

# 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** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ , - minus sign for  $Q_1$  (PNP) omitted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	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.

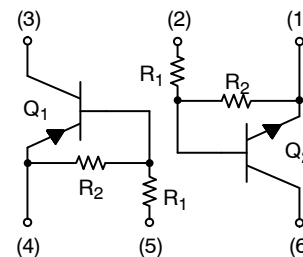


ON Semiconductor®

<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.

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ (Note 1) Derate above $25^\circ\text{C}$ (Note 1)	$P_D$	357 2.9	mW mW/ $^\circ\text{C}$
Thermal Resistance (Note 1) Junction-to-Ambient	$R_{\theta JA}$	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 $25^\circ\text{C}$ (Note 1)	$P_D$	500 4.0	mW mW/ $^\circ\text{C}$
Thermal Resistance (Note 1) Junction-to-Ambient	$R_{\theta JA}$	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

## DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (k $\Omega$ )	R2 (k $\Omega$ )
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	$\infty$
NSBC143TPDXV6T1G (Note 2)	SOT-563	16	4.7	$\infty$
NSVB143TPDXV6T1G (Note 2)	SOT-563	16	4.7	$\infty$
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

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>, – minus sign for Q<sub>1</sub> (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	–	100	nAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	500	nAdc
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>				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 <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 3) (I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	–	–	Vdc

## ON CHARACTERISTICS (Note 3)

DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	h <sub>FE</sub>				
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 <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA)	V <sub>CE(sat)</sub>				Vdc
NSBC114EPDXV6T1G		–	–	0.25	
NSBC124EPDXV6T1G		–	–	0.25	
NSBC144EPDXV6T1G, NSVB144EPDXV6T1G		–	–	0.25	
NSBC114YPDXV6T1G, NSVBC114YDXV6T1G		–	–	0.25	
NSBC143TPDXV6T1G, NSVB143TPDXV6T1G		–	–	0.25	
NSBC123JPDXV6T1G, NSVB123JPDXV6T1G		–	–	0.25	
(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 5 mA)					
NSBC113EPDXV6T1G		–	–	0.25	
NSBC123EPDXV6T1G		–	–	0.25	
(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 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%

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>, – minus sign for Q<sub>1</sub> (PNP) omitted)

