

# 20 V, 4.0 A, Low $V_{CE(sat)}$ PNP Transistor

## NSS20200LT1G, NSV20200LT1G

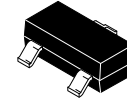
onsemi's e<sup>2</sup>PowerEdge family of low  $V_{CE(sat)}$  transistors are miniature surface mount devices featuring ultra low saturation voltage ( $V_{CE(sat)}$ ) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient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

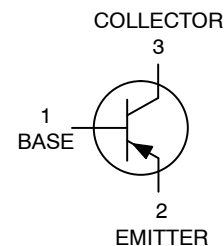
### Features

- AEC-Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant\*

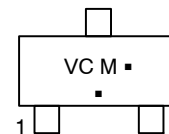
**-20 VOLTS  
4.0 AMPS  
PNP LOW  $V_{CE(sat)}$  TRANSISTOR  
EQUIVALENT  $R_{DS(on)}$  65 m $\Omega$**



SOT-23 (TO-236)  
CASE 318  
STYLE 6



### MARKING DIAGRAM



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

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NSS20200LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
NSV20200LT1G	SOT-23 (Pb-Free)	3,000 / 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.

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

# NSS20200LT1G, NSV20200LT1G

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

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	-20	Vdc
Collector-Base Voltage	$V_{CBO}$	-20	Vdc
Emitter-Base Voltage	$V_{EBO}$	-7.0	Vdc
Collector Current – Continuous	$I_C$	-2.0	A
Collector Current – Peak	$I_{CM}$	-4.0	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)	460 3.7	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	270	$^\circ\text{C/W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 2)	540 4.3	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	230	$^\circ\text{C/W}$
Total Device Dissipation (Single Pulse < 10 sec.)	$P_{D\text{single}}$ (Note 3)	710	mW
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

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.

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

# NSS20200LT1G, NSV20200LT1G

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector – Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	-20	–	–	Vdc
Collector – Base Breakdown Voltage ( $I_C = -0.1\text{ mA}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-20	–	–	Vdc
Emitter – Base Breakdown Voltage ( $I_E = -0.1\text{ mA}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-7.0	–	–	Vdc
Collector Cutoff Current ( $V_{CB} = -20\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	–	-0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = -7.0\text{ Vdc}$ )	$I_{EBO}$	–	–	-0.1	$\mu\text{Adc}$

### ON CHARACTERISTICS

DC Current Gain (Note 4) ( $I_C = -10\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = -500\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = -2.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ )	$h_{FE}$	250 250 180 150	– 300 – –	– – – –	
Collector – Emitter Saturation Voltage (Note 4) ( $I_C = -0.1\text{ A}$ , $I_B = -0.010\text{ A}$ ) (Note 5) ( $I_C = -1.0\text{ A}$ , $I_B = -0.100\text{ A}$ ) ( $I_C = -1.0\text{ A}$ , $I_B = -0.010\text{ A}$ ) ( $I_C = -2.0\text{ A}$ , $I_B = -0.200\text{ A}$ )	$V_{CE(sat)}$	– – – –	-0.008 -0.065 -0.100 -0.130	-0.013 -0.090 -0.120 -0.180	V
Base – Emitter Saturation Voltage (Note 4) ( $I_C = -1.0\text{ A}$ , $I_B = -0.01\text{ A}$ )	$V_{BE(sat)}$	–	–	-0.900	V
Base – Emitter Turn-on Voltage (Note 4) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ )	$V_{BE(on)}$	–	–	-0.900	V
Cutoff Frequency ( $I_C = -100\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ , $f = 100\text{ MHz}$ )	$f_T$	100	–	–	MHz
Input Capacitance ( $V_{EB} = 0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	–	–	330	pF
Output Capacitance ( $V_{CB} = 3.0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	–	100	pF

### SWITCHING CHARACTERISTICS

Delay ( $V_{CC} = -15\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_d$	–	–	60	ns
Rise ( $V_{CC} = -15\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_r$	–	–	120	ns
Storage ( $V_{CC} = -15\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_s$	–	–	300	ns
Fall ( $V_{CC} = -15\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_f$	–	–	130	ns

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.

4. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle  $\leq 2\%$ .

5. Guaranteed by design but not tested.

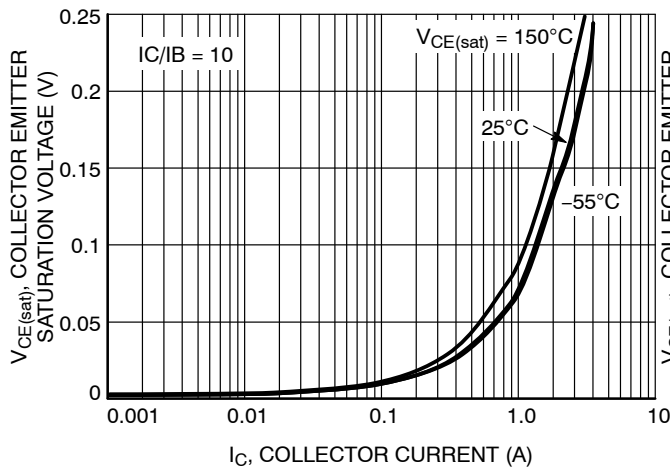


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

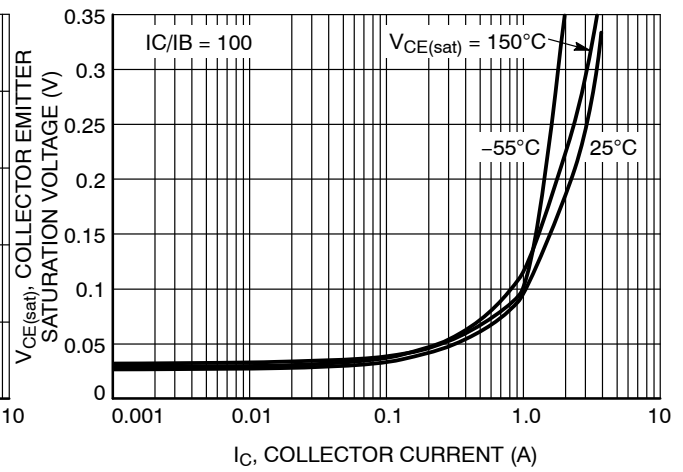


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

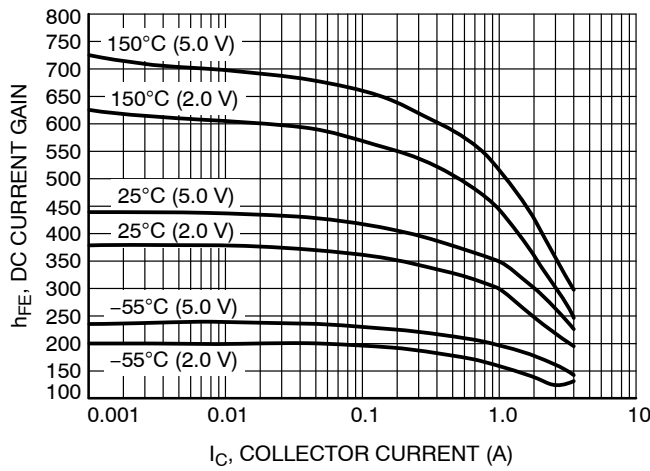


