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FAIRCHILD
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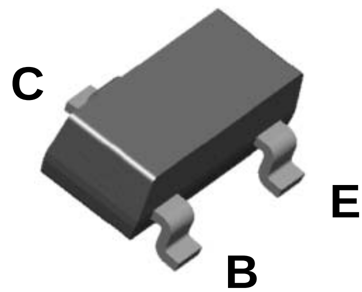
June 2007

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_{EBO}	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 Derate above 25℃	350 2.8	mW mW/℃
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	℃/W

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

Electrical Characteristics *T_a = 25°C unless otherwise noted

Symbol	Parameter	Test Condition	MIN	MAX	Units

Off Characteristics

Symbol	Parameter	Test Condition	MIN	MAX	Units
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_B = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_C = 10 µA, I_B = 0	6.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 30 V, T_A = 150°C		5.0	µA
I_{CEX}	Emitter-Cutoff Current	V_{CE} = 30 V, V_{EB} = 3.0 V		50	nA
I_{BEX}	I_{BEX} Reverse Base Current	V_{CE} = 30 V, V_{EB} = 3.0 V		50	nA

On Characteristics

Symbol	Parameter	Test Condition	MIN	MAX	Units
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 50 mA, V_{CE} = 1.0 V I_C = 100 mA, V_{CE} = 1.0 V	40 70 100 60 30	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage *	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.2 0.3	V V
$V_{BE(sat)}$	Emitter-Base Breakdown Voltage *	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.65	0.85 0.95	V V

Small Signal Characteristics

Symbol	Parameter	Test Condition	MIN	MAX	Units
f_T	Transition Frequency	I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	300		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 0.5 V, I_E = 0, f = 1.0 MHz		4.0	pF
C_{eb}	Emitter-Base Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz		8.0	pF
h_{ie}	Input Impedance	V_{CE}= 10 V,I_C= 1.0 mA,f=1.0 kHz	1.0	10	kΩ
h_{fe}	Small-Signal Current Gain	V_{CE}= 10 V,I_C= 1.0 mA,f=1.0 kHz	100	400	
h_{oe}	Output Admittance	V_{CE}= 10 V,I_C= 1.0 mA,f=1.0 kHz	1.0	40	µS

Switching Characteristics

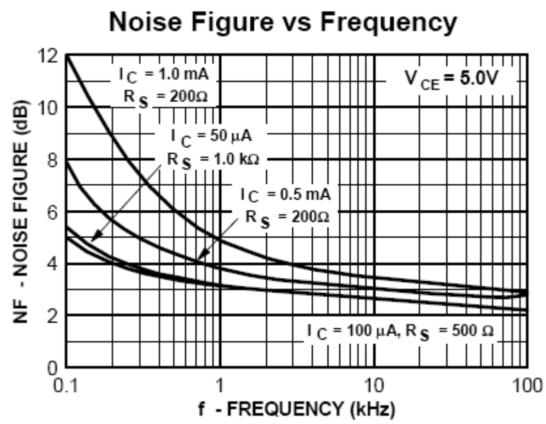
Symbol	Parameter	Test Condition	MIN	MAX	Units
t_d	Delay Time	I_C = 10 mA, $I_{B}1$ = 1.0 mA,V_{EB}= 0.5 V		35	ns
t_r	Rise Time			4.0	pF
t_s	Storage Time	I_C = 10 mA, I_{Bon} = I_{Boff} = 1.0 mA		200	ns
t_f	Fall Time			50	ns

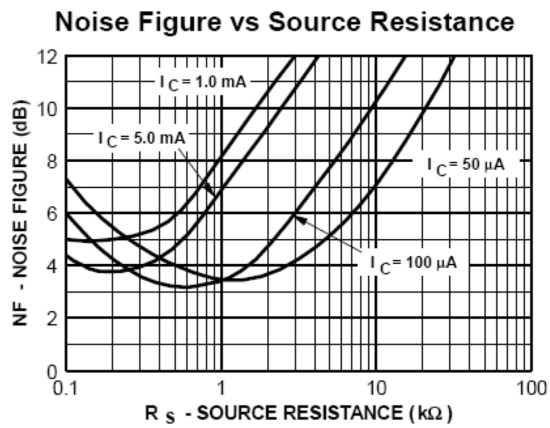
*Pulse Test: Pulse Width 300 s, Duty Cycle 2.0 %

