

# NSS12100UW3TCG

## 12 V, 1 A, Low $V_{CE(sat)}$ PNP Transistor

ON Semiconductor's e<sup>2</sup>PowerEdge family of low  $V_{CE(sat)}$  transistors are miniature surface mount devices featuring ultra low saturation voltage ( $V_{CE(sat)}$ ) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control is important.

Typical application are DC-DC converters and power management in portable and battery powered products such as cellular and cordless phones, PDAs, computers, printers, digital cameras and MP3 players. Other applications are low voltage motor controls in mass storage products such as disc drives and tape drives. In the automotive industry they can be used in air bag deployment and in the instrument cluster. The high current gain allows e<sup>2</sup>PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

### Features

- High Current Capability (1 A)
- High Power Handling (Up to 740 mW)
- Low  $V_{CE(s)}$  (200 mV Typical @ 500 mA)
- Small Size
- Low Noise
- 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

### Benefits

- High Specific Current and Power Capability Reduces Required PCB Area
- Reduced Parasitic Losses Increases Battery Life

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Rating                         | Symbol    | Max                        | Unit |
|--------------------------------|-----------|----------------------------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | -12                        | Vdc  |
| Collector-Base Voltage         | $V_{CBO}$ | -12                        | Vdc  |
| Emitter-Base Voltage           | $V_{EBO}$ | -5.0                       | Vdc  |
| Collector Current – Continuous | $I_C$     | -1.0                       | Adc  |
| – Peak                         | $I_{CM}$  | -2.0                       |      |
| Electrostatic Discharge        | ESD       | HBM Class 3B<br>MM Class C |      |

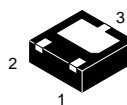
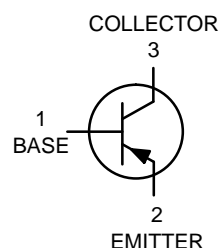
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



ON Semiconductor®

<http://onsemi.com>

**12 VOLTS, 1.0 AMPS**  
**PNP LOW  $V_{CE(sat)}$  TRANSISTOR**  
**EQUIVALENT  $R_{DS(on)}$  400 m $\Omega$**



**WDFN3**  
**CASE 506AU**

### MARKING DIAGRAM



VG = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

### ORDERING INFORMATION

| Device         | Package            | Shipping†            |
|----------------|--------------------|----------------------|
| NSS12100UW3TCG | WDFN3<br>(Pb-Free) | 3000/<br>Tape & Reel |
| NSV12100UW3TCG | WDFN3<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.

# NSS12100UW3TCG

## THERMAL CHARACTERISTICS

| Characteristic  | Symbol                   | Max         | Unit                       |
|---|--------------------------|-------------|----------------------------|
| Total Device Dissipation, $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 1)           | 740<br>6.0  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient   | $R_{\theta JA}$ (Note 1) | 169         | $^\circ\text{C}/\text{W}$  |
| Total Device Dissipation, $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 2)           | 1.1<br>9.0  | W<br>mW/ $^\circ\text{C}$  |
| Thermal Resistance, Junction-to-Ambient   | $R_{\theta JA}$ (Note 2) | 110         | $^\circ\text{C}/\text{W}$  |
| Thermal Resistance, Junction-to-Lead 6  | $R_{\theta JL}$ (Note 2) | 33          | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature Range  | $T_J, T_{stg}$           | -55 to +150 | $^\circ\text{C}$           |

- FR-4 @ 100 mm<sup>2</sup>, 1 oz copper traces.
- FR-4 @ 500 mm<sup>2</sup>, 1 oz copper traces.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|  |               |      |       |      |                 |
|--|---------------|------|-------|------|-----------------|
| Collector-Emitter Breakdown Voltage, ( $I_C = -10$ mAdc, $I_B = 0$ ) | $V_{(BR)CEO}$ | -12  | -     | -    | Vdc             |
| Collector-Base Breakdown Voltage, ( $I_C = -0.1$ mAdc, $I_E = 0$ )   | $V_{(BR)CBO}$ | -12  | -     | -    | Vdc             |
| Emitter-Base Breakdown Voltage, ( $I_E = -0.1$ mAdc, $I_C = 0$ )     | $V_{(BR)EBO}$ | -5.0 | -     | -    | Vdc             |
| Collector Cutoff Current, ( $V_{CB} = -12$ Vdc, $I_E = 0$ )          | $I_{CBO}$     | -    | -0.02 | -0.1 | $\mu\text{Adc}$ |
| Emitter Cutoff Current, ( $V_{CES} = -5.0$ Vdc, $I_E = 0$ )          | $I_{EBO}$     | -    | -0.03 | -0.1 | $\mu\text{Adc}$ |

