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

1. FR−4 @ Minimum Pad

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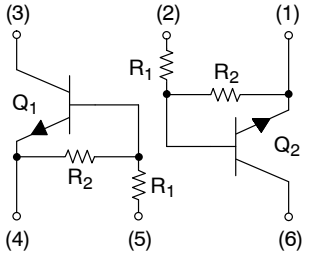
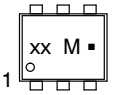


NSBC114EDXV6T1

MARKING DIAGRAM

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.

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°C unless otherwise noted, common for Q_1 and Q_2)

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)	NSBC114EDXV6T1	I_{EBO}	–	–	0.5	mAdc
	NSBC124EDXV6T1 / NSVBC124EDXV6T1G		–	–	0.2	
	NSBC144EDXV6T1		–	–	0.1	
	NSBC114YDXV6T1		–	–	0.2	
	NSBC114TDXV6T1		–	–	0.9	
	NSBC143TDXV6T1		–	–	1.9	
	NSBC113EDXV6T1		–	–	4.3	
	NSBC123EDXV6T1		–	–	2.3	
	NSBC143EDXV6T1		–	–	1.5	
	NSBC143ZDXV6T1		–	–	0.18	
	NSBC124XDXV6T1		–	–	0.13	
	NSBC123JDXV6T1		–	–	0.2	
	NSBC115EDXV6T1		–	–	0.05	
	NSBC144WDXV6T1		–	–	0.13	
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

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) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 4)						
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	NSBC114EDXV6T1	h_{FE}	35	60	–	
	NSBC124EDXV6T1 / NSVBC124EDXV6T1G		60	100	–	
	NSBC144EDXV6T1		80	140	–	
	NSBC114YDXV6T1		80	140	–	
	NSBC114TDXV6T1		160	350	–	
	NSBC143TDXV6T1		160	350	–	
	NSBC113EDXV6T1		3.0	5.0	–	
	NSBC123EDXV6T1		8.0	15	–	
	NSBC143EDXV6T1		15	30	–	
	NSBC143ZDXV6T1		80	200	–	
	NSBC124XDXV6T1		80	150	–	
	NSBC123JDXV6T1		80	140	–	
	NSBC115EDXV6T1		80	150	–	
	NSBC144WDXV6T1		80	140	–	
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)		$V_{CE(sat)}$	–	–	0.25	Vdc
(I_C = 10 mA, I_B = 5 mA)	NSBC113EDXV6T1/NSBC123EDXV6T1					
(I_C = 10 mA, I_B = 1 mA)	NSBC114TDXV6T1/NSBC143TDXV6T1					
	NSBC143EDXV6T1/NSBC143ZDXV6T1/NSBC124XDXV6T1					
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	NSBC114EDXV6T1		–	–	0.2	
	NSBC124EDXV6T1 / NSVBC124EDXV6T1G		–	–	0.2	
	NSBC114YDXV6T1		–	–	0.2	
	NSBC114TDXV6T1		–	–	0.2	
	NSBC143TDXV6T1		–	–	0.2	
	NSBC113EDXV6T1		–	–	0.2	
	NSBC123EDXV6T1		–	–	0.2	
	NSBC143EDXV6T1		–	–	0.2	
	NSBC143ZDXV6T1		–	–	0.2	
	NSBC124XDXV6T1		–	–	0.2	
	NSBC123JDXV6T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	NSBC144EDXV6T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	NSBC115EDXV6T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	NSBC144WDXV6T1		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.050 V, R_L = 1.0 kΩ)	NSBC113EDXV6T1					
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	NSBC114TDXV6T1					
	NSBC143TDXV6T1					
	NSBC143ZDXV6T1					
Input Resistor	NSBC114EDXV6T1	R1	7.0	10	13	k Ω
	NSBC124EDXV6T1 / NSVBC124EDXV6T1G		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/NSVBC124EDXV6T1G	R1/R2				
	NSBC144EDXV6T1/NSBC115EDXV6T1		0.8	1.0	1.2	
	NSBC114YDXV6T1		0.17	0.21	0.25	
	NSBC114TDXV6T1/NSBC143TDXV6T1		–	–	–	
	NSBC113EDXV6T1/NSBC123EDXV6T1/NSBC143EDXV6T1		0.8	1.0	1.2	
	NSBC143ZDXV6T1		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	

