

# Micropower Voltage Reference Diodes

## LM285, LM385B

The LM285/LM385 series are micropower two-terminal bandgap voltage regulator diodes. Designed to operate over a wide current range of 10  $\mu$ A to 20 mA, these devices feature exceptionally low dynamic impedance, low noise and stable operation over time and temperature. Tight voltage tolerances are achieved by on-chip trimming. The large dynamic operating range enables these devices to be used in applications with widely varying supplies with excellent regulation. Extremely low operating current make these devices ideal for micropower circuitry like portable instrumentation, regulators and other analog circuitry where extended battery life is required.

The LM285/LM385 series are packaged in a low cost TO-226 plastic case and are available in two voltage versions of 1.235 V and 2.500 V as denoted by the device suffix (see Ordering Information table). The LM285 is specified over a  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  temperature range while the LM385 is rated from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

The LM385 is also available in a surface mount plastic package in voltages of 1.235 V and 2.500 V.

### Features

- Operating Current from 10  $\mu$ A to 20 mA
- 1.0%, 1.5%, 2.0% and 3.0% Initial Tolerance Grades
- Low Temperature Coefficient
- 1.0  $\Omega$  Dynamic Impedance
- Surface Mount Package Available
- These Devices are Pb-Free and are RoHS Compliant

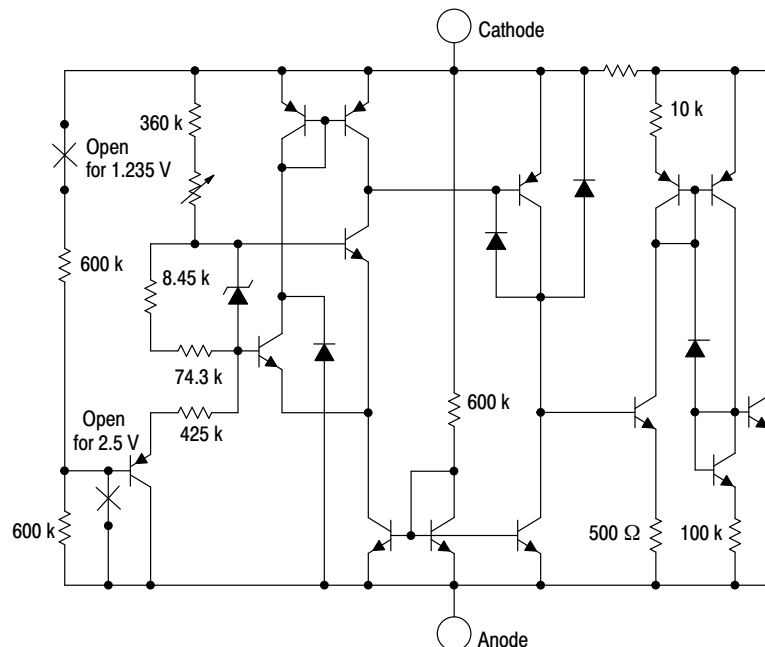
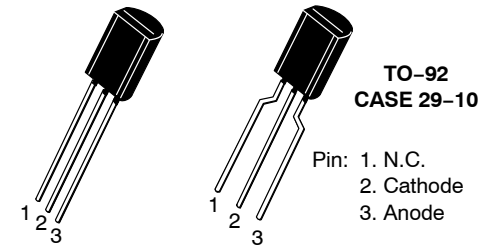


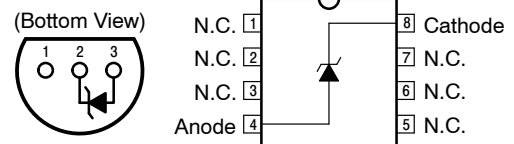
Figure 1. Representative Schematic Diagram

### MARKING DIAGRAMS

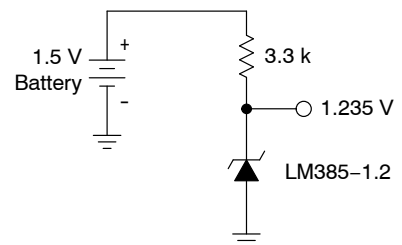


|               |                     |
|---------------|---------------------|
| STRAIGHT LEAD |                     |
| xxx           | = 1.2 or 2.5        |
| y             | = 2 or 3            |
| z             | = 1 or 2            |
| A             | = Assembly Location |
| L             | = Wafer Lot         |
| Y             | = Year              |
| W             | = Work Week         |
| ▪             | = Pb-Free Package   |

(Note: Microdot may be in either location)



### Standard Application



### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# LM285, LM385B

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

| Rating                                                                                                                  | Symbol           | Value                  | Unit             |
|-------------------------------------------------------------------------------------------------------------------------|------------------|------------------------|------------------|
| Reverse Current                                                                                                         | $I_R$            | 30                     | mA               |
| Forward Current                                                                                                         | $I_F$            | 10                     | mA               |
| Operating Ambient Temperature Range<br>LM285<br>LM385                                                                   | $T_A$            | -40 to +85<br>0 to +70 | $^\circ\text{C}$ |
| Operating Junction Temperature                                                                                          | $T_J$            | +150                   | $^\circ\text{C}$ |
| Storage Temperature Range                                                                                               | $T_{\text{stg}}$ | -65 to + 150           | $^\circ\text{C}$ |
| Electrostatic Discharge Sensitivity (ESD)<br>Human Body Model (HBM)<br>Machine Model (MM)<br>Charged Device Model (CDM) | ESD              | 4000<br>400<br>2000    | V                |

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.

