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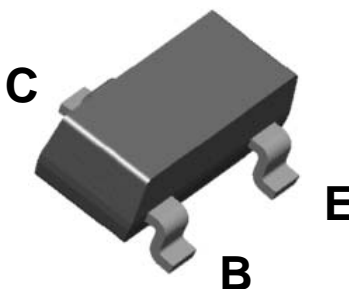
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# BSR17A

## 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
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**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	$I_C = 10\ \mu\text{A}, I_B = 0$	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_C = 10\ \mu\text{A}, I_B = 0$	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	$I_C = 0.1\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 1.0\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 100\text{ mA}, V_{CE} = 1.0\text{ V}$	40 70 100 60 30	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage *	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		0.2 0.3	V V
$V_{BE(sat)}$	Emitter-Base Breakdown Voltage *	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$	0.65	0.85 0.95	V 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**

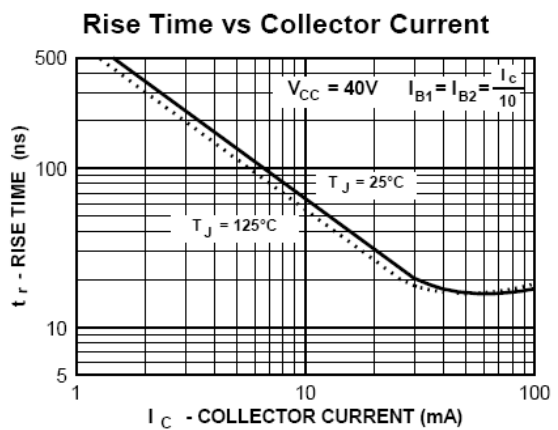
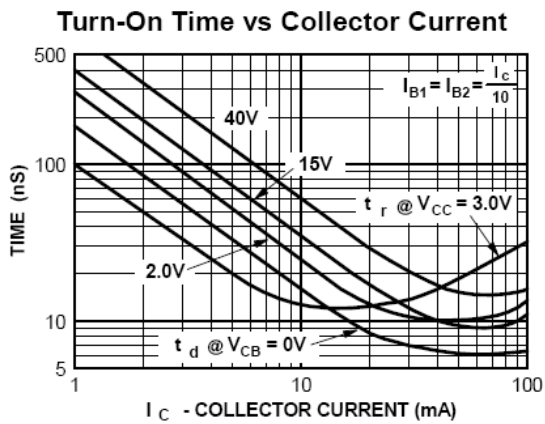
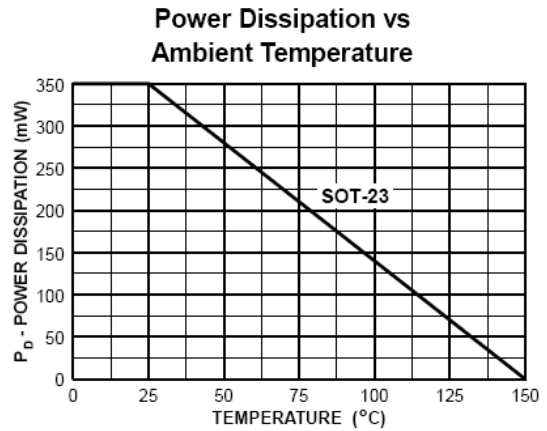
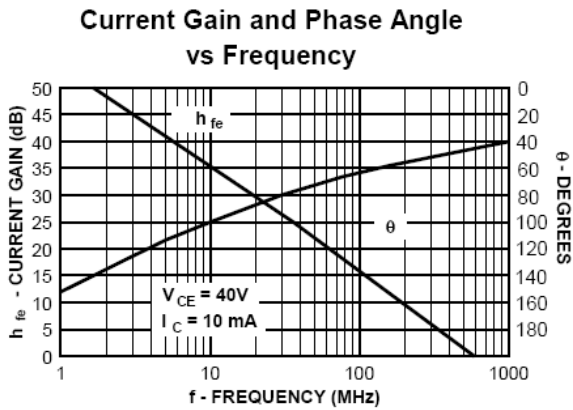
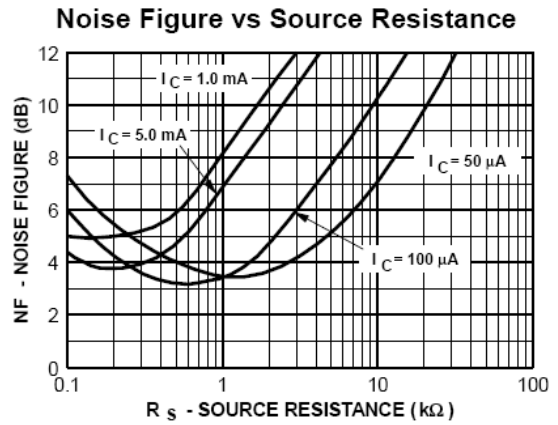
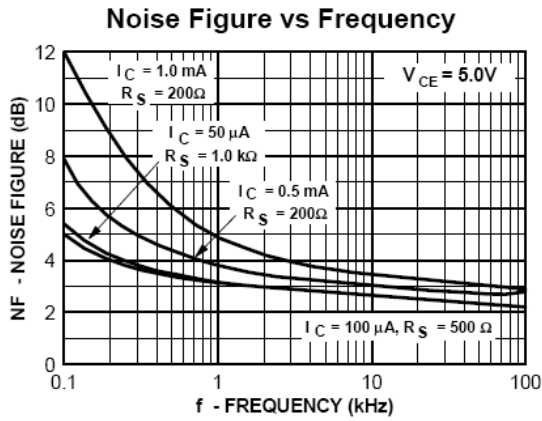
$t_d$	Delay Time	$I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}, V_{EB} = 0.5\text{ V}$		35	ns
$t_r$	Rise Time			4.0	pF
$t_s$	Storage Time	$I_C = 10\text{ mA}, I_{BON} = I_{BOff} = 1.0\text{ mA}$		200	ns
$t_f$	Fall Time			50	ns

