

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

NSS20201LT1G, NSV20201LT1G

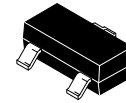
onsemi's e²PowerEdge family of low $V_{CE(sat)}$ transistors are miniature surface mount devices featuring ultra low saturation voltage ($V_{CE(sat)}$) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control 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 e²PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

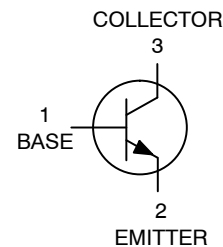
Features

- 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*

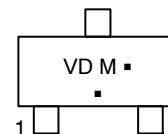
20 VOLTS 4.0 AMPS
NPN LOW $V_{CE(sat)}$ TRANSISTOR
EQUIVALENT $R_{DS(on)}$ 37 m Ω



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



MARKING DIAGRAM



VD = 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 [†]
NSS20201LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
NSV20201LT1G	SOT-23 (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.

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

NSS20201LT1G, NSV20201LT1G

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}	6.0	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°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°C	P_D (Note 2)	540 4.3	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	230	$^\circ\text{C/W}$
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 mm², 1 oz. copper traces.
2. FR-4 @ 500 mm², 1 oz. copper traces.

NSS20201LT1G, NSV20201LT1G

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 ($I_E = 0.1\text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	6.0	–	–	Vdc
Collector Cutoff Current ($V_{CB} = 20\text{ Vdc}$, $I_E = 0$)	I_{CBO}	–	–	0.1	μAdc
Emitter Cutoff Current ($V_{EB} = 6.0\text{ Vdc}$)	I_{EBO}	–	–	0.1	μAdc

ON CHARACTERISTICS

DC Current Gain (Note 3) ($I_C = 10\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 500\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 1.0\text{ A}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 2.0\text{ A}$, $V_{CE} = 2.0\text{ V}$)	h_{FE}	200 200 200 200	– 360 – –	– – – –	
Collector – Emitter Saturation Voltage (Note 3) ($I_C = 0.1\text{ A}$, $I_B = 0.010\text{ A}$) ($I_C = 1.0\text{ A}$, $I_B = 0.100\text{ A}$) ($I_C = 1.0\text{ A}$, $I_B = 0.010\text{ A}$) ($I_C = 2.0\text{ A}$, $I_B = 0.200\text{ A}$)	$V_{CE(sat)}$	– – – –	0.004 0.037 0.060 0.072	0.010 0.050 0.090 0.100	V
Base – Emitter Saturation Voltage (Note 3) ($I_C = 1.0\text{ A}$, $I_B = 10\text{ mA}$)	$V_{BE(sat)}$	–	0.760	0.900	V
Base – Emitter Turn-on Voltage (Note 3) ($I_C = 1.0\text{ A}$, $V_{CE} = 2.0\text{ V}$)	$V_{BE(on)}$	–	0.760	0.900	V
Cutoff Frequency ($I_C = 100\text{ mA}$, $V_{CE} = 5.0\text{ V}$, $f = 100\text{ MHz}$)	f_T	150	–	–	MHz
Input Capacitance ($V_{EB} = 0.5\text{ V}$, $f = 1.0\text{ MHz}$)	C_{ibo}	–	–	450	pF
Output Capacitance ($V_{CB} = 3.0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{obo}	–	–	45	pF

SWITCHING CHARACTERISTICS

Delay ($V_{CC} = 15\text{ V}$, $I_C = 750\text{ mA}$, $I_{B1} = 15\text{ mA}$)	t_d	–	–	100	ns
Rise ($V_{CC} = 15\text{ V}$, $I_C = 750\text{ mA}$, $I_{B1} = 15\text{ mA}$)	t_r	–	–	100	ns
Storage ($V_{CC} = 15\text{ V}$, $I_C = 750\text{ mA}$, $I_{B1} = 15\text{ mA}$)	t_s	–	–	500	ns
Fall ($V_{CC} = 15\text{ V}$, $I_C = 750\text{ mA}$, $I_{B1} = 15\text{ mA}$)	t_f	–	–	110	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.

