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With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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# NSBC123TPDP6

## Complementary Bias Resistor Transistors $R1 = 2.2 \text{ k}\Omega$ , $R2 = \infty \text{ k}\Omega$

### 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

( $T_A = 25^\circ\text{C}$  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	$V_{IN(rev)}$	6	Vdc
–NPN		5	
–PNP			

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

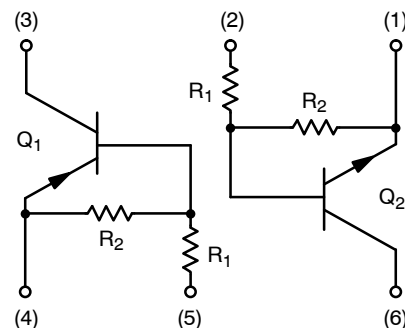
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



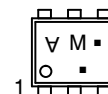
ON Semiconductor®

<http://onsemi.com>

#### 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) (Note 2)	$P_D$	231 269	mW
Derate above $25^\circ\text{C}$	(Note 1) (Note 2)		1.9 2.2	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	540 464	$^\circ\text{C/W}$

### NSBC123TPDP6 (SOT-963) Both Junction Heated (Note 3)

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

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

# NSBC123TPDP6

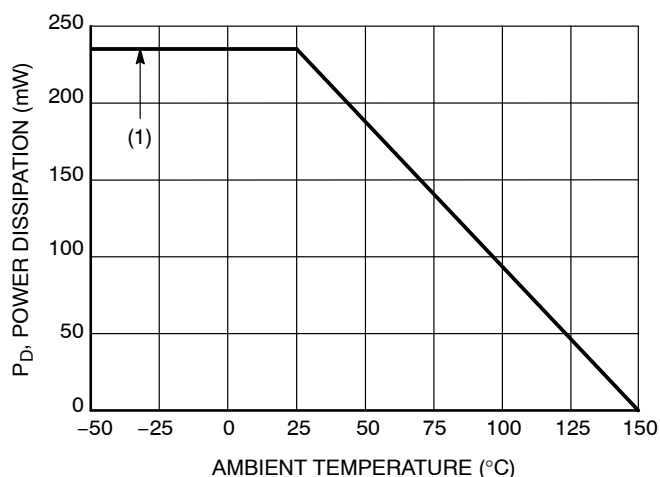
**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  both polarities  $Q_1$  (PNP) and  $Q_2$  (NPN), unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
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 ( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	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) ( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ ) (NPN) ( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ ) (PNP)	$V_{i(off)}$	–	0.6 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 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 mm<sup>2</sup>, 1 oz. copper trace

