NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

Dual 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 NSBC114EPDXV6T1 series, two complementary BRT devices are housed in the SOT−563 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
- AEC−Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These are Pb−Free Devices*

MAXIMUM RATINGS (T_A = 25°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

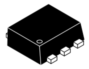
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

---

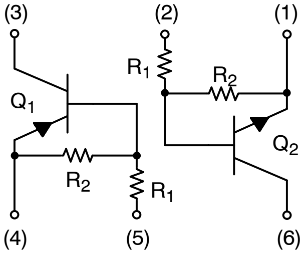
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor®

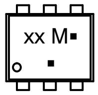
http://onsemi.com



SOT−563
CASE 463A
PLASTIC



MARKING DIAGRAM



xx = Specific Device Code
(see table on page 2)
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NSBC114EPDXV6T1G	SOT−563	4 mm pitch 4000/Tape & Reel
NSBC114EPDXV6T5G	SOT−563	2 mm pitch 8000/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.

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.

THERMAL CHARACTERISTICS

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

1. FR−4 @ Minimum Pad

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (kΩ)	R2 (kΩ)
NSBC114EPDXV6T1G	SOT−563	11	10	10
NSBC124EPDXV6T1G	SOT−563	12	22	22
NSBC144EPDXV6T1G	SOT−563	13	47	47
NSVB144EPDXV6T1G	SOT−563	13	47	47
NSBC114YPDXV6T1G	SOT−563	14	10	47
NSVBC114YDXV6T1G	SOT−563	14	10	47
NSBC114TPDXV6T1G (Note 2)	SOT−563	15	10	∞
NSBC143TPDXV6T1G (Note 2)	SOT−563	16	4.7	∞
NSVB143TPDXV6T1G (Note 2)	SOT−563	16	4.7	∞
NSBC113EPDXV6T1G (Note 2)	SOT−563	30	1.0	1.0
NSBC123EPDXV6T1G (Note 2)	SOT−563	31	2.2	2.2
NSBC143EPDXV6T1G (Note 2)	SOT−563	32	4.7	4.7
NSBC143ZPDXV6T1G (Note 2)	SOT−563	33	4.7	47
NSVB143ZPDXV6T1G (Note 2)	SOT−563	33	4.7	47
NSBC124XPDXV6T1G (Note 2)	SOT−563	34	22	47
NSVB124XPDXV6T1G (Note 2)	SOT−563	34	22	47
NSBC123JPDXV6T1G (Note 2)	SOT−563	35	2.2	47
NSVB123JPDXV6T1G (Note 2)	SOT−563	35	2.2	47

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2, – minus sign for Q_1 (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Cutoff Current (V_{CB} = 50 V, I_E = 0)	I_{CBO}	–	–	100	nAdc
Collector-Emitter Cutoff Current (V_{CE} = 50 V, I_B = 0)	I_{CEO}	–	–	500	nAdc
Emitter-Base Cutoff Current (V_{EB} = 6.0 V, I_C = 0)	I_{EBO}				mAdc
NSBC114EPDXV6T1G		–	–	0.5	
NSBC124EPDXV6T1G		–	–	0.2	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		–	–	0.1	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		–	–	0.2	
NSBC114TPDXV6T1G		–	–	0.9	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		–	–	1.9	
NSBC113EPDXV6T1G		–	–	4.3	
NSBC123EPDXV6T1G		–	–	2.3	
NSBC143EPDXV6T1G		–	–	1.5	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		–	–	0.18	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		–	–	0.13	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		–	–	0.2	
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 3) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS (Note 3)					
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	h_{FE}				
NSBC114EPDXV6T1G		35	60	–	
NSBC124EPDXV6T1G		60	100	–	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		80	140	–	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		80	140	–	
NSBC114TPDXV6T1G		160	350	–	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		160	350	–	
NSBC113EPDXV6T1G		3.0	5.0	–	
NSBC123EPDXV6T1G		8.0	15	–	
NSBC143EPDXV6T1G		15	30	–	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		80	200	–	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		80	150	–	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		80	140	–	
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)	$V_{CE(sat)}$				Vdc
NSBC114EPDXV6T1G		–	–	0.25	
NSBC124EPDXV6T1G		–	–	0.25	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		–	–	0.25	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		–	–	0.25	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		–	–	0.25	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		–	–	0.25	
(I_C = 10 mA, I_B = 5 mA)					
NSBC113EPDXV6T1G		–	–	0.25	
NSBC123EPDXV6T1G		–	–	0.25	
(I_C = 10 mA, I_B = 1 mA)					
NSBC114TPDXV6T1G		–	–	0.25	
NSBC143EPDXV6T1G		–	–	0.25	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		–	–	0.25	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		–	–	0.25	

