



**THE DATASHEET OF
PZT3904T1**



PZT3904T1G

General Purpose Transistor

NPN Silicon

Features

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

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage | V_{CEO} | 40 | Vdc |
| Collector-Base Voltage | V_{CBO} | 60 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current - Continuous | I_C | 200 | mAdc |

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

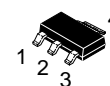
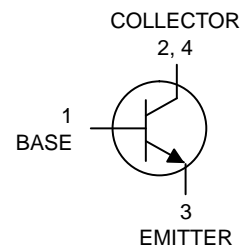
| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------|------------|
| Total Device Dissipation (Note 1) $T_A = 25^\circ\text{C}$ | P_D | 1.5 12 | W mW/°C |
| Thermal Resistance Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 83.3 | °C/W |
| Thermal Resistance Junction-to-Lead #4 | $R_{\theta JA}$ | 35 | °C/W |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | °C |

1. FR-4 with 1 oz and 713 mm² of copper area.



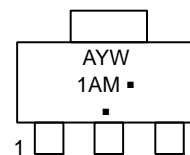
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<http://onsemi.com>



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

MARKING DIAGRAM



1AM = Specific Device Code
 A = Assembly Location
 Y = Year
 W = Work Week
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|----------------------|---------------------|
| PZT3904T1G | SOT-223 (Pb-Free) | 1,000 / Tape & Reel |
| SPZT3904T1G | SOT-223 (Pb-Free) | 1,000 / 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.

PZT3904T1G

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

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------------|-----|-----|------------------|
| OFF CHARACTERISTICS (Note 2) | | | | |
| Collector-Emmitter Breakdown Voltage (Note 3) (I _C = 1.0 mA _{dc} , I _B = 0) | V _{(BR)CEO} | 40 | - | V _{dc} |
| Collector-Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0) | V _{(BR)CBO} | 60 | - | |
| Emmitter-Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0) | V _{(BR)EBO} | 6.0 | - | |
| Base Cutoff Current (V _{CE} = 30 V _{dc} , V _{EB} = 3.0 V _{dc}) | I _{BL} | - | 50 | nA _{dc} |
| Collector Cutoff Current (V _{CE} = 30 V _{dc} , V _{EB} = 3.0 V _{dc}) | I _{CEX} | - | 50 | |

ON CHARACTERISTICS

| | | | | |
|--|----------------------|-----------------------------|-------------------------|-----------------|
| DC Current Gain (Note 2) (I _C = 0.1 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 1.0 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 10 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 50 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 100 mA _{dc} , V _{CE} = 1.0 V _{dc}) | H _{FE} | 40 70 100 60 30 | - - 300 - - | - |
| Collector-Emmitter Saturation Voltage (Note 3) (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) (I _C = 50 mA _{dc} , I _B = 5.0 mA _{dc}) | V _{CE(sat)} | - - | 0.2 0.3 | V _{dc} |
| Base-Emmitter Saturation Voltage (Note 3) (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) (I _C = 50 mA _{dc} , I _B = 5.0 mA _{dc}) | V _{BE(sat)} | 0.65 - | 0.85 0.95 | V _{dc} |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|---|------------------|-----|-----|--------------------|
| Current-Gain - Bandwidth Product (I _C = 10 mA _{dc} , V _{CE} = 20 V _{dc} , f = 100 MHz) | f _T | 300 | - | MHz |
| Output Capacitance (V _{CB} = 5.0 V _{dc} , I _E = 0, f = 1.0 MHz) | C _{obo} | - | 5.0 | pF |
| Input Capacitance (V _{EB} = 0.5 V _{dc} , I _C = 0, f = 1.0 MHz) | C _{ibo} | - | 8.0 | |
| Input Impedance (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz) | h _{ie} | 1.0 | 10 | kΩ |
| Voltage Feedback Ratio (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz) | h _{re} | 0.5 | 8.0 | X 10 ⁻⁴ |
| Small-Signal Current Gain (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz) | h _{fe} | 100 | 400 | - |
| Output Admittance (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz) | h _{oe} | 1.0 | 40 | μMhos |
| Noise Figure (V _{CE} = 5.0 V _{dc} , I _C = 100 μA _{dc} , R _S = 1.0 kΩ, f = 1.0 kHz) | nF | - | 5.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|--|----------------|---|-----|----|
| Delay Time | (V _{CC} = 3.0 V _{dc} , V _{BE} = -0.5 V _{dc} , I _C = 10 mA _{dc} , I _{B1} = 1.0 mA _{dc}) | t _d | - | 35 | ns |
| Rise Time | | t _r | - | 35 | |
| Storage Time | (V _{CC} = 3.0 V _{dc} , I _C = 10 mA _{dc} , I _{B1} = I _{B2} = 1.0 mA _{dc}) | t _s | - | 200 | |
| Fall Time | | t _f | - | 50 | |

