

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

Dual General Purpose Transistors

NPN/PNP Duals (Complementary)

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-363/SC-88 which is designed for low power surface mount applications.

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 – NPN

| Rating | Symbol | Value | Unit |
|--|-----------|----------------|------|
| Collector-Emitter Voltage BC846, SBC846 BC847, SBC847 BC848 | V_{CEO} | 65 45 30 | V |
| Collector-Base Voltage BC846, SBC846 BC847, SBC847 BC848 | V_{CBO} | 80 50 30 | V |
| Emitter-Base Voltage | V_{EBO} | 6.0 | V |
| Collector Current – Continuous | I_C | 100 | mAdc |
| Collector Current – Peak | I_{CM} | 200 | mAdc |

MAXIMUM RATINGS – PNP

| Rating | Symbol | Value | Unit |
|--|-----------|-------------------|------|
| Collector-Emitter Voltage BC846, SBC846 BC847, SBC847 BC848 | V_{CEO} | -65 -45 -30 | V |
| Collector-Base Voltage BC846, SBC846 BC847, SBC847 BC848 | V_{CBO} | -80 -50 -30 | V |
| Emitter-Base Voltage | V_{EBO} | -6.0 | V |
| Collector Current – Continuous | I_C | -100 | mAdc |
| Collector Current – Peak | I_{CM} | -200 | mAdc |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

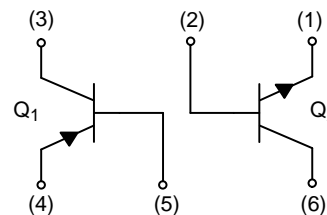


ON Semiconductor®

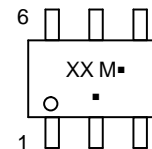
www.onsemi.com



SOT-363
CASE 419B
STYLE 1



MARKING DIAGRAM



XX = Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Mark | Package | Shipping† |
|----------------------------------|------|----------------------|-------------------------|
| BC846BPDW1T1G, SBC846BPDW1T1G | BB | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |
| SBC846BPDW1T2G | BB | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |
| BC847BPDW1T1G | BF | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |
| SBC847BPDW1T1G | BF | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |
| SBC847BPDW1T3G | BF | SOT-363 (Pb-Free) | 10,000 / Tape & Reel |
| BC847BPDW1T2G | BF | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |
| BC848CPDW1T1G | BL | SOT-363 (Pb-Free) | 3,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------------|--|
| Total Device Dissipation Per Device FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 380 250 3.0 | mW mW/ $^\circ\text{C}$ mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 328 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

1. FR-5 = 1.0 x 0.75 x 0.062 in.

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

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

OFF CHARACTERISTICS

| | | | | | |
|--|---------------|-------------------|-------------|-------------|---------------------|
| Collector-Emitter Breakdown Voltage ($I_C = 10\text{ mA}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)CEO}$ | 65 45 30 | - - - | - - - | V |
| Collector-Emitter Breakdown Voltage ($I_C = 10\ \mu\text{A}, V_{EB} = 0$) BC846, SBC846 Series BC847B, SBC847B Only BC848 Series | $V_{(BR)CES}$ | 80 50 30 | - - - | - - - | V |
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)CBO}$ | 80 50 30 | - - - | - - - | V |
| Emitter-Base Breakdown Voltage ($I_E = 1.0\ \mu\text{A}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)EBO}$ | 6.0 6.0 6.0 | - - - | - - - | 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 ($I_C = 10\ \mu\text{A}, V_{CE} = 5.0\text{ V}$) BC846B, SBC846B, BC847B, SBC847B BC848C ($I_C = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}$) BC846B, SBC846B, BC847B, SBC847B BC848C | h_{FE} | - - 200 420 | 150 270 290 520 | - - 475 800 | - |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}, I_B = 0.5\text{ mA}$) All devices except SBC847BPDW1T1G SBC847BPDW1T1G only ($I_C = 100\text{ mA}, I_B = 5.0\text{ mA}$) All devices ($I_C = 2\text{ mA}, I_B = 0.5\text{ mA}$) SBC847BPDW1T1G only | $V_{CE(sat)}$ | - - - - | - - - 0.024 | 0.25 0.1 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 ($I_C = 0.2\text{ mA}, V_{CE} = 5.0\text{ Vdc}, R_S = 2.0\text{ k}\Omega, f = 1.0\text{ kHz}, BW = 200\text{ Hz}$) | NF | - | - | 10 | dB |

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---------------|----------------------|--------------------------|----------------------------|---------------------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C = -10\text{ mA}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)CEO}$ | -65 -45 -30 | - | - | V |
| Collector–Emitter Breakdown Voltage ($I_C = -10\ \mu\text{A}$, $V_{EB} = 0$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)CES}$ | -80 -50 -30 | - | - | V |
| Collector–Base Breakdown Voltage ($I_C = -10\ \mu\text{A}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)CBO}$ | -80 -50 -30 | - | - | V |
| Emitter–Base Breakdown Voltage ($I_E = -1.0\ \mu\text{A}$) BC846, SBC846 Series BC847, SBC847 Series BC848 Series | $V_{(BR)EBO}$ | -6.0 -6.0 -6.0 | - | - | V |
| Collector Cutoff Current ($V_{CB} = -30\text{ V}$) ($V_{CB} = -30\text{ V}$, $T_A = 150^\circ\text{C}$) | I_{CBO} | - - | - - | -15 -4.0 | nA μA |
| ON CHARACTERISTICS | | | | | |
| DC Current Gain ($I_C = -10\ \mu\text{A}$, $V_{CE} = -5.0\text{ V}$) BC846B, SBC846B, BC847B, SBC847B BC848C ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) BC846B, SBC846B, BC847B, SBC847B BC848C | h_{FE} | - - 200 420 | 150 270 290 520 | - - 475 800 | - |
| Collector–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -0.5\text{ mA}$) All devices except SBC847BPDW1T1G SBC847BPDW1T1G only ($I_C = -100\text{ mA}$, $I_B = -5.0\text{ mA}$) All devices ($I_C = -2\text{ mA}$, $I_B = -0.5\text{ mA}$) SBC847BPDW1T1G only | $V_{CE(sat)}$ | - - - - | - - - -0.024 | -0.3 -0.1 -0.65 - | 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 On Voltage ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ V}$) | $V_{BE(on)}$ | -0.6 - | - - | -0.75 -0.82 | V |
| 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_{ob} | - | - | 4.5 | pF |
| Noise Figure ($I_C = -0.2\text{ mA}$, $V_{CE} = -5.0\text{ Vdc}$, $R_S = 2.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $BW = 200\text{ Hz}$) | NF | - | - | 10 | dB |

