

# Dual General Purpose Transistor

## NST3904DXV6T1G, NSVT3904DXV6T1G, NST3904DXV6T5G

The NST/NSV3904DXV6 device is a spin-off of our popular SOT-23/SOT-323 three-lead device. It is designed for general purpose amplifier applications and is housed in the SOT-563 six-lead surface mount package. By putting two discrete devices in one package, this device is ideal for low-power surface mount applications where board space is at a premium.

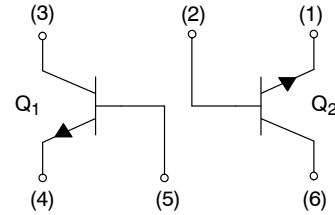
### Features

- $h_{FE}$ , 100–300
- Low  $V_{CE(sat)}$ ,  $\leq 0.4$  V
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- AEC-Q101 Qualified and PPAP Capable – NSVT3904DXV6T1G
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	40	Vdc
Collector – Base Voltage	$V_{CBO}$	60	Vdc
Emitter – Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current – Continuous	$I_C$	200	mAdc
Electrostatic Discharge	HBM MM	ESD >16000 >2000	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

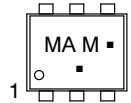


NST/NSV3904DXV6



SOT-563  
CASE 463A  
STYLE 1

### MARKING DIAGRAM



MA = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NST3904DXV6T1G	SOT-563 (Pb-Free)	4000/Tape & Reel
NSVT3904DXV6T1G	SOT-563 (Pb-Free)	4000/Tape & Reel
NST3904DXV6T5G	SOT-563 (Pb-Free)	8000/Tape & Reel
SNST3904DXV6T1G	SOT-563 (Pb-Free)	4000/Tape & Reel
SNST3904DXV6T5G	SOT-563 (Pb-Free)	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.

# NST3904DXV6T1G, NSVT3904DXV6T1G, NST3904DXV6T5G

## THERMAL CHARACTERISTICS

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

1. FR-4 @ Minimum Pad

# NST3904DXV6T1G, NSVT3904DXV6T1G, NST3904DXV6T5G

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

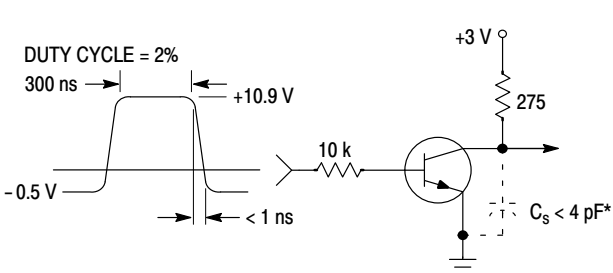
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage (Note 2) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	40	–	V <sub>dc</sub>
Collector – Base Breakdown Voltage (I <sub>C</sub> = 10 μA <sub>dc</sub> , I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	60	–	V <sub>dc</sub>
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0	–	V <sub>dc</sub>
Base Cutoff Current (V <sub>CE</sub> = 30 V <sub>dc</sub> , V <sub>EB</sub> = 3.0 V <sub>dc</sub> )	I <sub>BL</sub>	–	50	nA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 30 V <sub>dc</sub> , V <sub>EB</sub> = 3.0 V <sub>dc</sub> )	I <sub>CEX</sub>	–	50	nA <sub>dc</sub>
<b>ON CHARACTERISTICS (Note 2)</b>				
DC Current Gain (I <sub>C</sub> = 0.1 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )	h <sub>FE</sub>	40 70 100 60 30	– – 300 – –	–
Collector – Emitter Saturation Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 1.0 mA <sub>dc</sub> ) (I <sub>C</sub> = 50 mA <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> )	V <sub>CE(sat)</sub>	– –	0.2 0.3	V <sub>dc</sub>
Base – Emitter Saturation Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 1.0 mA <sub>dc</sub> ) (I <sub>C</sub> = 50 mA <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> )	V <sub>BE(sat)</sub>	0.65 –	0.85 0.95	V <sub>dc</sub>
<b>SMALL – SIGNAL CHARACTERISTICS</b>				
Current – Gain – Bandwidth Product (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 20 V <sub>dc</sub> , f = 100 MHz)	f <sub>T</sub>	300	–	MHz
Output Capacitance (V <sub>CB</sub> = 5.0 V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>obo</sub>	–	4.0	pF
Input Capacitance (V <sub>EB</sub> = 0.5 V <sub>dc</sub> , I <sub>C</sub> = 0, f = 1.0 MHz)	C <sub>ibo</sub>	–	8.0	pF
Input Impedance (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>ie</sub>	1.0 2.0	10 12	k Ω
Voltage Feedback Ratio (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>re</sub>	0.5 0.1	8.0 10	X 10 <sup>-4</sup>
Small – Signal Current Gain (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>fe</sub>	100 100	400 400	–
Output Admittance (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>oe</sub>	1.0 3.0	40 60	μmhos
Noise Figure (V <sub>CE</sub> = 5.0 V <sub>dc</sub> , I <sub>C</sub> = 100 μA <sub>dc</sub> , R <sub>S</sub> = 1.0 k Ω, f = 1.0 kHz)	NF	– –	5.0 4.0	dB

## SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = 3.0 V <sub>dc</sub> , V <sub>BE</sub> = –0.5 V <sub>dc</sub> )	t <sub>d</sub>	–	35	ns
Rise Time	(I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B1</sub> = 1.0 mA <sub>dc</sub> )	t <sub>r</sub>	–	35	
Storage Time	(V <sub>CC</sub> = 3.0 V <sub>dc</sub> , I <sub>C</sub> = 10 mA <sub>dc</sub> )	t <sub>s</sub>	–	200	ns
Fall Time	(I <sub>B1</sub> = I <sub>B2</sub> = 1.0 mA <sub>dc</sub> )	t <sub>f</sub>	–	50	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.



\* Total shunt capacitance of test jig and connectors

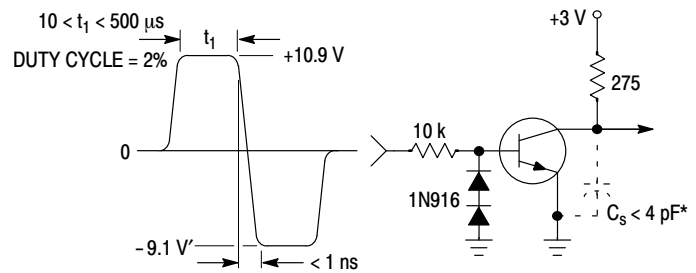


Figure 1. Delay and Rise Time Equivalent Test Circuit

Figure 2. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

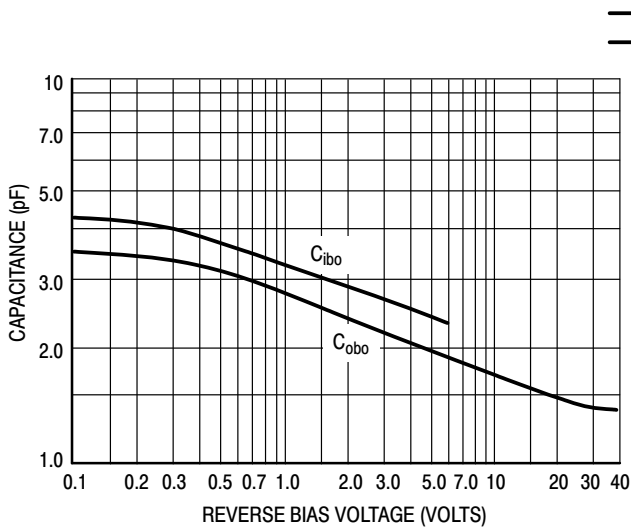


Figure 3. Capacitance

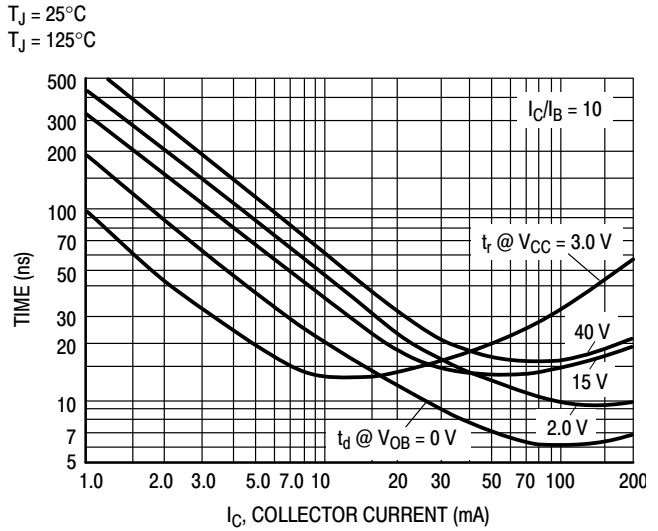


Figure 4. Turn-On Time

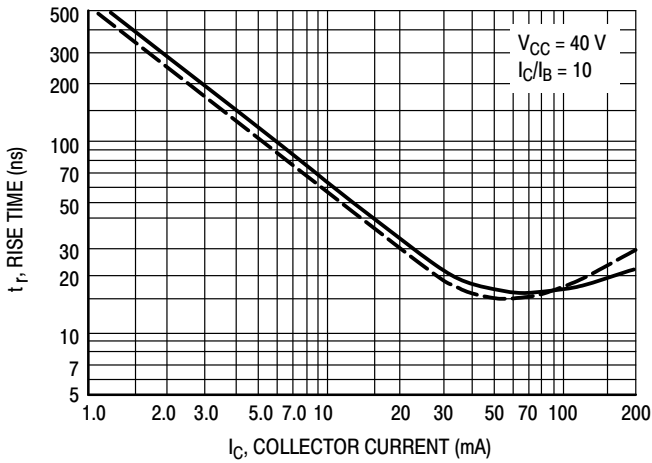


Figure 5. Rise Time

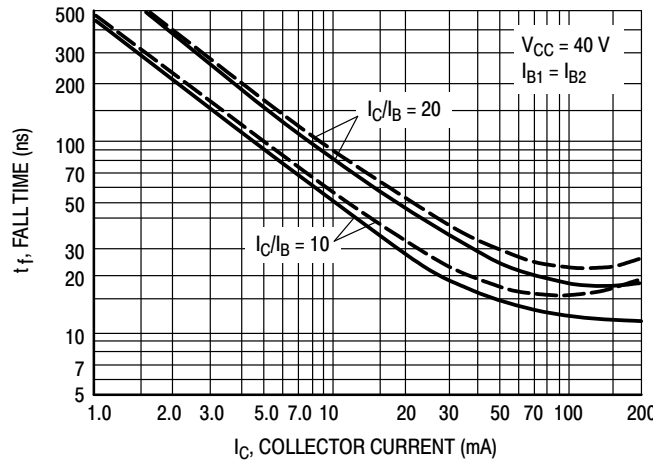


Figure 6. Fall Time

TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS  
NOISE FIGURE VARIATIONS

( $V_{CE} = 5.0$  Vdc,  $T_A = 25^\circ\text{C}$ , Bandwidth = 1.0 Hz)

