

NSBC123TPDP6

Complementary Bias Resistor Transistors R1 = 2.2 kΩ, R2 = ∞ kΩ

NPN and PNP 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 both polarities Q1 (PNP) and Q2 (NPN), unless otherwise noted)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	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)}		Vdc
-NPN		6	
-PNP		5	

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†
NSBC123TPDP6T5G	SOT-963	8,000 / Tape & Reel

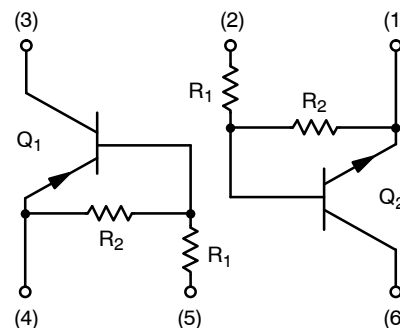
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



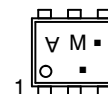
ON Semiconductor®

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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.

NSBC123TPDP6

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
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NSBC123TPDP6 (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	

NSBC123TPDP6 (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	$^\circ\text{C}$

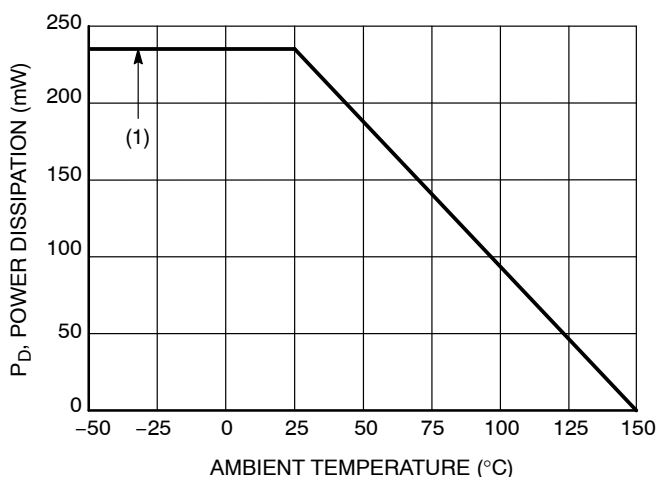
1. FR-4 @ 100 mm², 1 oz. copper traces, still air.
2. FR-4 @ 500 mm², 1 oz. copper traces, still air.
3. Both junction heated values assume total power is sum of two equally powered channels.

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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ both polarities Q_1 (PNP) and Q_2 (NPN), 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) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$) (NPN) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$) (PNP)	$V_{i(off)}$	-	0.6	-	Vdc
Input Voltage (on) ($V_{CE} = 0.2\text{ V}$, $I_C = 10\text{ mA}$) (NPN) ($V_{CE} = 0.2\text{ V}$, $I_C = 10\text{ mA}$) (PNP)	$V_{i(on)}$	-	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

