

# J309, J310

Preferred Device

## JFET VHF/UHF Amplifiers

### N-Channel — Depletion

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

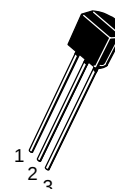
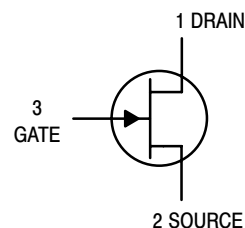
| Rating                                                                                   | Symbol    | Value       | Unit                       |
|------------------------------------------------------------------------------------------|-----------|-------------|----------------------------|
| Drain-Source Voltage                                                                     | $V_{DS}$  | 25          | Vdc                        |
| Gate-Source Voltage                                                                      | $V_{GS}$  | 25          | Vdc                        |
| Forward Gate Current                                                                     | $I_{GF}$  | 10          | mA dc                      |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $= 25^\circ\text{C}$ | $P_D$     | 350<br>2.8  | mW<br>mW/ $^\circ\text{C}$ |
| Junction Temperature Range                                                               | $T_J$     | -65 to +125 | $^\circ\text{C}$           |
| Storage Temperature Range                                                                | $T_{stg}$ | -65 to +150 | $^\circ\text{C}$           |

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.



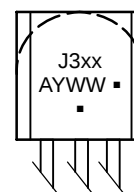
ON Semiconductor®

<http://onsemi.com>



TO-92  
CASE 29-11  
STYLE 5

#### MARKING DIAGRAM



J3xx = Device Code

xx = 09 or 10

A = Assembly Location

Y = Year

WW = Work Week

■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 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.

# J309, J310

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                                                                                                                                                              |                      |              |        |              |                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|--------|--------------|-------------------|
| Gate-Source Breakdown Voltage<br>(I <sub>G</sub> = -1.0 $\mu$ Adc, V <sub>DS</sub> = 0)                                                                                      | V <sub>(BR)GSS</sub> | -25          | -      | -            | Vdc               |
| Gate Reverse Current<br>(V <sub>GS</sub> = -15 Vdc, V <sub>DS</sub> = 0, T <sub>A</sub> = 25°C)<br>(V <sub>GS</sub> = -15 Vdc, V <sub>DS</sub> = 0, T <sub>A</sub> = +125°C) | I <sub>GSS</sub>     | -<br>-       | -<br>- | -1.0<br>-1.0 | nAdc<br>$\mu$ Adc |
| Gate Source Cutoff Voltage<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 1.0 nAdc)                                                                                          | V <sub>GS(off)</sub> | -1.0<br>-2.0 | -<br>- | -4.0<br>-6.5 | Vdc               |

### ON CHARACTERISTICS

|                                                                                                   |                    |          |        |          |      |
|---------------------------------------------------------------------------------------------------|--------------------|----------|--------|----------|------|
| Zero-Gate-Voltage Drain Current <sup>(1)</sup><br>(V <sub>DS</sub> = 10 Vdc, V <sub>GS</sub> = 0) | I <sub>DSS</sub>   | 12<br>24 | -<br>- | 30<br>60 | mAdc |
| Gate-Source Forward Voltage<br>(V <sub>DS</sub> = 0, I <sub>G</sub> = 1.0 mAdc)                   | V <sub>GS(f)</sub> | -        | -      | 1.0      | Vdc  |

### SMALL-SIGNAL CHARACTERISTICS

|                                                                                                             |                      |               |                |                |           |
|-------------------------------------------------------------------------------------------------------------|----------------------|---------------|----------------|----------------|-----------|
| Common-Source Input Conductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 MHz)        | Re(y <sub>is</sub> ) | -<br>-        | 0.7<br>0.5     | -<br>-         | mmhos     |
| Common-Source Output Conductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 MHz)       | Re(y <sub>os</sub> ) | -             | 0.25           | -              | mmhos     |
| Common-Gate Power Gain<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 MHz)                 | G <sub>pg</sub>      | -             | 16             | -              | dB        |
| Common-Source Forward Transconductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 MHz) | Re(y <sub>fs</sub> ) | -             | 12             | -              | mmhos     |
| Common-Gate Input Conductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 MHz)          | Re(y <sub>ig</sub> ) | -             | 12             | -              | mmhos     |
| Common-Source Forward Transconductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 1.0 kHz) | g <sub>fs</sub>      | 10000<br>8000 | -<br>-         | 20000<br>18000 | $\mu$ mos |
| Common-Source Output Conductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 1.0 kHz)       | g <sub>os</sub>      | -             | -              | 250            | $\mu$ mos |
| Common-Gate Forward Transconductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 1.0 kHz)   | g <sub>fg</sub>      | -<br>-        | 13000<br>12000 | -<br>-         | $\mu$ mos |
| Common-Gate Output Conductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 1.0 kHz)         | g <sub>og</sub>      | -<br>-        | 100<br>150     | -<br>-         | $\mu$ mos |
| Gate-Drain Capacitance<br>(V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 Vdc, f = 1.0 MHz)                     | C <sub>gd</sub>      | -             | 1.8            | 2.5            | pF        |
| Gate-Source Capacitance<br>(V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 Vdc, f = 1.0 MHz)                    | C <sub>gs</sub>      | -             | 4.3            | 5.0            | pF        |

