20 V, 1.0 A, Low $V_{CE(sat)}$ NPN Transistor

NSS20101J, NSV20101J

onsemi's e^{2}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^{2}PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

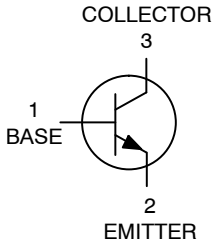
Features

- 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 and are RoHS Compliant*

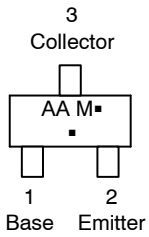
*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

SC−89
CASE 463C
STYLE 1



MARKING DIAGRAM



AA = 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†
NSS20101JT1G	SC−89 (Pb−Free)	3,000 / Tape & Reel
NSV20101JT1G	SC−89 (Pb−Free)	3,000 / Tape & Reel

†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.

MAXIMUM RATINGS (T_A = 25°C)

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	20	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EBO}	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	

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 T_A = 25°C Derate above 25°C	P_D (Note 1)	 255 2.0	 mW mW/°C
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$ (Note 1)	 490	°C/W
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D (Note 2)	 300 2.4	 mW mW/°C
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$ (Note 2)	 415	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	–55 to +150	°C

1. FR–4 @ 100 mm^2, 1 oz. copper traces.
2. FR–4 @ 500 mm^2, 1 oz. copper traces.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	20			Vdc
Collector – Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	40			Vdc
Emitter – Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)	$V_{(BR)EBO}$	6.0			Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}			0.1	μAdc
Emitter Cutoff Current (V_{EB} = 5.0 Vdc)	I_{EBO}			0.1	μAdc
ON CHARACTERISTICS					
DC Current Gain (Note 3) (I_C = 10 mA, V_{CE} = 2.0 V) (I_C = 100 mA, V_{CE} = 2.0 V) (I_C = 500 mA, V_{CE} = 2.0 V) (I_C = 1.0 A, V_{CE} = 2.0 V)	h_{FE}	200 200 150 100		500	
Collector – Emitter Saturation Voltage (Note 3) (I_C = 10 mA, I_B = 0.5 mA) (I_C = 0.10 A, I_B = 0.010 A) (I_C = 0.5 A, I_B = 0.050 A) (I_C = 1.0 A, I_B = 0.1 A)	$V_{CE(sat)}$			0.015 0.040 0.115 0.220	V
Base – Emitter Saturation Voltage (Note 3) (I_C = 0.5 A, I_B = 50 mA)	$V_{BE(sat)}$			1.1	V
Base – Emitter Turn–on Voltage (Note 3) (I_C = 0.5 A, V_{CE} = 2.0 V)	$V_{BE(on)}$			0.90	V
Cutoff Frequency (I_C = 100 mA, V_{CE} = 2.0 V, f = 100 MHz)	f_T		350		MHz
Input Capacitance (V_{EB} = 0.5 V, f = 1.0 MHz)	Cibo		40		pF
Output Capacitance (V_{CB} = 4.0 V, f = 1.0 MHz)	Cobo		6		pF

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.

