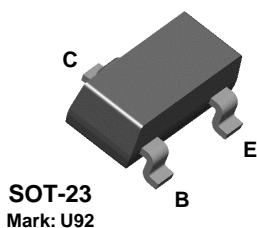


## BSR17A



### NPN General Purpose Amplifier

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\*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V <sub>CEO</sub>	Collector-Emitter Voltage	40	V
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>EBO</sub>	Emitter-Base Voltage	6.0	V
I <sub>C</sub>	Collector Current - Continuous	200	mA
T <sub>J</sub> , T <sub>stg</sub>	Operating and Storage Junction Temperature Range	-55 to +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

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		*BSR17A	
P <sub>D</sub>	Total Device Dissipation Derate above 25°C	350	mW
		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.

# NPN General Purpose Amplifier

(continued)

BSR17A

## Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
<b>OFF CHARACTERISTICS</b>					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10 \mu A, I_B = 0$	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 1.0 \text{ mA}, I_E = 0$	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu A, I_C = 0$	6.0		V
$I_{CBO}$	Collector-Cutoff Current	$V_{CB} = 30 \text{ V}, T_A = 150^\circ\text{C}$		5.0	$\mu A$
$I_{CEX}$	Collector-Cutoff Current	$V_{CE} = 30 \text{ V}, V_{EB} = 3.0 \text{ V}$		50	nA
$I_{BEX}$	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
$V_{BE(sat)}$	Base-Emitter Saturation Voltage*	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$	0.65	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	$V_{CB} = 5.0 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		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	$\mu S$

## 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			35	ns
$t_s$	Storage Time	$I_C = 10 \text{ mA}, I_{BON} = I_{BOFF} = 1.0 \text{ mA}$		200	ns
$t_f$	Fall Time			50	ns

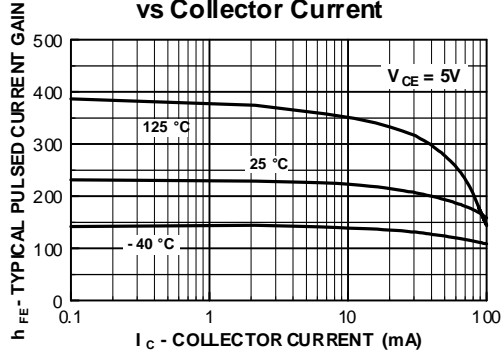
\* Pulse Test: Pulse Width  $\leq 300 \mu s$ , Duty Cycle  $\leq 2.0\%$

## Spice Model

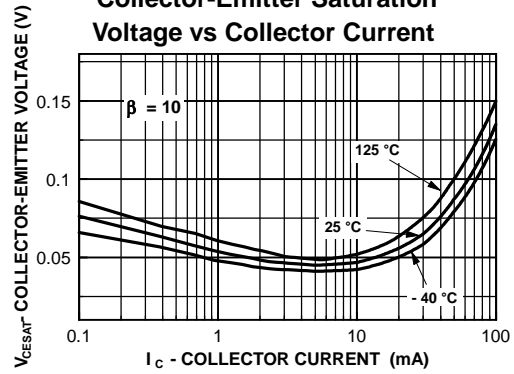
NPN (Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Ise=6.734 Ikf=66.78m Xtb=1.5 Br=.7371 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=239.5n Tf=301.2p Itf=.4 Vtf=4 Xtlf=2 Rb=10)

Typical Characteristics

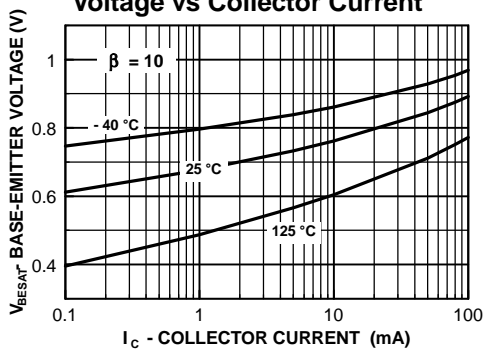
Typical Pulsed Current Gain vs Collector Current



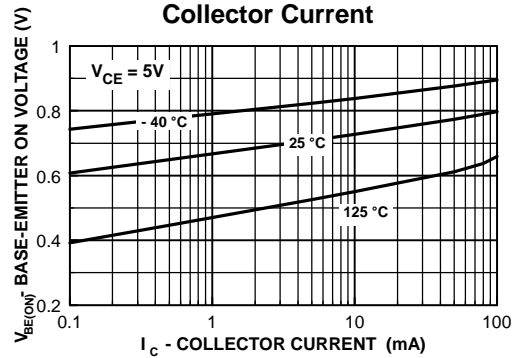
Collector-Emitter Saturation Voltage vs Collector Current



