

NJL3281D (NPN) NJL1302D (PNP)

Complementary ThermalTrak™ Transistors

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

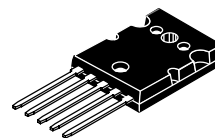
- High-End Consumer Audio Products
 - ◆ Home Amplifiers
 - ◆ Home Receivers
- Professional Audio Amplifiers
 - ◆ Theater and Stadium Sound Systems
 - ◆ Public Address Systems (PAs)



ON Semiconductor®

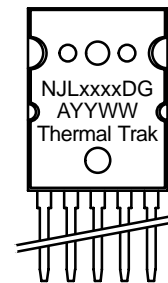
<http://onsemi.com>

**BIPOLAR POWER
TRANSISTORS**
15 AMP, 260 VOLT, 200 WATT

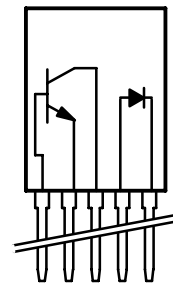


TO-264, 5 LEAD
CASE 340AA
STYLE 1

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 |
|-----------|---------------------|-----------------|
| NJL3281D | TO-264 | 25 Units / Rail |
| NJL3281DG | TO-264 (Pb-Free) | 25 Units / Rail |
| NJL1302D | TO-264 | 25 Units / Rail |
| NJL1302DG | TO-264 (Pb-Free) | 25 Units / Rail |

*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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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 1) | 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 _{θJC} | 0.625 | °C/W |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 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 |

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

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------|----------------------------|-------------------------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 260 | – | Vdc |
| Collector Cutoff Current ($V_{CB} = 260\text{ Vdc}$, $I_E = 0$) | I_{CBO} | – | 50 | μAdc |
| Emitter Cutoff Current ($V_{EB} = 5\text{ Vdc}$, $I_C = 0$) | I_{EBO} | – | 5 | μAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 500\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 3\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 5\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) | h_{FE} | 75 75 75 75 45 | 150 150 150 150 – | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ Adc}$, $I_B = 1\text{ Adc}$) | $V_{CE(sat)}$ | – | 3 | Vdc |
| DYNAMIC CHARACTERISTICS | | | | |
| Current-Gain – Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$, $f_{test} = 1\text{ MHz}$) | f_T | 30 | – | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$) | C_{ob} | – | 600 | pF |
| Maximum Instantaneous Forward Voltage (Note 2) ($i_F = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$) ($i_F = 1.0\text{ A}$, $T_J = 150^\circ\text{C}$) | V_F | | 1.1 0.93 | V |
| Maximum Instantaneous Reverse Current (Note 2) (Rated dc Voltage, $T_J = 25^\circ\text{C}$) (Rated dc Voltage, $T_J = 150^\circ\text{C}$) | i_R | | 10 100 | μA |
| Maximum Reverse Recovery Time ($i_F = 1.0\text{ A}$, $di/dt = 50\text{ A}/\mu\text{s}$) | t_{rr} | | 100 | ns |

