

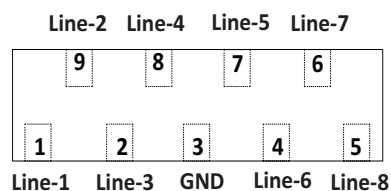
# AQ7538-08UTG

## 0.3pF Diode Array, Low Capacitance ESD Protection

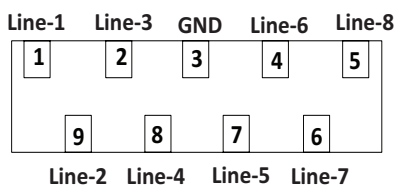


Note: This package image is for example and reference only. For detail package drawing, please refer to the package section in this datasheet.

### Pinout

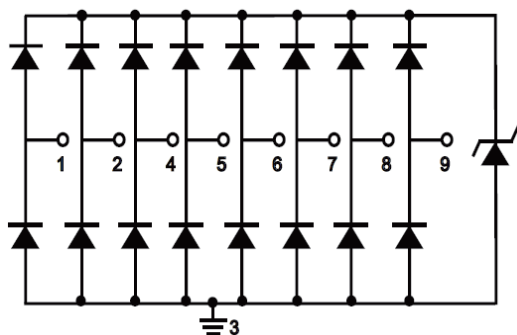


Top View



Bottom View

### Functional Block Diagram



#### 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 AQ7538 integrates 8 channels of ultra low capacitance rail-to-rail diodes and an additional zener diode to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). This robust device can safely absorb repetitive ESD strikes above the maximum level maximum level,  $\pm 8\text{kV}$  contact discharge, as specified in the international standard IEC 61000-4-2, without performance degradation standard ( $\pm 8\text{kV}$  contact discharge) without performance degradation. The extremely low loading capacitance also makes it ideal for protecting high speed signal pins such as V-By-One, HDMI, USB3.0, USB3.1, USB2.0, and IEEE 1394.

### Features

- ESD, IEC 61000-4-2,  $\pm 22\text{kV}$  contact,  $\pm 30\text{kV}$  air
- ESD, ISO 10605, 330pF 330 $\Omega$ , +30kV/-18kV contact, +30kV/-18kV air
- EFT, IEC 61000-4-4, 40A ( $t_p=5/50\text{ns}$ )
- Surge Tolerance, IEC 61000-4-5 2nd edition, 3A ( $t_p=8/20\mu\text{s}$ )
- Low capacitance of 0.3pF @0V, 3GHz (TYP) per I/O
- Low leakage current of 0.5 $\mu\text{A}$  (MAX) at 5V
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)
- AEC-Q101 Qualified and PPAP capable

### Applications

- V-By-One
- Embedded DisplayPort
- USB 2.0/3.0/3.1 Ports
- HDMI
- Flat Panel Displays
- LCD/LED TVs
- Smartphones
- Mobile Computing
- Automotive

**AQ7538-08UTG****0.3pF Diode Array, Low Capacitance ESD Protection****Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	3.0	A
$T_{OP}$	Operating Temperature	-40 to 150	°C
$T_{STOR}$	Storage Temperature	-55 to 150	°C

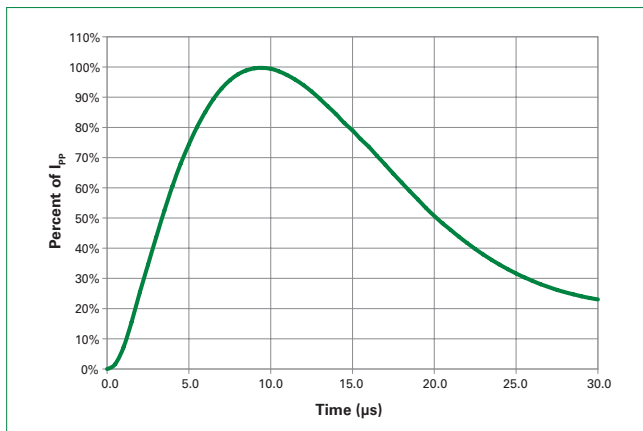
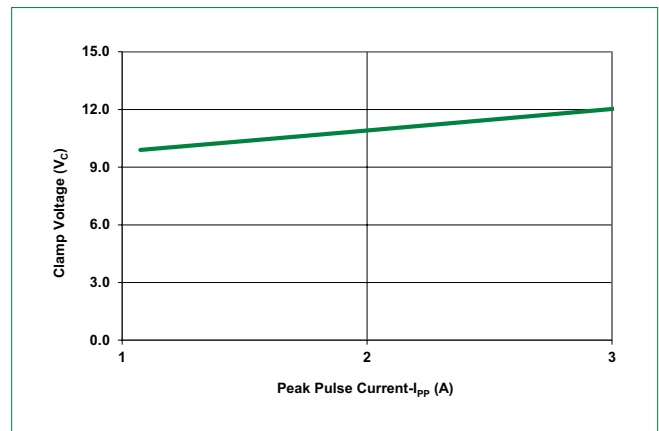
**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	Pin-1,-2,-4,-5,-6,-7,-8,-9 to pin-3			5	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	6			V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5V$ , I/O to GND			0.5	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd		9.9		V
		$I_{PP}=2A$ , $t_p=8/20\mu s$ , Fwd		10.9		V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to GND		0.5		$\Omega$
ESD Withstand Voltage <sup>1,3</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 22$			kV
		IEC 61000-4-2 (Air Discharge)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_{I/O-GND}$	Reverse Bias=0V, $f=3GHz$		0.3		pF

