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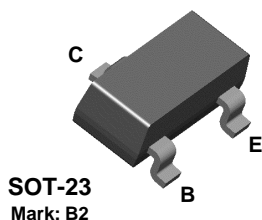


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BSV52



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 | mW |
| | | 1.8 | mW/°C |
| R _{θJA} | 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)

BSV52

Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|--------|-----------|-----------------|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-------|

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

| | | | | | |
|---------------|--------------------------------------|--|----------------|--------------------|-------------|
| η_{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

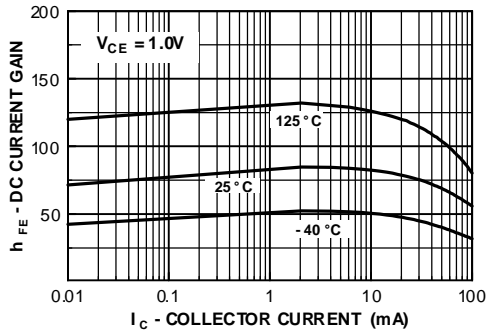
| | | | | | |
|-----------|---------------|--|--|----|----|
| t_s | Storage Time | $I_{B1} = I_{B2} = I_C = 10 \text{ mA}$ | | 13 | ns |
| t_{on} | Turn-On Time | $V_{CC} = 3.0 \text{ V}, I_C = 10 \text{ mA},$ $I_{B1} = 3.0 \text{ mA}$ | | 12 | ns |
| t_{off} | Turn-Off Time | $V_{CC} = 3.0 \text{ V},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

Spice Model

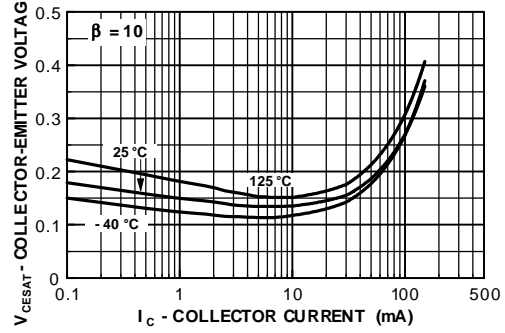
NPN (Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10)

Typical Characteristics

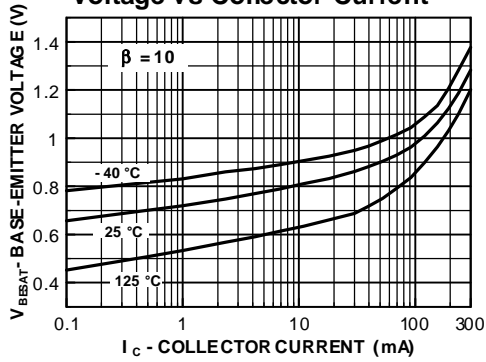
DC Current Gain vs Collector Current



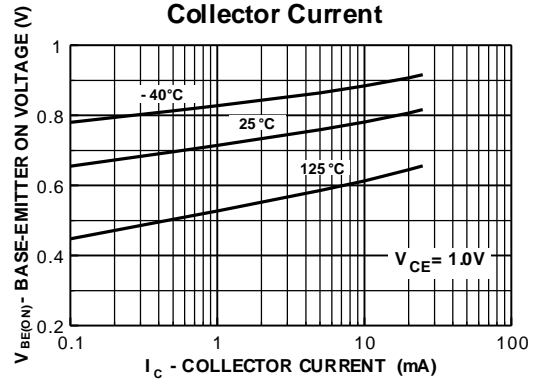
Collector-Emitter Saturation Voltage vs Collector Current



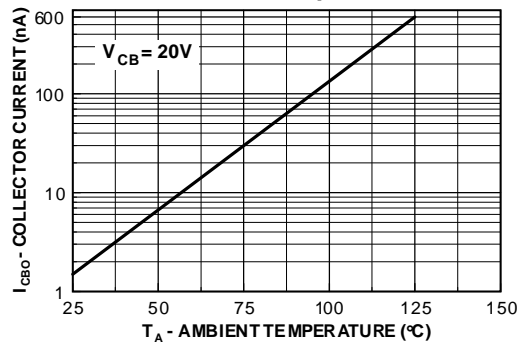
Base-Emitter Saturation Voltage vs Collector Current



Base-Emitter ON Voltage vs Collector Current

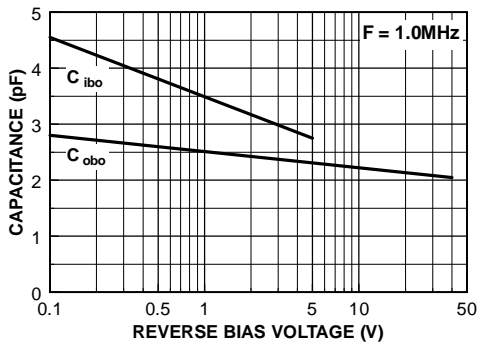


Collector-Cutoff Current vs Ambient Temperature

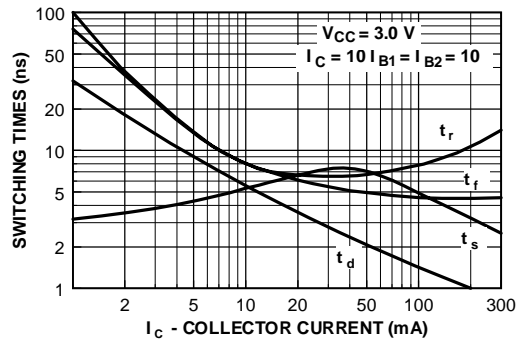


Typical Characteristics (continued)

