

BC846ALT1G Series, SBC846ALT1G Series



ON Semiconductor®

<http://onsemi.com>

General Purpose Transistors

NPN Silicon

Features

- Moisture Sensitivity Level: 1
- ESD Rating – Human Body Model: >4000 V
– Machine Model: >400 V
- AEC-Q101 Qualified and PPAP Capable
- S 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

MAXIMUM RATINGS

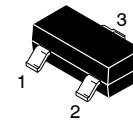
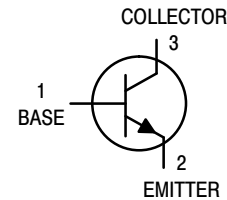
| Rating | Symbol | Value | Unit |
|--|-----------|-------------------|------|
| Collector-Emitter Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848 | V_{CEO} | 65 45 30 | Vdc |
| Collector-Base Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848 | V_{CBO} | 80 50 30 | Vdc |
| Emitter-Base Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848 | V_{EBO} | 6.0 6.0 5.0 | Vdc |
| Collector Current – Continuous | I_C | 100 | 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

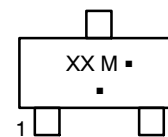
| Characteristic | Symbol | Max | Unit |
|---|-----------------|----------------|---------------------------|
| Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 | mW |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$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

1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in 99.5% alumina.



**SOT-23
CASE 318
STYLE 6**

MARKING DIAGRAM



XX = 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

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

BC846ALT1G Series, SBC846ALT1G Series

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit | |
|---|--|---------------|-------------------|-------------------|-------------------|---------------------|
| OFF CHARACTERISTICS | | | | | | |
| Collector – Emitter Breakdown Voltage ($I_C = 10\text{ mA}$) | BC846A, B, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B | $V_{(BR)CEO}$ | 65 45 30 | – – – | – – – | V |
| Collector – Emitter Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $V_{EB} = 0$) | BC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B | $V_{(BR)CES}$ | 80 50 30 | – – – | – – – | V |
| Collector – Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$) | BC846A, B, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B | $V_{(BR)CBO}$ | 80 50 30 | – – – | – – – | V |
| Emitter – Base Breakdown Voltage ($I_E = 1.0\ \mu\text{A}$) | BC846A, B, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B | $V_{(BR)EBO}$ | 6.0 6.0 5.0 | – – – | – – – | V |
| Collector Cutoff Current ($V_{CB} = 30\text{ V}$) ($V_{CB} = 30\text{ V}$, $T_A = 150^\circ\text{C}$) | | I_{CBO} | – – | – – | 15 5.0 | nA μA |
| ON CHARACTERISTICS | | | | | | |
| DC Current Gain ($I_C = 10\ \mu\text{A}$, $V_{CE} = 5.0\text{ V}$) | BC846A, BC847A, BC848A, SBC846A BC846B, BC847B, BC848B, SBC846B, SBC848B BC847C, BC848C, SBC847C | h_{FE} | – – – | 90 150 270 | – – – | – |
| ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | BC846A, BC847A, BC848A, SBC846A, SBC846A BC846B, BC847B, BC848B, BC849B, BC850B, SBC846B, SBC848B BC847C, BC848C, BC849C, BC850C, SBC847C | | 110 200 420 | 180 290 520 | 220 450 800 | |
| Collector – Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 100\text{ mA}$, $I_B = 5.0\text{ mA}$) | | $V_{CE(sat)}$ | – – | – – | 0.25 0.6 | V |
| Base – Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 100\text{ mA}$, $I_B = 5.0\text{ mA}$) | | $V_{BE(sat)}$ | – – | 0.7 0.9 | – – | V |
| Base – Emitter Voltage ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 10\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | | $V_{BE(on)}$ | 580 – | 660 – | 700 770 | mV |
| SMALL-SIGNAL CHARACTERISTICS | | | | | | |
| Current – Gain – Bandwidth Product ($I_C = 10\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$, $f = 100\text{ MHz}$) | | f_T | 100 | – | – | MHz |
| Output Capacitance ($V_{CB} = 10\text{ V}$, $f = 1.0\text{ MHz}$) | | C_{obo} | – | – | 4.5 | pF |
| Noise Figure ($I_C = 0.2\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$, $R_S = 2.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $BW = 200\text{ Hz}$) | BC846A,B, BC847A,B,C, BC848A,B,C, SBC846A, B, SBC847C, SBC848B BC849B,C, BC850B,C | NF | – – | – – | 10 4.0 | dB |

