

20 V, 5 A, Low $V_{CE(sat)}$ PNP Transistor

NSS20300MR6

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 application 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.

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

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	-20	Vdc
Collector-Base Voltage	V_{CBO}	-30	Vdc
Emitter-Base Voltage	V_{EBO}	-6.0	Vdc
Collector Current - Continuous	I_C	-3.0	Adc
Collector Current - Peak	I_{CM}	-5.0	A
Electrostatic Discharge	ESD	HBM Class 3B MM Class C	

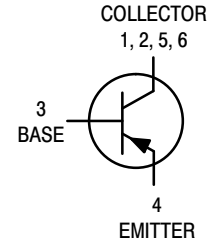
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D (Note 1)	545 4.3	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	230	$^\circ\text{C}/\text{W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D (Note 2)	1.06 8.5	W mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	118	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Lead #1	$R_{\theta JL}$ (Note 1) $R_{\theta JL}$ (Note 2)	48 40	$^\circ\text{C}/\text{W}$ $^\circ\text{C}/\text{W}$
Total Device Dissipation (Single Pulse < 10 sec.)	$P_{D\text{single}}$ (Note 2)	1.75	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.

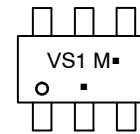
- FR-4 @ 100 mm², 2 oz copper traces.
- FR-4 @ 500 mm², 2 oz copper traces.

20 VOLTS
5.0 AMPS
PNP LOW $V_{CE(sat)}$ TRANSISTOR
EQUIVALENT $R_{DS(on)}$ 78 m Ω



TSOP-6
CASE 318G
STYLE 6

DEVICE MARKING



VS1 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NSS20300MR6T1G	TSOP-6 (Pb-Free)	3000/Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NSS20300MR6

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

Characteristic	Symbol	Min	Typical	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage ($I_C = -10\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	-20		-	Vdc
Collector – Base Breakdown Voltage ($I_C = -0.1\text{ mA}$, $I_E = 0$)	$V_{(BR)CBO}$	-30		-	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	μA dc
Collector – Emitter Cutoff Current ($V_{CES} = -20\text{ Vdc}$)	I_{CES}	-		-0.1	μA dc
Emitter Cutoff Current ($V_{EB} = -6.0\text{ Vdc}$)	I_{EBO}	-		-0.1	μA dc
ON CHARACTERISTICS					
DC Current Gain ⁽¹⁾ ($I_C = -1.0\text{ A}$, $V_{CE} = -1.5\text{ V}$) ($I_C = -1.5\text{ A}$, $V_{CE} = -2.0\text{ V}$) ($I_C = -2.0\text{ A}$, $V_{CE} = -2.0\text{ V}$)	h_{FE}	100 100 100	230	- 400 -	
Collector – Emitter Saturation Voltage (Note 3) ($I_C = -0.10\text{ A}$, $I_B = -0.010\text{ A}$) ($I_C = -1.0\text{ A}$, $I_B = -0.010\text{ A}$) ($I_C = -2.0\text{ A}$, $I_B = -0.02\text{ A}$)	$V_{CE(sat)}$	- - -	-0.010 -0.127 -0.250	-0.015 -0.145 -0.320	V
Base – Emitter Saturation Voltage (Note 3) ($I_C = -1\text{ A}$, $I_B = -0.010\text{ A}$)	$V_{BE(sat)}$	-	-	-0.85	V
Base – Emitter Turn-on Voltage (Note 3) ($I_C = -2.0\text{ A}$, $V_{CE} = -3.0\text{ V}$)	$V_{BE(on)}$	-	-	-0.875	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}	-		650	pF
Output Capacitance ($V_{CB} = -3.0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{OBO}	-		100	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 $\leq 300\ \mu\text{sec}$, Duty Cycle $\leq 2\%$.