2. New resistor combinations. Updated curves to follow in subsequent data sheets.
3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2, – minus sign for Q_1 (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 3)					
Output Voltage (on)	V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)					
NSBC114EPDXV6T1G		–	–	0.2	
NSBC124EPDXV6T1G		–	–	0.2	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		–	–	0.2	
NSBC114TPDXV6T1G		–	–	0.2	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		–	–	0.2	
NSBC113EPDXV6T1G		–	–	0.2	
NSBC123EPDXV6T1G		–	–	0.2	
NSBC143EPDXV6T1G		–	–	0.2	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		–	–	0.2	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		–	–	0.2	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)					
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		–	–	0.2	
Output Voltage (off)	V_{OH}				Vdc
(V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)					
NSBC114EPDXV6T1G		4.9	–	–	
NSBC124EPDXV6T1G		4.9	–	–	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		4.9	–	–	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		4.9	–	–	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		4.9	–	–	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		4.9	–	–	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		4.9	–	–	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		4.9	–	–	
(V_{CC} = 5.0 V, V_B = 0.050 V, R_L = 1.0 kΩ)					
NSBC113EPDXV6T1G		4.9	–	–	
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)					
NSBC114TPDXV6T1G		4.9	–	–	
NSBC123EPDXV6T1G		4.9	–	–	
NSBC143EPDXV6T1G		4.9	–	–	
Input Resistor	R1				k Ω
NSBC114EPDXV6T1G		7.0	10	13	
NSBC124EPDXV6T1G		15.4	22	28.6	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		32.9	47	61.1	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		7.0	10	13	
NSBC114TPDXV6T1G		7.0	10	13	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		3.3	4.7	6.1	
NSBC113EPDXV6T1G		0.7	1.0	1.3	
NSBC123EPDXV6T1G		1.5	2.2	2.9	
NSBC143EPDXV6T1G		3.3	4.7	6.1	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		3.3	4.7	6.1	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		15.4	22	28.6	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		1.54	2.2	2.86	
Resistor Ratio	R1/R2				
NSBC114EPDXV6T1G		0.8	1.0	1.2	
NSBC124EPDXV6T1G		0.8	1.0	1.2	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		0.8	1.0	1.2	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		0.17	0.21	0.25	
NSBC114TPDXV6T1G		–	–	–	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		–	–	–	
NSBC113EPDXV6T1G		0.8	1.0	1.2	
NSBC123EPDXV6T1G		0.8	1.0	1.2	
NSBC143EPDXV6T1G		0.8	1.0	1.2	
NSBC143ZPDXV6T1G, NSVB143ZPDXV6T1G		0.055	0.1	0.185	
NSBC124XPDXV6T1G, NSVB124XPDXV6T1G		0.38	0.47	0.56	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		0.038	0.047	0.056	

2. New resistor combinations. Updated curves to follow in subsequent data sheets.
3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

