

# 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
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

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

| 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

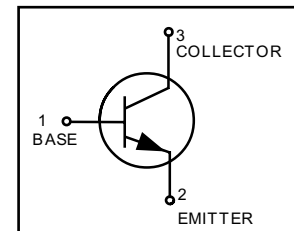
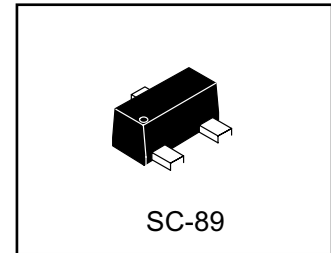
| Characteristic   | Symbol          | Max            | Unit                      |
|--|-----------------|----------------|---------------------------|
| Total Device Dissipation,<br>FR-4 Board (Note 1)<br>$T_A = 25^\circ\text{C}$<br>Derated above $25^\circ\text{C}$ | $P_D$           | 200          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

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

### ORDERING INFORMATION

| Device                       | Marking | Package | Shipping†           |
|------------------------------|---------|---------|---------------------|
| LBC847ATT1G<br>S-LBC847ATT1G | 1E      | SC-89   | 3,000 / Tape & Reel |
| LBC847BTT1G<br>S-LBC847BTT1G | 1F      | SC-89   | 3,000 / Tape & Reel |
| LBC847CTT1G<br>S-LBC847CTT1G | 1G      | SC-89   | 3,000 / Tape & Reel |

**LBC847ATT1G  
S-LBC847ATT1G  
Series**



**LBC847ATT1G Series**  
**S-LBC847ATT1G Series**

**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<br>( $I_C = 10\text{ mA}$ )  | LBC847 Series<br>$V_{(BR)CEO}$ | 45                | –                 | –                 | V                   |
| Collector–Emitter Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $V_{EB} = 0$ )  | LBC847 Series<br>$V_{(BR)CES}$ | 50                | –                 | –                 | V                   |
| Collector–Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ )  | LBC847 Series<br>$V_{(BR)CBO}$ | 50                | –                 | –                 | V                   |
| Emitter–Base Breakdown Voltage<br>( $I_E = 1.0\text{ }\mu\text{A}$ )   | LBC847 Series<br>$V_{(BR)EBO}$ | 6.0               | –                 | –                 | V                   |
| Collector Cutoff Current ( $V_{CB} = 30\text{ V}$ )<br>( $V_{CB} = 30\text{ V}$ , $T_A = 150^\circ\text{C}$ )                                    | $I_{CBO}$                      | –                 | –                 | 15<br>5.0         | nA<br>$\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>  |                                |                   |                   |                   |                     |
| DC Current Gain<br>( $I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )   | LBC847A<br>LBC847B<br>LBC847C  | –                 | 90                | –                 | –                   |
| ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )  | LBC847A<br>LBC847B<br>LBC847C  | 110<br>200<br>420 | 180<br>290<br>520 | 220<br>450<br>800 | –                   |
| Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )<br>( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )       | $V_{CE(sat)}$                  | –                 | –                 | 0.25<br>0.6       | V                   |
| Base–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )<br>( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )            | $V_{BE(sat)}$                  | –                 | 0.7<br>0.9        | –                 | V                   |
| Base–Emitter Voltage ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )                   | $V_{BE(on)}$                   | 580               | 660               | 700<br>770        | mV                  |
| <b>SMALL–SIGNAL CHARACTERISTICS</b>  |                                |                   |                   |                   |                     |
| Current–Gain – Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                  | $f_T$                          | 100               | –                 | –                 | MHz                 |
| Output Capacitance ( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )   | $C_{obo}$                      | –                 | –                 | 4.5               | pF                  |
| Noise Figure<br>( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | NF                             | –                 | –                 | 10                | dB                  |

