

# 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  $\mu$ s (Unidirectional), per Figure 6 Waveform
- Maximum Clamping Voltage @ Peak Pulse Current
- Low Leakage < 2.0  $\mu$ 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®

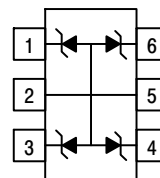
[www.onsemi.com](http://www.onsemi.com)

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



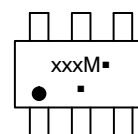
SC-74  
CASE 318F  
STYLE 1

#### 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<sub>A</sub> = 25°C Unless Otherwise Noted)

| Characteristic                                                                                        | Symbol                            | Value       | Unit        |
|-------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|-------------|
| Peak Power Dissipation @ 1.0 ms (Note 1)<br>@ T <sub>A</sub> ≤ 25°C                                   | P <sub>pk</sub>                   | 24          | W           |
| Peak Power Dissipation @ 20 μs (Note 2)<br>@ T <sub>A</sub> ≤ 25°C                                    | P <sub>pk</sub>                   | 150         | W           |
| Total Power Dissipation on FR-5 Board (Note 3)<br>@ T <sub>A</sub> = 25°C                             | P <sub>D</sub>                    | 225<br>1.8  | MW<br>mW/°C |
| Thermal Resistance from Junction-to-Ambient                                                           | R <sub>θJA</sub>                  | 556         | °C/W        |
| Total Power Dissipation on Alumina Substrate (Note 4)<br>@ T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 300<br>2.4  | MW<br>mW/°C |
| Thermal Resistance from Junction-to-Ambient                                                           | R <sub>θJA</sub>                  | 417         | °C/W        |
| Junction and Storage Temperature Range                                                                | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150 | °C          |
| Lead Solder Temperature – Maximum (10 Second Duration)                                                | T <sub>L</sub>                    | 260         | °C          |

1. Non-repetitive current pulse per Figure 5 and derate above T<sub>A</sub> = 25°C per Figure 4.
2. Non-repetitive current pulse per Figure 6 and derate above T<sub>A</sub> = 25°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<sub>A</sub> = 25°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<sub>F</sub> = 0.9 V Max @ I<sub>F</sub> = 10 mA)

| Device<br>(Note 5) | Breakdown Voltage |                                    |      |                   | Max Reverse Leakage Current |                | Max Zener Impedance<br>(Note 7) | Max Reverse Surge Current | Max Reverse Voltage @<br>I <sub>RSM</sub><br>(Note 8)<br>(Clamping Voltage) | Maximum Temperature Coefficient of V <sub>Z</sub> | Capacitance @ 0 Volt Bias, 1 MHz |     |
|--------------------|-------------------|------------------------------------|------|-------------------|-----------------------------|----------------|---------------------------------|---------------------------|-----------------------------------------------------------------------------|---------------------------------------------------|----------------------------------|-----|
|                    |                   | V <sub>ZT</sub><br>(Note 6)<br>(V) |      | @ I <sub>ZT</sub> | I <sub>R</sub>              | V <sub>R</sub> |                                 |                           |                                                                             |                                                   | (pF)                             |     |
|                    | Min               | Nom                                | Max  | (mA)              | (nA)                        | (V)            |                                 |                           |                                                                             |                                                   |                                  |     |
| 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<sub>Z</sub> measured at pulse test current I<sub>T</sub> at an ambient temperature of 25°C.
7. Z<sub>ZT</sub> is measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are I<sub>Z(AC)</sub> = 0.1 I<sub>Z(DC)</sub>, 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