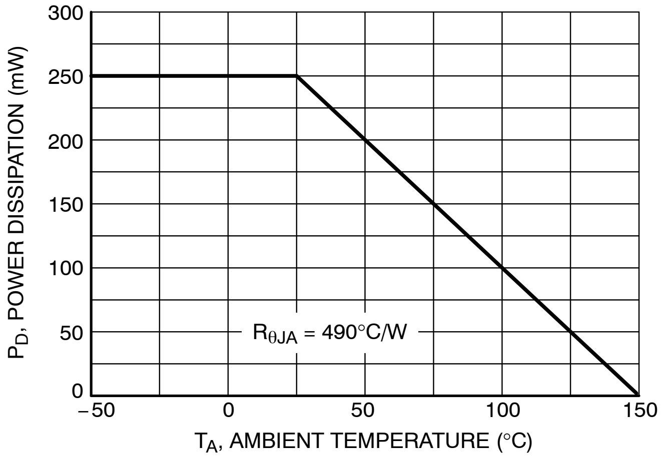


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1 NPN TRANSISTOR

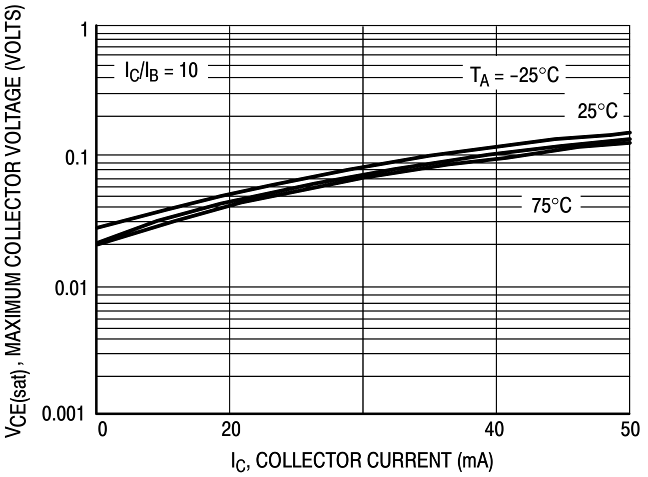


Figure 2. $V_{CE(sat)}$ versus I_C

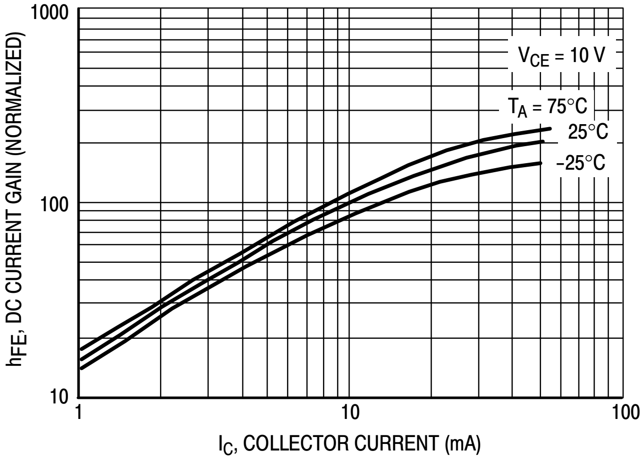


Figure 3. DC Current Gain

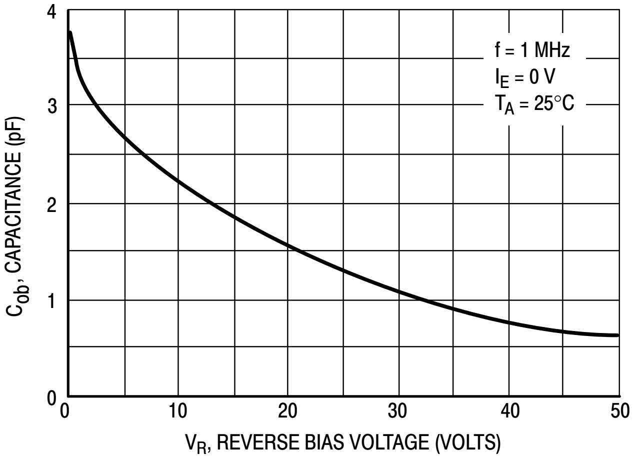


Figure 4. Output Capacitance

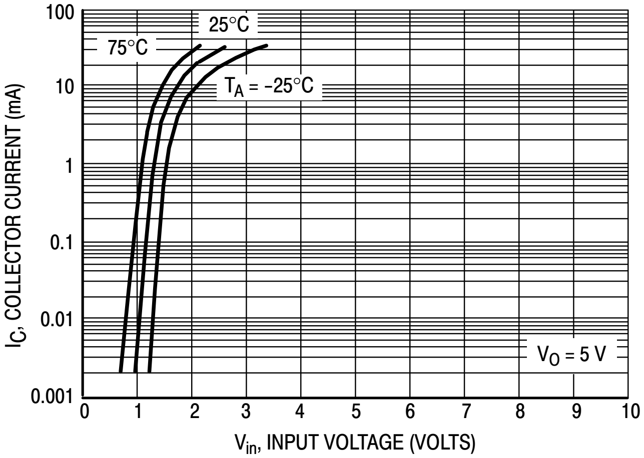


