

**AQHVxx-01LTG Series 250W Discrete Unidirectional TVS Diode**



**Description**

The AQHVxx-01LTG series is designed to provide an option for very fast acting, high performance over-voltage protection 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.

It 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 10A (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.

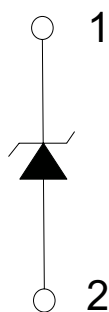
**Pinout**



**Features**

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 10A (8/20µs as defined in IEC 61000-4-5 2<sup>nd</sup> edition) for AQHV12
- Low clamping voltage
- PPAP capable
- Low leakage current
- 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 ( $t_p=8/20\mu s$ )	250	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	$V_{RWM}$	$I_R=1\mu A$			12.0	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	13.3	14.3		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=12V$		5	50	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND		16.5	20	V
		$I_{PP}=10A, t_p=8/20\mu s, I/O$ to GND		23.5	26	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.22		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			10.0	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		55.5	60	pF

### AQHV15 Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			15	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	16.7	18.7		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=15V$		5	50	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND		21.5	25	V
		$I_{PP}=7A, t_p=8/20\mu s, I/O$ to GND		30	35	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.25		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			7.0	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		43	46	pF

### AQHV24 Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			24	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	26.7	28.7		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=24V$		5	50	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND		33	38	V
		$I_{PP}=5A, t_p=8/20\mu s, I/O$ to GND		46.5	52	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.35		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			5	A
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 25$			kV
		IEC 61000-4-2 (Air Discharge)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		30	32	pF

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

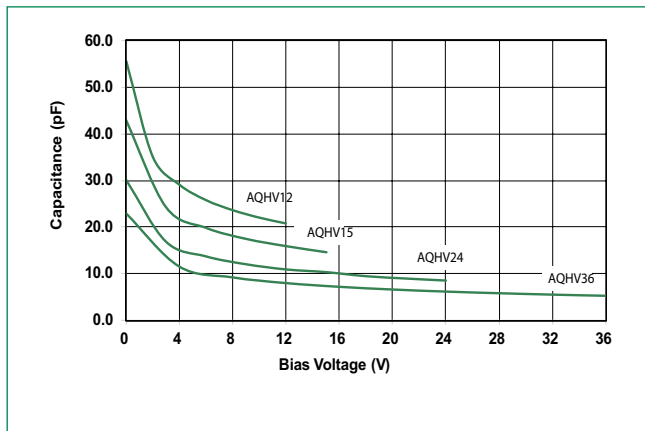
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>	I <sub>R</sub> =1μA			36	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> =1mA	40	42.4		V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> =36V		5	50	nA
Clamp Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> =1A, t <sub>p</sub> =8/20μs, I/O to GND		49.5	55	V
		I <sub>PP</sub> =3A, t <sub>p</sub> =8/20μs, I/O to GND		52.5	58	V
Dynamic Resistance <sup>2</sup>	R <sub>DYN</sub>	TLP, t <sub>p</sub> =100ns, I/O to GND		1.15		Ω
Peak Pulse Current	I <sub>PP</sub>	t <sub>p</sub> =8/20μs			3	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>VO-GND</sub>	Reverse Bias=0V, f=1MHz		23	25	pF

Note:

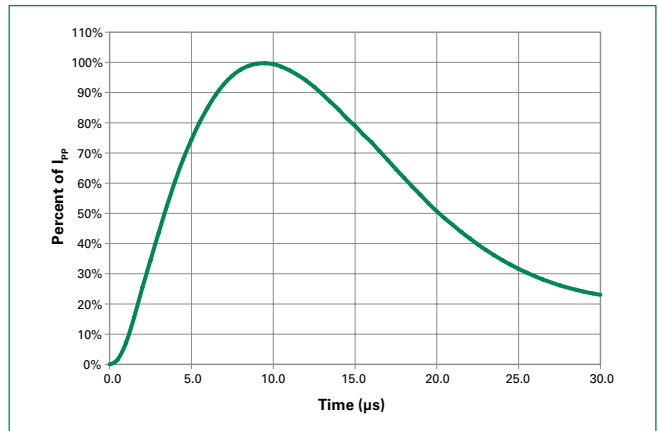
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