### FUNCTIONAL CHARACTERISTICS

|                                                                                                                  |             |   |    |   |                        |
|------------------------------------------------------------------------------------------------------------------|-------------|---|----|---|------------------------|
| Equivalent Short-Circuit Input Noise Voltage<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 10 mAdc, f = 100 Hz) | $\bar{e}_n$ | - | 10 | - | nV/ $\sqrt{\text{Hz}}$ |
|------------------------------------------------------------------------------------------------------------------|-------------|---|----|---|------------------------|

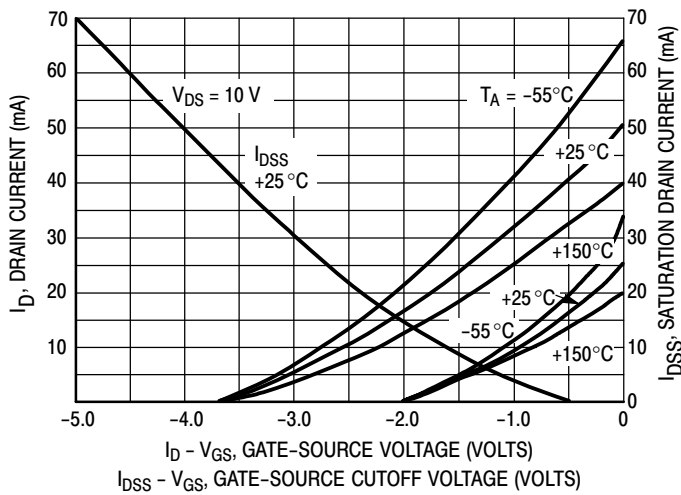
1. Pulse Test: Pulse Width  $\leq$  300  $\mu$ s, Duty Cycle  $\leq$  3.0%.

# J309, J310

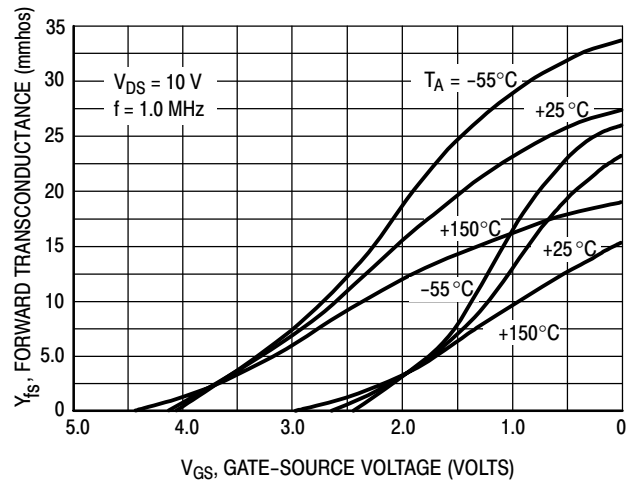
## ORDERING INFORMATION

| Device    | Package            | Shipping <sup>†</sup>        |
|-----------|--------------------|------------------------------|
| J309      | TO-92              | 1000 Units / Bulk            |
| J309G     | TO-92<br>(Pb-Free) |                              |
| J310      | TO-92              | 1000 Units / Bulk            |
| J310G     | TO-92<br>(Pb-Free) |                              |
| J310RLRP  | TO-92              | 2000 Units / Tape & Ammo Box |
| J310RLRPG | TO-92<br>(Pb-Free) |                              |
| J310ZL1   | TO-92              | 2000 Units / Tape & Ammo Box |
| J310ZL1G  | TO-92<br>(Pb-Free) |                              |

