

# NST65010MW6

## Dual Matched General Purpose Transistor

### PNP Matched Pair

These transistors are housed in an ultra-small SOT-363 package ideally suited for portable products. They are assembled to create a pair of devices highly matched in all parameters, eliminating the need for costly trimming. Applications are Current Mirrors; Differential, Sense and Balanced Amplifiers; Mixers; Detectors and Limiters. Complementary NPN equivalent NST65011MW6T1G is available.

#### Features

- Current Gain Matching to 10%
- Base-Emitter Voltage Matched to  $\leq 2$  mV
- Drop-In Replacement for Standard Device
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

| Rating                         | Symbol    | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | -65   | V    |
| Collector-Base Voltage         | $V_{CBO}$ | -80   | V    |
| Emitter-Base Voltage           | $V_{EBO}$ | -5.0  | V    |
| Collector Current - Continuous | $I_C$     | -100  | mAdc |

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.

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                                               | Symbol          | Max         | Unit               |
|------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|--------------------|
| Total Device Dissipation<br>Per Device<br>FR-5 Board (Note 1)<br>$T_A = 25^\circ\text{C}$<br>Derate Above $25^\circ\text{C}$ | $P_D$           | 380<br>250  | mW                 |
| Thermal Resistance,<br>Junction to Ambient                                                                                   | $R_{\theta JA}$ | 328         | $^\circ\text{C/W}$ |
| Junction and Storage<br>Temperature Range                                                                                    | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$   |

1. FR-5 = 1.0 x 0.75 x 0.062 in.

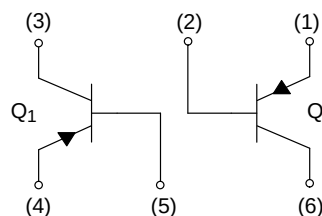


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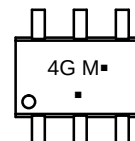
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SOT-363  
CASE 419B  
STYLE 1



#### MARKING DIAGRAMS



4G = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device          | Package              | Shipping†             |
|-----------------|----------------------|-----------------------|
| NST65010MW6T1G  | SOT-363<br>(Pb-Free) | 3000 /<br>Tape & Reel |
| NSVT65010MW6T1G | SOT-363<br>(Pb-Free) | 3000 /<br>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.

# NST65010MW6

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic                                                                                                  | Symbol        | Min  | Typ | Max         | Unit                |
|-----------------------------------------------------------------------------------------------------------------|---------------|------|-----|-------------|---------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                      |               |      |     |             |                     |
| Collector – Emitter Breakdown Voltage, ( $I_C = -10\text{ mA}$ )                                                | $V_{(BR)CEO}$ | -65  | –   | –           | V                   |
| Collector – Emitter Breakdown Voltage, ( $I_C = -10\text{ }\mu\text{A}$ , $V_{EB} = 0$ )                        | $V_{(BR)CES}$ | -80  | –   | –           | V                   |
| Collector – Base Breakdown Voltage, ( $I_C = -10\text{ }\mu\text{A}$ )                                          | $V_{(BR)CBO}$ | -80  | –   | –           | V                   |
| Emitter – Base Breakdown Voltage, ( $I_E = -1.0\text{ }\mu\text{A}$ )                                           | $V_{(BR)EBO}$ | -5.0 | –   | –           | V                   |
| Collector Cutoff Current ( $V_{CB} = -30\text{ V}$ )<br>( $V_{CB} = -30\text{ V}$ , $T_A = 150^\circ\text{C}$ ) | $I_{CBO}$     | –    | –   | -15<br>-5.0 | nA<br>$\mu\text{A}$ |

## ON CHARACTERISTICS

|                                                                                                                                                                                                              |                                             |                 |                   |                      |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------|-------------------|----------------------|----|
| DC Current Gain<br>( $I_C = -10\text{ }\mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) (Note 2)  | $h_{FE}$<br><br>$h_{FE(1)}/h_{FE(2)}$       | –<br>220<br>0.9 | 150<br>290<br>1.0 | –<br>475<br>1.1      | –  |
| Collector – Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )                                                          | $V_{CE(sat)}$                               | –<br>–          | –<br>–            | -300<br>-650         | mV |
| Base – Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )                                                               | $V_{BE(sat)}$                               | –<br>–          | -700<br>-900      | –<br>–               | mV |
| Base – Emitter On Voltage<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) (Note 3) | $V_{BE(on)}$<br><br>$V_{BE(1)} - V_{BE(2)}$ | -600<br>–<br>–  | –<br>–<br>-1.0    | -750<br>-820<br>-2.0 | mV |