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

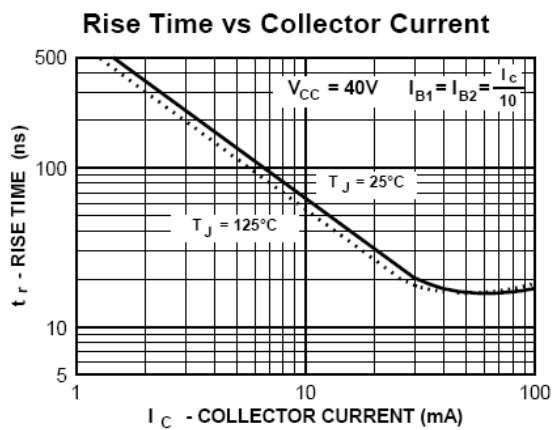
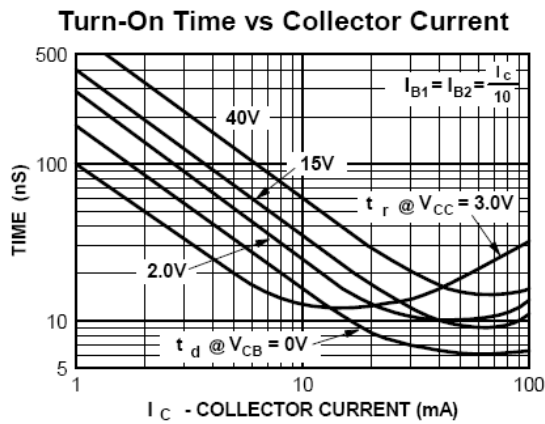
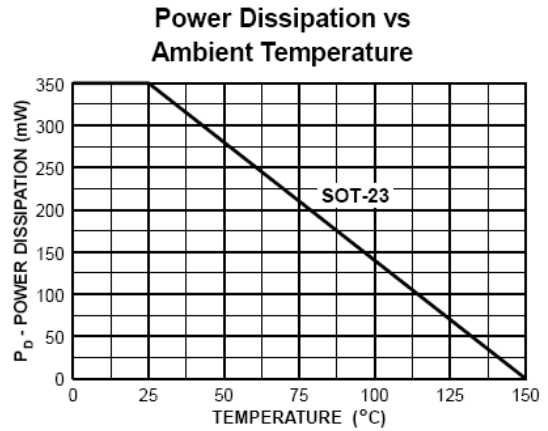
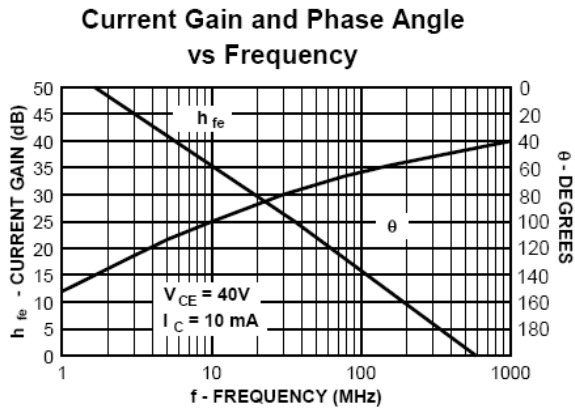
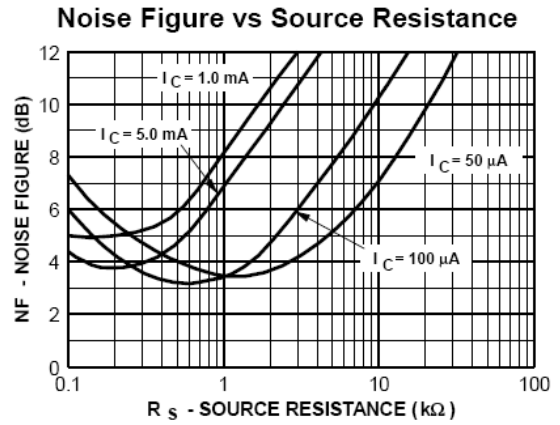
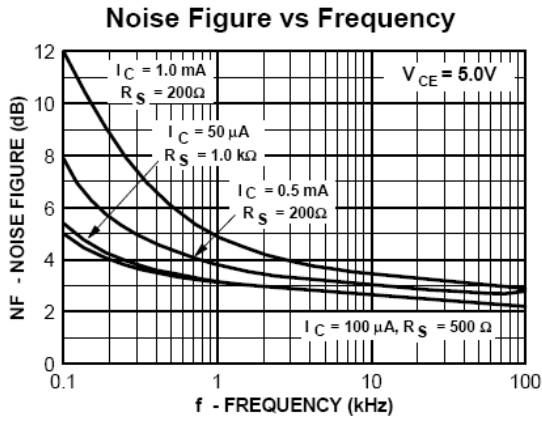
**Spice Model**

