Complementary ThermalTrak™ Transistors

NJL3281D (NPN)
NJL1302D (PNP)

The ThermalTrak family of devices has been designed to eliminate thermal equilibrium lag time and bias trimming in audio amplifier applications. They can also be used in other applications as transistor die protection devices.

Features

- Thermally Matched Bias Diode
- Instant Thermal Bias Tracking
- Absolute Thermal Integrity
- High Safe Operating Area
- Pb-Free Packages are Available*

Benefits

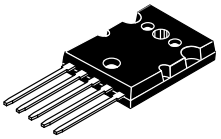
- Eliminates Thermal Equilibrium Lag Time and Bias Trimming
- Superior Sound Quality Through Improved Dynamic Temperature Response
- Significantly Improved Bias Stability
- Simplified Assembly
  - Reduced Labor Costs
  - Reduced Component Count
- High Reliability

Applications

- High-End Consumer Audio Products
  - Home Amplifiers
  - Home Receivers
- Professional Audio Amplifiers
  - Theater and Stadium Sound Systems
  - Public Address Systems (PAs)

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

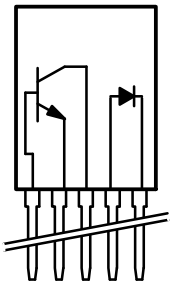
BIPOLAR POWER TRANSISTORS 15 AMP, 260 VOLT, 200 WATT



TO-264, 5-LEAD
CASE 340AA
STYLE 1

MARKING DIAGRAM

SCHEMATIC



NJLxxxxD = Device Code
xxxx = 3281 or 1302
G = Pb-Free Package
A = Assembly Location
YY = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NJL3281DG	TO-264 (Pb-Free)	25 Units / Rail
NJL1302DG	TO-264 (Pb-Free)	25 Units / Rail

DISCONTINUED (Note 1)

NJL3281D	TO-264	25 Units / Rail
NJL1302D	TO-264	25 Units / Rail

1. **DISCONTINUED:** These devices are not available. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

MAXIMUM RATINGS (T_J = 25 °C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	260	Vdc
Collector-Base Voltage	V_{CBO}	260	Vdc
Emitter-Base Voltage	V_{EBO}	5	Vdc
Collector-Emitter Voltage – 1.5 V	V_{CEX}	260	Vdc
Collector Current – Continuous – Peak (Note 2)	I_C	15 25	Adc
Base Current – Continuous	I_B	1.5	Adc
Total Power Dissipation @ T_C = 25 °C Derate Above 25 °C	P_D	200 1.43	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	– 65 to +150	°C
DC Blocking Voltage	V_R	200	V
Average Rectified Forward Current	$I_{F(AV)}$	1.0	A

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.625	°C/W

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.

2. Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

ATTRIBUTES

Characteristic		Value
ESD Protection	Human Body Model Machine Model	>8000 V > 400 V
Flammability Rating		UL 94 V-0 @ 0.125 in

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	$V_{CEO(sus)}$	260	–	Vdc
Collector Cutoff Current (V_{CB} = 260 Vdc, I_E = 0)	I_{CBO}	–	50	μAdc
Emitter Cutoff Current (V_{EB} = 5 Vdc, I_C = 0)	I_{EBO}	–	5	μAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5 Vdc) (I_C = 1 Adc, V_{CE} = 5 Vdc) (I_C = 3 Adc, V_{CE} = 5 Vdc) (I_C = 5 Adc, V_{CE} = 5 Vdc) (I_C = 8 Adc, V_{CE} = 5 Vdc)	h_{FE}	 75 75 75 75 45	 150 150 150 150 –	
Collector-Emitter Saturation Voltage (I_C = 10 Adc, I_B = 1 Adc)	$V_{CE(sat)}$	–	3	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain – Bandwidth Product (I_C = 1 Adc, V_{CE} = 5 Vdc, f_{test} = 1 MHz)	f_T	30	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 MHz)	C_{ob}	–	600	pF
Maximum Instantaneous Forward Voltage (Note 3) (i_F = 1.0 A, T_J = 25 °C) (i_F = 1.0 A, T_J = 150 °C)	v_F	 1.1 0.93		V
Maximum Instantaneous Reverse Current (Note 3) (Rated dc Voltage, T_J = 25 °C) (Rated dc Voltage, T_J = 150 °C)	i_R	 10 100		μA
Maximum Reverse Recovery Time (i_F = 1.0 A, di/dt = 50 A/μs)	t_{rr}	100		ns

