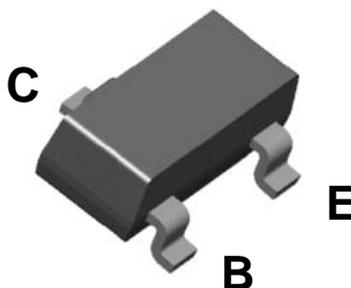


# BSR17A

## NPN General Purpose Amplifier



**SOT-23**  
**MARK: U92**

### Features

This device is designed as a general purpose amplifier and switch.

The useful dynamic range extends to 100 mA as a switch and to 100 MHz as an amplifier. Sourced from Process 23.

### Absolute Maximum Ratings \*T<sub>a</sub> = 25°C unless otherwise noted

| Symbol           | Parameter                 | Value      | Units |
|------------------|---------------------------|------------|-------|
| V <sub>CBO</sub> | Collector-Base Voltage    | 60         | V     |
| V <sub>CEO</sub> | Collector-Emitter Voltage | 40         | V     |
| V <sub>EBO</sub> | Emitter-Base Voltage      | 6.0        | V     |
| I <sub>C</sub>   | Collector Current (DC)    | 200        | mA    |
| T <sub>J</sub>   | Junction Temperature      | -55 ~ +150 | °C    |
| T <sub>STG</sub> | Storage Temperature       | -55 ~ +150 | °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<sub>a</sub> = 25°C unless otherwise noted

| Symbol           | Characteristic                          | Max | Units |
|------------------|---|-----|-------|
| P <sub>d</sub>   | Total Device Dissipation                | 350 | mW    |
|                  | Derate above 25°C                       | 2.8 | mW/°C |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient | 357 | °C/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 |
|--------|-----------|----------------|-----|-----|-------|
|--------|-----------|----------------|-----|-----|-------|

**Off Characteristics**

|               |                                     |   |     |     |               |
|---------------|-------------------------------------|---|-----|-----|---------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage | $I_C = 1.0\text{ mA}, I_B = 0$                  | 40  |     | V             |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage    | $I_C = 10\text{ }\mu\text{A}, I_B = 0$          | 60  |     | V             |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage      | $I_C = 10\text{ }\mu\text{A}, I_B = 0$          | 6.0 |     | V             |
| $I_{CBO}$     | Collector-Cutoff Current            | $V_{CB} = 30\text{ V}, T_A = 150^\circ\text{C}$ |     | 5.0 | $\mu\text{A}$ |
| $I_{CEX}$     | Emitter-Cutoff Current              | $V_{CE} = 30\text{ V}, V_{EB} = 3.0\text{ V}$   |     | 50  | nA            |
| $I_{BEX}$     | $I_{BEX}$ Reverse Base Current      | $V_{CE} = 30\text{ V}, V_{EB} = 3.0\text{ V}$   |     | 50  | nA            |

**On Characteristics**

|               |  |  |                             |              |        |
|---------------|--|--|-----------------------------|--------------|--------|
| $h_{FE}$      | DC Current Gain                        | $I_C = 0.1\text{ mA}, V_{CE} = 1.0\text{ V}$<br>$I_C = 1.0\text{ mA}, V_{CE} = 1.0\text{ V}$<br>$I_C = 10\text{ mA}, V_{CE} = 1.0\text{ V}$<br>$I_C = 50\text{ mA}, V_{CE} = 1.0\text{ V}$<br>$I_C = 100\text{ mA}, V_{CE} = 1.0\text{ V}$ | 40<br>70<br>100<br>60<br>30 | 300          |        |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage * | $I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$<br>$I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$   |                             | 0.2<br>0.3   | V<br>V |
| $V_{BE(sat)}$ | Emitter-Base Breakdown Voltage *       | $I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$<br>$I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$   | 0.65                        | 0.85<br>0.95 | V<br>V |

