

# NSS20101J

## 20 V, 1.0 A, Low $V_{CE(sat)}$ NPN 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 applications 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.

- This is a Pb-Free Device

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

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	20	Vdc
Collector-Base Voltage	$V_{CBO}$	40	Vdc
Emitter-Base Voltage	$V_{EB0}$	6.0	Vdc
Collector Current - Continuous	$I_C$	1.0	A
Collector Current - Peak	$I_{CM}$	2.0	A
Electrostatic Discharge	ESD	HBM Class 3B MM Class C	

### 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)	255	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	490	$^\circ\text{C}/\text{W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 2)	300	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	415	$^\circ\text{C}/\text{W}$
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.

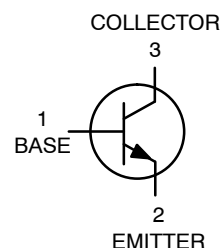
1. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces.
2. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces.



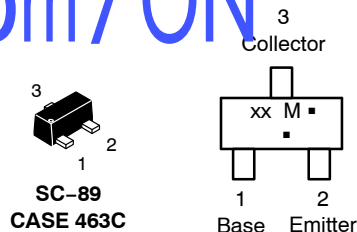
ON Semiconductor®

<http://onsemi.com>

## 20 VOLTS, 1.0 AMPS NPN LOW $V_{CE(sat)}$ TRANSISTOR



### MARKING DIAGRAM & PIN ASSIGNMENT



- xx = Specific Device Code
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NSS20101JT1G	SC-89 (Pb-Free)	3000/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 Specification Brochure, BRD8011/D.

# NSS20101J

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	20			Vdc
Collector–Base Breakdown Voltage (I <sub>C</sub> = 0.1 mA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	40			Vdc
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 0.1 mA, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0			Vdc
Collector Cutoff Current (V <sub>CB</sub> = 30 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>			0.1	μAdc
Emitter Cutoff Current (V <sub>EB</sub> = 5.0 Vdc)	I <sub>EBO</sub>			0.1	μAdc

## ON CHARACTERISTICS

DC Current Gain (Note 3) (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 V)	h <sub>FE</sub>	200 200 150 100		500	
Collector–Emitter Saturation Voltage (Note 3) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA) (I <sub>C</sub> = 0.10 A, I <sub>B</sub> = 0.010 A) (I <sub>C</sub> = 0.5 A, I <sub>B</sub> = 0.050 A) (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 0.1 A)	V <sub>CE(sat)</sub>			0.015 0.040 0.115 0.220	V
Base–Emitter Saturation Voltage (Note 3) (I <sub>C</sub> = 0.5 A, I <sub>B</sub> = 50 mA)	V <sub>BE(sat)</sub>			1.1	V
Base–Emitter Turn-on Voltage (Note 3) (I <sub>C</sub> = 0.5 A, V <sub>CE</sub> = 2.0 V)	V <sub>BE(on)</sub>			0.90	V
Cutoff Frequency (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 2.0 V, f = 100 MHz)	f <sub>T</sub>		350		MHz
Input Capacitance (V <sub>EB</sub> = 0.5 V, f = 1.0 MHz)	C <sub>ibo</sub>		40		pF
Output Capacitance (V <sub>CB</sub> = 4.0 V, f = 1.0 MHz)	C <sub>obo</sub>		6		pF

3. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

## TYPICAL CHARACTERISTICS

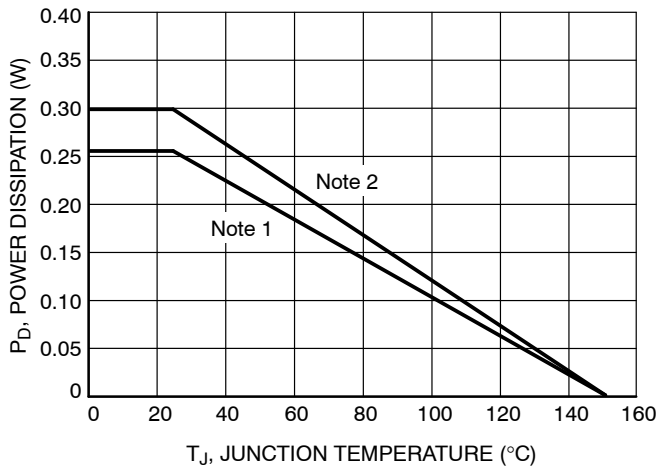


Figure 1. Power Derating

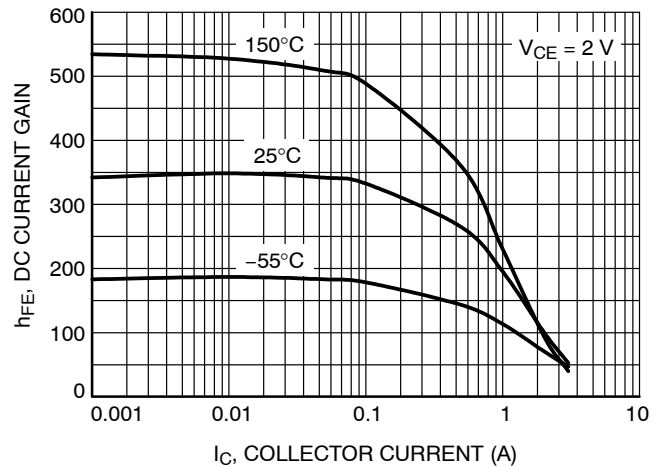


Figure 2. DC Current Gain

TYPICAL CHARACTERISTICS

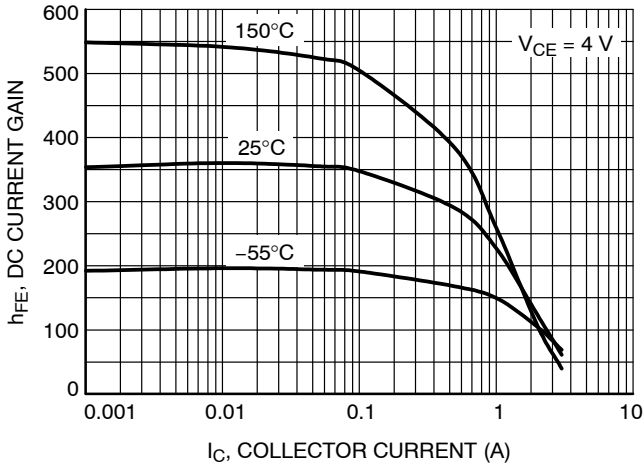


Figure 3. DC Current Gain

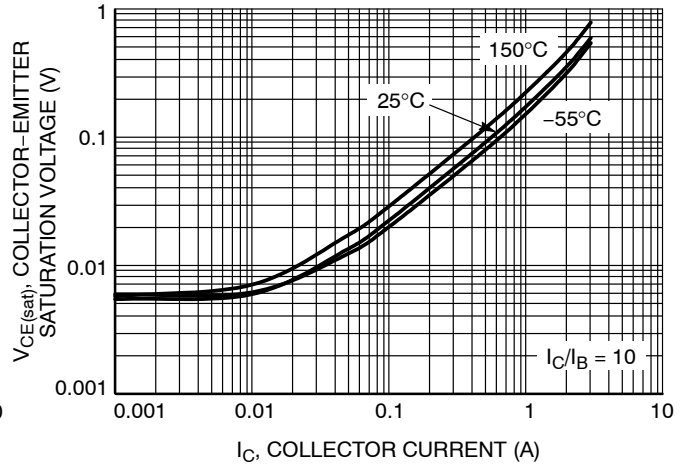


Figure 4. Collector-Emitter Saturation Voltage

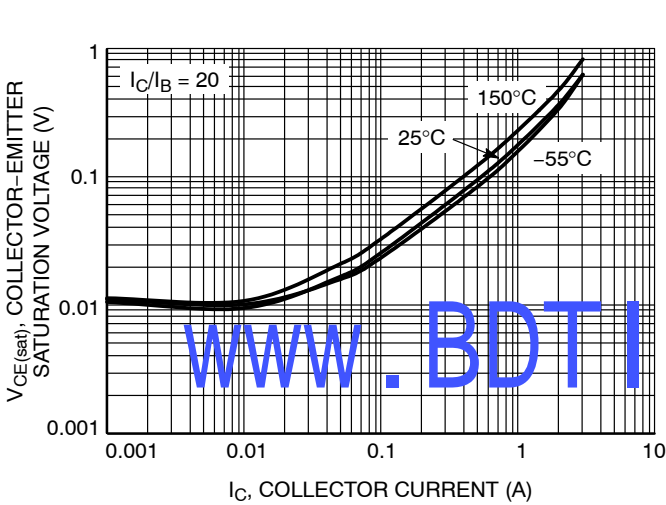


Figure 5. Collector-Emitter Saturation Voltage

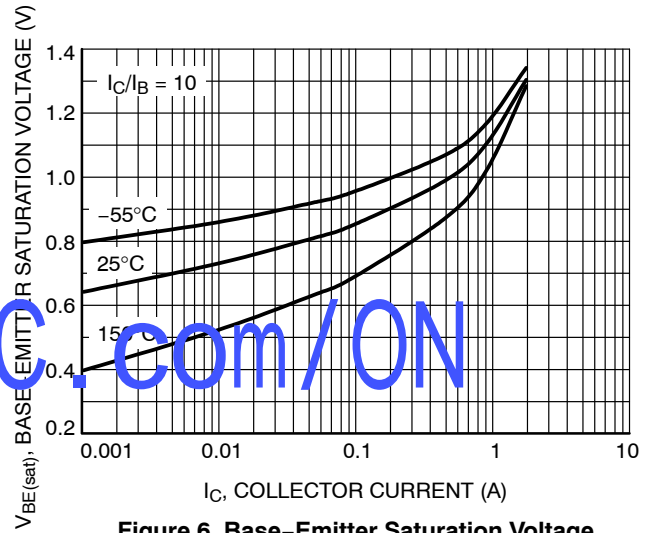


Figure 6. Base-Emitter Saturation Voltage

