

# NSBC114EDXV6T1, NSBC114EDXV6T5

## 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.

#### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Lead-Free Solder Plating
- These are Pb-Free Devices
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

#### 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

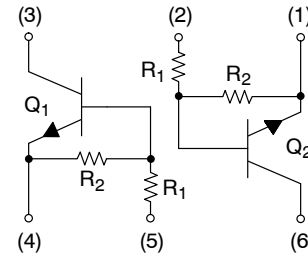
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation; $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	357 (Note 1) 2.9 (Note 1)	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	350 (Note 1)	$^\circ\text{C}/\text{W}$
Characteristic (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



ON Semiconductor®

<http://onsemi.com>



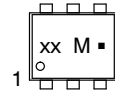
NSBC114EDXV6T1

#### MARKING DIAGRAM



1

SOT-563  
CASE 463A



xx = Device Code (Refer to Page 2)

M = Date Code

■ = Pb-Free Package

#### ORDERING INFORMATION

Device	Package	Shipping†
NSBC1xxxDXV6T1	SOT-563	4000/Tape & Reel
NSBC1xxxDXV6T1G	SOT-563	4000/Tape & Reel
NSVBC1xxxDXV6T1G	SOT-563	4000/Tape & Reel
NSBC1xxxDXV6T5	SOT-563	8000/Tape & Reel
NSBC1xxxDXV6T5G	SOT-563	8000/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.

#### DEVICE MARKING INFORMATION

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

# NSBC114EDXV6T1, NSBC114EDXV6T5

## DEVICE MARKING, ORDERING, AND RESISTOR VALUES

Device†	Package*	Marking	R1 (kΩ)	R2 (kΩ)
NSBC114EDXV6T1	SOT-563	7A	10	10
NSBC124EDXV6T1 / NSVBC124EDXV6T1G	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

†The “G” suffix indicates Pb-Free package available.

\*This package is inherently Pb-Free.

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

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

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 ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	-	-	0.5	mAdc
	NSBC114EDXV6T1	-	-	0.2	
	NSBC124EDXV6T1 / NSVBC124EDXV6T1G	-	-	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 ( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	-	-	Vdc