Notes:

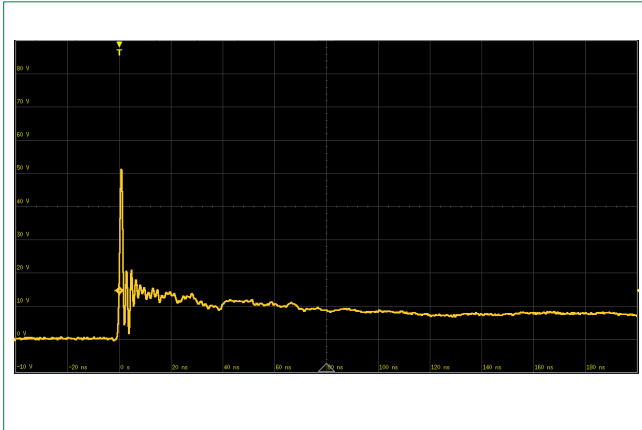
- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) test setting : Std.TDR(50 $\Omega$ ), $t_p=100ns$ ,  $tr=0.2ns$  ITLP and VTLP averaging window: start  $t_1=70ns$  to end  $t_2=90ns$
- Device stressed with ten non-repetitive ESD pulses.

**8/20 $\mu s$  Pulse Waveform****Clamping Voltage vs  $I_{PP}$** 

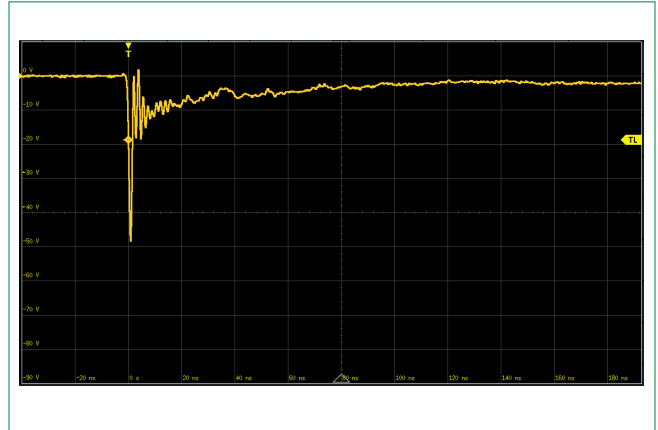
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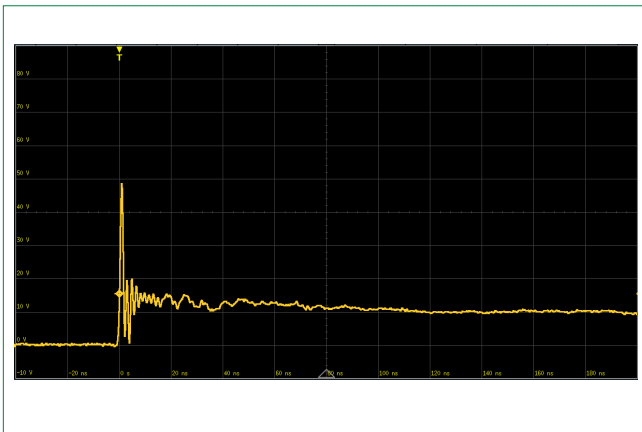
IEC 61000-4-2 +8 kV Contact ESD Clamping Voltage



