# AQHVxx-01ETG series 200W Unidirectional TVS Diode

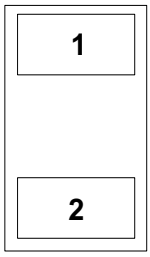
AUTOMOTIVE GRADE | RoHS | Pb | GREEN

## Description

The AQHVxx-01ETG series is designed to provide an option for very fast acting, high performance over-voltage protection components. This series is ideally suited for suited for power interfaces, passenger charging interfaces, and well as LED lighting modules, and low speed I/Os. It will protect sensitive equipment from damage due to electrostatic discharge (ESD) and other overvoltage transients.

The AQHVxx-01ETG series can safely absorb repetitive ESD strikes above the maximum level of the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation and safely conduct up to 8A (AQHV12) of induced surge current (IEC 61000-4-5 2nd edition, $t_P$=8/20µs) with very low clamping voltages.

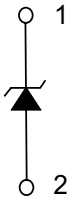
## Pinout




## Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 8A (8/20 as defined in IEC 61000-4-5 2nd edition) for AQHV12
- Low clamping voltage
- PPAP capable
- Low leakage current
- Small SOD882 packaging helps save board space
- AEC-Q101 qualified
- Moisture Sensitivity Level(MSL -1)
- Halogen free, lead free and RoHS compliant

## Functional Block Diagram




## Applications

- LED Lighting Modules
- Portable Instrumentation
- General Purpose I/O
- RS232 / RS485
- CAN and LIN Bus
- Automotive application



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# TVS Diode Array (SPA® Diodes)

## General Purpose ESD Protection - AQHVxx-01ETG series

## Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $P_{pk}$ | Peak Pulse Power ($t_p$=8/20µs) | 200 | W |
| $T_{OP}$ | Operating Temperature | -40 to 150 | °C |
| $T_{STOR}$ | Storage Temperature | -55 to 150 | °C |

Notes:

*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.*

## AQHV12 Electrical Characteristics ($T_{OP}$=25°C)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA | | | 12.0 | V |
| Breakdown Voltage | $V_{BR}$ | $I_R$=1mA | 13.3 | | | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=12V | | | 1.0 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | | 19.0 | V |
| | | $I_{PP}$=8A, $t_p$=8/20µs, Fwd | | | 25.0 | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP, $t_p$=100ns, I/O to GND | | 0.37 | | Ω |
| Peak Pulse Current | $I_{pp}$ | $t_p$=8/20µs | | | 8.0 | A |
| ESD Withstand Voltage[1] | $V_{ESD}$ | IEC 61000-4-2 (Contact Discharge) | ±30 | | | kV |
| | | IEC 61000-4-2 (Air Discharge) | ±30 | | | kV |
| Diode Capacitance[1] | $C_{D-GND}$ | Reverse Bias=0V, f=1MHz | | | 60 | pF |

## AQHV15 Electrical Characteristics ($T_{OP}$=25°C)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA | | | 15.0 | V |
| Breakdown Voltage | $V_{BR}$ | $I_R$=1mA | 16.7 | | | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=15V | | | 1.0 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | | 22.0 | V |
| | | $I_{PP}$=5A, $t_p$=8/20µs, Fwd | | | 28.0 | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP, $t_p$=100ns, I/O to GND | | 0.40 | | Ω |
| Peak Pulse Current | $I_{pp}$ | $t_p$=8/20µs | | | 5.0 | A |
| ESD Withstand Voltage[1] | $V_{ESD}$ | IEC 61000-4-2 (Contact Discharge) | ±30 | | | kV |
| | | IEC 61000-4-2 (Air Discharge) | ±30 | | | kV |
| Diode Capacitance[1] | $C_{I/O-GND}$ | Reverse Bias=0V, f=1MHz | | | 46 | pF |


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## AQHV24 Electrical Characteristics ($T_{OP}$=25°C)