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

TYPICAL CHARACTERISTICS

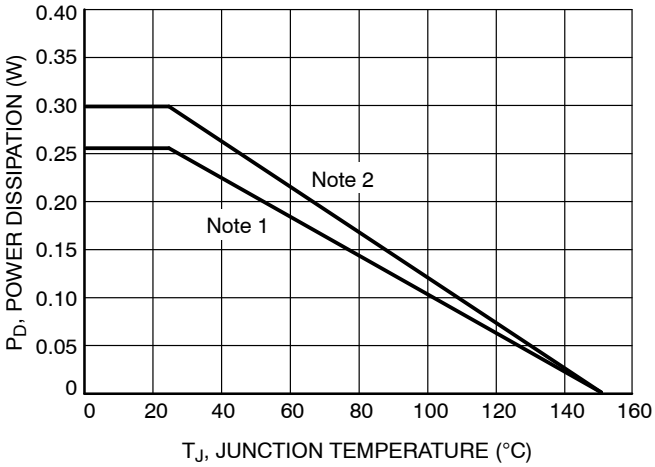


Figure 1. Power Derating

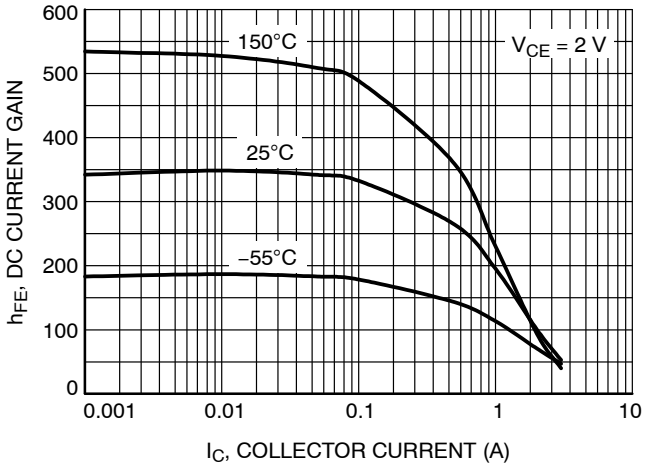


Figure 2. DC Current Gain

TYPICAL CHARACTERISTICS

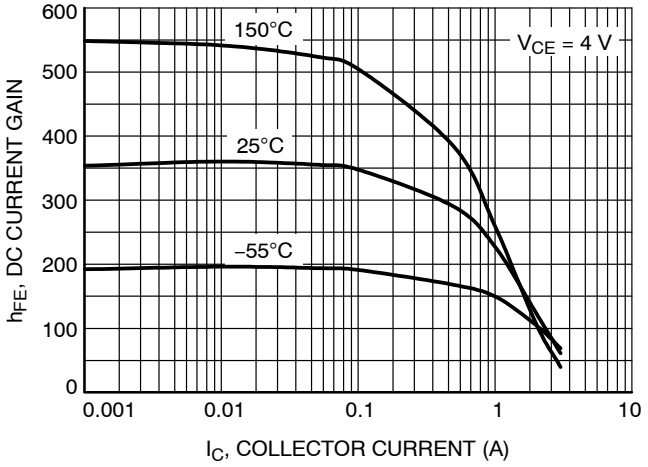


Figure 3. DC Current Gain

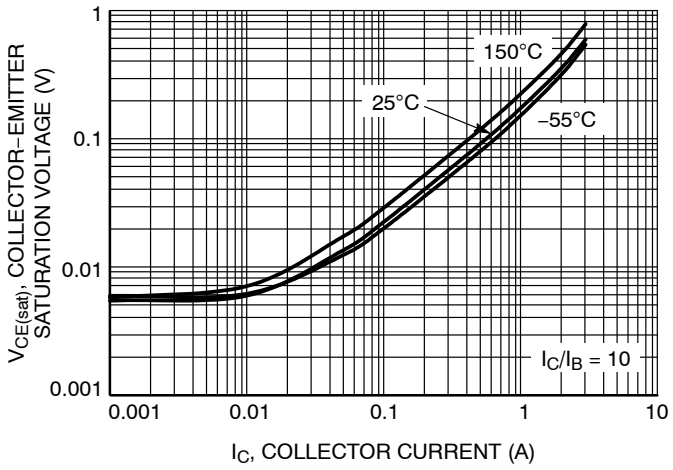


Figure 4. Collector−Emitter Saturation Voltage

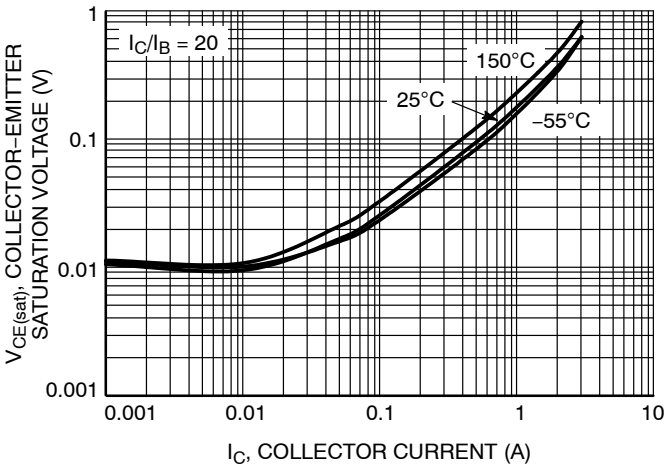


Figure 5. Collector−Emitter Saturation Voltage

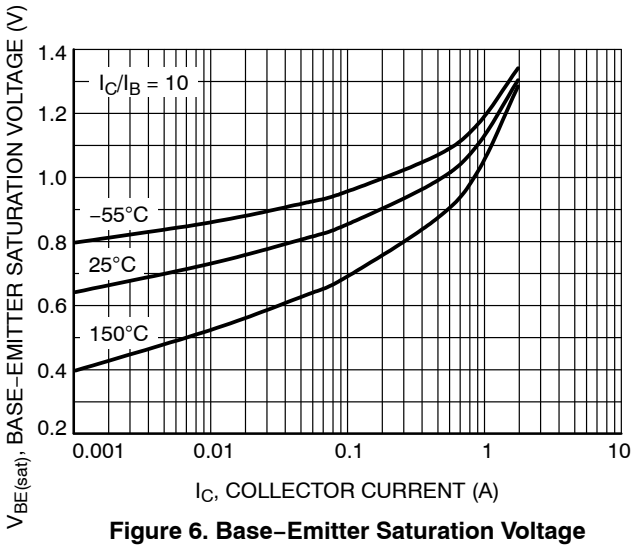


Figure 6. Base−Emitter Saturation Voltage