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

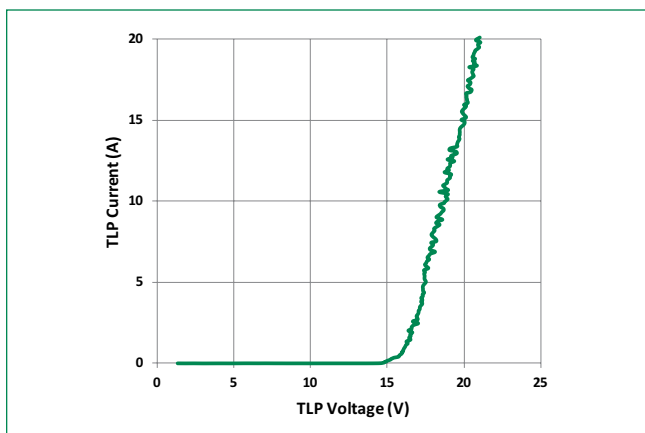
**Capacitance vs. Reverse Bias**



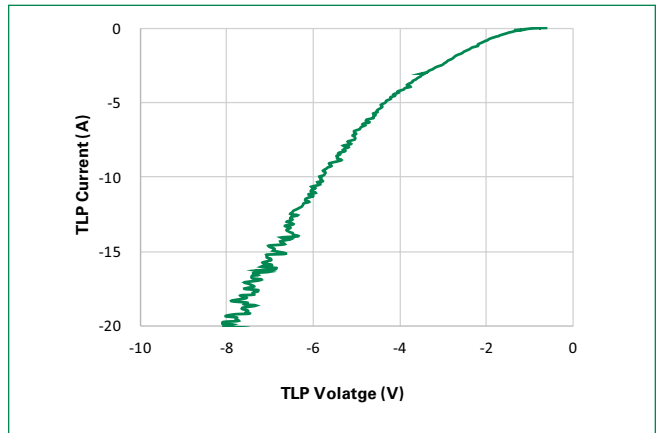
**8/20μs Pulse Waveform**



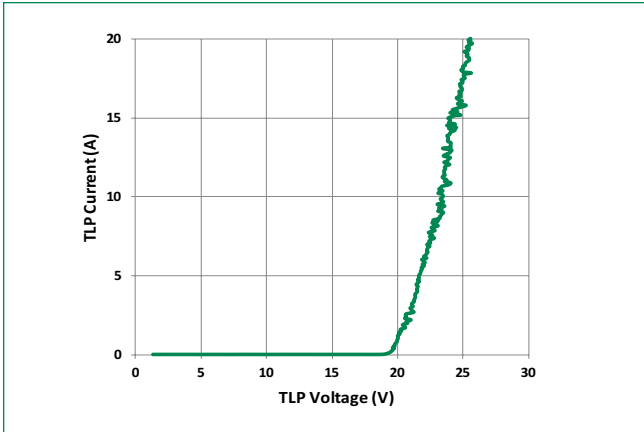
**AQHV12 Positive Transmission Line Pulsing (TLP) Plot**



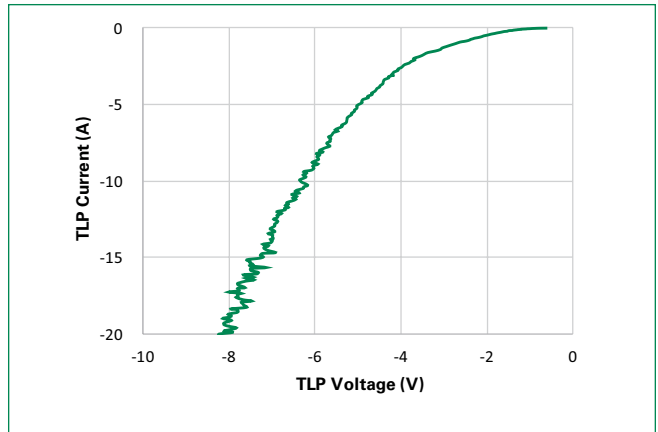
**AQHV12 Negative Transmission Line Pulsing (TLP) Plot**



