

# NSBC114EDXV6T1, NSBC114EDXV6T5

Preferred Devices

## Dual Bias Resistor Transistors

### NPN 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 NSBC114EDXV6T1 series, two 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.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Lead-Free Solder Plating

#### MAXIMUM RATINGS

( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ )

Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	50	Vdc
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector Current	$I_C$	100	mAdc

#### THERMAL CHARACTERISTICS

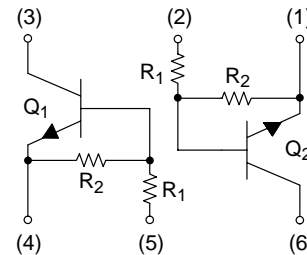
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	357 (Note 1) 2.9 (Note 1)	mW mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	350 (Note 1)	$^\circ\text{C}/\text{W}$
Characteristic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

1. FR-4 @ Minimum Pad

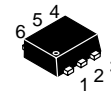


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NSBC114EDXV6T1



SOT-563  
CASE 463A  
PLASTIC

#### MARKING DIAGRAM



xx = Specific Device Code  
(see table on following page)  
D = Date Code

#### ORDERING INFORMATION

Device	Package	Shipping
NSBC114EDXV6T1	SOT-563	4 mm pitch 4000/Tape & Reel
NSBC114EDXV6T5	SOT-563	2 mm pitch 8000/Tape & Reel

#### DEVICE MARKING INFORMATION

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

Preferred devices are recommended choices for future use and best overall value.

# NSBC114EDXV6T1, NSBC114EDXV6T5

## DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (kΩ)	R2 (kΩ)
NSBC114EDXV6T1	SOT-563	7A	10	10
NSBC124EDXV6T1	SOT-563	7B	22	22
NSBC144EDXV6T1	SOT-563	7C	47	47
NSBC114YDXV6T1	SOT-563	7D	10	47
NSBC114TDXV6T1 (Note 2)	SOT-563	7E	10	∞
NSBC143TDXV6T1 (Notes 2)	SOT-563	7F	4.7	∞
NSBC113EDXV6T1 (Note 2)	SOT-563	7G	1.0	1.0
NSBC123EDXV6T1 (Notes 2)	SOT-563	7H	2.2	2.2
NSBC143EDXV6T1 (Notes 2)	SOT-563	7J	4.7	4.7
NSBC143ZDXV6T1 (Notes 2)	SOT-563	7K	4.7	47
NSBC124XDXV6T1 (Notes 2)	SOT-563	7L	22	47
NSBC123JDXV6T1 (Note 2)	SOT-563	7M	2.2	47
NSBC115EDXV6T1 (Notes 2)	SOT-563	7N	100	100
NSBC144WDXV6T1 (Notes 2)	SOT-563	7P	47	22

2. New resistor combinations. Updated curves to follow in subsequent data sheets.

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

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>	-	-	0.5	mAdc
	NSBC114EDXV6T1	-	-	0.2	
	NSBC124EDXV6T1	-	-	0.1	
	NSBC144EDXV6T1	-	-	0.2	
	NSBC114YDXV6T1	-	-	0.9	
	NSBC114TDXV6T1	-	-	1.9	
	NSBC143TDXV6T1	-	-	4.3	
	NSBC113EDXV6T1	-	-	2.3	
	NSBC123EDXV6T1	-	-	1.5	
	NSBC143EDXV6T1	-	-	0.18	
	NSBC143ZDXV6T1	-	-	0.13	
	NSBC124XDXV6T1	-	-	0.2	
	NSBC123JDXV6T1	-	-	0.05	
	NSBC115EDXV6T1	-	-	0.13	
	NSBC144WDXV6T1	-	-		
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