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

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

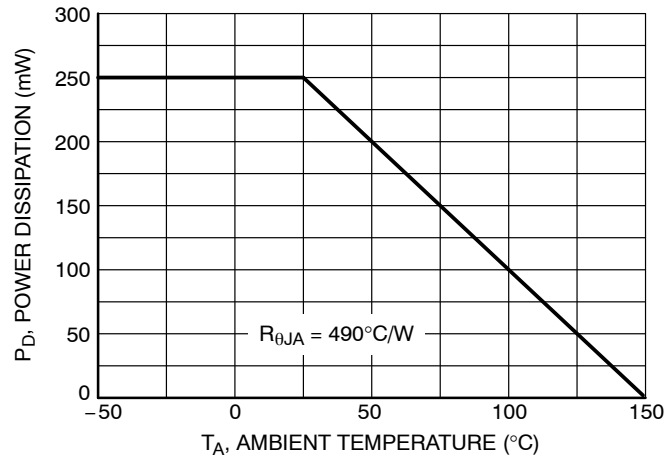


Figure 1. Derating Curve

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1 NPN TRANSISTOR

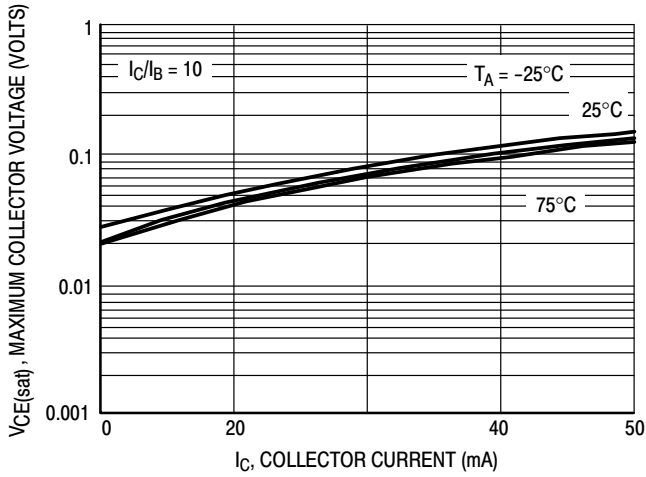


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

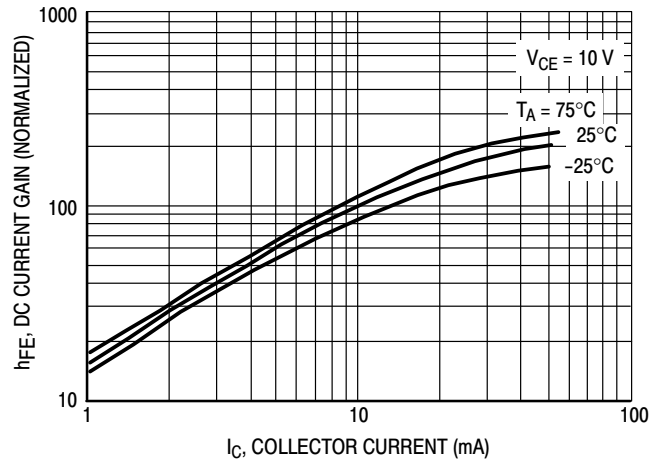


Figure 3. DC Current Gain

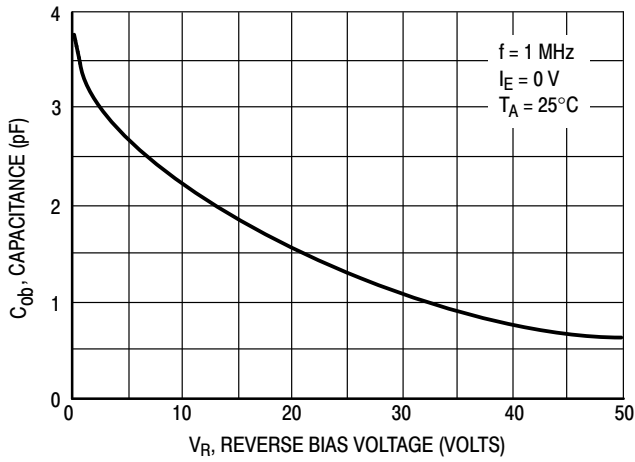


Figure 4. Output Capacitance

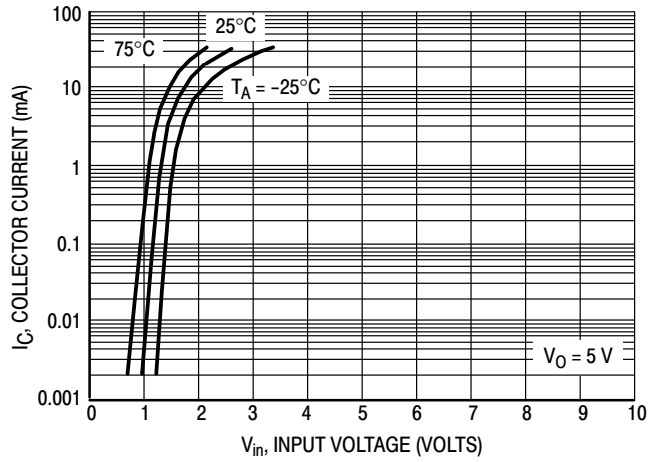


Figure 5. Output Current versus Input Voltage

