

Description

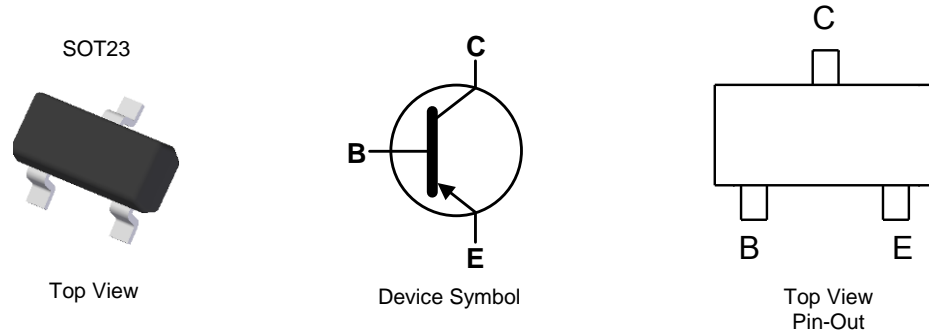
The AC857BQ-AC857CQ Bipolar Junction Transistors (BJT) are designed to meet the stringent requirements of Automotive Applications.

Features

- Ideally Suited for Automatic Insertion
- Complementary NPN Types: AC847BQ-AC847CQ
- 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 (e3)
- Weight: 0.008 grams (Approximate)

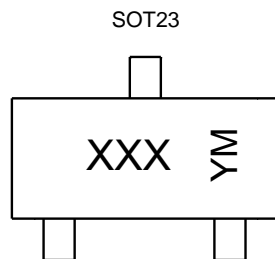


Ordering Information (Notes 4 & 5)

| Product | Compliance | Marking | Reel Size (inches) | Quantity per Reel |
|-----------|------------|---------|--------------------|-------------------|
| AC857BQ-7 | Automotive | 2C6 | 7 | 3,000 |
| AC857CQ-7 | Automotive | 2C7 | 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. Refer to http://www.diodes.com/product_compliance_definitions.html.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



XXX = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: E = 2017)
 M or \bar{M} = Month (ex: 9 = September)

Date Code Key

| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|------|------|------|------|------|------|------|------|------|
| Code | D | E | F | G | H | I | J | K |

| 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 |

Absolute Maximum Ratings (@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} | -5.0 | V |
| Continuous Collector Current | I _C | -100 | mA |
| Peak Collector Current | I _{CM} | -200 | mA |
| Peak Emitter Current | I _{EM} | -200 | mA |
| Peak Base Current | I _{BM} | -200 | mA |

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

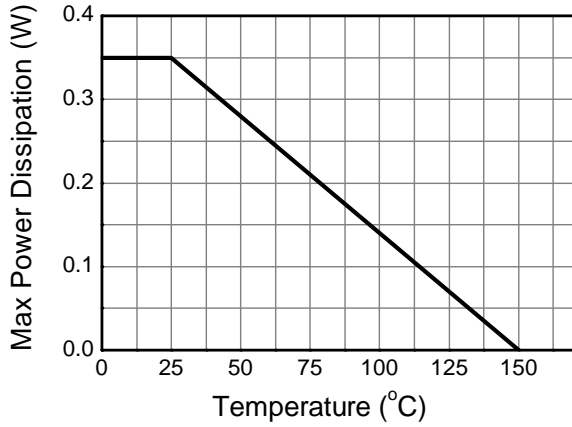
| Characteristic | Symbol | Value | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation | P _D | (Note 6) | 310 |
| | | (Note 7) | 350 |
| Thermal Resistance, Junction to Ambient | R _{θJA} | (Note 6) | 403 |
| | | (Note 7) | 357 |
| Thermal Resistance, Junction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

ESD Ratings (Note 9)

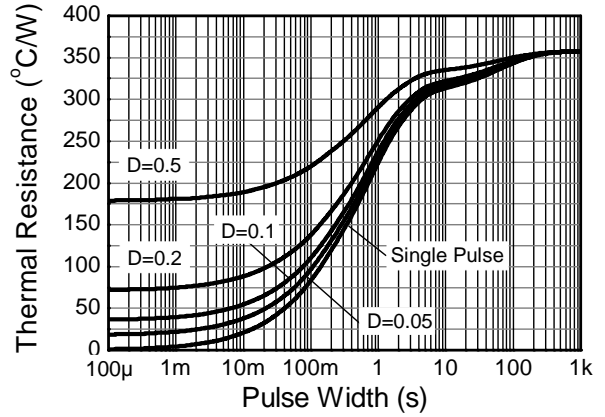
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

- Notes:
6. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 7. Same as Note 6, except the device is mounted on 15mm x 15mm 1oz copper.
 8. Thermal resistance from junction to solder-point (at the end of the leads).
 9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