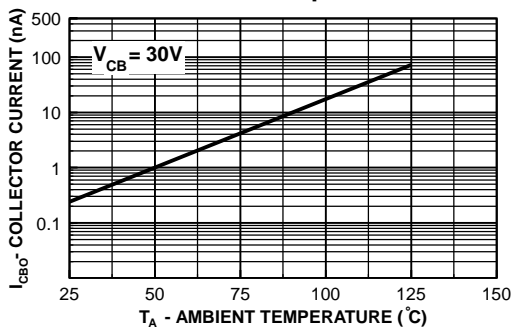
Base-Emitter Saturation Voltage vs Collector Current



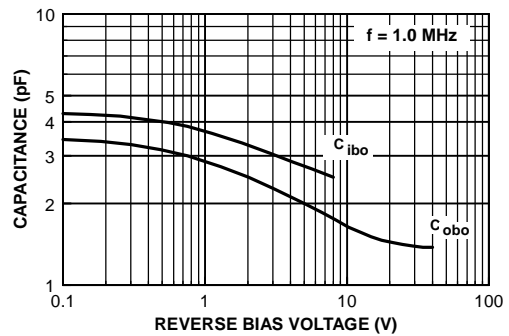
Base-Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

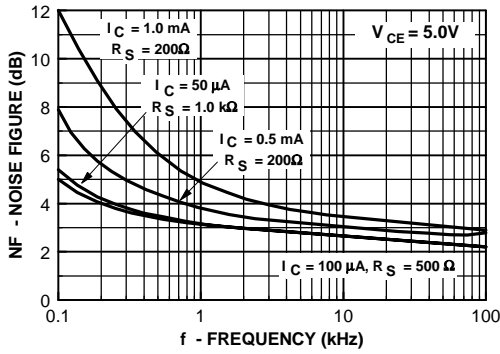


Capacitance vs Reverse Bias Voltage

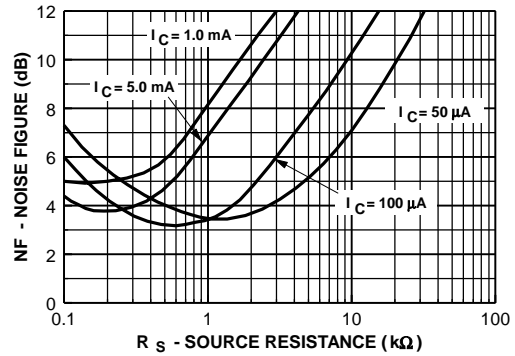


Typical Characteristics (continued)

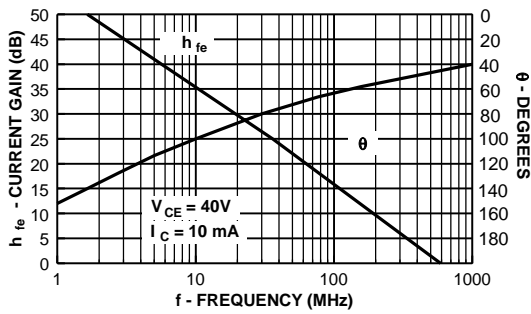
Noise Figure vs Frequency



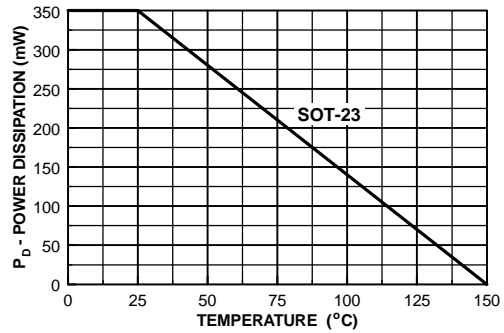
Noise Figure vs Source Resistance



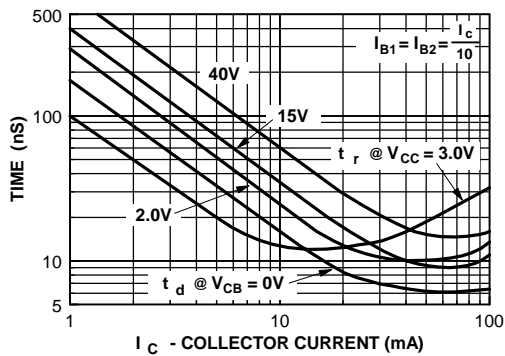
Current Gain and Phase Angle vs Frequency



