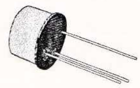
SGS-THOMSON
MICROELECTRONICS

BSX39

HIGH-SPEED SATURATED SWITCH

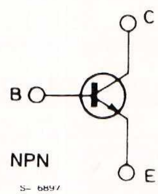
DESCRIPTION

The BSX39 is a silicon planar epitaxial NPN transistor in Jedec TO-18 metal case. It is designed for very fast switching applications up to 500 mA.



TO-18

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base Voltage ($I_E = 0$)	45	V
V_{CEO}	Collector-emitter Voltage ($I_B = 0$)	20	V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	5	V
I_C	Collector Current	500	mA
P_{tot}	Total Power Dissipation at $T_{amb} \le 25$ °C at $T_{case} \le 25$ °C at $T_{case} \le 100$ °C	0.36 1.2 0.68	W W W
T_{stg}, T_j	Storage and Junction Temperature	– 55 to 200	°C

THERMAL DATA

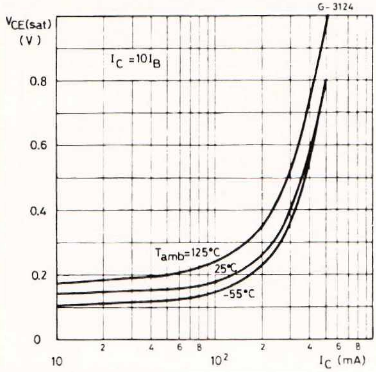
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	146	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	486	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

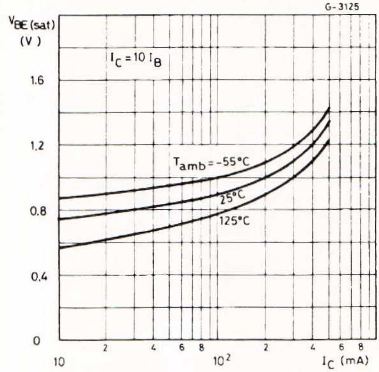
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cutoff Current (V_{BE} = 0)	V_{CE} = 20 V V_{CE} = 20 V T_{amb} = 125 °C			0.1 30	μA μA
$V_{(BR)CBO}$	Collector-base Breakdown Voltage (I_E = 0)	I_c = 10 μA	45			V
$V_{(BR)CEO}$*	Collector-emitter Breakdown Voltage (I_B = 0)	I_c = 10 mA	20			V
$V_{(BR)EBO}$	Emitter-base Breakdown Voltage (I_c = 0)	I_E = 100 μA	5			V
$V_{CE(sat)}$*	Collectro-emitter Saturation Voltage	I_c = 30 mA I_B = 3 mA I_c = 100 mA I_B = 10 mA I_c = 300 mA I_B = 30 mA I_c = 30 mA I_B = 3 mA T_{amb} = 85 °C		0.15 0.18 0.39 0.17	0.18 0.28 0.5 0.3	V V V V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_c = 30 mA I_B = 3 mA I_c = 100 mA I_B = 10 mA I_c = 300 mA I_B = 30 mA	0.75	0.8 0.9 1.1	0.95 1.2 1.7	V V V
h_{FE}*	DC Current Gain	I_c = 30 mA V_{CE} = 0.4 V I_c = 100 mA V_{CE} = 0.5 V I_c = 300 mA V_{CE} = 1 V I_c = 30 mA V_{CE} = 0.4 V T_{amb} = − 55 °C	40 25 15 12	60 55 40	120	
f_T	Transition Frequency	I_c = 30 mA V_{CE} = 10 V f = 100 MHz	350	600		MHz
C_{EBO}	Emitter-base Capacitance	I_c = 0 V_{EB} = 0.5 V f = 1 MHz		7	8	pF
C_{CBO}	Collector-base Capacitance	I_E = 0 V_{CB} = 5 V f = 1 MHz		4	5	pF
t_s	Storage Time	I_c = 10 mA V_{CC} = 10 V I_{B1} = − I_{B2} = 10 mA		8	18	ns
t_{on}**	Turn-on Time	I_c = 300 mA V_{CC} = 10 V I_{B1} = 30 mA		9	15	ns
t_{off}**	Turn-off Time	I_c = 300 mA V_{CC} = 10 V I_{B1} − I_{B2} = 30 mA		15	25	ns

* Pulsed : pulse duration = 300 μs, duty cycle = 1 %.
** See test circuit.