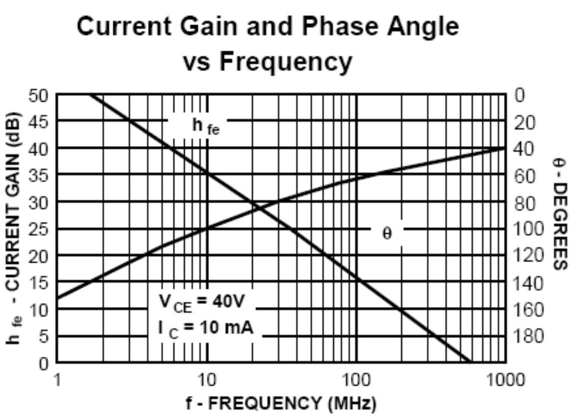
Spice Model

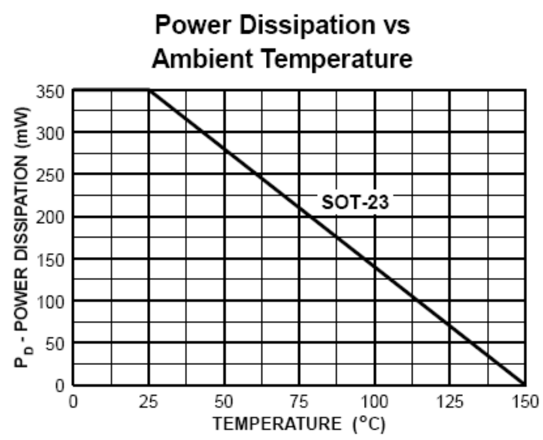
NPN (Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Ise=6.734 Ikf=66.78m Xtb=1.5 Br=.7371 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=239.5n Tf=301.2p Itf=.4 Vtf=4 Xtf=2 Rb=10)

