

# NST3906DP6T5G

## Dual General Purpose Transistor

The NST3906DP6T5G device is a spin-off of our popular SOT-23/SOT-323/SOT-563 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SOT-963 six-leaded 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
- This is a Pb-Free Device

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	–40	V
Collector – Base Voltage	$V_{CBO}$	–40	V
Emitter – Base Voltage	$V_{EBO}$	–5.0	V
Collector Current – Continuous	$I_C$	–200	mA
Electrostatic Discharge	HBM MM	ESD Class 2 B	

### THERMAL CHARACTERISTICS

Characteristic (Single Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ (Note 1)	$P_D$	240 1.9	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	520	$^\circ\text{C}/\text{W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ (Note 2)	$P_D$	280 2.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	446	$^\circ\text{C}/\text{W}$
Characteristic (Dual Heated) (Note 3)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ (Note 1)	$P_D$	350 2.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ (Note 2)	$P_D$	420 3.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	297	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	–55 to +150	$^\circ\text{C}$

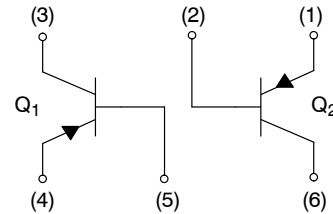
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
2. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.
3. Dual heated values assume total power is sum of two equally powered channels.

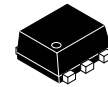


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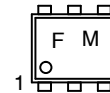


NST3906DP6T5G



SOT-963  
CASE 527AD

### MARKING DIAGRAM



F = Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NST3906DP6T5G	SOT-963 (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.

# NST3906DP6T5G

## 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 4) (I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	-40	-	V
Collector – Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	-40	-	V
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 μA, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	-5.0	-	V
Collector Cutoff Current (V <sub>CE</sub> = 30 Vdc, V <sub>EB</sub> = 3.0 Vdc)	I <sub>CEX</sub>	-	-50	nA

## ON CHARACTERISTICS (Note 4)

DC Current Gain (I <sub>C</sub> = -0.1 mA, V <sub>CE</sub> = -1.0 V) (I <sub>C</sub> = -1.0 mA, V <sub>CE</sub> = -1.0 V) (I <sub>C</sub> = -10 mA, V <sub>CE</sub> = -1.0 V) (I <sub>C</sub> = -50 mA, V <sub>CE</sub> = -1.0 V) (I <sub>C</sub> = -100 mA, V <sub>CE</sub> = -1.0 V)	h <sub>FE</sub>	60 80 100 60 30	- - 300 - -	-
Collector – Emitter Saturation Voltage (I <sub>C</sub> = -10 mA, I <sub>B</sub> = -1.0 mA) (I <sub>C</sub> = -50 mA, I <sub>B</sub> = -5.0 mA)	V <sub>CE(sat)</sub>	- -	-0.25 -0.4	V
Base – Emitter Saturation Voltage (I <sub>C</sub> = -10 mA, I <sub>B</sub> = -1.0 mA) (I <sub>C</sub> = -50 mA, I <sub>B</sub> = -5.0 mA)	V <sub>BE(sat)</sub>	-0.65 -	-0.85 -0.95	V

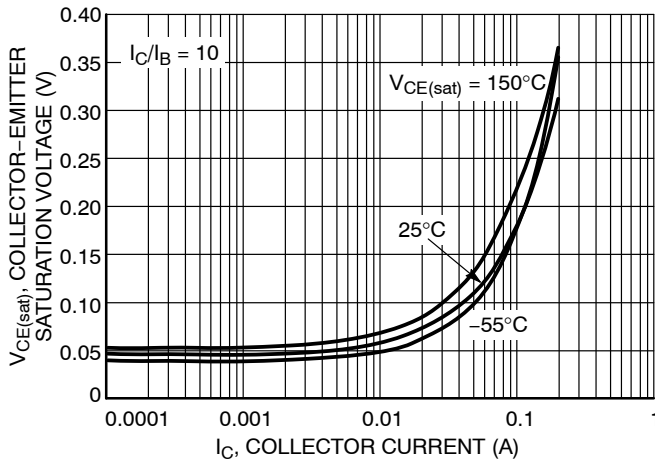
## SMALL-SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 20 Vdc, f = 100 MHz)	f <sub>T</sub>	250	-	MHz
Output Capacitance (V <sub>CB</sub> = -5.0 V, I <sub>E</sub> = 0 mA, f = 1.0 MHz)	C <sub>obo</sub>	-	4.5	pF
Input Capacitance (V <sub>EB</sub> = -0.5 V, I <sub>E</sub> = 0 mA, f = 1.0 MHz)	C <sub>ibo</sub>	-	10.0	pF
Noise Figure (V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA, R <sub>S</sub> = 1.0 kΩ, f = 1.0 kHz)	NF	-	4.0	dB

