

# MMQA Quad Common Anode Series

Preferred Devices

## SC-74 Quad Monolithic Common Anode Transient Voltage Suppressors for ESD Protection

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.

### Specification 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  $\mu$ s (Unidirectional), per Figure 6 Waveform
- Maximum Clamping Voltage @ Peak Pulse Current
- Low Leakage  $< 2.0 \mu$ A
- ESD Rating of Class N (exceeding 16 kV) per the Human Body Model
- Pb-Free Packages are Available

### 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 $\mu$ s (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<br>1.8  | mW<br>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<br>2.4  | mW<br>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         | $^\circ\text{C}$           |

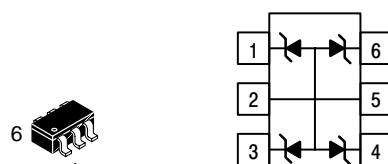


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### SC-74 QUAD TRANSIENT VOLTAGE SUPPRESSOR 24 WATTS PEAK POWER 5.6 – 33 VOLTS

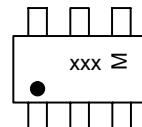
#### PIN ASSIGNMENT



SC-74  
PLASTIC  
CASE 318F

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

#### MARKING DIAGRAM



xxx = Device Code  
M = Date Code

#### ORDERING INFORMATION

See detailed ordering and shipping information in the table on page 5 of this data sheet.

#### DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 5 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

# MMQA Quad Common Anode Series

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       | Breakdown Voltage     |            |       |       | Max Reverse Leakage Current |     | Max Zener Impedance (Note 7) (Ω) | Max Reverse Surge Current | Max Reverse Voltage @ $I_{RSM}$ (Note 6) (Clamping Voltage) (V) | Maximum Temperature Coefficient of $V_Z$ (mV/°C) | Capacitance @ 0 Volt Bias, 1 MHz (pF) |     |     |
|--------------|-----------------------|------------|-------|-------|-----------------------------|-----|----------------------------------|---------------------------|---|--|---------------------------------------|-----|-----|
|              | $V_{ZT}$ (Note 5) (V) | @ $I_{ZT}$ | $I_R$ | $V_R$ | Min                         | Nom | Max                              | (mA)                      | (nA)  | (V)  | Min                                   | Max |     |
|              |                       |            |       |       |                             |     |                                  |                           |   |  |                                       |     |     |
| MMQA5V6T1,T3 | 5.32                  | 5.6        | 5.88  | 1.0   | 2000                        | 3.0 | 400                              | 3.0                       |   | 8.0  | 1.26                                  | —   | —   |
| MMQA6V2T1,T3 | 5.89                  | 6.2        | 6.51  | 1.0   | 700                         | 4.0 | 300                              | 2.66                      |   | 9.0  | 10.6                                  | —   | —   |
| MMQA6V8T1,T3 | 6.46                  | 6.8        | 7.14  | 1.0   | 500                         | 4.3 | 300                              | 2.45                      |   | 9.8  | 10.9                                  | 100 | 250 |
| MMQA12VT1,T3 | 11.4                  | 12         | 12.6  | 1.0   | 75                          | 9.1 | 80                               | 1.39                      |   | 17.3   | 14                                    | —   | —   |
| MMQA13VT1    | 12.4                  | 13         | 13.7  | 1.0   | 75                          | 9.8 | 80                               | 1.29                      |   | 18.6   | 15                                    | —   | —   |
| MMQA15VT1,T3 | 14.3                  | 15         | 15.8  | 1.0   | 75                          | 11  | 80                               | 1.1                       |   | 21.7   | 16                                    | —   | —   |
| MMQA18VT1,T3 | 17.1                  | 18         | 18.9  | 1.0   | 75                          | 14  | 80                               | 0.923                     |   | 26   | 19                                    | —   | —   |
| MMQA20VT1,T3 | 19                    | 20         | 21    | 1.0   | 75                          | 15  | 80                               | 0.84                      |   | 28.6   | 20.1                                  | —   | —   |
| MMQA21VT1,T3 | 20                    | 21         | 22.1  | 1.0   | 75                          | 16  | 80                               | 0.792                     |   | 30.3   | 21                                    | —   | —   |
| MMQA22VT1,T3 | 20.9                  | 22         | 23.1  | 1.0   | 75                          | 17  | 80                               | 0.758                     |   | 31.7   | 22                                    | —   | —   |
| MMQA24VT1,T3 | 22.8                  | 24         | 25.2  | 1.0   | 75                          | 18  | 100                              | 0.694                     |   | 34.6   | 25                                    | —   | —   |
| MMQA27VT1,T3 | 25.7                  | 27         | 28.4  | 1.0   | 75                          | 21  | 125                              | 0.615                     |   | 39   | 28                                    | —   | —   |
| MMQA30VT1,T3 | 28.5                  | 30         | 31.5  | 1.0   | 75                          | 23  | 150                              | 0.554                     |   | 43.3   | 32                                    | —   | —   |
| MMQA33VT1,T3 | 31.4                  | 33         | 34.7  | 1.0   | 75                          | 25  | 200                              | 0.504                     |   | 48.6   | 37                                    | —   | —   |