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

| Characteristic                                                                                                                                                                                                                                                                                                          | Symbol                            | LM285-1.2                |                      |                          | LM385-1.2/LM385B-1.2             |                          |                                  | Unit                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------|----------------------|--------------------------|----------------------------------|--------------------------|----------------------------------|-----------------------|
|                                                                                                                                                                                                                                                                                                                         |                                   | Min                      | Typ                  | Max                      | Min                              | Typ                      | Max                              |                       |
| Reverse Breakdown Voltage ( $I_{R\text{min}} \leq I_R \leq 20 \text{ mA}$ )<br>LM285-1.2/LM385B-1.2<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)<br>LM385-1.2<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)                                                                                        | $V_{(\text{BR})R}$                | 1.223<br>1.200<br>—<br>— | 1.235<br>—<br>—<br>— | 1.247<br>1.270<br>—<br>— | 1.223<br>1.210<br>1.205<br>1.192 | 1.235<br>—<br>1.235<br>— | 1.247<br>1.260<br>1.260<br>1.273 | V                     |
| Minimum Operating Current<br>$T_A = 25^\circ\text{C}$<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)                                                                                                                                                                                                           | $I_{R\text{min}}$                 | —<br>—                   | 8.0<br>—             | 10<br>20                 | —<br>—                           | 8.0<br>—                 | 15<br>20                         | $\mu\text{A}$         |
| Reverse Breakdown Voltage Change with Current<br>$I_{R\text{min}} \leq I_R \leq 1.0 \text{ mA}$ , $T_A = +25^\circ\text{C}$<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)<br>$1.0 \text{ mA} \leq I_R \leq 20 \text{ mA}$ , $T_A = +25^\circ\text{C}$<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1) | $\Delta V_{(\text{BR})R}$         | —<br>—<br>—<br>—         | —<br>—<br>—<br>—     | 1.0<br>1.5<br>10<br>20   | —<br>—<br>—<br>—                 | —<br>—<br>—<br>—         | 1.0<br>1.5<br>20<br>25           | mV                    |
| Reverse Dynamic Impedance<br>$I_R = 100 \mu\text{A}$ , $T_A = +25^\circ\text{C}$                                                                                                                                                                                                                                        | Z                                 | —                        | 0.6                  | —                        | —                                | 0.6                      | —                                | $\Omega$              |
| Average Temperature Coefficient<br>$10 \mu\text{A} \leq I_R \leq 20 \text{ mA}$ , $T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)                                                                                                                                                                                  | $\Delta V_{(\text{BR})}/\Delta T$ | —                        | 80                   | —                        | —                                | 80                       | —                                | ppm/ $^\circ\text{C}$ |
| Wideband Noise (RMS)<br>$I_R = 100 \mu\text{A}$ , $10 \text{ Hz} \leq f \leq 10 \text{ kHz}$                                                                                                                                                                                                                            | n                                 | —                        | 60                   | —                        | —                                | 60                       | —                                | $\mu\text{V}$         |
| Long Term Stability<br>$I_R = 100 \mu\text{A}$ , $T_A = +25^\circ\text{C} \pm 0.1^\circ\text{C}$                                                                                                                                                                                                                        | S                                 | —                        | 20                   | —                        | —                                | 20                       | —                                | ppm/kHR               |
| Reverse Breakdown Voltage ( $I_{R\text{min}} \leq I_R \leq 20 \text{ mA}$ )<br>LM285-2.5/LM385B-2.5<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)<br>LM385-2.5<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)                                                                                        | $V_{(\text{BR})R}$                | 2.462<br>2.415<br>—<br>— | 2.5<br>—<br>—<br>—   | 2.538<br>2.585<br>—<br>— | 2.462<br>2.436<br>2.425<br>2.400 | 2.5<br>—<br>2.5<br>—     | 2.538<br>2.564<br>2.575<br>2.600 | V                     |
| Minimum Operating Current<br>$T_A = 25^\circ\text{C}$<br>$T_A = T_{\text{low}}$ to $T_{\text{high}}$ (Note 1)                                                                                                                                                                                                           | $I_{R\text{min}}$                 | —<br>—                   | 13<br>—              | 20<br>30                 | —<br>—                           | 13<br>—                  | 20<br>30                         | $\mu\text{A}$         |

- $T_{\text{low}} = -40^\circ\text{C}$  for LM285-1.2, LM285-2.5  
 $T_{\text{high}} = +85^\circ\text{C}$  for LM285-1.2, LM285-2.5  
 $T_{\text{low}} = 0^\circ\text{C}$  for LM385-1.2, LM385B-1.2, LM385-2.5, LM385B-2.5  
 $T_{\text{high}} = +70^\circ\text{C}$  for LM385-1.2, LM385B-1.2, LM385-2.5, LM385B-2.5

# LM285, LM385B

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

| Characteristic                                                                                                                                                                                                                                                                       | Symbol                     | LM285-1.2 |     |                        | LM385-1.2/LM385B-1.2 |     |                        | Unit                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------|-----|------------------------|----------------------|-----|------------------------|-----------------------|
|                                                                                                                                                                                                                                                                                      |                            | Min       | Typ | Max                    | Min                  | Typ | Max                    |                       |
| Reverse Breakdown Voltage Change with Current<br>$I_{Rmin} \leq I_R \leq 1.0 \text{ mA}$ , $T_A = +25^\circ\text{C}$<br>$T_A = T_{low}$ to $T_{high}$ (Note 2)<br>$1.0 \text{ mA} \leq I_R \leq 20 \text{ mA}$ , $T_A = +25^\circ\text{C}$<br>$T_A = T_{low}$ to $T_{high}$ (Note 2) | $\Delta V_{(BR)R}$         | –         | –   | 1.0<br>1.5<br>10<br>20 | –                    | –   | 2.0<br>2.5<br>20<br>25 | mV                    |
| Reverse Dynamic Impedance<br>$I_R = 100 \mu\text{A}$ , $T_A = +25^\circ\text{C}$                                                                                                                                                                                                     | Z                          | –         | 0.6 | –                      | –                    | 0.6 | –                      | $\Omega$              |
| Average Temperature Coefficient<br>$20 \mu\text{A} \leq I_R \leq 20 \text{ mA}$ , $T_A = T_{low}$ to $T_{high}$ (Note 2)                                                                                                                                                             | $\Delta V_{(BR)}/\Delta T$ | –         | 80  | –                      | –                    | 80  | –                      | ppm/ $^\circ\text{C}$ |
| Wideband Noise (RMS)<br>$I_R = 100 \mu\text{A}$ , $10 \text{ Hz} \leq f \leq 10 \text{ kHz}$                                                                                                                                                                                         | n                          | –         | 120 | –                      | –                    | 120 | –                      | $\mu\text{V}$         |
| Long Term Stability<br>$I_R = 100 \mu\text{A}$ , $T_A = +25^\circ\text{C} \pm 0.1^\circ\text{C}$                                                                                                                                                                                     | S                          | –         | 20  | –                      | –                    | 20  | –                      | ppm/kHR               |

