

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

NSS20201LT1G, NSV20201LT1G

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 e²PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

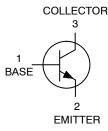
Features

- 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.

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

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	Α
Collector Current - Peak	I _{CM}	4.0	Α
Electrostatic Discharge	ESD		lass 3B lass C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D (Note 1)	460 3.7	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R _{θJA} (Note 1)	270	°C/W
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D (Note 2)	540 4.3	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R _{θJA} (Note 2)	230	°C/W
Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +150	°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.

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

V _(BR) CEO V _(BR) CBO V _(BR) EBO I _{CBO} I _{EBO}	20 20 6.0 -	- - - -	- - - 0.1	Vdc Vdc Vdc uAdc
V _(BR) CBO V _(BR) EBO I _{CBO}	20 6.0	-	- 0.1	Vdc Vdc μAdc
V _{(BR)EBO} I _{CBO} I _{EBO}	6.0	-		Vdc μAdc
I _{CBO}	-	-		μAdc
I _{EBO}				
	-	-	0.1	μAdc
h _{FE}				
h _{FE}		T .		
	200 200 200 200	- 360 - -	- - - -	
V _{CE(sat)}	- - - -	0.004 0.037 0.060 0.072	0.010 0.050 0.090 0.100	V
V _{BE(sat)}	-	0.760	0.900	V
V _{BE(on)}	-	0.760	0.900	V
f _T	150	-	-	MHz
Cibo	-	-	450	pF
Cobo	-	-	45	pF
t _d	-	-	100	ns
t _r	-	_	100	ns
t _s	-	-	500	ns
t _f	-	-	110	ns
	$V_{CE(sat)}$ $V_{BE(sat)}$ $V_{BE(on)}$ f_{T} $Cibo$ $Cobo$ t_{d} t_{r} t_{s}	200 200	200	200

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

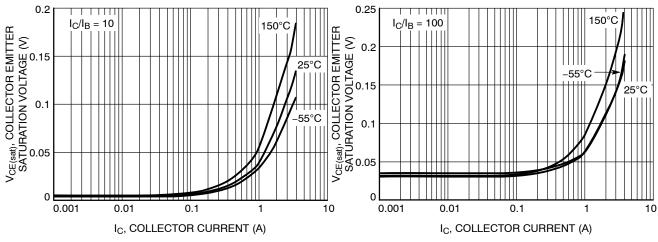


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

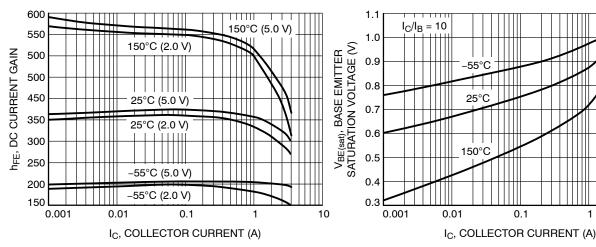


Figure 3. DC Current Gain vs. Collector Current

Figure 4. Base Emitter Saturation Voltage vs.
Collector Current

10

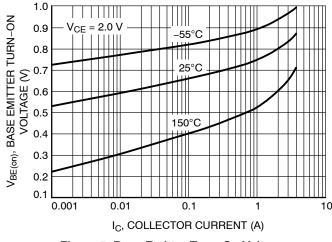


Figure 5. Base Emitter Turn-On Voltage vs. Collector Current

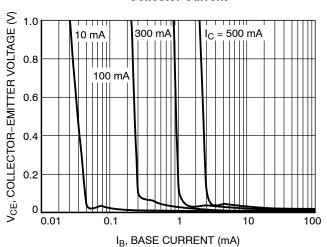


Figure 6. Saturation Region

TYPICAL CHARACTERISTICS

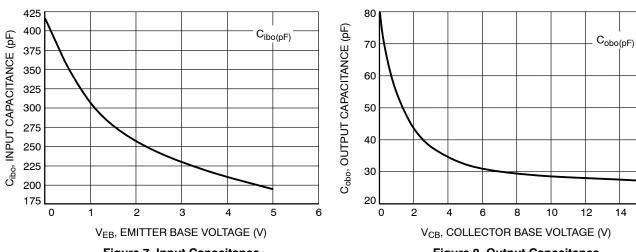


Figure 7. Input Capacitance

Figure 8. Output Capacitance

14

16

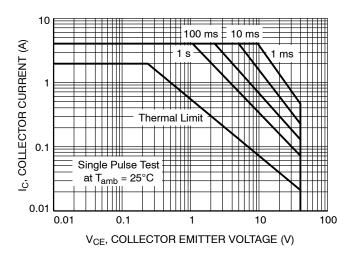


Figure 9. Safe Operating Area





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

DATE 01 MAR 2023









NOTES:

- 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.

	MILLIMETERS INCHES					
DIM	MIN.	N□M.	MAX.	MIN.	N□M.	MAX.
Α	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
С	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
Ε	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
HE	2.10	2.40	2.64	0.083	0.094	0.104
Т	0*		10°	0*		10°

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

M = Date Code

■ = Pb-Free Package



RECOMMENDED MOUNTING FOOTPRINT

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

STYLES ON PAGE 2

DOCUMENT NUMBER:	NUMBER: 98ASB42226B Electronic versions are uncontrolled except when accessed of Printed versions are uncontrolled except when stamped "CO"			
DESCRIPTION:	SOT-23 (TO-236)		PAGE 1 OF 2	

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

^{*}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.

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	1	
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: N 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				

DOCUMENT NUMBER:	98ASB42226B	Electronic versions are uncontrolled except when accessed directly from the E Printed versions are uncontrolled except when stamped "CONTROLLED COP"	
DESCRIPTION:	SOT-23 (TO-236)		PAGE 2 OF 2

onsemi and ONSEMi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, Onsemi, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. Onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA class 3 medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

 $\textbf{Technical Library:} \ \underline{www.onsemi.com/design/resources/technical-documentation}$

onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at

www.onsemi.com/support/sales