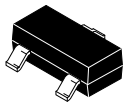
# MMBT6427LT1G, SMMBT6427LT1G

# Darlington Transistor

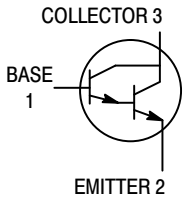
## NPN Silicon

**ON Semiconductor®**

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**SOT−23 (TO−236)**
**CASE 318**
**STYLE 6**




### Features

- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector − Emitter Voltage | $V_{CEO}$ | 40 | Vdc |
| Collector − Base Voltage | $V_{CBO}$ | 40 | Vdc |
| Emitter − Base Voltage | $V_{EBO}$ | 12 | Vdc |
| Collector Current − Continuous | $I_C$ | 500 | mAdc |

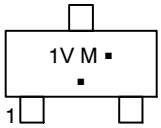
### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Total Device Dissipation FR−5 Board, (Note 1) $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 225<br>1.8 | mW<br>mW/°C |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 556 | °C/W |
| Total Device Dissipation Alumina Substrate, (Note 2) $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 300<br>2.4 | mW<br>mW/°C |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 417 | °C/W |
| Junction and Storage Temperature | $T_J$, $T_{stg}$ | −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.

1. FR−5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

### MARKING DIAGRAM




1V = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MMBT6427LT1G | SOT−23 (Pb−Free) | 3,000 Tape & Reel |
| SMMBT6427LT1G | SOT−23 (Pb−Free) | 3,000 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.

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector – Emitter Breakdown Voltage ($I_C$ = 10 mAdc, $V_{BE}$ = 0) | $V_{(BR)CEO}$ | 40 | – | Vdc |
| Collector – Base Breakdown Voltage ($I_C$ = 100 μAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | 40 | – | Vdc |
| Emitter – Base Breakdown Voltage ($I_C$ = 10 μAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 12 | – | Vdc |
| Collector Cutoff Current ($V_{CE}$ = 25 Vdc, $I_B$ = 0) | $I_{CES}$ | – | 1.0 | μAdc |
| Collector Cutoff Current ($V_{CB}$ = 30 Vdc, $I_E$ = 0) | $I_{CBO}$ | – | 50 | nAdc |
| Emitter Cutoff Current ($V_{EB}$ = 10 Vdc, $I_C$ = 0) | $I_{EBO}$ | – | 50 | nAdc |
| **ON CHARACTERISTICS** | | | | |
| DC Current Gain<br>($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc)<br>($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc)<br>($I_C$ = 500 mAdc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | <br>10,000<br>20,000<br>14,000 | <br>100,000<br>200,000<br>140,000 | – |
| Collector – Emitter Saturation Voltage<br>($I_C$ = 50 mAdc, $I_B$ = 0.5 mAdc)<br>($I_C$ = 500 mAdc, $I_B$ = 0.5 mAdc) | $V_{CE(sat)}$ (3) | <br>–<br>– | <br>1.2<br>1.5 | Vdc |
| Base – Emitter Saturation Voltage ($I_C$ = 500 mAdc, $I_B$ = 0.5 mAdc) | $V_{BE(sat)}$ | – | 2.0 | Vdc |
| Base – Emitter On Voltage ($I_C$ = 50 mAdc, $V_{CE}$ = 5.0 Vdc) | $V_{BE(on)}$ | – | 1.75 | Vdc |
| **SMALL– SIGNAL CHARACTERISTICS** | | | | |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{obo}$ | – | 7.0 | pF |
| Input Capacitance ($V_{EB}$ = 0.5 Vdc, $I_C$ = 0, f = 1.0 MHz) | $C_{ibo}$ | – | 15 | pF |
| Current Gain – High Frequency ($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc, f = 100 MHz) | $\|h_{fe}\|$ | 1.3 | – | Vdc |
| Noise Figure ($I_C$ = 1.0 mAdc, $V_{CE}$ = 5.0 Vdc, $R_S$ = 100 kΩ, f = 1.0 kHz) | NF | – | 10 | dB |

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.

3. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2.0%.