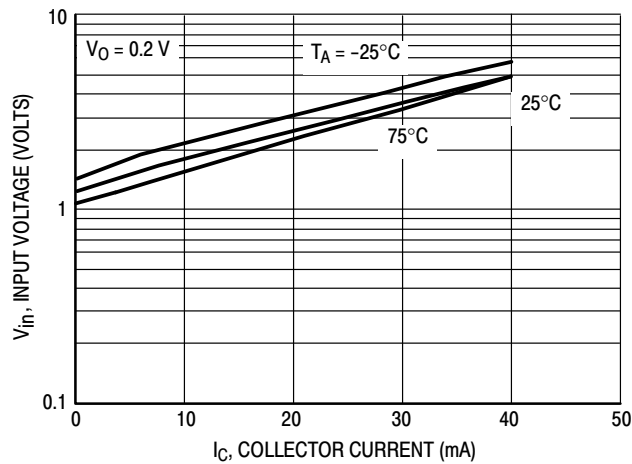


Figure 6. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1 PNP TRANSISTOR

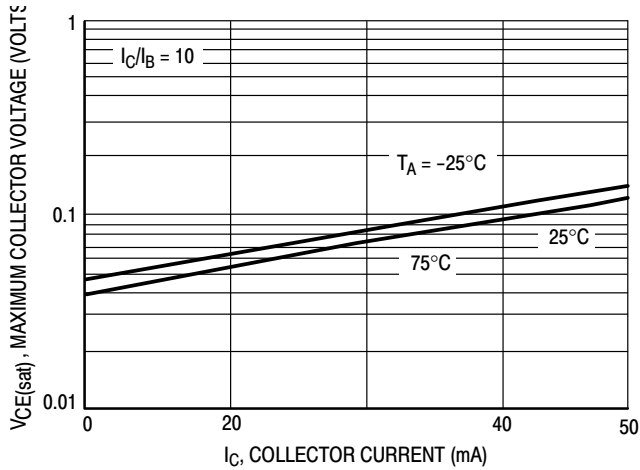


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

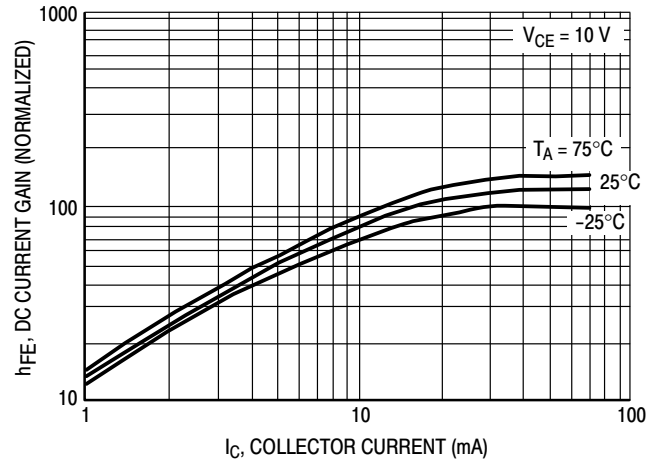


Figure 8. DC Current Gain

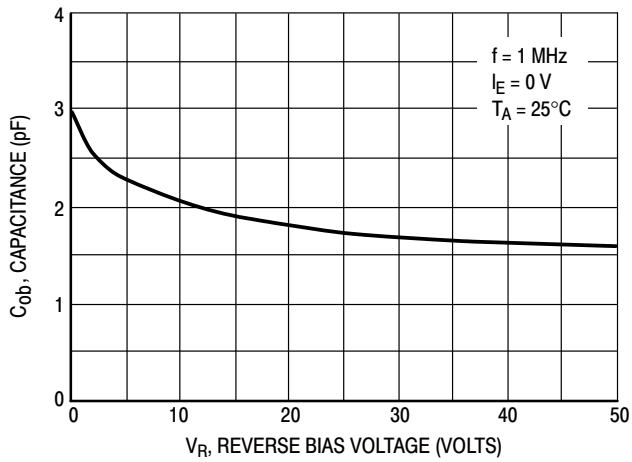


Figure 9. Output Capacitance

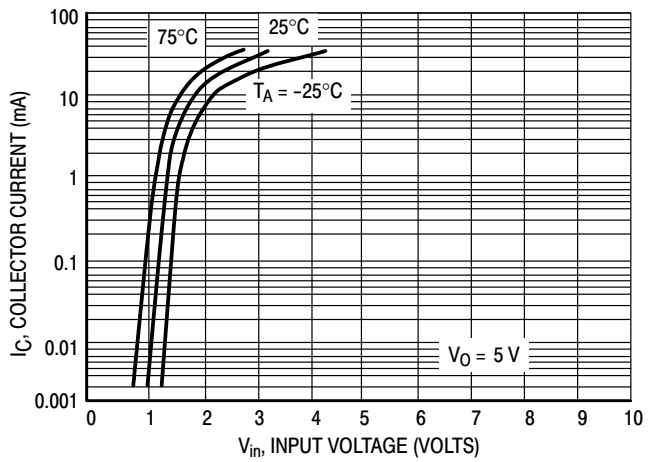


Figure 10. Output Current versus Input Voltage

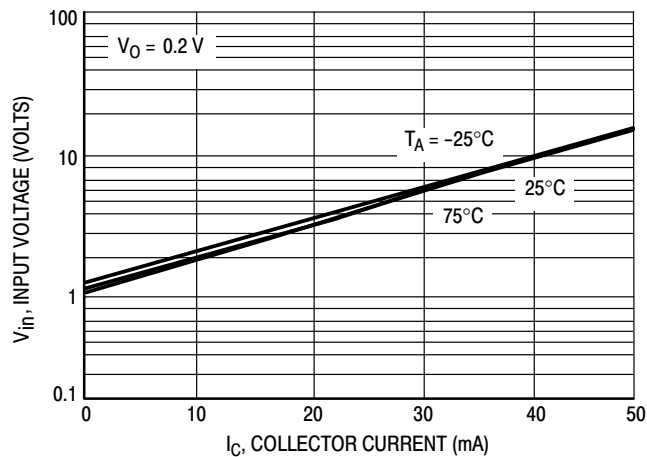


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – NSBC124EPDXV6T1 NPN TRANSISTOR

