# 50V NPN LOW SATURATION POWER TRANSISTOR IN SOT89

## Features

- $BV_{CEO}$ > 50V
- $I_C$ = 3A High Continuous Collector Current
- $I_{CM}$ up to 6A Peak Pulse Current
- 2W Power Dissipation
- Low Saturation Voltage $V_{CE(sat)}$ < 220mV @ 1A
- $R_{CE(sat)}$ = 87mΩ @ 2.75A for a Low Equivalent On-Resistance
- $h_{FE}$ Characterized up to 6A for High Current Gain Hold-Up
- **Lead-Free Finish; 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

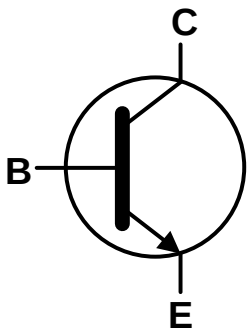
- Case: SOT89
- Case Material: Molded Plastic, "Green" Molding Compound UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.052 grams (Approximate)

## Applications

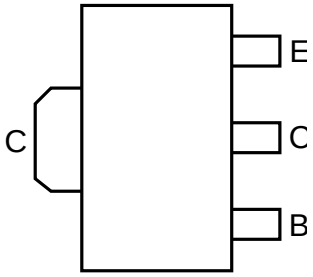
- Load Management Functions
- Motor Control
- DC-DC / DC-AC Converters

SOT89

Top View




Device Symbol



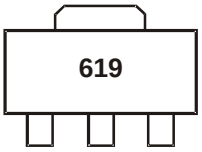

Top View
Pin-Out

## Ordering Information (Notes 4 and 5)

| Part number | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|---|
| FCX619TA | AEC-Q101 | 619 | 7 | 12 | 1,000 |
| FCX619-13R | AEC-Q101 | 619 | 13 | 12 | 4,000 |
| FCX619QTA | Automotive | 619 | 7 | 12 | 1,000 |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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/product_compliance_definitions.html.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information




619 = Product Type Marking Code

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 50 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7 | V |
| Continuous Collector Current | $I_C$ | 3 | A |
| Peak Pulse Current | $I_{CM}$ | 6 | A |
| Continuous Base Current | $I_B$ | 500 | mA |

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

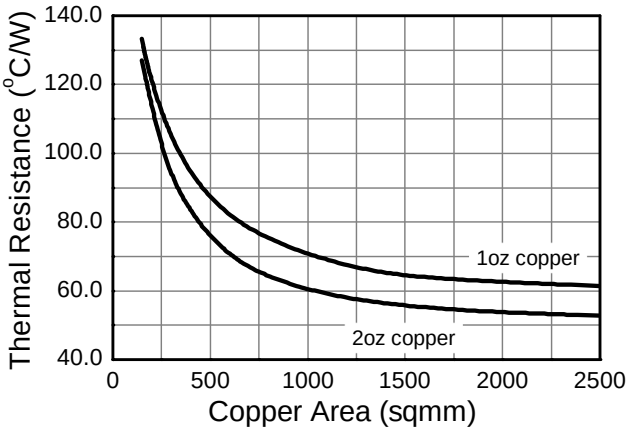
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 6) | $P_D$ | 0.7 | W |
| | (Note 7) | | 1.0 | |
| | (Note 8) | | 1.5 | |
| | (Note 9) | | 2.0 | |
| Thermal Resistance, Junction to Ambient Air | (Note 6) | $R_{\theta JA}$ | 178 | °C/W |
| | (Note 7) | | 125 | |
| | (Note 8) | | 83 | |
| | (Note 9) | | 62.5 | |
| Thermal Resistance, Junction to Lead | (Note 10) | $R_{\theta JL}$ | 6 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