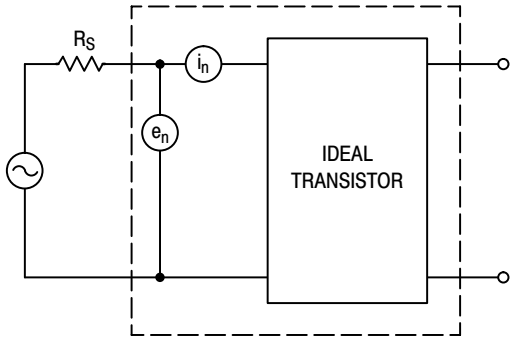



**Figure 1. Transistor Noise Model**

## NOISE CHARACTERISTICS

($V_{CE}$ = 5.0 Vdc, $T_A$ = 25°C)

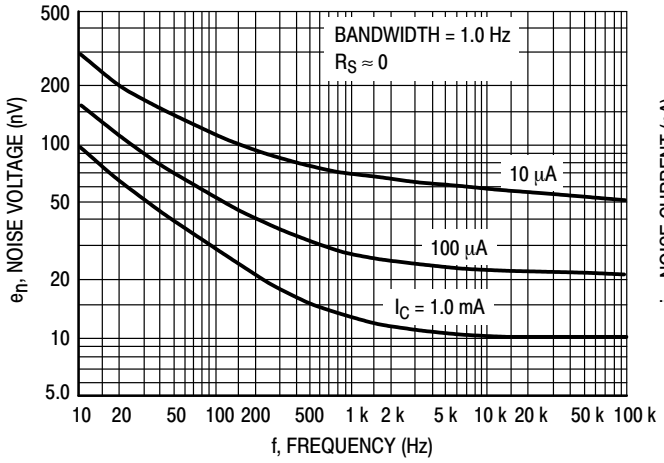



**Figure 2. Noise Voltage**

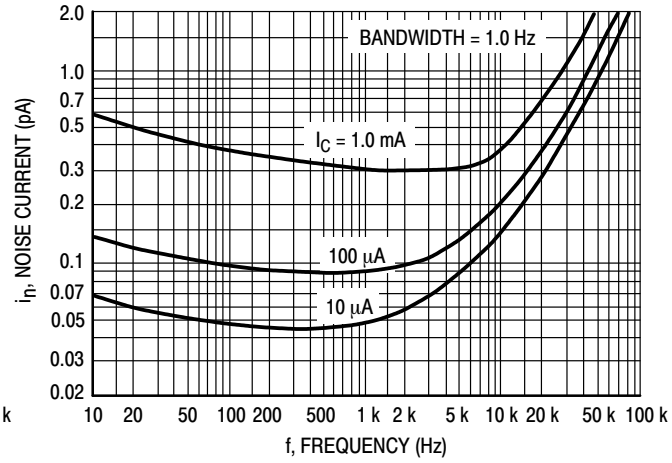



**Figure 3. Noise Current**

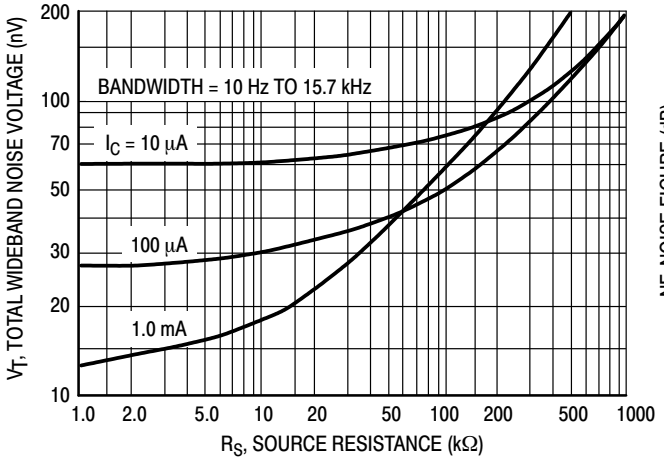



**Figure 4. Total Wideband Noise Voltage**

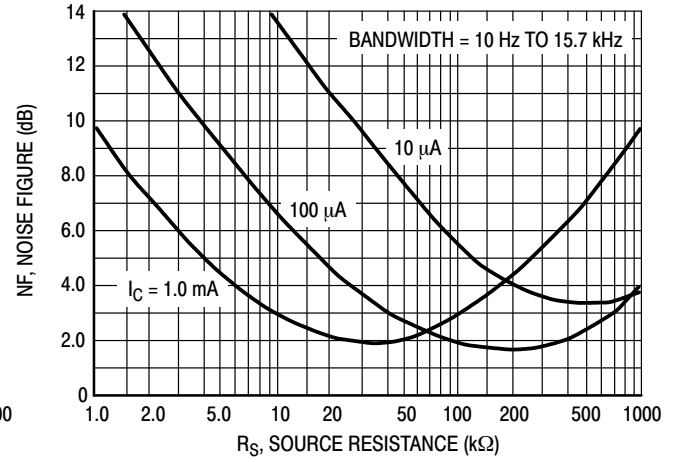



**Figure 5. Wideband Noise Figure**

## SMALL−SIGNAL CHARACTERISTICS

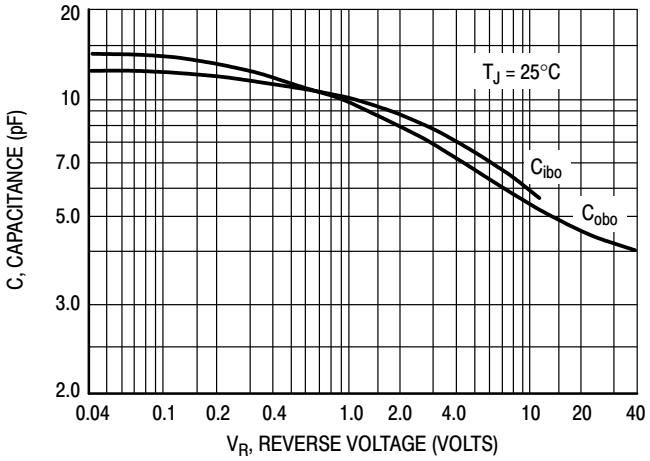