2. Diode Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

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TYPICAL CHARACTERISTICS

PNP NJL1302D

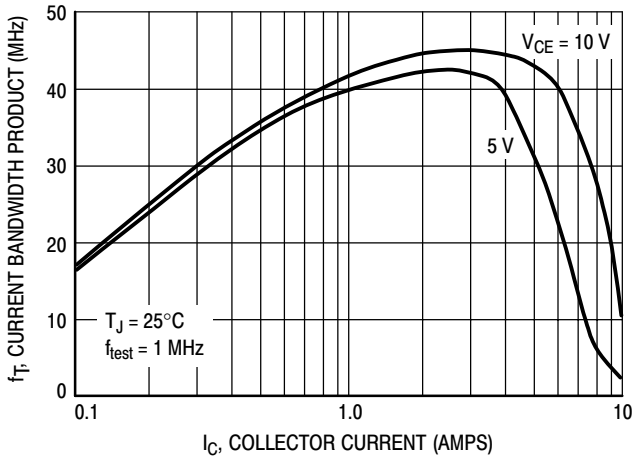


Figure 1. Typical Current Gain Bandwidth Product

NPN NJL3281D

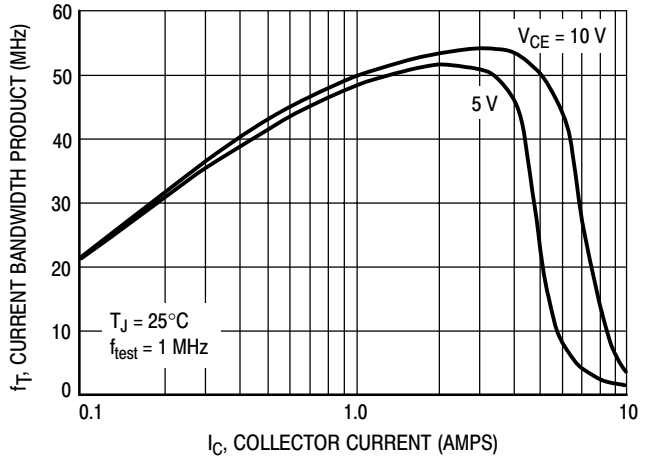


Figure 2. Typical Current Gain Bandwidth Product

PNP NJL1302D

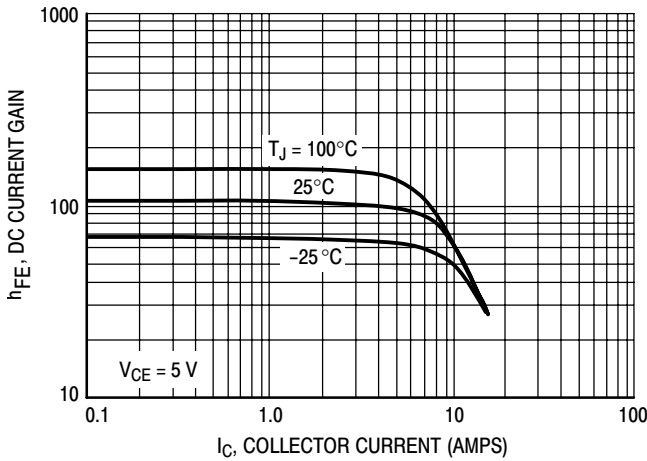