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 =  $1.0 \times 0.75 \times 0.62$  in.
4. Alumina =  $0.4 \times 0.3 \times 0.024$  in., 99.5% alumina
5.  $V_Z$  measured at pulse test current  $I_T$  at an ambient temperature of  $25^\circ\text{C}$ .
6. Surge current waveform per Figure 5 and derate per Figure 4.
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.

## TYPICAL CHARACTERISTICS

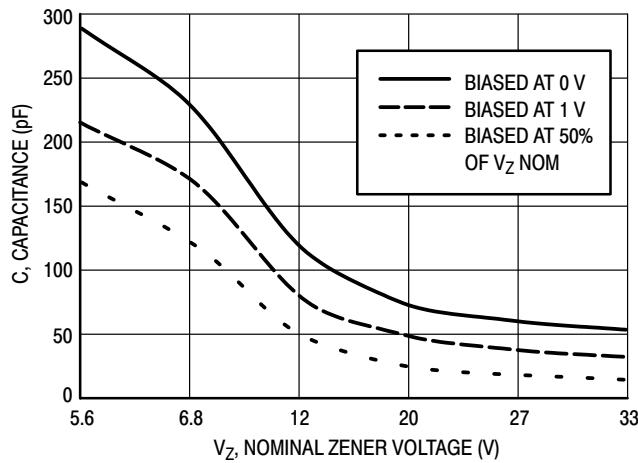


Figure 1. Typical Capacitance

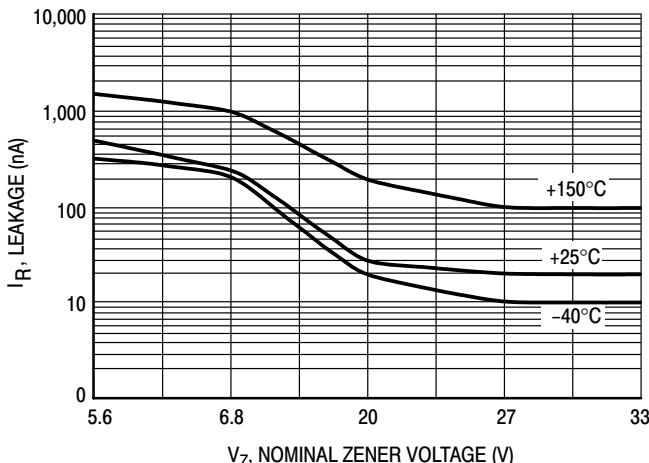


Figure 2. Typical Leakage Current

# MMQA Quad Common Anode Series

## TYPICAL CHARACTERISTICS

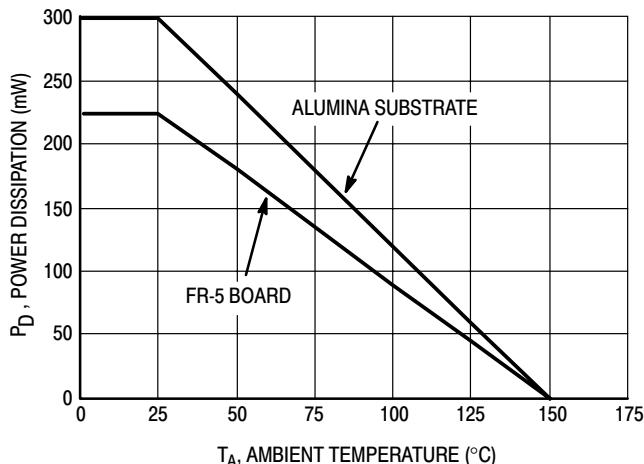


Figure 3. Steady State Power Derating Curve

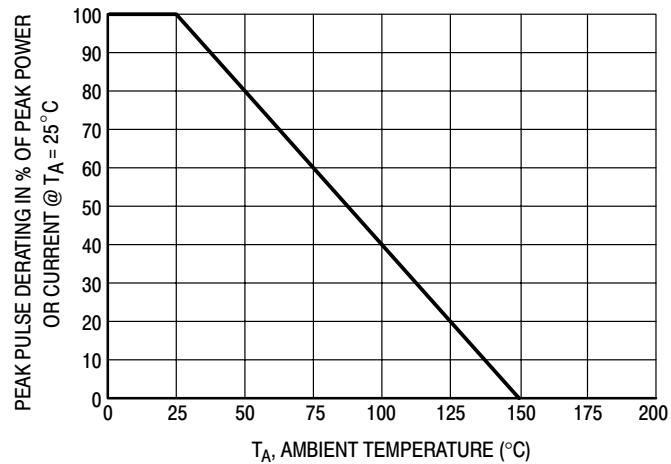


Figure 4. Pulse Derating Curve

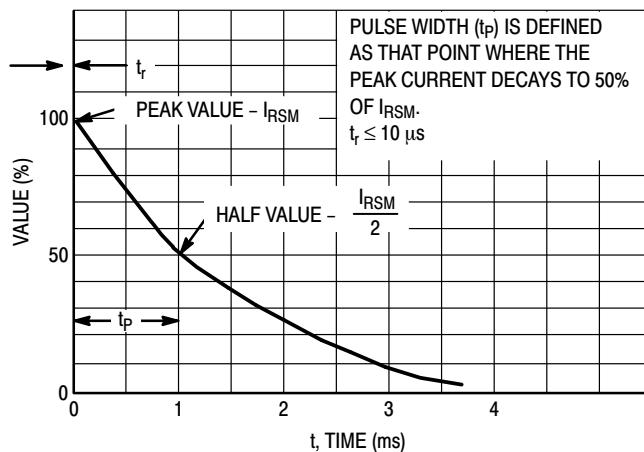


Figure 5. 10 × 1000  $\mu$ s Pulse Waveform

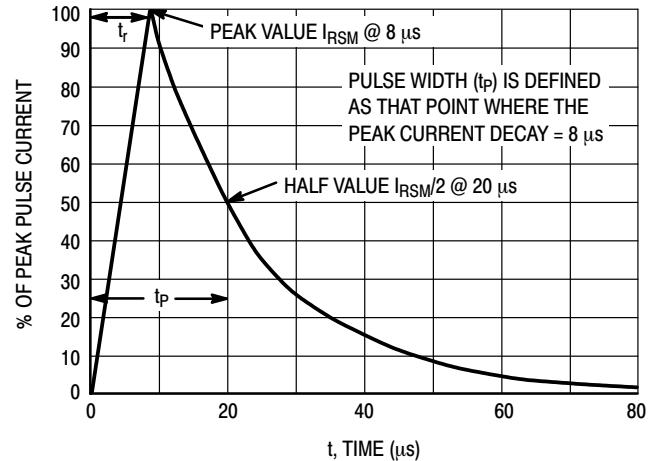


Figure 6. 8 × 20  $\mu$ s Pulse Waveform

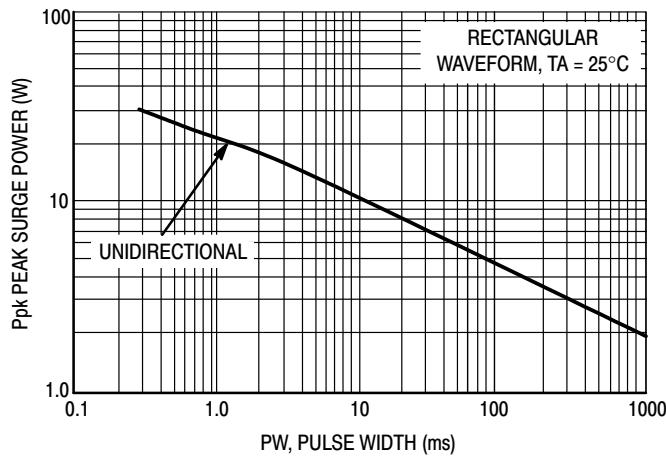


Figure 7. Maximum Non-Repetitive Surge Power, Ppk versus PW

