Lead-free Green

# BC847BVN

## COMPLEMENTARY PAIR SMALL SIGNAL SURFACE MOUNT TRANSISTOR

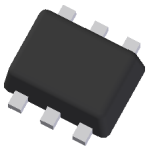
## Features

- Epitaxial Die Construction
- Two Internally Isolated NPN/PNP Transistors in One Package
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

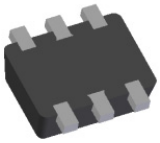
## Mechanical Data

- Case: SOT563
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Finish. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.003 grams (approximate)

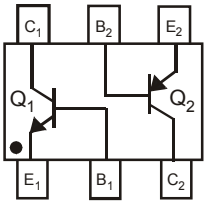
SOT563



Top View



Bottom View



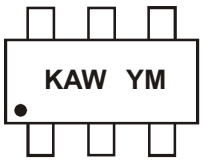

Device Schematic
Top View

## Ordering Information (Note 4 & 5)

| Part Number | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---|---|---|---|---|---|
| BC847BVN-7 | AEC-Q101 | KAW | 7 | 8 | 3000 |
| BC847BVNQ-7 | Automotive | KAW | 7 | 8 | 3000 |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product_compliance_definitions/.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information




KAW = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Code | X | Y | Z | A | B | C | D | E |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |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## Maximum Ratings: NPN, BC847B Type ($Q_1$) (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 45 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Collector Current | $I_C$ | 100 | mA |
| Peak Collector Current | $I_{CM}$ | 200 | mA |
| Peak Emitter Current | $I_{EM}$ | 200 | mA |

## Maximum Ratings: PNP, BC857B Type ($Q_2$) (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -45 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -6 | V |
| Collector Current | $I_C$ | -100 | mA |
| Peak Collector Current | $I_{CM}$ | -200 | mA |
| Peak Emitter Current | $I_{EM}$ | -200 | mA |

## Thermal Characteristics – Total Device (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 6) Total Device | $P_D$ | 150 | mW |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 833 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -65 to +150 | °C |

Note: 6. For a device surface mounted on minimum recommended pad layout FR-4 PCB with single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.

## Thermal Characteristics – Total Device

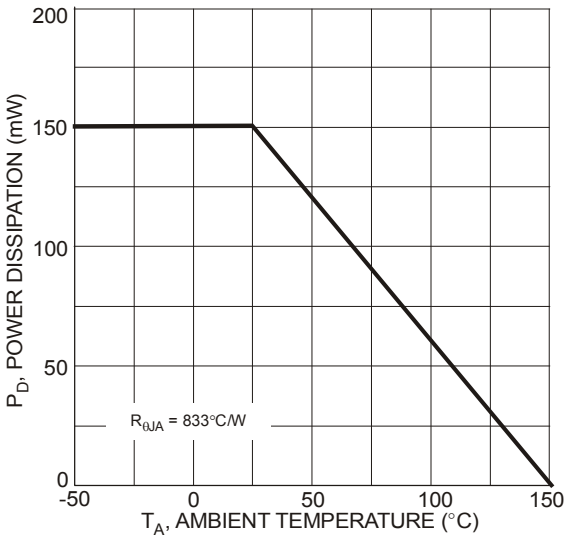


Figure 1. Power Dissipation vs. Ambient Temperature Total Device


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## Electrical Characteristics: NPN, BC847B Type ($Q_1$) (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic (Note 7) | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | — | — | V | $I_C$ = 100μA, $I_B$ = 0 |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | 45 | — | — | V | $I_C$ = 10mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 6 | — | — | V | $I_E$ = 100μA, $I_C$ = 0 |
| DC Current Gain | $h_{FE}$ | 200 | 290 | 450 | — | $V_{CE}$ = 5.0V, $I_C$ = 2.0mA |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | 90<br>200 | 250<br>600 | mV | $I_C$ = 10mA, $I_B$ = 0.5mA<br>$I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | 700<br>900 | — | mV | $I_C$ = 10mA, $I_B$ = 0.5mA<br>$I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Voltage | $V_{BE(on)}$ | 580<br>— | 660<br>— | 700<br>720 | mV | $V_{CE}$ = 5.0V, $I_C$ = 2.0mA<br>$V_{CE}$ = 5.0V, $I_C$ = 10mA |
| Collector-Cutoff Current | $I_{CBO}$ | —<br>— | —<br>— | 15<br>5.0 | nA<br>μA | $V_{CB}$ = 30V<br>$V_{CB}$ = 30V, $T_A$ = +150°C |
| Gain Bandwidth Product | $f_T$ | 100 | 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 |

Note: 7. Short duration pulse test used to minimize self-heating effect.

