

# General Purpose Transistors

## NPN Silicon

- Moisture Sensitivity Level: 1
- ESD Rating – Human Body Model: >4000 V  
– Machine Model: >400 V
- We declare that the material of product compliance with RoHS requirements.

### MAXIMUM RATINGS

| Rating                                                                  | Symbol    | Value             | Unit |
|-------------------------------------------------------------------------|-----------|-------------------|------|
| Collector–Emitter Voltage<br>LBC846<br>LBC847, LBC850<br>LBC848, LBC849 | $V_{CEO}$ | 65<br>45<br>30    | Vdc  |
| Collector–Base Voltage<br>LBC846<br>LBC847, LBC850<br>LBC848, LBC849    | $V_{CBO}$ | 80<br>50<br>30    | Vdc  |
| Emitter–Base Voltage<br>LBC846<br>LBC847, LBC850<br>LBC848, LBC849      | $V_{EBO}$ | 6.0<br>6.0<br>5.0 | Vdc  |
| Collector Current – Continuous                                          | $I_C$     | 100               | mAdc |

### THERMAL CHARACTERISTICS

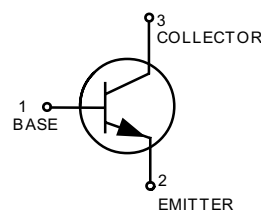
| Characteristic                                                                                                         | Symbol          | Max            | Unit                       |
|------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|----------------------------|
| Total Device Dissipation FR–5 Board<br>(Note 1.)<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8     | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction to Ambient (Note 1.)                                                                   | $R_{\theta JA}$ | 556            | $^\circ\text{C/W}$         |
| Total Device Dissipation<br>Alumina Substrate (Note 2.)<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4     | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction to Ambient (Note 2.)                                                                   | $R_{\theta JA}$ | 417            | $^\circ\text{C/W}$         |
| Junction and Storage<br>Temperature Range                                                                              | $T_J, T_{stg}$  | –55 to<br>+150 | $^\circ\text{C}$           |

1. FR–5 = 1.0 x 0.75 x 0.062 in
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

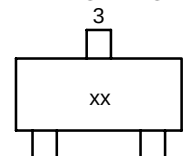
### LBC846ALT1G Series



SOT–23



### MARKING DIAGRAM



xx= Device Marking  
(See Table Below)

**LBC846ALT1G Series****DEVICE MARKING AND ORDERING INFORMATION**

| Device      | Marking | Package | Shipping        |
|-------------|---------|---------|-----------------|
| LBC846ALT1G | 1A      | SOT-23  | 3000/Tape&Reel  |
| LBC846ALT3G | 1A      | SOT-23  | 10000/Tape&Reel |
| LBC846BLT1G | 1B      | SOT-23  | 3000/Tape&Reel  |
| LBC846BLT3G | 1B      | SOT-23  | 10000/Tape&Reel |
| LBC847ALT1G | 1E      | SOT-23  | 3000/Tape&Reel  |
| LBC847ALT3G | 1E      | SOT-23  | 10000/Tape&Reel |
| LBC847BLT1G | 1F      | SOT-23  | 3000/Tape&Reel  |
| LBC847BLT3G | 1F      | SOT-23  | 10000/Tape&Reel |
| LBC847CLT1G | 1G      | SOT-23  | 3000/Tape&Reel  |
| LBC847CLT3G | 1G      | SOT-23  | 10000/Tape&Reel |
| LBC848ALT1G | 1J      | SOT-23  | 3000/Tape&Reel  |
| LBC848ALT3G | 1J      | SOT-23  | 10000/Tape&Reel |
| LBC848BLT1G | 1K      | SOT-23  | 3000/Tape&Reel  |
| LBC848BLT3G | 1K      | SOT-23  | 10000/Tape&Reel |
| LBC848CLT1G | 1L      | SOT-23  | 3000/Tape&Reel  |
| LBC848CLT3G | 1L      | SOT-23  | 10000/Tape&Reel |
| LBC849BLT1G | 2B      | SOT-23  | 3000/Tape&Reel  |
| LBC849BLT3G | 2B      | SOT-23  | 10000/Tape&Reel |
| LBC849CLT1G | 2C      | SOT-23  | 3000/Tape&Reel  |
| LBC849CLT3G | 2C      | SOT-23  | 10000/Tape&Reel |
| LBC850BLT1G | 2F      | SOT-23  | 3000/Tape&Reel  |
| LBC850BLT3G | 2F      | SOT-23  | 10000/Tape&Reel |
| LBC850CLT1G | 2G      | SOT-23  | 3000/Tape&Reel  |
| LBC850CLT3G | 2G      | SOT-23  | 10000/Tape&Reel |

