# 45V NPN SMALL SIGNAL TRANSISTOR IN DFN0806

## Features

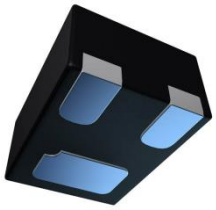
- $BV_{CEO}$ > 45V
- $I_C$ = 100mA High Collector Current
- $P_D$ = 435mW Power Dissipation
- 0.48mm$^2$ Package Footprint, 16 times smaller than SOT23
- 0.4mm Height Package Minimizing Off-Board Profile
- Complementary PNP Type BC857BFA
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

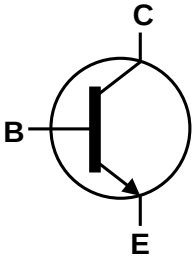
- Case: X2-DFN0806-3
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu, Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.0008 grams (Approximate)

X2-DFN0806-3

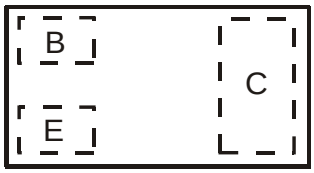
Top View



Bottom View




Device Symbol




Top View
Device Schematic

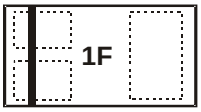
## Ordering Information (Note 4)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|
| BC847BFA-7B | 1F | 7 | 8mm | 10,000 |

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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information

X2-DFN0806-3




1F = Product Type Marking Code

Top View
Bar Denotes Base
and Emitter Side

## 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 | $V_{EBO}$ | 6.0 | V |
| Continuous Collector Current | $I_C$ | 100 | mA |
| Peak Pulse Collector Current | $I_{CM}$ | 200 | mA |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## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

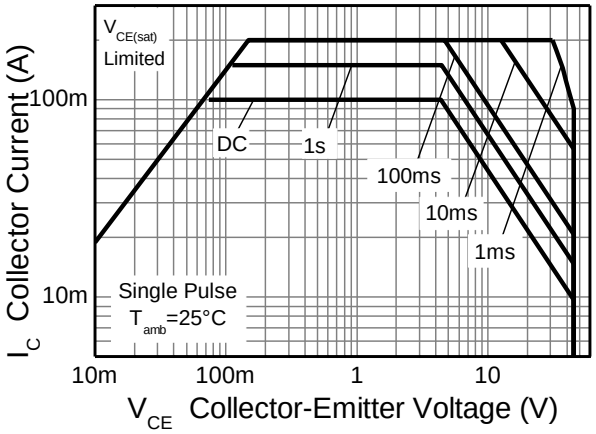
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 5) | $P_D$ | 435 | mW |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 287 | °C/W |
| Thermal Resistance, Junction to Lead (Note 6) | $R_{\theta JL}$ | 150 | °C/W |
| Operating and Storage and Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 7)

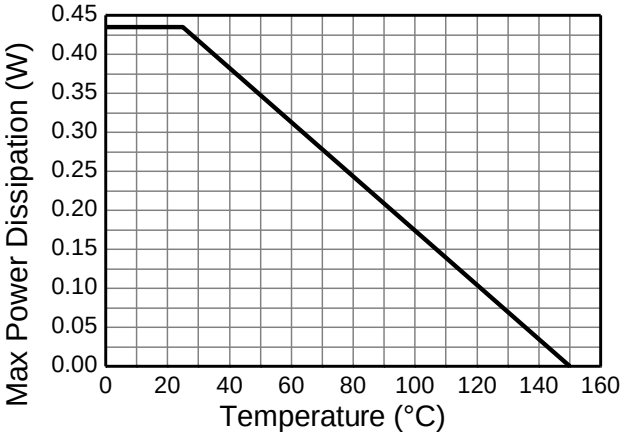
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 200 | V | B |

Notes:
5. For the device mounted on minimum recommended pad layout 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady state condition. The entire exposed collector pad is attached to the heatsink.
6. Thermal resistance from junction to solder-point (on the exposed collector pad).
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