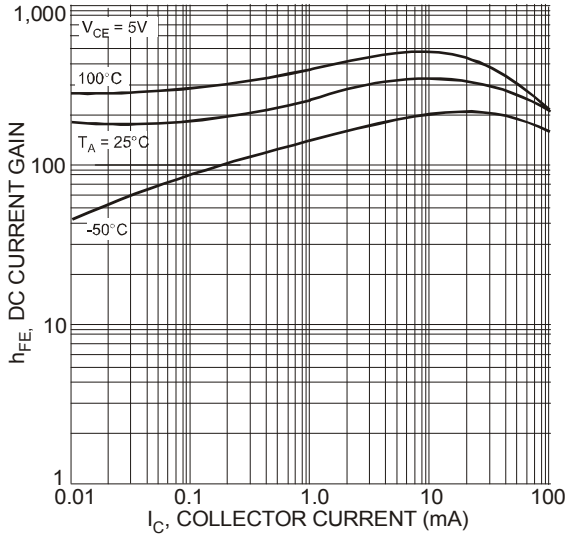


Figure 2. Typical DC Current Gain vs. Collector Current (BC847B Type)

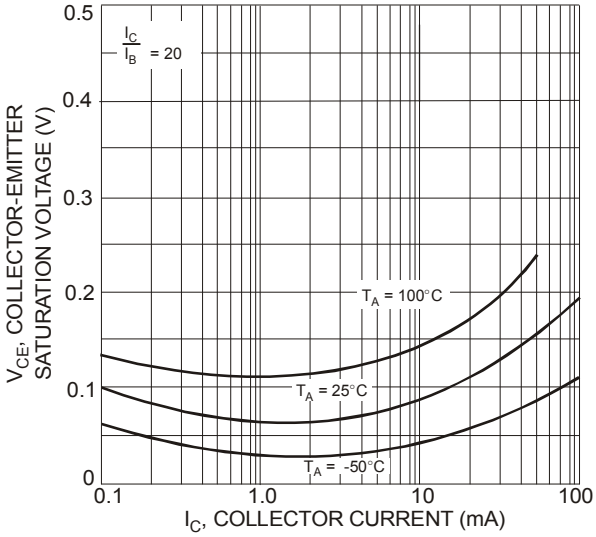


Figure 3. Typical Collector-Emitter Saturation Voltage vs. Collector Current (BC847B Type)

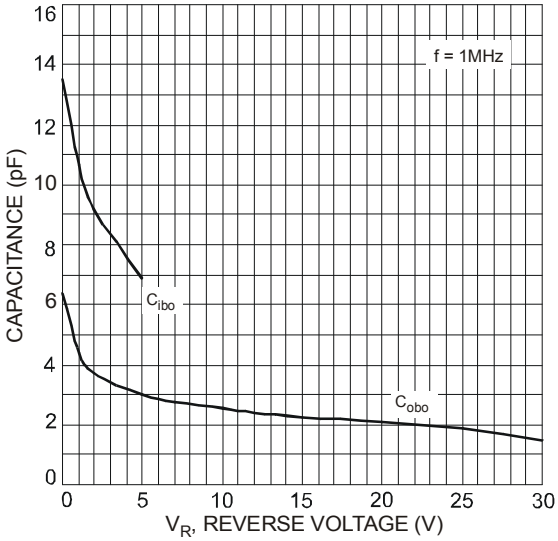


Figure 4. Typical Capacitance Characteristics (BC847B Type)

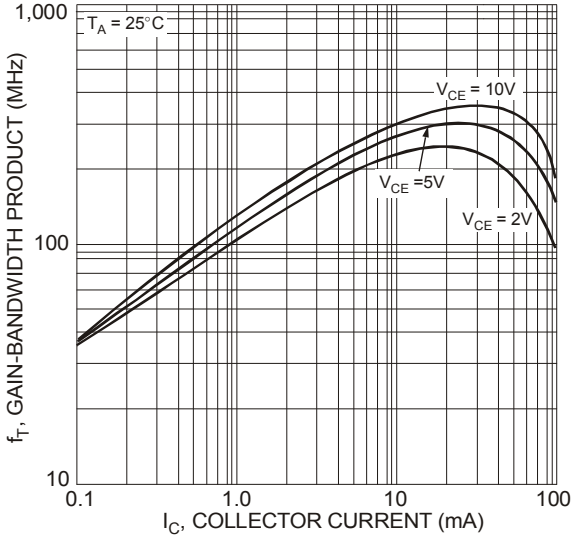


Figure 5. Typical Gain-Bandwidth Product vs. Collector Current (BC847B Type)


