

**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.

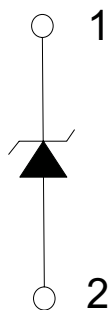
**Pinout**



**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)**

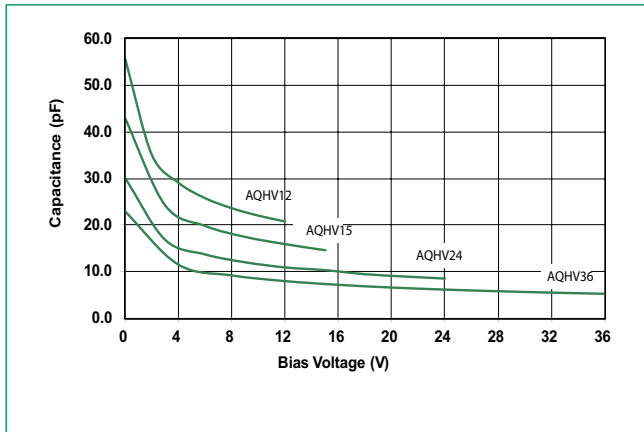
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>	I <sub>R</sub> =1μA			36	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> =1mA	40	42.4		V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> =36V		5	50	nA
Clamp Voltage <sup>1</sup>	V <sub>C</sub>	I <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:

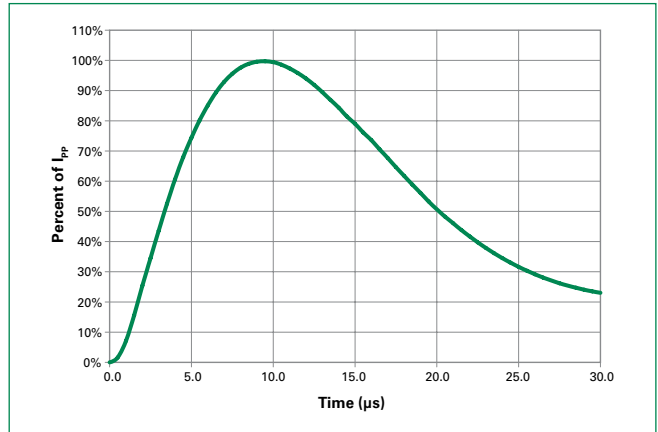
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