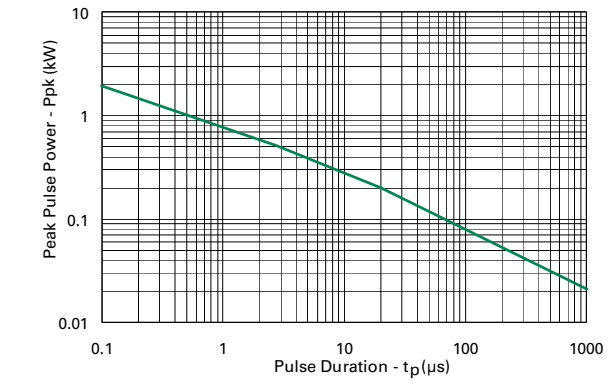
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA | | | 24.0 | V |
| Breakdown Voltage | $V_{BR}$ | $I_R$=1mA | 26.7 | | | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=24V | | | 1.0 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | | 36.0 | V |
| | | $I_{PP}$=3A, $t_p$=8/20µs, Fwd | | | 50.0 | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP, $t_p$=100ns, I/O to GND | | 0.56 | | Ω |
| Peak Pulse Current | $I_{pp}$ | $t_p$=8/20µs | | | 3.0 | A |
| ESD Withstand Voltage[1] | $V_{ESD}$ | IEC 61000-4-2 (Contact Discharge) | ±24 | | | kV |
| | | IEC 61000-4-2 (Air Discharge) | ±30 | | | kV |
| Diode Capacitance[1] | $C_{I/O-GND}$ | Reverse Bias=0V, f=1MHz | | | 32 | pF |

## AQHV36 Electrical Characteristics ($T_{OP}$=25°C)

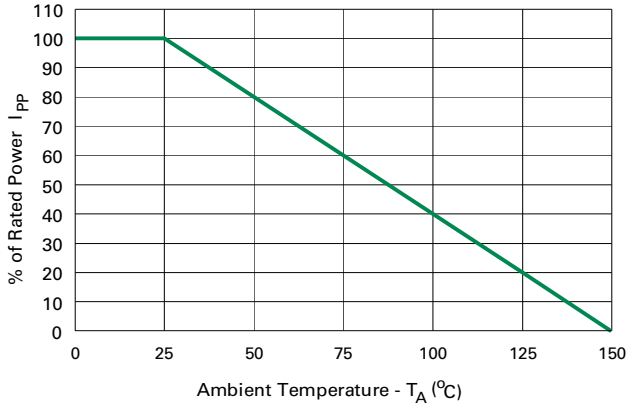
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA | | | 36.0 | V |
| Breakdown Voltage | $V_{BR}$ | $I_R$=1mA | 40.0 | | | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=36V | | | 1.0 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | | 52.0 | V |
| | | $I_{PP}$=2A, $t_p$=8/20µs, Fwd | | | 60.0 | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP, $t_p$=100ns, I/O to GND | | 1.28 | | Ω |
| Peak Pulse Current | $I_{pp}$ | $t_p$=8/20µs | | | 2.0 | A |
| ESD Withstand Voltage[1] | $V_{ESD}$ | IEC 61000-4-2 (Contact Discharge) | ±15 | | | kV |
| | | IEC 61000-4-2 (Air Discharge) | ±20 | | | kV |
| Diode Capacitance[1] | $C_{I/O-GND}$ | Reverse Bias=0V, f=1MHz | | | 25 | pF |

Note:
[1] Parameter is guaranteed by design and/or component characterization.
[2] Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window t1=70ns to t2= 90ns

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




## Power Derating Curve





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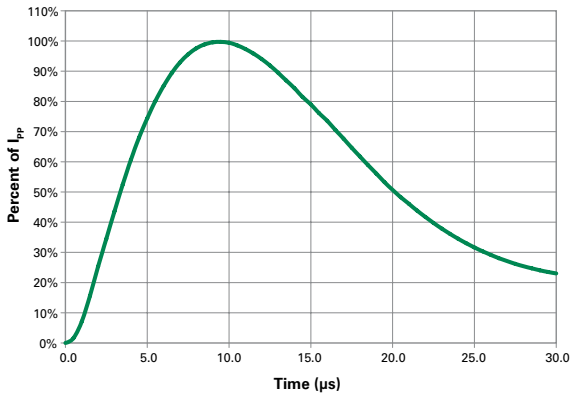
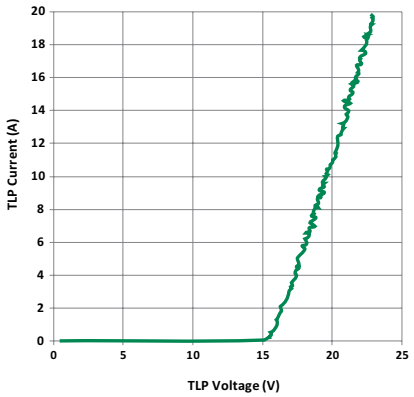
# TVS Diode Array (SPA® Diodes)