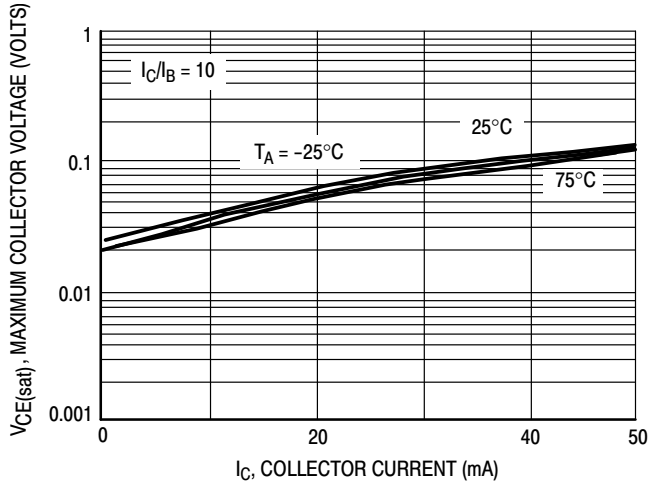


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

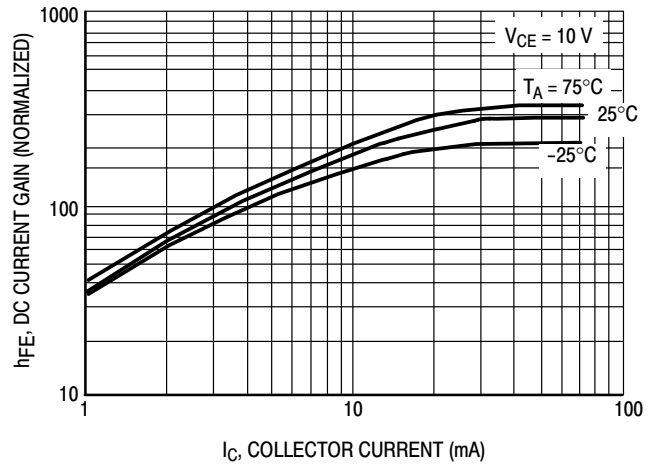


Figure 13. DC Current Gain

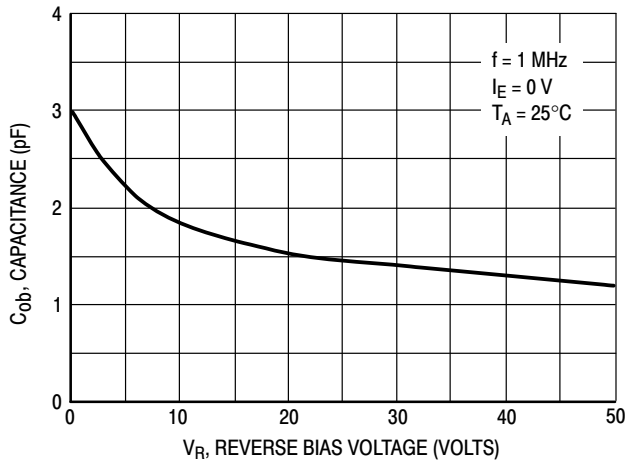


Figure 14. Output Capacitance

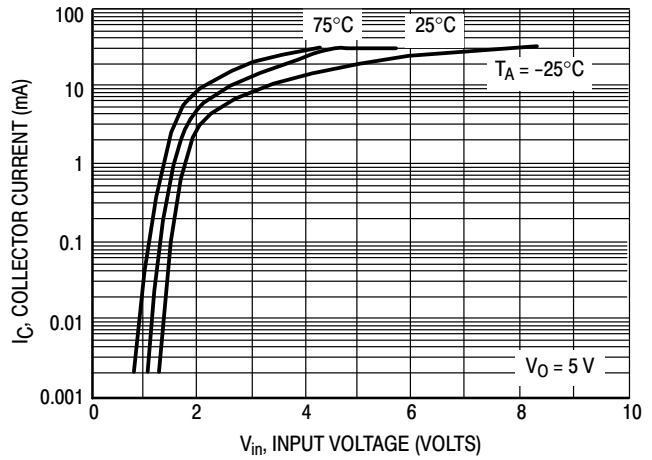


Figure 15. Output Current versus Input Voltage

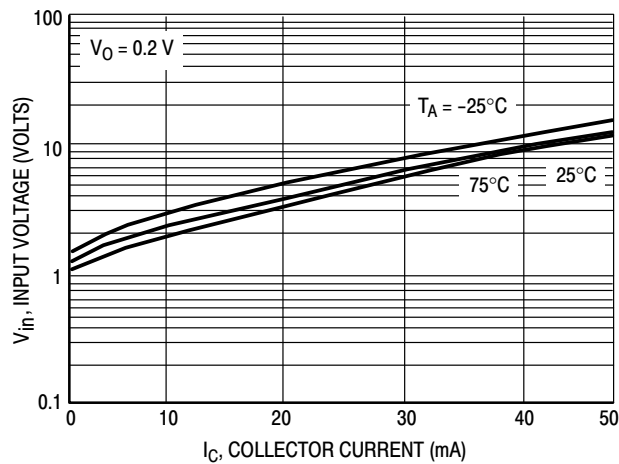


Figure 16. Input Voltage versus Output Current



TYPICAL ELECTRICAL CHARACTERISTICS – NSBC124EPDXV6T1 PNP TRANSISTOR

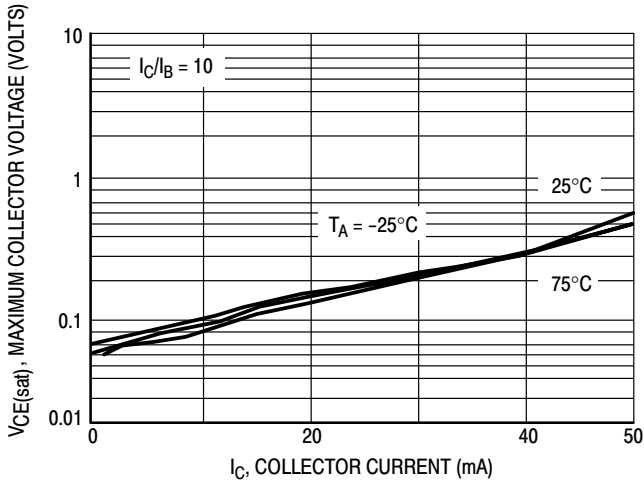


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

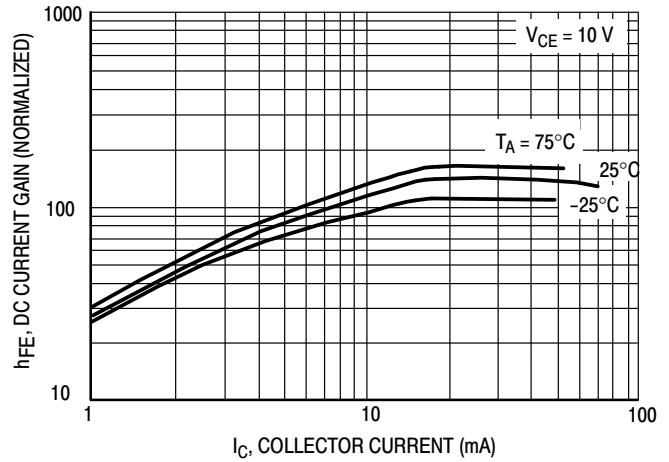


Figure 18. DC Current Gain

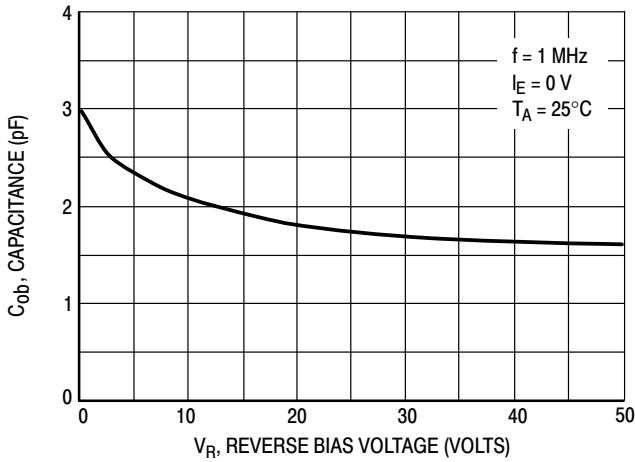


Figure 19. Output Capacitance

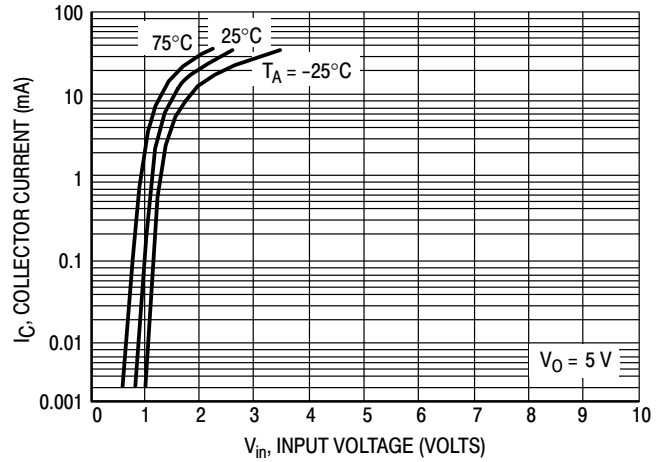


Figure 20. Output Current versus Input Voltage

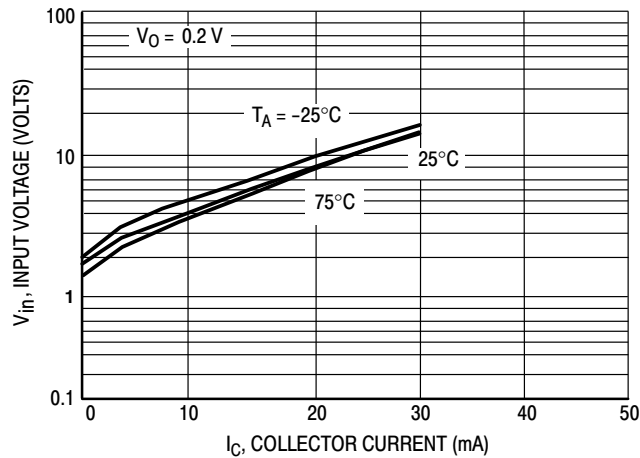


Figure 21. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1, NSVB114EPDXV6T1 NPN TRANSISTOR