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

# NSBC114EDXV6T1, NSBC114EDXV6T5

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS</b> (Note 4)						
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	NSBC114EDXV6T1 NSBC124EDXV6T1 NSBC144EDXV6T1 NSBC114YDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC113EDXV6T1 NSBC123EDXV6T1 NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 NSBC115EDXV6T1 NSBC144WDXV6T1	h <sub>FE</sub>	35 60 80 80 160 160 3.0 8.0 15 80 80 80 80 80	60 100 140 140 350 350 5.0 15 30 200 150 140 150 140	- - - - - - - - - - - - - -	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 5 mA) NSBC113EDXV6T1/NSBC123EDXV6T1 (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1 mA) NSBC114TDXV6T1/NSBC143TDXV6T1 NSBC143EDXV6T1/NSBC143ZDXV6T1/NSBC124XDXV6T1		V <sub>CE(sat)</sub>	-	-	0.25	Vdc
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1.0 kΩ)	NSBC114EDXV6T1 NSBC124EDXV6T1 NSBC114YDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC113EDXV6T1 NSBC123EDXV6T1 NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 3.5 V, R <sub>L</sub> = 1.0 kΩ) NSBC144EDXV6T1 (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 5.5 V, R <sub>L</sub> = 1.0 kΩ) NSBC115EDXV6T1 (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 4.0 V, R <sub>L</sub> = 1.0 kΩ) NSBC144WDXV6T1	V <sub>OL</sub>	- - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - -	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	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) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.050 V, R <sub>L</sub> = 1.0 kΩ) NSBC113EDXV6T1 (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.25 V, R <sub>L</sub> = 1.0 kΩ) NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC143ZDXV6T1		V <sub>OH</sub>	4.9	-	-	Vdc

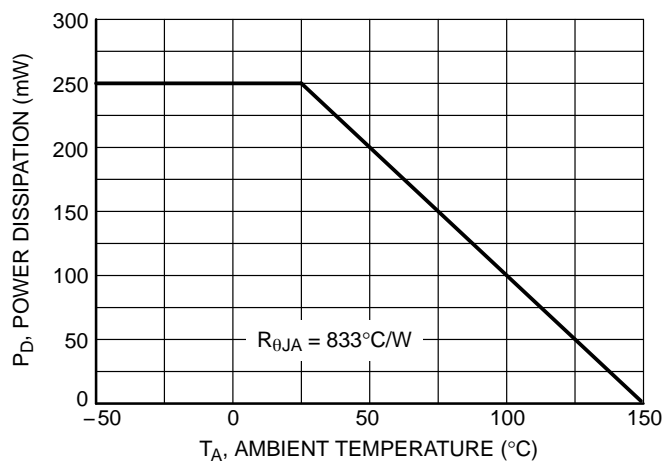
4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

# NSBC114EDXV6T1, NSBC114EDXV6T5

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS</b> (Note 5) (Continued)						
Input Resistor	NSBC114EDXV6T1	R1	7.0	10	13	k $\Omega$
	NSBC124EDXV6T1		15.4	22	28.6	
	NSBC144EDXV6T1		32.9	47	61.1	
	NSBC114YDXV6T1		7.0	10	13	
	NSBC114TDXV6T1		7.0	10	13	
	NSBC143TDXV6T1		3.3	4.7	6.1	
	NSBC113EDXV6T1		0.7	1.0	1.3	
	NSBC123EDXV6T1		1.5	2.2	2.9	
	NSBC143EDXV6T1		3.3	4.7	6.1	
	NSBC143ZDXV6T1		3.3	4.7	6.1	
	NSBC124XDXV6T1		15.4	22	28.6	
	NSBC123JDXV6T1		1.54	2.2	2.86	
	NSBC115EDXV6T1		70	100	130	
NSBC144WDXV6T1		32.9	47	61.1		
Resistor Ratio	NSBC114EDXV6T1/NSBC124EDXV6T1/ NSBC144EDXV6T1/NSBC115EDXV6T1 NSBC114YDXV6T1	R1/R2	0.8	1.0	1.2	
	NSBC114TDXV6T1/NSBC143TDXV6T1		0.17	0.21	0.25	
	NSBC113EDXV6T1/NSBC123EDXV6T1/NSBC143EDXV6T1		–	–	–	
	NSBC143ZDXV6T1		0.8	1.0	1.2	
	NSBC124XDXV6T1		0.055	0.1	0.185	
	NSBC124XDXV6T1		0.38	0.47	0.56	
	NSBC123JDXV6T1		0.038	0.047	0.056	
	NSBC144WDXV6T1		1.7	2.1	2.6	

5. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%



**Figure 1. Derating Curve**

# NSBC114EDXV6T1, NSBC114EDXV6T5

## TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114EDXV6T1

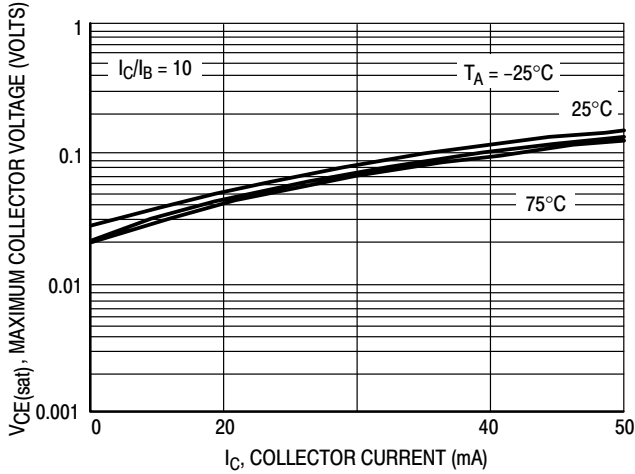


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

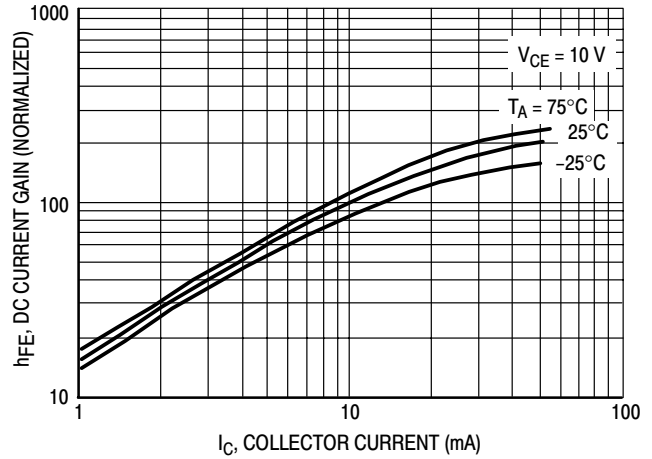


Figure 3. DC Current Gain

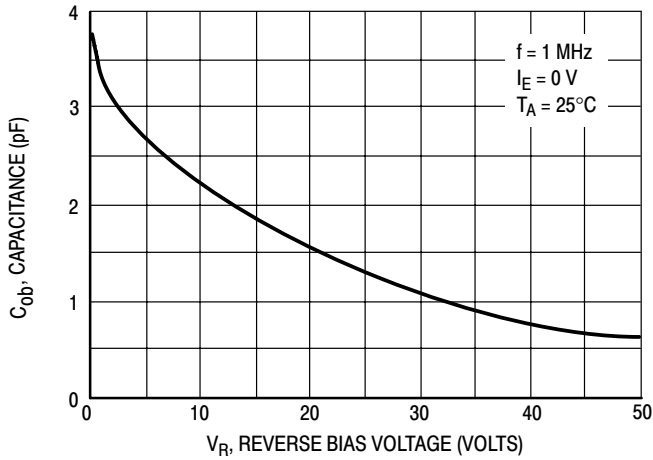


Figure 4. Output Capacitance

