

NSS40301MZ4, NSV40301MZ4T1G

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

ON Semiconductor's e²PowerEdge 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 e²PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

Features

- AEC-Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant*



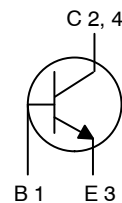
ON Semiconductor®

<http://onsemi.com>

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

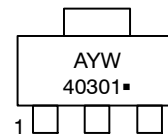


**SOT-223
CASE 318E
STYLE 1**



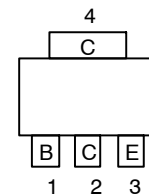
Schematic

MARKING DIAGRAM



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

PIN ASSIGNMENT



Top View Pinout

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ORDERING INFORMATION

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

NSS40301MZ4, NSV40301MZ4T1G

MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|------|
| Collector–Emitter Voltage | V _{CEO} | 40 | Vdc |
| Collector–Base Voltage | V _{CB} | 40 | Vdc |
| Emitter–Base Voltage | V _{EB} | 6.0 | Vdc |
| Base Current – Continuous | I _B | 1.0 | Adc |
| Collector Current Continuous Peak | I _C | 3.0 5.0 | Adc |
| Total Power Dissipation Total P _D @ T _A = 25°C mounted on 1" sq. (645 sq. mm) Collector pad on FR–4 bd material Total P _D @ T _A = 25°C mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR–4 bd material | P _D | 2.0 0.80 | W |
| Operating and Storage Junction 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.

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 _{θJA} R _{θJA} | 64 155 | °C/W |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds | T _L | 260 | °C |

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|----------------|----------------------|-----------------------|
| NSS40301MZ4T1G | SOT–223 (Pb–Free) | 1,000 / Tape & Reel |
| NSV40301MZ4T1G | SOT–223 (Pb–Free) | 1,000 / Tape & Reel |
| NSS40301MZ4T3G | SOT–223 (Pb–Free) | 4,000 / 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.

NSS40301MZ4, NSV40301MZ4T1G

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|-----------------------------------------------------------------------------------------|-----------------------|-----|--|-----|------|
| Collector–Emitter Sustaining Voltage (I _C = 10 mAdc, I _B = 0 Adc) | V _{CEO(sus)} | 40 | | | Vdc |
| Emitter–Base Voltage (I _E = 50 μAdc, I _C = 0 Adc) | V _{EBO} | 6.0 | | | Vdc |
| Collector Cutoff Current (V _{CB} = 40 Vdc) | I _{CBO} | | | 100 | nAdc |
| Emitter Cutoff Current (V _{BE} = 6.0 Vdc) | I _{EBO} | | | 100 | nAdc |

ON CHARACTERISTICS (Note 1)

| | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|--|-------------------------|-----|
| Collector–Emitter Saturation Voltage (I _C = 0.5 Adc, I _B = 50 mAdc) (I _C = 1.0 Adc, I _B = 20 mAdc) (I _C = 3.0 Adc, I _B = 0.3 Adc) | V _{CE(sat)} | | | 0.050 0.100 0.200 | Vdc |
| Base–Emitter Saturation Voltage (I _C = 1.0 Adc, I _B = 0.1 Adc) | V _{BE(sat)} | | | 1.0 | Vdc |
| Base–Emitter On Voltage (I _C = 1.0 Adc, V _{CE} = 2.0 Vdc) | V _{BE(on)} | | | 0.9 | Vdc |
| DC Current Gain (I _C = 0.5 Adc, V _{CE} = 1.0 Vdc) (I _C = 1.0 Adc, V _{CE} = 1.0 Vdc) (I _C = 3.0 Adc, V _{CE} = 1.0 Vdc) | h _{FE} | 220 200 100 | | 500 | |

DYNAMIC CHARACTERISTICS

| | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------|--|-----|--|-----|
| Output Capacitance (V _{CB} = 10 Vdc, f = 1.0 MHz) | C _{ob} | | 25 | | pF |
| Input Capacitance (V _{EB} = 5.0 Vdc, f = 1.0 MHz) | C _{ib} | | 170 | | pF |
| Current–Gain – Bandwidth Product (Note 2) (I _C = 500 mA, V _{CE} = 10 V, F _{test} = 1.0 MHz) | f _T | | 215 | | MHz |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. f_T = |h_{FE}| • f_{test}

