

MMBT3906LT1

Preferred Device

General Purpose Transistor

PNP Silicon

Features

- Pb-Free Packages are Available

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|-----------------------------------|-----------|-------|------|
| Collector - Emitter Voltage | V_{CEO} | -40 | Vdc |
| Collector - Base Voltage | V_{CBO} | -40 | Vdc |
| Emitter - Base Voltage | V_{EBO} | -5.0 | Vdc |
| Collector Current - Continuous | I_C | -200 | mAdc |
| Collector Current - Peak (Note 3) | I_{CM} | -800 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------|----------------------------|
| Total Device Dissipation FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 1.8 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation Alumina Substrate, (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 2.4 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

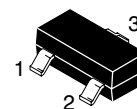
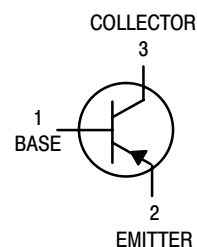
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

- FR-5 = $1.0 \times 0.75 \times 0.062$ in.
- Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.
- Reference SOA curve.



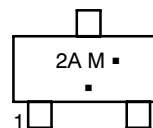
ON Semiconductor®

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SOT-23 (TO-236)
CASE 318
STYLE 6

MARKING DIAGRAM



2A = Specific Device Code
M = Date Code*
■ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|---------------------|----------------------|
| MMBT3906LT1 | SOT-23 | 3,000 / Tape & Reel |
| MMBT3906LT1G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| MMBT3906LT3 | SOT-23 | 10,000 / Tape & Reel |
| MMBT3906LT3G | SOT-23 (Pb-Free) | 10,000 / 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.

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

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

| Characteristic | Symbol | Min | Max | Unit |
|---|----------------------|------|-----|------|
| OFF CHARACTERISTICS | | | | |
| Collector - Emitter Breakdown Voltage (I _C = -1.0 mAdc, I _B = 0) | V _{(BR)CEO} | -40 | - | Vdc |
| Collector - Base Breakdown Voltage (I _C = -10 μAdc, I _E = 0) | V _{(BR)CBO} | -40 | - | Vdc |
| Emitter - Base Breakdown Voltage (I _E = -10 μAdc, I _C = 0) | V _{(BR)EBO} | -5.0 | - | Vdc |
| Base Cutoff Current (V _{CE} = -30 Vdc, V _{EB} = -3.0 Vdc) | I _{BL} | - | -50 | nAdc |
| Collector Cutoff Current (V _{CE} = -30 Vdc, V _{EB} = -3.0 Vdc) | I _{CEX} | - | -50 | nAdc |

ON CHARACTERISTICS (Note 4)

| | | | | |
|---|----------------------|-----------------------------|-------------------------|-----|
| DC Current Gain (I _C = -0.1 mAdc, V _{CE} = -1.0 Vdc) (I _C = -1.0 mAdc, V _{CE} = -1.0 Vdc) (I _C = -10 mAdc, V _{CE} = -1.0 Vdc) (I _C = -50 mAdc, V _{CE} = -1.0 Vdc) (I _C = -100 mAdc, V _{CE} = -1.0 Vdc) | H _{FE} | 60 80 100 60 30 | - - 300 - - | - |
| Collector - Emitter Saturation Voltage (I _C = -10 mAdc, I _B = -1.0 mAdc) (I _C = -50 mAdc, I _B = -5.0 mAdc) | V _{CE(sat)} | - - | -0.25 -0.4 | Vdc |
| Base - Emitter Saturation Voltage (I _C = -10 mAdc, I _B = -1.0 mAdc) (I _C = -50 mAdc, I _B = -5.0 mAdc) | V _{BE(sat)} | -0.65 - | -0.85 -0.95 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|--|------------------|-----|-----|--------------------|
| Current - Gain - Bandwidth Product (I _C = -10 mAdc, V _{CE} = -20 Vdc, f = 100 MHz) | f _T | 250 | - | MHz |
| Output Capacitance (V _{CB} = -5.0 Vdc, I _E = 0, f = 1.0 MHz) | C _{obo} | - | 4.5 | pF |
| Input Capacitance (V _{EB} = -0.5 Vdc, I _C = 0, f = 1.0 MHz) | C _{ibo} | - | 10 | pF |
| Input Impedance (I _C = -1.0 mAdc, V _{CE} = -10 Vdc, f = 1.0 kHz) | h _{ie} | 2.0 | 12 | kΩ |
| Voltage Feedback Ratio (I _C = -1.0 mAdc, V _{CE} = -10 Vdc, f = 1.0 kHz) | h _{re} | 0.1 | 10 | X 10 ⁻⁴ |
| Small - Signal Current Gain (I _C = -1.0 mAdc, V _{CE} = -10 Vdc, f = 1.0 kHz) | h _{fe} | 100 | 400 | - |
| Output Admittance (I _C = -1.0 mAdc, V _{CE} = -10 Vdc, f = 1.0 kHz) | h _{oe} | 3.0 | 60 | μmhos |
| Noise Figure (I _C = -100 μAdc, V _{CE} = -5.0 Vdc, R _S = 1.0 kΩ, f = 1.0 kHz) | NF | - | 4.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|--|----------------|---|-----|----|
| Delay Time | (V _{CC} = -3.0 Vdc, V _{BE} = 0.5 Vdc, I _C = -10 mAdc, I _{B1} = -1.0 mAdc) | t _d | - | 35 | ns |
| Rise Time | | t _r | - | 35 | |
| Storage Time | (V _{CC} = -3.0 Vdc, I _C = -10 mAdc, I _{B1} = I _{B2} = -1.0 mAdc) | t _s | - | 225 | ns |
| Fall Time | | t _f | - | 75 | |