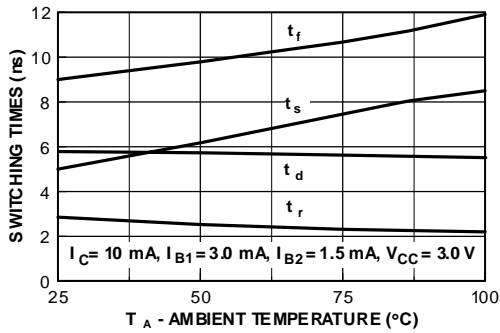
Output Capacitance vs Reverse Bias Voltage



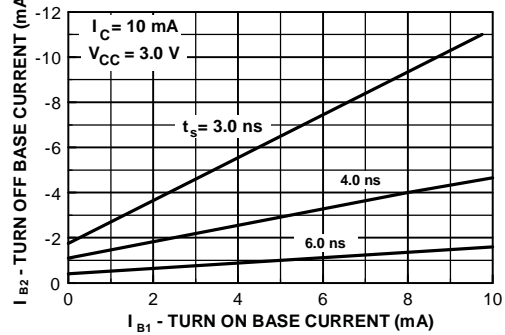
Switching Times vs Collector Current



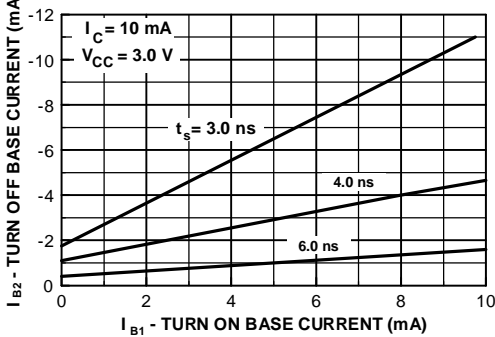
Switching Times vs Ambient Temperature



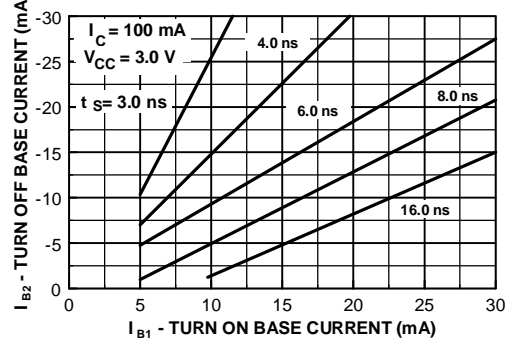
Storage Time vs Turn On and Turn Off Base Currents



Storage Time vs Turn On and Turn Off Base Currents

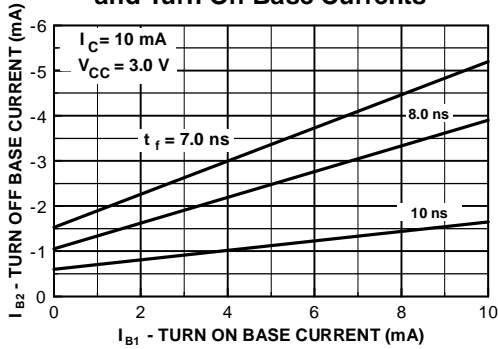


Storage Time vs Turn On and Turn Off Base Currents

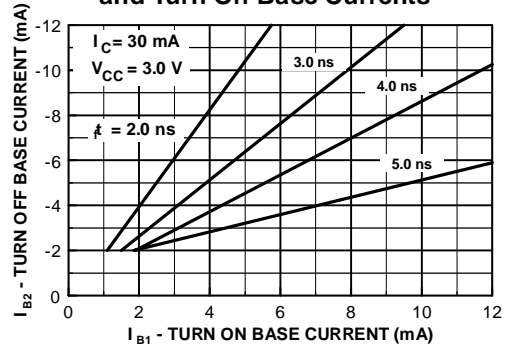


Typical Characteristics (continued)

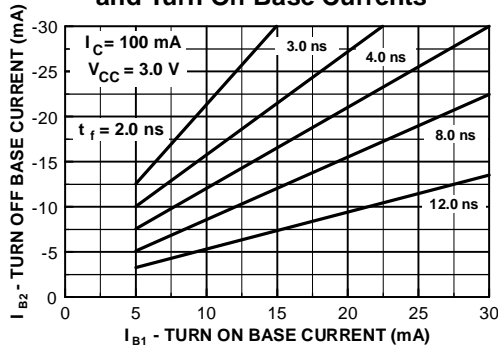
Fall Time vs Turn On
and Turn Off Base Currents