Figure 3. DC Current Gain, $V_{CE} = 5V$

NPN NJL3281D

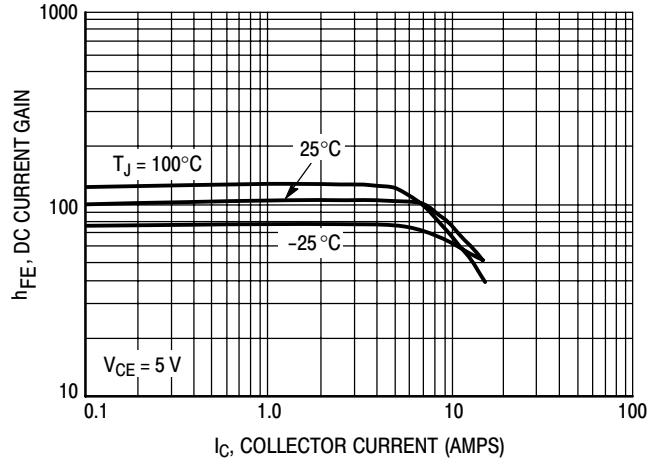


Figure 4. DC Current Gain, $V_{CE} = 5V$

PNP NJL1302D

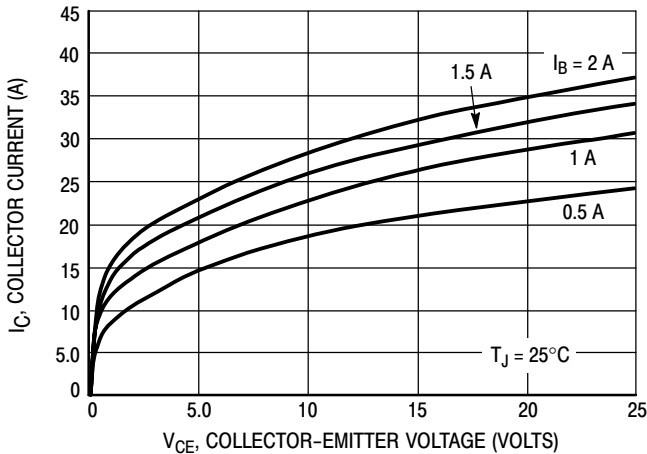


Figure 5. Typical Output Characteristics

NPN NJL3281D

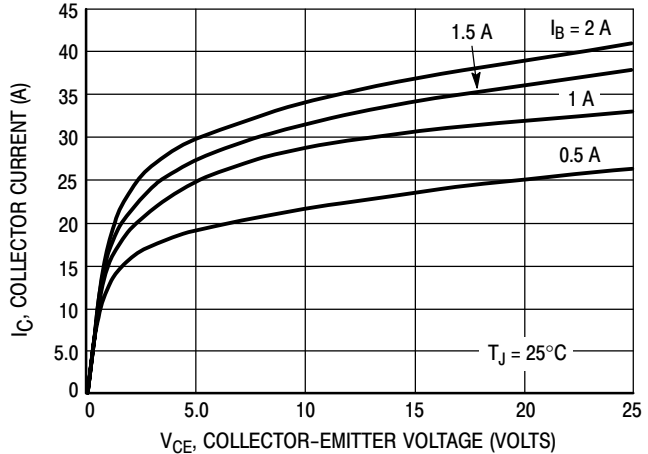


Figure 6. Typical Output Characteristics

NJL3281D (NPN) NJL1302D (PNP)