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

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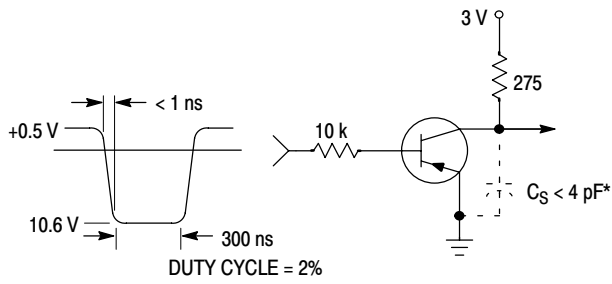


Figure 1. Delay and Rise Time Equivalent Test Circuit

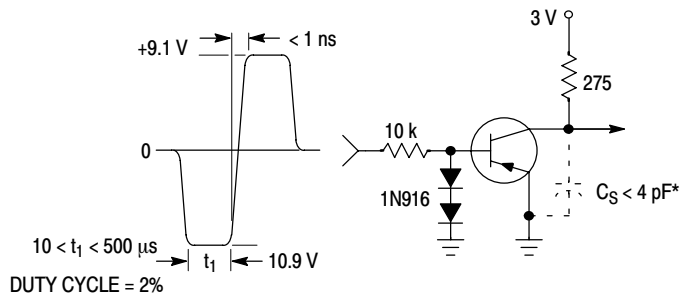


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

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

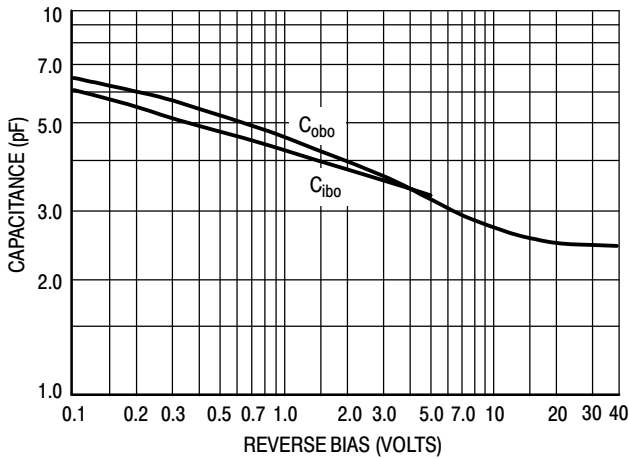


Figure 3. Capacitance

