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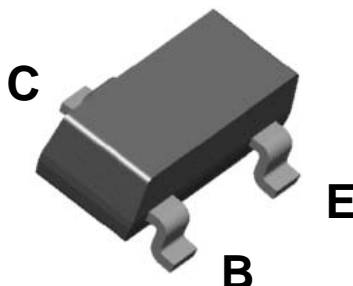
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BSR17A

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_a = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CBO}	Collector-Base Voltage	60	V
V _{CEO}	Collector-Emitter Voltage	40	V
V _{EB0}	Emitter-Base Voltage	6.0	V
I _C	Collector Current (DC)	200	mA
T _J	Junction Temperature	-55 ~ +150	°C
T _{STG}	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_a = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
P _D	Total Device Dissipation	350	mW
	Derate above 25°C	2.8	mW/°C
R _{θ JA}	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	$I_C = 10\text{ }\mu\text{A}, I_B = 0$	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	μA
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	μS

Switching Characteristics

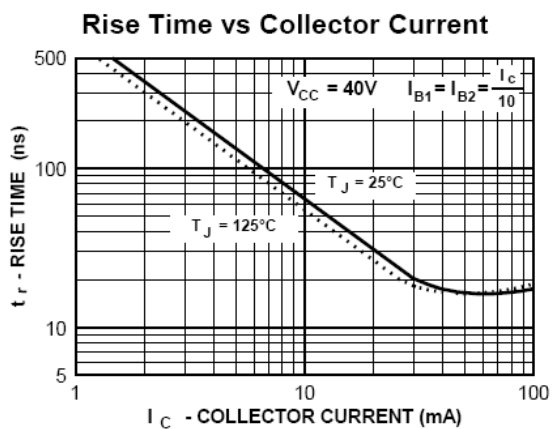
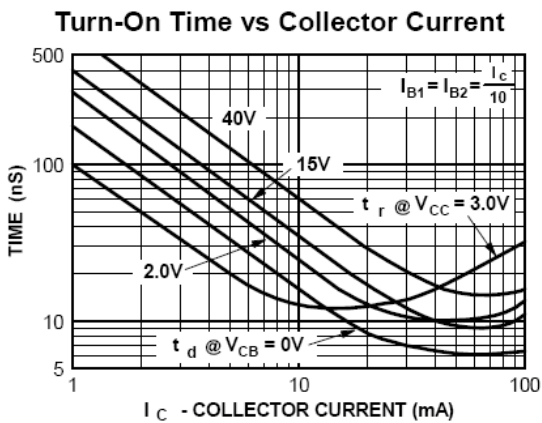
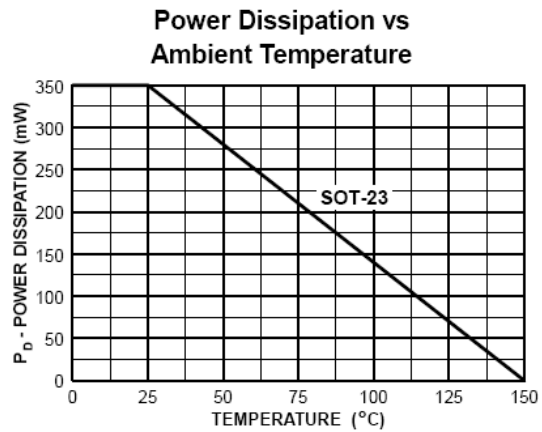
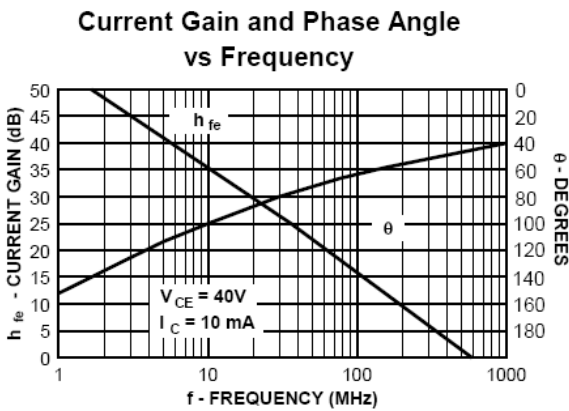
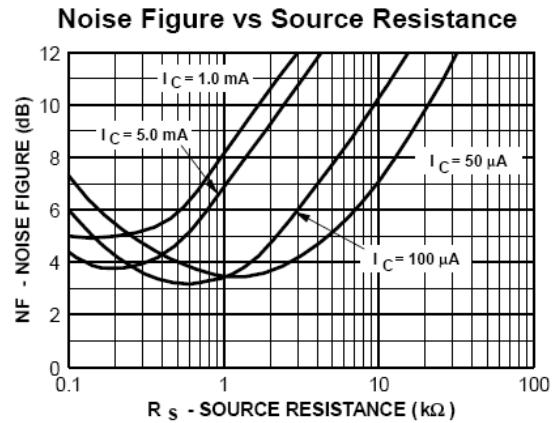
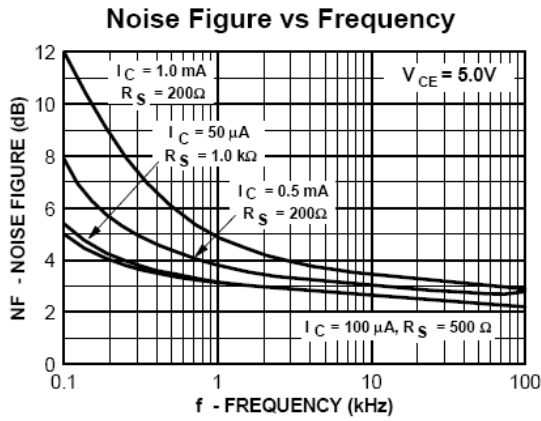
t_d	Delay Time	$I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}, V_{EB} = 0.5\text{ V}$		35	ns
t_r	Rise Time			4.0	pF
t_s	Storage Time	$I_C = 10\text{ mA}, I_{B(on)} = I_{B(off)} = 1.0\text{ mA}$		200	ns
t_f	Fall Time			50	ns