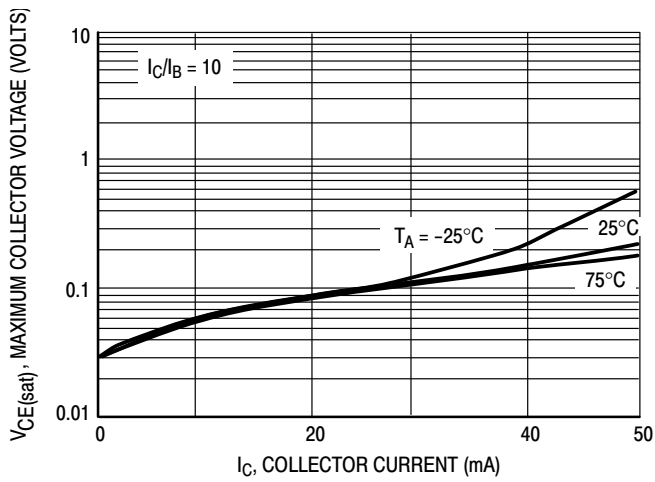


Figure 22.  $V_{CE(sat)}$  versus  $I_C$

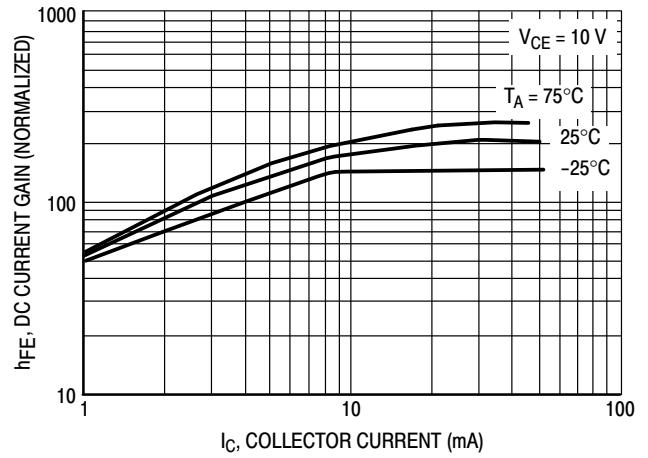


Figure 23. DC Current Gain

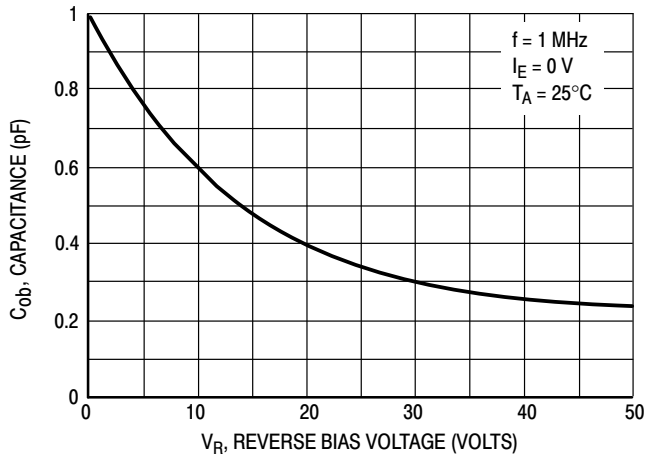


Figure 24. Output Capacitance

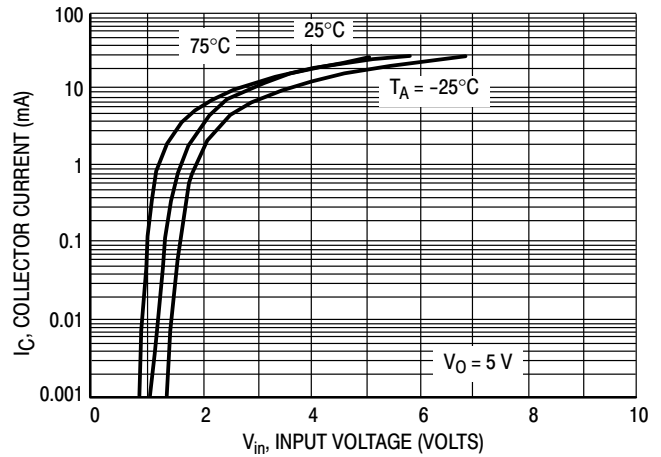


Figure 25. Output Current versus Input Voltage

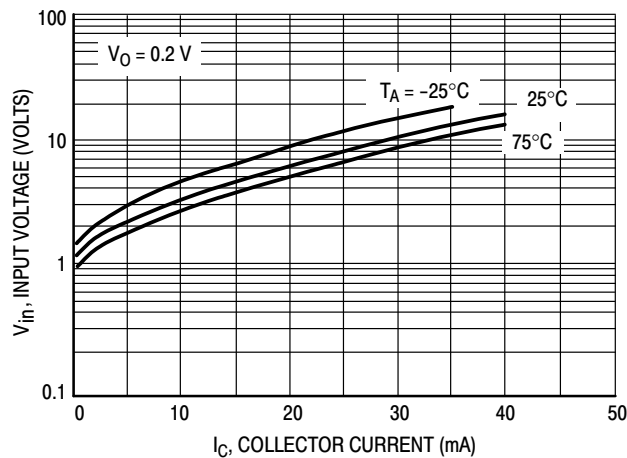


Figure 26. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1, NSVB114EPDXV6T1 PNP TRANSISTOR