**Figure 6. Capacitance**

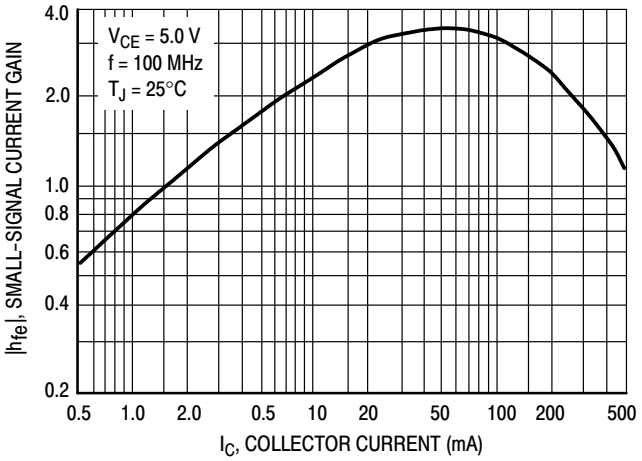



**Figure 7. High Frequency Current Gain**

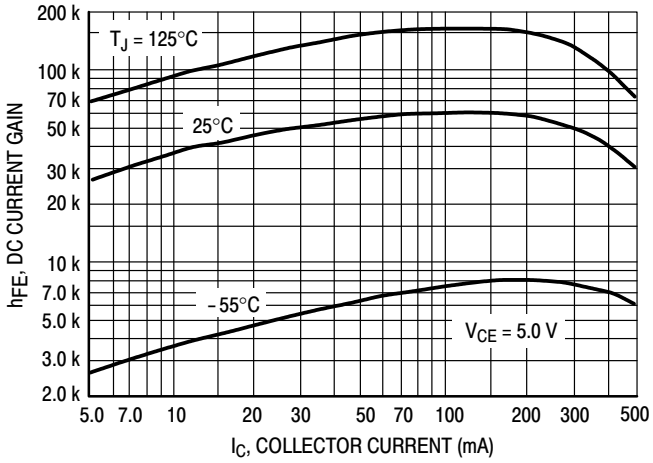



**Figure 8. DC Current Gain**

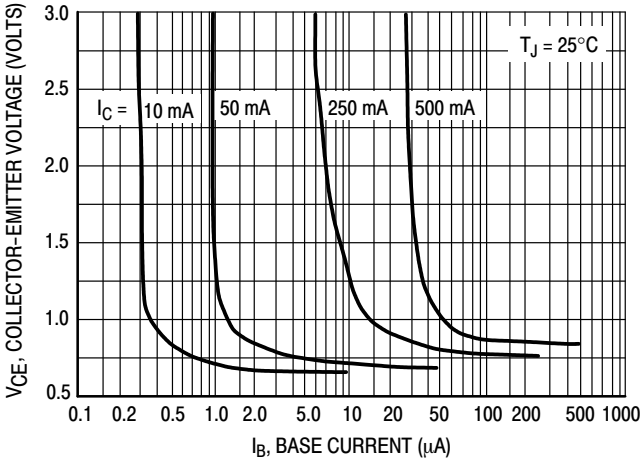



**Figure 9. Collector Saturation Region**

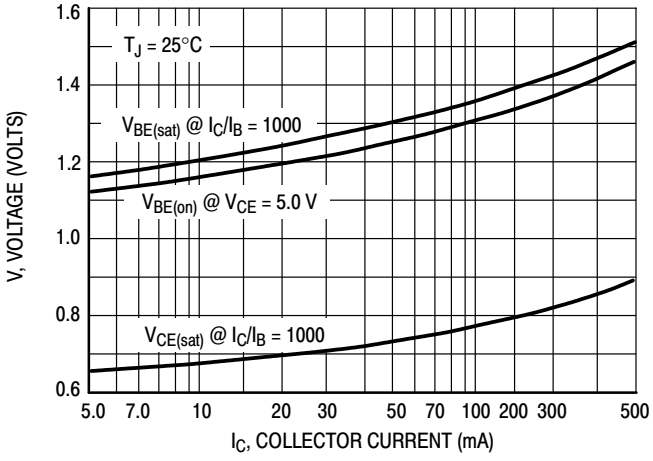



**Figure 10. “On” Voltages**

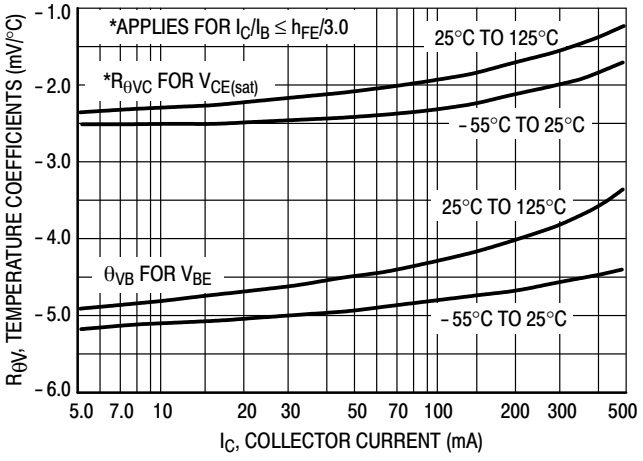



**Figure 11. Temperature Coefficients**

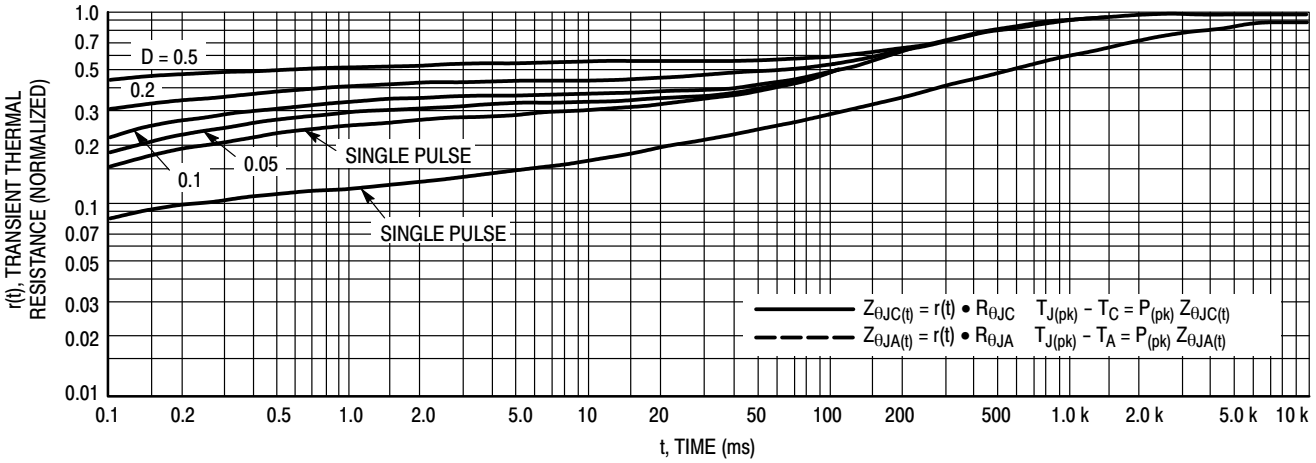
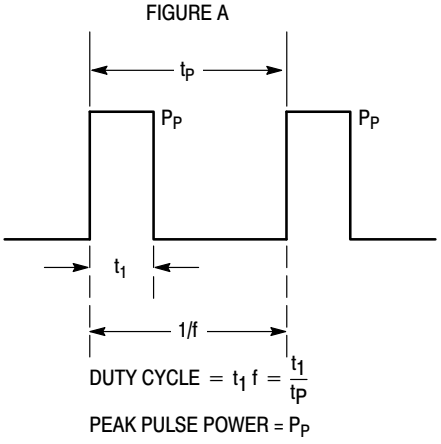
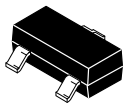



