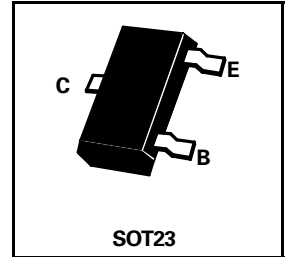


# SOT23 NPN SILICON PLANAR GENERAL PURPOSE TRANSISTORS

ISSUE 6 - JANUARY 1997

|       |       |
|-------|-------|
| BC846 | BC847 |
| BC848 | BC849 |
| BC850 |       |

| PARTMARKING DETAILS |            | COMPLEMENTARY TYPES |       |
|---------------------|------------|---------------------|-------|
| BC846A-Z1A          | BC848B-1K  | BC846               | BC856 |
| BC846B-1B           | BC848C-Z1L | BC847               | BC857 |
| BC847A-Z1E          | BC849B-2B  | BC848               | BC858 |
| BC847B-1F           | BC849C-2C  | BC849               | BC859 |
| BC847C-1GZ          | BC850B-2FZ | BC850               | BC860 |
| BC848A-1JZ          | BC850C-Z2G |                     |       |



## ABSOLUTE MAXIMUM RATINGS.

| PARAMETER                                   | SYMBOL                           | BC846       | BC847 | BC848 | BC849 | BC850 | UNIT |
|---------------------------------------------|----------------------------------|-------------|-------|-------|-------|-------|------|
| Collector-Base Voltage                      | V <sub>CBO</sub>                 | 80          | 50    | 30    | 30    | 50    | V    |
| Collector-Emitter Voltage                   | V <sub>CES</sub>                 | 80          | 50    | 30    | 30    | 50    | V    |
| Collector-Emitter Voltage                   | V <sub>CEO</sub>                 | 65          | 45    | 30    | 30    | 45    | V    |
| Emitter-Base Voltage                        | V <sub>EBO</sub>                 | 6           |       | 5     |       |       | V    |
| Continuous Collector Current                | I <sub>C</sub>                   | 100         |       |       |       |       | mA   |
| Peak Collector Current                      | I <sub>CM</sub>                  | 200         |       |       |       |       | mA   |
| Peak Base Current                           | I <sub>BM</sub>                  | 200         |       |       |       |       | mA   |
| Peak Emitter Current                        | I <sub>EM</sub>                  | 200         |       |       |       |       | mA   |
| Power Dissipation at T <sub>amb</sub> =25°C | P <sub>tot</sub>                 | 330         |       |       |       |       | mW   |
| Operating and Storage Temperature Range     | T <sub>J</sub> :T <sub>stg</sub> | -55 to +150 |       |       |       |       | °C   |

## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}C$ unless otherwise stated).

| PARAMETER                            | SYMBOL        |      | BC846 | BC847 | BC848 | BC849 | BC850   | UNIT                                     | CONDITIONS. |
|--------------------------------------|---------------|------|-------|-------|-------|-------|---------|------------------------------------------|-------------|
| Collector Cut-Off Current            | $I_{CBO}$     | Max  | 15    |       |       |       | nA      | $V_{CB} = 30V$                           |             |
|                                      |               | Max  | 5     |       |       |       | $\mu A$ | $V_{CB} = 30V$<br>$T_{amb}=150^{\circ}C$ |             |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | Typ  | 90    |       |       |       | mV      | $I_C=10mA$ ,<br>$I_B=0.5mA$              |             |
|                                      |               | Max. | 250   |       |       |       | mV      | $I_C=100mA$ ,<br>$I_B=5mA$               |             |
|                                      |               | Typ  | 200   |       |       |       | mV      | $I_C=10mA$ ,<br>$I_B=5mA$                |             |
|                                      |               | Max. | 600   |       |       |       | mV      | $I_C=10mA$ *                             |             |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ | Typ  | 700   |       |       |       | mV      | $I_C=10mA$ ,<br>$I_B=0.5mA$              |             |
|                                      |               | Typ  | 900   |       |       |       | mV      | $I_C=100mA$ ,<br>$I_B=5mA$               |             |
| Base-Emitter Voltage                 | $V_{BE}$      | Min  | 580   |       |       |       | mV      | $I_C=2mA$                                |             |
|                                      |               | Typ  | 660   |       |       |       | mV      | $V_{CE}=5V$                              |             |
|                                      |               | Max  | 700   |       |       |       | mV      | $I_C=10mA$                               |             |
|                                      |               | Max  | 770   |       |       |       | mV      | $V_{CE}=5V$                              |             |

\* Collector-Emitter Saturation Voltage at  $I_C = 10mA$  for the characteristics going through the operating point  $I_C = 11mA$ ,  $V_{CE} = 1V$  at constant base current.

