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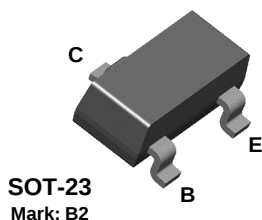
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BSV52



NPN Switching Transistor

This device is designed for high speed saturated switching at collector currents of 10 mA to 100 mA. Sourced from Process 21.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	12	V
V_{CES}	Collector-Base Voltage	20	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	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
		*BSV52	
P_D	Total Device Dissipation Derate above 25°C	225 1.8	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	556	°C/W

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

NPN Switching Transistor

(continued)

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10\text{ mA}, I_B = 0$	12		V
$V_{(BR)CES}$	Collector-Base Breakdown Voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	20		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100\text{ }\mu\text{A}, I_C = 0$	5.0		V
I_{CBO}	Collector-Cutoff Current	$V_{CB} = 10\text{ V}, I_E = 0$ $V_{CB} = 10\text{ V}, I_E = 0, T_A = 125^\circ\text{C}$		100 5.0	nA μA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 1.0\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1.0\text{ V}$	25 40 25	120	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 0.3\text{ mA}$ $I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		0.3 0.25 0.4	V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$	0.7	0.85 1.2	V V

SMALL SIGNAL CHARACTERISTICS

f_T	Transition Frequency	$I_C = 10\text{ mA}, V_{CE} = 10\text{ V},$ $f = 100\text{ MHz}$	400		MHz
C_{cb}	Collector-Base Capacitance	$I_E = 0, V_{CB} = 5.0\text{ V}, f = 1.0\text{ MHz}$		4.0	pF
C_{eb}	Emitter-Base Capacitance	$I_C = 0, V_{EB} = 1.0\text{ V}, f = 1.0\text{ MHz}$		4.5	pF

SWITCHING CHARACTERISTICS

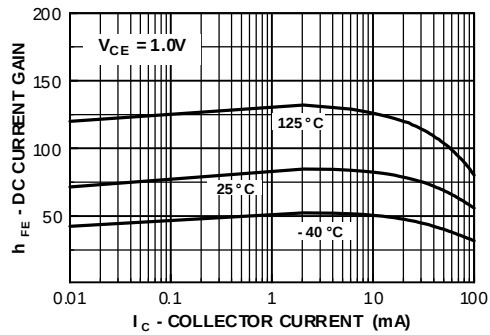
t_s	Storage Time	$I_{B1} = I_{B2} = I_C = 10\text{ mA}$		13	ns
t_{on}	Turn-On Time	$V_{CC} = 3.0\text{ V}, I_C = 10\text{ mA},$ $I_{B1} = 3.0\text{ mA}$		12	ns
t_{off}	Turn-Off Time	$V_{CC} = 3.0\text{ V}, I_C = 10\text{ mA},$ $I_{B1} = 3.0\text{ mA}, I_{B2} = 1.5\text{ mA}$		18	ns

Spice Model

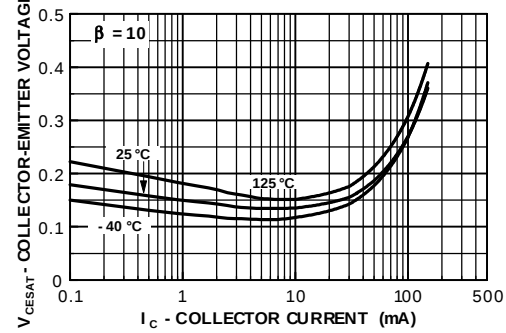
NPN (Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10)

Typical Characteristics

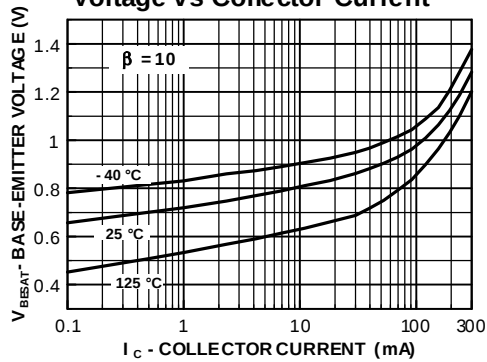
DC Current Gain
vs Collector Current



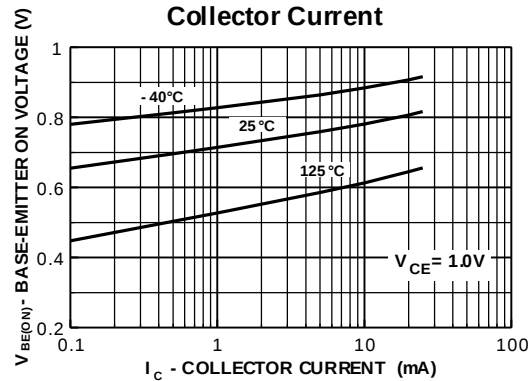
Collector-Emitter Saturation
Voltage vs Collector Current