BC846ALT1G Series, SBC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

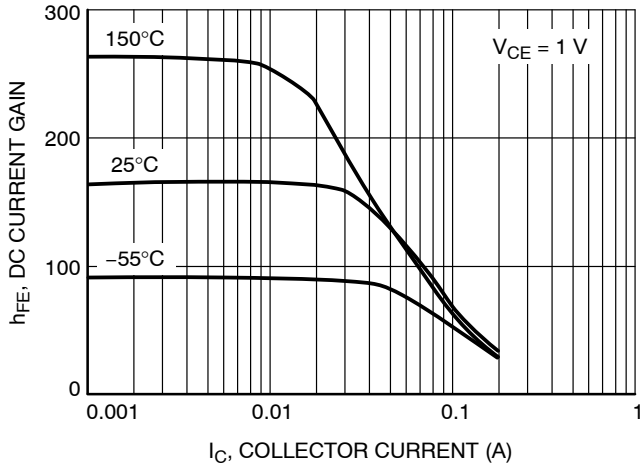


Figure 1. DC Current Gain vs. Collector Current

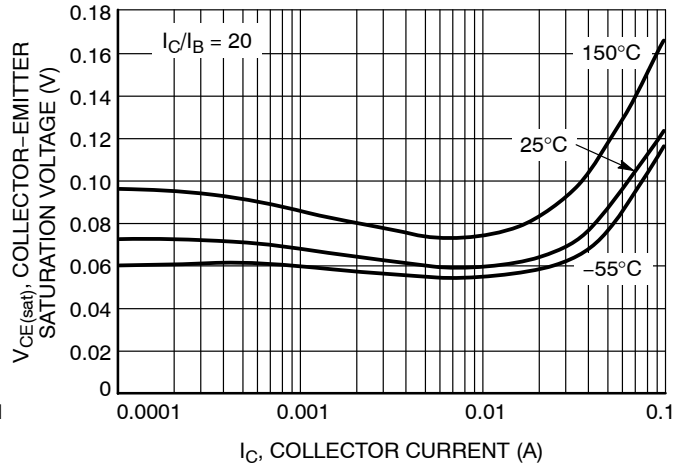


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

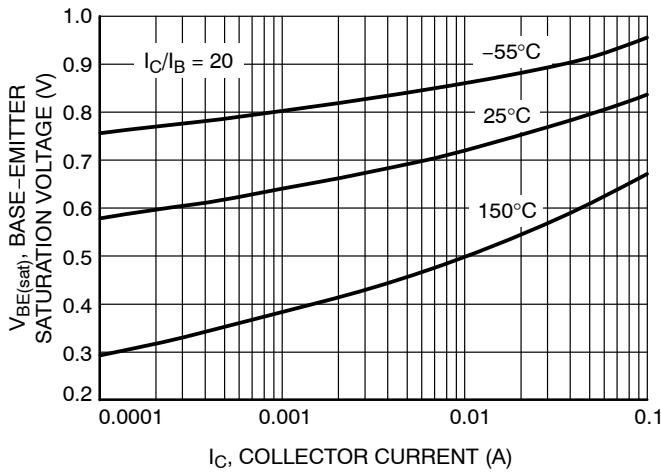


Figure 3. Base Emitter Saturation Voltage vs. Collector Current

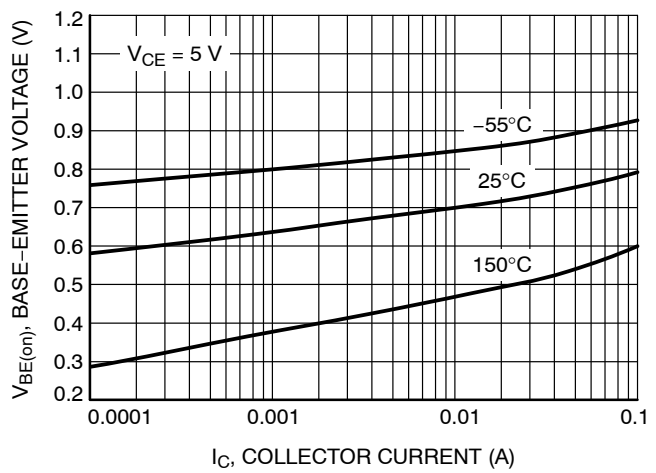


Figure 4. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series, SBC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

