

20 V, 1.0 A, Low $V_{CE(sat)}$ NPN Transistor

NSS20101J, NSV20101J

onsemi's e²PowerEdge family of low $V_{CE(sat)}$ transistors are miniature surface mount devices featuring ultra low saturation voltage ($V_{CE(sat)}$) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control is important.

Typical applications are DC-DC converters and power management in portable and battery powered products such as cellular and cordless phones, PDAs, computers, printers, digital cameras and MP3 players. Other applications are low voltage motor controls in mass storage products such as disc drives and tape drives. In the automotive industry they can be used in air bag deployment and in the instrument cluster. The high current gain allows e²PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

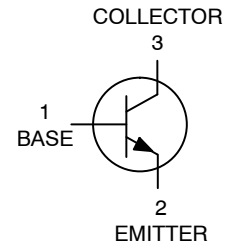
Features

- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant*

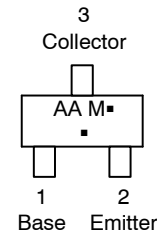
20 VOLTS, 1.0 AMPS NPN LOW $V_{CE(sat)}$ TRANSISTOR



SC-89
CASE 463C
STYLE 1



MARKING DIAGRAM



AA = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|--------------|--------------------|------------------------|
| NSS20101JT1G | SC-89 (Pb-Free) | 3,000 / Tape & Reel |
| NSV20101JT1G | SC-89 (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 Specification Brochure, BRD8011/D.

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

NSS20101J, NSV20101J

MAXIMUM RATINGS (T_A = 25°C)

| Rating | Symbol | Max | Unit |
|--------------------------------|------------------|----------------------------|------|
| Collector-Emitter Voltage | V _{CEO} | 20 | Vdc |
| Collector-Base Voltage | V _{CBO} | 40 | Vdc |
| Emitter-Base Voltage | V _{EBO} | 6.0 | Vdc |
| Collector Current – Continuous | I _C | 1.0 | A |
| Collector Current – Peak | I _{CM} | 2.0 | A |
| Electrostatic Discharge | ESD | HBM Class 3B MM Class 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 |
|------------------------------------------------------------------------|-----------------------------------|-------------|-------------|
| Total Device Dissipation T _A = 25°C Derate above 25°C | P _D (Note 1) | 255 2.0 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} (Note 1) | 490 | °C/W |
| Total Device Dissipation T _A = 25°C Derate above 25°C | P _D (Note 2) | 300 2.4 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} (Note 2) | 415 | °C/W |
| Junction and Storage Temperature Range | T _J , T _{stg} | -55 to +150 | °C |

1. FR-4 @ 100 mm², 1 oz. copper traces.
2. FR-4 @ 500 mm², 1 oz. copper traces.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---------------------------------------------------------------------------------|---------------|-----|-----|-----|-----------------|
| OFF CHARACTERISTICS | | | | | |
| Collector - Emitter Breakdown Voltage ($I_C = 10\text{ mAdc}$, $I_B = 0$) | $V_{(BR)CEO}$ | 20 | | | Vdc |
| Collector - Base Breakdown Voltage ($I_C = 0.1\text{ mAdc}$, $I_E = 0$) | $V_{(BR)CBO}$ | 40 | | | Vdc |
| Emitter - Base Breakdown Voltage ($I_E = 0.1\text{ mAdc}$, $I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | | | Vdc |
| Collector Cutoff Current ($V_{CB} = 30\text{ Vdc}$, $I_E = 0$) | I_{CBO} | | | 0.1 | μAdc |
| Emitter Cutoff Current ($V_{EB} = 5.0\text{ Vdc}$) | I_{EBO} | | | 0.1 | μAdc |

