

# MMBZxxVxL, SZMMBZxxVxL Series

## Zener Diodes, 40 Watt Peak Power

### SOT-23 Dual Common Cathode Zeners

These dual monolithic silicon zener diodes are designed for applications requiring 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 cathode 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
- Standard Zener Breakdown Voltage Range – 15 V, 27 V, 39 V
- Peak Power – 40 W @ 1.0 ms (Bidirectional), per Figure 5 Waveform
- ESD Rating of Class 3B (exceeding 16 kV) per the Human Body Model
- ESD Rating of IEC61000-4-2 Level 4,  $\pm 30$  kV Contact Discharge
- Low Leakage < 100 nA
- Flammability Rating: UL 94 V-O
- 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

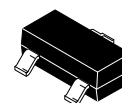
**FINISH:** Corrosion resistant finish, easily solderable

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**  
260°C for 10 Seconds

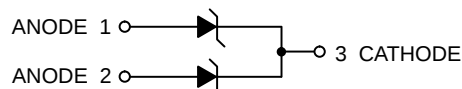


**ON Semiconductor®**

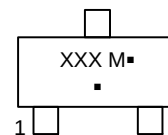
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**SOT-23  
CASE 318  
STYLE 9**



#### MARKING DIAGRAM



XXX = 15D, 27C or 39C

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device                          | Package             | Shipping <sup>†</sup>   |
|---------------------------------|---------------------|-------------------------|
| MMBZ15VDLT1G,<br>SZMMBZ15VDLT1G | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| MMBZ15VDLT3G,<br>SZMMBZ15VDLT3G | SOT-23<br>(Pb-Free) | 10,000 /<br>Tape & Reel |
| MMBZxxVCLT1G,<br>SZMMBZxxVCLT1G | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| MMBZxxVCLT3G,<br>SZMMBZxxVCLT3G | SOT-23<br>(Pb-Free) | 10,000 /<br>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.

# MMBZxxVxL, SZMMBZxxVxL Series

## MAXIMUM RATINGS

| Rating                                                                                                                 | Symbol          | Value        | Unit                       |
|------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|----------------------------|
| Peak Power Dissipation @ 1.0 ms (Note 1) @ $T_L \leq 25^\circ\text{C}$                                                 | $P_{pk}$        | 40           | Watts                      |
| Total Power Dissipation on FR-5 Board (Note 2)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8   | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction-to-Ambient                                                                                 | $R_{\theta JA}$ | 556          | $^\circ\text{C/W}$         |
| Total Power Dissipation on Alumina Substrate (Note 3)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4   | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction-to-Ambient                                                                                 | $R_{\theta JA}$ | 417          | $^\circ\text{C/W}$         |
| 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.

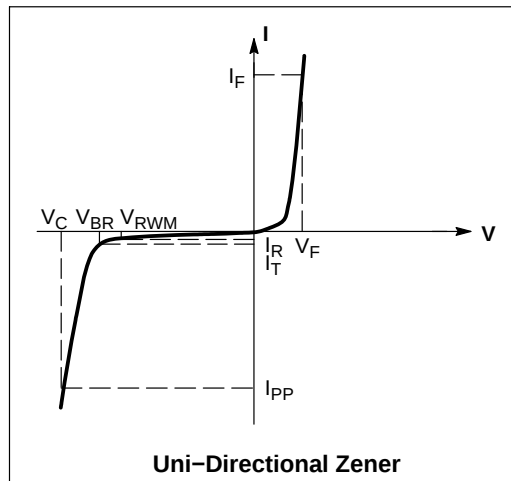
1. Nonrepetitive current pulse per Figure 5 and derate above  $T_A = 25^\circ\text{C}$  per Figure 6.
2. FR-5 =  $1.0 \times 0.75 \times 0.62$  in.
3. Alumina =  $0.4 \times 0.3 \times 0.024$  in., 99.5% alumina

## ELECTRICAL CHARACTERISTICS

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

### 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                                |
| $V_{BR}$  | Maximum Temperature Coefficient of $V_{BR}$ |
| $I_F$     | Forward Current                             |
| $V_F$     | Forward Voltage @ $I_F$                     |



