



**THE DATASHEET OF  
BC847B-13-F**

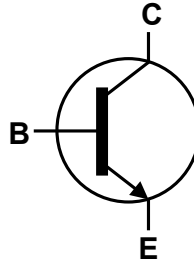


## Features

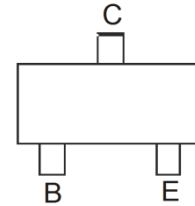
- Ideally Suited for Automatic Insertion
- Complementary PNP Types: BC856 – BC858
- For switching and AF Amplifier Applications
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**



Top View



Device Symbol


 Top View  
Pin-Out

## 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)

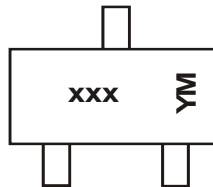
## Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Quantity per reel
BC846A-7-F	AEC-Q101	K1Q	7	3,000
BC846AQ-7-F	Automotive	K1Q	7	3,000
BC846B-7-F	AEC-Q101	K1R	7	3,000
BC846BQ-7-F	Automotive	K1R	7	3,000
BC846B-13-F	AEC-Q101	K1R	13	10,000
BC846BQ-13-F	Automotive	K1R	13	10,000
BC847A-7-F	AEC-Q101	K1Q	7	3,000
BC847AQ-7-F	Automotive	K1Q	7	3,000
BC847A-13-F	AEC-Q101	K1Q	13	10,000
BC847B-7-F	AEC-Q101	K1R	7	3,000
BC847BQ-7-F	Automotive	K1R	7	3,000

Product	Compliance	Marking	Reel size (inches)	Quantity per reel
BC847B-13-F	AEC-Q101	K1R	13	10,000
BC847C-7-F	AEC-Q101	K1M	7	3,000
BC847CQ-7-F	Automotive	K1M	7	3,000
BC847C-13-F	AEC-Q101	K1M	13	10,000
BC848A-7-F	AEC-Q101	K1Q	7	3,000
BC848B-7-F	AEC-Q101	K1R	7	3,000
BC848B-13-F	AEC-Q101	K1R	13	10,000
BC848C-7-F	AEC-Q101	K1M	7	3,000
BC848CQ-7-F	Automotive	K1M	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](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/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  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: Y = 2011)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016	2017
Code	X	Y	Z	A	B	C	D	E

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

Characteristic		Symbol	Value	Unit
Collector-Base Voltage	BC846	$V_{CBO}$	80	V
	BC847		50	
	BC848		30	
Collector-Emitter Voltage	BC846	$V_{CEO}$	65	V
	BC847		45	
	BC848		30	
Emitter-Base Voltage	BC846, BC847	$V_{EBO}$	6.0	V
	BC848		5.0	
Continuous Collector Current		$I_C$	100	mA
Peak Collector Current		$I_{CM}$	200	mA
Peak Emitter Current		$I_{EM}$	200	mA

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

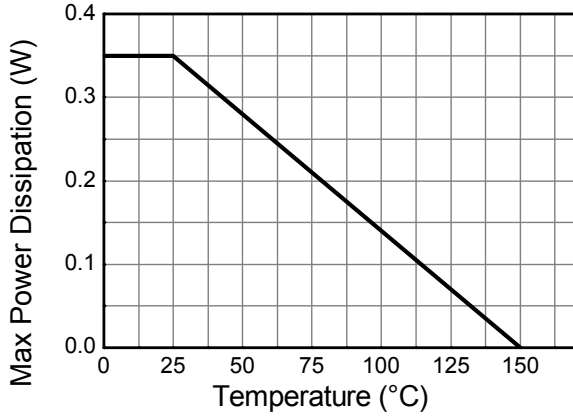
Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 6)	$P_D$	310	mW
	(Note 7)		350	
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	403	$^\circ\text{C/W}$
	(Note 7)		357	
Thermal Resistance, Junction to Leads	(Note 8)	$R_{\theta JL}$	350	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-65 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 9)

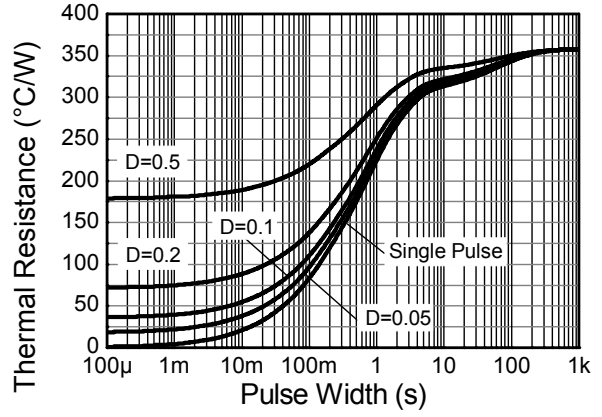
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR4 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 15 mm 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.