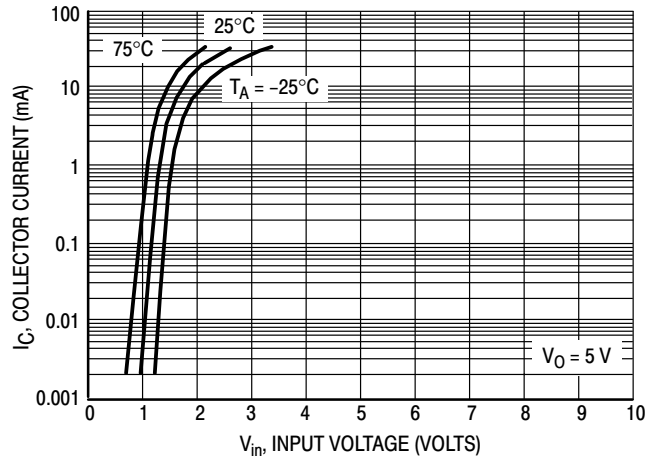


Figure 5. Output Current versus Input Voltage

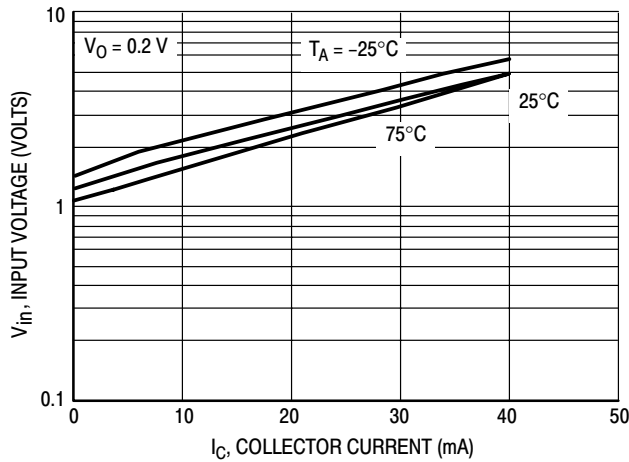


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC124EDXV6T1

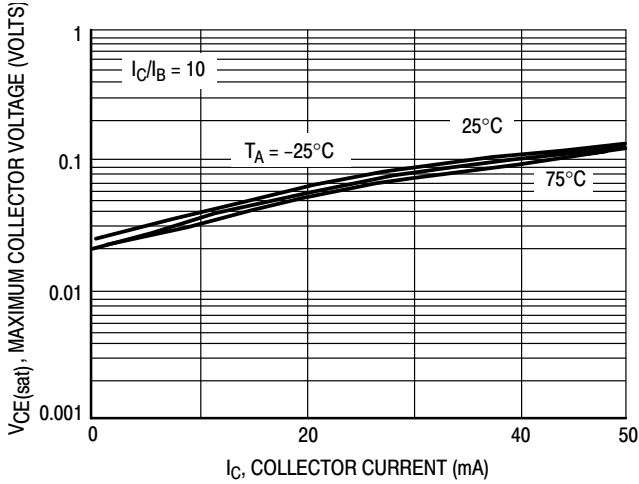


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

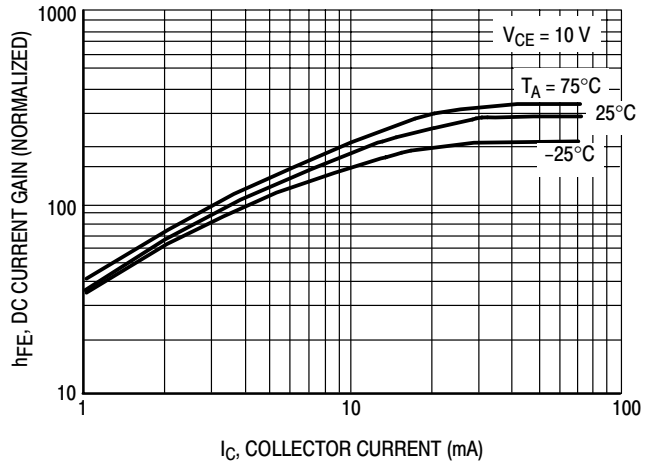


Figure 8. DC Current Gain

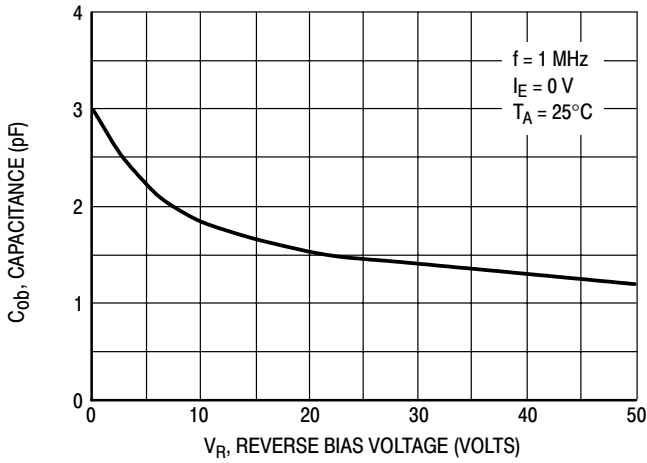


Figure 9. Output Capacitance

