



**THE DATASHEET OF
MMQA24VT1G**



MMQA, SZMMQA Quad Common Anode Series

ESD Protection Diode

SC-74 Quad Monolithic Common Anode

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

- SC-74 Package Allows Four Separate Unidirectional Configurations
- Peak Power – Min. 24 W @ 1.0 ms (Unidirectional), per Figure 5 Waveform
- Peak Power – Min. 150 W @ 20 μ s (Unidirectional), per Figure 6 Waveform
- Maximum Clamping Voltage @ Peak Pulse Current
- Low Leakage < 2.0 μ A
- ESD Rating of Class 3B (exceeding 16 kV) per the Human Body Model
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant*



ON Semiconductor®

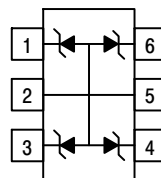
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SC-74 QUAD SURGE PROTECTION 24 WATTS PEAK POWER 5.6 – 33 VOLTS



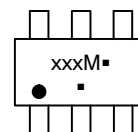
SC-74
CASE 318F
STYLE 1

PIN ASSIGNMENT



PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

MARKING DIAGRAM



xxx = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

DEVICE MARKING & ORDERING INFORMATION

See specific marking and ordering information in the device marking and ordering information table on page 6 of this data sheet.

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

MMQA, SZMMQA Quad Common Anode Series

THERMAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Characteristic	Symbol	Value	Unit
Peak Power Dissipation @ 1.0 ms (Note 1) @ $T_A \leq 25^\circ\text{C}$	P_{pk}	24	W
Peak Power Dissipation @ 20 μs (Note 2) @ $T_A \leq 25^\circ\text{C}$	P_{pk}	150	W
Total Power Dissipation on FR-5 Board (Note 3) @ $T_A = 25^\circ\text{C}$	P_D	225 1.8	MW mW/ $^\circ\text{C}$
Thermal Resistance from Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Power Dissipation on Alumina Substrate (Note 4) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	MW mW/ $^\circ\text{C}$
Thermal Resistance from Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
Lead Solder Temperature – Maximum (10 Second Duration)	T_L	260	$^\circ\text{C}$

1. Non-repetitive current pulse per Figure 5 and derate above $T_A = 25^\circ\text{C}$ per Figure 4.
2. Non-repetitive current pulse per Figure 6 and derate above $T_A = 25^\circ\text{C}$ per Figure 4.
3. FR-5 = 1.0 x 0.75 x 0.62 in.
4. Alumina = 0.4 x 0.3 x 0.024 in., 99.5% alumina

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

UNIDIRECTIONAL

(Circuit tied to pins 1, 2, and 5; Pins 2, 3, and 5; Pins 2, 4, and 5; or Pins 2, 5, and 6) ($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

Device (Note 5)	Breakdown Voltage			Max Reverse Leakage Current			Max Zener Impedance (Note 7)	Max Reverse Surge Current	Max Reverse Voltage @ I_{RSM} (Note 8) (Clamping Voltage)	Maximum Temperature Coefficient of V_Z	Capacitance @ 0 Volt Bias, 1 MHz	
	V_{ZT} (Note 6) (V)			@ I_{ZT}	I_R	V_R					Min	Max
MMQA5V6T1G	5.32	5.6	5.88	1.0	2000	3.0	400	3.0	8.0	1.26	-	-
MMQA6V2T1G/T3G	5.89	6.2	6.51	1.0	700	4.0	300	2.66	9.0	10.6	-	-
MMQA6V8T1G	6.46	6.8	7.14	1.0	500	4.3	300	2.45	9.8	10.9	100	250
MMQA12VT1G	11.4	12	12.6	1.0	75	9.1	80	1.39	17.3	14	-	-
MMQA13VT1G	12.4	13	13.7	1.0	75	9.8	80	1.29	18.6	15	-	-
MMQA15VT1G	14.3	15	15.8	1.0	75	11	80	1.1	21.7	16	-	-
MMQA18VT1G	17.1	18	18.9	1.0	75	14	80	0.923	26	19	-	-
MMQA20VT1G/T3G	19	20	21	1.0	75	15	80	0.84	28.6	20.1	-	-
MMQA22VT1G	20.9	22	23.1	1.0	75	17	80	0.758	31.7	22	-	-
MMQA24VT1G	22.8	24	25.2	1.0	75	18	100	0.694	34.6	25	-	-
MMQA27VT1G	25.7	27	28.4	1.0	75	21	125	0.615	39	28	-	-
MMQA33VT1G	31.4	33	34.7	1.0	75	25	200	0.504	48.6	37	-	-