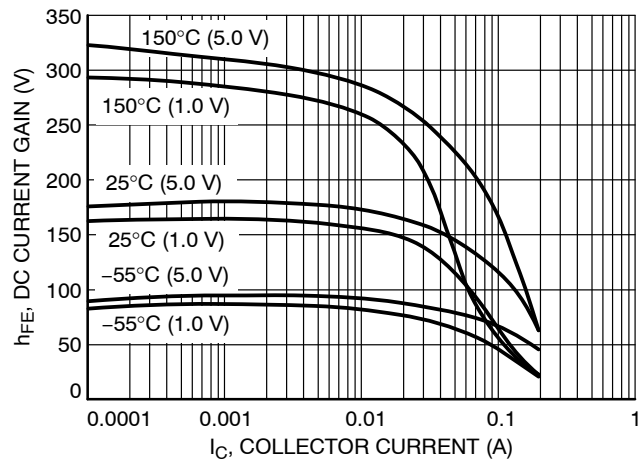
## SWITCHING CHARACTERISTICS

Delay Time (V <sub>CC</sub> = -3.0 V, V <sub>BE</sub> = 0.5 V)	t <sub>d</sub>	-	35	ns
Rise Time (I <sub>C</sub> = -10 mA, I <sub>B1</sub> = -1.0 mA)	t <sub>r</sub>	-	35	
Storage Time (V <sub>CC</sub> = -3.0 V, I <sub>C</sub> = -10 mA)	t <sub>s</sub>	-	250	ns
Fall Time (I <sub>B1</sub> = I <sub>B2</sub> = -1.0 mA)	t <sub>f</sub>	-	50	

