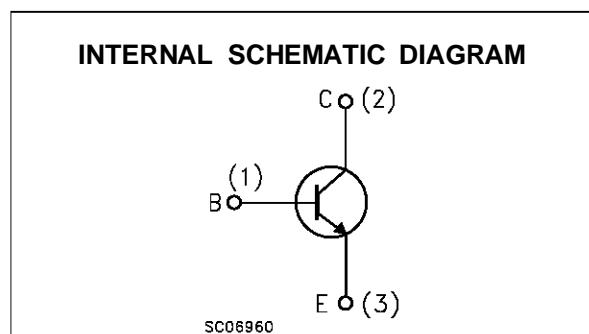
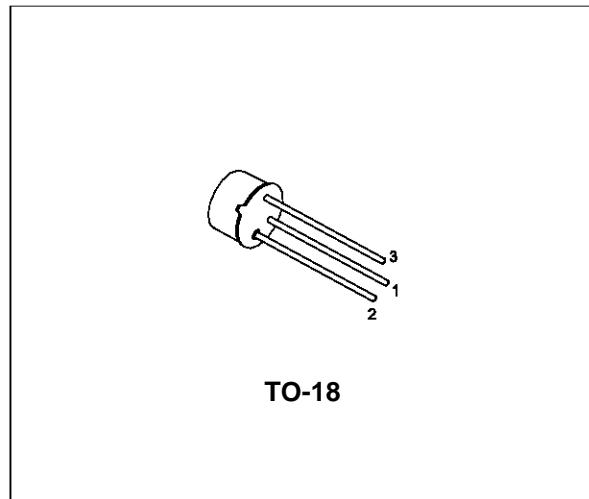


## HIGH SPEED SATURATED SWITCHES

### DESCRIPTION

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



### 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
$I_C$	Collector Current ( $t = 10 \mu s$ )	0.5	A
$P_{tot}$	Total Dissipation at $T_{amb} \leq 25^\circ C$ at $T_{case} \leq 25^\circ C$	0.36 1.2	W W
$T_{stg}$	Storage Temperature	-65 to 200	°C
$T_j$	Max. Operating Junction Temperature	200	°C

# BSX20

## THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-Case	Max	146	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	486	$^{\circ}\text{C}/\text{W}$