### ON CHARACTERISTICS

|  |               |                       |  |  |    |
|--|---------------|-----------------------|--|--|----|
| DC Current Gain (Note 3)<br>( $I_C = -10$ mA, $V_{CE} = -2.0$ V)<br>( $I_C = -500$ mA, $V_{CE} = -2.0$ V)<br>( $I_C = -1.0$ A, $V_{CE} = -2.0$ V)  | $h_{FE}$      | 200<br>100<br>75      | -<br>-<br>-                                    | 400<br>250<br>-                                |    |
| Collector-Emitter Saturation Voltage (Note 3)<br>( $I_C = -0.05$ A, $I_B = -0.005$ A) (Note 4)<br>( $I_C = -0.1$ A, $I_B = -0.002$ A)<br>( $I_C = -0.1$ A, $I_B = -0.010$ A)<br>( $I_C = -0.5$ A, $I_B = -0.050$ A)<br>( $I_C = -1.0$ A, $I_B = -0.100$ A) | $V_{CE(sat)}$ | -<br>-<br>-<br>-<br>- | -0.030<br>-0.080<br>-0.050<br>-0.200<br>-0.400 | -0.040<br>-0.100<br>-0.060<br>-0.225<br>-0.440 | V  |
| Base-Emitter Saturation Voltage (Note 3)<br>( $I_C = -1.0$ A, $I_B = -0.01$ A)   | $V_{BE(sat)}$ | -                     | -0.95  | -1.15  | V  |
| Base-Emitter Turn-on Voltage (Note 3)<br>( $I_C = -2.0$ A, $V_{CE} = -1.0$ V)  | $V_{BE(on)}$  | -                     | -1.05  | -1.20  | V  |
| Input Capacitance ( $V_{EB} = -0.5$ V, $f = 1.0$ MHz)  | $C_{ibo}$     | -                     | 40   | 50   | pF |
| Output Capacitance ( $V_{CB} = -3.0$ V, $f = 1.0$ MHz)   | $C_{obo}$     | -                     | 15   | 20   | pF |

### SWITCHING CHARACTERISTICS

|   |       |   |   |     |    |
|---|-------|---|---|-----|----|
| Delay ( $V_{CC} = -10$ V, $I_C = 750$ mA, $I_{B1} = 15$ mA)   | $t_d$ | - | - | 20  | ns |
| Rise ( $V_{CC} = -10$ V, $I_C = 750$ mA, $I_{B1} = 15$ mA)    | $t_r$ | - | - | 90  | ns |
| Storage ( $V_{CC} = -10$ V, $I_C = 750$ mA, $I_{B1} = 15$ mA) | $t_s$ | - | - | 140 | ns |
| Fall ( $V_{CC} = -10$ V, $I_C = 750$ mA, $I_{B1} = 15$ mA)    | $t_f$ | - | - | 100 | ns |

### SMALL-SIGNAL CHARACTERISTICS

|   |       |     |   |     |     |
|---|-------|-----|---|-----|-----|
| Current-Gain - Bandwidth Product, ( $I_C = -100$ mA, $V_{CE} = -5$ Vdc, $f = 100$ MHz)                        | $f_T$ | 200 | - | -   | MHz |
| Noise Figure, ( $I_C = -0.2$ mA, $V_{CE} = -5$ Vdc, $R_S = 2$ k $\Omega$ , $f = 1$ kHz, $BW = 200\text{Hz}$ ) | NF    | -   | - | 5.0 | 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.

- Pulsed Condition: Pulse Width = 300  $\mu\text{sec}$ , Duty Cycle  $\leq 2\%$ .
- Guaranteed by design but not tested.

