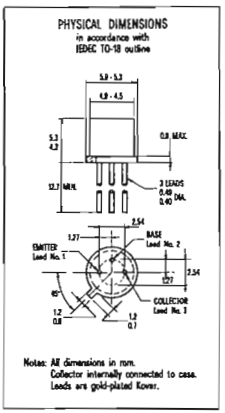
BSX 39

HIGH-SPEED SATURATED SWITCH

NPN DIFFUSED SILICON PLANAR EPITAXIAL TRANSISTOR

GENERAL DESCRIPTION - The BSX 39 is an NPN silicon PLANAR epitaxial transistor designed for very fast switching applications up to 500mA collector current. This device is expecially suitable for memory applications and features a typical f_T of 600 MHz together with 20 V V_{CEO} and 0.39 V V_{CE} (sat) at 300 mA collector current.



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

T_{STG}	Storage Temperature	- 55°C to + 200°C
T_J	Operating Junction Temperature	+ 200°C Maximum
T_L	Lead Temperature (Soldering, 10 sec. Time Limit)	+ 260°C Maximum

Maximum Power Dissipations

P	Total Dissipation at 25°C Case Temperature (Notes 2 and 3)	1.2 Watt
	at 100°C Case Temperature (Notes 2 and 3)	0.68 Watt
	at 25°C Ambient Temperature (Notes 2 and 3)	0.36 Watt

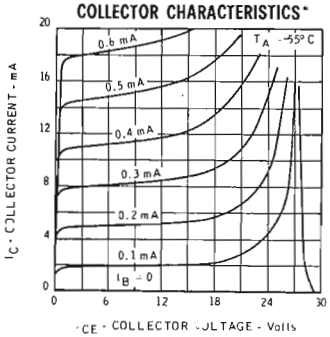
Maximum Voltages (25°C free air temperature unless otherwise noted)

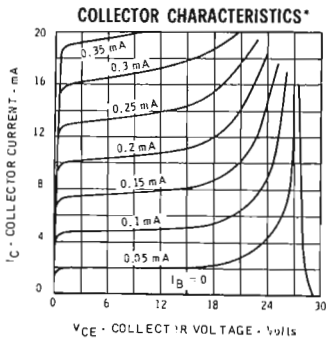
V_{CBO}	Collector to Base Voltage	45 Volts
V_{CEO}	Collector to Emitter Voltage (Note 4)	20 Volts
V_{EBO}	Emitter to Base Voltage	5 Volts

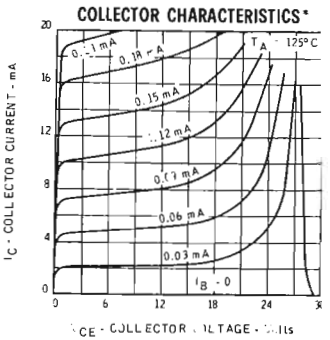
ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

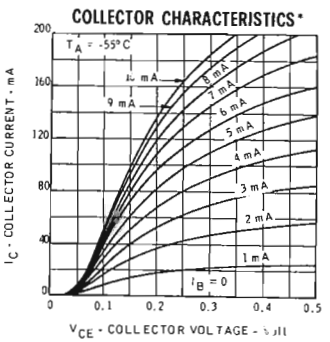
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	
h_{FE}	DC Pulse Current Gain (Note 5)	40	60	120		I_C = 30 mA	V_{CE} = 0.4 V
h_{FE}	DC Pulse Current Gain (Note 5)	25	55			I_C = 100 mA	V_{CE} = 0.5 V
h_{FE}	DC Pulse Current Gain (Note 5)	15	40			I_C = 300 mA	V_{CE} = 1 V
h_{FE} (-55°C)	DC Pulse Current Gain (Note 5)	12				I_C = 30 mA	V_{CE} = 0.4 V
V_{BE} (sat)	Base Saturation Voltage (Note 5)	0.75	0.80	0.95	V	I_C = 30 mA	I_B = 3 mA
V_{BE} (sat)	Base Saturation Voltage (Note 5)		0.90	1.2	V	I_C = 100 mA	I_B = 10 mA
V_{BE} (sat)	Base Saturation Voltage (Note 5)		1.1	1.7	V	I_C = 300 mA	I_B = 30 mA
V_{CE} (sat)	Collector Saturation Voltage (Note 5)		0.15	0.18	V	I_C = 30 mA	I_B = 3 mA
V_{CE} (sat)	Collector Saturation Voltage (Note 5)		0.18	0.28	V	I_C = 100 mA	I_B = 10 mA
V_{CE} (sat)	Collector Saturation Voltage (Note 5)		0.39	0.5	V	I_C = 300 mA	I_B = 30 mA
V_{CE} (sat)	Collector Saturation Voltage (85°C) (Note 5)		0.17	0.3	V	I_C = 30 mA	I_B = 3 mA
I_{CES}	Collector Cutoff Current		0.02	0.1	µA	V_{CE} = 20 V	V_{EB} = 0
I_{CES} (125°C)	Collector Cutoff Current			30	µA	V_{CE} = 20 V	V_{EB} = 0
BV_{CBO}	Collector Base Breakdown Voltage	45			V	I_C = 100 µA	I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5			V	I_E = 100 µA	I_C = 0
V_{CEO} (sust)	Collector Emitter Sustaining Voltage (Notes 4 and 5)	20			V	I_C = 10 mA	I_B = 0
h_{fe}	High Frequency Current Gain (f = 100 MHz)	3.5	6			I_C = 30 mA	V_{CE} = 10 V
C_{ob}	Output Capacitance		4	5	pF	V_{CB} = 5 V	I_E = 0
C_{TE}	Emitter Transition Capacitance		7	8	pF	V_{EB} = 0.5 V	I_C = 0
τ_s	Charge Storage Time Constant		8	18	nsec	$I_C = I_{B1} = I_{B2}$ = 10 mA	
t_{on}	Turn On Time		9	15	nsec	I_C = 300 mA	I_{B1} = 30 mA
t_{off}	Turn Off Time		15	25	nsec	I_C = 300 mA	$I_{B1} = I_{B2}$ = 30 mA

