

# NSS40301MZ4

Preferred Device

## Bipolar Power Transistors 40 V, 3.0 A, Low $V_{CE(sat)}$ NPN Transistor

ON Semiconductor's e<sup>2</sup>PowerEdge 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<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.

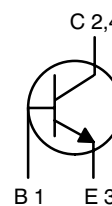
- These are Pb-Free Devices



ON Semiconductor®

<http://onsemi.com>

**NPN TRANSISTOR**  
**3.0 AMPERES**  
**40 VOLTS, 2.0 WATTS**

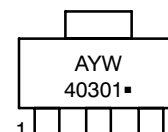


Schematic

### MARKING DIAGRAM

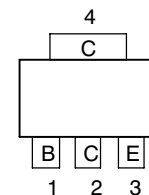


SOT-223  
CASE 318E  
STYLE 1



A = Assembly Location  
Y = Year  
W = Work Week  
40301 = Specific Device Code  
▪ = Pb-Free Package

### PIN ASSIGNMENT



Top View Pinout

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

# NSS40301MZ4

## MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	40	Vdc
Collector-Base Voltage	V <sub>CB</sub>	40	Vdc
Emitter-Base Voltage	V <sub>EB</sub>	6.0	Vdc
Base Current - Continuous	I <sub>B</sub>	1.0	Adc
Collector Current - Continuous - Peak	I <sub>C</sub>	3.0 5.0	Adc
Total Power Dissipation Total P <sub>D</sub> @ T <sub>A</sub> = 25°C mounted on 1" sq. (645 sq. mm) Collector pad on FR-4 bd material Total P <sub>D</sub> @ T <sub>A</sub> = 25°C mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 bd material	P <sub>D</sub>	2.0 0.80	W
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-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.

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case - Junction-to-Ambient on 1" sq. (645 sq. mm) Collector pad on FR-4 bd material - Junction-to-Ambient on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 bd material	R <sub>θJA</sub> R <sub>θJA</sub>	64 155	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T <sub>L</sub>	260	°C

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NSS40301MZ4T1G	SOT-223 (Pb-Free)	1000 / Tape & Reel
NSS40301MZ4T3G	SOT-223 (Pb-Free)	4000 / 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.

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## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0 A)	V <sub>CEO(sus)</sub>	40			Vdc
Emitter-Base Voltage (I <sub>E</sub> = 50 μA, I <sub>C</sub> = 0 A)	V <sub>EBO</sub>	6.0			Vdc
Collector Cutoff Current (V <sub>CB</sub> = 40 Vdc)	I <sub>CBO</sub>			100	nA
Emitter Cutoff Current (V <sub>BE</sub> = 6.0 Vdc)	I <sub>EBO</sub>			100	nA

### ON CHARACTERISTICS (Note 1)

Collector-Emitter Saturation Voltage (I <sub>C</sub> = 0.5 A, I <sub>B</sub> = 50 mA) (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 20 mA) (I <sub>C</sub> = 3.0 A, I <sub>B</sub> = 0.3 A)	V <sub>CE(sat)</sub>			0.050 0.100 0.200	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 0.1 A)	V <sub>BE(sat)</sub>			1.0	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 Vdc)	V <sub>BE(on)</sub>			0.9	Vdc
DC Current Gain (I <sub>C</sub> = 0.5 A, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 3.0 A, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	220 200 100		500	

### DYNAMIC CHARACTERISTICS

Output Capacitance (V <sub>CB</sub> = 10 Vdc, f = 1.0 MHz)	C <sub>ob</sub>		25		pF
Input Capacitance (V <sub>EB</sub> = 5.0 Vdc, f = 1.0 MHz)	C <sub>ib</sub>		170		pF
Current-Gain - Bandwidth Product (Note 2) (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 V, F <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>		215		MHz

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. f<sub>T</sub> = |h<sub>FE</sub>| • f<sub>test</sub>

