

AQHVxx-01ETG series 200W Unidirectional TVS Diode  **AUTOMOTIVE GRADE**  **RoHS**  **Pb**  **GREEN**

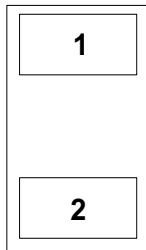


Description

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, $t_p=8/20\mu s$) with very low clamping voltages.

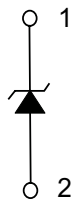
Pinout



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

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 |
|------------|--------------------------------------|------------|-------|
| P_{pk} | Peak Pulse Power ($t_p=8/20\mu s$) | 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 ($T_{OP}=25^\circ C$)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|-------------|-------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage | V_{RWM} | $I_R \leq 1\mu A$ | | | 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 | $I_{PP} = 1A, t_p = 8/20\mu s, Fwd$ | | | 19.0 | V |
| | | $I_{PP} = 8A, t_p = 8/20\mu s, Fwd$ | | | 25.0 | V |
| Dynamic Resistance ² | R_{DYN} | TLP, $t_p = 100ns, I/O$ to GND | | 0.37 | | Ω |
| Peak Pulse Current | I_{PP} | $t_p = 8/20\mu s$ | | | 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 ($T_{OP}=25^\circ C$)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|---------------|-------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage | V_{RWM} | $I_R \leq 1\mu A$ | | | 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 | $I_{PP} = 1A, t_p = 8/20\mu s, Fwd$ | | | 22.0 | V |
| | | $I_{PP} = 5A, t_p = 8/20\mu s, Fwd$ | | | 28.0 | V |
| Dynamic Resistance ² | R_{DYN} | TLP, $t_p = 100ns, I/O$ to GND | | 0.40 | | Ω |
| Peak Pulse Current | I_{PP} | $t_p = 8/20\mu s$ | | | 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 |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|----------------------|--|------|------|------|-------|
| Reverse Standoff Voltage | V _{RWM} | I _R ≤ 1 μA | | | 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)

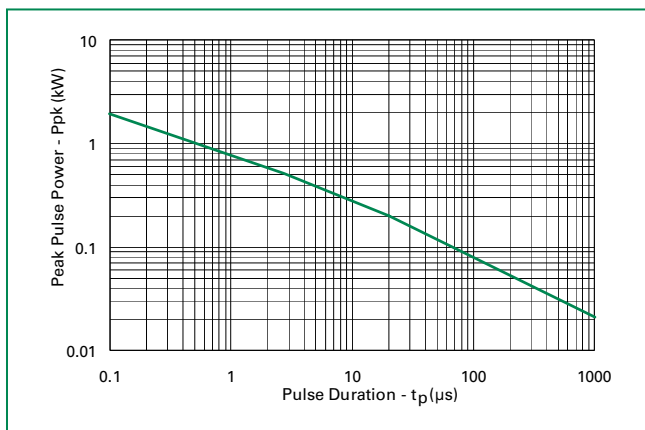
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|----------------------|--|------|------|------|-------|
| Reverse Standoff Voltage | V _{RWM} | I _R ≤ 1 μA | | | 36.0 | V |
| Breakdown Voltage | V _{BR} | I _R = 1mA | 40.0 | | | V |
| Leakage Current | 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:

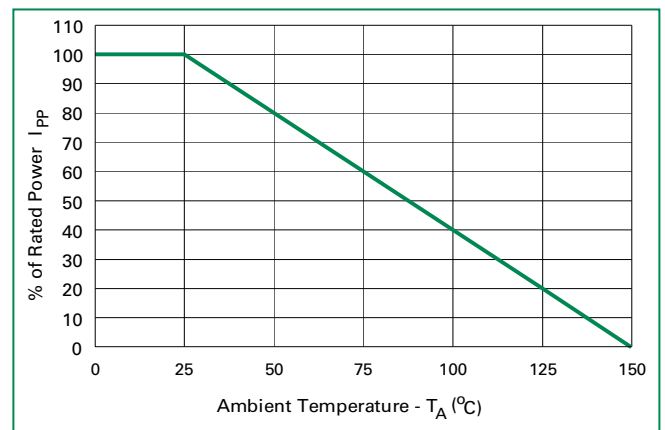
¹ Parameter is guaranteed by design and/or component characterization.

² Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window t1=70ns to t2= 90ns

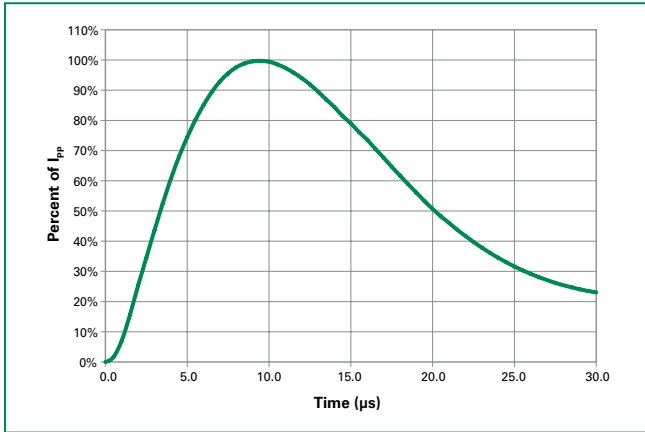
Non-Repetitive Peak Pulse Power vs. Pulse Time



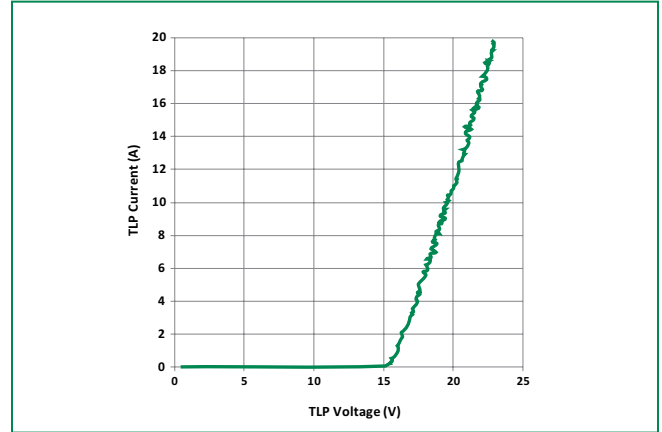
Power Derating Curve



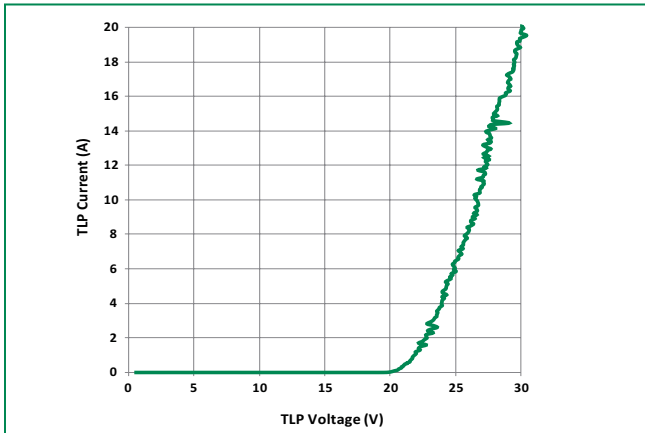
8/20 μ s Pulse Waveform



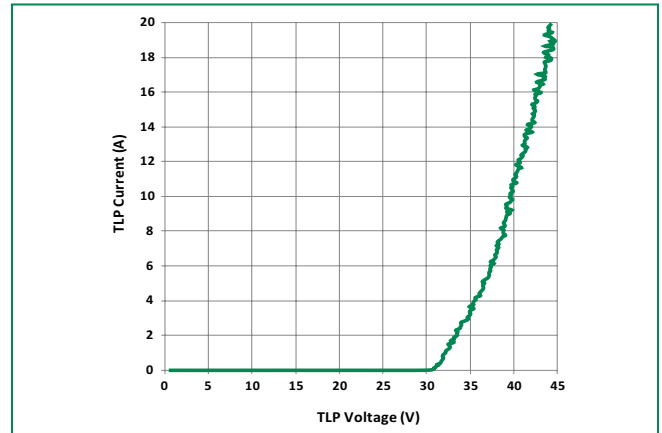
AQHV12 Transmission Line Pulsing(TLP) Plot



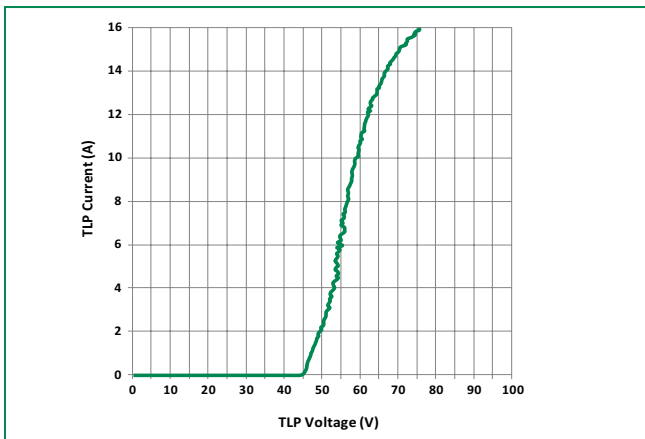
AQHV15 Transmission Line Pulsing(TLP) Plot