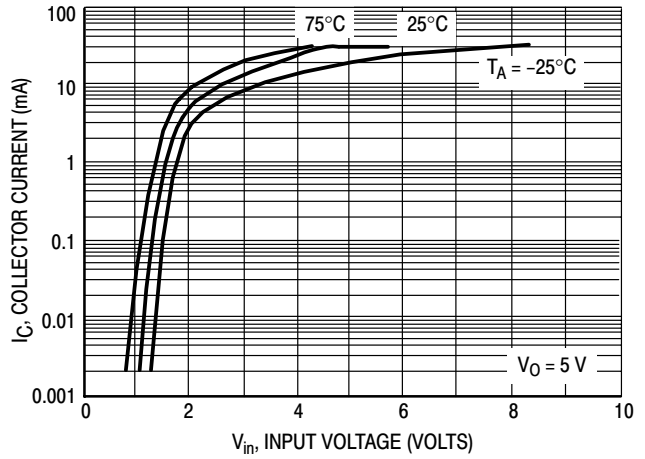


Figure 10. Output Current versus Input Voltage

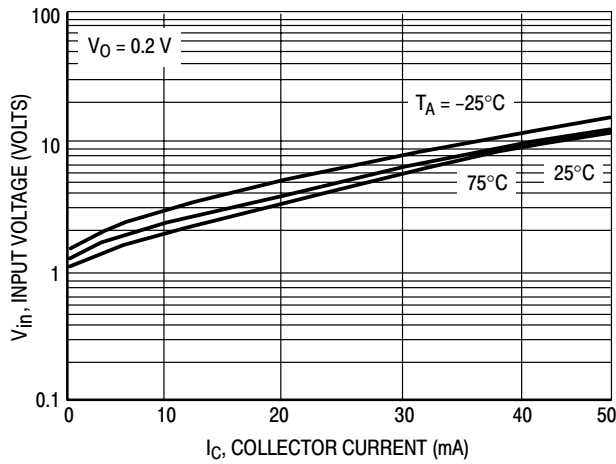


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114EDXV6T1

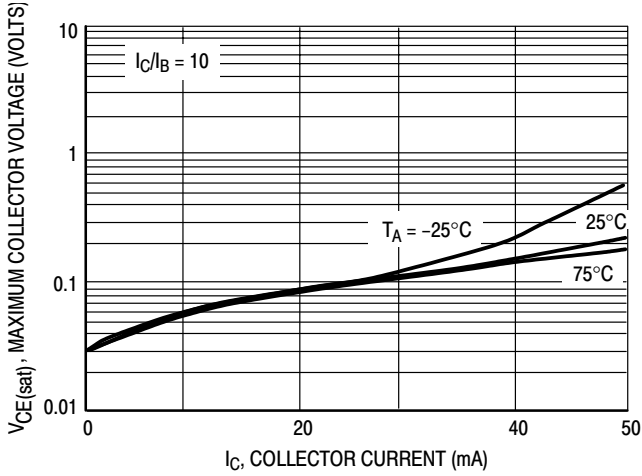


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

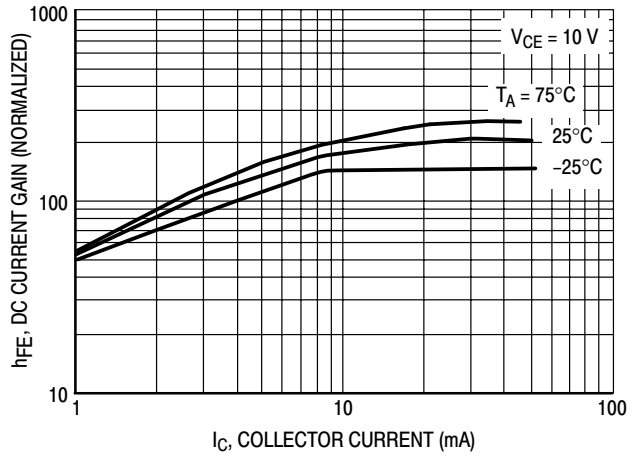


Figure 13. DC Current Gain

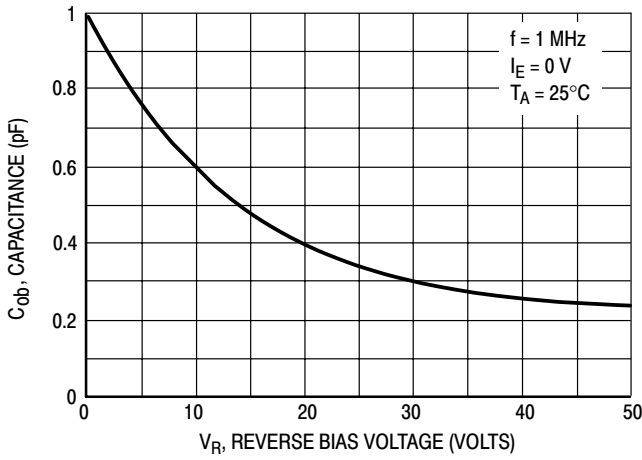


Figure 14. Output Capacitance