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC846/SBC846

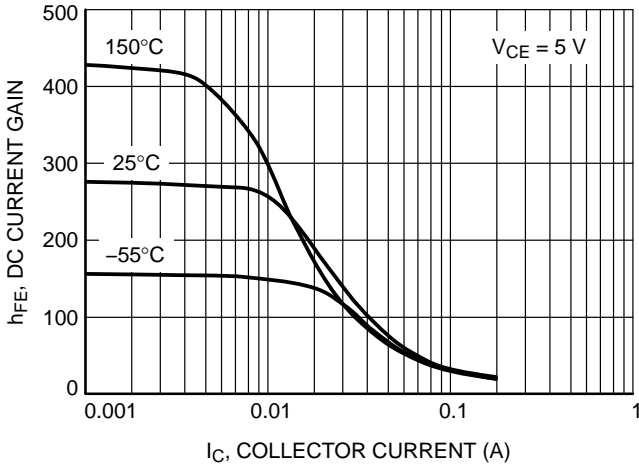


Figure 1. DC Current Gain vs. Collector Current

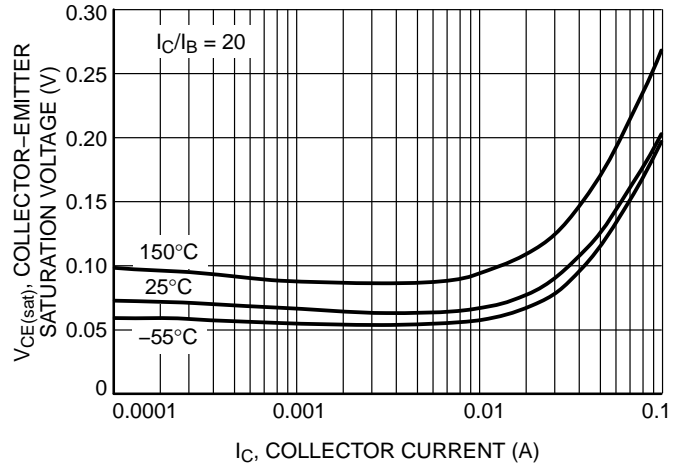


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

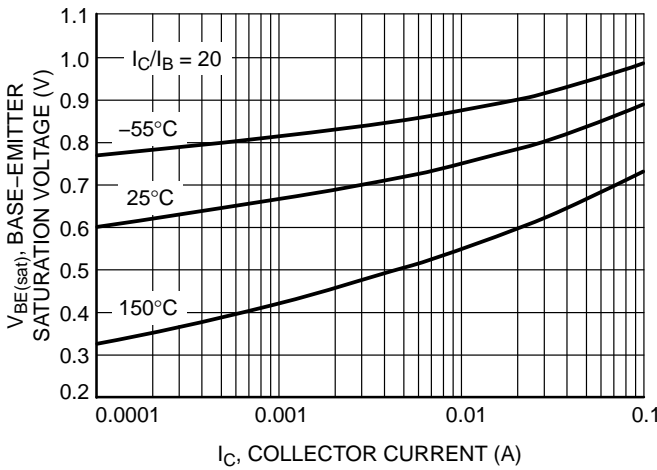


Figure 3. Base Emitter Saturation Voltage vs. Collector Current

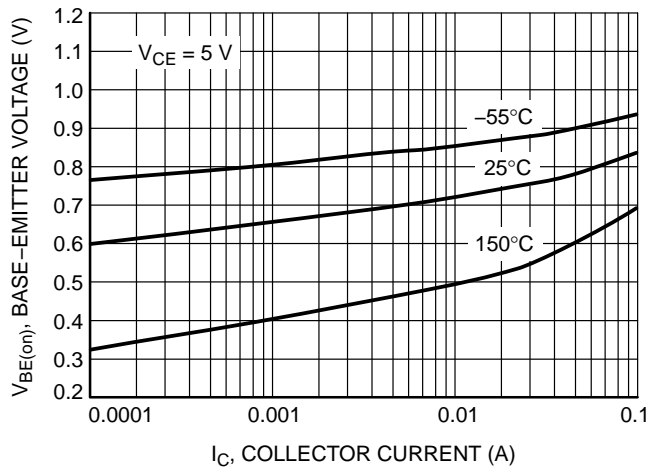


Figure 4. Base Emitter Voltage vs. Collector Current

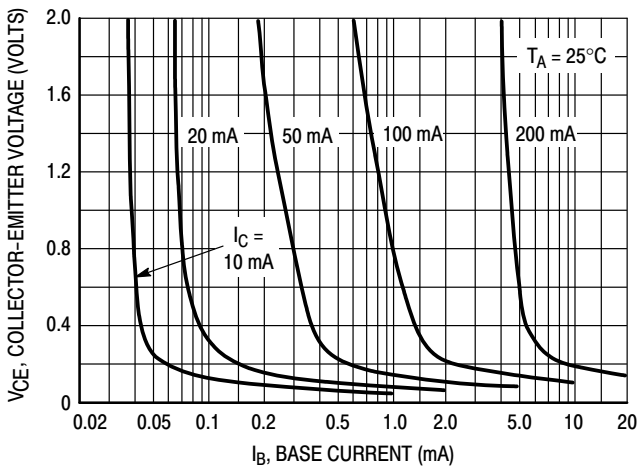


Figure 5. Collector Saturation Region

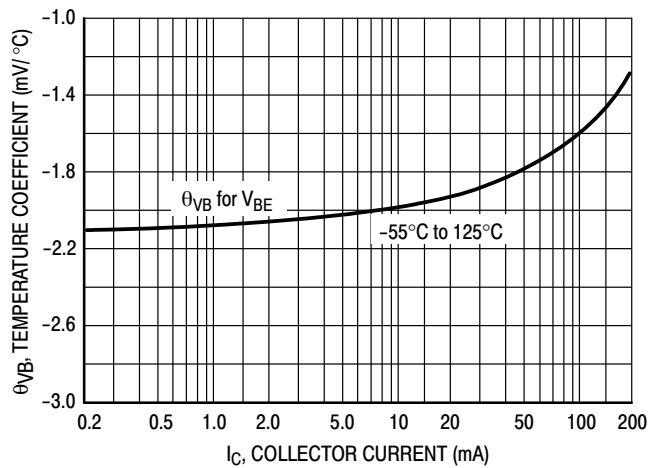


Figure 6. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC846/SBC846

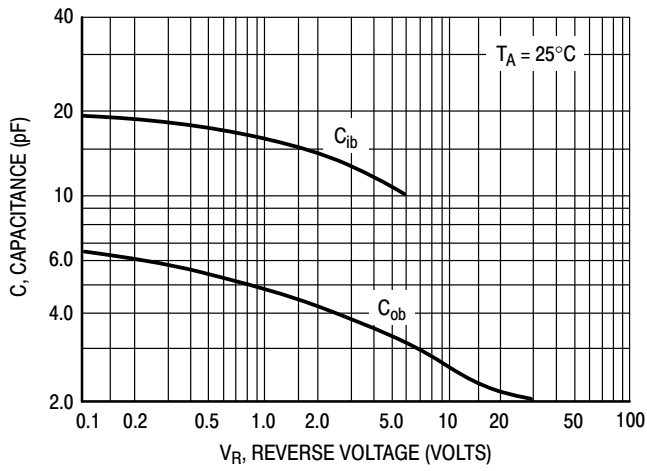


Figure 7. Capacitance

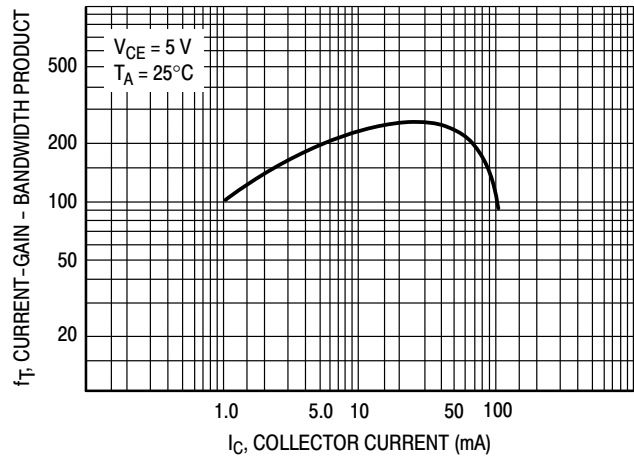


Figure 8. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS — BC846/SBC846