## LBC846ALT1G Series

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

| Characteristic                                                                                        | Symbol                                                        | Min                  | Typ               | Max         | Unit        |          |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------|-------------------|-------------|-------------|----------|
| OFF CHARACTERISTICS                                                                                   |                                                               |                      |                   |             |             |          |
| Collector–Emitter Breakdown Voltage<br>(I <sub>C</sub> = 10 mA)                                       | LBC846A,B<br>LBC847A,B,C, LBC850B,C<br>LBC848A,B,C, LBC849B,C | V <sub>(BR)CEO</sub> | 65<br>45<br>30    | –<br>–<br>– | –<br>–<br>– | V        |
| Collector–Emitter Breakdown Voltage<br>(I <sub>C</sub> = 10 μA, V <sub>EB</sub> = 0)                  | LBC846A,B<br>LBC847A,B,C, LBC850B,C<br>LBC848A,B,C, LBC849B,C | V <sub>(BR)CES</sub> | 80<br>50<br>30    | –<br>–<br>– | –<br>–<br>– | V        |
| Collector–Base Breakdown Voltage<br>(I <sub>C</sub> = 10 μA)                                          | LBC846A,B<br>LBC847A,B,C, LBC850B,C<br>LBC848A,B,C, LBC849B,C | V <sub>(BR)CBO</sub> | 80<br>50<br>30    | –<br>–<br>– | –<br>–<br>– | V        |
| Emitter–Base Breakdown Voltage<br>(I <sub>E</sub> = 1.0 μA)                                           | LBC846A,B<br>LBC847A,B,C, LBC850B,C<br>LBC848A,B,C, LBC849B,C | V <sub>(BR)EBO</sub> | 6.0<br>6.0<br>5.0 | –<br>–<br>– | –<br>–<br>– | V        |
| Collector Cutoff Current (V <sub>CB</sub> = 30 V)<br>(V <sub>CB</sub> = 30 V, T <sub>A</sub> = 150°C) |                                                               | I <sub>CBO</sub>     | –<br>–            | –<br>–      | 15<br>5.0   | nA<br>μA |

### ON CHARACTERISTICS

|                                                                                                                                            |                                                                                                                   |               |                   |                   |                   |    |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------|-------------------|-------------------|-------------------|----|
| DC Current Gain<br>( $I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )                                                             | LBC846A, LBC847A, LBC848A<br>LBC846B, LBC847B, LBC848B<br>LBC847C, LBC848C                                        | $h_{FE}$      | –<br>–<br>–       | 90<br>150<br>270  | –<br>–<br>–       | –  |
| ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )                                                                                        | LBC846A, LBC847A, LBC848A<br>LBC846B, LBC847B, LBC848B,<br>LBC849B, LBC850B<br>LBC847C, LBC848C, LBC849C, LBC850C |               | 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>( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ ) |                                                                                                                   | $V_{CE(sat)}$ | –<br>–            | –<br>–            | 0.25<br>0.6       | V  |
| Base–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )<br>( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )      |                                                                                                                   | $V_{BE(sat)}$ | –<br>–            | 0.7<br>0.9        | –<br>–            | 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<br>–          | 660<br>–          | 700<br>770        | mV |

### SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                                     |                                                             |           |        |        |           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------|--------|--------|-----------|-----|
| 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 ( $I_C = 0.2\text{ mA}$ ,<br>( $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$<br>$f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | LBC846A,B, LBC847A,B,C, LBC848A,B,C<br>LBC849B,C, LBC850B,C | NF        | –<br>– | –<br>– | 10<br>4.0 | dB  |