**Small Signal Characteristics**

|          |                            |   |     |     |               |
|----------|----------------------------|---|-----|-----|---------------|
| $f_T$    | Transition Frequency       | $I_C = 20\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$  | 300 |     | MHz           |
| $C_{cb}$ | Collector-Base Capacitance | $V_{CB} = 0.5\text{ V}, I_E = 0, f = 1.0\text{ MHz}$            |     | 4.0 | pF            |
| $C_{eb}$ | Emitter-Base Capacitance   | $V_{EB} = 0.5\text{ V}, I_C = 0, f = 1.0\text{ MHz}$            |     | 8.0 | pF            |
| $h_{ie}$ | Input Impedance            | $V_{CE} = 10\text{ V}, I_C = 1.0\text{ mA}, f = 1.0\text{ kHz}$ | 1.0 | 10  | k $\Omega$    |
| $h_{fe}$ | Small-Signal Current Gain  | $V_{CE} = 10\text{ V}, I_C = 1.0\text{ mA}, f = 1.0\text{ kHz}$ | 100 | 400 |               |
| $h_{oe}$ | Output Admittance          | $V_{CE} = 10\text{ V}, I_C = 1.0\text{ mA}, f = 1.0\text{ kHz}$ | 1.0 | 40  | $\mu\text{S}$ |