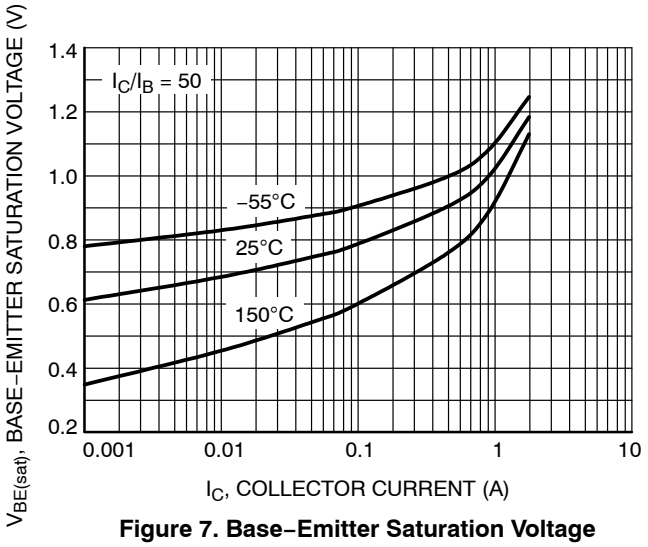


Figure 7. Base−Emitter Saturation Voltage

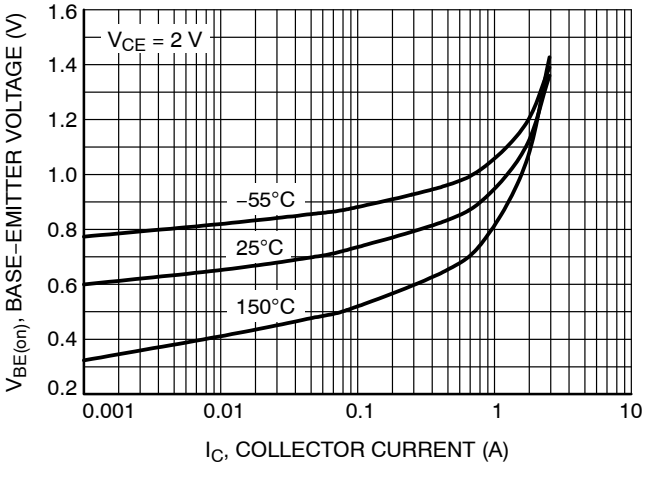


Figure 8. Base−Emitter Voltage

TYPICAL CHARACTERISTICS

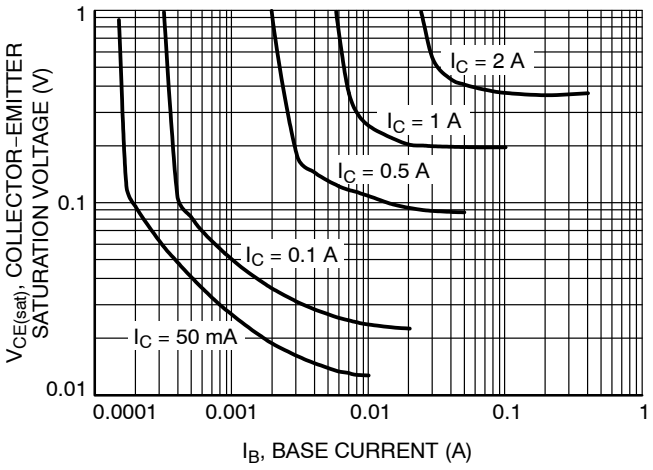


Figure 9. Saturation Region

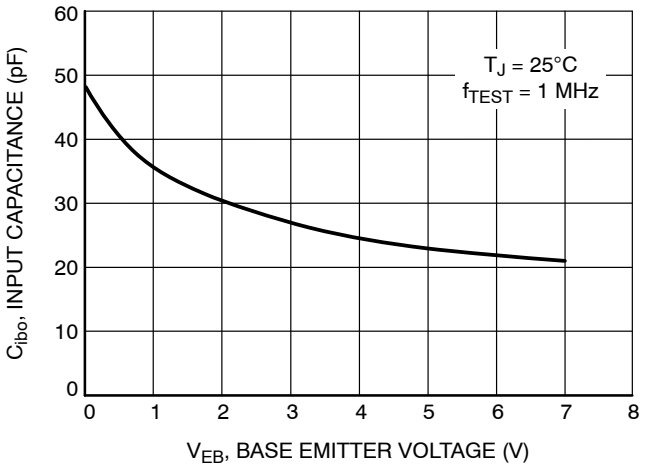


Figure 10. Input Capacitance

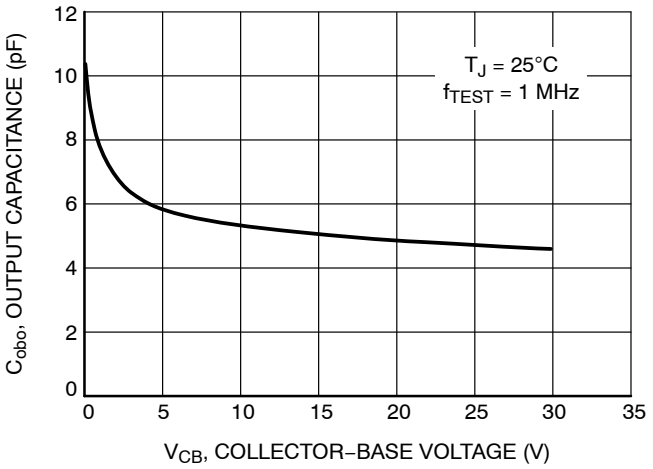


Figure 11. Output Capacitance

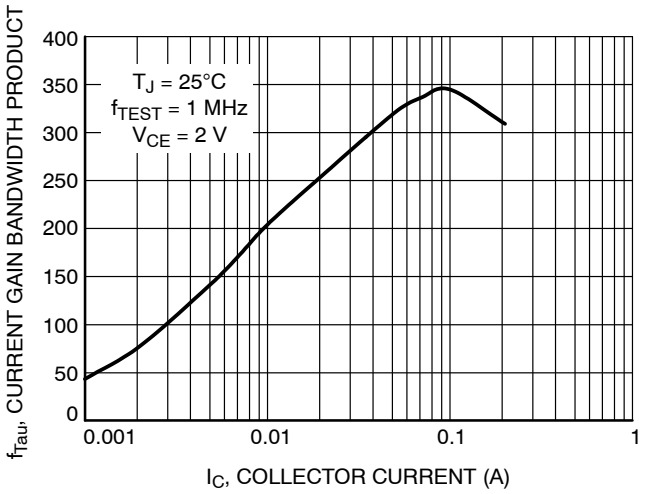


Figure 12. Current Gain Bandwidth Product

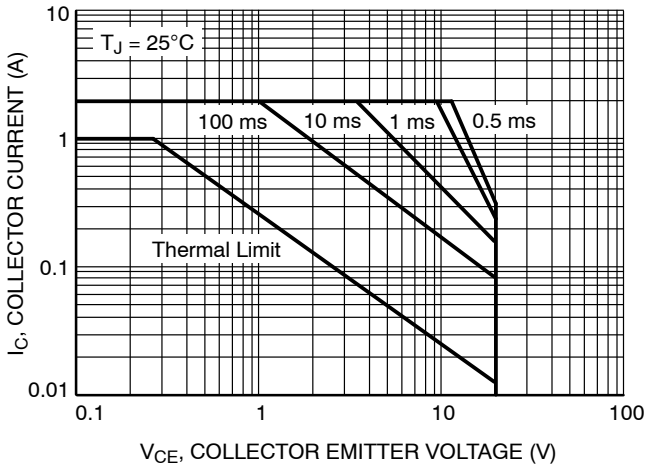
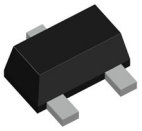