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## Electrical Characteristics: PNP, BC857B Type ($Q_2$) (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic (Note 8) | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -50 | — | — | V | $I_C$ = -100μA, $I_B$ = 0 |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | -45 | — | — | V | $I_C$ = -10mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -6 | — | — | V | $I_E$ = -100μA, $I_C$ = 0 |
| DC Current Gain | $h_{FE}$ | 220 | 290 | 475 | — | $V_{CE}$ = -5.0V, $I_C$ = -2.0mA |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | -75<br>-250 | -300<br>-650 | mV | $I_C$ = -10mA, $I_B$ = -0.5mA<br>$I_C$ = -100mA, $I_B$ = -5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | -700<br>-850 | —<br>-950 | mV | $I_C$ = -10mA, $I_B$ = -0.5mA<br>$I_C$ = -100mA, $I_B$ = -5.0mA |
| Base-Emitter Voltage | $V_{BE(on)}$ | -600<br>— | -650<br>— | -750<br>-820 | mV | $V_{CE}$ = -5.0V, $I_C$ = -2.0mA<br>$V_{CE}$ = -5.0V, $I_C$ = -10mA |
| Collector-Cutoff Current | $I_{CBO}$ | —<br>— | —<br>— | -15<br>-4.0 | nA<br>μA | $V_{CB}$ = -30V<br>$V_{CB}$ = -30V, $T_A$ = +150°C |
| Gain Bandwidth Product | $f_T$ | 100 | 200 | — | MHz | $V_{CE}$ = -5.0V, $I_C$ = -10mA, f = 100MHz |
| Collector-Base Capacitance | $C_{CBO}$ | — | 3 | 4.5 | pF | $V_{CB}$ = -10V, f = 1.0MHz |

Note: 8. Short duration pulse test used to minimize self-heating effect.

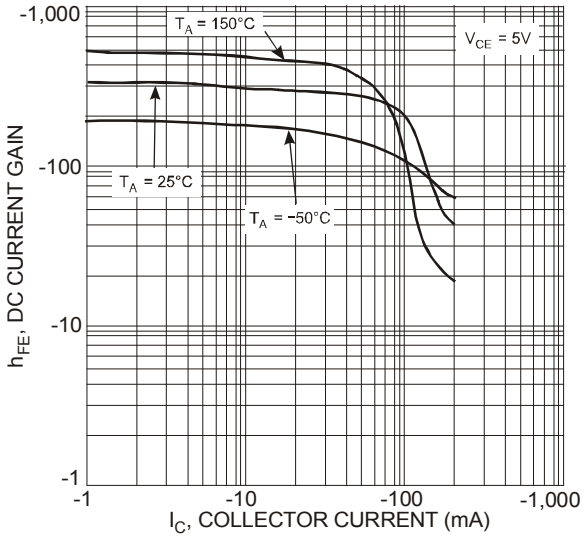


Figure 6. Typical DC Current Gain vs. Collector Current (BC857B Type)

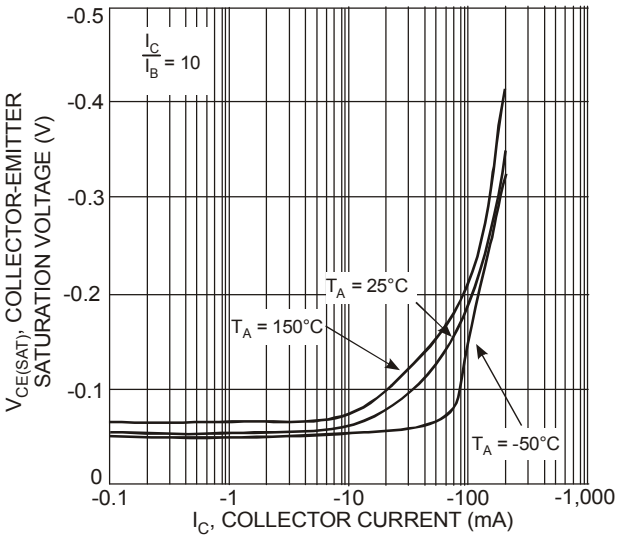


Figure 7. Typical Collector-Emitter Saturation Voltage vs. Collector Current (BC857B Type)

