# BC846A - BC848C

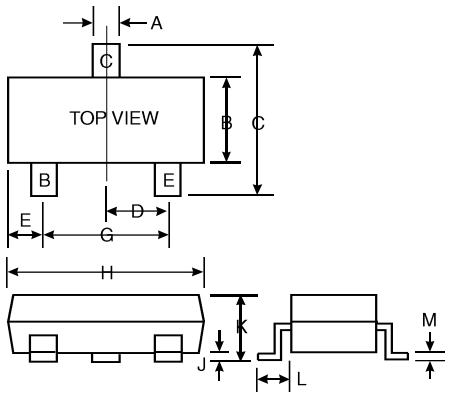
## NPN SURFACE MOUNT SMALL SIGNAL TRANSISTOR

## Features

- Epitaxial Die Construction
- Ideally Suited for Automatic Insertion
- 310 mW Power Dissipation
- Complementary PNP Types Available (BC856-BC858)
- For Switching and AF Amplifier Applications

## Mechanical Data

- Case: SOT-23, Molded Plastic
- Terminals: Solderable per MIL-STD-202, Method 208
- Pin Connections and Marking Codes (See Table & Diagram)
- Approx. Weight: 0.008 grams
- Mounting Position: Any




| SOT-23 | | |
|---|---|---|
| Dim | Min | Max |
| A | 0.37 | 0.51 |
| B | 1.19 | 1.40 |
| C | 2.10 | 2.50 |
| D | 0.89 | 1.05 |
| E | 0.45 | 0.61 |
| G | 1.78 | 2.05 |
| H | 2.65 | 3.05 |
| J | 0.013 | 0.15 |
| K | 0.89 | 1.10 |
| L | 0.45 | 0.61 |
| M | 0.076 | 0.178 |
| All Dimensions in mm | | |

| Marking Code | | | |
|---|---|---|---|
| Type | Marking | Type | Marking |
| BC846A | 1A | BC847C | 1G |
| BC846B | 1B | BC848A | 1J |
| BC847A | 1E | BC848B | 1K |
| BC847B | 1F | BC848C | 1L |

## Maximum Ratings

@ $T_A = 25^{\circ}C$ unless otherwise specified

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | BC846<br>BC847<br>BC848 | $V_{CBO}$ | 80<br>50<br>30 | V |
| Collector-Emitter Voltage | BC846<br>BC847<br>BC848 | $V_{CEO}$ | 65<br>45<br>30 | V |
| Emitter-Base Voltage | BC846, BC847<br>BC848 | $V_{EBO}$ | 6.0<br>5.0 | V |
| Collector Current | | $I_C$ | 100 | mA |
| Peak Collector Current | | $I_{CM}$ | 200 | mA |
| Peak Emitter Current | | $I_{EM}$ | 200 | mA |
| Power Dissipation at $T_{SB} = 50^{\circ}C$ (Note 1) | | $P_d$ | 310 | mW |
| Operating and Storage Temperature Range | | $T_j$, $T_{STG}$ | -65 to +150 | $^{\circ}C$ |

Notes: 1. Device mounted on ceramic substrate 0.7mm x 2.5cm$^2$ area.
2. Current gain subgroup “C” is not available for BC846.