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

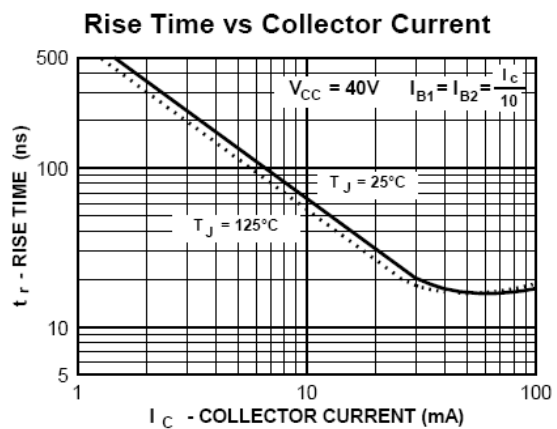
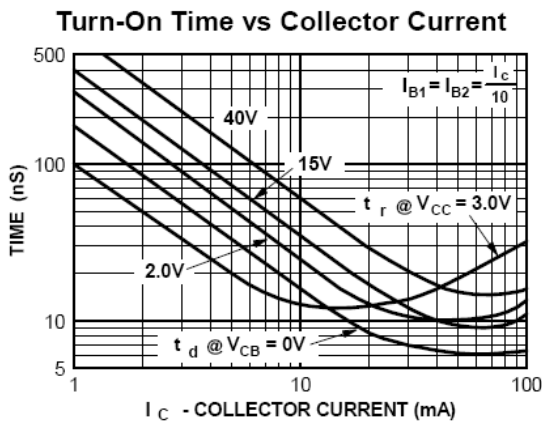
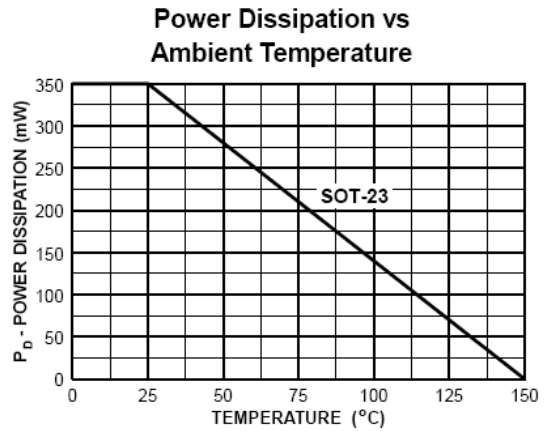
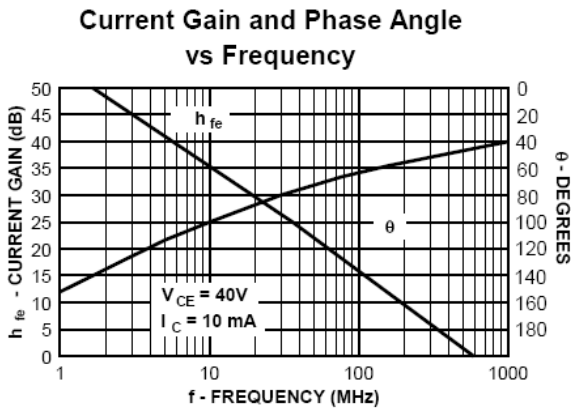
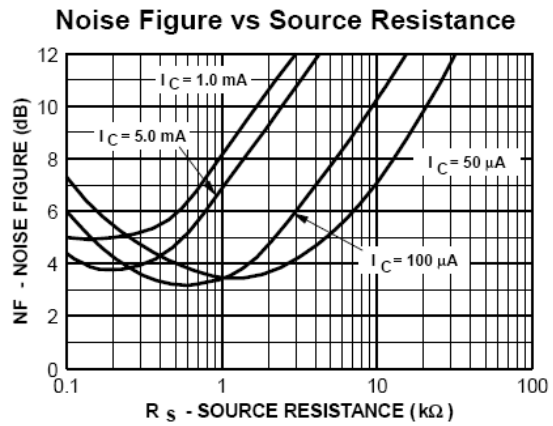
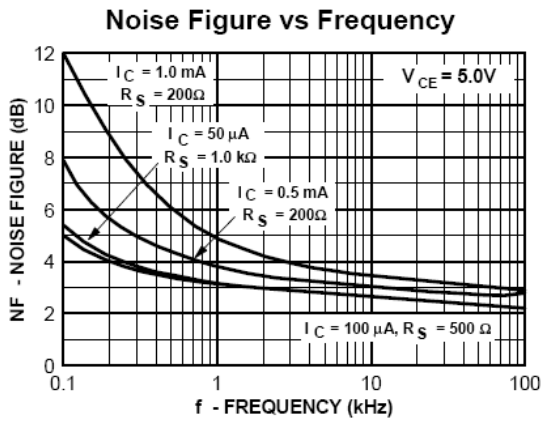
Spice Model

NPN ($I_s=6.734f$ $X_{ti}=3$ $E_g=1.11$ $V_{af}=74.03$ $B_f=416.4$ $N_e=1.259$ $I_{se}=6.734$ $I_{kf}=66.78m$ $X_{tb}=1.5$ $Br=.7371$ $N_c=2$ $I_{sc}=0$ $I_{kr}=0$ $R_c=1$ $C_{jc}=3.638p$ $M_{jc}=.3085$ $V_{jc}=.75$ $F_c=.5$ $C_{je}=4.493p$ $M_{je}=.2593$ $V_{je}=.75$ $T_r=239.5n$ $T_f=301.2p$ $I_{tf}=.4$ $V_{tf}=4$ $X_{tf}=2$ $R_b=10$)

