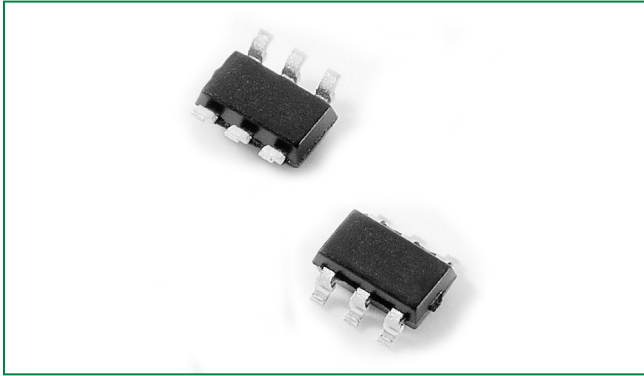
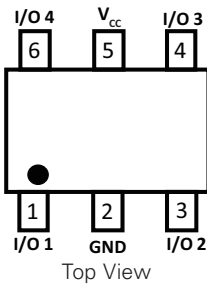


AQRV05-4HTG

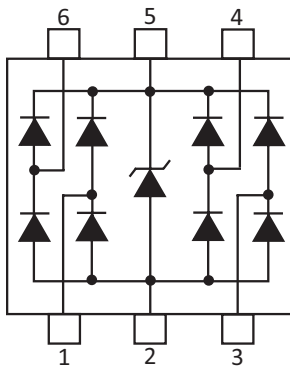
1pF 12A Low Capacitance ESD Protection



Pinout



Functional Block Diagram



Applications

- 10/100/1000 Ethernet
- Automotive Touch Screen
- Automotive Display
- USB2.0 Power and Data Line

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.

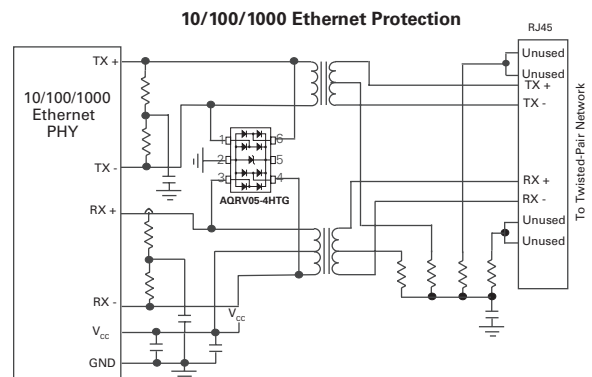
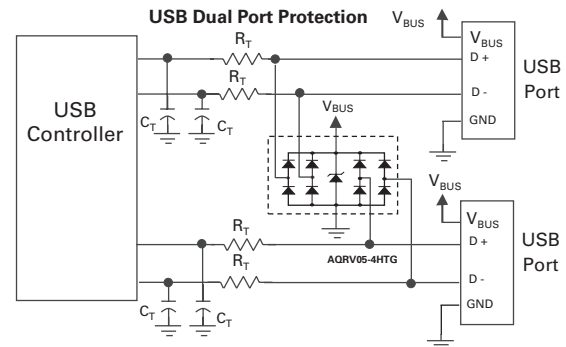
Description

The AQRV05-4HTG integrates low capacitance rail-to-rail diodes with an additional zener diode to protect each I/O pin against ESD and high surge events. This robust device can absorb maximum 12A surge current per IEC 61000-4-5 ($t_p=8/20\mu s$) without performance degradation and a minimum $\pm 30kV$ ESD per IEC 61000-4-2. Their very low loading capacitance also makes them ideal for protecting high speed signal pins.

Features

- ESD, IEC 61000-4-2, $\pm 30kV$ contact/air
- ESD, ISO10605 330pF 330 Ω , $\pm 30kV$ contact/air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Maximum surge tolerance, IEC 61000-4-5 2nd Edition, 12A (8/20 μs)
- Low capacitance of 1pF (TYP) per I/O
- Low leakage current of 0.5 μA (MAX) at 5V
- Small SOT23-6 (JEDEC MO-178) packaging
- Halogen free, lead free and RoHS compliant
- Moisture Sensitivity Level (MSL-1)
- AEC-Q101 qualified and PPAP capable

Application Examples



AQRV05-4HTG

1pF 12A Low Capacitance ESD Protection

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current ($t_p=8/20\mu s$)	12	A
P_{PK}	Peak Pulse Power ($t_p=8/20\mu s$)	180	W
T_{OP}	Operating Temperature	-40 to 150	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