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

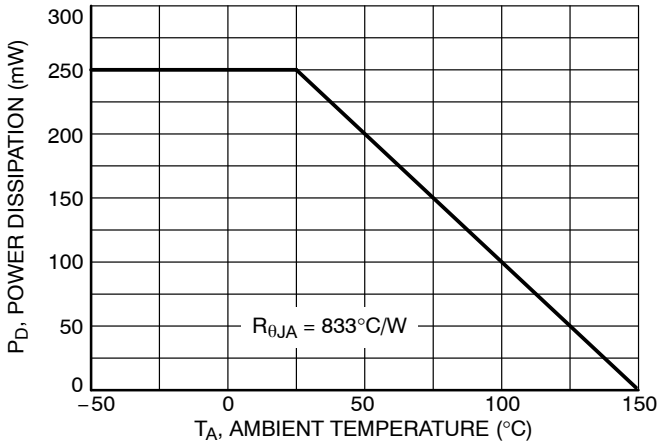


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114EDXV6T1

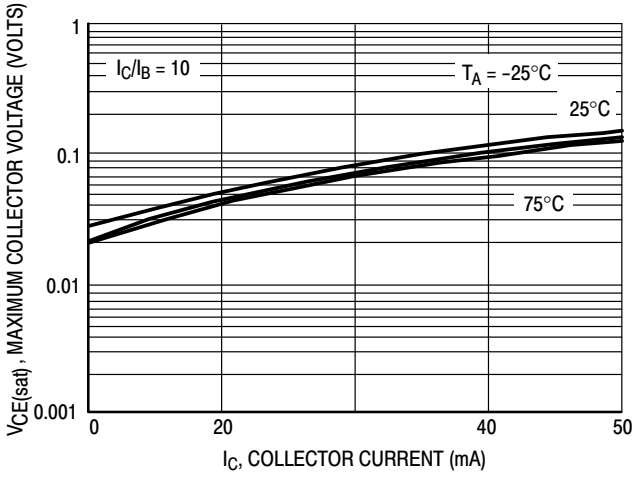


Figure 2. $V_{CE(sat)}$ versus I_C

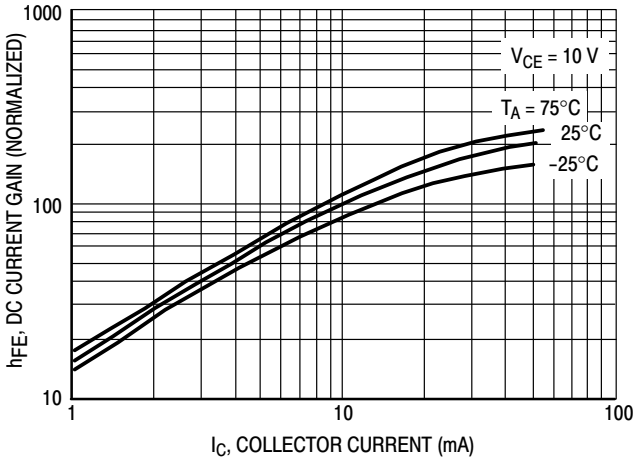


Figure 3. DC Current Gain