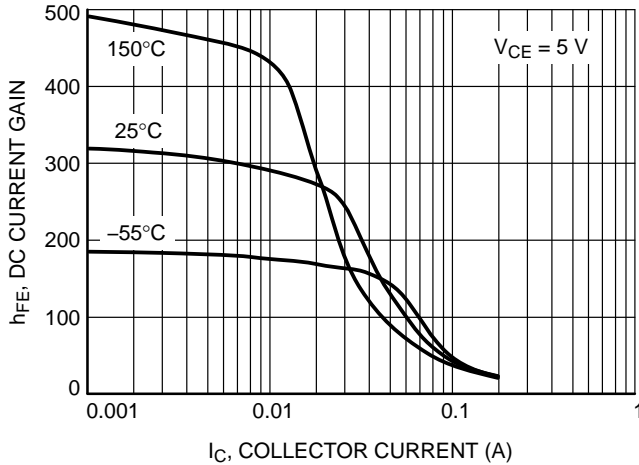


Figure 9. DC Current Gain vs. Collector Current

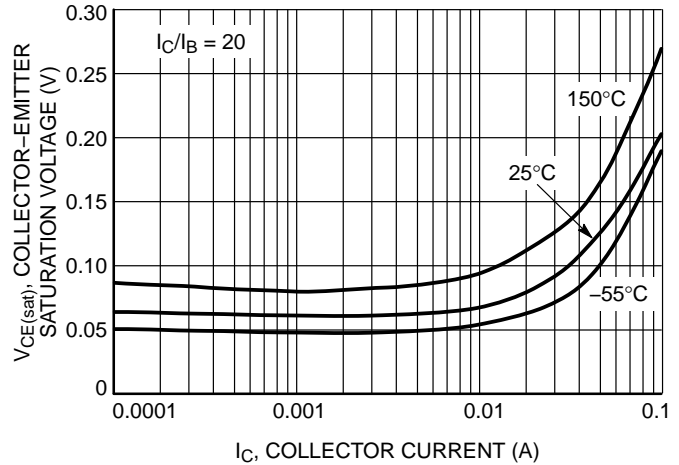


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

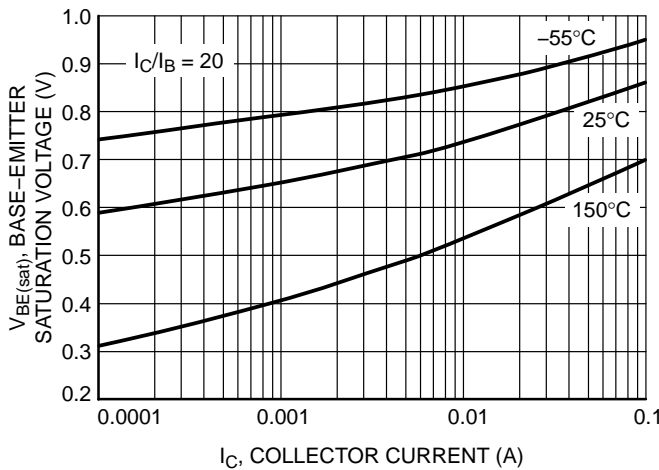


Figure 11. Base Emitter Saturation Voltage vs. Collector Current

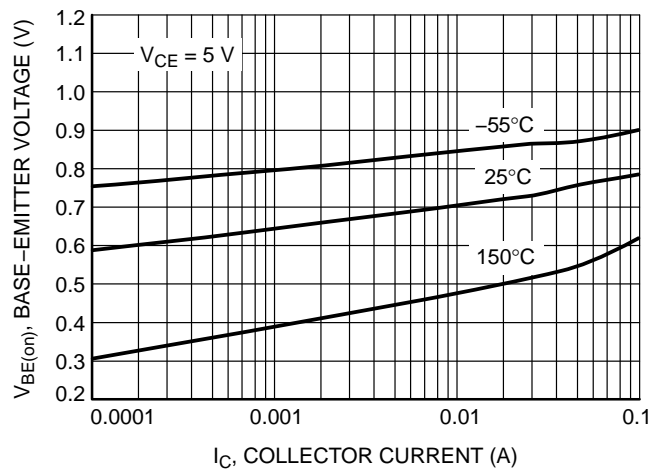


Figure 12. Base Emitter Voltage vs. Collector Current

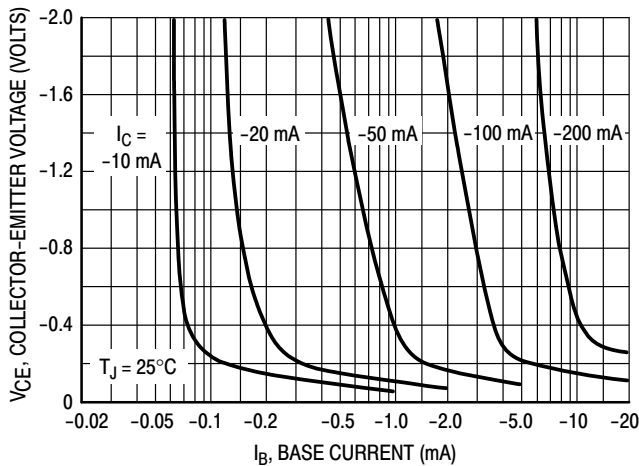


Figure 13. Collector Saturation Region

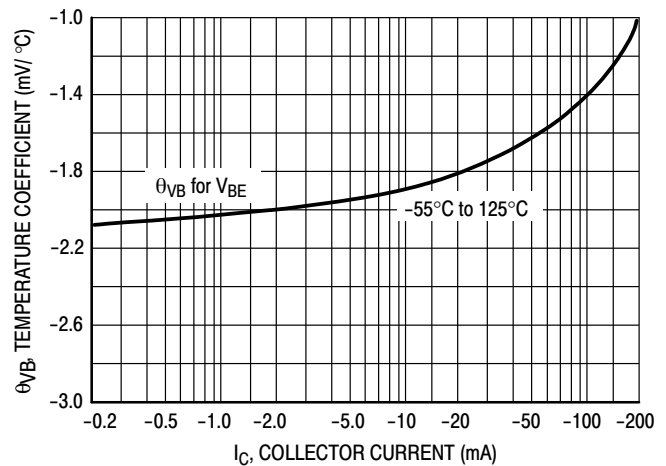


Figure 14. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS — BC846/SBC846

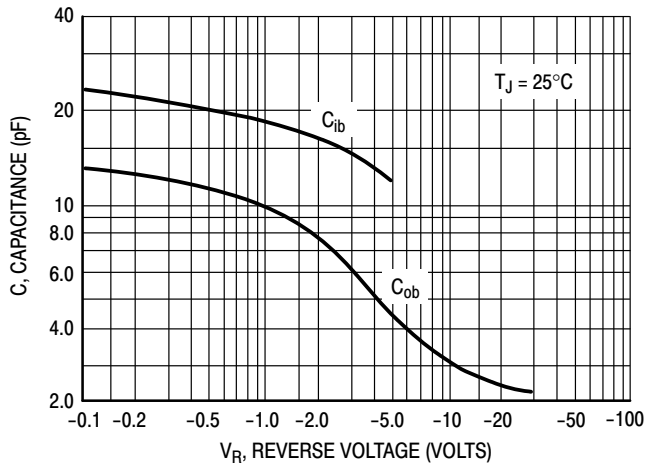


Figure 15. Capacitance

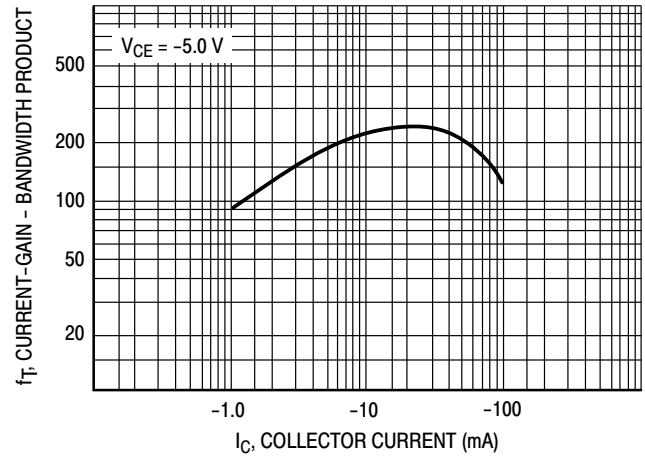


Figure 16. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC847/SBC847 SERIES

