# MJE700G, MJE702G, MJE703G (PNP), MJE800G, MJE802G, MJE803G (NPN)

# Plastic Darlington Complementary Silicon Power Transistors

These devices are designed for general−purpose amplifier and low−speed switching applications.

**Features**

- High DC Current Gain − $h_{FE}$ = 2000 (Typ) @ $I_C$ = 2.0 Adc
- Monolithic Construction with Built−in Base−Emitter Resistors to Limit Leakage − Multiplication
- Choice of Packages − MJE700 and MJE800 Series
- These Devices are Pb−Free and are RoHS Compliant*

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector−Emitter Voltage<br>MJE700G, MJE800G<br>MJE702G, MJE703G, MJE802G, MJE803G | $V_{CEO}$ | <br>60<br>80 | Vdc |
| Collector−Base Voltage<br>MJE700G, MJE800G<br>MJE702G, MJE703G, MJE802G, MJE803G | $V_{CB}$ | <br>60<br>80 | Vdc |
| Emitter−Base Voltage | $V_{EB}$ | 5.0 | Vdc |
| Collector Current | $I_C$ | 4.0 | Adc |
| Base Current | $I_B$ | 0.1 | Adc |
| Total Power Dissipation<br>@ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | <br>40<br>0.32 | <br>W<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −55 to +150 | °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.

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 3.12 | °C/W |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 83.3 | °C/W |

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

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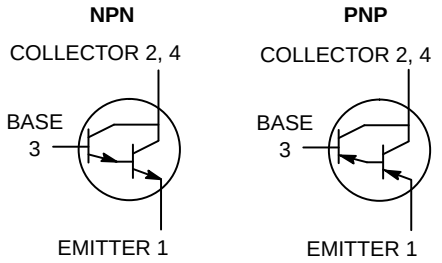
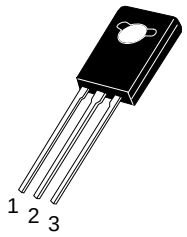
## 4.0 AMPERE DARLINGTON POWER TRANSISTORS COMPLEMENTARY SILICON 40 WATT

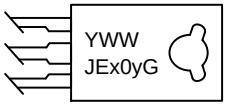



**MJE800 MJE802 MJE803** | **MJE700 MJE702 MJE703**




**TO−225**
**CASE 77−09**
**STYLE 1**

**MARKING DIAGRAM**




Y = Year
WW = Work Week
JEx0y = Device Code
x = 7 or 8
y = 0, 2, or 3
G = Pb−Free Package

