

# MCR100 Series

Preferred Device

## Sensitive Gate Silicon Controlled Rectifiers

### Reverse Blocking Thyristors

PNPN devices designed for high volume, line-powered consumer applications such as relay and lamp drivers, small motor controls, gate drivers for larger thyristors, and sensing and detection circuits. Supplied in an inexpensive plastic TO-226AA package which is readily adaptable for use in automatic insertion equipment.

#### Features

- Sensitive Gate Allows Triggering by Microcontrollers and Other Logic Circuits
- Blocking Voltage to 600 V
- On-State Current Rating of 0.8 Amperes RMS at 80°C
- High Surge Current Capability – 10 A
- Minimum and Maximum Values of IGT, VGT and IH Specified for Ease of Design
- Immunity to  $dV/dt$  – 20 V/ $\mu$ sec Minimum at 110°C
- Glass-Passivated Surface for Reliability and Uniformity
- Pb-Free Packages are Available\*



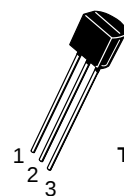
ON Semiconductor®

<http://onsemi.com>

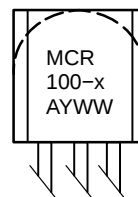
**SCRs**  
**0.8 A RMS**  
**100 thru 600 V**



#### MARKING DIAGRAM



**TO-92 (TO-226)**  
**CASE 029**  
**STYLE 10**



x = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week

#### PIN ASSIGNMENT

| PIN ASSIGNMENT |         |
|----------------|---------|
| 1              | Cathode |
| 2              | Gate    |
| 3              | Anode   |

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

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

# MCR100 Series

## ORDERING INFORMATION

| Device        | Package Code                | Shipping <sup>†</sup>              |
|---------------|-----------------------------|------------------------------------|
| MCR100-003    | TO-92 (TO-226)              | 5000 Units / Bulk                  |
| MCR100-004    |                             |                                    |
| MCR100-006    |                             |                                    |
| MCR100-008    |                             |                                    |
| MCR100-3RL    |                             |                                    |
| MCR100-6RL    |                             | 2000 Units / Tape & Reel           |
| MCR100-6RLRA  |                             | 2000 Units / Tape & Ammunition Box |
| MCR100-6RLRM  |                             |                                    |
| MCR100-6ZL1   |                             | 2000 Units / Tape & Reel           |
| MCR100-8RL    |                             |                                    |
| MCR100-003G   | TO-92 (TO-226)<br>(Pb-Free) | 5000 Units / Bulk                  |
| MCR100-006G   |                             | 2000 Units / Tubes                 |
| MCR100-008G   |                             |                                    |
| MCR100-3RLG   |                             | 2000 Units / Tape & Reel           |
| MCR100-6RLG   |                             |                                    |
| MCR100-6RLRAG |                             | 2000 Units / Tape & Ammunition Box |
| MCR100-6RLRMG |                             |                                    |
| MCR100-6ZL1G  |                             | 2000 Units / Tape & Reel           |
| MCR100-8RLG   |                             |                                    |

<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.

## MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

| Rating                                                                                                           | Symbol                                 | Value      | Unit             |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------|------------------|
| Peak Repetitive Off-State Voltage (Note 1)<br>(T <sub>J</sub> = -40 to 110°C, Sine Wave, 50 to 60 Hz; Gate Open) | V <sub>DRM</sub> ,<br>V <sub>RRM</sub> |            | V                |
| MCR100-3                                                                                                         |                                        | 100        |                  |
| MCR100-4                                                                                                         |                                        | 200        |                  |
| MCR100-6                                                                                                         |                                        | 400        |                  |
| MCR100-8                                                                                                         |                                        | 600        |                  |
| On-State RMS Current, (T <sub>C</sub> = 80°C) 180° Conduction Angles                                             | I <sub>T(RMS)</sub>                    | 0.8        | A                |
| Peak Non-Repetitive Surge Current, (1/2 Cycle, Sine Wave, 60 Hz, T <sub>J</sub> = 25°C)                          | I <sub>TSM</sub>                       | 10         | A                |
| Circuit Fusing Consideration, (t = 8.3 ms)                                                                       | I <sup>2</sup> t                       | 0.415      | A <sup>2</sup> s |
| Forward Peak Gate Power, (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)                                           | P <sub>GM</sub>                        | 0.1        | W                |
| Forward Average Gate Power, (T <sub>A</sub> = 25°C, t = 8.3 ms)                                                  | P <sub>G(AV)</sub>                     | 0.10       | W                |
| Forward Peak Gate Current, (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)                                         | I <sub>GM</sub>                        | 1.0        | A                |
| Reverse Peak Gate Voltage, (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)                                         | V <sub>GRM</sub>                       | 5.0        | V                |
| Operating Junction Temperature Range @ Rate V <sub>RRM</sub> and V <sub>DRM</sub>                                | T <sub>J</sub>                         | -40 to 110 | °C               |
| Storage Temperature Range                                                                                        | T <sub>stg</sub>                       | -40 to 150 | °C               |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. V<sub>DRM</sub> and V<sub>RRM</sub> for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

# MCR100 Series

## THERMAL CHARACTERISTICS

| Characteristic                                                  | Symbol                             | Max       | Unit                        |
|-----------------------------------------------------------------|------------------------------------|-----------|-----------------------------|
| Thermal Resistance, Junction-to-Case<br>Junction-to-Ambient     | $R_{\theta JC}$<br>$R_{\theta JA}$ | 75<br>200 | $^{\circ}\text{C}/\text{W}$ |
| Lead Solder Temperature<br>( $< 1/16''$ from case, 10 secs max) | $T_L$                              | 260       | $^{\circ}\text{C}$          |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                                                        |                    |        |        |           |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------|--------|-----------|---------------|
| Peak Repetitive Forward or Reverse Blocking Current (Note 2)<br><br>( $V_D = \text{Rated } V_{DRM} \text{ and } V_{RRM}; R_{GK} = 1 \text{ k}\Omega$ ) | $I_{DRM}, I_{RRM}$ | –<br>– | –<br>– | 10<br>100 | $\mu\text{A}$ |
| $T_C = 25^{\circ}\text{C}$<br>$T_C = 110^{\circ}\text{C}$                                                                                              |                    |        |        |           |               |

### ON CHARACTERISTICS

|                                                                                                   |          |        |           |            |               |
|---------------------------------------------------------------------------------------------------|----------|--------|-----------|------------|---------------|
| Peak Forward On-State Voltage*<br>( $I_{TM} = 1.0 \text{ A Peak @ } T_A = 25^{\circ}\text{C}$ )   | $V_{TM}$ | –      | –         | 1.7        | V             |
| Gate Trigger Current (Continuous dc) (Note 3)<br>( $V_{AK} = 7.0 \text{ Vdc}, R_L = 100 \Omega$ ) | $I_{GT}$ | –      | 40        | 200        | $\mu\text{A}$ |
| Holding Current <sup>(2)</sup><br>( $V_{AK} = 7.0 \text{ Vdc}$ , Initiating Current = 20 mA)      | $I_H$    | –<br>– | 0.5<br>–  | 5.0<br>10  | mA            |
| Latch Current<br>( $V_{AK} = 7.0 \text{ V}$ , $I_g = 200 \mu\text{A}$ )                           | $I_L$    | –<br>– | 0.6<br>–  | 10<br>15   | mA            |
| Gate Trigger Voltage (Continuous dc) (Note 3)<br>( $V_{AK} = 7.0 \text{ Vdc}, R_L = 100 \Omega$ ) | $V_{GT}$ | –<br>– | 0.62<br>– | 0.8<br>1.2 | V             |
| $T_C = 25^{\circ}\text{C}$<br>$T_C = -40^{\circ}\text{C}$                                         |          |        |           |            |               |

