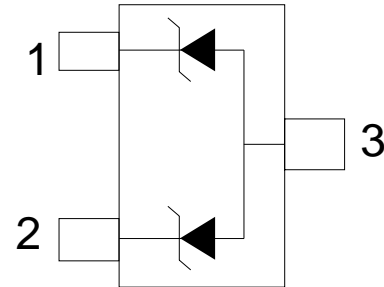


Description

The AQxx-02HTG Series TVS Diode Array is designed to protect sensitive equipment from damage due to electrostatic discharge (ESD), electrical fast transients (EFT), and lightning induced surges.

This AQxx series can safely absorb repetitive ESD strikes of ± 30 kV (contact and air discharge as defined in IEC 61000-4-2) without any performance degradation.



Features

- ESD, IEC 61000-4-2, ± 30 kV contact, ± 30 kV air
- EFT, IEC 61000-4-4, 50A (5/50ns)
- Lightning, 33A (8/20 μ s as defined in IEC 61000-4-5 2nd edition) for the AQ05
- Working voltages: 5V, 12V, 15V, 24V and 36V
ESD, ISO 10605, 330pF 330 Ω , ± 30 kV contact, ± 30 kV air
- Low clamping voltage
- Low leakage current
- Moisture Sensitivity Level (MSL -1)

Applications

- Industrial Equipment
- Test and Medical Equipment
- Point-of-Sale Terminals
- Motor Controls
- Legacy Ports (RS-232, RS-485)
- Security and Alarm Systems

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{PK}	Peak Pulse Power ($t_p=8/20\mu s$)	500	W
T_{OP}	Operating Temperature	-40 to 150	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

AQ05 Electrical Characteristics ($T_{OP}=25^\circ C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			5.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	6.0	7.0		V
Reverse Leakage Current	I_{LEAK}	$V_R=5V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		8.0	9.8	V
		$I_{PP}=10A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		10.5	13.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, Pin 1 or Pin 2 to Pin 3		0.19		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			33	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 ³	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		290	350	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		145	180	pF

AQ12 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	14.2		V
Reverse Leakage Current	I_{LEAK}	$V_R=12V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		16.0	18.5	V
		$I_{PP}=10A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		20.0	22.5	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, Pin 1 or Pin 2 to Pin 3		0.25		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			20	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 ³	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		110	135	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		55	85	pF

AQ15 Electrical Characteristics ($T_{OP}=25^{\circ}C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			15.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	16.7	18.5		V
Reverse Leakage Current	I_{LEAK}	$V_R=15V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		20.5	24.0	V
		$I_{PP}=10A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		26.6	30.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, Pin 1 or Pin 2 to Pin 3		0.30		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			15	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		85	100	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		45	75	pF

AQ24 Electrical Characteristics ($T_{OP}=25^{\circ}C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			24.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	26.7	28		V
Reverse Leakage Current	I_{LEAK}	$V_R=24V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		30.0	36.0	V
		$I_{PP}=5A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		36.0	42.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, Pin 1 or Pin 2 to Pin 3		0.50		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			9	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		60	65	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		30	50	pF

AQ36 Electrical Characteristics ($T_{OP}=25^{\circ}C$)

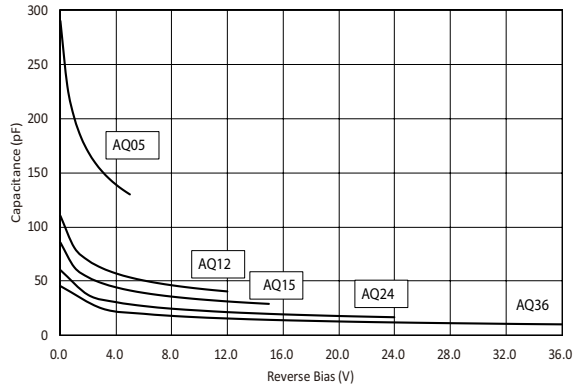
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			36.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	40.0	41.8		V
Reverse Leakage Current	I_{LEAK}	$V_R=36V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		45.0	52.0	V
		$I_{PP}=5A, t_p=8/20\mu s$, Pin 1 or Pin 2 to Pin 3		58.5	62.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, Pin 1 or Pin 2 to Pin 3		0.65		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			7	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		45	50	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		25	40	pF