NPN (Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Ise=6.734 Ikf=66.78m Xtb=1.5 Br=.7371 Nc=2  
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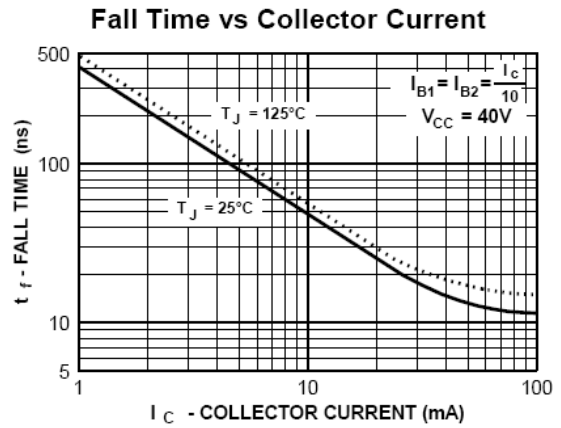
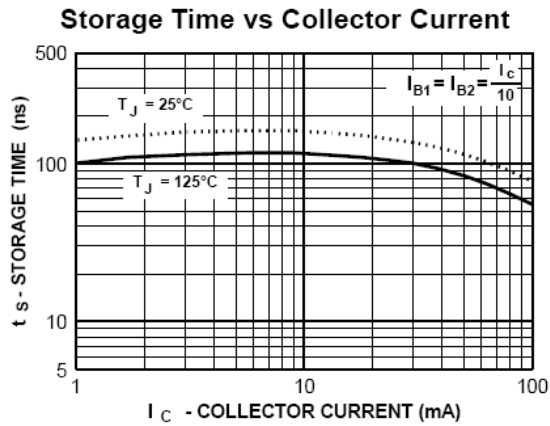
## Typical Performance Characteristics



### Typical Performance Characteristics (continued)



### Typical Performance Characteristics (continued)



### Test Circuits

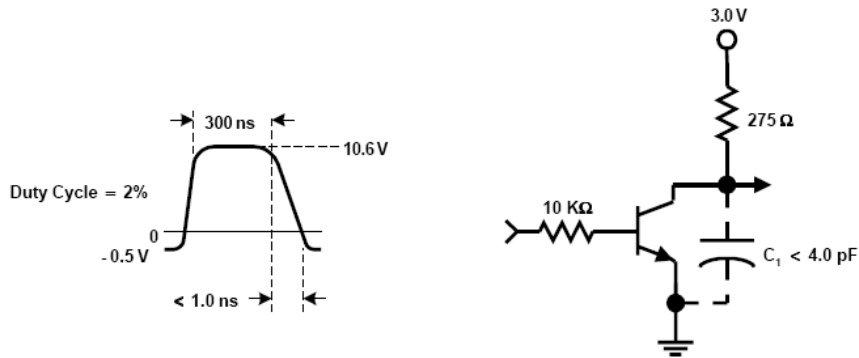


FIGURE 1: Delay and Rise Time Equivalent Test Circuit

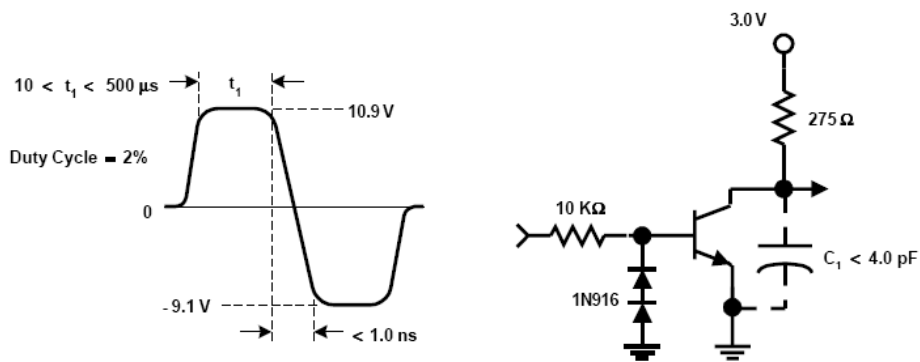


FIGURE 2: Storage and Fall Time Equivalent Test Circuit



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