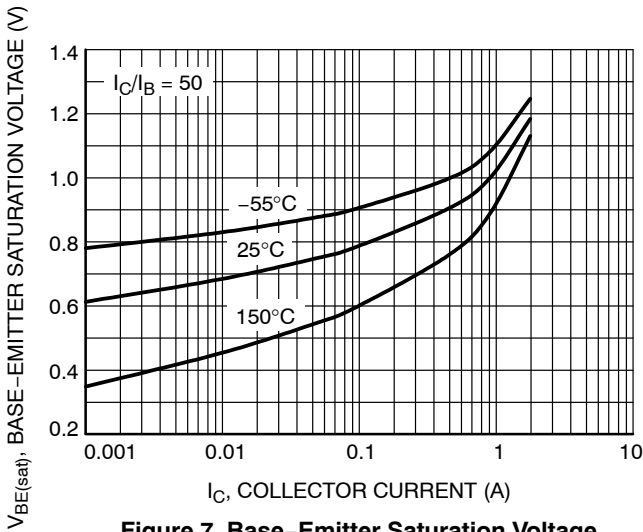


Figure 7. Base-Emitter Saturation Voltage

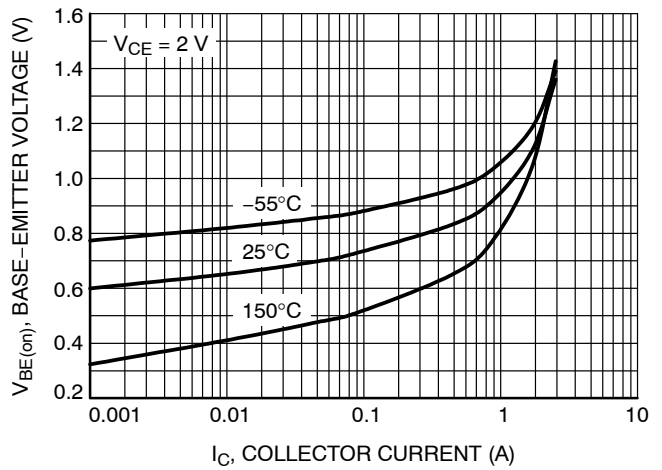


Figure 8. Base-Emitter Voltage

TYPICAL CHARACTERISTICS

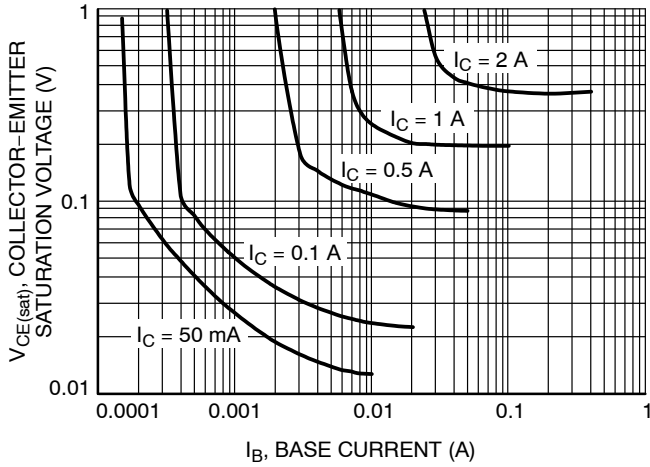


Figure 9. Saturation Region

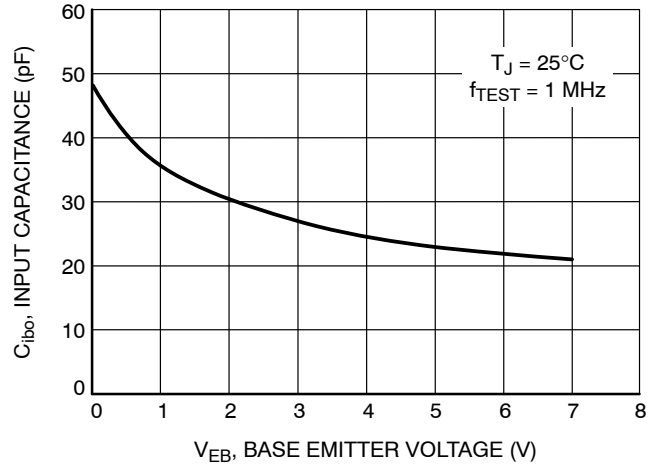


Figure 10. Input Capacitance

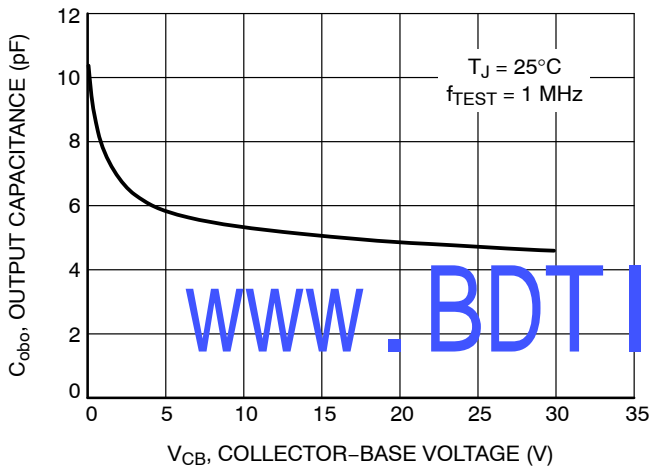


Figure 11. Output Capacitance

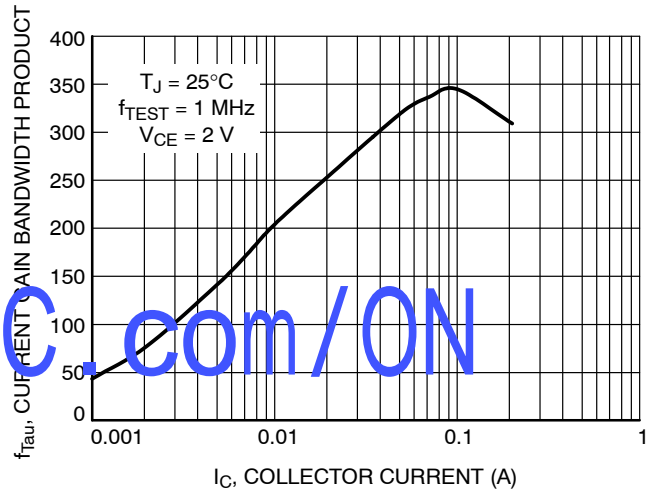


Figure 12. Current Gain Bandwidth Product

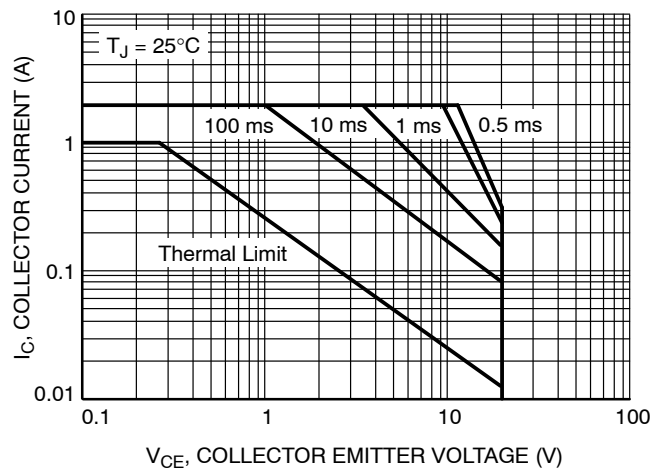
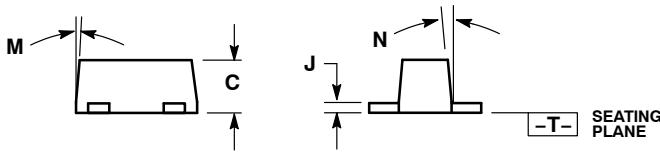
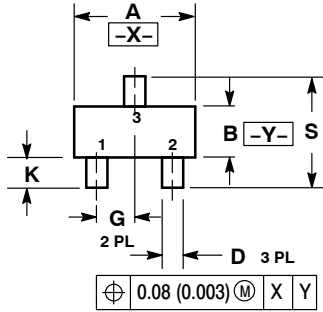


Figure 13. Safe Operating Area

# NSS20101J

## PACKAGE DIMENSIONS

### SC-89, 3 LEAD CASE 463C-03 ISSUE C

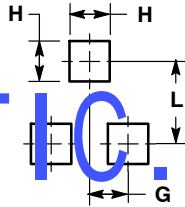


#### NOTES:

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.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	---	---	10	---	---	10
N	---	---	10	---	---	10
S	1.50	1.60	1.70	0.059	0.063	0.067

#### SOLDERING FOOTPRINT\*



[www.BDTIC.com/ON](http://www.BDTIC.com/ON)

\*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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