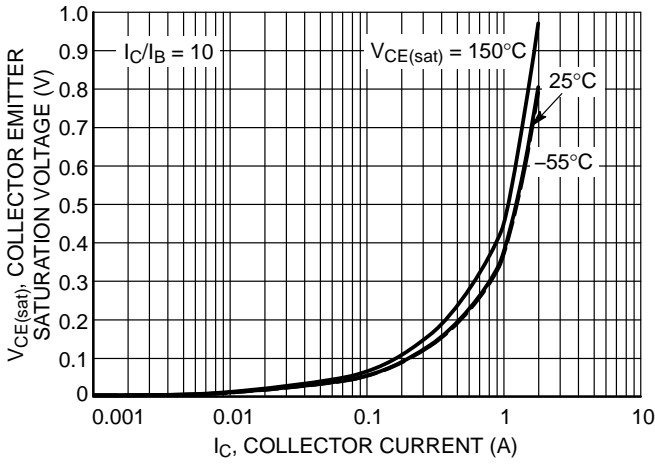


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

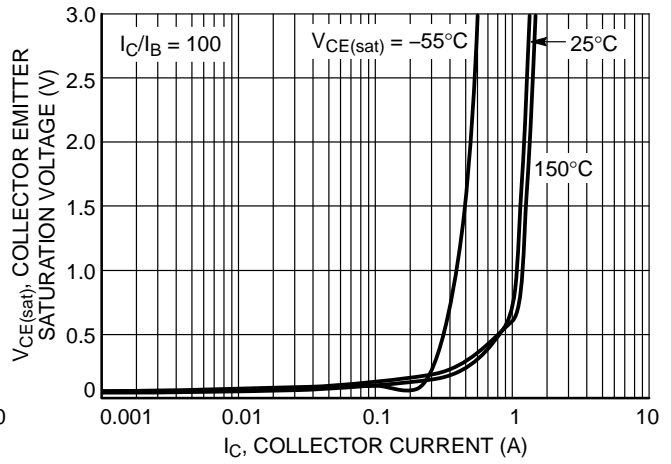


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

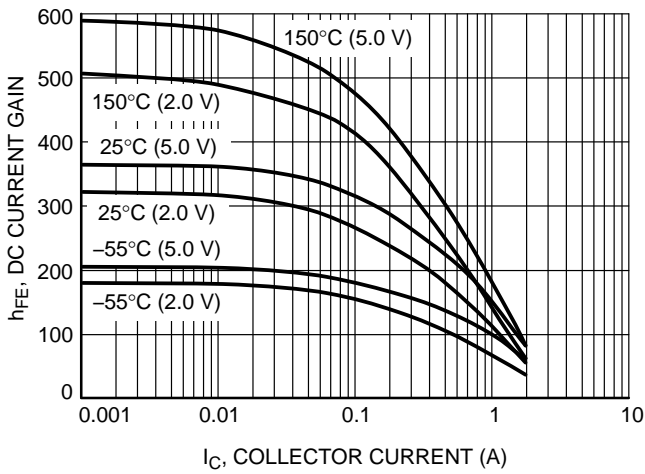


Figure 3. DC Current Gain vs. Collector Current

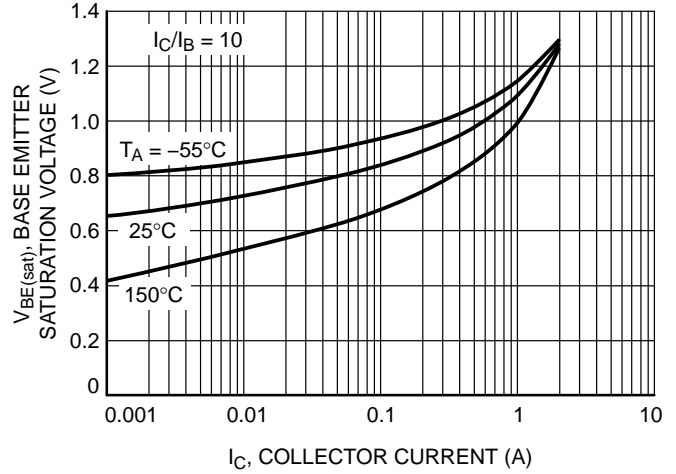


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

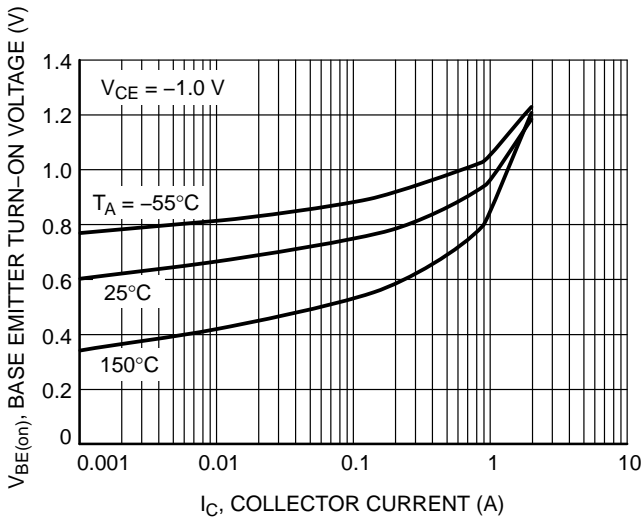


Figure 5. Base Emitter Turn-On Voltage vs. Collector Current

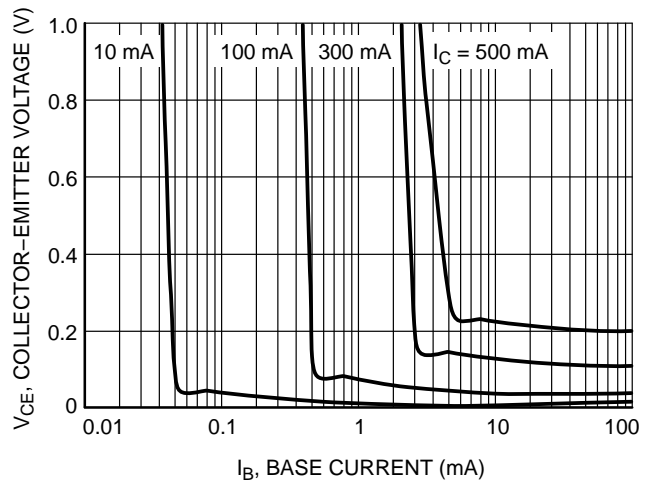


Figure 6. Saturation Region

# NSS12100UW3TCG

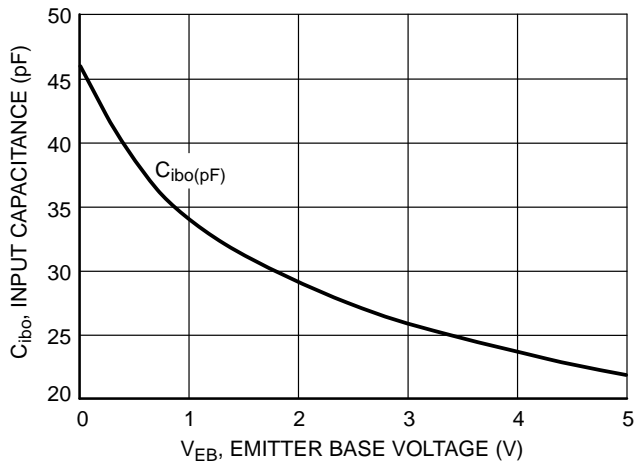


Figure 7. Input Capacitance

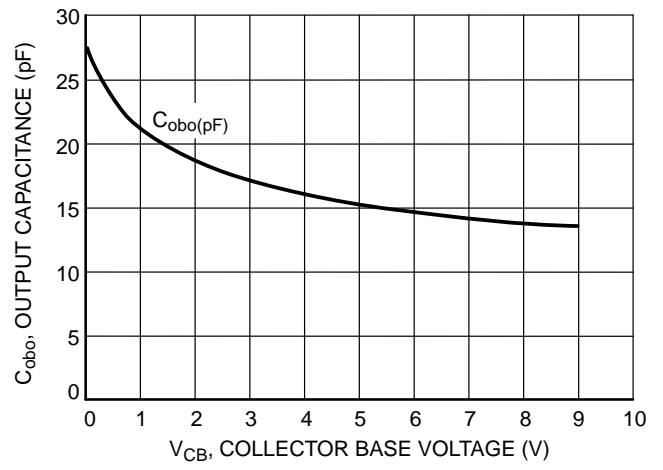


Figure 8. Output Capacitance

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**WDFN3 2x2, 1.3P**  
CASE 506AU  
ISSUE A

DATE 18 AUG 2016



SCALE 4:1



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 0.70        | 0.75 | 0.80 | 0.028     | 0.030 | 0.031 |