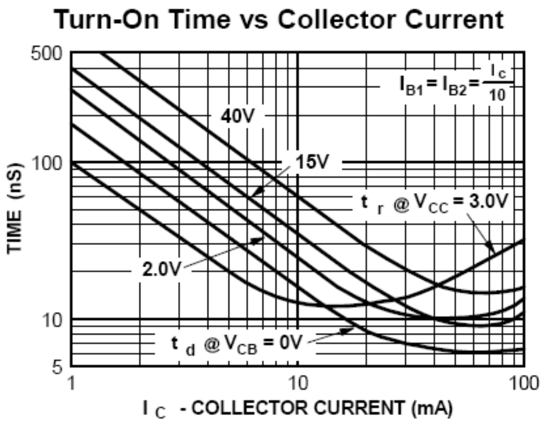
Typical Performance Characteristics

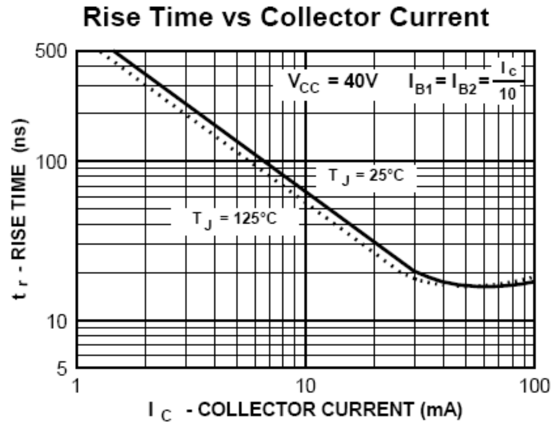






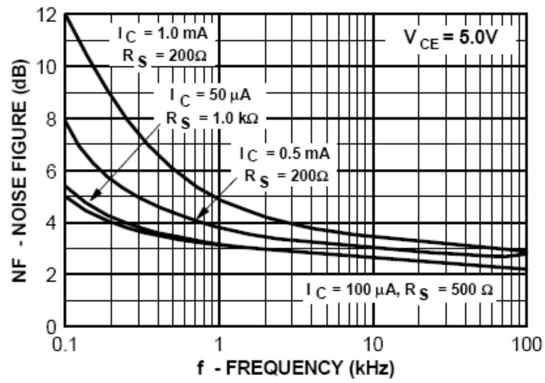




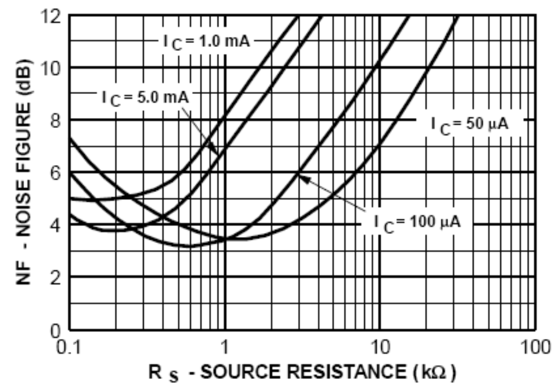


Typical Performance Characteristics (continued)

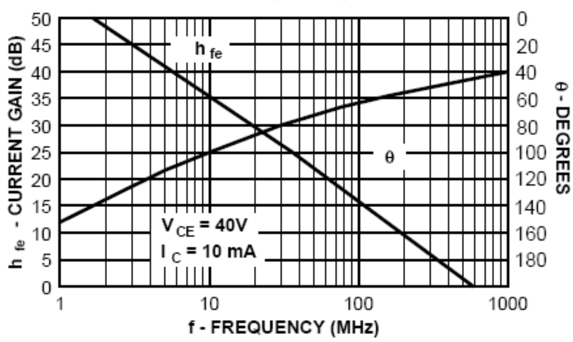
Noise Figure vs Frequency



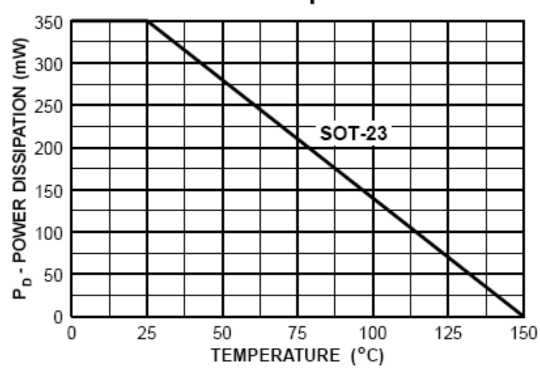
Noise Figure vs Source Resistance



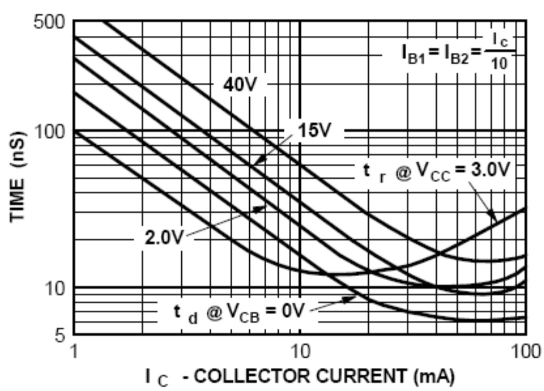
Current Gain and Phase Angle vs Frequency



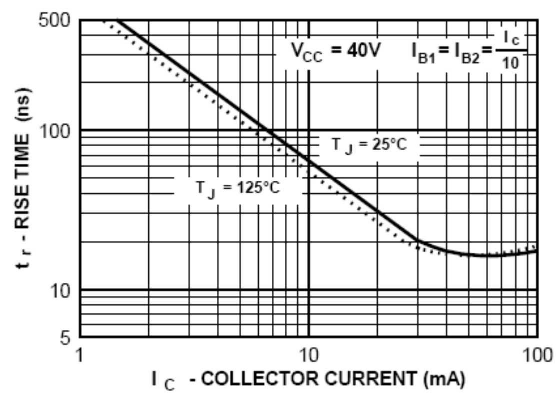
Power Dissipation vs Ambient Temperature