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

TYPICAL CHARACTERISTICS

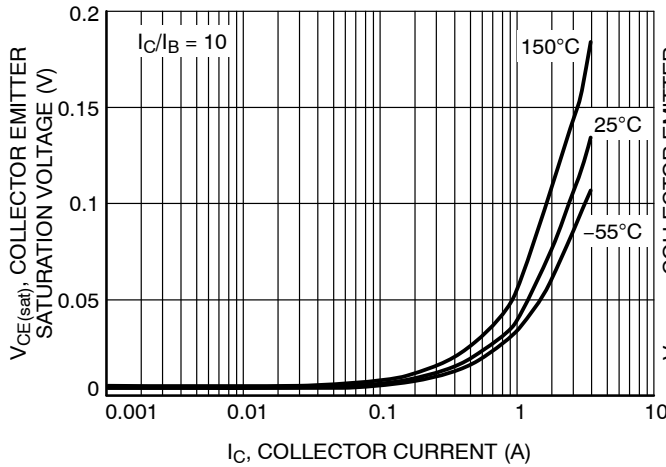


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

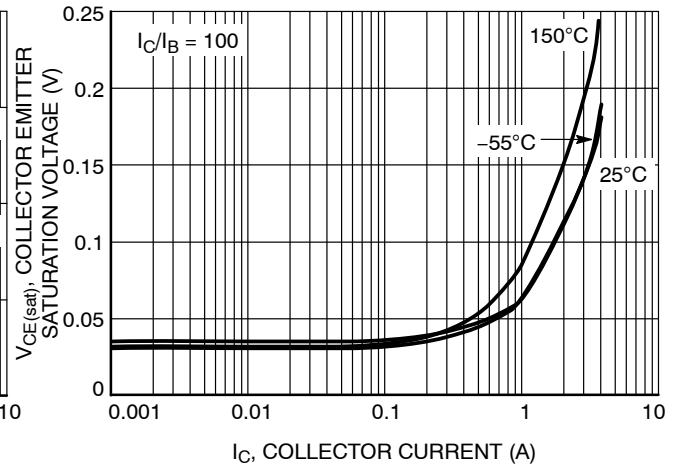


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

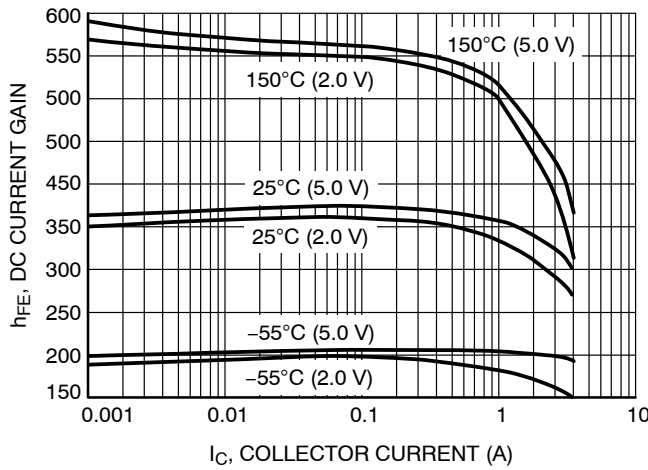


Figure 3. DC Current Gain vs. Collector Current

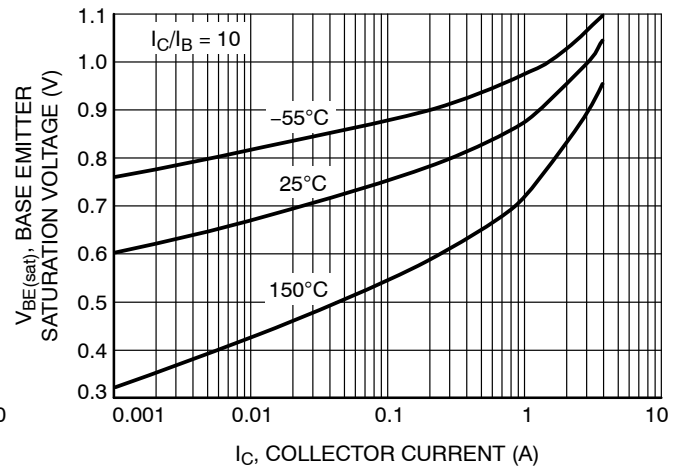


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

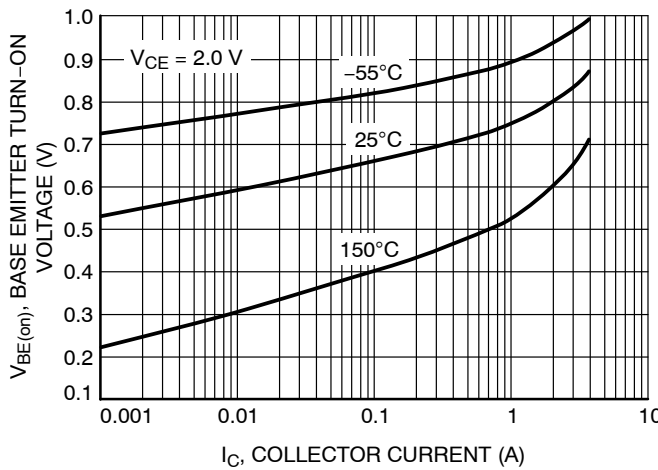