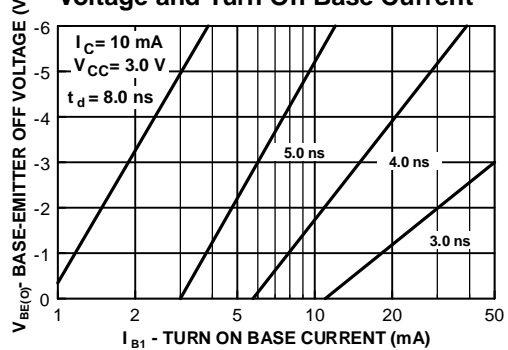
Fall Time vs Turn On
and Turn Off Base Currents



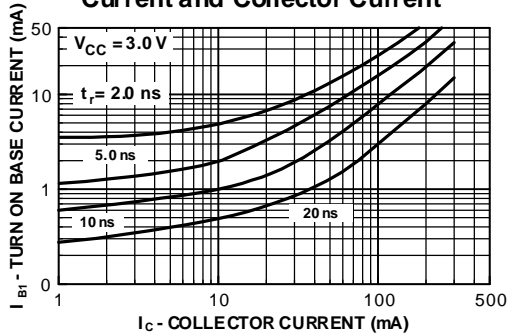
Fall Time vs Turn On
and Turn Off Base Currents



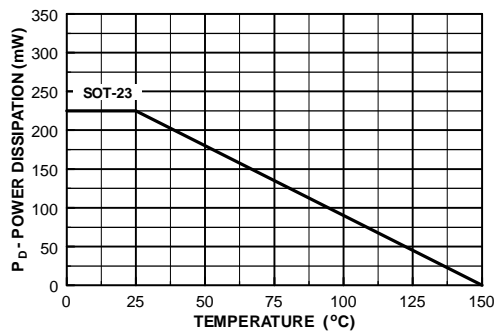
Delay Time vs Base-Emitter OFF
Voltage and Turn On Base Current



Rise Time vs. Turn On Base
Current and Collector Current



Power Dissipation vs
Ambient Temperature



Test Circuits

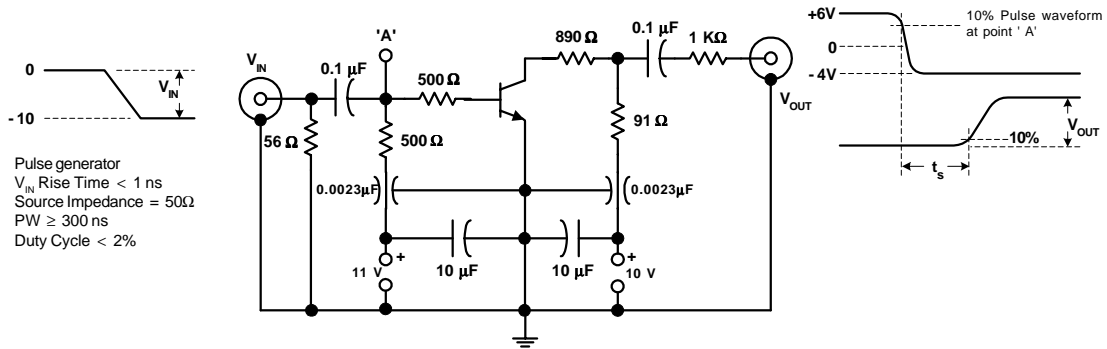


FIGURE 1: Charge Storage Time Measurement Circuit

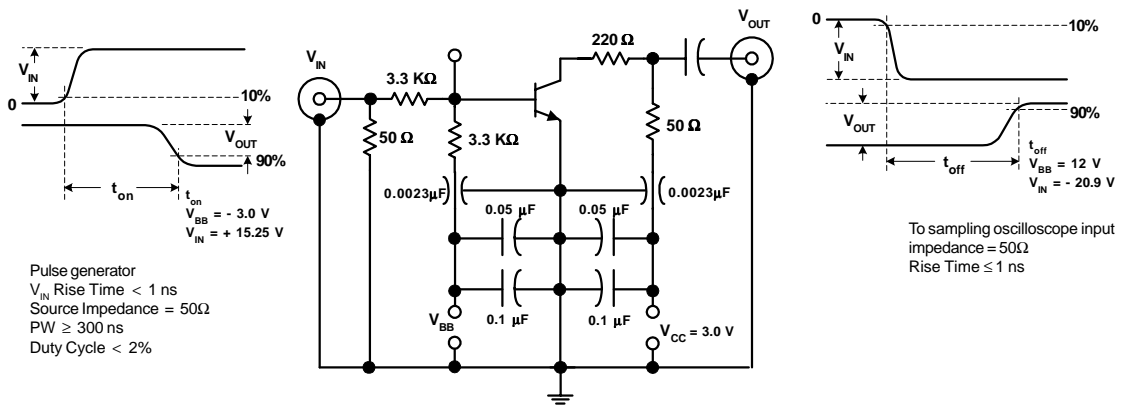


FIGURE 2: t_{ON} , t_{OFF} Measurement Circuit

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