Figure 3. DC Current Gain vs. Collector Current

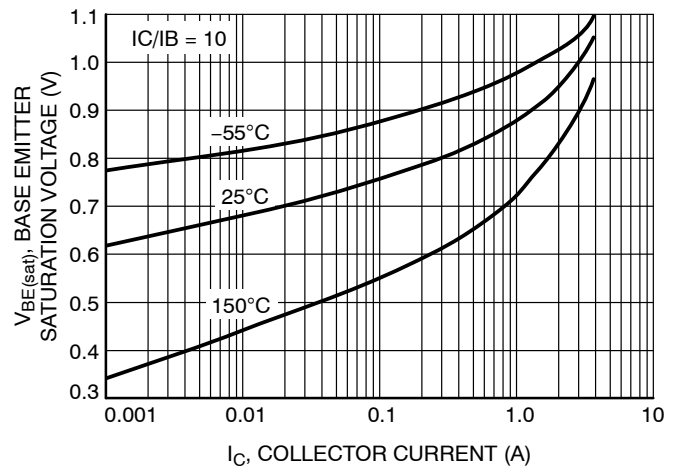


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

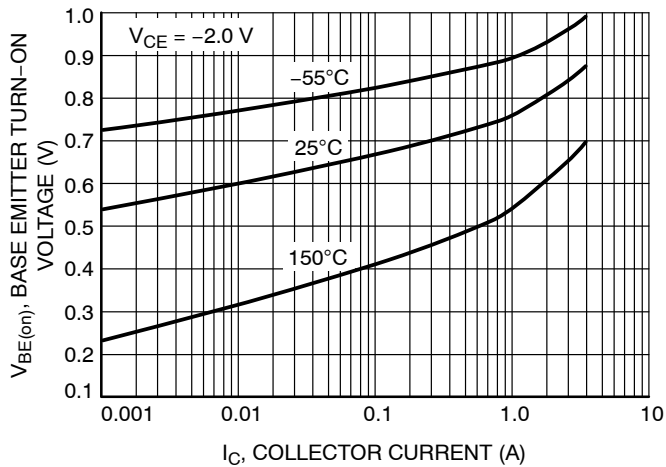


Figure 5. Base Emitter Turn-On Voltage vs. Collector Current

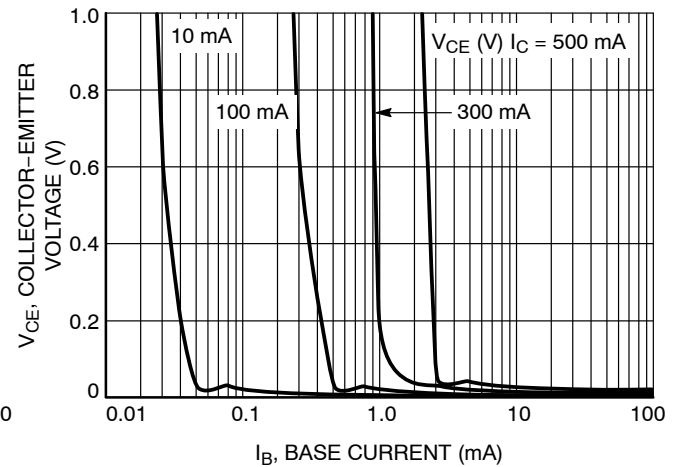
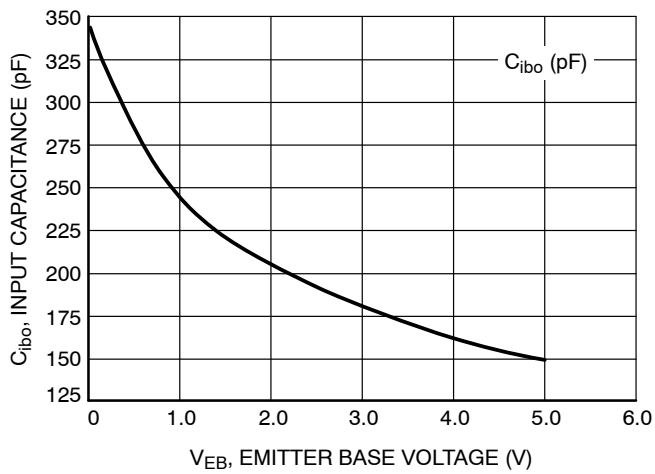
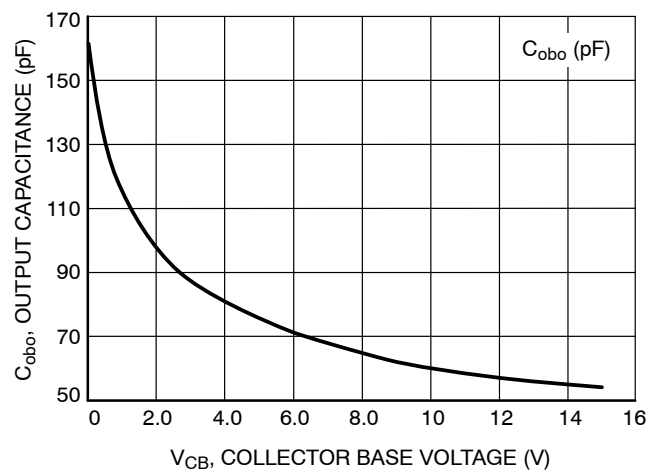