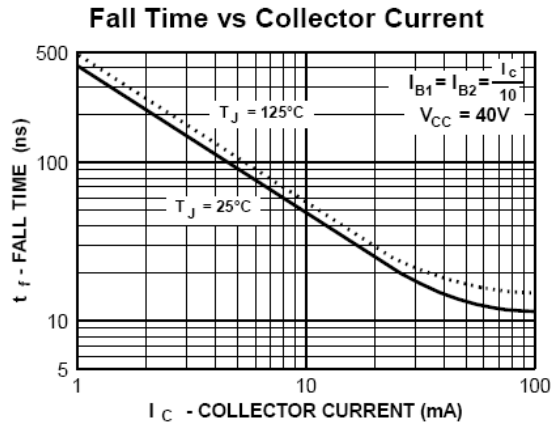
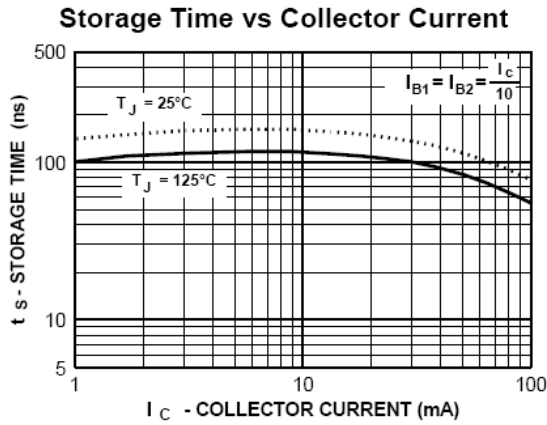
Typical Performance Characteristics



Typical Performance Characteristics (continued)



Typical Performance Characteristics (continued)



Test Circuits

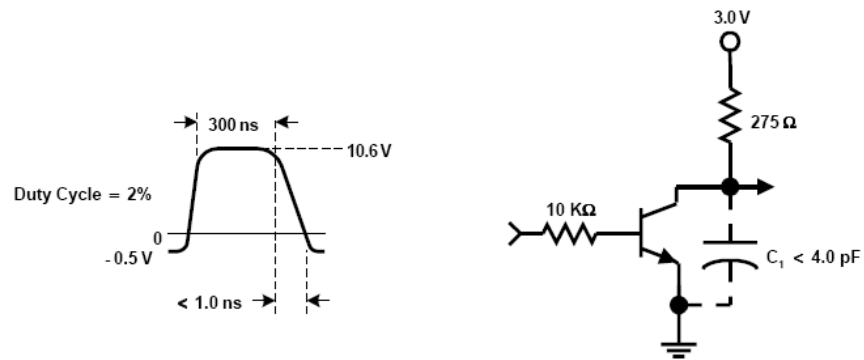


FIGURE 1: Delay and Rise Time Equivalent Test Circuit

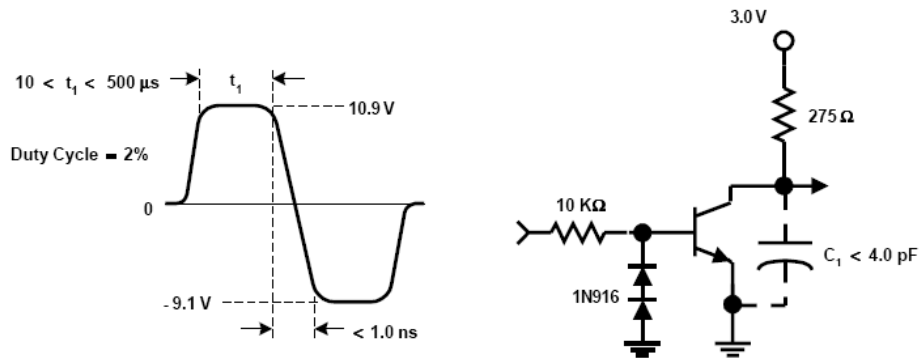


FIGURE 2: Storage and Fall Time Equivalent Test Circuit



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