Figure 5. Output Current versus Input Voltage

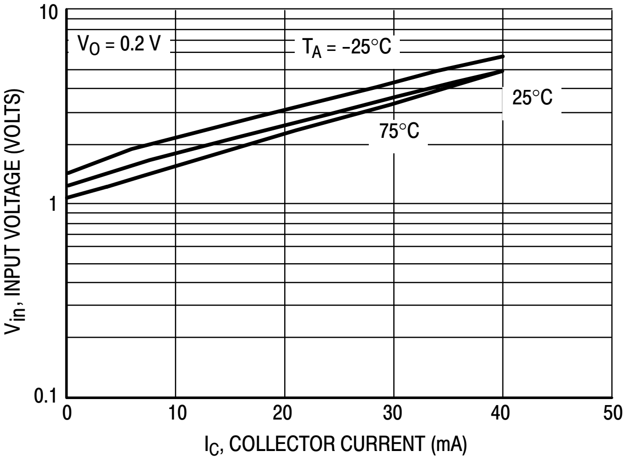


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1 PNP TRANSISTOR

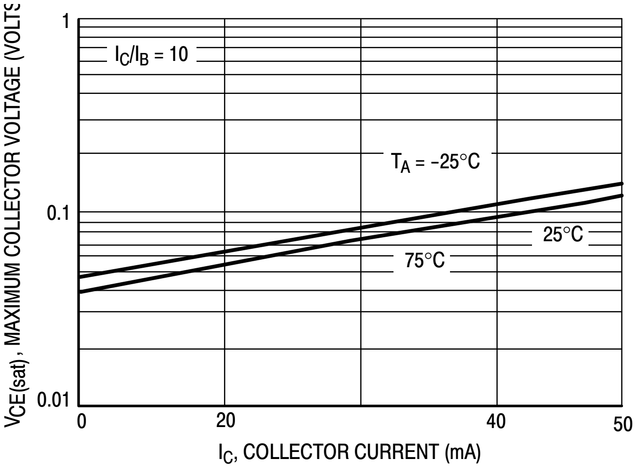


Figure 7. $V_{CE(sat)}$ versus I_C

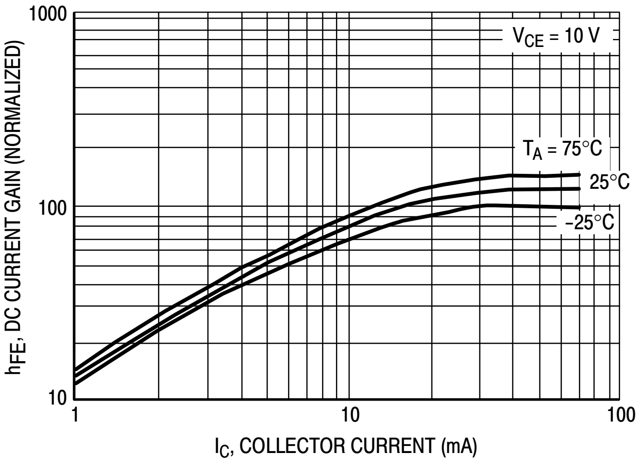


Figure 8. DC Current Gain

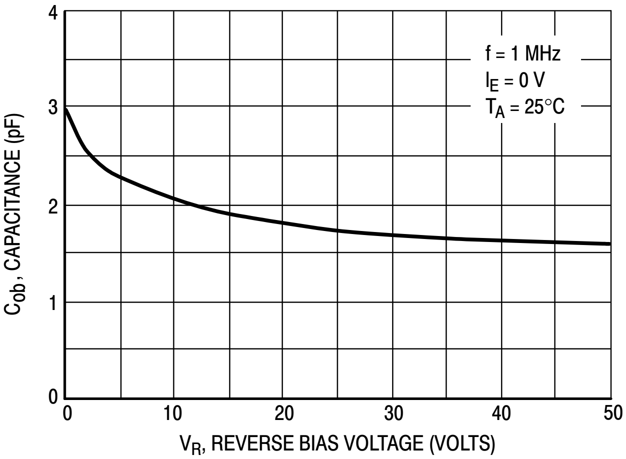


Figure 9. Output Capacitance