**LBC847ATT1G Series**  
**S-LBC847ATT1G Series**

**LBC847ATT1G, LBC847BTT1G, LBC847CTT1G**

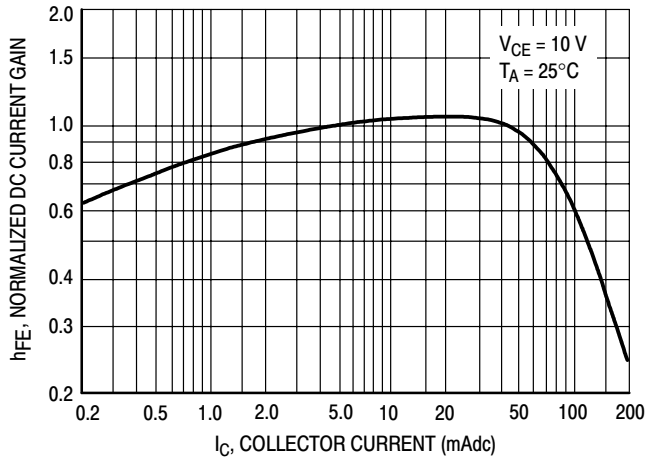


Figure 1. Normalized DC Current Gain

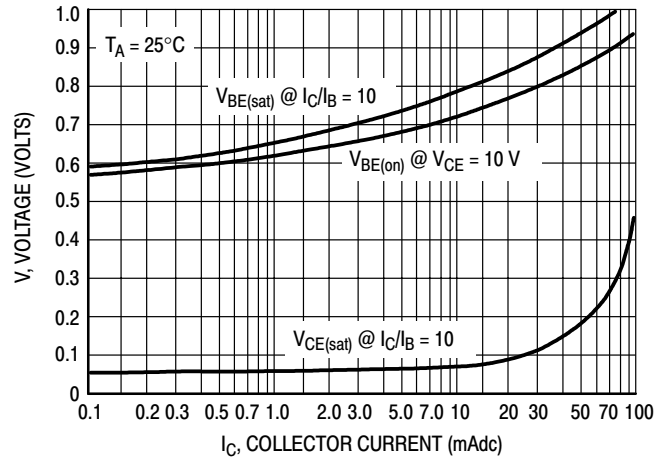


Figure 2. "Saturation" and "On" Voltages

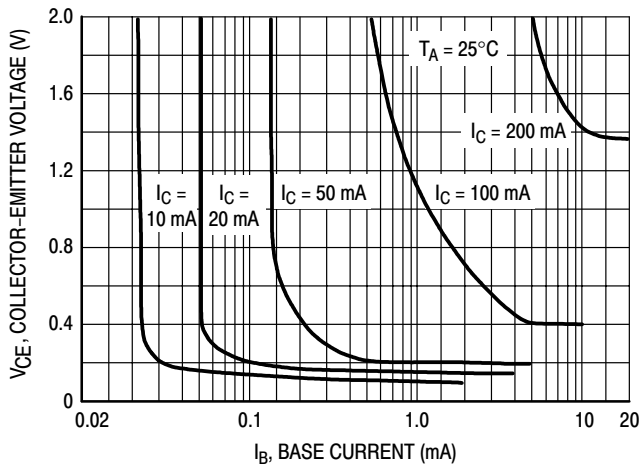


Figure 3. Collector Saturation Region

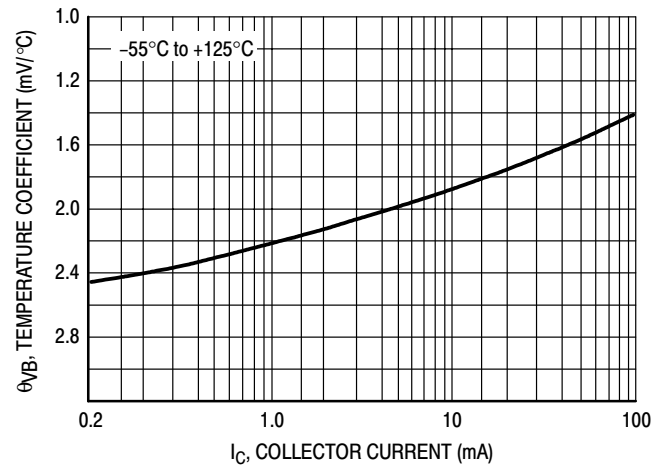
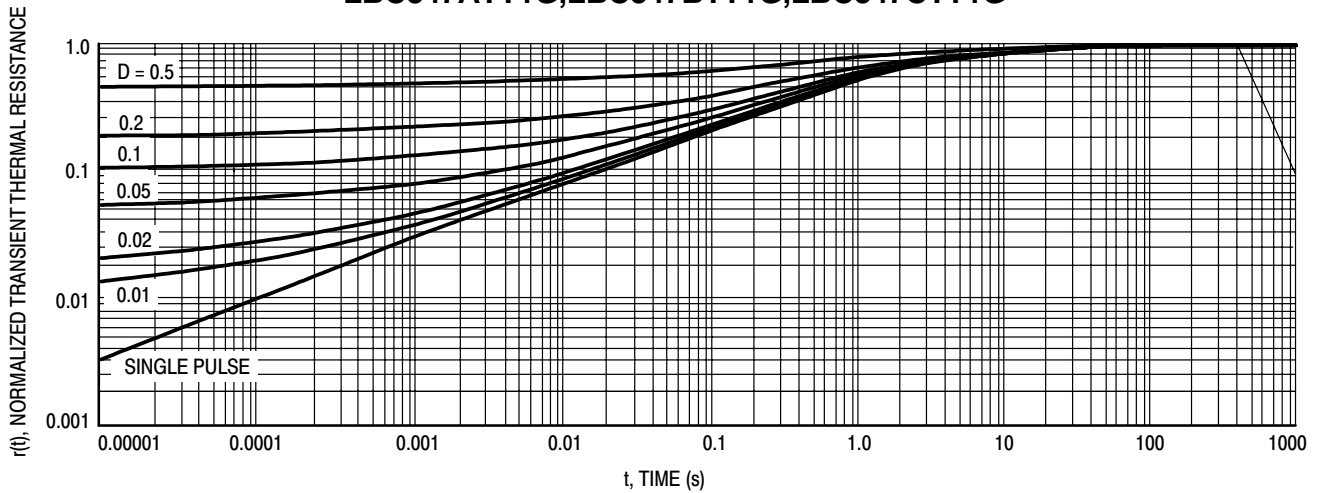