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

TYPICAL CHARACTERISTICS

PNP NJL1302D

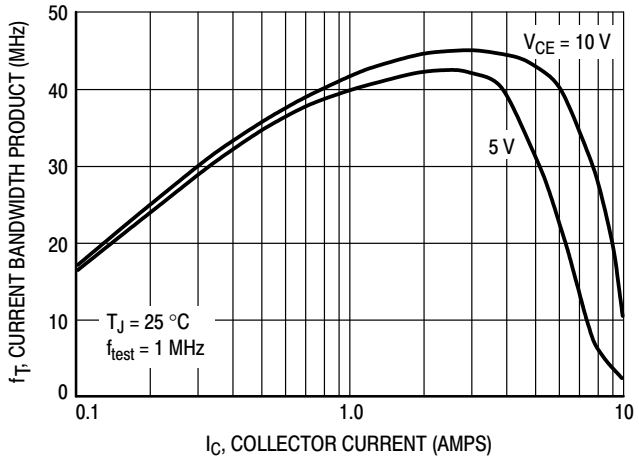


Figure 1. Typical Current Gain Bandwidth Product

NPN NJL3281D

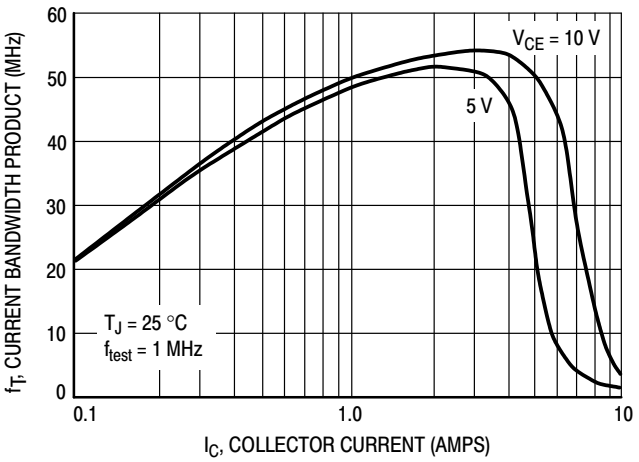


Figure 2. Typical Current Gain Bandwidth Product

PNP NJL1302D

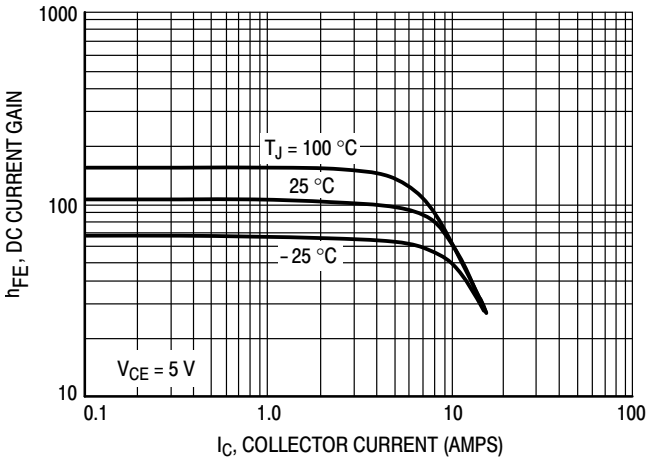


Figure 3. DC Current Gain, V_{CE} = 5 V

NPN NJL3281D

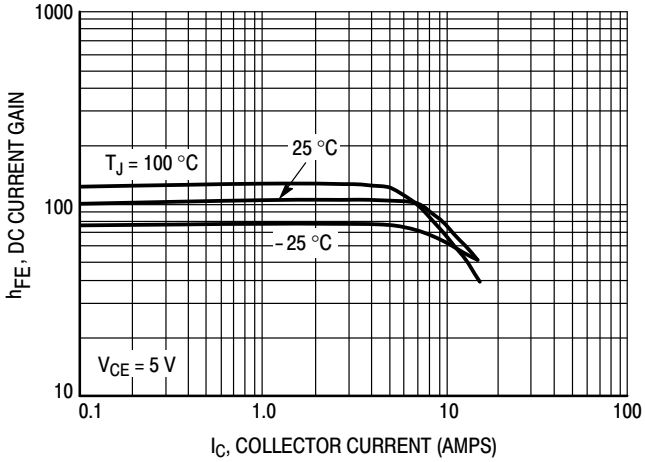


Figure 4. DC Current Gain, V_{CE} = 5 V