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector−Emitter Breakdown Voltage (Note 1) ($I_C$ = 50 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | | | Vdc |
| MJE700G, MJE800G | | 60 | − | |
| MJE702G, MJE703G, MJE802G, MJE803G | | 80 | − | |
| Collector Cutoff Current ($V_{CE}$ = 60 Vdc, $I_B$ = 0) | $I_{CEO}$ | | | μAdc |
| MJE700G, MJE800G | | − | 100 | |
| ($V_{CE}$ = 80 Vdc, $I_B$ = 0) | | | | |
| MJE702G, MJE703G, MJE802G, MJE803G | | − | 100 | |
| Collector Cutoff Current | $I_{CBO}$ | | | μAdc |
| ($V_{CB}$ = Rated $BV_{CEO}$, $I_E$ = 0) | | − | 100 | |
| ($V_{CB}$ = Rated $BV_{CEO}$, $I_E$ = 0, $T_C$ = 100°C) | | − | 500 | |
| Emitter Cutoff Current ($V_{BE}$ = 5.0 Vdc, $I_C$ = 0) | $I_{EBO}$ | − | 2.0 | mAdc |
| **ON CHARACTERISTICS** | | | | |
| DC Current Gain (Note 1) | $h_{FE}$ | | | − |
| ($I_C$ = 1.5 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| MJE700G, MJE702G, MJE800G, MJE802G | | 750 | − | |
| ($I_C$ = 2.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| MJE703G, MJE803G | | 750 | − | |
| ($I_C$ = 4.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| All devices | | 100 | − | |
| Collector−Emitter Saturation Voltage (Note 1) | $V_{CE(sat)}$ | | | Vdc |
| ($I_C$ = 1.5 Adc, $I_B$ = 30 mAdc) | | | | |
| MJE700G, MJE702G, MJE800G, MJE802G | | − | 2.5 | |
| ($I_C$ = 2.0 Adc, $I_B$ = 40 mAdc) | | | | |
| MJE703G, MJE803G | | − | 2.8 | |
| ($I_C$ = 4.0 Adc, $I_B$ = 40 mAdc) | | | | |
| All devices | | − | 3.0 | |
| Base−Emitter On Voltage (Note 1) | $V_{BE(on)}$ | | | Vdc |
| ($I_C$ = 1.5 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| MJE700G, MJE702G, MJE800G, MJE802G | | − | 2.5 | |
| ($I_C$ = 2.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| MJE703G, MJE803G | | − | 2.5 | |
| ($I_C$ = 4.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | | |
| All devices | | − | 3.0 | |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Small−Signal Current Gain ($I_C$ = 1.5 Adc, $V_{CE}$ = 3.0 Vdc, f = 1.0 MHz) | $h_{fe}$ | 1.0 | − | − |

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.