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TYPICAL CHARACTERISTICS – NPN TRANSISTOR NSBC123TPDP6

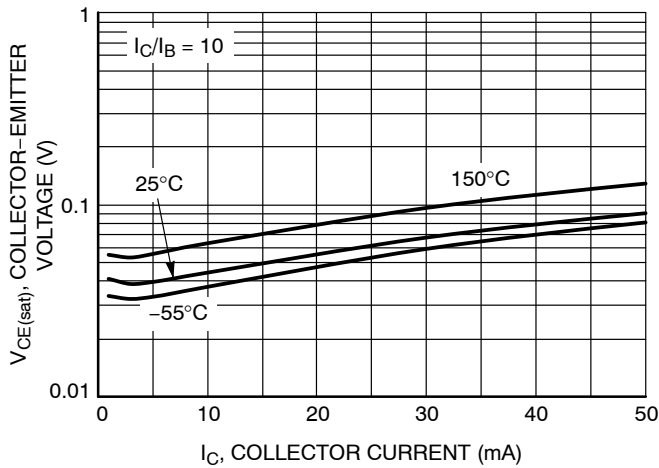


Figure 2. $V_{CE(sat)}$ vs. I_C

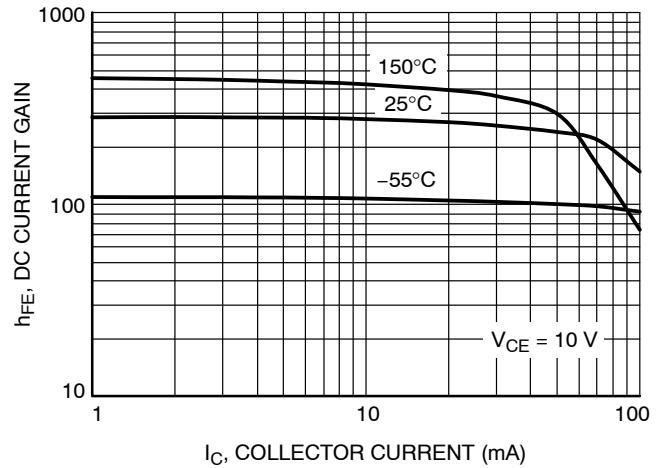


Figure 3. DC Current Gain

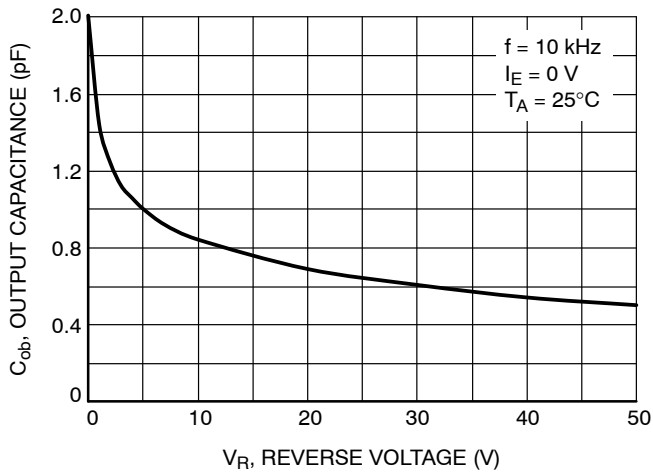


Figure 4. Output Capacitance

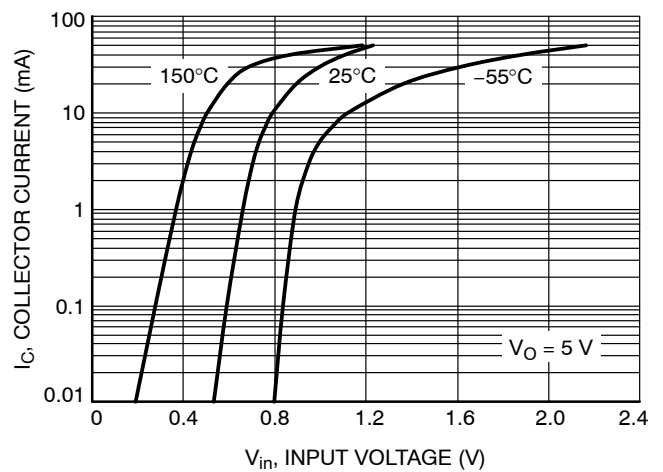


Figure 5. Output Current vs. Input Voltage

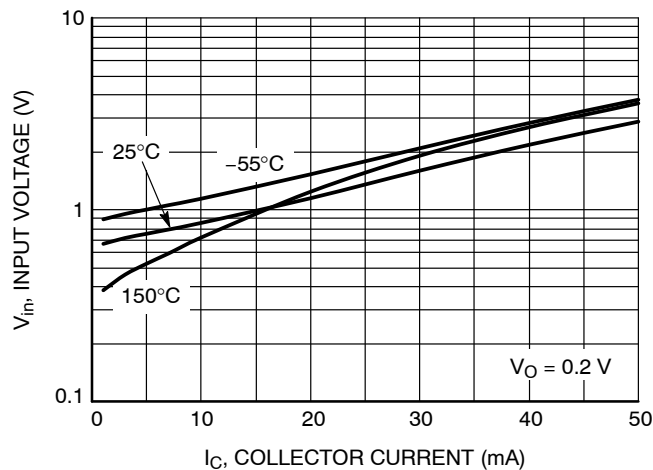


Figure 6. Input Voltage vs. Output Current

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TYPICAL CHARACTERISTICS – PNP TRANSISTOR NSBC123TPDP6

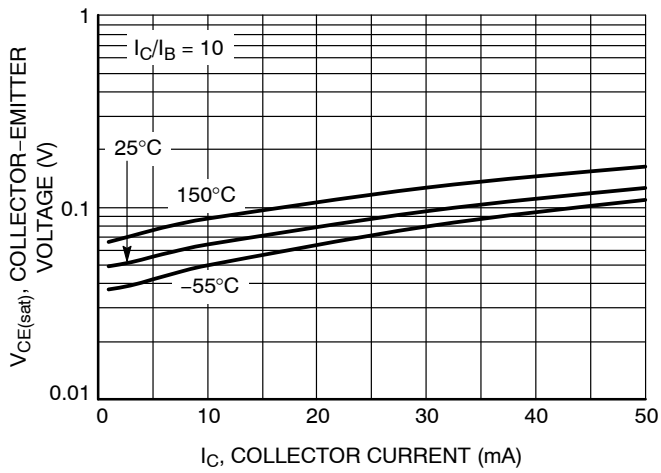