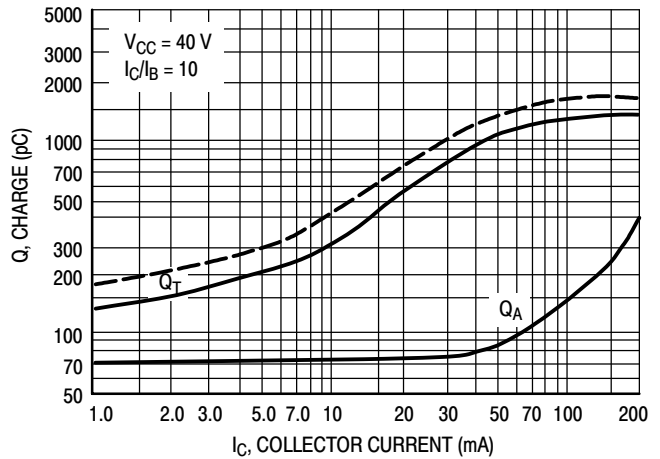


Figure 4. Charge Data

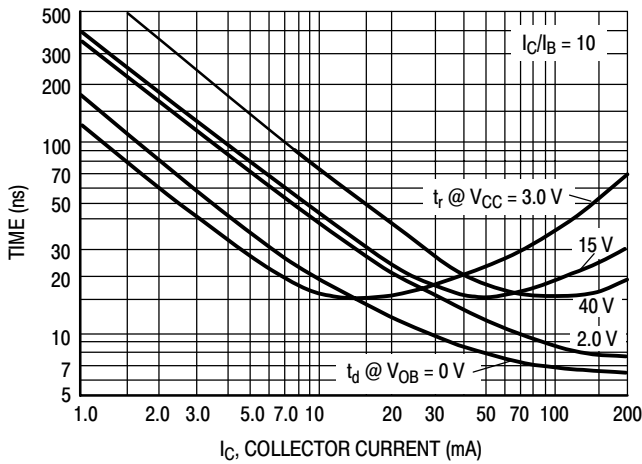


Figure 5. Turn-On Time

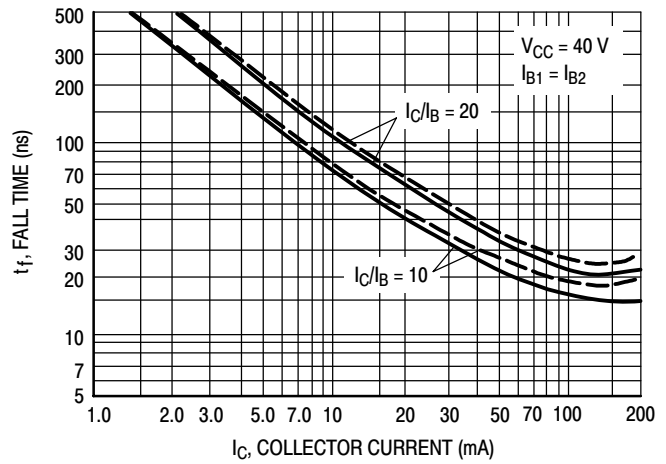


Figure 6. Fall Time

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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)

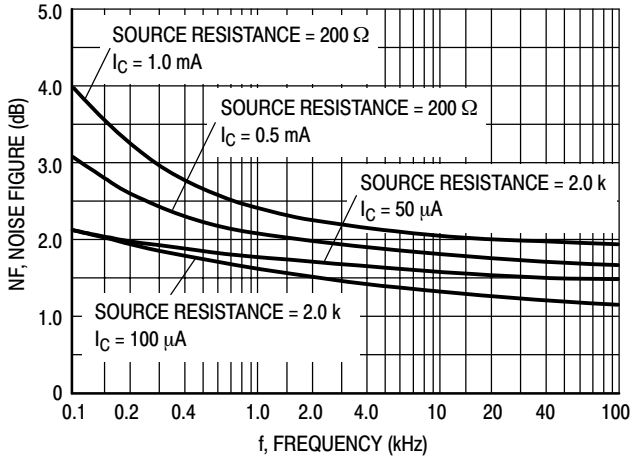


Figure 7.

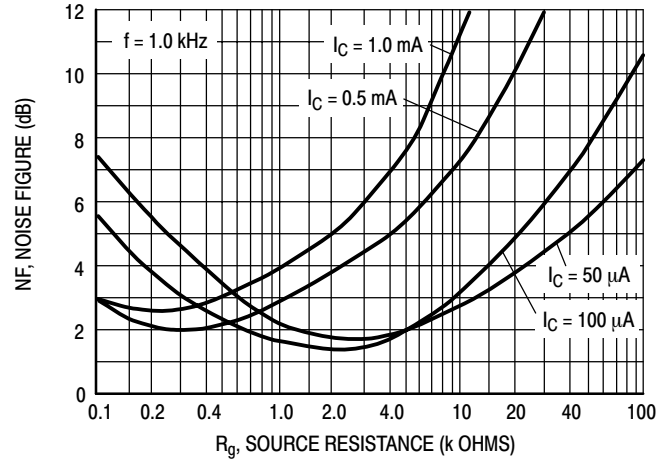


Figure 8.

