

NPN SURFACE MOUNT SMALL SIGNAL TRANSISTOR IN SOT23
Features

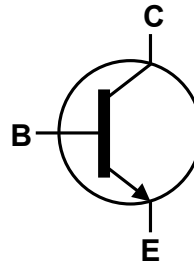
- Ideally Suited for Automatic Insertion
- Complementary PNP Types Available (BC856 – BC858)
- For switching and AF Amplifier Applications
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**

Mechanical Data

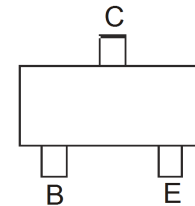
- Case: SOT23
- Case material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 ②
- Weight: 0.008 grams (Approximate)



Top View



Device Symbol

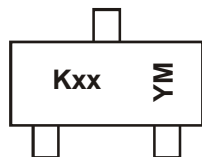

 Top View
Pin-Out

Ordering Information (Notes 4 & 5)

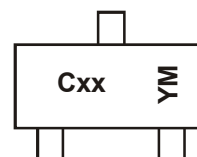
| Product | Compliance | Marking | Reel size (inches) | Quantity per reel |
|--------------|------------|-----------|--------------------|-------------------|
| BC846A-7-F | AEC-Q101 | K1Q | 7 | 3,000 |
| BC846AQ-7-F | Automotive | K1Q | 7 | 3,000 |
| BC846B-7-F | AEC-Q101 | K1R / C1R | 7 | 3,000 |
| BC846BQ-7-F | Automotive | K1R | 7 | 3,000 |
| BC846B-13-F | AEC-Q101 | K1R / C1R | 13 | 10,000 |
| BC846BQ-13-F | Automotive | K1R | 13 | 10,000 |
| BC847A-7-F | AEC-Q101 | K1Q | 7 | 3,000 |
| BC847AQ-7-F | Automotive | K1Q | 7 | 3,000 |
| BC847A-13-F | AEC-Q101 | K1Q | 13 | 10,000 |
| BC847B-7-F | AEC-Q101 | K1R / C1R | 7 | 3,000 |
| BC847BQ-7-F | Automotive | K1R | 7 | 3,000 |

| Product | Compliance | Marking | Reel size (inches) | Quantity per reel |
|-------------|------------|-----------|--------------------|-------------------|
| BC847B-13-F | AEC-Q101 | K1R / C1R | 13 | 10,000 |
| BC847C-7-F | AEC-Q101 | K1M | 7 | 3,000 |
| BC847CQ-7-F | Automotive | K1M | 7 | 3,000 |
| BC847C-13-F | AEC-Q101 | K1M | 13 | 10,000 |
| BC848A-7-F | AEC-Q101 | K1Q | 7 | 3,000 |
| BC848B-7-F | AEC-Q101 | K1R | 7 | 3,000 |
| BC848B-13-F | AEC-Q101 | K1R | 13 | 10,000 |
| BC848C-7-F | AEC-Q101 | K1M | 7 | 3,000 |
| BC848CQ-7-F | Automotive | K1M | 7 | 3,000 |

- 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


K = SAT (Shanghai Assembly / Test site)
 xx = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: Y = 2011)
 M = Month (ex: 9 = September)



C = CAT (Chengdu Assembly / Test site)
 xx = 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 |

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|------------------------------|--------------|------------------|-------|------|
| Collector-Base Voltage | BC846 | V _{CBO} | 80 | V |
| | BC847 | | 50 | |
| | BC848 | | 30 | |
| Collector-Emitter Voltage | BC846 | V _{CEO} | 65 | V |
| | BC847 | | 45 | |
| | BC848 | | 30 | |
| Emitter-Base Voltage | BC846, BC847 | V _{EBO} | 6.0 | V |
| | BC848 | | 5.0 | |
| Continuous Collector Current | | I _C | 100 | mA |
| Peak Collector Current | | I _{CM} | 200 | mA |
| Peak Emitter Current | | I _{EM} | 200 | mA |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