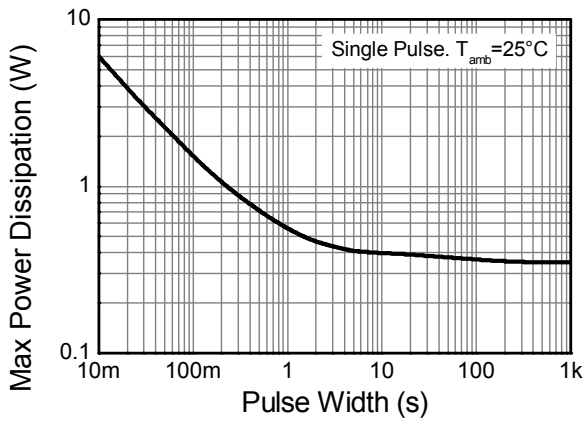
**Thermal Characteristics and Derating Information**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BC846	BV <sub>CB0</sub>	80	—	—	V	I <sub>C</sub> = 10μA
	BC847		50				
	BC848		30				
Collector-Emitter Breakdown Voltage (Note 10)	BC846	BV <sub>CEO</sub>	65	—	—	V	I <sub>C</sub> = 10mA
	BC847		45				
	BC848		30				
Emitter-Base Breakdown Voltage	BC846 / BC847	BV <sub>EBO</sub>	6	—	—	V	I <sub>E</sub> = 1μA
	BC848		5				
Collector Cutoff Current		I <sub>CB0</sub>	—	—	15	nA	V <sub>CB</sub> = 30V
					5	μA	V <sub>CB</sub> = 30V, T <sub>J</sub> = +150°C
Collector Emitter Cutoff Current	BC846	I <sub>CES</sub>	—	—	15	nA	V <sub>CE</sub> = 80V
	BC847				15		V <sub>CE</sub> = 50V
	BC848				15		V <sub>CE</sub> = 30V
Emitter Base Cutoff Current		I <sub>EBO</sub>	—	—	100	nA	V <sub>EB</sub> = 5V
Small Signal Current Gain (Note 10)	BC846A / BC847A / BC848A	h <sub>fe</sub>	—	—	200	—	—
	BC846B / BC847B / BC848B				330		
	BC847C / BC848C				600		
Input Impedance (Note 10)	BC846A / BC847A / BC848A	h <sub>ie</sub>	—	—	2.7	kΩ	I <sub>C</sub> = 2.0mA, V <sub>CE</sub> = 5V f = 1.0kHz
	BC846B / BC847B / BC848B				4.5		
	BC847C / BC848C				8.7		
Output Admittance (Note 10)	BC846A / BC847A / BC848A	h <sub>oe</sub>	—	—	18	μS	I <sub>C</sub> = 2.0mA, V <sub>CE</sub> = 5V f = 1.0kHz
	BC846B / BC847B / BC848B				30		
	BC847C / BC848C				60		
Reverse Voltage Transfer Ratio (Note 10)	BC846A / BC847A / BC848A	h <sub>re</sub>	—	—	1.5x10 <sup>-4</sup>	—	—
	BC846B / BC847B / BC848B				2x10 <sup>-4</sup>		
	BC847C / BC848C				3x10 <sup>-4</sup>		
DC Current Gain (Note 10)	BC846A / BC847A / BC848A	h <sub>FE</sub>	110	180	220	—	I <sub>C</sub> = 2.0mA, V <sub>CE</sub> = 5V
	BC846B / BC847B / BC848B		200	290	450		
	BC847C / BC848C		420	520	800		
Collector-Emitter Saturation Voltage (Note 10)		V <sub>CE(sat)</sub>	—	—	90	mV	I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.5mA
					200		600
Base-Emitter Turn-On Voltage (Note 10)		V <sub>BE(on)</sub>	—	—	580	mV	I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5V
					—		770
Base-Emitter Saturation Voltage (Note 10)		V <sub>BE(sat)</sub>	—	—	700	mV	I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.5mA
					900		I <sub>C</sub> = 100mA, I <sub>B</sub> = 5mA
Output Capacitance		C <sub>obo</sub>	—	3	—	pF	V <sub>CB</sub> = 10V, f = 1.0MHz
Transition Frequency		f <sub>T</sub>	100	300	—	MHz	V <sub>CE</sub> = 5V, I <sub>C</sub> = 10mA, f = 100MHz
Noise Figure		NF	—	2	10	dB	V <sub>CE</sub> = 5V, I <sub>C</sub> = 200μA R <sub>S</sub> = 2kΩ, f = 1kHz Δf = 200Hz

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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