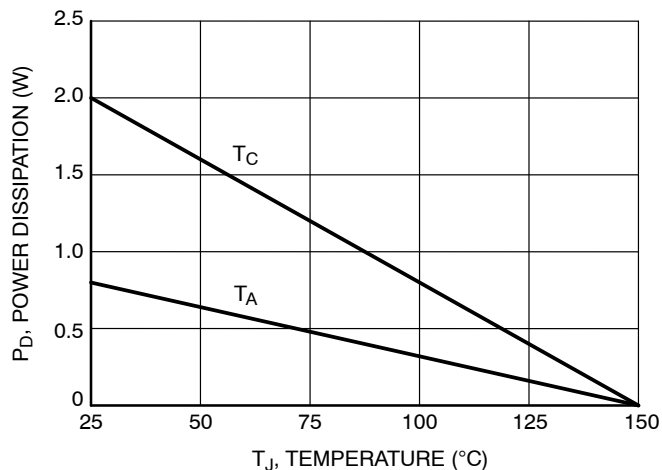


Figure 1. Power Derating

TYPICAL CHARACTERISTICS

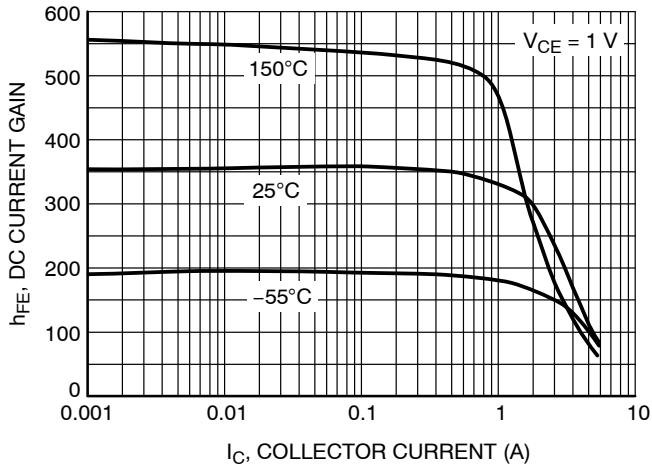


Figure 2. DC Current Gain

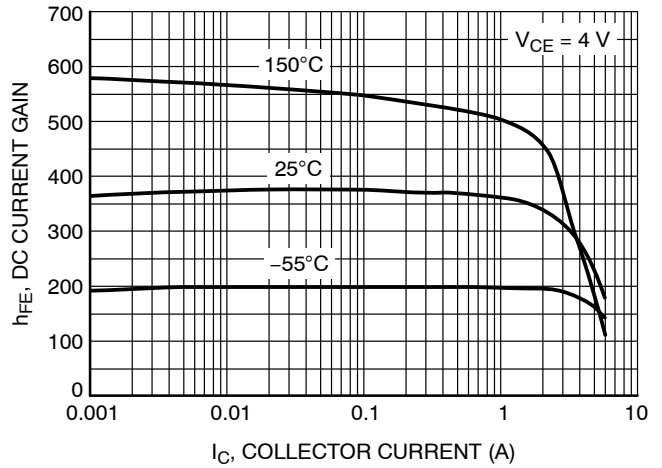


Figure 3. DC Current Gain

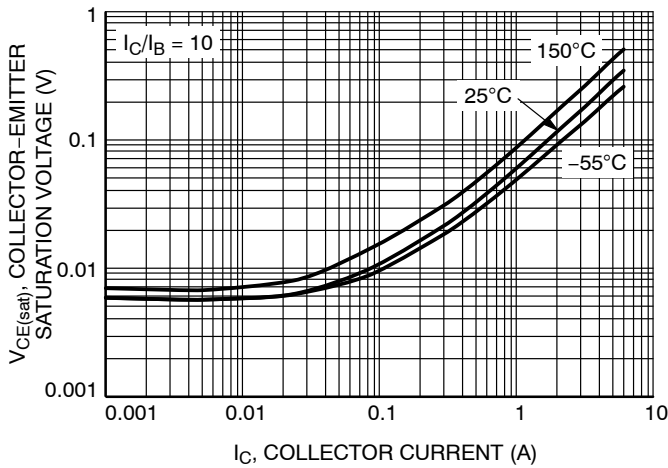


Figure 4. Collector-Emitter Saturation Voltage

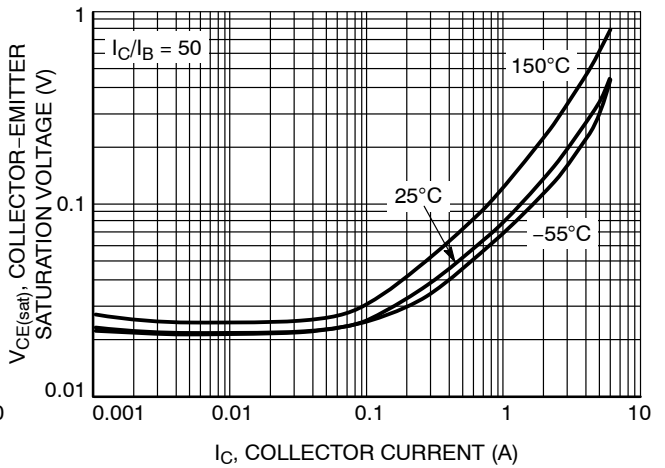


Figure 5. Collector-Emitter Saturation Voltage