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.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}				6	V
Breakdown Voltage	V_{BR}	$I_R=1\text{mA}$, I/O to GND	6	8.5		V
Reverse Leakage Current	I_{LEAK}	$V_R=5\text{V}$, I/O to GND		0.1	0.5	μA
Clamp Voltage ¹	V_C	$I_{PP}=5\text{A}$, $t_p=8/20\mu s$, I/O to GND		11.7	13	V
		$I_{PP}=10\text{A}$, $t_p=8/20\mu s$, I/O to GND		13.2	15	
		$I_{PP}=12\text{A}$, $t_p=8/20\mu s$, I/O to GND		15		
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100\text{ns}$, I/O to GND		0.2		Ω
ESD Withstand Voltage ^{1,3}	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
		ISO10605 (Contact Discharge)	± 30			kV
		ISO10605 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-GND}$	Reverse Bias=0V, $f=1\text{MHz}$, I/O to GND		1	3	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1\text{MHz}$, I/O to I/O		0.5		

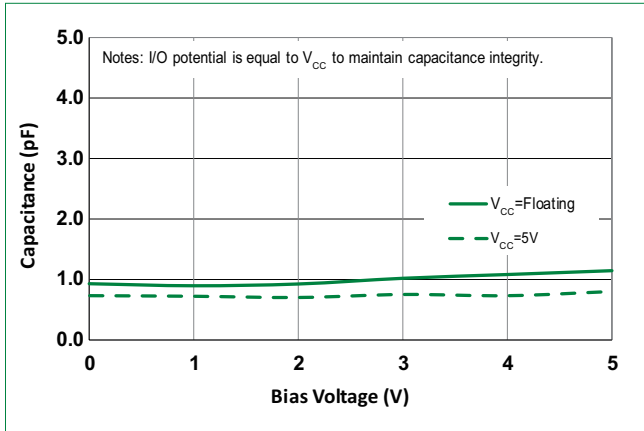
Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 0.2ns rise time, and average window $t_1=70\text{ns}$ to $t_2=90\text{ns}$.
- Device stressed with ten non-repetitive ESD pulses.

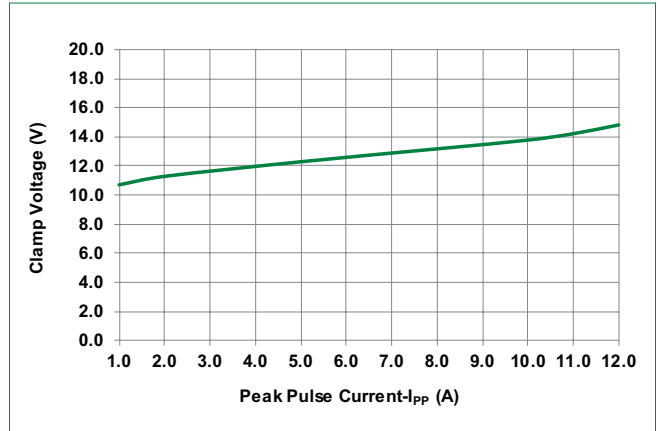
AQRV05-4HTG

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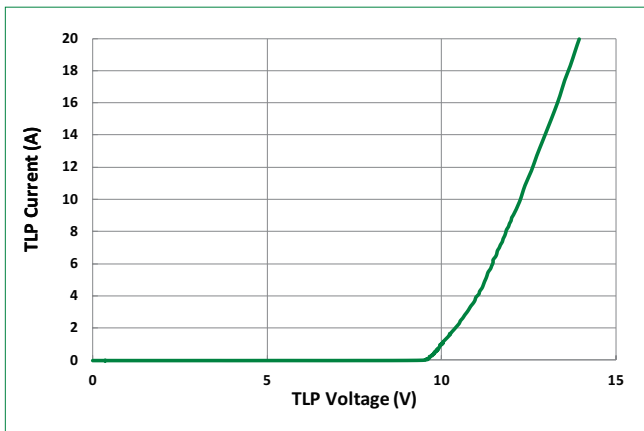
Capacitance vs Reverse Bias