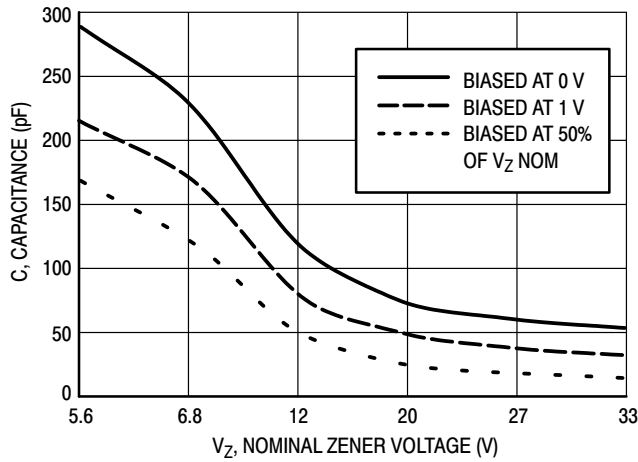


Figure 1. Typical Capacitance

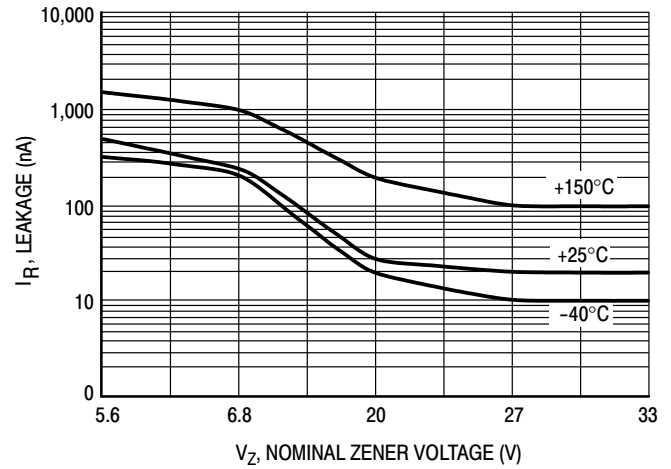


Figure 2. Typical Leakage Current

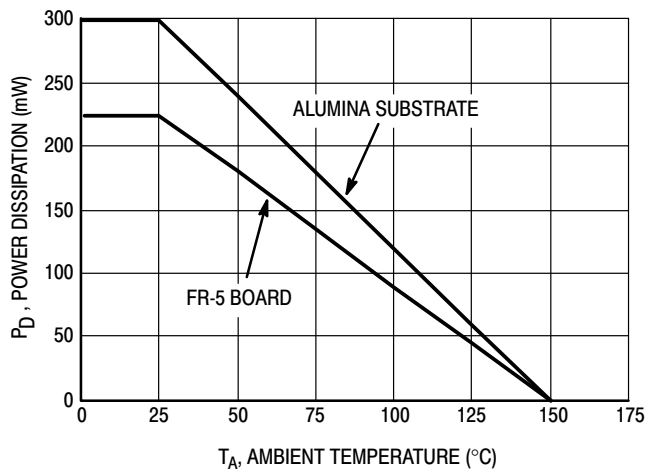


Figure 3. Steady State Power Derating Curve

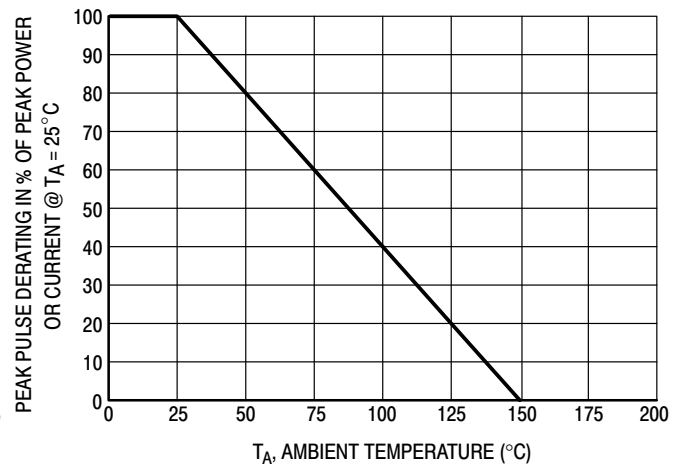


Figure 4. Pulse Derating Curve

# MMQA, SZMMQA Quad Common Anode Series

## TYPICAL CHARACTERISTICS

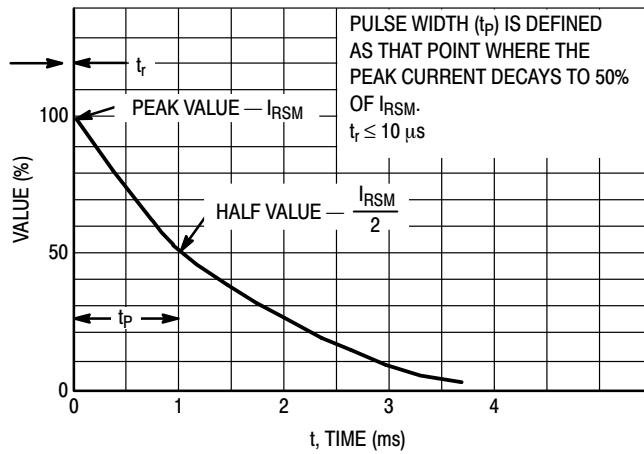