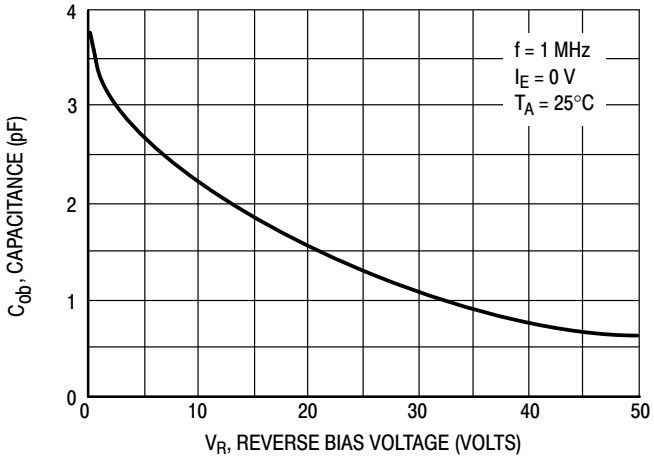


Figure 4. Output Capacitance

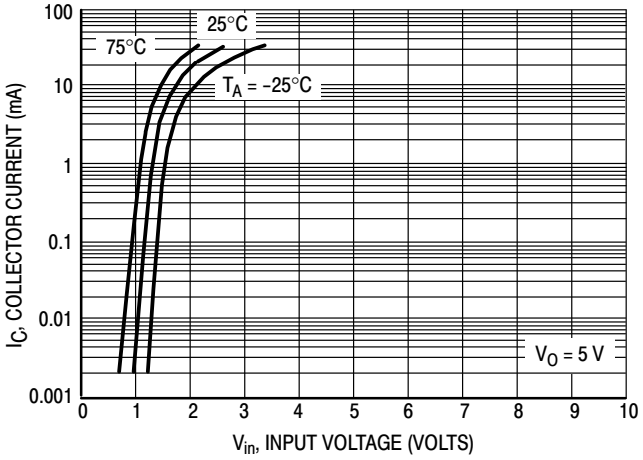


Figure 5. Output Current versus Input Voltage

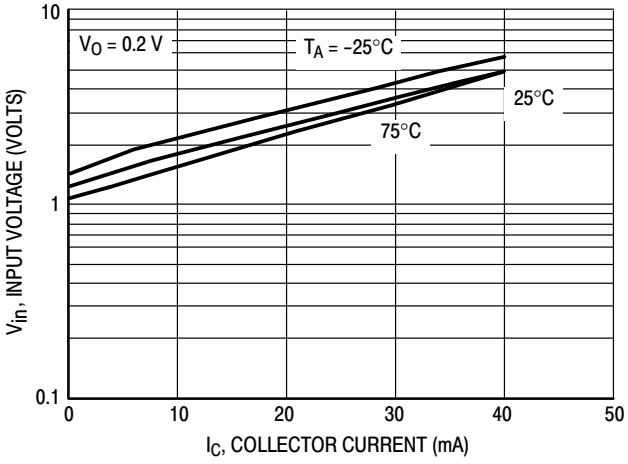


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC124EDXV6T1 / NSVBC124EDXV6T1G