**Switching Characteristics**

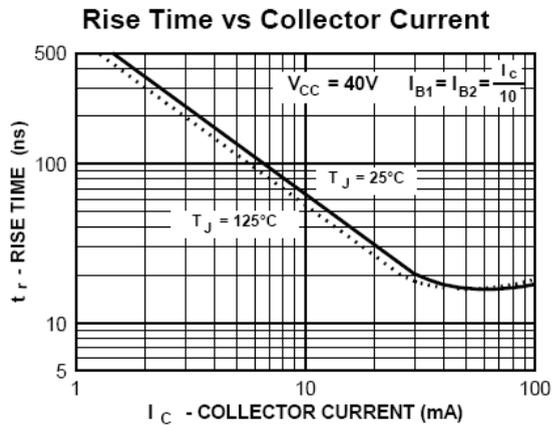
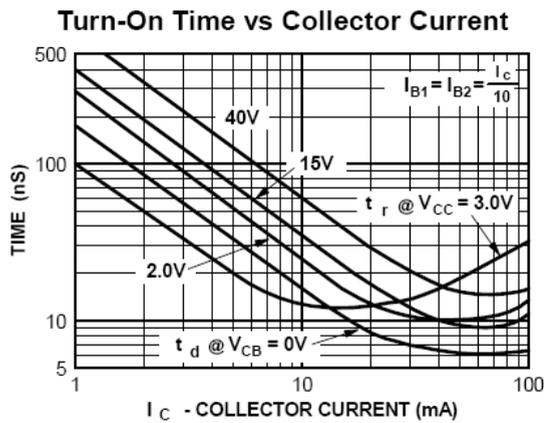
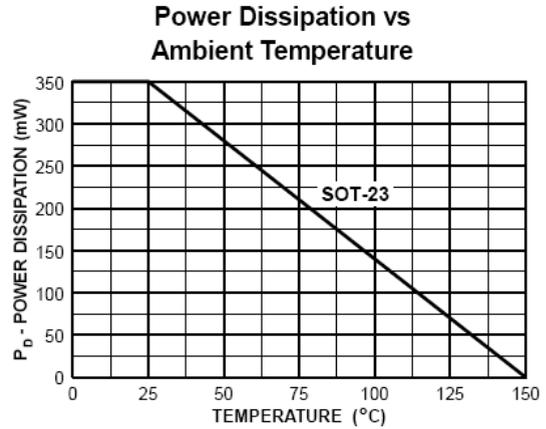
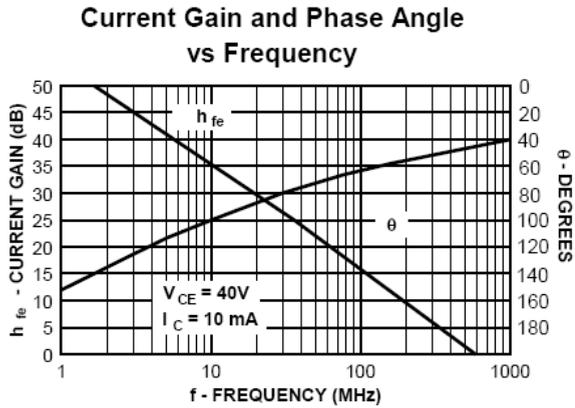
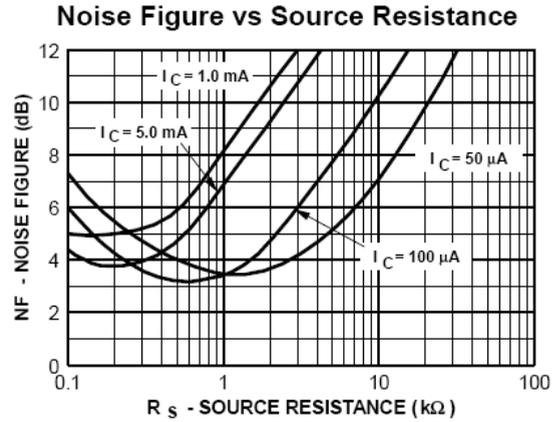
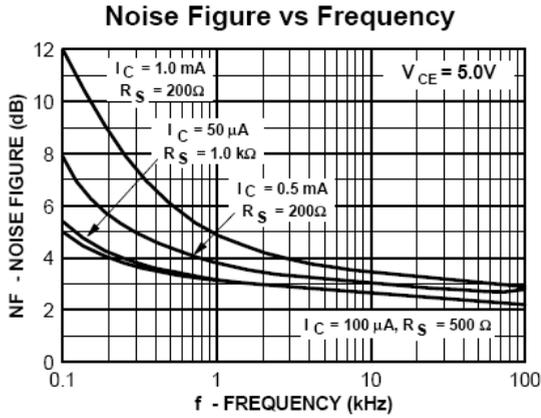
|       |              |   |  |     |    |
|-------|--------------|---|--|-----|----|
| $t_d$ | Delay Time   | $I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}, V_{EB} = 0.5\text{ V}$ |  | 35  | ns |
| $t_r$ | Rise Time    |   |  | 4.0 | pF |
| $t_s$ | Storage Time | $I_C = 10\text{ mA}, I_{B(on)} = I_{B(off)} = 1.0\text{ mA}$        |  | 200 | ns |
| $t_f$ | Fall Time    |   |  | 50  | ns |

