

# NST3904F3T5G

## NPN General Purpose Transistor

The NST3904F3T5G device is a spin-off of our popular SOT-23/SOT-323/SOT-563/SOT-963 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SOT-1123 surface mount 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
- Reduces Board Space
- This is a Pb-Free Device

### 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

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 1)	290 2.3	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	432	$^\circ\text{C}/\text{W}$
Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 2)	347 2.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	360	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Lead 3	$R_{\psi JL}$ (Note 2)	143	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

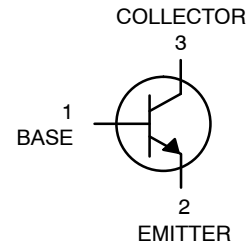
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 100 mm<sup>2</sup> 1 oz, copper traces.
2. 500 mm<sup>2</sup> 1 oz, copper traces.

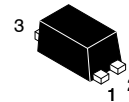


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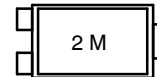


NST3904F3T5G



SOT-1123  
CASE 524AA  
STYLE 1

### MARKING DIAGRAM



2 = Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NST3904F3T5G	SOT-1123 (Pb-Free)	8000/Tape & Reel

<sup>†</sup>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.

# NST3904F3T5G

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector – Emitter Breakdown Voltage (Note 3) (I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	40	–	Vdc
Collector – Base Breakdown Voltage (I <sub>C</sub> = 10 μAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	60	–	Vdc
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 μAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 30 Vdc, V <sub>EB</sub> = 3.0 Vdc)	I <sub>CEX</sub>	–	50	nAdc

### ON CHARACTERISTICS (Note 3)

DC Current Gain (I <sub>C</sub> = 0.1 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 50 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	40 70 100 60 30	– – 300 – –	–
Collector – Emitter Saturation Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc) (I <sub>C</sub> = 50 mAdc, I <sub>B</sub> = 5.0 mAdc)	V <sub>CE(sat)</sub>	– –	0.2 0.3	Vdc
Base – Emitter Saturation Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc) (I <sub>C</sub> = 50 mAdc, I <sub>B</sub> = 5.0 mAdc)	V <sub>BE(sat)</sub>	0.65 –	0.85 1.0	Vdc

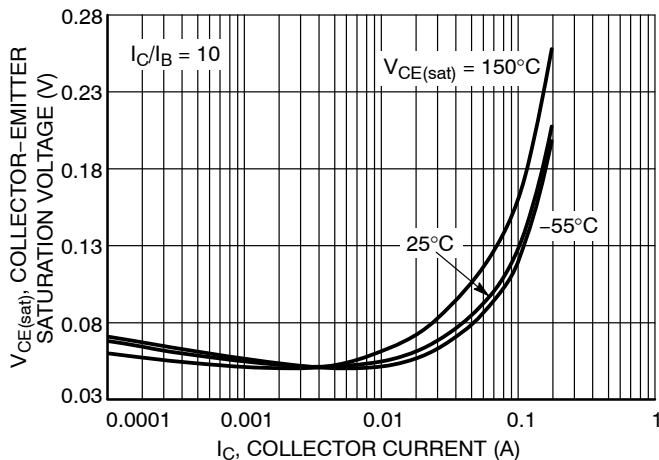
### SMALL-SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 20 Vdc, f = 100 MHz)	f <sub>T</sub>	200	–	MHz
Output Capacitance (V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>obo</sub>	–	4.0	pF
Input Capacitance (V <sub>EB</sub> = 0.5 Vdc, I <sub>C</sub> = 0, f = 1.0 MHz)	C <sub>ibo</sub>	–	8.0	pF
Noise Figure (V <sub>CE</sub> = 5.0 Vdc, I <sub>C</sub> = 100 μAdc, R <sub>S</sub> = 1.0 kΩ, f = 1.0 kHz)	NF	–	5.0	dB