TYPICAL CHARACTERISTICS

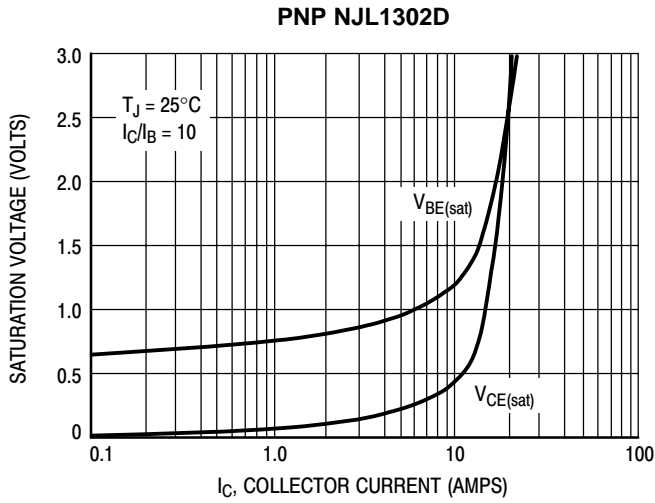


Figure 7. Typical Saturation Voltages

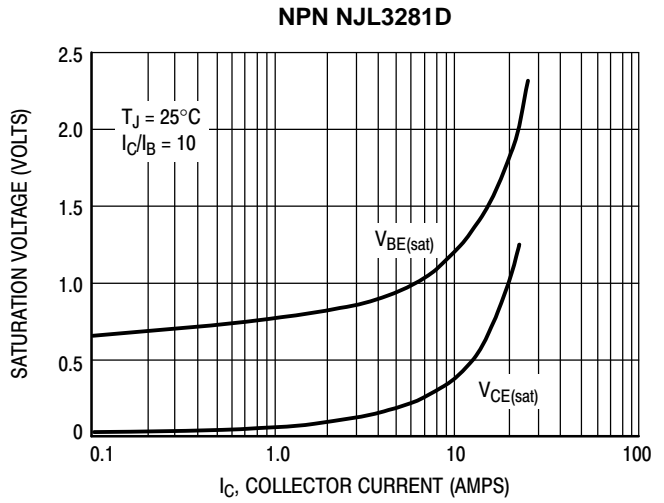


Figure 8. Typical Saturation Voltages

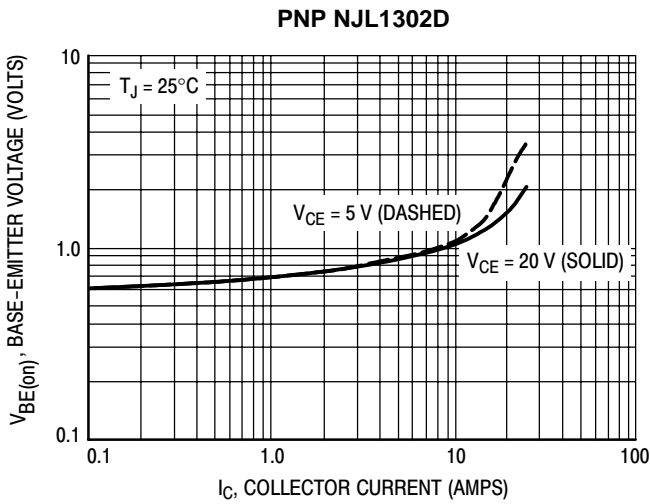


Figure 9. Typical Base-Emitter Voltage

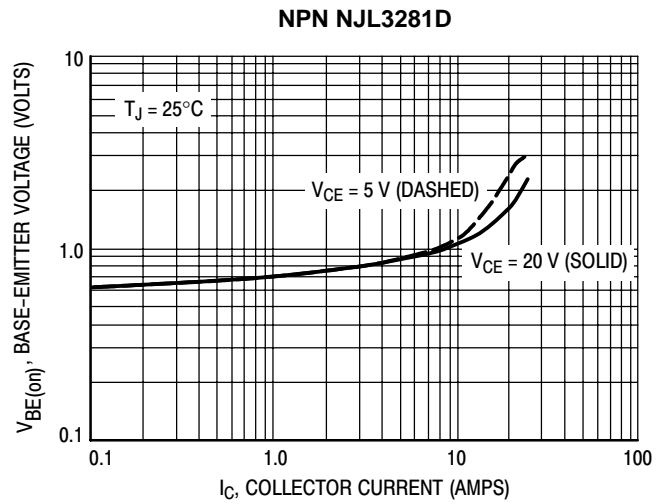


Figure 10. Typical Base-Emitter Voltage

NJL3281D (NPN) NJL1302D (PNP)

TYPICAL CHARACTERISTICS

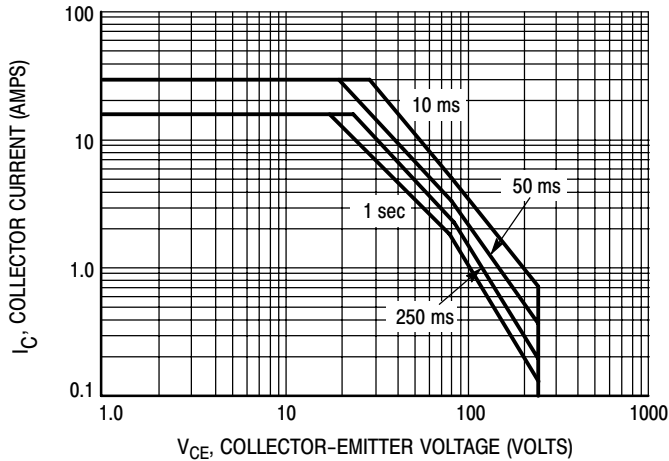


Figure 11. Active Region Safe Operating Area

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 $T_{J(pk)} = 150^\circ\text{C}$; 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.