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

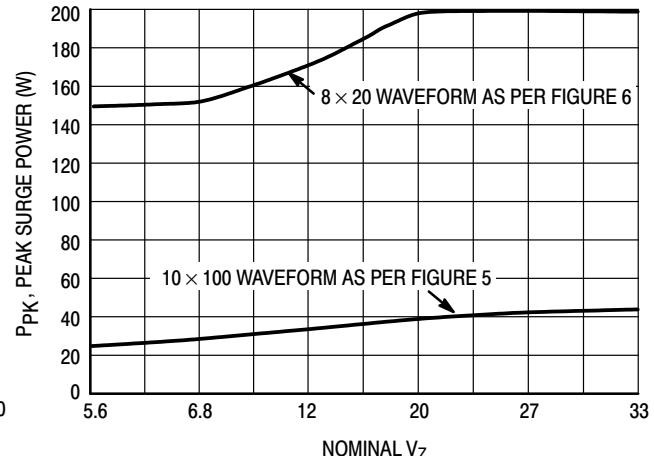


Figure 8. Typical Maximum Non-Repetitive Surge Power, Ppk versus  $V_{BR}$

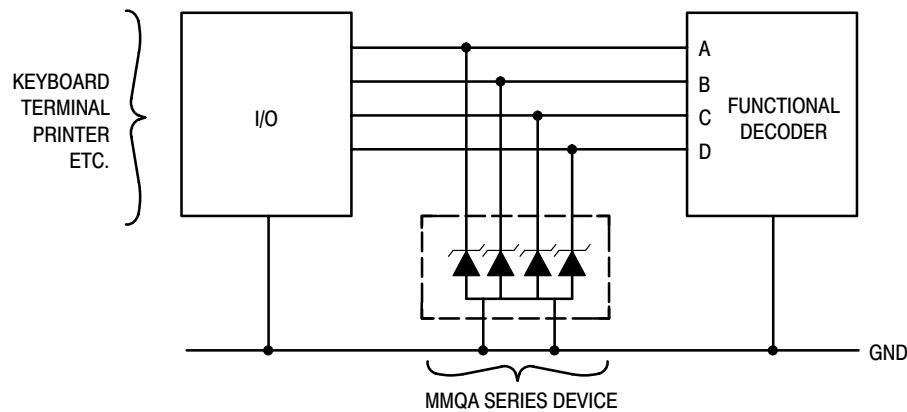
## MMQA Quad Common Anode Series

### TYPICAL COMMON ANODE APPLICATIONS

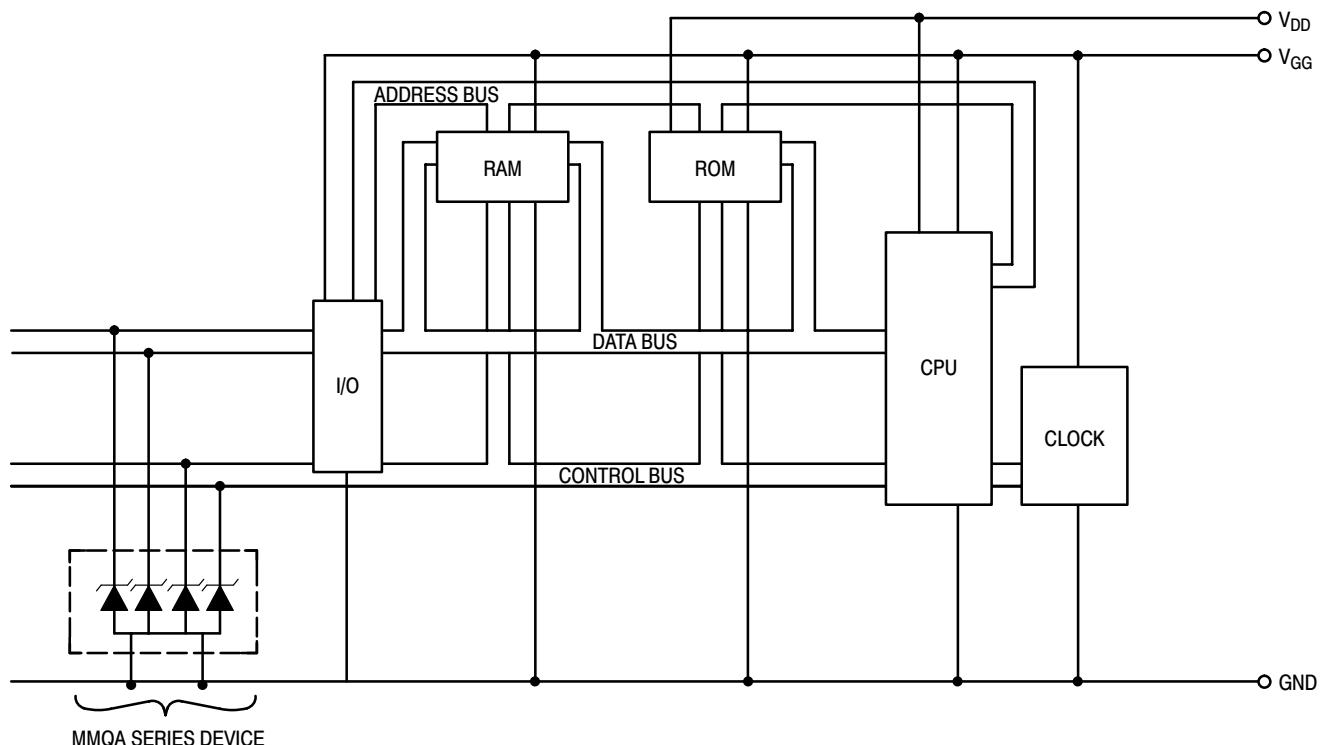
A quad junction common anode design in a SC-74 package protects four separate lines using only one package. This adds flexibility and creativity to PCB design especially

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

#### Computer Interface Protection



#### Microprocessor Protection



## MMQA Quad Common Anode Series

### DEVICE MARKING AND ORDERING INFORMATION

| Device     | Device Marking | Package            | Shipping <sup>†</sup> |
|------------|----------------|--------------------|-----------------------|
| MMQA5V6T1  | 5A6            | SC-74              | 3,000/Tape & Reel     |
| MMQA5V6T3  | 5A6            | SC-74              | 10,000/Tape & Reel    |
| MMQA6V2T1  | 6A2            | SC-74              | 3,000/Tape & Reel     |