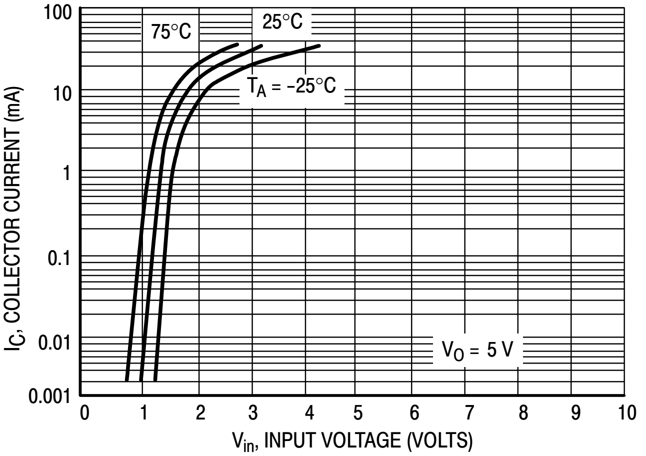


Figure 10. Output Current versus Input Voltage

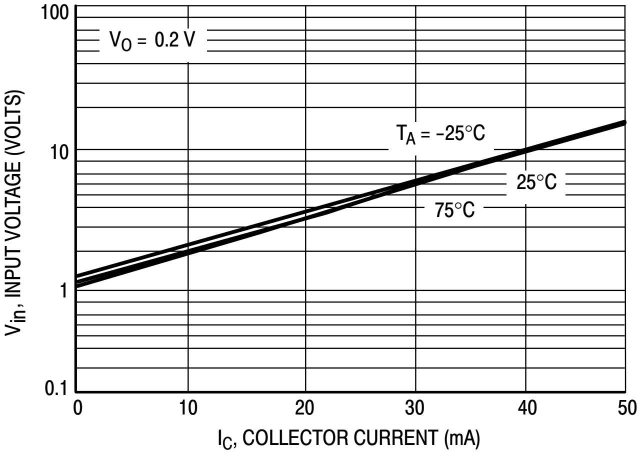


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC124EPDXV6T1 NPN TRANSISTOR

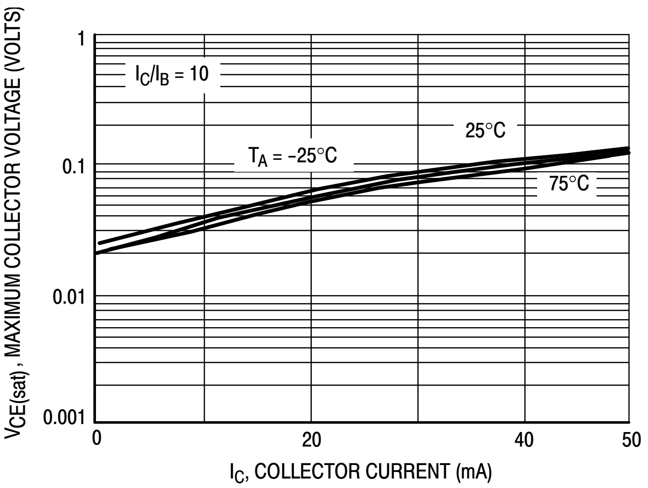


Figure 12. $V_{CE(sat)}$ versus I_C

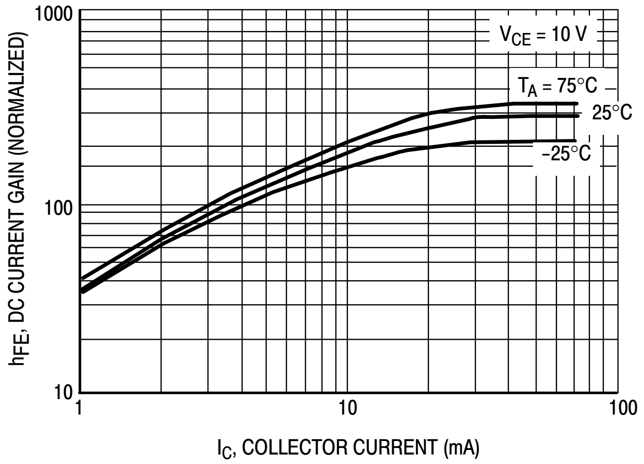


Figure 13. DC Current Gain