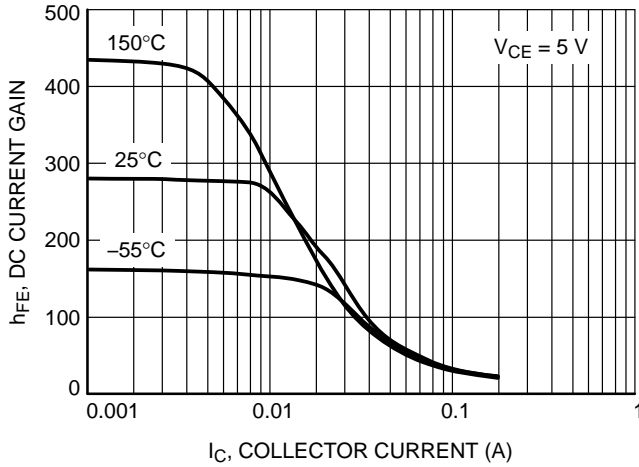


Figure 17. DC Current Gain vs. Collector Current

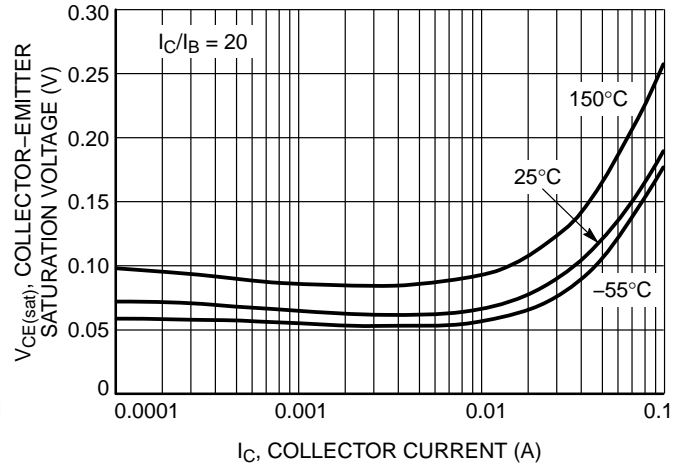


Figure 18. Collector Emitter Saturation Voltage vs. Collector Current

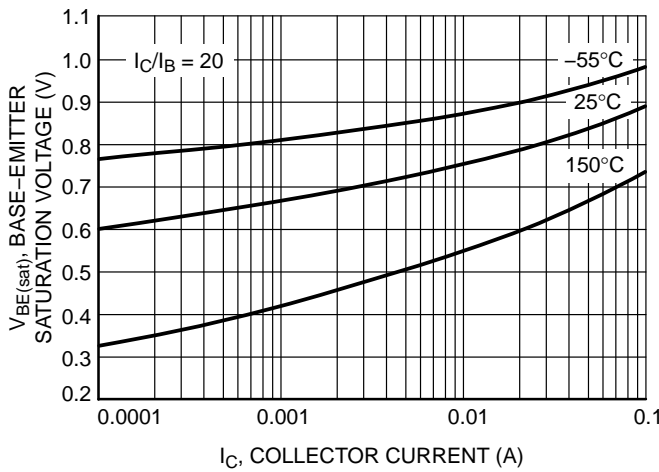


Figure 19. Base Emitter Saturation Voltage vs. Collector Current

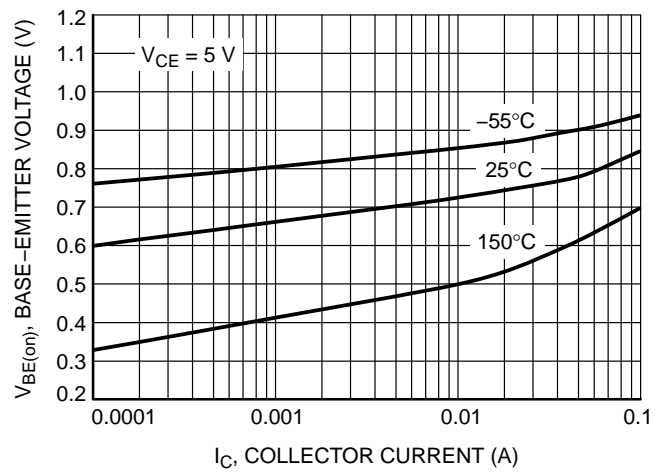


Figure 20. Base Emitter Voltage vs. Collector Current

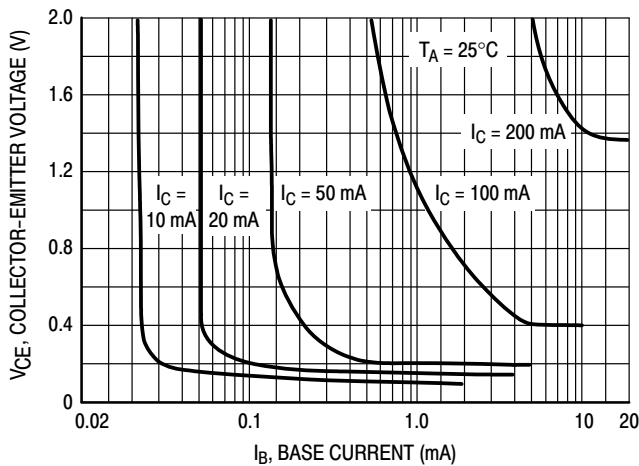


Figure 21. Collector Saturation Region

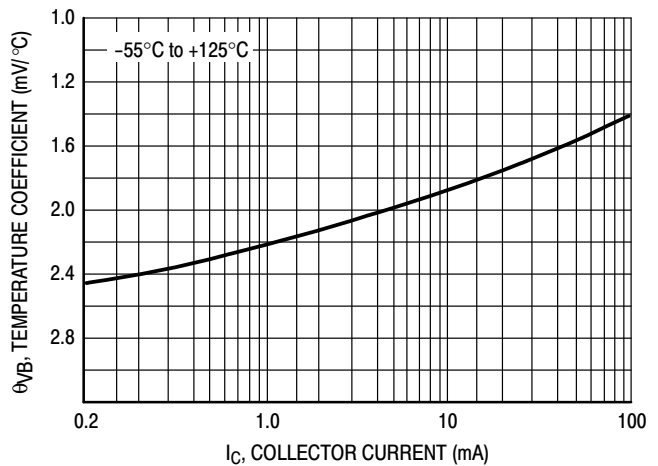


Figure 22. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC847/SBC847 SERIES

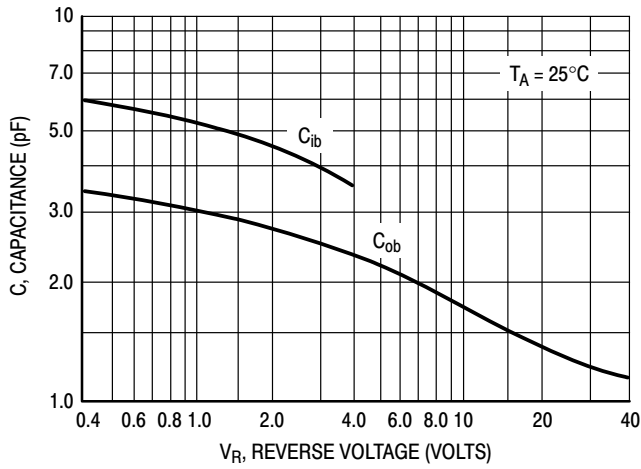


Figure 23. Capacitances

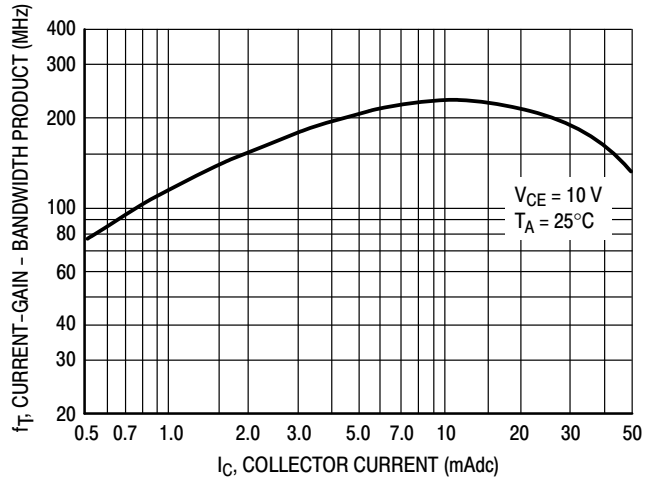


Figure 24. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS – BC847/SBC847 SERIES