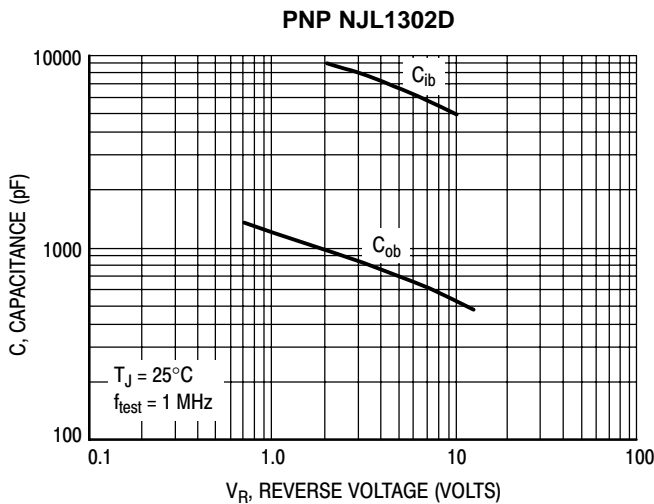


Figure 12. NJL1302D Typical Capacitance

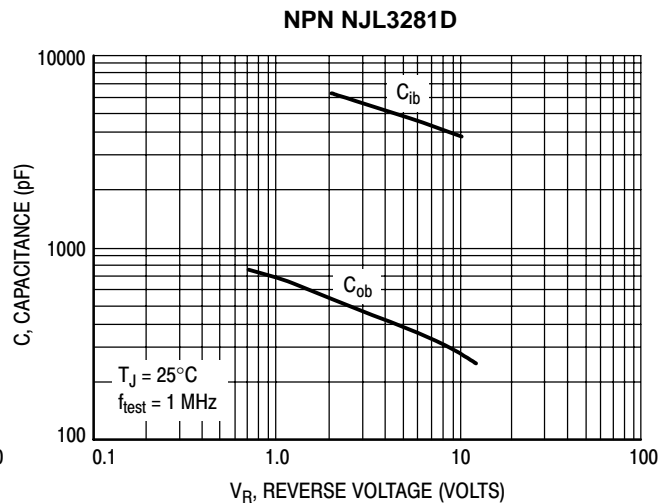


Figure 13. NJL3281D Typical Capacitance

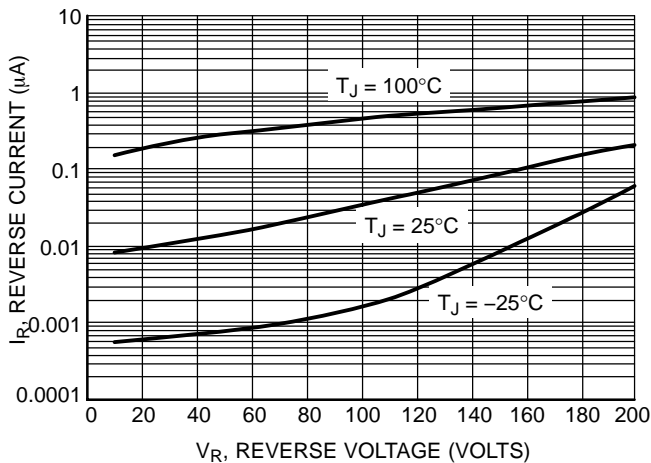


Figure 14. Typical Reverse Current

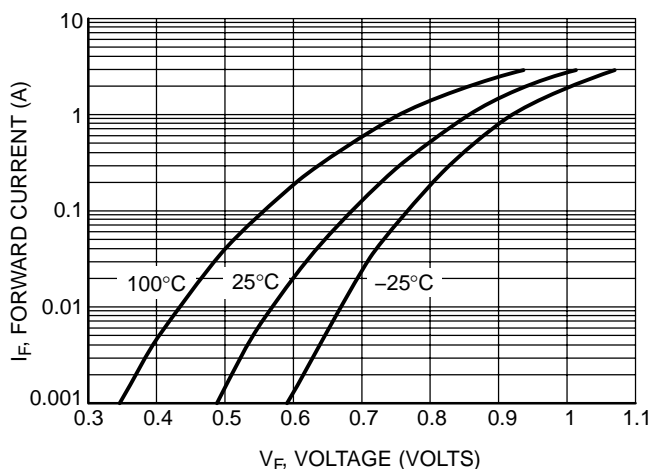
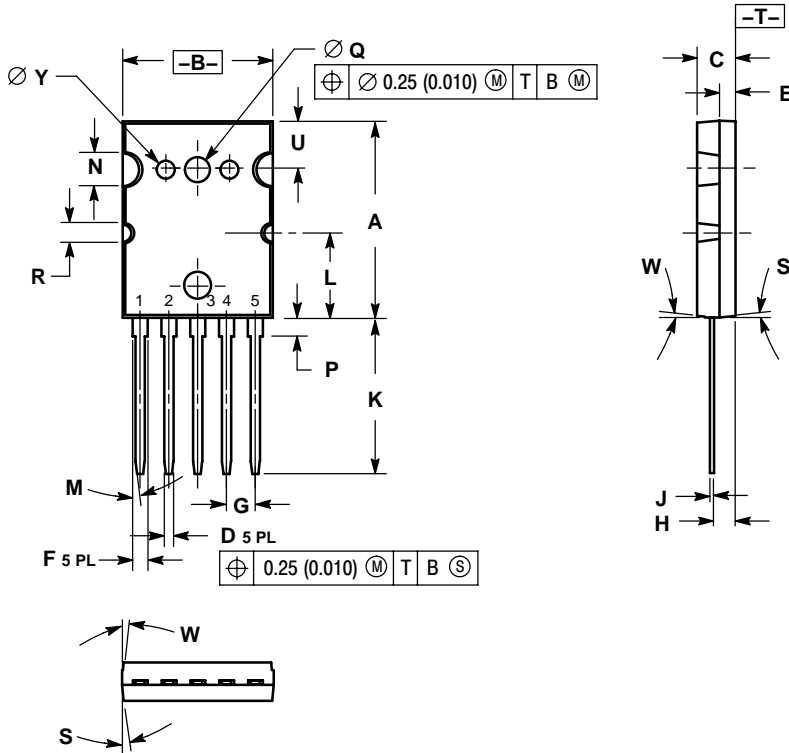


Figure 15. Typical Forward Voltage

NJL3281D (NPN) NJL1302D (PNP)

PACKAGE DIMENSIONS

TO-264, 5 LEAD
CASE 340AA-01
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|--------|--------|------------|--------|--------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 25.857 | 25.984 | 26.111 | 1.018 | 1.023 | 1.028 |
| B | 19.761 | 19.888 | 20.015 | 0.778 | 0.783 | 0.788 |
| C | 4.928 | 5.055 | 5.182 | 0.194 | 0.199 | 0.204 |
| D | 1.219 BSC | | | 0.0480 BSC | | |