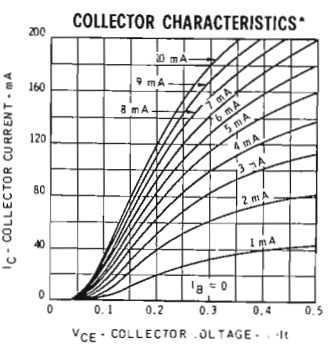
TYPICAL ELECTRICAL CHARACTERISTICS (25° C free air temperature unless otherwise noted)

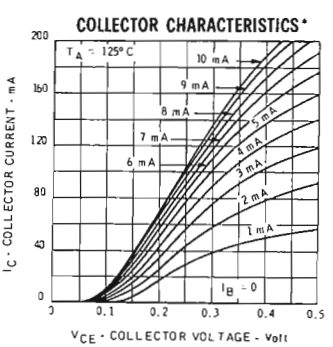


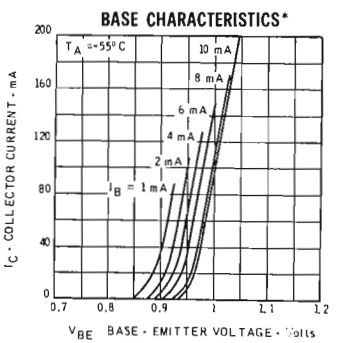


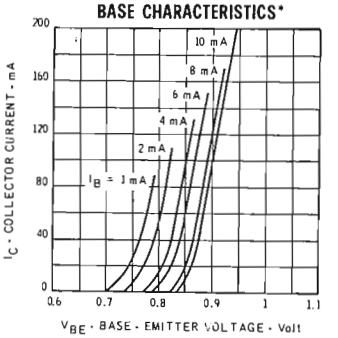


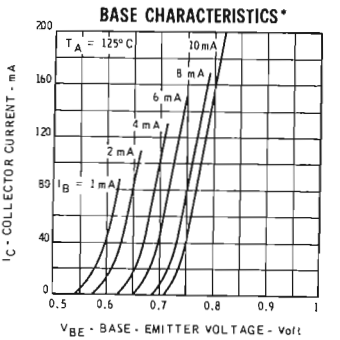








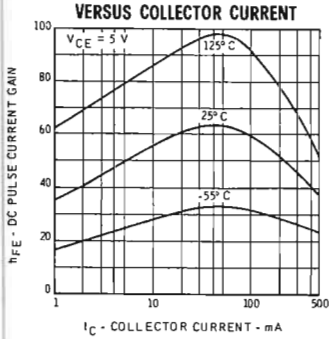




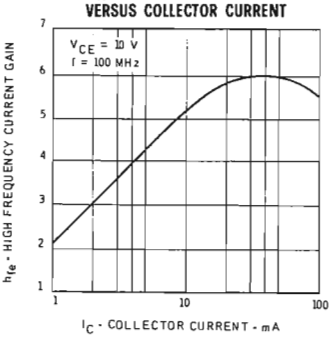
* Single family characteristics on Transistor Curve Tracer.