2. FR-5 = 1.0 × 0.75 × 0.062 in.

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

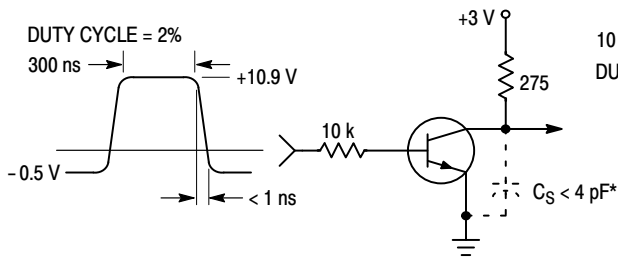


Figure 1. Delay and Rise Time Equivalent Test Circuit

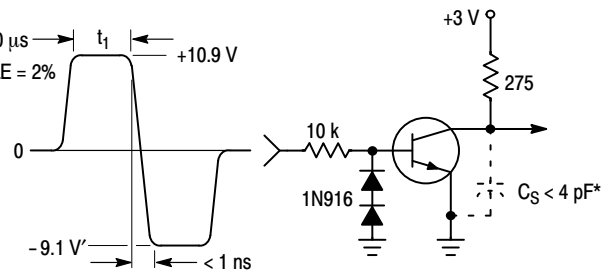


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

PZT3904T1G

TYPICAL TRANSIENT CHARACTERISTICS

— $T_J = 25^\circ\text{C}$
 - - - $T_J = 125^\circ\text{C}$