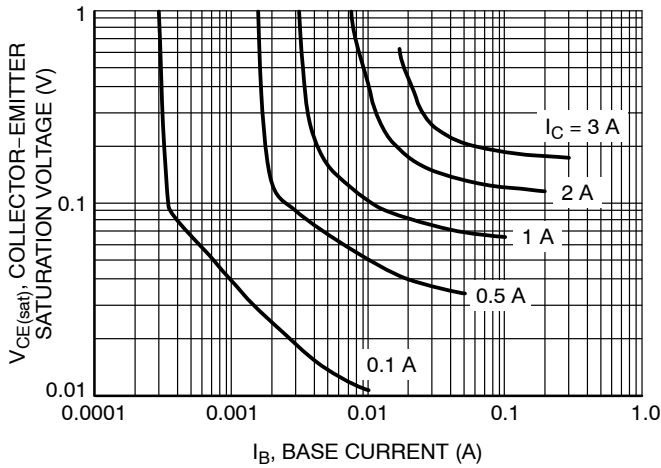


Figure 6. Collector Saturation Region

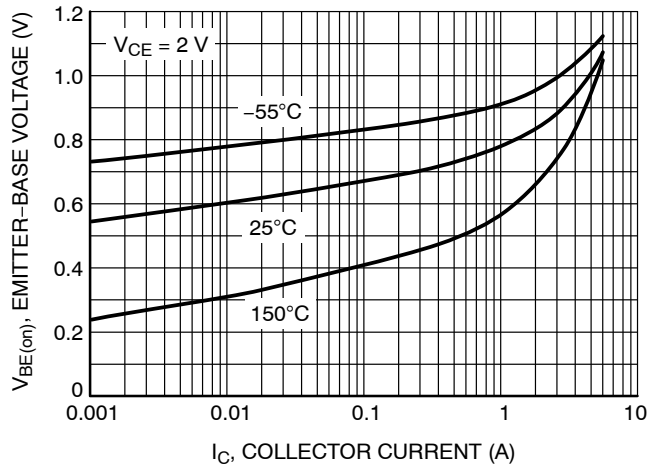


Figure 7. $V_{BE(on)}$ Voltage

TYPICAL CHARACTERISTICS

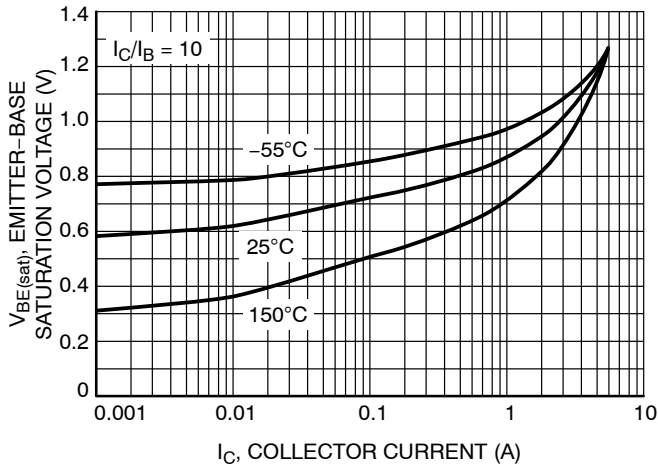


Figure 8. Base-Emitter Saturation Voltage

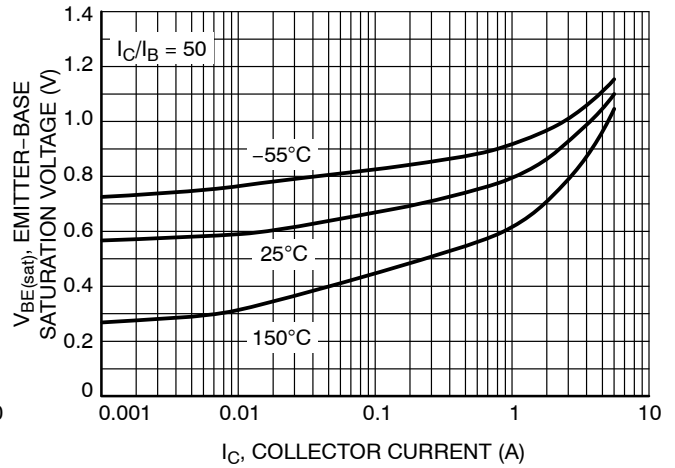


Figure 9. Base-Emitter Saturation Voltage

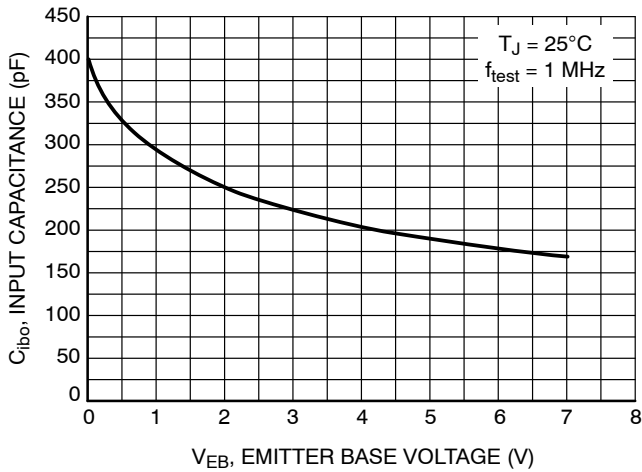


Figure 10. Input Capacitance