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

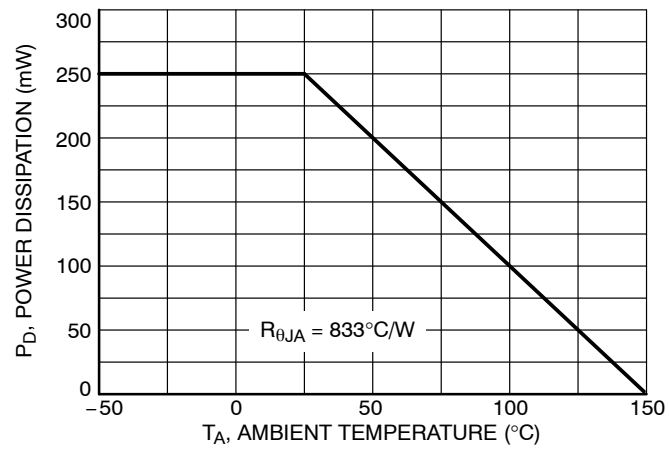
# NSBC114EDXV6T1, NSBC114EDXV6T5

## 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 4)						
DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	NSBC114EDXV6T1 NSBC124EDXV6T1 / NSVBC124EDXV6T1G NSBC144EDXV6T1 NSBC114YDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC113EDXV6T1 NSBC123EDXV6T1 NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 NSBC115EDXV6T1 NSBC144WDXV6T1	$h_{FE}$	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 ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 5\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ )	NSBC113EDXV6T1/NSBC123EDXV6T1 NSBC114TDXV6T1/NSBC143TDXV6T1 NSBC143EDXV6T1/NSBC143ZDXV6T1/NSBC124XDXV6T1	$V_{CE(sat)}$	-	-	0.25	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )  ( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 5.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 4.0\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	NSBC114EDXV6T1 NSBC124EDXV6T1 / NSVBC124EDXV6T1G NSBC114YDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC113EDXV6T1 NSBC123EDXV6T1 NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 NSBC144EDXV6T1 NSBC115EDXV6T1 NSBC144WDXV6T1	$V_{OL}$	-	-	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) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.050\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	NSBC113EDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC143ZDXV6T1	$V_{OH}$	4.9	-	-	Vdc
Input Resistor	NSBC114EDXV6T1 NSBC124EDXV6T1 / NSVBC124EDXV6T1G NSBC144EDXV6T1 NSBC114YDXV6T1 NSBC114TDXV6T1 NSBC143TDXV6T1 NSBC113EDXV6T1 NSBC123EDXV6T1 NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 NSBC115EDXV6T1 NSBC144WDXV6T1	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 70 32.9	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 2.2 100 47	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86 130 61.1	k $\Omega$
Resistor Ratio	NSBC114EDXV6T1/NSBC124EDXV6T1/NSVBC124EDXV6T1G NSBC144EDXV6T1/NSBC115EDXV6T1 NSBC114YDXV6T1 NSBC114TDXV6T1/NSBC143TDXV6T1 NSBC113EDXV6T1/NSBC123EDXV6T1/NSBC143EDXV6T1 NSBC143ZDXV6T1 NSBC124XDXV6T1 NSBC123JDXV6T1 NSBC144WDXV6T1	R1/R2	0.8 0.17 - 0.8 0.055 0.38 0.038 1.7	1.0 0.21 - 1.0 0.1 0.47 0.047 2.1	1.2 0.25 - 1.2 0.185 0.56 0.056 2.6	