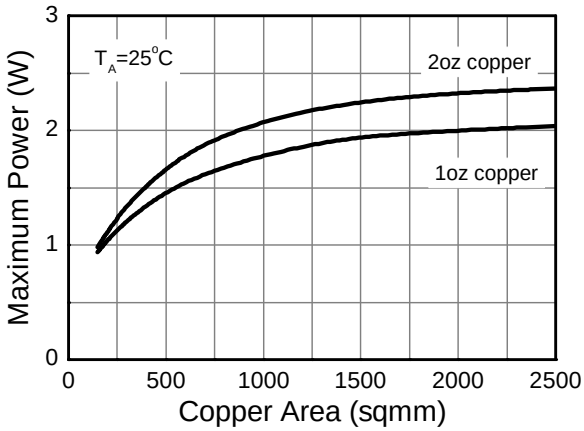
## ESD Ratings (Note 11)

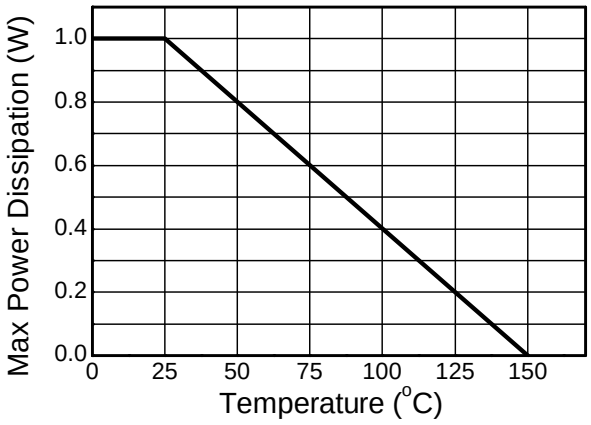
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
6. For a device mounted with the exposed collector pad on minimum recommended pad layout (MRP) 1oz copper that is on a single-sided 1.6mm 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 with the exposed collector pad on 15mm x 15mm 1oz copper.
8. Same as Note 6, except the device is mounted with the exposed collector pad on 25mm x 25mm 1oz copper.
9. Same as Note 6, except the device is mounted with the exposed collector pad on 40mm x 40mm 1oz copper.
10. Thermal resistance from junction to solder-point (on the exposed collector pad).
11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

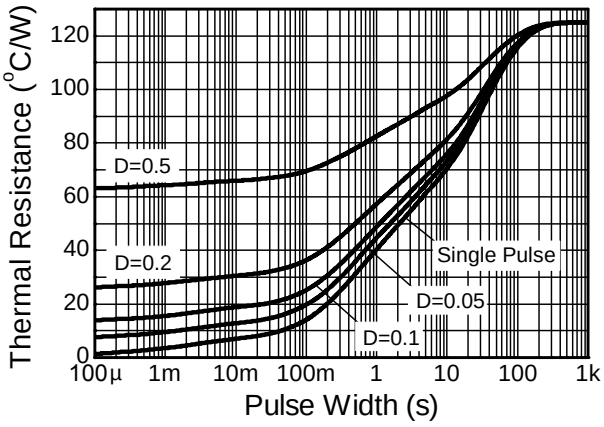
## Thermal Characteristics and Derating Information