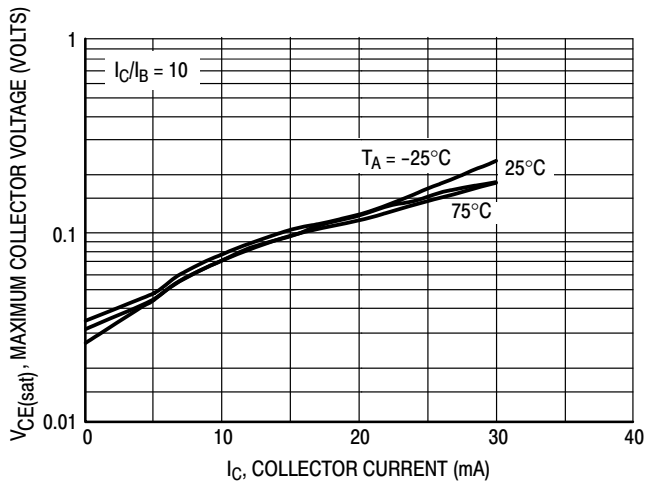


Figure 27.  $V_{CE(sat)}$  versus  $I_C$

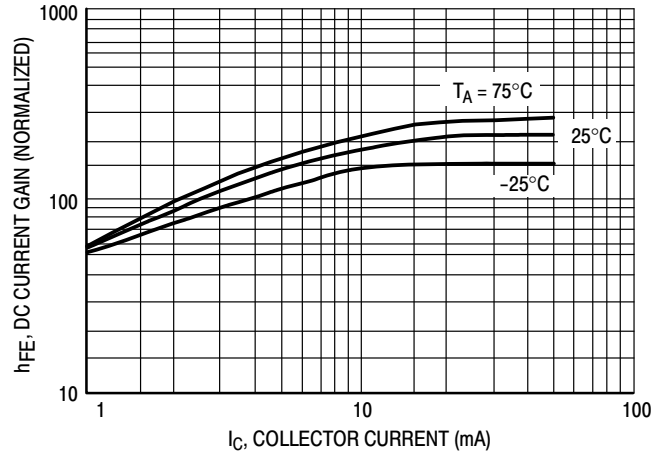


Figure 28. DC Current Gain

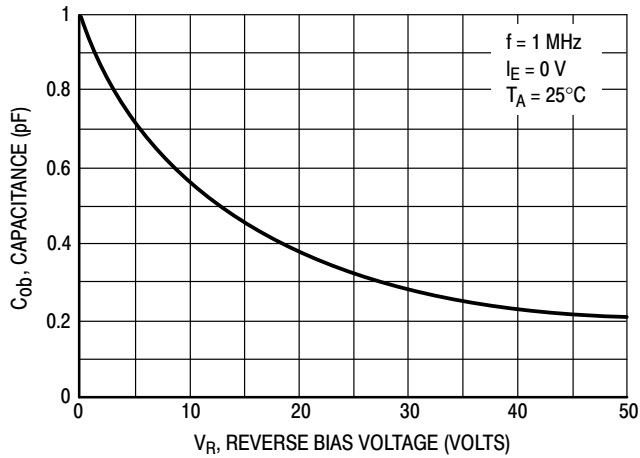


Figure 29. Output Capacitance

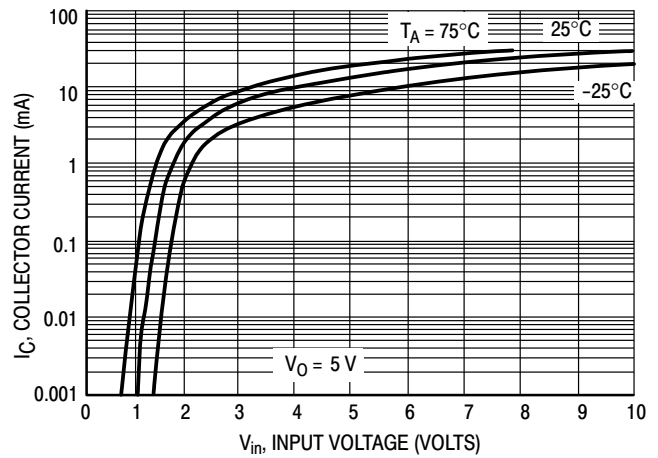


Figure 30. Output Current versus Input Voltage

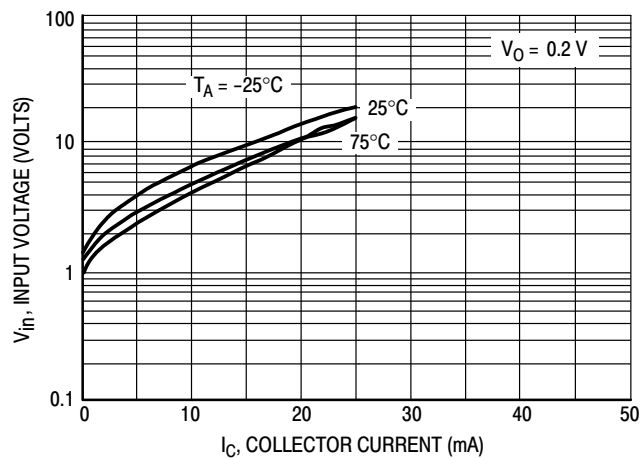


Figure 31. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1, NSVBC114EPDXV6T1 NPN TRANSISTOR