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

# NSBC114EDXV6T1, NSBC114EDXV6T5



**Figure 1. Derating Curve**

# NSBC114EDXV6T1, NSBC114EDXV6T5

## TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114EDXV6T1

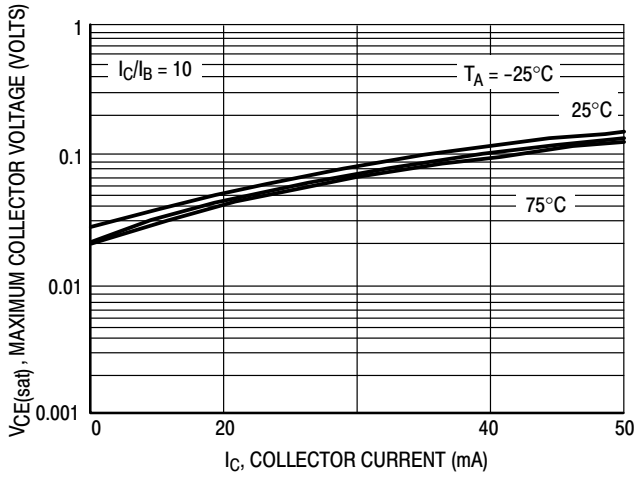


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

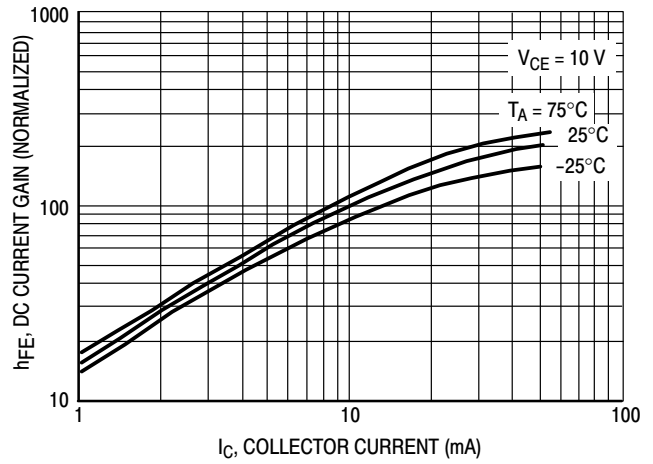


Figure 3. DC Current Gain

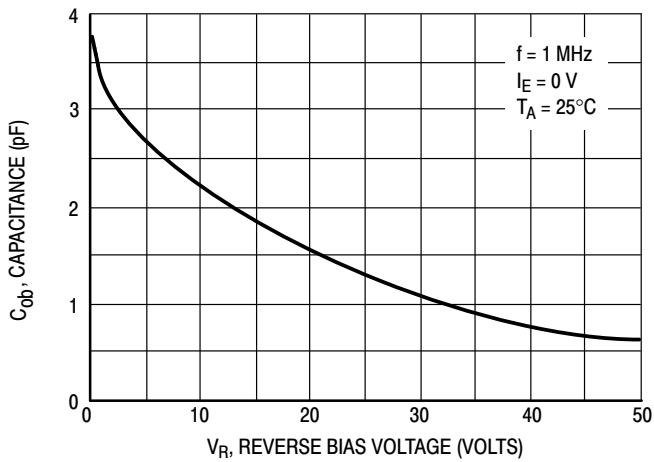


Figure 4. Output Capacitance

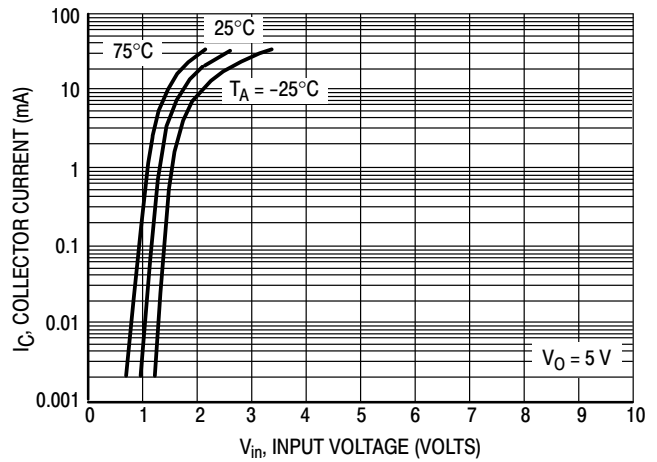