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

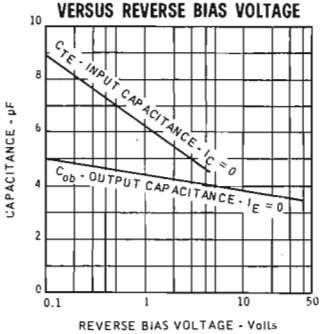
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



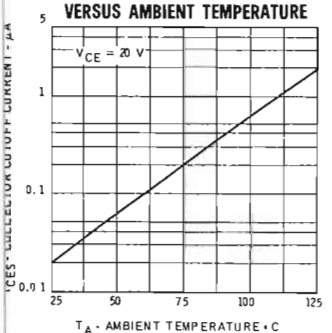
HIGH FREQUENCY CURRENT GAIN VERSUS COLLECTOR CURRENT



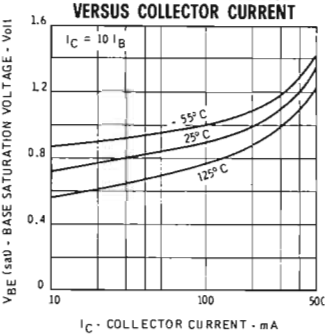
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



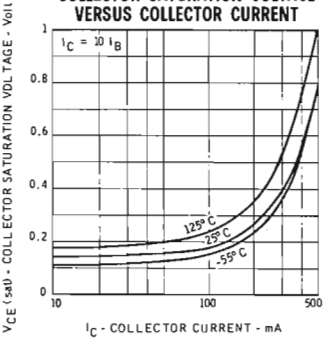
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



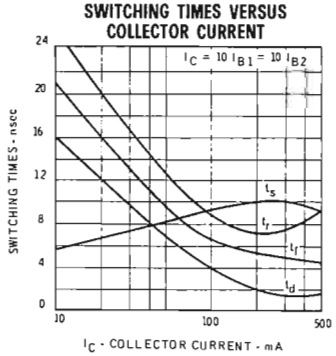
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



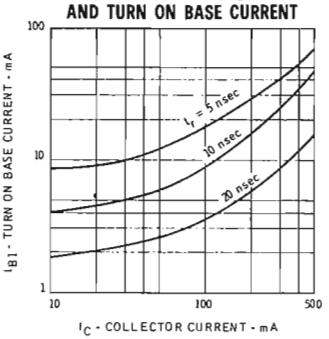
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



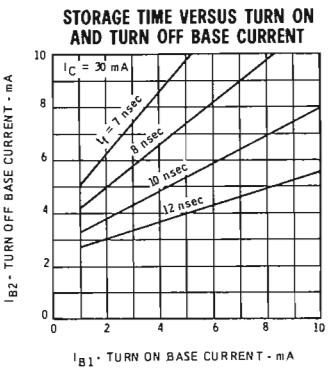
SWITCHING TIMES VERSUS COLLECTOR CURRENT

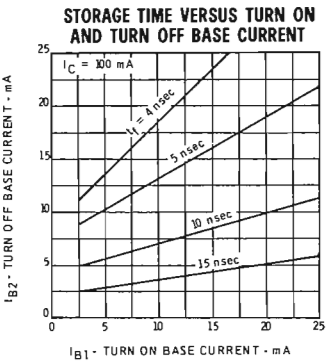


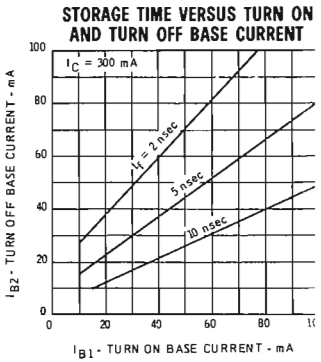
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENT

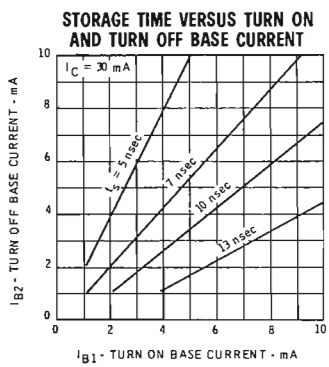


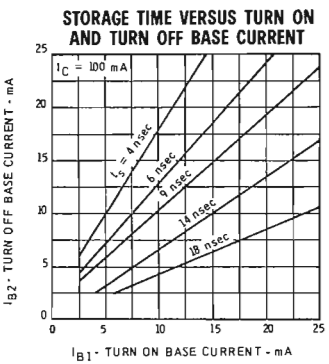
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

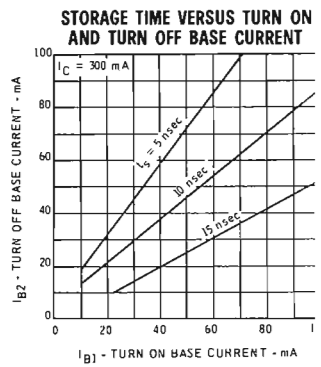












NOTES:

(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 146°C/watt (derating factor of 6.85 mW/°C); junction-to-ambient thermal resistance of 486°C/watt (derating factor of 2.06 mW/°C).

(4) These ratings refers to a high-current point where collector-to-emitter voltage is lowest. For more information send for SGS-AR 5.

(5) Pulse Conditions: length ≤ 300 μsec; duty cycle ≤ 1%.