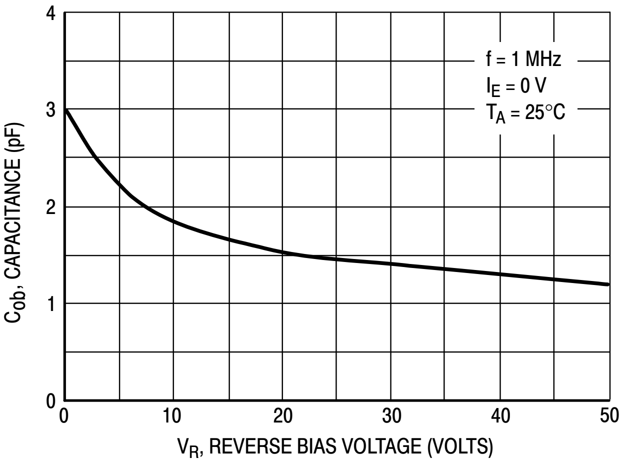


Figure 14. Output Capacitance

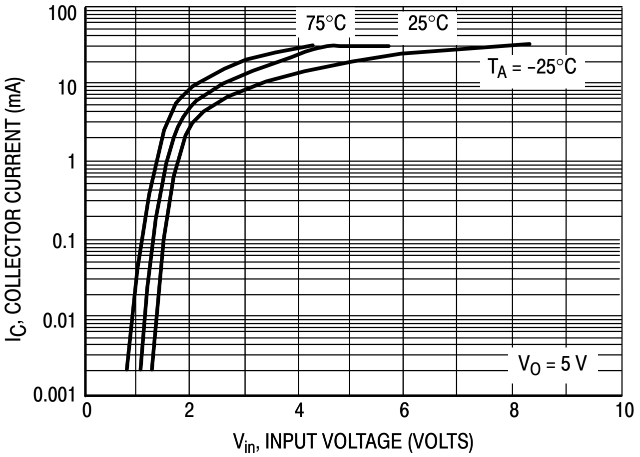


Figure 15. Output Current versus Input Voltage

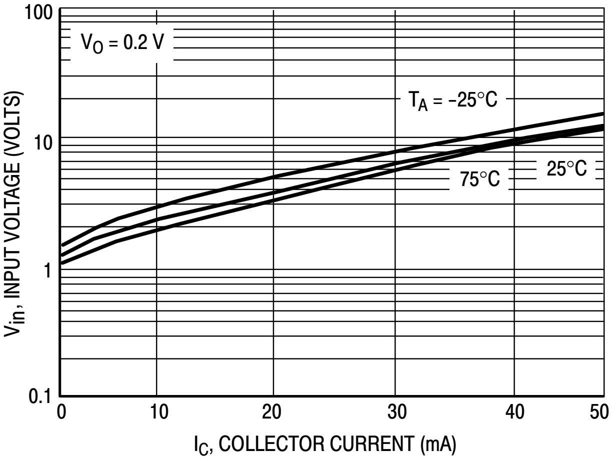


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC124EPDXV6T1 PNP TRANSISTOR

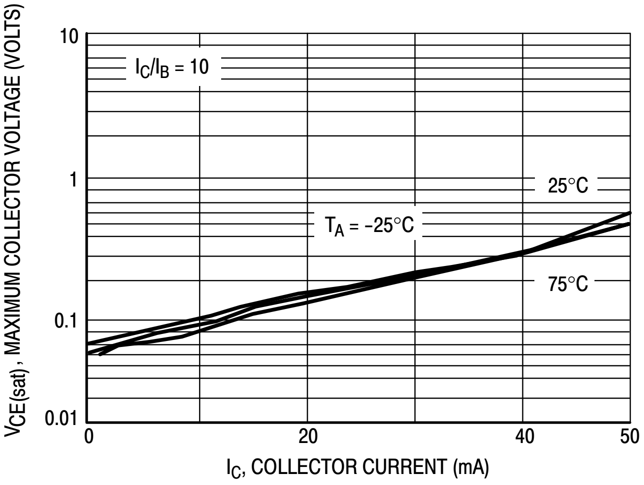


Figure 17. $V_{CE(sat)}$ versus I_C