2.  $T_{low} = -40^\circ\text{C}$  for LM285-1.2, LM285-2.5  
 $T_{high} = +85^\circ\text{C}$  for LM285-1.2, LM285-2.5  
 $T_{low} = 0^\circ\text{C}$  for LM385-1.2, LM385B-1.2, LM385-2.5, LM385B-2.5  
 $T_{high} = +70^\circ\text{C}$  for LM385-1.2, LM385B-1.2, LM385-2.5, LM385B-2.5

# LM285, LM385B

## TYPICAL PERFORMANCE CURVES FOR LM285-1.2/385-1.2/385B-1.2

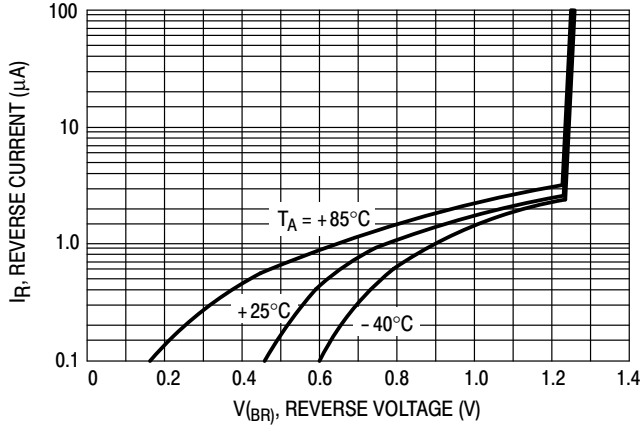


Figure 2. Reverse Characteristics

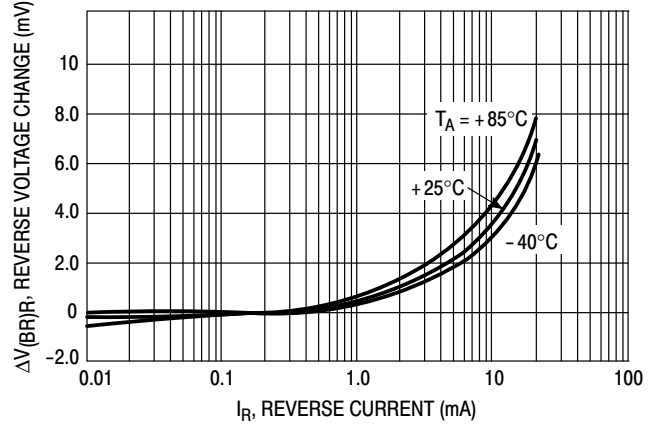


Figure 3. Reverse Characteristics

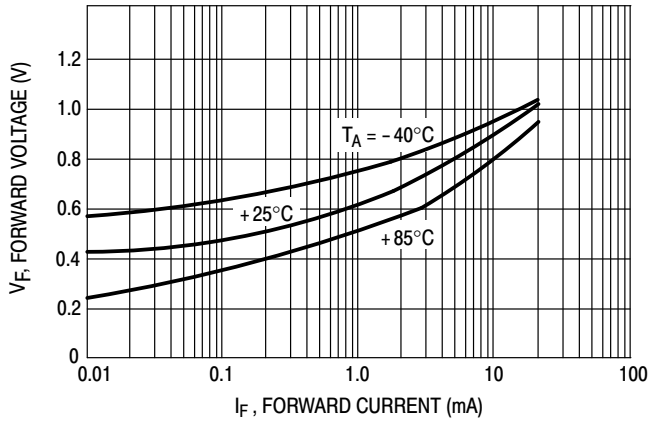


Figure 4. Forward Characteristics

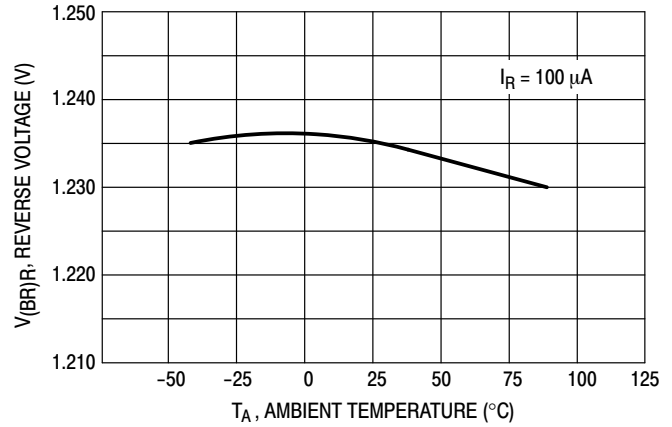


Figure 5. Temperature Drift

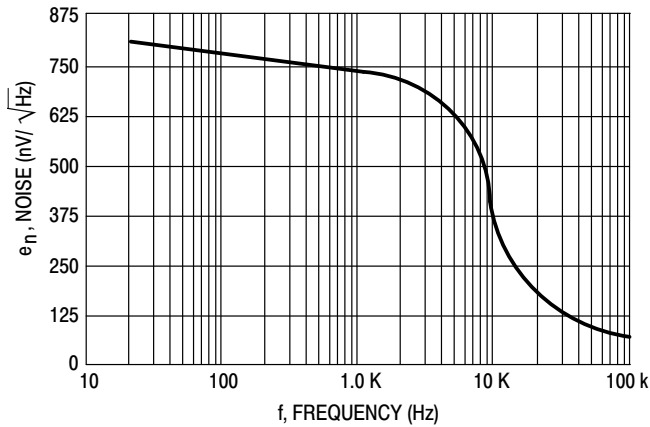


Figure 6. Noise Voltage

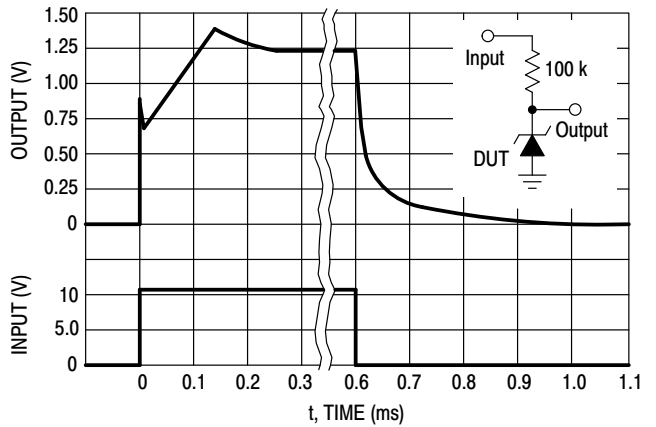


Figure 7. Response Time

# LM285, LM385B

## TYPICAL PERFORMANCE CURVES FOR LM285-2.5/385-2.5/385B-2.5

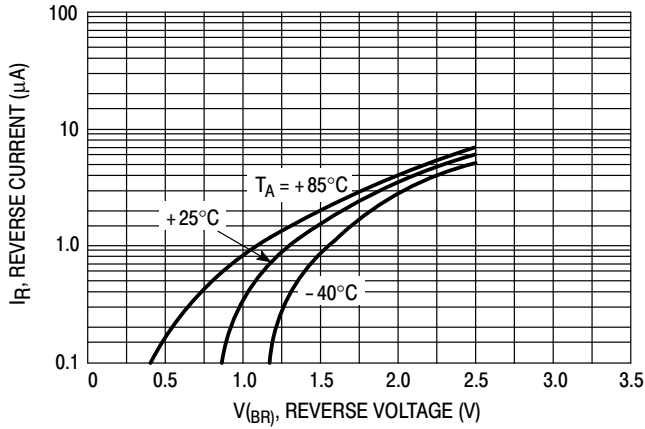


Figure 8. Reverse Characteristics

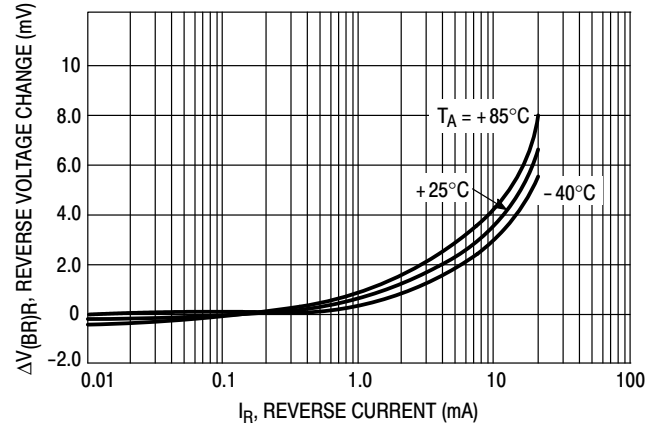


Figure 9. Reverse Characteristics

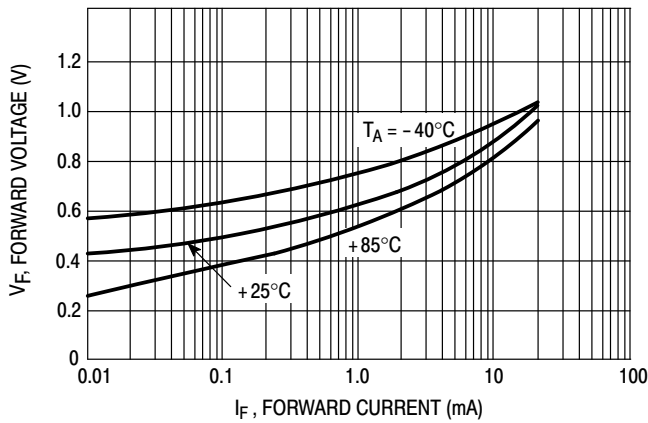


Figure 10. Forward Characteristics

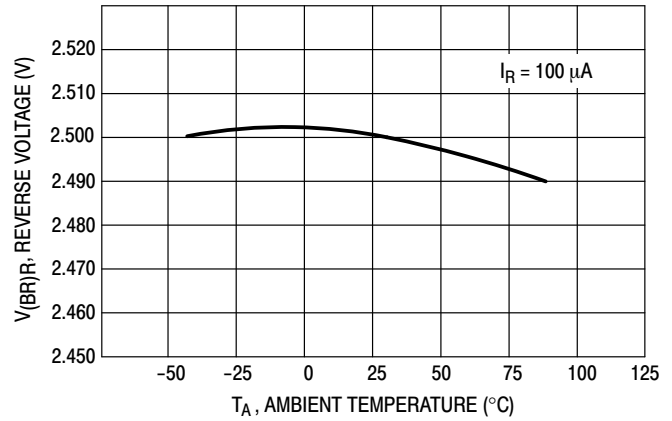


Figure 11. Temperature Drift

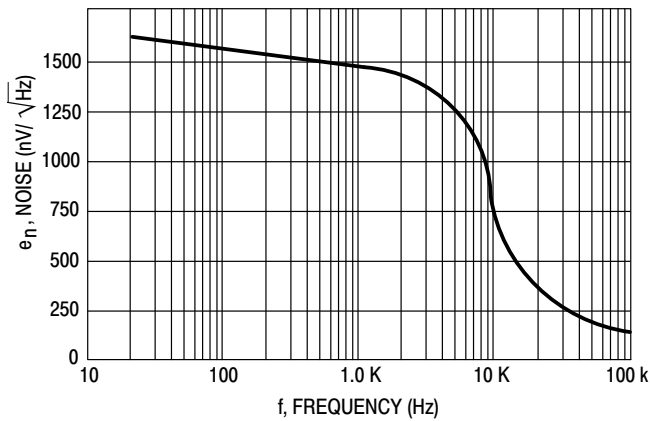


Figure 12. Noise Voltage

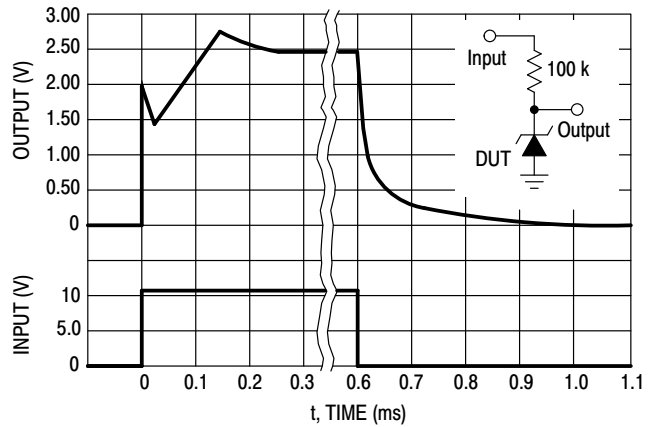


Figure 13. Response Time

# LM285, LM385B

## ORDERING INFORMATION

| Device         | Operating Temperature Range     | Reverse Break-Down Voltage | Package          | Shipping†             |
|----------------|---------------------------------|----------------------------|------------------|-----------------------|
| LM285D-1.2     | T <sub>A</sub> = -40°C to +85°C | 1.235 V                    | SOIC-8           | 98 Units / Rail       |
| LM285D-1.2G    |                                 |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM285D-1.2R2   |                                 |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM285D-1.2R2G  |                                 |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM285D-2.5     |                                 | 2.500 V                    | SOIC-8           | 98 Units / Rail       |
| LM285D-2.5G    |                                 |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM285D-2.5R2   |                                 |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM285D-2.5R2G  |                                 |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM285Z-1.2     |                                 | 1.235 V                    | TO-92            | 2000 Units / Bag      |
| LM285Z-1.2G    |                                 |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM285Z-2.5     |                                 | 2.500 V                    | TO-92            | 2000 Units / Bag      |
