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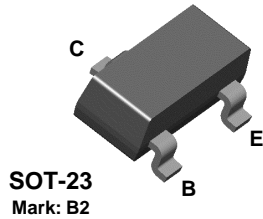
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# BSV52



## 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

TA = 25°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 $\mu\text{A}$

### 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

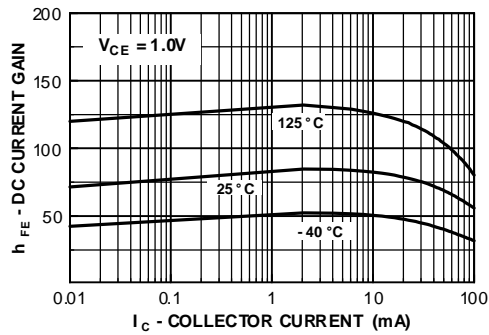
$t_s$	Storage Time	$I_{B1} = I_{B2} = I_C = 10 \text{ mA}$		13	ns
$t_{on}$	Turn-On Time	$V_{CC} = 3.0 \text{ V}, I_C = 10 \text{ mA},$ $I_{B1} = 3.0 \text{ mA}$		12	ns
$t_{off}$	Turn-Off Time	$V_{CC} = 3.0 \text{ V}, I_C = 10 \text{ mA},$ $I_{B1} = 3.0 \text{ mA}, I_{B2} = 1.5 \text{ mA}$		18	ns

## Spice Model

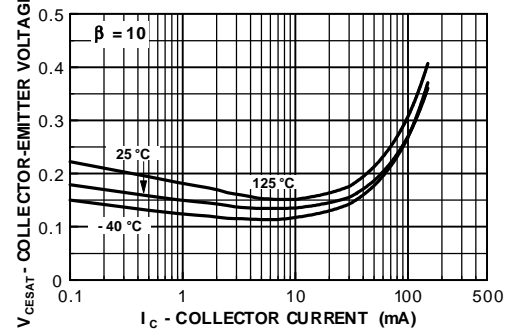
NPN (Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10)

## Typical Characteristics

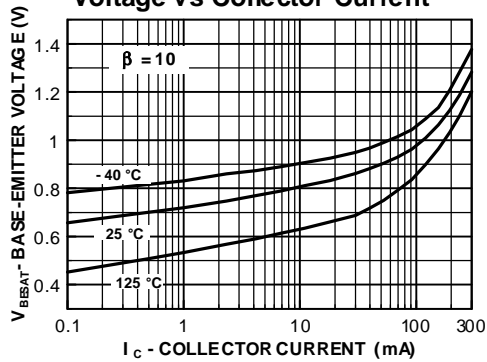
DC Current Gain  
vs Collector Current



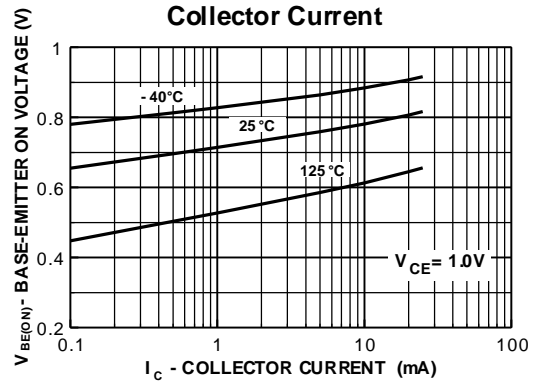
Collector-Emitter Saturation  
Voltage vs Collector Current



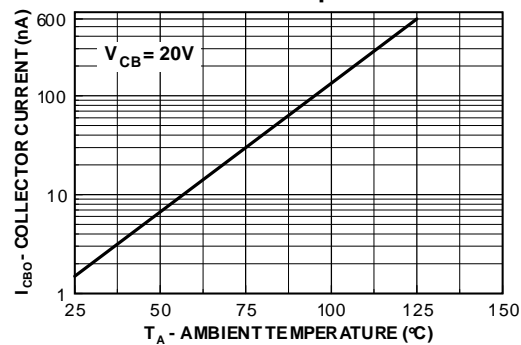
Base-Emitter Saturation  
Voltage vs Collector Current



Base-Emitter ON Voltage vs  
Collector Current



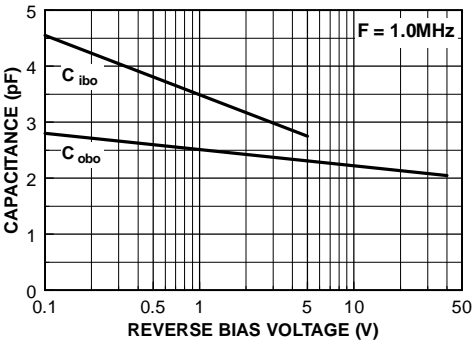
Collector-Cutoff Current  
vs Ambient Temperature