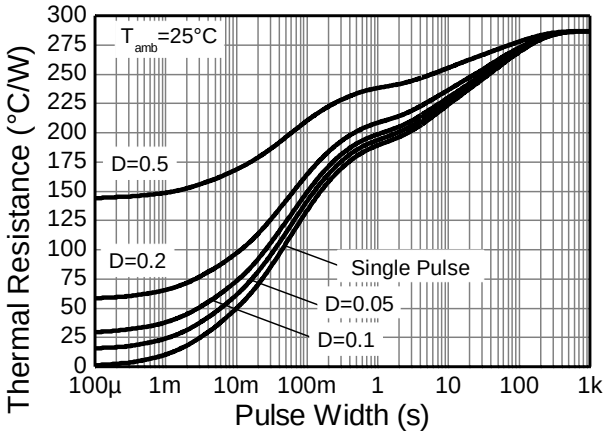
## Thermal Characteristics and Derating Information



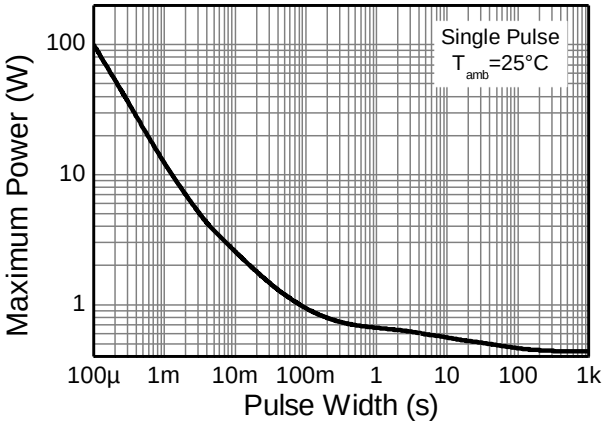

**Safe Operating Area**




**Derating Curve**




**Transient Thermal Impedance**




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

| Characteristic | Symbol | Min | Typical | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | 150 | — | V | $I_C$ = 50µA, $I_B$ = 0 |
| Collector-Emitter Breakdown Voltage | $BV_{CES}$ | 50 | 150 | — | | $I_C$ = 50µA, $I_B$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 8) | $BV_{CEO}$ | 45 | 65 | — | V | $I_C$ = 1mA, $I_B$ = 0 |
| Collector-Base Breakdown Voltage | $BV_{EBO}$ | 6.0 | 8.35 | — | V | $I_E$ = 50µA, $I_C$ = 0 |
| Collector-Base Cut-Off Current | $I_{CBO}$ | — | — | 15 | nA | $V_{CB}$ = 40V |
| Collector-Emitter Cut-Off Current | $I_{CES}$ | — | — | 15 | nA | $V_{CE}$ = 40V |
| **ON CHARACTERISTICS** (Note 8) | | | | | | |
| DC Current Gain | $h_{FE}$ | —<br>200 | 220<br>260 | —<br>470 | — | $I_C$ = 10µA, $V_{CE}$ = 5.0V<br>$I_C$ = 2.0mA, $V_{CE}$ = 5.0V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | 50<br>122 | 125<br>300 | mV | $I_C$ = 10mA, $I_B$ = 0.5mA<br>$I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | 760<br>880 | 1000<br>1100 | mV | $I_C$ = 10mA, $I_B$ = 0.5mA<br>$I_C$ = 100mA, $I_B$ = 5.0mA |
| Base-Emitter Voltage | $V_{BE(on)}$ | 580<br>— | 650<br>725 | 750<br>800 | mV | $I_C$ = 2.0mA, $V_{CE}$ = 5V<br>$I_C$ = 10mA, $V_{CE}$ = 5V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | $C_{obo}$ | — | 1.5 | — | pF | $V_{CB}$ = 10.0V, f = 1.0MHz, $I_E$ = 0 |
| Current Gain-Bandwidth Product | $f_T$ | 100 | 170 | — | MHz | $V_{CE}$ = 5V, $I_C$ = 10mA, f = 100MHz |

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.