5. Includes SZ-prefix devices where applicable.
6. V_Z measured at pulse test current I_T at an ambient temperature of 25°C .
7. Z_{ZT} is measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.
8. Surge current waveform per Figure 5 and derate per Figure 4.

MMQA, SZMMQA Quad Common Anode Series

TYPICAL CHARACTERISTICS



Figure 1. Typical Capacitance

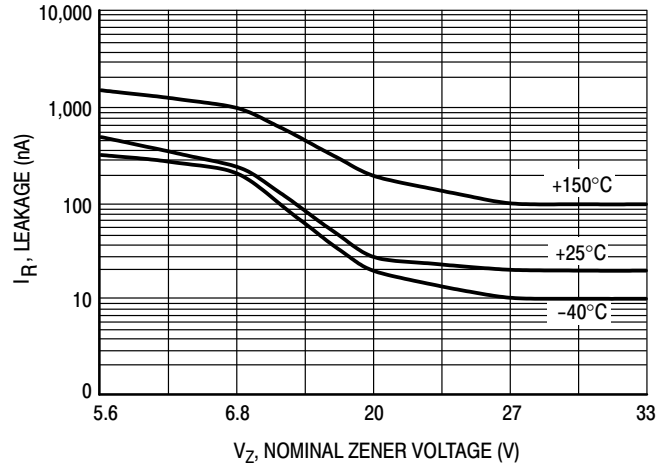


Figure 2. Typical Leakage Current

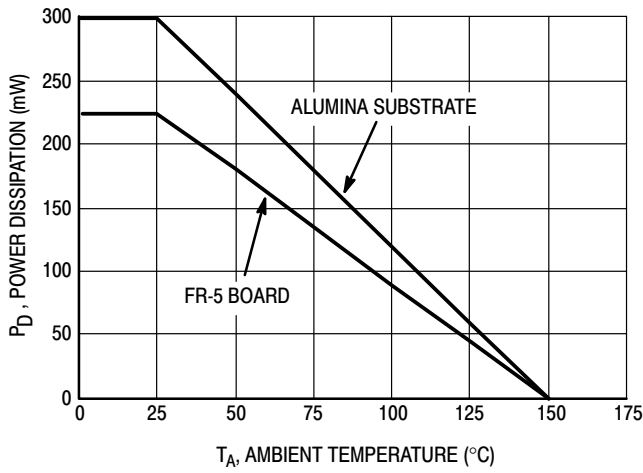


Figure 3. Steady State Power Derating Curve

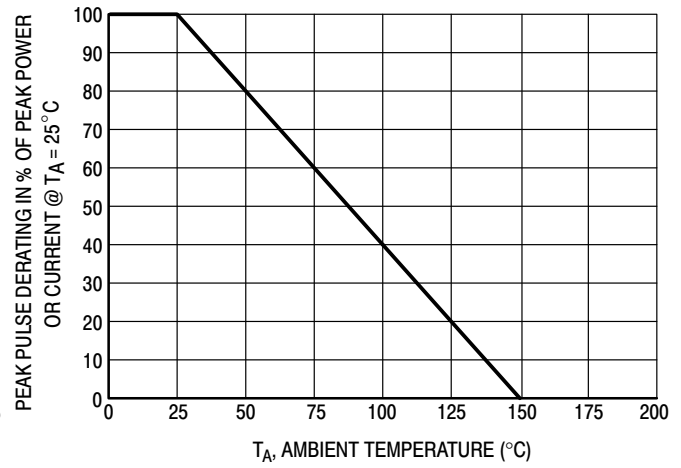


Figure 4. Pulse Derating Curve

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TYPICAL CHARACTERISTICS

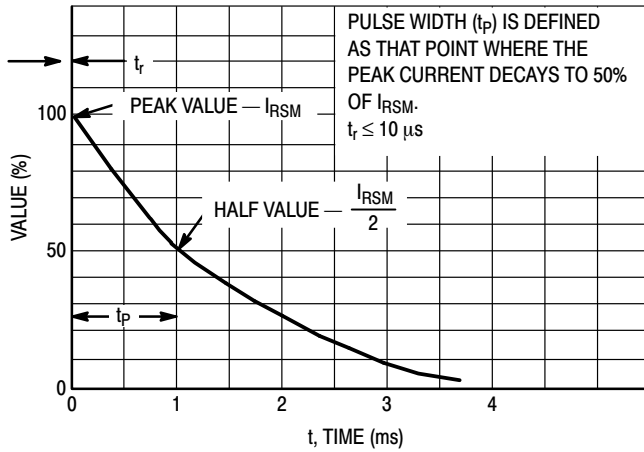


Figure 5. $10 \times 1000 \mu\text{s}$ Pulse Waveform



