

65V NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

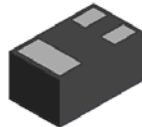
Features

- Low Collector-Emitter Saturation Voltage, $V_{CE(sat)}$
- Ultra-Small Leadless Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

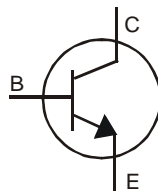
Mechanical Data

- Case: X2-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 **(e4)**
- Weight: 0.0009 grams (Approximate)

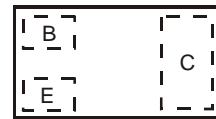
X2-DFN1006-3



Bottom View



Device Symbol



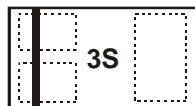
Top View
Device Schematic

Ordering Information (Note 4)

| Part Number | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|--------------------|-----------------|-------------------|
| BC846BLP4-7B | 3S | 7 | 8 | 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> 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>.

Marking Information



3S = Product Type Marking Code

Top View
Bar Denotes Base
and Emitter Side

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

| Characteristic | Symbol | Value | Unit |
|--------------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CBO} | 80 | V |
| Collector-Emitter Voltage | V _{CEO} | 65 | V |
| Emitter-Base Voltage | V _{EBO} | 6 | V |
| Collector Current - Continuous | I _C | 100 | mA |
| Peak Collector Current | I _{CM} | 200 | mA |
| Peak Emitter Current | I _{EM} | 200 | mA |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|-----------------------------------|------------------|------|
| Power Dissipation | P _D | (Note 5) 0.46 | W |
| | | (Note 6) 1 | |
| Thermal Resistance, Junction to Ambient | R _{θJA} | (Note 5) 272 | °C/W |
| | | (Note 6) 120 | |
| Thermal Resistance, Junction to Leads | R _{θJL} | 110 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

ESD Ratings (Note 8)

| 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:
5. 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. The entire exposed collector pad is attached to the heatsink.
 6. Same as note 5, except device is surface mounted on 25mm X 25mm collector pad heatsink with 1oz copper.
 7. Thermal resistance from junction to solder-point (at the end of the collector lead).
 8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics

