

**65V NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR**

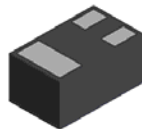
**Features**

- 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**

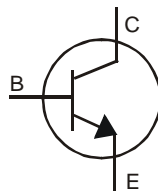
**Mechanical Data**

- 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)

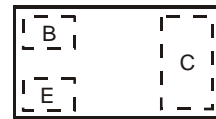
X2-DFN1006-3



Bottom View



Device Symbol



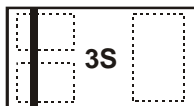
Top View  
Device Schematic

**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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	80	V
Collector-Emitter Voltage	V <sub>CEO</sub>	65	V
Emitter-Base Voltage	V <sub>EBO</sub>	6	V
Collector Current - Continuous	I <sub>C</sub>	100	mA
Peak Collector Current	I <sub>CM</sub>	200	mA
Peak Emitter Current	I <sub>EM</sub>	200	mA

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	0.46	W
		1	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	272	°C/W
		120	
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	110	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-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**

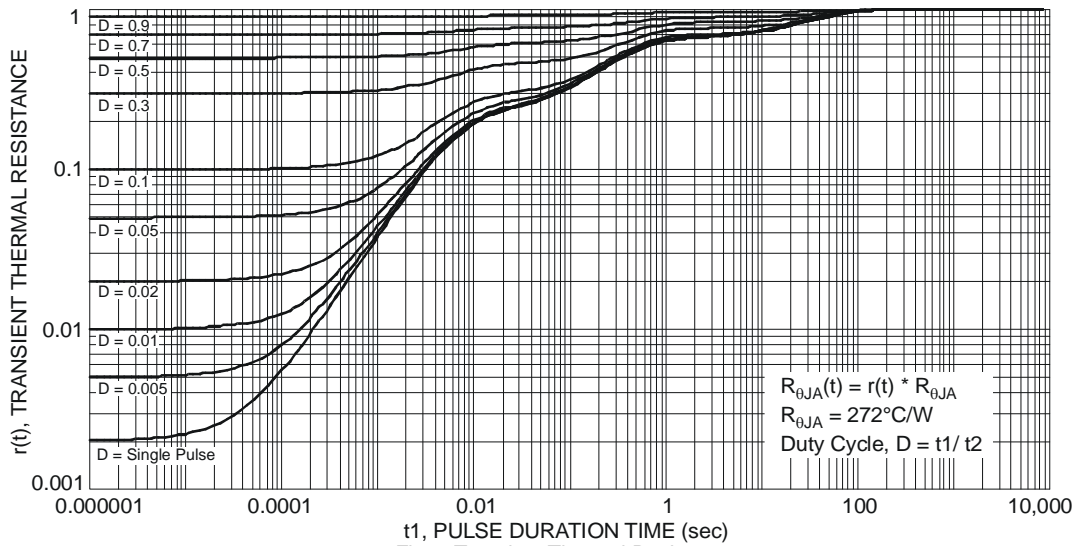


Fig. 1 Transient Thermal Resistance

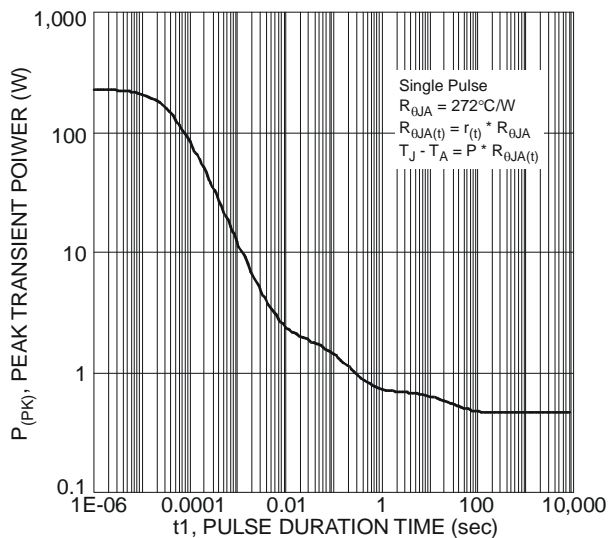


Fig. 2 Single Pulse Maximum Power Dissipation

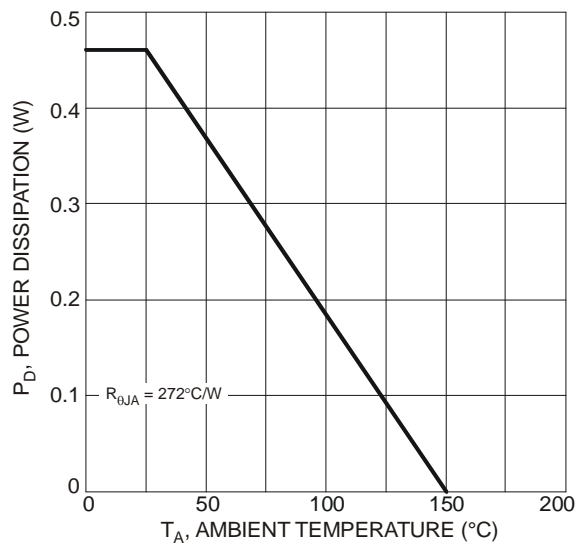


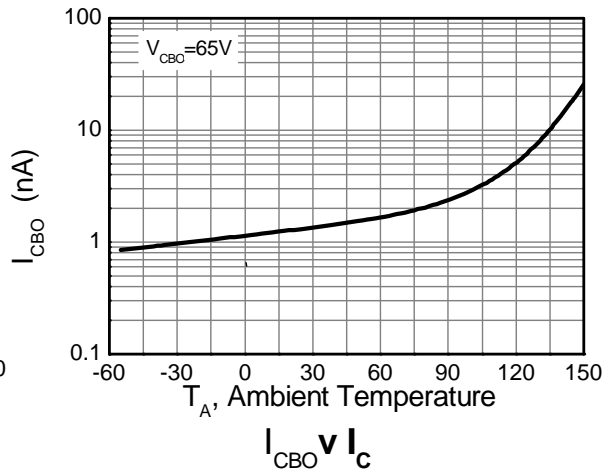
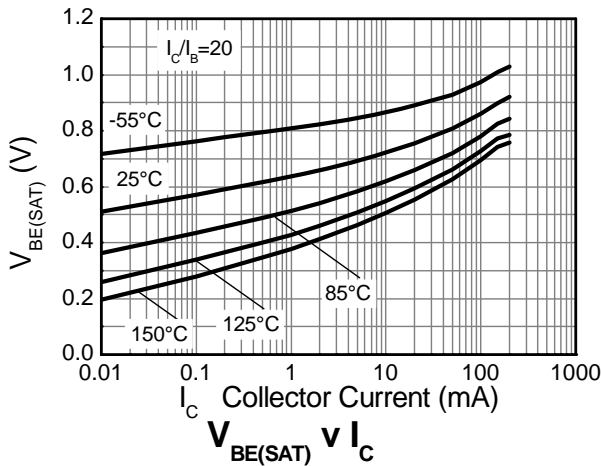
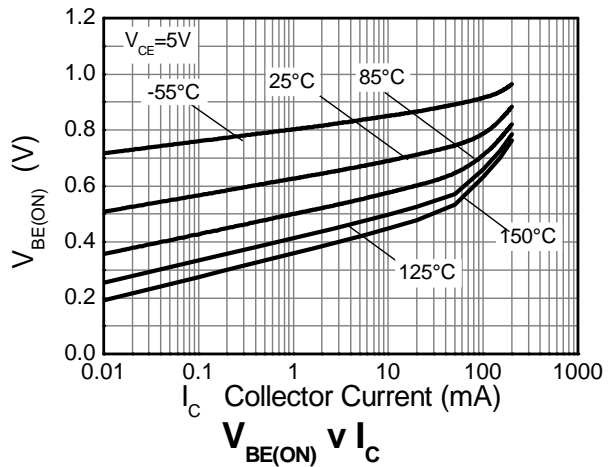
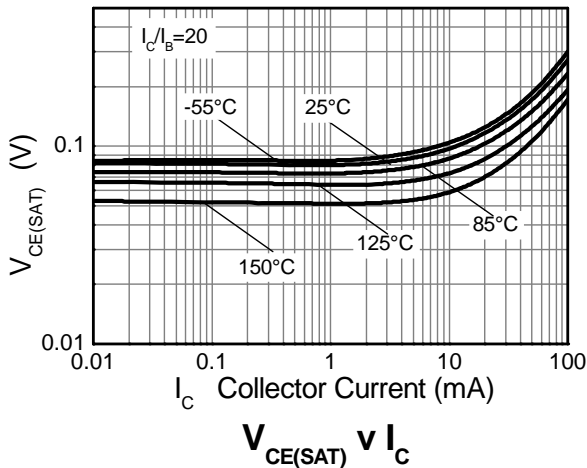
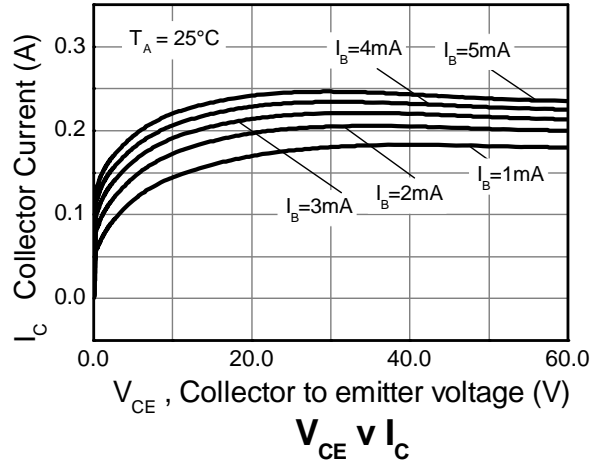
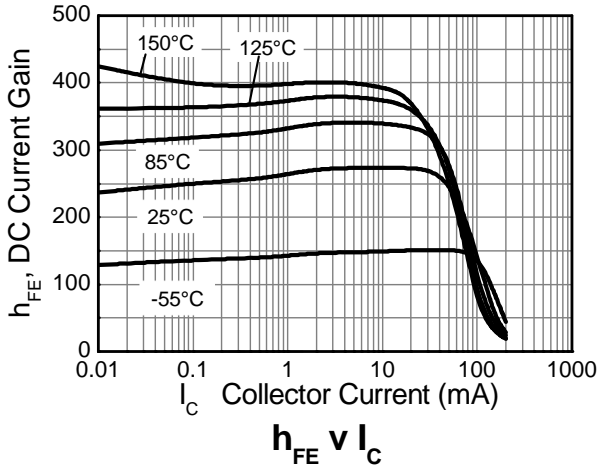
Fig. 3 Power Dissipation vs. Ambient Temperature