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

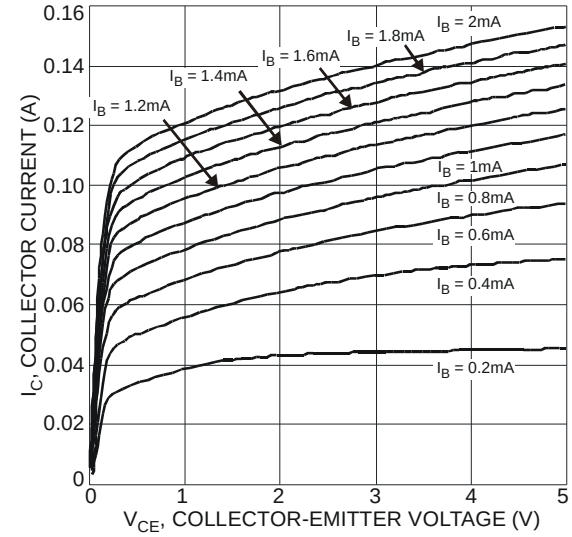


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

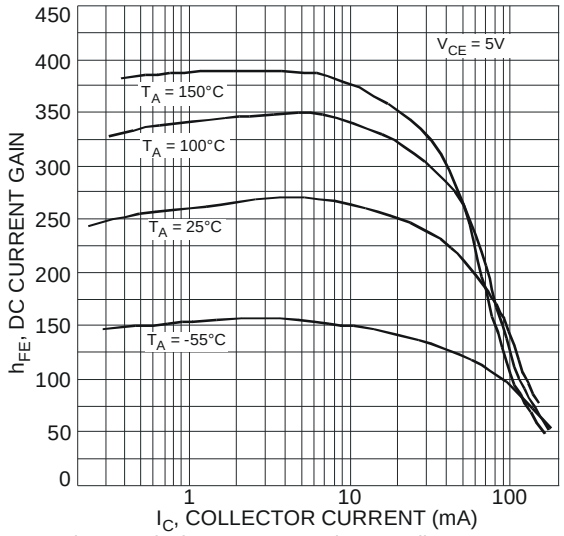


Fig. 5 Typical DC Current Gain vs. Collector Current

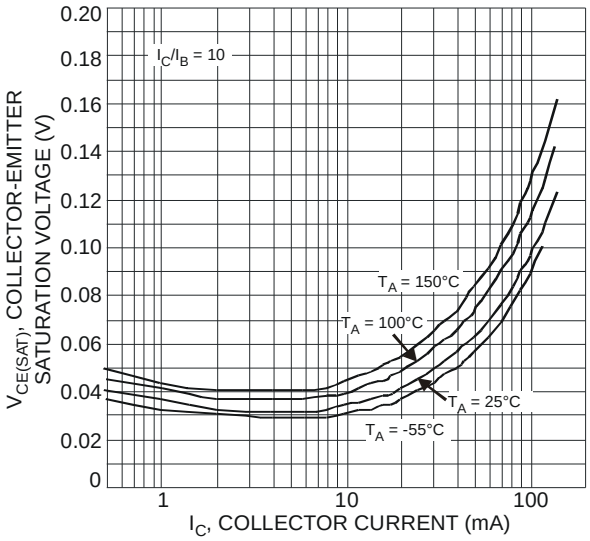


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

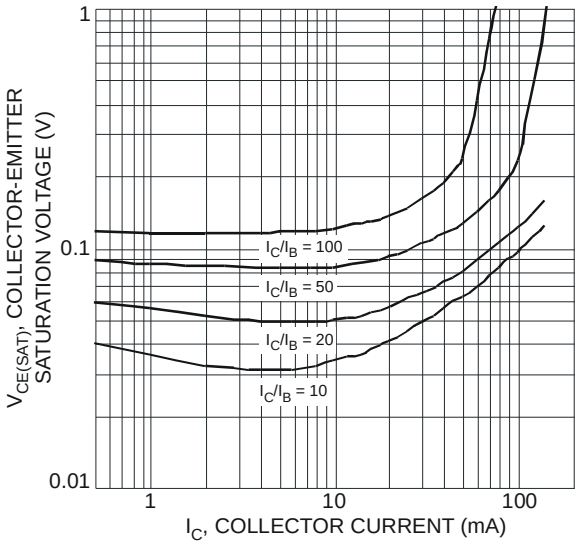


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

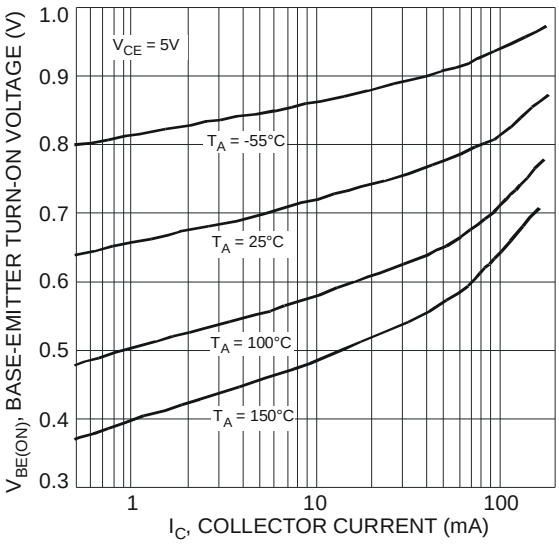


Fig. 8 Typical Base-Emitter Turn-On Voltage vs. Collector Current

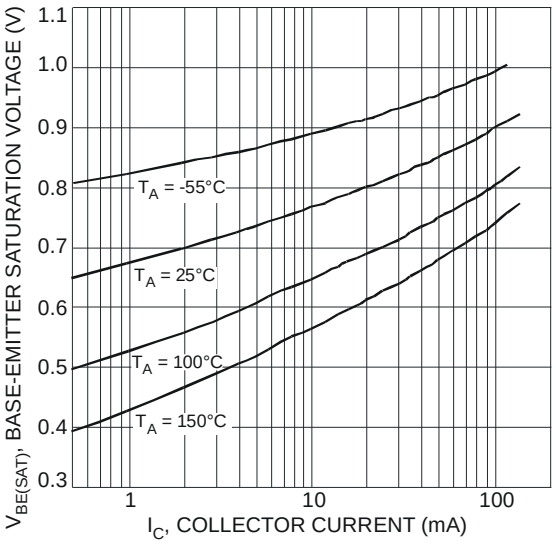


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current


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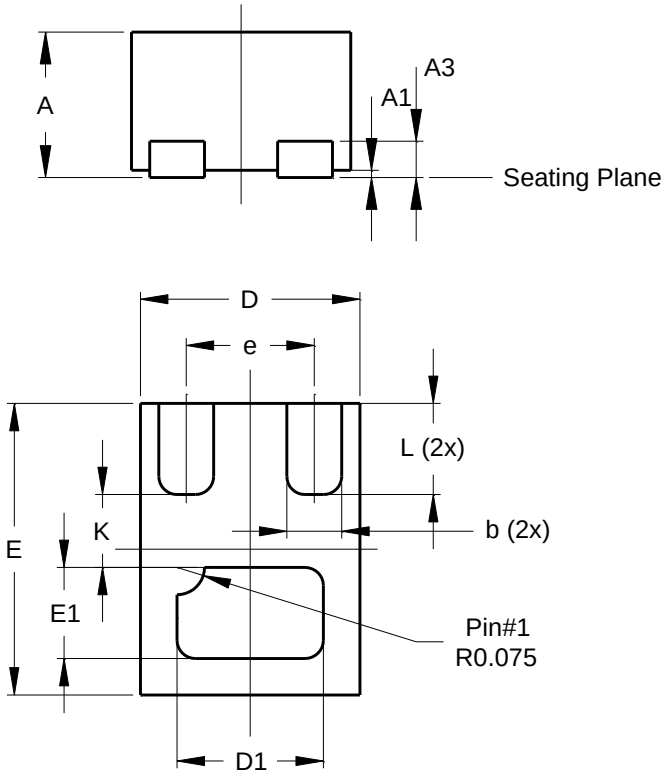
