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Expertise Applied | Answers Delivered

TVS Diode Array (SPA® Diodes)

General Purpose ESD Protection - AQHVxx-01ETG series

AQHVxx-01ETG series 200W Unidirectional TVS Diode

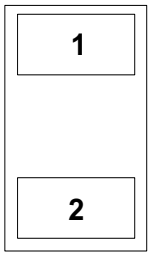
AUTOMOTIVE GRADE | RoHS | Pb | GREEN

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=8/20µs) with very low clamping voltages.

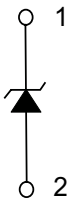
Pinout



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.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{pk}	Peak Pulse Power (t_p=8/20µs)	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°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			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=8/20µs, Fwd			19.0	V
		I_{PP}=8A, t_p=8/20µs, 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=8/20µs			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°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			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=8/20µs, Fwd			22.0	V
		I_{PP}=5A, t_p=8/20µs, 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=8/20µs			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

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

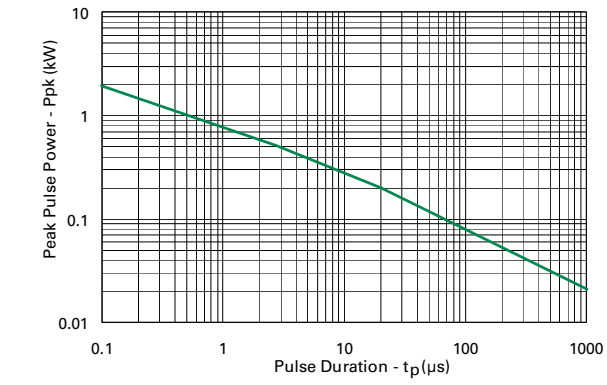
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			24.0	V
Breakdown Voltage	V_{BR}	I_R=1mA	26.7			V
Leakage Current	I_{LEAK}	V_R=24V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			36.0	V
		I_{PP}=3A, t_p=8/20µs, Fwd			50.0	V
Dynamic Resistance[2]	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)

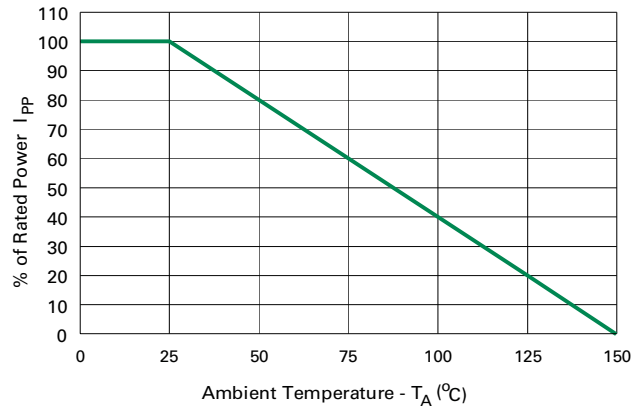
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			36.0	V
Breakdown Voltage	V_{BR}	I_R=1mA	40.0			V
Leakage Current	I_{LEAK}	V_R=36V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			52.0	V
		I_{PP}=2A, t_p=8/20µs, Fwd			60.0	V
Dynamic Resistance[2]	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



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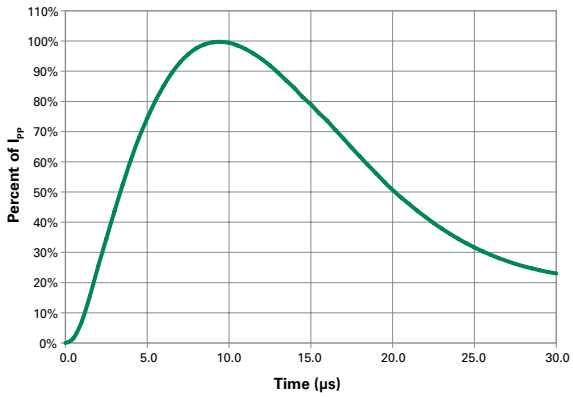
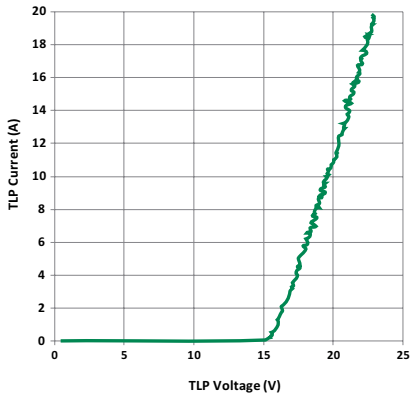
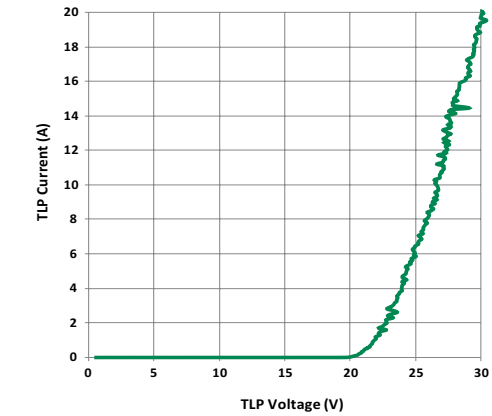
8/20µs Pulse Waveform



