

NSTB1005DXV5T1G

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. The NSTB1005DXV5T1 contains 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.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch Tape and Reel
- This is a Pb-Free Device

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

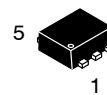
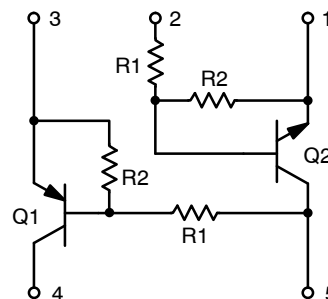
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ (Note 1) Derate above 25°C (Note 1)	P_D	357 2.9	mW mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient (Note 1)	$R_{\theta JA}$	350	$^\circ\text{C}/\text{W}$
Characteristic (Both Junctions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

1. FR-4 @ Minimum Pad



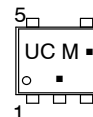
ON Semiconductor®

<http://onsemi.com>



SOT-553
CASE 463B

MARKING DIAGRAM



UC = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NSTB1005DXV5T1G	SOT-553 (Pb-Free)	4000/Tape & Reel

†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.

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

Characteristic	Symbol	Min	Typ	Max	Unit
Q1 TRANSISTOR: PNP – 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}	–	–	0.1	mAdc
Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 2.0\text{ mA}, I_B = 0$)	$V_{(BR)CEO}$	50	–	–	Vdc

ON CHARACTERISTICS

DC Current Gain	h_{FE}	80	140	–	
Collector–Emitter Saturation Voltage ($I_C = 10\text{ mA}, I_E = 0.3\text{ mA}$)	$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) ($V_{CC} = 5.0\text{ V}, V_B = 3.5\text{ V}, R_L = 1.0\text{ k}\Omega$)	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	R1	32.9	47	61.1	k Ω
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 ($V_{EB} = 6.0, I_C = 0$)	I_{EBO}	–	–	0.1	mAdc

ON CHARACTERISTICS

Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	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}	80	140	–	
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	R1	33	47	61	k Ω
Resistor Ratio	R_1/R_2	0.8	1.0	1.2	