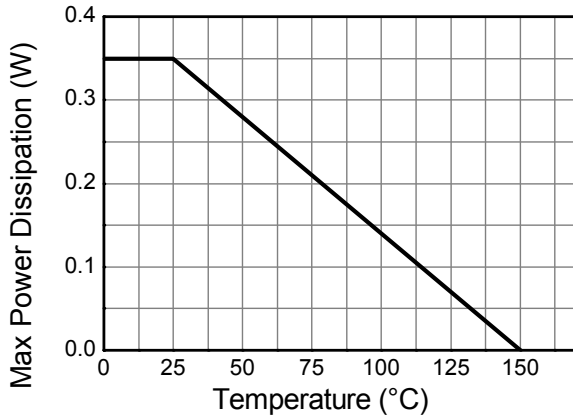
| Characteristic | | Symbol | Value | Unit |
|---|----------|-----------------------------------|-------------|------|
| Power Dissipation | (Note 6) | P _D | 310 | mW |
| | (Note 7) | | 350 | |
| Thermal Resistance, Junction to Ambient | (Note 6) | R _{θJA} | 403 | °C/W |
| | (Note 7) | | 357 | |
| Thermal Resistance, Junction to Leads | (Note 8) | R _{θJL} | 350 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -65 to +150 | °C |

ESD Ratings (Note 9)

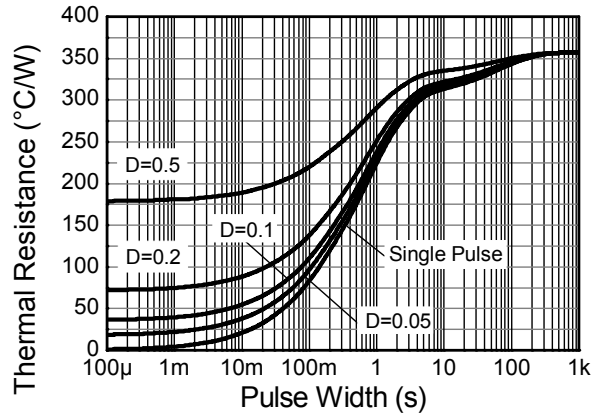
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|---------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | ≥ 8,000 | V | 3B |
| Electrostatic Discharge - Machine Model | ESD MM | ≥ 400 | V | C |

- Notes:
6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
 7. For the device mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
 8. Thermal resistance from junction to solder-point (at the end of the leads).
 9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

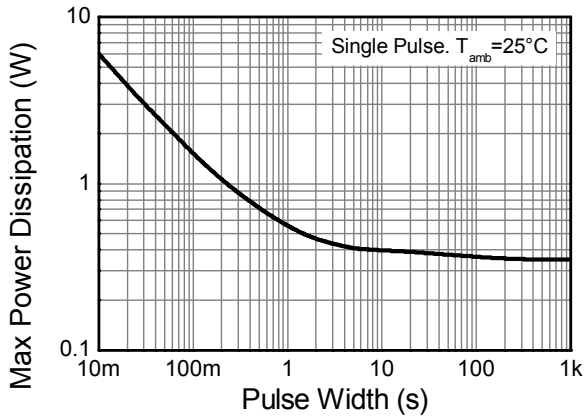
Thermal Characteristics and Derating Information



