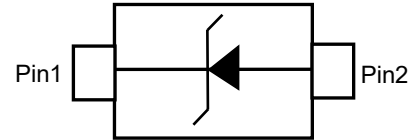


## Description

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



## Features

- ESD, IEC 61000-4-2,  $\pm 30\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 10A (8/20 $\mu\text{s}$  as defined in IEC 61000-4-5 2<sup>nd</sup> edition) for AQHV12
- Low clamping voltage
- Low leakage current

## Applications

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

## 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	$^{\circ}C$
$T_{STOR}$	Storage Temperature	-55 to 150	$^{\circ}C$

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>3</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>3</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>3</sup>	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		30	32	pF

**AQHV36 Electrical Characteristics**( $T_{OP}=25^{\circ}C$ )

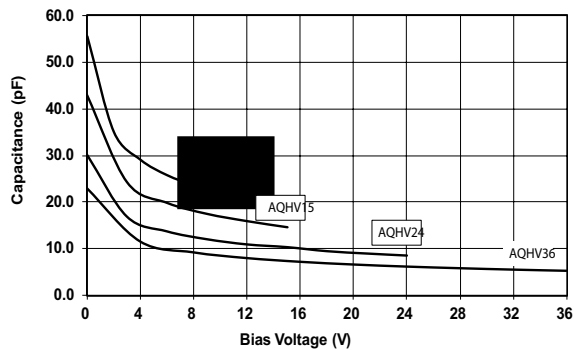
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			36	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	40	42.4		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=36V$		5	50	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to GND		49.5	55	V
		$I_{PP}=3A, t_p=8/20\mu s, I/O$ to GND		52.5	58	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		1.15		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			3	A
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 15$			kV
		IEC 61000-4-2 (Air Discharge)	$\pm 20$			kV
Diode Capacitance <sup>1</sup>	$C_{VIO-GND}$	Reverse Bias=0V, f=1MHz		23	25	pF

Note:

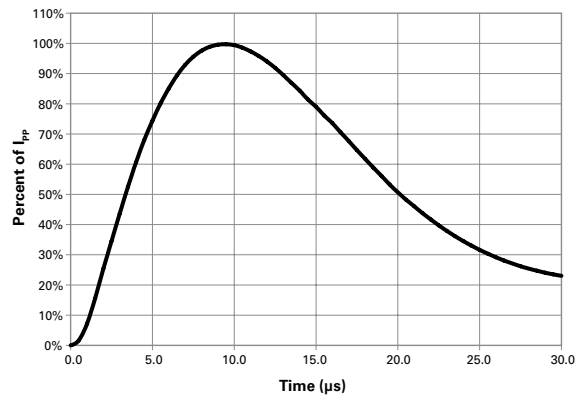
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

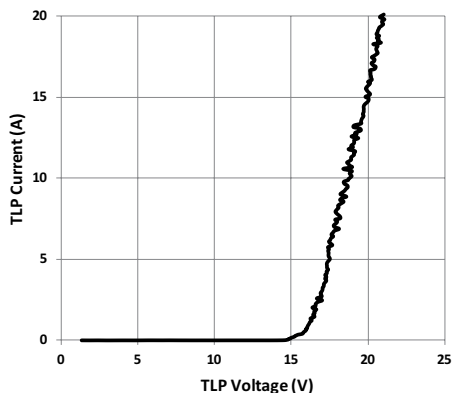
**Capacitance vs. Reverse Bias**



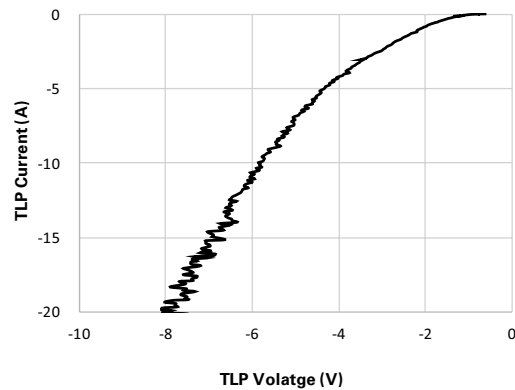
**8/20 $\mu s$  Pulse Waveform**



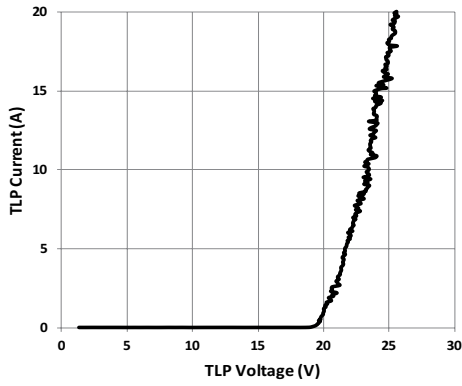
**AQHV12 Positive Transmission Line Pulsing (TLP) Plot**