## General Purpose ESD Protection - AQHVxx-01ETG series

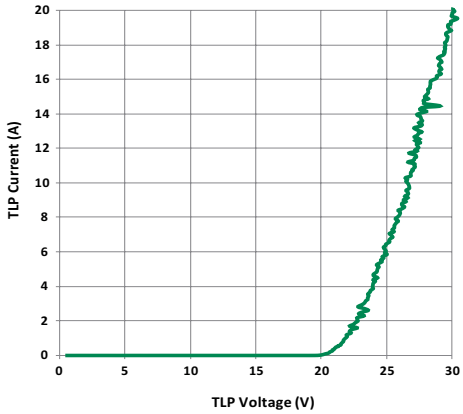
### 8/20µs Pulse Waveform



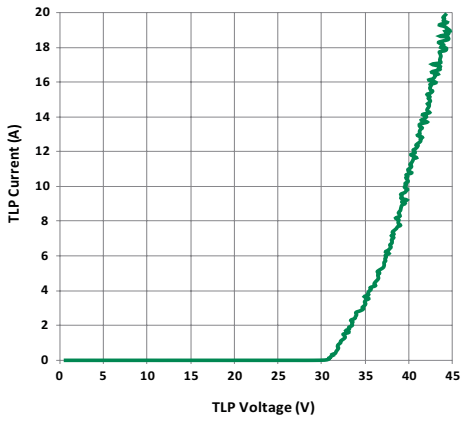

### AQHV12 Transmission Line Pulsing(TLP) Plot



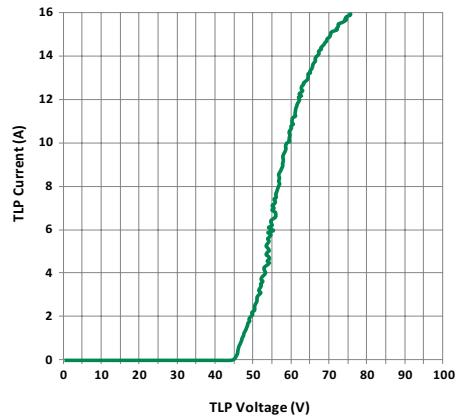

### AQHV15 Transmission Line Pulsing(TLP) Plot




### AQHV24 Transmission Line Pulsing(TLP) Plot




### AQHV36 Transmission Line Pulsing(TLP) Plot





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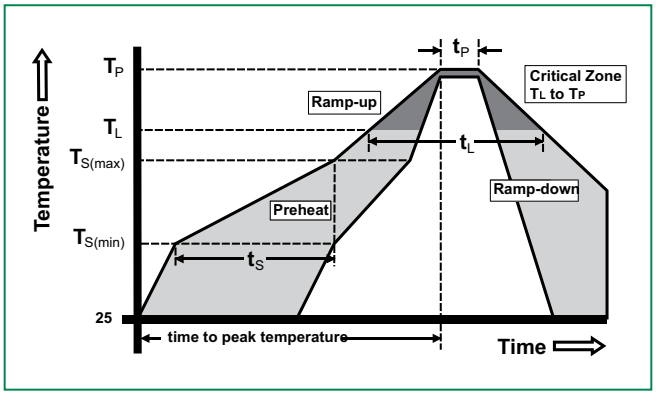
# TVS Diode Array (SPA® Diodes)

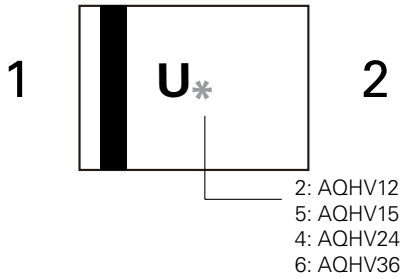
## General Purpose ESD Protection - AQHVxx-01ETG series

## 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 – 180 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 ($T_P$) | | $260^{+0/-5}$ °C |
| Time within 5°C of actual peak Temperature ($t_p$) | | 20 – 40 seconds |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature ($T_P$) | | 8 minutes Max. |
| Do not exceed | | 260°C |