\* Pulse Test: Pulse Width 300 s, Duty Cycle 2.0 %

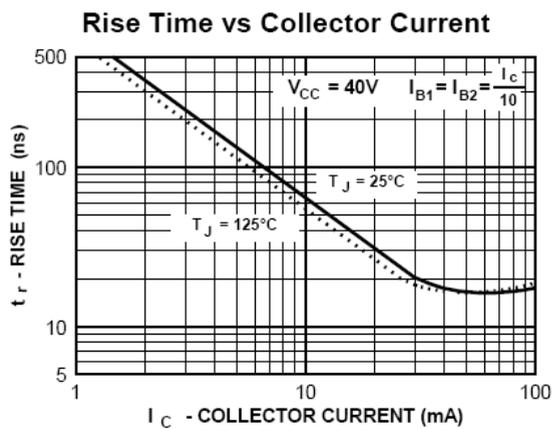
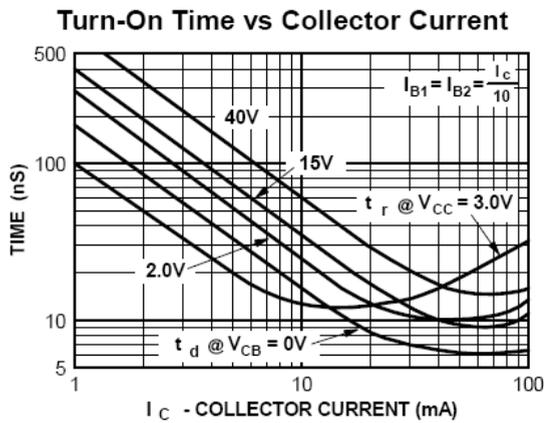
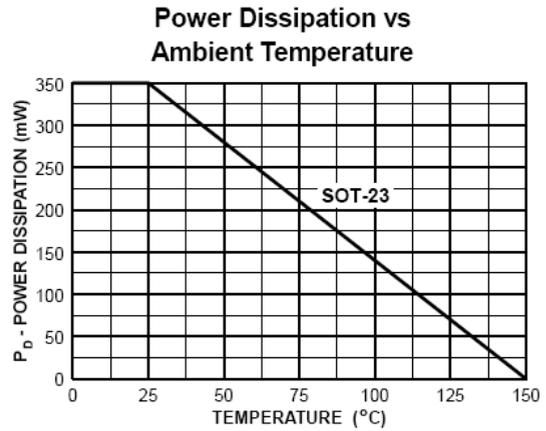
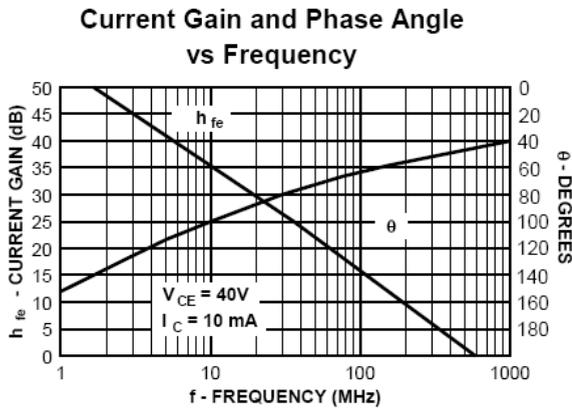
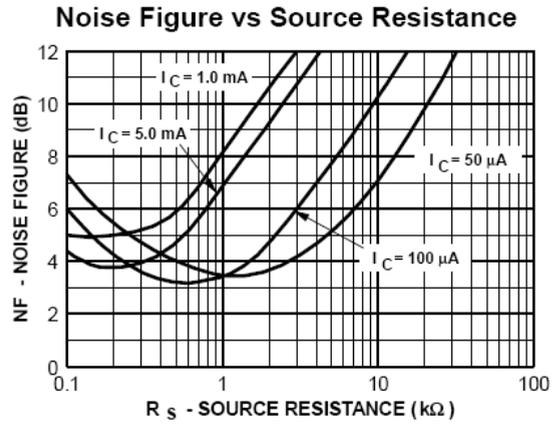
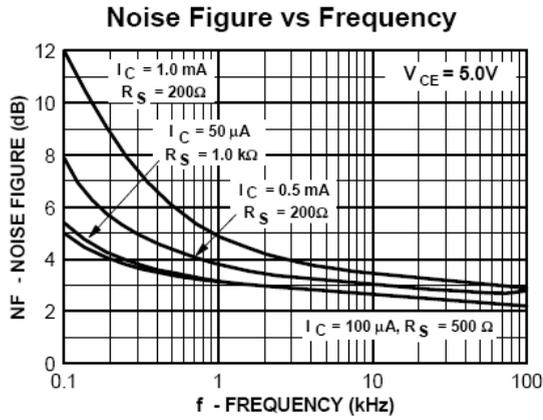
**Spice Model**

