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[ON Semiconductor](#)  
[NSS20300MR6T1G](#)

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# NSS20300MR6T1G

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

ON Semiconductor'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 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 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.

### 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 $25^\circ\text{C}$	$P_D$ (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 $25^\circ\text{C}$	$P_D$ (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	$T_J, T_{\text{stg}}$	-55 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

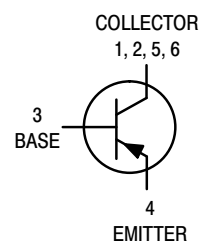
- FR-4 @ 100 mm<sup>2</sup>, 2 oz copper traces.
- FR-4 @ 500 mm<sup>2</sup>, 2 oz copper traces.



**ON Semiconductor**

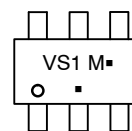
<http://onsemi.com>

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



**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 <sup>†</sup>
NSS20300MR6T1G	TSOP-6 (Pb-Free)	3000/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 Specifications Brochure, BRD8011/D.

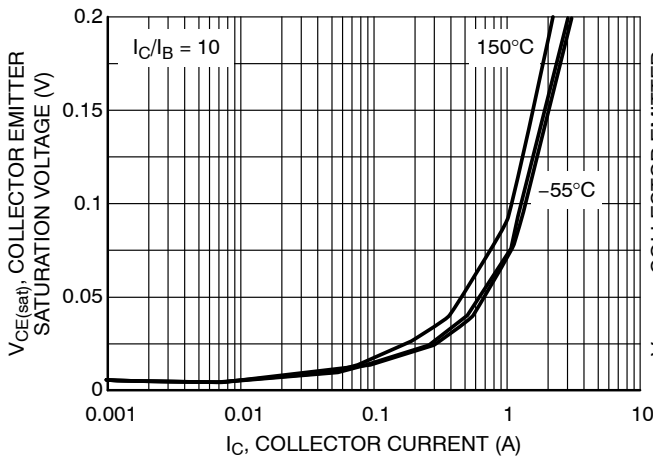
## NSS20300MR6T1G

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

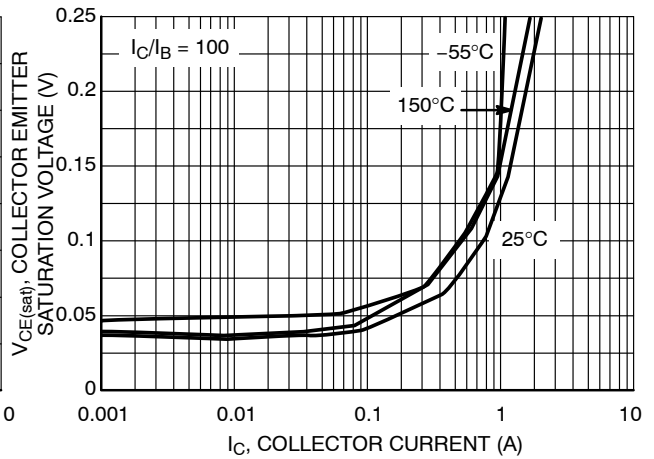
Characteristic	Symbol	Min	Typical	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage ( $I_C = -10 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	-20		-	Vdc
Collector – Base Breakdown Voltage ( $I_C = -0.1 \text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-30		-	Vdc
Emitter – Base Breakdown Voltage ( $I_E = -0.1 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-6.0		-	Vdc
Collector Cutoff Current ( $V_{CB} = -20 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-		-0.1	$\mu\text{Adc}$
Collector–Emitter Cutoff Current ( $V_{CES} = -20 \text{ Vdc}$ )	$I_{CES}$	-		-0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = -6.0 \text{ Vdc}$ )	$I_{EBO}$	-		-0.1	$\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>					
DC Current Gain <sup>(1)</sup> ( $I_C = -1.0 \text{ A}$ , $V_{CE} = -1.5 \text{ V}$ ) ( $I_C = -1.5 \text{ A}$ , $V_{CE} = -2.0 \text{ V}$ ) ( $I_C = -2.0 \text{ A}$ , $V_{CE} = -2.0 \text{ V}$ )	$h_{FE}$	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

