

# MSQA6V1W5T2

## Quad Array for ESD Protection

### ESD Protection Diodes with Low Clamping Voltage

This quad monolithic silicon voltage suppressor is designed for applications requiring transient overvoltage protection capability. It is intended for use in voltage and ESD sensitive equipment such as computers, printers, business machines, communication systems, medical equipment, and other applications. Its quad junction common anode design protects four separate lines using only one package. These devices are ideal for situations where board space is at a premium.

#### Features

- Low Clamping Voltage
- Stand Off Voltage 3 V
- Low Leakage < 1  $\mu$ A @ 3 V
- SC-88A Package Allows Four Separate Unidirectional Configurations
- IEC1000-4-2 Level 4 ESD Protection
- Pb-Free Package is Available\*

#### Mechanical Characteristics:

- Void Free, Transfer-Molded, Thermosetting Plastic Case
- Corrosion Resistant Finish, Easily Solderable
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 20 $\mu$ s @ $T_A \leq 25^\circ\text{C}$ (Note 1)	$P_{pk}$	150	W
Steady State Power – 1 Diode (Note 2)	$P_D$	385	mW
Thermal Resistance, Junction-to-Ambient Above $25^\circ\text{C}$ , Derate	$R_{\theta JA}$	325 3.1	$^\circ\text{C/W}$ $\text{mW}/^\circ\text{C}$
Maximum Junction Temperature	$T_{Jmax}$	150	$^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_J T_{stg}$	-55 to +150	$^\circ\text{C}$
ESD Discharge MIL STD 883C – Method 3015-6 IEC1000-4-2, Air Discharge IEC1000-4-2, Contact Discharge	$V_{PP}$	16 16 9	kV
Lead Solder Temperature (10 s duration)	$T_L$	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Non-repetitive current per Figure 5. Derate per Figure 10.
2. Only 1 diode under power. For all 4 diodes under power,  $P_D$  will be 25%. Mounted on FR-4 board with min pad.

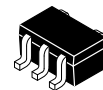
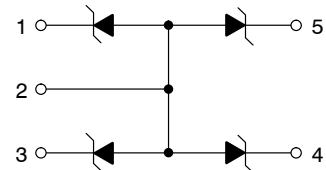
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

See Application Note AND8308/D for further description of survivability specs.



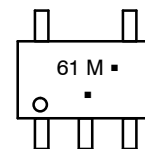
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SC-88A/SOT-323  
CASE 419A

#### MARKING DIAGRAM



61 = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping†
MSQA6V1W5T2	SC-88A	3000/Tape & Reel
MSQA6V1W5T2G	SC-88A (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

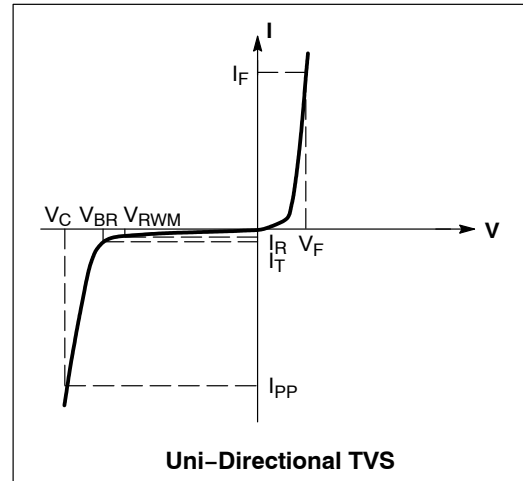
\*T2 Suffix Devices are Packaged with Pin 1 Opposing Sprocket Hole.

# MSQA6V1W5T2

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter
I <sub>PP</sub>	Maximum Reverse Peak Pulse Current
V <sub>C</sub>	Clamping Voltage @ I <sub>PP</sub>
V <sub>RWM</sub>	Working Peak Reverse Voltage
I <sub>R</sub>	Maximum Reverse Leakage Current @ V <sub>RWM</sub>
V <sub>BR</sub>	Breakdown Voltage @ I <sub>T</sub>
I <sub>T</sub>	Test Current
I <sub>F</sub>	Forward Current
V <sub>F</sub>	Forward Voltage @ I <sub>F</sub>
P <sub>pk</sub>	Peak Power Dissipation
C	Capacitance @ V <sub>R</sub> = 0 and f = 1.0 MHz



