

NSBC123TDP6

Dual NPN Bias Resistor Transistors

R1 = 2.2 kΩ, R2 = ∞ kΩ

NPN Transistors with Monolithic Bias Resistor Network

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space.

Features

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

(T_A = 25°C, common for Q1 and Q2, unless otherwise noted)

| Rating | Symbol | Max | Unit |
|--------------------------------|----------------------|-----|------|
| Collector-Base Voltage | V _{CB0} | 50 | Vdc |
| Collector-Emitter Voltage | V _{CEO} | 50 | Vdc |
| Collector Current - Continuous | I _C | 100 | mAdc |
| Input Forward Voltage | V _{IN(fwd)} | 12 | Vdc |
| Input Reverse Voltage | V _{IN(rev)} | 6 | Vdc |

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.

ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|---------|---------------------|
| NSBC123TDP6T5G | SOT-963 | 8,000 / Tape & Reel |

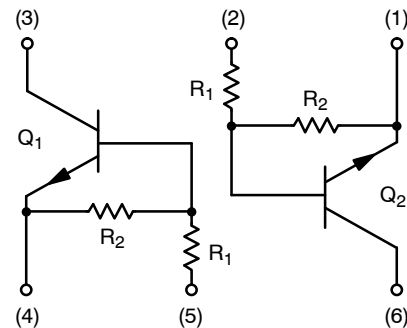
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



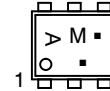
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PIN CONNECTIONS



MARKING DIAGRAMS



SOT-963
CASE 527AD

- A = 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.

NSBC123TDP6

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|----------------|--------|-----|------|
|----------------|--------|-----|------|

NSBC123TDP6 (SOT-963) One Junction Heated

| | | | | |
|--|----------|-----------------|-----|---------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ | (Note 1) | P_D | 231 | mW |
| | (Note 2) | | 269 | |
| Derate above 25°C | (Note 1) | | 1.9 | mW/ $^\circ\text{C}$ |
| | (Note 2) | | 2.2 | |
| Thermal Resistance, Junction to Ambient | (Note 1) | $R_{\theta JA}$ | 540 | $^\circ\text{C}/\text{W}$ |
| | (Note 2) | | 464 | |

NSBC123TDP6 (SOT-963) Both Junction Heated (Note 3)

| | | | | |
|--|----------|-----------------|-------------|---------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ | (Note 1) | P_D | 339 | mW |
| | (Note 2) | | 408 | |
| Derate above 25°C | (Note 1) | | 2.7 | mW/ $^\circ\text{C}$ |
| | (Note 2) | | 3.3 | |
| Thermal Resistance, Junction to Ambient | (Note 1) | $R_{\theta JA}$ | 369 | $^\circ\text{C}/\text{W}$ |
| | (Note 2) | | 306 | |
| Junction and Storage Temperature Range | | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

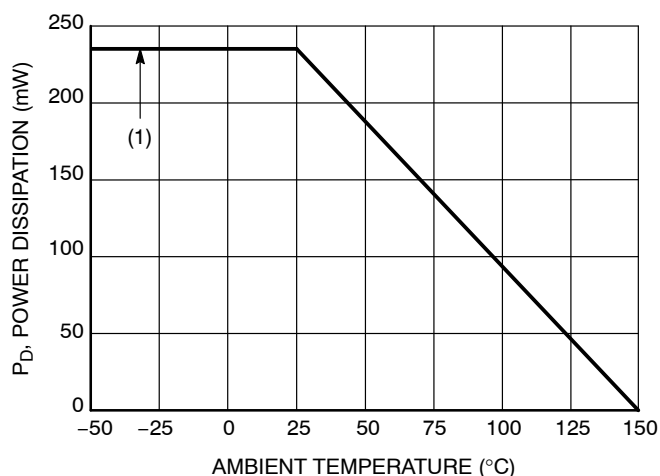
1. FR-4 @ 100 mm², 1 oz. copper traces, still air.
2. FR-4 @ 500 mm², 1 oz. copper traces, still air.
3. Both junction heated values assume total power is sum of two equally powered channels.