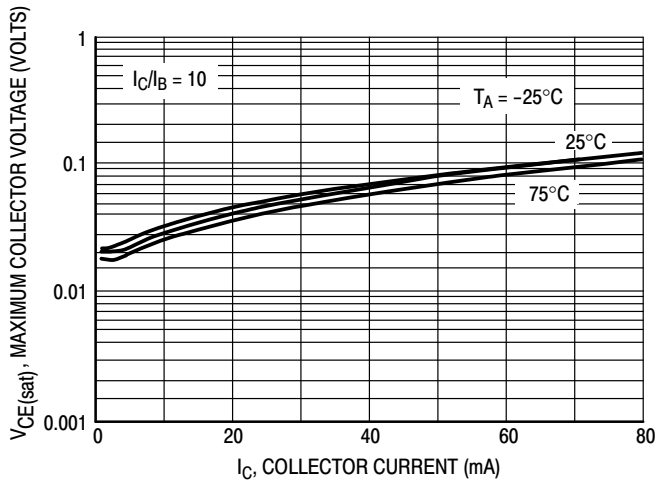


Figure 32.  $V_{CE(sat)}$  versus  $I_C$

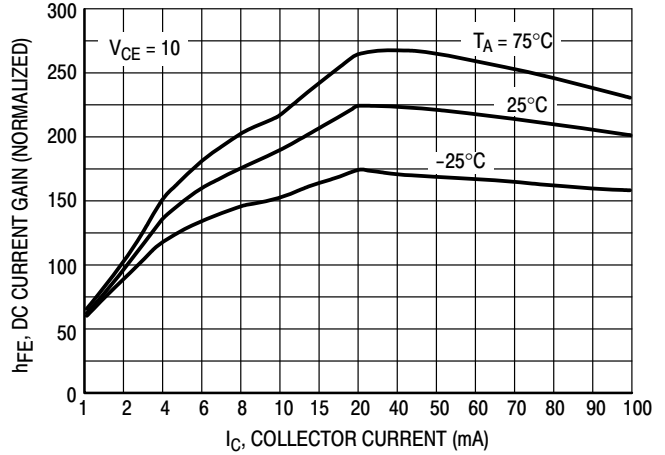


Figure 33. DC Current Gain

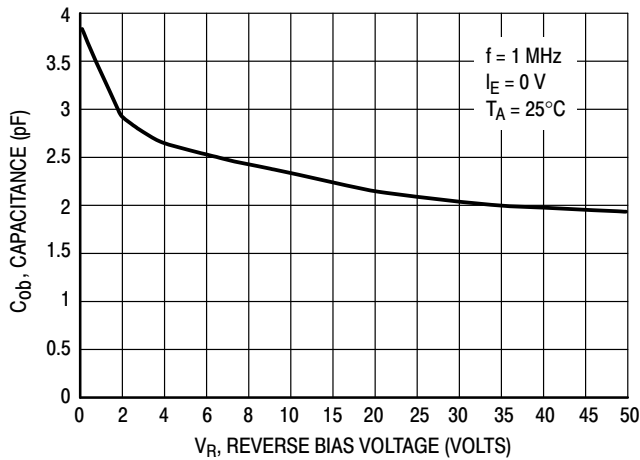


Figure 34. Output Capacitance

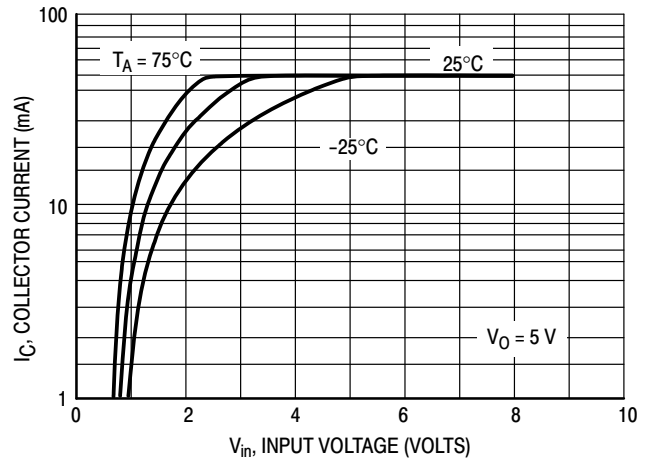


Figure 35. Output Current versus Input Voltage

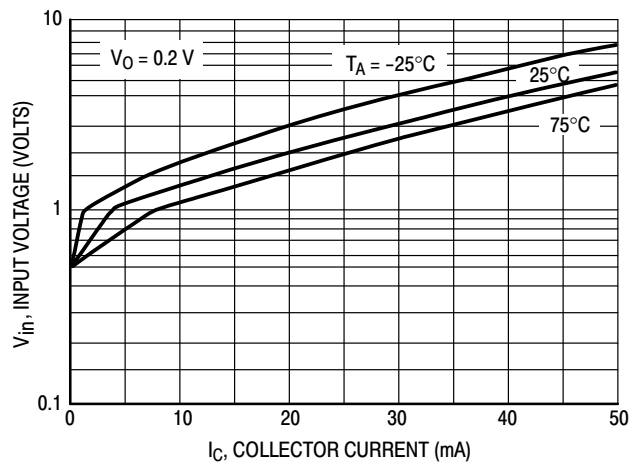


Figure 36. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDXV6T1, NSVBC114EPDXV6T1 PNP TRANSISTOR