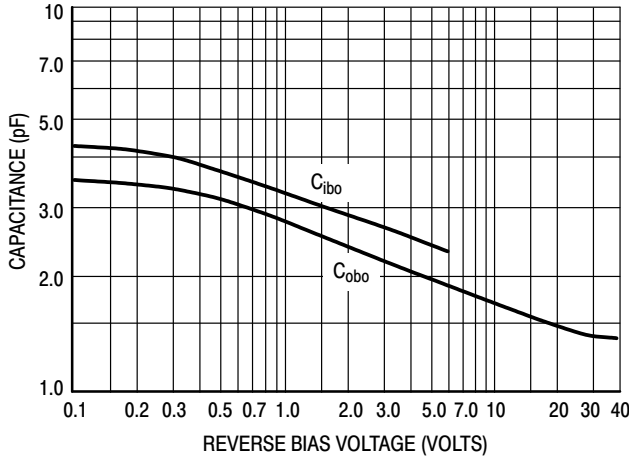


Figure 3. Capacitance

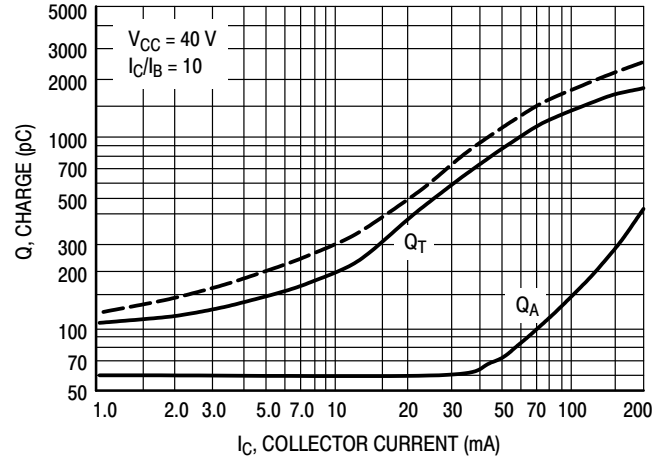


Figure 4. Charge Data

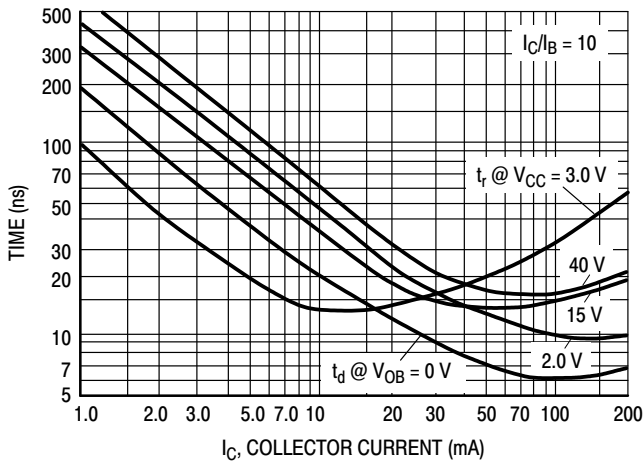


Figure 5. Turn-On Time

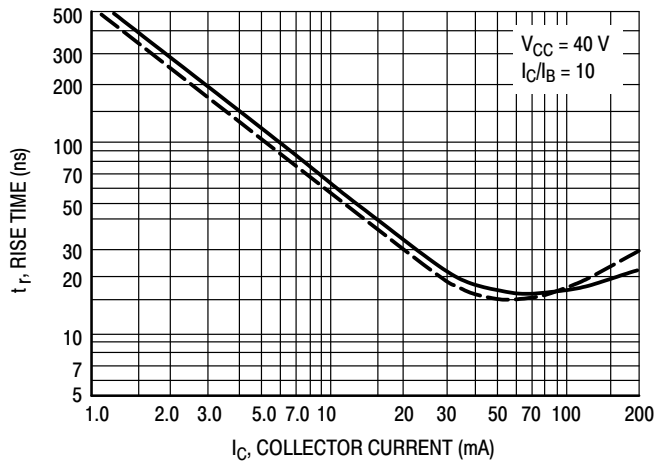


Figure 6. Rise Time

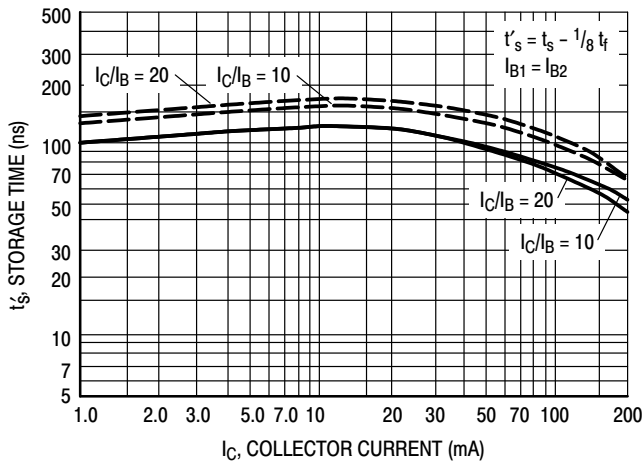


Figure 7. Storage Time

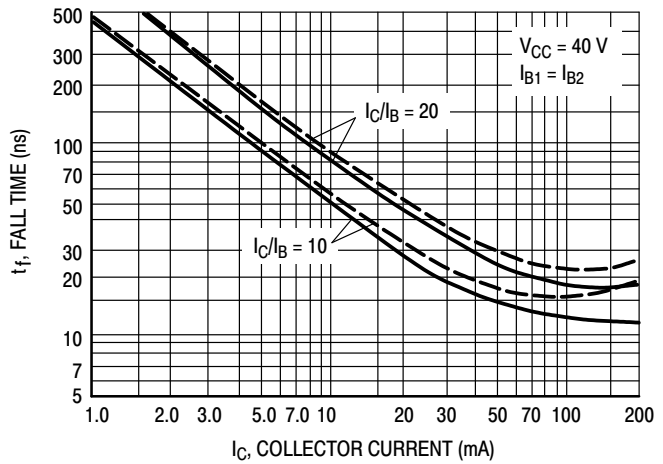


