

# NSTB1010XV5T5

Preferred Device

## Product Preview

# Dual Common Base-Collector Bias Resistor Transistors

## NPN and PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the NSTB1010XV5T5, two complementary BRT devices are housed in the SOT-553 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch Tape and Reel
- Pb-Free Package May be Available

**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ , – minus sign for  $Q_1$  (PNP) omitted)

| Rating                    | Symbol    | Value | Unit |
|---------------------------|-----------|-------|------|
| Collector-Base Voltage    | $V_{CBO}$ | 50    | Vdc  |
| Collector-Emitter Voltage | $V_{CEO}$ | 50    | Vdc  |
| Collector Current         | $I_C$     | 100   | mAdc |

### THERMAL CHARACTERISTICS

| Characteristic<br>(One Junction Heated)   | Symbol          | Max                          | Unit                       |
|---|-----------------|------------------------------|----------------------------|
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 357 (Note 1)<br>2.9 (Note 1) | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance –<br>Junction-to-Ambient   | $R_{\theta JA}$ | 350 (Note 1)                 | $^\circ\text{C}/\text{W}$  |
| Characteristic<br>(Both Junctions Heated)   | Symbol          | Max                          | Unit                       |
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 500 (Note 1)<br>4.0 (Note 1) | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance –<br>Junction-to-Ambient   | $R_{\theta JA}$ | 250 (Note 1)                 | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature  | $T_J, T_{stg}$  | –55 to +150                  | $^\circ\text{C}$           |

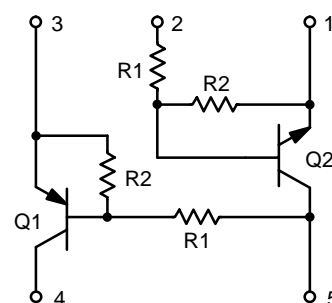
1. FR-4 @ Minimum Pad.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

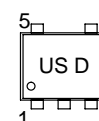


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### MARKING DIAGRAM



US = Specific Device Code  
D = Date Code

### ORDERING INFORMATION

| Device        | Package | Shipping†                      |
|---------------|---------|--------------------------------|
| NSTB1010XV5T1 | SOT-553 | 4 mm pitch<br>4000/Tape & Reel |
| NSTB1010XV5T5 | SOT-553 | 2 mm pitch<br>8000/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.

**Preferred** devices are recommended choices for future use and best overall value.

# NSTB1010XV5T5

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

#### Q1 TRANSISTOR: PNP

|   |               |     |   |      |      |
|---|---------------|-----|---|------|------|
| Collector-Base Cutoff Current ( $V_{CB} = -50\text{ V}$ , $I_E = 0$ )               | $I_{CBO}$     | –   | – | –100 | nAdc |
| Collector-Emitter Cutoff Current ( $V_{CB} = -50\text{ V}$ , $I_B = 0$ )            | $I_{CEO}$     | –   | – | –500 | nAdc |
| Emitter-Base Cutoff Current ( $V_{EB} = -6.0\text{ V}$ , $I_C = 0$ )                | $I_{EBO}$     | –   | – | –1.5 | mAdc |
| Collector-Base Breakdown Voltage ( $I_C = -10\text{ }\mu\text{A}$ , $I_E = 0$ )     | $V_{(BR)CBO}$ | –50 | – | –    | Vdc  |
| Collector-Emitter Breakdown Voltage (Note 2) ( $I_C = -2.0\text{ mA}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | –50 | – | –    | Vdc  |