 3. Pulsed Condition: Pulse Width  $\leq 300 \mu\text{sec}$ , Duty Cycle  $\leq 2\%$ .

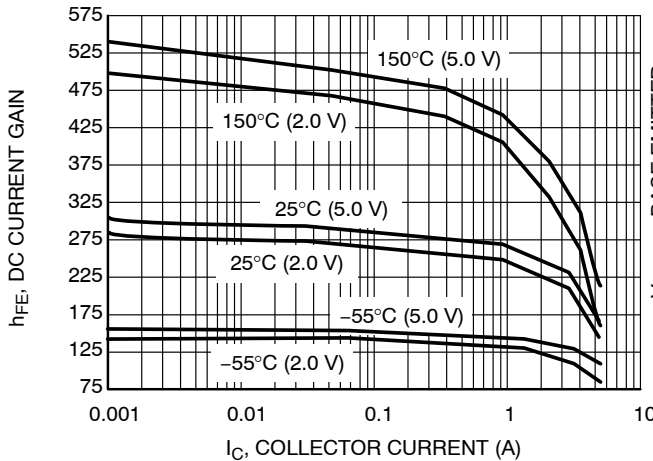
**NSS20300MR6T1G**



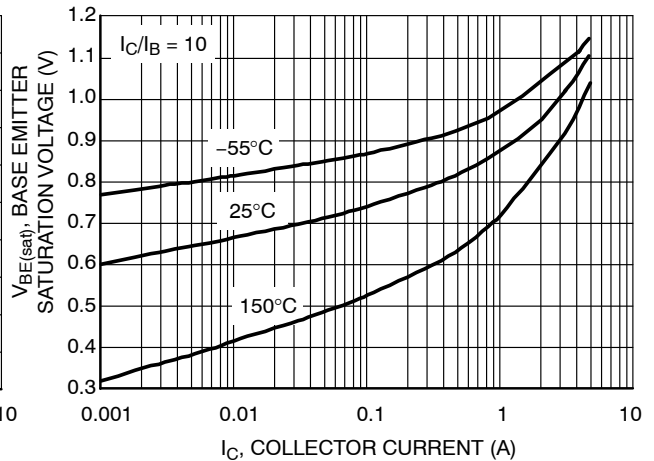
**Figure 1. Collector Emitter Saturation Voltage versus Collector Current**



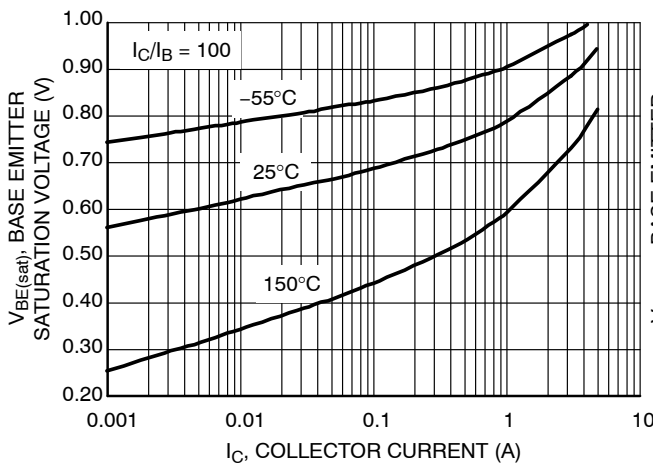
**Figure 2. Collector Emitter Saturation Voltage versus Collector Current**



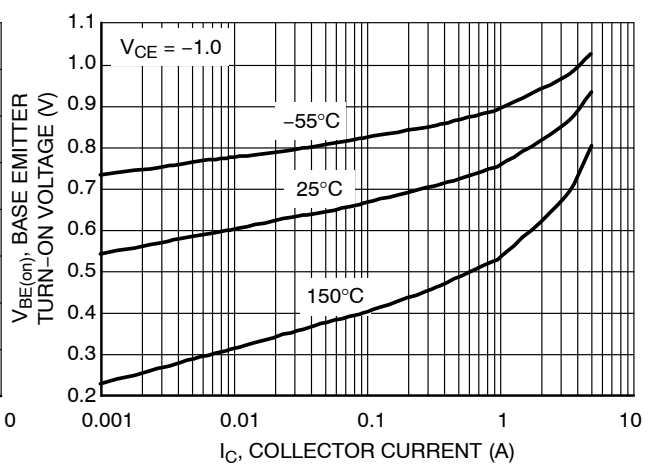
**Figure 3. DC Current Gain versus Collector Current**