|              |              |
|--------------|--------------|
| <b>BC846</b> | <b>BC847</b> |
| <b>BC848</b> | <b>BC849</b> |
| <b>BC850</b> |              |

## ELECTRICAL CHARACTERISTICS (Continued)

| PARAMETER                    | SYMBOL    |          | BC846 | BC847 | BC848 | BC849 | BC850 | UNIT | CONDITIONS.                                                                                                          |
|------------------------------|-----------|----------|-------|-------|-------|-------|-------|------|----------------------------------------------------------------------------------------------------------------------|
| Static Forward Current Ratio | Group VI  | $h_{FE}$ | Min   | 75    | 75    | 75    | —     | —    | $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$                                                                                |
|                              |           |          | Typ   | 110   | 110   | 110   | —     | —    |                                                                                                                      |
|                              |           |          | Max   | 150   | 150   | 150   | —     | —    |                                                                                                                      |
|                              | Group A   | $h_{FE}$ | Typ   | 90    | 90    | 90    | —     | —    | $I_C=0.01\text{mA}$ , $V_{CE}=5\text{V}$                                                                             |
|                              |           |          | Min   | 110   | 110   | 110   | —     | —    | $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$                                                                                |
|                              |           |          | Typ   | 180   | 180   | 180   | —     | —    |                                                                                                                      |
|                              |           |          | Max   | 220   | 220   | 220   | —     | —    | $I_C=100\text{mA}$ , $V_{CE}=5\text{V}$                                                                              |
|                              | Group B   | $h_{FE}$ | Typ   | 120   | 120   | 120   | —     | —    |                                                                                                                      |
|                              |           |          | Min   | 150   |       |       |       |      | $I_C=0.01\text{mA}$ , $V_{CE}=5\text{V}$                                                                             |
|                              |           |          | Typ   | 200   |       |       |       |      | $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$                                                                                |
|                              |           |          | Max   | 290   |       |       |       |      | $I_C=100\text{mA}$ , $V_{CE}=5\text{V}$                                                                              |
|                              |           |          | Typ   | 450   |       |       |       |      |                                                                                                                      |
| Group C                      | $h_{FE}$  | Typ.     | —     | 270   | 270   | 270   | 270   |      | $I_C=0.01\text{mA}$ , $V_{CE}=5\text{V}$                                                                             |
|                              |           |          | Min   | —     | 420   | 420   | 420   |      | $I_C=2\text{mA}$ , $V_{CE}=5\text{V}$                                                                                |
|                              |           |          | Typ   | —     | 500   | 500   | 500   |      |                                                                                                                      |
|                              |           |          | Max   | —     | 800   | 800   | 800   |      | $I_C=100\text{mA}$ , $V_{CE}=5\text{V}$                                                                              |
|                              |           |          | Typ   | —     | —     | 400   | —     | —    |                                                                                                                      |
| Transition Frequency         | $f_T$     | Typ      | 300   |       |       |       |       | MHz  | $I_C=10\text{mA}$ , $V_{CE}=5\text{V}$<br>$f=100\text{MHz}$                                                          |
| Collector-Base Capacitance   | $C_{obo}$ | Typ      | 2.5   |       |       |       |       | pF   | $V_{CB}=10\text{V}$ $f=1\text{MHz}$                                                                                  |
|                              |           | Max      | 4.5   |       |       |       |       | pF   |                                                                                                                      |
| Emitter-Base Capacitance     | $C_{ib0}$ | Typ      | 9     |       |       |       |       | pF   | $V_{EB}=0.5\text{V}$ $f=1\text{MHz}$                                                                                 |
| Noise Figure                 | N         | Typ      | 2     | 2     | 2     | 1.2   | 1     | dB   | $V_{CE}=5\text{V}$ , $I_C=200\mu\text{A}$ ,<br>$R_C=2\text{k}\Omega$ , $f=1\text{kHz}$ ,<br>$\Delta f=200\text{Hz}$  |
|                              |           | Max      | 10    | 10    | 10    | 4     | 4     | dB   |                                                                                                                      |
|                              |           | Typ      | —     | —     | —     | 1.2   | 1     | dB   | $V_{CE}=5\text{V}$ , $I_C=200\mu\text{A}$ ,<br>$R_C=2\text{k}\Omega$ , $f=30\text{Hz}$ to<br>15kHz at -3dB<br>points |
|                              |           | Max      | —     | —     | —     | 4     | 3     | dB   |                                                                                                                      |
| Equivalent Noise Voltage     | $e_n$     | Max.     | —     | —     | —     | 110   | 110   | nV   | $V_{CE}=5\text{V}$ , $I_C=200\mu\text{A}$ ,<br>$R_C=2\text{k}\Omega$ , $f=10\text{Hz}$ to<br>50Hz at -3dB<br>points  |