| LM285Z-2.5G    |                                 |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM285Z-1.2RA   |                                 | 1.235 V                    | TO-92            | 2000 / Tape & Reel    |
| LM285Z-1.2RAG  |                                 |                            | TO-92 (Pb-Free)  | 2000 / Tape & Reel    |
| LM285Z-2.5RA   |                                 | 2.500 V                    | TO-92            | 2000 / Tape & Reel    |
| LM285Z-2.5RAG  |                                 |                            | TO-92 (Pb-Free)  | 2000 / Tape & Reel    |
| LM285Z-2.5RP   |                                 |                            | TO-92            | 2000 Units / Fan-Fold |
| LM285Z-2.5RPG  |                                 |                            | TO-92 (Pb-Free)  | 2000 Units / Fan-Fold |
| LM385BD-1.2    | T <sub>A</sub> = 0°C to +70°C   | 1.235 V                    | SOIC-8           | 98 Units / Rail       |
| LM385BD-1.2G   |                                 |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM385BD-1.2R2  |                                 |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM385BD-1.2R2G |                                 |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM385BD-2.5    |                                 | 2.500 V                    | SOIC-8           | 98 Units / Rail       |
| LM385BD-2.5G   |                                 |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM385BD-2.5R2  |                                 |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM385BD-2.5R2G |                                 |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM385BZ-1.2    |                                 | 1.235 V                    | TO-92            | 2000 Units / Bag      |
| LM385BZ-1.2G   |                                 |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM385BZ-1.2RA  |                                 |                            | TO-92            | 2000 / Tape & Reel    |
| LM385BZ-1.2RAG |                                 |                            | TO-92 (Pb-Free)  | 2000 / Tape & Reel    |

†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.

# LM285, LM385B

## ORDERING INFORMATION

| Device         | Operating Temperature Range                       | Reverse Break-Down Voltage | Package          | Shipping <sup>†</sup> |
|----------------|---------------------------------------------------|----------------------------|------------------|-----------------------|
| LM385BZ-2.5    | $T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ | 2.500 V                    | TO-92            | 2000 Units / Bag      |