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

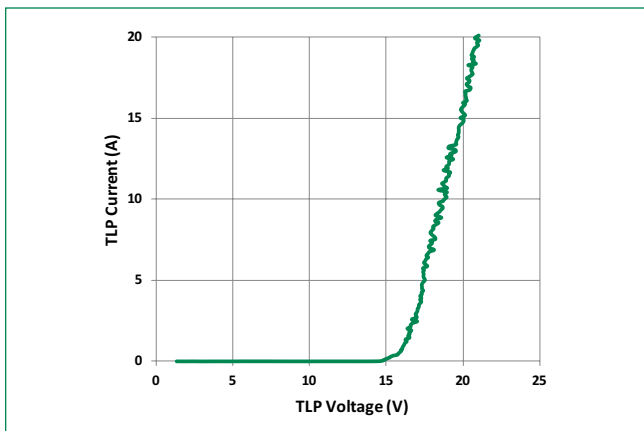
**Capacitance vs. Reverse Bias**



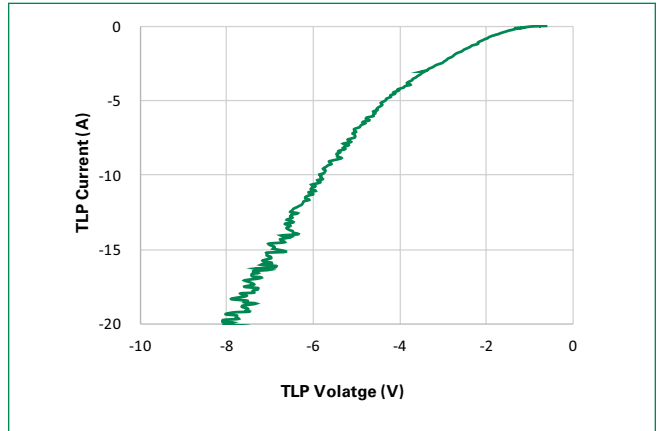
**8/20μs Pulse Waveform**



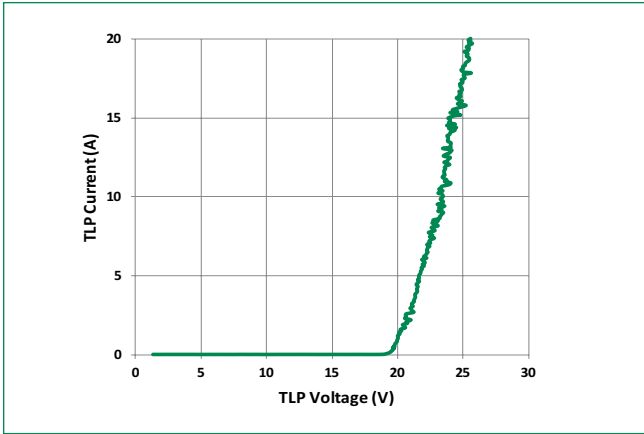
**AQHV12 Positive Transmission Line Pulsing (TLP) Plot**



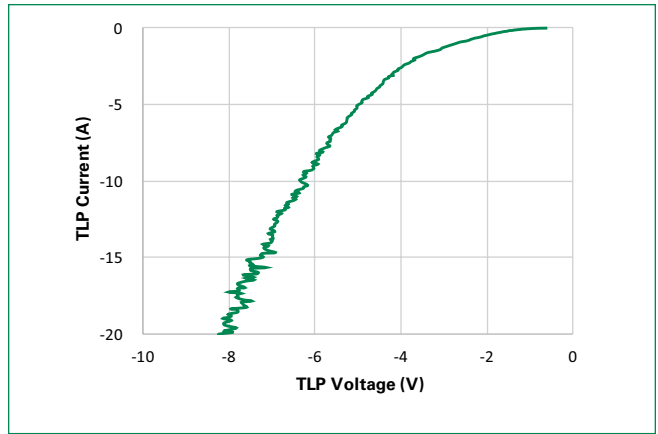
**AQHV12 Negative Transmission Line Pulsing (TLP) Plot**



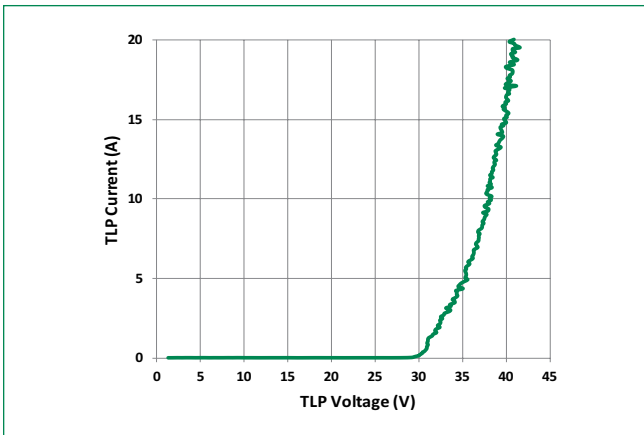
**AQHV15 Positive Transmission Line Pulsing (TLP) Plot**