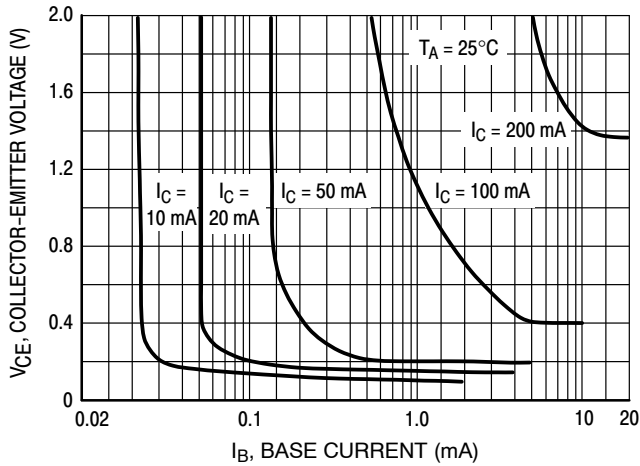


Figure 5. Collector Saturation Region

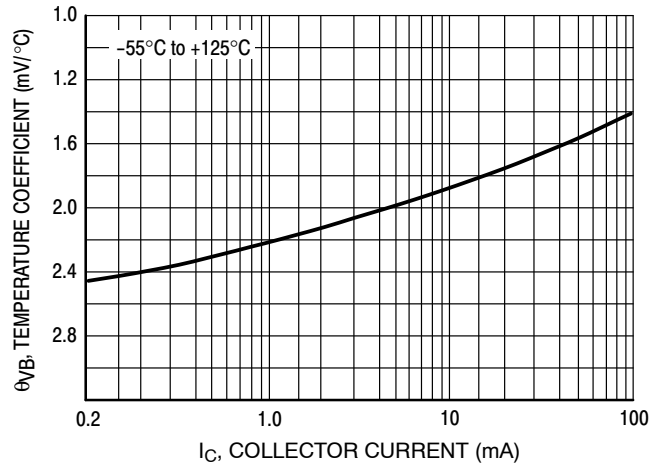


Figure 6. Base-Emitter Temperature Coefficient

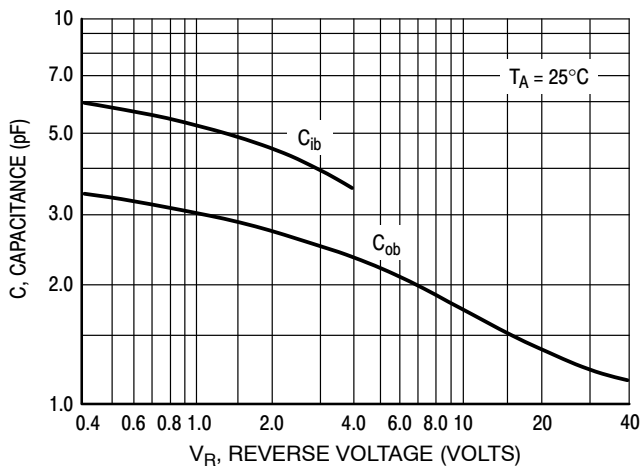


Figure 7. Capacitances

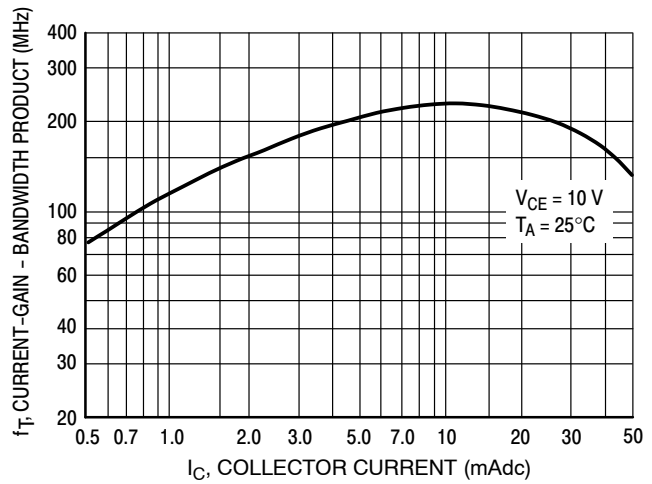


Figure 8. Current-Gain - Bandwidth Product

BC846ALT1G Series, SBC846ALT1G Series

BC846B, SBC846B

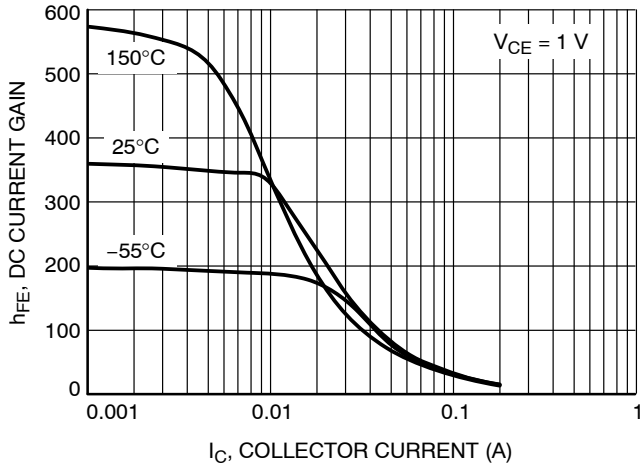


Figure 9. DC Current Gain vs. Collector Current

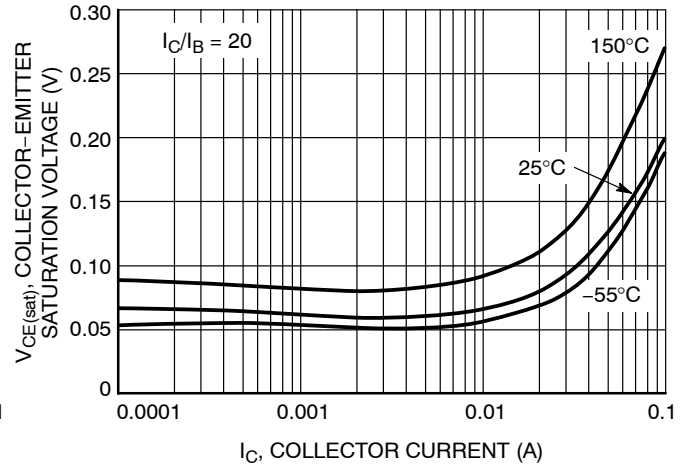


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

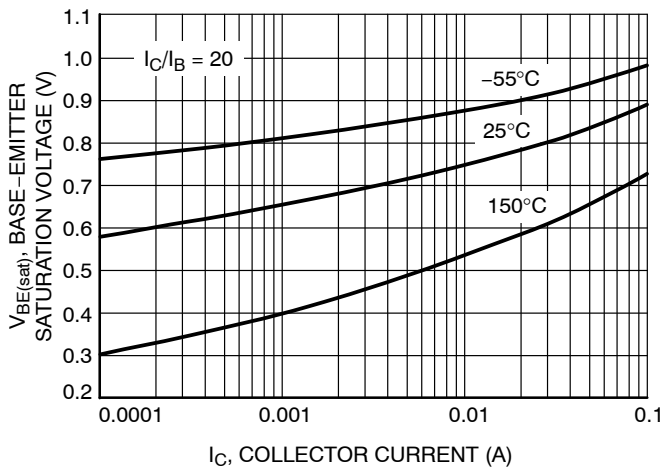


Figure 11. Base Emitter Saturation Voltage vs. Collector Current

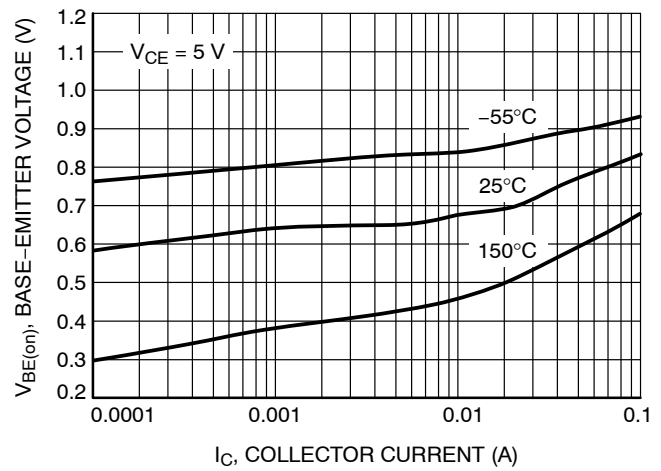


Figure 12. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series, SBC846ALT1G Series