| LM385BZ-2.5G   |                                                   |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM385BZ-2.5RA  |                                                   |                            | TO-92            | 2000 / Tape & Reel    |
| LM385BZ-2.5RAG |                                                   |                            | TO-92 (Pb-Free)  | 2000 / Tape & Reel    |
| LM385D-1.2     |                                                   | 1.235 V                    | SOIC-8           | 98 Units / Rail       |
| LM385D-1.2G    |                                                   |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM385D-1.2R2   |                                                   |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM385D-1.2R2G  |                                                   |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM385D-2.5     |                                                   | 2.500 V                    | SOIC-8           | 98 Units / Rail       |
| LM385D-2.5G    |                                                   |                            | SOIC-8 (Pb-Free) | 98 Units / Rail       |
| LM385D-2.5R2   |                                                   |                            | SOIC-8           | 2500 / Tape & Reel    |
| LM385D-2.5R2G  |                                                   |                            | SOIC-8 (Pb-Free) | 2500 / Tape & Reel    |
| LM385Z-1.2     |                                                   | 1.235 V                    | TO-92            | 2000 Units / Bag      |
| LM385Z-1.2G    |                                                   |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM385Z-1.2RA   |                                                   |                            | TO-92            | 2000 / Tape & Reel    |
| LM385Z-1.2RAG  |                                                   |                            | TO-92 (Pb-Free)  | 2000 / Tape & Reel    |
| LM385Z-1.2RP   |                                                   |                            | TO-92            | 2000 / Ammo Box       |
| LM385Z-1.2RPG  |                                                   |                            | TO-92 (Pb-Free)  | 2000 / Ammo Box       |
| LM385Z-2.5     |                                                   | 2.500 V                    | TO-92            | 2000 Units / Bag      |
| LM385Z-2.5G    |                                                   |                            | TO-92 (Pb-Free)  | 2000 Units / Bag      |
| LM385Z-2.5RP   |                                                   |                            | TO-92            | 2000 / Ammo Box       |
| LM385Z-2.5RPG  |                                                   |                            | TO-92 (Pb-Free)  | 2000 / Ammo Box       |

<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.