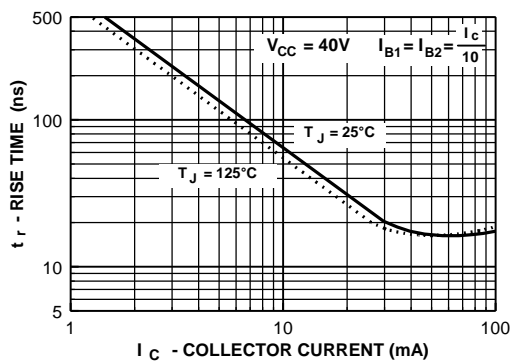
Power Dissipation vs Ambient Temperature



Turn-On Time vs Collector Current

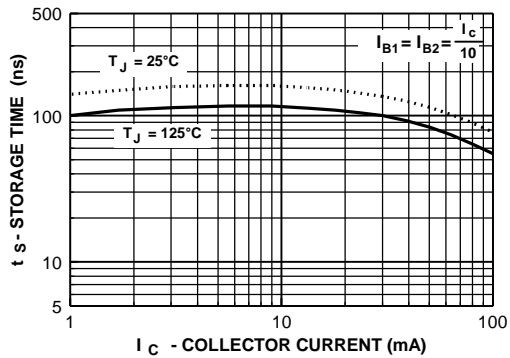


Rise Time vs Collector Current

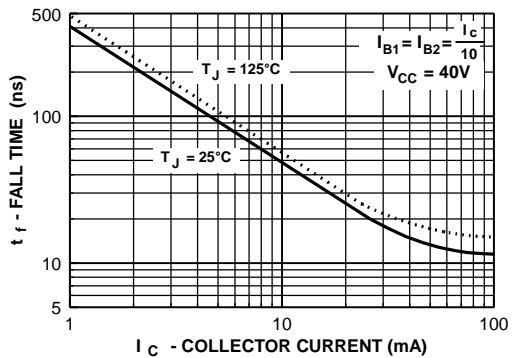


Typical Characteristics (continued)

Storage Time vs Collector Current



Fall Time vs Collector Current



Test Circuits

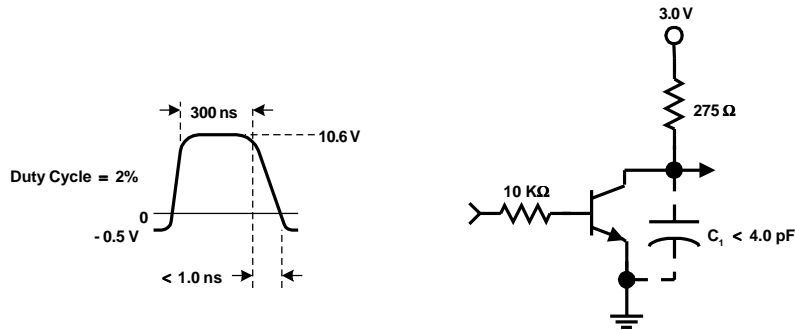


FIGURE 1: Delay and Rise Time Equivalent Test Circuit

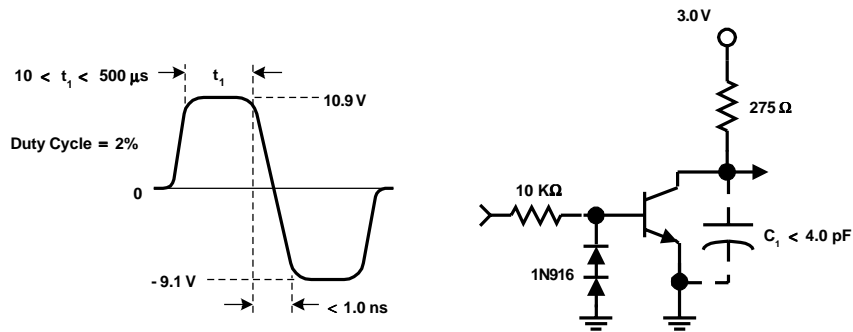


FIGURE 2: Storage and Fall Time Equivalent Test Circuit

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