## LBC846ALT1G Series

### LBC847, LBC848, LBC849, LBC850

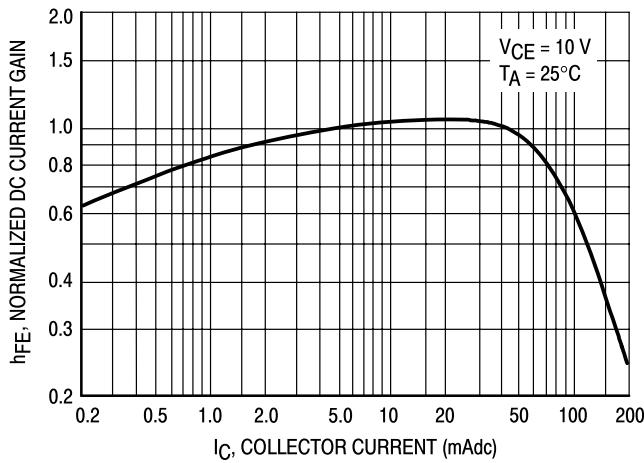


Figure 1. Normalized DC Current Gain

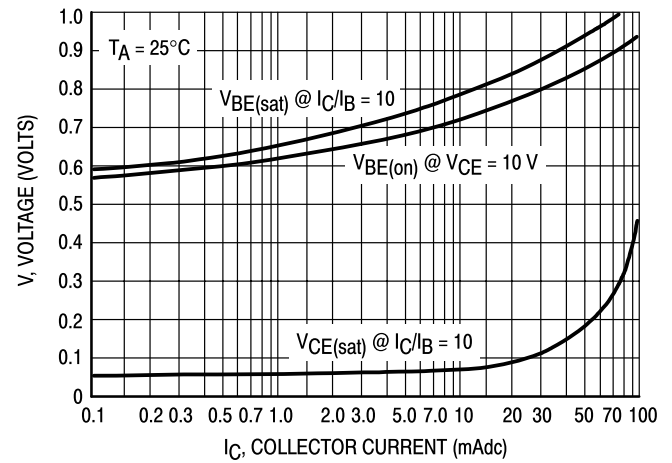


Figure 2. "Saturation" and "On" Voltages

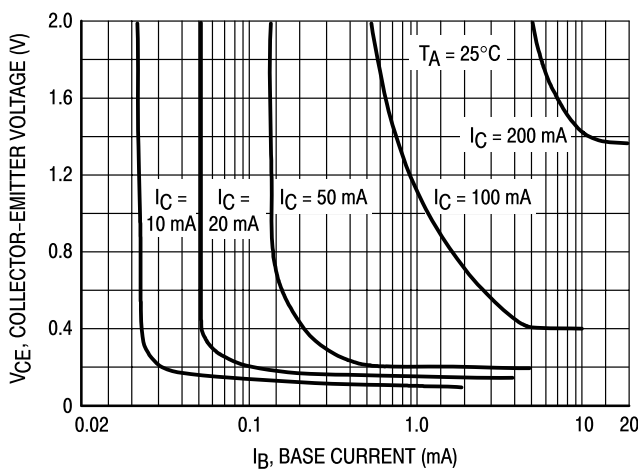


Figure 3. Collector Saturation Region

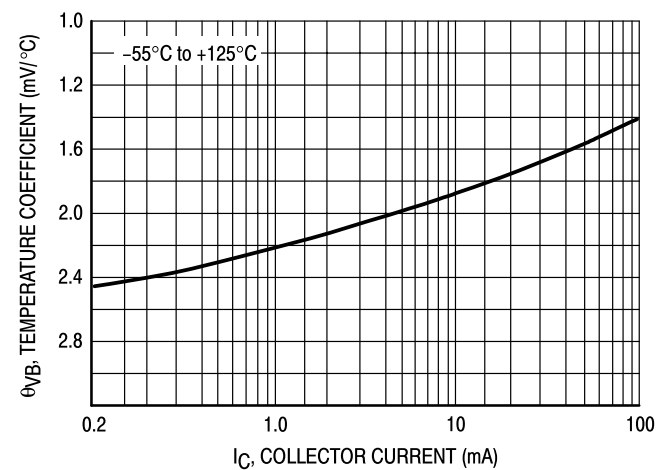


Figure 4. Base-Emitter Temperature Coefficient

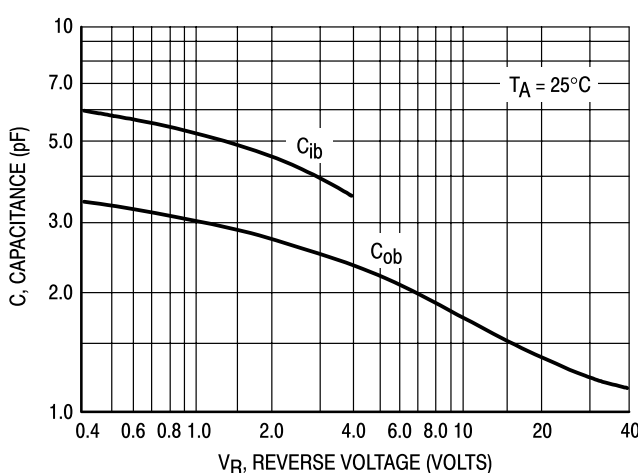


Figure 5. Capacitances

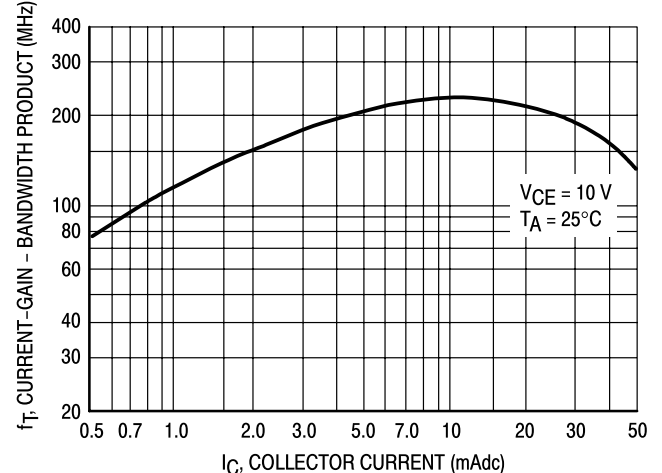


Figure 6. Current-Gain - Bandwidth Product

## LBC846ALT1G Series

### LBC846

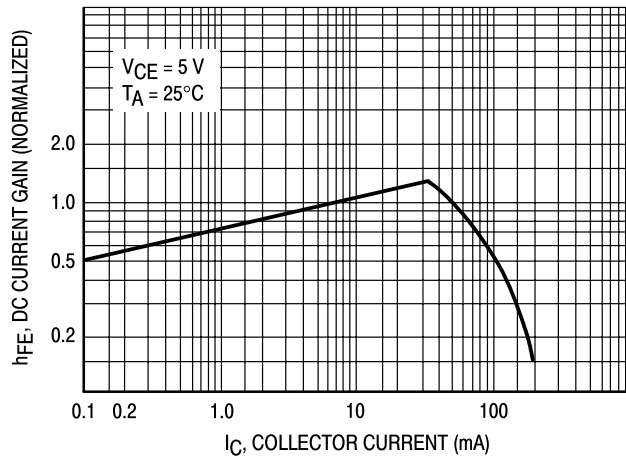