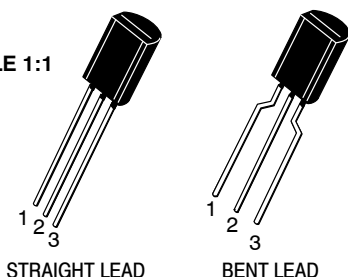
# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1



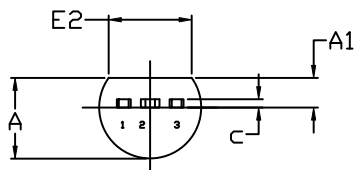
STRAIGHT LEAD

BENT LEAD

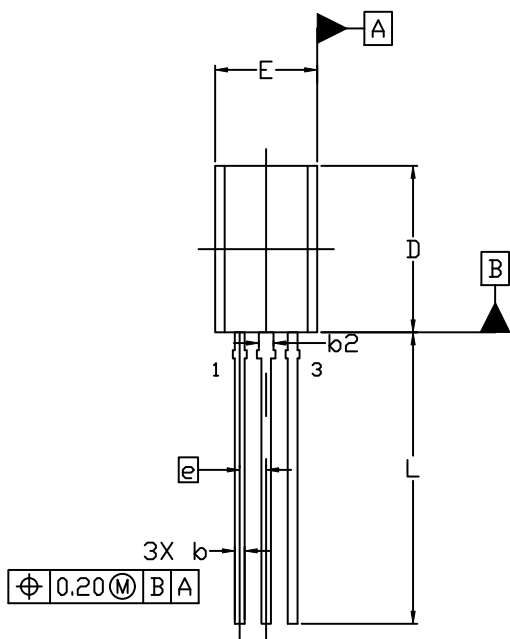
TO-92 (TO-226) 1 WATT  
CASE 29-10  
ISSUE D

DATE 05 MAR 2021

### STRAIGHT LEAD



END VIEW



TOP VIEW

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS.
4. DIMENSION b AND b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 0.20. DIMENSION b2 LOCATED ABOVE THE DAMBAR PORTION OF MIDDLE LEAD.

| DIM | MILLIMETERS |       |       |
|-----|-------------|-------|-------|
|     | MIN.        | NOM.  | MAX.  |
| A   | 3.75        | 3.90  | 4.05  |
| A1  | 1.28        | 1.43  | 1.58  |
| b   | 0.38        | 0.465 | 0.55  |
| b2  | 0.62        | 0.70  | 0.78  |
| c   | 0.35        | 0.40  | 0.45  |
| D   | 7.85        | 8.00  | 8.15  |
| E   | 4.75        | 4.90  | 5.05  |
| E2  | 3.90        | ---   | ---   |
| e   | 1.27 BSC    |       |       |
| L   | 13.80       | 14.00 | 14.20 |

### STYLES AND MARKING ON PAGE 3

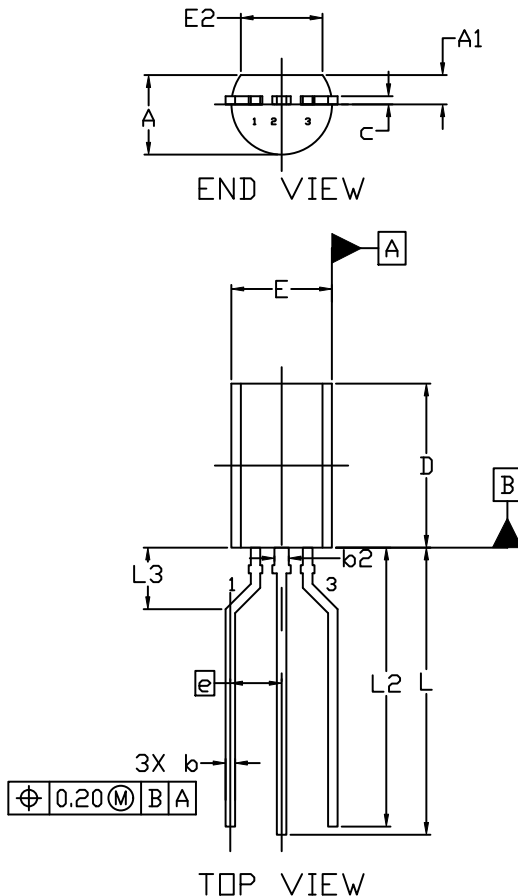
|                  |                       |                                                                                                                                                                                  |
|------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOCUMENT NUMBER: | 98AON52857E           | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | TO-92 (TO-226) 1 WATT | PAGE 1 OF 3                                                                                                                                                                      |

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ISSUE D

DATE 05 MAR 2021

**FORMED LEAD**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS.
4. DIMENSION b AND b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 0.20. DIMENSION b2 LOCATED ABOVE THE DAMBAR PORTION OF MIDDLE LEAD.

| DIM | MILLIMETERS |       |       |
|-----|-------------|-------|-------|
|     | MIN.        | NOM.  | MAX.  |
| A   | 3.75        | 3.90  | 4.05  |
| A1  | 1.28        | 1.43  | 1.58  |
| b   | 0.38        | 0.465 | 0.55  |
| b2  | 0.62        | 0.70  | 0.78  |
| c   | 0.35        | 0.40  | 0.45  |
| D   | 7.85        | 8.00  | 8.15  |
| E   | 4.75        | 4.90  | 5.05  |
| E2  | 3.90        | ---   | ---   |
| e   | 2.50 BSC    |       |       |
| L   | 13.80       | 14.00 | 14.20 |
| L2  | 13.20       | 13.60 | 14.00 |
| L3  | 3.00 REF    |       |       |