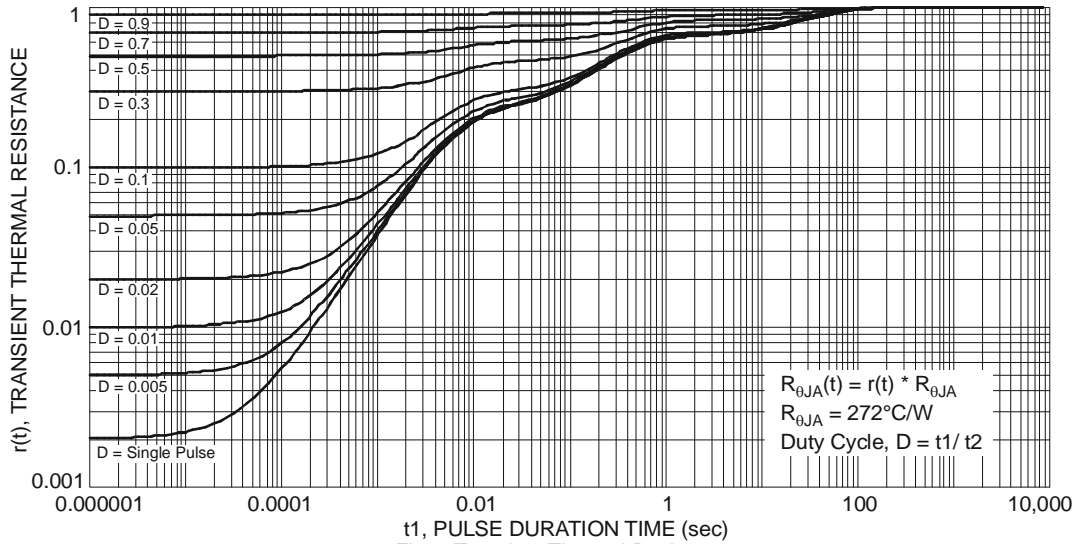


Fig. 1 Transient Thermal Resistance

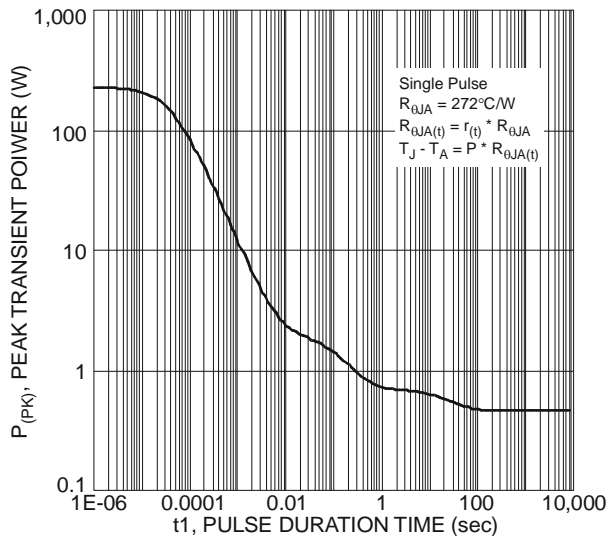


Fig. 2 Single Pulse Maximum Power Dissipation

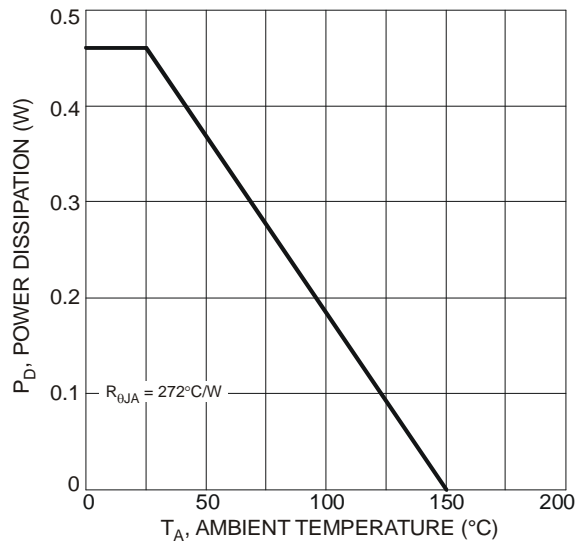


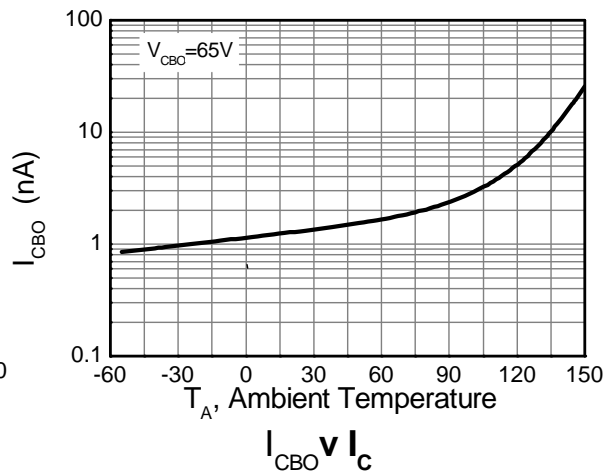
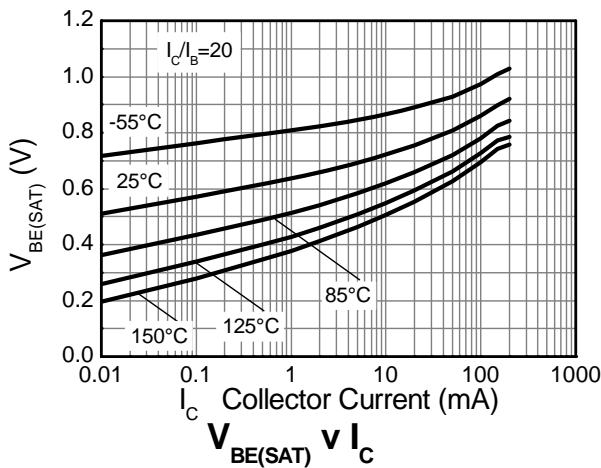
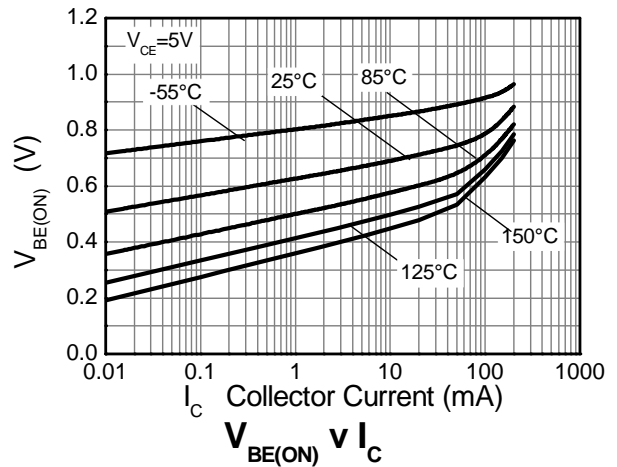
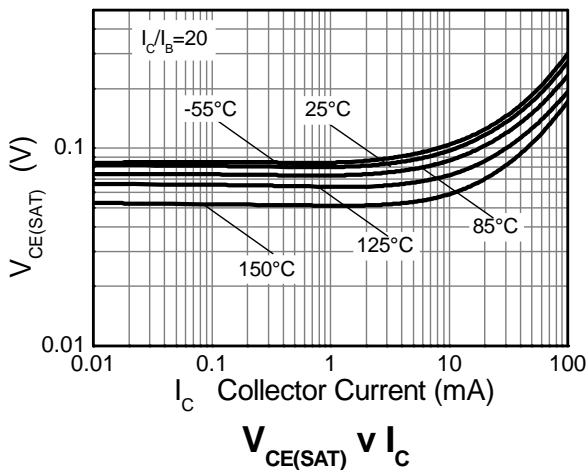
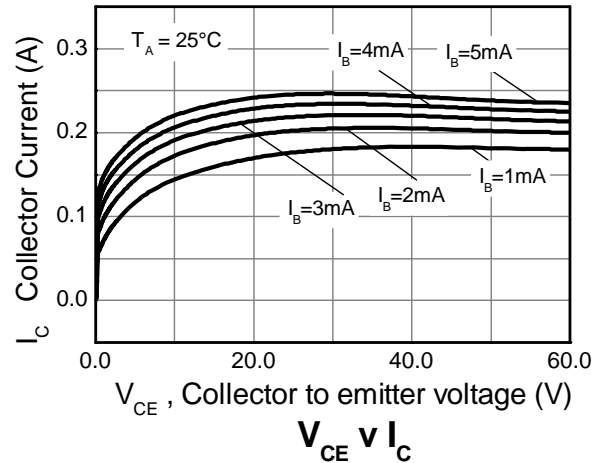
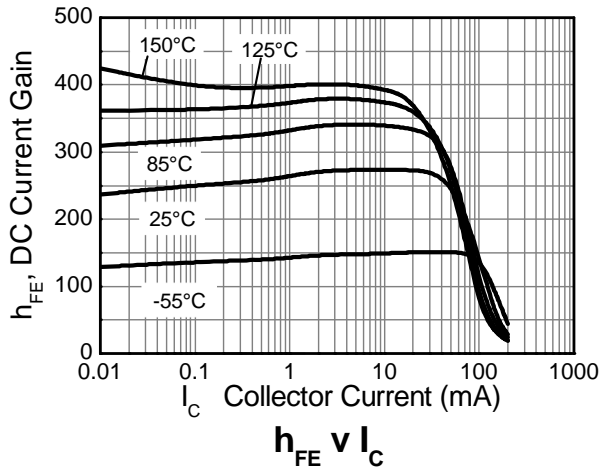
Fig. 3 Power Dissipation vs. Ambient Temperature