Derating Curve



Transient Thermal Impedance



Pulse Power Dissipation

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------------------|----------------------|-----|----------------------|-----|------|--|
| Collector-Base Breakdown Voltage | BC846 | BV _{CBO} | 80 | — | — | V | I _C = 10μA |
| | BC847 | | 50 | | | | |
| | BC848 | | 30 | | | | |
| Collector-Emitter Breakdown Voltage (Note 10) | BC846 | BV _{CEO} | 65 | — | — | V | I _C = 10mA |
| | BC847 | | 45 | | | | |
| | BC848 | | 30 | | | | |
| Emitter-Base Breakdown Voltage | BC846 / BC847 | BV _{EBO} | 6 | — | — | V | I _E = 1μA |
| | BC848 | | 5 | | | | |
| Collector Cutoff Current | | I _{CBO} | — | — | — | μA | V _{CB} = 40V V _{CB} = 30V, T _A = +150°C |
| Collector Emitter Cutoff Current | BC846 | I _{CES} | — | — | 15 | nA | V _{CE} = 80V V _{CE} = 50V V _{CE} = 30V |
| | BC847 | | | | 15 | | |
| | BC848 | | | | 15 | | |
| Small Signal Current Gain (Note 10) | BC846A / BC847A / BC848A | h _{fe} | — | 200 | — | — | I _C = 2.0mA, V _{CE} = 5V f = 1.0kHz |
| | BC846B / BC847B / BC848B | | | 330 | | | |
| | BC847C / BC848C | | | 600 | | | |
| Input Impedance (Note 10) | BC846A / BC847A / BC848A | h _{ie} | — | 2.7 | — | kΩ | |
| | BC846B / BC847B / BC848B | | | 4.5 | | | |
| | BC847C / BC848C | | | 8.7 | | | |
| Output Admittance (Note 10) | BC846A / BC847A / BC848A | h _{oe} | — | 18 | — | μS | |
| | BC846B / BC847B / BC848B | | | 30 | | | |
| | BC847C / BC848C | | | 60 | | | |
| Reverse Voltage Transfer Ratio (Note 10) | BC846A / BC847A / BC848A | h _{re} | — | 1.5x10 ⁻⁴ | — | — | |
| | BC846B / BC847B / BC848B | | | 2x10 ⁻⁴ | | | |
| | BC847C / BC848C | | | 3x10 ⁻⁴ | | | |
| DC Current Gain (Note 10) | BC846A / BC847A / BC848A | h _{FE} | — | 110 | 180 | 220 | I _C = 2.0mA, V _{CE} = 5V |
| | BC846B / BC847B / BC848B | | | 200 | 290 | 450 | |
| | BC847C / BC848C | | | 420 | 520 | 800 | |
| Collector-Emitter Saturation Voltage (Note 10) | | V _{CE(sat)} | — | 90 | 250 | mV | I _C = 10mA, I _B = 0.5mA |
| | | | | 200 | 600 | | I _C = 100mA, I _B = 5.0mA |
| Base-Emitter Turn-On Voltage (Note 10) | | V _{BE(on)} | — | 580 | 660 | mV | I _C = 2mA, V _{CE} = 5V |
| | | | | — | — | | 770 |
| Base-Emitter Saturation Voltage (Note 10) | | V _{BE(sat)} | — | 700 | — | mV | I _C = 10mA, I _B = 0.5mA |
| | | | | 900 | | | I _C = 100mA, I _B = 5mA |
| Output Capacitance | | C _{obo} | — | 3 | — | pF | V _{CB} = 10V, f = 1.0MHz |
| Transition Frequency | | f _T | 100 | 300 | — | MHz | V _{CE} = 5V, I _C = 10mA, f = 100MHz |
| Noise Figure | | NF | — | 2 | 10 | dB | V _{CE} = 5V, I _C = 200μA R _S = 2kΩ, f = 1kHz Δf = 200Hz |

