

# NSS12601CF8T1G

## 12 V, 8.0 A, Low $V_{CE(sat)}$ NPN 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 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.

- This is a Pb-Free Device

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

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	12	Vdc
Collector-Base Voltage	$V_{CBO}$	12	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current - Continuous	$I_C$	6.0	Adc
Collector Current - Peak	$I_{CM}$	8.0	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)	830 6.7	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	150	$^\circ\text{C}/\text{W}$
Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 2)	1.4 11.1	W mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	90	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Lead #1	$R_{\theta JL}$ (Note 2)	15	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-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.

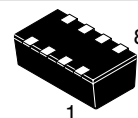
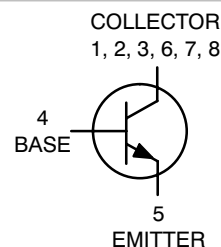
1. FR-4 @ 100 mm<sup>2</sup>, 1 oz copper traces.
2. FR-4 @ 500 mm<sup>2</sup>, 1 oz copper traces.



**ON Semiconductor**<sup>®</sup>

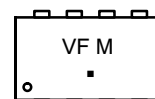
<http://onsemi.com>

## 12 VOLTS, 8.0 AMPS NPN LOW $V_{CE(sat)}$ TRANSISTOR EQUIVALENT $R_{DS(on)} 30\text{ m}\Omega$



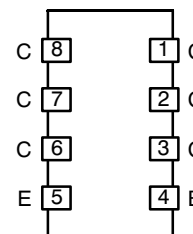
ChipFET<sup>™</sup>  
CASE 1206A  
STYLE 4

### MARKING DIAGRAM



VF = Specific Device Code  
M = Month Code  
▪ = Pb-Free Package

### PIN CONNECTIONS



### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NSS12601CF8T1G	ChipFET (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.

# NSS12601CF8T1G

## 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 ( $I_C = 10\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	12	-	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = 0.1\text{ mA}$ , $I_E = 0$ )	$V_{(BR)CBO}$	12	-	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 0.1\text{ mA}$ , $I_C = 0$ )	$V_{(BR)EBO}$	6.0	-	-	Vdc
Collector Cutoff Current ( $V_{CB} = 12\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-	-	0.1	$\mu\text{A}$ dc
Emitter Cutoff Current ( $V_{EB} = 6.0\text{ Vdc}$ )	$I_{EBO}$	-	-	0.1	$\mu\text{A}$ dc

## ON CHARACTERISTICS

DC Current Gain (Note 3) ( $I_C = 10\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 500\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 2.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 3.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )	$h_{FE}$	200 200 200 200 200	- - 395 - -	- - - - -	
Collector-Emitter Saturation Voltage (Note 3) ( $I_C = 0.1\text{ A}$ , $I_B = 0.010\text{ A}$ ) ( $I_C = 1.0\text{ A}$ , $I_B = 0.100\text{ A}$ ) ( $I_C = 1.0\text{ A}$ , $I_B = 0.010\text{ A}$ ) ( $I_C = 2.0\text{ A}$ , $I_B = 0.020\text{ A}$ ) ( $I_C = 3.0\text{ A}$ , $I_B = 0.030\text{ A}$ ) ( $I_C = 4.0\text{ A}$ , $I_B = 0.400\text{ A}$ )	$V_{CE(sat)}$	- - - - - -	0.007 0.030 0.045 0.055 0.080 0.090	0.010 0.050 0.060 0.070 0.110 0.120	V
Base-Emitter Saturation Voltage (Note 3) ( $I_C = 1.0\text{ A}$ , $I_B = 0.01\text{ A}$ )	$V_{BE(sat)}$	-	0.760	0.900	V
Base-Emitter Turn-on Voltage (Note 3) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )	$V_{BE(on)}$	-	0.720	0.900	V
Cutoff Frequency ( $I_C = 100\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 100\text{ MHz}$ )	$f_T$	140	-	-	MHz
Input Capacitance ( $V_{EB} = 0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	-	-	1000	pF
Output Capacitance ( $V_{CB} = 3.0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	-	-	200	pF