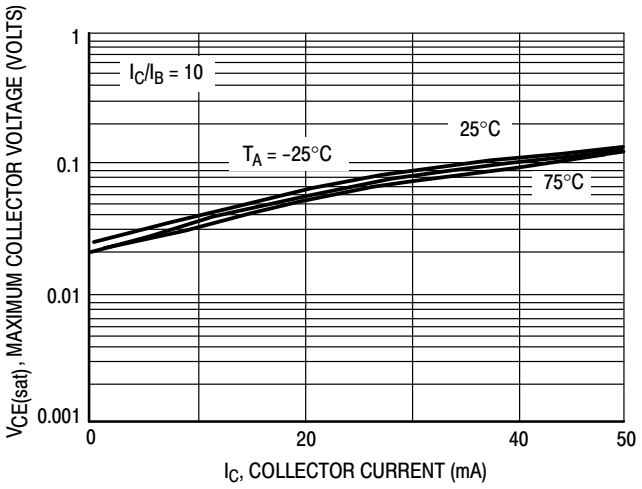


Figure 7. $V_{CE(sat)}$ versus I_C

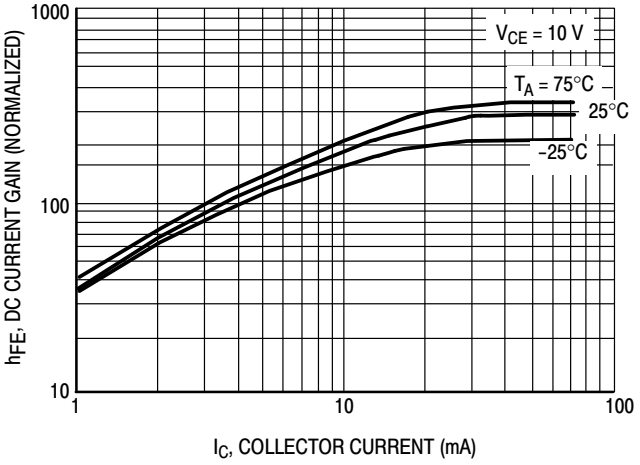


Figure 8. DC Current Gain

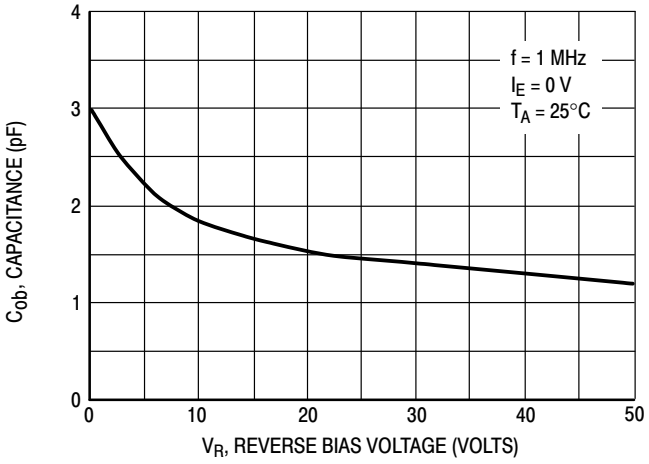


Figure 9. Output Capacitance

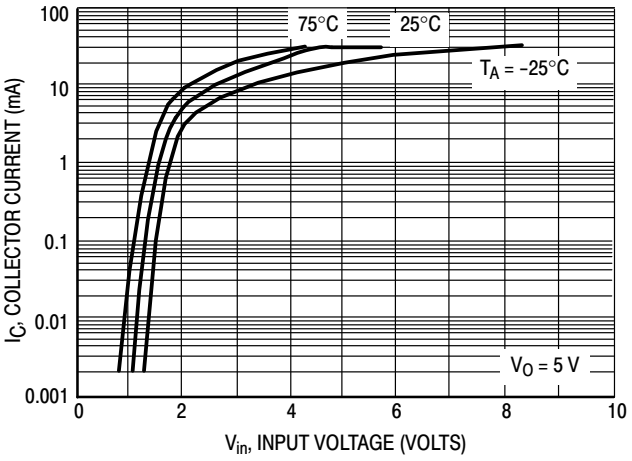


Figure 10. Output Current versus Input Voltage

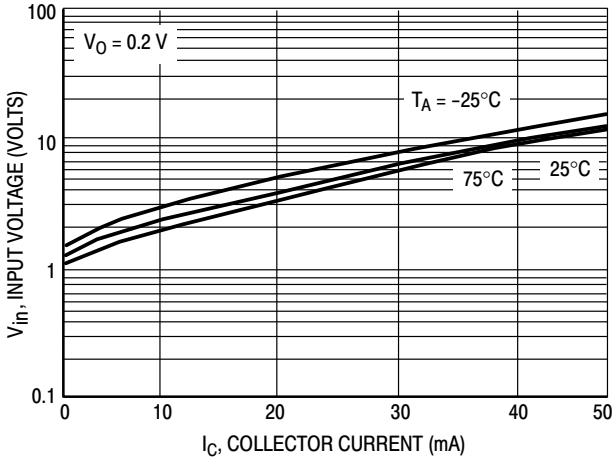


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC144EDXV6T1