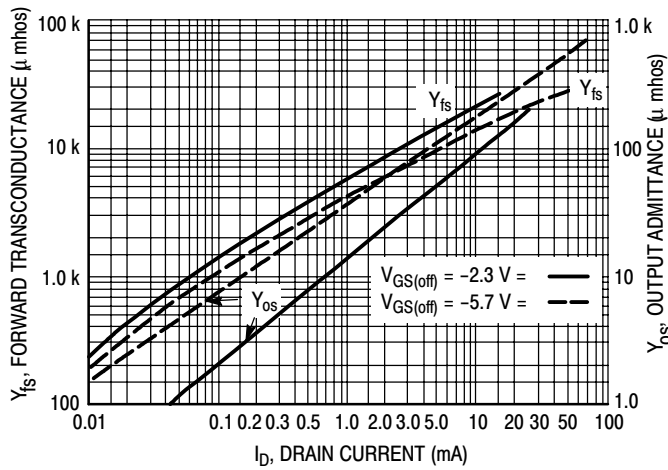
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



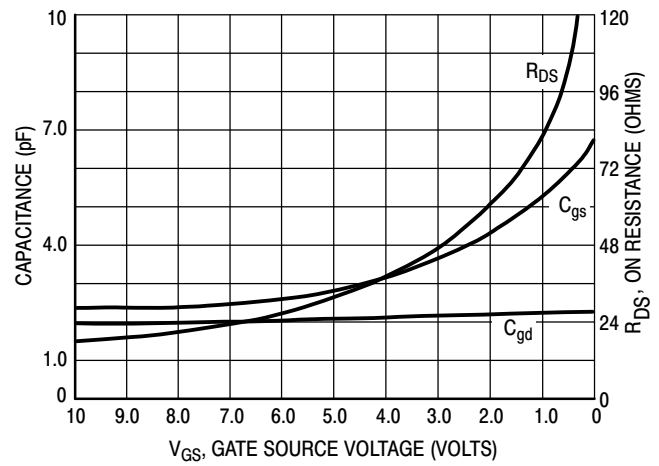
**Figure 1. Drain Current and Transfer Characteristics versus Gate-Source Voltage**



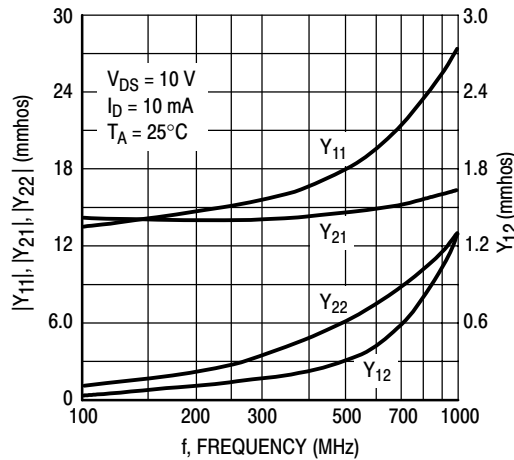
**Figure 2. Forward Transconductance versus Gate-Source Voltage**



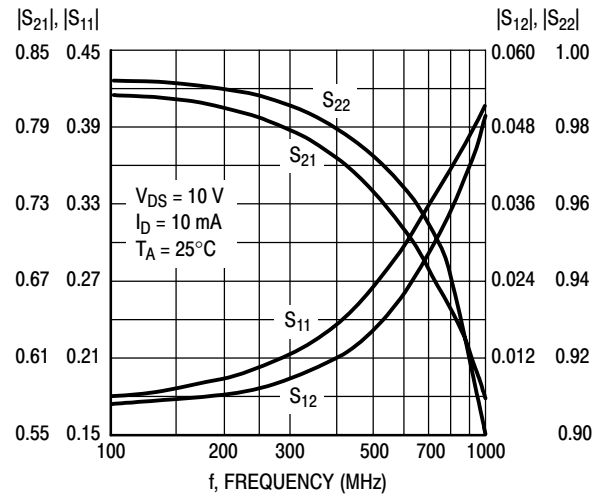
**Figure 3. Common-Source Output Admittance and Forward Transconductance versus Drain Current**



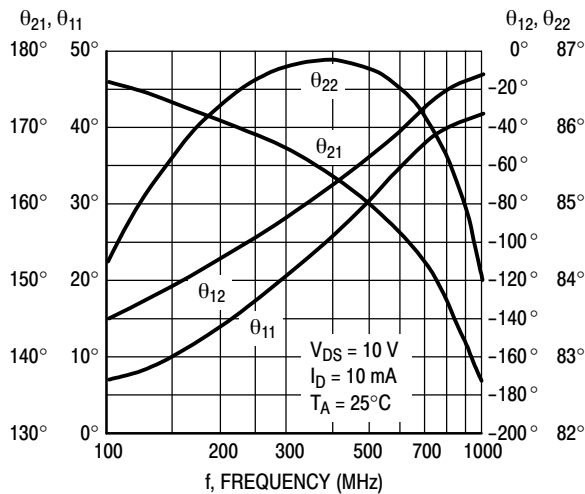
**Figure 4. On Resistance and Junction Capacitance versus Gate-Source Voltage**