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

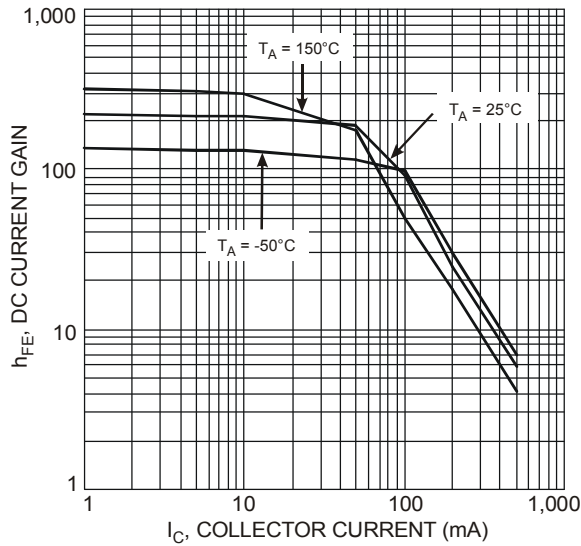


Figure 1 Typical DC Current Gain vs. Collector Current

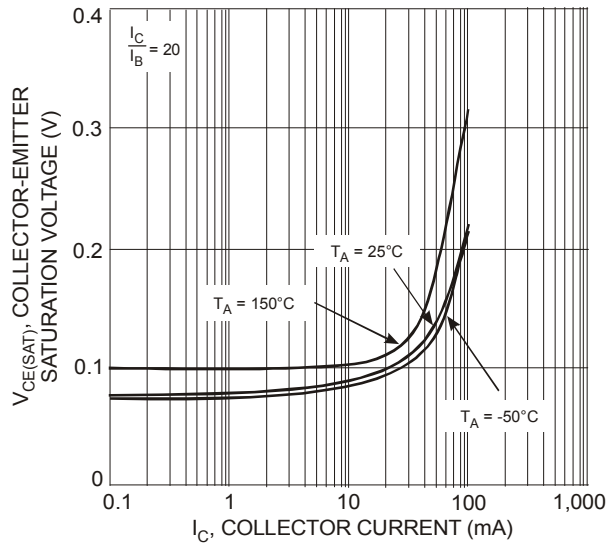


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

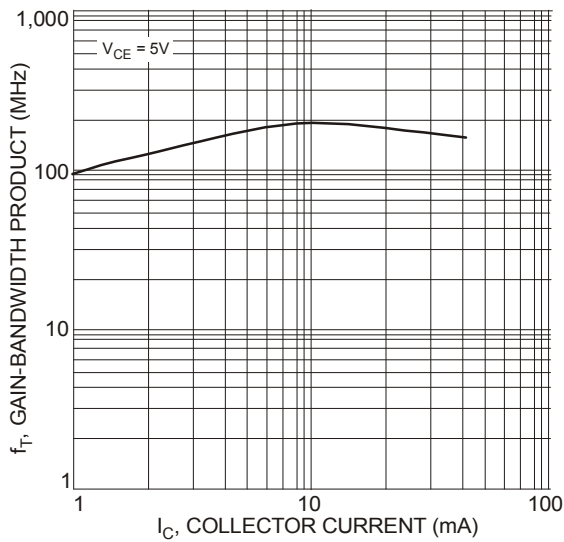
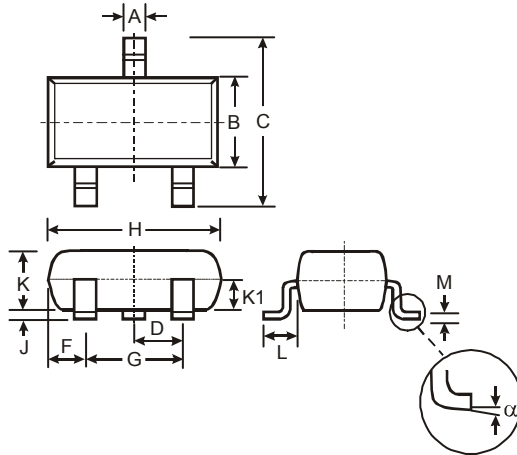


Figure 3 Typical Gain-Bandwidth Product vs. Collector Current

Package Outline Dimensions

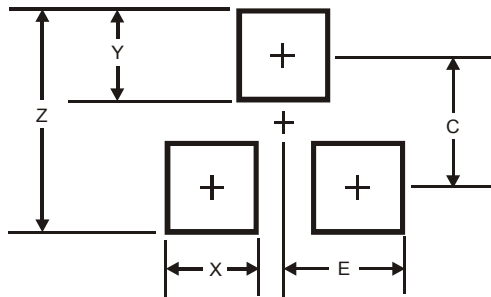
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT23 | | | |
|----------------------|-------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.903 | 1.10 | 1.00 |
| K1 | - | - | 0.400 |
| L | 0.45 | 0.61 | 0.55 |
| M | 0.085 | 0.18 | 0.11 |
| α | 0° | 8° | - |
| 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 | 2.9 |
| X | 0.8 |
| Y | 0.9 |
| C | 2.0 |
| E | 1.35 |

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