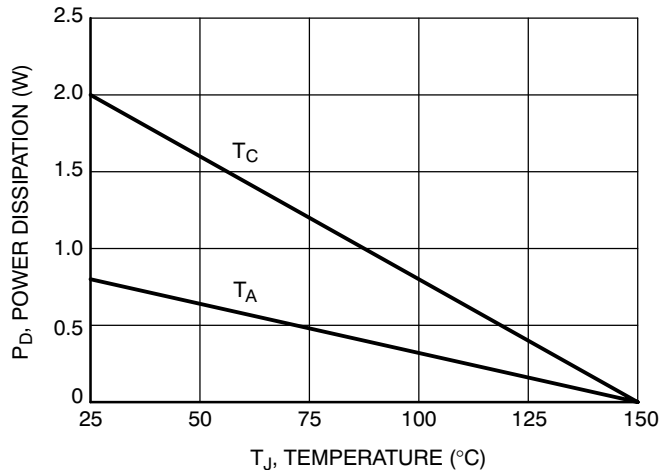


Figure 1. Power Derating

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## TYPICAL CHARACTERISTICS

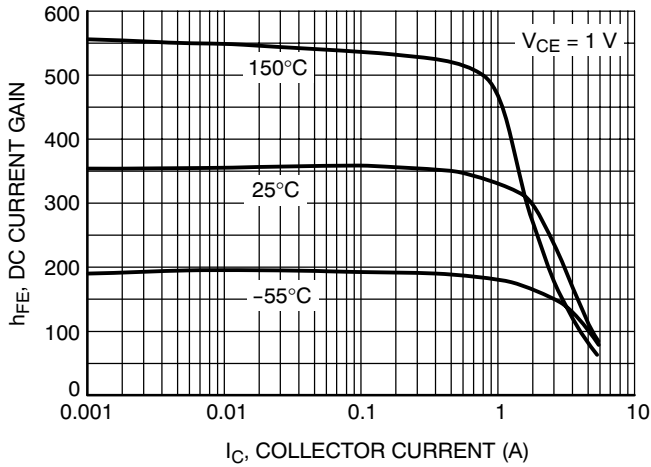


Figure 2. DC Current Gain

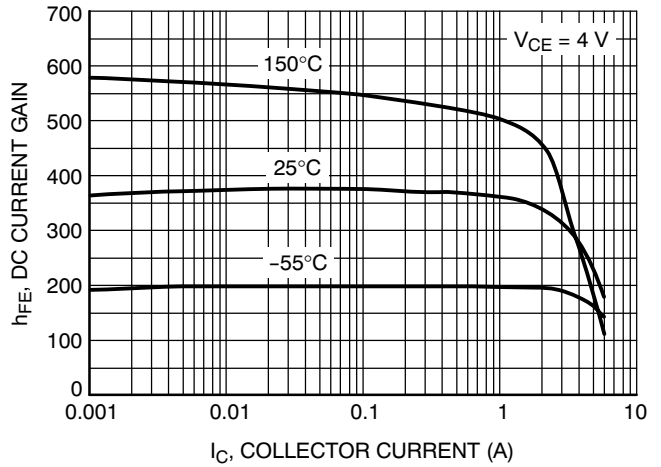


Figure 3. DC Current Gain

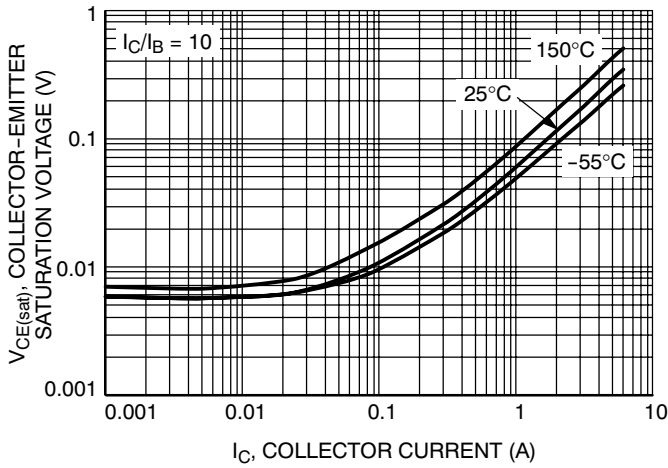


Figure 4. Collector-Emitter Saturation Voltage

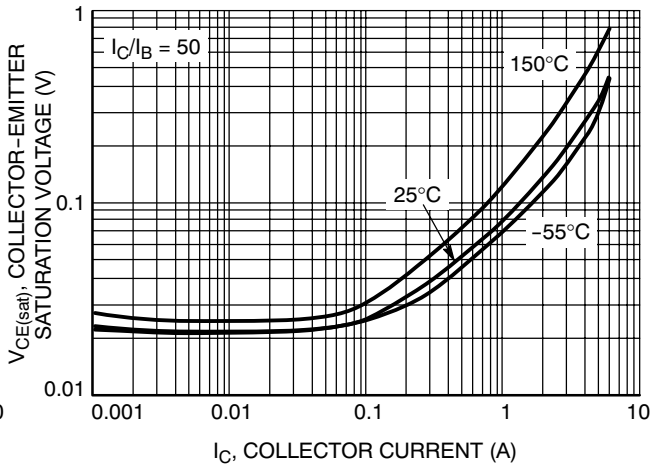