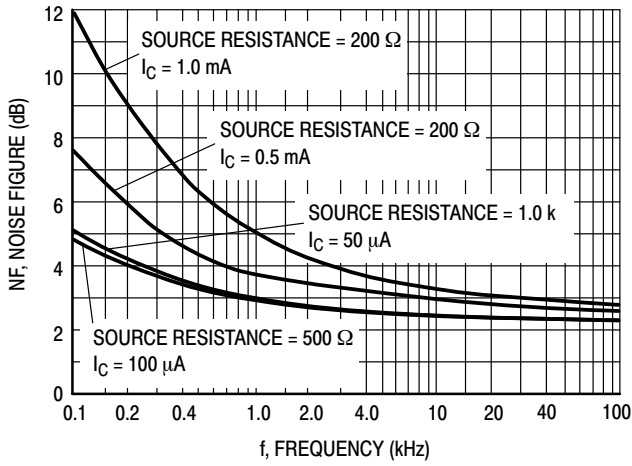


Figure 7. Noise Figure

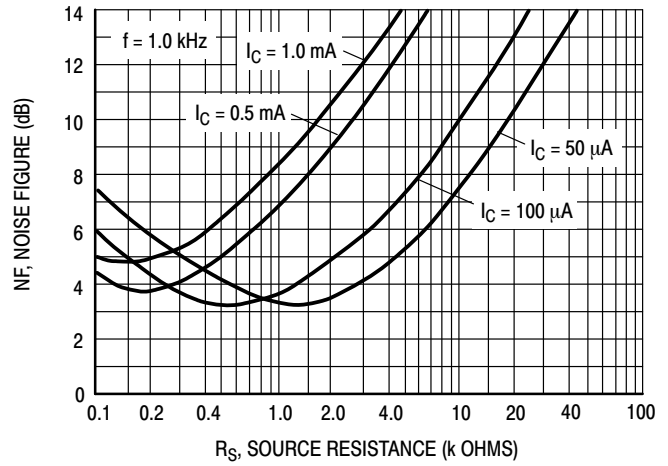


Figure 8. Noise Figure

h PARAMETERS

( $V_{CE} = 10$  Vdc,  $f = 1.0$  kHz,  $T_A = 25^\circ\text{C}$ )

