

# ESD Protection Diode Array

## Dual Common Anode

## SM05T1G Series

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

### Specification Features:

- SOT-23 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Working Peak Reverse Voltage Range – 5.0 V to 36 V
- Peak Power – 300 Watt (8/20  $\mu$ s)
- Low Leakage – 1.0  $\mu$ A
- Flammability Rating UL 94 V-0
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

### Mechanical Characteristics:

**CASE:** Void-Free, Transfer-Molded, Thermosetting Plastic Case

**FINISH:** Corrosion Resistant Finish, Easily Solderable

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**

260°C for 10 Seconds

Package Designed for Optimal Automated Board Assembly

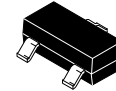
Small Package Size for High Density Applications

Available in 8 mm Tape and Reel

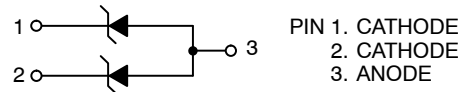
Use the Device Number to Order the 7 Inch/3,000 Unit Reel

Replace the “T1” with “T3” in the Device Number to Order the

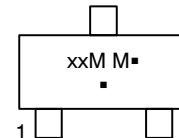
13 Inch/10,000 Unit Reel



SOT-23  
CASE 318  
STYLE 12



### MARKING DIAGRAM



xxM = Device Code  
xx = 05, 12, 15, 24, 36  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device    | Package             | Shipping <sup>†</sup> |
|-----------|---------------------|-----------------------|
| SM05T1G   | SOT-23<br>(Pb-Free) | 3,000/Tape & Reel     |
| SZSM05T1G |                     |                       |
| SM15T1G   |                     |                       |
| SM24T1G   |                     |                       |
| SZSM24T1G |                     |                       |
| SM36T1G   |                     |                       |

<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.

# SM05T1G Series

## MAXIMUM RATINGS

| Rating                                                                                                                                                         | Symbol                   | Value                | Unit                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|---------------------------------------------------------|
| Peak Power Dissipation @ 20 $\mu$ s (Note 1) @ $T_L \leq 25^\circ\text{C}$                                                                                     | $P_{pk}$                 | 300                  | W                                                       |
| IEC 61000-4-2 (ESD)<br>Air<br>Contact                                                                                                                          |                          | $\pm 15$<br>$\pm 26$ | kV                                                      |
| IEC 61000-4-4 (EFT)                                                                                                                                            |                          | 40                   | A                                                       |
| IEC 61000-4-5 (Lightning)                                                                                                                                      |                          | 12                   | A                                                       |
| Total Power Dissipation on FR-5 Board (Note 2) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$<br>Thermal Resistance, Junction-to-Ambient        | $P_D$<br>$R_{\theta JA}$ | 225<br>1.8<br>556    | mW<br>mW/ $^\circ\text{C}$<br>$^\circ\text{C}/\text{W}$ |
| Total Power Dissipation on Alumina Substrate (Note 3) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$<br>Thermal Resistance, Junction-to-Ambient | $P_D$<br>$R_{\theta JA}$ | 300<br>2.4<br>417    | mW<br>mW/ $^\circ\text{C}$<br>$^\circ\text{C}/\text{W}$ |
| 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                  | $^\circ\text{C}$                                        |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Non-repetitive current pulse per Figure 3

2. FR-5 = 1.0 x 0.75 x 0.62 in.

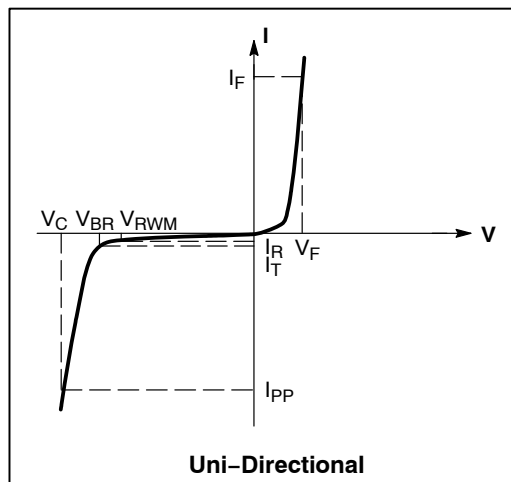
3. Alumina = 0.4 x 0.3 x 0.024 in., 99.5% alumina