**STYLES AND MARKING ON PAGE 3**

|                         |                              |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>TO-92 (TO-226) 1 WATT</b> | <b>PAGE 2 OF 3</b>                                                                                                                                                                  |

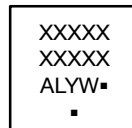
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**TO-92 (TO-226) 1 WATT**  
**CASE 29-10**  
**ISSUE D**

DATE 05 MAR 2021

|                                                                 |                                                                      |                                                              |                                                                 |                                                             |
|-----------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR           | STYLE 2:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR                | STYLE 3:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE           | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE            | STYLE 5:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE            |
| STYLE 6:<br>PIN 1. GATE<br>2. SOURCE & SUBSTRATE<br>3. DRAIN    | STYLE 7:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE                     | STYLE 8:<br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE & SUBSTRATE | STYLE 9:<br>PIN 1. BASE 1<br>2. EMITTER<br>3. BASE 2            | STYLE 10:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE & ANODE<br>3. CATHODE   | STYLE 12:<br>PIN 1. MAIN TERMINAL 1<br>2. GATE<br>3. MAIN TERMINAL 2 | STYLE 13:<br>PIN 1. ANODE 1<br>2. GATE<br>3. CATHODE 2       | STYLE 14:<br>PIN 1. EMITTER<br>2. COLLECTOR<br>3. BASE          | STYLE 15:<br>PIN 1. ANODE 1<br>2. CATHODE<br>3. ANODE 2     |
| STYLE 16:<br>PIN 1. ANODE<br>2. GATE<br>3. CATHODE              | STYLE 17:<br>PIN 1. COLLECTOR<br>2. BASE<br>3. EMITTER               | STYLE 18:<br>PIN 1. ANODE<br>2. CATHODE<br>3. NOT CONNECTED  | STYLE 19:<br>PIN 1. GATE<br>2. ANODE<br>3. CATHODE              | STYLE 20:<br>PIN 1. NOT CONNECTED<br>2. CATHODE<br>3. ANODE |
| STYLE 21:<br>PIN 1. COLLECTOR<br>2. EMITTER<br>3. BASE          | STYLE 22:<br>PIN 1. SOURCE<br>2. GATE<br>3. DRAIN                    | STYLE 23:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN            | STYLE 24:<br>PIN 1. EMITTER<br>2. COLLECTOR/ANODE<br>3. CATHODE | STYLE 25:<br>PIN 1. MT 1<br>2. GATE<br>3. MT 2              |
| STYLE 26:<br>PIN 1. V <sub>CC</sub><br>2. GROUND 2<br>3. OUTPUT | STYLE 27:<br>PIN 1. MT<br>2. SUBSTRATE<br>3. MT                      | STYLE 28:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE           | STYLE 29:<br>PIN 1. NOT CONNECTED<br>2. ANODE<br>3. CATHODE     | STYLE 30:<br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE           |
| STYLE 31:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE               | STYLE 32:<br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER               | STYLE 33:<br>PIN 1. RETURN<br>2. INPUT<br>3. OUTPUT          | STYLE 34:<br>PIN 1. INPUT<br>2. GROUND<br>3. LOGIC              | STYLE 35:<br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER      |

**GENERIC  
MARKING DIAGRAM\***



XXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = 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.

|                         |                              |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>TO-92 (TO-226) 1 WATT</b> | <b>PAGE 3 OF 3</b>                                                                                                                                                                  |

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-8 NB  
CASE 751-07  
ISSUE AK

DATE 16 FEB 2011



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

## GENERIC MARKING DIAGRAM\*



SCALE 6:1 (mm/inches)



XXXXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

XXXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = 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.

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

## STYLES ON PAGE 2

|                  |             |                                                                                                                                                                                  |
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| DESCRIPTION:     | SOIC-8 NB   | PAGE 1 OF 2                                                                                                                                                                      |

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**SOIC-8 NB**  
**CASE 751-07**  
**ISSUE AK**