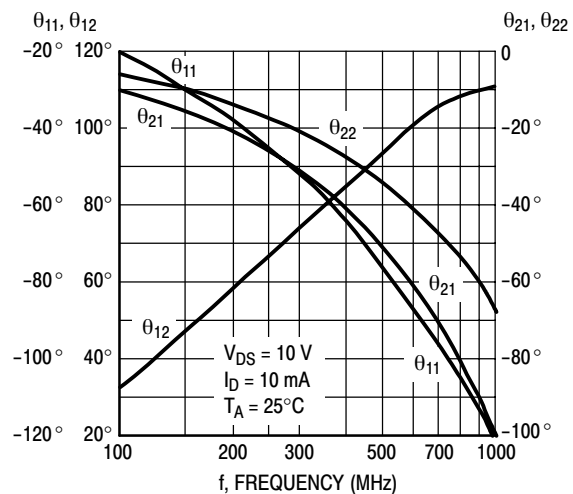
**Figure 5. Common-Gate Y Parameter Magnitude versus Frequency**



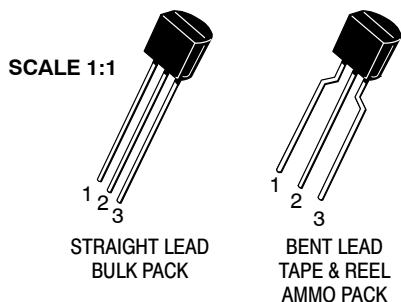
**Figure 6. Common-Gate S Parameter Magnitude versus Frequency**



**Figure 7. Common-Gate Y Parameter Phase-Angle versus Frequency**

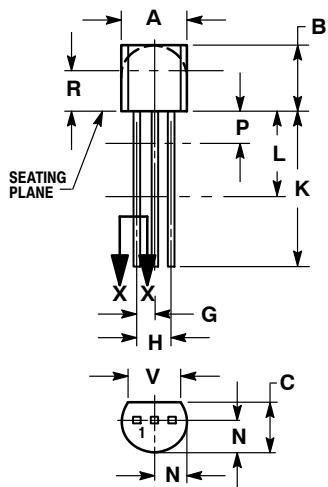


**Figure 8. S Parameter Phase-Angle versus Frequency**

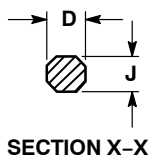


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CASE 29-11  
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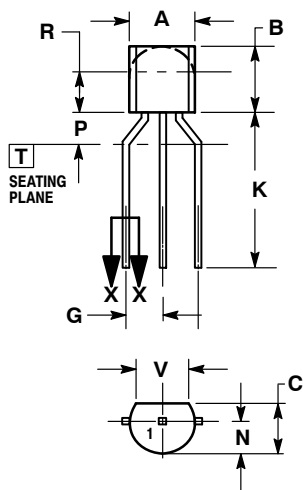
STRAIGHT LEAD  
BULK PACK



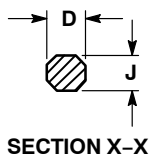
NOTES:

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 |
| G   | 0.045  | 0.055 | 1.15        | 1.39  |
| H   | 0.095  | 0.105 | 2.42        | 2.66  |
| J   | 0.015  | 0.020 | 0.39        | 0.50  |
| K   | 0.500  | ---   | 12.70       | ---   |
| L   | 0.250  | ---   | 6.35        | ---   |
| N   | 0.080  | 0.105 | 2.04        | 2.66  |
| P   | ---    | 0.100 | ---         | 2.54  |
| R   | 0.115  | ---   | 2.93        | ---   |
| V   | 0.135  | ---   | 3.43        | ---   |



BENT LEAD  
TAPE & REEL  
AMMO PACK



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 4.45        | 5.20 |
| B   | 4.32        | 5.33 |
| C   | 3.18        | 4.19 |
| D   | 0.40        | 0.54 |
| G   | 2.40        | 2.80 |
| J   | 0.39        | 0.50 |
| K   | 12.70       | ---  |
| N   | 2.04        | 2.66 |
| P   | 1.50        | 4.00 |
| R   | 2.93        | ---  |
| V   | 3.43        | ---  |

STYLES ON PAGE 2

|                  |                |                                                                                                                                                                                     |
|------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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**TO-92 (TO-226)**  
**CASE 29-11**  
**ISSUE AM**

DATE 09 MAR 2007

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

|                         |                       |                                                                                                                                                                                     |
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