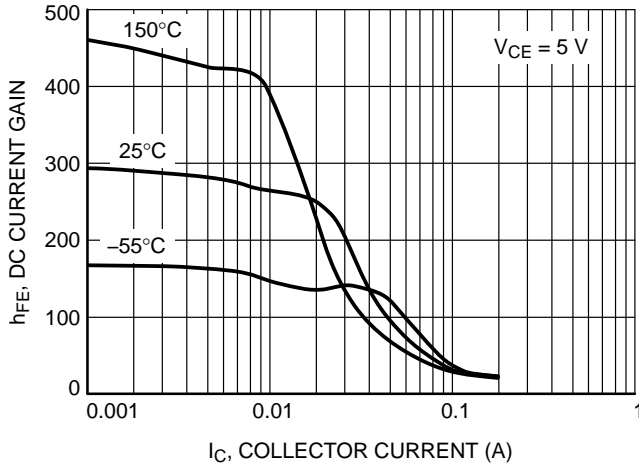


Figure 25. DC Current Gain vs. Collector Current

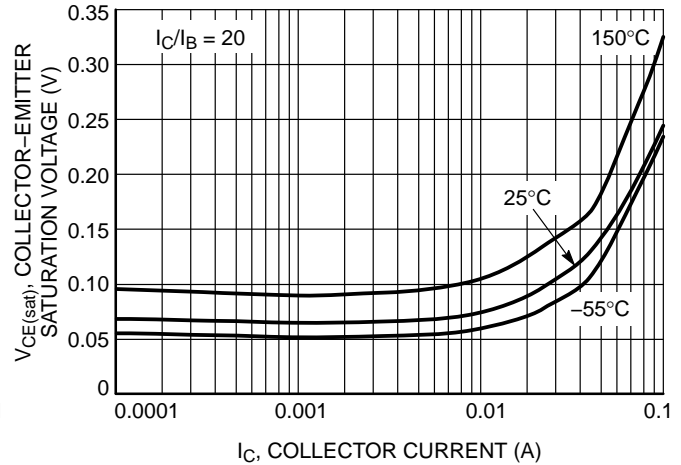


Figure 26. Collector Emitter Saturation Voltage vs. Collector Current

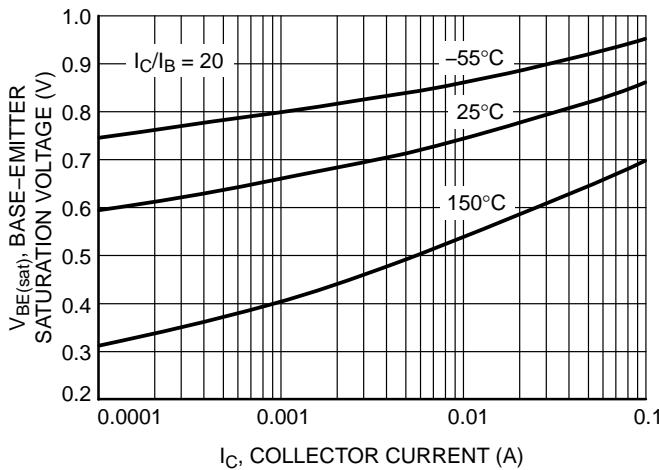


Figure 27. Base Emitter Saturation Voltage vs. Collector Current

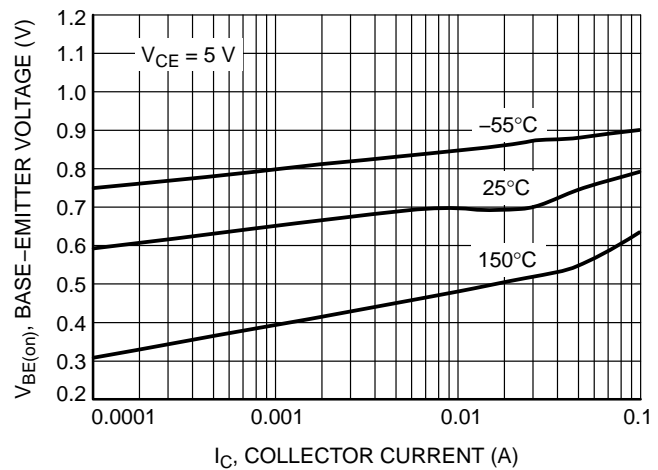


Figure 28. Base Emitter Voltage vs. Collector Current

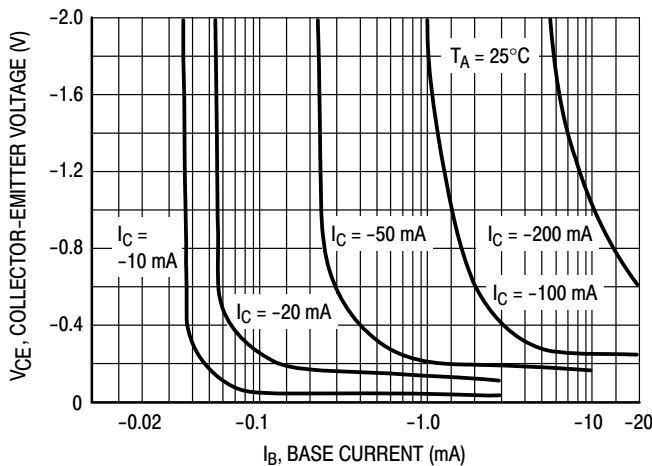


Figure 29. Collector Saturation Region

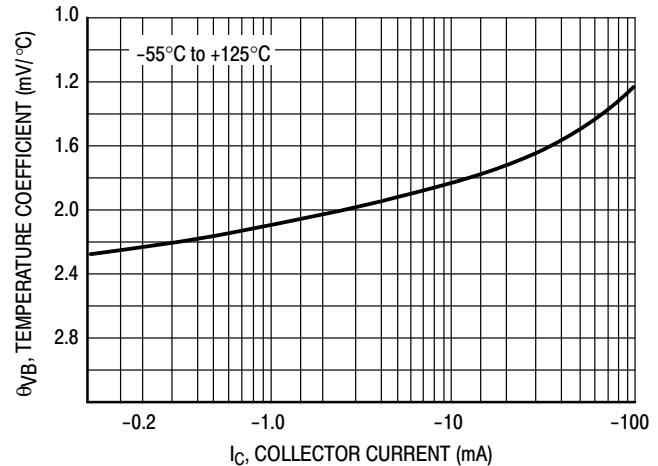


Figure 30. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS – BC847/SBC847 SERIES