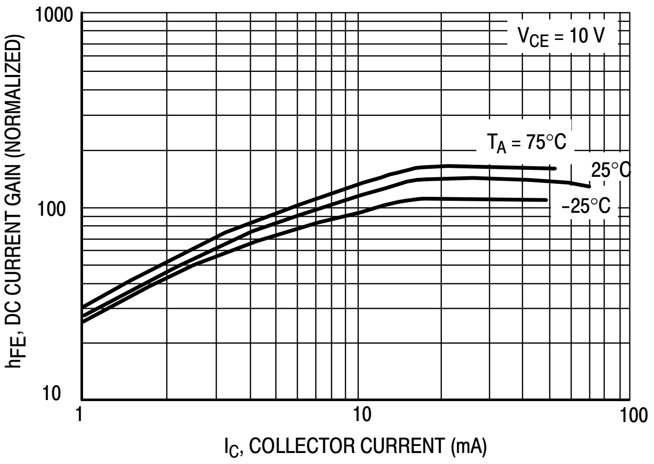


Figure 18. DC Current Gain

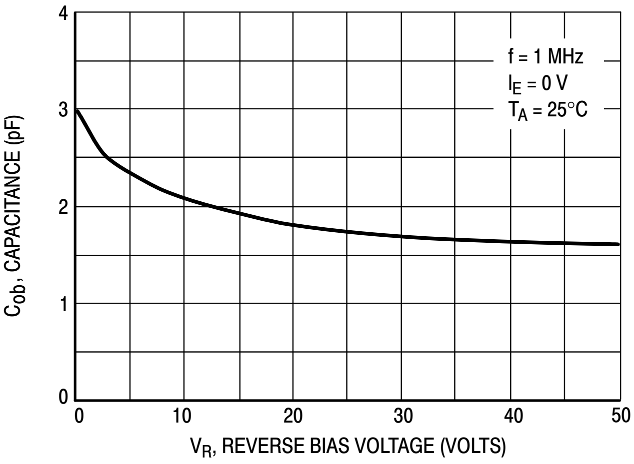


Figure 19. Output Capacitance

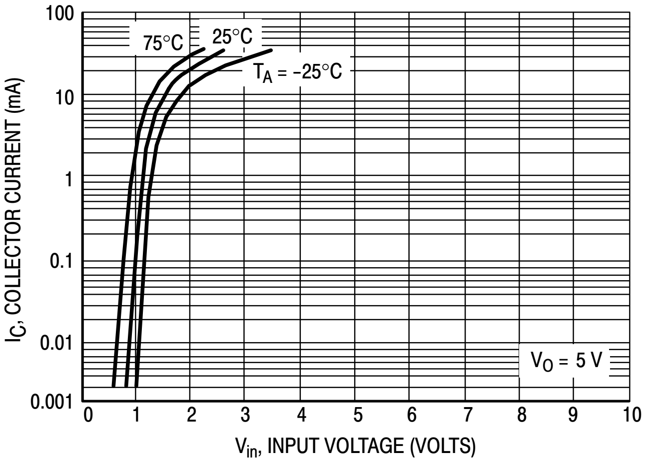


Figure 20. Output Current versus Input Voltage

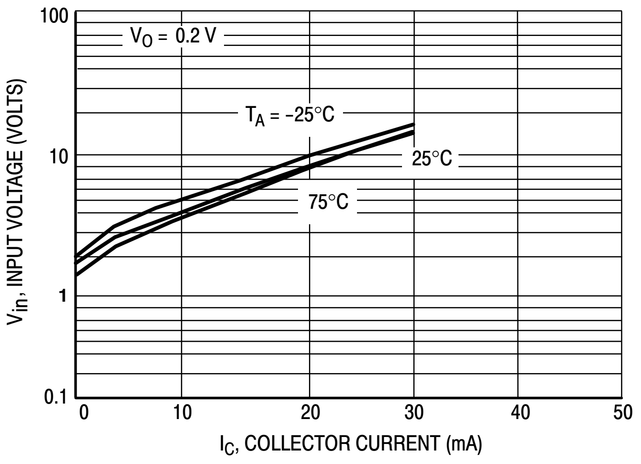


Figure 21. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC144EPDXV6T1, NSVB144EPDXV6T1 NPN TRANSISTOR