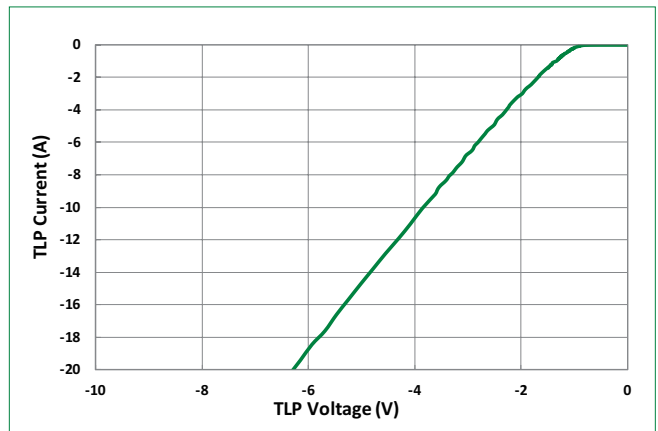
Clamping Voltage vs I_{PP}



Positive Transmission Line Pulsing (TLP) Plot



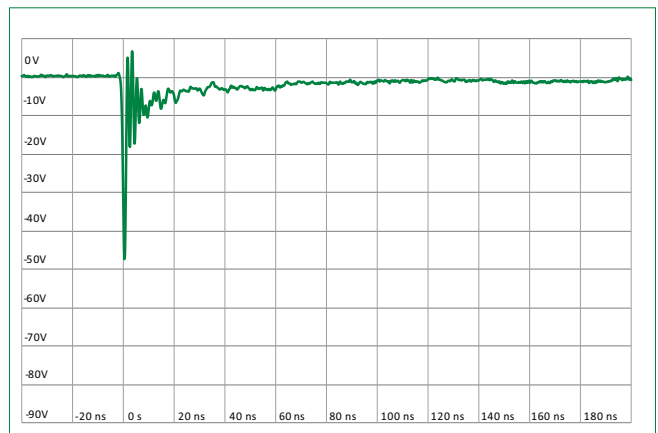
Negative Transmission Line Pulsing (TLP) Plot



IEC 61000-4-2 +8 kV Contact ESD Clamping Voltage



IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage



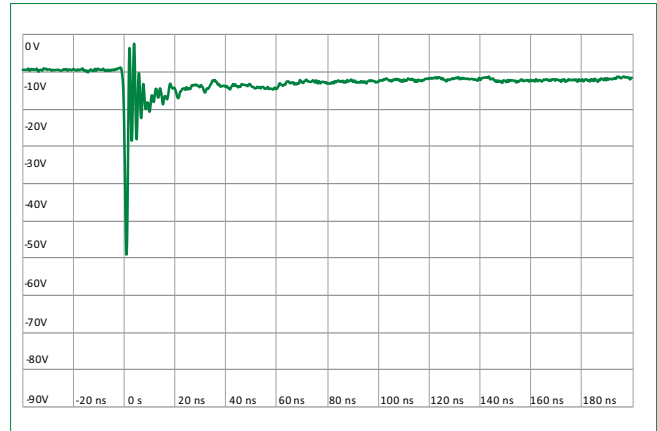
AQRV05-4HTG

1pF 12A Low Capacitance ESD Protection

ISO10605 Contact Discharge Plot at +8 kV

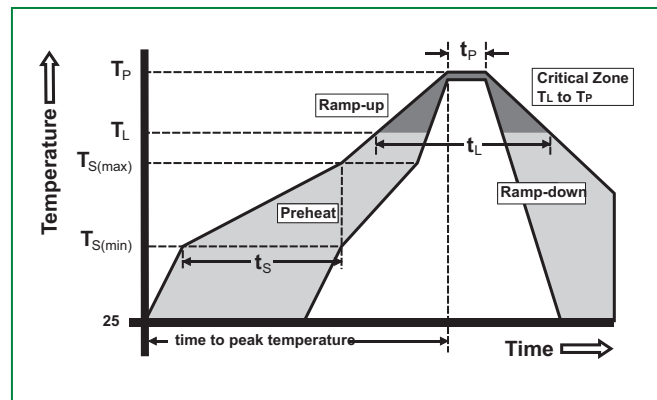


ISO10605 Contact Discharge Plot at -8 kV



Soldering Parameters

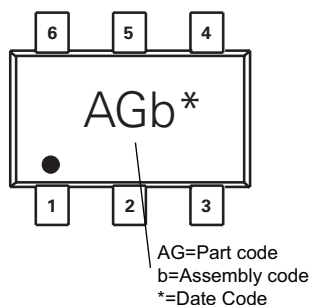
Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus) Temp (T_L) to peak		3°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (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)		30 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_p)		8 minutes Max.
Do not exceed		260°C