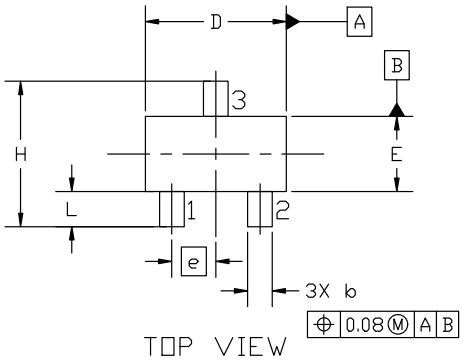
Figure 13. Safe Operating Area

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

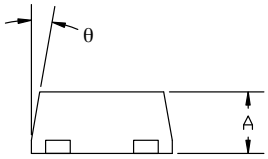


SC−89 3LEAD 1.60x0.85x0.70, 0.50P
CASE 463C
ISSUE D

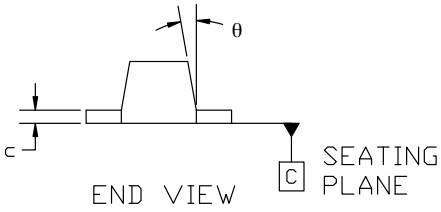
DATE 20 FEB 2024



TOP VIEW



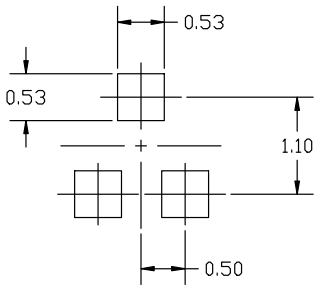
SIDE VIEW



END VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

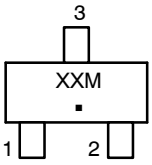
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.60	0.70	0.80
b	0.23	0.28	0.33
c	0.10	0.15	0.20
D	1.50	1.60	1.70
E	0.75	0.85	0.95
e	0.50 BSC		
H	1.50	1.60	1.70
L	0.30	0.40	0.50
θ	---	---	10°



RECOMMENDED MOUNTING FOOTPRINT

* FOR ADDITIONAL INFORMATION ON OUR PB−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*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. Some products may not follow the Generic Marking.

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. N/C
3. CATHODE

STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

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DESCRIPTION:	**SC−89 3LEAD 1.60x0.85x0.70, 0.50P**		**PAGE 1 OF 1**

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