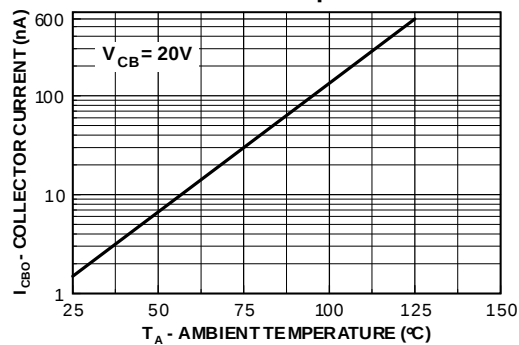
Base-Emitter Saturation
Voltage vs Collector Current



Base-Emitter ON Voltage vs
Collector Current



Collector-Cutoff Current
vs Ambient Temperature

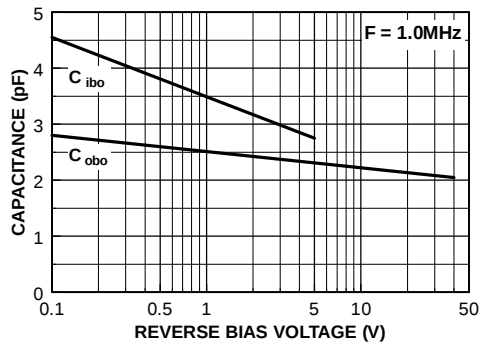


NPN Switching Transistor

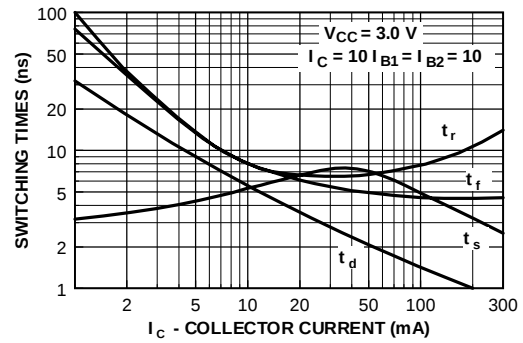
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Typical Characteristics (continued)

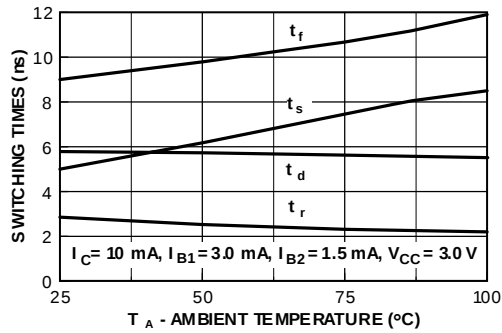
Output Capacitance vs
Reverse Bias Voltage



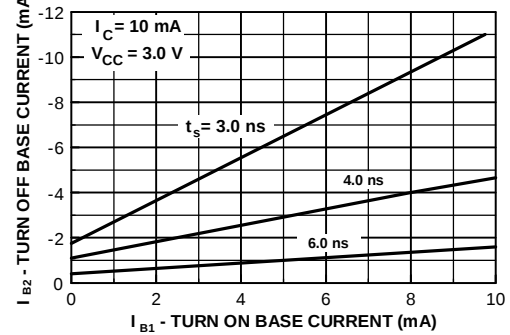
Switching Times vs
Collector Current



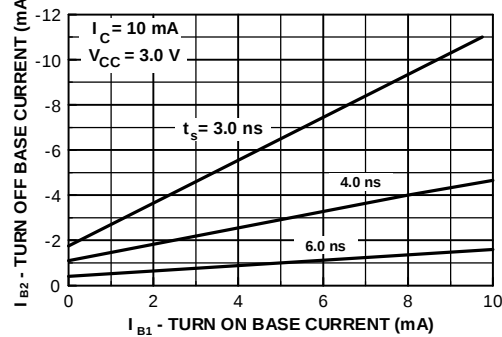
Switching Times vs
Ambient Temperature



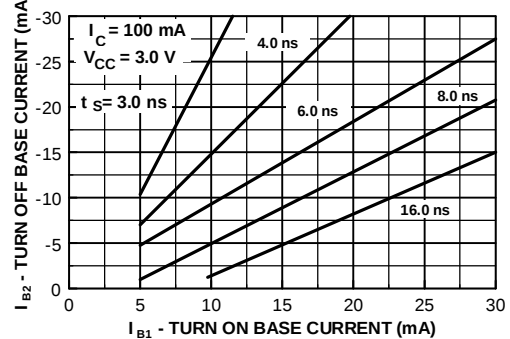
Storage Time vs Turn On
and Turn Off Base Currents