### DYNAMIC CHARACTERISTICS

|                                                                                                                                                                      |         |    |    |    |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|----|----|------------------------|
| Critical Rate of Rise of Off-State Voltage<br>( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, $R_{GK} = 1000 \Omega, T_J = 110^{\circ}\text{C}$ )            | $dV/dt$ | 20 | 35 | –  | $\text{V}/\mu\text{s}$ |
| Critical Rate of Rise of On-State Current<br>( $I_{PK} = 20 \text{ A}$ ; $P_w = 10 \mu\text{sec}$ ; $di/dt = 1 \text{ A}/\mu\text{sec}$ , $I_{gt} = 20 \text{ mA}$ ) | $di/dt$ | –  | –  | 50 | $\text{A}/\mu\text{s}$ |

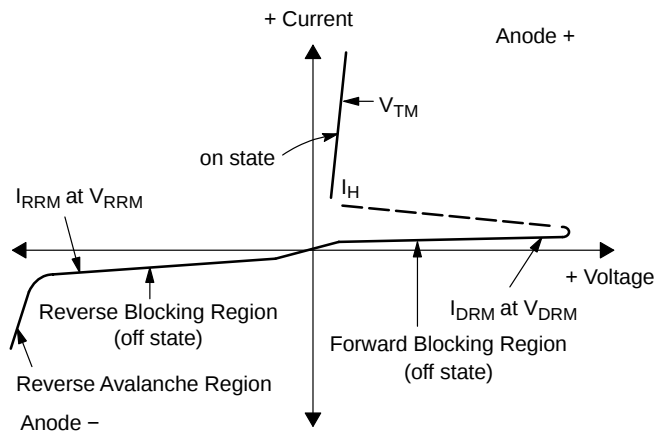
\*Indicates Pulse Test: Pulse Width  $\leq 1.0 \text{ ms}$ , Duty Cycle  $\leq 1\%$ .

2.  $R_{GK} = 1000 \Omega$  included in measurement.

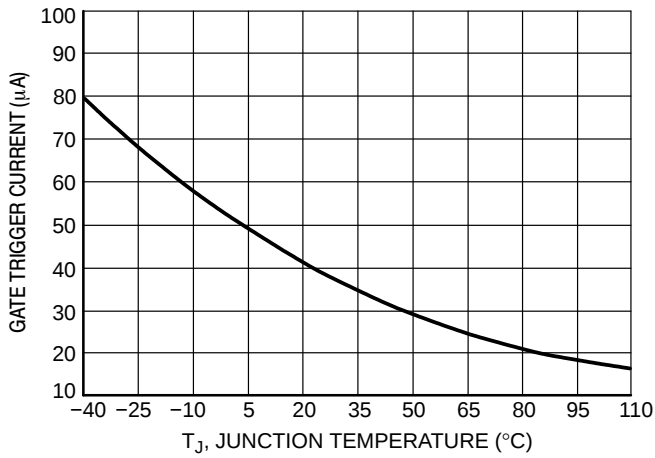
3. Does not include  $R_{GK}$  in measurement.