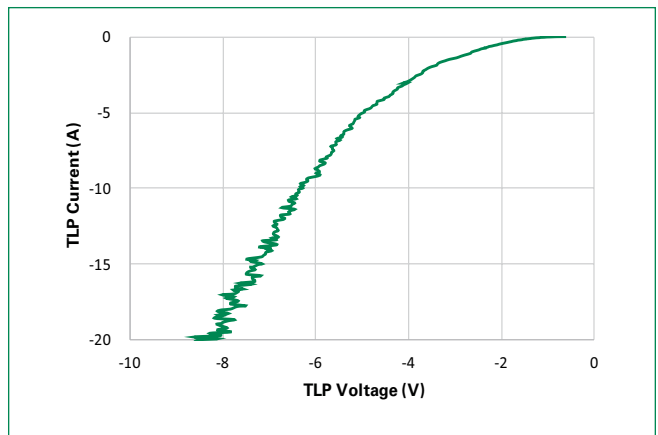
**AQHV15 Negative Transmission Line Pulsing(TLP) Plot**



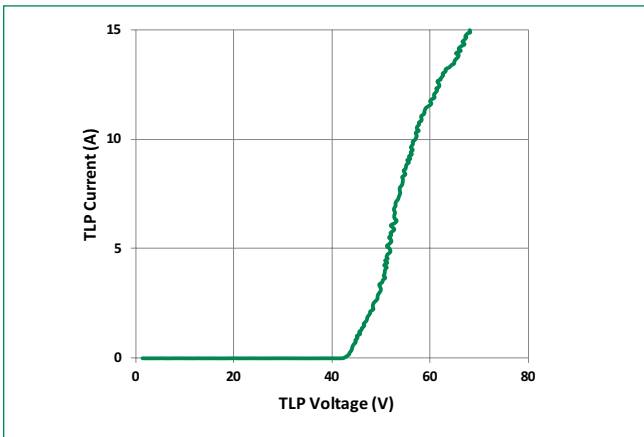
**AQHV24 Positive Transmission Line Pulsing (TLP) Plot**



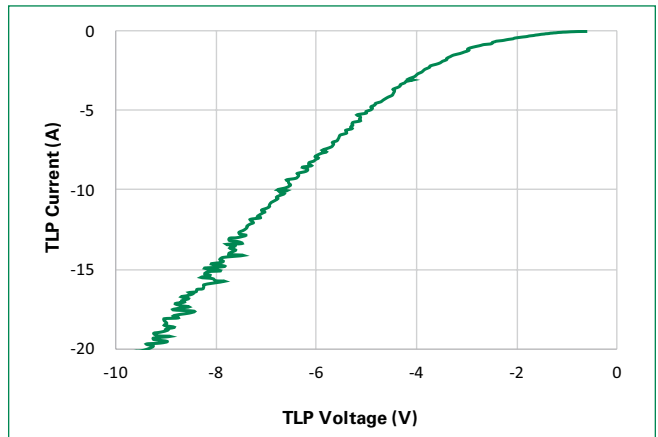
**AQHV24 Negative Transmission Line Pulsing(TLP) Plot**



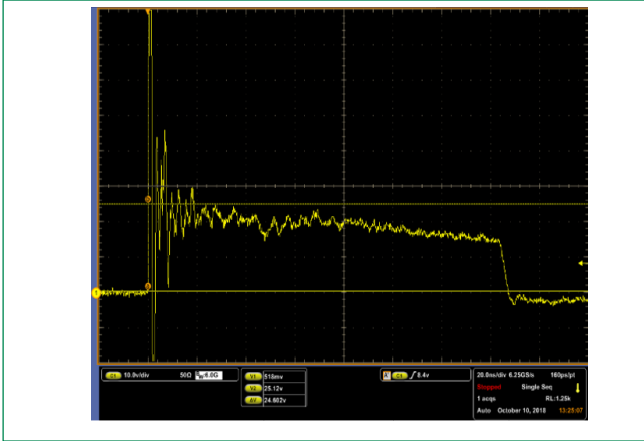
**AQHV36 Positive Transmission Line Pulsing(TLP) Plot**