Figure 5. Collector-Emitter Saturation Voltage

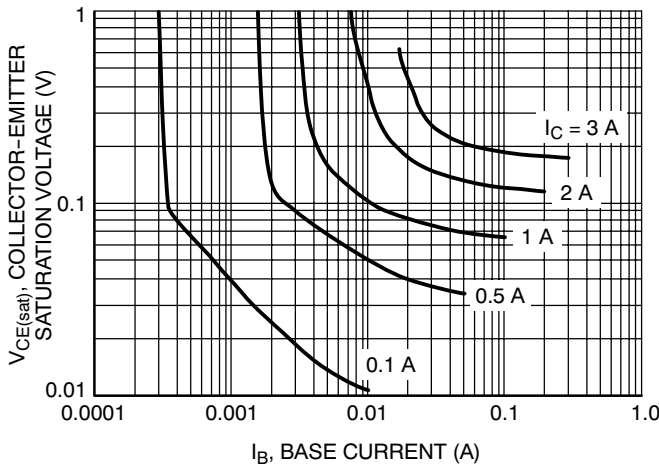


Figure 6. Collector Saturation Region

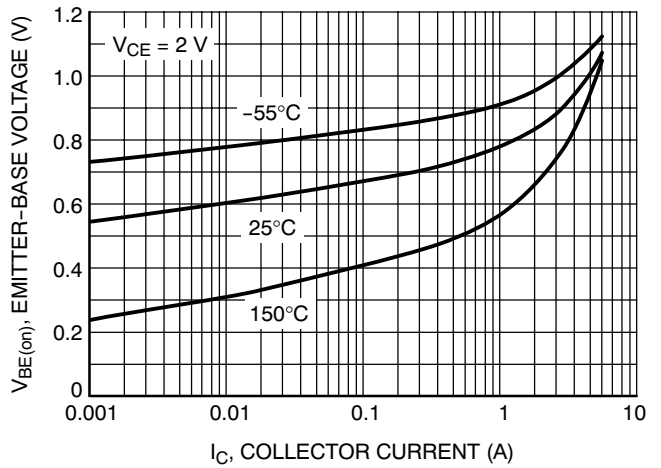


Figure 7.  $V_{BE(on)}$  Voltage

TYPICAL CHARACTERISTICS

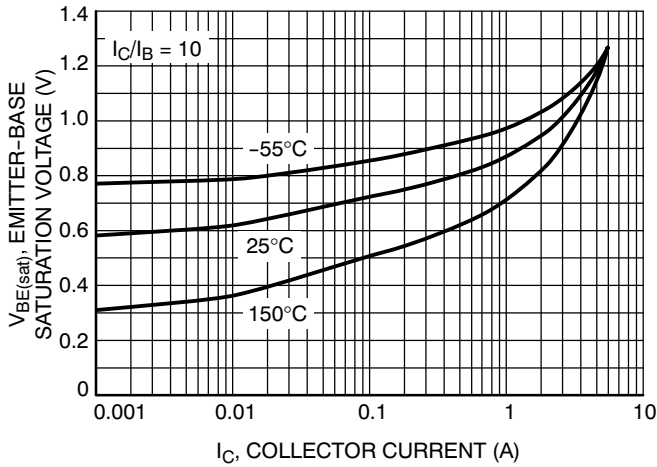


Figure 8. Base-Emitter Saturation Voltage

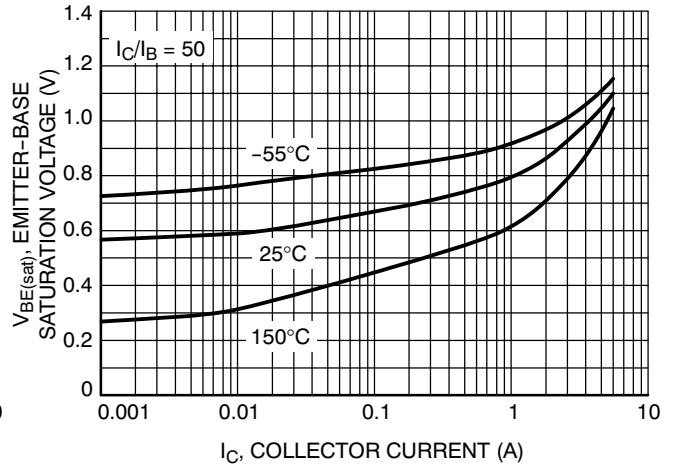


Figure 9. Base-Emitter Saturation Voltage