ON CHARACTERISTICS

| | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|-----|----------------------------------|-----|
| DC Current Gain (Note 3) ($I_C = 10\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 100\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 500\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 1.0\text{ A}$, $V_{CE} = 2.0\text{ V}$) | h_{FE} | 200 200 150 100 | | 500 | |
| Collector - Emitter Saturation Voltage (Note 3) ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 0.10\text{ A}$, $I_B = 0.010\text{ A}$) ($I_C = 0.5\text{ A}$, $I_B = 0.050\text{ A}$) ($I_C = 1.0\text{ A}$, $I_B = 0.1\text{ A}$) | $V_{CE(sat)}$ | | | 0.015 0.040 0.115 0.220 | V |
| Base - Emitter Saturation Voltage (Note 3) ($I_C = 0.5\text{ A}$, $I_B = 50\text{ mA}$) | $V_{BE(sat)}$ | | | 1.1 | V |
| Base - Emitter Turn-on Voltage (Note 3) ($I_C = 0.5\text{ A}$, $V_{CE} = 2.0\text{ V}$) | $V_{BE(on)}$ | | | 0.90 | V |
| Cutoff Frequency ($I_C = 100\text{ mA}$, $V_{CE} = 2.0\text{ V}$, $f = 100\text{ MHz}$) | f_T | | 350 | | MHz |
| Input Capacitance ($V_{EB} = 0.5\text{ V}$, $f = 1.0\text{ MHz}$) | C_{ibo} | | 40 | | pF |
| Output Capacitance ($V_{CB} = 4.0\text{ V}$, $f = 1.0\text{ MHz}$) | C_{obo} | | 6 | | pF |

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. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