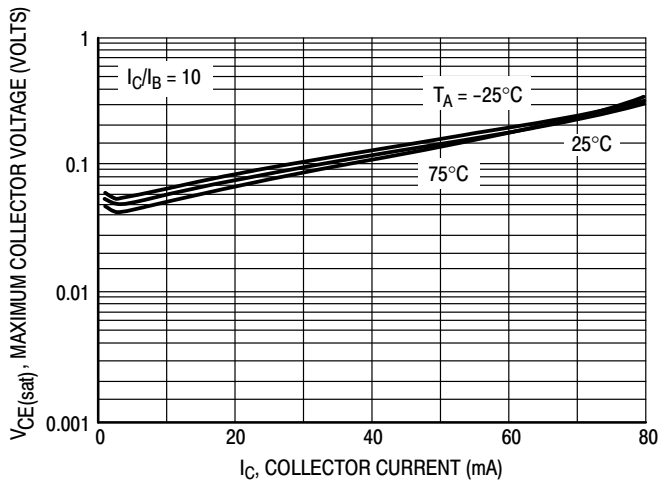


Figure 37.  $V_{CE(sat)}$  versus  $I_C$

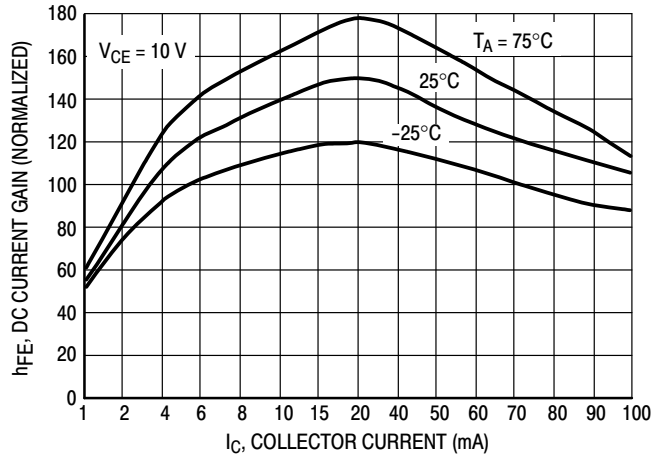


Figure 38. DC Current Gain

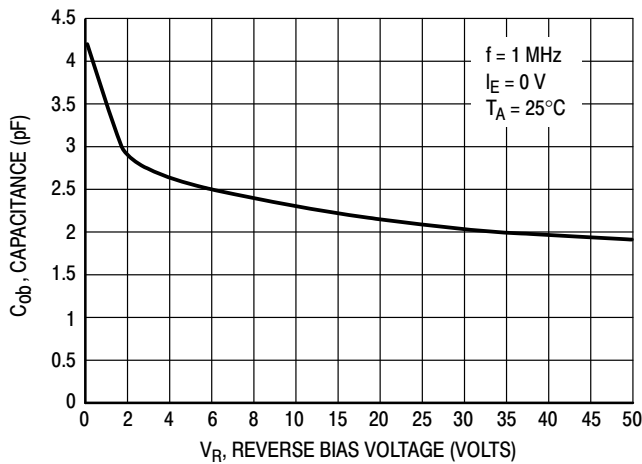


Figure 39. Output Capacitance

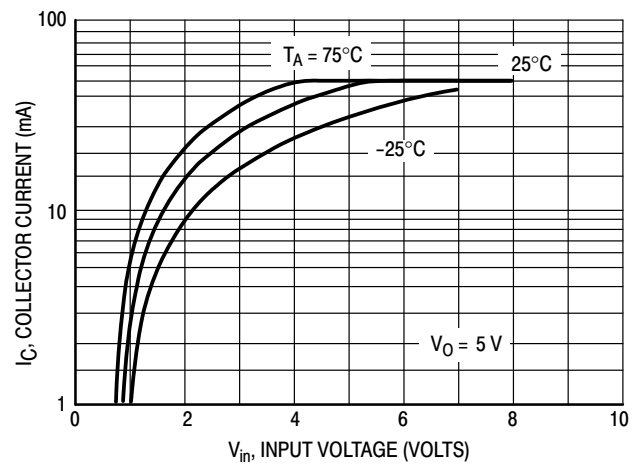


Figure 40. Output Current versus Input Voltage

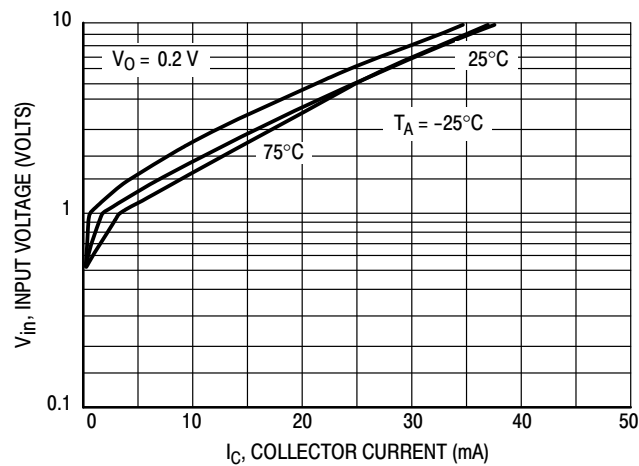


Figure 41. Input Voltage versus Output Current

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114TPDXV6T1

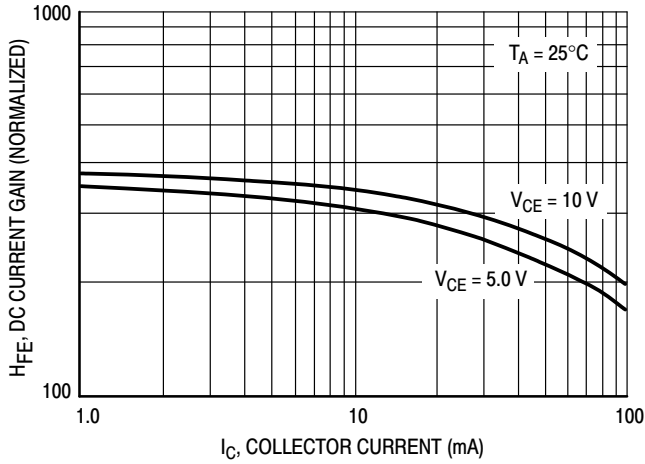


Figure 42. DC Current Gain – PNP

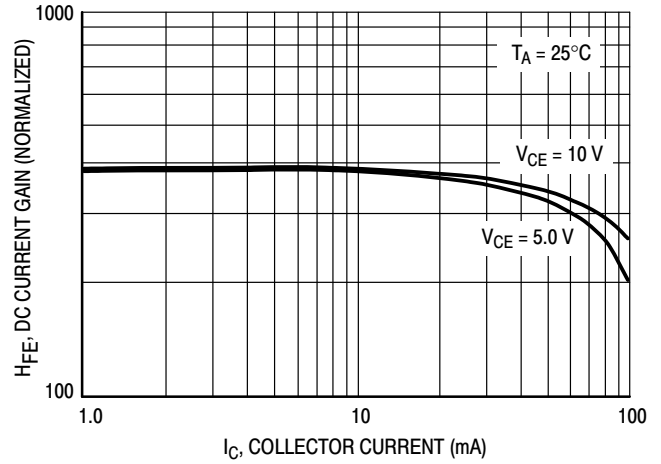


Figure 43. DC Current Gain – NPN

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC143TPDXV6T1, NSVB143TPDXV6T1

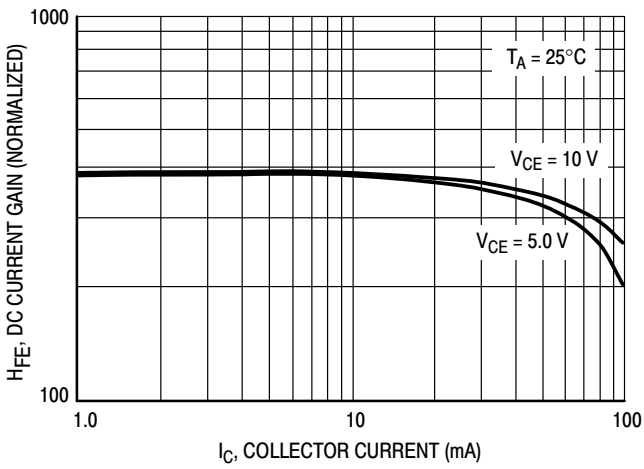


Figure 44. DC Current Gain – PNP

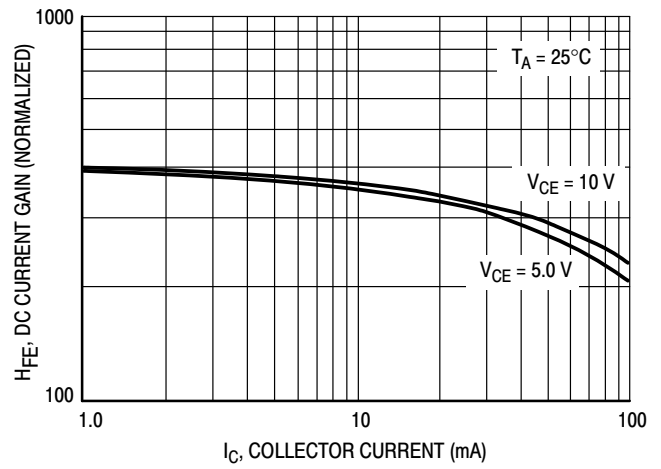
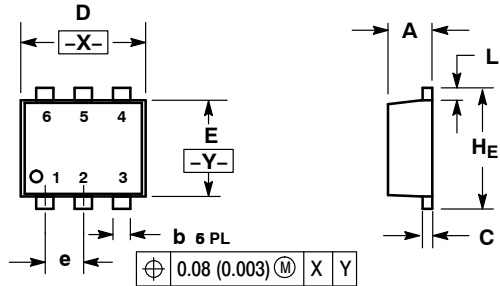


Figure 45. DC Current Gain – NPN

# NSBC114EPDXV6T1G, NSVBC114EPDXV6T1G Series

## PACKAGE DIMENSIONS

### SOT-563, 6 LEAD CASE 463A-01 ISSUE F

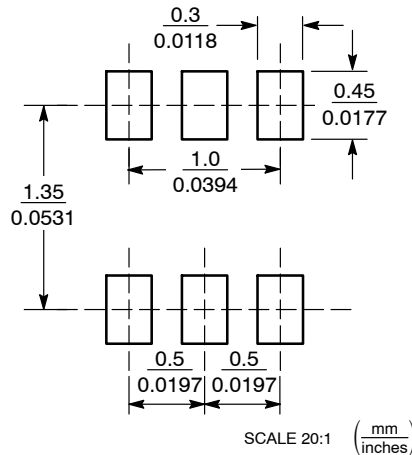


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
C	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.5 BSC			0.02 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H <sub>E</sub>	1.50	1.60	1.70	0.059	0.062	0.066

### SOLDERING 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.

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