| A1  | 0.00        |      | 0.05 | 0.000     |       | 0.002 |
| A3  | 0.20 REF    |      |      | 0.008 REF |       |       |
| b   | 0.25        | 0.30 | 0.35 | 0.010     | 0.012 | 0.014 |
| D   | 2.00 BSC    |      |      | 0.079 BSC |       |       |
| D2  | 1.40        | 1.50 | 1.60 | 0.055     | 0.059 | 0.063 |
| E   | 2.00 BSC    |      |      | 0.079 BSC |       |       |
| E2  | 0.90        | 1.00 | 1.10 | 0.035     | 0.039 | 0.043 |
| e   | 1.30 BSC    |      |      | 0.051 BSC |       |       |
| K   | 0.35 REF    |      |      | 0.014 REF |       |       |
| L   | 0.35        | 0.40 | 0.45 | 0.014     | 0.016 | 0.018 |

**GENERIC MARKING DIAGRAM\***

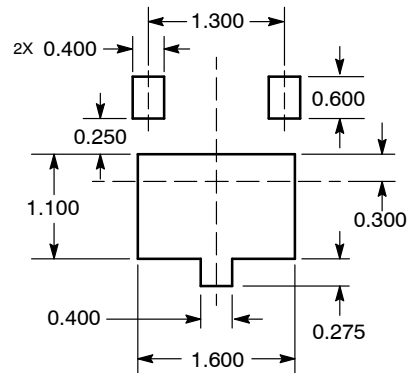


XX = Specific Device Code  
M = Date Code

\*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.

**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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