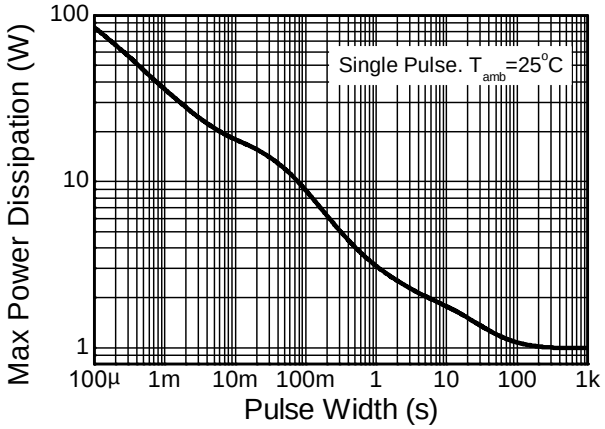




**Derating Curve**




**Transient Thermal Impedance**



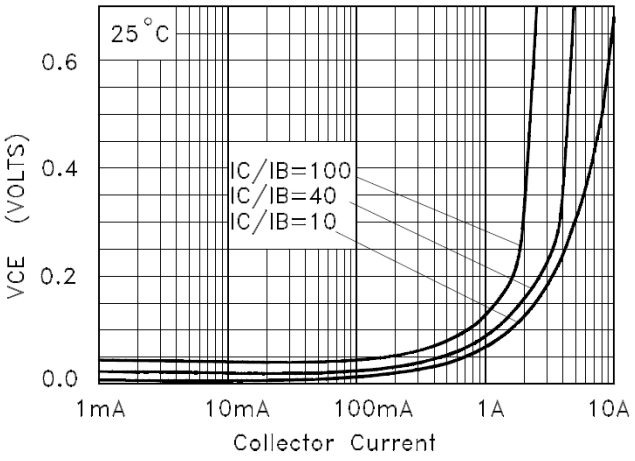

**Pulse Power Dissipation**

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

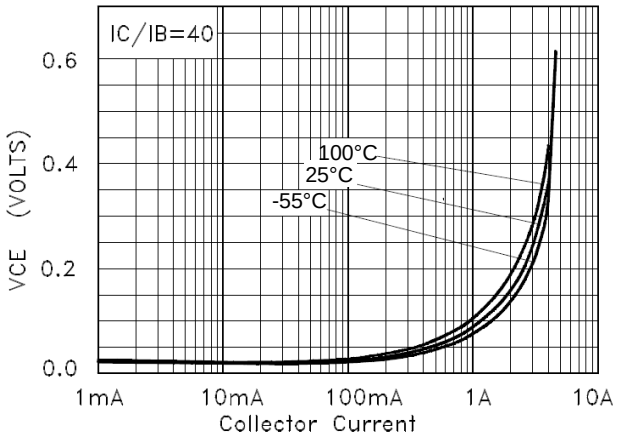
| Characteristic | Symbol | Min | Typ. | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | 190 | — | V | $I_C$ = 100µA |
| Collector-Emitter Breakdown Voltage (Note 12) | $BV_{CEO}$ | 50 | 65 | — | V | $I_C$ = 10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 7 | 8.3 | — | V | $I_E$ = 100µA |
| Collector Cutoff Current | $I_{CBO}$ | — | — | 100 | nA | $V_{CB}$ = 40V |
| Emitter Cutoff Current | $I_{EBO}$ | — | — | 100 | nA | $V_{EB}$ = 5.6V |
| Emitter Cutoff Current | $I_{CES}$ | — | — | 100 | nA | $V_{CES}$ = 40V |
| DC Current Transfer Static Ratio (Note 12) | $h_{FE}$ | 200<br>300<br>200<br>100<br>— | 400<br>450<br>400<br>200<br>30 | — | — | $I_C$ = 10mA, $V_{CE}$ = 2V<br>$I_C$ = 200mA, $V_{CE}$ = 2V<br>$I_C$ = 1A, $V_{CE}$ = 2V<br>$I_C$ = 2A, $V_{CE}$ = 2V<br>$I_C$ = 6A, $V_{CE}$ = 2V |
| Collector-Emitter Saturation Voltage (Note 12) | $V_{CE(sat)}$ | — | 13<br>150<br>190<br>240 | 25<br>220<br>260<br>320 | mV | $I_C$ = 100mA, $I_B$ = 10mA<br>$I_C$ = 1A, $I_B$ = 10mA<br>$I_C$ = 2A, $I_B$ = 50mA<br>$I_C$ = 2.75A, $I_B$ = 100mA |
| Base-Emitter Saturation Voltage (Note 12) | $V_{BE(sat)}$ | — | 0.97 | 1.1 | V | $I_C$ = 2.75A, $I_B$ = 100mA |
| Base-Emitter Turn-On Voltage (Note 12) | $V_{BE(on)}$ | — | 0.89 | 1 | V | $I_C$ = 2.75A, $V_{CE}$ = 2V |
| Transitional Frequency | $f_T$ | 100 | 165 | — | MHz | $I_C$ = 50mA, $V_{CE}$ = 10V<br>f = 100MHz |
| Output Capacitance | $C_{obo}$ | — | 12 | 20 | pF | $V_{CB}$ = 10V, f = 1MHz, |
| Turn-On Time | $t_{(on)}$ | — | 170 | — | ns | $V_{CC}$ = 10V, $I_C$ =1A<br>$I_{B1}$ = 10mA,<br>$I_{B2}$ = -10mA |
| Turn-Off Time | $t_{(off)}$ | — | 750 | — | ns | |

