

# Low V<sub>CE(sat)</sub> Transistor, PNP, -60 V, 2.0 A

## NSS60200L

onsemi's e<sup>2</sup>PowerEdge family of low V<sub>CE(sat)</sub> transistors are miniature surface mount devices featuring ultra low saturation voltage (V<sub>CE(sat)</sub>) 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 e<sup>2</sup>PowerEdge 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, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	-60	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	-80	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	-7.0	Vdc
Collector Current – Continuous	I <sub>C</sub>	-2.0	A
Collector Current – Peak	I <sub>CM</sub>	-4.0	A

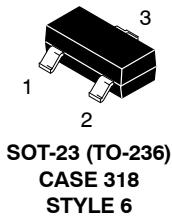
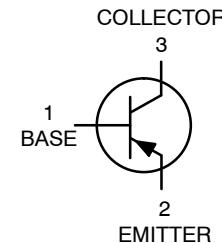
### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25 °C Derate above 25 °C	P <sub>D</sub> (Note 1)	460 3.7	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub> (Note 1)	270	°C/W
Total Device Dissipation T <sub>A</sub> = 25 °C Derate above 25 °C	P <sub>D</sub> (Note 2)	540 4.3	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub> (Note 2)	230	°C/W
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-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.

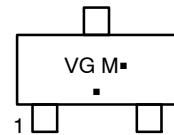
1. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces.
2. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces.

**-60 VOLTS, 4.0 AMPS  
PNP LOW V<sub>CE(sat)</sub> TRANSISTOR  
EQUIVALENT R<sub>DS(on)</sub> 80 mΩ**



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

### MARKING DIAGRAM



VG = Specific 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 <sup>†</sup>
NSS60200LT1G	SOT-23 (Pb-Free)	3000/Tape & Reel
NSV60200LT1G	SOT-23 (Pb-Free)	3000/Tape & Reel

<sup>†</sup> 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](#).

# NSS60200L

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

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = -10 \text{ mA}_\text{dc}$ , $I_B = 0$ )	$V_{(\text{BR})\text{CEO}}$	-60	-	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = -0.1 \text{ mA}_\text{dc}$ , $I_E = 0$ )	$V_{(\text{BR})\text{CBO}}$	-80	-	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -0.1 \text{ mA}_\text{dc}$ , $I_C = 0$ )	$V_{(\text{BR})\text{EBO}}$	-7.0	-	-	Vdc
Collector Cutoff Current ( $V_{CB} = -60 \text{ Vdc}$ , $I_E = 0$ )	$I_{\text{CBO}}$	-	-	-0.1	$\mu\text{A}_\text{dc}$
Emitter Cutoff Current ( $V_{EB} = -6.0 \text{ Vdc}$ )	$I_{\text{EBO}}$	-	-	-0.1	$\mu\text{A}_\text{dc}$

## ON CHARACTERISTICS

DC Current Gain (Note 3) ( $I_C = -10 \text{ mA}$ , $V_{CE} = -2.0 \text{ V}$ ) ( $I_C = -500 \text{ mA}$ , $V_{CE} = -2.0 \text{ V}$ ) ( $I_C = -1.0 \text{ A}$ , $V_{CE} = -2.0 \text{ V}$ ) ( $I_C = -2.0 \text{ A}$ , $V_{CE} = -2.0 \text{ V}$ )	$h_{\text{FE}}$	150 150 100 100	- 300 - -	- - - -	
Collector-Emitter Saturation Voltage (Note 3) ( $I_C = -0.1 \text{ A}$ , $I_B = -0.010 \text{ A}$ ) ( $I_C = -1.0 \text{ A}$ , $I_B = -0.100 \text{ A}$ ) ( $I_C = -1.0 \text{ A}$ , $I_B = -0.010 \text{ A}$ ) ( $I_C = -2.0 \text{ A}$ , $I_B = -0.200 \text{ A}$ )	$V_{CE(\text{sat})}$	- - - -	-0.017 -0.095 -0.180 -0.170	-0.030 -0.120 -0.270 -0.220	V
Base-Emitter Saturation Voltage (Note 3) ( $I_C = -1.0 \text{ A}$ , $I_B = -0.010 \text{ A}$ )	$V_{BE(\text{sat})}$	-	-	-0.900	V
Base-Emitter Turn-on Voltage (Note 3) ( $I_C = -1.0 \text{ A}$ , $V_{CE} = -2.0 \text{ V}$ )	$V_{BE(\text{on})}$	-	-	-0.850	V
Cutoff Frequency ( $I_C = -100 \text{ mA}$ , $V_{CE} = -5.0 \text{ V}$ , $f = 100 \text{ MHz}$ )	$f_T$	100	-	-	MHz
Input Capacitance ( $V_{EB} = 0.5 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_{\text{ibo}}$	-	-	325	pF
Output Capacitance ( $V_{CB} = 3.0 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_{\text{obo}}$	-	-	62	pF