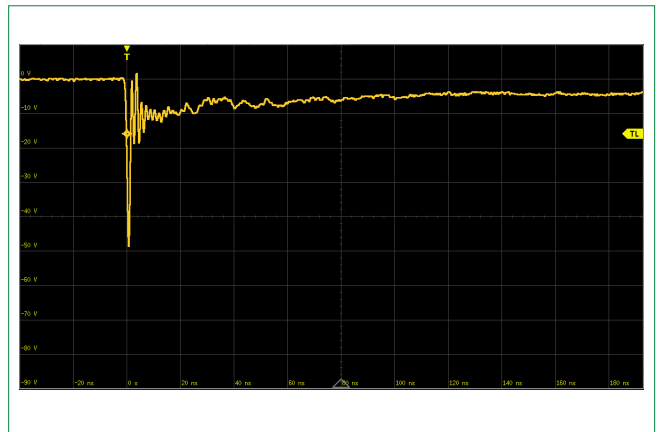
IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage



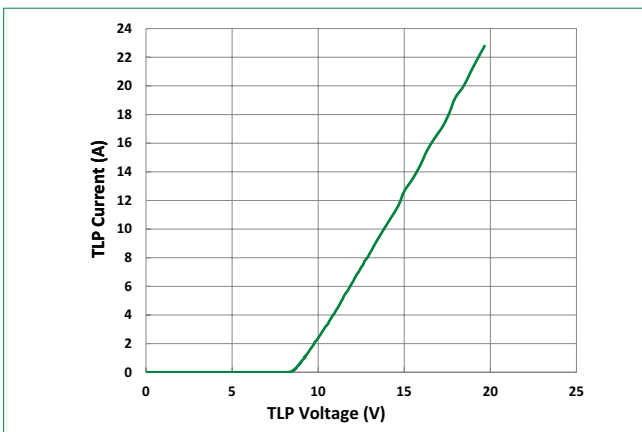
ISO10605 Contact Discharge Plot at +8 kV



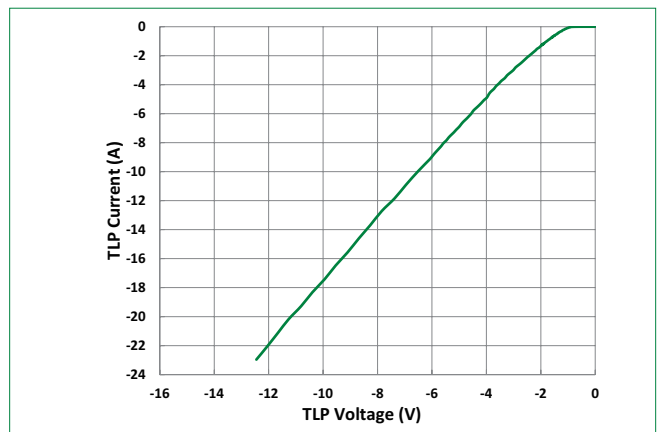
ISO10605 Contact Discharge Plot at -8 kV



Positive Transmission Line Pulsing (TLP) Plot



Negative Transmission Line Pulsing (TLP) Plot

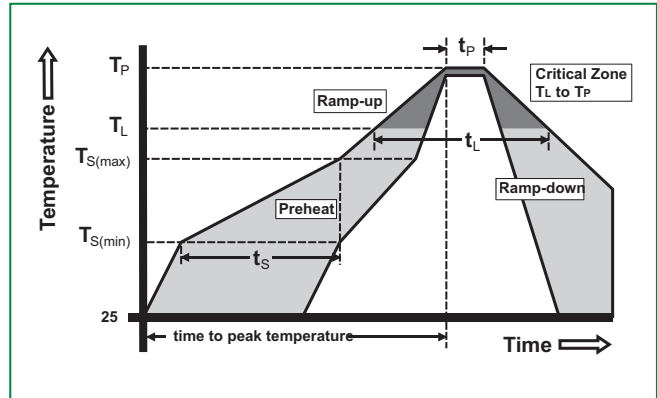


# AQ7538-08UTG

## 0.3pF Diode Array, Low Capacitance ESD Protection

### 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 – 120 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>		30 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