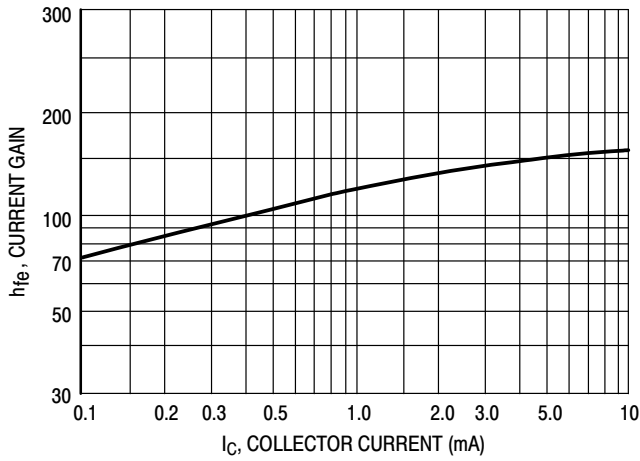


Figure 9. Current Gain

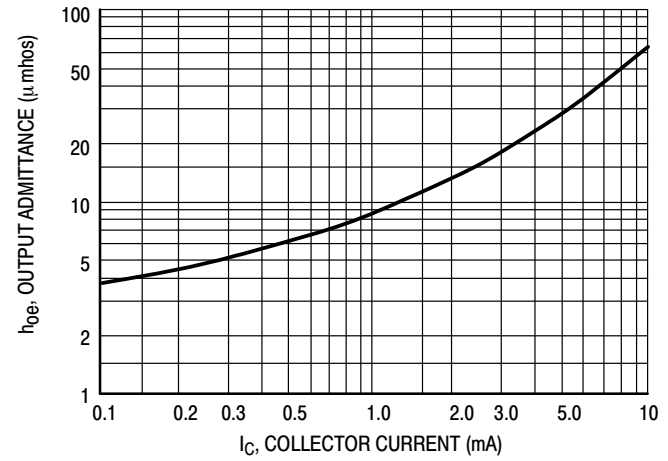


Figure 10. Output Admittance

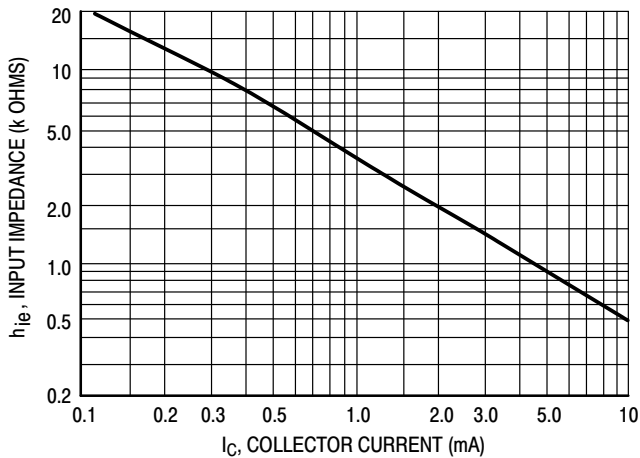


Figure 11. Input Impedance

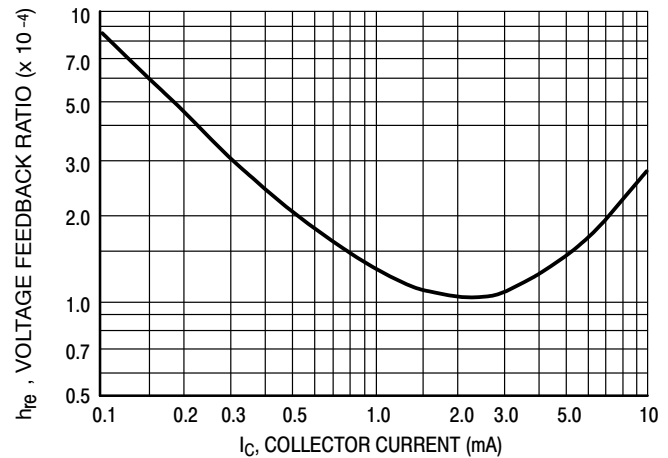


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

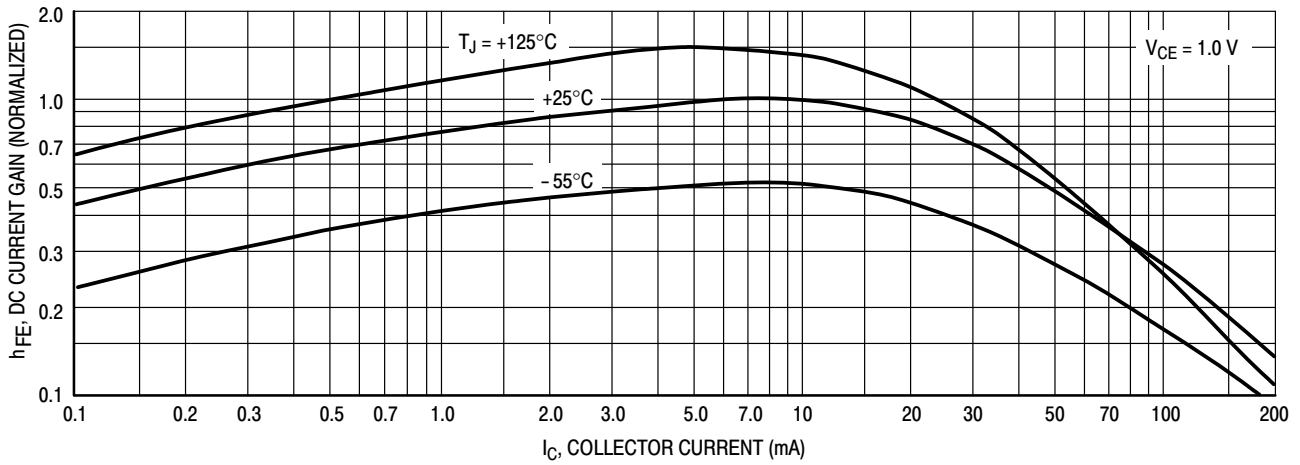


Figure 13. DC Current Gain

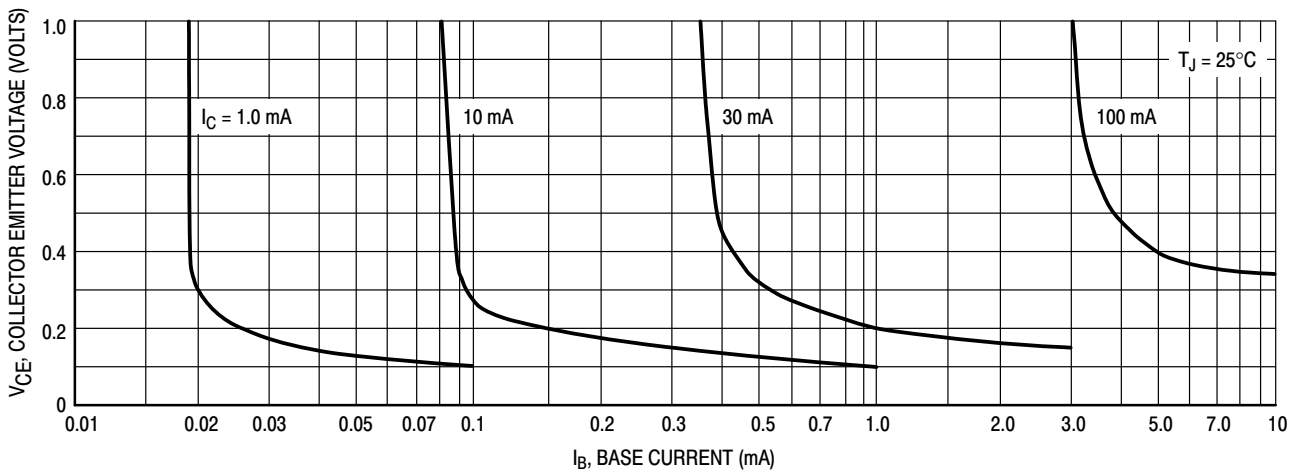


Figure 14. Collector Saturation Region

TYPICAL STATIC CHARACTERISTICS

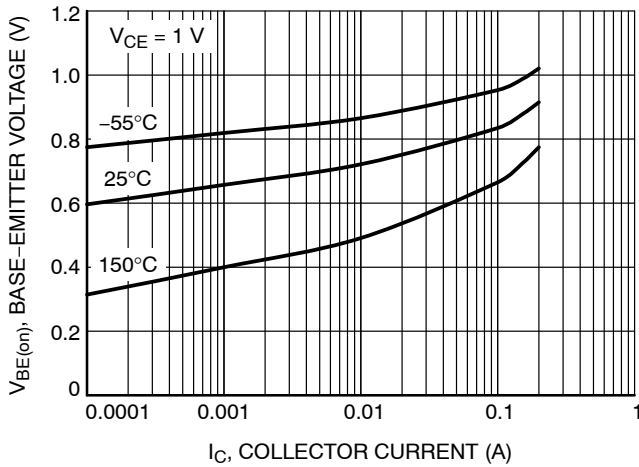


Figure 15. Base Emitter Voltage vs. Collector Current

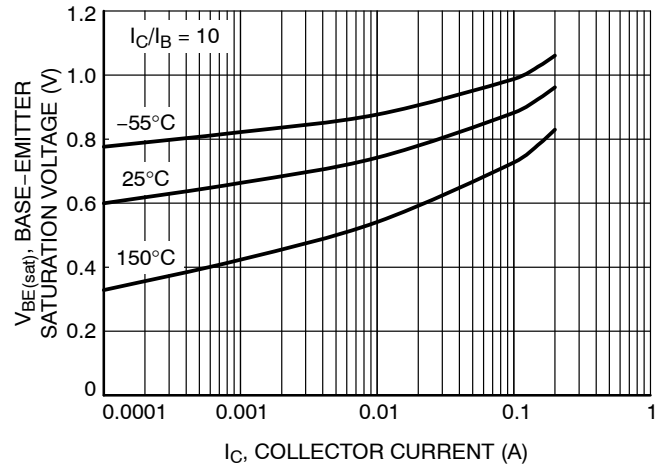