NOTE: Other voltages may be available upon request

## ELECTRICAL CHARACTERISTICS

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or 2 and 3)

| Symbol          | Parameter                                   |
|-----------------|---------------------------------------------|
| $I_{PP}$        | Maximum Reverse Peak Pulse Current          |
| $V_C$           | Clamping Voltage @ $I_{PP}$                 |
| $V_{RWM}$       | Working Peak Reverse Voltage                |
| $I_R$           | Maximum Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$        | Breakdown Voltage @ $I_T$                   |
| $I_T$           | Test Current                                |
| $\Theta V_{BR}$ | Maximum Temperature Coefficient of $V_{BR}$ |
| $I_F$           | Forward Current                             |
| $V_F$           | Forward Voltage @ $I_F$                     |
| $Z_{ZT}$        | Maximum Zener Impedance @ $I_{ZT}$          |
| $I_{ZK}$        | Reverse Current                             |
| $Z_{ZK}$        | Maximum Zener Impedance @ $I_{ZK}$          |



## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Device* | Device Marking | V <sub>RWM</sub> | I <sub>R</sub> @ V <sub>RWM</sub> | V <sub>BR</sub> , Breakdown Voltage |       | I <sub>T</sub> | V <sub>C</sub> @<br>I <sub>PP</sub> =<br>1 Amp | Max I <sub>PP</sub><br>(Note 4) | Typical Capacitance     |
|---------|----------------|------------------|-----------------------------------|-------------------------------------|-------|----------------|------------------------------------------------|---------------------------------|-------------------------|
|         |                |                  |                                   | (Volts)                             |       |                |                                                |                                 | (pF)                    |
|         |                | (Volts)          | (μA)                              | Min                                 | Max   | mA             | (Volts)                                        | (Amps)                          | Pin 1 to 3<br>@ 0 Volts |
| SM05T1G | 05M            | 5                | 10                                | 6.2                                 | 7.3   | 1.0            | 9.8                                            | 17                              | 225                     |
| SM12T1G | 12M            | 12               | 1.0                               | 13.3                                | 15.75 | 1.0            | 19                                             | 12                              | 95                      |
| SM15T1G | 15M            | 15               | 1.0                               | 16.7                                | 19.6  | 1.0            | 24                                             | 10                              | 100                     |
| SM24T1G | 24M            | 24               | 1.0                               | 26.7                                | 31.35 | 1.0            | 43                                             | 5.0                             | 60                      |
| SM36T1G | 36M            | 36               | 1.0                               | 40.0                                | 46.95 | 1.0            | 60                                             | 4.0                             | 45                      |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. 8/20  $\mu$ s pulse waveform per Figure 3

\*Include SZ-prefix devices where applicable.

