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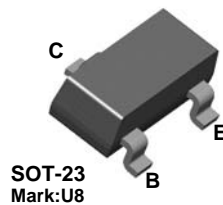
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# BSR14

## NPN General Purpose Amplifier

### Features

- This device is for use as a medium power amplifier and switch requiring collector currents up to 500 mA.
- Sourced from Process 19.
- See BCW65C for characteristics.



### Absolute Maximum Ratings\* $T_a = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter  | Value       | Units            |
|----------------|--|-------------|------------------|
| $V_{CEO}$      | Collector-Emitter Voltage                        | 40          | V                |
| $V_{CBO}$      | Collector-Base Voltage                           | 75          | V                |
| $V_{EBO}$      | Emitter-Base Voltage                             | 6.0         | V                |
| $I_C$          | Collector Current - Continuous                   | 800         | mA               |
| $T_J, T_{stg}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

\* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

#### NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

### Thermal Characteristics $T_a = 25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter   | Max.   | Units                     |
|-----------------|---|--------|---------------------------|
|                 |   | *BSR14 |                           |
| $P_D$           | Total Device Dissipation<br>Derate above $25^\circ\text{C}$ | 350    | mW                        |
|                 |   | 2.8    | mW/ $^\circ\text{C}$      |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient                     | 357    | $^\circ\text{C}/\text{W}$ |

\* Device mounted on FR-4 PCB 40 mm X 40 mm X 1.5 mm.

**Electrical Characteristics**  $T_a = 25^\circ\text{C}$  unless otherwise noted

| Symbol                              | Parameter                            | Test Condition   | Min.                              | Max.       | Units               |
|-------------------------------------|--------------------------------------|--|-----------------------------------|------------|---------------------|
| <b>OFF CHARACTERISTICS</b>          |                                      |  |                                   |            |                     |
| $V_{(BR)CEO}$                       | Collector-Emitter Breakdown Voltage  | $I_C = 10\mu\text{A}, I_B = 0$   | 40                                |            | V                   |
| $V_{(BR)CBO}$                       | Collector-Base Breakdown Voltage     | $I_C = 10\mu\text{A}, I_E = 0$   | 75                                |            | V                   |
| $V_{(BR)EBO}$                       | Emitter-Base Breakdown Voltage       | $I_E = 10\mu\text{A}, I_C = 0$   | 6.0                               |            | V                   |
| $I_{CBO}$                           | Collector-Cutoff Current             | $V_{CB} = 60\text{V},$<br>$V_{CB} = 60\text{V}, T_a = 150^\circ\text{C}$   |                                   | 10<br>10   | nA<br>$\mu\text{A}$ |
| $I_{CEX}$                           | Collector-Cutoff Current             | $V_{CE} = 60\text{V}, V_{EB} = 3.0\text{V}$  |                                   | 10         | nA                  |
| $I_{BEX}$                           | Reverse Base Current                 | $V_{CE} = 60\text{V}, V_{EB} = 3.0\text{V}$  |                                   | 20         | nA                  |
| $I_{EBO}$                           | Emitter-Cutoff Current               | $V_{EB} = 3.0\text{V}, I_C = 0$  |                                   | 15         | nA                  |
| <b>ON CHARACTERISTICS</b>           |                                      |  |                                   |            |                     |
| $h_{FE}$                            | DC Current Gain                      | $I_C = 0.1\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 1.0\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 150\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 150\text{mA}, V_{CE} = 1.0\text{V}$<br>$I_C = 500\text{mA}, V_{CE} = 10\text{V}$ | 35<br>50<br>75<br>100<br>50<br>40 | 300        |                     |
| $V_{CE(sat)}$                       | Collector-Emitter Saturation Voltage | $I_C = 150\text{mA}, I_B = 15\text{mA}$<br>$I_C = 500\text{mA}, I_B = 50\text{mA}$   |                                   | 0.3<br>1.0 | V<br>V              |
| $V_{BE(sat)}$                       | Base-Emitter Saturation Voltage      | $I_C = 150\text{mA}, I_B = 15\text{mA}$<br>$I_C = 500\text{mA}, I_B = 50\text{mA}$   | 0.6                               | 1.2<br>2.0 | V<br>V              |
| <b>SMALL SIGNAL CHARACTERISTICS</b> |                                      |  |                                   |            |                     |
| $f_T$                               | Current Gain - Bandwidth Product     | $I_C = 20\text{mA}, V_{CE} = 20\text{V},$<br>$f = 100\text{MHz}$   | 300                               |            | MHz                 |
| $C_{CB}$                            | Collector-Base Capacitance           | $V_{CB} = 10\text{V}, I_E = 0,$<br>$f = 1.0\text{MHz}$   |                                   | 8.0        | pF                  |
| $h_{ie}$                            | Input Impedance                      | $V_{CE} = 10\text{V}, I_C = 1.0\text{mA},$<br>$f = 1.0\text{kHz}$  | 2.0                               | 8.0        | k $\Omega$          |
| $h_{fe}$                            | Small-Signal Current Gain            | $V_{CE} = 10\text{V}, I_C = 1.0\text{mA},$<br>$f = 1.0\text{kHz}$  | 50                                | 300        |                     |
| $h_{oe}$                            | Output Admittance                    | $V_{CE} = 10\text{V}, I_C = 1.0\text{mA},$<br>$f = 1.0\text{kHz}$  | 5                                 | 35         | $\mu\text{S}$       |
| <b>SWITCHING CHARACTERISTICS</b>    |                                      |  |                                   |            |                     |
| $t_d$                               | Delay Time                           | $V_{CC} = 30\text{V}, V_{BE(OFF)} =$<br>$0.5\text{V}, I_C = 150\text{mA},$<br>$I_{B1} = 15\text{mA}$   |                                   | 10         | ns                  |
| $t_r$                               | Rise Time                            |  |                                   | 25         | ns                  |
| $t_s$                               | Storage Time                         | $V_{CC} = 30\text{V}, I_C = 150\text{mA},$<br>$I_{B1} = I_{B2} = 15\text{mA}$  |                                   | 225        | ns                  |
| $t_f$                               | Fall Time                            |  |                                   | 60         | ns                  |



**Spice Model**

NPN (Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10)



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