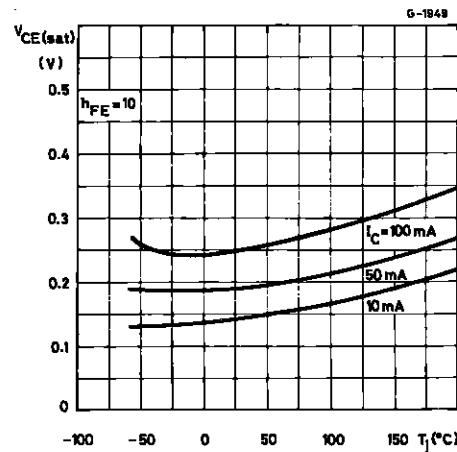
## ELECTRICAL CHARACTERISTICS ( $\text{T}_{\text{case}} = 25 \ ^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CBO}$	Collector Cut-off Current ( $I_E = 0$ )	$V_{CB} = 20 \text{ V}$ $V_{CB} = 20 \text{ V} \quad T_{\text{amb}} = 150 \ ^{\circ}\text{C}$			0.4 30	$\mu\text{A}$ $\mu\text{A}$
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 15 \text{ V} \quad T_{\text{amb}} = 55 \ ^{\circ}\text{C}$ $V_{CE} = 40 \text{ V}$			0.4 1	$\mu\text{A}$ $\mu\text{A}$
$I_{CEX}$	Collector Cut-off Current ( $V_{BE} = -3\text{V}$ )	$V_{CE} = 15 \text{ V} \quad T_{\text{amb}} = 55 \ ^{\circ}\text{C}$			0.6	$\mu\text{A}$
$I_{BEX}$	Base Cut-off Current ( $V_{BE} = -3\text{V}$ )	$V_{CE} = 15 \text{ V} \quad T_{\text{amb}} = 55 \ ^{\circ}\text{C}$			0.6	$\mu\text{A}$
$I_{EBO}$	Emitter Cut-off Current ( $I_c = 0$ )	$V_{EB} = 4.5 \text{ V}$			10	$\mu\text{A}$
$V_{CER(\text{sus})}^*$	Collector-Emitter Sustaining Voltage ( $R_{BE} = 10\Omega$ )	$I_c = 10 \text{ mA}$	20			$\text{V}$
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ( $I_B = 0$ )	$I_c = 10 \text{ mA}$	15			$\text{V}$
$V_{CE(\text{sat})}^*$	Collector-Emitter Saturation Voltage	$I_c = 10 \text{ mA} \quad I_B = 1 \text{ mA}$ $I_c = 100 \text{ mA} \quad I_B = 10 \text{ mA}$ $I_c = 10 \text{ mA} \quad I_B = 0.3 \text{ mA}$			0.25 0.6 0.3	$\text{V}$ $\text{V}$ $\text{V}$
$V_{BE(\text{sat})}^*$	Base-Emitter Saturation Voltage	$I_c = 10 \text{ mA} \quad I_B = 1 \text{ mA}$ $I_c = 100 \text{ mA} \quad I_B = 10 \text{ mA}$	0.7		0.85 1.5	$\text{V}$ $\text{V}$
$V_{BE(\text{on})}^*$	Base-Emitter On Voltage	$I_c = 30 \mu\text{A} \quad V_{CE} = 20 \text{ V}$ $T_{\text{amb}} = 100 \ ^{\circ}\text{C}$	350			$\text{mV}$
$h_{FE}^*$	DC Current Gain	$I_c = 10 \text{ mA} \quad V_{CE} = 1 \text{ V}$ $I_c = 100 \text{ mA} \quad V_{CE} = 2 \text{ V}$ $I_c = 10 \text{ mA} \quad V_{CE} = 1 \text{ V}$ $T_{\text{amb}} = -55 \ ^{\circ}\text{C}$	40 20 20		60	
$f_T$	Transition Frequency	$I_c = 10 \text{ mA} \quad V_{CE} = 10 \text{ V}$	500	600		$\text{MHz}$
$C_{CBO}$	Collector Base Capacitance	$I_E = 0 \quad V_{CB} = 5 \text{ V}$			4	$\text{pF}$
$C_{EBO}$	Emitter Base Capacitance	$I_c = 0 \quad V_{EB} = 1 \text{ V}$			4.5	$\text{pF}$
$t_s^{**}$	Storage Time	$V_{CC} = 10 \text{ V} \quad I_c = 10 \text{ mA}$ $I_{B1} = -I_{B2} = 10 \text{ mA}$		6	13	$\text{ns}$
$t_{on}^{**}$	Turn-on Time	$V_{CC} = 3 \text{ V} \quad I_c = 10 \text{ mA}$ $I_{B1} = 3 \text{ mA}$ $V_{CC} = 6 \text{ V} \quad I_c = 100 \text{ mA}$ $I_{B1} = 40 \text{ mA}$			12 7	$\text{ns}$ $\text{ns}$
$t_{off}^{**}$	Turn-off Time	$V_{CC} = 3 \text{ V} \quad I_c = 10 \text{ mA}$ $I_{B1} = 3 \text{ mA} \quad I_{B2} = -1.5 \text{ mA}$ $V_{CC} = 6 \text{ V} \quad I_c = 100 \text{ mA}$ $I_{B1} = 40 \text{ mA} \quad I_{B2} = -20 \text{ mA}$			18 21	$\text{ns}$ $\text{ns}$

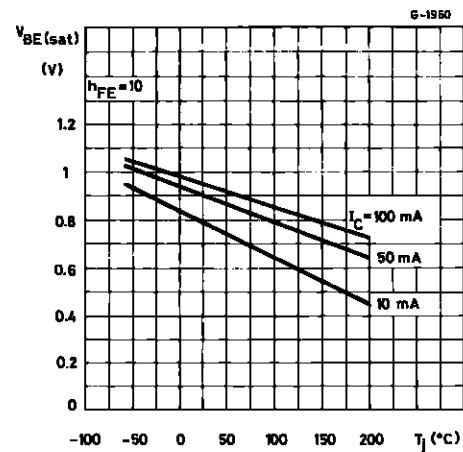
\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1 \%$