BC846B, SBC846B

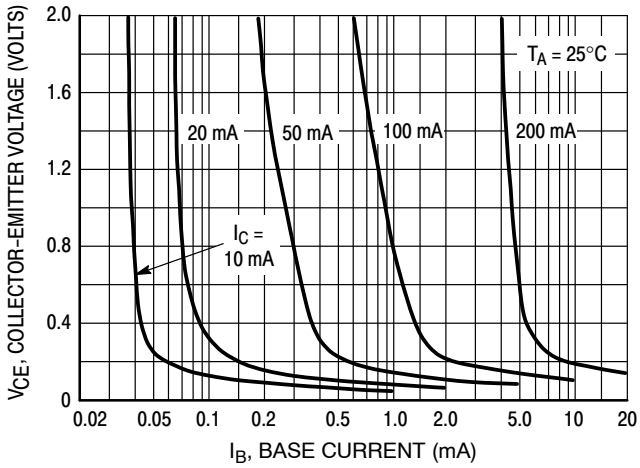


Figure 13. Collector Saturation Region

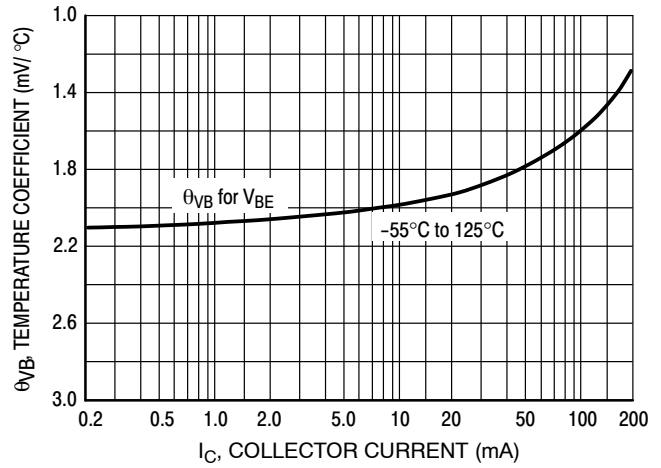


Figure 14. Base-Emitter Temperature Coefficient

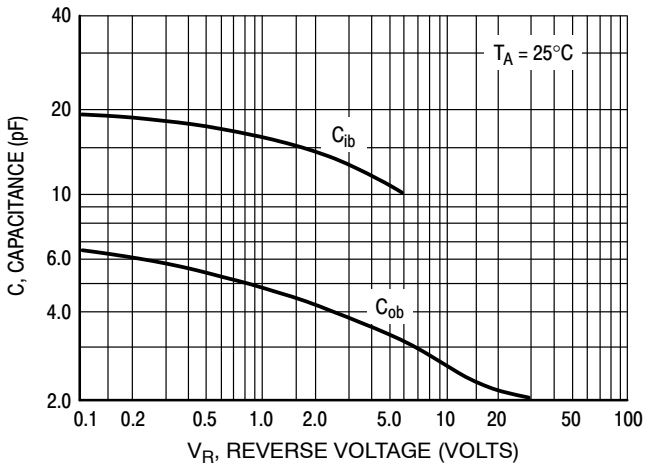


Figure 15. Capacitance

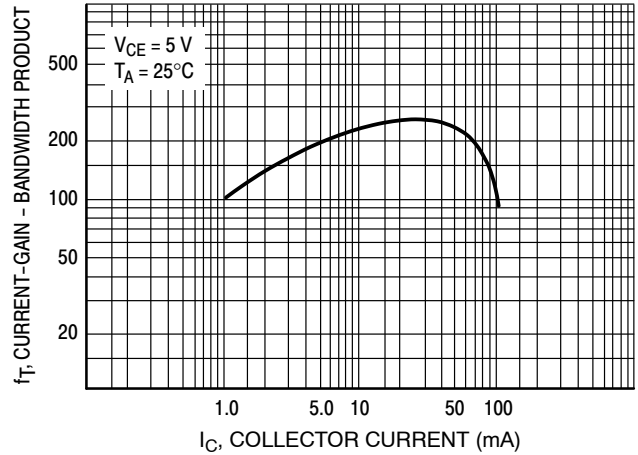


Figure 16. Current-Gain - Bandwidth Product

BC846ALT1G Series, SBC846ALT1G Series

BC847B, BC848B, BC849B, BC850B, SBC846B, SBC847B, SBC848B