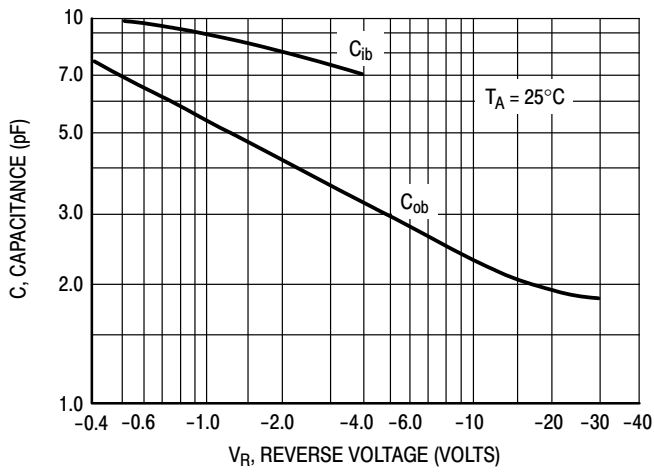


Figure 31. Capacitances

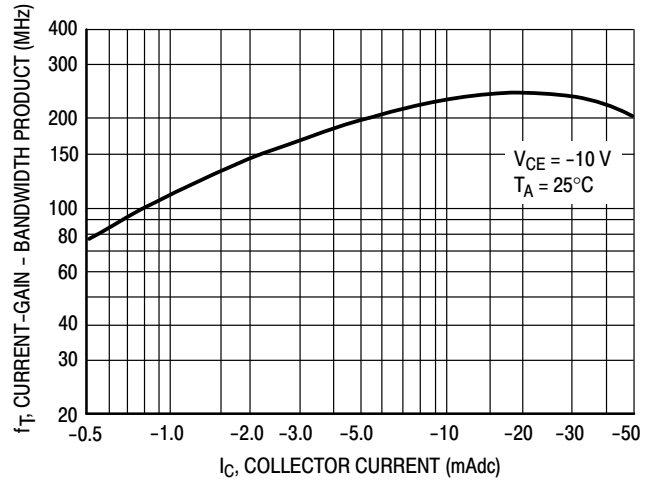


Figure 32. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC848 SERIES

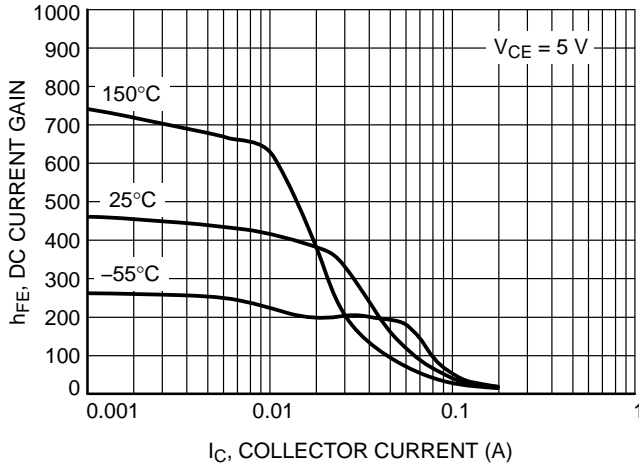


Figure 33. DC Current Gain vs. Collector Current

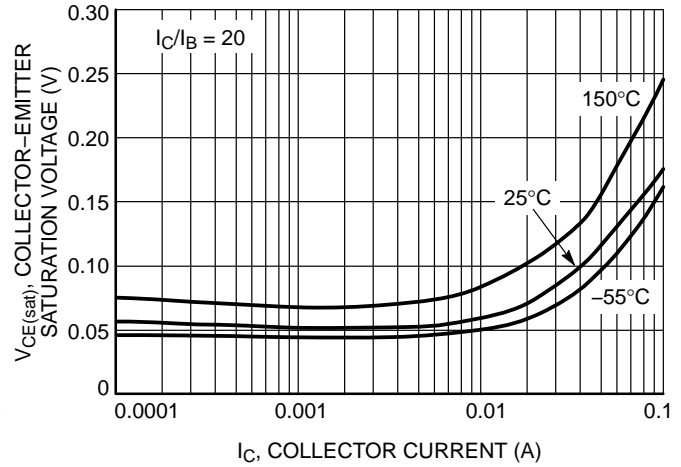


Figure 34. Collector Emitter Saturation Voltage vs. Collector Current

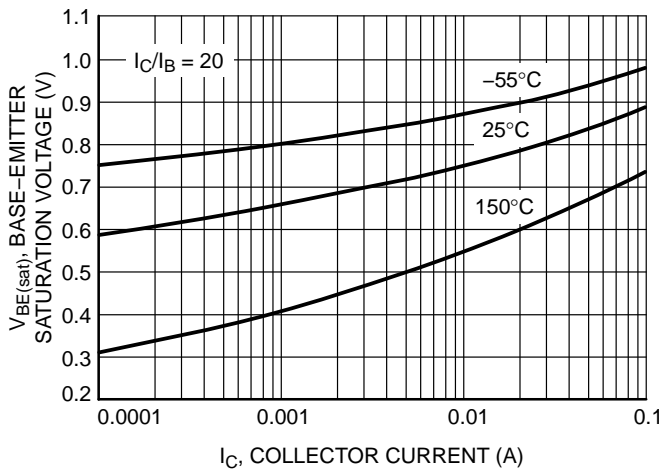


Figure 35. Base Emitter Saturation Voltage vs. Collector Current

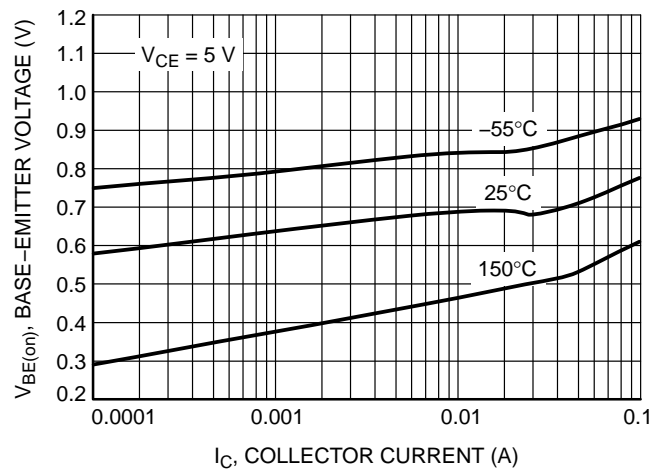


Figure 36. Base Emitter Voltage vs. Collector Current

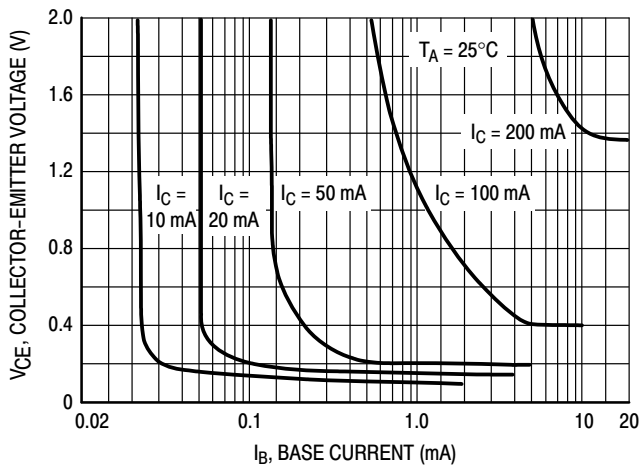


Figure 37. Collector Saturation Region

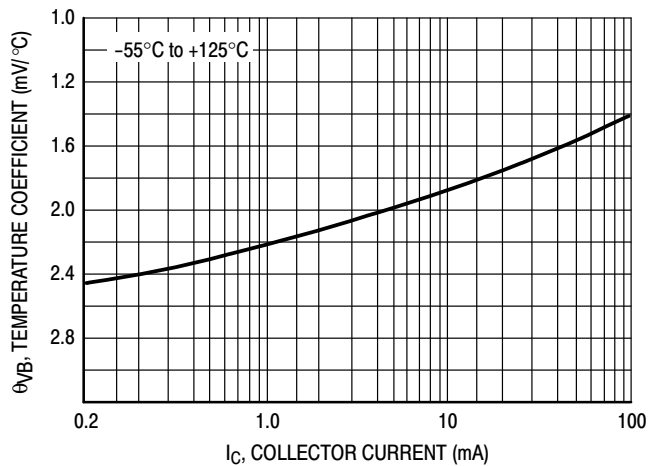


Figure 38. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL NPN CHARACTERISTICS – BC848 SERIES