Figure 5. Output Current versus Input Voltage

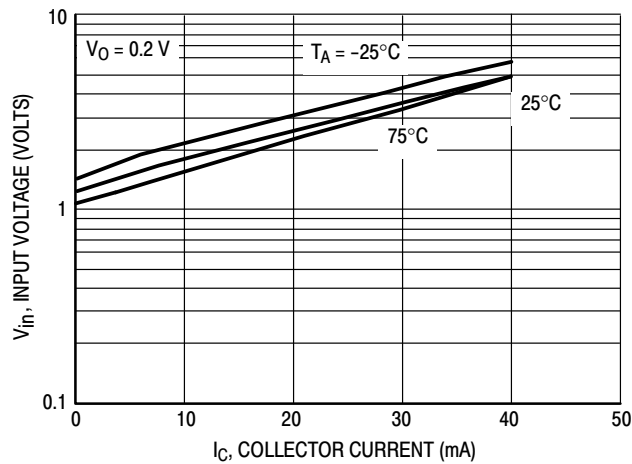


Figure 6. Input Voltage versus Output Current

# NSBC114EDXV6T1, NSBC114EDXV6T5

## TYPICAL ELECTRICAL CHARACTERISTICS — NSBC124EDXV6T1 / NSVBC124EDXV6T1G

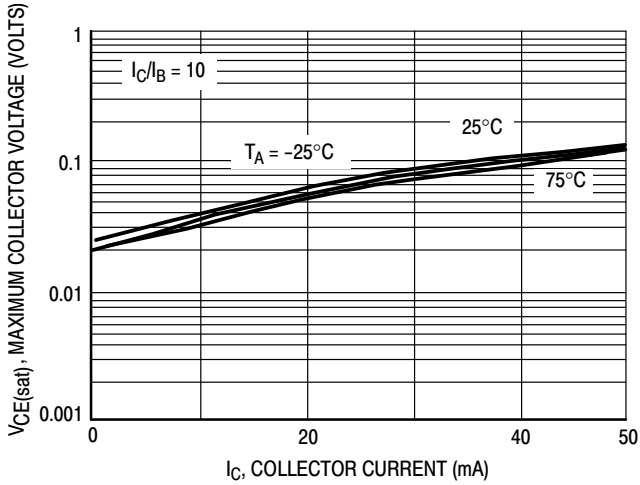


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

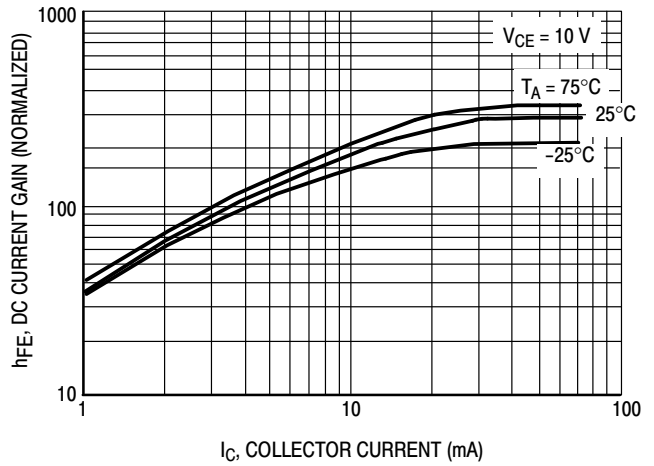


Figure 8. DC Current Gain

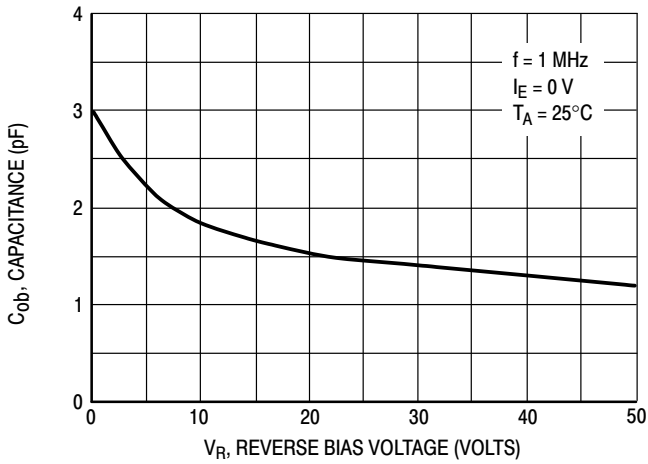


