NSS60601MZ4

60 V, 6.0 A, Low $V_{CE(sat)}$ NPN Transistor

ON Semiconductor's e^2PowerEdge family of low $V_{CE(sat)}$ transistors are 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^2PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

Features

- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS (T_A = 25°C)

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	60	Vdc
Collector-Base Voltage	V_{CBO}	100	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous	I_C	6.0	A
Collector Current − Peak	I_{CM}	12.0	A

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D (Note 1)	800 6.5	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$ (Note 1)	155	°C/W
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D (Note 2)	2 15.6	W mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$ (Note 2)	64	°C/W
Total Device Dissipation (Single Pulse < 10 sec.)	$P_{Dsingle}$ (Note 3)	710	mW
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°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 @ 7.6 mm^2, 1 oz. copper traces.
2. FR−4 @ 645 mm^2, 1 oz. copper traces.
3. Thermal response.

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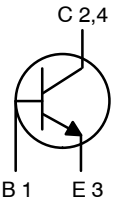
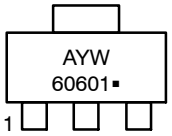
60 VOLTS, 6.0 AMPS
2.0 WATTS
NPN LOW $V_{CE(sat)}$ TRANSISTOR
EQUIVALENT $R_{DS(on)}$ 50 mΩ



Schematic

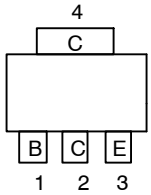
MARKING DIAGRAM

SOT−223
CASE 318E
STYLE 1



A = Assembly Location
Y = Year
W = Work Week
60601 = Specific Device Code
▪ = Pb−Free Package

PIN ASSIGNMENT



Top View Pinout

ORDERING INFORMATION

Device	Package	Shipping†
NSS60601MZ4T1G	SOT−223 (Pb−Free)	1000/ Tape & Reel
NSS60601MZ4T3G	SOT−223 (Pb−Free)	4000/ 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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	60			Vdc
Collector – Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	100			Vdc
Emitter – Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)	$V_{(BR)EBO}$	6.0			Vdc
Collector Cutoff Current (V_{CB} = 40 Vdc, I_E = 0)	I_{CBO}			0.1	μAdc
Emitter Cutoff Current (V_{EB} = 6.0 Vdc)	I_{EBO}			0.1	μAdc
ON CHARACTERISTICS					
DC Current Gain (Note 4) (I_C = 500 mA, V_{CE} = 2.0 V) (I_C = 1.0 A, V_{CE} = 2.0 V) (I_C = 2.0 A, V_{CE} = 2.0 V) (I_C = 6.0 A, V_{CE} = 2.0 V)	h_{FE}	 150 120 100 50		 360	
Collector – Emitter Saturation Voltage (Note 4) (I_C = 0.1 A, I_B = 2.0 mA) (I_C = 1.0 A, I_B = 0.100 A) (I_C = 2.0 A, I_B = 0.200 A) (I_C = 3.0 A, I_B = 60 mA) (I_C = 6.0 A, I_B = 0.6 A)	$V_{CE(sat)}$		 0.045 0.085 	 0.040 0.060 0.100 0.220 0.300	V
Base – Emitter Saturation Voltage (Note 4) (I_C = 1.0 A, I_B = 0.1 A)	$V_{BE(sat)}$			 0.900	V
Base – Emitter Turn–on Voltage (Note 4) (I_C = 1.0 A, V_{CE} = 2.0 V)	$V_{BE(on)}$			 0.900	V
Cutoff Frequency (I_C = 500 mA, V_{CE} = 10 V, f = 1.0 MHz)	f_T	 100			MHz
Input Capacitance (V_{EB} = 5.0 V, f = 1.0 MHz)	Cibo		400		pF
Output Capacitance (V_{CB} = 10 V, f = 1.0 MHz)	Cobo		37		pF
SWITCHING CHARACTERISTICS					
Delay (V_{CC} = 30 V, I_C = 750 mA, I_{B1} = 15 mA)	t_d		85		ns
Rise (V_{CC} = 30 V, I_C = 750 mA, I_{B1} = 15 mA)	t_r		115		ns
Storage (V_{CC} = 30 V, I_C = 750 mA, I_{B1} = 15 mA)	t_s		1350		ns
Fall (V_{CC} = 30 V, I_C = 750 mA, I_{B1} = 15 mA)	t_f		125		ns

4. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

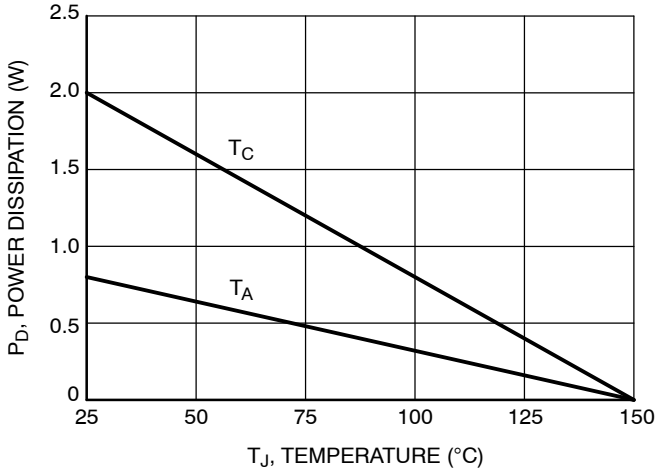


Figure 1. Power Derating

TYPICAL CHARACTERISTICS

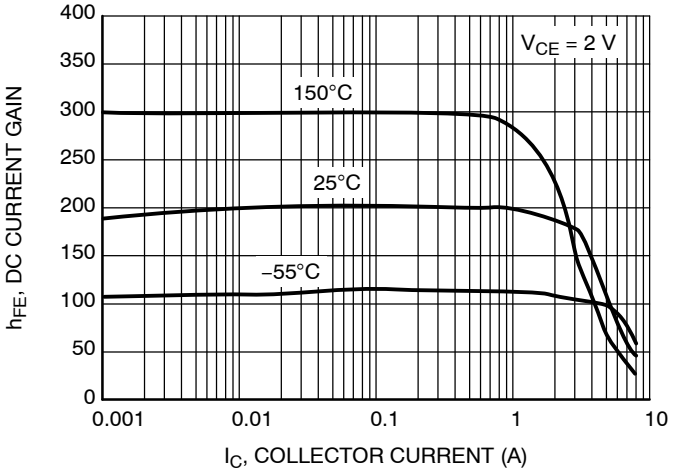


Figure 2. DC Current Gain

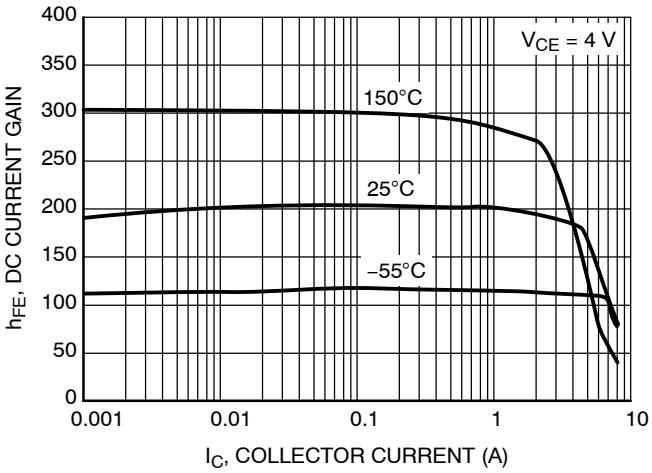


Figure 3. DC Current Gain

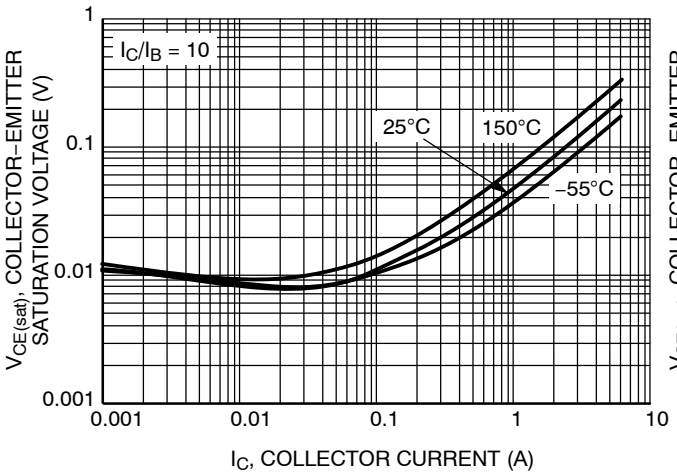


Figure 4. Collector−Emitter Saturation Voltage

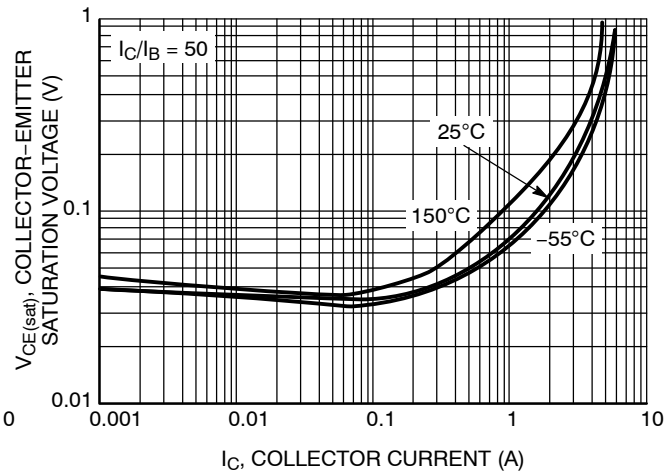


Figure 5. Collector−Emitter Saturation Voltage