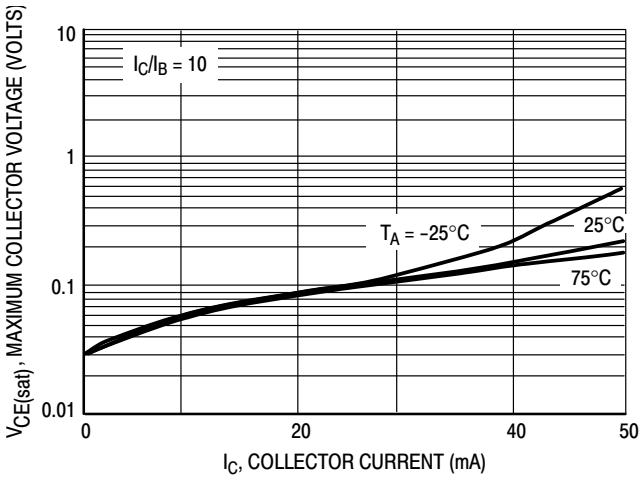


Figure 12. $V_{CE(sat)}$ versus I_C

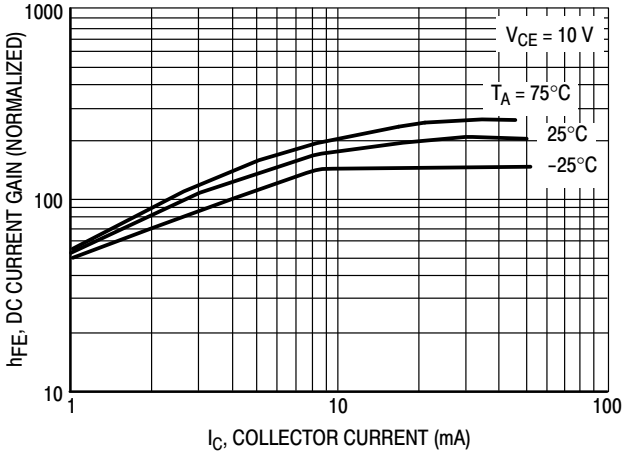


Figure 13. DC Current Gain

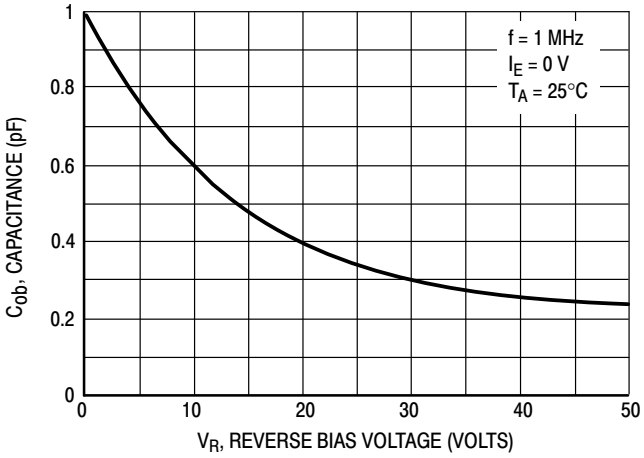


Figure 14. Output Capacitance

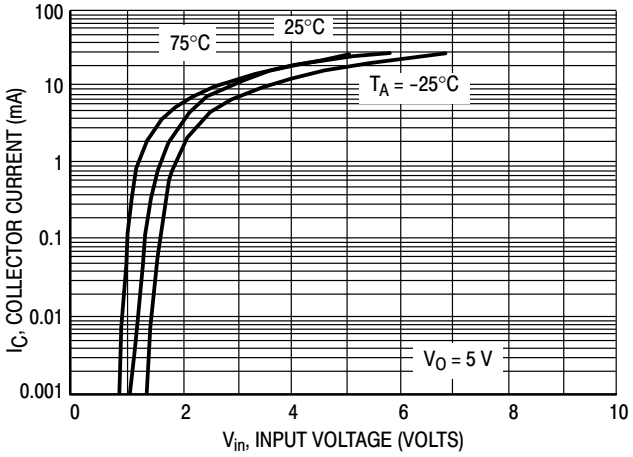


Figure 15. Output Current versus Input Voltage

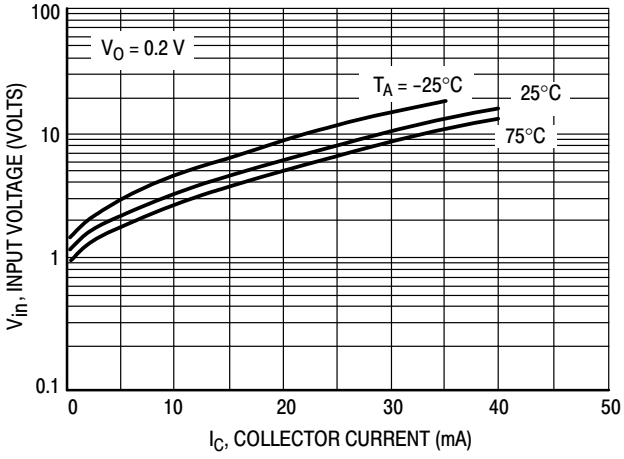


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — NSBC114YDXV6T1

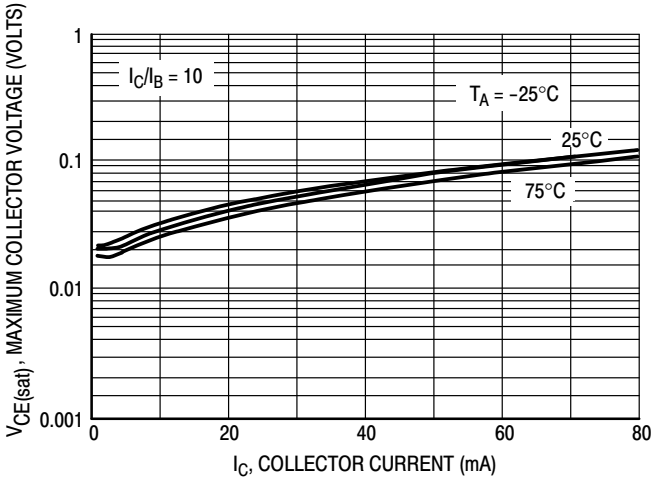