Note:

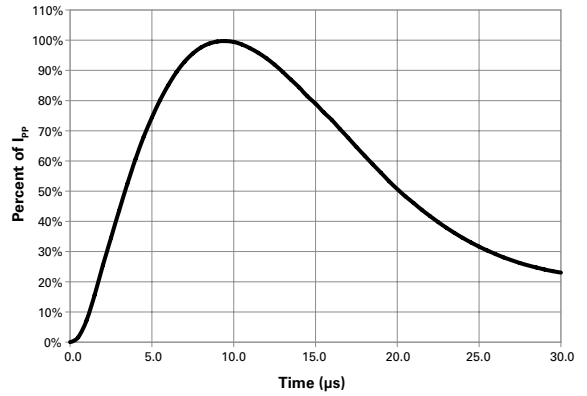
¹ Parameter is guaranteed by design and/or component characterization.

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

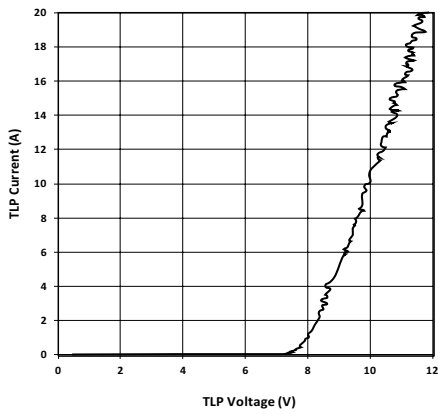
Capacitance vs. Reverse Bias (Pin1 or Pin2 to Pin3)



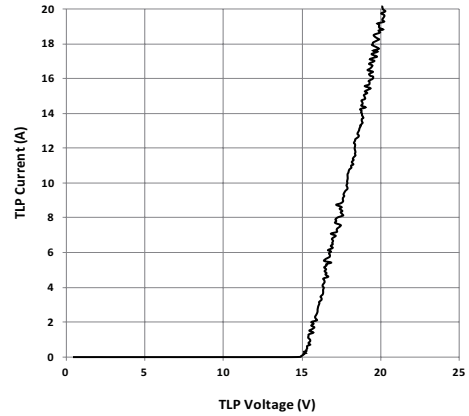
8/20μs Pulse Waveform



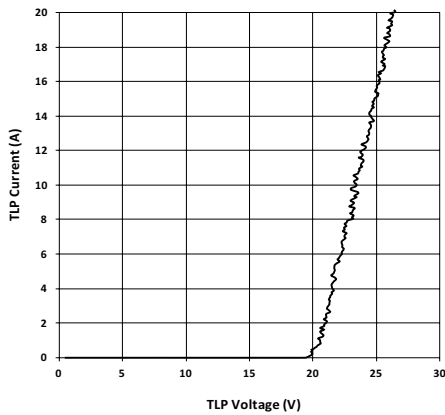
AQ05 Transmission Line Pulsing(TLP) Plot



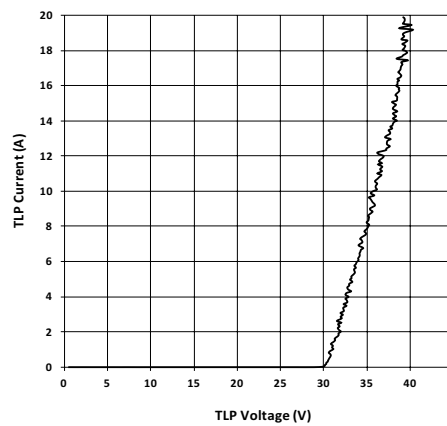
AQ12 Transmission Line Pulsing(TLP) Plot



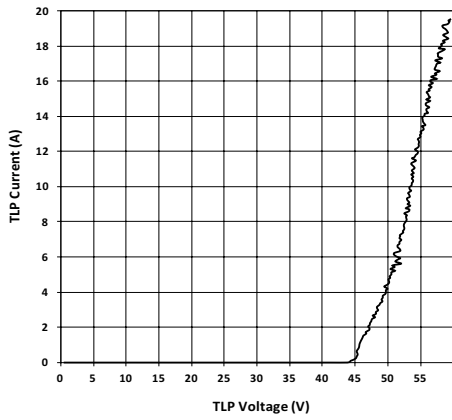
AQ15 Transmission Line Pulsing(TLP) Plot