Spice parameter data is available upon request for this device

|              |              |
|--------------|--------------|
| <b>BC846</b> | <b>BC847</b> |
| <b>BC848</b> | <b>BC849</b> |
| <b>BC850</b> |              |

# ELECTRICAL CHARACTERISTICS (Continued)

| PARAMETER               |                                           | SYMBOL          |     | BC846 | BC847 | BC848 | BC849 | BC850             | UNIT              | CONDITIONS.                                |    |
|-------------------------|-------------------------------------------|-----------------|-----|-------|-------|-------|-------|-------------------|-------------------|--------------------------------------------|----|
| Dynamic Characteristics | Group VI<br>Group A<br>Group B<br>Group C | h <sub>ie</sub> | Min | 0.4   | 0.4   | 0.4   | –     | –                 | kΩ                | V <sub>CE</sub> =5V<br>I <sub>C</sub> =2mA |    |
|                         |                                           |                 | Typ | 1.2   | 1.2   | 1.2   | –     | –                 | kΩ                |                                            |    |
|                         |                                           |                 | Max | 2.2   | 2.2   | 2.2   | –     | –                 | kΩ                |                                            |    |
|                         |                                           |                 | Min | 1.6   | 1.6   | 1.6   | –     | –                 | kΩ                |                                            |    |
|                         |                                           |                 | Typ | 2.7   | 2.7   | 2.7   | –     | –                 | kΩ                |                                            |    |
|                         |                                           |                 | Max | 4.5   | 4.5   | 4.5   | –     | –                 | kΩ                |                                            |    |
|                         |                                           |                 | Min | 3.2   |       |       |       |                   |                   |                                            | kΩ |
|                         |                                           |                 | Typ | 4.5   |       |       |       |                   |                   |                                            | kΩ |
|                         |                                           |                 | Max | 8.5   |       |       |       |                   |                   |                                            | kΩ |
|                         |                                           |                 | Min | –     | –     | 6     | 6     | 6                 | kΩ                |                                            |    |
|                         |                                           |                 | Typ | –     | –     | 8.7   | 8.7   | 8.7               | kΩ                |                                            |    |
|                         |                                           |                 | Max | –     | –     | 15    | 15    | 15                | kΩ                |                                            |    |
|                         | Group VI<br>Group A<br>Group B<br>Group C | h <sub>re</sub> | Typ | 2.5   | 2.5   | 2.5   | –     | –                 | x10 <sup>-4</sup> |                                            |    |
|                         |                                           | Typ             | 1.5 | 1.5   | 1.5   | –     | –     | x10 <sup>-4</sup> |                   |                                            |    |
|                         |                                           | Typ             | 2   | 2     | 2     | 2     | 2     | x10 <sup>-4</sup> |                   |                                            |    |
|                         |                                           | Typ             | –   | –     | 3     | 3     | 3     | x10 <sup>-4</sup> |                   |                                            |    |
|                         | Group VI<br>Group A<br>Group B<br>Group C | h <sub>fe</sub> | Min | 75    | 75    | 75    | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Typ | 110   | 110   | 110   | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Max | 150   | 150   | 150   | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Min | 125   | 125   | 125   | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Typ | 220   | 220   | 220   | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Max | 260   | 260   | 260   | –     | –                 |                   |                                            |    |
|                         |                                           |                 | Min | 240   |       |       |       |                   |                   |                                            |    |
|                         |                                           |                 | Typ | 330   |       |       |       |                   |                   |                                            |    |
|                         |                                           |                 | Max | 500   |       |       |       |                   |                   |                                            |    |
|                         |                                           |                 | Min | –     | 450   | 450   | 450   | 450               |                   |                                            |    |
|                         |                                           |                 | Typ | –     | 600   | 600   | 600   | 600               |                   |                                            |    |
|                         |                                           |                 | Max | –     | 900   | 900   | 900   | 900               |                   |                                            |    |
|                         | Group VI<br>Group A<br>Group B<br>Group C | h <sub>oe</sub> | Typ | 20    | 20    | 20    | –     | –                 | μs                |                                            |    |
|                         |                                           |                 | Max | 40    | 40    | 40    | –     | –                 | μs                |                                            |    |
|                         |                                           |                 | Typ | 18    | 18    | 18    | –     | –                 | μs                |                                            |    |
|                         |                                           |                 | Max | 30    | 30    | 30    | –     | –                 | μs                |                                            |    |
|                         |                                           |                 | Typ | 30    |       |       |       |                   |                   | μs                                         |    |
|                         |                                           |                 | Max | 60    |       |       |       |                   |                   | μs                                         |    |
|                         |                                           |                 | Typ | –     | –     | 60    | 60    | 60                | μs                |                                            |    |
|                         |                                           |                 | Max | –     | –     | 110   | 110   | 110               | μs                |                                            |    |

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