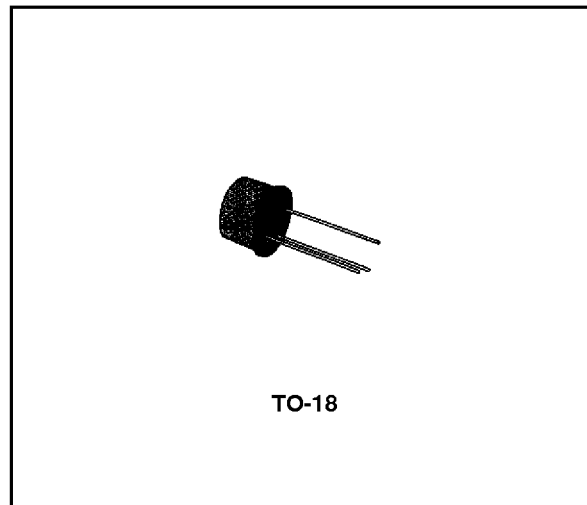
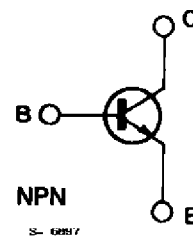


## HIGH-SPEED SATURATED SWITCHES

**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.


**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 ( $t = 10 \mu s$ )	0.5	A
$P_{tot}$	Total Power Dissipation at $T_{amb} \leq 25 \text{ }^\circ\text{C}$ at $T_{case} \leq 25 \text{ }^\circ\text{C}$	0.36	W
		1.2	W
$T_{stg}, T_j$	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

## BSX19-BSX20

### THERMAL DATA

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

### ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CBO}$	Collector Cutoff Current ( $I_E = 0$ )	$V_{CB} = 20\text{ V}$ $V_{CB} = 20\text{ V}$ $T_{amb} = 150\text{ °C}$			0.4 30	$\mu\text{A}$ $\mu\text{A}$
$I_{CES}$	Collector Cutoff Current ( $V_{BE} = 0$ )	$V_{CE} = 15\text{ V}$ $T_{amb} = 55\text{ °C}$ $V_{CE} = 40\text{ V}$			0.4 1	$\mu\text{A}$ $\mu\text{A}$
$I_{CEX}$	Collector Cutoff Current ( $V_{BE} = -3\text{ V}$ )	$V_{CE} = 15\text{ V}$ $T_{amb} = 55\text{ °C}$			0.6	$\mu\text{A}$
$I_{EBO}$	Emitter Cutoff Current ( $I_C = 0$ )	$V_{EB} = 4.5\text{ V}$			10	$\mu\text{A}$
$I_{BEX}$	Base Cutoff Current ( $V_{BE} = -3\text{ V}$ )	$V_{CE} = 15\text{ V}$ $T_{amb} = 55\text{ °C}$			0.6	$\mu\text{A}$
$V_{CER(sus)}^*$	Collector-emitter Sustaining Voltage ( $R_{BE} = 10\ \Omega$ )	$I_C = 10\text{ mA}$	20			V
$V_{(BR)CEO}^*$	Collector-emitter Breakdown Voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$	15			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 10\text{ mA}$ $I_B = 1\text{ mA}$ $I_C = 100\text{ mA}$ $I_B = 10\text{ mA}$ for <b>BSX19</b> $I_C = 10\text{ mA}$ $I_B = 0.6\text{ mA}$ for <b>BSX20</b> $I_C = 10\text{ mA}$ $I_B = 0.3\text{ mA}$			0.25 0.6 0.3 0.3	V V V V
$V_{BE}$	Base-emitter Voltage	$I_C = 30\ \mu\text{A}$ $V_{CE} = 20\text{ V}$ $T_{amb} = 100\text{ °C}$	0.35			V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = 10\text{ mA}$ $I_B = 1\text{ mA}$ $I_C = 100\text{ mA}$ $I_B = 10\text{ mA}$	0.7		0.85 1.5	V V
$h_{FE}^*$	DC Current Gain	for <b>BSX19</b> $I_C = 10\text{ mA}$ $V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 1\text{ V}$ $T_{amb} = -55\text{ °C}$ for <b>BSX20</b> $I_C = 10\text{ mA}$ $V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 1\text{ V}$ $T_{amb} = -55\text{ °C}$	20 10 10 40 20 20		60 120	
$f_T$	Transition Frequency	$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ for <b>BSX19</b> for <b>BSX20</b>	400 500	500 600		MHz MHz
$C_{EBO}$	Emitter–base Capacitance	$I_C = 0$ $V_{EB} = 1\text{ V}$			4.5	pF
$C_{BO}$	Collector–base Capacitance	$I_E = 0$ $V_{CB} = 5\text{ V}$			4	pF
$t_s^{**}$	Storage Time	$I_C = 10\text{ mA}$ $V_{CC} = 10\text{ V}$ $I_{B1} = -I_{B2} = 10\text{ mA}$ for <b>BSX19</b> for <b>BSX20</b>		5 6	10 13	ns ns