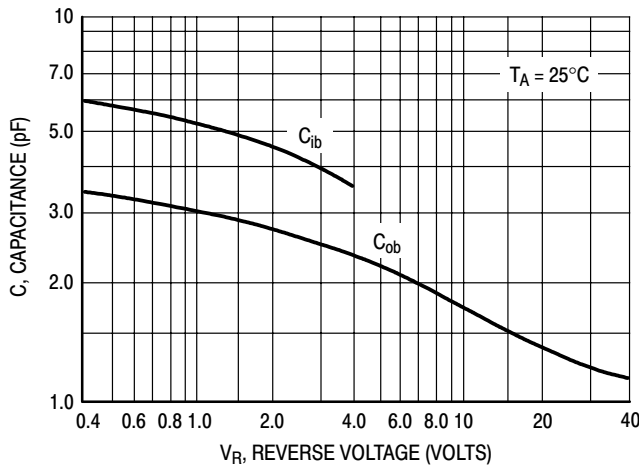
Figure 4. Base-Emitter Temperature Coefficient

**LBC847ATT1G Series**  
**S-LBC847ATT1G Series**

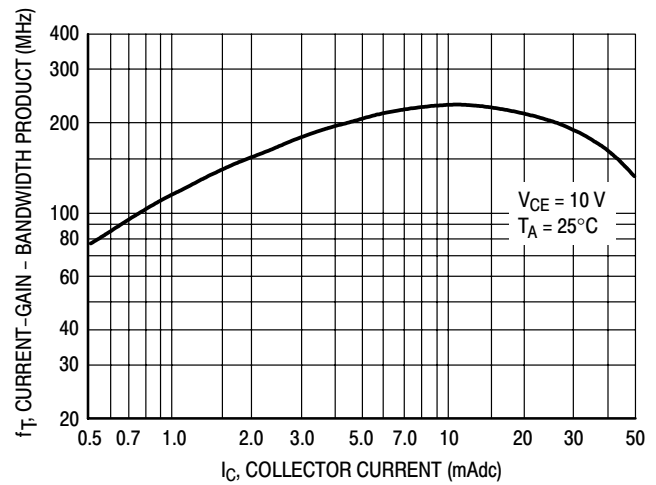
**LBC847ATT1G, LBC847BTT1G, LBC847CTT1G**



**Figure 5. Normalized Thermal Response**



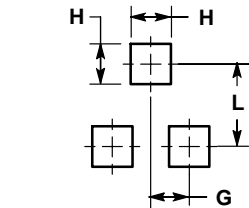
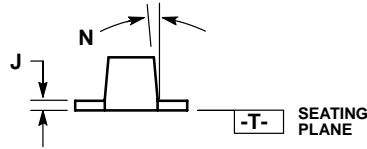
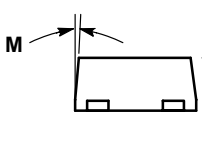
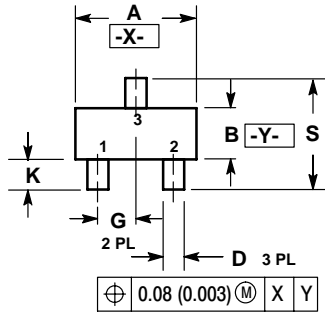
**Figure 6. Capacitances**



**Figure 7. Current-Gain - Bandwidth Product**

**LBC847ATT1G Series**  
**S-LBC847ATT1G Series**

SC-89



RECOMMENDED PATTERN OF SOLDER PADS

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 |