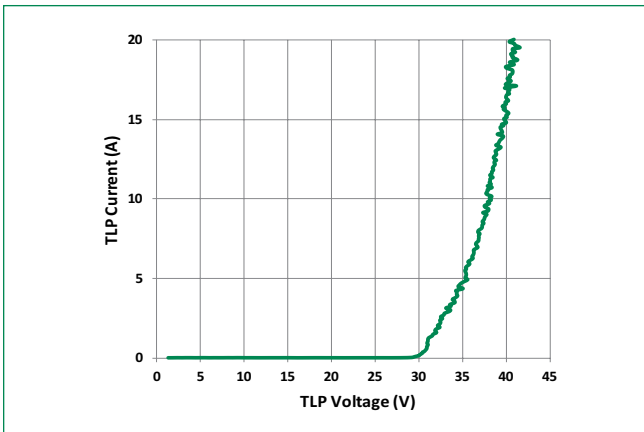
**AQHV15 Positive Transmission Line Pulsing (TLP) Plot**



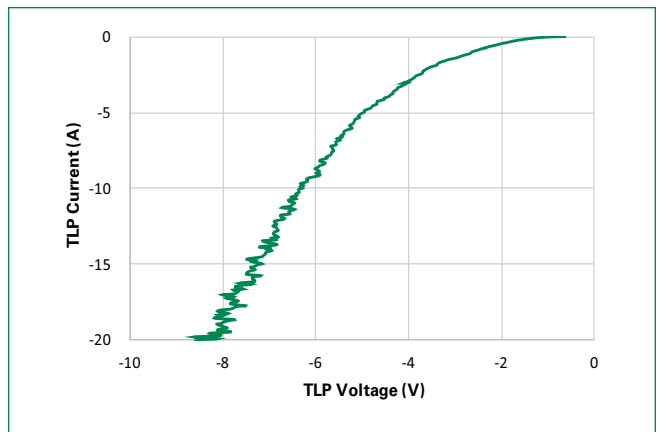
**AQHV15 Negative Transmission Line Pulsing(TLP) Plot**



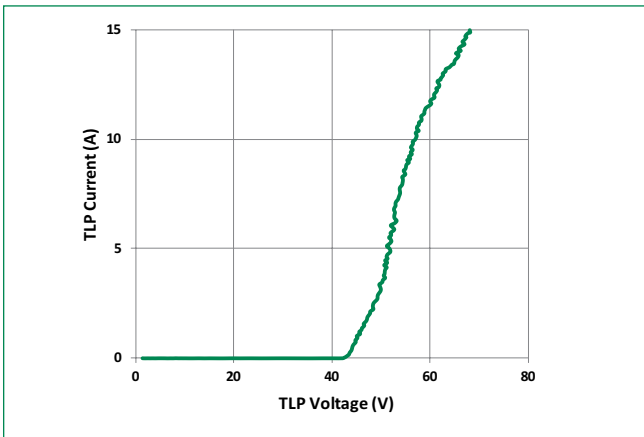
**AQHV24 Positive Transmission Line Pulsing (TLP) Plot**



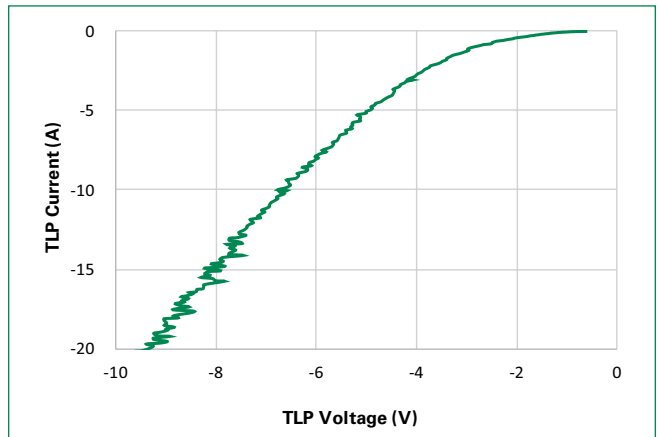
**AQHV24 Negative Transmission Line Pulsing(TLP) Plot**



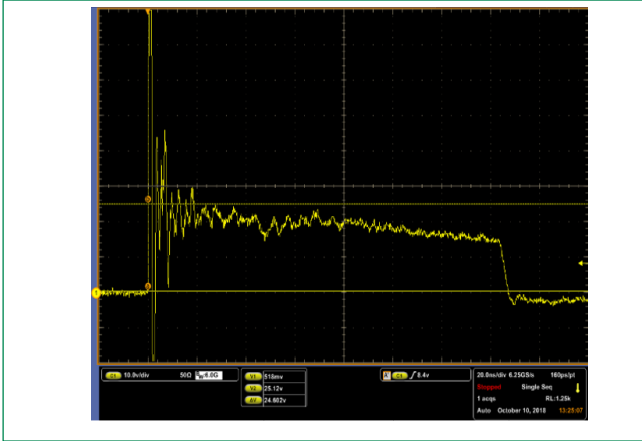
**AQHV36 Positive Transmission Line Pulsing(TLP) Plot**