NSS2030MR6

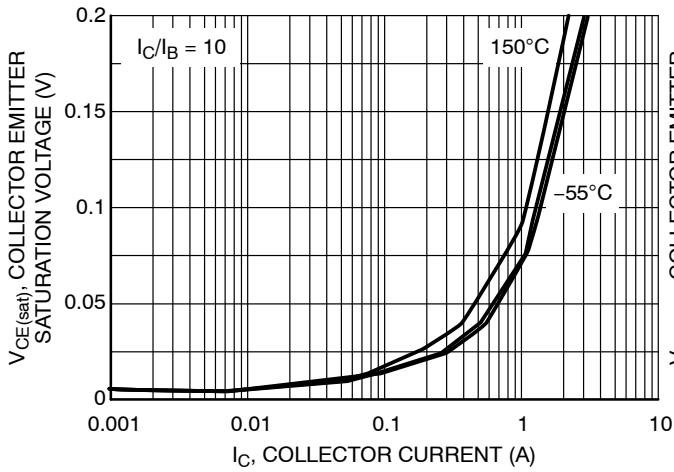


Figure 1. Collector Emitter Saturation Voltage versus Collector Current

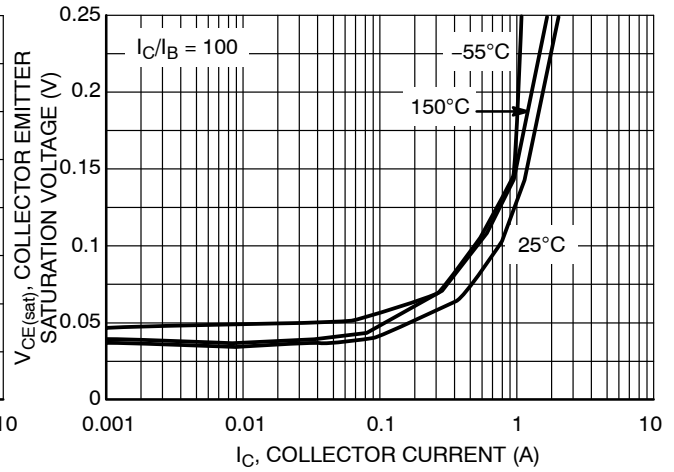


Figure 2. Collector Emitter Saturation Voltage versus Collector Current

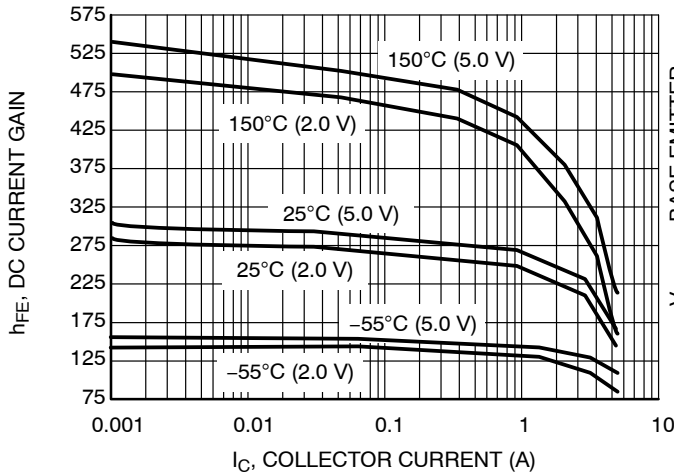


Figure 3. DC Current Gain versus Collector Current

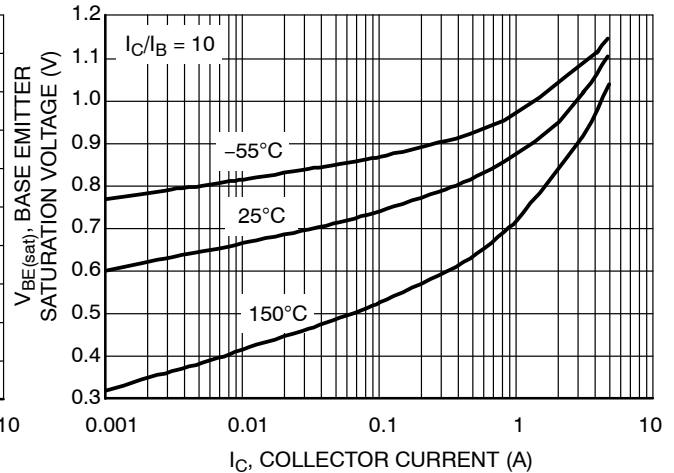


Figure 4. Base Emitter Saturation Voltage versus Collector Current

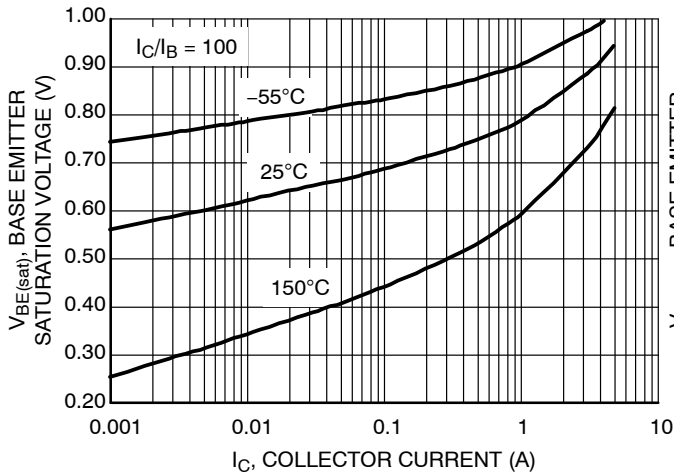


Figure 5. Base Emitter Saturation Voltage versus Collector Current

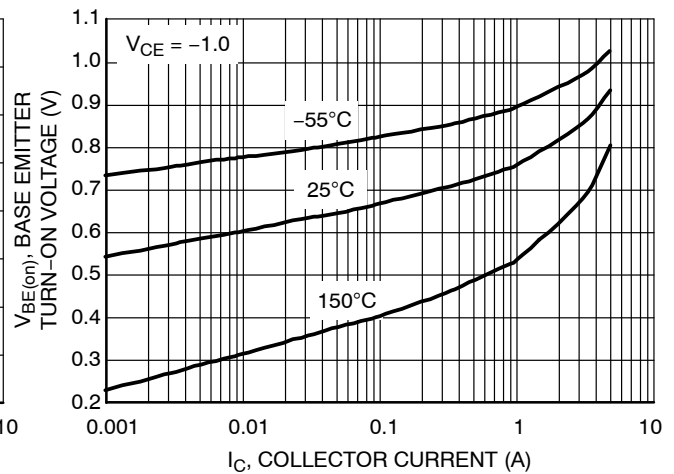


Figure 6. Base Emitter Turn-On Voltage versus Collector Current

NSS20300MR6

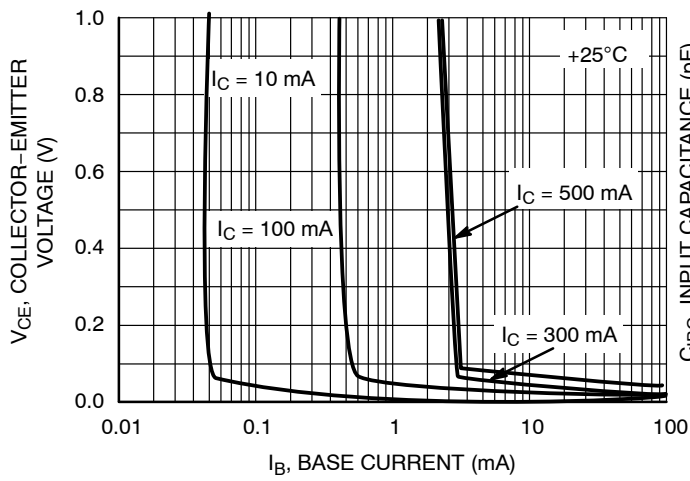


Figure 7. Saturation Region

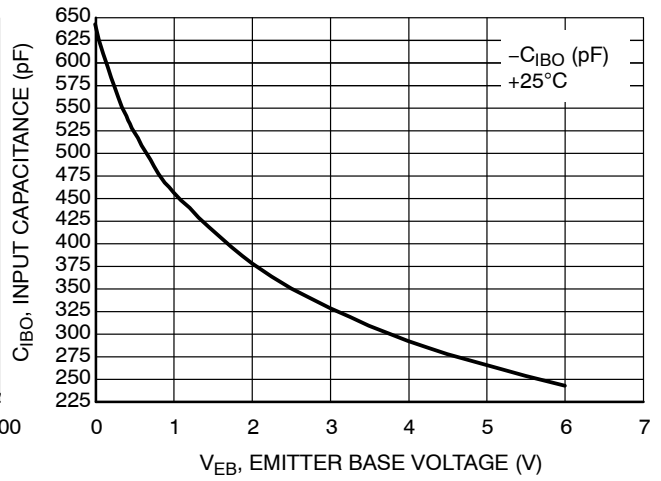


Figure 8. NSS20300MR6T1G Input Capacitance

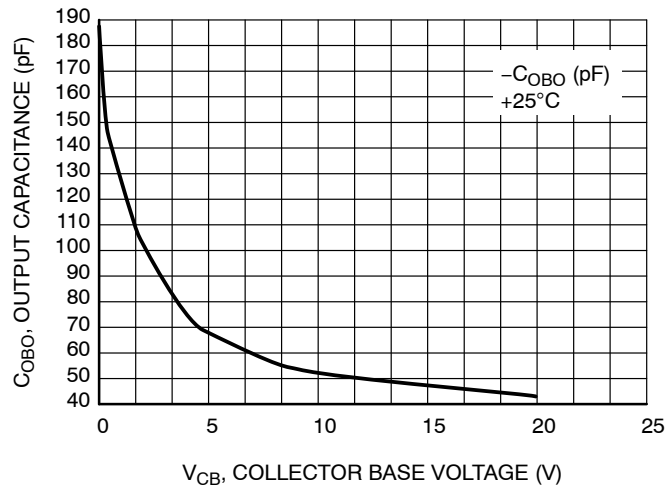


Figure 9. NSS20300MR6T1G Output Capacitance

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



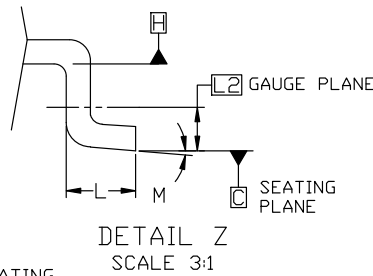
TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