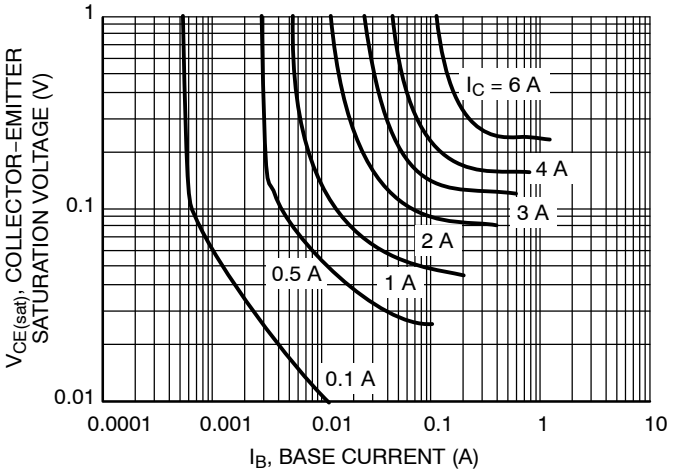


Figure 6. Collector Saturation Region

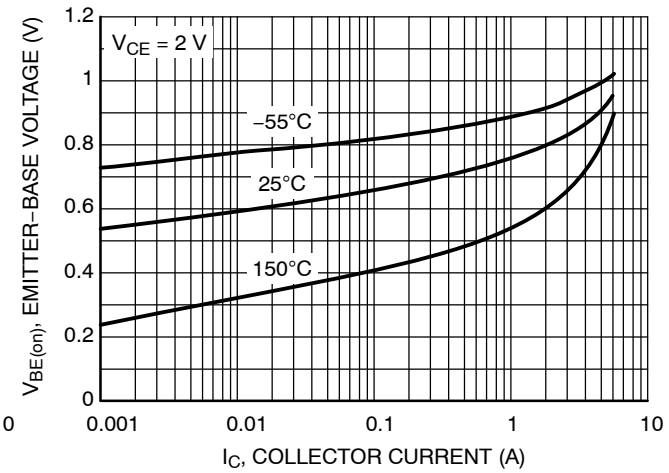


Figure 7. $V_{BE(on)}$ Voltage

TYPICAL CHARACTERISTICS

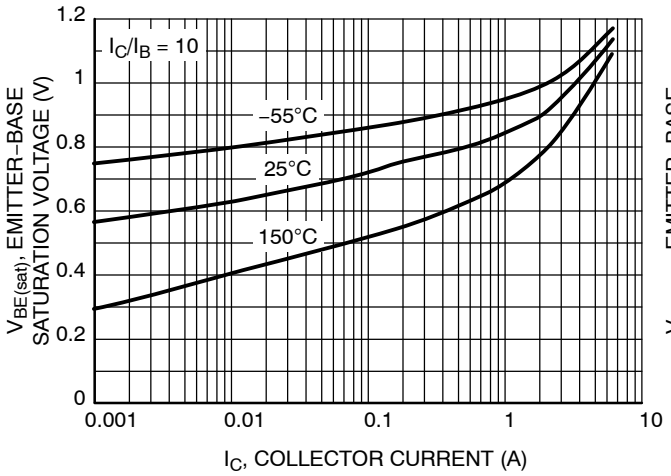


Figure 8. Base−Emitter Saturation Voltage

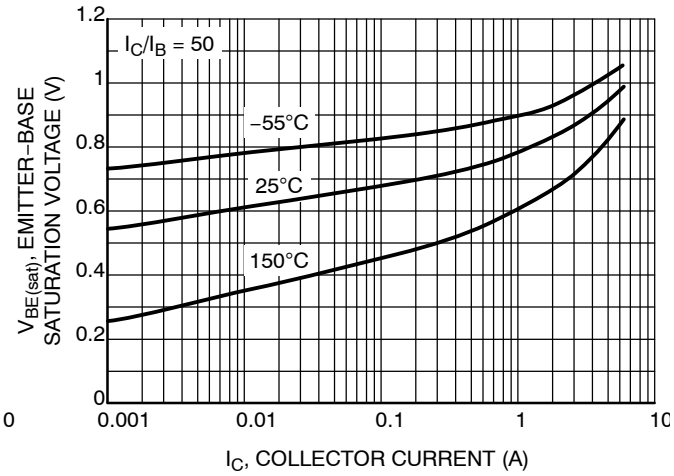


Figure 9. Base−Emitter Saturation Voltage

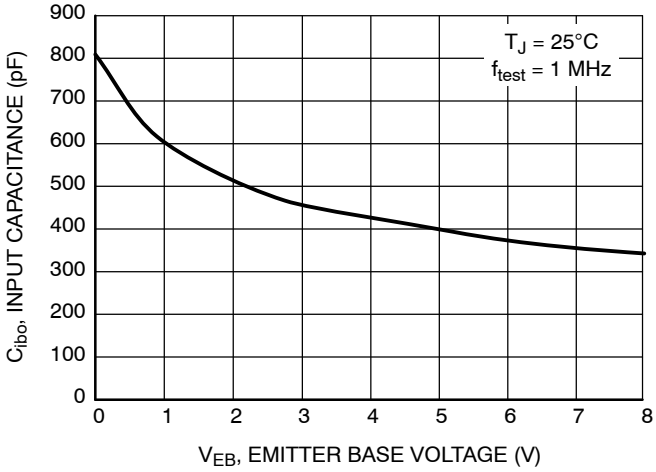


Figure 10. Input Capacitance

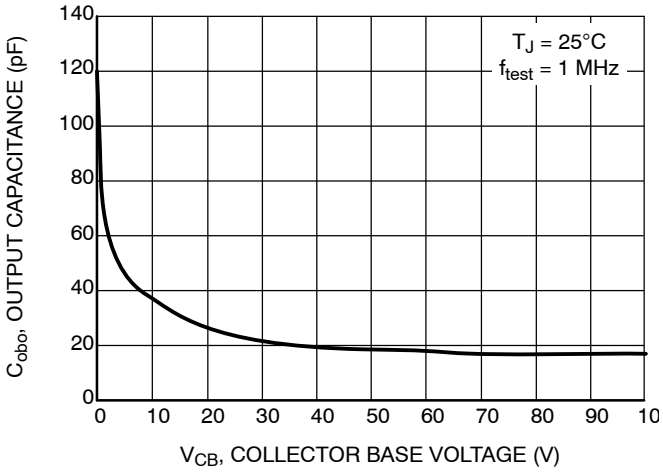