Figure 16. Base Emitter Saturation Voltage vs. Collector Current

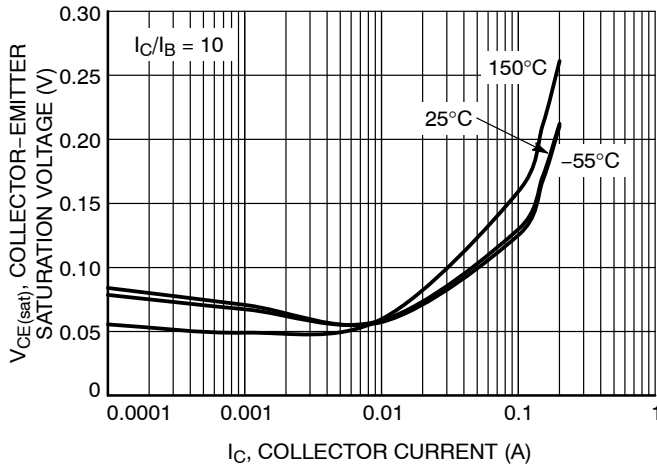


Figure 17. Collector Emitter Saturation Voltage vs. Collector Current

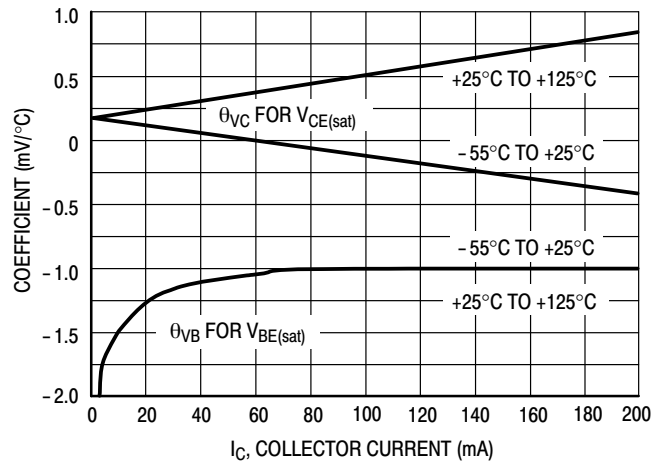


Figure 18. Temperature Coefficients

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

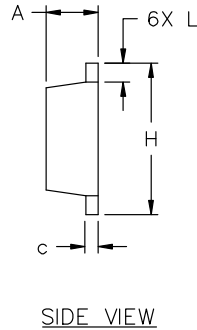
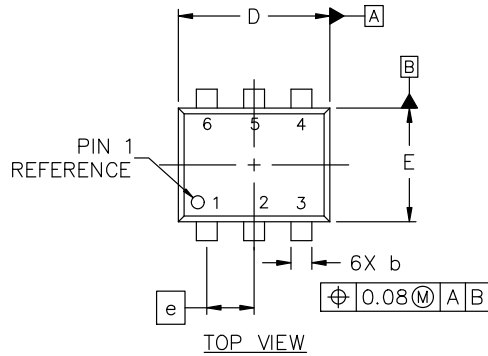


**SOT-563-6 1.60x1.20x0.55, 0.50P**  
**CASE 463A**  
**ISSUE J**

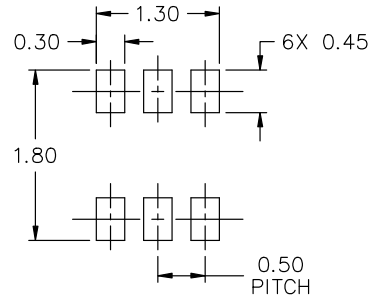
DATE 15 FEB 2024

**NOTES:**

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.50	1.60	1.70
E	1.10	1.20	1.30