**Figure 1. Derating Curve**

# NSBC123TPDP6

## TYPICAL CHARACTERISTICS – NPN TRANSISTOR NSBC123TPDP6

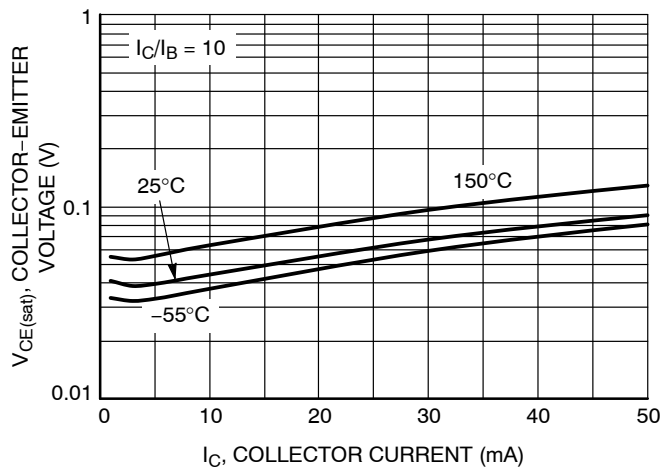


Figure 2.  $V_{CE(sat)}$  vs.  $I_C$

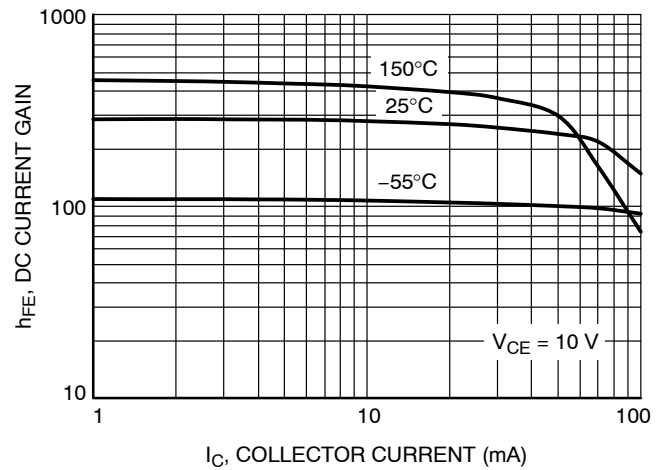


Figure 3. DC Current Gain

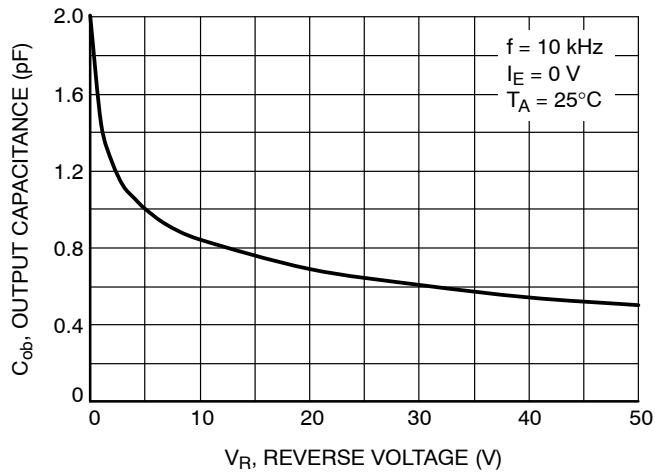


Figure 4. Output Capacitance

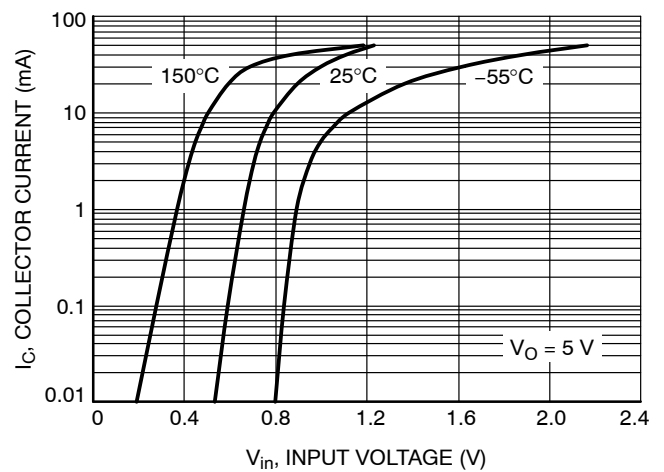


Figure 5. Output Current vs. Input Voltage

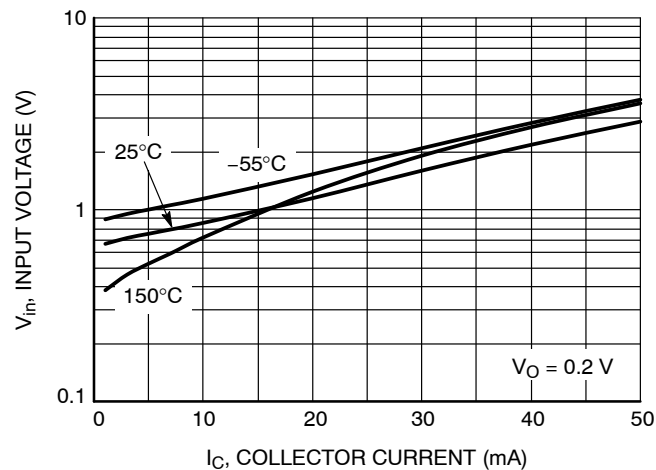


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS – PNP TRANSISTOR  
NSBC123TPDP6