### ON CHARACTERISTICS (Note 2)

|  |               |      |     |       |            |
|--|---------------|------|-----|-------|------------|
| Collector-Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ )                | $V_{CE(sat)}$ | –    | –   | –0.25 | Vdc        |
| DC Current Gain ( $V_{CE} = -10\text{ V}$ , $I_C = -5.0\text{ mA}$ )                                   | $h_{FE}$      | 15   | 27  | –     | –          |
| 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) ( $V_{CC} = -5.0\text{ V}$ , $V_B = -0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) | $V_{OH}$      | –4.9 | –   | –     | Vdc        |
| Input Resistor   | $R_1$         | 3.3  | 4.7 | 6.1   | k $\Omega$ |
| Resistor Ratio   | $R_1/R_2$     | 0.8  | 1.0 | 1.2   | –          |

### Q2 TRANSISTOR: NPN

#### OFF CHARACTERISTICS

|   |           |   |   |     |      |
|---|-----------|---|---|-----|------|
| Collector-Base Cutoff Current ( $V_{CB} = 50\text{ V}$ , $I_E = 0$ )            | $I_{CBO}$ | – | – | 100 | nAdc |
| Collector-Emitter Cutoff Current ( $V_{CB} = 50\text{ V}$ , $I_B = 0$ )         | $I_{CEO}$ | – | – | 500 | nAdc |
| Emitter-Base Cutoff Current ( $V_{EB} = 6.0\text{ V}$ , $I_C = 5.0\text{ mA}$ ) | $I_{EBO}$ | – | – | 0.5 | mAdc |

### ON CHARACTERISTICS

|  |               |     |     |      |            |
|--|---------------|-----|-----|------|------------|
| Collector-Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )                       | $V_{(BR)CBO}$ | 50  | –   | –    | Vdc        |
| Collector-Emitter Breakdown Voltage ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )                            | $V_{(BR)CEO}$ | 50  | –   | –    | Vdc        |
| DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )                                   | $h_{FE}$      | 35  | 60  | –    | –          |
| Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )                | $V_{CE(SAT)}$ | –   | –   | 0.25 | 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) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) | $V_{OH}$      | 4.9 | –   | –    | Vdc        |
| Input Resistor   | $R_1$         | 7.0 | 10  | 13   | k $\Omega$ |
| Resistor Ratio   | $R_1/R_2$     | 0.8 | 1.0 | 1.2  | –          |

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%.