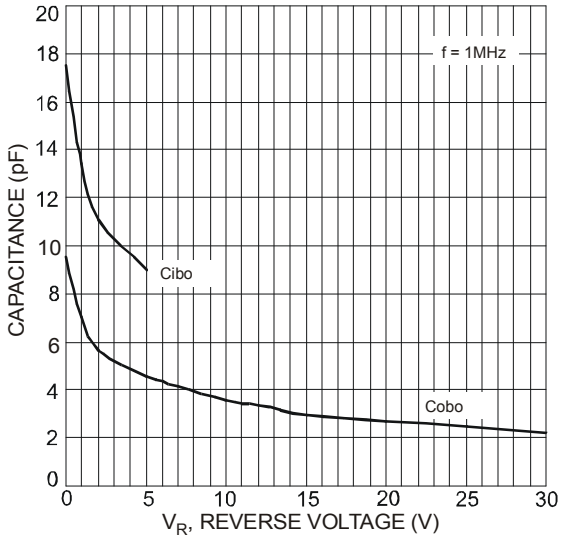


Figure 8. Typical Capacitance Characteristics (BC857B Type)

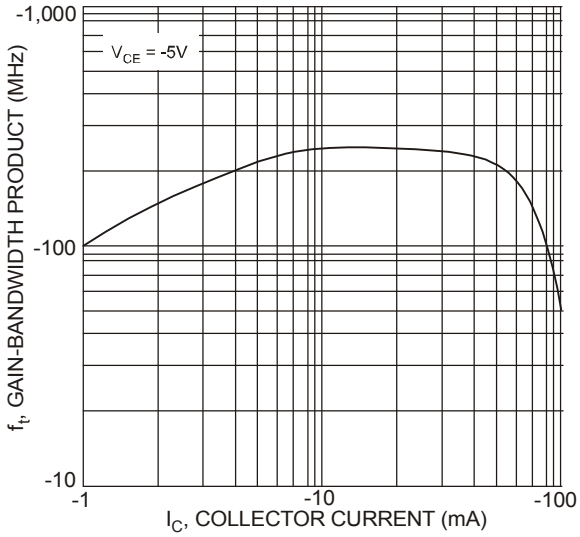


Figure 9. Typical Gain-Bandwidth Product vs. Collector Current (BC857B Type)


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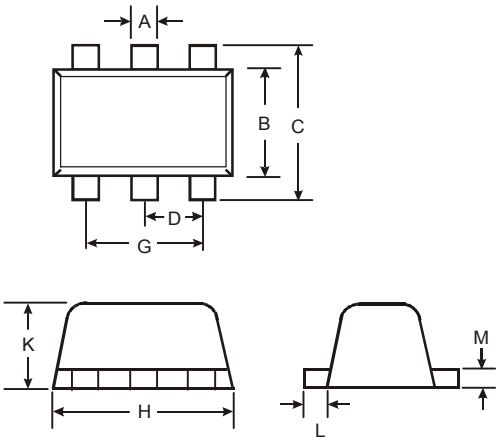
## Package Outline Dimensions

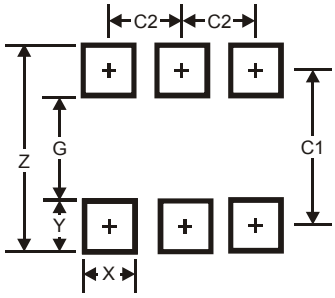
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| SOT563 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.15 | 0.30 | 0.20 |
| **B** | 1.10 | 1.25 | 1.20 |
| **C** | 1.55 | 1.70 | 1.60 |
| **D** | - | - | 0.50 |
| **G** | 0.90 | 1.10 | 1.00 |
| **H** | 1.50 | 1.70 | 1.60 |
| **K** | 0.55 | 0.60 | 0.60 |
| **L** | 0.10 | 0.30 | 0.20 |
| **M** | 0.10 | 0.18 | 0.11 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.




| Dimensions | Value (in mm) |
|---|---|
| **Z** | 2.2 |
| **G** | 1.2 |
| **X** | 0.375 |
| **Y** | 0.5 |
| **C1** | 1.7 |
| **C2** | 0.5 |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