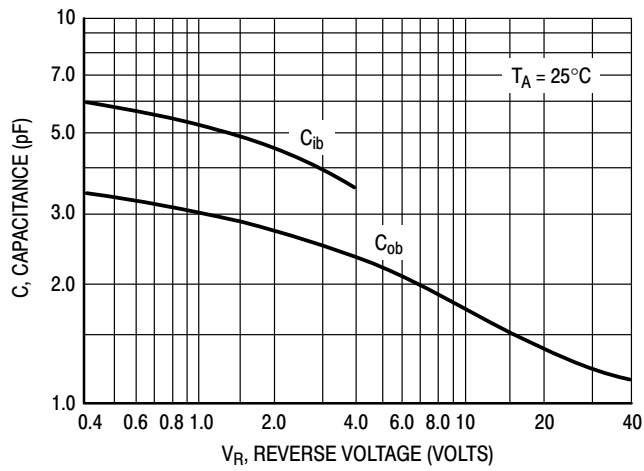


Figure 39. Capacitances

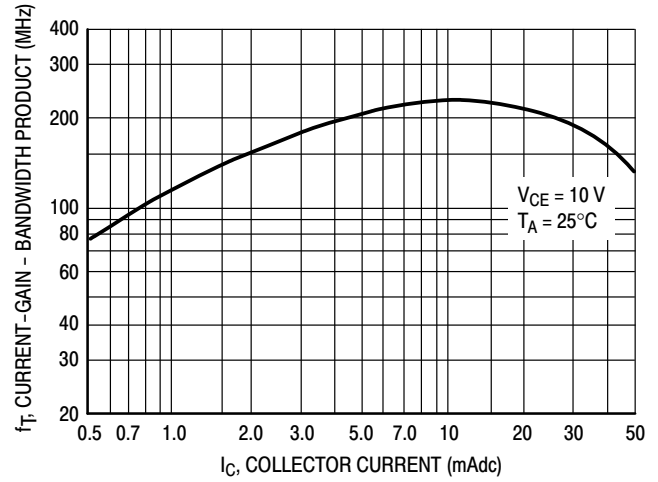


Figure 40. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS – BC848 SERIES

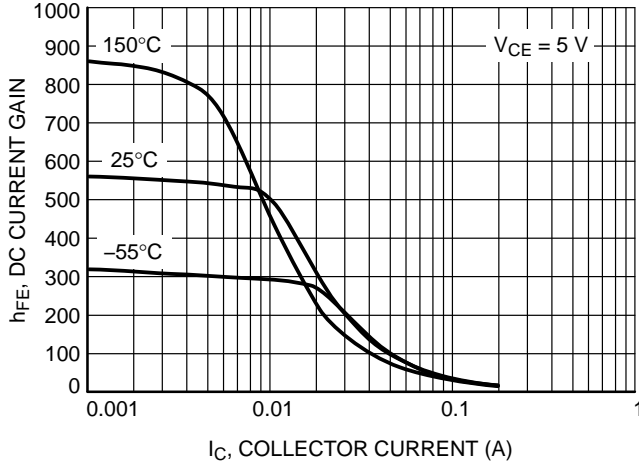


Figure 41. DC Current Gain vs. Collector Current

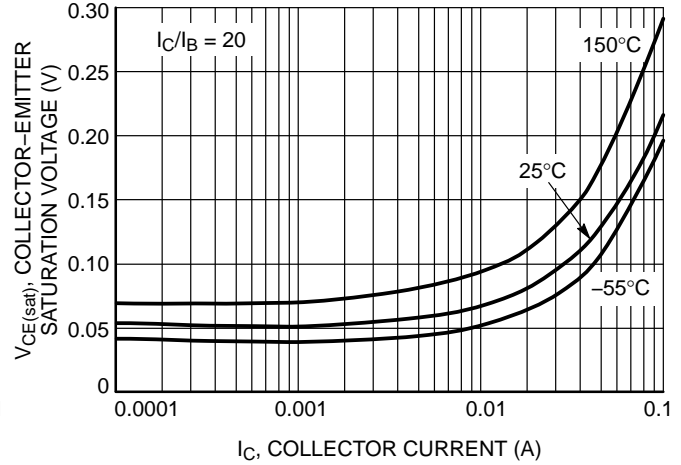


Figure 42. Collector Emitter Saturation Voltage vs. Collector Current

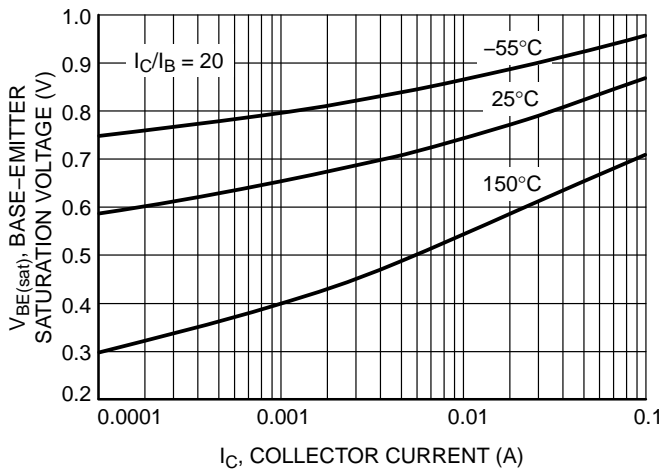


Figure 43. Base Emitter Saturation Voltage vs. Collector Current

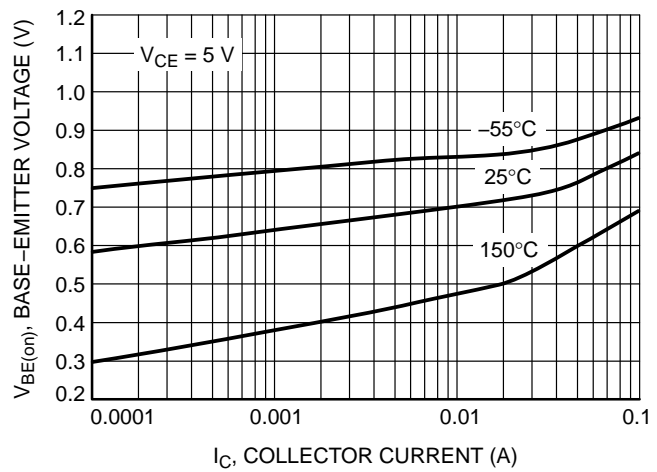


Figure 44. Base Emitter Voltage vs. Collector Current

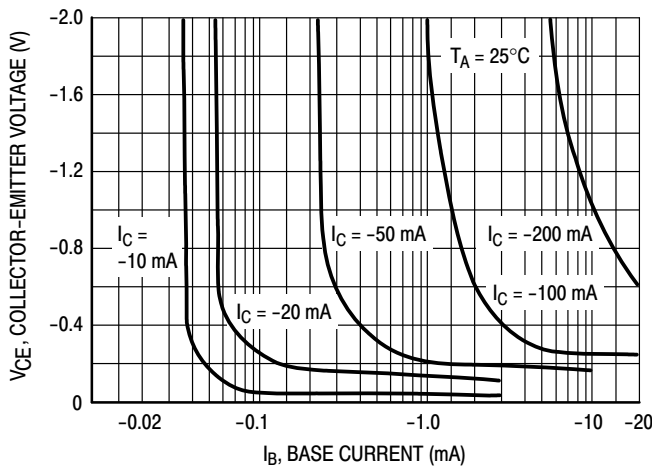


Figure 45. Collector Saturation Region

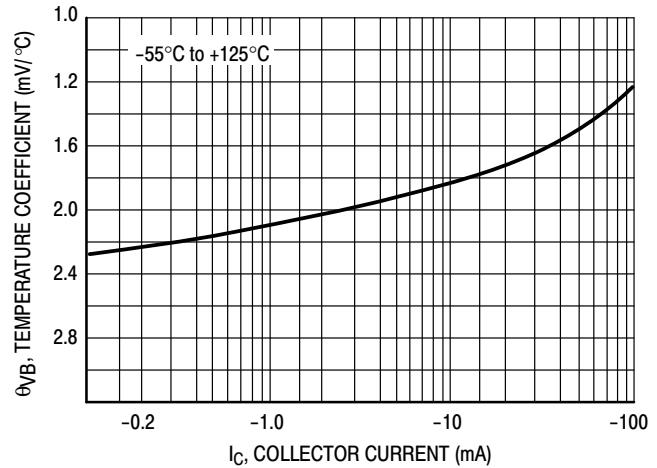


Figure 46. Base-Emitter Temperature Coefficient

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

TYPICAL PNP CHARACTERISTICS – BC848 SERIES

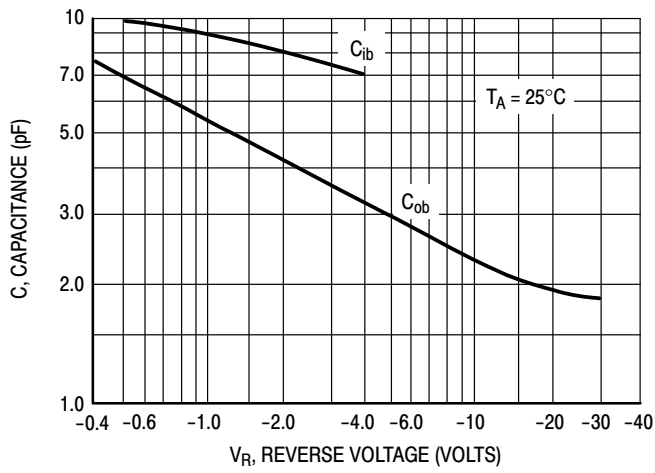


Figure 47. Capacitances

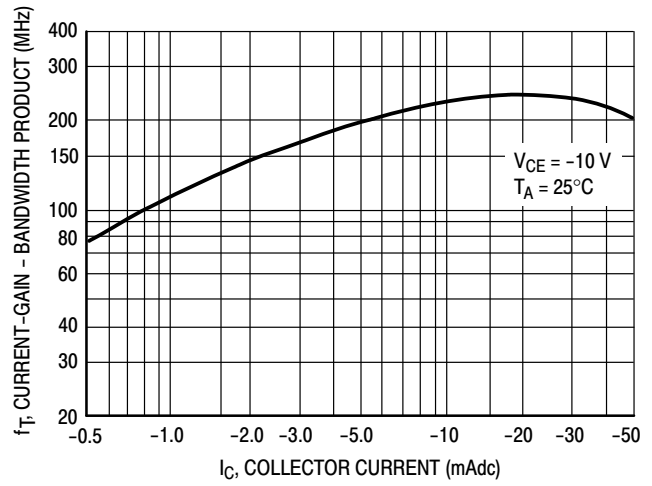


Figure 48. Current-Gain - Bandwidth Product

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

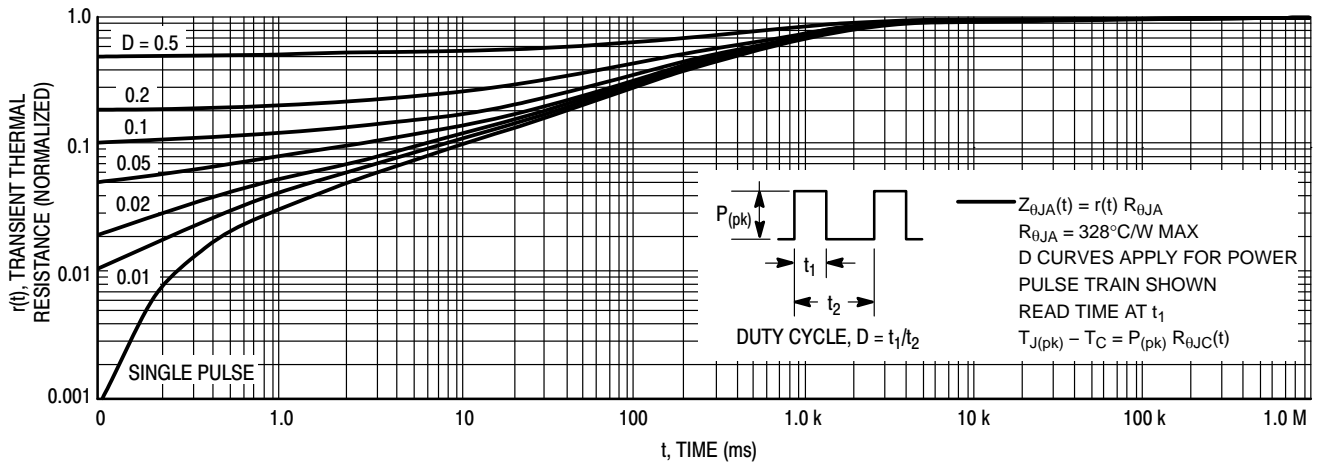


Figure 49. Thermal Response

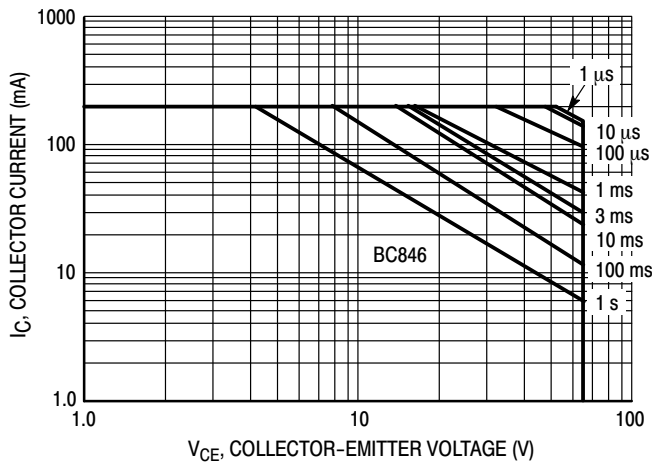


Figure 50. Safe Operating Area – BC846

The safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 50 is based upon $T_{J(pk)} = 150^{\circ}\text{C}$; T_C or T_A is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^{\circ}\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 49. At high case or ambient temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by the secondary breakdown.