Figure 6. $8 \times 20 \mu\text{s}$ Pulse Waveform

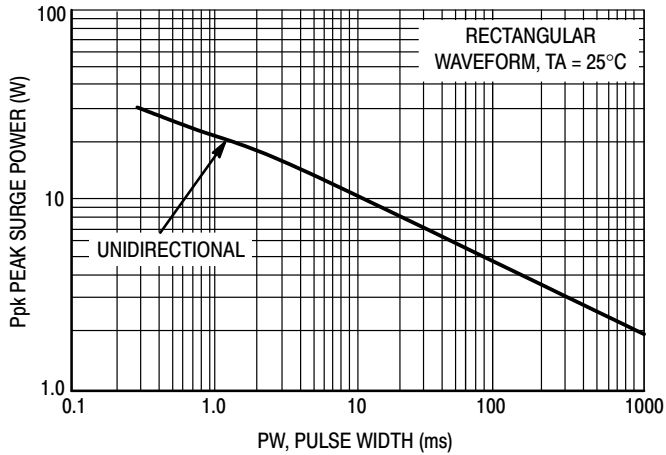


Figure 7. Maximum Non-Repetitive Surge Power, P_{pk} versus PW

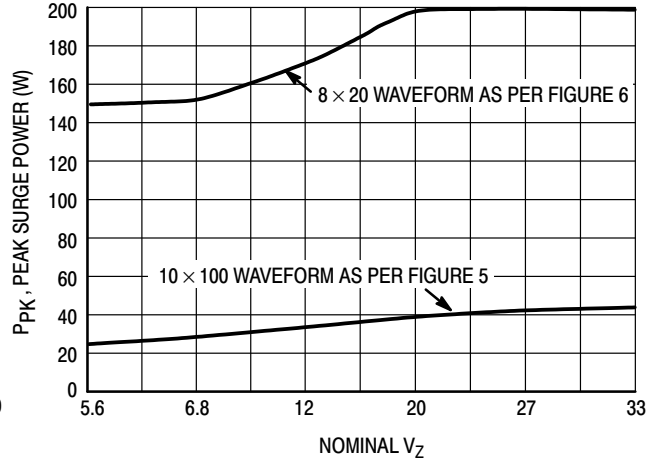


Figure 8. Typical Maximum Non-Repetitive Surge Power, P_{pk} versus V_Z

Power is defined as $V_{RSM} \times I_Z(pk)$ where V_{RSM} is the clamping voltage at $I_Z(pk)$.

MMQA, SZMMQA Quad Common Anode Series

TYPICAL COMMON ANODE APPLICATIONS

A quad junction common anode design in a SC-74 package protects four separate lines using only one package. This adds flexibility and creativity to PCB design especially

when board space is at a premium. A simplified example of MMQA/SZMMQA Series Device applications is illustrated below.