Figure 7. DC Current Gain

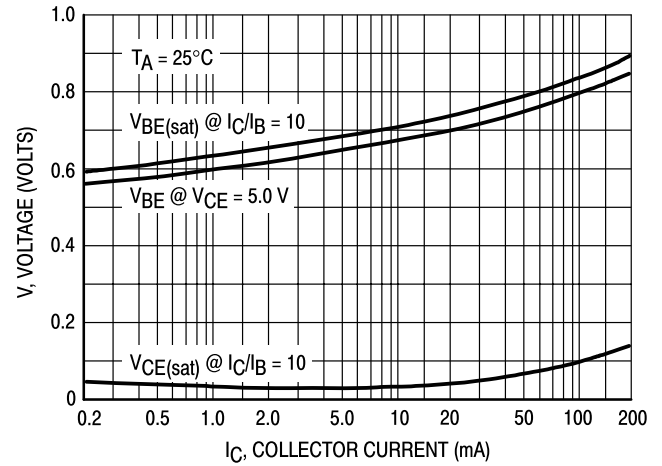


Figure 8. "On" Voltage

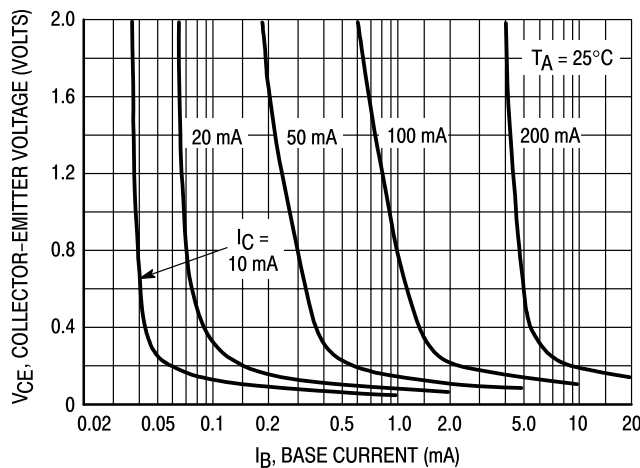


Figure 9. Collector Saturation Region

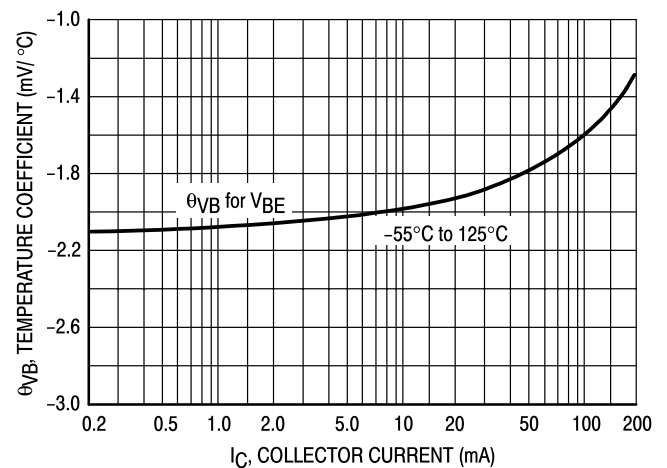


Figure 10. Base-Emitter Temperature Coefficient

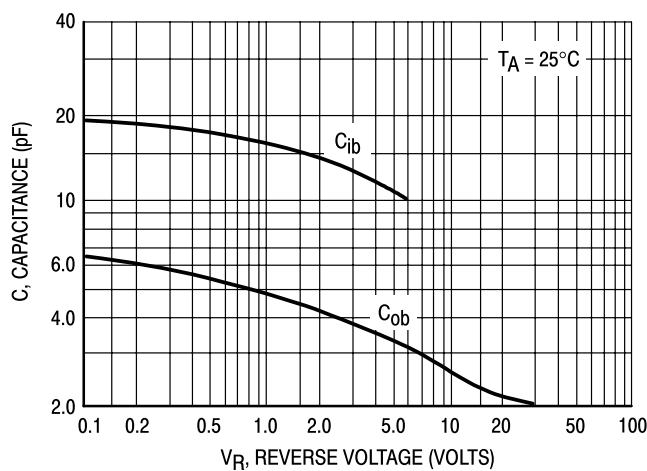


Figure 11. Capacitance

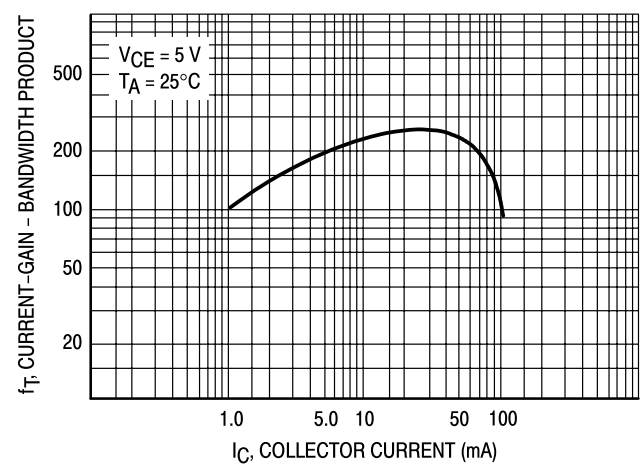
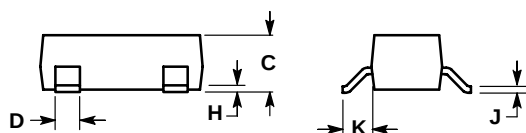
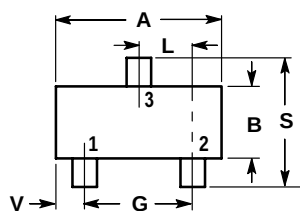


Figure 12. Current-Gain - Bandwidth Product

**LBC846ALT1G Series**
**SOT-23**

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES |        | MILLIMETERS |       |
|-----|--------|--------|-------------|-------|
|     | MIN    | MAX    | MIN         | MAX   |
| A   | 0.1102 | 0.1197 | 2.80        | 3.04  |
| B   | 0.0472 | 0.0551 | 1.20        | 1.40  |
| C   | 0.0350 | 0.0440 | 0.89        | 1.11  |
| D   | 0.0150 | 0.0200 | 0.37        | 0.50  |
| G   | 0.0701 | 0.0807 | 1.78        | 2.04  |
| H   | 0.0005 | 0.0040 | 0.013       | 0.100 |
| J   | 0.0034 | 0.0070 | 0.085       | 0.177 |
| K   | 0.0140 | 0.0285 | 0.35        | 0.69  |
| L   | 0.0350 | 0.0401 | 0.89        | 1.02  |
| S   | 0.0830 | 0.1039 | 2.10        | 2.64  |
| V   | 0.0177 | 0.0236 | 0.45        | 0.60  |