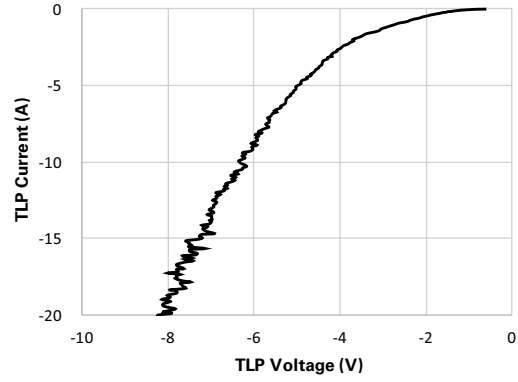
**AQHV12 Negative Transmission Line Pulsing(TLP) Plot**



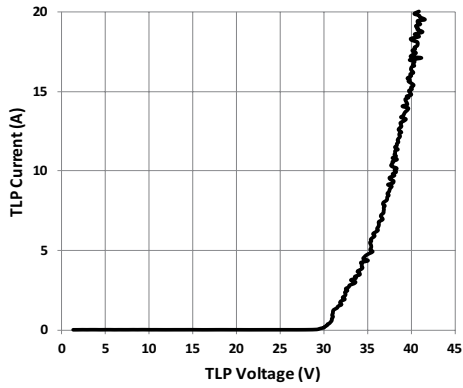
AQHV15 Positive Transmission Line Pulsing (TLP) Plot



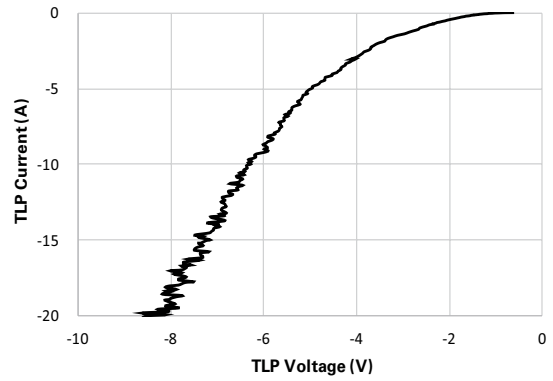
AQHV15 Negative Transmission Line Pulsing(TLP) Plot



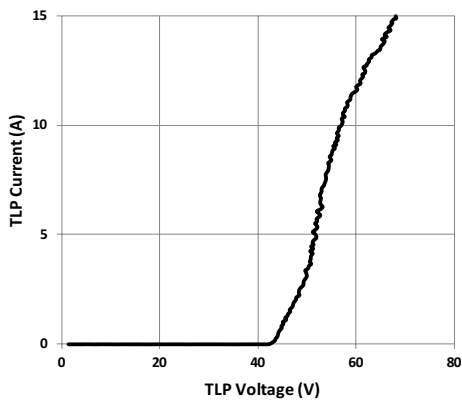
AQHV24 Positive Transmission Line Pulsing (TLP) Plot



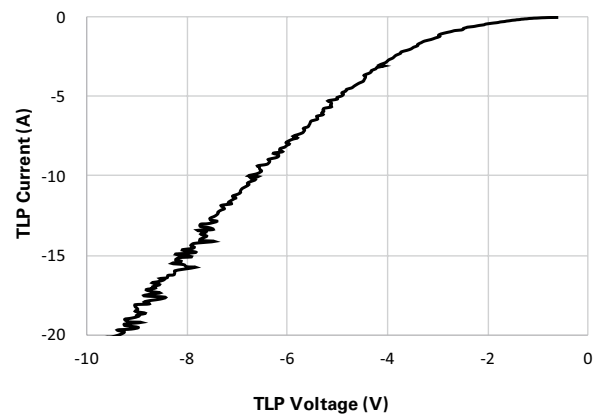
AQHV24 Negative Transmission Line Pulsing(TLP) Plot



AQHV36 Positive Transmission Line Pulsing(TLP) Plot



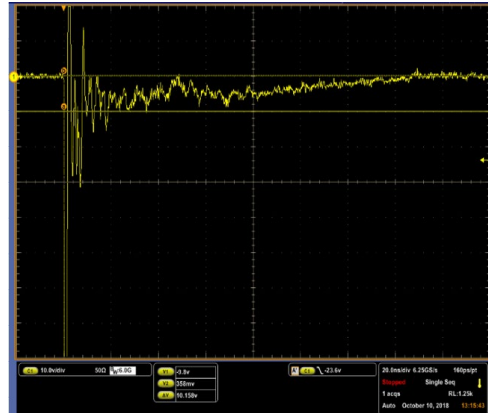
AQHV36 Negative Transmission Line Pulsing(TLP) Plot