Figure 5.  $10 \times 1000 \mu s$  Pulse Waveform

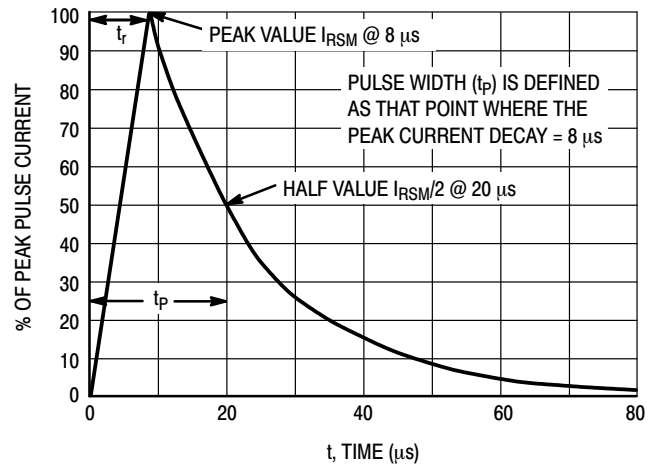


Figure 6.  $8 \times 20 \mu s$  Pulse Waveform

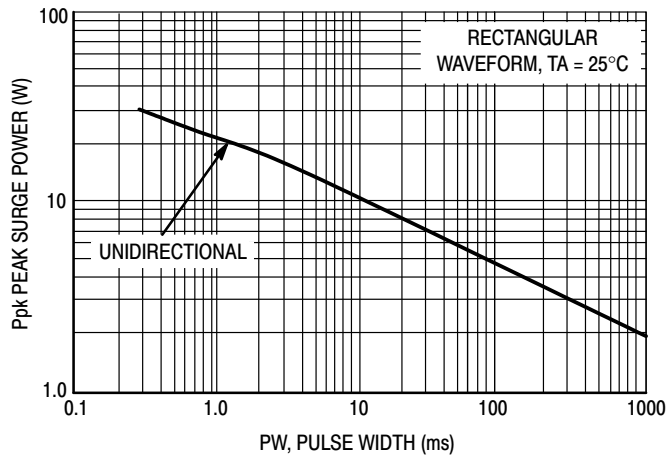


Figure 7. Maximum Non-Repetitive Surge Power,  $P_{pk}$  versus PW

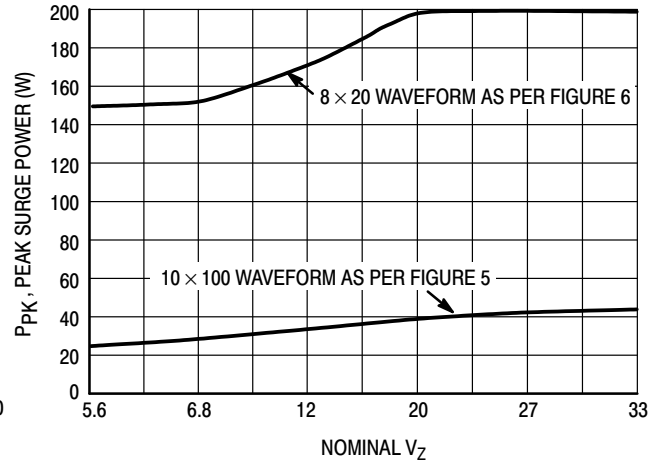


Figure 8. Typical Maximum Non-Repetitive Surge Power,  $P_{pk}$  versus  $V_Z$

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.