e	0.50 BSC		
H	1.50	1.60	1.70
L	0.10	0.20	0.30



**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

**STYLE 5:**  
 PIN 1. CATHODE  
 2. CATHODE  
 3. ANODE  
 4. ANODE  
 5. CATHODE  
 6. CATHODE

**STYLE 6:**  
 PIN 1. CATHODE  
 2. ANODE  
 3. CATHODE  
 4. CATHODE  
 5. CATHODE  
 6. CATHODE

**STYLE 7:**  
 PIN 1. CATHODE  
 2. ANODE  
 3. CATHODE  
 4. CATHODE  
 5. ANODE  
 6. CATHODE

**STYLE 8:**  
 PIN 1. DRAIN  
 2. DRAIN  
 3. GATE  
 4. SOURCE  
 5. DRAIN  
 6. DRAIN

**STYLE 9:**  
 PIN 1. SOURCE 1  
 2. GATE 1  
 3. DRAIN 2  
 4. SOURCE 2  
 5. GATE 2  
 6. DRAIN 1

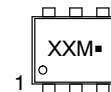
**STYLE 10:**  
 PIN 1. CATHODE 1  
 2. N/C  
 3. CATHODE 2  
 4. ANODE 2  
 5. N/C  
 6. ANODE 1

**STYLE 11:**  
 PIN 1. EMITTER 2  
 2. BASE 2  
 3. COLLECTOR 1  
 4. EMITTER 1  
 5. BASE 1  
 6. COLLECTOR 2

**RECOMMENDED MOUNTING 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.

**GENERIC MARKING DIAGRAM\***



XX = Specific Device Code  
 M = Month Code  
 ■ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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<b>DESCRIPTION:</b>	<b>SOT-563-6 1.60x1.20x0.55, 0.50P</b>	<b>PAGE 1 OF 1</b>

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