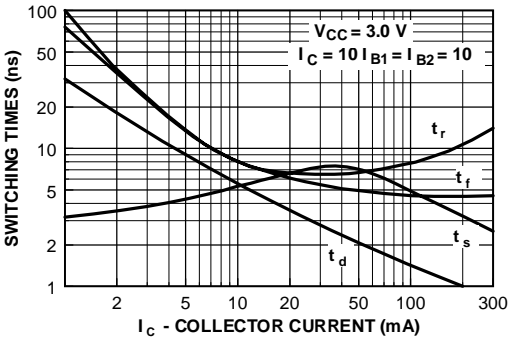
NPN Switching Transistor  
(continued)

Typical Characteristics (continued)

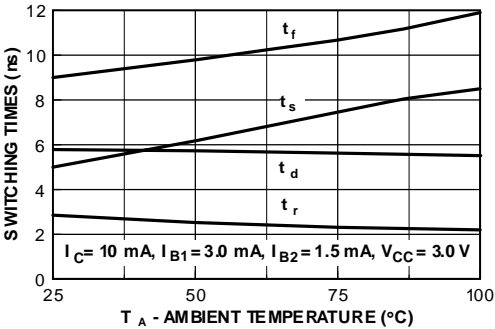
Output Capacitance vs  
Reverse Bias Voltage



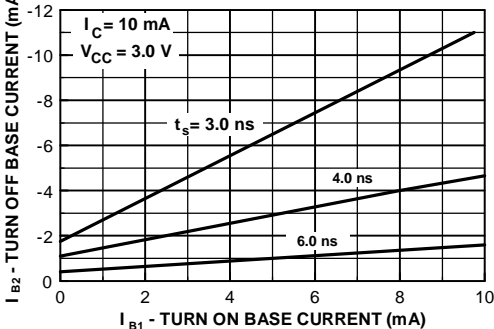
Switching Times vs  
Collector Current



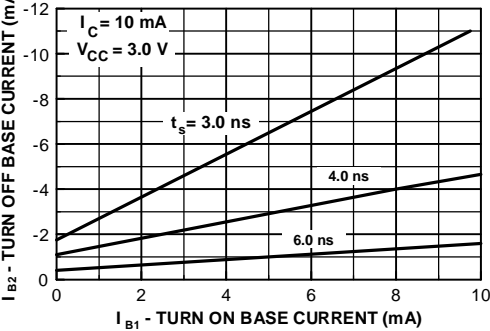
Switching Times vs  
Ambient Temperature



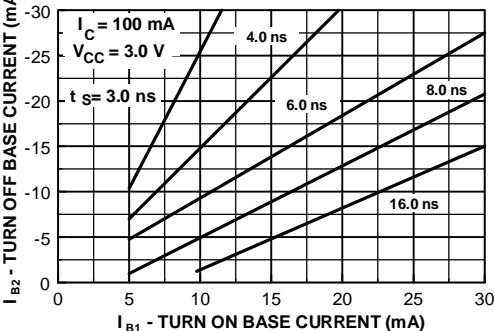
Storage Time vs Turn On  
and Turn Off Base Currents



Storage Time vs Turn On  
and Turn Off Base Currents

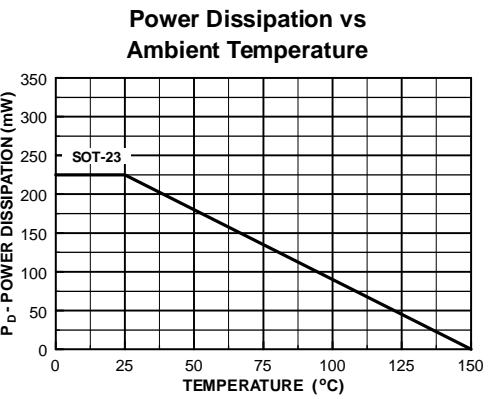
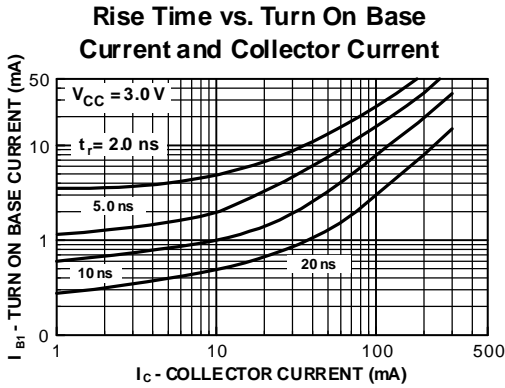
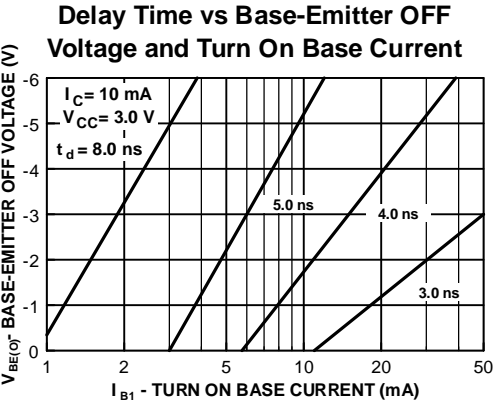
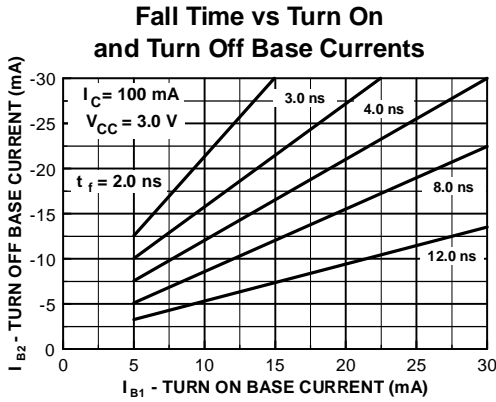
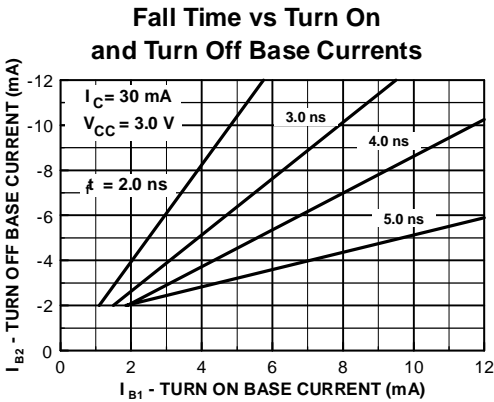
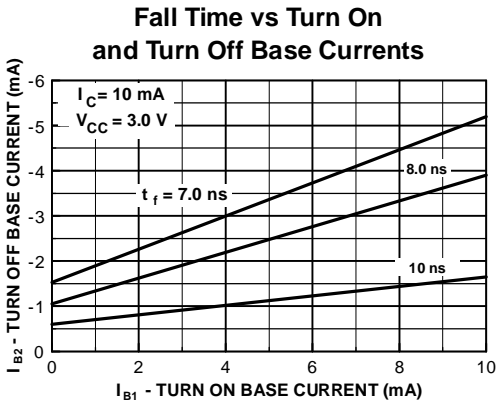