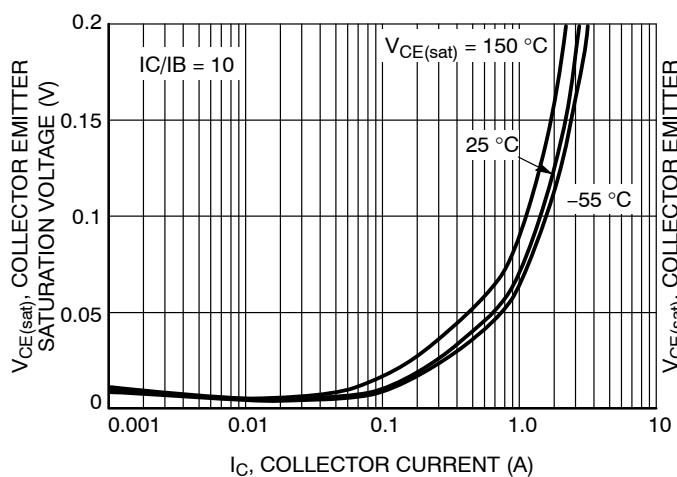
## SWITCHING CHARACTERISTICS

Delay ( $V_{CC} = -30 \text{ V}$ , $I_C = 750 \text{ mA}$ , $I_{B1} = 15 \text{ mA}$ )	$t_d$	-	-	60	ns
Rise ( $V_{CC} = -30 \text{ V}$ , $I_C = 750 \text{ mA}$ , $I_{B1} = 15 \text{ mA}$ )	$t_r$	-	-	120	ns
Storage ( $V_{CC} = -30 \text{ V}$ , $I_C = 750 \text{ mA}$ , $I_{B1} = 15 \text{ mA}$ )	$t_s$	-	-	400	ns
Fall ( $V_{CC} = -30 \text{ V}$ , $I_C = 750 \text{ mA}$ , $I_{B1} = 15 \text{ mA}$ )	$t_f$	-	-	130	ns

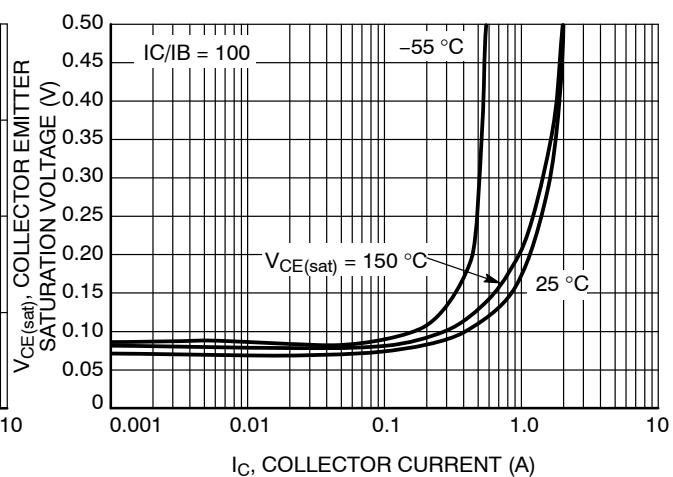
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