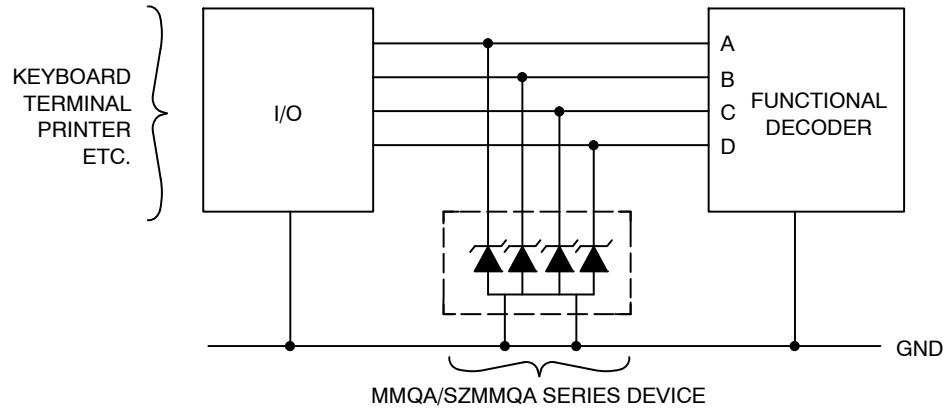


Figure 9. Computer Interface Protection

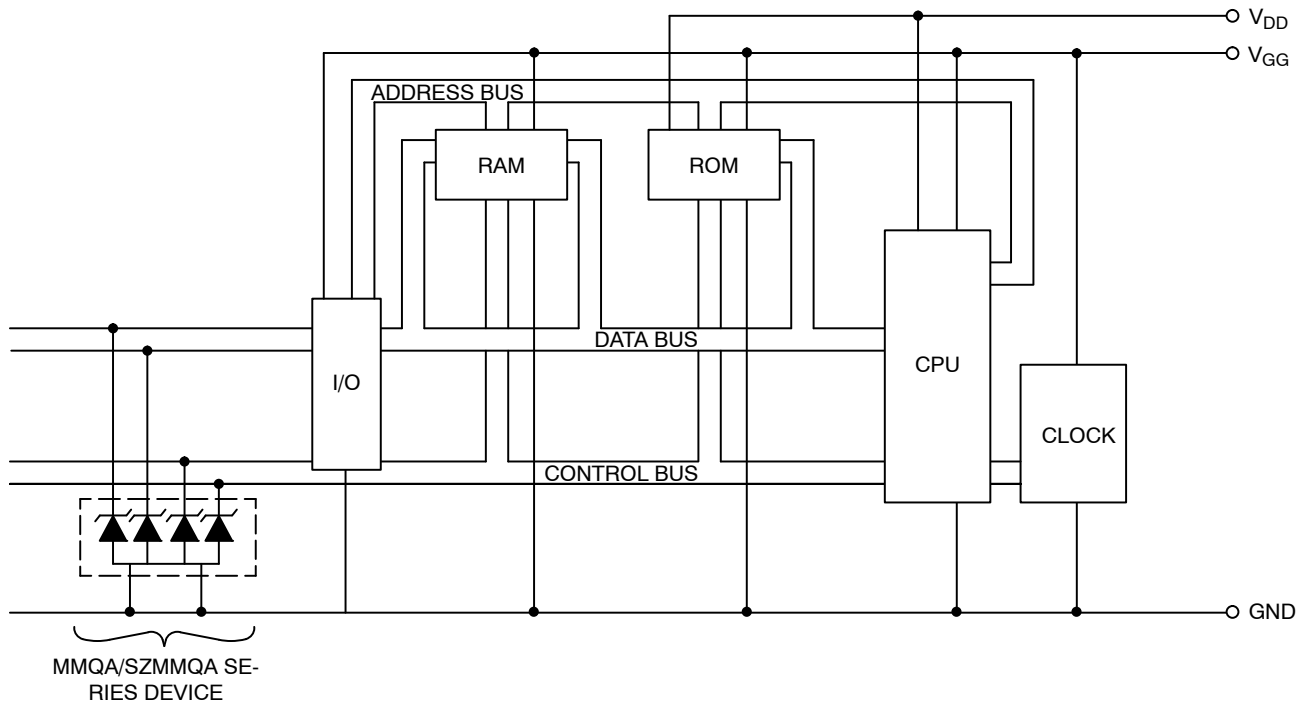


Figure 10. Microprocessor Protection

## MMQA, SZMMQA Quad Common Anode Series

### DEVICE MARKING AND ORDERING INFORMATION

| Device*    | Device Marking | Package            | Shipping           |
|------------|----------------|--------------------|--------------------|
| MMQA5V6T1G | 5A6            | SC-74<br>(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.

