

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

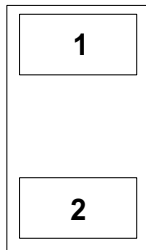


**Description**

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 2<sup>nd</sup> edition,  $t_p=8/20\mu s$ ) with very low clamping voltages.

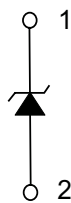
**Pinout**



**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 2<sup>nd</sup> 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.

©2018 Littelfuse, Inc.  
Specifications are subject to change without notice.  
Revision: 10/15/18

### 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	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s, Fwd$			19.0	V
		$I_{PP} = 8A, t_p = 8/20\mu s, Fwd$			25.0	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p = 100ns, I/O$ to GND		0.37		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu s$			8.0	A
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>	$C_{D-GND}$	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	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s, Fwd$			22.0	V
		$I_{PP} = 5A, t_p = 8/20\mu s, Fwd$			28.0	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p = 100ns, I/O$ to GND		0.40		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu s$			5.0	A
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>	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			46	pF

### AQHV24 Electrical Characteristics (T<sub>OP</sub>=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>	I <sub>R</sub> ≤ 1 μA			24.0	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> = 1mA	26.7			V
Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> = 24V			1.0	μA
Clamp Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> = 1A, t <sub>p</sub> = 8/20μs, Fwd			36.0	V
		I <sub>PP</sub> = 3A, t <sub>p</sub> = 8/20μs, Fwd			50.0	V
Dynamic Resistance <sup>2</sup>	R <sub>DYN</sub>	TLP, t <sub>p</sub> = 100ns, I/O to GND		0.56		Ω
Peak Pulse Current	I <sub>PP</sub>	t <sub>p</sub> = 8/20μs			3.0	A
ESD Withstand Voltage <sup>1</sup>	V <sub>ESD</sub>	IEC 61000-4-2 (Contact Discharge)	±24			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance <sup>1</sup>	C <sub>I/O-GND</sub>	Reverse Bias = 0V, f = 1MHz			32	pF

### AQHV36 Electrical Characteristics (T<sub>OP</sub>=25°C)

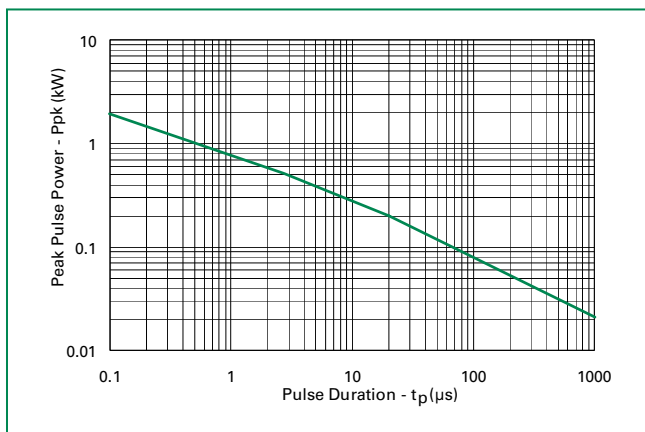
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>	I <sub>R</sub> ≤ 1 μA			36.0	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> = 1mA	40.0			V
Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> = 36V			1.0	μA
Clamp Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> = 1A, t <sub>p</sub> = 8/20μs, Fwd			52.0	V
		I <sub>PP</sub> = 2A, t <sub>p</sub> = 8/20μs, Fwd			60.0	V
Dynamic Resistance <sup>2</sup>	R <sub>DYN</sub>	TLP, t <sub>p</sub> = 100ns, I/O to GND		1.28		Ω
Peak Pulse Current	I <sub>PP</sub>	t <sub>p</sub> = 8/20μs			2.0	A
ESD Withstand Voltage <sup>1</sup>	V <sub>ESD</sub>	IEC 61000-4-2 (Contact Discharge)	±15			kV
		IEC 61000-4-2 (Air Discharge)	±20			kV
Diode Capacitance <sup>1</sup>	C <sub>I/O-GND</sub>	Reverse Bias = 0V, f = 1MHz			25	pF

Note:

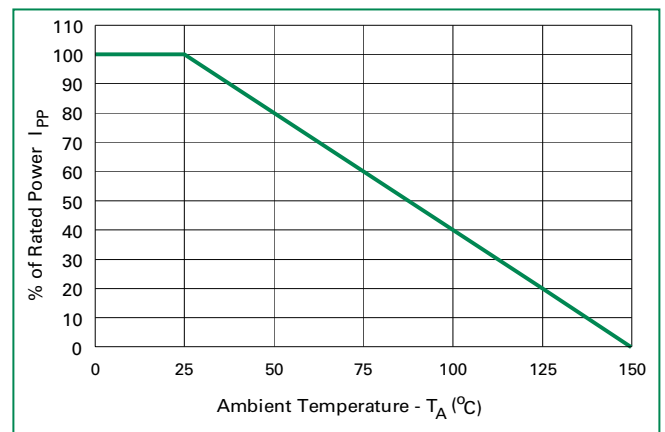
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