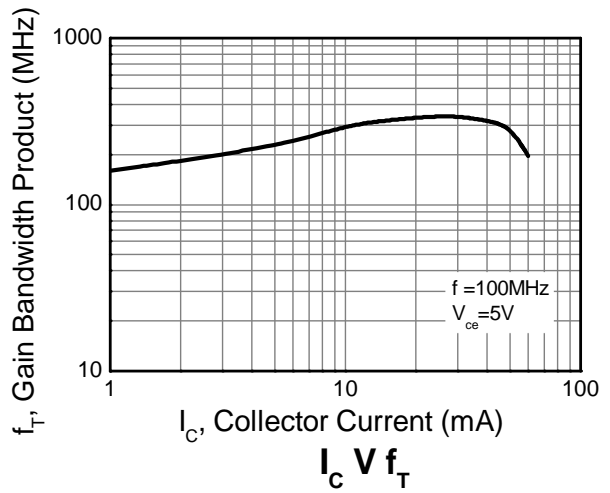
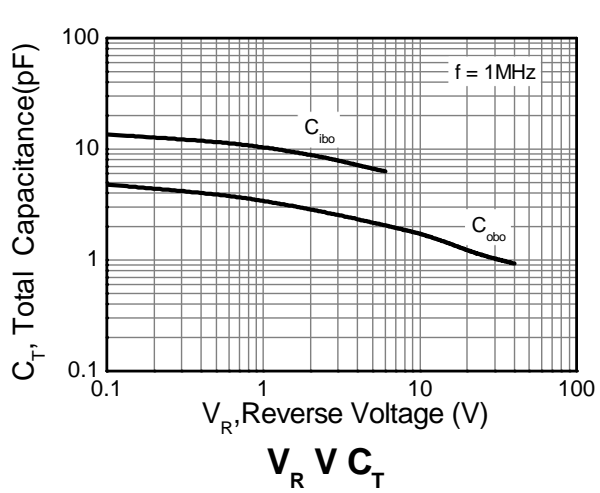
**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
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 $\mu\text{A}$	$V_{CB} = 40\text{V}$ $V_{CB} = 30\text{V}, T_A = +150^\circ\text{C}$
<b>ON CHARACTERISTICS (Note 9)</b>						
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	$V_{CE} = 5\text{V}, I_C = 2.0\text{mA}$ $V_{CE} = 5\text{V}, I_C = 10\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS (Note 9)</b>						
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	

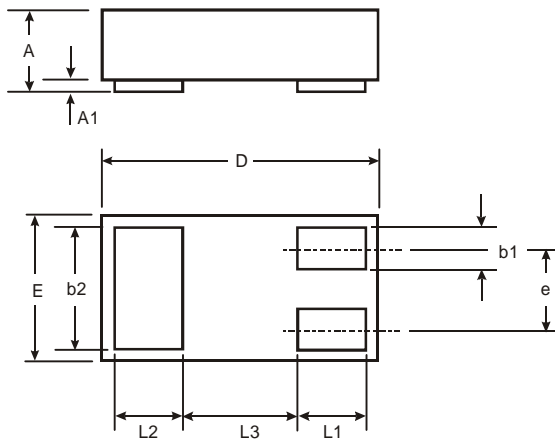
Note: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**Typical Electrical Characteristics**



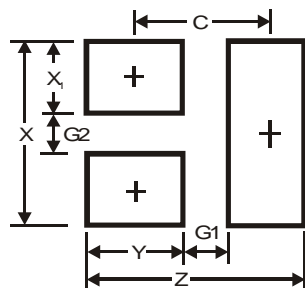


**Package Outline Dimensions**



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

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