

Complementary Bias Resistor Transistors

R1 = 2.2 kΩ, R2 = ∞ kΩ

NSBC123TPDP6

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

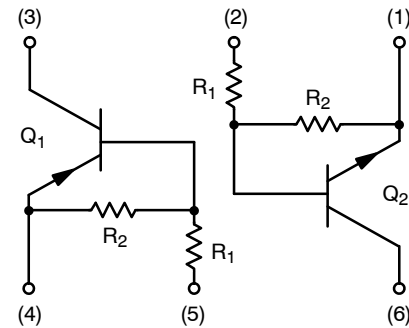
MAXIMUM RATINGS

(T_A = 25°C both polarities Q1 (PNP) and Q2 (NPN), unless otherwise noted)

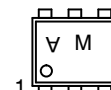
Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current – Continuous	I _C	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	12	Vdc
Input Reverse Voltage	V _{IN(rev)}	6	Vdc
–NPN		5	
–PNP			

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

PIN CONNECTIONS



MARKING DIAGRAMS



SOT-963
CASE 527AD

A = Specific Device Code
M = Date Code*

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
NSBC123TPDP6T5G	SOT-963	3000 / 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](#).

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) Derate above 25°C (Note 1) (Note 2)	P_D	231 269 1.9 2.2	mW 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) Derate above 25°C (Note 1) (Note 2)	P_D	339 408 2.7 3.3	mW 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 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.



NSBC123TPDP6

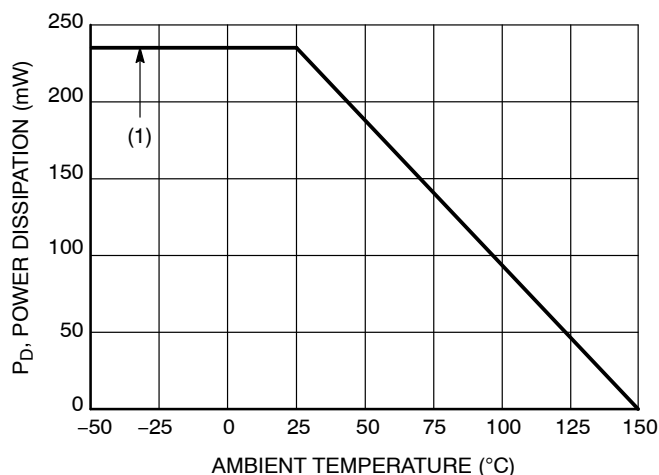
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ both polarities Q_1 (PNP) and Q_2 (NPN), unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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 ($I_C = 10\text{ }\mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	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 mm², 1 oz. copper trace