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

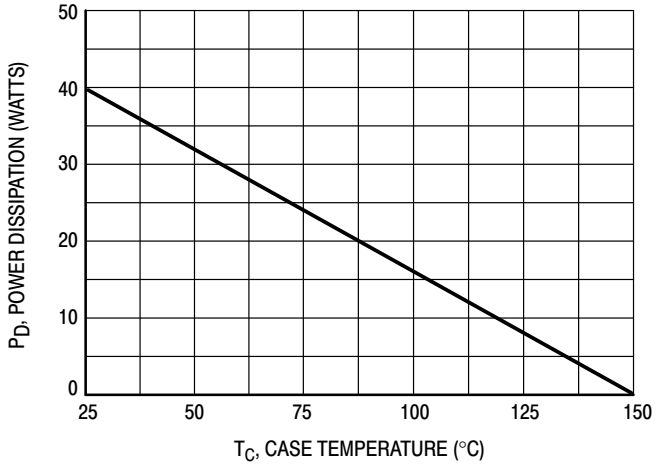



**Figure 1. Power Derating**

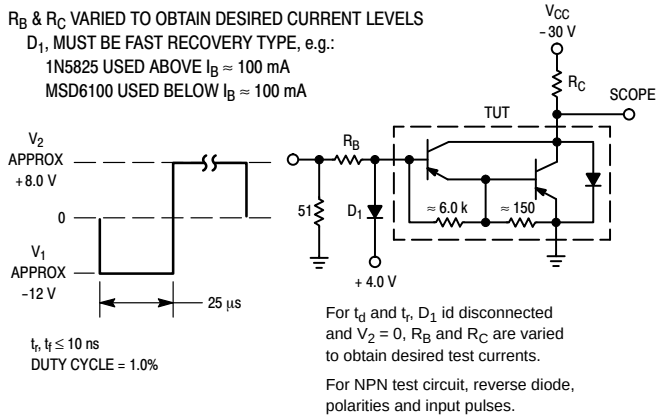



**Figure 2. Switching Times Test Circuit**

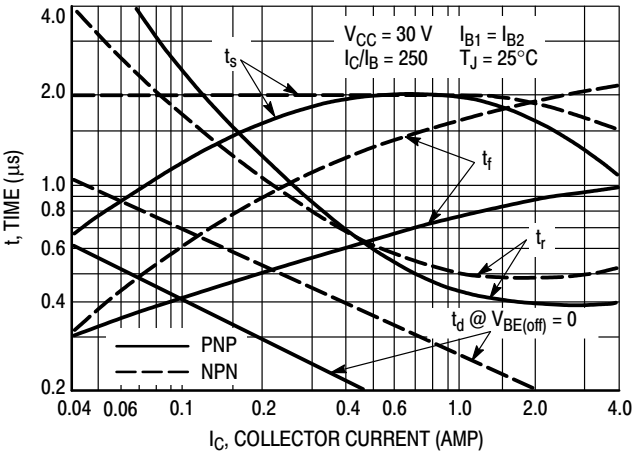



**Figure 3. Switching Times**

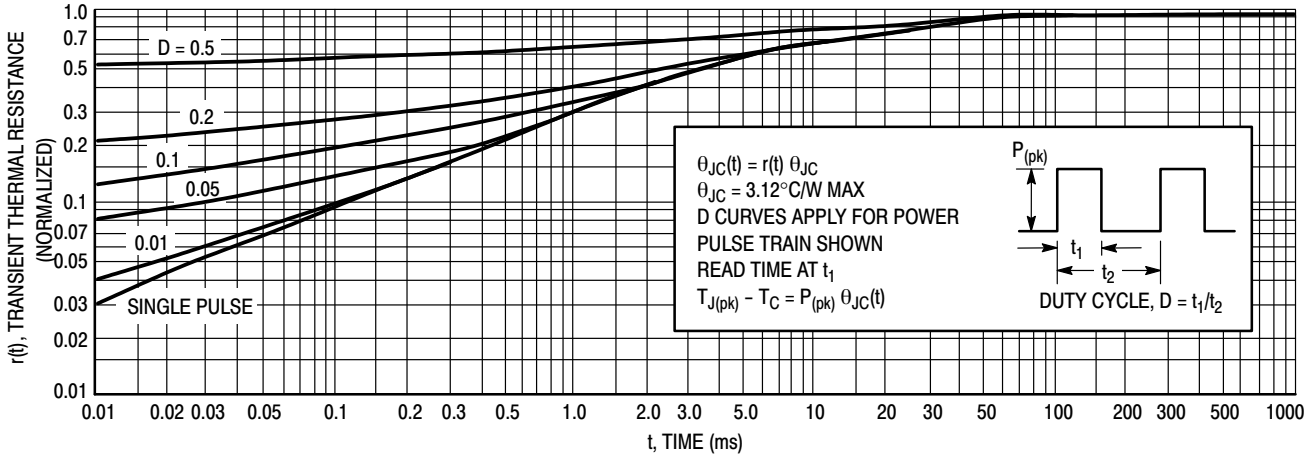



**Figure 4. Thermal Response (MJE700, 800 Series)**

## ACTIVE−REGION SAFE−OPERATING AREA

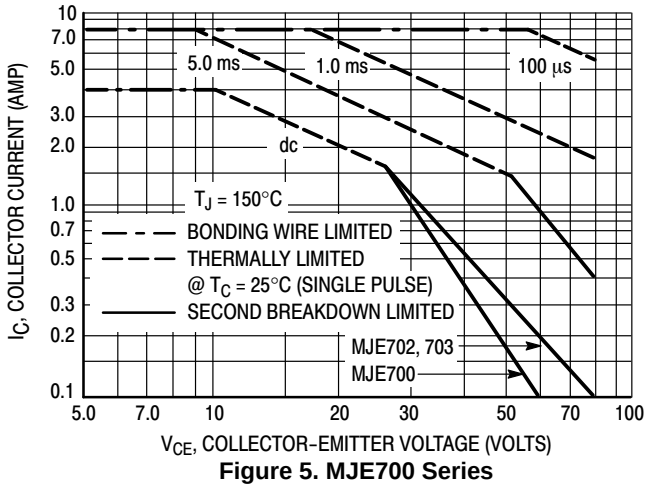