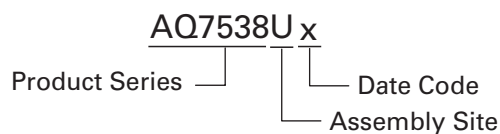
### Ordering Information

Part Number	Package	Min. Order Qty.
AQ7538-08UTG	$\mu$ DFN-9	3000

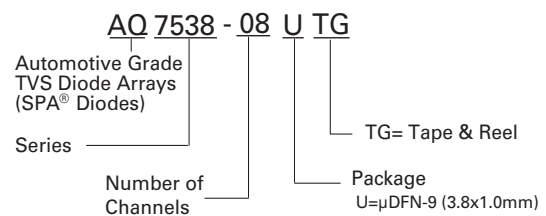
### Product Characteristics

<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 Marking System



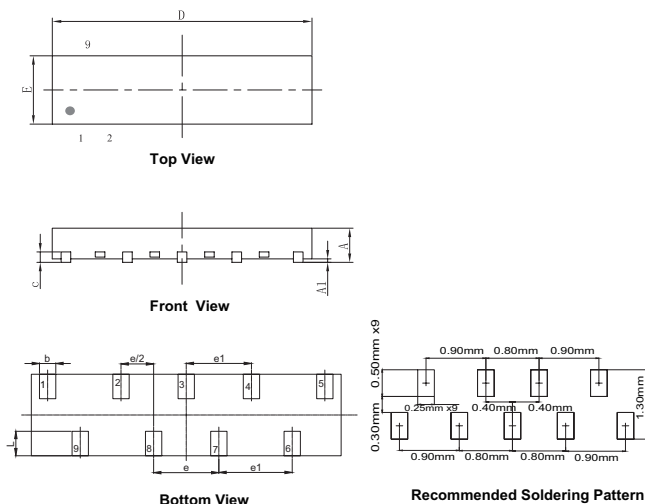
### Part Numbering System



# AQ7538-08UTG

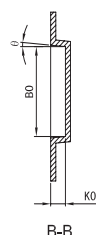
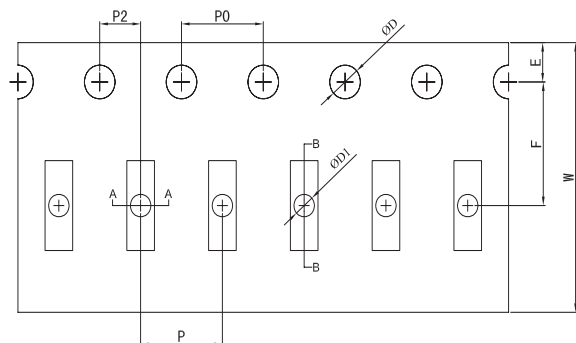
## 0.3pF Diode Array, Low Capacitance ESD Protection

### Package Dimensions

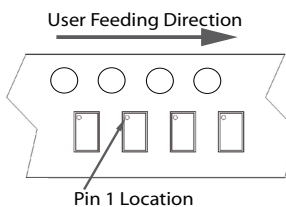
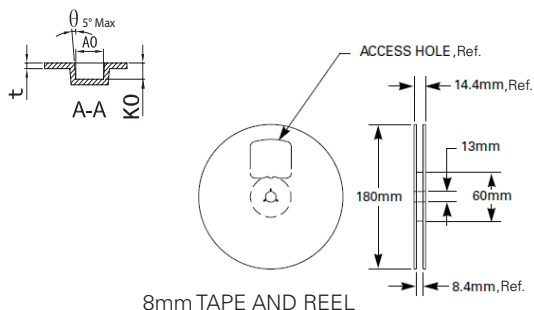


Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
<b>A</b>	0.45	0.50	0.55	0.018	0.020	0.022
<b>A1</b>	-	0.02	0.05	-	0.001	0.002
<b>b</b>	0.15	0.20	0.25	0.006	0.008	0.010
<b>c</b>	0.10	0.15	0.20	0.004	0.006	0.008
<b>D</b>	3.70	3.80	3.90	0.146	0.150	0.154
<b>e</b>	0.80 BSC			0.031 BSC		
<b>e1</b>	0.90 BSC			0.035 BSC		
<b>E</b>	0.90	1.00	1.10	0.035	0.039	0.043
<b>L</b>	0.20	0.30	0.40	0.008	0.012	0.016

### Embossed Carrier Tape & Reel Specification



Symbol	Millimeters
<b>A0</b>	1.35 +/- 0.10
<b>B0</b>	4.00 +/- 0.05
<b>D</b>	$\text{Ø} 1.50 + 0.1/ -0$
<b>D1</b>	$\text{Ø} 1.00 +/- 0.05$
<b>E</b>	1.75 +/- 0.10
<b>F</b>	5.50 +/- 0.05
<b>K0</b>	0.72 +/- 0.05
<b>P</b>	4.00 +/- 0.10
<b>P0</b>	4.00 +/- 0.10
<b>P2</b>	2.00 +/- 0.05
<b>T</b>	0.25 +/- 0.02
<b>W</b>	12.00 + 0.30 / - 0.10



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