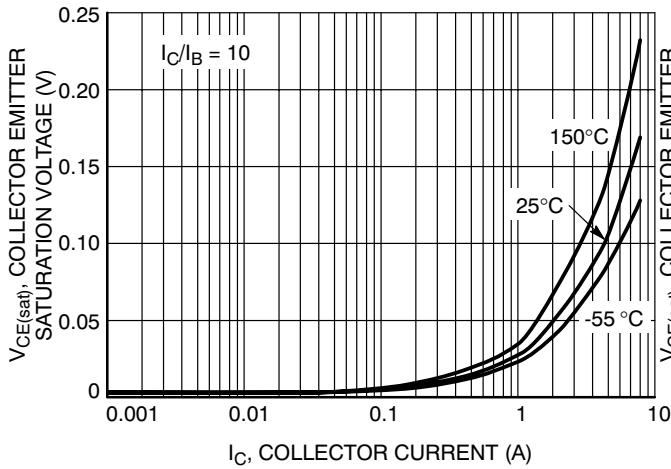
## SWITCHING CHARACTERISTICS

Delay ( $V_{CC} = 10\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_d$	-	-	110	ns
Rise ( $V_{CC} = 10\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_r$	-	-	140	ns
Storage ( $V_{CC} = 10\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_s$	-	-	550	ns
Fall ( $V_{CC} = 10\text{ V}$ , $I_C = 750\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )	$t_f$	-	-	140	ns

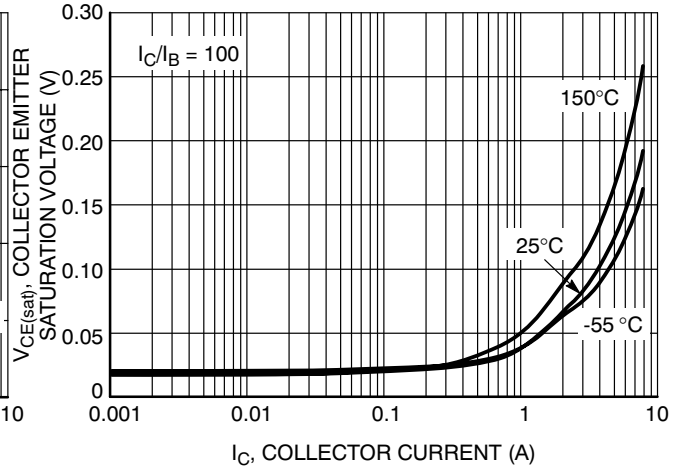
3. Pulsed Condition: Pulse Width = 300  $\mu\text{sec}$ , Duty Cycle  $\leq 2\%$ .

## TYPICAL CHARACTERISTICS

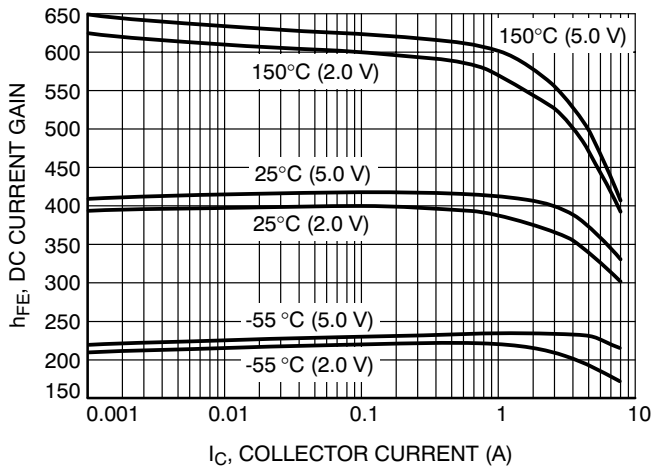
# NSS12601CF8T1G



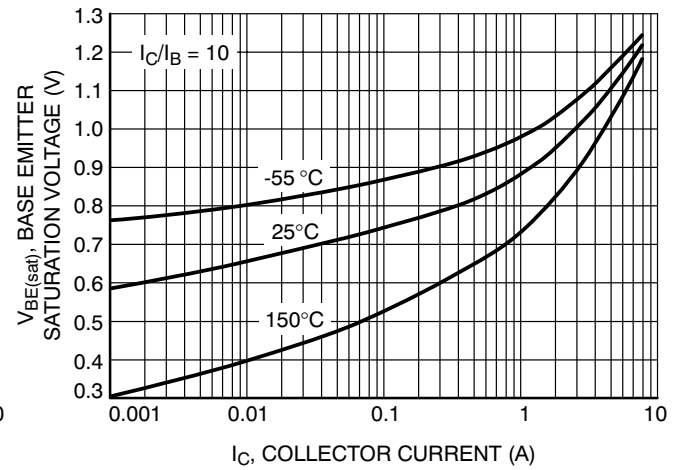
**Figure 1. Collector Emitter Saturation Voltage vs. Collector Current**