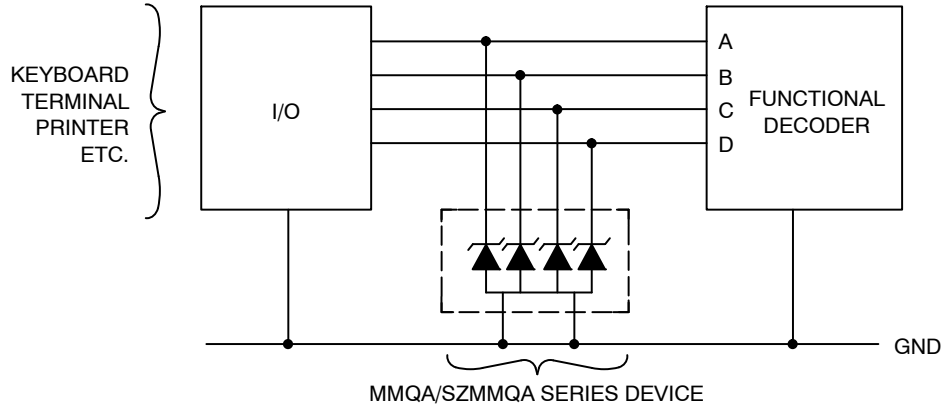


Figure 9. Computer Interface Protection

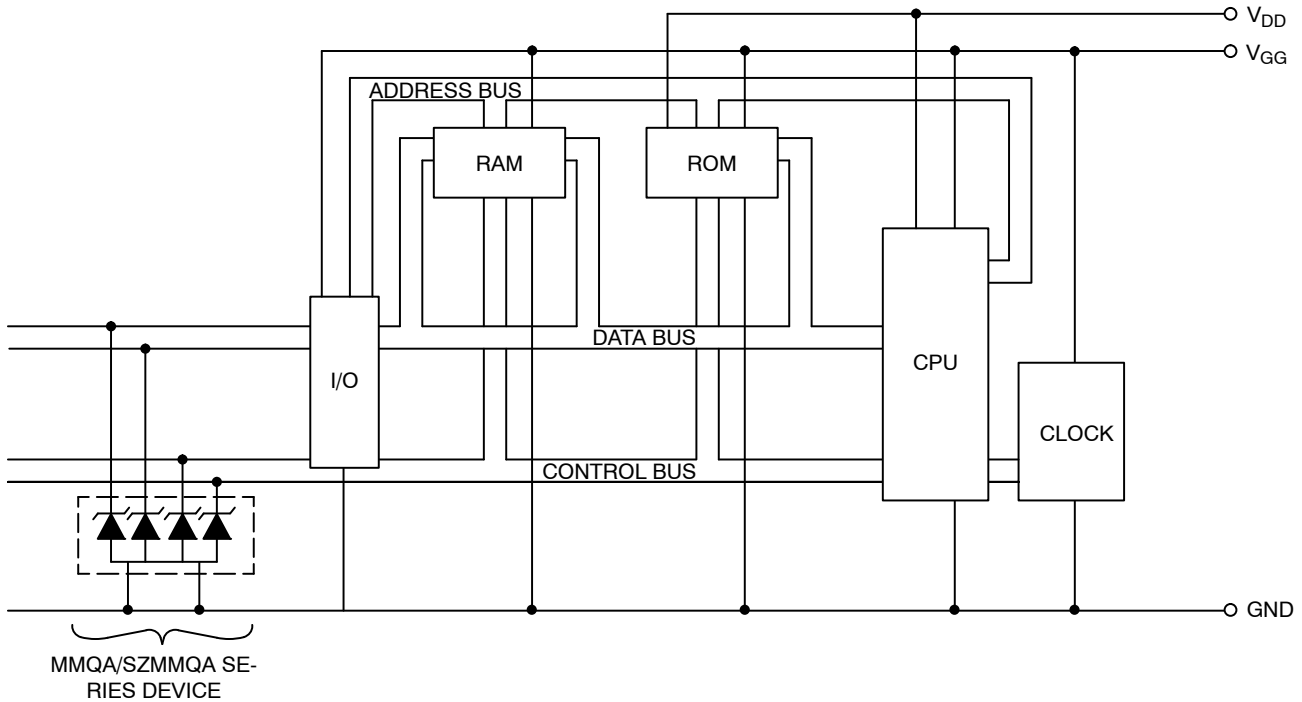


Figure 10. Microprocessor Protection

MMQA, SZMMQA Quad Common Anode Series

DEVICE MARKING AND ORDERING INFORMATION

Device*	Device Marking	Package	Shipping
MMQA5V6T1G	5A6	SC-74 (Pb-Free)	3,000/Tape & Reel
MMQA6V2T1G	6A2		3,000/Tape & Reel
MMQA6V2T3G	6A2		10,000/Tape & Reel
MMQA6V8T1G	6A8		3,000/Tape & Reel
MMQA12VT1G	12A		3,000/Tape & Reel
MMQA13VT1G	13A		3,000/Tape & Reel
MMQA15VT1G	15A		3,000/Tape & Reel
MMQA18VT1G	18A		3,000/Tape & Reel
MMQA20VT1G	20A		3,000/Tape & Reel
MMQA20VT3G	20A		10,000/Tape & Reel
MMQA22VT1G	22A		3,000/Tape & Reel
MMQA24VT1G	24A		3,000/Tape & Reel
MMQA27VT1G	27A		3,000/Tape & Reel
MMQA27VT3G	27A		10,000/Tape & Reel
MMQA33VT1G	33A		3,000/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.

*Include S SZ-prefix devices where applicable.

Mechanical Characteristics:

