## NPN General Purpose Transistor

## NST3904F3T5G

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

- $\mathrm{h}_{\mathrm{FE}}, 100-300$
- Low $\mathrm{V}_{\mathrm{CE}(\mathrm{sat})}, \leq 0.4 \mathrm{~V}$
- Reduces Board Space
- This is a $\mathrm{Pb}-$ Free Device


## MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
| :--- | :---: | :---: | :---: |
| Collector-Emitter Voltage | $\mathrm{V}_{\text {CEO }}$ | 40 | Vdc |
| Collector-Base Voltage | $\mathrm{V}_{\text {CBO }}$ | 60 | Vdc |
| Emitter-Base Voltage | $\mathrm{V}_{\text {EBO }}$ | 6.0 | Vdc |
| Collector Current - Continuous | $\mathrm{I}_{\mathrm{C}}$ | 200 | mAdc |

THERMAL CHARACTERISTICS
$\left.\begin{array}{|c|c|c|c|}\hline \text { Characteristic } & \text { Symbol } & \text { Max } & \text { Unit } \\ \hline \begin{array}{c}\text { Total Device Dissipation, } \mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C} \\ \text { Derate above } 25^{\circ} \mathrm{C}\end{array} & \begin{array}{c}\mathrm{P}_{\mathrm{D}} \\ (\text { Note 1) }\end{array} & \begin{array}{c}290 \\ 2.3\end{array} & \begin{array}{c}\mathrm{mW} \\ \mathrm{mW} /{ }^{\circ} \mathrm{C}\end{array} \\ \hline \begin{array}{c}\text { Thermal Resistance, } \\ \text { Junction-to-Ambient }\end{array} & \mathrm{R}_{\text {日JA }} & 432 & { }^{\circ} \mathrm{C} / \mathrm{W} \\ (\text { Note 1) }\end{array}\right)$

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. $100 \mathrm{~mm}^{2} 1 \mathrm{oz}$, copper traces.
2. $500 \mathrm{~mm}^{2} 1 \mathrm{oz}$, copper traces.


EMITTER


SOT-1123
CASE 524AA STYLE 1

## MARKING DIAGRAM

2 M

2 = Device Code
M = Date Code

## ORDERING INFORMATION

| Device | Package | Shipping $^{\dagger}$ |
| :---: | :---: | :---: |
| NST3904F3T5G | SOT-1123 <br> (Pb-Free) | 8000 / Tape \& Reel |

$\dagger$ 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.

ELECTRICAL CHARACTERISTICS $\left(\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}\right.$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
| :---: | :---: | :---: | :---: | :---: |
| OFF CHARACTERISTICS |  |  |  |  |
| Collector-Emitter Breakdown Voltage (Note 3) ( $\mathrm{I}_{\mathrm{C}}=1.0 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=0$ ) | $\mathrm{V}_{\text {(BR) }}$ CEO | 40 | - | Vdc |
| Collector-Base Breakdown Voltage ( $\mathrm{I}_{\mathrm{C}}=10 \mu \mathrm{Adc}, \mathrm{I}_{\mathrm{E}}=0$ ) | $\mathrm{V}_{\text {(BR) } \mathrm{CBO}}$ | 60 | - | Vdc |
| Emitter-Base Breakdown Voltage ( $\mathrm{I}_{\mathrm{E}}=10 \mu \mathrm{Adc}, \mathrm{I}_{\mathrm{C}}=0$ ) | $\mathrm{V}_{(\mathrm{BR}) \text { EBO }}$ | 6.0 | - | Vdc |
| Collector Cutoff Current ( $\mathrm{V}_{\mathrm{CE}}=30 \mathrm{Vdc}$, $\left.\mathrm{V}_{\mathrm{EB}}=3.0 \mathrm{Vdc}\right)$ | $I_{\text {CEX }}$ | - | 50 | nAdc |

ON CHARACTERISTICS (Note 3)

| DC Current Gain $\begin{aligned} & \left(\begin{array}{l} \left(\mathrm{I}_{\mathrm{C}}=0.1 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=1.0 \mathrm{Vdc}\right) \\ \left(\mathrm{I}_{\mathrm{C}}=1.0 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=1.0 \mathrm{Vdc}\right) \\ \left(\mathrm{I}_{\mathrm{C}}=10 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=1.0 \mathrm{Vdc}\right) \\ \left(\mathrm{I}_{\mathrm{C}}=50 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=1.0 \mathrm{Vdc}\right) \\ \left(\mathrm{ICC}_{\mathrm{C}}=100 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=1.0 \mathrm{Vdc}\right) \end{array}\right. \end{aligned}$ | $\mathrm{h}_{\text {FE }}$ | $\begin{gathered} 40 \\ 70 \\ 100 \\ 60 \\ 30 \end{gathered}$ | $\begin{gathered} - \\ - \\ 300 \\ - \\ - \end{gathered}$ | - |
| :---: | :---: | :---: | :---: | :---: |
| Collector-Emitter Saturation Voltage $\left(I_{C}=10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=1.0 \mathrm{mAdc}\right)$ ( $\mathrm{I}_{\mathrm{C}}=50 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=5.0 \mathrm{mAdc}$ ) | $\mathrm{V}_{\text {CE(sat) }}$ | - | $\begin{aligned} & 0.2 \\ & 0.3 \end{aligned}$ | Vdc |
| Base-Emitter Saturation Voltage $\left(I_{C}=10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=1.0 \mathrm{mAdc}\right)$ ( $\mathrm{I}_{\mathrm{C}}=50 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=5.0 \mathrm{mAdc}$ ) | $V_{\text {BE (sat) }}$ | $0.65$ | $\begin{gathered} 0.85 \\ 1.0 \end{gathered}$ | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| Current-Gain - Bandwidth Product $\left(\mathrm{I}_{\mathrm{C}}=10 \mathrm{mAdc}, \mathrm{V}_{\mathrm{CE}}=20 \mathrm{Vdc}, \mathrm{f}=100 \mathrm{MHz}\right)$ | $\mathrm{f}_{\mathrm{T}}$ | 200 | - | MHz |
| :--- | :---: | :---: | :---: | :---: |
| Output Capacitance $\left(\mathrm{V}_{\mathrm{CB}}=5.0 \mathrm{Vdc}, \mathrm{I}_{\mathrm{E}}=0, \mathrm{f}=1.0 \mathrm{MHz}\right)$ | $\mathrm{C}_{\mathrm{obo}}$ | - | 4.0 | pF |
| Input Capacitance $\left(\mathrm{V}_{\mathrm{EB}}=0.5 \mathrm{Vdc}, \mathrm{I}_{\mathrm{C}}=0, \mathrm{f}=1.0 \mathrm{MHz}\right)$ | $\mathrm{C}_{\mathrm{ibo}}$ | - | 8.0 | pF |
| Noise Figure $\left(\mathrm{V}_{\mathrm{CE}}=5.0 \mathrm{Vdc}, \mathrm{I}_{\mathrm{C}}=100 \mu \mathrm{Adc}, \mathrm{R}_{\mathrm{S}}=1.0 \mathrm{k} \Omega, \mathrm{f}=1.0 \mathrm{kHz}\right)$ | NF | - | 5.0 | dB |