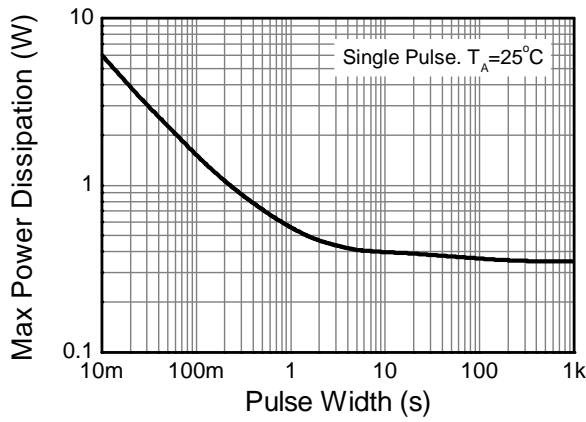
Thermal Characteristics and Derating Information



Derating Curve



Transient Thermal Impedance



Pulse Power Dissipation

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------|------|--------------------|-------|---------------|---|
| Collector-Base Breakdown Voltage | BV_{CBO} | -50 | — | — | V | $I_C = -10\mu\text{A}$ |
| Collector-Emitter Breakdown Voltage (Note 10) | BV_{CEO} | -45 | — | — | V | $I_C = -10\text{mA}$ |
| Emitter-Base Breakdown Voltage | BV_{EBO} | -5 | — | — | V | $I_E = -1\mu\text{A}$ |
| Collector Cutoff Current | I_{CBO} | — | — | -15 | nA | $V_{CB} = -30\text{V}$ |
| | | | | -4 | μA | $V_{CB} = -30\text{V}, T_J = +150^\circ\text{C}$ |
| Collector Emitter Cutoff Current | I_{CES} | — | — | -15 | nA | $V_{CE} = -50\text{V}$ |
| Emitter-Base Cutoff Current | I_{EBO} | — | — | -100 | nA | $V_{EB} = -5\text{V}$ |
| Small Signal Current Gain (Note 10) | AC857BQ | — | 330 | — | — | $I_C = -2.0\text{mA}, V_{CE} = -5\text{V}$ $f = 1.0\text{kHz}$ |
| | AC857CQ | — | 600 | — | — | |
| Input Impedance (Note 10) | AC857BQ | — | 4.5 | — | k Ω | |
| | AC857CQ | — | 8.7 | — | k Ω | |
| Output Admittance (Note 10) | AC857BQ | — | 30 | — | μS | |
| | AC857CQ | — | 60 | — | μS | |
| Reverse Voltage Transfer Ratio (Note 10) | AC857BQ | — | 2×10^{-4} | — | — | |
| | AC857CQ | — | 3×10^{-4} | — | — | |
| DC Current Gain (Note 10) | AC857BQ | 220 | 290 | 475 | — | |
| | AC857CQ | 420 | 520 | 800 | — | |
| Collector-Emitter Saturation Voltage (Note 10) | $V_{CE(SAT)}$ | — | -75 | -300 | mV | $I_C = -10\text{mA}, I_B = -0.5\text{mA}$ |
| | | | -250 | -650 | mV | $I_C = -100\text{mA}, I_B = -5.0\text{mA}$ |
| Base-Emitter Turn-On Voltage (Note 10) | $V_{BE(ON)}$ | -600 | -650 | -750 | mV | $I_C = -2\text{mA}, V_{CE} = -5\text{V}$ |
| | | | — | -820 | mV | $I_C = -10\text{mA}, V_{CE} = -5\text{V}$ |
| Base-Emitter Saturation Voltage (Note 10) | $V_{BE(SAT)}$ | — | -700 | — | mV | $I_C = -10\text{mA}, I_B = -0.5\text{mA}$ |
| | | | -850 | -1100 | mV | $I_C = -100\text{mA}, I_B = -5\text{mA}$ |
| Output Capacitance | C_{obo} | — | 3 | — | pF | $V_{CB} = -10\text{V}, f = 1.0\text{MHz}$ |
| Transition Frequency | f_T | 100 | 200 | — | MHz | $V_{CE} = -5\text{V}, I_C = -10\text{mA}, f = 100\text{MHz}$ |
| Noise Figure | NF | — | 2 | 10 | dB | $V_{CE} = -5\text{V}, I_C = -200\mu\text{A}$ $R_S = 2\text{k}\Omega, f = 1\text{kHz}$ $\Delta f = 200\text{Hz}$ |