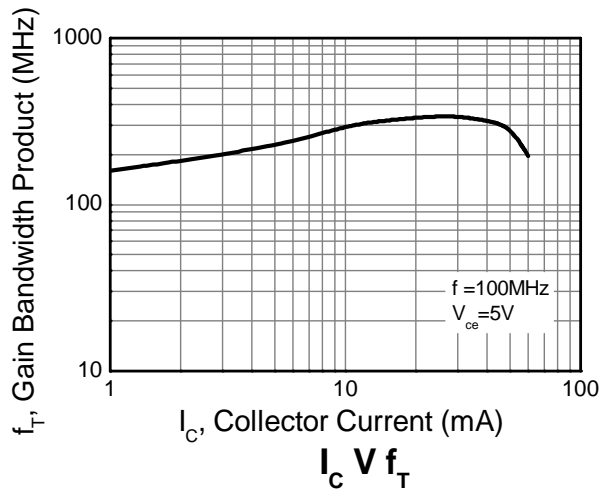
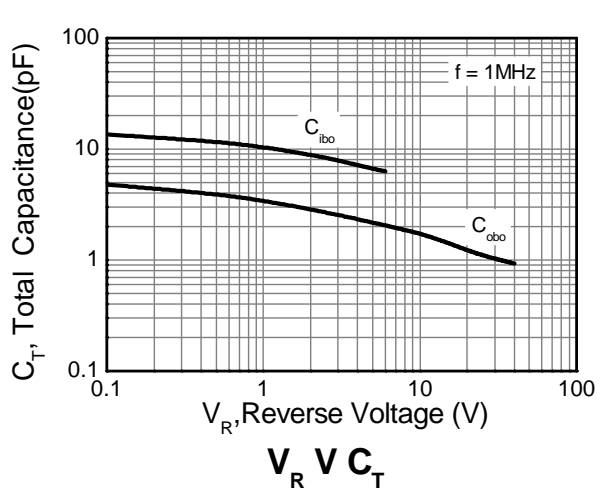
Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------|----------|------------|------------|---------------------|--|
| OFF CHARACTERISTICS | | | | | | |
| Collector-Base Breakdown Voltage | BV_{CBO} | 80 | — | — | V | $I_C = 100\mu\text{A}, I_E = 0$ |
| Collector-Emitter Breakdown Voltage (Note 9) | BV_{CEO} | 65 | — | — | V | $I_C = 10\text{mA}, I_B = 0$ |
| Emitter-Base Breakdown Voltage | BV_{EBO} | 6 | — | — | V | $I_E = 100\mu\text{A}, I_C = 0$ |
| Collector Cutoff Current | I_{CES} | — | — | 15 | nA | $V_{CE} = 65\text{V}$ |
| Collector Cutoff Current | I_{CBO} | — | — | 15 5.0 | nA μA | $V_{CB} = 40\text{V}$ $V_{CB} = 30\text{V}, T_A = +150^\circ\text{C}$ |
| ON CHARACTERISTICS (Note 9) | | | | | | |
| DC Current Gain | h_{FE} | 200 | 270 | 450 | — | $V_{CE} = 5\text{V}, I_C = 2.0\text{mA}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | 90 220 | 250 600 | mV | $I_C = 10\text{mA}, I_B = 0.5\text{mA}$ $I_C = 100\text{mA}, I_B = 5.0\text{mA}$ |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | 720 870 | 900 — | mV | $I_C = 10\text{mA}, I_B = 0.5\text{mA}$ $I_C = 100\text{mA}, I_B = 5.0\text{mA}$ |
| Base-Emitter Voltage | $V_{BE(on)}$ | 580 — | 650 — | 700 770 | mV | $V_{CE} = 5\text{V}, I_C = 2.0\text{mA}$ $V_{CE} = 5\text{V}, I_C = 10\text{mA}$ |
| SMALL SIGNAL CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{ibo} | — | 6.7 | — | pF | $V_{CB} = 5\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{obo} | — | 1.76 | — | pF | $V_{CB} = 10\text{V}, f = 1.0\text{MHz}$ |
| Current Gain-Bandwidth Product | f_T | 100 | 300 | — | MHz | $V_{CE} = 5\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$ |
| Noise Figure | NF | — | 2 | 10 | dB | $V_{CE} = 5\text{V}, I_C = 200\mu\text{A}, R_S = 2.0\text{k}\Omega,$ $f = 1.0\text{kHz}, \Delta f = 200\text{Hz}$ |
| Delay time | t_d | — | 11.2 | — | ns | $V_{CC} = 30\text{V},$ $I_C = 150\text{mA},$ $I_{B1} = I_{B2} = 15\text{mA}$ |
| Rise time | t_r | — | 59.7 | — | ns | |
| Storage time | t_s | — | 190.8 | — | ns | |
| Fall time | t_f | — | 108.6 | — | ns | |