## SWITCHING CHARACTERISTICS

| Delay Time | $\left(\mathrm{V}_{\mathrm{CC}}=3.0 \mathrm{Vdc}, \mathrm{V}_{\mathrm{BE}}=-0.5 \mathrm{Vdc}\right)$ | $\mathrm{t}_{\mathrm{d}}$ | - | 35 |
| :--- | :--- | :--- | :---: | :---: |
| Rise Time | $\left(\mathrm{I}_{\mathrm{C}}=10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B} 1}=1.0 \mathrm{mAdc}\right)$ | $\mathrm{t}_{\mathrm{r}}$ | - | 35 |
| Storage Time | $\left(\mathrm{V}_{\mathrm{CC}}=3.0 \mathrm{Vdc}, \mathrm{I}_{\mathrm{C}}=10 \mathrm{mAdc}\right)$ | $\mathrm{t}_{\mathrm{s}}$ | - | 275 |
| Fall Time | $\left(\mathrm{I}_{\mathrm{B} 1}=\mathrm{I}_{\mathrm{B} 2}=1.0 \mathrm{mAdc}\right)$ | $\mathrm{t}_{\mathrm{f}}$ | - | 275 |

3. Pulse Test: Pulse Width $\leq 300 \mu$ s; Duty Cycle $\leq 2.0 \%$.


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

$\mathrm{I}_{\mathrm{C}}$, COLLECTOR CURRENT (A)
Figure 2. DC Current Gain vs. Collector Current

$\mathrm{I}_{\mathrm{C}}$, COLLECTOR CURRENT (A)
Figure 3. Base Emitter Saturation Voltage vs. Collector Current


Figure 5. Saturation Region

$\mathrm{I}_{\mathrm{C}}$, COLLECTOR CURRENT (A)
Figure 4. Base Emitter Turn-On Voltage vs. Collector Current


Figure 6. Input Capacitance


Figure 7. Output Capacitance


## SOT-1123 0.80x0.60x0.37, 0.35P <br> CASE 524AA <br> ISSUE D

DATE 18 JAN 2024


SIDE VIEW


## GENERIC MARKING DIAGRAM*


X = Specific Device Code
M = Date Code
*This information is generic. Please refer to device data sheet for actual part marking. $\mathrm{Pb}-\mathrm{Free}$ indicator, " G " or microdot " * ", may or may not be present. Some products may not follow the Generic Marking.

NDTES:

1. DIMENSIUNING AND TQLERANCING PER ASME Y14.5M, 2018,
2. CONTROLLING DIMENSIDN: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS IF BASE MATERIAL.
4. DIMENSIUNS D AND E D N T INCLUDE MULD FLASH, PRITRUSIUNS, QR GATE BURRS.

| MILLIMETERS |  |  |  |
| :---: | :---: | :---: | :---: |
| DIM | MIN | NDM | MAX |
| A | 0.34 | 0.37 | 0.40 |
| $b$ | 0.15 | 0.22 | 0.28 |
| b1 | 0.10 | 0.15 | 0.20 |
| $c$ | 0.07 | 0.12 | 0.17 |
| D | 0.75 | 0.80 | 0.85 |
| E | 0.55 | 0.60 | 0.65 |
| e | 0.35 | 0.38 | 0.40 |
| H | 0.950 | 1.000 | 1.050 |
| L | 0.185 REF |  |  |
| L2 | 0.05 | 0.10 | 0.15 |



RECDMMENDED MUUNTING FQDTPRINT
*For additional information on our $\mathrm{Pb}-$ Free strategy and soldering details, please download the GN Semiconductor Soldering and Mounting Techniques Reference manual, SDLDERRM/D.

[^0]STYLE 5:
PIN 1. GATE 2. SOURCE 3. DRAIN

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| ---: | :--- | :--- | :--- |
| DESCRIPTION: | SOT-1123 0.80x0.60×0.37, 0.35P | PAGE 1 OF 1 |

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[^0]:    STYLE 4:
    PIN 1. CATHODE 2. CATHODE 3. ANODE

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