Figure 1. Derating Curve

TYPICAL CHARACTERISTICS – NPN TRANSISTOR
NSBC123TPDP6

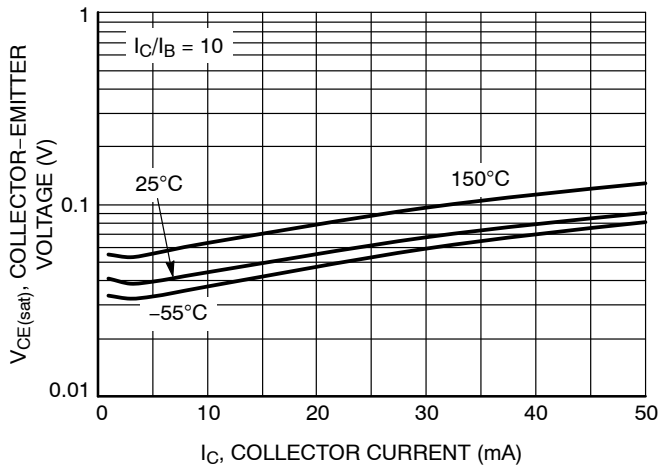


Figure 2. $V_{CE(sat)}$ vs. I_C

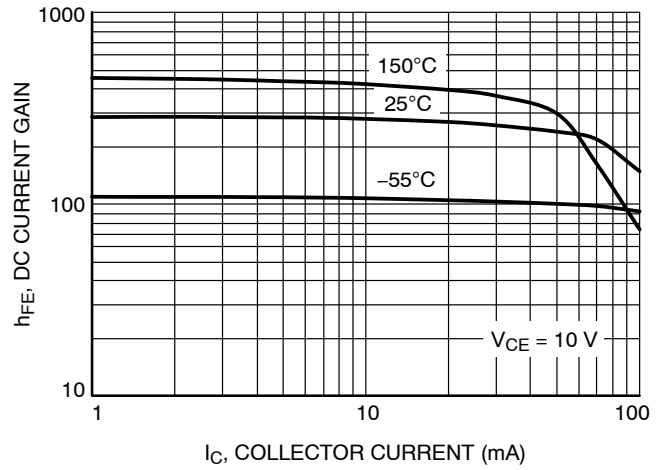


Figure 3. DC Current Gain

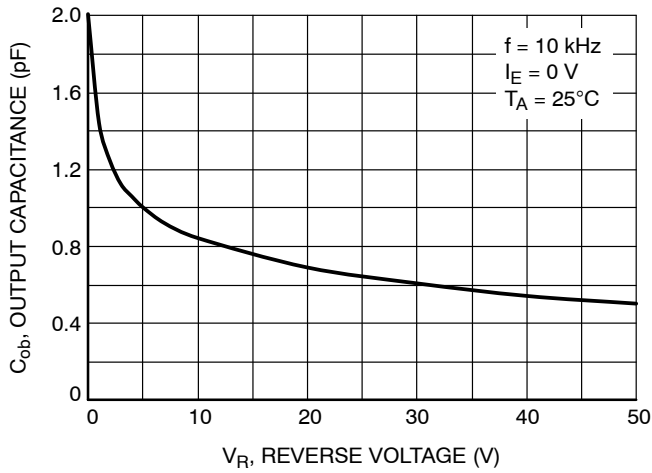


Figure 4. Output Capacitance

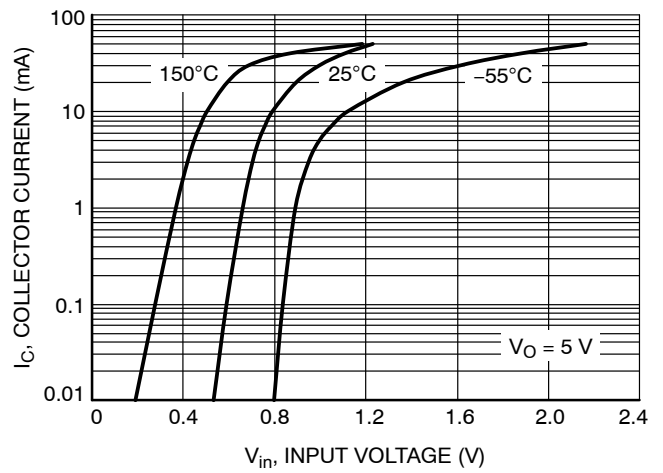


Figure 5. Output Current vs. Input Voltage

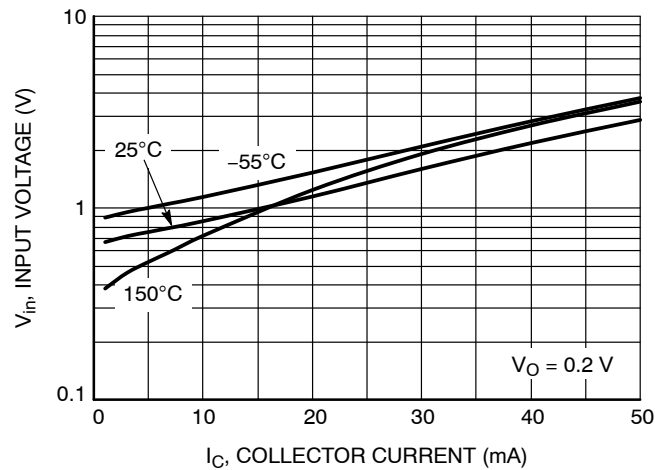


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS – PNP TRANSISTOR
NSBC123TPDP6