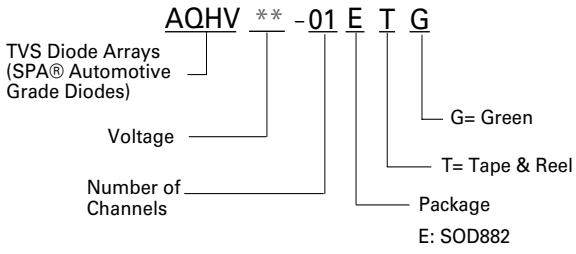

## Part Marking System




## 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




## Ordering Information

| Part Number | Package | Min. Order Qty. |
|---|---|---|
| AQHV12-01ETG | SOD882 | 10000 |
| AQHV15-01ETG | | |
| AQHV24-01ETG | | |
| AQHV36-01ETG | | |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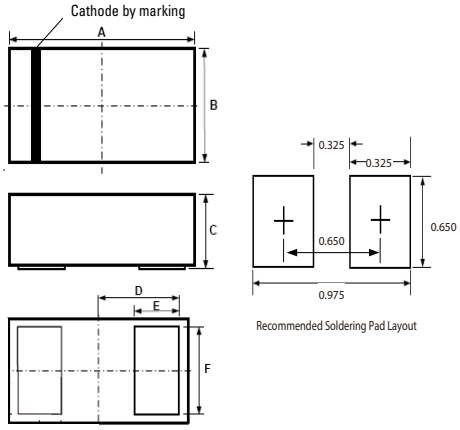
# TVS Diode Array (SPA® Diodes)

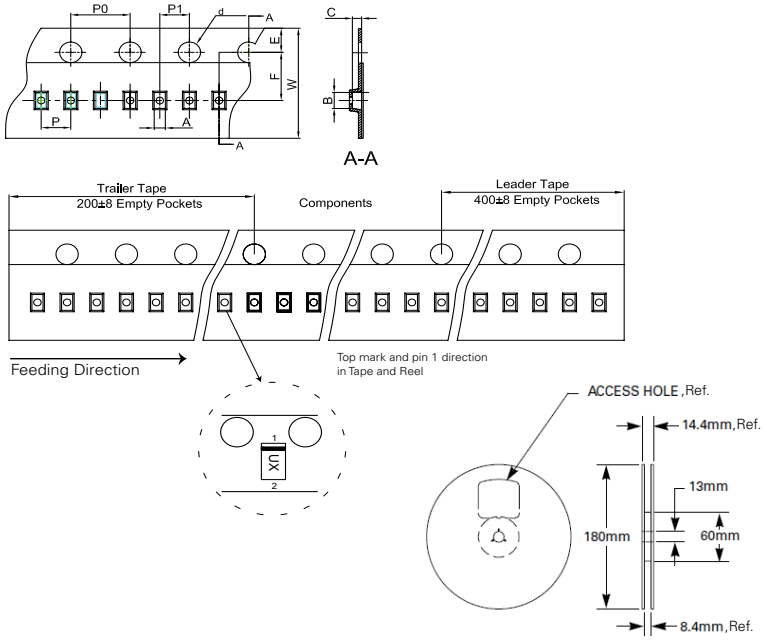
## General Purpose ESD Protection - AQHVxx-01ETG series

## Package Dimensions — SOD882




| Symbol | Package | SOD882 | | | | |
|---|---|---|---|---|---|---|
| | JEDEC | MO-236 | | | | |
| | | Millimeters | | | Inches | |
| | | Min | Typ | Max | Min | Typ | Max |
| **A** | | 0.90 | 1.00 | 1.10 | 0.037 | 0.039 | 0.041 |
| **B** | | 0.50 | 0.60 | 0.70 | 0.022 | 0.024 | 0.026 |
| **C** | | 0.40 | 0.50 | 0.60 | 0.016 | 0.020 | 0.024 |
| **D** | | | 0.45 | | | 0.018 | |
| **E** | | 0.20 | 0.25 | 0.35 | 0.008 | 0.010 | 0.012 |
| **F** | | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |

## Embossed Carrier Tape & Reel Specification




| Symbol | Millimeters |
|---|---|
| **A** | 0.70+/-0.045 |
| **B** | 1.10+/-0.045 |
| **C** | 0.65+/-0.045 |
| **d** | 1.55+/-0.10 |
| **E** | 1.75+/-0.05 |
| **F** | 3.50+/-0.05 |
| **P** | 2.00+/-0.10 |
| **P0** | 4.00+/-0.10 |
| **P1** | 2.00+/-0.10 |
| **W** | 8.00 + 0.30 -0.10 |




8mm TAPE AND REEL



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