## Voltage Current Characteristic of SCR

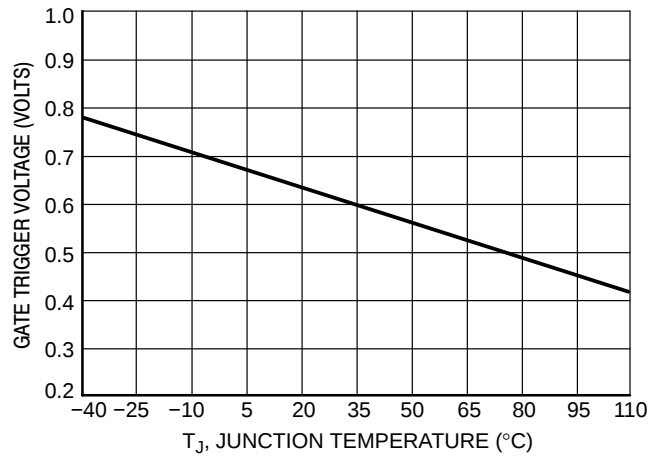
| Symbol    | Parameter                                 |
|-----------|-------------------------------------------|
| $V_{DRM}$ | Peak Repetitive Off State Forward Voltage |
| $I_{DRM}$ | Peak Forward Blocking Current             |
| $V_{RRM}$ | Peak Repetitive Off State Reverse Voltage |
| $I_{RRM}$ | Peak Reverse Blocking Current             |
| $V_{TM}$  | Peak on State Voltage                     |
| $I_H$     | Holding Current                           |



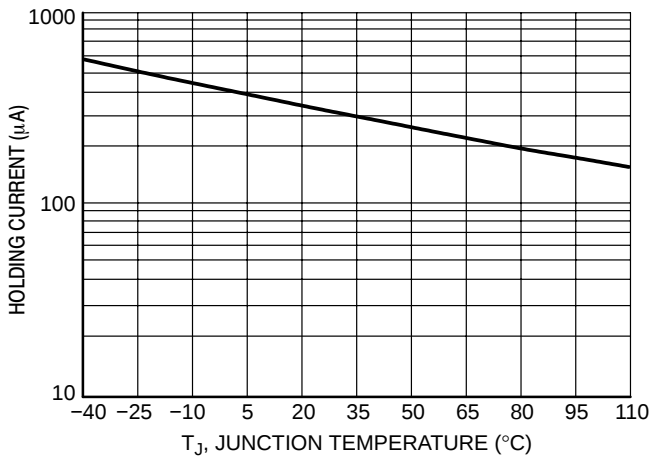
## MCR100 Series



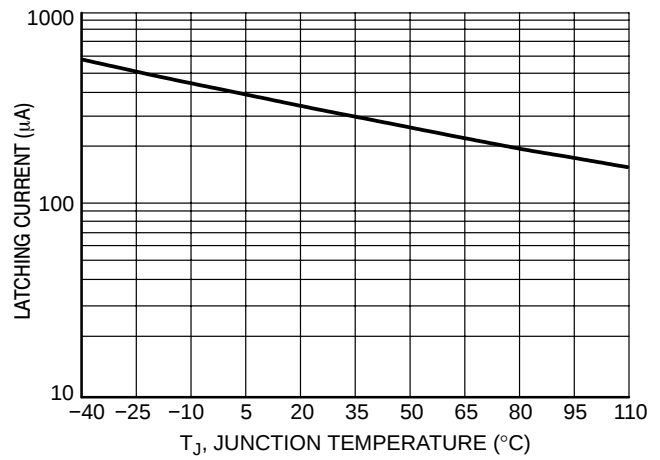
**Figure 1. Typical Gate Trigger Current versus Junction Temperature**



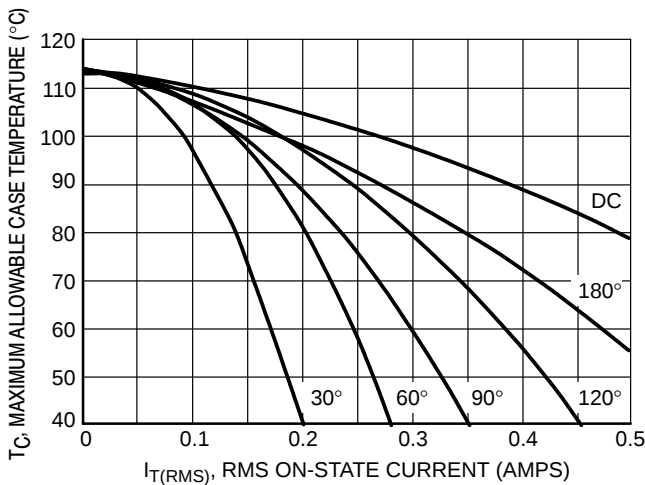
**Figure 2. Typical Gate Trigger Voltage versus Junction Temperature**