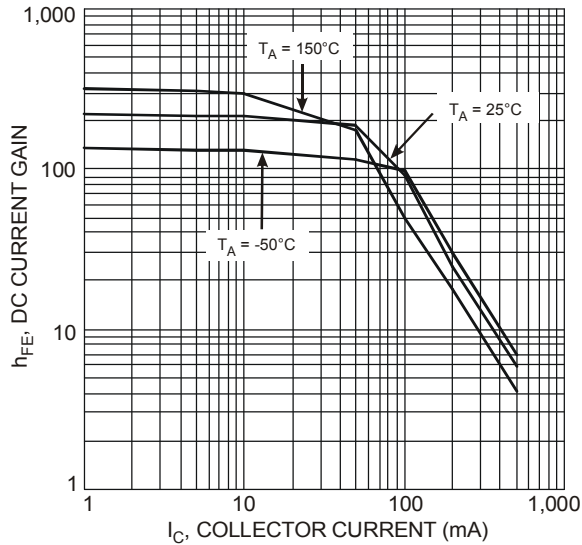


Figure 1 Typical DC Current Gain vs. Collector Current

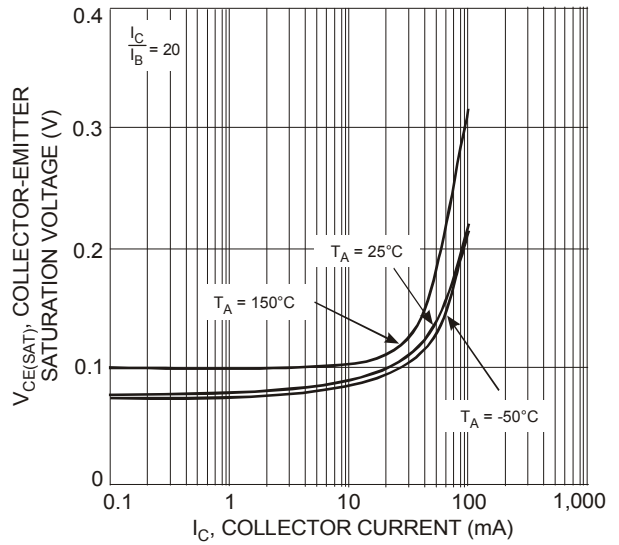


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

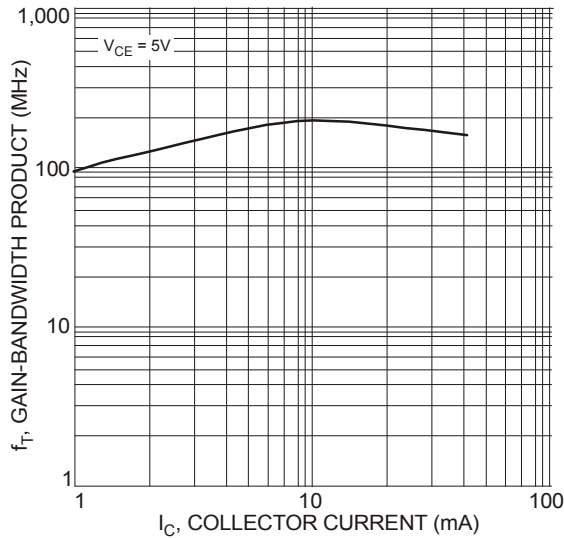
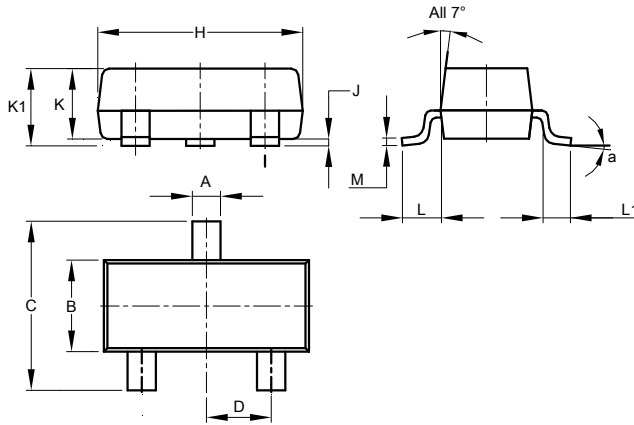


Figure 3 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

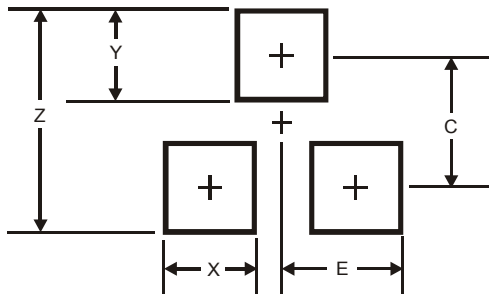
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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	8°		
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)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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