Figure 6. Saturation Region

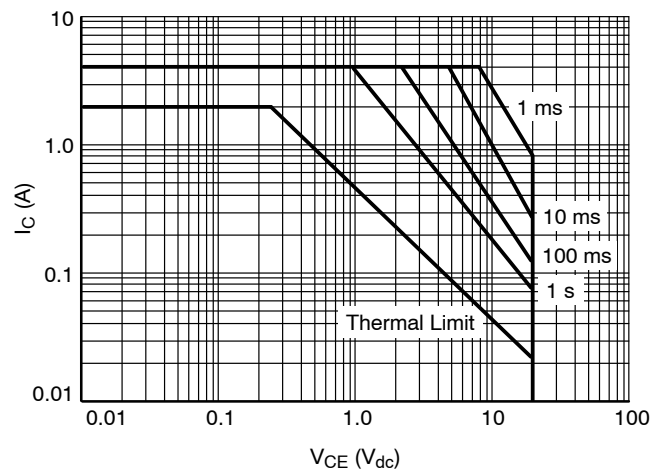
# NSS20200LT1G, NSV20200LT1G



**Figure 7. Input Capacitance**



**Figure 8. Output Capacitance**



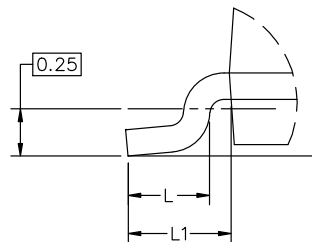
**Figure 9. Safe Operating Area**



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024



MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***



XXX = 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.



**RECOMMENDED MOUNTING FOOTPRINT**

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

**STYLES ON PAGE 2**

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**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

STYLE 1 THRU 5: CANCELLED	STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 7: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 8: PIN 1. ANODE 2. NO CONNECTION 3. CATHODE		
STYLE 9: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 10: PIN 1. DRAIN 2. SOURCE 3. GATE	STYLE 11: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 12: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 13: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 14: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 15: PIN 1. GATE 2. CATHODE 3. ANODE	STYLE 16: PIN 1. ANODE 2. CATHODE 3. CATHODE	STYLE 17: PIN 1. NO CONNECTION 2. ANODE 3. CATHODE	STYLE 18: PIN 1. NO CONNECTION 2. CATHODE 3. ANODE	STYLE 19: PIN 1. CATHODE 2. ANODE 3. CATHODE-ANODE	STYLE 20: PIN 1. CATHODE 2. ANODE 3. GATE
STYLE 21: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 22: PIN 1. RETURN 2. OUTPUT 3. INPUT	STYLE 23: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 24: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 25: PIN 1. ANODE 2. CATHODE 3. GATE	STYLE 26: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION
STYLE 27: PIN 1. CATHODE 2. CATHODE 3. CATHODE	STYLE 28: PIN 1. ANODE 2. ANODE 3. ANODE				

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