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

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

( $V_F = 0.9 \text{ V Max @ } I_F = 10 \text{ mA}$ )

| Device*          | Device Marking | V <sub>RWM</sub><br>Volts | I <sub>R</sub> @ V <sub>RWM</sub><br>nA | Breakdown Voltage            |     |      |                  | V <sub>C</sub> @ I <sub>PP</sub> (Note 5) |                      | V <sub>BR</sub><br>mV/°C |
|------------------|----------------|---------------------------|-----------------------------------------|------------------------------|-----|------|------------------|-------------------------------------------|----------------------|--------------------------|
|                  |                |                           |                                         | V <sub>BR</sub> (Note 4) (V) |     |      | @ I <sub>T</sub> | V <sub>C</sub><br>V                       | I <sub>PP</sub><br>A |                          |
|                  |                |                           |                                         | Min                          | Nom | Max  |                  |                                           |                      |                          |
| MMBZ15VCLT1G/T3G | 15D            | 12.8                      | 100                                     | 14.3                         | 15  | 15.8 | 1.0              | 21.2                                      | 1.9                  | 12                       |

( $V_F = 1.1 \text{ V Max @ } I_F = 200 \text{ mA}$ )

| Device*          | Device Marking | V <sub>RWM</sub> | I <sub>R</sub> @ V <sub>RWM</sub> | Breakdown Voltage            |     |       |                  | V <sub>C</sub> @ I <sub>PP</sub> (Note 5) |                 | V <sub>BR</sub> |
|------------------|----------------|------------------|-----------------------------------|------------------------------|-----|-------|------------------|-------------------------------------------|-----------------|-----------------|
|                  |                |                  |                                   | V <sub>BR</sub> (Note 4) (V) |     |       | @ I <sub>T</sub> | V <sub>C</sub>                            | I <sub>PP</sub> |                 |
|                  |                | Volts            | nA                                | Min                          | Nom | Max   | mA               | V                                         | A               |                 |
| MMBZ27VCLT1G/T3G | 27C            | 22               | 50                                | 25.65                        | 27  | 28.35 | 1.0              | 38                                        | 1.0             | 26              |
| MMBZ39VCLT1G/T3G | 39C            | 31.2             | 50                                | 37.05                        | 39  | 40.95 | 1.0              | 55                                        | 0.76            | 35.3            |

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.

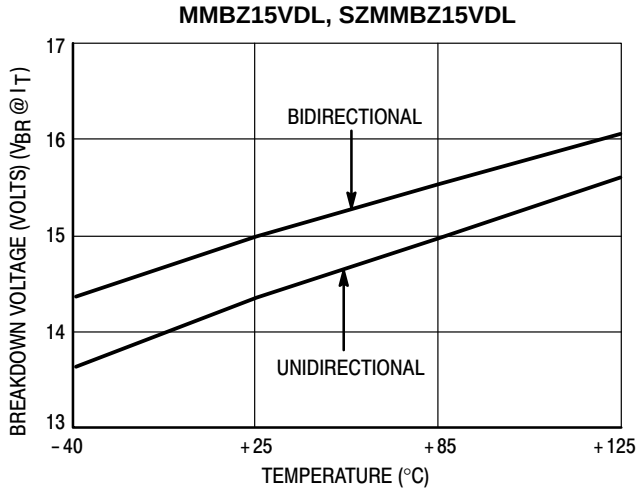
4.  $V_{BR}$  measured at pulse test current  $I_T$  at an ambient temperature of  $25^\circ\text{C}$ .

5. Surge current waveform per Figure 5 and derate per Figure 6

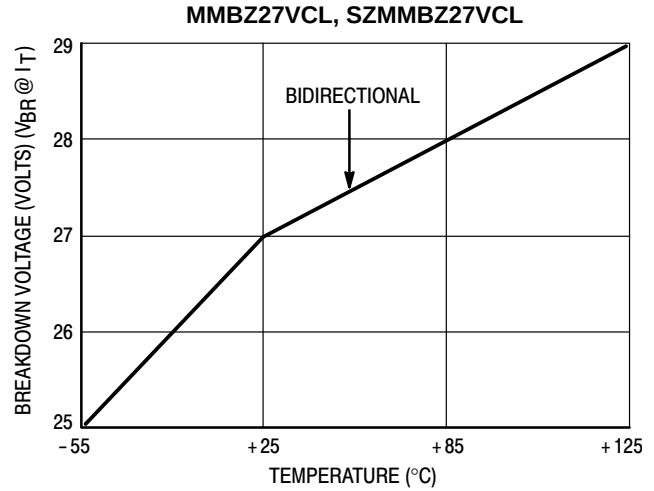
\*Include SZ-prefix devices where applicable.