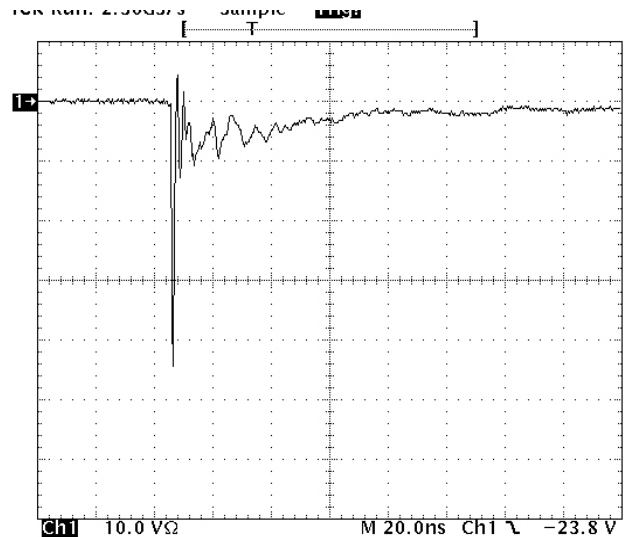
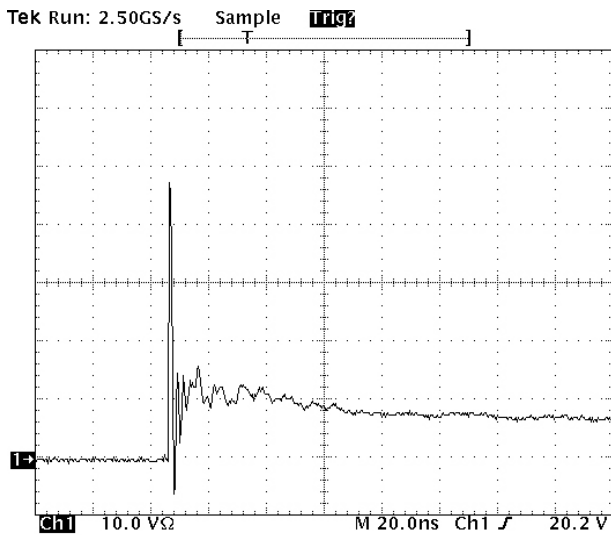
\*See Application Note AND8308/D for detailed explanations of datasheet parameters.

## ELECTRICAL CHARACTERISTICS

Device	Breakdown Voltage V <sub>BR</sub> @ 1 mA (Vo) (Note 3)			Leakage Current I <sub>RM</sub> @ V <sub>RWM</sub> = 3 V (μA)	Capacitance @ 0 V Bias (pF)	Max V <sub>F</sub> @ I <sub>F</sub> = 200 mA (V)	V <sub>C</sub>
	Min	Nom	Max				Per IEC61000-4-2 (Note 4)
MSQA6V1W5	6.1	6.6	7.2	1.0	90	1.25	Figures 1 and 2 See Below

3. V<sub>BR</sub> is measured with a pulse test current I<sub>T</sub> at an ambient temperature of 25°C.

4. For test procedure see Figures 3 and 4 and Application Note AND8307/D.



# MSQA6V1W5T2

## IEC 61000-4-2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

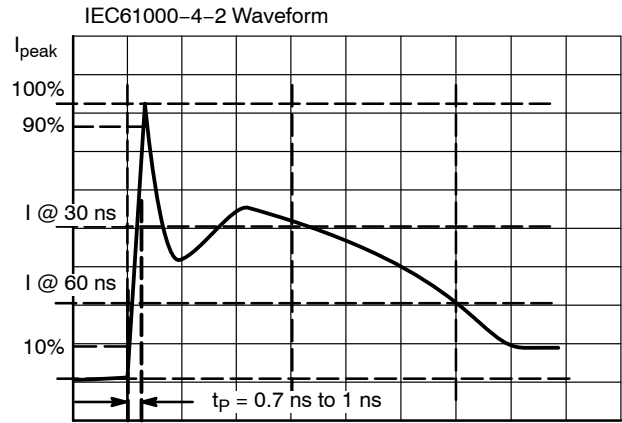


Figure 3. IEC61000-4-2 Spec

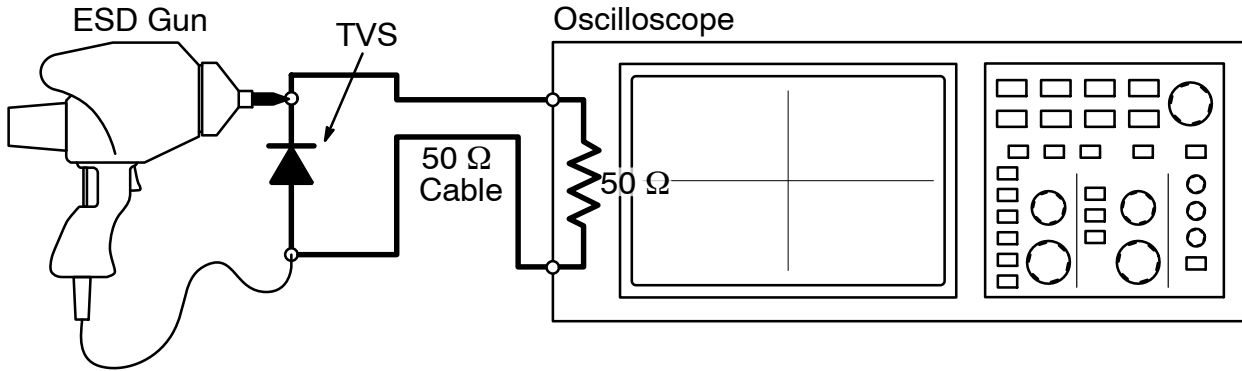


Figure 4. Diagram of ESD Test Setup

The following is taken from Application Note AND8308/D – Interpretation of Datasheet Parameters for ESD Devices.

### ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger

systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage at the device level. ON Semiconductor has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the datasheets for all ESD protection diodes. For more information on how ON Semiconductor creates these screenshots and how to interpret them please refer to AND8307/D.

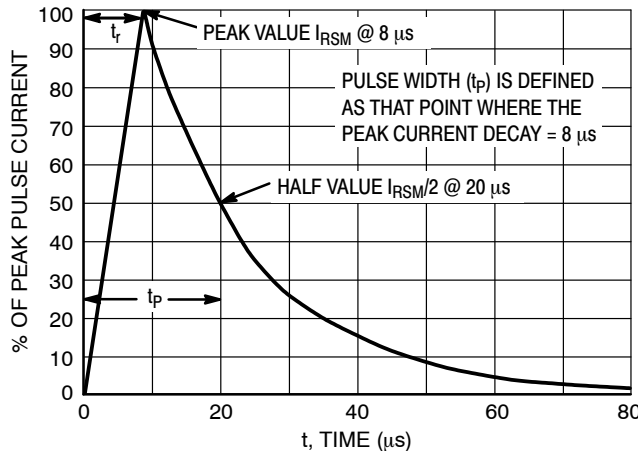


Figure 5. 8 X 20 μs Pulse Waveform

# MSQA6V1W5T2

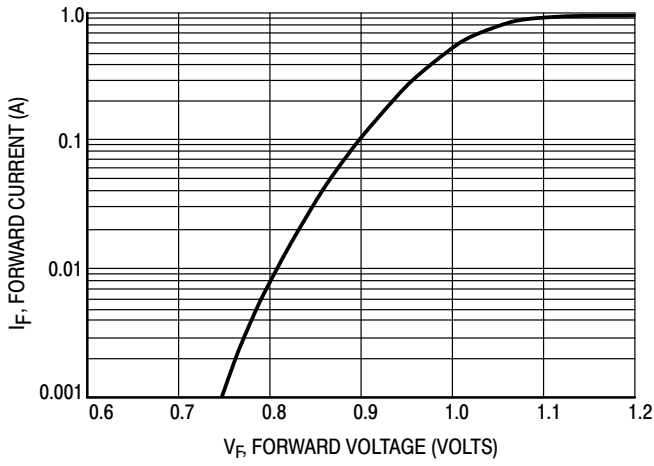


Figure 6. Forward Voltage

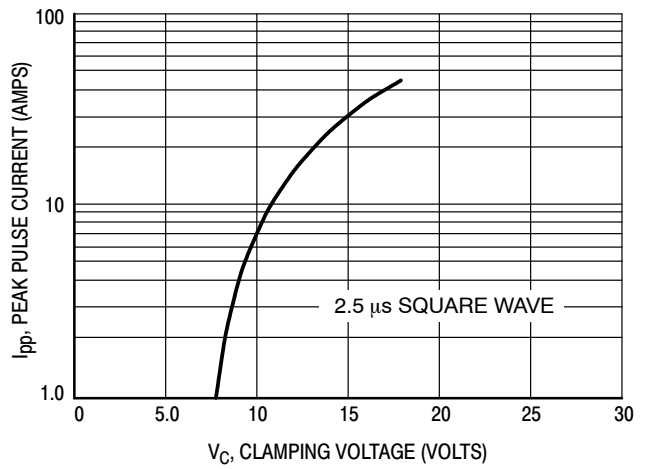


Figure 7. Clamping Voltage versus Peak Pulse Current (Reverse Direction)

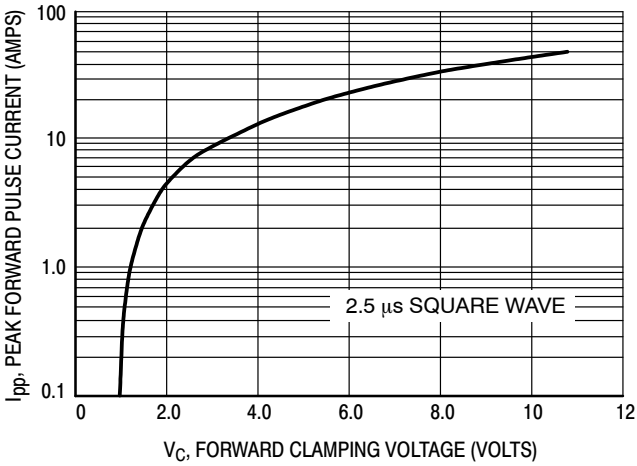


Figure 8. Clamping Voltage versus Peak Pulse Current (Forward Direction)