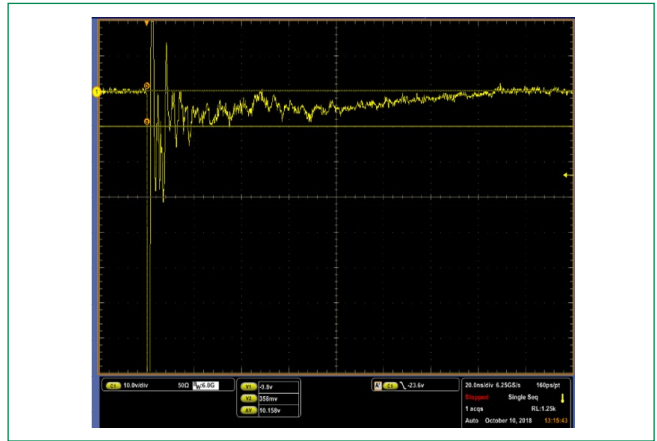
**AQHV36 Negative Transmission Line Pulsing(TLP) Plot**



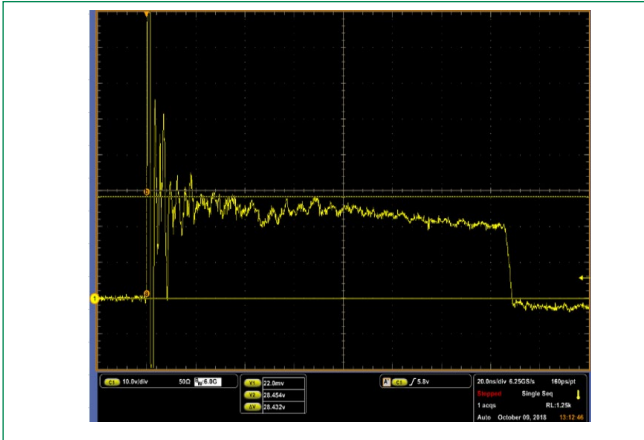
**AQHV12 +8kV Contact ESD Clamping Voltage**



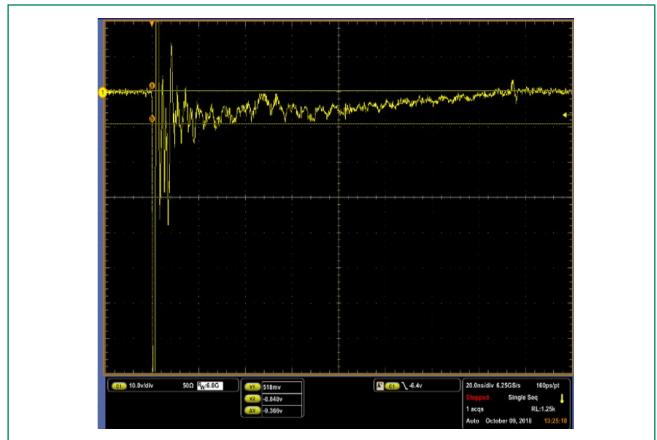
**AQHV12 -8kV Contact ESD Clamping Voltage**



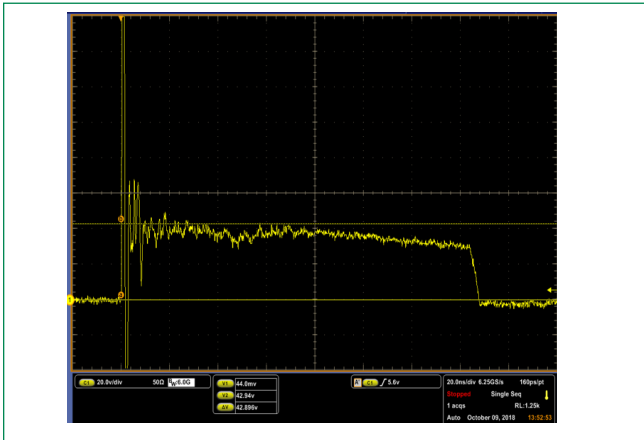
**AQHV15 +8kV Contact ESD Clamping Voltage**