## SMALL – SIGNAL CHARACTERISTICS

|                                                                                                                                            |          |     |   |     |     |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|---|-----|-----|
| Current – Gain – Bandwidth Product, ( $I_C = -10\text{ mA}$ , $V_{CE} = -5\text{ Vdc}$ , $f = 100\text{ MHz}$ )                            | $f_T$    | 100 | – | –   | MHz |
| Output Capacitance, ( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                     | $C_{ob}$ | –   | – | 4.5 | pF  |
| Noise Figure, ( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5\text{ Vdc}$ , $R_S = 2\text{ k}\Omega$ , $f = 1\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | NF       | –   | – | 10  | dB  |

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.

- $h_{FE(1)}/h_{FE(2)}$  is the ratio of one transistor compared to the other transistor within the same package. The smaller  $h_{FE}$  is used as numerator.
- $V_{BE(1)} - V_{BE(2)}$  is the absolute difference of one transistor compared to the other transistor within the same package.

TYPICAL CHARACTERISTICS

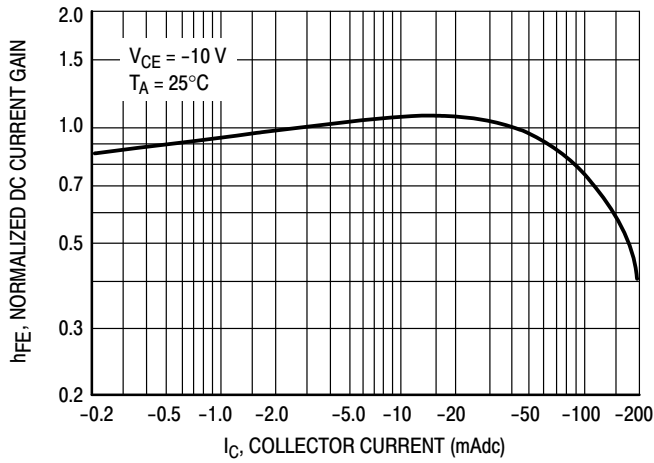


Figure 1. Normalized DC Current Gain

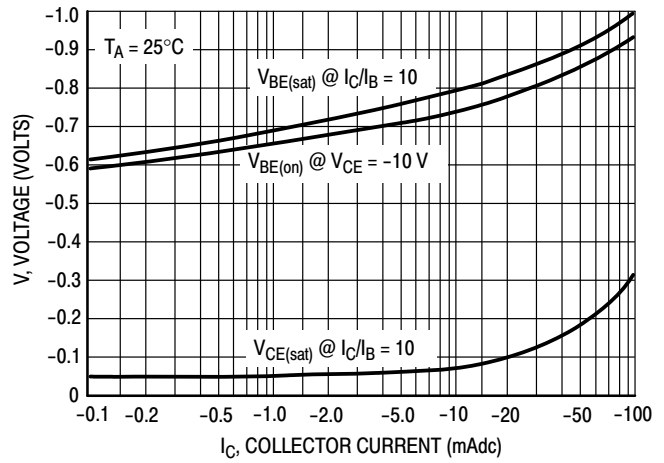


Figure 2. "Saturation" and "On" Voltages

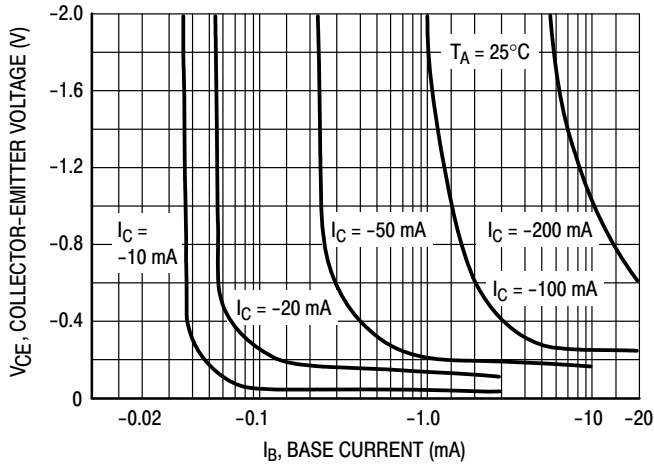


Figure 3. Collector Saturation Region

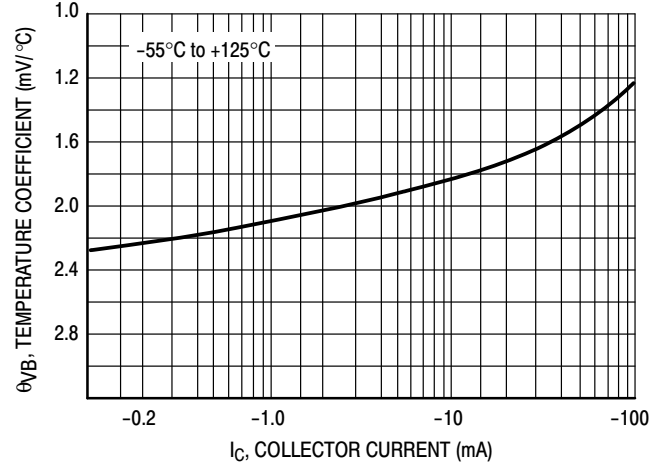


Figure 4. Base-Emitter Temperature Coefficient

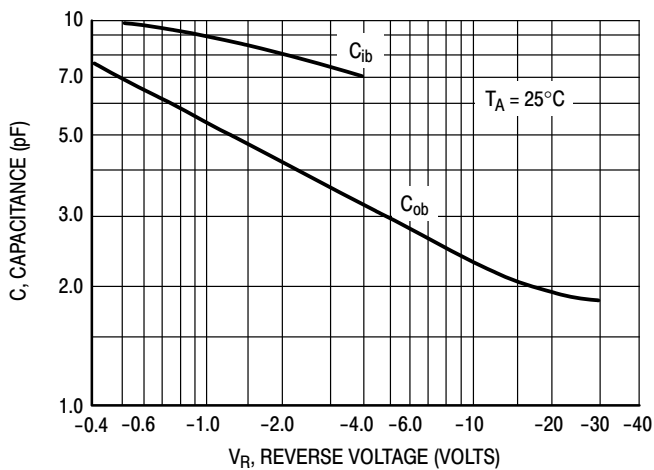


Figure 5. Capacitances

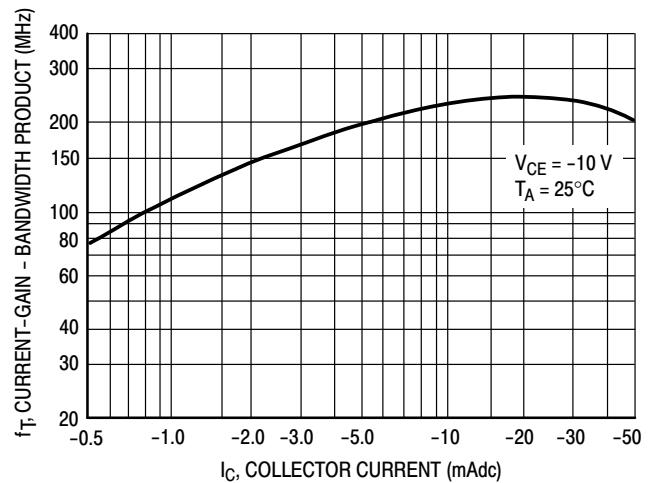


Figure 6. Current-Gain - Bandwidth Product

TYPICAL CHARACTERISTICS

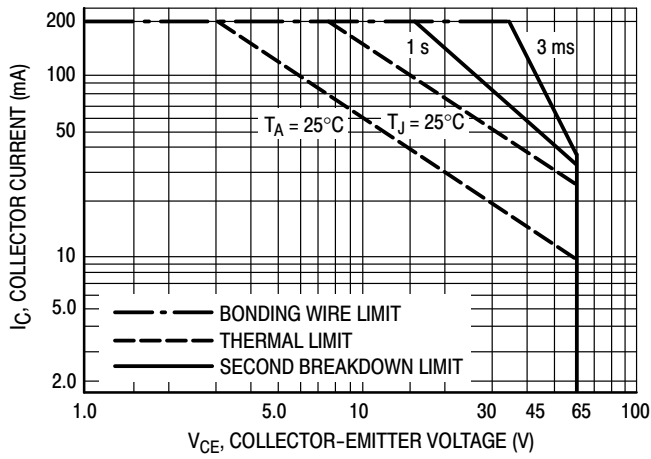


Figure 7. Active Region Safe Operating Area

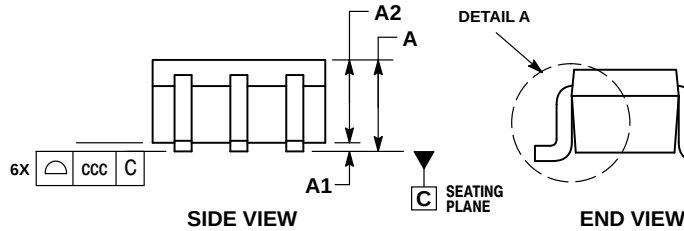
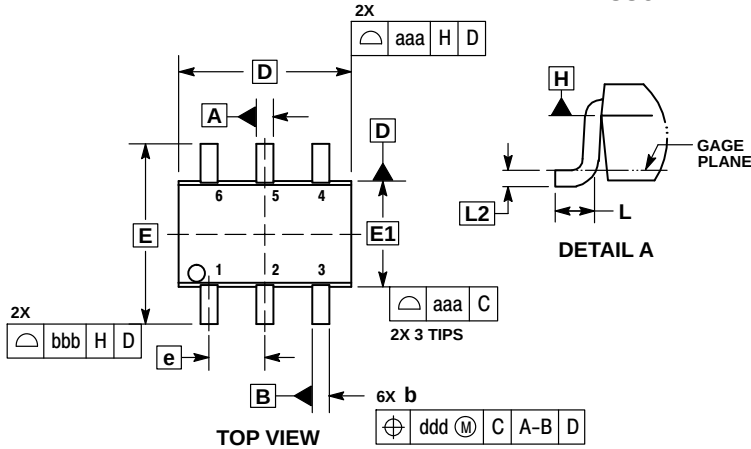
The safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 7 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions.

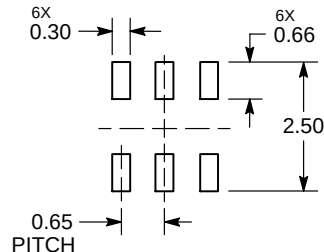
# NST65010MW6

## PACKAGE DIMENSIONS

### SC-88 (SOT-363) CASE 419B-02 ISSUE Y



#### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | ---         | ---  | 1.10 | ---       | ---   | 0.043 |
| A1  | 0.00        | ---  | 0.10 | 0.000     | ---   | 0.004 |
| A2  | 0.70        | 0.90 | 1.00 | 0.027     | 0.035 | 0.039 |
| b   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 |
| C   | 0.08        | 0.15 | 0.22 | 0.003     | 0.006 | 0.009 |
| D   | 1.80        | 2.00 | 2.20 | 0.070     | 0.078 | 0.086 |
| E   | 2.00        | 2.10 | 2.20 | 0.078     | 0.082 | 0.086 |
| E1  | 1.15        | 1.25 | 1.35 | 0.045     | 0.049 | 0.053 |
| e   | 0.65 BSC    |      |      | 0.026 BSC |       |       |
| L   | 0.26        | 0.36 | 0.46 | 0.010     | 0.014 | 0.018 |
| L2  | 0.15 BSC    |      |      | 0.006 BSC |       |       |
| aaa | 0.15        |      |      | 0.006     |       |       |
| bbb | 0.30        |      |      | 0.012     |       |       |
| ccc | 0.10        |      |      | 0.004     |       |       |
| ddd | 0.10        |      |      | 0.004     |       |       |

#### STYLE 1:

1. PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

\*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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NST65010MW6/D

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