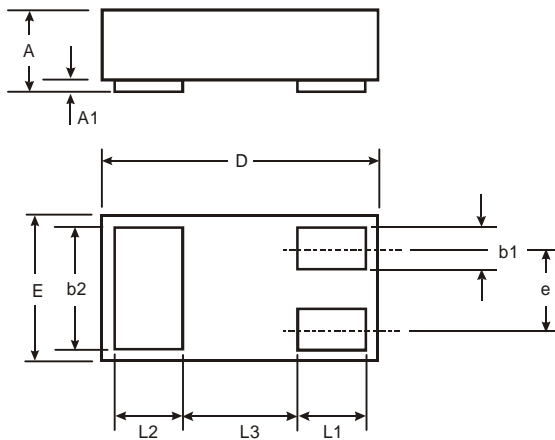
Note: 9. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

Typical Electrical Characteristics



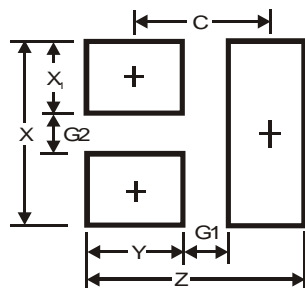


Package Outline Dimensions



| X2-DFN1006-3 | | | |
|----------------------|------|------|------|
| Dim | Min | Max | Typ |
| A | — | 0.40 | — |
| A1 | 0 | 0.05 | 0.03 |
| b1 | 0.10 | 0.20 | 0.15 |
| b2 | 0.45 | 0.55 | 0.50 |
| D | 0.95 | 1.05 | 1.00 |
| E | 0.55 | 0.65 | 0.60 |
| e | — | — | 0.35 |
| L1 | 0.20 | 0.30 | 0.25 |
| L2 | 0.20 | 0.30 | 0.25 |
| L3 | — | — | 0.40 |
| All Dimensions in mm | | | |

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 1.1 |
| G1 | 0.3 |
| G2 | 0.2 |
| X | 0.7 |
| X1 | 0.25 |
| Y | 0.4 |
| C | 0.7 |

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2012, Diodes Incorporated

www.diodes.com



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.