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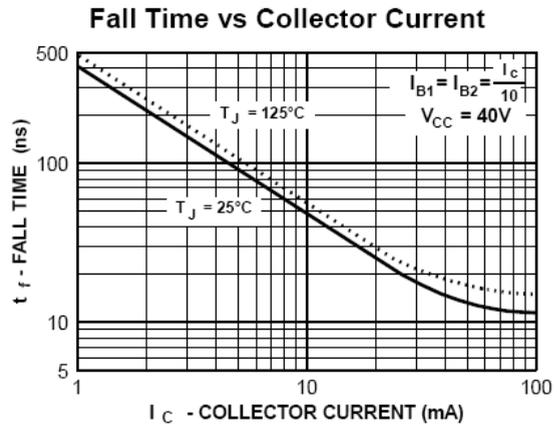
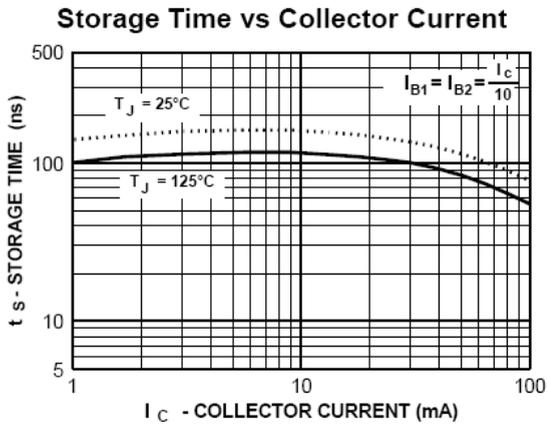
## Typical Performance Characteristics



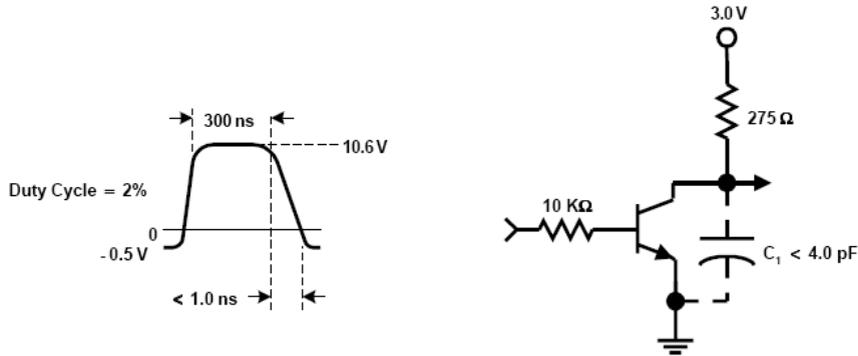
**Typical Performance Characteristics (continued)**



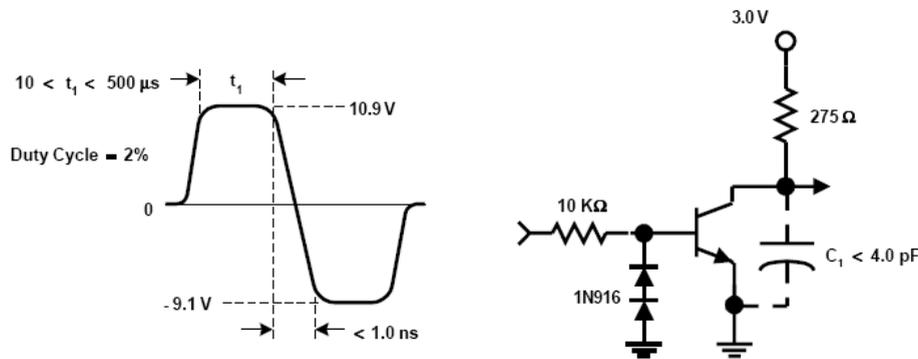
**Typical Performance Characteristics (continued)**



**Test Circuits**



**FIGURE 1: Delay and Rise Time Equivalent Test Circuit**



**FIGURE 2: Storage and Fall Time Equivalent Test Circuit**



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