Note: 12. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

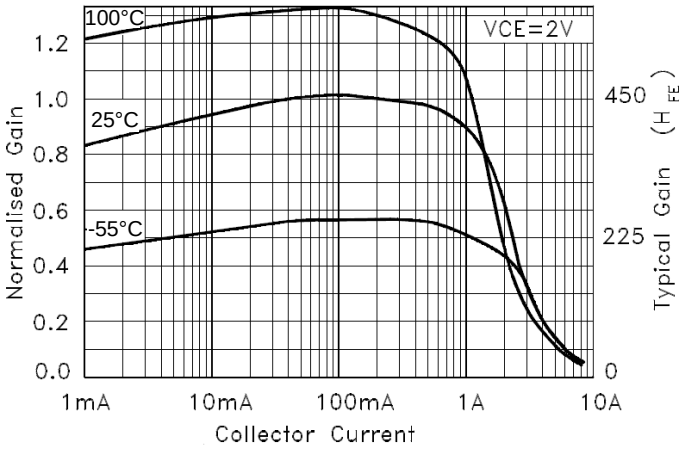
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



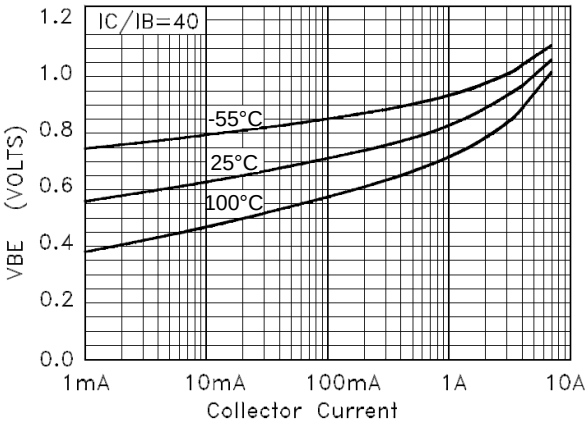

$V_{CE(SAT)}$ vs $I_C$



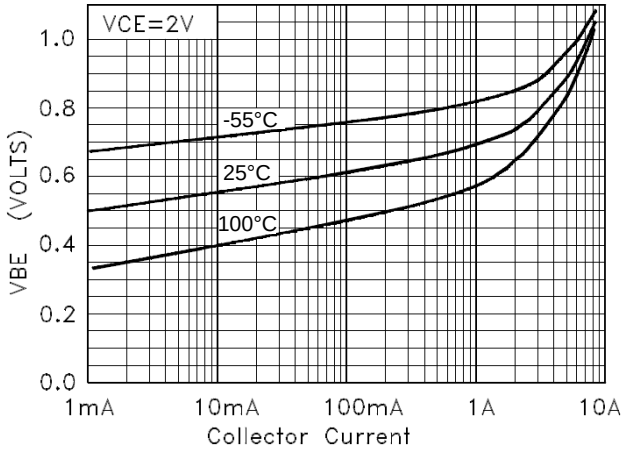

$V_{CE(SAT)}$ vs $I_C$




$h_{FE}$ vs $I_C$




$V_{BE(SAT)}$ vs $I_C$

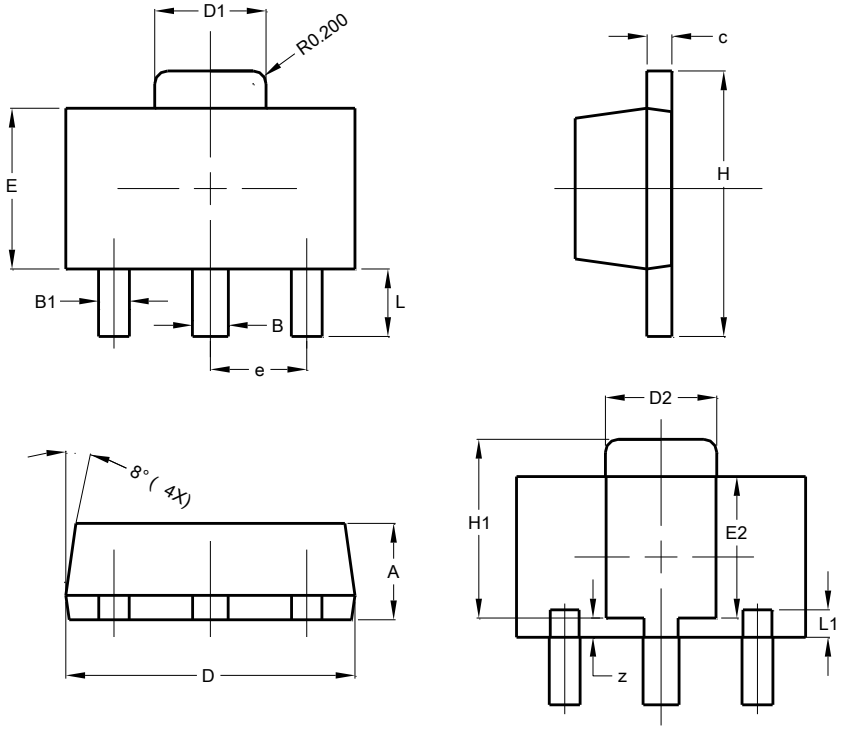



$V_{BE(ON)}$ vs $I_C$

## Package Outline Dimensions

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

**SOT89**

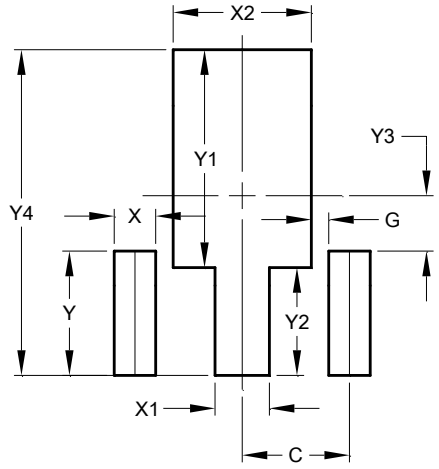



| SOT89 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.60 | 1.50 |
| **B** | 0.50 | 0.62 | 0.56 |
| **B1** | 0.42 | 0.54 | 0.48 |
| **c** | 0.35 | 0.43 | 0.38 |
| **D** | 4.40 | 4.60 | 4.50 |
| **D1** | 1.62 | 1.83 | 1.733 |
| **D2** | 1.61 | 1.81 | 1.71 |
| **E** | 2.40 | 2.60 | 2.50 |
| **E2** | 2.05 | 2.35 | 2.20 |
| **e** | - | - | 1.50 |
| **H** | 3.95 | 4.25 | 4.10 |
| **H1** | 2.63 | 2.93 | 2.78 |
| **L** | 0.90 | 1.20 | 1.05 |
| **L1** | 0.327 | 0.527 | 0.427 |
| **z** | 0.20 | 0.40 | 0.30 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**SOT89**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.500 |
| **G** | 0.244 |
| **X** | 0.580 |
| **X1** | 0.760 |
| **X2** | 1.933 |
| **Y** | 1.730 |
| **Y1** | 3.030 |
| **Y2** | 1.500 |
| **Y3** | 0.770 |
| **Y4** | 4.530 |

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