## Electrical Characteristics @ $T_A$ = 25°C unless otherwise specified

| Characteristic | | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|---|
| h-Parameters (Note 2) | | | | | | | |
| Small Signal Current Gain | Current Gain Group A | $h_{fe}$ | — | 220 | — | — | |
| | B | $h_{fe}$ | — | 330 | — | — | |
| | C | $h_{fe}$ | — | 600 | — | — | |
| Input Impedance | Current Gain Group A | $h_{ie}$ | 1.6 | 2.7 | 4.5 | k | |
| | B | $h_{ie}$ | 3.2 | 4.5 | 8.5 | k | $V_{CE}$ = 5.0V, $I_C$ = 2.0mA, |
| | C | $h_{ie}$ | 6.0 | 8.7 | 15 | k | f = 1.0kHz |
| Output Admittance | Current Gain Group A | $h_{oe}$ | — | 18 | 30 | µS | |
| | B | $h_{oe}$ | — | 30 | 60 | µS | |
| | C | $h_{oe}$ | — | 60 | 110 | µS | |
| Reverse Voltage Transfer Ratio | Current Gain Group A | $h_{re}$ | — | $1.5x10^{-4}$ | — | — | |
| | B | $h_{re}$ | — | $2x10^{-4}$ | — | — | |
| | C | $h_{re}$ | — | $3x10^{-4}$ | — | — | |
| DC Current Gain | | | | | | | |
| | Current Gain Group A | | — | 90 | — | | $V_{CE}$ = 5.0V, $I_C$ = 10µA |
| | B | | — | 150 | — | | |
| | C | $h_{FE}$ | — | 270 | — | — | |
| | Current Gain Group A | | 110 | 180 | 220 | | |
| | B | | 200 | 290 | 450 | | $V_{CE}$ = 5.0V, $I_C$ = 2.0mA |
| | (Note 2) C | | 420 | 520 | 800 | | |
| Thermal Resistance, Junction to Substrate Backside | | $R_{SB}$ | — | — | 320 | K/W | Note 1 |
| Thermal Resistance, Junction to Ambient Air | | $R_{JA}$ | — | — | 400 | K/W | Note 1 |
| Collector-Emitter Saturation Voltage | | $V_{CE(SAT)}$ | — | 90 | 250 | mV | $I_C$ = 10mA, $I_B$ = 0.5mA |
| | | | | 200 | 600 | | $I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Saturation Voltage | | $V_{BE(SAT)}$ | — | 700 | — | mV | $I_C$ = 10mA, $I_B$ = 0.5mA |
| | | | | 900 | | | $I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Voltage | | $V_{BE}$ | 580 | 660 | 700 | mV | $V_{CE}$ = 5.0V, $I_C$ = 2.0mA |
| | | | — | — | 720 | | $V_{CE}$ =5.0V, $I_C$ = 10mA |
| Collector-Emitter Cutoff Current | BC846 | $I_{CES}$ | | 0.2 | 15 | nA | $V_{CE}$ = 80V |
| | BC847 | $I_{CES}$ | | 0.2 | 15 | nA | $V_{CE}$ = 50V |
| | BC848 | $I_{CES}$ | | 0.2 | 15 | nA | $V_{CE}$ = 30V |
| | BC846 | $I_{CES}$ | | — | 4.0 | µA | $V_{CE}$ = 80V, $T_j$ = 125°C |
| | BC847 | $I_{CES}$ | — | — | 4.0 | µA | $V_{CE}$ = 50V, $T_j$ = 125°C |
| | BC848 | $I_{CES}$ | | — | 4.0 | µA | $V_{CE}$ = 30V, $T_j$ = 125°C |
| | | $I_{CBO}$ | | — | 15 | nA | $V_{CB}$ = 30V |
| | | $I_{CBO}$ | | — | 5.0 | µA | $V_{CB}$ = 30V, $T_j$ = 125°C |
| Gain Bandwidth Product | | $f_T$ | — | 300 | — | MHz | $V_{CE}$ = 5.0V, $I_C$ = 10mA, f = 100MHz |
| Collector-Base Capacitance | | $C_{CBO}$ | — | 3.5 | 6.0 | pF | $V_{CB}$ = 10V, f = 1.0MHz |
| Emitter-Base Capacitance | | $C_{EBO}$ | — | 9.0 | — | pF | $V_{EB}$ = 0.5V, f = 1.0MHz |
| Noise Figure | | NF | — | 2.0 | 10 | dB | $V_{CE}$ = 5V, $I_C$ = 200µA, $R_G$ = 2.0k f = 1.0kHz, f = 200Hz |

Notes: 1. Device mounted on ceramic substrate 0.7mm x 2.5$cm^2$ area.
2. Current gain subgroup “C” is not available for BC846.