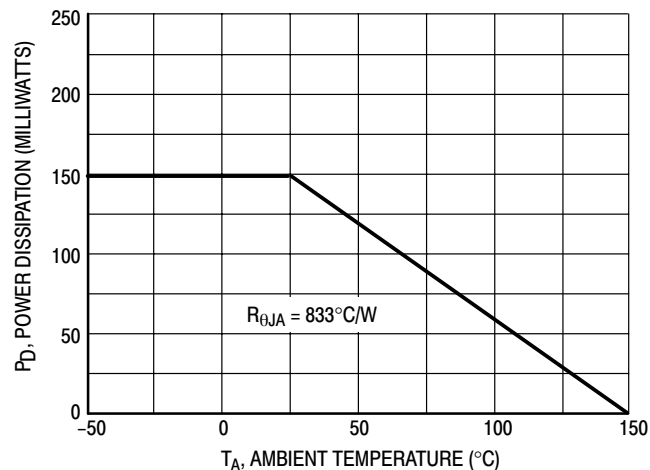


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS — PNP TRANSISTOR

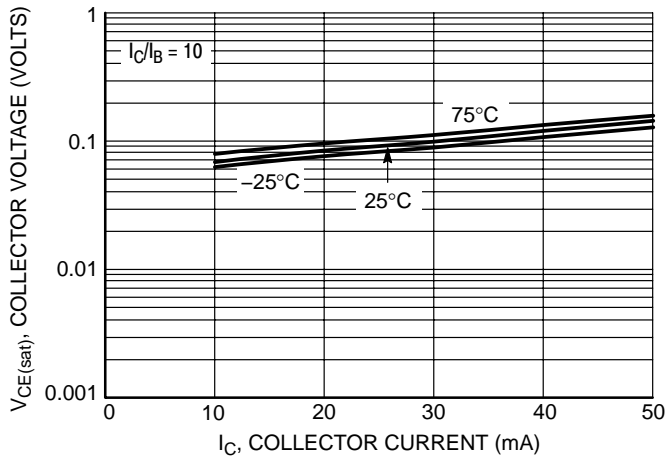


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

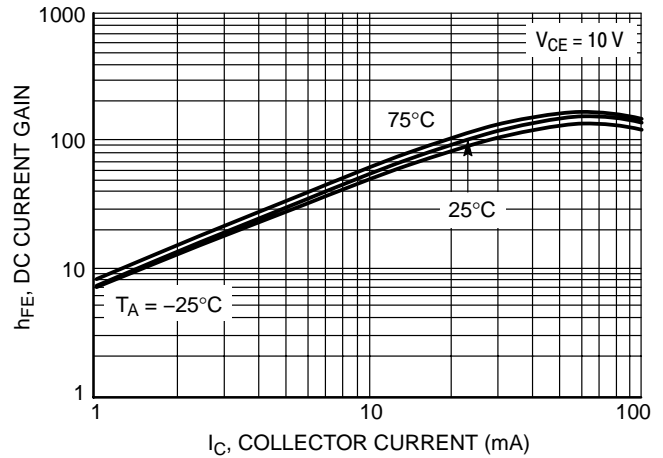


Figure 3. DC Current Gain

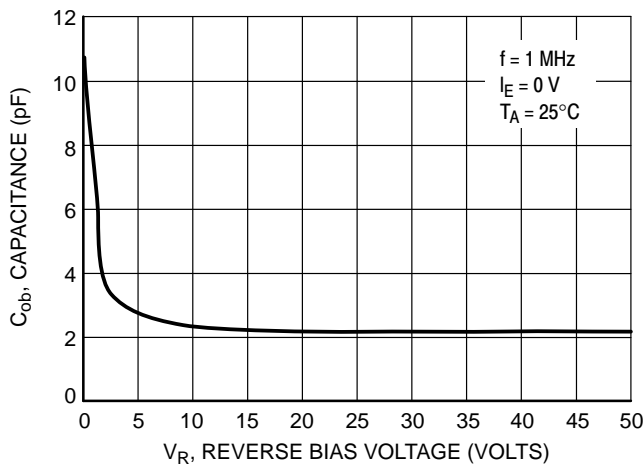


Figure 4. Output Capacitance

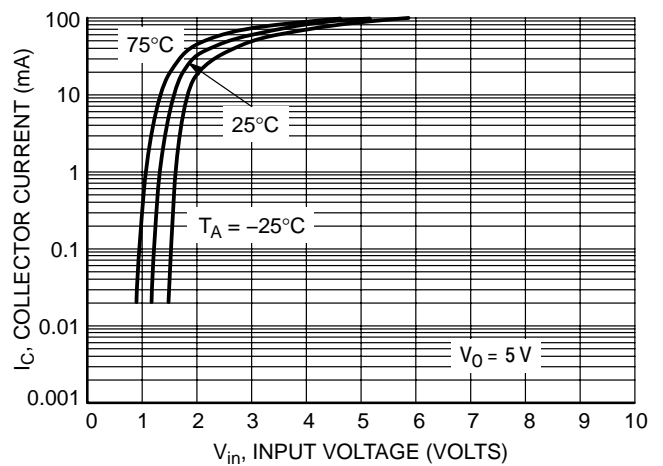


Figure 5. Output Current versus Input Voltage

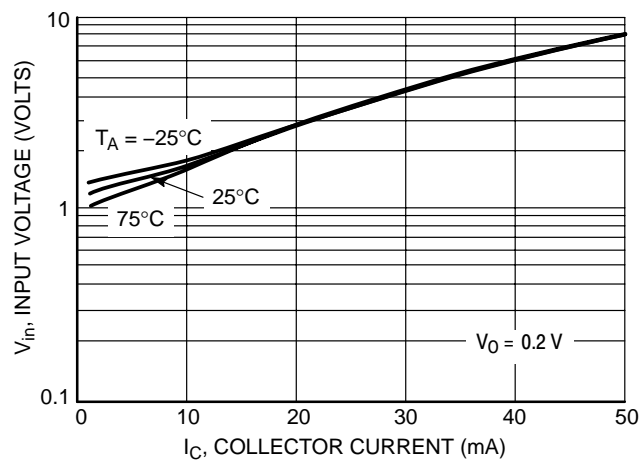


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NPN TRANSISTOR