PNP NJL1302D

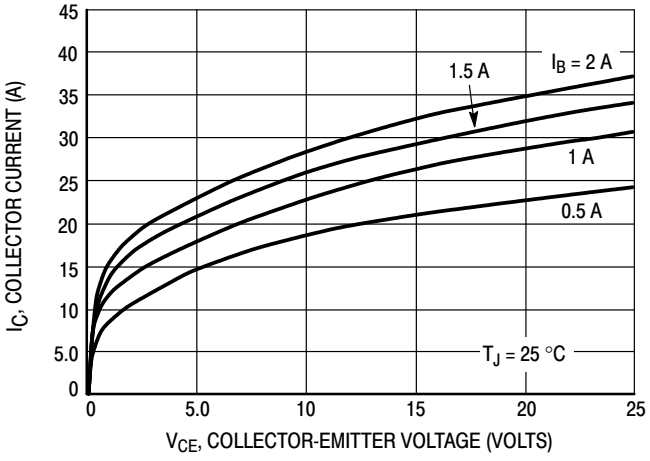


Figure 5. Typical Output Characteristics

NPN NJL3281D

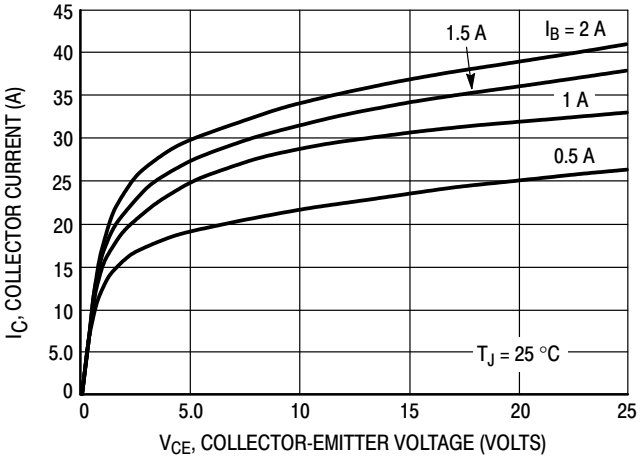


Figure 6. Typical Output Characteristics

TYPICAL CHARACTERISTICS

PNP NJL1302D

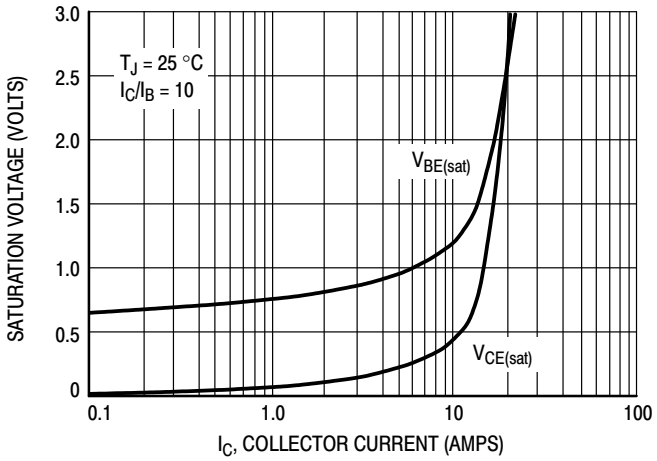


Figure 7. Typical Saturation Voltages

NPN NJL3281D

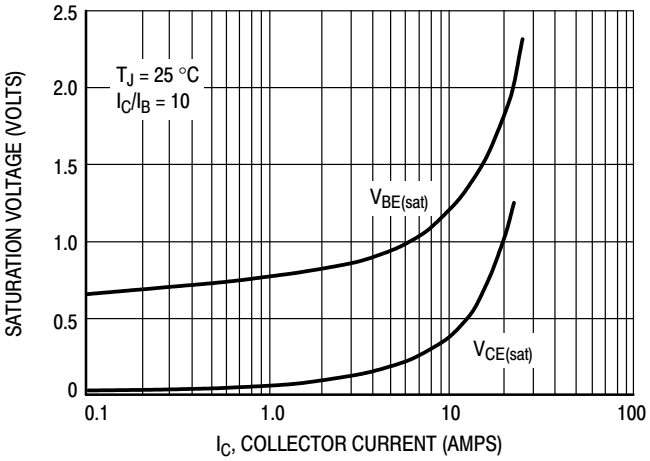


Figure 8. Typical Saturation Voltages

PNP NJL1302D

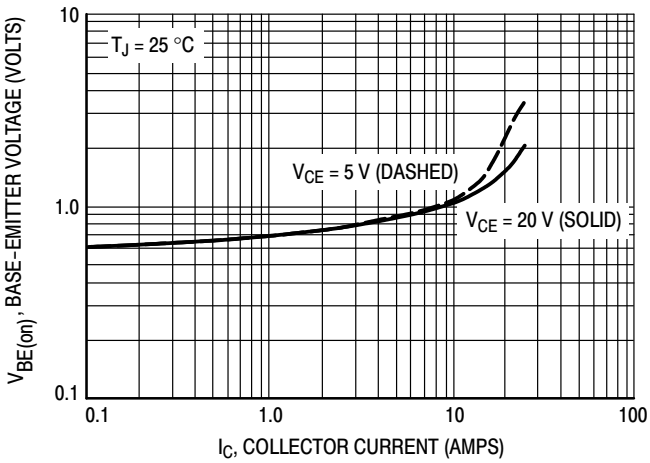