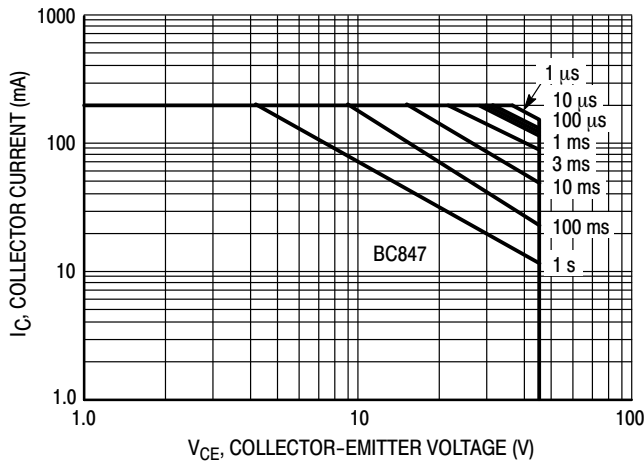


Figure 51. Safe Operating Area – BC847

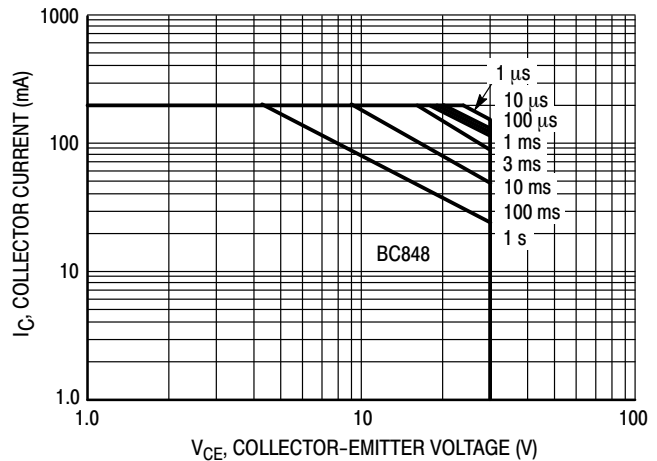
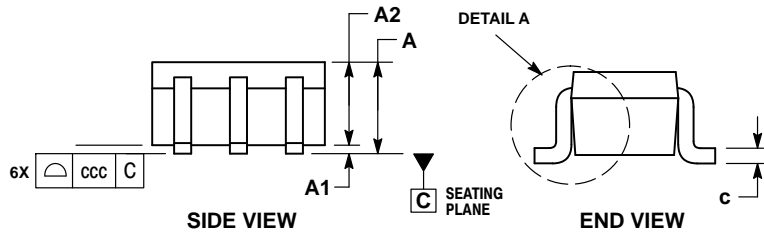
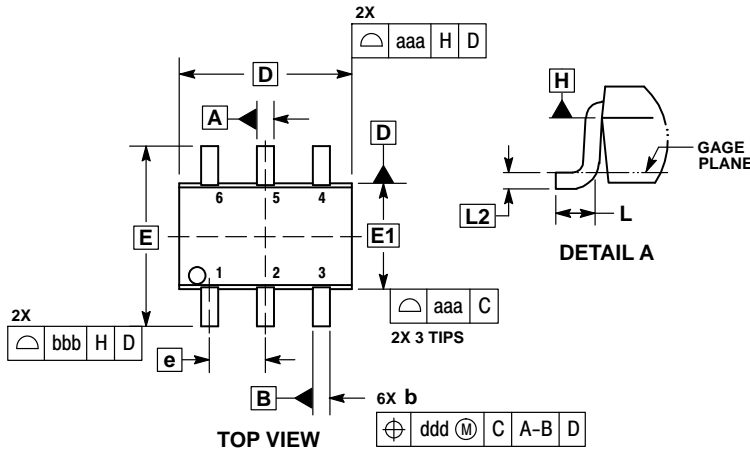


Figure 52. Safe Operating Area – BC848

BC846BPDW1, BC847BPDW1, BC848CPDW1 Series

PACKAGE DIMENSIONS

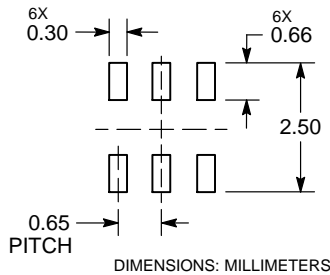
SC-88/SOT-363/SC70-6
CASE 419B-02
ISSUE Y



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
 5. DATUMS A AND B ARE DETERMINED AT DATUM H.
 6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
 7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | --- | --- | 1.10 | --- | --- | 0.043 |
| A1 | 0.00 | --- | 0.10 | 0.000 | --- | 0.004 |
| A2 | 0.70 | 0.90 | 1.00 | 0.027 | 0.035 | 0.039 |
| b | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| C | 0.08 | 0.15 | 0.22 | 0.003 | 0.006 | 0.009 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |
| E1 | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.26 | 0.36 | 0.46 | 0.010 | 0.014 | 0.018 |
| L2 | 0.15 BSC | | | 0.006 BSC | | |
| aaa | 0.15 | | | 0.006 | | |
| bbb | 0.30 | | | 0.012 | | |
| ccc | 0.10 | | | 0.004 | | |
| ddd | 0.10 | | | 0.004 | | |

RECOMMENDED SOLDERING FOOTPRINT*



- STYLE 1:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

*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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