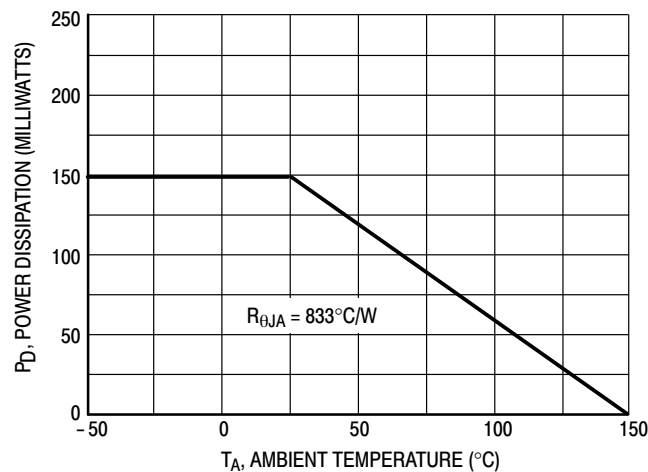


Figure 1. Derating Curve

NSTB1005DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – PNP TRANSISTOR

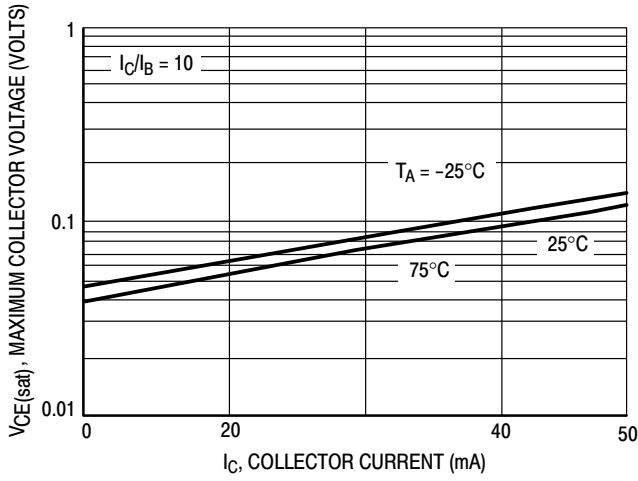


Figure 2. $V_{CE(sat)}$ versus I_C

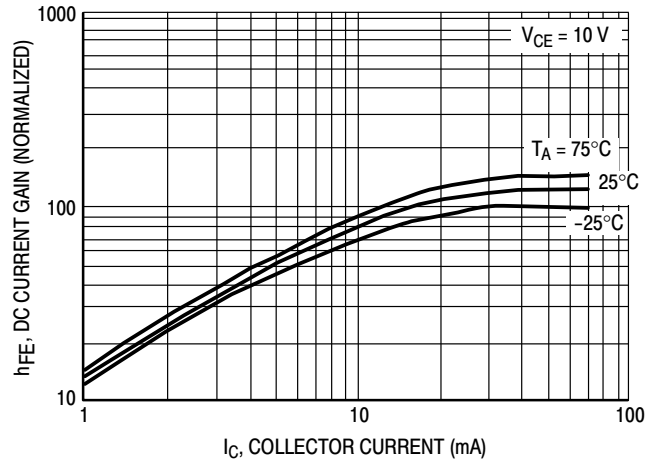


Figure 3. DC Current Gain

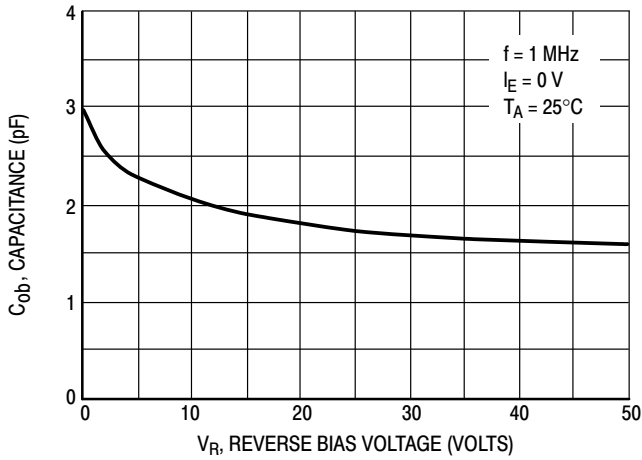


Figure 4. Output Capacitance

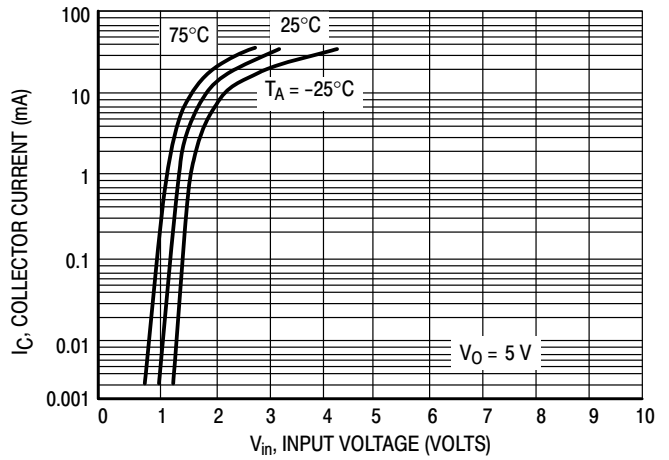


Figure 5. Output Current versus Input Voltage

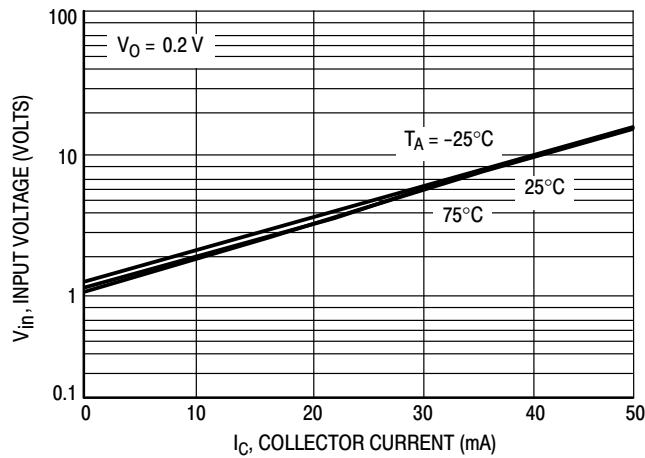


Figure 6. Input Voltage versus Output Current

NSTB1005DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS — NPN TRANSISTOR

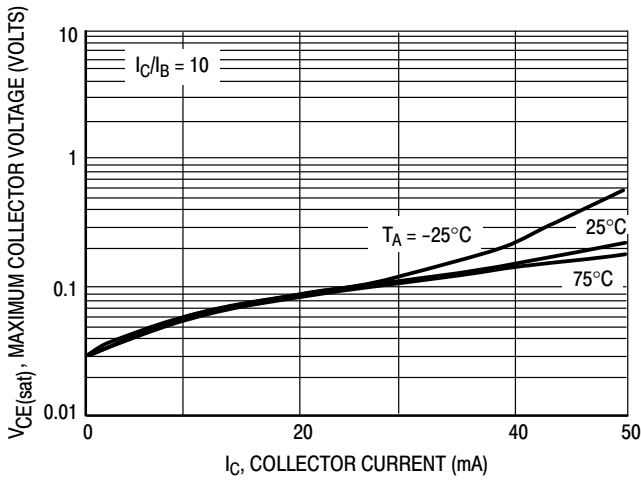


Figure 7. $V_{CE(sat)}$ versus I_C

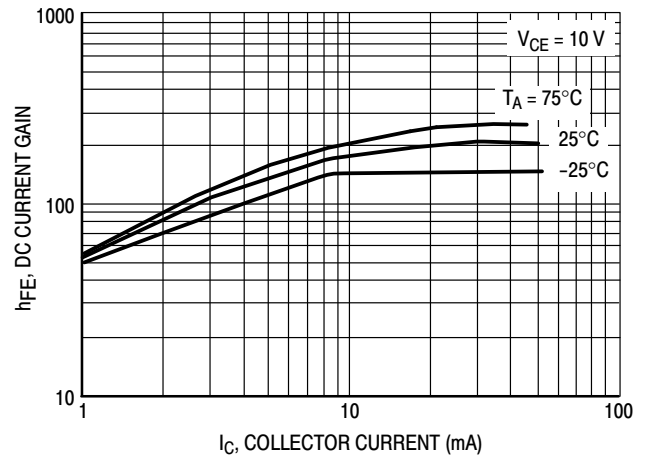


Figure 8. DC Current Gain

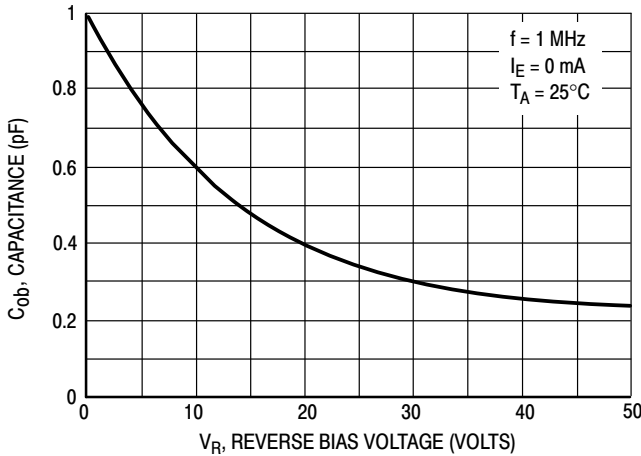