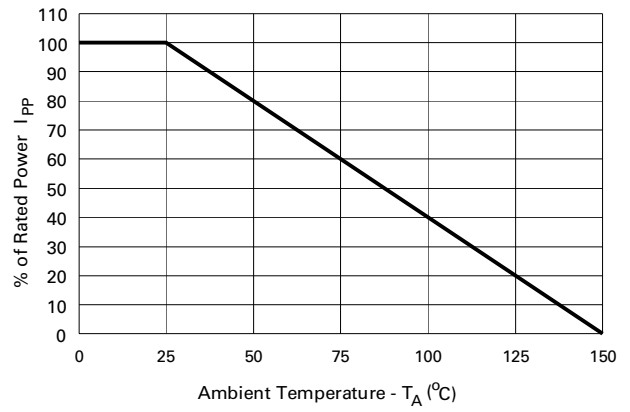
AQ24 Transmission Line Pulsing(TLP) Plot



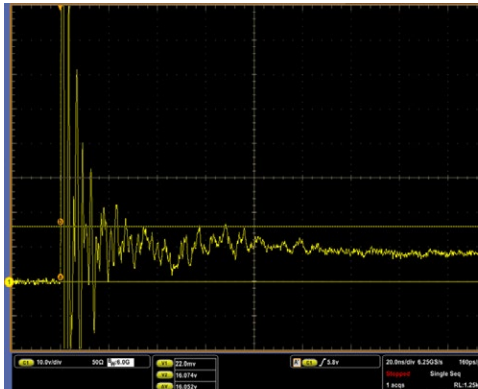
AQ36 Transmission Line Pulsing(TLP) Plot



Power Derating Curve



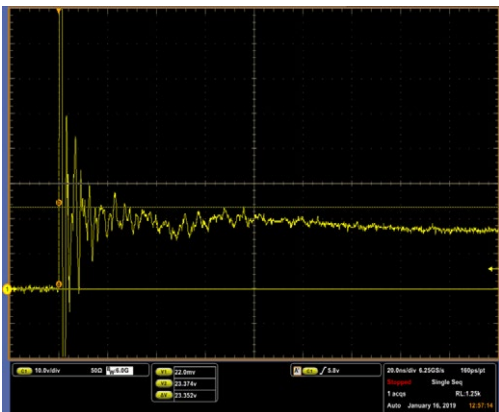
ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV



ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV



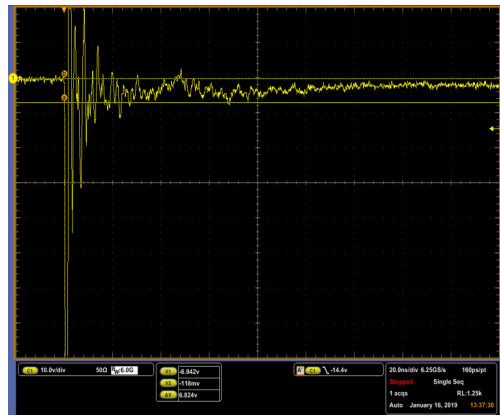
ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



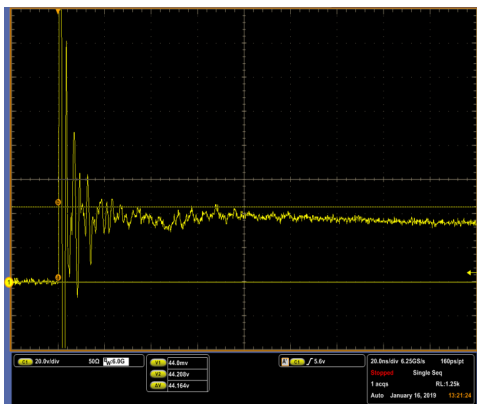
ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV



