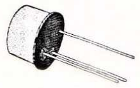
SGS-THOMSON
MICROELECTRONICS

BSX19
BSX20

HIGH-SPEED SATURATED SWITCHES

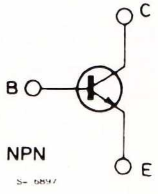
DESCRIPTION

The BSX19 and BSX20 are silicon planar epitaxial NPN transistors in Jedec TO-18 metal case. They are primarily intended for very high speed saturated switching applications.



TO-18

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base Voltage (I_E = 0)	40	V
V_{CES}	Collector-emitter Voltage (V_{BE} = 0)	40	V
V_{CEO}	Collector-emitter Voltage (I_B = 0)	15	V
V_{EBO}	Emitter-base Voltage (I_C = 0)	4.5	V
I_{CM}	Collector Peak Current (t = 10 µs)	0.5	A
P_{tot}	Total Power Dissipation at $T_{amb} \leq 25$ °C at $T_{case} \leq 25$ °C	0.36 1.2	W W
T_{stg}, T_j	Storage and Junction Temperature	– 65 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_{CBO}	Collector Cutoff Current ($I_E = 0$)	V_{CB} = 20 V			0.4	µA
		V_{CB} = 20 V T_{amb} = 150 °C			30	µA
I_{CES}	Collector Cutoff Current ($V_{BE} = 0$)	V_{CE} = 15 V T_{amb} = 55 °C			0.4	µA
		V_{CE} = 40 V			1	µA
I_{CEX}	Collector Cutoff Current (V_{BE} = – 3 V)	V_{CE} = 15 V T_{amb} = 55 °C			0.6	µA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	V_{EB} = 4.5 V			10	µA
I_{BEX}	Base Cutoff Current (V_{BE} = – 3 V)	V_{CE} = 15 V T_{amb} = 55 °C			0.6	µA
$V_{CER\,(sus)}$*	Collector-emitter Sustaining Voltage (R_{BE} = 10 Ω)	I_C = 10 mA	20			V
$V_{(BR)CEO}$*	Collector-emitter Breakdown Voltage ($I_B = 0$)	I_C = 10 mA	15			V
$V_{CE(sat)}$*	Collector-emitter Saturation Voltage	I_C = 10 mA I_B = 1 mA			0.25	V
		I_C = 100 mA I_B = 10 mA			0.6	V
		for **BSX19**				
		I_C = 10 mA I_B = 0.6 mA			0.3	V
		for **BSX20**				
		I_C = 10 mA I_B = 0.3 mA			0.3	V
V_{BE}	Base-emitter Voltage	I_C = 30 µA V_{CE} = 20 V T_{amb} = 100 °C	0.35			V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_C = 10 mA I_B = 1 mA	0.7		0.85	V
		I_C = 100 mA I_B = 10 mA			1.5	V
h_{FE}*	DC Current Gain	for **BSX19**				
		I_C = 10 mA V_{CE} = 1 V	20		60	
		I_C = 100 mA V_{CE} = 2 V	10			
		I_C = 10 mA V_{CE} = 1 V T_{amb} = – 55 °C	10			
		for **BSX20**				
		I_C = 10 mA V_{CE} = 1 V	40		120	
		I_C = 100 mA V_{CE} = 2 V	20			
		I_C = 10 mA V_{CE} = 1 V T_{amb} = – 55 °C	20			
f_T	Transition Frequency	I_C = 10 mA V_{CE} = 10 V				
		for **BSX19**	400	500		MHz
		for **BSX20**	500	600		MHz
C_{EBO}	Emitter–base Capacitance	$I_C = 0$ V_{EB} = 1 V			4.5	pF
C_{BO}	Collector–base Capacitance	$I_E = 0$ V_{CB} = 5 V			4	pF
t_s**	Storage Time	I_C = 10 mA V_{CC} = 10 V $I_{B1} = - I_{B2}$ = 10 mA				
		for **BSX19**		5	10	ns
		for **BSX20**		6	13	ns

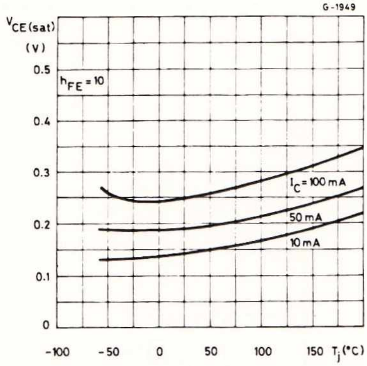
* Pulsed : pulse duration = 300µs, duty cycle = 1%

** See test circuit.

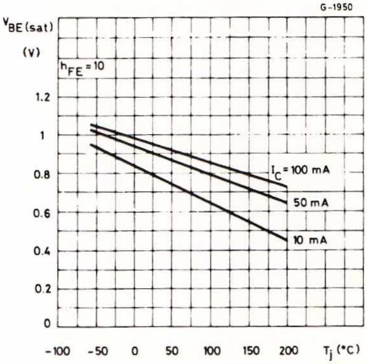
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Time	I_C = 10 mA V_{CC} = 3 V I_{B1} = 3 mA			12	ns
		I_C = 100 mA V_{CC} = 6 V I_{B1} = 40 mA			7	ns
t_{off}	Turn-off Time	I_C = 10 mA V_{CC} = 3 V I_{B1} = 3 mA I_{B2} = – 1.5 mA for **BSX19**			15	ns
		for **BSX20**			18	ns
		I_C = 100 mA V_{CC} = 6 V I_{B1} = 40 mA I_{B2} = – 20 mA for **BSX19**			18	ns
		for **BSX20**			21	ns

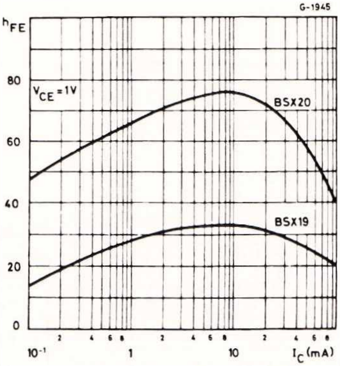
Collector-emitter Saturation Voltage.



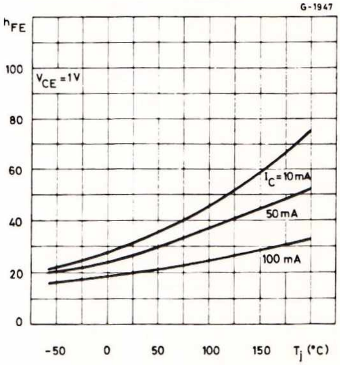
Base-emitter Saturation Voltage.



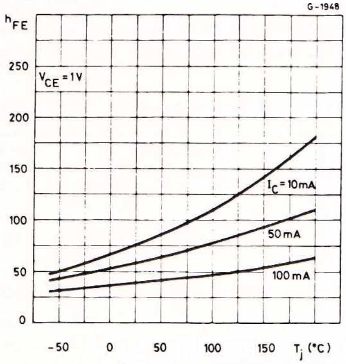
DC Current Gain.



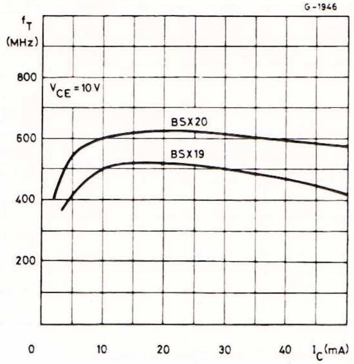
DC Current Gain (for BSX19 only).



DC Current Gain (for BSX20 only).



Transition Frequency.



Test circuit for ts.