## Package Outline Dimensions

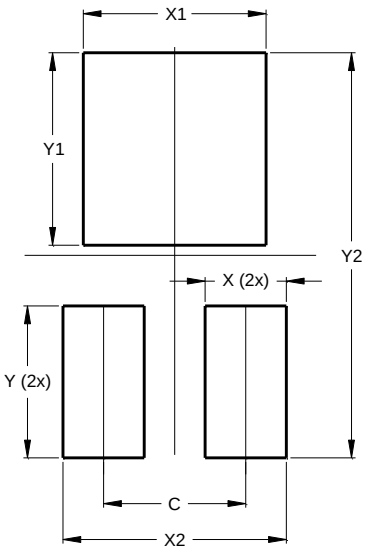
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| X2-DFN0806-3 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.375 | 0.40 | 0.39 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | - | - | 0.10 |
| **b** | 0.10 | 0.20 | 0.15 |
| **D** | 0.55 | 0.65 | 0.60 |
| **D1** | 0.35 | 0.45 | 0.40 |
| **E** | 0.75 | 0.85 | 0.80 |
| **E1** | 0.20 | 0.30 | 0.25 |
| **e** | - | - | 0.35 |
| **K** | - | - | 0.20 |
| **L** | 0.20 | 0.30 | 0.25 |
| **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) |
|---|---|
| **C** | 0.350 |
| **X** | 0.200 |
| **X1** | 0.450 |
| **X2** | 0.550 |
| **Y** | 0.375 |
| **Y1** | 0.475 |
| **Y2** | 1.000 |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