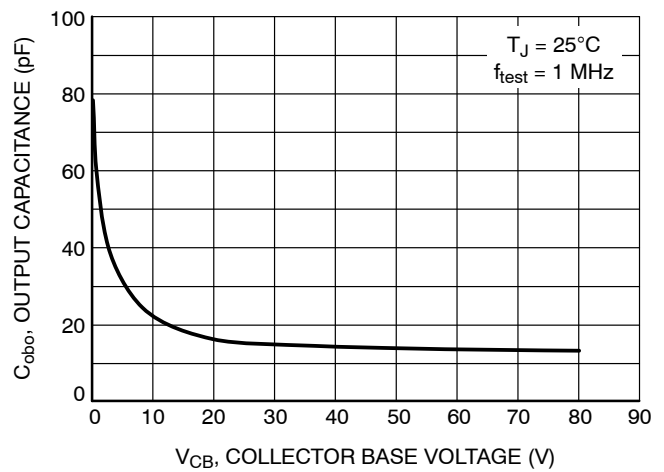


Figure 11. Output Capacitance

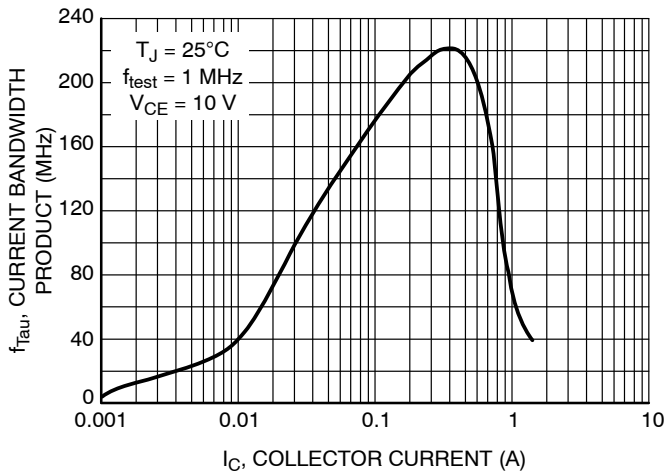


Figure 12. Current-Gain Bandwidth Product

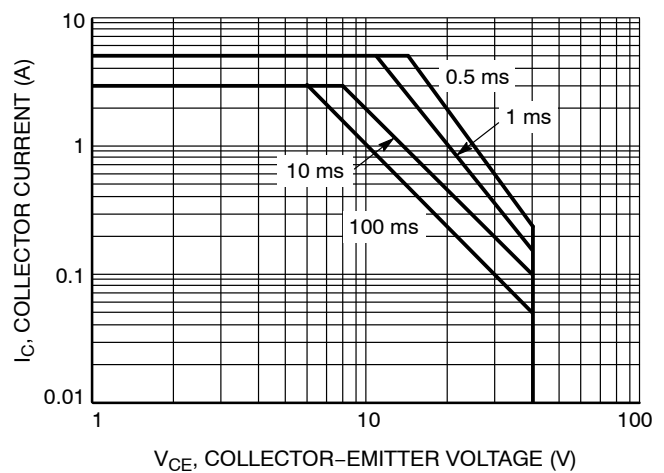
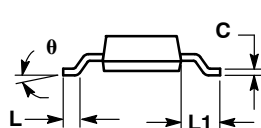
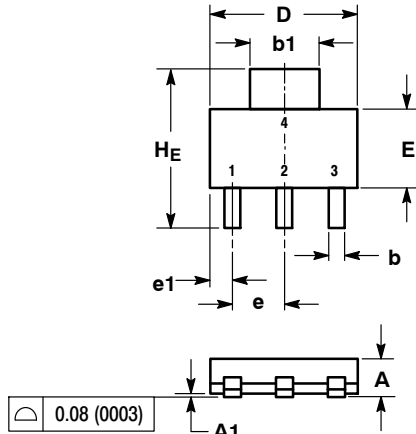


Figure 13. Safe Operating Area

NSS40301MZ4, NSV40301MZ4T1G

PACKAGE DIMENSIONS

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

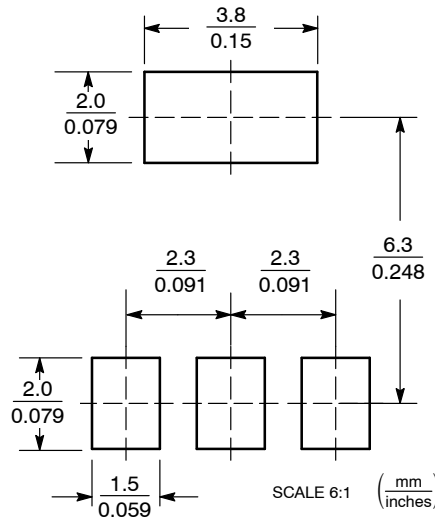


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

| 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 |
| L | 0.20 | --- | --- | 0.008 | --- | --- |
| 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° |

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

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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