AQHV24 Transmission Line Pulsing(TLP) Plot

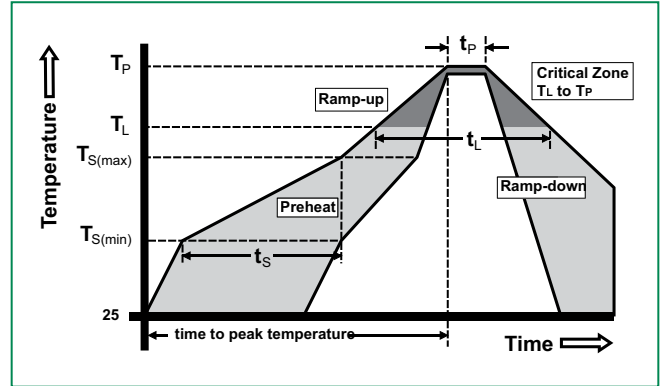


AQHV36 Transmission Line Pulsing(TLP) Plot

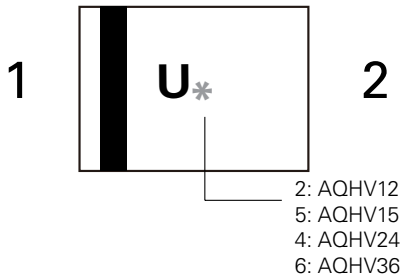


Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| 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 |



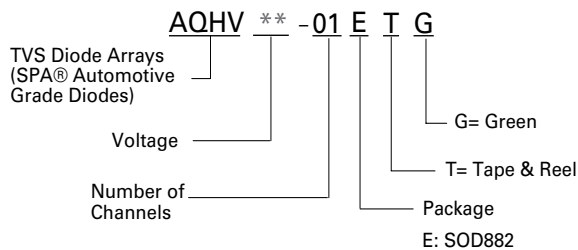
Part Marking System



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 |

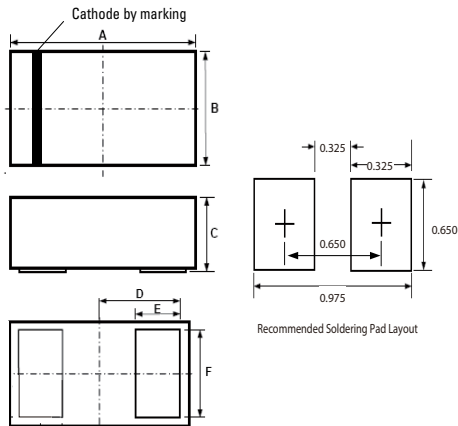
Part Numbering System



Ordering Information

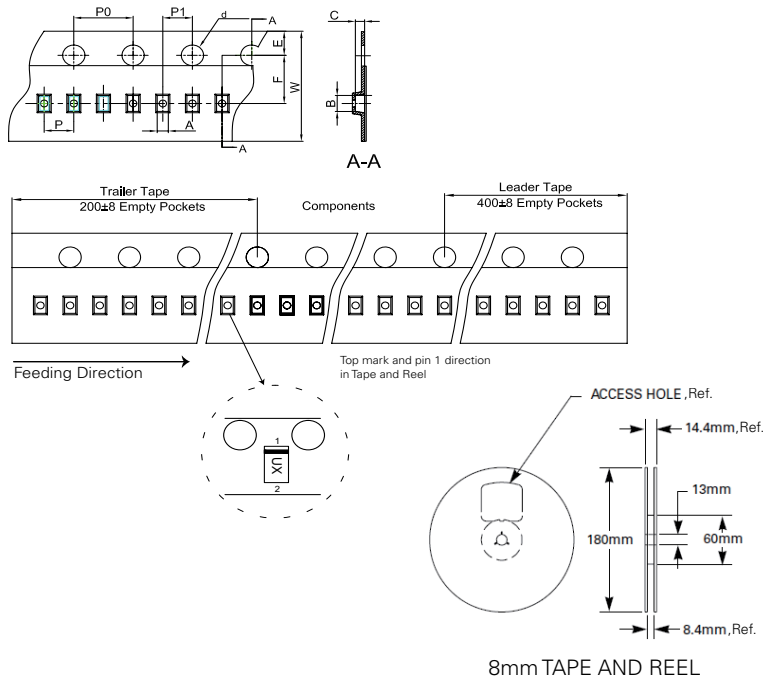
| Part Number | Package | Min. Order Qty. |
|--------------|---------|-----------------|
| AQHV12-01ETG | SOD882 | 10000 |
| AQHV15-01ETG | | |
| AQHV24-01ETG | | |
| AQHV36-01ETG | | |

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 |

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