| E | 2.032 | 2.108 | 2.184 | 0.0800 | 0.0830 | 0.0860 |
| F | 1.981 BSC | | | 0.0780 BSC | | |
| G | 3.81 BSC | | | 0.150 BSC | | |
| H | 2.667 | 2.718 | 2.769 | 0.1050 | 0.1070 | 0.1090 |
| J | 0.584 BSC | | | 0.0230 BSC | | |
| K | 20.422 | 20.549 | 20.676 | 0.804 | 0.809 | 0.814 |
| L | 11.28 REF | | | 0.444 REF | | |
| M | 0° | --- | 7° | 0° | --- | 7° |
| N | 4.57 REF | | | 0.180 REF | | |
| P | 2.259 | 2.386 | 2.513 | 0.0889 | 0.0939 | 0.0989 |
| Q | 3.480 BSC | | | 0.1370 BSC | | |
| R | 2.54 REF | | | 0.100 REF | | |
| S | 0° | --- | 8° | 0° | --- | 8° |
| U | 6.17 REF | | | 0.243 REF | | |
| W | 0° | --- | 6° | 0° | --- | 6° |
| Y | 2.388 BSC | | | 0.0940 BSC | | |

STYLE 1:

1. BASE
2. EMITTER
3. COLLECTOR
4. ANODE
5. CATHODE

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