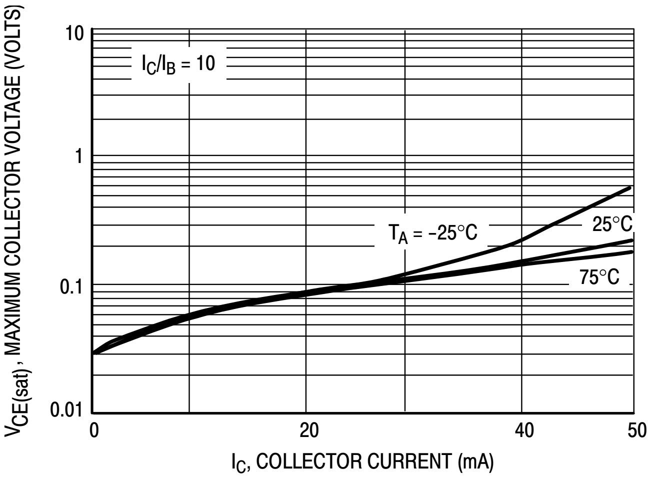


Figure 22. $V_{CE(sat)}$ versus I_C

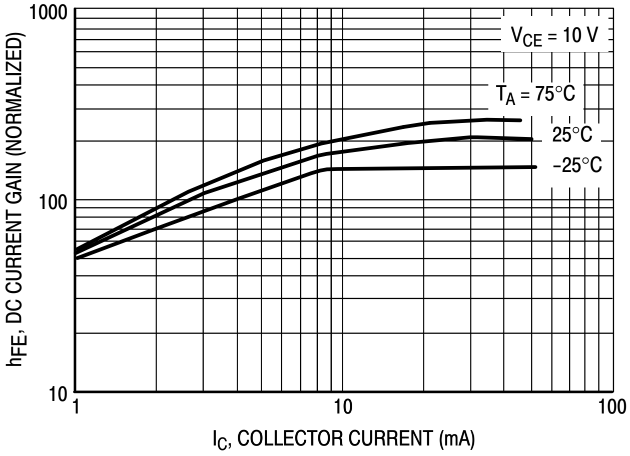


Figure 23. DC Current Gain

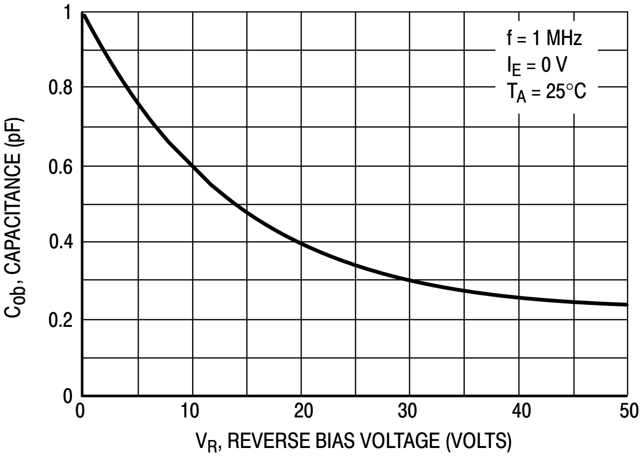


Figure 24. Output Capacitance

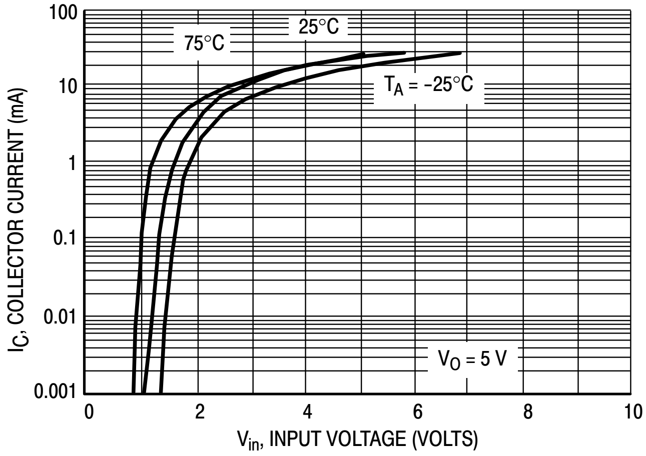


Figure 25. Output Current versus Input Voltage

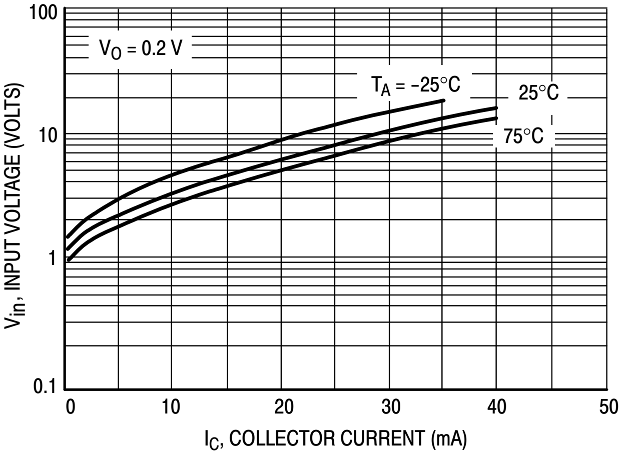


Figure 26. Input Voltage versus Output Current