

## General Purpose Transistors

### NPN Silicon

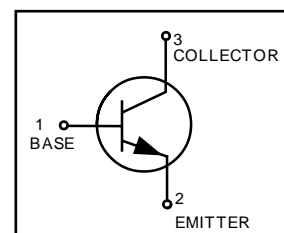
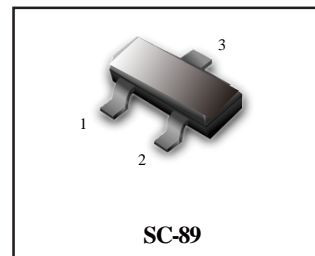
These transistors are designed for general purpose amplifier applications. They are housed in the SC-89 package which is designed for low power surface mount applications.

#### Features

- Pb-Free Packages are Available

#### MAXIMUM RATINGS ( $T_A = 25\text{ C}$ )

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	45	V
Collector-Base Voltage	$V_{CBO}$	50	V
Emitter-Base Voltage	$V_{EBO}$	6.0	V
Collector Current - Continuous	$I_C$	100	mAdc



#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation, FR-4 Board (Note 1) $T_A = 25\text{ C}$ Derated above 25 C	$P_D$	200	mW
		1.6	mW/ C
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	600	C/W
Total Device Dissipation, FR-4 Board (Note 2) $T_A = 25\text{ C}$ Derated above 25 C	$P_D$	300	mW
		2.4	mW/ C
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	400	C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	C

1. FR-4 @ min pad.
2. FR-4 @  $1.0 \times 1.0$  in pad.

#### ORDERING INFORMATION

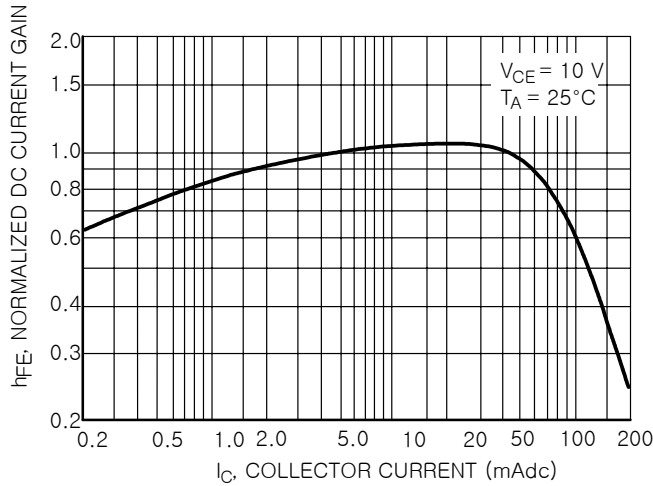
Device	Marking	Package	Shipping†
BC847EAT1G	1E	SC-89	3,000 / Tape & Reel
BC847EBT1G	1F	SC-89	3,000 / Tape & Reel
BC847ECT1G	1G	SC-89	3,000 / Tape & Reel