# MMBZxxVxL, SZMMBZxxVxL Series

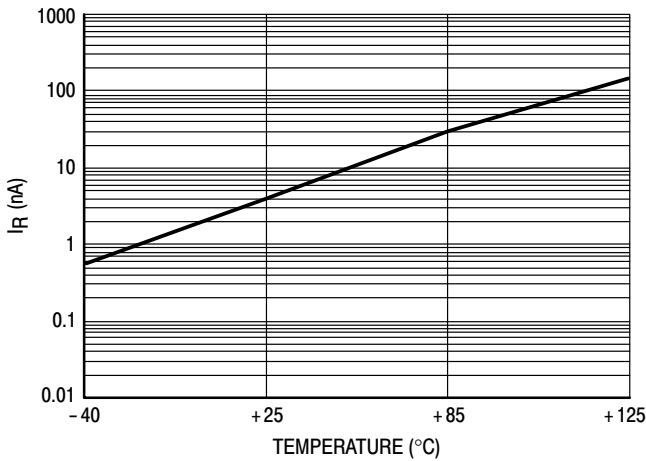
## TYPICAL CHARACTERISTICS



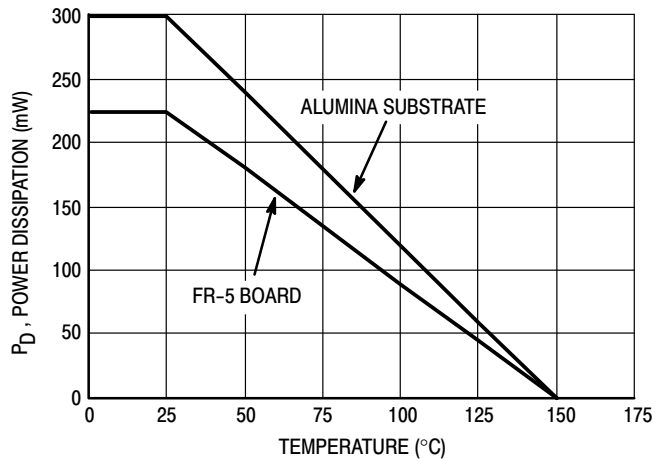
**Figure 1. Typical Breakdown Voltage versus Temperature**



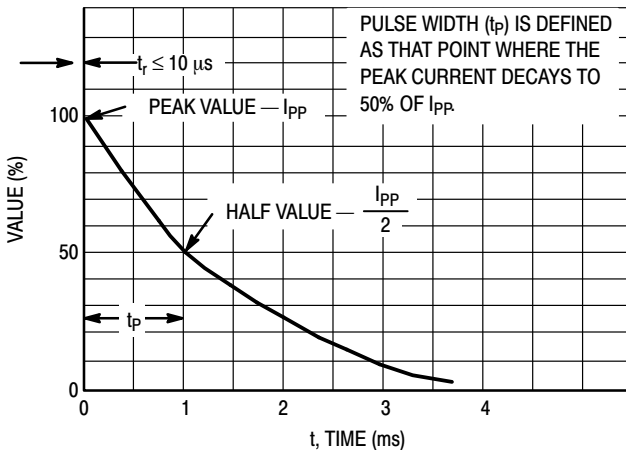
**Figure 2. Typical Breakdown Voltage versus Temperature**



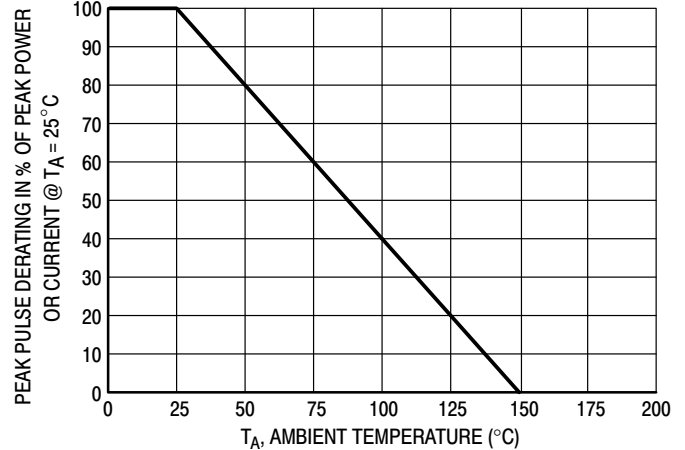
**Figure 3. Typical Leakage Current versus Temperature**