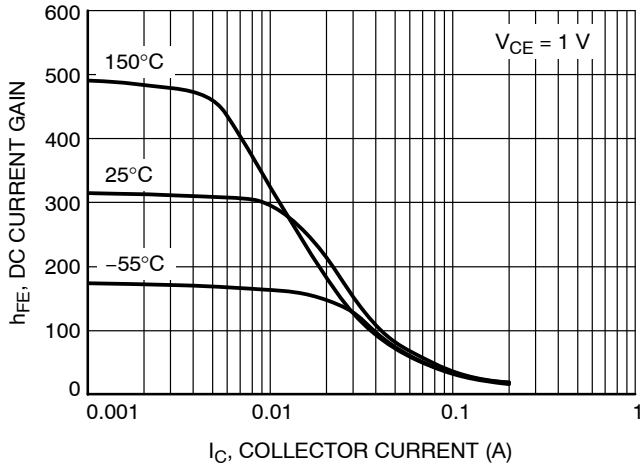


Figure 17. DC Current Gain vs. Collector Current

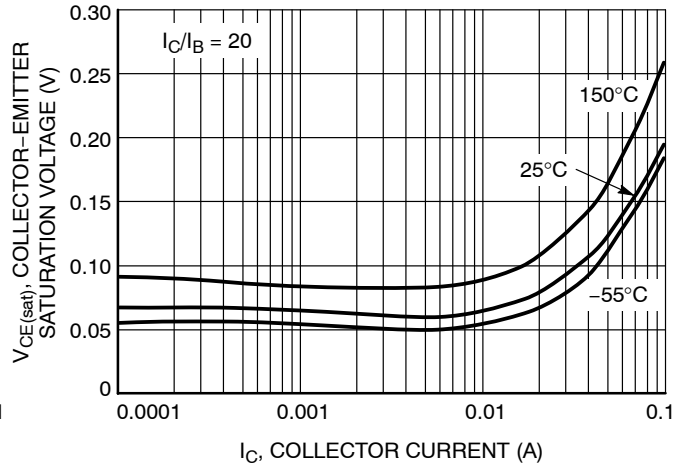


Figure 18. Collector Emitter Saturation Voltage vs. Collector Current

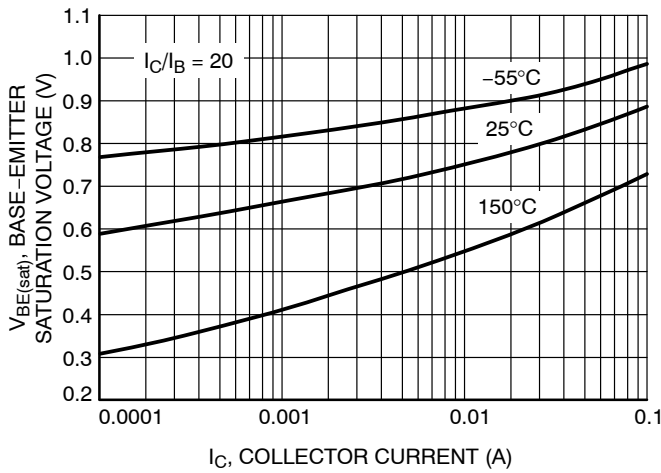


Figure 19. Base Emitter Saturation Voltage vs. Collector Current

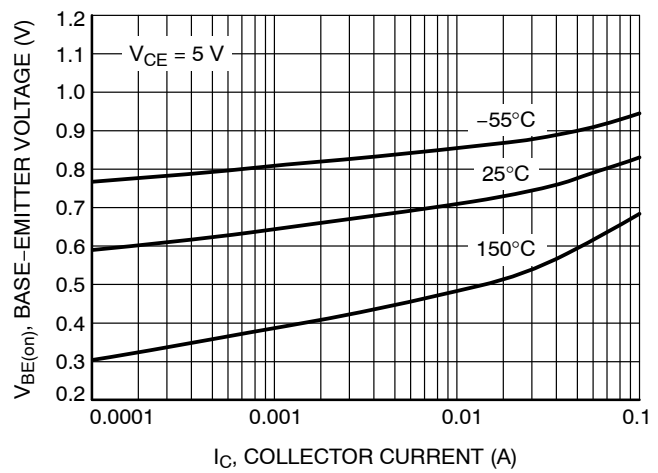


Figure 20. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series, SBC846ALT1G Series