h PARAMETERS

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

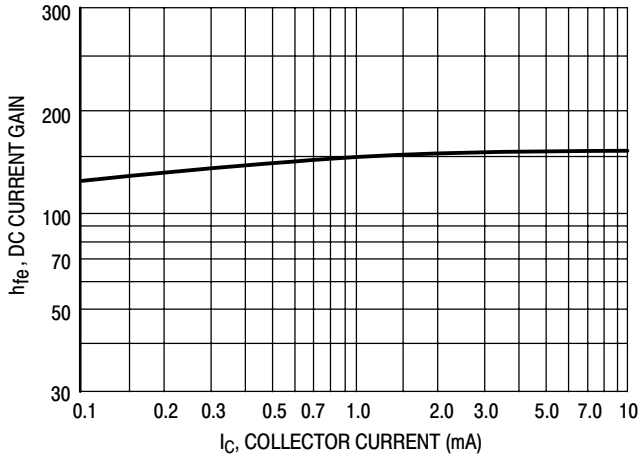


Figure 9. Current Gain

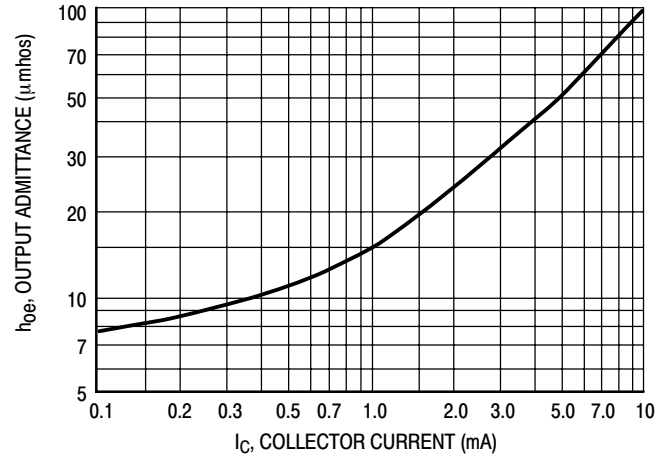


Figure 10. Output Admittance

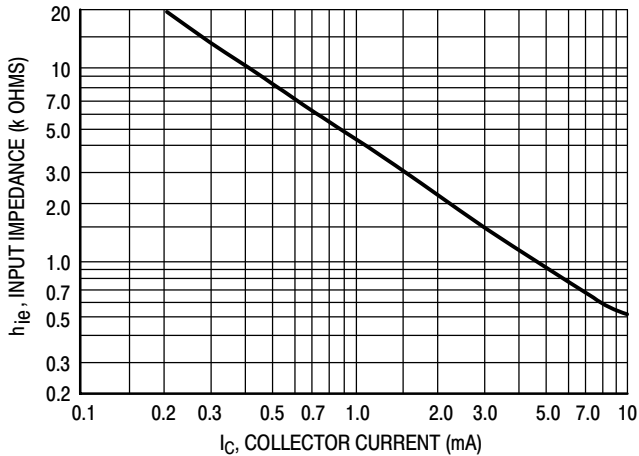


Figure 11. Input Impedance

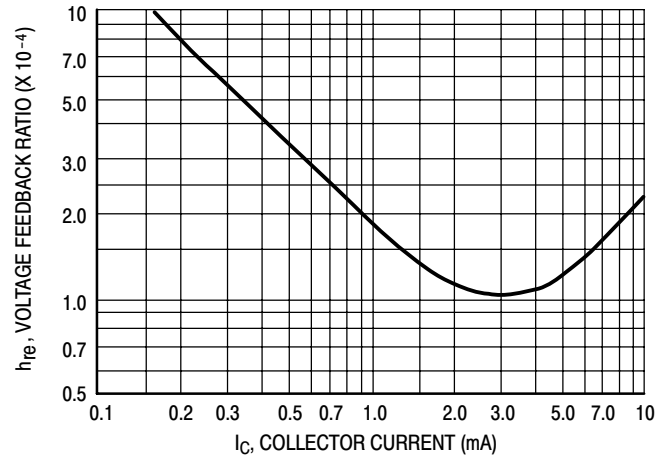


Figure 12. Voltage Feedback Ratio

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TYPICAL STATIC CHARACTERISTICS