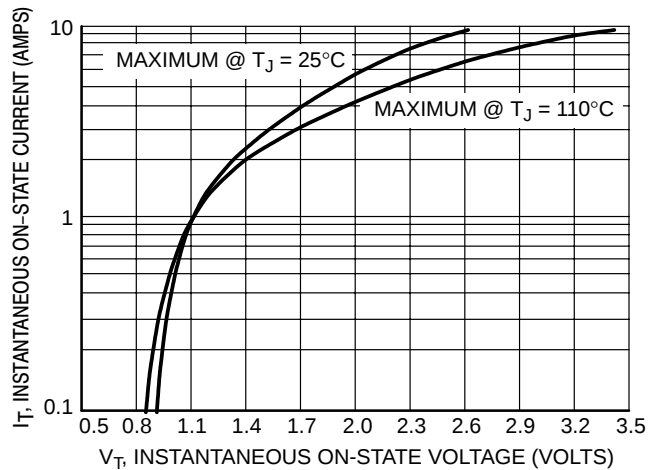
**Figure 3. Typical Holding Current versus Junction Temperature**



**Figure 4. Typical Latching Current versus Junction Temperature**



**Figure 5. Typical RMS Current Derating**



**Figure 6. Typical On-State Characteristics**

## MCR100 Series

### TO-92 EIA RADIAL TAPE IN FAN FOLD BOX OR ON REEL

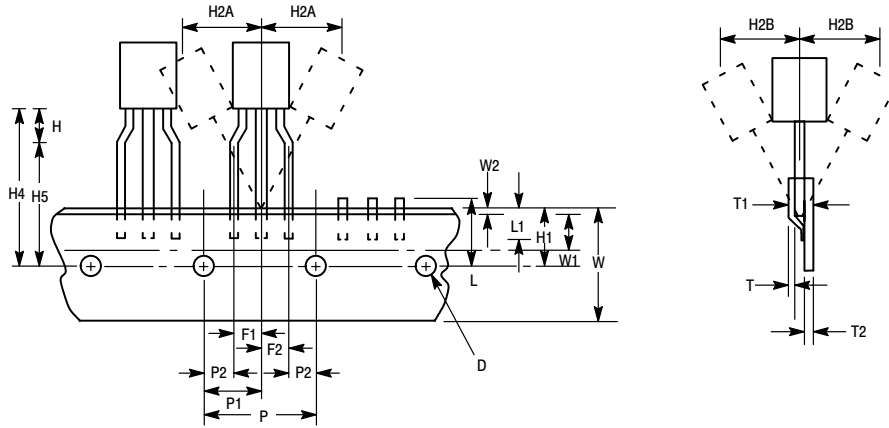


Figure 7. Device Positioning on Tape

| Symbol | Item                                 | Specification |         |            |      |
|--------|--------------------------------------|---------------|---------|------------|------|
|        |                                      | Inches        |         | Millimeter |      |
|        |                                      | Min           | Max     | Min        | Max  |
| D      | Tape Feedhole Diameter               | 0.1496        | 0.1653  | 3.8        | 4.2  |
| D2     | Component Lead Thickness Dimension   | 0.015         | 0.020   | 0.38       | 0.51 |
| F1, F2 | Component Lead Pitch                 | 0.0945        | 0.110   | 2.4        | 2.8  |
| H      | Bottom of Component to Seating Plane | .059          | .156    | 1.5        | 4.0  |
| H1     | Feedhole Location                    | 0.3346        | 0.3741  | 8.5        | 9.5  |
| H2A    | Deflection Left or Right             | 0             | 0.039   | 0          | 1.0  |
| H2B    | Deflection Front or Rear             | 0             | 0.051   | 0          | 1.0  |
| H4     | Feedhole to Bottom of Component      | 0.7086        | 0.768   | 18         | 19.5 |
| H5     | Feedhole to Seating Plane            | 0.610         | 0.649   | 15.5       | 16.5 |
| L      | Defective Unit Clipped Dimension     | 0.3346        | 0.433   | 8.5        | 11   |
| L1     | Lead Wire Enclosure                  | 0.09842       | —       | 2.5        | —    |
| P      | Feedhole Pitch                       | 0.4921        | 0.5079  | 12.5       | 12.9 |
| P1     | Feedhole Center to Center Lead       | 0.2342        | 0.2658  | 5.95       | 6.75 |
| P2     | First Lead Spacing Dimension         | 0.1397        | 0.1556  | 3.55       | 3.95 |