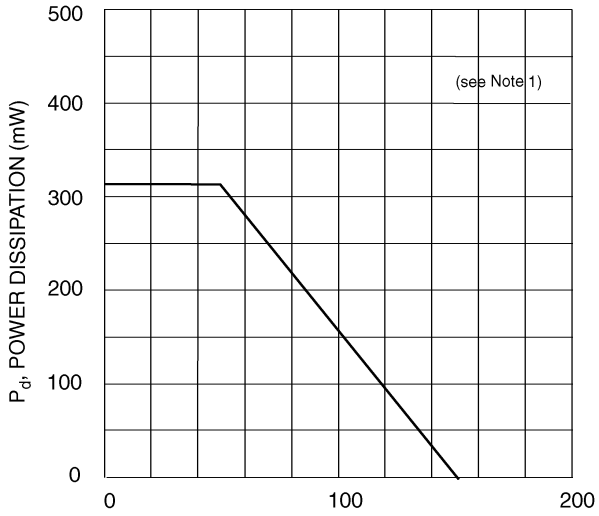



Fig. 1, Power Derating Curve

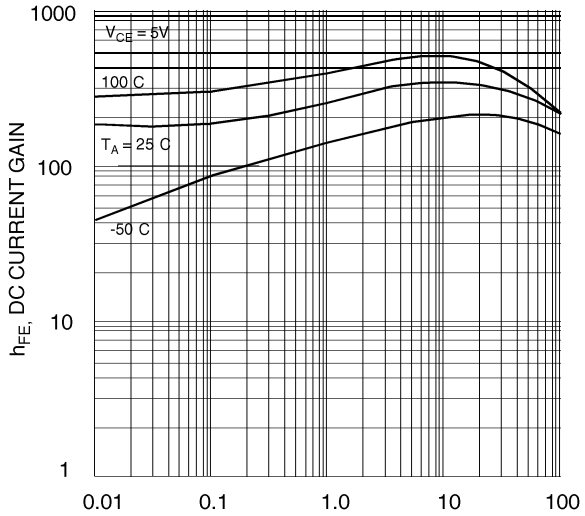



Fig. 2, DC Current Gain vs Collector Current

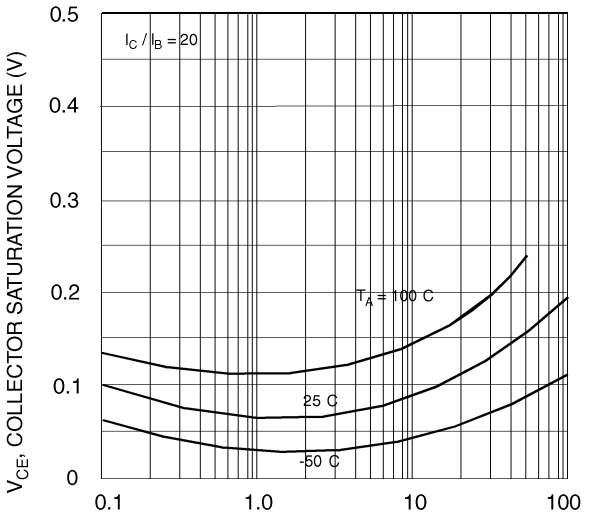



Fig. 3, Collector Saturation Voltage vs Collector Current

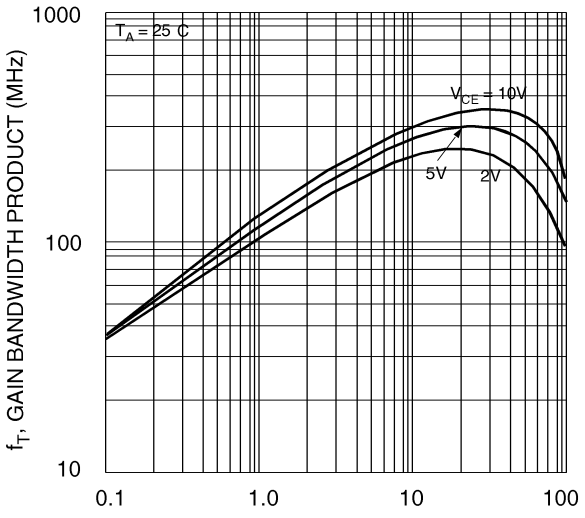



Fig. 4, Gain Bandwidth Product vs Collector Current

Notes: 1. Device mounted on ceramic substrate 0.7mm x 2.5cm$^2$ area