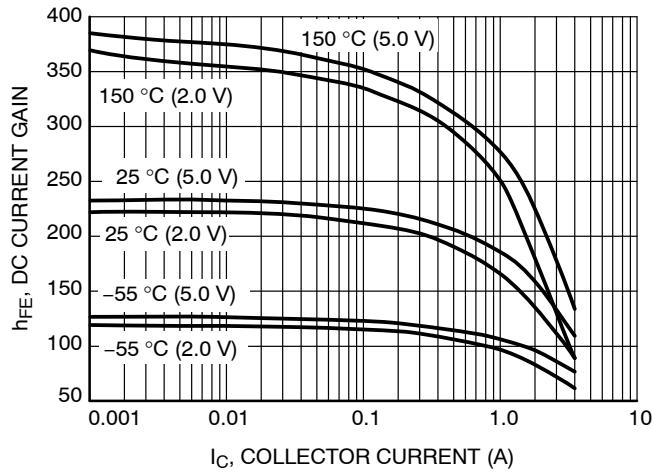
## TYPICAL CHARACTERISTICS



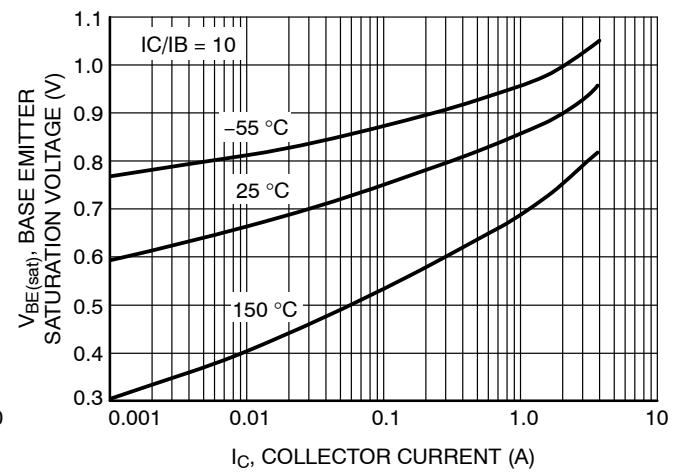
**Figure 1. Collector Emitter Saturation Voltage vs. Collector Current**



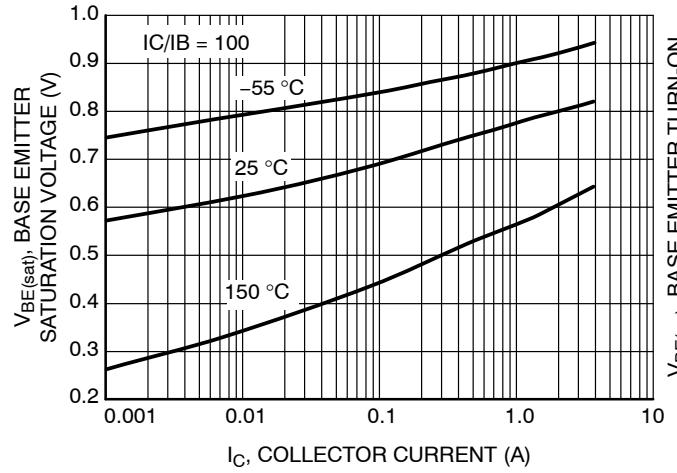
**Figure 2. Collector Emitter Saturation Voltage vs. Collector Current**



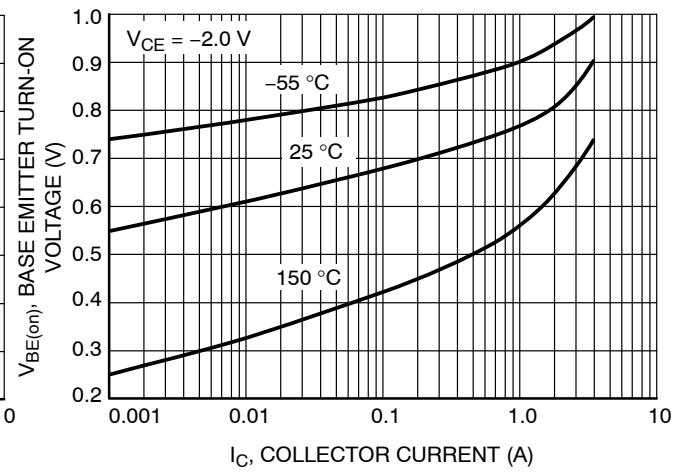
**Figure 3. DC Current Gain vs. Collector Current**