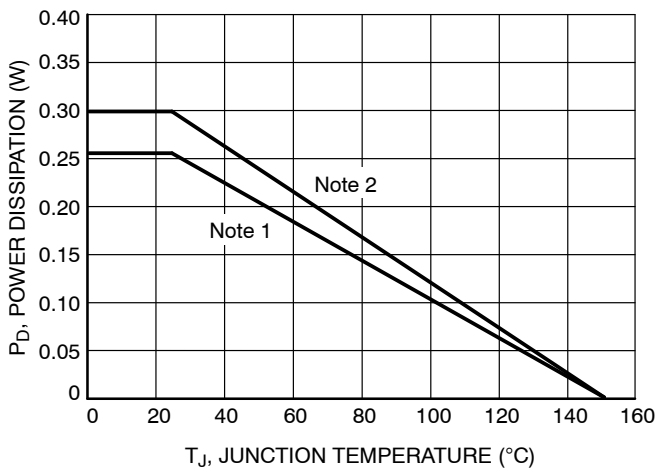


Figure 1. Power Derating

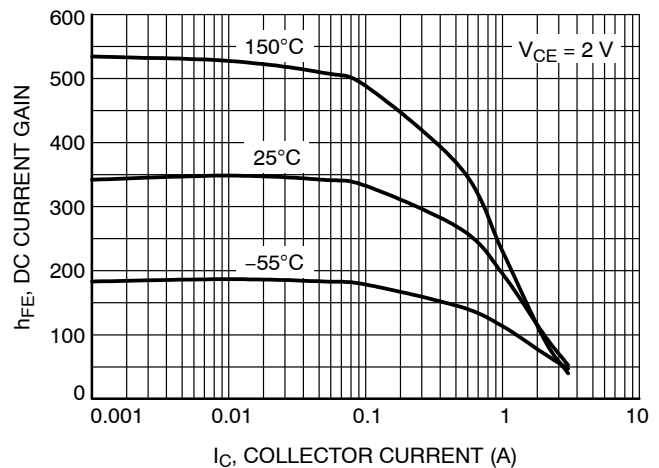


Figure 2. DC Current Gain

TYPICAL CHARACTERISTICS

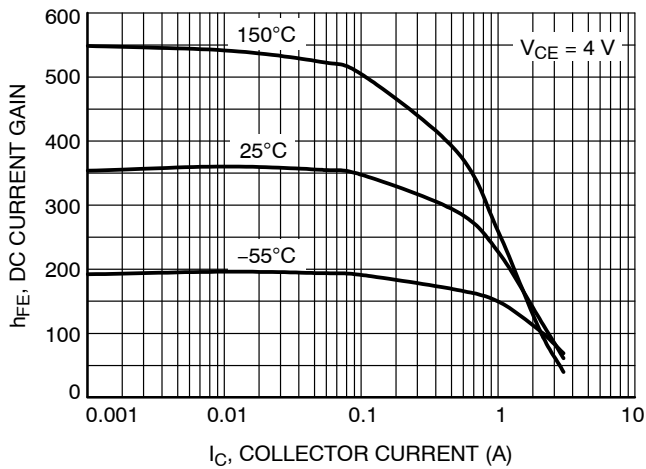


Figure 3. DC Current Gain

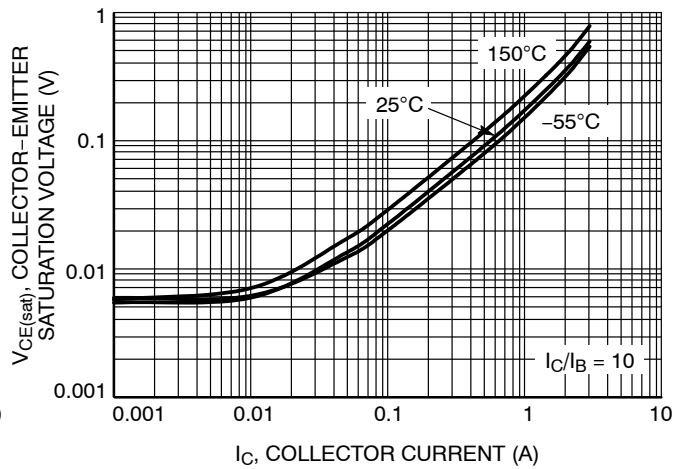


Figure 4. Collector-Emitter Saturation Voltage

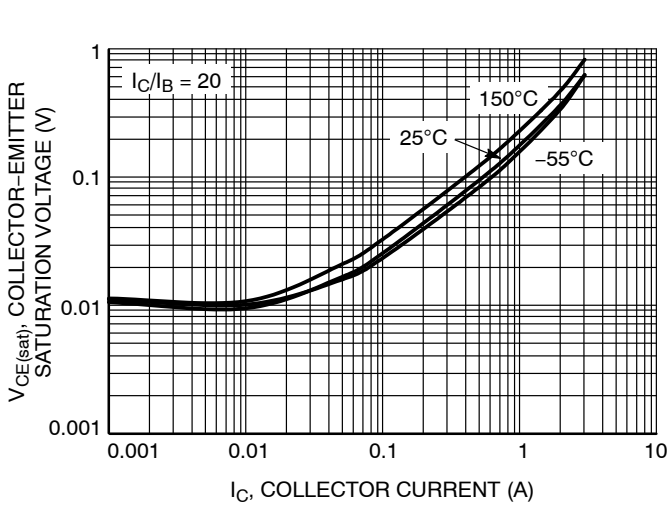


Figure 5. Collector-Emitter Saturation Voltage

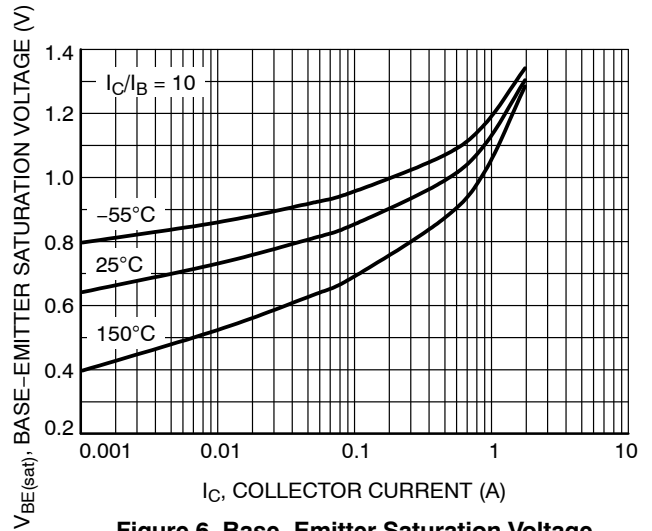


Figure 6. Base-Emitter Saturation Voltage

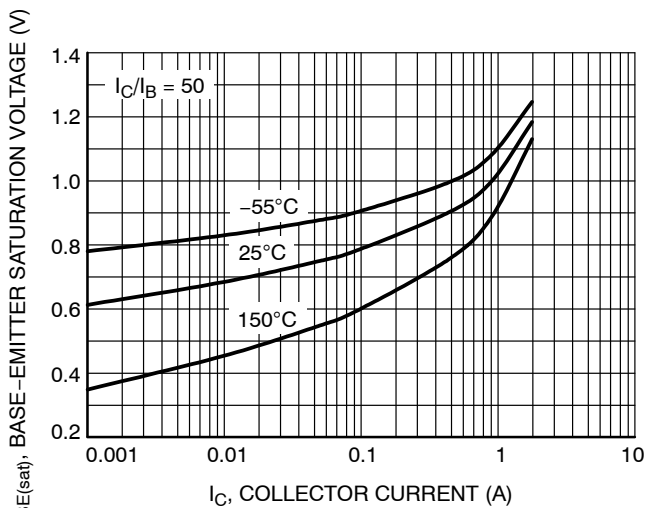


Figure 7. Base-Emitter Saturation Voltage

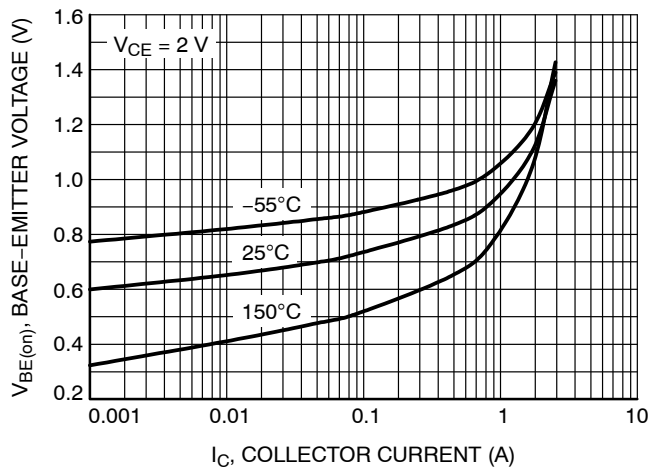


Figure 8. Base-Emitter Voltage

TYPICAL CHARACTERISTICS

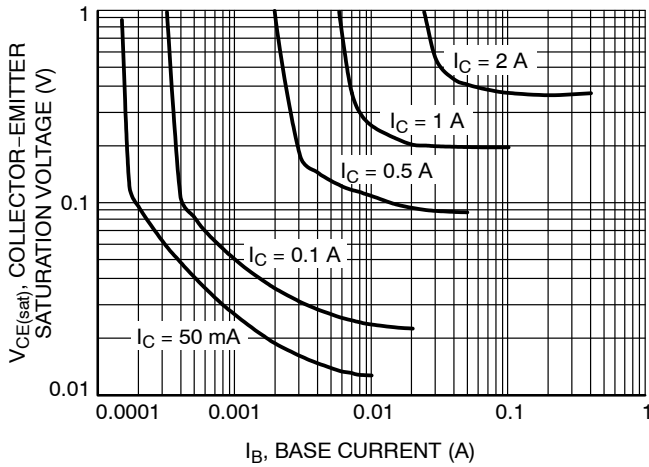