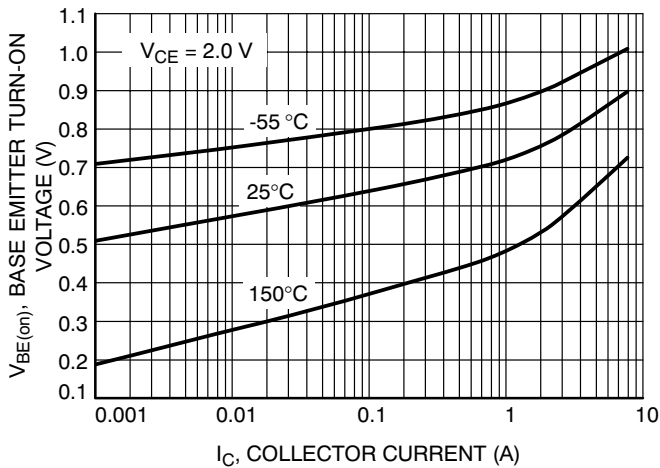
**Figure 2. Collector Emitter Saturation Voltage vs. Collector Current**



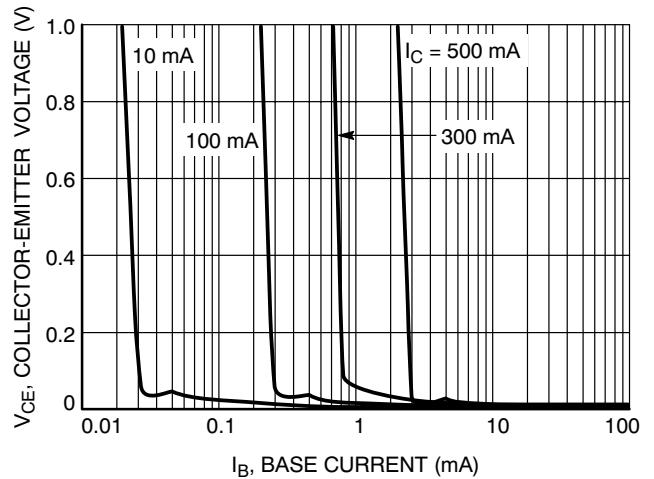
**Figure 3. DC Current Gain vs. Collector Current**