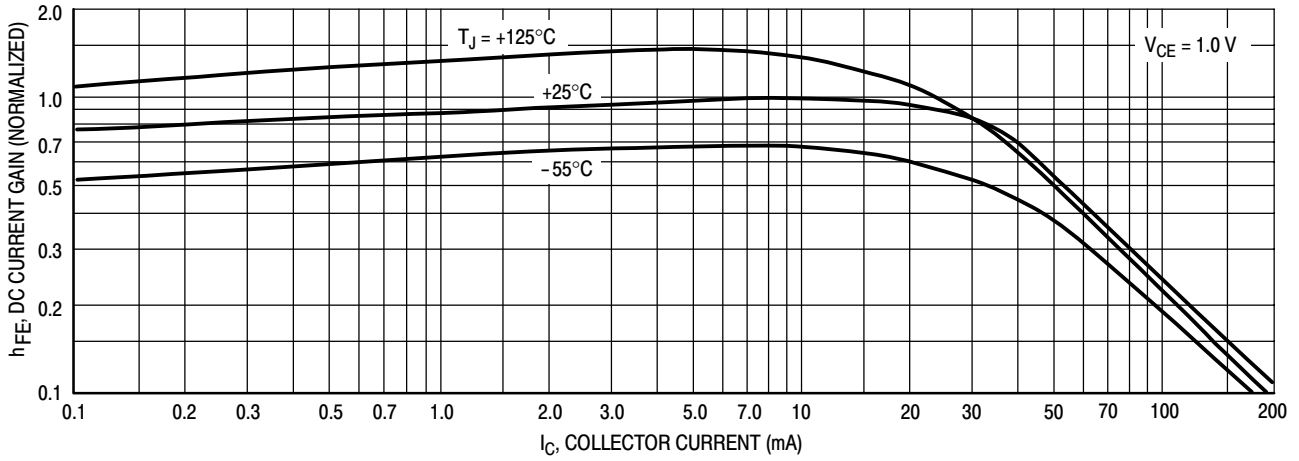


Figure 13. DC Current Gain

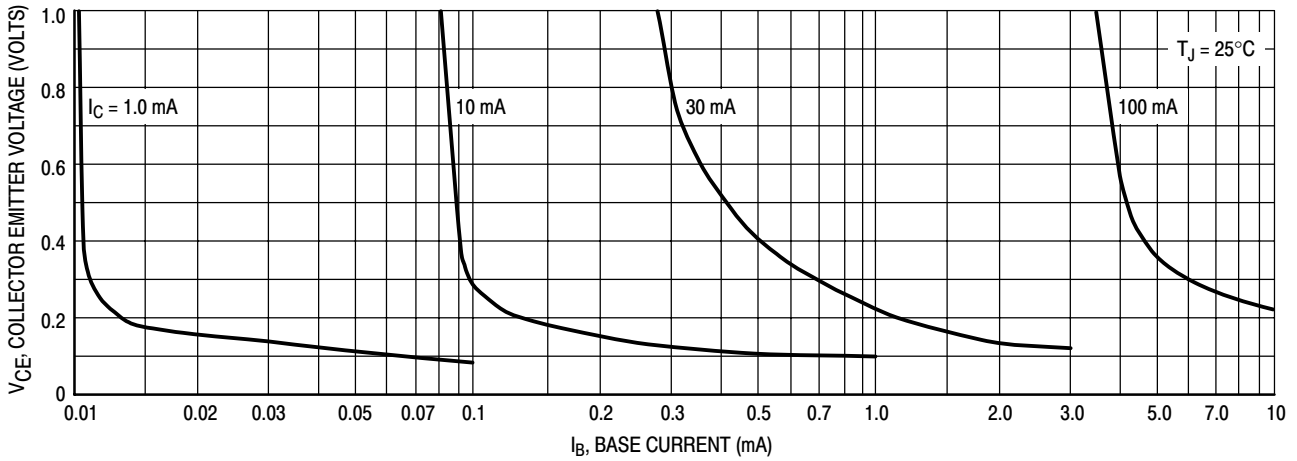


Figure 14. Collector Saturation Region

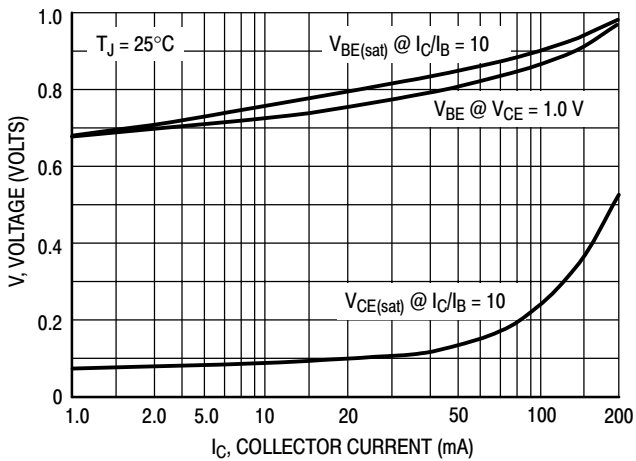


Figure 15. "ON" Voltages

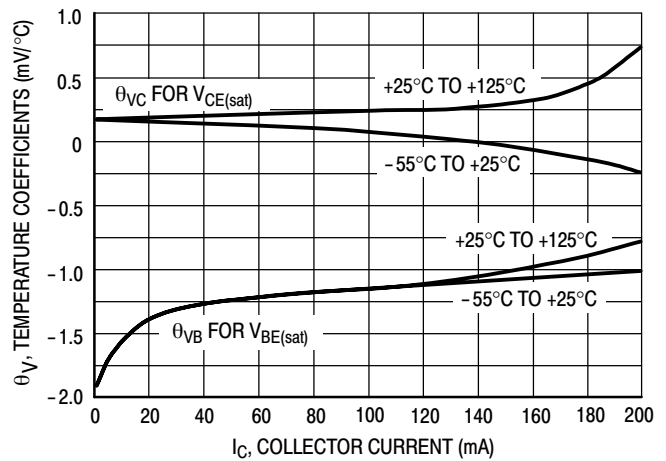


Figure 16. Temperature Coefficients

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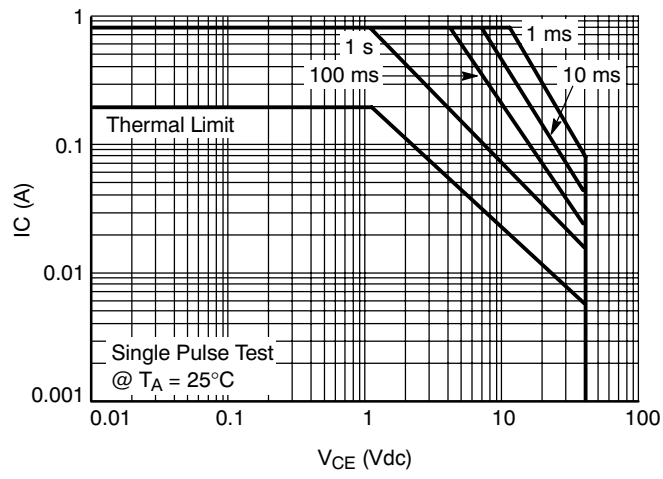
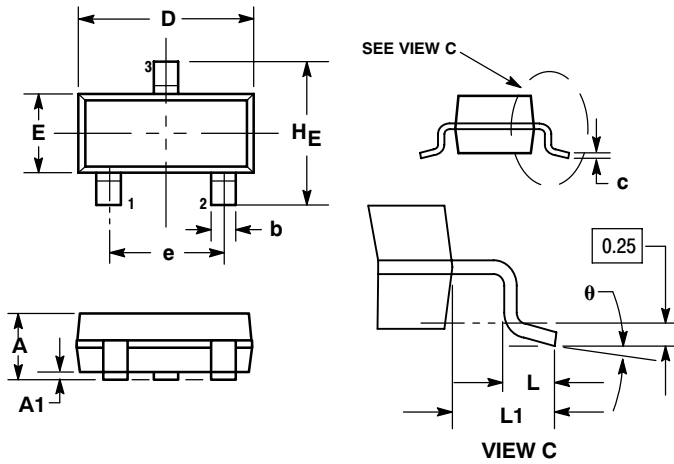


Figure 17. Safe Operating Area

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PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AN



NOTES:

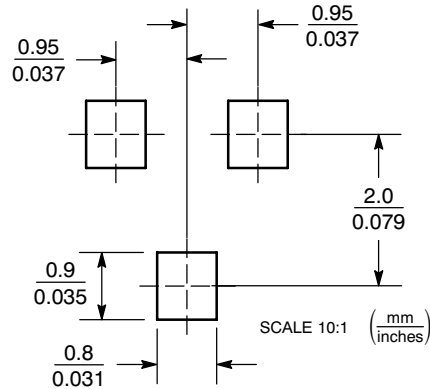
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.040 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.018 | 0.020 |
| c | 0.09 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.081 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.029 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |

STYLE 6:

1. BASE
2. EMITTER
3. 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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