**Figure 5. MJE700 Series**

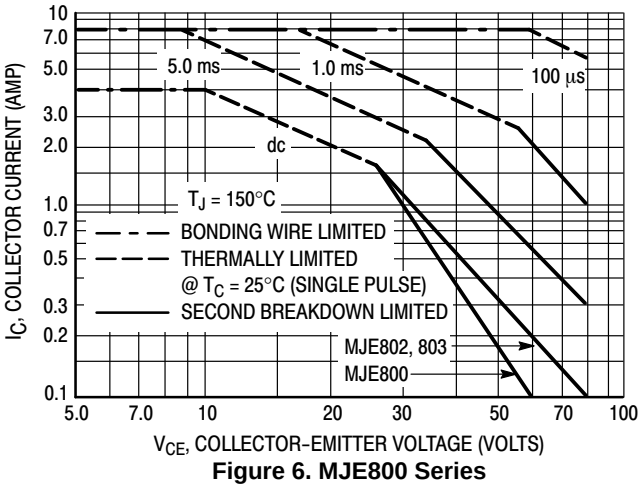
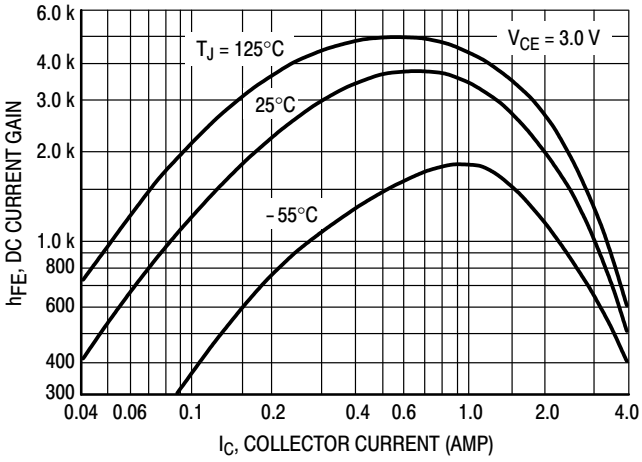



**Figure 6. MJE800 Series**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 5 and 6 are based on $T_{J(pk)} = 150°C$; $T_C$ is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

**PNP**
**MJE700 Series**




**NPN**
**MJE800 Series**

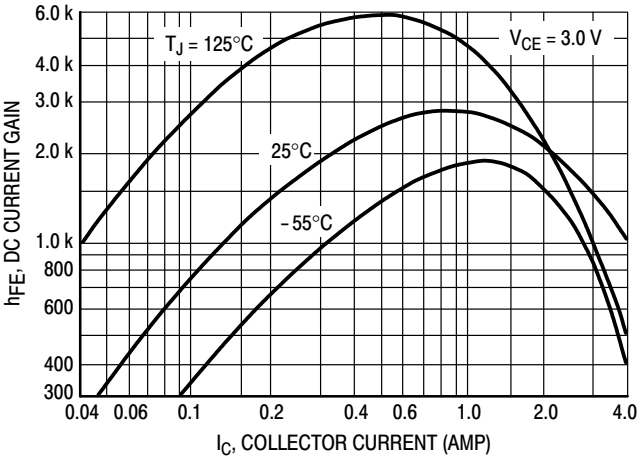
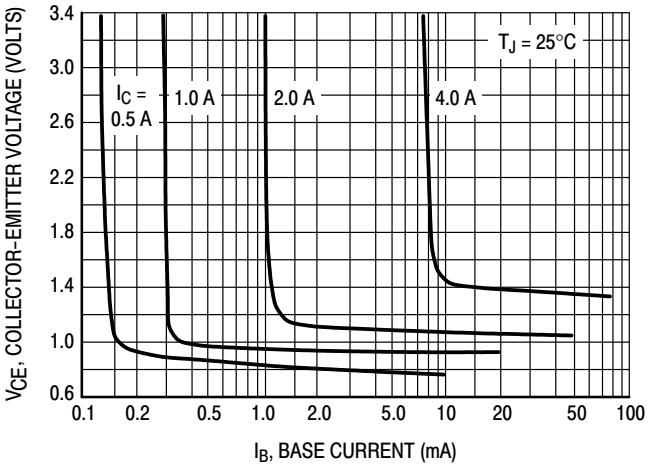