Figure 8. Fall Time

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TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

($V_{CE} = 5.0$ Vdc, $T_A = 25^\circ\text{C}$, Bandwidth = 1.0 Hz)

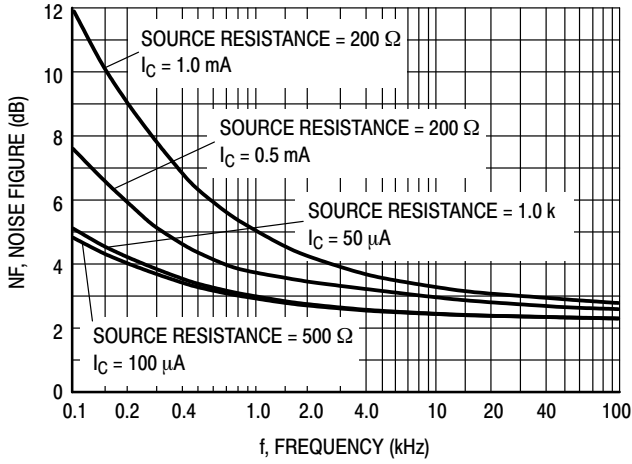


Figure 9.

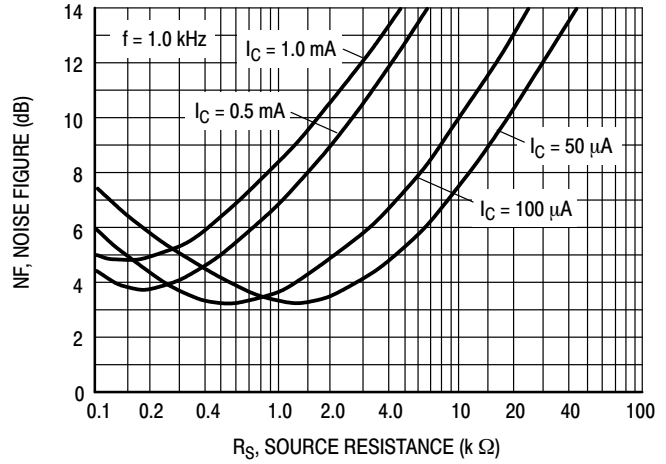


Figure 10.

h PARAMETERS

($V_{CE} = 10$ Vdc, $f = 1.0$ kHz, $T_A = 25^\circ\text{C}$)