Figure 9. Output Capacitance

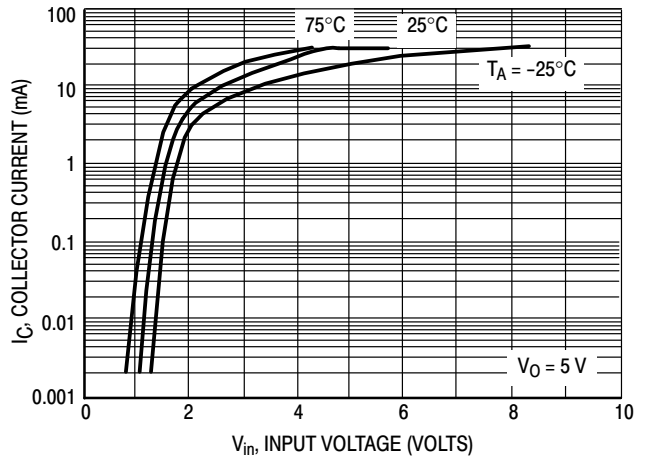


Figure 10. Output Current versus Input Voltage

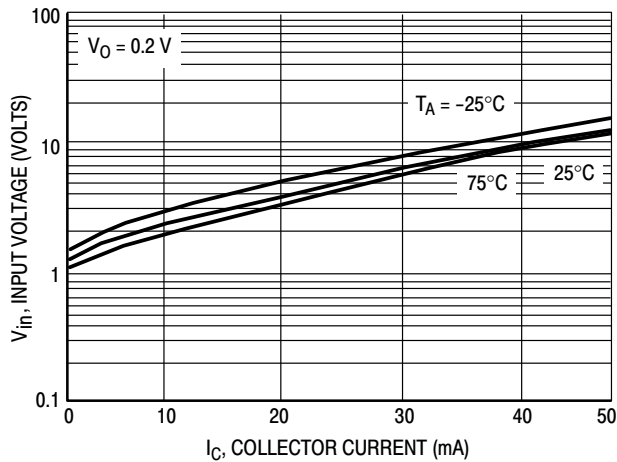


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114EDXV6T1

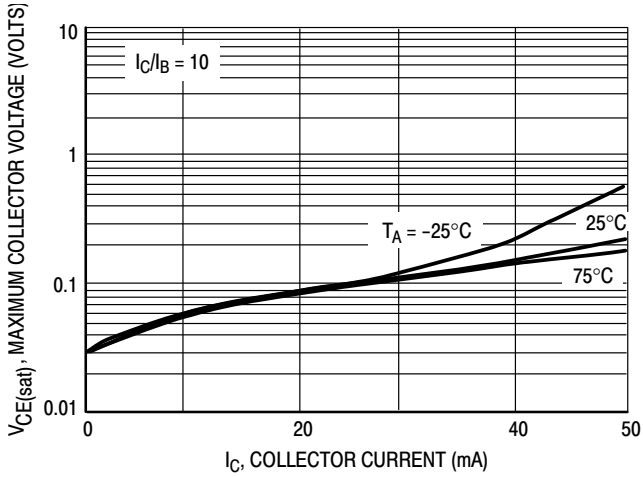


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

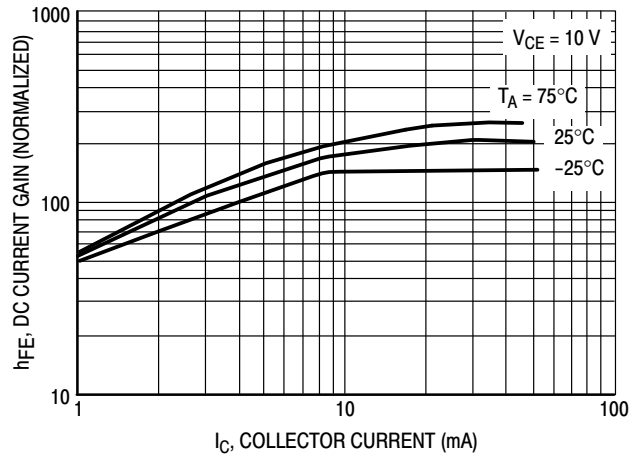


Figure 13. DC Current Gain

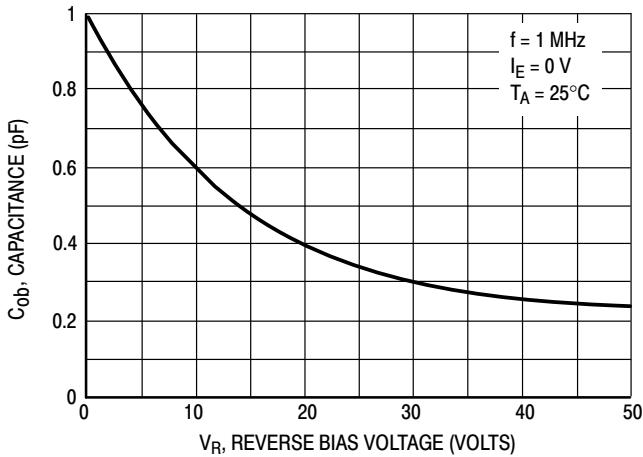


Figure 14. Output Capacitance

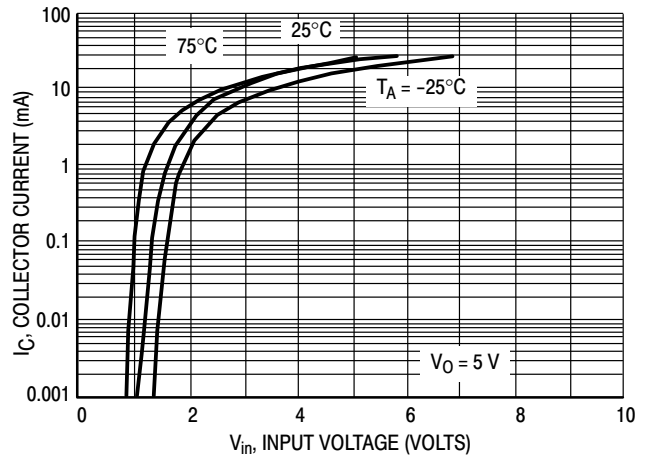