**Figure 4. Steady State Power Derating Curve**



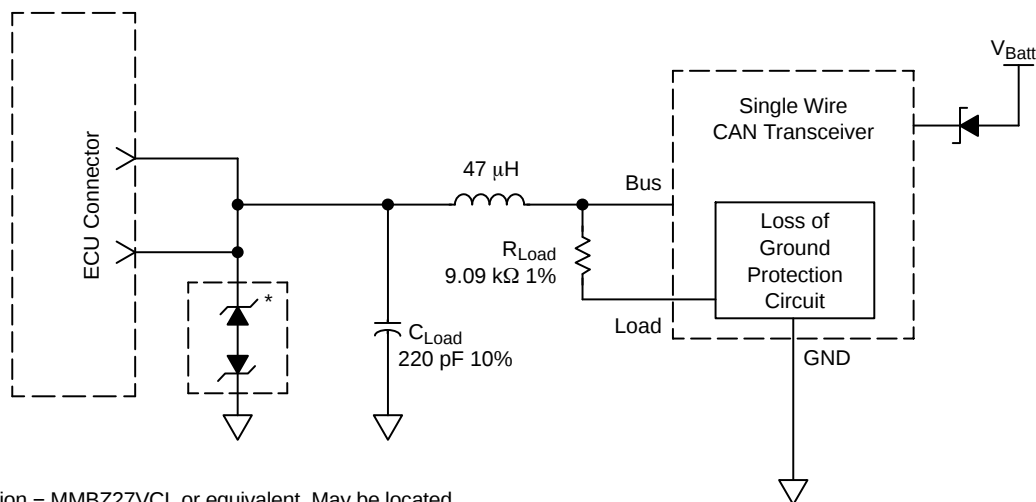
**Figure 5. Pulse Waveform**



**Figure 6. Pulse Derating Curve**

## MMBZxxVxL, SZMMBZxxVxL Series

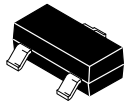
### TYPICAL APPLICATIONS



\*ESD Protection – MMBZ27VCL or equivalent. May be located in each ECU ( $C_{Load}$  needs to be reduced accordingly) or at a central point near the DLC.

**Figure 7. Single Wire CAN Network**

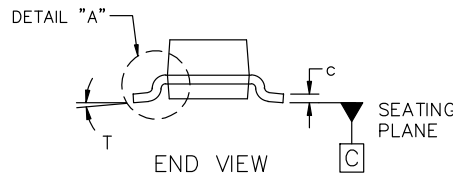
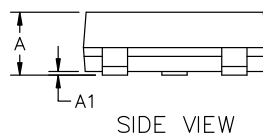
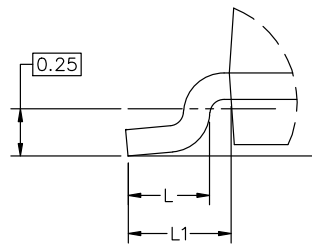
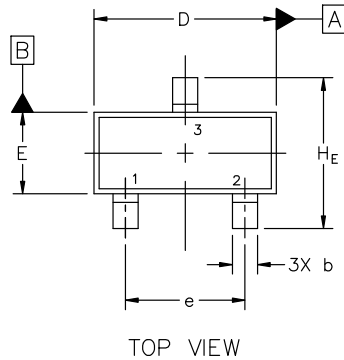
Figure is the recommended solution for transient EMI/ESD protection. This circuit is shown in the Society of Automotive Engineers February, 2000 J2411 “Single Wire CAN Network for Vehicle Applications” specification (Figure 6, page 11). Note: the dual common anode zener configuration shown above is electrically equivalent to a dual common cathode zener configuration.



SCALE 4:1

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

DATE 14 AUG 2024

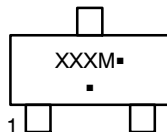


| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 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:

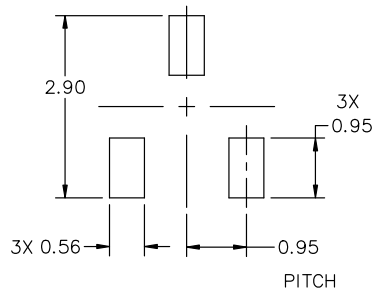
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**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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**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**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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