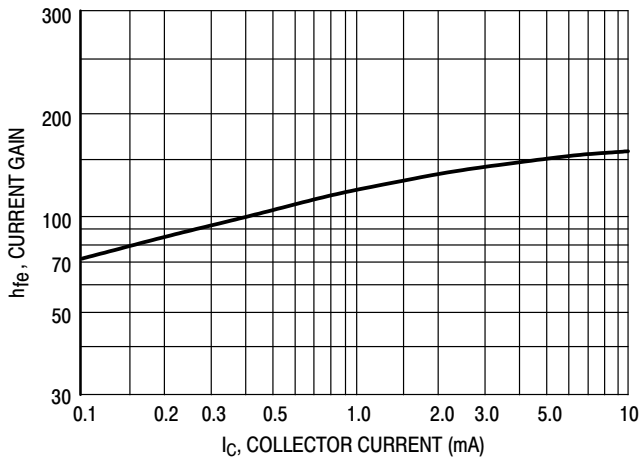


Figure 11. Current Gain

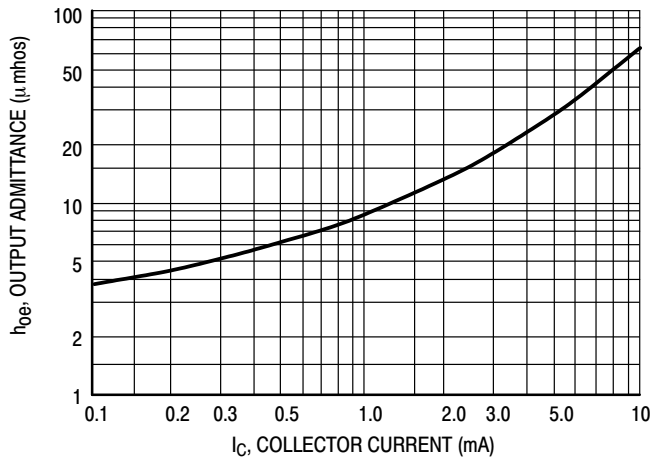


Figure 12. Output Admittance

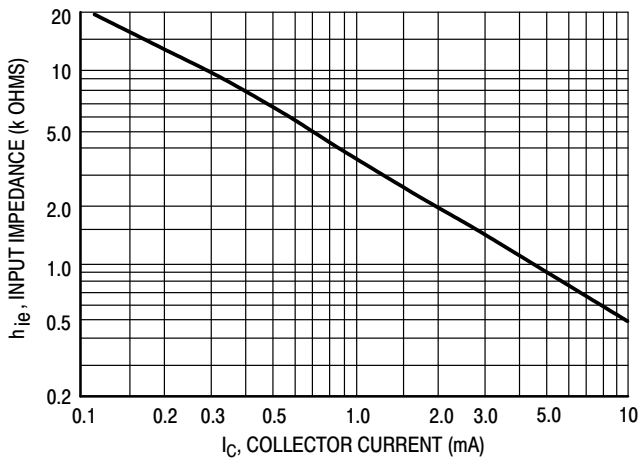


Figure 13. Input Impedance

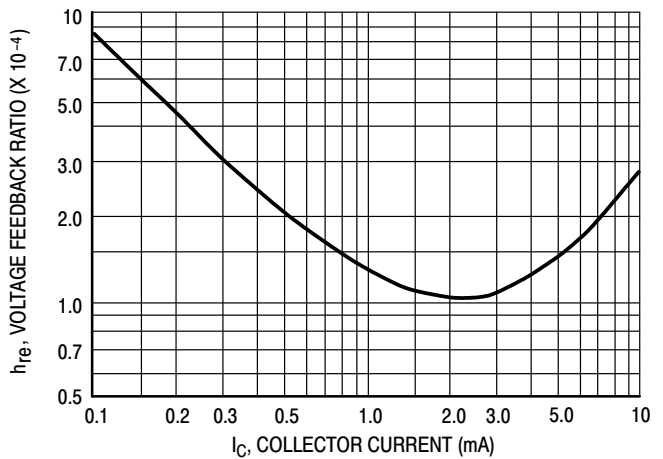


Figure 14. Voltage Feedback Ratio

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TYPICAL STATIC CHARACTERISTICS