Figure 11. Output Capacitance

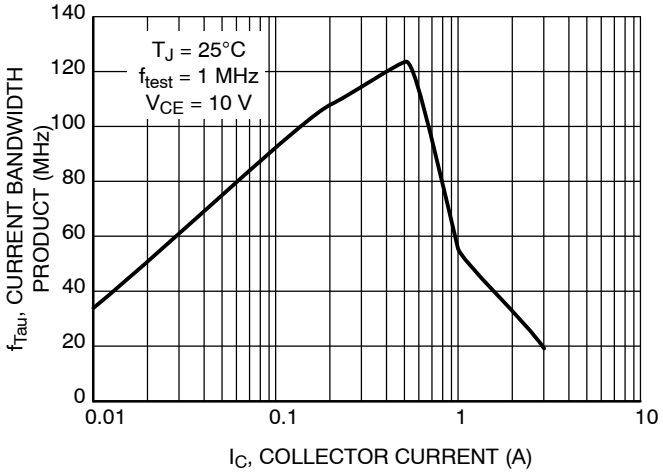


Figure 12. Current−Gain Bandwidth Product

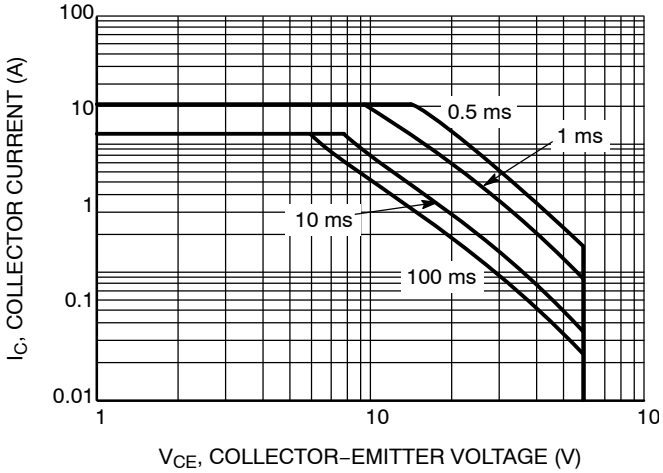
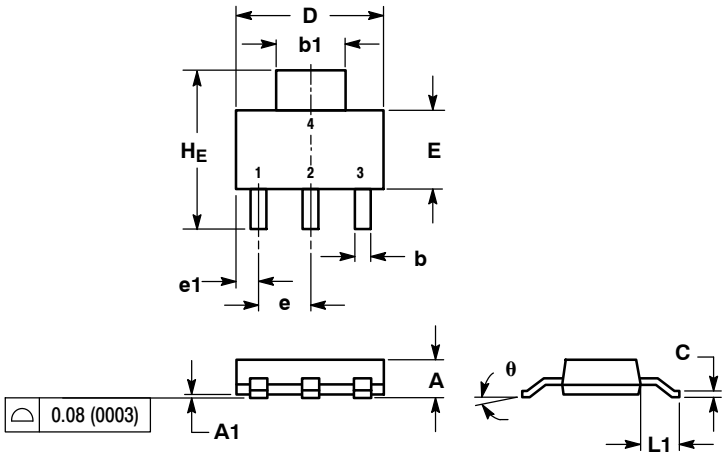


Figure 13. Safe Operating Area

PACKAGE DIMENSIONS

SOT−223 (TO−261)
CASE 318E−04
ISSUE L

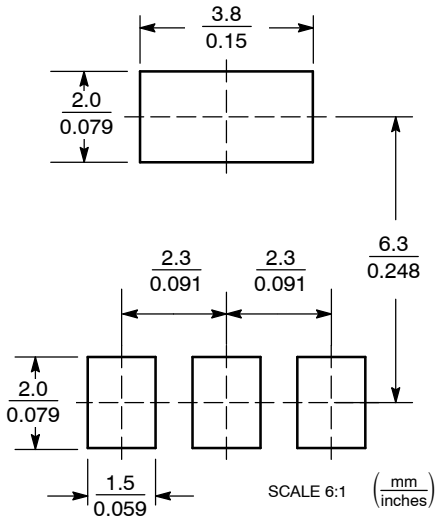


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.63	1.75	0.060	0.064	0.068
A1	0.02	0.06	0.10	0.001	0.002	0.004
b	0.60	0.75	0.89	0.024	0.030	0.035
b1	2.90	3.06	3.20	0.115	0.121	0.126
c	0.24	0.29	0.35	0.009	0.012	0.014
D	6.30	6.50	6.70	0.249	0.256	0.263
E	3.30	3.50	3.70	0.130	0.138	0.145
e	2.20	2.30	2.40	0.087	0.091	0.094
e1	0.85	0.94	1.05	0.033	0.037	0.041
L1	1.50	1.75	2.00	0.060	0.069	0.078
H_E	6.70	7.00	7.30	0.264	0.276	0.287
θ	0°	–	10°	0°	–	10°

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

SOLDERING FOOTPRINT



PUBLICATION ORDERING INFORMATION

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