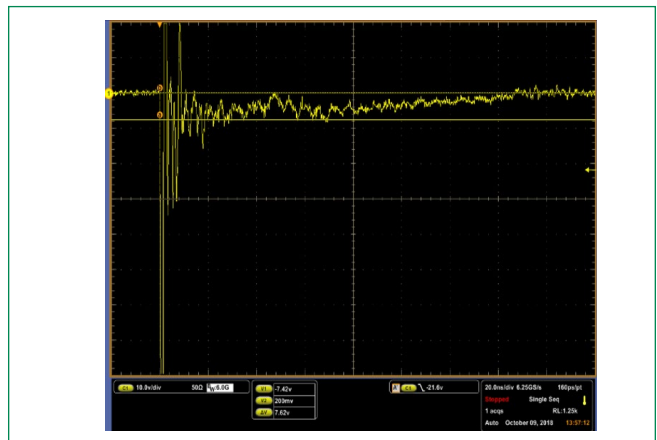
**AQHV15 -8kV Contact ESD Clamping Voltage**



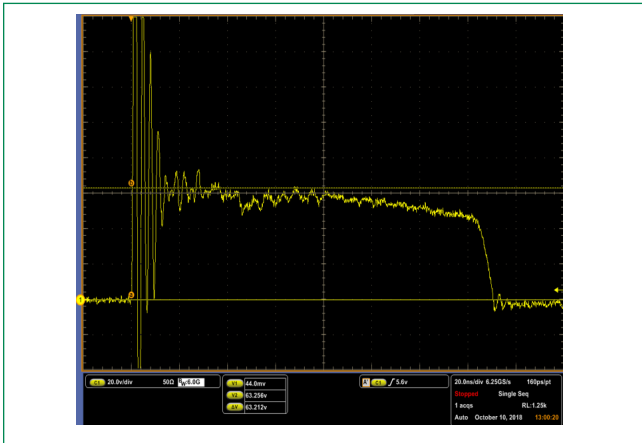
**AQHV24 +8kV Contact ESD Clamping Voltage**



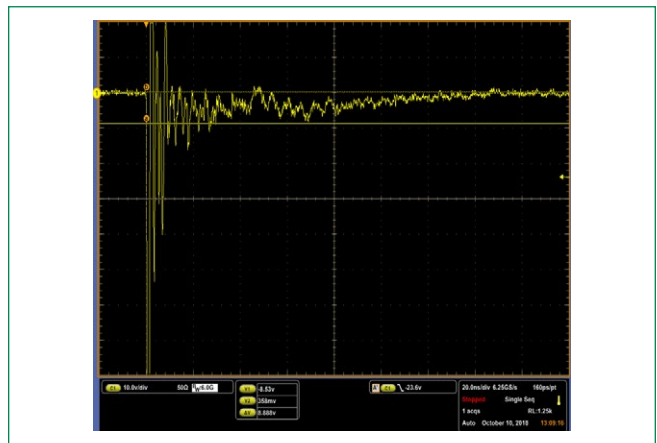
**AQHV24 -8kV Contact ESD Clamping Voltage**