BC847B, BC848B, BC849B, BC850B, SBC846B, SBC847B, SBC848B

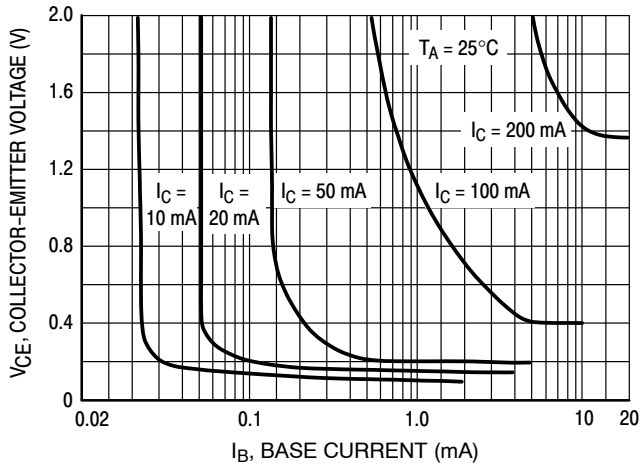


Figure 21. Collector Saturation Region

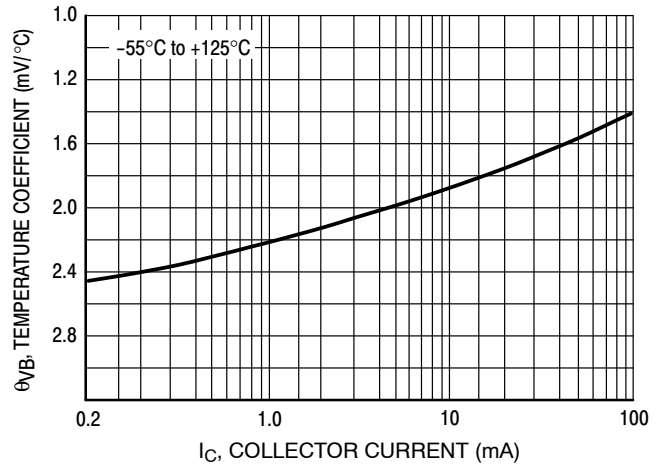


Figure 22. Base-Emitter Temperature Coefficient

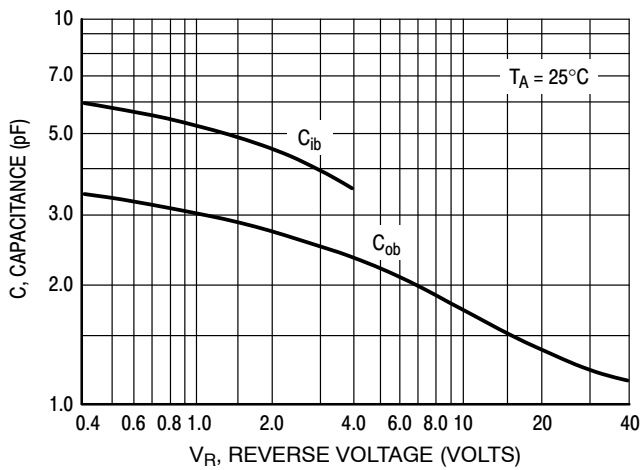


Figure 23. Capacitances

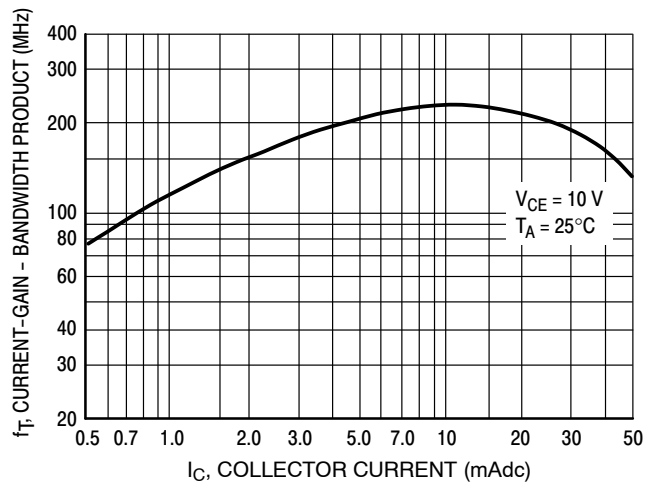


Figure 24. Current-Gain - Bandwidth Product

BC846ALT1G Series, SBC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

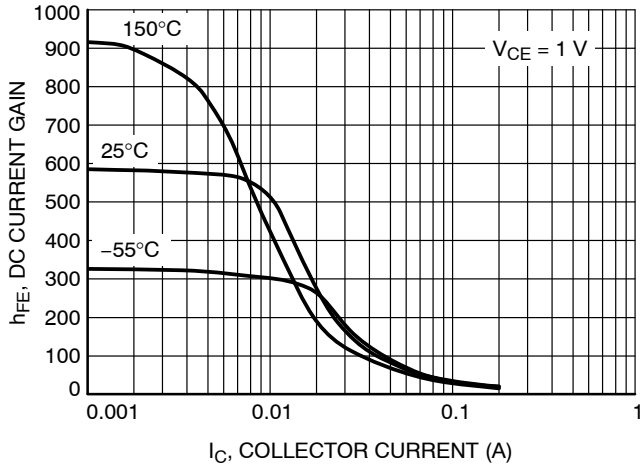


Figure 25. DC Current Gain vs. Collector Current

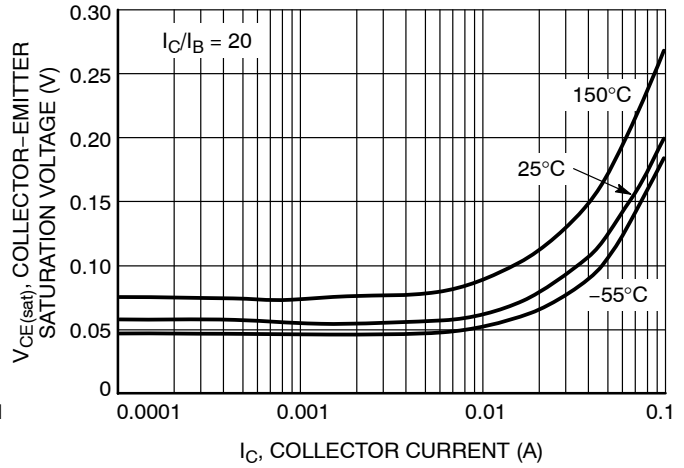


Figure 26. Collector Emitter Saturation Voltage vs. Collector Current

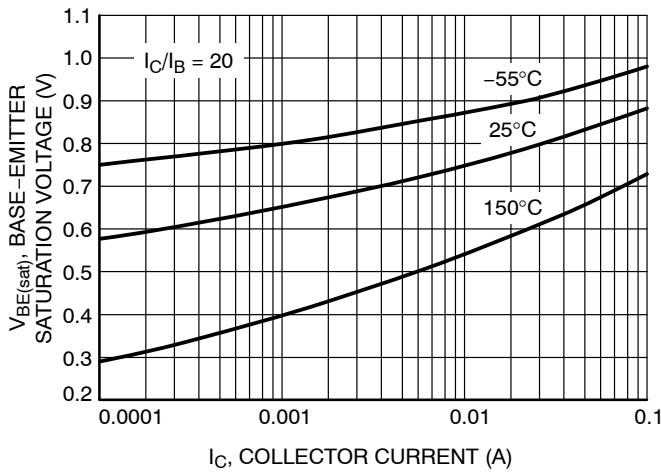


Figure 27. Base Emitter Saturation Voltage vs. Collector Current

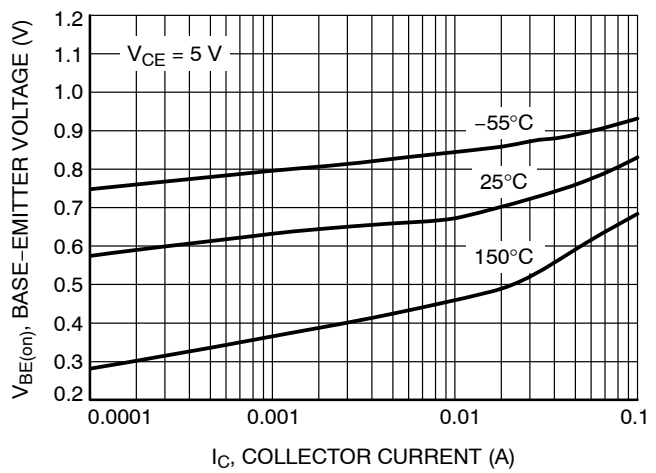


Figure 28. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series, SBC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