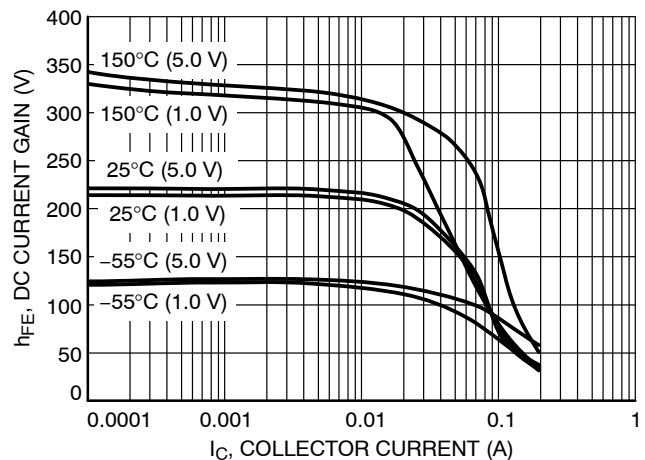
### SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = 3.0 Vdc, V <sub>BE</sub> = –0.5 Vdc)	t <sub>d</sub>	–	35	ns
Rise Time	(I <sub>C</sub> = 10 mAdc, I <sub>B1</sub> = 1.0 mAdc)	t <sub>r</sub>	–	35	
Storage Time	(V <sub>CC</sub> = 3.0 Vdc, I <sub>C</sub> = 10 mAdc)	t <sub>s</sub>	–	275	ns
Fall Time	(I <sub>B1</sub> = I <sub>B2</sub> = 1.0 mAdc)	t <sub>f</sub>	–	50	