DATE 26 FEB 2024



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN 1 INDICATOR MUST BE LOCATED IN THE INDICATED ZONE



MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
A2	0.80	0.90	1.00
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	---	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.

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

DATE 26 FEB 2024

GENERIC MARKING DIAGRAM*



IC



STANDARD

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb-Free Package

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.

- | | | | | | |
|--|--|---|---|---|--|
| <p>STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN</p> | <p>STYLE 2:
PIN 1. EMITTER 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. BASE 2
6. COLLECTOR 2</p> | <p>STYLE 3:
PIN 1. ENABLE
2. N/C
3. R BOOST
4. Vz
5. V in
6. V out</p> | <p>STYLE 4:
PIN 1. N/C
2. V in
3. NOT USED
4. GROUND
5. ENABLE
6. LOAD</p> | <p>STYLE 5:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2</p> | <p>STYLE 6:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR</p> |
| <p>STYLE 7:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. N/C
5. COLLECTOR
6. EMITTER</p> | <p>STYLE 8:
PIN 1. Vbus
2. D(in)
3. D(in)+
4. D(out)+
5. D(out)
6. GND</p> | <p>STYLE 9:
PIN 1. LOW VOLTAGE GATE
2. DRAIN
3. SOURCE
4. DRAIN
5. DRAIN
6. HIGH VOLTAGE GATE</p> | <p>STYLE 10:
PIN 1. D(OUT)+
2. GND
3. D(OUT)-
4. D(IN)-
5. VBUS
6. D(IN)+</p> | <p>STYLE 11:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1/GATE 2</p> | <p>STYLE 12:
PIN 1. I/O
2. GROUND
3. I/O
4. I/O
5. VCC
6. I/O</p> |
| <p>STYLE 13:
PIN 1. GATE 1
2. SOURCE 2
3. GATE 2
4. DRAIN 2
5. SOURCE 1
6. DRAIN 1</p> | <p>STYLE 14:
PIN 1. ANODE
2. SOURCE
3. GATE
4. CATHODE/DRAIN
5. CATHODE/DRAIN
6. CATHODE/DRAIN</p> | <p>STYLE 15:
PIN 1. ANODE
2. SOURCE
3. GATE
4. DRAIN
5. N/C
6. CATHODE</p> | <p>STYLE 16:
PIN 1. ANODE/CATHODE
2. BASE
3. EMITTER
4. COLLECTOR
5. ANODE
6. CATHODE</p> | <p>STYLE 17:
PIN 1. EMITTER
2. BASE
3. ANODE/CATHODE
4. ANODE
5. CATHODE
6. COLLECTOR</p> | |

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