Storage Time vs Turn On  
and Turn Off Base Currents



NPN Switching Transistor  
(continued)

Typical Characteristics (continued)



## Test Circuits

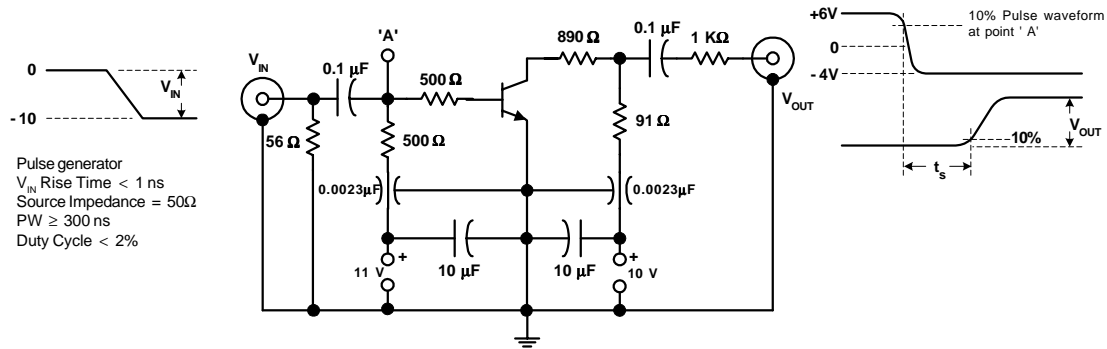


FIGURE 1: Charge Storage Time Measurement Circuit

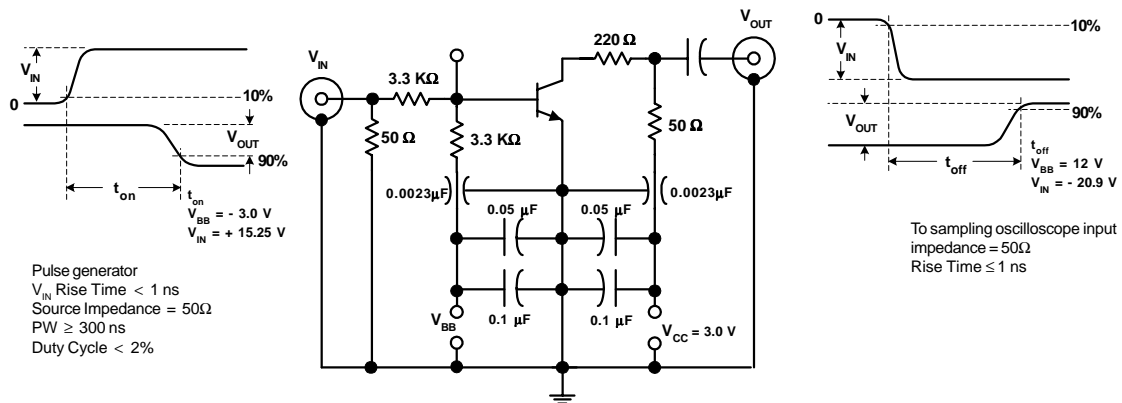


FIGURE 2:  $t_{ON}$ ,  $t_{OFF}$  Measurement Circuit

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