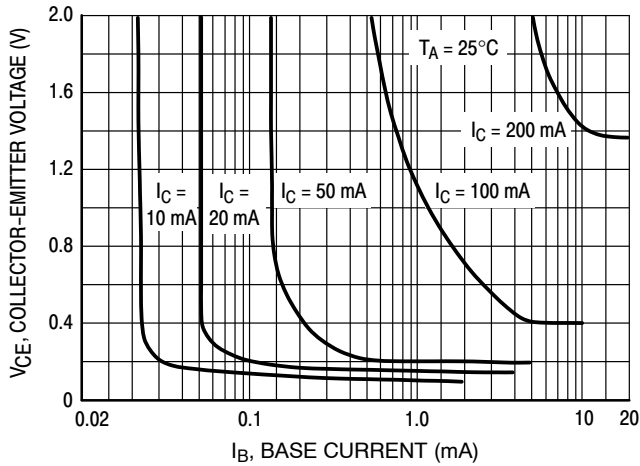


Figure 29. Collector Saturation Region

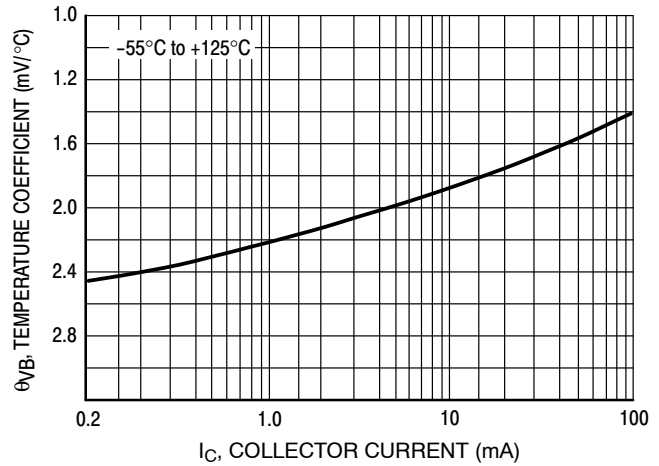


Figure 30. Base-Emitter Temperature Coefficient

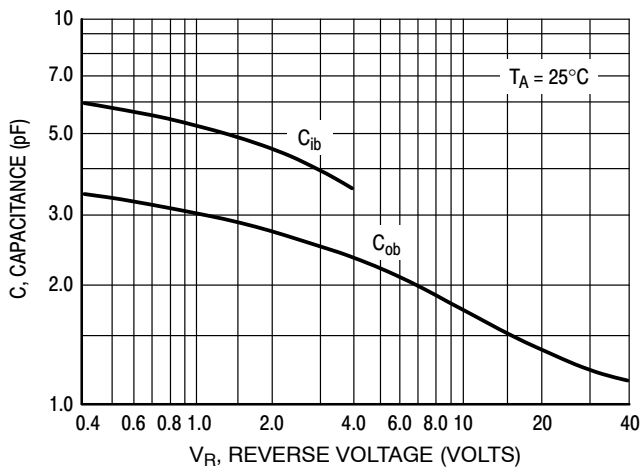


Figure 31. Capacitances

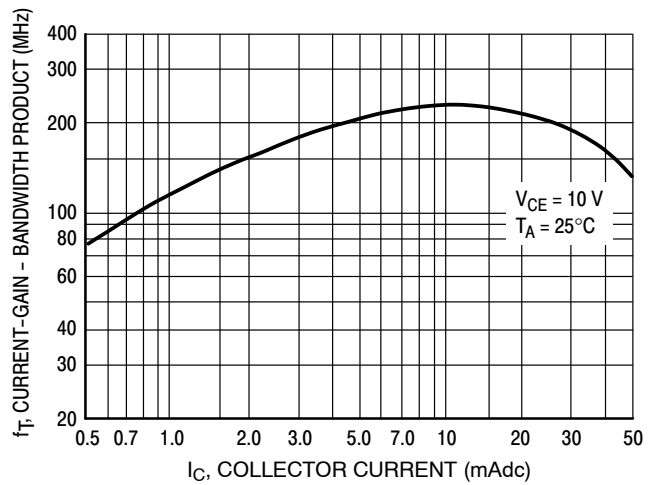


Figure 32. Current-Gain - Bandwidth Product

BC846ALT1G Series, SBC846ALT1G Series

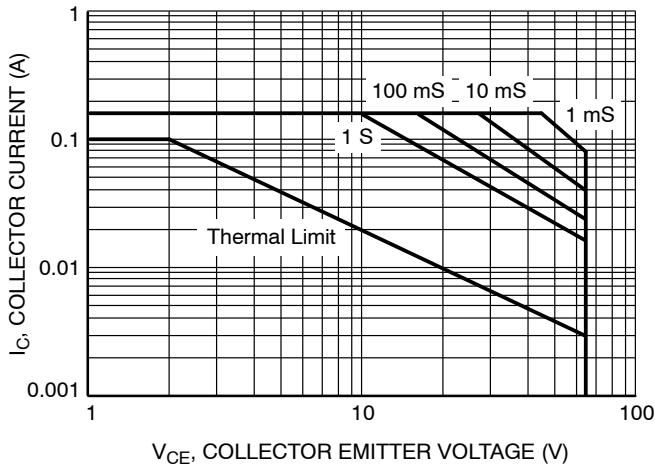


Figure 33. Safe Operating Area for BC846A, BC846B

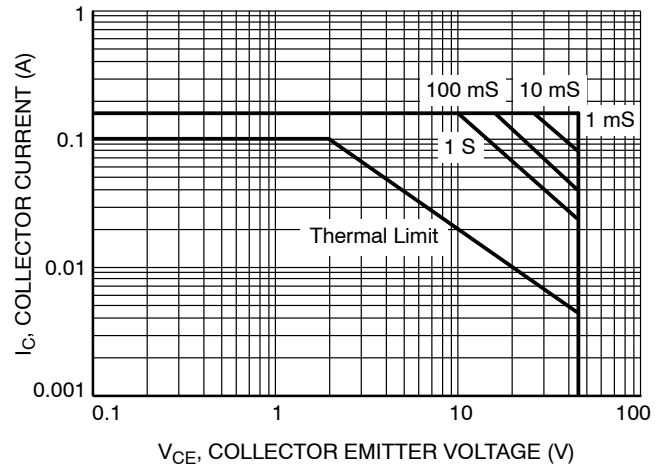


Figure 34. Safe Operating Area for BC847A, BC847B, BC847C, BC850B, BC850C

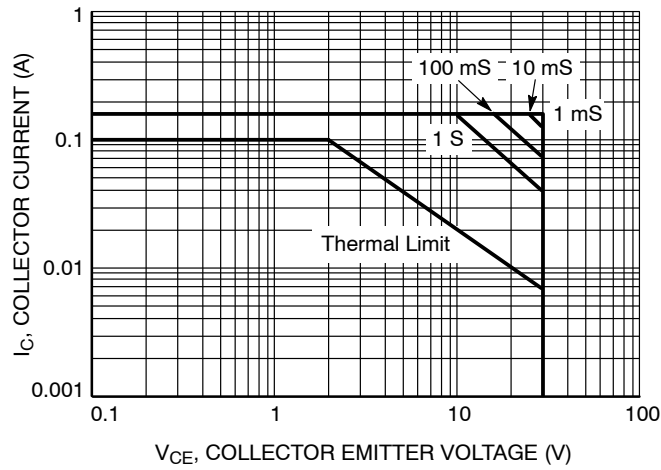


Figure 35. Safe Operating Area for BC848A, BC848B, BC848C, BC849B, BC849C

BC846ALT1G Series, SBC846ALT1G Series

ORDERING INFORMATION

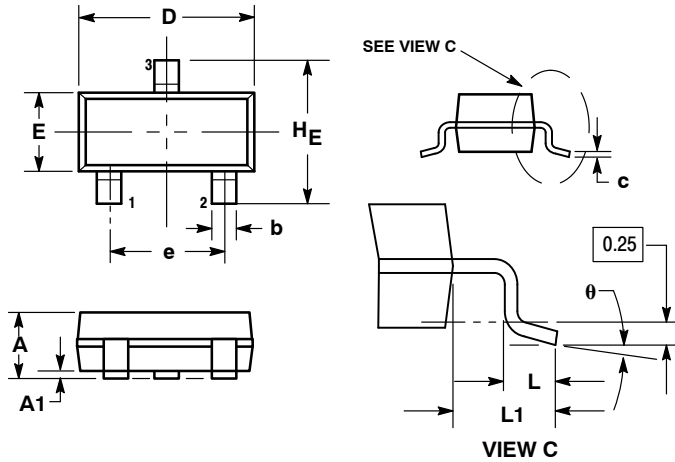
| Device | Marking | Package | Shipping† |
|-------------|---------|---------------------|----------------------|
| BC846ALT1G | 1A | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC846ALT1G | | | |
| BC846ALT3G | 1A | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC846BLT1G | 1B | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC846BLT1G | | | |
| BC846BLT3G | 1B | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| SBC846BLT3G | | | |
| BC847ALT1G | 1E | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC847ALT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC847BLT1G | 1F | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC847BLT1G | | | |