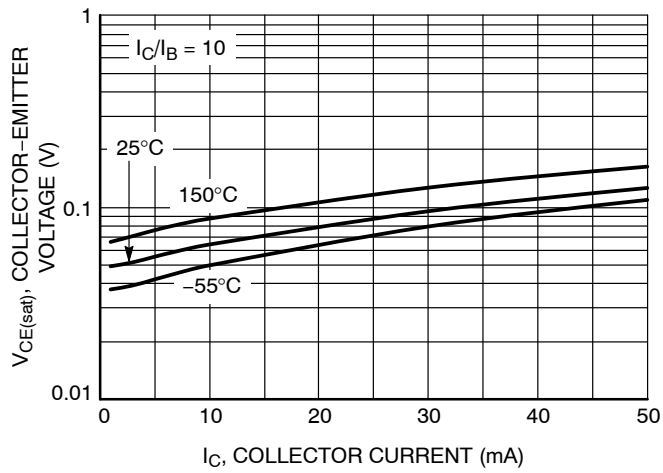


Figure 7.  $V_{CE(sat)}$  vs.  $I_C$

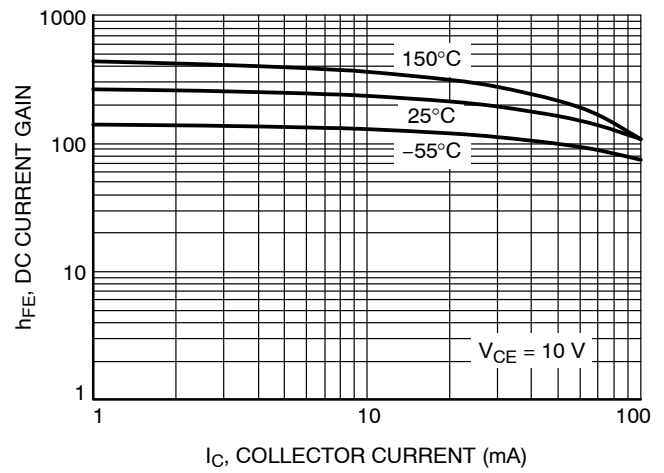


Figure 8. DC Current Gain

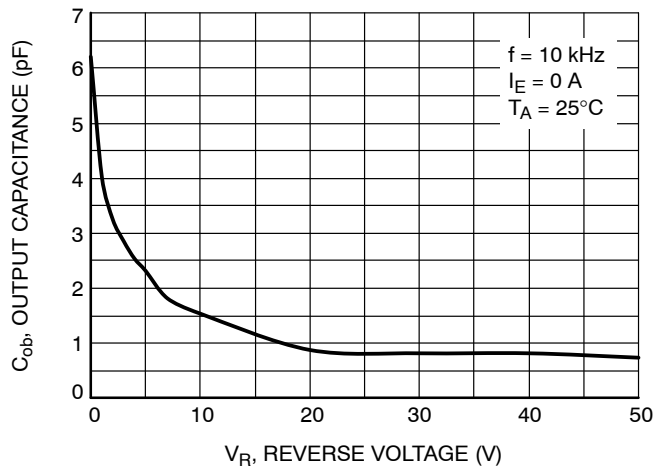


Figure 9. Output Capacitance

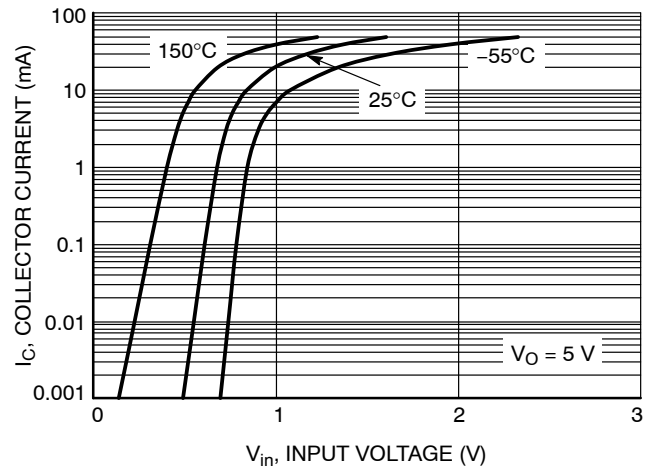


Figure 10. Output Current vs. Input Voltage

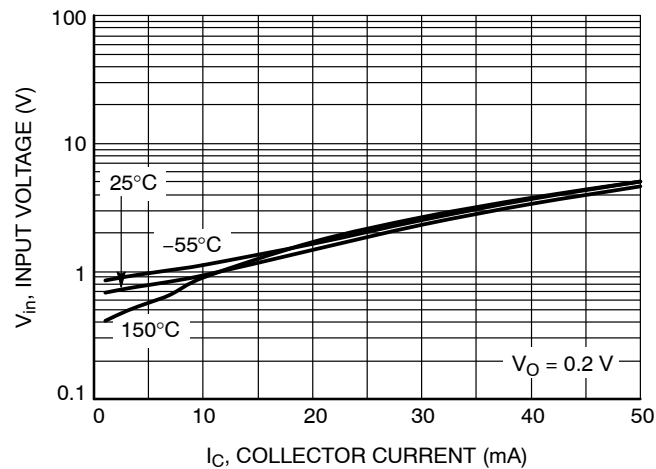
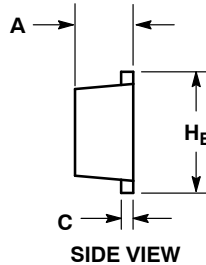
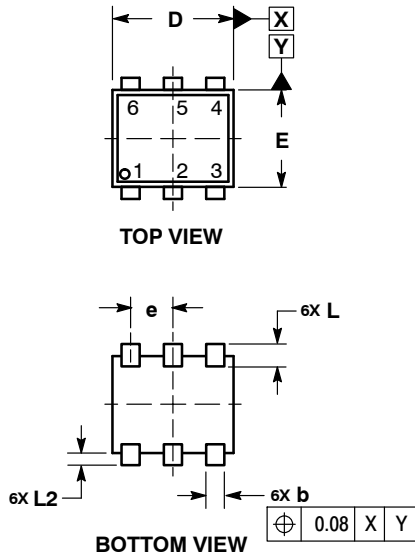


Figure 11. Input Voltage vs. Output Current

# NSBC123TPDP6

## PACKAGE DIMENSIONS

### SOT-963 CASE 527AD ISSUE E

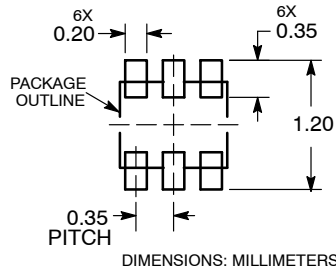


#### NOTES:

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.

DIM	MILLIMETERS		
	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 <sub>E</sub>	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15

### RECOMMENDED MOUNTING FOOTPRINT



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