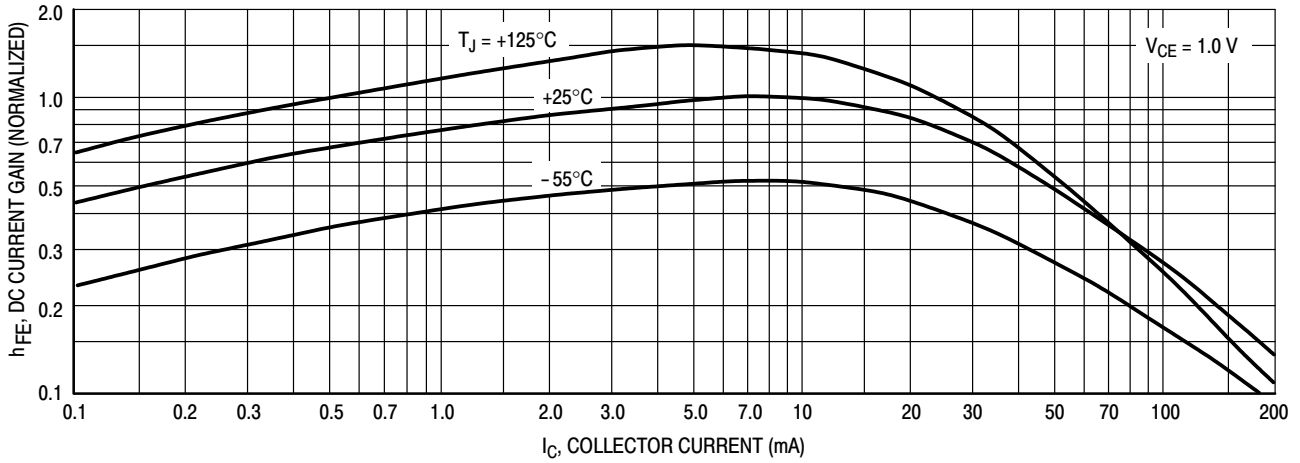


Figure 15. DC Current Gain

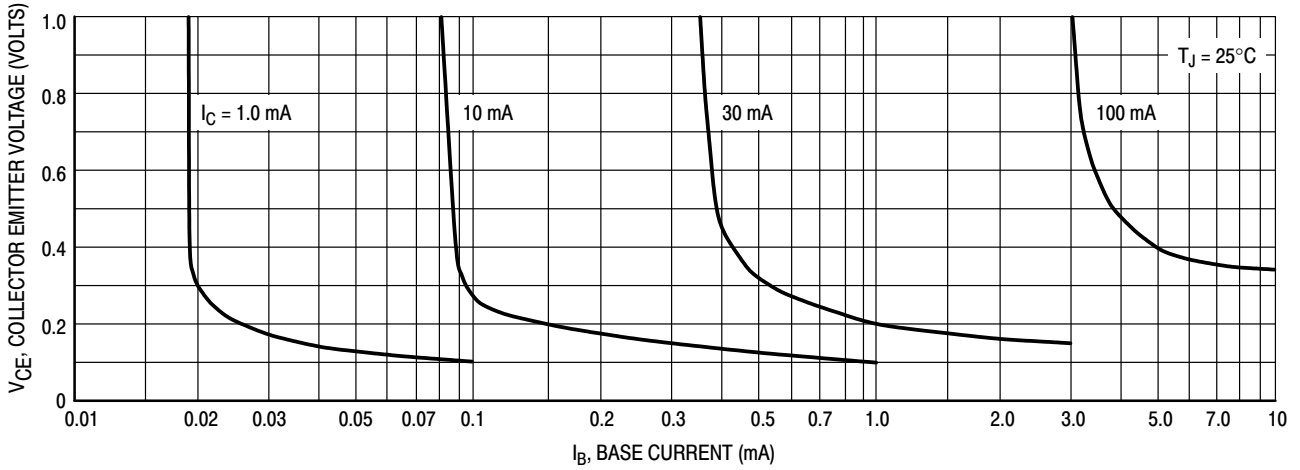


Figure 16. Collector Saturation Region

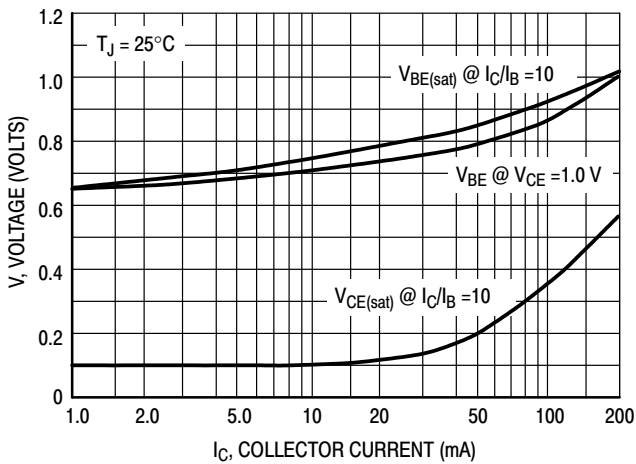


Figure 17. "ON" Voltages

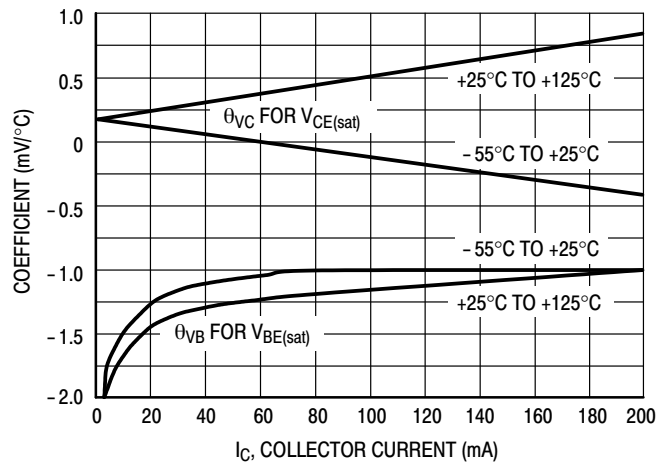


Figure 18. Temperature Coefficients

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TYPICAL CHARACTERISTICS

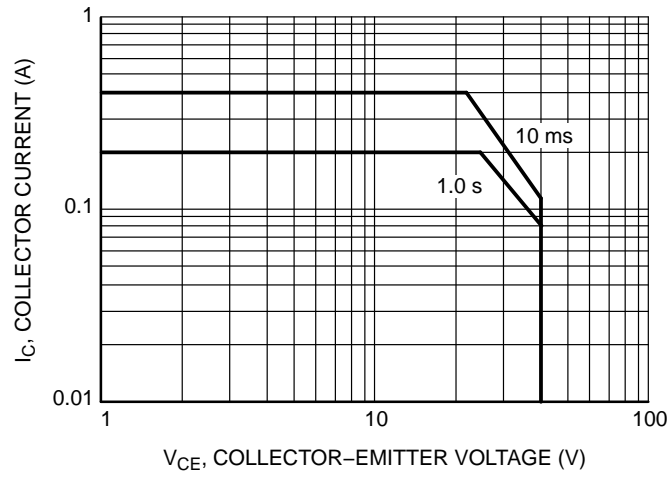


Figure 19. Safe Operating Area

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

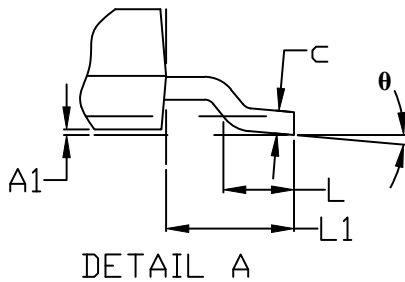
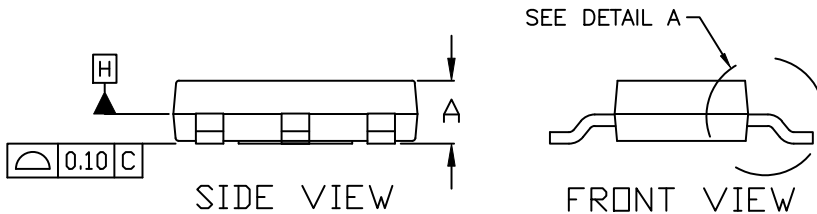
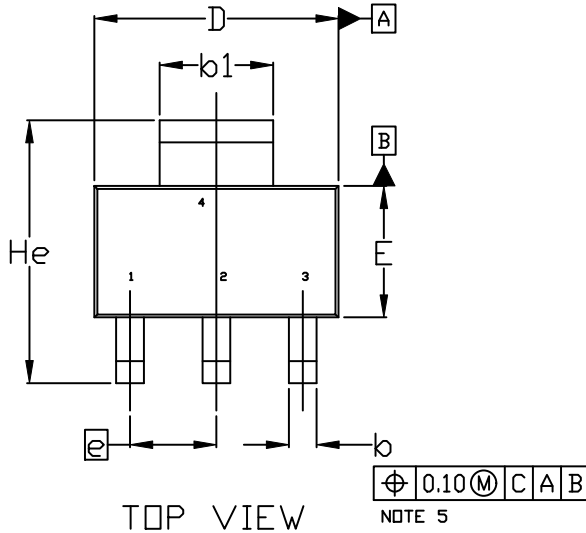
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SCALE 1:1

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

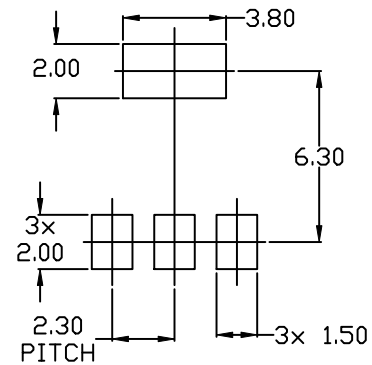
DATE 02 OCT 2018



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