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



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



**Figure 6. Saturation Region**

# NSS12601CF8T1G

## TYPICAL CHARACTERISTICS

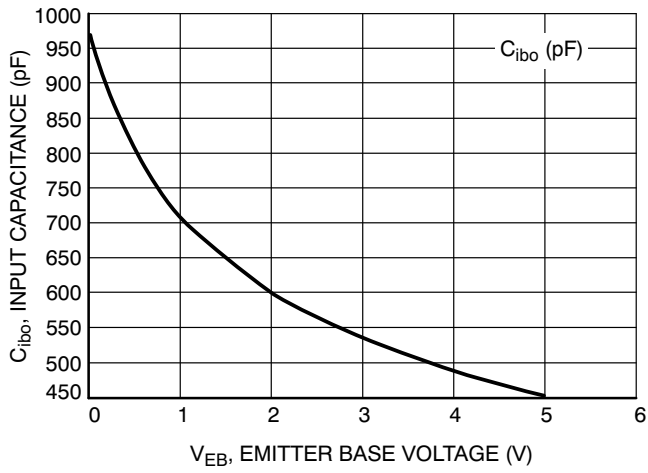


Figure 7. Input Capacitance

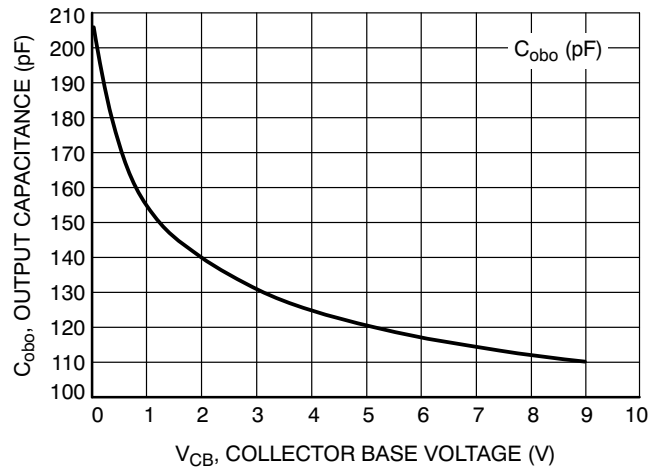


Figure 8. Output Capacitance

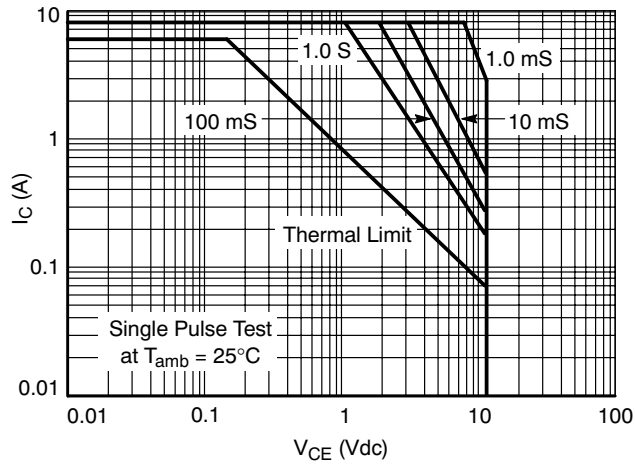


Figure 9. Safe Operating Area

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



### ChipFET™ CASE1206A-03 ISSUE K

DATE 19 MAY 2009



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.05	1.10	0.039	0.041	0.043
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	1.55	1.65	1.70	0.061	0.065	0.067
e	0.65 BSC			0.025 BSC		
e1	0.55 BSC			0.022 BSC		
L	0.28	0.35	0.42	0.011	0.014	0.017
HE	1.80	1.90	2.00	0.071	0.075	0.079
θ	5° NOM			5° NOM		

- |   |   |   |  |   |   |
|---|---|---|--|---|---|
| <b>STYLE 1:</b><br>PIN 1. DRAIN<br>2. DRAIN<br>3. DRAIN<br>4. GATE<br>5. SOURCE<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN | <b>STYLE 2:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. SOURCE 2<br>4. GATE 2<br>5. DRAIN 2<br>6. DRAIN 2<br>7. DRAIN 1<br>8. DRAIN 1 | <b>STYLE 3:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. CATHODE<br>8. CATHODE | <b>STYLE 4:</b><br>PIN 1. COLLECTOR<br>2. COLLECTOR<br>3. COLLECTOR<br>4. BASE<br>5. EMITTER<br>6. COLLECTOR<br>7. COLLECTOR<br>8. COLLECTOR | <b>STYLE 5:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. DRAIN<br>4. DRAIN<br>5. SOURCE<br>6. GATE<br>7. CATHODE<br>8. CATHODE | <b>STYLE 6:</b><br>PIN 1. ANODE<br>2. DRAIN<br>3. DRAIN<br>4. GATE<br>5. SOURCE<br>6. DRAIN<br>7. DRAIN<br>8. CATHODE / DRAIN |
|---|---|---|--|---|---|

### SOLDERING FOOTPRINT



Basic Style

### GENERIC MARKING DIAGRAM\*



- xxx = Specific Device Code
  - M = Month Code
  - = Pb-Free Package
- (Note: Microdot may be in either location)

\*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.

### OPTIONAL SOLDERING FOOTPRINTS ON PAGE 2

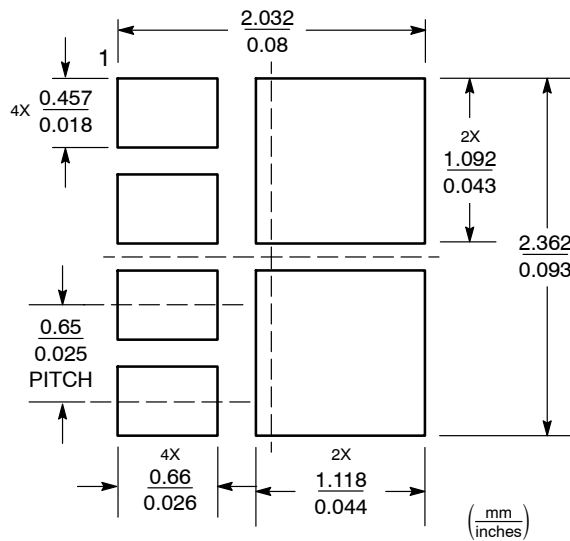
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<b>DESCRIPTION:</b>	<b>ChipFET</b>	<b>PAGE 1 OF 2</b>

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ADDITIONAL SOLDERING FOOTPRINTS\*



Styles 1 and 4



Style 2



Style 3



Style 5

\*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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