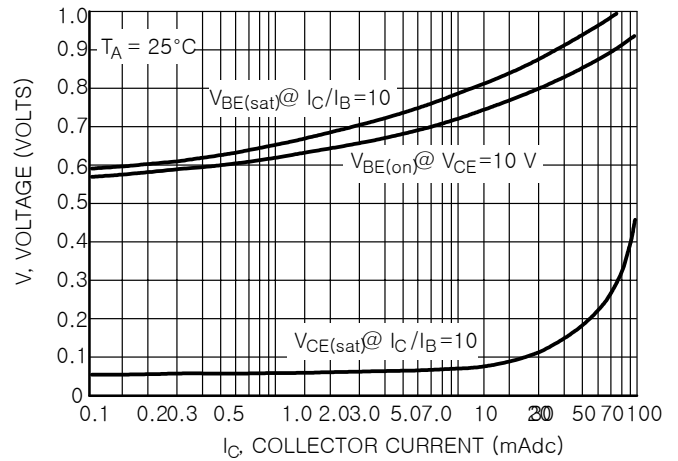
# BC847E

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

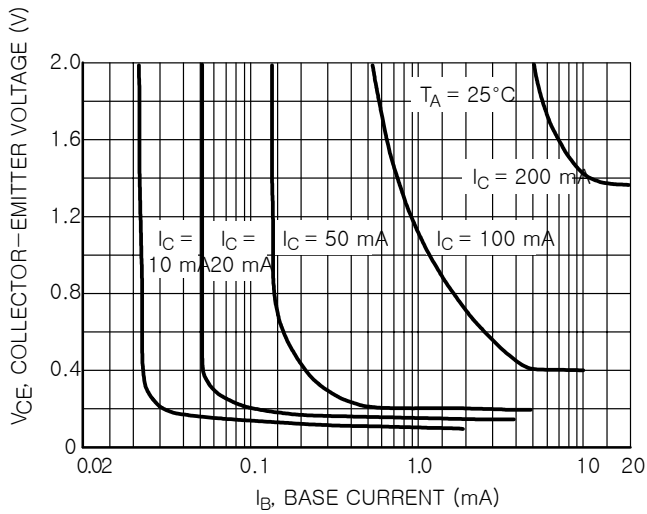
Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage ( $I_C = 10\text{ mA}$ )	$V_{(BR)CEO}$	45	–	–	V
Collector – Emitter Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $V_{EB} = 0$ )	$V_{(BR)CES}$	50	–	–	V
Collector – Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ )	$V_{(BR)CBO}$	50	–	–	V
Emitter – Base Breakdown Voltage ( $I_E = 1.0\ \mu\text{A}$ )	$V_{(BR)EBO}$	6.0	–	–	V
Collector Cutoff Current ( $V_{CB} = 30\text{ V}$ ) ( $V_{CB} = 30\text{ V}$ , $T_A = 150^\circ\text{C}$ )	$I_{CBO}$	– –	– –	15 5.0	nA $\mu\text{A}$
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 10\ \mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )	$h_{FE}$	–	90	–	–
BC847EA		–	150	–	–
BC847EB BC847EC		–	270	–	–
( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	BC847EA	110	180	220	
	BC847EB	200	290	450	
	BC847EC	420	520	800	
Collector – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{CE(sat)}$	– –	– –	0.25 0.6	V
Base – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{BE(sat)}$	– –	0.7 0.9	– –	V
Base – Emitter Voltage ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	$V_{BE(on)}$	580 –	660 –	700 770	mV
<b>SMALL-SIGNAL CHARACTERISTICS</b>					
Current – Gain – Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	100	–	–	MHz
Output Capacitance ( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	–	4.5	pF
Noise Figure ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	–	–	10	dB



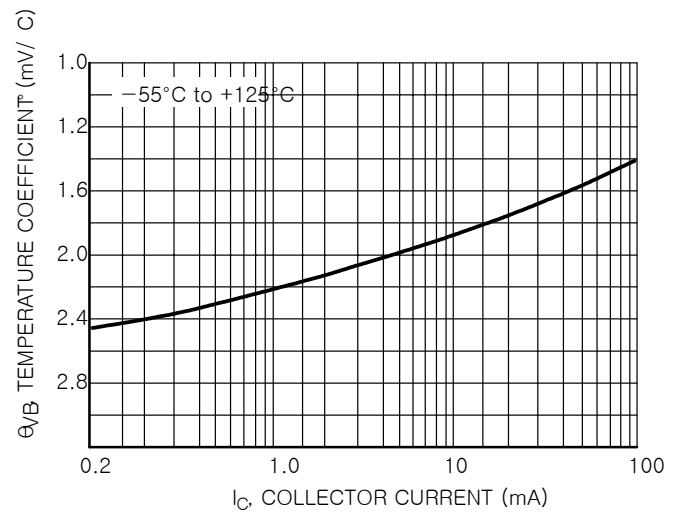
**Figure 1. Normalized DC Current Gain**



**Figure 2. "Saturation" and "On" Voltages**



**Figure 3. Collector Saturation Region**



**Figure 4. Base-Emitter Temperature Coefficient**



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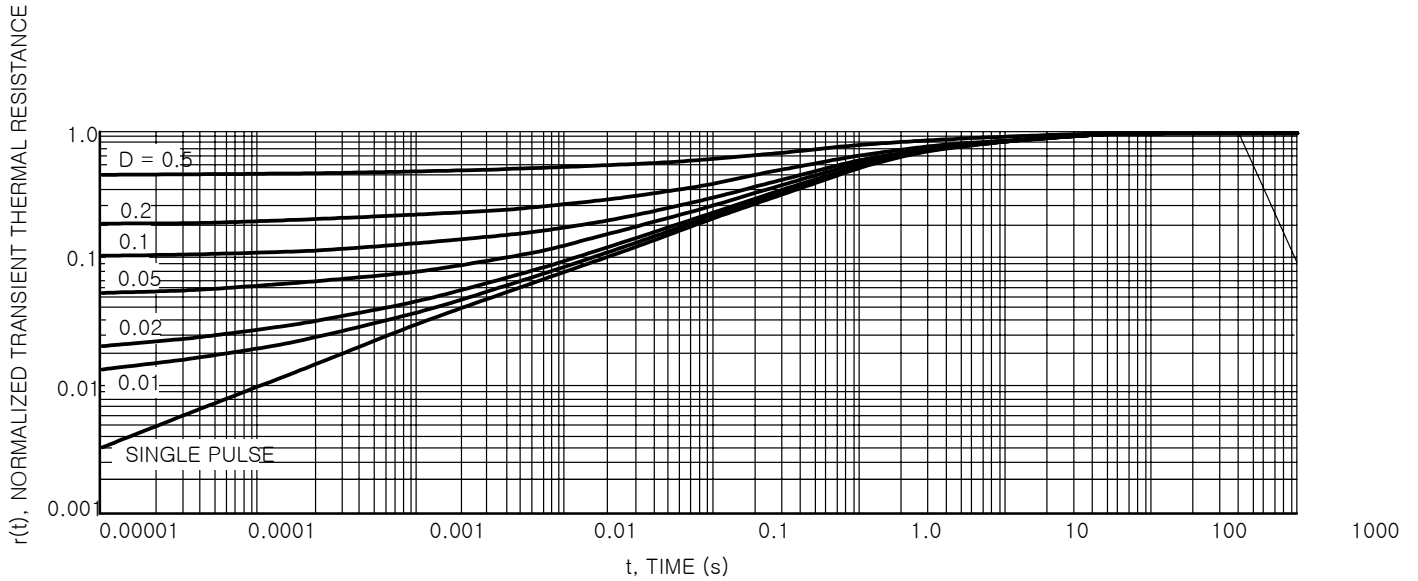