# SM05T1G Series

## TYPICAL CHARACTERISTICS

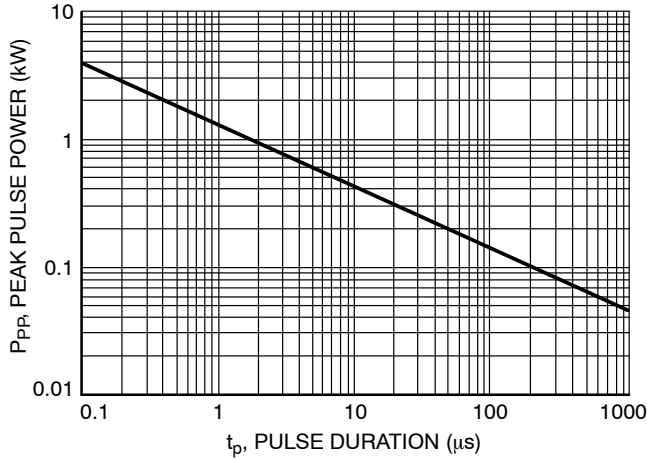


Figure 1. Non-Repetitive Peak Pulse Power versus Pulse Time

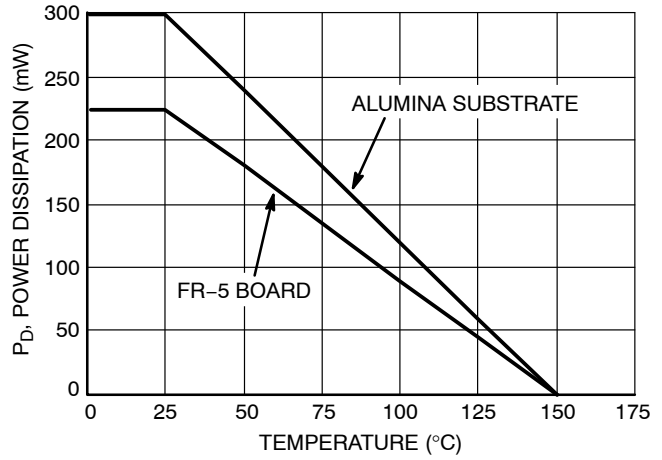


Figure 2. Steady State Power Derating Curve

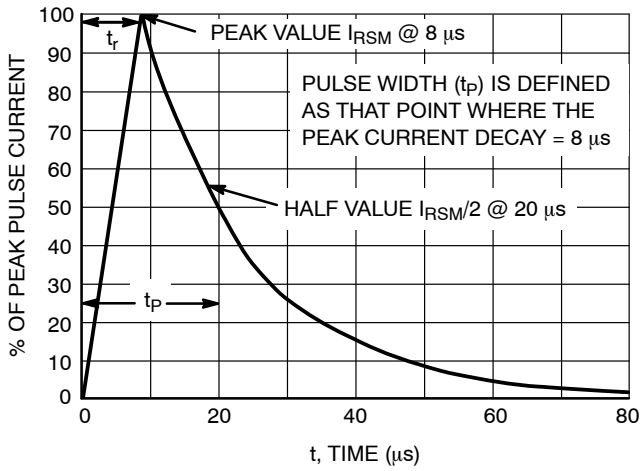


Figure 3. 8/20  $\mu$ s Pulse Waveform

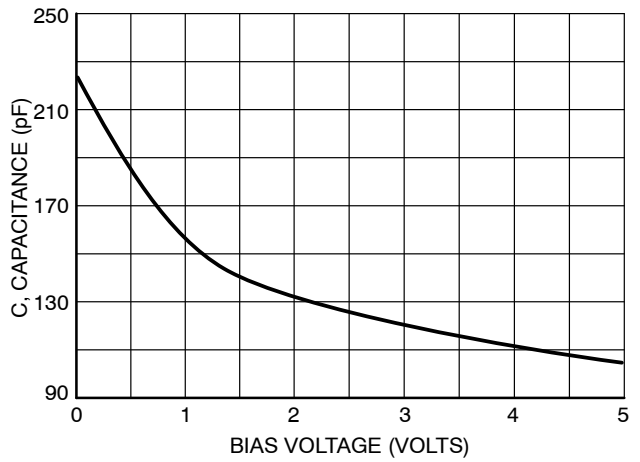


Figure 4. Typical Diode Capacitance (SM05)