| MILLIMETERS | | | |
|-------------|----------|------|------|
| DIM | MIN. | NOM. | MAX. |
| A | 1.50 | 1.63 | 1.75 |
| A1 | 0.02 | 0.06 | 0.10 |
| b | 0.60 | 0.75 | 0.89 |
| b1 | 2.90 | 3.06 | 3.20 |
| c | 0.24 | 0.29 | 0.35 |
| D | 6.30 | 6.50 | 6.70 |
| E | 3.30 | 3.50 | 3.70 |
| e | 2.30 BSC | | |
| L | 0.20 | --- | --- |
| L1 | 1.50 | 1.75 | 2.00 |
| He | 6.70 | 7.00 | 7.30 |
| θ | 0° | --- | 10° |



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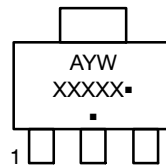
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SOT-223 (TO-261)
CASE 318E-04
ISSUE R

DATE 02 OCT 2018

- | | | | | |
|--|---|---|---|---|
| STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR | STYLE 2: PIN 1. ANODE 2. CATHODE 3. NC 4. CATHODE | STYLE 3: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN | STYLE 4: PIN 1. SOURCE 2. DRAIN 3. GATE 4. DRAIN | STYLE 5: PIN 1. DRAIN 2. GATE 3. SOURCE 4. GATE |
| STYLE 6: PIN 1. RETURN 2. INPUT 3. OUTPUT 4. INPUT | STYLE 7: PIN 1. ANODE 1 2. CATHODE 3. ANODE 2 4. CATHODE | STYLE 8: CANCELLED | STYLE 9: PIN 1. INPUT 2. GROUND 3. LOGIC 4. GROUND | STYLE 10: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE |
| STYLE 11: PIN 1. MT 1 2. MT 2 3. GATE 4. MT 2 | STYLE 12: PIN 1. INPUT 2. OUTPUT 3. NC 4. OUTPUT | STYLE 13: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR | | |

**GENERIC
 MARKING DIAGRAM***



- A = Assembly Location
- Y = Year
- W = Work Week
- XXXXX = Specific Device 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. Some products may not follow the Generic Marking.

| | | |
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-  Alternative Solution
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