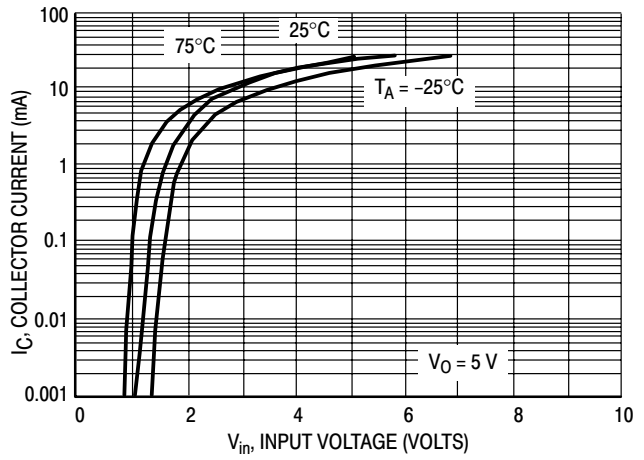


Figure 15. Output Current versus Input Voltage

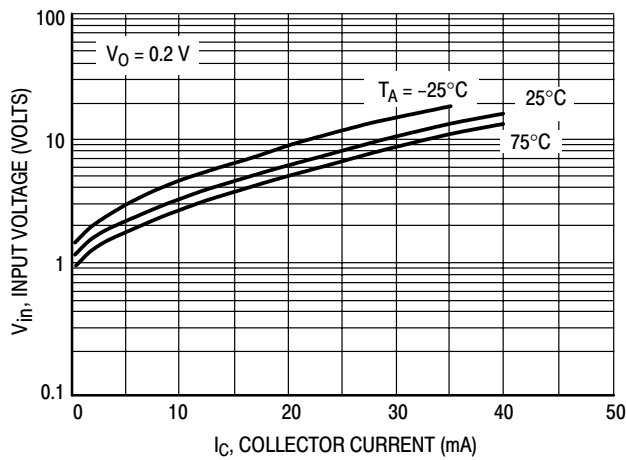


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114YDXV6T1

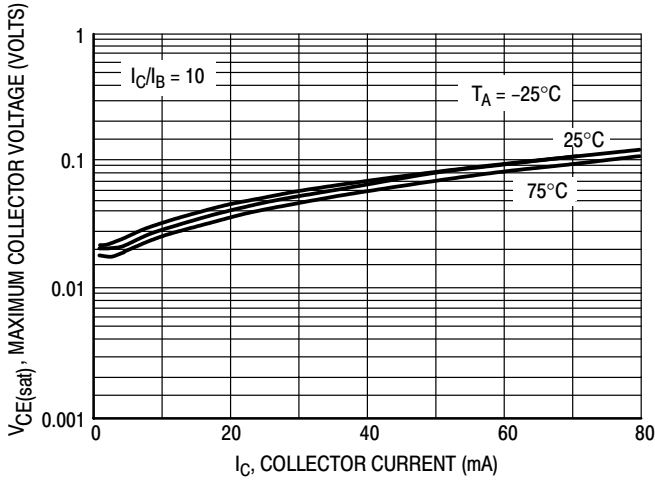


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

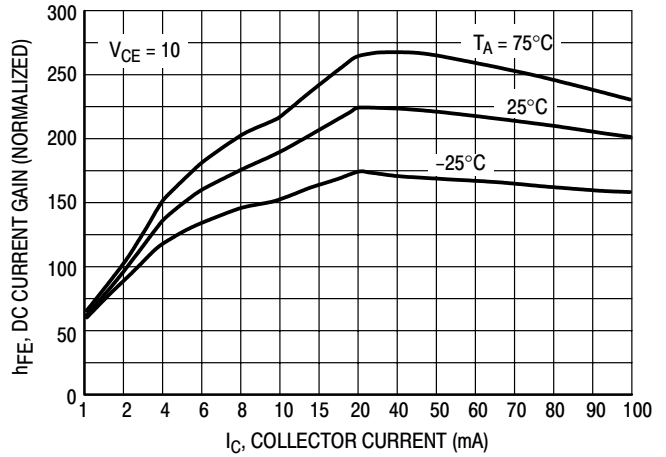


Figure 18. DC Current Gain

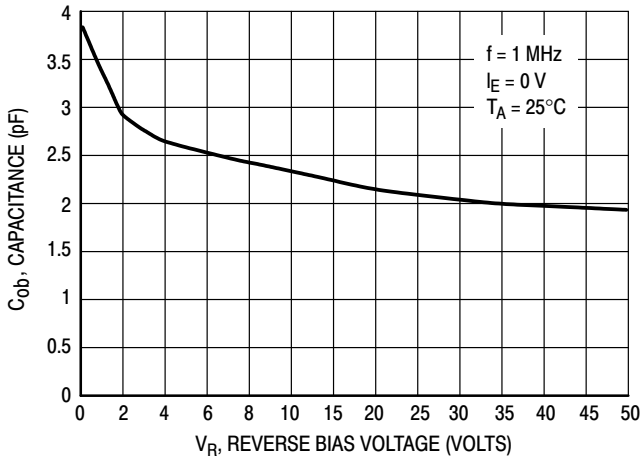


Figure 19. Output Capacitance

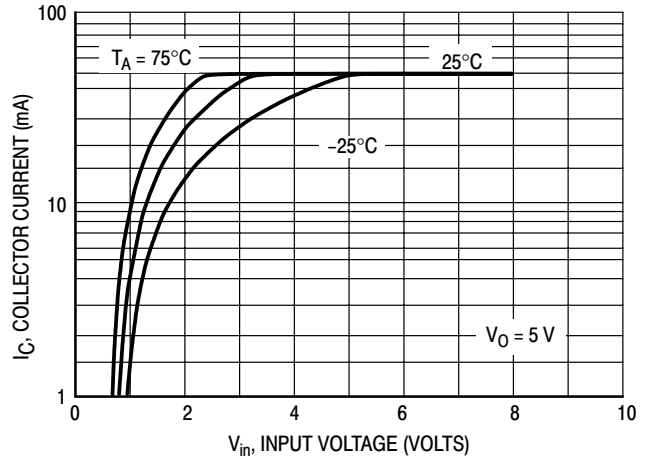