| T      | Adhesive Tape Thickness              | 0.06          | 0.08    | 0.15       | 0.20 |
| T1     | Overall Taped Package Thickness      | —             | 0.0567  | —          | 1.44 |
| T2     | Carrier Strip Thickness              | 0.014         | 0.027   | 0.35       | 0.65 |
| W      | Carrier Strip Width                  | 0.6889        | 0.7481  | 17.5       | 19   |
| W1     | Adhesive Tape Width                  | 0.2165        | 0.2841  | 5.5        | 6.3  |
| W2     | Adhesive Tape Position               | .0059         | 0.01968 | .15        | 0.5  |

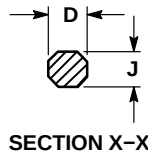
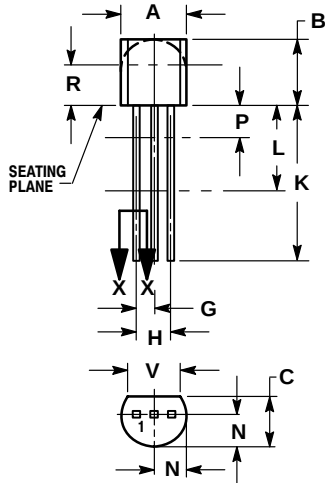
NOTES:

1. Maximum alignment deviation between leads not to be greater than 0.2 mm.
2. Defective components shall be clipped from the carrier tape such that the remaining protrusion (L) does not exceed a maximum of 11 mm.
3. Component lead to tape adhesion must meet the pull test requirements.
4. Maximum non-cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
5. Holddown tape not to extend beyond the edge(s) of carrier tape and there shall be no exposure of adhesive.
6. No more than 1 consecutive missing component is permitted.
7. A tape trailer and leader, having at least three feed holes is required before the first and after the last component.
8. Splices will not interfere with the sprocket feed holes.

# MCR100 Series

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 029-11  
ISSUE AL



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.175  | 0.205 | 4.45        | 5.20  |
| B   | 0.170  | 0.210 | 4.32        | 5.33  |
| C   | 0.125  | 0.165 | 3.18        | 4.19  |
| D   | 0.016  | 0.021 | 0.407       | 0.533 |
| E   | 0.045  | 0.055 | 1.15        | 1.39  |
| F   | 0.095  | 0.105 | 2.42        | 2.66  |
| G   | 0.015  | 0.020 | 0.39        | 0.50  |
| H   | 0.500  | ---   | 12.70       | ---   |
| I   | 0.250  | ---   | 6.35        | ---   |
| J   | 0.080  | 0.105 | 2.04        | 2.66  |
| K   | ---    | 0.100 | ---         | 2.54  |
| L   | 0.115  | ---   | 2.93        | ---   |
| M   | 0.135  | ---   | 3.43        | ---   |

### STYLE 10:

1. CATHODE
2. GATE
3. ANODE

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