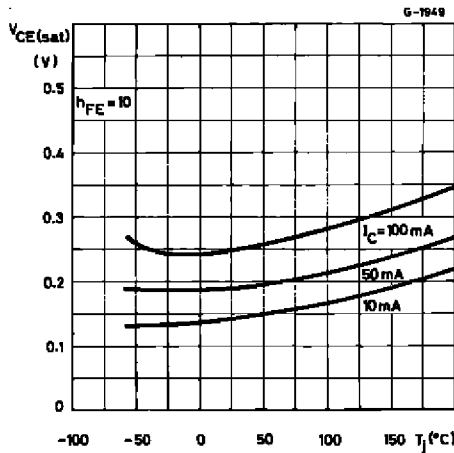
\* Pulsed : pulse duration = 300 $\mu\text{s}$ , duty cycle = 1%

\*\* See test circuit.

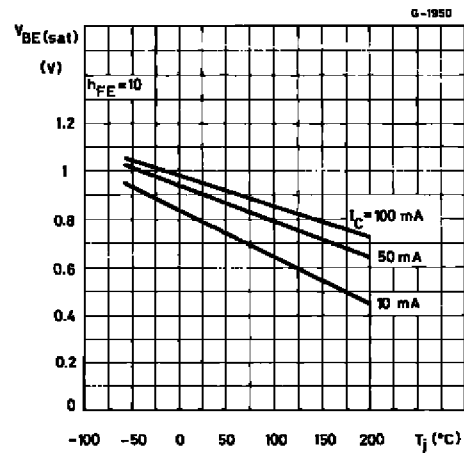
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{on}$	Turn-on Time	$I_C = 10\text{ mA}$ $V_{CC} = 3\text{ V}$ $I_{B1} = 3\text{ mA}$			12	ns
		$I_C = 100\text{ mA}$ $V_{CC} = 6\text{ V}$ $I_{B1} = 40\text{ mA}$			7	ns
$t_{off}$	Turn-off Time	$I_C = 10\text{ mA}$ $V_{CC} = 3\text{ V}$ $I_{B1} = 3\text{ mA}$			15	ns
					18	ns
		$I_C = 100\text{ mA}$ $V_{CC} = 6\text{ V}$ $I_{B1} = 40\text{ mA}$			18	ns
					21	ns

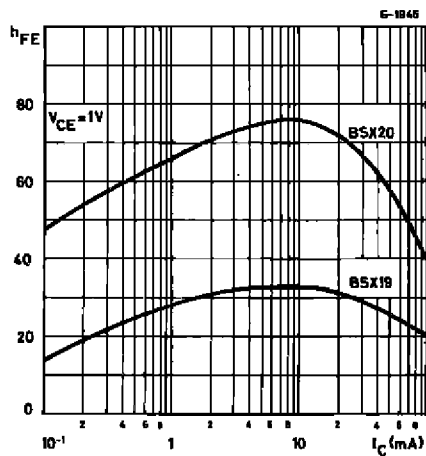
Collector-emitter Saturation Voltage.



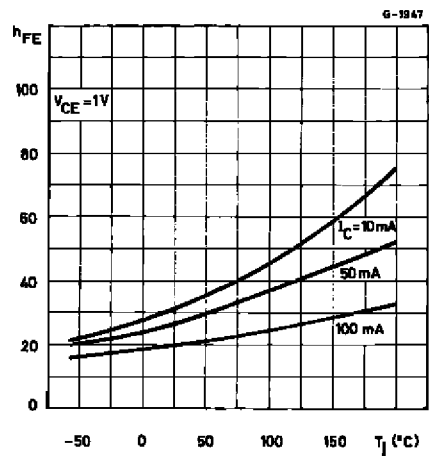
Base-emitter Saturation Voltage.



DC Current Gain.

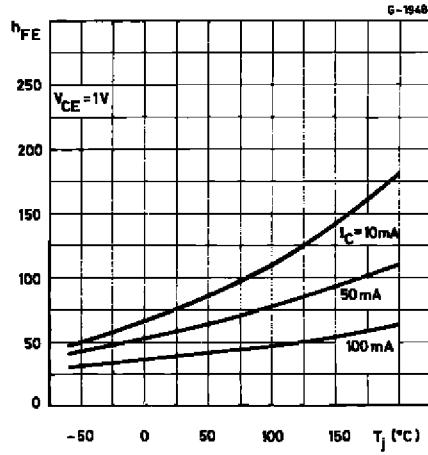


DC Current Gain (for BSX19 only).