Figure 17. $V_{CE(sat)}$ versus I_C

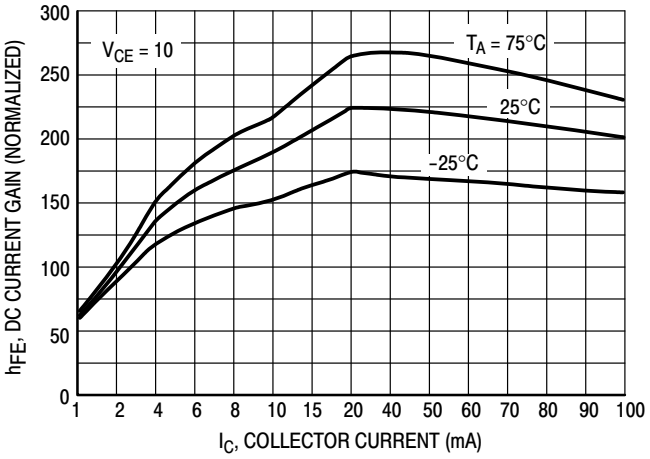


Figure 18. DC Current Gain

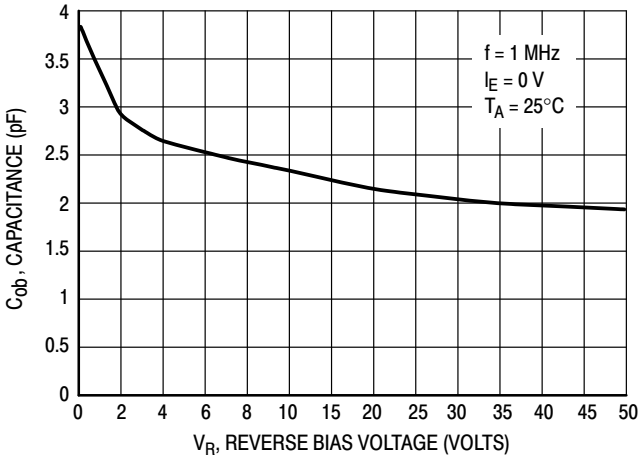


Figure 19. Output Capacitance

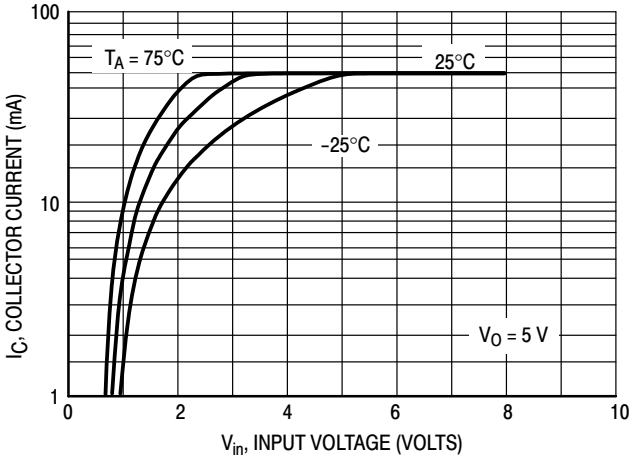


Figure 20. Output Current versus Input Voltage

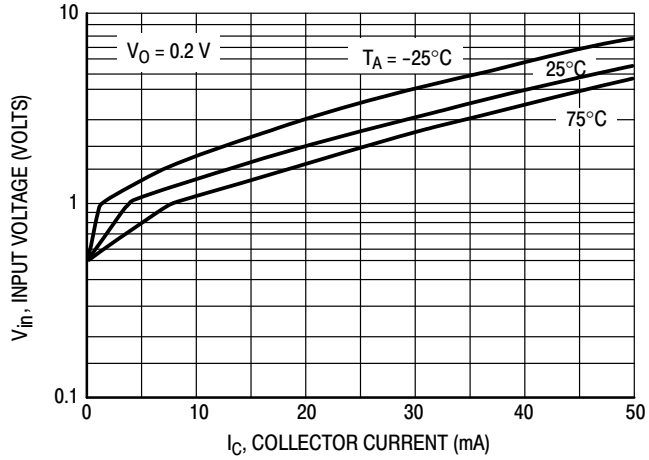
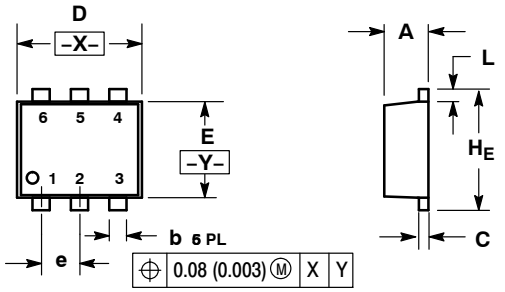


Figure 21. Input Voltage versus Output Current

PACKAGE DIMENSIONS

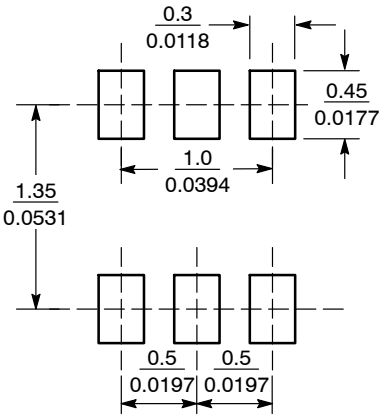
SOT−563, 6 LEAD
CASE 463A
ISSUE F



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.

	MILLIMETERS			INCHES		
DIM	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_E	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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: 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

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