Figure 5. Normalized Thermal Response

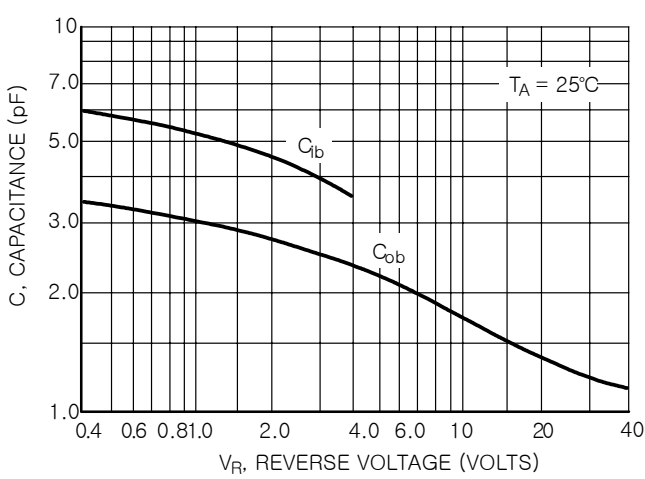


Figure 6. Capacitances

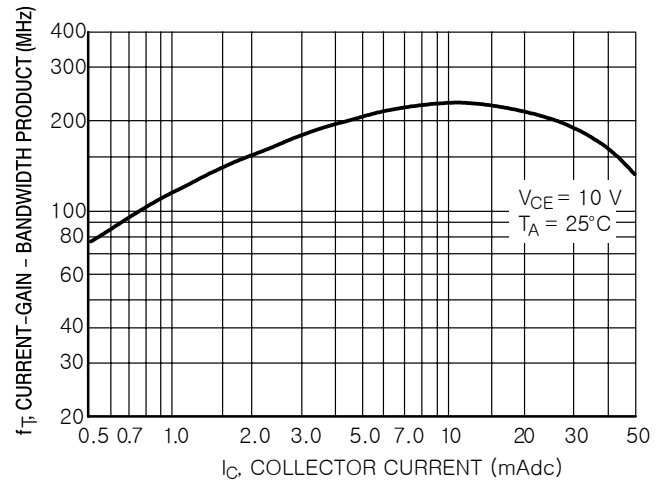
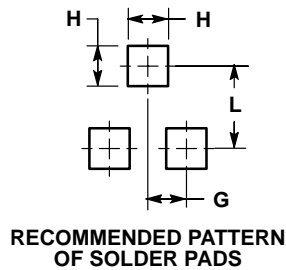
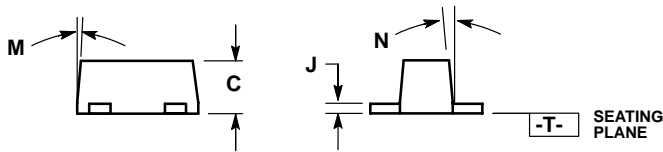
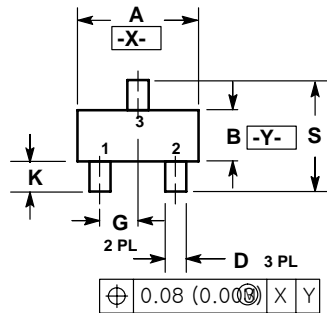


Figure 7. Current-Gain - Bandwidth Product

## SC-89



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	---	---	°10	---	---	°10
N	---	---	°10	---	---	°10
S	1.50	1.60	1.70	0.059	0.063	0.067