AQHV12 +8kV Contact ESD Clamping Voltage



AQHV12 -8kV Contact ESD Clamping Voltage



AQHV15 +8kV Contact ESD Clamping Voltage



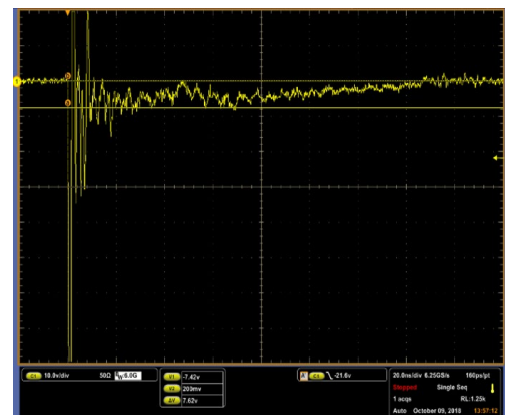
AQHV15 -8kV Contact ESD Clamping Voltage



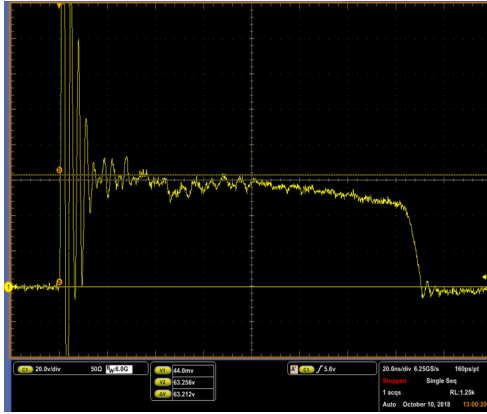
AQHV24 +8kV Contact ESD Clamping Voltage



AQHV24 -8kV Contact ESD Clamping Voltage



AQHV36 +8kV Contact ESD Clamping Voltage

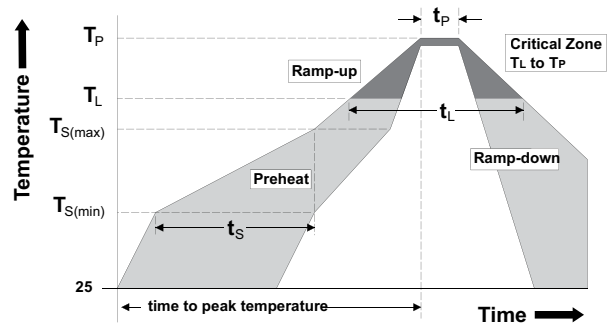


AQHV36 -8kV Contact ESD Clamping Voltage



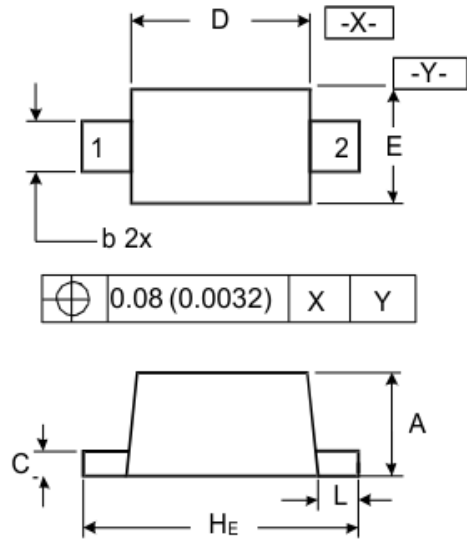
### Soldering Parameters

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



Package outline dimensions

SOD-523



DIMENSIONS

SYMBOL	MILLIMETER		INCHES	
	MIN	MAX	MIN	MAX
A	0.50	0.70	0.020	0.028
b	0.25	0.35	0.010	0.014
C	0.07	0.20	0.0028	0.0079
D	1.10	1.30	0.043	0.051
E	0.70	0.90	0.028	0.035
H <sub>E</sub>	1.50	1.70	0.059	0.067
L	0.15	0.25	0.006	0.010

Ordering information

Order code	Package	Base qty	Delivery mode	Marking
UMW AQHV12-01LTG	SOD-523	3000	Tape and reel	U2 U
UMW AQHV15-01LTG	SOD-523	3000	Tape and reel	U5 U
UMW AQHV24-01LTG	SOD-523	3000	Tape and reel	U4 U
UMW AQHV36-01LTG	SOD-523	3000	Tape and reel	U6 U