| BC847BLT3G | 1F | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC847CLT1G | 1G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC847CLT1G | | | |
| BC847CLT3G | 1G | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC848ALT1G | 1J | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC848BLT1G | 1K | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC848BLT1G | | | |
| BC848BLT3G | 1K | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC848CLT1G | 1L | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC848CLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC849BLT1G | 2B | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC849BLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC849CLT1G | 2C | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC849CLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC850BLT1G | 2F | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC850CLT1G | 2G | SOT-23 (Pb-Free) | |

†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.

BC846ALT1G Series, SBC846ALT1G Series

PACKAGE DIMENSIONS

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



NOTES:

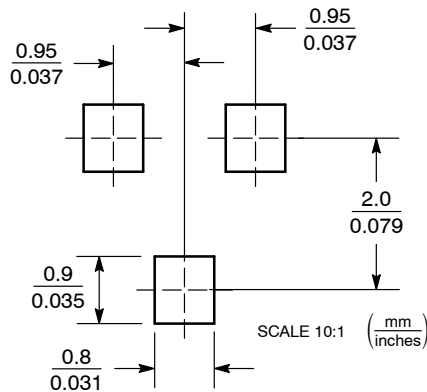
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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 |
| θ | 0° | --- | 10° | 0° | --- | 10° |

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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