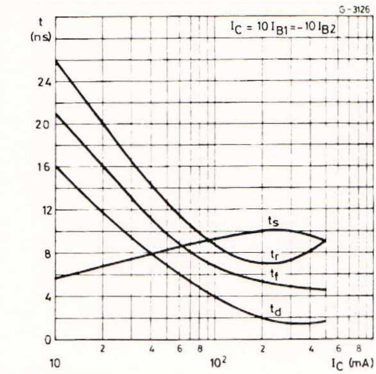
Collector-emitter Saturation Voltage.



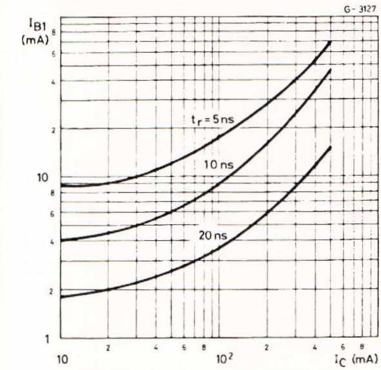
Base-emitter Saturation Voltage.



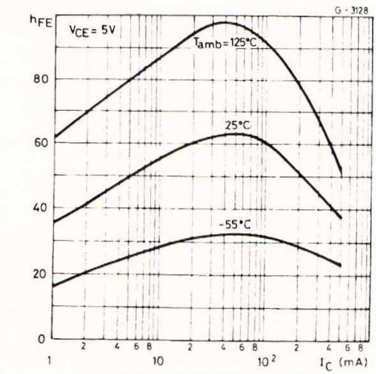
Switching Characteristics.



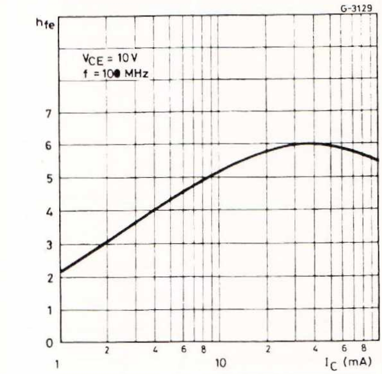
Switching Characteristics.



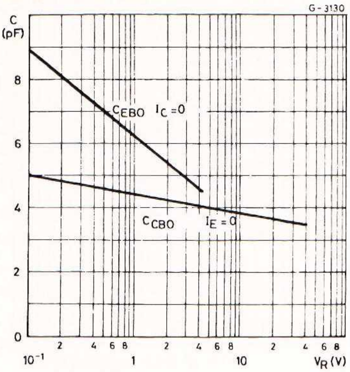
CD Current Gain.



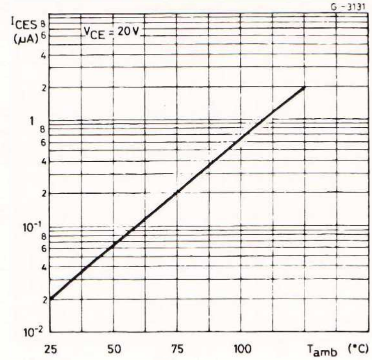
High Frequency Current Gain.



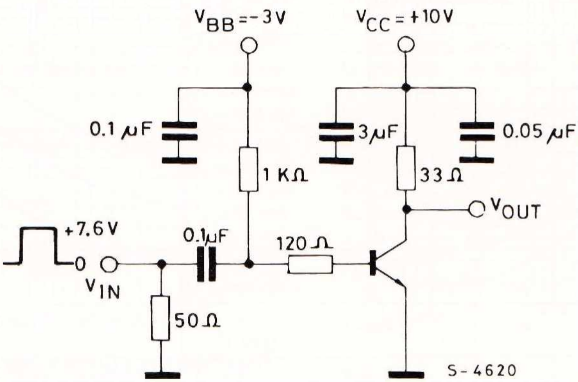
Emitter-base and Collector-base Capacitances.



Collector Cut off Current.



Test circuit for t_{on}, t_{off}.



PULSE GENERATOR :
t_r, t_f < 1.0 ns
PW ≥ 240 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE :
t_r < 1.0 ns
Z_{IN} ≈ 100 KΩ