Figure 9. Saturation Region

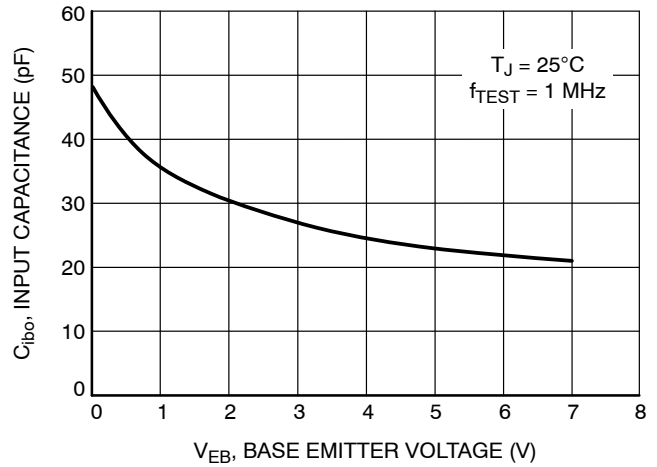


Figure 10. Input Capacitance

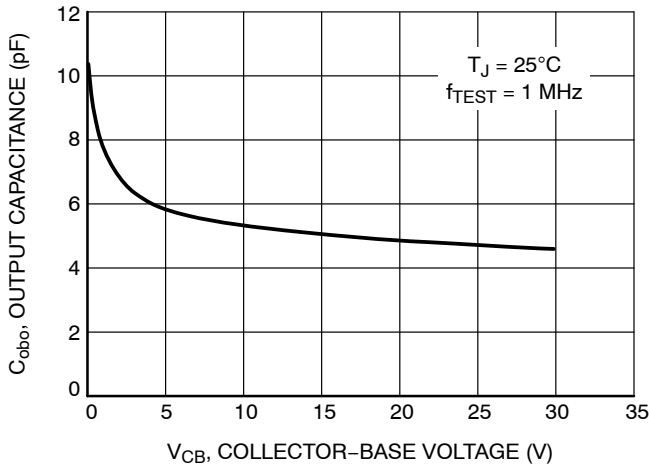


Figure 11. Output Capacitance

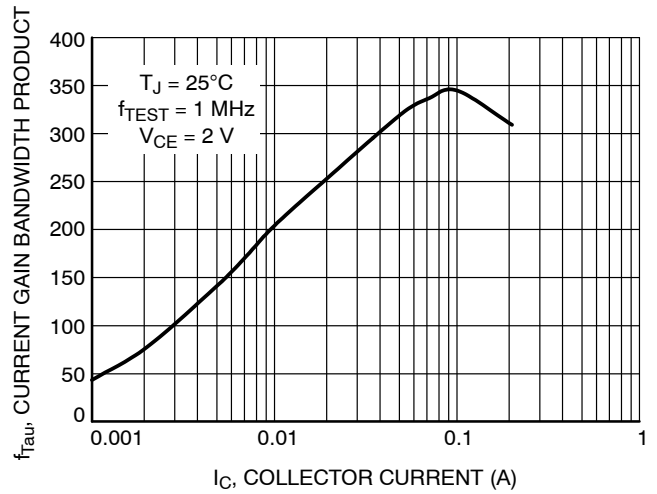


Figure 12. Current Gain Bandwidth Product

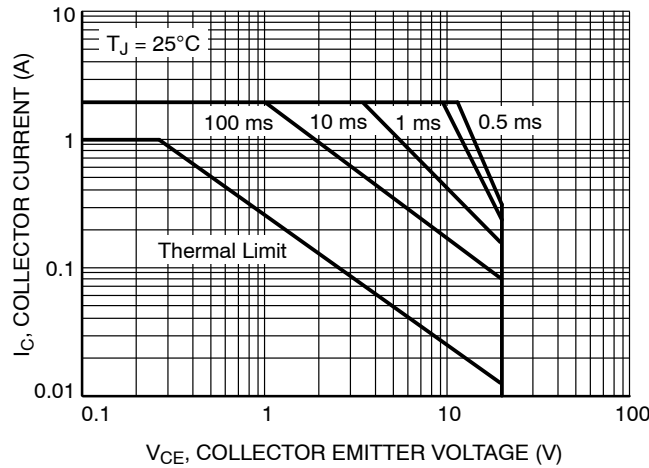
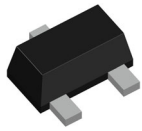


Figure 13. Safe Operating Area

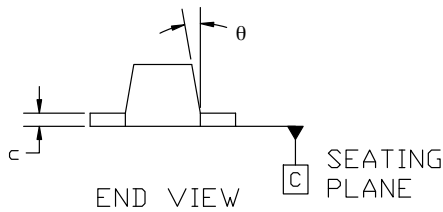
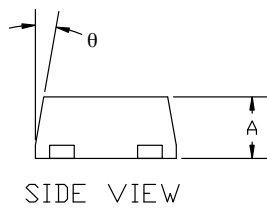
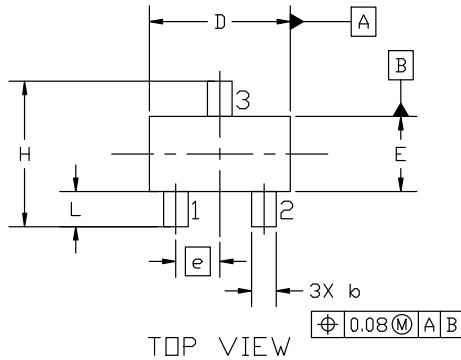
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

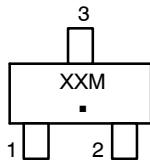


SC-89 3LEAD 1.60x0.85x0.70, 0.50P
CASE 463C
ISSUE D

DATE 20 FEB 2024



GENERIC MARKING DIAGRAM*



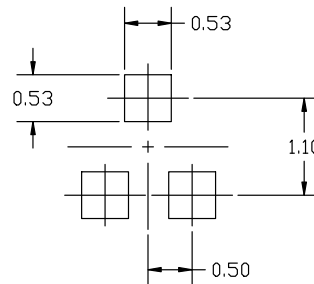
XX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*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.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.60 | 0.70 | 0.80 |
| b | 0.23 | 0.28 | 0.33 |
| c | 0.10 | 0.15 | 0.20 |
| D | 1.50 | 1.60 | 1.70 |
| E | 0.75 | 0.85 | 0.95 |
| e | 0.50 BSC | | |
| H | 1.50 | 1.60 | 1.70 |
| L | 0.30 | 0.40 | 0.50 |
| θ | --- | --- | 10° |



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.

STYLE 1:

- PIN 1. BASE
- EMITTER
- COLLECTOR

STYLE 2:

- PIN 1. ANODE
- N/C
- CATHODE

STYLE 3:

- PIN 1. ANODE
- ANODE
- CATHODE

STYLE 4:

- PIN 1. CATHODE
- CATHODE
- ANODE

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