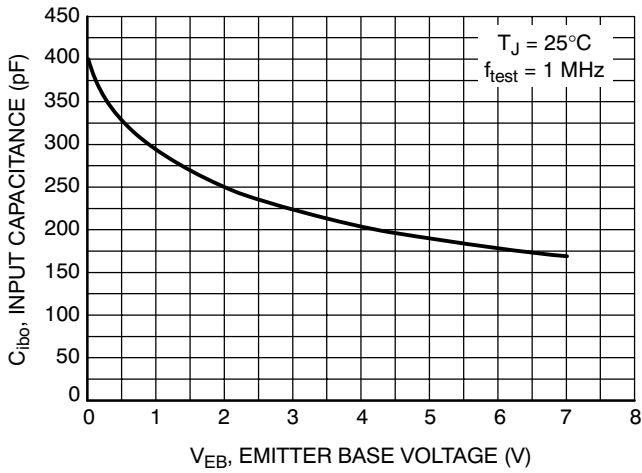


Figure 10. Input Capacitance

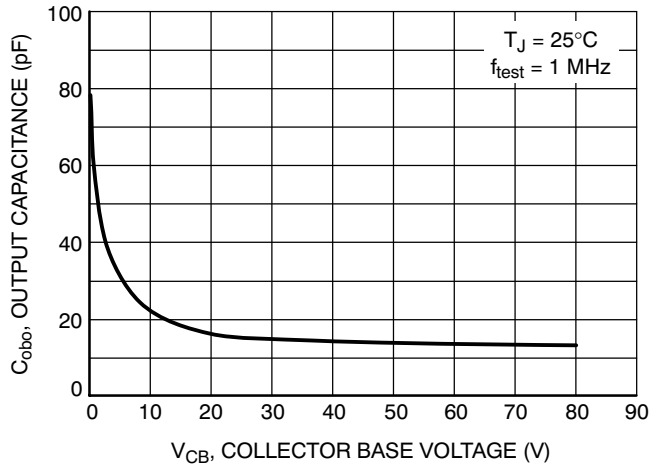


Figure 11. Output Capacitance

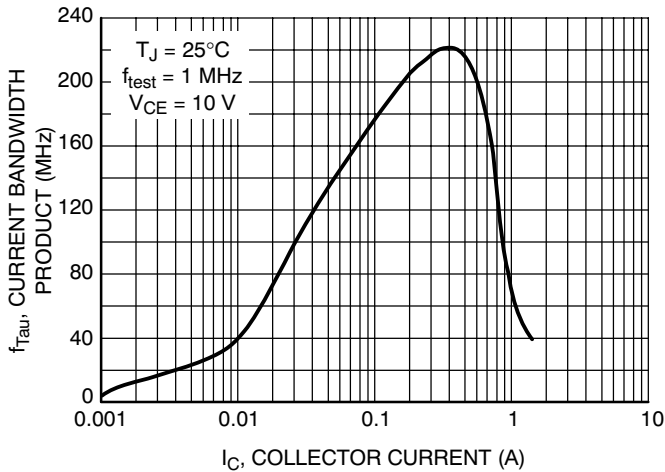


Figure 12. Current-Gain Bandwidth Product

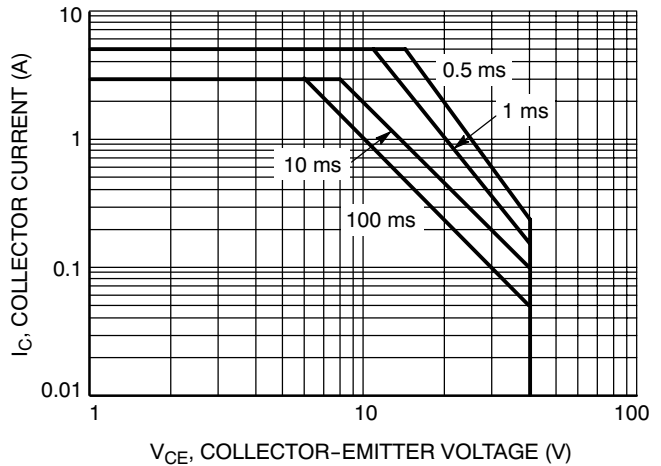
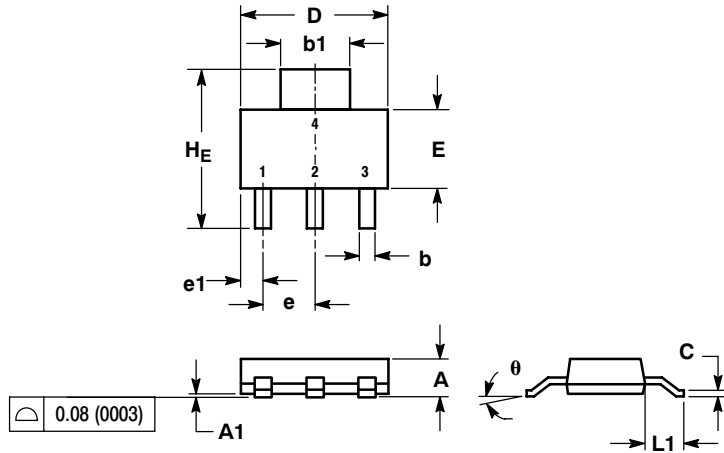


Figure 13. Safe Operating Area

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## PACKAGE DIMENSIONS

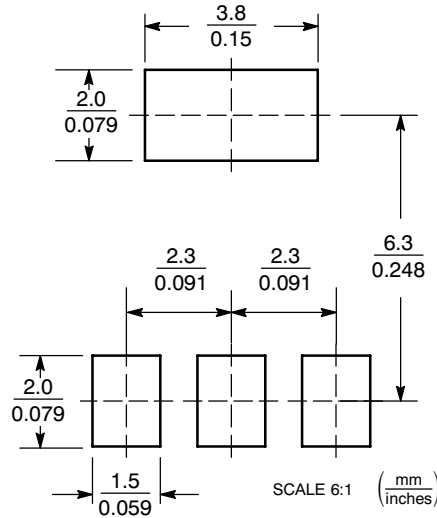
SOT-223 (TO-261)  
CASE 318E-04  
ISSUE L



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

DIM	MILLIMETERS			INCHES		
	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
HE	6.70	7.00	7.30	0.264	0.276	0.287
θ	0°	-	10°	0°	-	10°

### SOLDERING 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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