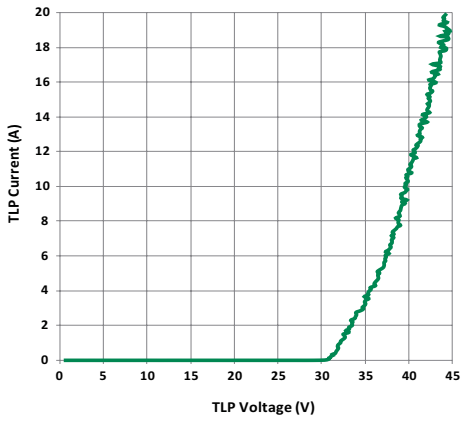
AQHV12 Transmission Line Pulsing(TLP) Plot



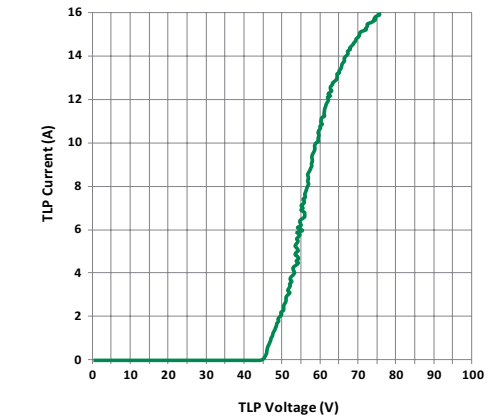
AQHV15 Transmission Line Pulsing(TLP) Plot



AQHV24 Transmission Line Pulsing(TLP) Plot



AQHV36 Transmission Line Pulsing(TLP) Plot



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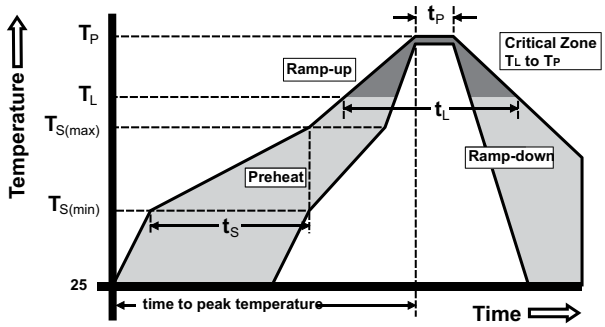
TVS Diode Array (SPA® Diodes)

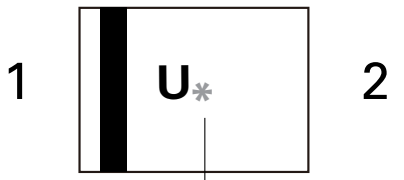
General Purpose ESD Protection - AQHVxx-01ETG series

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



2: AQHV12
5: AQHV15
4: AQHV24
6: AQHV36

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

AQHV ** -01 E T G

- AQHV: TVS Diode Arrays (SPA® Automotive Grade Diodes)
- **: Voltage
- 01: Number of Channels
- E: Package — E: SOD882
- T: T= Tape & Reel
- G: G= Green

Ordering Information

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

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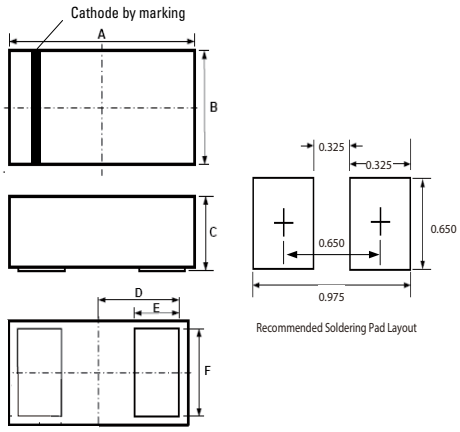
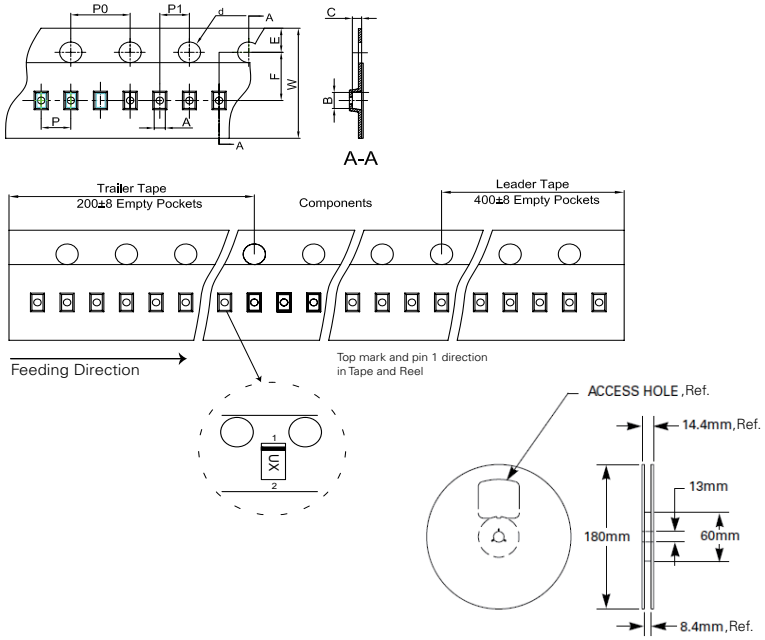
Package Dimensions — SOD882



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

8mm TAPE AND REEL

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