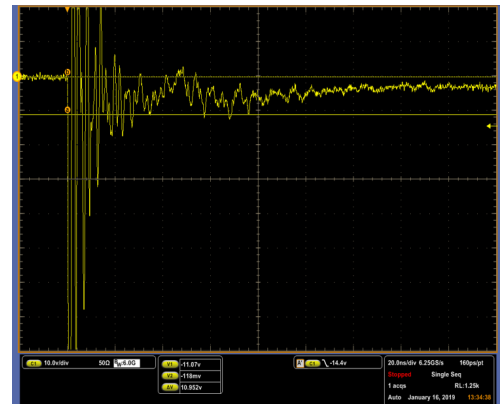
ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



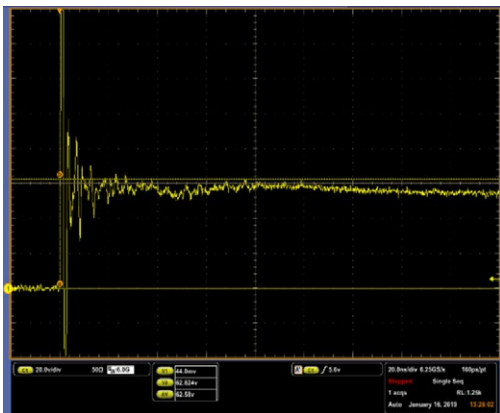
ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV



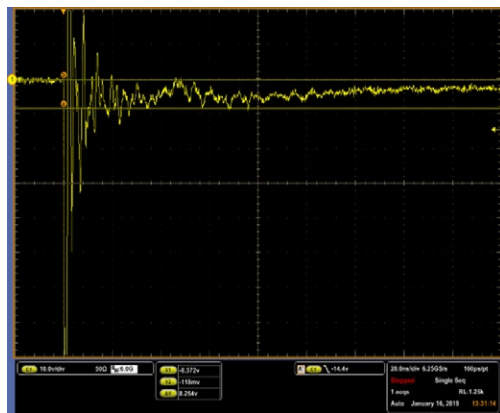
ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



ISO10605 (C:330pF, R:330Ω) contact discharge plot at +8KV

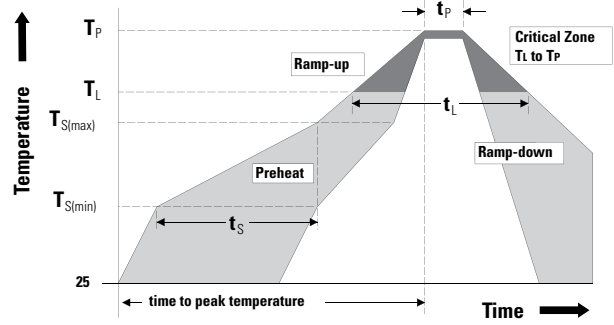


ISO10605 (C:330pF, R:330Ω) contact discharge plot at -8KV



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_p)	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



L1 (group plane)

L L

Marking

Ordering information

Order code	Package	Baseqty	Deliverymode
UMW AQ36-02HTG	SOT-23	3000	Tape and reel

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[SMBJ33CATR](#) [SMBJ6.5A](#) [SMBJ8.0A](#) [ESD101-B1-02ELS](#) [E6327](#) [ESD112-B1-02EL](#) [E6327](#) [ESD7451N2T5G](#) [19180-510](#) [CPDT-5V0USP-](#)
[HF](#) [3.0SMCJ33CA-F](#) [3.0SMCJ36A-F](#) [HSPC16701B02TP](#) [JANTX1N6126A](#) [D3V3Q1B2DLP3-7](#) [D55V0M1B2WS-7](#) [SCM1293A-04SO](#)
[ESD200-B1-CSP0201](#) [E6327](#) [SM12-7](#) [CEN955](#) [W/DATA](#) [VESD12A1A-HD1-GS08](#) [CPDQC5V0-HF](#) [D1213A-01LP4-7B](#) [ESD101-B1-02EL](#)
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[P6KE13CA](#) [P6KE43CA](#) [P6KE6.8CA](#) [P6KE8.2](#) [P6SMBJ20CA](#) [JANTX1N6072A](#) [SR2835ESKG](#) [SA90CA](#)