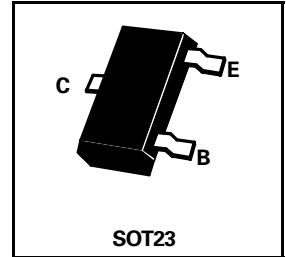


# SOT23 NPN SILICON PLANAR GENERAL PURPOSE TRANSISTORS

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      | $I_C=10mA$ ,                             |
|                                      |               | Max. | 250   |       |       |       |       | mV      | $I_B=0.5mA$                              |
|                                      |               | Typ  | 200   |       |       |       |       | mV      | $I_C=100mA$ ,                            |
|                                      |               | Max. | 600   |       |       |       |       | mV      | $I_B=5mA$                                |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ | Typ  | 300   |       |       |       |       | mV      | $I_C=10mA^*$                             |
|                                      |               | Max. | 600   |       |       |       |       | mV      |                                          |
|                                      |               | Typ  | 700   |       |       |       |       | mV      | $I_C=10mA$ ,                             |
| Base-Emitter Voltage                 | $V_{BE}$      | Typ  | 900   |       |       |       |       | mV      | $I_B=0.5mA$                              |
|                                      |               | Max. |       |       |       |       |       | mV      | $I_C=100mA$ ,                            |
|                                      |               | Min  |       |       |       |       |       | mV      | $I_B=5mA$                                |
|                                      |               | Max  |       |       |       |       |       | mV      | $I_C=2mA$<br>$V_{CE}=5V$                 |
| Base-Emitter Voltage                 | $V_{BE}$      | Min  | 580   |       |       |       |       | 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 <sub>FE</sub> | Min   | 75    | 75    | 75                                         | —                                          | —                                        | I <sub>C</sub> =2mA, V <sub>CE</sub> =5V                                                                  |
|                              |                  |                 | Typ   | 110   | 110   | 110                                        | —                                          | —                                        |                                                                                                           |
|                              |                  |                 | Max   | 150   | 150   | 150                                        | —                                          | —                                        |                                                                                                           |
|                              | Group A          | h <sub>FE</sub> | Typ   | 90    | 90    | 90                                         | —                                          | —                                        | I <sub>C</sub> =0.01mA, V <sub>CE</sub> =5V                                                               |
|                              |                  |                 | Min   | 110   | 110   | 110                                        | —                                          | —                                        | I <sub>C</sub> =2mA, V <sub>CE</sub> =5V                                                                  |
|                              |                  |                 | Typ   | 180   | 180   | 180                                        | —                                          | —                                        |                                                                                                           |
|                              |                  |                 | Max   | 220   | 220   | 220                                        | —                                          | —                                        |                                                                                                           |
|                              | Group B          | h <sub>FE</sub> | Typ   | 120   | 120   | 120                                        | —                                          | —                                        | I <sub>C</sub> =100mA, V <sub>CE</sub> =5V                                                                |
|                              |                  |                 | Typ   | 150   |       |                                            |                                            |                                          | I <sub>C</sub> =0.01mA, V <sub>CE</sub> =5V                                                               |
|                              |                  |                 | Min   | 200   |       |                                            |                                            |                                          | I <sub>C</sub> =2mA, V <sub>CE</sub> =5V                                                                  |
|                              |                  |                 | Typ   | 290   |       |                                            |                                            |                                          |                                                                                                           |
|                              | Max              | 450             |       |       |       |                                            |                                            |                                          |                                                                                                           |
|                              | Typ              | 200             | 200   | 200   | —     | —                                          | I <sub>C</sub> =100mA, V <sub>CE</sub> =5V |                                          |                                                                                                           |
|                              | Group C          | h <sub>FE</sub> | Typ.  | —     | 270   | 270                                        | 270                                        | 270                                      | I <sub>C</sub> =0.01mA, V <sub>CE</sub> =5V                                                               |
| Min                          |                  |                 | —     | 420   | 420   | 420                                        | 420                                        | I <sub>C</sub> =2mA, V <sub>CE</sub> =5V |                                                                                                           |
| Typ                          |                  |                 | —     | 500   | 500   | 500                                        | 500                                        |                                          |                                                                                                           |
| Max                          |                  |                 | —     | 800   | 800   | 800                                        | 800                                        |                                          |                                                                                                           |
| Typ                          | —                | —               | 400   | —     | —     | I <sub>C</sub> =100mA, V <sub>CE</sub> =5V |                                            |                                          |                                                                                                           |
| Transition Frequency         | f <sub>T</sub>   | Typ             | 300   |       |       |                                            |                                            | MHz                                      | I <sub>C</sub> =10mA, V <sub>CE</sub> =5V<br>f=100MHz                                                     |
| Collector-Base Capacitance   | C <sub>obo</sub> | Typ             | 2.5   |       |       |                                            |                                            | pF                                       | V <sub>CB</sub> =10V f=1MHz                                                                               |
| Max                          | 4.5              |                 |       |       |       |                                            |                                            |                                          |                                                                                                           |
| Emitter-Base Capacitance     | C <sub>ib0</sub> | Typ             | 9     |       |       |                                            |                                            | pF                                       | V <sub>EB</sub> =0.5V f=1MHz                                                                              |
| Noise Figure                 | N                | Typ             | 2     | 2     | 2     | 1.2                                        | 1                                          | dB                                       | V <sub>CE</sub> = 5V, I <sub>C</sub> =200μA,<br>R <sub>C</sub> =2kΩ, f=1kHz,<br>Δf=200Hz                  |
|                              |                  | Max             | 10    | 10    | 10    | 4                                          | 4                                          |                                          |                                                                                                           |
|                              |                  | Typ             | —     | —     | —     | 1.2                                        | 1                                          | dB                                       | V <sub>CE</sub> = 5V, I <sub>C</sub> =200μA,<br>R <sub>C</sub> =2kΩ, f=30Hz to<br>15kHz at -3dB<br>points |
|                              |                  | Max             | —     | —     | —     | 4                                          | 3                                          |                                          |                                                                                                           |
| Equivalent Noise Voltage     | e <sub>n</sub>   | Max.            | —     | —     | —     | 110                                        | 110                                        | nV                                       | V <sub>CE</sub> = 5V, I <sub>C</sub> =200μA,<br>R <sub>C</sub> =2kΩ, f=10Hz 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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