\*IncludeS 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.

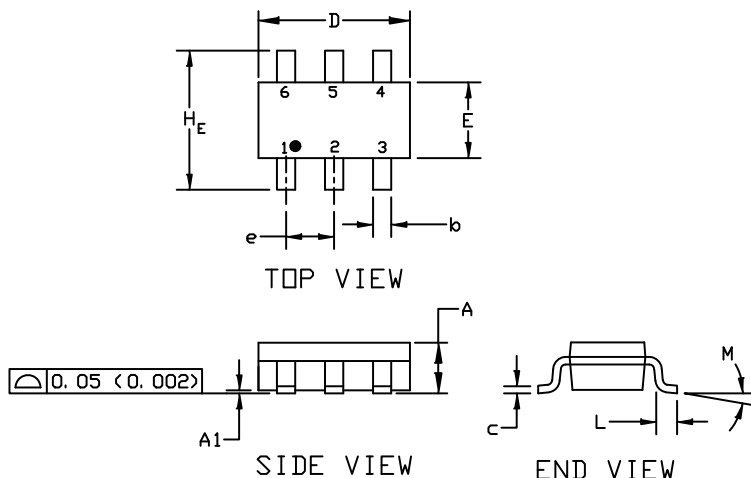
Replace the “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.



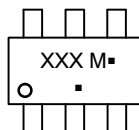
SCALE 2:1

SC-74  
CASE 318F  
ISSUE P

DATE 07 OCT 2021



GENERIC  
MARKING DIAGRAM\*



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

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994
2. CONTROLLING DIMENSION: INCHES
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.

| 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 |
| H <sub>E</sub> | 2.50        | 2.75 | 3.00 | 0.099  | 0.108 | 0.118 |
| L              | 0.20        | 0.40 | 0.60 | 0.008  | 0.016 | 0.024 |
| M              | 0°          | ---  | 10°  | 0°     | ---   | 10°   |



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

SOLDERING FOOTPRINT

|                                                                                                         |                                                                                                                      |                                                                                                                   |                                                                                                                                                |                                                                                                               |                                                                                                       |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>STYLE 1:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. CATHODE<br>5. ANODE<br>6. CATHODE     | <b>STYLE 2:</b><br>PIN 1. NO CONNECTION<br>2. COLLECTOR<br>3. EMITTER<br>4. NO CONNECTION<br>5. COLLECTOR<br>6. BASE | <b>STYLE 3:</b><br>PIN 1. EMITTER 1<br>2. BASE 1<br>3. COLLECTOR 2<br>4. EMITTER 2<br>5. BASE 2<br>6. COLLECTOR 1 | <b>STYLE 4:</b><br>PIN 1. COLLECTOR 2<br>2. EMITTER 1/EMITTER 2<br>3. COLLECTOR 1<br>4. EMITTER 3<br>5. BASE 1/BASE 2/COLLECTOR 3<br>6. BASE 3 | <b>STYLE 5:</b><br>PIN 1. CHANNEL 1<br>2. ANODE<br>3. CHANNEL 2<br>4. CHANNEL 3<br>5. CATHODE<br>6. CHANNEL 4 | <b>STYLE 6:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. CATHODE<br>5. CATHODE<br>6. CATHODE |
| <b>STYLE 7:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 2<br>6. DRAIN 1 | <b>STYLE 8:</b><br>PIN 1. EMITTER 1<br>2. BASE 2<br>3. COLLECTOR 2<br>4. EMITTER 2<br>5. BASE 1<br>6. COLLECTOR 1    | <b>STYLE 9:</b><br>PIN 1. EMITTER 2<br>2. BASE 2<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. BASE 1<br>6. COLLECTOR 2 | <b>STYLE 10:</b><br>PIN 1. ANODE/CATHODE<br>2. BASE<br>3. EMITTER<br>4. COLLECTOR<br>5. ANODE<br>6. CATHODE                                    | <b>STYLE 11:</b><br>PIN 1. EMITTER<br>2. BASE<br>3. ANODE/CATHODE<br>4. ANODE<br>5. CATHODE<br>6. COLLECTOR   |                                                                                                       |

|                         |                    |                                                                                                                                                                                     |
|-------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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