High frequency saturated switch

The BSX 93 is an NPN silicon Planar epitaxial transistor designed specifically for high-speed saturated switching applications in the 50 - 100MHz range at current levels from 100 microamps to 100milliamps. It is suitable for most satellite and conventional, small signal, RF and digital type circuits.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Characteristic and test conditions	Min.	Typ.	Max.	Unit
h_{FE}	DC Current Gain (5) I_C = 10 mA V_{CE} = 1V I_C = 100 mA V_{CE} = 1V	40 20	80 70	120	
h_{FE}	DC Current Gain (5) I_C = 10 mA V_{CE} = 1V T_A = 55°C	20	40		
$V_{BE\,sat}$	Base Saturation Voltage (5) I_C = 10 mA I_B = 1 mA	0.72	0.75	0.85	V
$V_{BE\,on}$	Base-Emitter On Voltage I_C = 10 mA V_{CE} = 1V		0.7		V
$V_{CE\,sat}$	Collector Saturation Voltage (5) I_C = 10 mA I_B = 1 mA		0.15	0.20	V
I_{CBO}	Collector Reverse Current V_{CB} = 20 V I_E = 0		0.1	0.2	µA
I_{CBO}	Collector Reverse Current V_{CB} = 20 V I_E = 0 T_A = 150°C		10	70	uA
BV_{CBO}	Collector to Base Breakdown Voltage I_C = 10 µA I_E = 0	40			V
BV_{CES}	Collector to Emitter Breakdown Voltage I_C = 10 µA V_{EB} = 0	40			V
BV_{EBO}	Emitter to Base Breakdown Voltage I_E = 10 µA I_C = 0	5			V
LV_{CEO}	Collector to Emitter Sustaining Voltage (4 and 5) I_C = 10 mA I_B = 0	15			V
h_{fe}	High Freq. Current Gain I_C = 10 mA V_{CE} = 10V f = 100 MHz	4	6.5		
C_{TE}	Emitter Transition Capacitance I_C = 0 V_{EB} = 0.5V		3.8	6	pF
C_{obo}	Base-Collector Capacitance I_E = 0 V_{CB} = 5V		2.5	4	pF
τ_s	Charge Storage Time Constant (6) $I_C = I_{B1} = I_{B2}$ = 10 mA		6	13	ns
t_{on}	Turn On Time (6) I_C = 10 mA I_{B1} = 3 mA		9	12	ns
t_{off}	Turn Off Time (6) I_C = 10 mA I_{B1} = 3 mA I_{B2} = 1.5 mA		13	18	ns

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
(3) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 175°C/W (derating factor of 5.7 mW/°C); junction-to-ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C).
(4) These ratings refer to a high-current point where collector-to-emitter voltage is lowest. For more information send for SGS - AR 5.
(5) Measured under pulse conditions: pulse length = 300 µsec; duty cycle = 1%.
(6) See switching circuits for exact values of I_C, I_{B1} and I_{B2}.

ABSOLUTE MAXIMUM RATINGS (1)

(T_A = 25°C unless otherwise noted)

Voltages and Currents

Collector to Base	V_{CBO}	40V
Collector to Emitter (4)	V_{CEO}	15V
Collector to Emitter	V_{CES}	40V
Emitter to Base	V_{EBO}	5V
Collector Current (10 µsec Pulse)	I_C	500mA

Temperatures

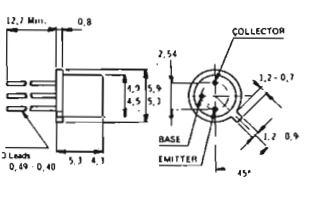
Storage Temperature	T_{STG}	-65°C to 200°C
Junction Temperature	T_J	200°C
Lead Temperature (Soldering, no time limit)	T_L	300°C

Power (2-3)

Dissipation at 25°C Case Temperature	P_D	1W
Dissipation at 25°C Ambient Temperature	P_D	0.36W

PHYSICAL DIMENSIONS

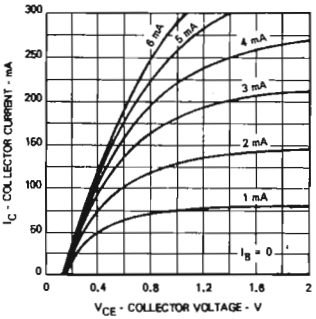
Similar to Jedec TO-18



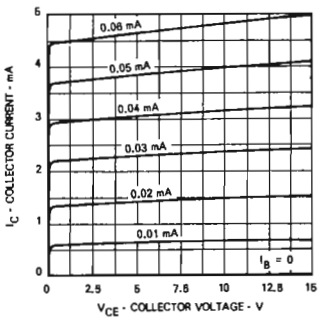
Note All dimensions are in mm.

TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

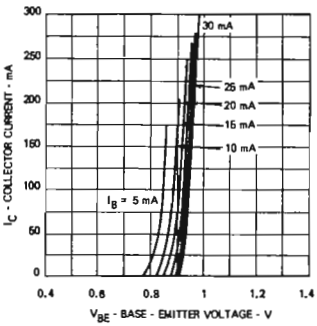
COLLECTOR CHARACTERISTICS *



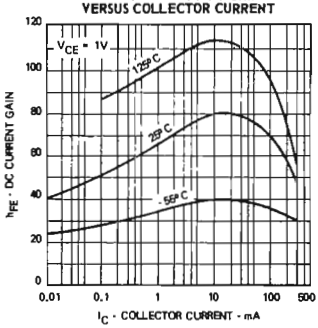
COLLECTOR CHARACTERISTICS *



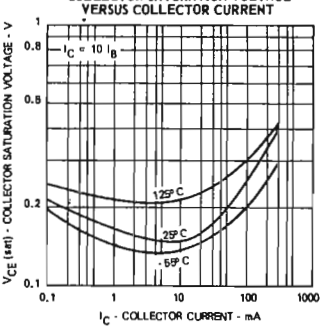
BASE CHARACTERISTICS *



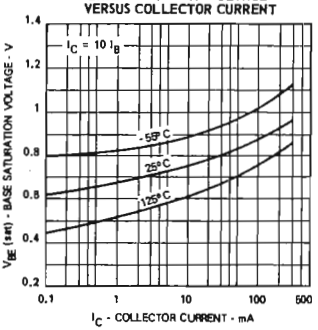
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



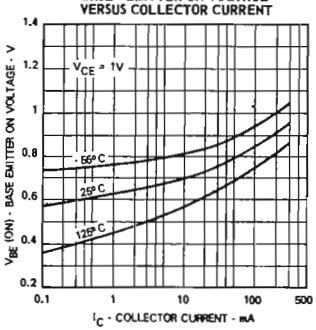
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



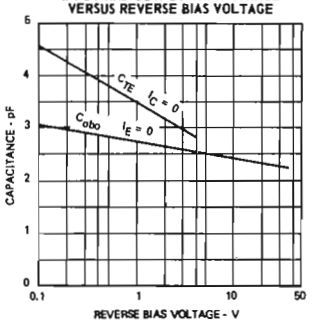
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



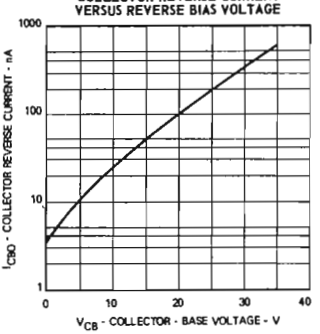
BASE - EMITTER ON VOLTAGE VERSUS COLLECTOR CURRENT



INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE

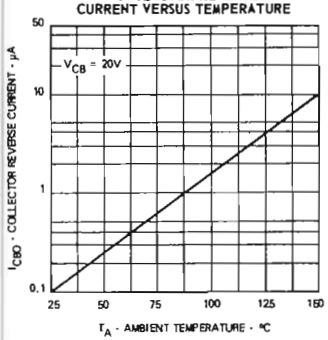


COLLECTOR REVERSE CURRENT VERSUS REVERSE BIAS VOLTAGE

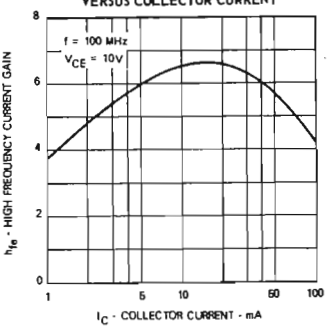


TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

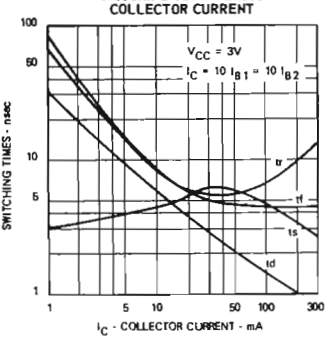
COLLECTOR REVERSE CURRENT VERSUS TEMPERATURE



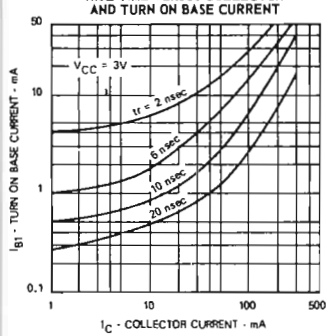
HIGH FREQUENCY CURRENT GAIN VERSUS COLLECTOR CURRENT