Figure 5. Base Emitter Turn-On Voltage vs. Collector Current

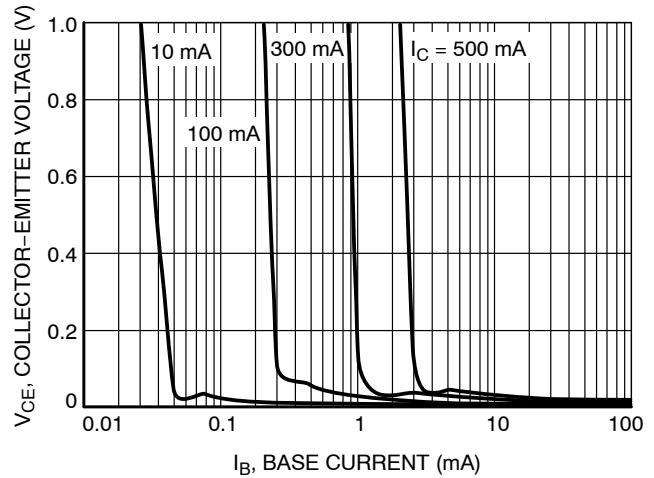


Figure 6. Saturation Region

TYPICAL CHARACTERISTICS

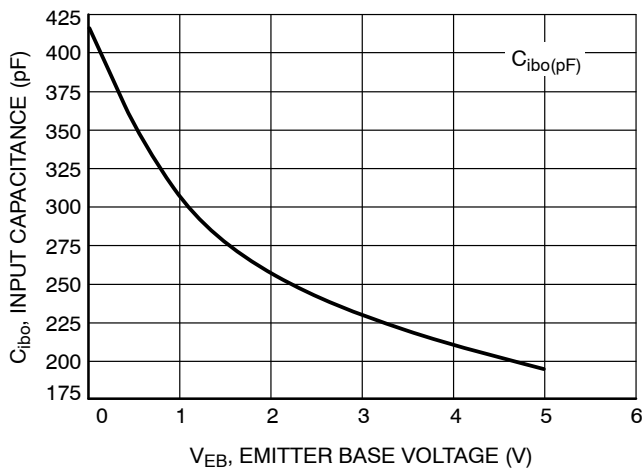


Figure 7. Input Capacitance

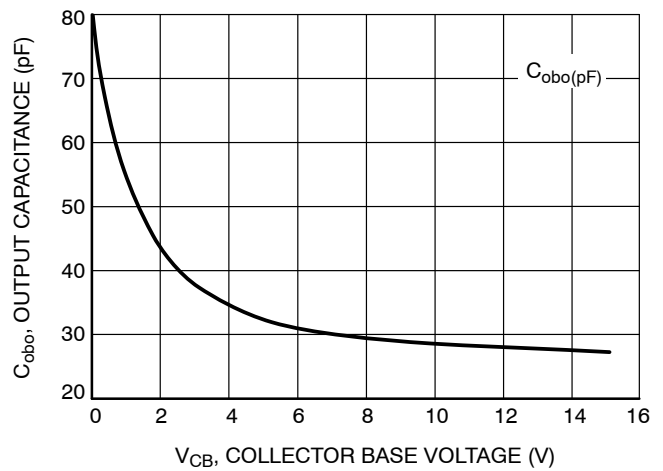


Figure 8. Output Capacitance

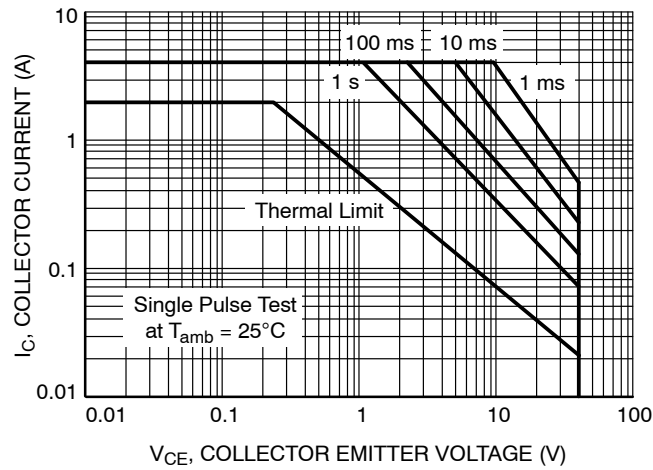
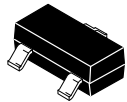


Figure 9. Safe Operating Area

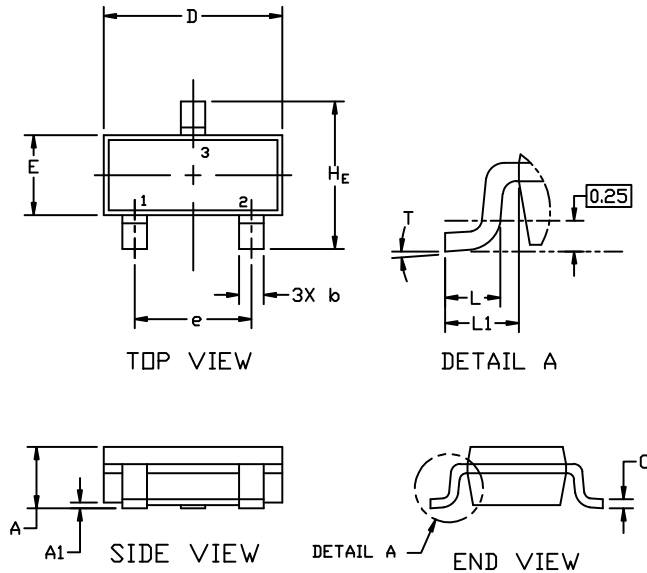
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

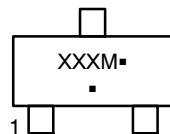


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: 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.

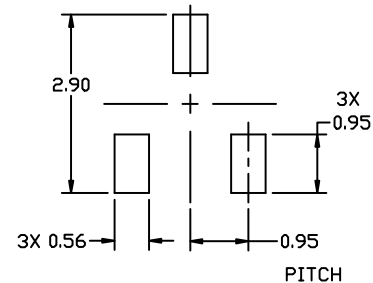
DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H _E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

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 ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

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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