Note: 10. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

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

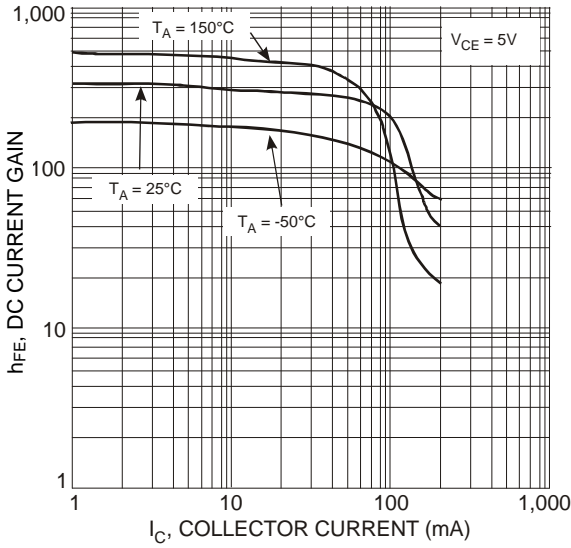


Figure 1 Typical DC Current Gain vs. Collector Current

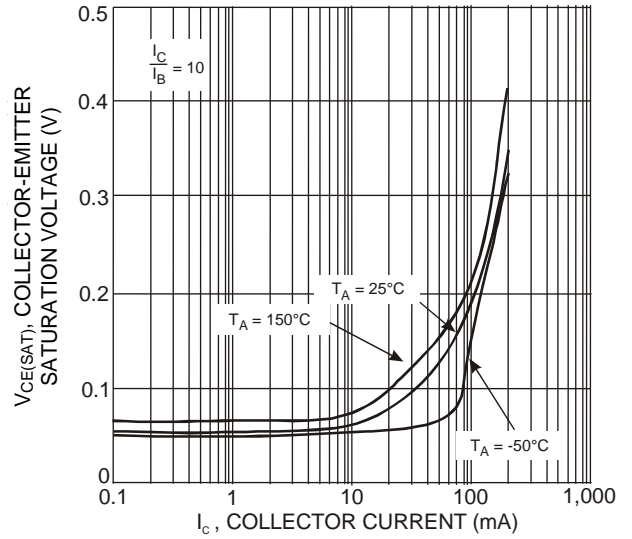


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

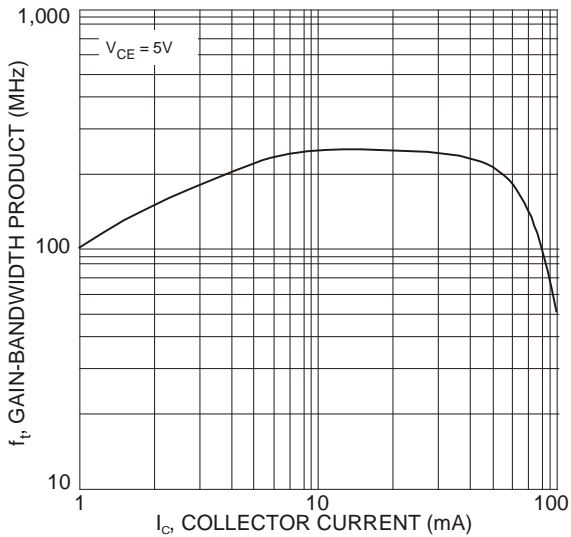
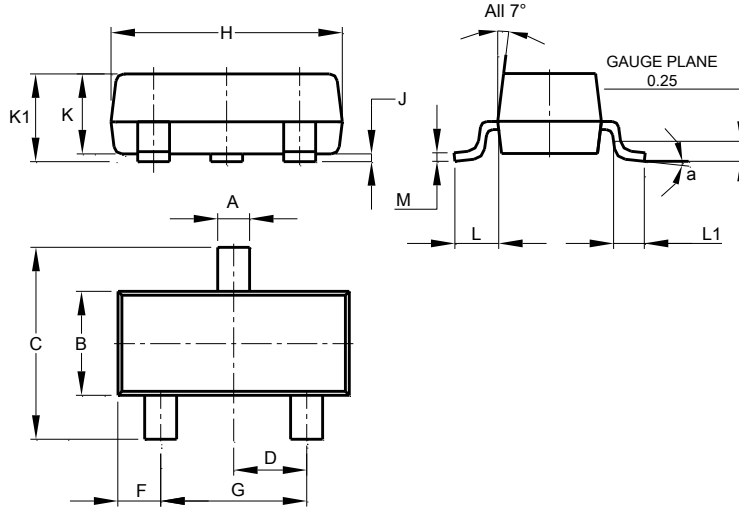


Figure 3 Gain-Bandwidth Product vs Collector Current

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

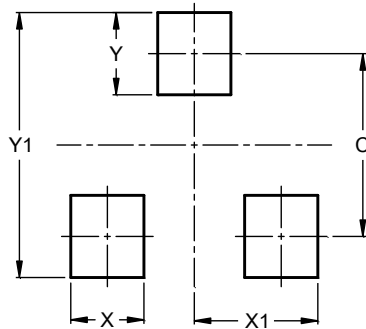


| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.890 | 1.00 | 0.975 |
| K1 | 0.903 | 1.10 | 1.025 |
| L | 0.45 | 0.61 | 0.55 |
| L1 | 0.25 | 0.55 | 0.40 |
| M | 0.085 | 0.150 | 0.110 |
| a | 0° | 8° | -- |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.0 |
| X | 0.8 |
| X1 | 1.35 |
| Y | 0.9 |
| Y1 | 2.9 |

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