| MMQA6V2T1G | 6A2            | SC-74<br>(Pb-Free) | 3,000/Tape & Reel     |
| MMQA6V2T3  | 6A2            | SC-74              | 10,000/Tape & Reel    |
| MMQA6V8T1  | 6A8            | SC-74              | 3,000/Tape & Reel     |
| MMQA6V8T3  | 6A8            | SC-74              | 10,000/Tape & Reel    |
| MMQA12VT1  | 12A            | SC-74              | 3,000/Tape & Reel     |
| MMQA12VT1G | 12A            | SC-74<br>(Pb-Free) | 3,000/Tape & Reel     |
| MMQA12VT3  | 12A            | SC-74              | 10,000/Tape & Reel    |
| MMQA13VT1  | 13A            | SC-74              | 3,000/Tape & Reel     |
| MMQA15VT1  | 15A            | SC-74              | 3,000/Tape & Reel     |
| MMQA15VT3  | 15A            | SC-74              | 10,000/Tape & Reel    |
| MMQA18VT1  | 18A            | SC-74              | 3,000/Tape & Reel     |
| MMQA18VT3  | 18A            | SC-74              | 10,000/Tape & Reel    |
| MMQA20VT1  | 20A            | SC-74              | 3,000/Tape & Reel     |
| MMQA20VT3  | 20A            | SC-74              | 10,000/Tape & Reel    |
| MMQA20VT3G | 20A            | SC-74<br>(Pb-Free) | 10,000/Tape & Reel    |
| MMQA21VT1  | 21A            | SC-74              | 3,000/Tape & Reel     |
| MMQA21VT3  | 21A            | SC-74              | 10,000/Tape & Reel    |
| MMQA22VT1  | 22A            | SC-74              | 3,000/Tape & Reel     |
| MMQA22VT3  | 22A            | SC-74              | 10,000/Tape & Reel    |
| MMQA24VT1  | 24A            | SC-74              | 3,000/Tape & Reel     |
| MMQA24VT3  | 24A            | SC-74              | 10,000/Tape & Reel    |
| MMQA27VT1  | 27A            | SC-74              | 3,000/Tape & Reel     |
| MMQA27VT3  | 27A            | SC-74              | 10,000/Tape & Reel    |
| MMQA30VT1  | 30A            | SC-74              | 3,000/Tape & Reel     |
| MMQA30VT3  | 30A            | SC-74              | 10,000/Tape & Reel    |
| MMQA33VT1  | 33A            | SC-74              | 3,000/Tape & Reel     |
| MMQA33VT3  | 33A            | SC-74              | 10,000/Tape & Reel    |