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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, common for Q_1 and Q_2 , unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|---------------|-----|-----|------|------------------|
| OFF CHARACTERISTICS | | | | | |
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | - | - | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | - | - | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$) | I_{EBO} | - | - | 4.0 | mAdc |
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage (Note 4) ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | - | - | Vdc |
| ON CHARACTERISTICS | | | | | |
| DC Current Gain (Note 4) ($I_C = 5.0\text{ mA}$, $V_{CE} = 10\text{ V}$) | h_{FE} | 160 | 350 | - | |
| Collector-Emitter Saturation Voltage (Note 4) ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) | $V_{CE(sat)}$ | - | - | 0.25 | Vdc |
| Input Voltage (off) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$) | $V_{i(off)}$ | - | 0.6 | - | Vdc |
| Input Voltage (on) ($V_{CE} = 0.2\text{ V}$, $I_C = 10\text{ mA}$) | $V_{i(on)}$ | - | 0.9 | - | Vdc |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | - | - | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | - | - | Vdc |
| Input Resistor | R_1 | 1.5 | 2.2 | 2.9 | $\text{k}\Omega$ |
| Resistor Ratio | R_1/R_2 | - | - | - | |

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



(1) SOT-963; 100 mm², 1 oz. copper trace

Figure 1. Derating Curve

NSBC123TDP6

TYPICAL CHARACTERISTICS NSBC123TDP6

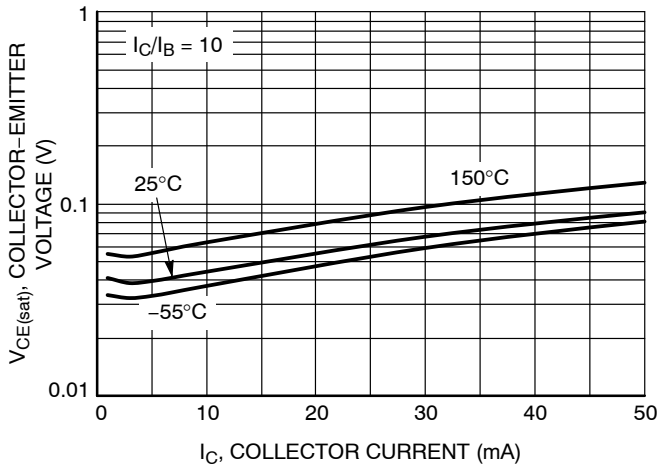


Figure 2. $V_{CE(sat)}$ vs. I_C

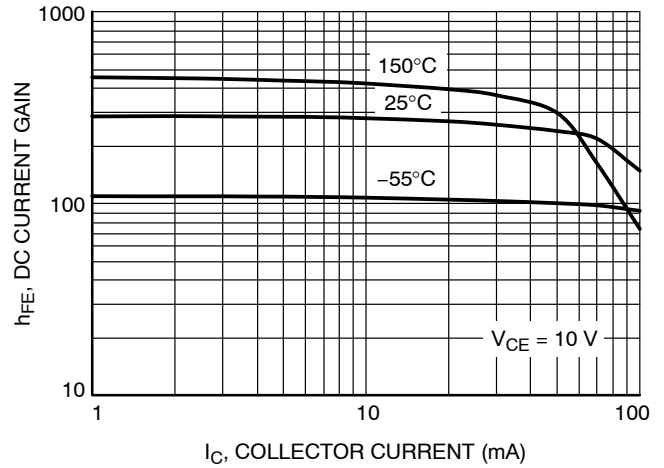


Figure 3. DC Current Gain

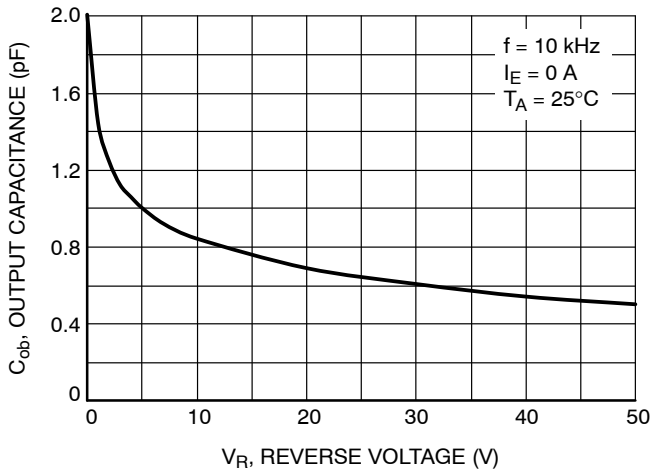


Figure 4. Output Capacitance

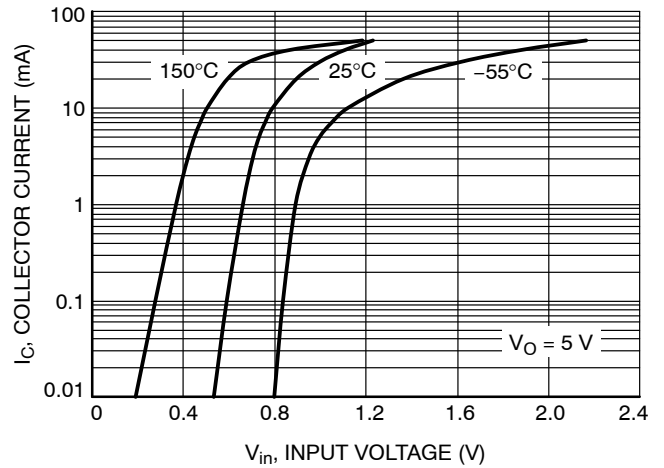


Figure 5. Output Current vs. Input Voltage

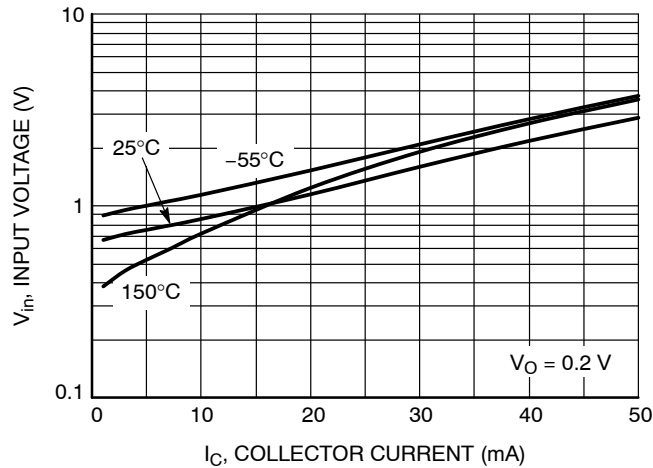
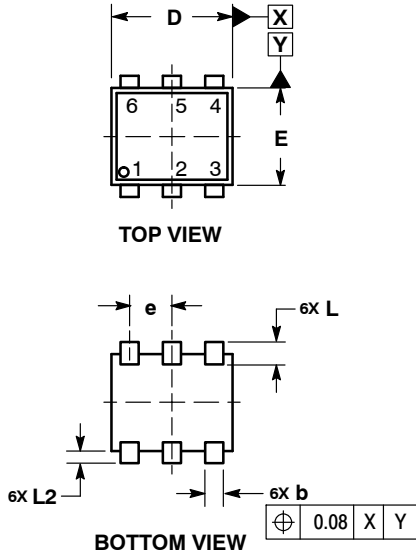


Figure 6. Input Voltage vs. Output Current

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PACKAGE DIMENSIONS

SOT-963 CASE 527AD ISSUE E

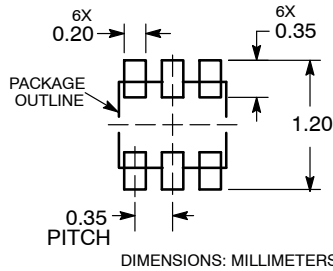


NOTES:

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

| MILLIMETERS | | | |
|----------------|----------|------|------|
| DIM | MIN | NOM | MAX |
| A | 0.34 | 0.37 | 0.40 |
| b | 0.10 | 0.15 | 0.20 |
| C | 0.07 | 0.12 | 0.17 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.35 BSC | | |
| H _E | 0.95 | 1.00 | 1.05 |
| L | 0.19 REF | | |
| L2 | 0.05 | 0.10 | 0.15 |

RECOMMENDED MOUNTING FOOTPRINT



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