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

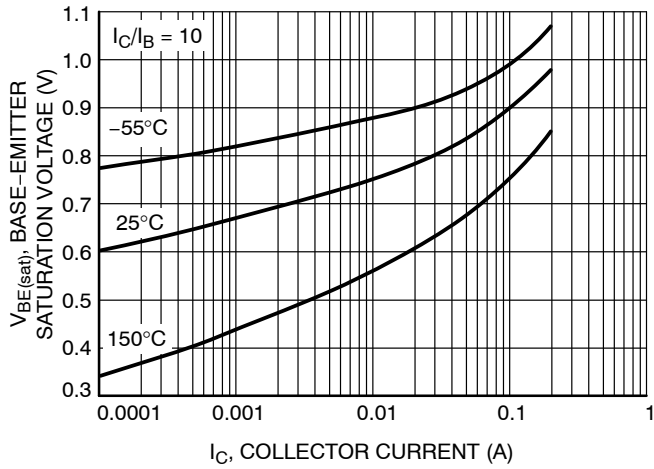


**Figure 1. Collector Emitter Saturation Voltage vs. Collector Current**

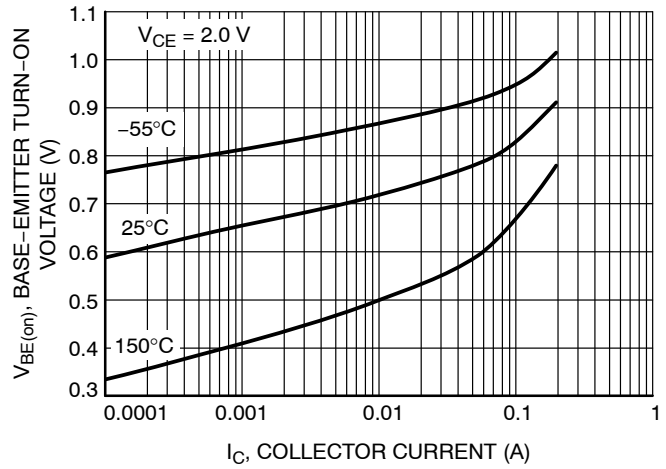


**Figure 2. DC Current Gain vs. Collector Current**

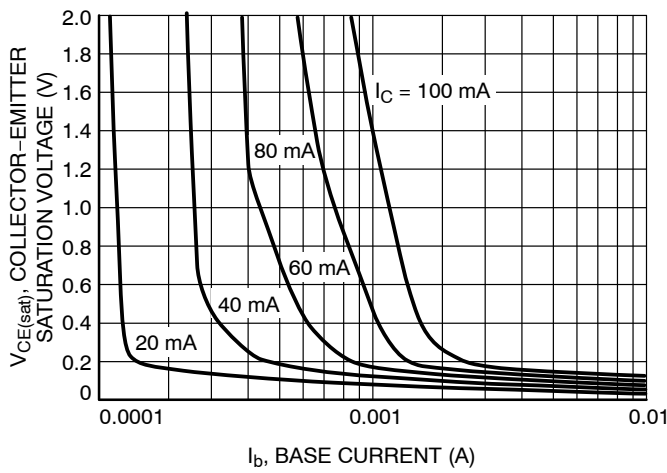
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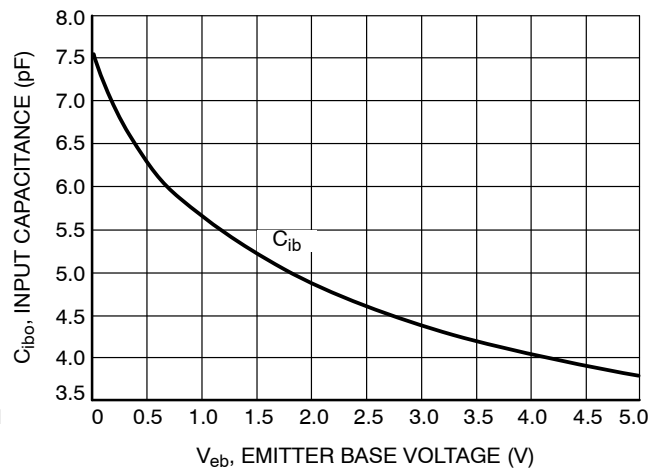
**Figure 3. Base Emitter Saturation Voltage vs. Collector Current**



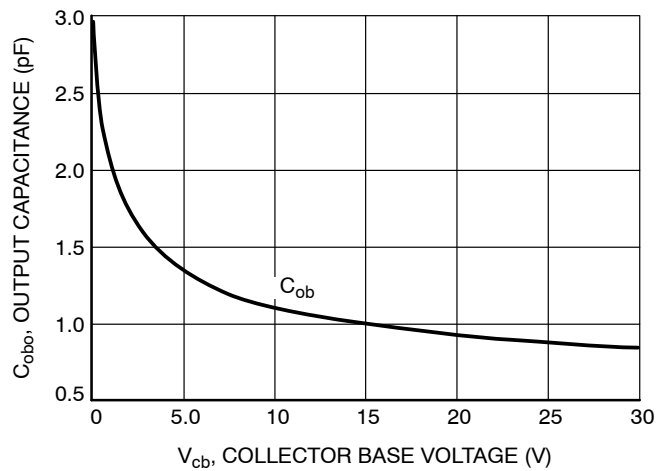
**Figure 4. Base Emitter Turn-On Voltage vs. Collector Current**



**Figure 5. Saturation Region**



**Figure 6. Input Capacitance**

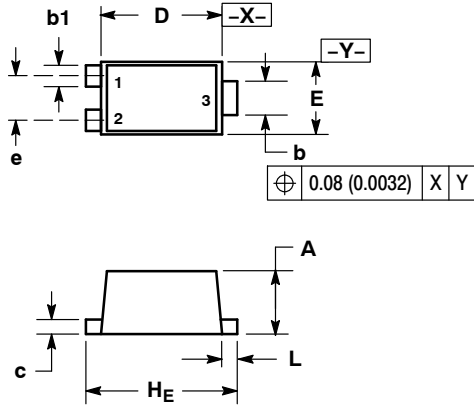


**Figure 7. Output Capacitance**

# NST3904F3T5G

## PACKAGE DIMENSIONS

SOT-1123  
CASE 524AA-01  
ISSUE A

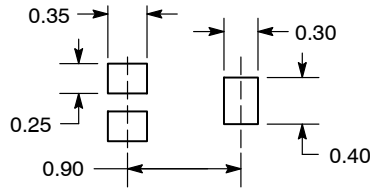


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.34	0.37	0.40	0.013	0.015	0.016
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.10	0.15	0.20	0.004	0.006	0.008
c	0.07	0.12	0.17	0.003	0.005	0.007
D	0.75	0.80	0.85	0.030	0.031	0.033
E	0.55	0.60	0.65	0.022	0.024	0.026
e	0.35			0.014		
HE	0.95	1.00	1.05	0.037	0.039	0.041
L	0.05	0.10	0.15	0.002	0.004	0.006

STYLE 1:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

### SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*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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