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

#### **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.

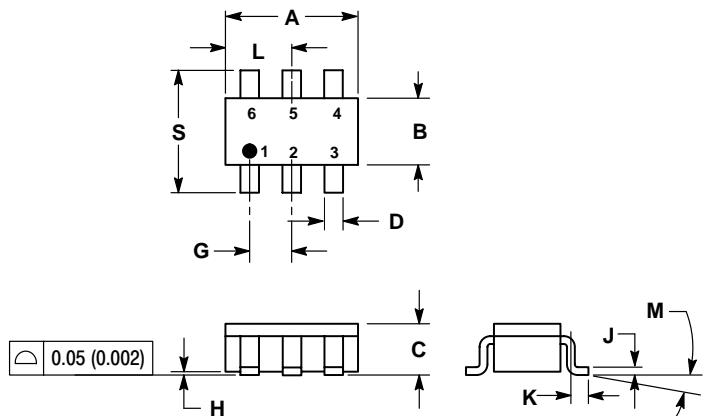
Use the Device Number to order the 7 inch/3,000 unit reel.

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

# MMQA Quad Common Anode Series

## PACKAGE DIMENSIONS

### SC-74 CASE 318F-05 ISSUE K

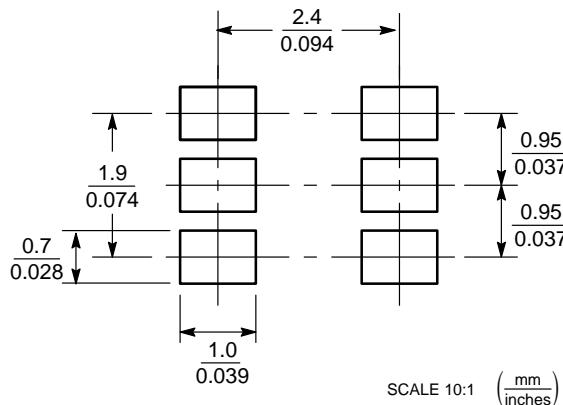


NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.  
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.  
 4. 318F-01, -02, -03 OBSOLETE. NEW STANDARD 318F-04.

| DIM | INCHES |        | MILLIMETERS |       |
|-----|--------|--------|-------------|-------|
|     | MIN    | MAX    | MIN         | MAX   |
| A   | 0.1142 | 0.1220 | 2.90        | 3.10  |
| B   | 0.0512 | 0.0669 | 1.30        | 1.70  |
| C   | 0.0354 | 0.0433 | 0.90        | 1.10  |
| D   | 0.0098 | 0.0197 | 0.25        | 0.50  |
| G   | 0.0335 | 0.0413 | 0.85        | 1.05  |
| H   | 0.0005 | 0.0040 | 0.013       | 0.100 |
| J   | 0.0040 | 0.0102 | 0.10        | 0.26  |
| K   | 0.0079 | 0.0236 | 0.20        | 0.60  |
| L   | 0.0493 | 0.0649 | 1.25        | 1.65  |
| M   | 0°     | 10°    | 0°          | 10°   |
| S   | 0.0985 | 0.1181 | 2.50        | 3.00  |

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

### SOLDERING FOOTPRINT\*



\*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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