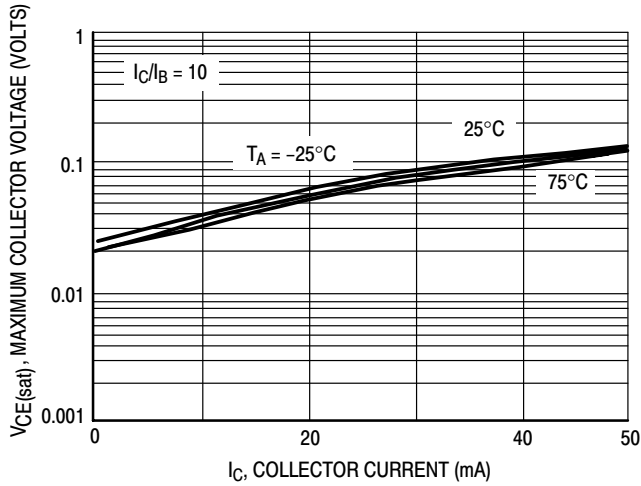


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

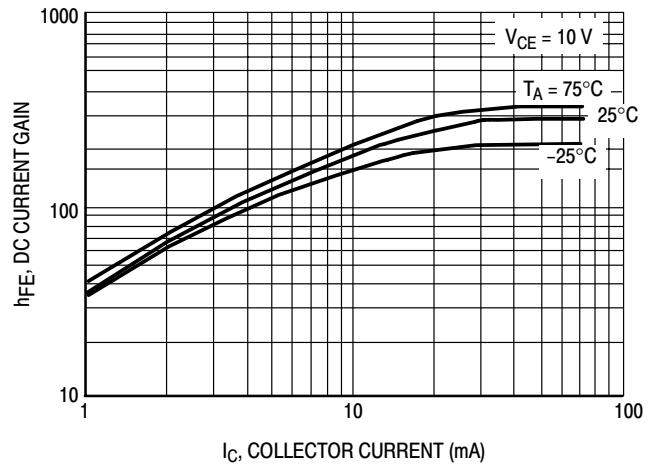


Figure 8. DC Current Gain

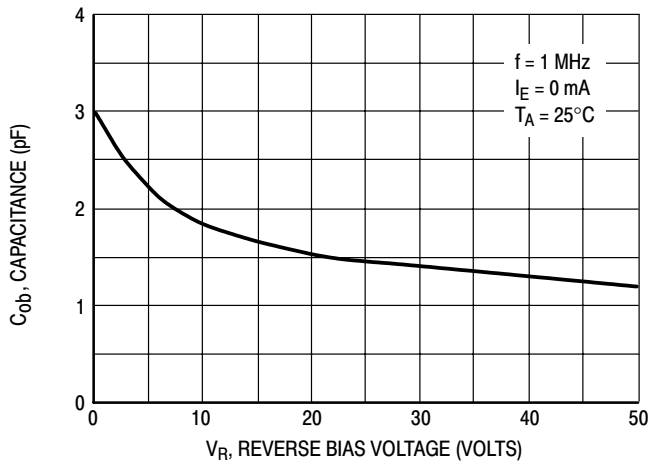


Figure 9. Output Capacitance

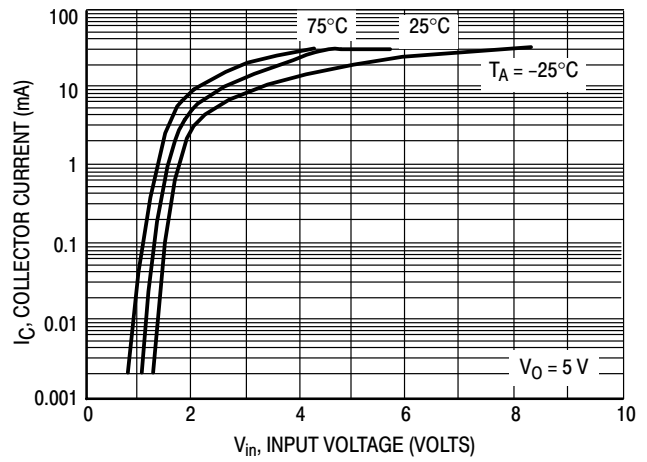


Figure 10. Output Current versus Input Voltage

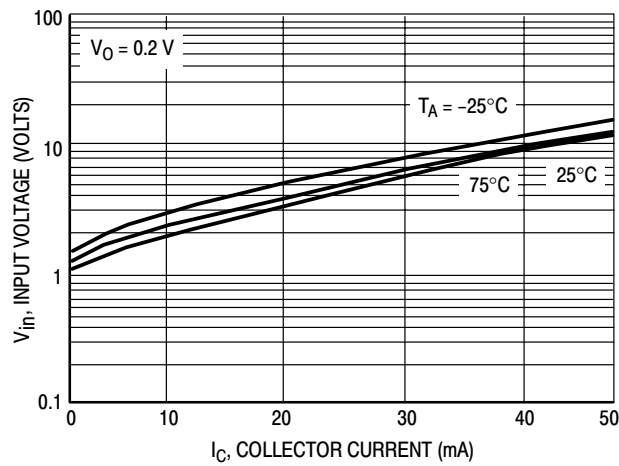
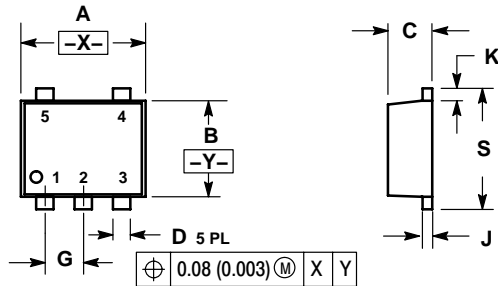


Figure 11. Input Voltage versus Output Current

# NSTB1010XV5T5

## PACKAGE DIMENSIONS

**SOT-553**  
5-LEAD PACKAGE  
CASE 463B-01  
ISSUE A

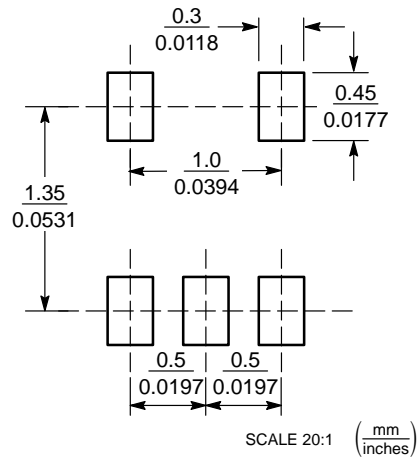


### NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 1.50        | 1.70 | 0.059     | 0.067 |
| B   | 1.10        | 1.30 | 0.043     | 0.051 |
| C   | 0.50        | 0.60 | 0.020     | 0.024 |
| D   | 0.17        | 0.27 | 0.007     | 0.011 |
| G   | 0.50 BSC    |      | 0.020 BSC |       |
| J   | 0.08        | 0.18 | 0.003     | 0.007 |
| K   | 0.10        | 0.30 | 0.004     | 0.012 |
| S   | 1.50        | 1.70 | 0.059     | 0.067 |

## SOLDERING 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.

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