DATE 16 FEB 2011

|                                                                                                                                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                    |                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STYLE 1:</b><br>PIN 1. EMITTER<br>2. COLLECTOR<br>3. COLLECTOR<br>4. EMITTER<br>5. EMITTER<br>6. BASE<br>7. BASE<br>8. EMITTER                                                                 | <b>STYLE 2:</b><br>PIN 1. COLLECTOR, DIE, #1<br>2. COLLECTOR, #1<br>3. COLLECTOR, #2<br>4. COLLECTOR, #2<br>5. BASE, #2<br>6. EMITTER, #2<br>7. BASE, #1<br>8. EMITTER, #1               | <b>STYLE 3:</b><br>PIN 1. DRAIN, DIE #1<br>2. DRAIN, #1<br>3. DRAIN, #2<br>4. DRAIN, #2<br>5. GATE, #2<br>6. SOURCE, #2<br>7. GATE, #1<br>8. SOURCE, #1                            | <b>STYLE 4:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE<br>4. ANODE<br>5. ANODE<br>6. ANODE<br>7. ANODE<br>8. COMMON CATHODE                                                                           |
| <b>STYLE 5:</b><br>PIN 1. DRAIN<br>2. DRAIN<br>3. DRAIN<br>4. DRAIN<br>5. GATE<br>6. GATE<br>7. SOURCE<br>8. SOURCE                                                                               | <b>STYLE 6:</b><br>PIN 1. SOURCE<br>2. DRAIN<br>3. DRAIN<br>4. SOURCE<br>5. SOURCE<br>6. GATE<br>7. GATE<br>8. SOURCE                                                                    | <b>STYLE 7:</b><br>PIN 1. INPUT<br>2. EXTERNAL BYPASS<br>3. THIRD STAGE SOURCE<br>4. GROUND<br>5. DRAIN<br>6. GATE 3<br>7. SECOND STAGE Vd<br>8. FIRST STAGE Vd                    | <b>STYLE 8:</b><br>PIN 1. COLLECTOR, DIE #1<br>2. BASE, #1<br>3. BASE, #2<br>4. COLLECTOR, #2<br>5. COLLECTOR, #2<br>6. EMITTER, #2<br>7. EMITTER, #1<br>8. COLLECTOR, #1                              |
| <b>STYLE 9:</b><br>PIN 1. EMITTER, COMMON<br>2. COLLECTOR, DIE #1<br>3. COLLECTOR, DIE #2<br>4. EMITTER, COMMON<br>5. EMITTER, COMMON<br>6. BASE, DIE #2<br>7. BASE, DIE #1<br>8. EMITTER, COMMON | <b>STYLE 10:</b><br>PIN 1. GROUND<br>2. BIAS 1<br>3. OUTPUT<br>4. GROUND<br>5. GROUND<br>6. BIAS 2<br>7. INPUT<br>8. GROUND                                                              | <b>STYLE 11:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. SOURCE 2<br>4. GATE 2<br>5. DRAIN 2<br>6. DRAIN 2<br>7. DRAIN 1<br>8. DRAIN 1                                               | <b>STYLE 12:</b><br>PIN 1. SOURCE<br>2. SOURCE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                                 |
| <b>STYLE 13:</b><br>PIN 1. N.C.<br>2. SOURCE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                              | <b>STYLE 14:</b><br>PIN 1. N-SOURCE<br>2. N-GATE<br>3. P-SOURCE<br>4. P-GATE<br>5. P-DRAIN<br>6. P-DRAIN<br>7. N-DRAIN<br>8. N-DRAIN                                                     | <b>STYLE 15:</b><br>PIN 1. ANODE 1<br>2. ANODE 1<br>3. ANODE 1<br>4. ANODE 1<br>5. CATHODE, COMMON<br>6. CATHODE, COMMON<br>7. CATHODE, COMMON<br>8. CATHODE, COMMON               | <b>STYLE 16:</b><br>PIN 1. EMITTER, DIE #1<br>2. BASE, DIE #1<br>3. EMITTER, DIE #2<br>4. BASE, DIE #2<br>5. COLLECTOR, DIE #2<br>6. COLLECTOR, DIE #2<br>7. COLLECTOR, DIE #1<br>8. COLLECTOR, DIE #1 |
| <b>STYLE 17:</b><br>PIN 1. VCC<br>2. V2OUT<br>3. V1OUT<br>4. TXE<br>5. RXE<br>6. VEE<br>7. GND<br>8. ACC                                                                                          | <b>STYLE 18:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. CATHODE<br>8. CATHODE                                                                 | <b>STYLE 19:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. SOURCE 2<br>4. GATE 2<br>5. DRAIN 2<br>6. MIRROR 2<br>7. DRAIN 1<br>8. MIRROR 1                                             | <b>STYLE 20:</b><br>PIN 1. SOURCE (N)<br>2. GATE (N)<br>3. SOURCE (P)<br>4. GATE (P)<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                   |
| <b>STYLE 21:</b><br>PIN 1. CATHODE 1<br>2. CATHODE 2<br>3. CATHODE 3<br>4. CATHODE 4<br>5. CATHODE 5<br>6. COMMON ANODE<br>7. COMMON ANODE<br>8. CATHODE 6                                        | <b>STYLE 22:</b><br>PIN 1. I/O LINE 1<br>2. COMMON CATHODE/VCC<br>3. COMMON CATHODE/VCC<br>4. I/O LINE 3<br>5. COMMON ANODE/GND<br>6. I/O LINE 4<br>7. I/O LINE 5<br>8. COMMON ANODE/GND | <b>STYLE 23:</b><br>PIN 1. LINE 1 IN<br>2. COMMON ANODE/GND<br>3. COMMON ANODE/GND<br>4. LINE 2 IN<br>5. LINE 2 OUT<br>6. COMMON ANODE/GND<br>7. COMMON ANODE/GND<br>8. LINE 1 OUT | <b>STYLE 24:</b><br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR/ANODE<br>4. COLLECTOR/ANODE<br>5. CATHODE<br>6. CATHODE<br>7. COLLECTOR/ANODE<br>8. COLLECTOR/ANODE                                      |
| <b>STYLE 25:</b><br>PIN 1. VIN<br>2. N/C<br>3. REXT<br>4. GND<br>5. IOUT<br>6. IOUT<br>7. IOUT<br>8. IOUT                                                                                         | <b>STYLE 26:</b><br>PIN 1. GND<br>2. dv/dt<br>3. ENABLE<br>4. ILIMIT<br>5. SOURCE<br>6. SOURCE<br>7. SOURCE<br>8. VCC                                                                    | <b>STYLE 27:</b><br>PIN 1. ILIMIT<br>2. OVLO<br>3. UVLO<br>4. INPUT+<br>5. SOURCE<br>6. SOURCE<br>7. SOURCE<br>8. DRAIN                                                            | <b>STYLE 28:</b><br>PIN 1. SW_TO_GND<br>2. DASIC_OFF<br>3. DASIC_SW_DET<br>4. GND<br>5. V_MON<br>6. VBULK<br>7. VBULK<br>8. VIN                                                                        |
| <b>STYLE 29:</b><br>PIN 1. BASE, DIE #1<br>2. EMITTER, #1<br>3. BASE, #2<br>4. EMITTER, #2<br>5. COLLECTOR, #2<br>6. COLLECTOR, #2<br>7. COLLECTOR, #1<br>8. COLLECTOR, #1                        | <b>STYLE 30:</b><br>PIN 1. DRAIN 1<br>2. DRAIN 1<br>3. GATE 2<br>4. SOURCE 2<br>5. SOURCE 1/DRAIN 2<br>6. SOURCE 1/DRAIN 2<br>7. SOURCE 1/DRAIN 2<br>8. GATE 1                           |                                                                                                                                                                                    |                                                                                                                                                                                                        |

|                         |                    |                                                                                                                                                                                     |
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