Figure 15. Output Current versus Input Voltage

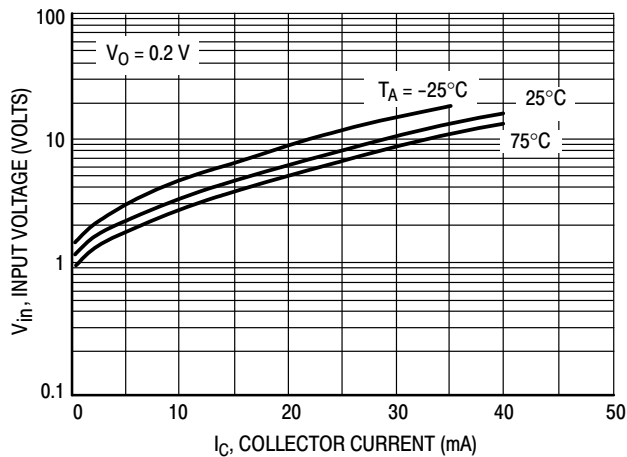


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114YDXV6T1

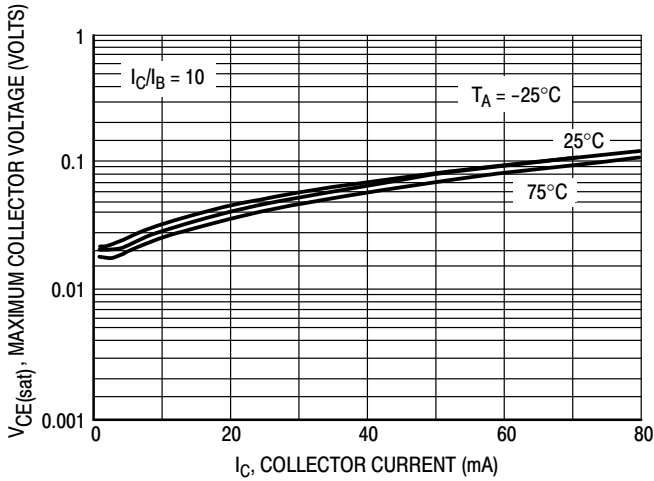


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

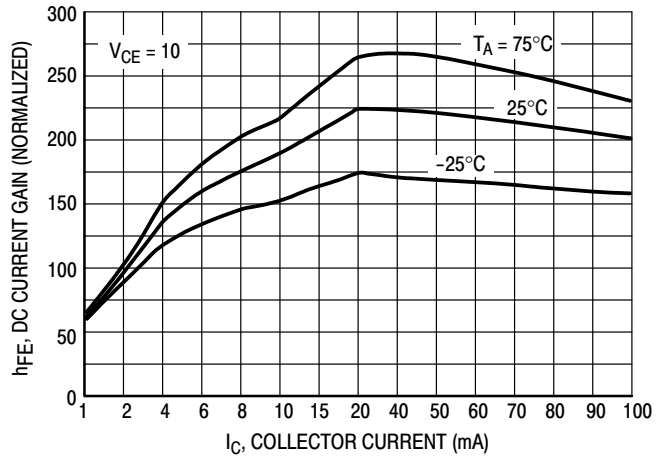


Figure 18. DC Current Gain

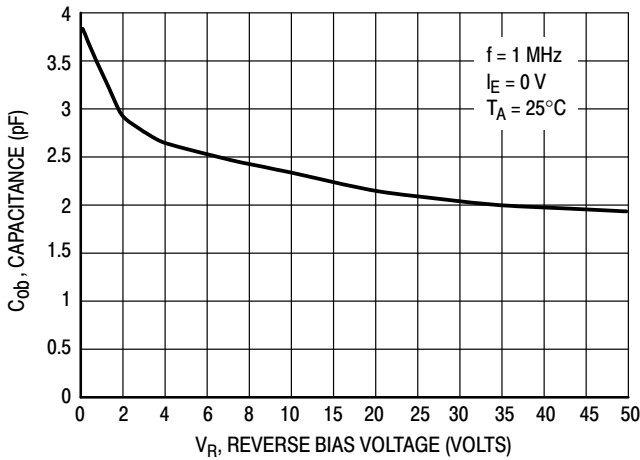


Figure 19. Output Capacitance

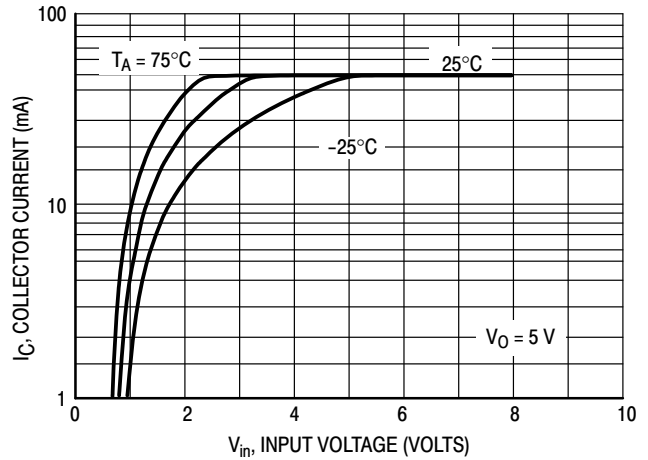


Figure 20. Output Current versus Input Voltage

