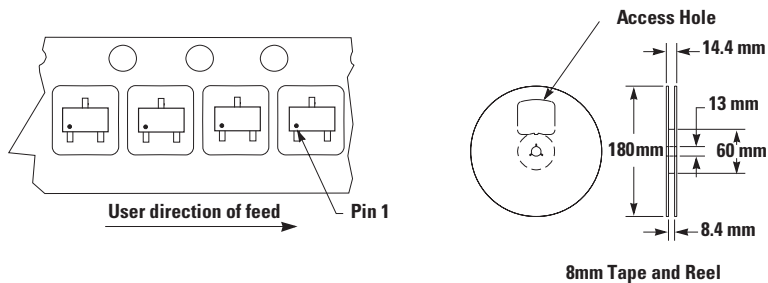
Package	SOT23-3			
Pins	3			
JEDEC	TO-236			
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.880	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.880	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
C	0.080	0.200	0.003	0.008
D	2.800	3.040	0.110	0.120
E	1.200	1.400	0.047	0.055
E1	2.100	2.640	0.083	0.104
e	0.950 TYP		0.037 TYP	
e1	1.780	2.050	0.070	0.081
L	0.550 REF		0.022 REF	
L1	0.300	0.550	0.012	0.022
$\theta$	0°	8°	0°	8°

**AQ24ETH-02HTG**

24 V, 1.6 pF, 30 kV, SOT23-3L, Bidirectional TVS Diode, Low Capacitance ESD Protection

**Embossed Carrier Tape & Reel Specification – SOT23-3**

Symbol	Millimeters	
	Min	Max
A0	3.05	3.25
A1	0.79	1.19
B0	2.67	2.87
B1	1.96	2.16
D	1.50	1.60
D1	1.00	1.25
F	3.40	3.60
E	1.65	1.85
W	7.90	8.30
P0	3.90	4.10
P1	3.90	4.10
P2	1.95	2.05
K	0.71	0.81
K0	1.12	1.30
T	0.18	0.22

**8mm Tape and Reel**

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