**Figure 7. DC Current Gain**



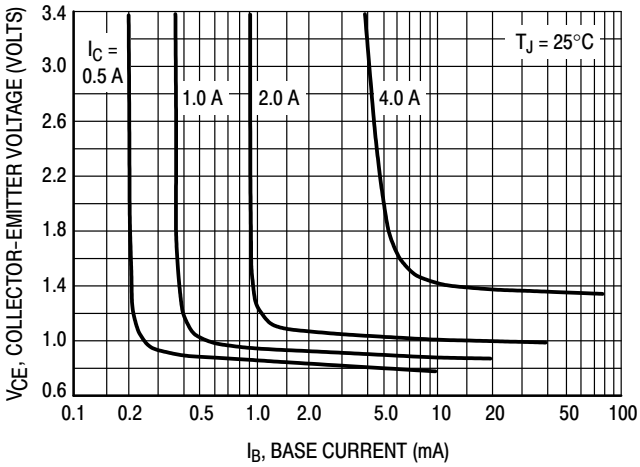
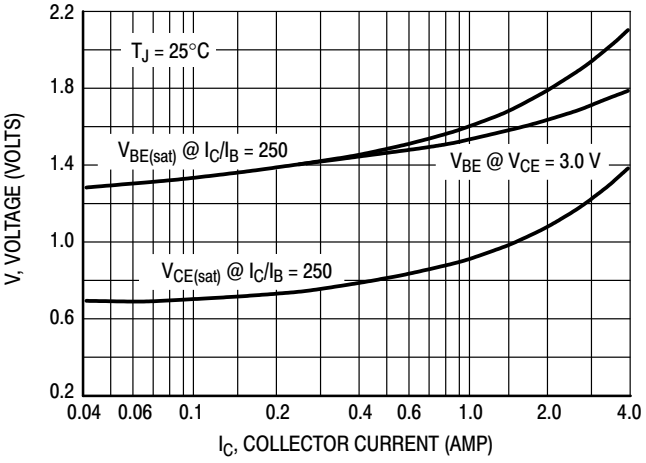




**Figure 8. Collector Saturation Region**



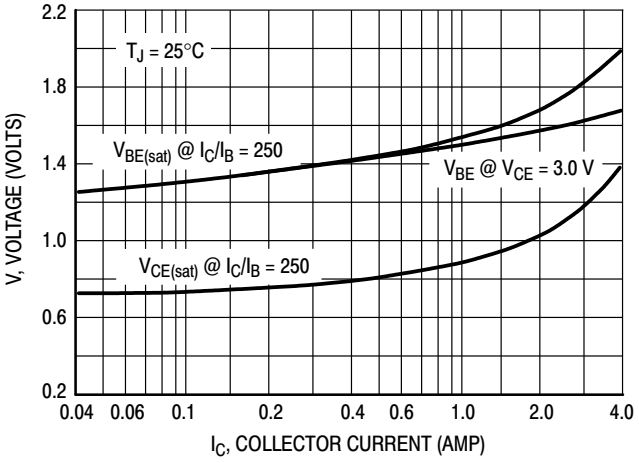



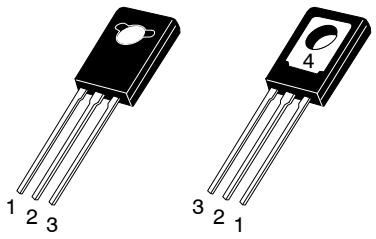

**Figure 9. “On” Voltages**

**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| MJE700G | TO−225<br>(Pb−Free) | 50 Units / Bulk |
| MJE702G | TO−225<br>(Pb−Free) | 50 Units / Bulk |
| MJE703G | TO−225<br>(Pb−Free) | 50 Units / Bulk |
| MJE800G | TO−225<br>(Pb−Free) | 50 Units / Bulk |
| MJE802G | TO−225<br>(Pb−Free) | 50 Units / Bulk |
| MJE803G | TO−225<br>(Pb−Free) | 50 Units / Bulk |