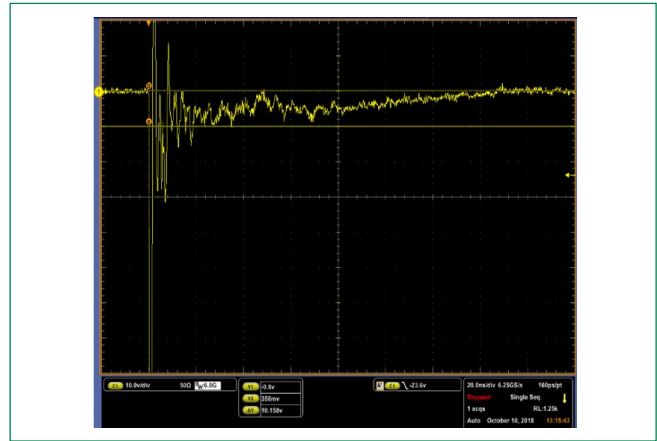
**AQHV36 Negative Transmission Line Pulsing(TLP) Plot**



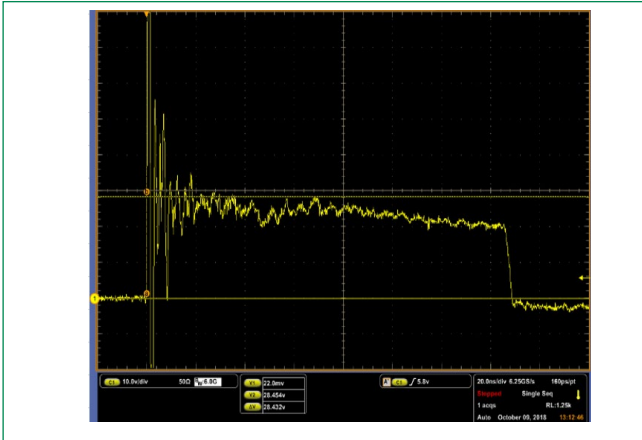
**AQHV12 +8kV Contact ESD Clamping Voltage**



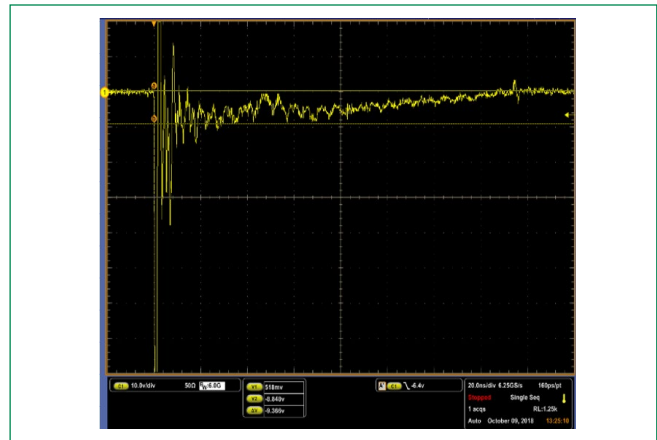
**AQHV12 -8kV Contact ESD Clamping Voltage**



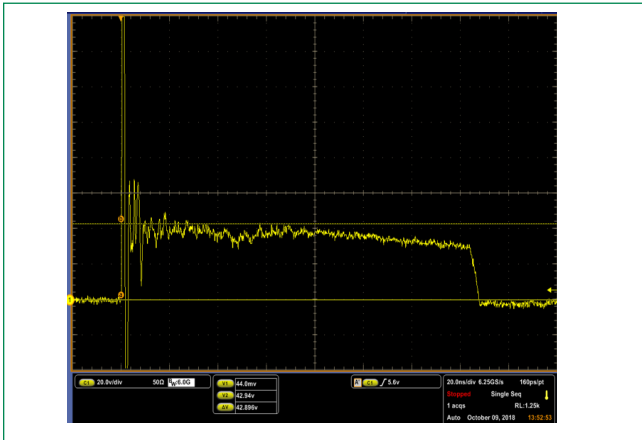
**AQHV15 +8kV Contact ESD Clamping Voltage**