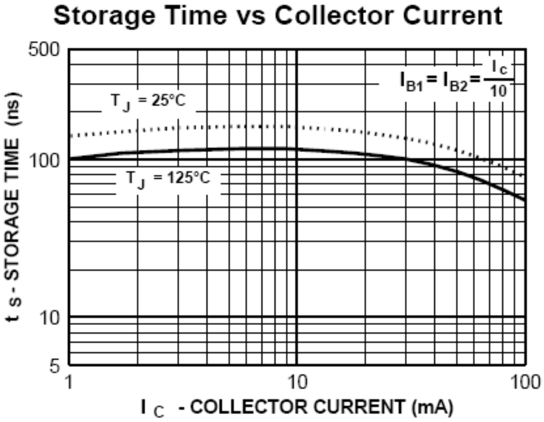
Turn-On Time vs Collector Current

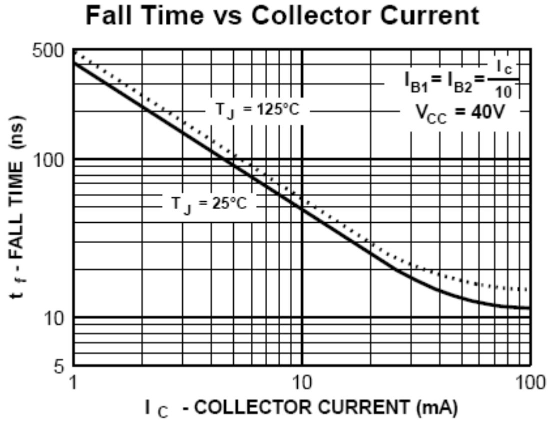


Rise Time vs Collector Current



Typical Performance Characteristics (continued)





Test Circuits

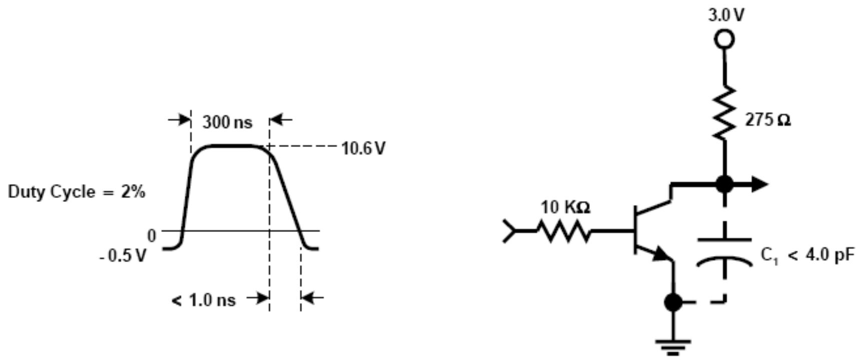


FIGURE 1: Delay and Rise Time Equivalent Test Circuit

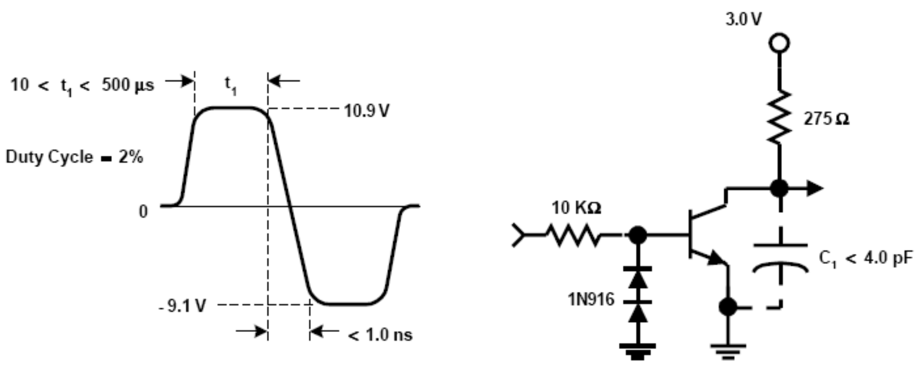


FIGURE 2: Storage and Fall Time Equivalent Test Circuit

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