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

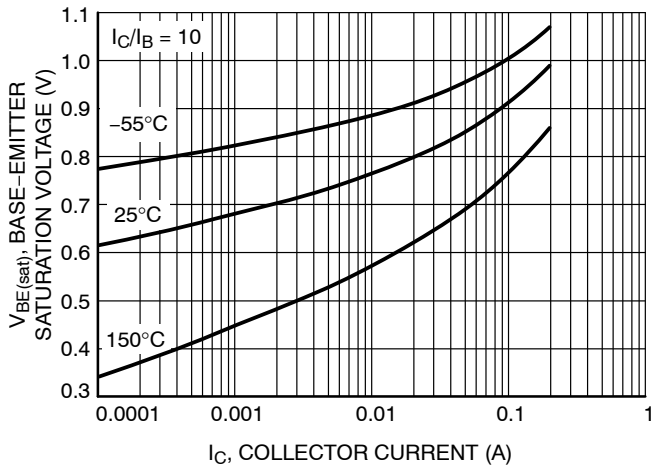


**Figure 1. Collector Emitter Saturation Voltage vs. Collector Current**

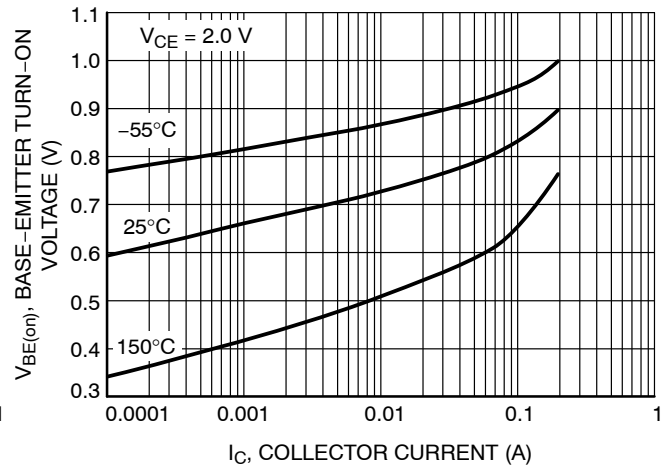


**Figure 2. DC Current Gain vs. Collector Current**

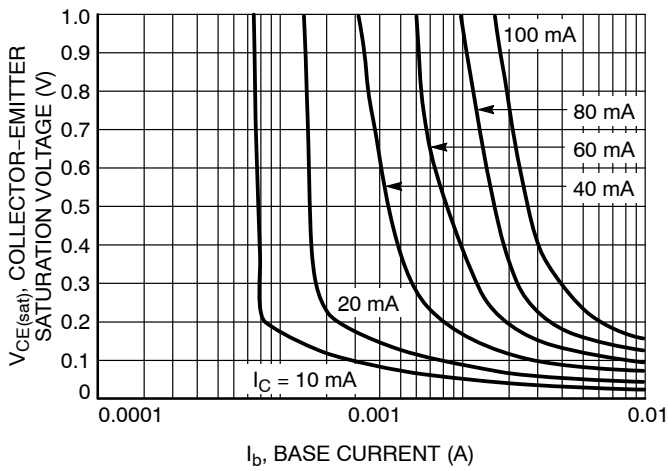
# NST3906DP6T5G



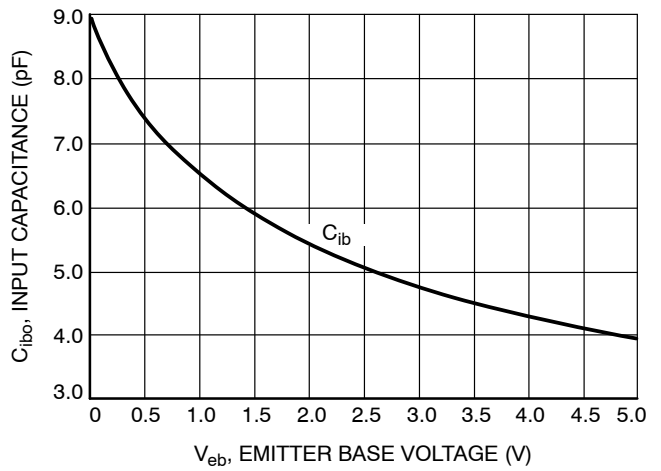
**Figure 3. Base Emitter Saturation Voltage vs. Collector Current**



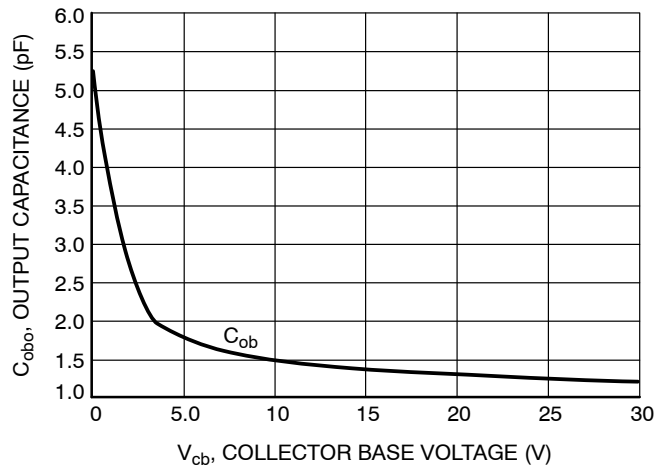
**Figure 4. Base Emitter Turn-On Voltage vs. Collector Current**



**Figure 5. Saturation Region**



**Figure 6. Input Capacitance**



**Figure 7. Output Capacitance**

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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SCALE 4:1

**SOT-963**  
CASE 527AD-01  
ISSUE E

DATE 09 FEB 2010



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H <sub>E</sub>	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15

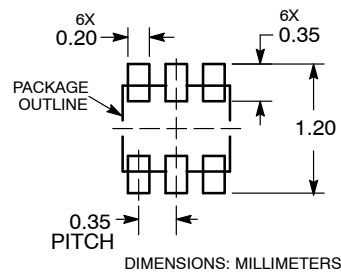
**GENERIC MARKING DIAGRAM\***



X = Specific Device Code  
M = Month Code

\*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.

**RECOMMENDED MOUNTING FOOTPRINT**



- 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. EMITTER2  
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. SOURCE3  
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

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