Figure 9. Typical Base-Emitter Voltage

NPN NJL3281D

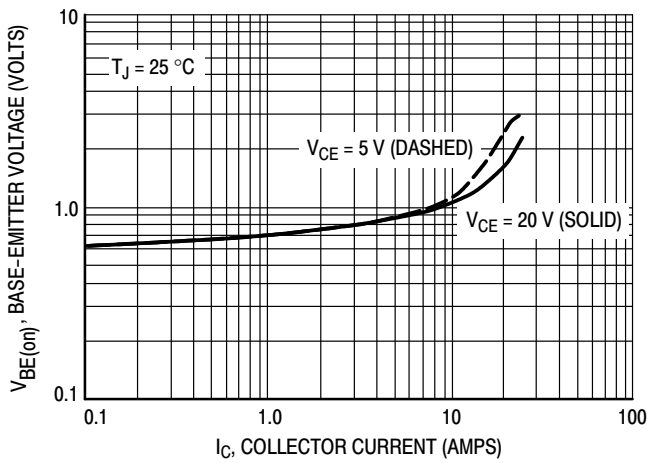


Figure 10. Typical Base-Emitter Voltage

TYPICAL CHARACTERISTICS

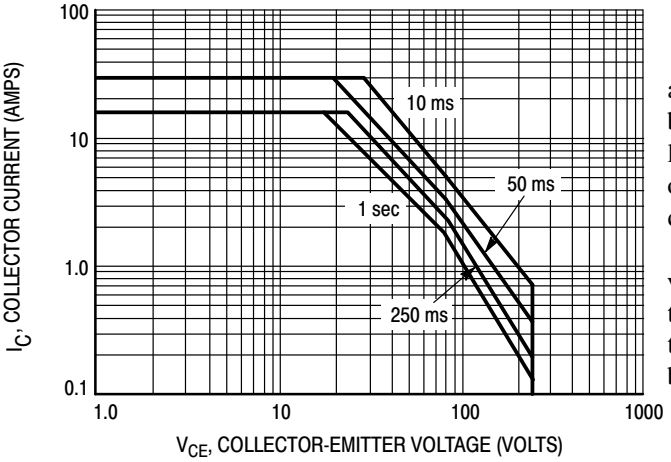


Figure 11. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor; average junction temperature and secondary 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 Figure 11 is based on $T_{J(pk)}$ = 150 °C; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