**Figure 4. Base Emitter Saturation Voltage vs. Collector Current**

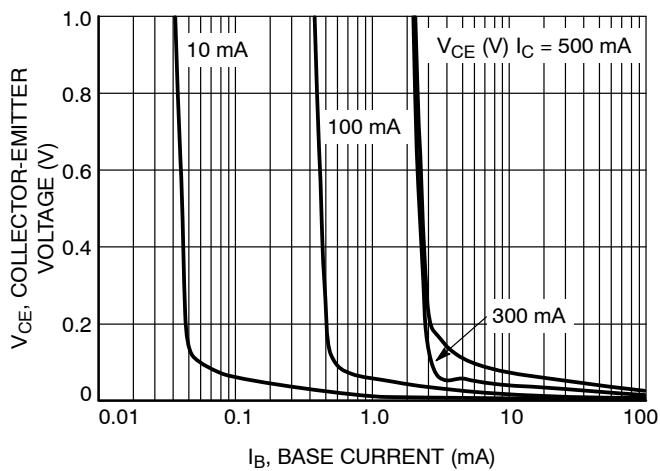


**Figure 5. Base Emitter Saturation Voltage vs. Collector Current**

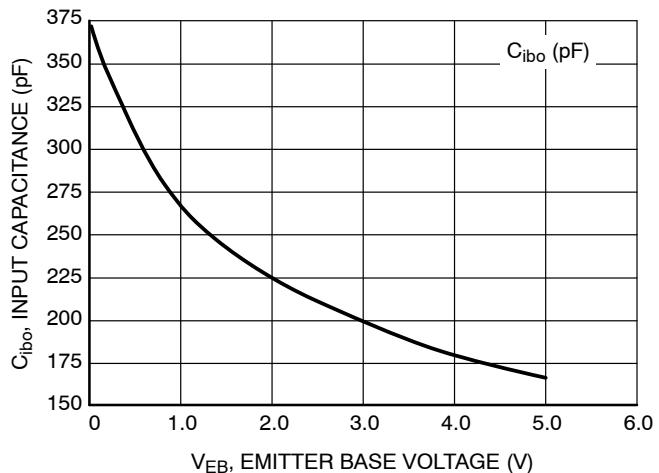


**Figure 6. Base Emitter Turn-On Voltage vs. Collector Current**

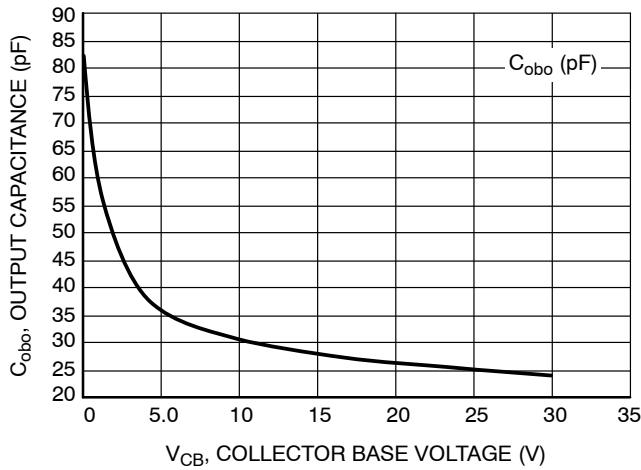
**TYPICAL CHARACTERISTICS**



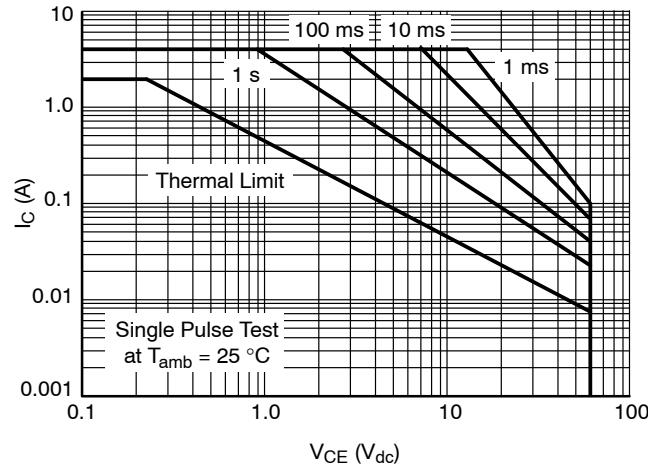
**Figure 7. Saturation Region**



**Figure 8. Input Capacitance**



**Figure 9. Output Capacitance**

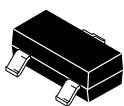


**Figure 10. Safe Operating Area**

**REVISION HISTORY**

Revision	Description of Changes	Date
4	Rebranded the Data Sheet to <b>onsemi</b> format.	10/31/2025