Figure 7. $V_{CE(sat)}$ vs. I_C

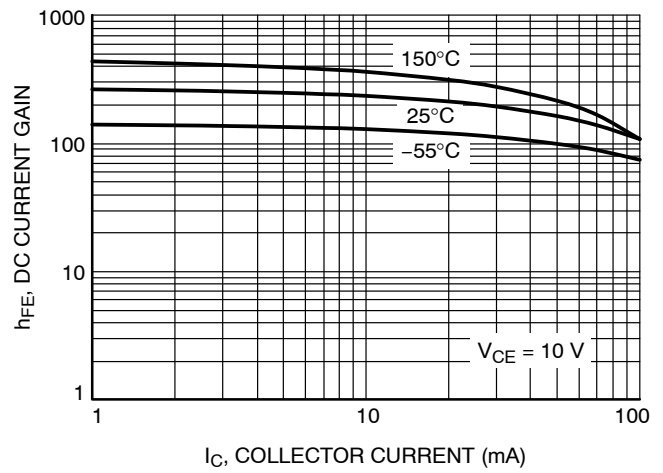


Figure 8. DC Current Gain

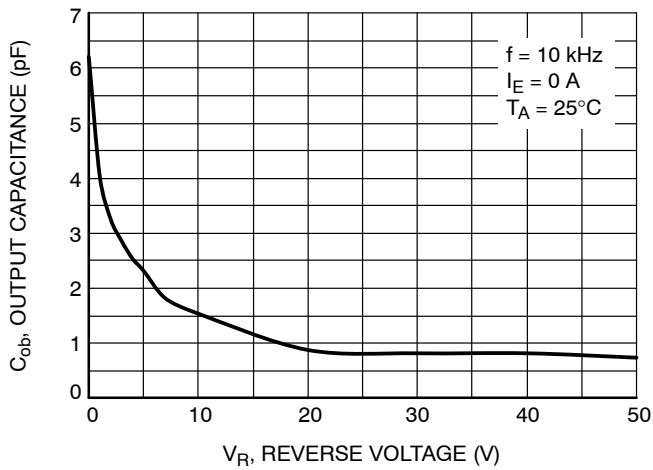


Figure 9. Output Capacitance

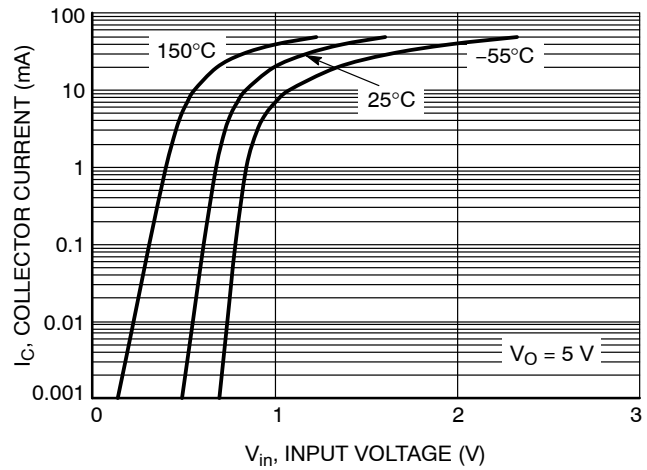


Figure 10. Output Current vs. Input Voltage

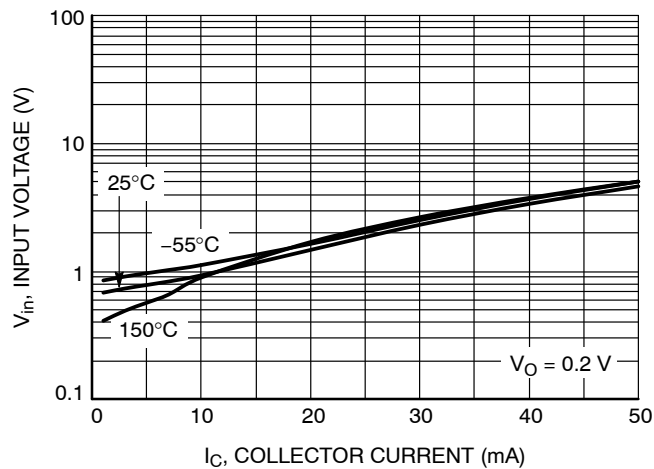
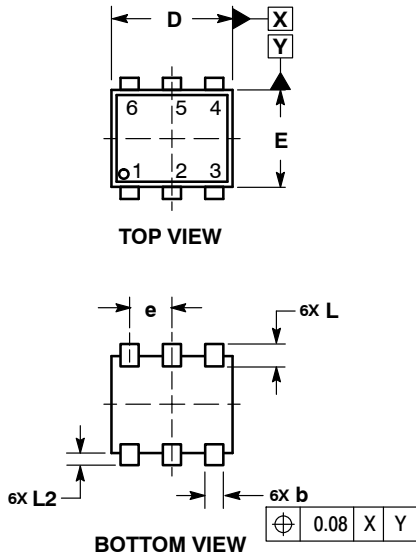


Figure 11. Input Voltage vs. Output Current

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PACKAGE DIMENSIONS

SOT-963 CASE 527AD ISSUE E

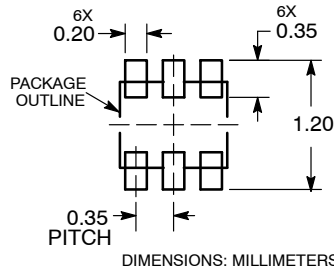


NOTES:

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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