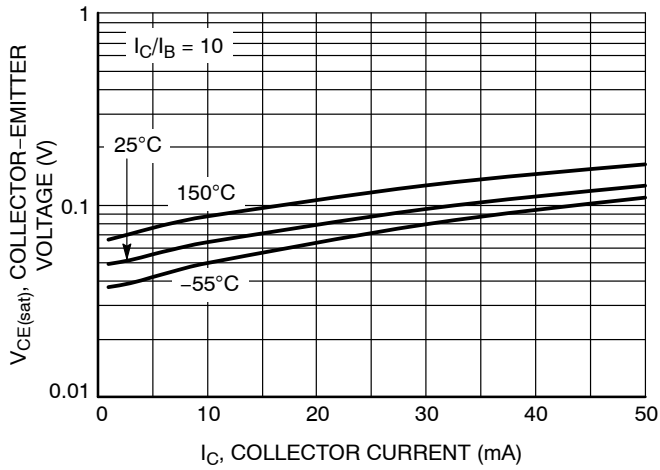


Figure 7. $V_{CE(sat)}$ vs. I_C

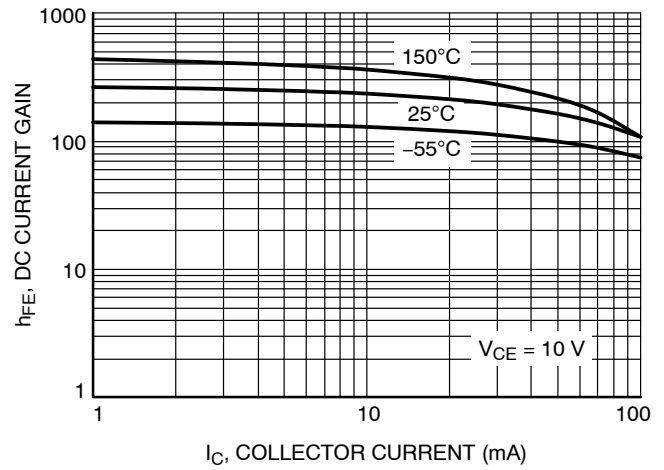


Figure 8. DC Current Gain

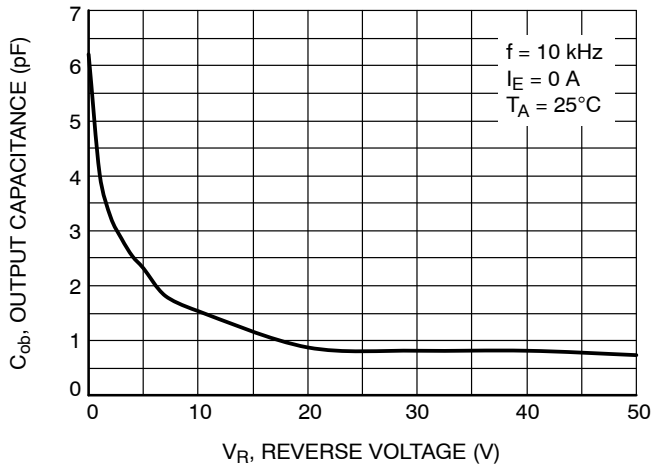


Figure 9. Output Capacitance

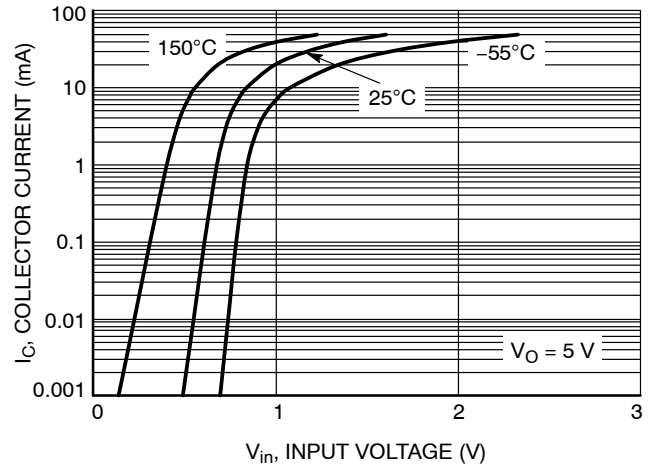


Figure 10. Output Current vs. Input Voltage

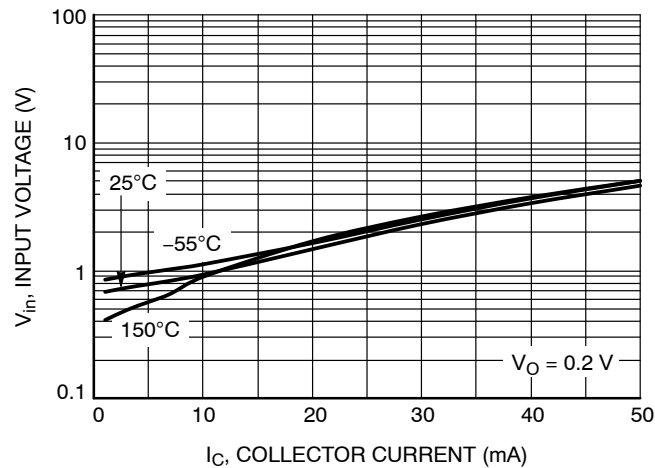
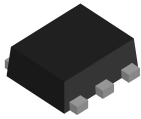


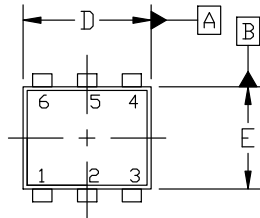
Figure 11. Input Voltage vs. Output Current


SOT-963 1.00x1.00x0.37, 0.35P
CASE 527AD
ISSUE F

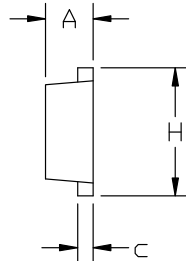
DATE 20 FEB 2024

NOTES:

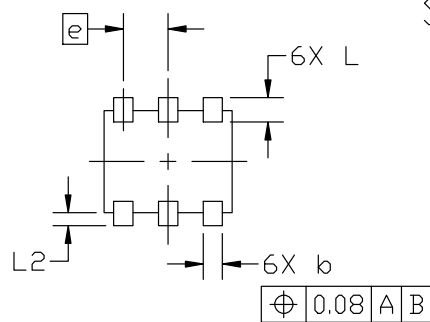
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



TOP VIEW

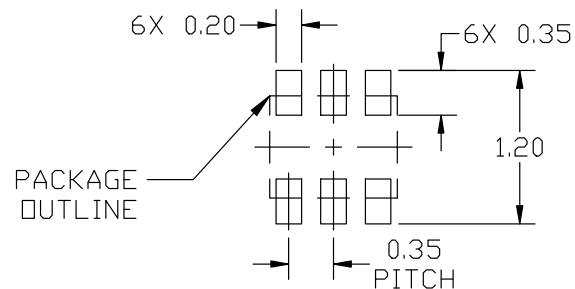


SIDE VIEW



BOTTOM VIEW

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	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15


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.

STYLE 1:

- PIN 1. EMITTER 1
2. BASE 1
3. COLLECTOR 2
4. EMITTER 2
5. BASE 2
6. COLLECTOR 1

STYLE 2:

- PIN 1. EMITTER 1
2. EMITTER 2
3. BASE 2
4. COLLECTOR 2
5. BASE 1
6. COLLECTOR 1

STYLE 3:

- PIN 1. CATHODE 1
2. CATHODE 1
3. ANODE/ANODE 2
4. CATHODE 2
5. CATHODE 2
6. ANODE/ANODE 1

STYLE 4:

- PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 5:

- PIN 1. CATHODE
2. CATHODE
3. ANODE
4. ANODE
5. CATHODE
6. CATHODE

STYLE 6:

- PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 7:

- PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

STYLE 8:

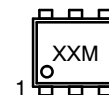
- PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 9:

- PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 10:

- PIN 1. CATHODE 1
2. N/C
3. CATHODE 2
4. ANODE 2
5. N/C
6. ANODE 1

**GENERIC
MARKING DIAGRAM***


XX = Specific Device Code
M = Month Code

*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.

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DESCRIPTION:	SOT-963 1.00x1.00x0.37, 0.35P	PAGE 1 OF 1

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