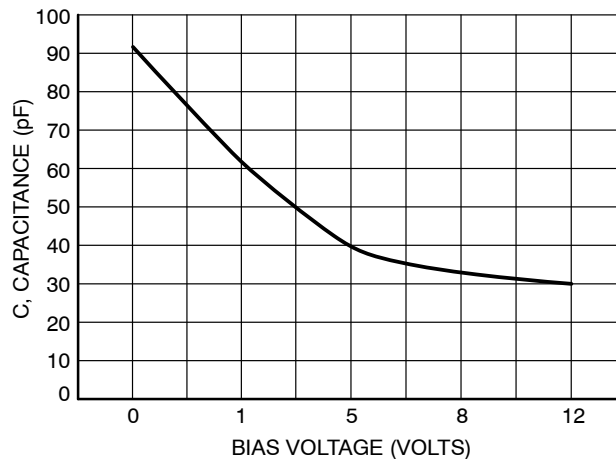


Figure 5. Typical Diode Capacitance (SM12)

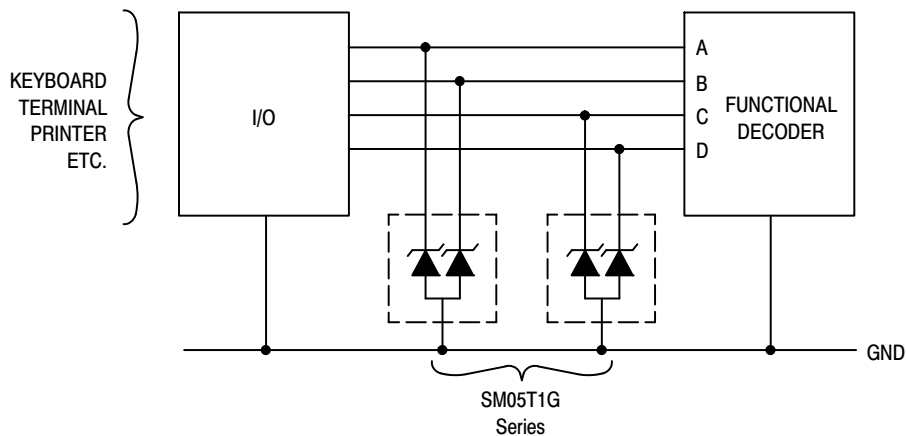
## SM05T1G Series

### TYPICAL COMMON ANODE APPLICATIONS

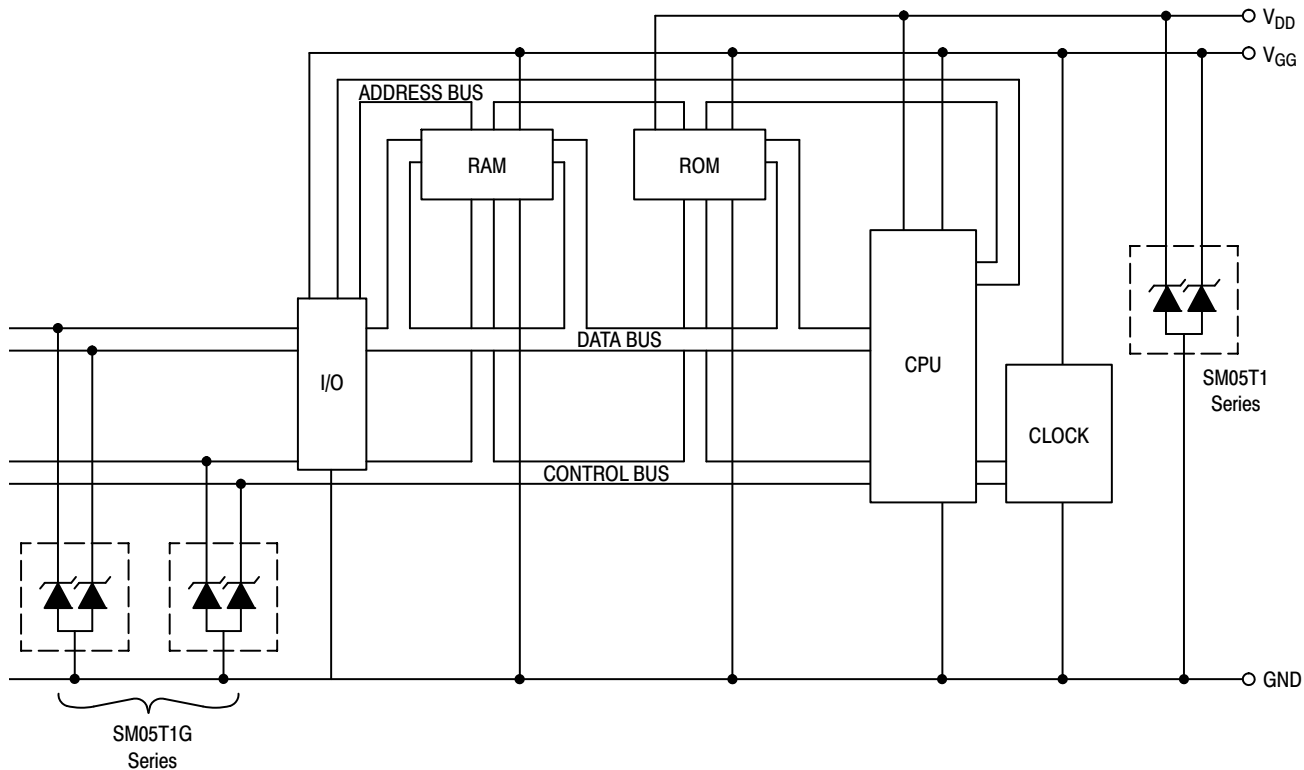
A quad junction common anode design in a SOT-23 package protects four separate lines using only one package. This adds flexibility and creativity to PCB design especially