**Figure 4. Base Emitter Saturation Voltage versus Collector Current**

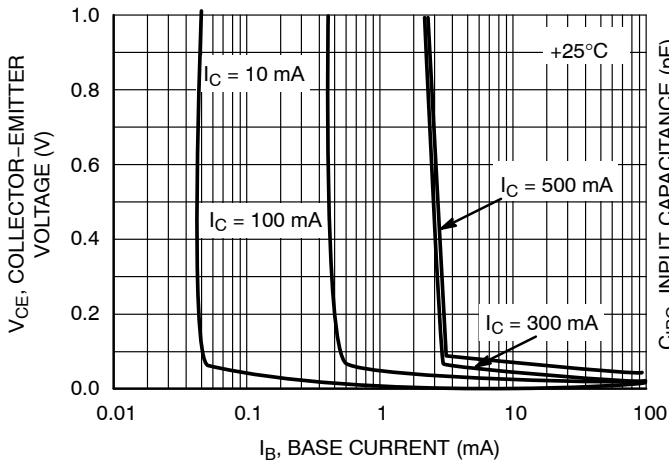


**Figure 5. Base Emitter Saturation Voltage versus Collector Current**

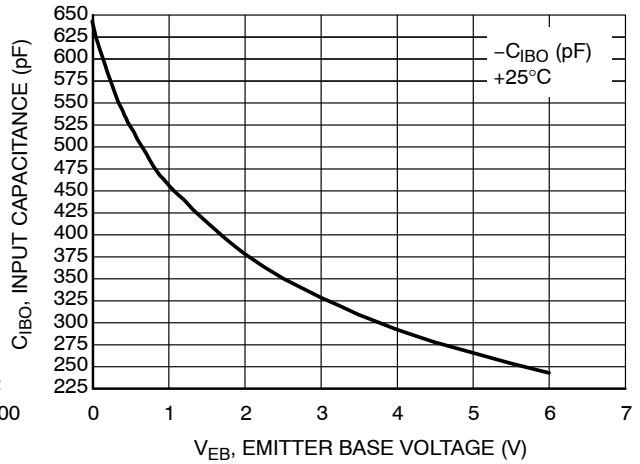


**Figure 6. Base Emitter Turn-On Voltage versus Collector Current**

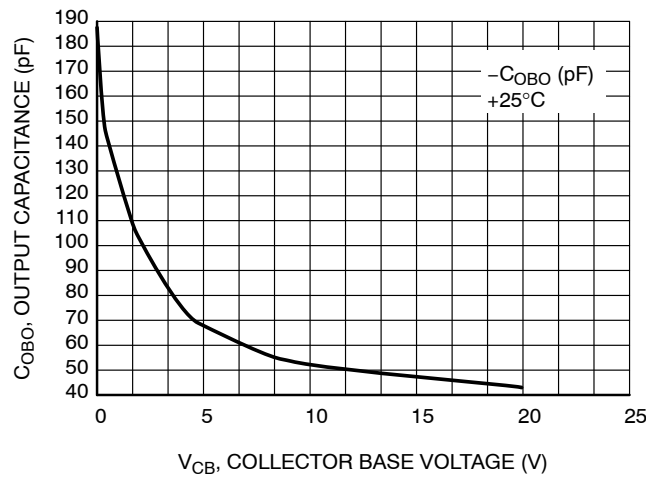
**NSS20300MR6T1G**



**Figure 7. Saturation Region**



**Figure 8. NSS20300MR6T1G Input Capacitance**

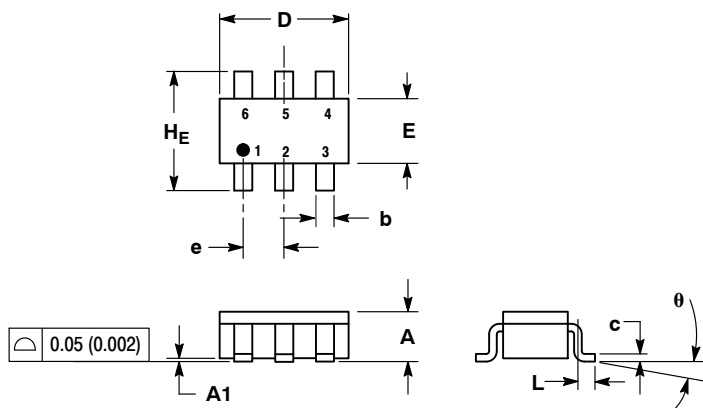


**Figure 9. NSS20300MR6T1G Output Capacitance**

## NSS20300MR6T1G

### PACKAGE DIMENSIONS

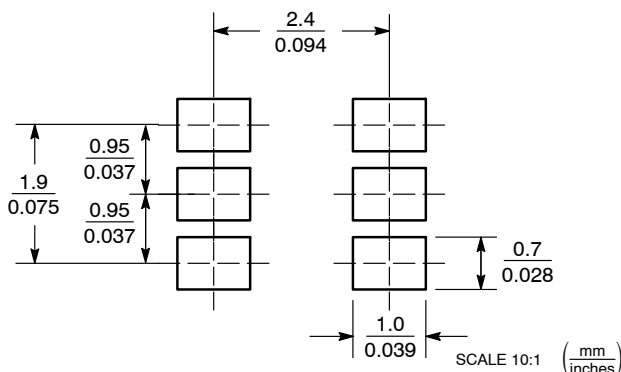
TSOP-6  
 CASE 318G-02  
 ISSUE T



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	-	10°	0°	-	10°

### SOLDERING FOOTPRINT\*



- STYLE 6:
1. COLLECTOR
  2. COLLECTOR
  3. BASE
  4. EMITTER
  5. COLLECTOR
  6. COLLECTOR

\*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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