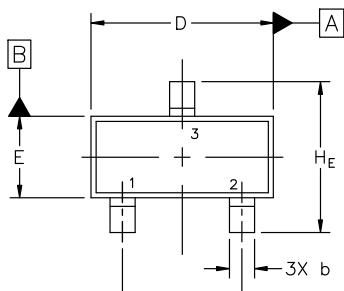
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



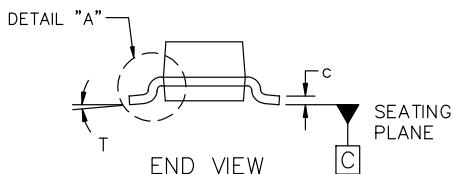
SCALE 4:1

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P  
CASE 318  
ISSUE AU

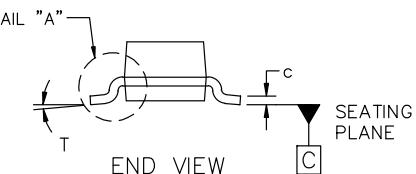
DATE 14 AUG 2024



TOP VIEW



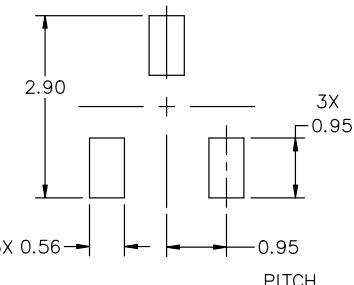
SIDE VIEW

DETAIL "A"  
Scale 3:1

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

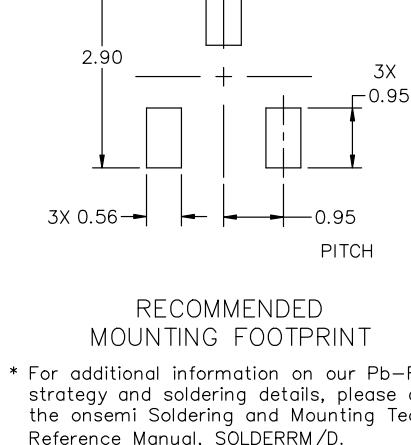
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: 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.

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 onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## STYLES ON PAGE 2

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**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**

CASE 318

ISSUE AU

DATE 14 AUG 2024

STYLE 1 THRU 5:  
CANCELLEDSTYLE 6:  
PIN 1. BASE  
2. Emitter  
3. CollectorSTYLE 7:  
PIN 1. Emitter  
2. Base  
3. CollectorSTYLE 8:  
PIN 1. Anode  
2. No Connection  
3. CathodeSTYLE 9:  
PIN 1. Anode  
2. Anode  
3. CathodeSTYLE 10:  
PIN 1. Drain  
2. Source  
3. GateSTYLE 11:  
PIN 1. Anode  
2. Cathode  
3. Cathode-AnodeSTYLE 12:  
PIN 1. Cathode  
2. Cathode  
3. AnodeSTYLE 13:  
PIN 1. Source  
2. Drain  
3. GateSTYLE 14:  
PIN 1. Cathode  
2. Gate  
3. AnodeSTYLE 15:  
PIN 1. Gate  
2. Cathode  
3. AnodeSTYLE 16:  
PIN 1. Anode  
2. Cathode  
3. CathodeSTYLE 17:  
PIN 1. No Connection  
2. Anode  
3. CathodeSTYLE 18:  
PIN 1. No Connection  
2. Cathode  
3. AnodeSTYLE 19:  
PIN 1. Cathode  
2. Anode  
3. Cathode-AnodeSTYLE 20:  
PIN 1. Cathode  
2. Anode  
3. GateSTYLE 21:  
PIN 1. Gate  
2. Source  
3. DrainSTYLE 22:  
PIN 1. Return  
2. Output  
3. InputSTYLE 23:  
PIN 1. Anode  
2. Anode  
3. CathodeSTYLE 24:  
PIN 1. Gate  
2. Drain  
3. SourceSTYLE 25:  
PIN 1. Anode  
2. Cathode  
3. GateSTYLE 26:  
PIN 1. Cathode  
2. Anode  
3. No ConnectionSTYLE 27:  
PIN 1. Cathode  
2. Cathode  
3. CathodeSTYLE 28:  
PIN 1. Anode  
2. Anode  
3. Anode

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