Storage Time vs Turn On
and Turn Off Base Currents



Storage Time vs Turn On
and Turn Off Base Currents

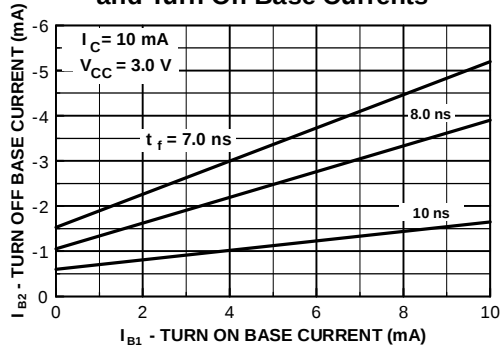


NPN Switching Transistor

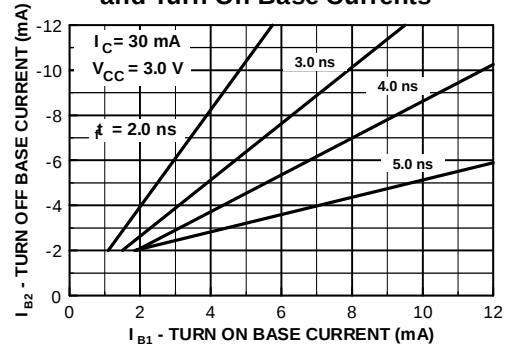
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Typical Characteristics (continued)

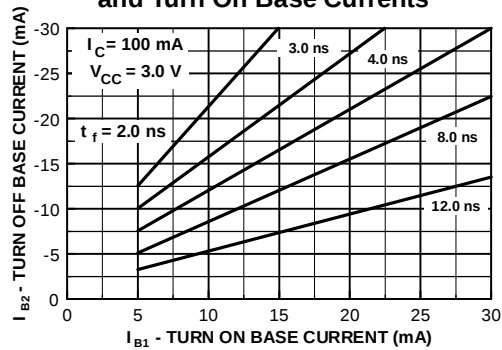
Fall Time vs Turn On
and Turn Off Base Currents



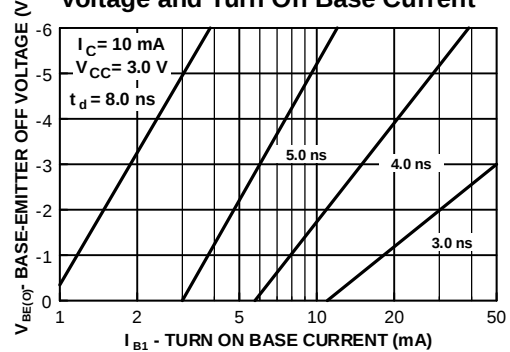
Fall Time vs Turn On
and Turn Off Base Currents



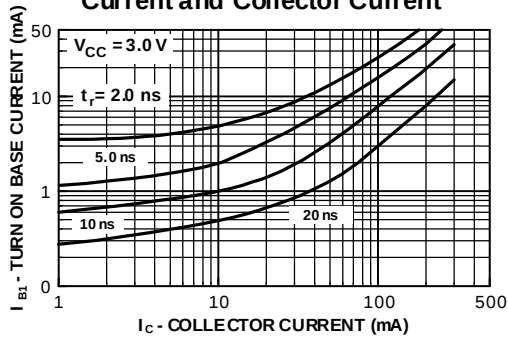
Fall Time vs Turn On
and Turn Off Base Currents



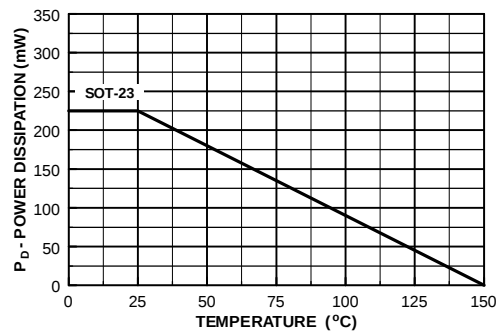
Delay Time vs Base-Emitter OFF
Voltage and Turn On Base Current



Rise Time vs. Turn On Base
Current and Collector Current



Power Dissipation vs
Ambient Temperature



Pulse generator
 V_{IN} Rise Time < 1 ns
 Source Impedance = 50Ω
 PW ≥ 300 ns
 Duty Cycle < 2%

10% Pulse waveform at point 'A'

The circuit diagram shows a differential signal source. A pulse generator provides a differential input V_{IN} to a differential pair of BJTs. The BJTs are biased with $V_{BB} = -3.0\text{ V}$ and $V_{IN} = +15.25\text{ V}$. The output V_{OUT} is taken from the collector nodes. The circuit includes a $3.3\text{ K}\Omega$ resistor, a $50\text{ }\Omega$ resistor, and a $220\text{ }\Omega$ resistor. The output is connected to a load with a $50\text{ }\Omega$ resistor. The output waveform shows a rise time t_{on} and a fall time t_{off} . The input and output waveforms are shown with 10% and 90% rise/fall times. The input waveform has a rise time t_{on} and a fall time t_{off} . The output waveform has a rise time t_{on} and a fall time t_{off} . The input and output waveforms are shown with 10% and 90% rise/fall times.

Pulse generator
 V_{IN} Rise Time $< 1\text{ ns}$
 Source Impedance $= 50\text{ }\Omega$
 $PW \geq 300\text{ ns}$
 Duty Cycle $< 2\%$

To sampling oscilloscope input
 impedance $= 50\text{ }\Omega$
 Rise Time $\leq 1\text{ ns}$

FIGURE 2: t_{ON} , t_{OFF} Measurement Circuit

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