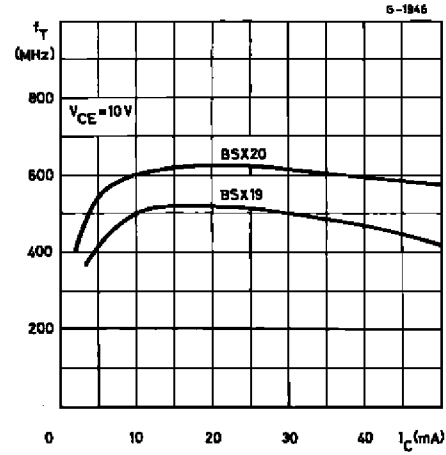


# BSX19-BSX20

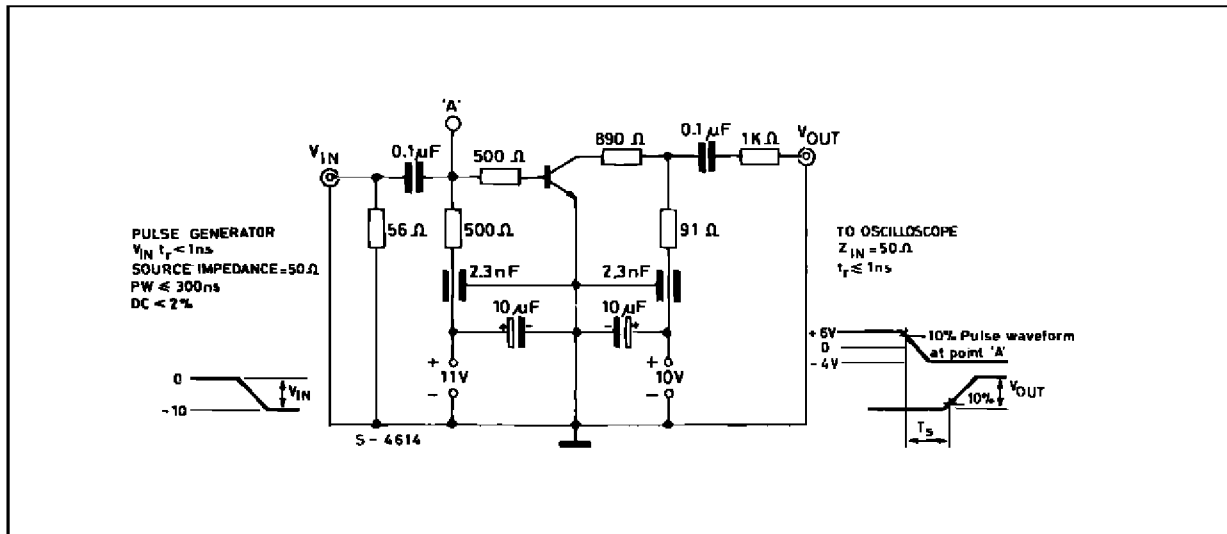
DC Current Gain (for BSX20 only).



Transition Frequency.

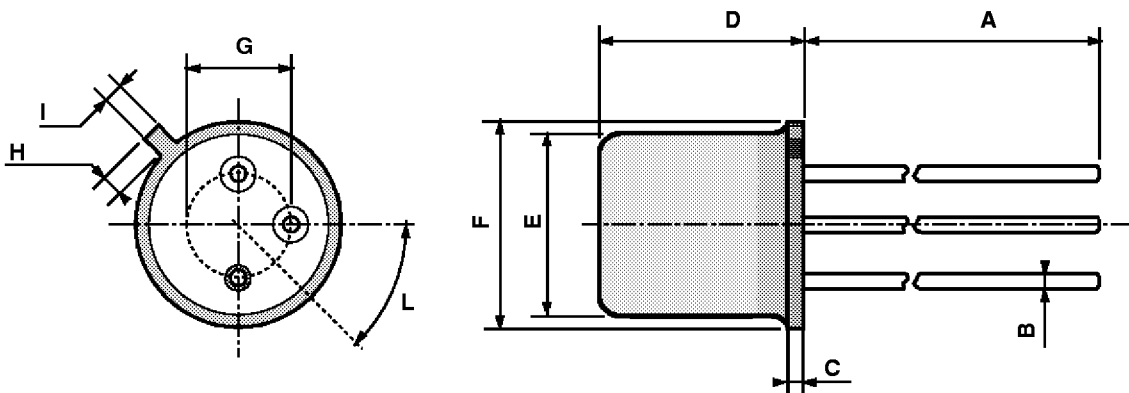


Test circuit for  $t_s$ .



## TO-18 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		12.7			0.500	
B			0.49			0.019
D			5.3			0.208
E			4.9			0.193
F			5.8			0.228
G	2.54			0.100		
H			1.2			0.047
I			1.16			0.045
L	45°			45°		



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