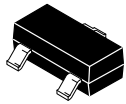
when board space is at a premium. Two simplified examples of surge protection applications are illustrated below.

#### Computer Interface Protection



#### Microprocessor Protection

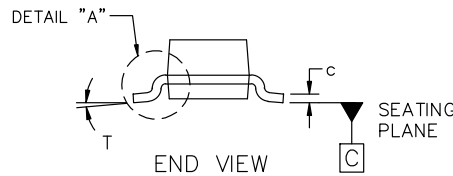
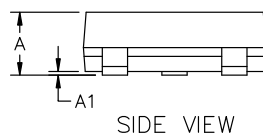
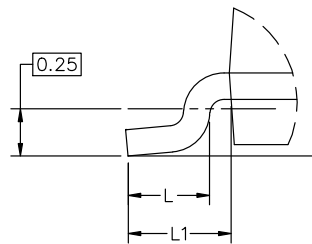
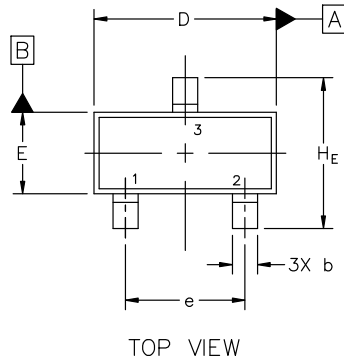




SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

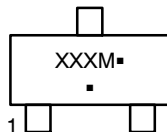


| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 1.20 | 1.30 | 1.40 |
| e           | 1.78 | 1.90 | 2.04 |
| L           | 0.30 | 0.43 | 0.55 |
| L1          | 0.35 | 0.54 | 0.69 |
| HE          | 2.10 | 2.40 | 2.64 |
| T           | 0°   | ---  | 10°  |

NOTES:

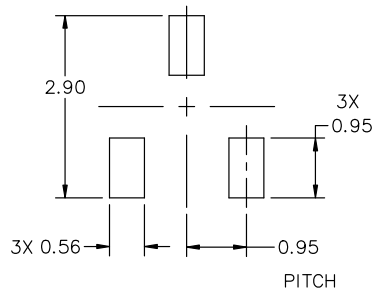
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***



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

\*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.



**RECOMMENDED MOUNTING FOOTPRINT**

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

**STYLES ON PAGE 2**

|                         |                                             |                                                                                                                                                                                     |
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**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

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