**Figure 12. Thermal Response**




**Design Note: Use of Transient Thermal Resistance Data**

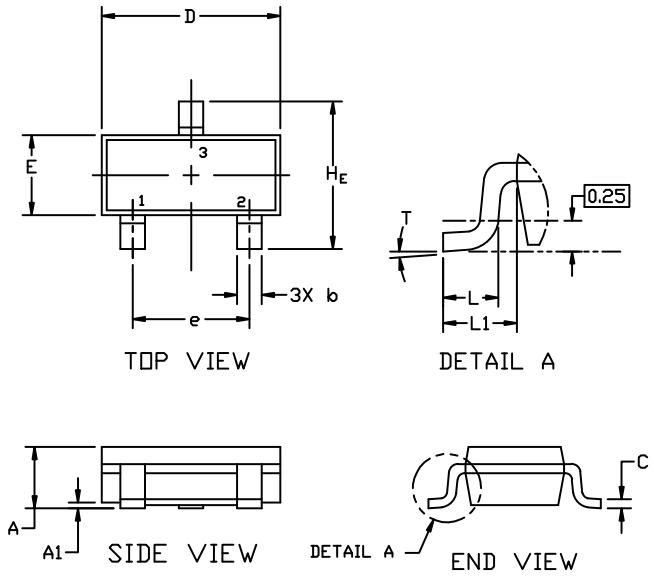
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS



SCALE 4:1

**SOT−23 (TO−236)**
CASE 318
ISSUE AT

DATE 01 MAR 2023

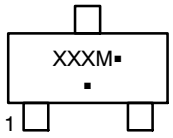



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

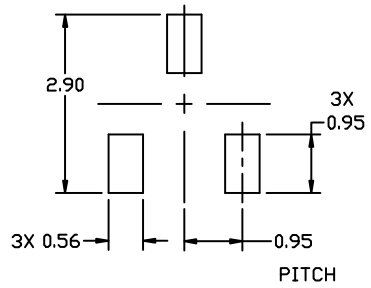
| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| $H_E$ | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

### GENERIC MARKING DIAGRAM*




XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.




RECOMMENDED
MOUNTING FOOTPRINT

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

**STYLES ON PAGE 2**

| | | | |
|---|---|---|---|
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**SOT−23 (TO−236)**
CASE 318
ISSUE AT

DATE 01 MAR 2023

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

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

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE−ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE



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