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

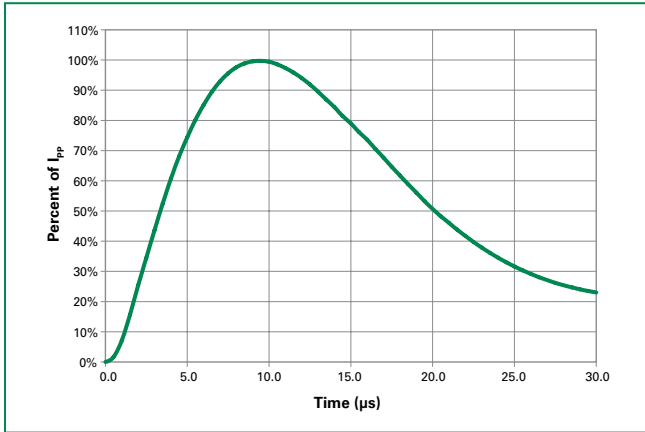
### Non-Repetitive Peak Pulse Power vs. Pulse Time



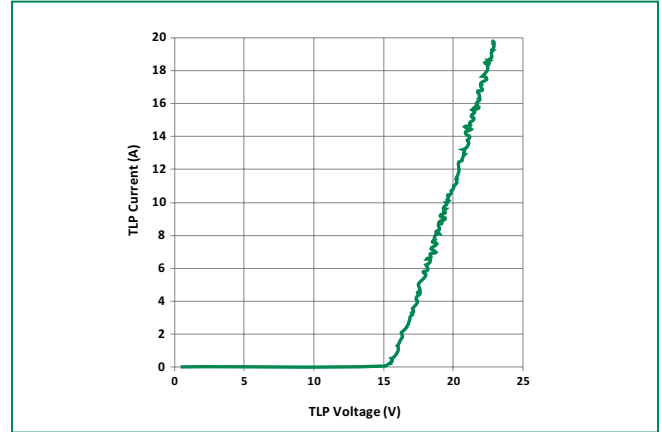
### Power Derating Curve



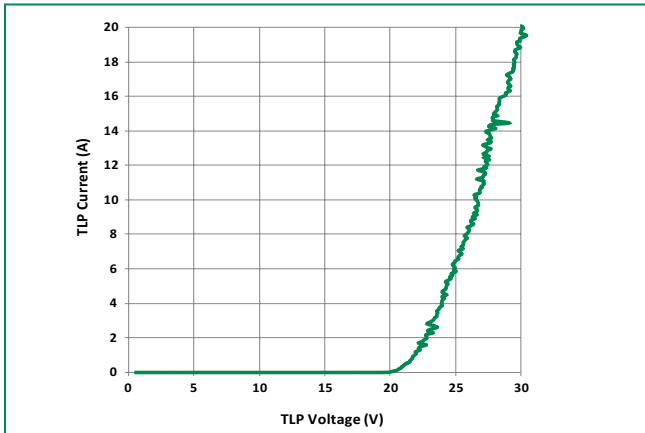
**8/20µs Pulse Waveform**



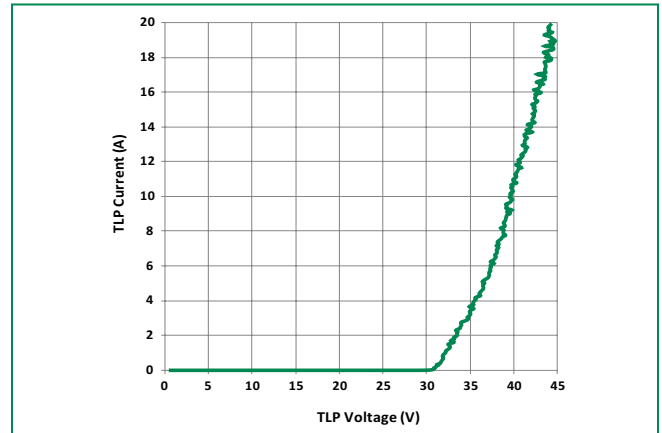
**AQHV12 Transmission Line Pulsing(TLP) Plot**



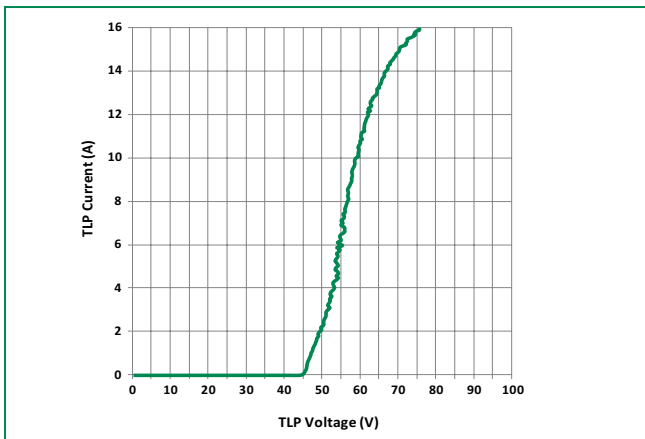
**AQHV15 Transmission Line Pulsing(TLP) Plot**