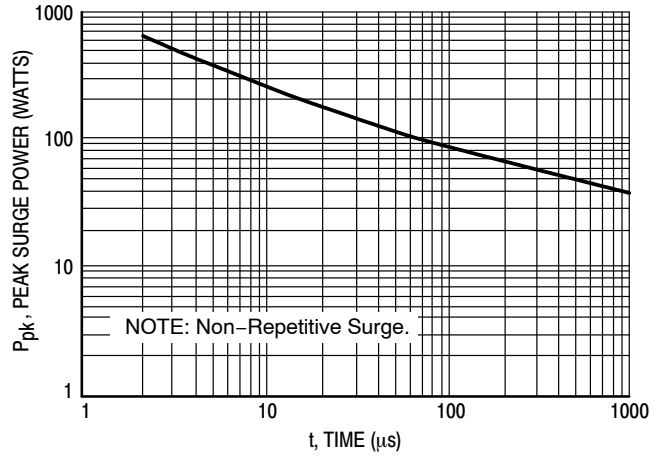


Figure 9. Pulse Width

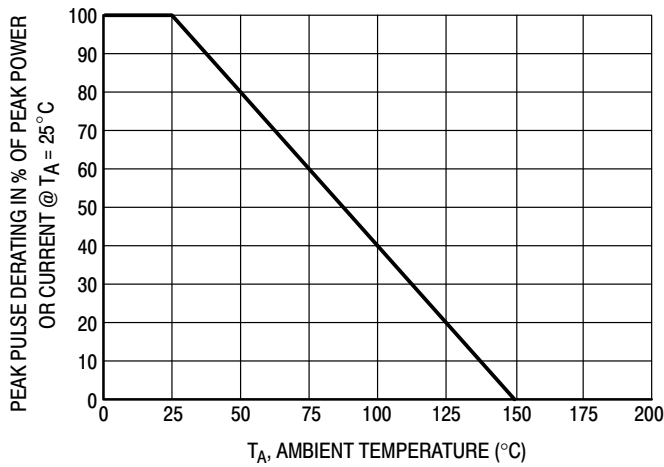


Figure 10. Pulse Derating Curve

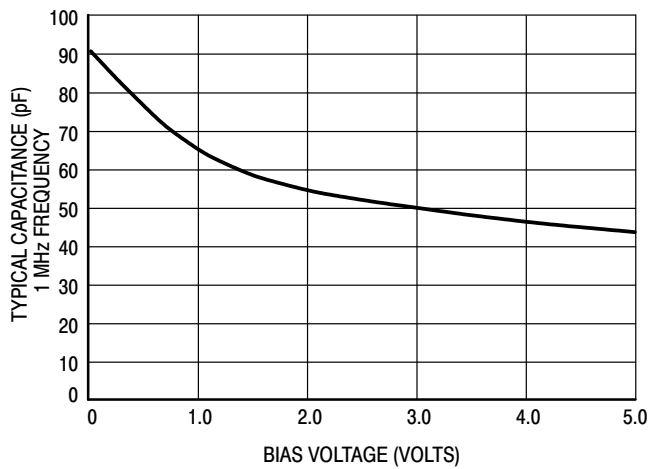
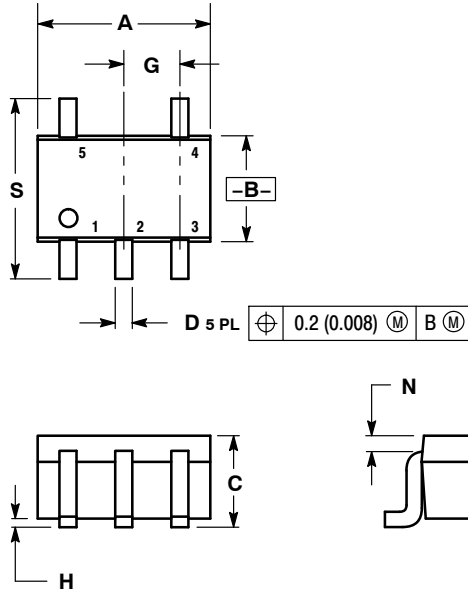


Figure 11. Capacitance

# MSQA6V1W5T2

## PACKAGE DIMENSIONS

SC-88A / SOT-353 / SC-70  
CASE 419A-02  
ISSUE J



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

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