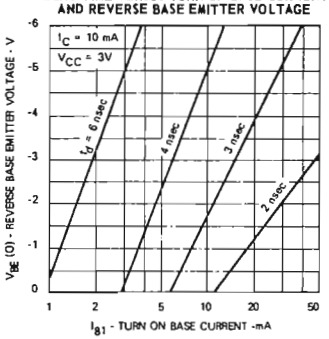
SWITCHING TIMES VERSUS COLLECTOR CURRENT



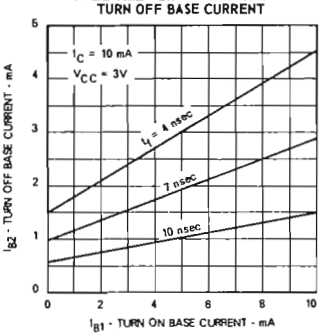
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENT



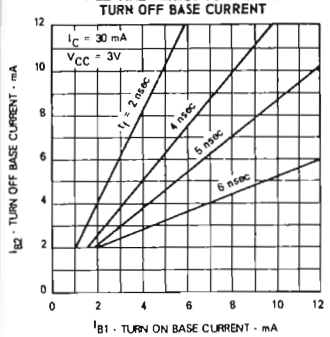
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



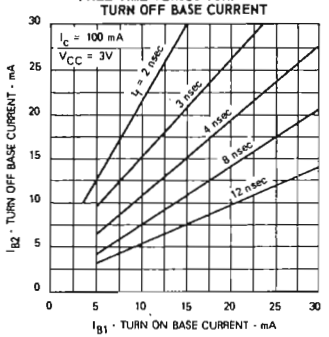
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



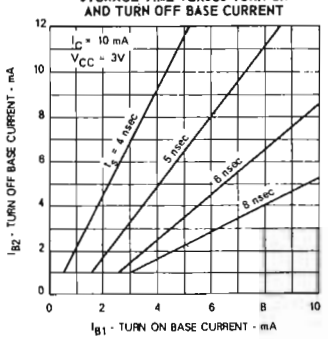
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



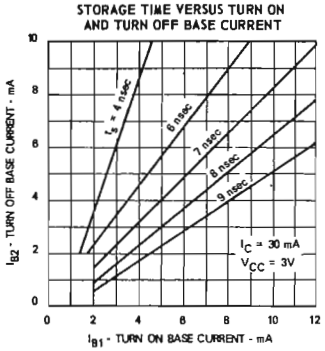
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENT

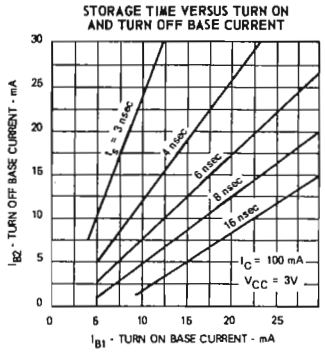


STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT

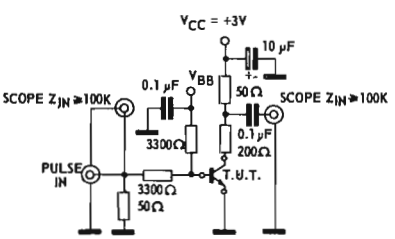


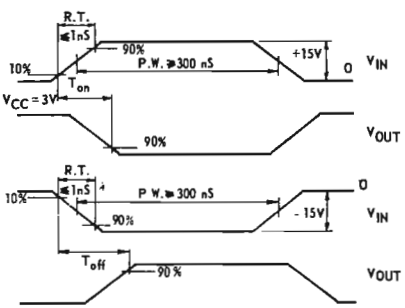
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)





TEST CIRCUIT T_{ON} T_{OFF}

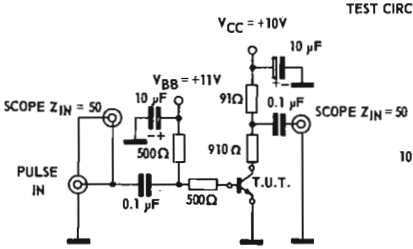


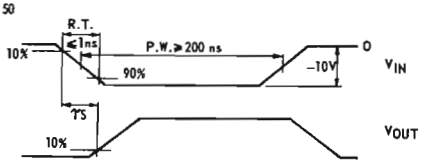


T_{on} : I_C = 10 mA I_{B1} = 3 mA V_{BB} = -3V

T_{off}: I_C = 10 mA I_{B1} = 3 mA I_{B2} = 1.5 mA V_{BB} = +12V

TEST CIRCUIT τ_S





τ_s = I_C = I_{B1} = I_{B2} = 10 mA