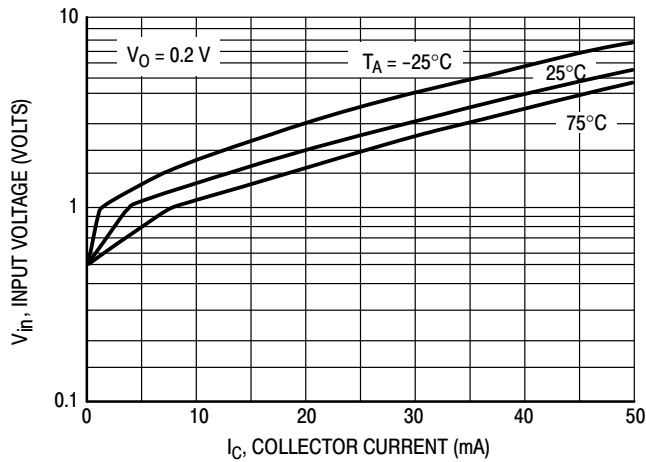


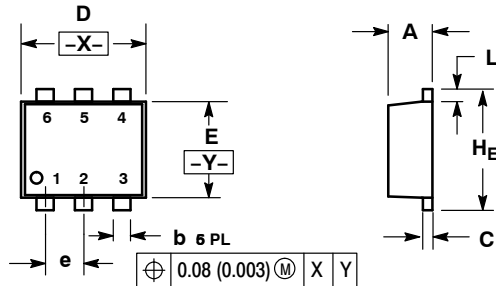
Figure 21. Input Voltage versus Output Current



# NSBC114EDXV6T1, NSBC114EDXV6T5

## PACKAGE DIMENSIONS

SOT-563, 6 LEAD  
CASE 463A  
ISSUE F

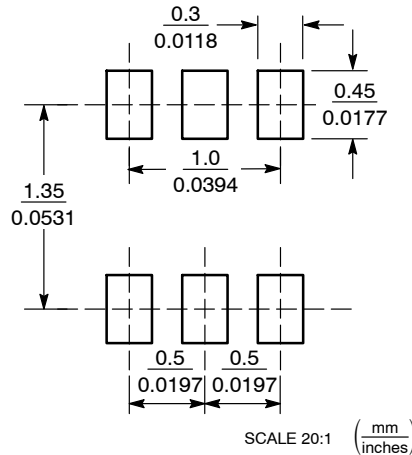


**NOTES:**

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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**  
Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local Sales Representative