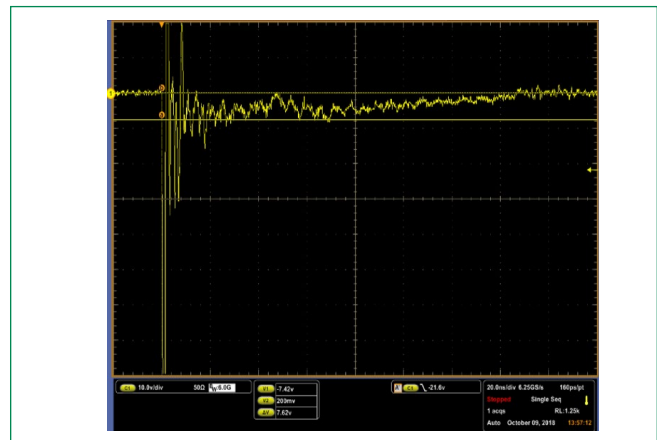
**AQHV15 -8kV Contact ESD Clamping Voltage**



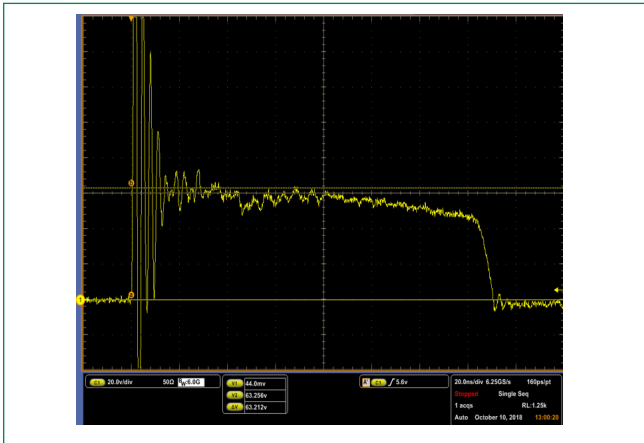
**AQHV24 +8kV Contact ESD Clamping Voltage**



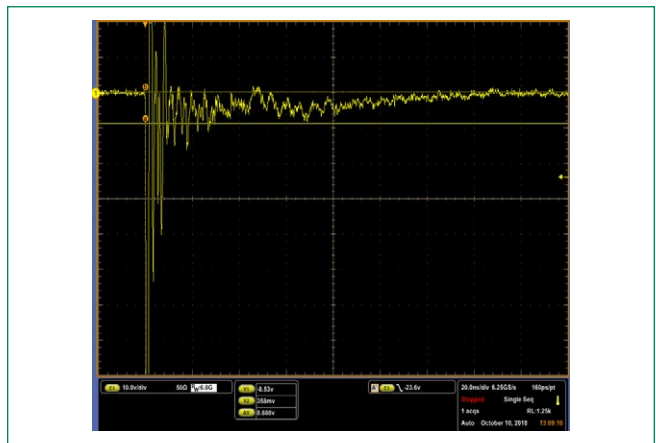
**AQHV24 -8kV Contact ESD Clamping Voltage**



**AQHV36 +8kV Contact ESD Clamping Voltage**

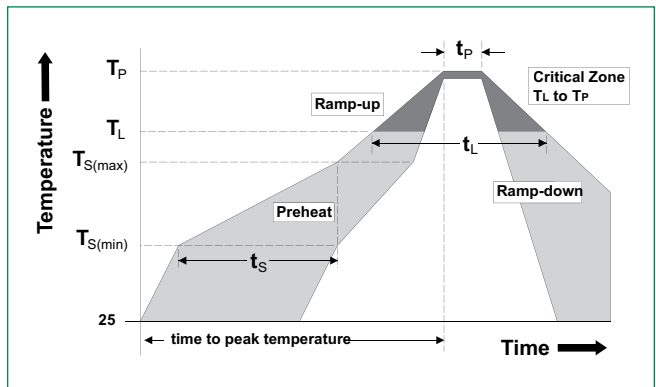


**AQHV36 -8kV Contact ESD Clamping Voltage**

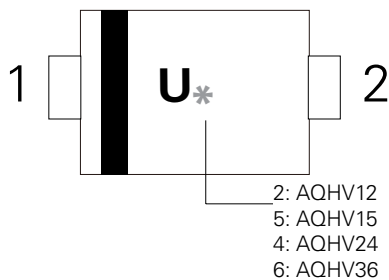


**Soldering Parameters**

<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 – 180 secs
<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>		20 – 40 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