Figure 20. Output Current versus Input Voltage

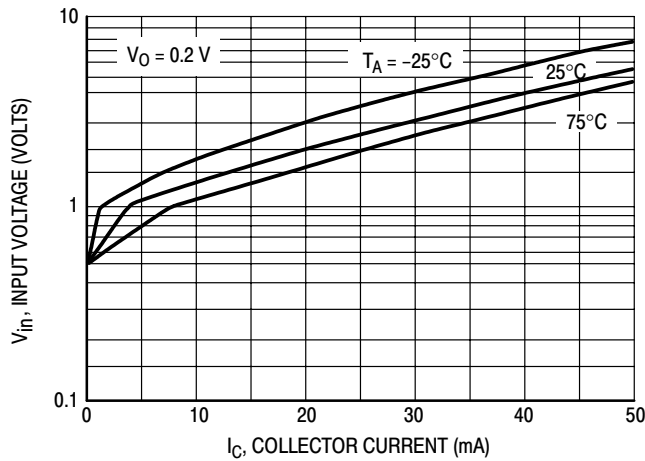


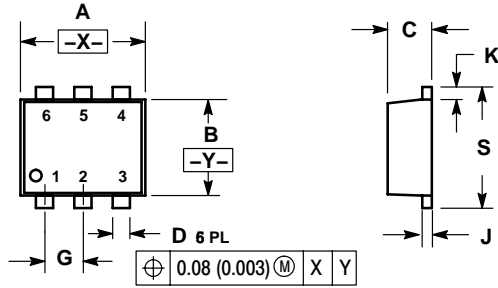
Figure 21. Input Voltage versus Output Current



# NSBC114EDXV6T1, NSBC114EDXV6T5

## PACKAGE DIMENSIONS

SOT-563, 6 LEAD  
CASE 463A-01  
ISSUE O



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	MAX	MIN	MAX
A	1.50	1.70	0.059	0.067
B	1.10	1.30	0.043	0.051
C	0.50	0.60	0.020	0.024
D	0.17	0.27	0.007	0.011
G	0.50 BSC		0.020 BSC	
J	0.08	0.18	0.003	0.007
K	0.10	0.30	0.004	0.012
S	1.50	1.70	0.059	0.067

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

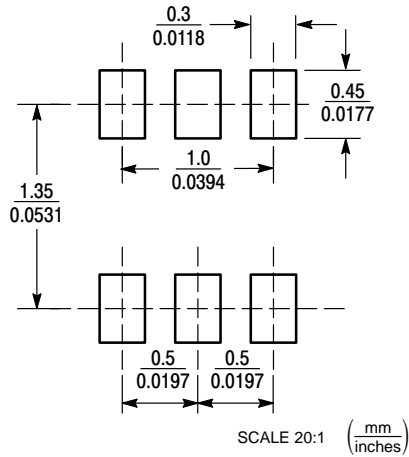
STYLE 3:

- 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

### 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.

# NSBC114EDXV6T1, NSBC114EDXV6T5

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**NSBC114EDXV6/D**