PNP NJL1302D

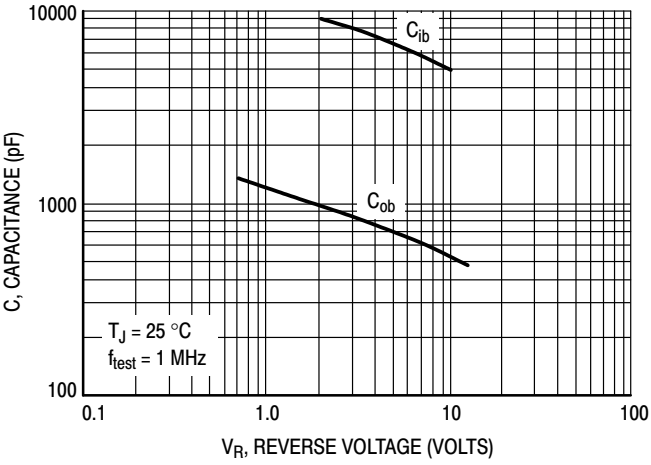


Figure 12. NJL1302D Typical Capacitance

NPN NJL3281D

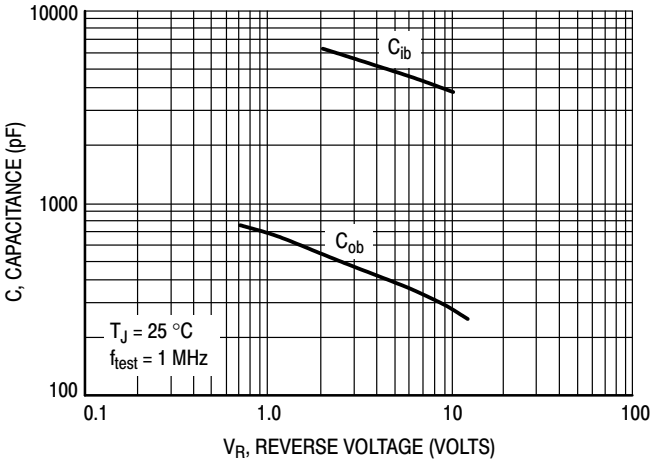


Figure 13. NJL3281D Typical Capacitance

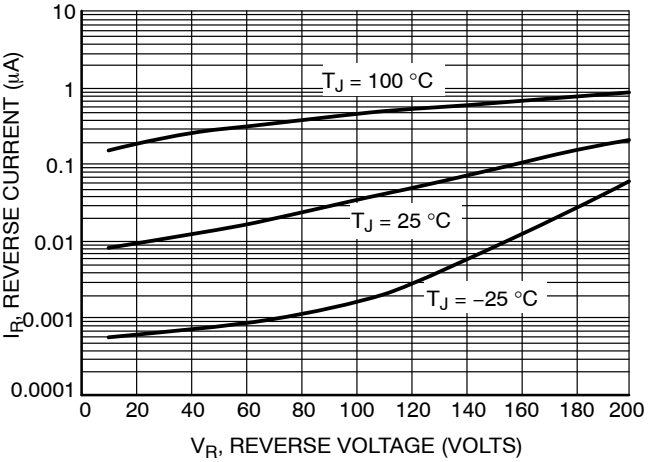


Figure 14. Typical Reverse Current

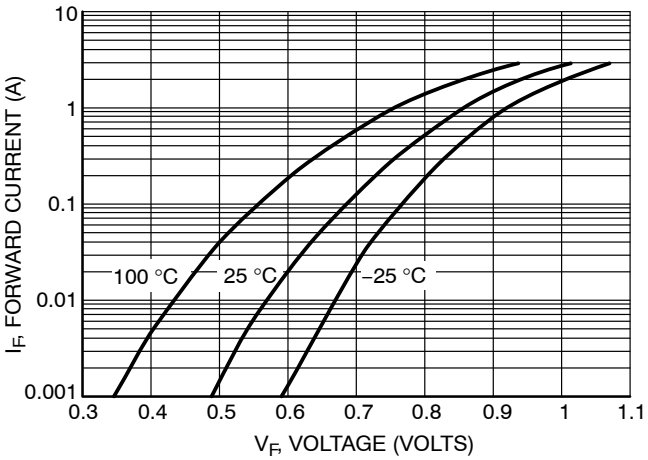


Figure 15. Typical Forward Voltage

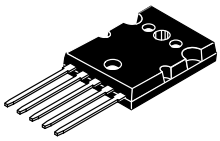
REVISION HISTORY

Revision	Description of Changes	Date
3	Document rebranded to **onsemi** format. NJL1302D and NJL3281D OPNs marked as discontinued.	2/2/2026

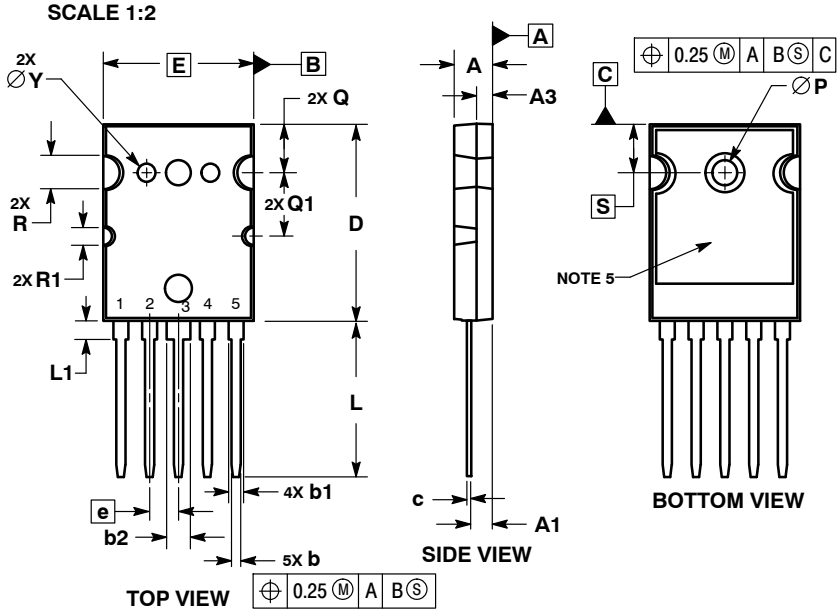
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

TO−264, 5−LEAD
CASE 340AA
ISSUE A

DATE 04 FEB 2013



SCALE 1:2

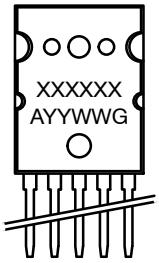


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES BETWEEN 2.50 AND 3.81 FROM THE LEAD TIP.
4. DIMENSION S APPLIES TO THE MOUNTING HOLE (∅P). DIMENSION Q APPLIES TO THE NOTCHES (2X R).
5. THERMAL PAD SIZE AND SHAPE MAY VARY WITHIN THE AREA DEFINED BY DIMENSIONS D AND E.

	MILLIMETERS	
DIM	MIN	MAX
A	4.70	5.31
A1	2.50	3.10
A3	2.00 REF	
b	1.10	1.50
b1	2.00 REF	
b2	3.00 REF	
c	0.43	0.74
D	25.58	26.59
E	19.30	20.29
e	3.81 BSC	
L	19.79	21.39
L1	2.10	2.30
P	3.00	3.51
Q	5.80	6.20
Q1	8.80	9.20
R	4.00 REF	
R1	2.00 REF	
S	9.00 BSC	
Y	1.80 REF	

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. ANODE
5. CATHODE

GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
YY = Year
WW = Work Week
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.

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DESCRIPTION:	**TO−264, 5−LEAD**		**PAGE 1 OF 1**

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