Ordering Information

Part Number	Package	Min. Order Qty.
AQRV05-4HTG	SOT23-6	3000

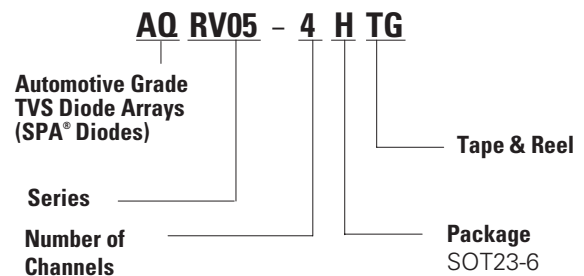
Part Marking System



Product Characteristics

Lead Plating	Matte Tin
Lead material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate Material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating 94V-0

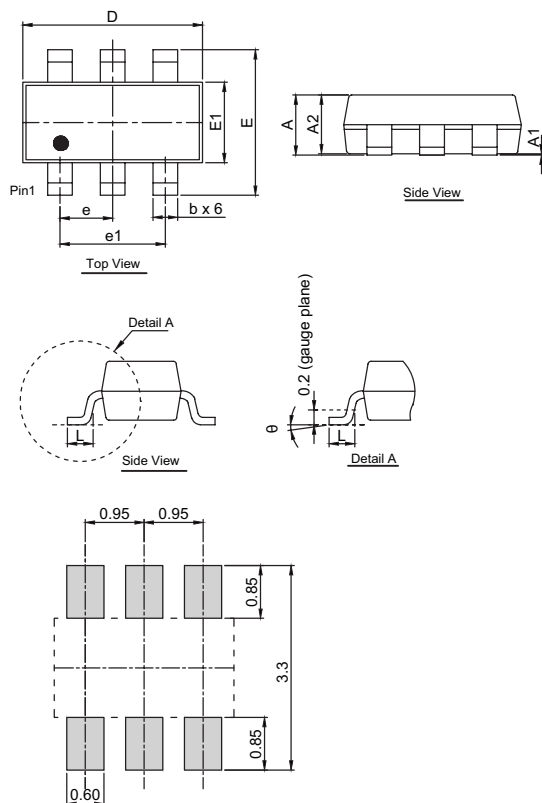
Part Numbering System



AQRV05-4HTG

1pF 12A Low Capacitance ESD Protection

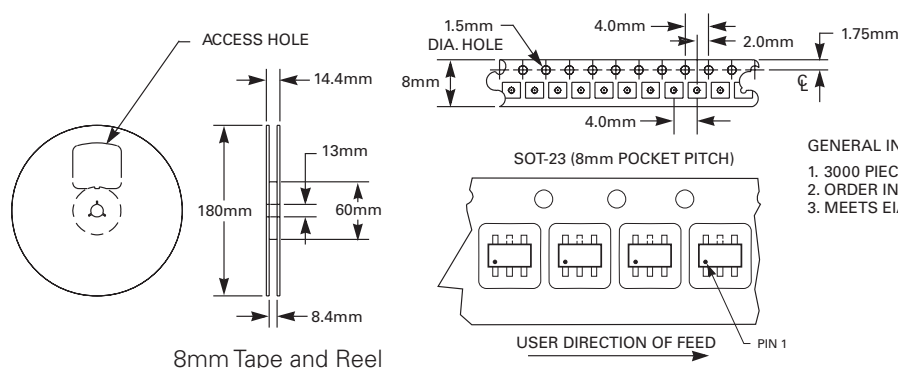
Package Dimensions - SOT23-6



Recommended soldering pad layout (unit :mm)

Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	1.45	-	0.057
A1	0	0.15	0	0.006
A2	0.90	1.30	0.035	0.051
b	0.25	0.50	0.010	0.020
D	2.70	3.05	0.106	0.120
E	2.60	3.00	0.102	0.118
E1	1.45	1.75	0.057	0.069
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.30	0.55	0.012	0.022
θ	0°	8°	0°	8°

Embossed Carrier Tape & Reel Specification – SOT23-6



Product Disclaimer: Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, automotive, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse. "Littelfuse" includes Littelfuse, Inc., and all of its affiliate entities. <http://www.littelfuse.com/disclaimer-electronics>.