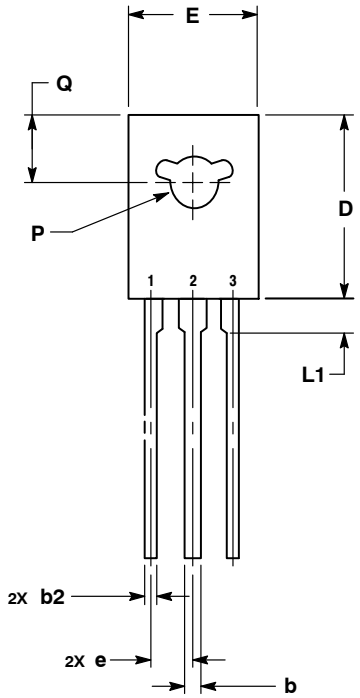
**TO−225**
CASE 77−09
ISSUE AD

DATE 25 MAR 2015

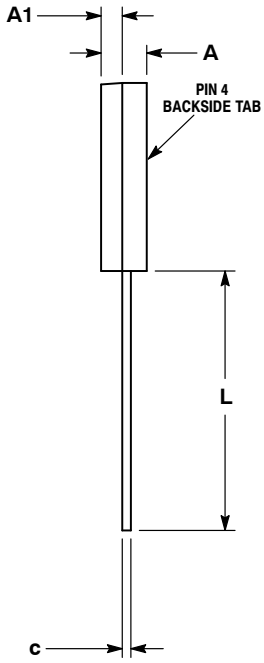



**FRONT VIEW** **BACK VIEW**

**SCALE 1:1**




**FRONT VIEW**

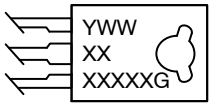



**SIDE VIEW**

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

| | MILLIMETERS | |
|---|---|---|
| DIM | MIN | MAX |
| A | 2.40 | 3.00 |
| A1 | 1.00 | 1.50 |
| b | 0.60 | 0.90 |
| b2 | 0.51 | 0.88 |
| c | 0.39 | 0.63 |
| D | 10.60 | 11.10 |
| E | 7.40 | 7.80 |
| e | 2.04 | 2.54 |
| L | 14.50 | 16.63 |
| L1 | 1.27 | 2.54 |
| P | 2.90 | 3.30 |
| Q | 3.80 | 4.20 |

**GENERIC MARKING DIAGRAM***




Y = Year
WW = Work Week
XXXXX = Device Code
G = 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.

STYLE 1:
PIN 1. EMITTER
2., 4. COLLECTOR
3. BASE

STYLE 2:
PIN 1. CATHODE
2., 4. ANODE
3. GATE

STYLE 3:
PIN 1. BASE
2., 4. COLLECTOR
3. EMITTER

STYLE 4:
PIN 1. ANODE 1
2., 4. ANODE 2
3. GATE

STYLE 5:
PIN 1. MT 1
2., 4. MT 2
3. GATE

STYLE 6:
PIN 1. CATHODE
2., 4. GATE
3. ANODE

STYLE 7:
PIN 1. MT 1
2., 4. GATE
3. MT 2

STYLE 8:
PIN 1. SOURCE
2., 4. GATE
3. DRAIN

STYLE 9:
PIN 1. GATE
2., 4. DRAIN
3. SOURCE

STYLE 10:
PIN 1. SOURCE
2., 4. DRAIN
3. GATE

| | | |
|---|---|---|
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