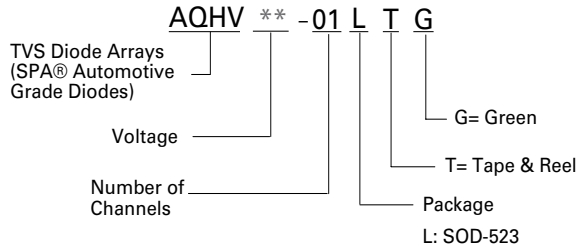
**Part Marking System**



**Product Characteristics**

<b>Lead Plating</b>	Matte Tin
<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

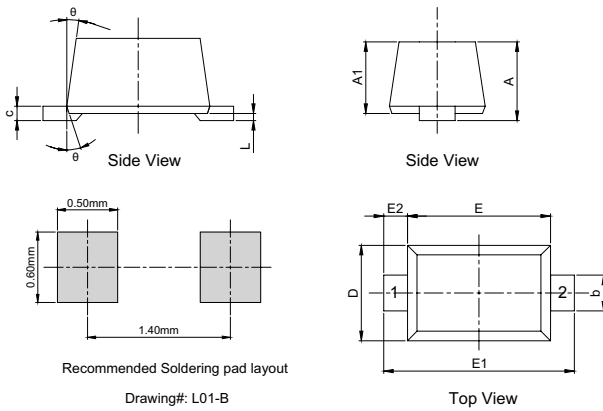
**Part Numbering System**



**Ordering Information**

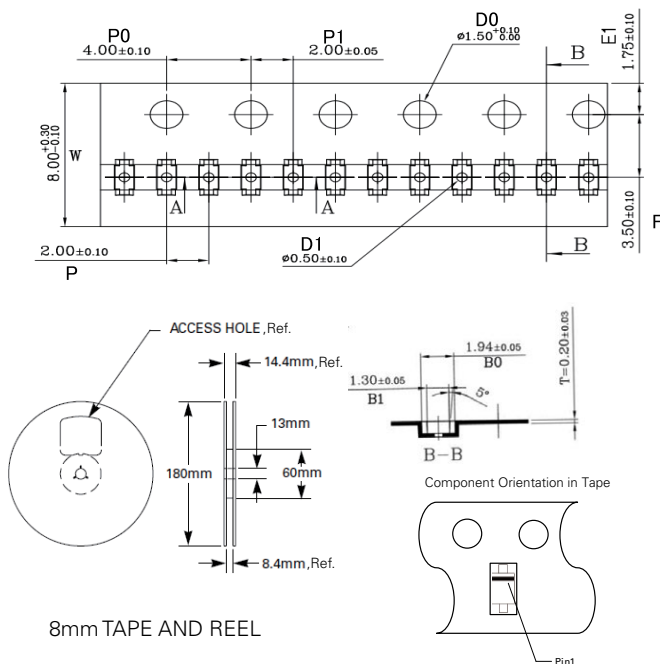
Part Number	Package	Min. Order Qty.
AQHV12-01LTG	SOD-523	5000
AQHV15-01LTG		
AQHV24-01LTG		
AQHV36-01LTG		

**Package Dimensions — SOD-523**



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.51	0.77	0.020	0.030
<b>A1</b>	0.50	0.70	0.020	0.028
<b>b</b>	0.25	0.35	0.010	0.014
<b>c</b>	0.08	0.15	0.003	0.006
<b>D</b>	0.70	0.90	0.028	0.035
<b>E</b>	1.10	1.30	0.043	0.051
<b>E1</b>	1.50	1.70	0.059	0.067
<b>E2</b>	0.20 REF		0.001 REF	
<b>L</b>	0.01	0.07	0.000	0.003
<b>θ</b>	7° REF		7° REF	

**Embossed Carrier Tape & Reel Specification — SOD-523**



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
<b>A0</b>	0.91	1.01	0.036	0.040
<b>B0</b>	1.89	1.99	0.074	0.078
<b>D0</b>	1.50	1.60	0.059	0.063
<b>D1</b>	0.40	0.60	0.016	0.024
<b>E1</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>	1.95	2.05	0.077	0.081
<b>K0</b>	0.68	0.78	0.027	0.031
<b>T</b>	0.17	0.23	0.007	0.009
<b>W</b>	7.90	8.30	0.311	0.327

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