**AQHV24 Transmission Line Pulsing(TLP) Plot**

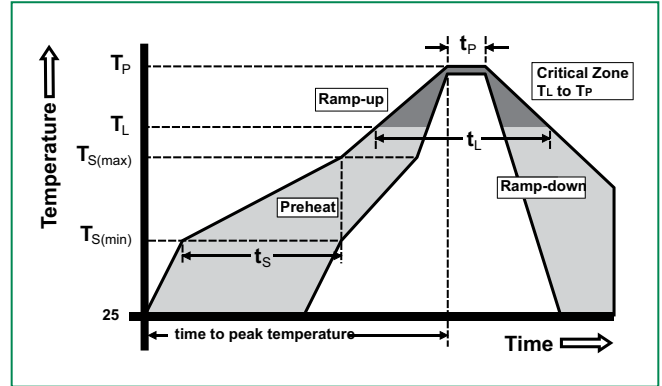


**AQHV36 Transmission Line Pulsing(TLP) Plot**

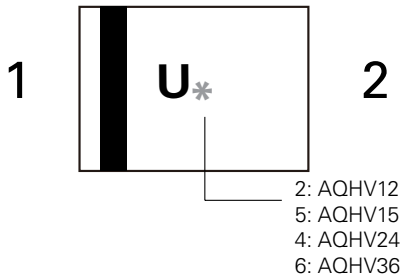


**Soldering Parameters**

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 <sup>+0/-5</sup> °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



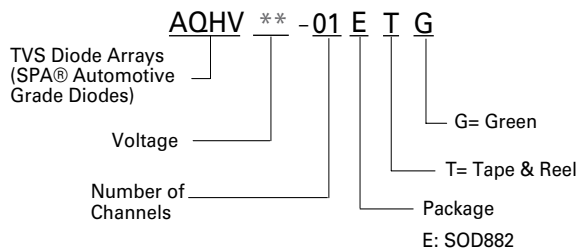
**Part Marking System**



**Product Characteristics**

<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

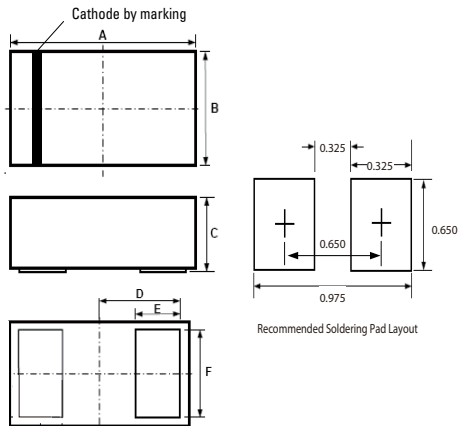
**Part Numbering System**



**Ordering Information**

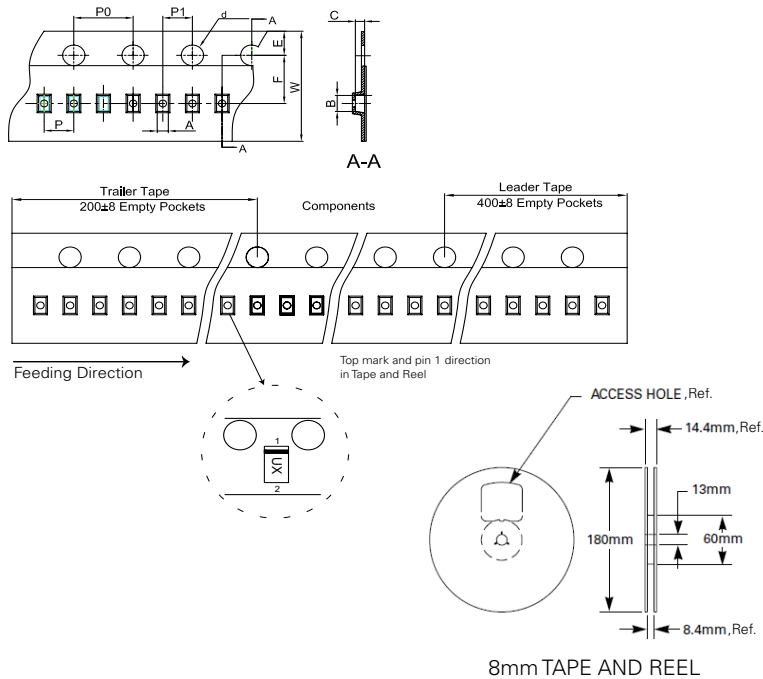
Part Number	Package	Min. Order Qty.
AQHV12-01ETG	SOD882	10000
AQHV15-01ETG		
AQHV24-01ETG		
AQHV36-01ETG		

**Package Dimensions — SOD882**



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

**Embossed Carrier Tape & Reel Specification**



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

**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.

©2018 Littelfuse, Inc.  
Specifications are subject to change without notice.  
Revision: 10/15/18