Figure 9. Output Capacitance

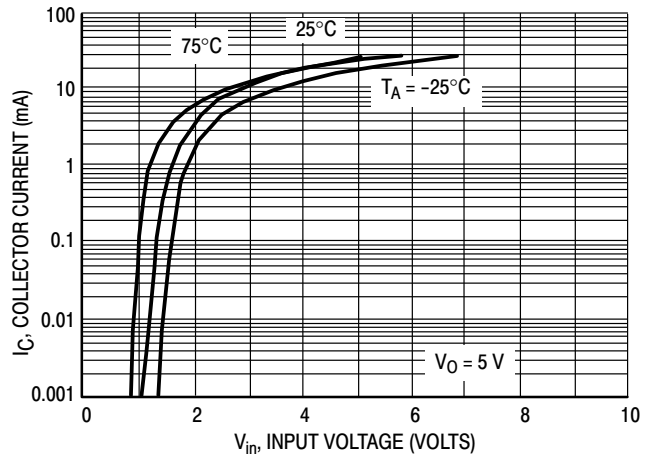


Figure 10. Output Current versus Input Voltage

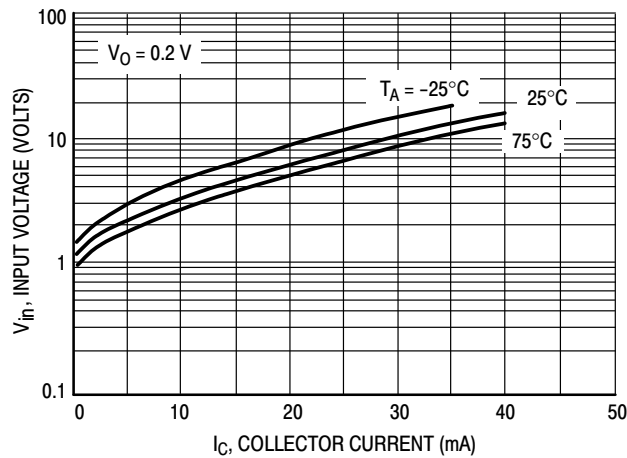
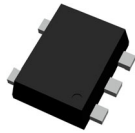


Figure 11. Input Voltage versus Output Current

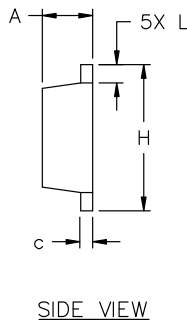
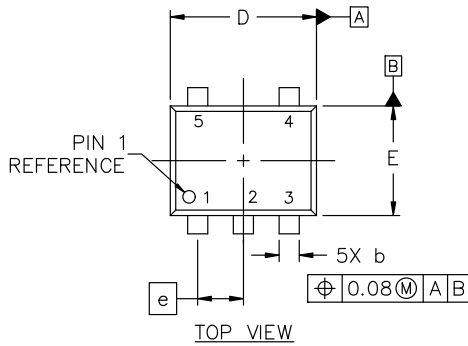
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



SOT-553-5 1.60x1.20x0.55, 0.50P
CASE 463B
ISSUE D

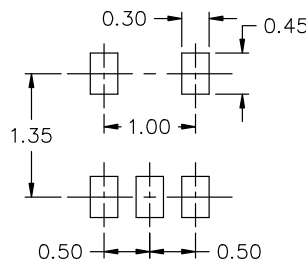
DATE 21 FEB 2024



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.55	1.60	1.65
E	1.15	1.20	1.25
e	0.50 BSC		
H	1.55	1.60	1.65
L	0.10	0.20	0.30



RECOMMENDED MOUNTING 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.

GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*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.

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

STYLE 2:
 PIN 1. CATHODE
 2. COMMON ANODE
 3. CATHODE 2
 4. CATHODE 3
 5. CATHODE 4

STYLE 3:
 PIN 1. ANODE 1
 2. N/C
 3. ANODE 2
 4. CATHODE 2
 5. CATHODE 1

STYLE 4:
 PIN 1. SOURCE 1
 2. DRAIN 1/2
 3. SOURCE 1
 4. GATE 1
 5. GATE 2

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

STYLE 6:
 PIN 1. EMITTER 2
 2. BASE 2
 3. EMITTER 1
 4. COLLECTOR 1
 5. COLLECTOR 2/BASE 1

STYLE 7:
 PIN 1. BASE
 2. EMITTER
 3. BASE
 4. COLLECTOR
 5. COLLECTOR

STYLE 8:
 PIN 1. CATHODE
 2. COLLECTOR
 3. N/C
 4. BASE
 5. EMITTER

STYLE 9:
 PIN 1. ANODE
 2. CATHODE
 3. ANODE
 4. ANODE
 5. ANODE

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DESCRIPTION:	SOT-553-5 1.60x1.20x0.55, 0.50P	PAGE 1 OF 1

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