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

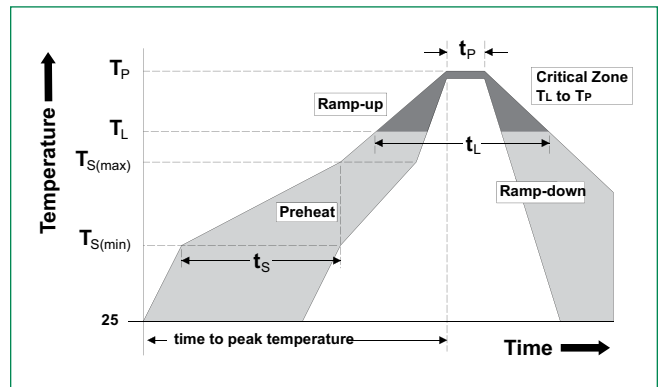


**AQHV36 -8kV Contact ESD Clamping Voltage**

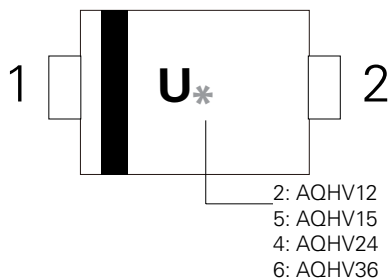


**Soldering Parameters**

<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



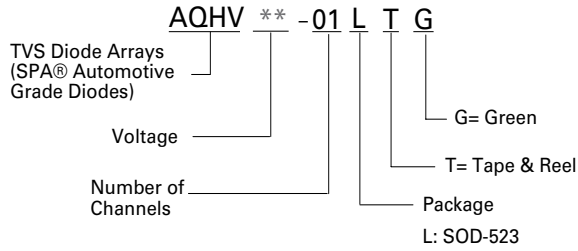
**Part Marking System**



**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

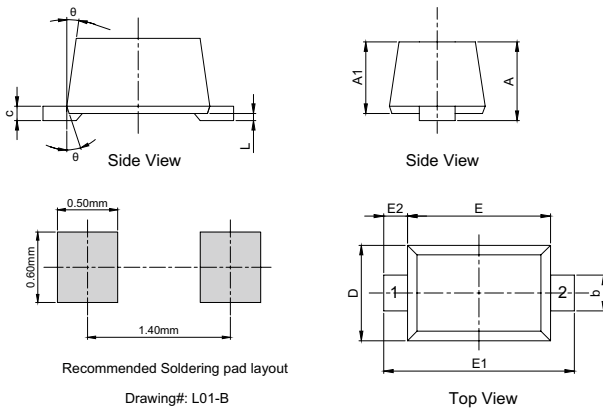
**Part Numbering System**



**Ordering Information**

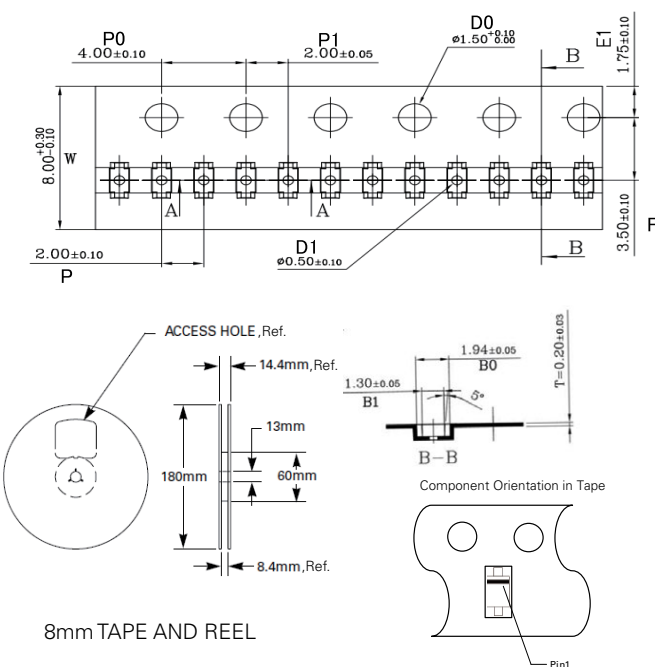
Part Number	Package	Min. Order Qty.
AQHV12-01LTG	SOD-523	5000
AQHV15-01LTG		
AQHV24-01LTG		
AQHV36-01LTG		

**Package Dimensions – SOD-523**



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

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



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A0	0.91	1.01	0.036	0.040
B0	1.89	1.99	0.074	0.078
D0	1.50	1.60	0.059	0.063
D1	0.40	0.60	0.016	0.024
E1	1.65	1.85	0.065	0.073
F	3.40	3.60	0.134	0.142
P0	3.90	4.10	0.154	0.161
P	1.90	2.10	0.075	0.083
P1	1.95	2.05	0.077	0.081
K0	0.68	0.78	0.027	0.031
T	0.17	0.23	0.007	0.009
W	7.90	8.30	0.311	0.327

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