CASE: Void-free, Transfer-molded, Thermosetting Plastic Case.

FINISH: Corrosion resistant finish, easily solderable.

Package designed for optimal automated board assembly.

Small package size for high density applications.

Available in 8 mm Tape and Reel.

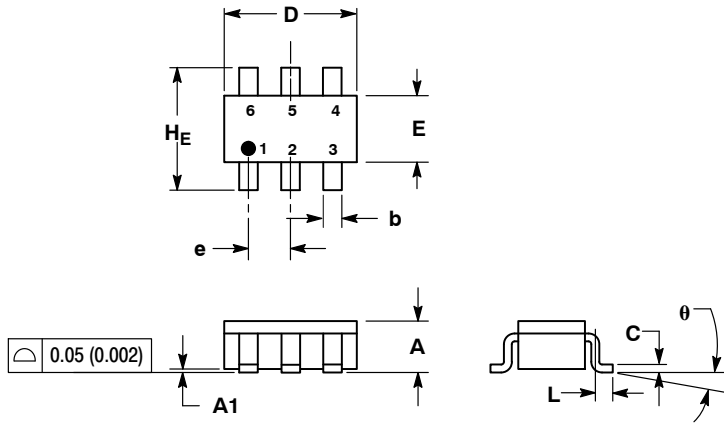
Use the Device Number to order the 7 inch/3,000 unit reel.

Replace the "T1" with "T3" in the Device Number to order the 13 inch/10,000 unit reel.

MMQA, SZMMQA Quad Common Anode Series

PACKAGE DIMENSIONS

SC-74
CASE 318F-05
ISSUE N

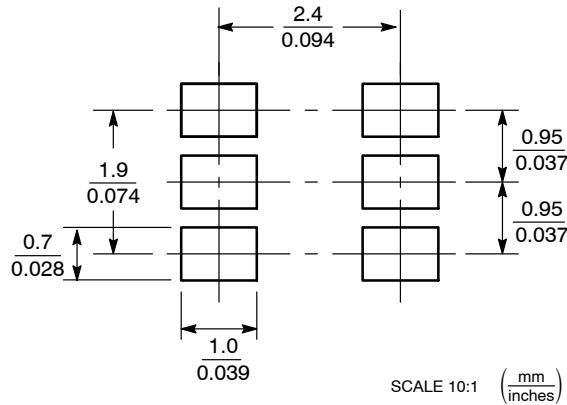


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
H _E	2.50	2.75	3.00	0.099	0.108	0.118
θ						

SOLDERING FOOTPRINT*



STYLE 1:

- Pin 1: 0° 10°
1. CATHODE
 2. ANODE
 3. CATHODE
 4. CATHODE
 5. ANODE
 6. CATHODE

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

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