\*\* See test circuit

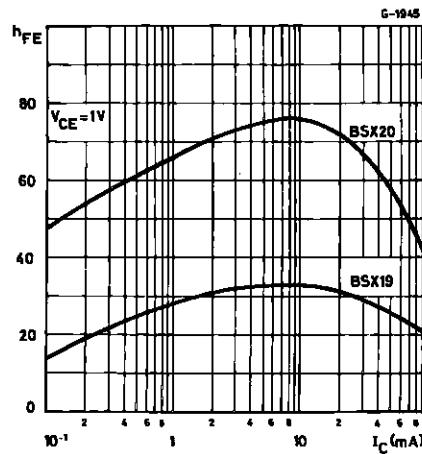
Collector-emitter Saturation Voltage



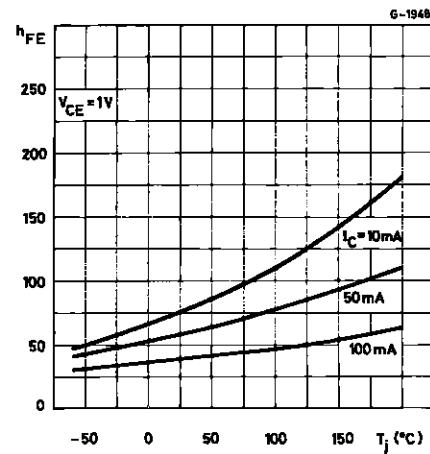
Base-emitter Saturation Voltage.



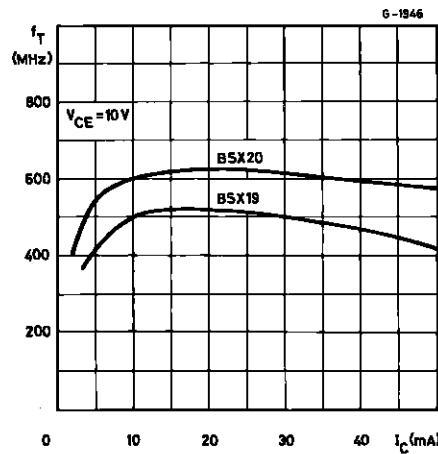
DC Current Gain



DC Current Gain

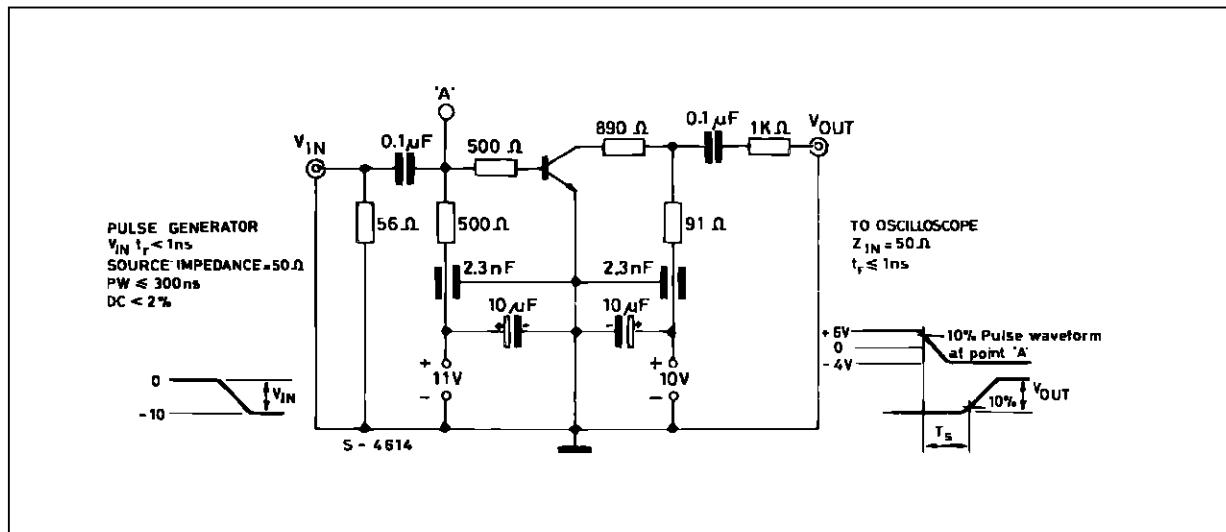


Transition Frequency.



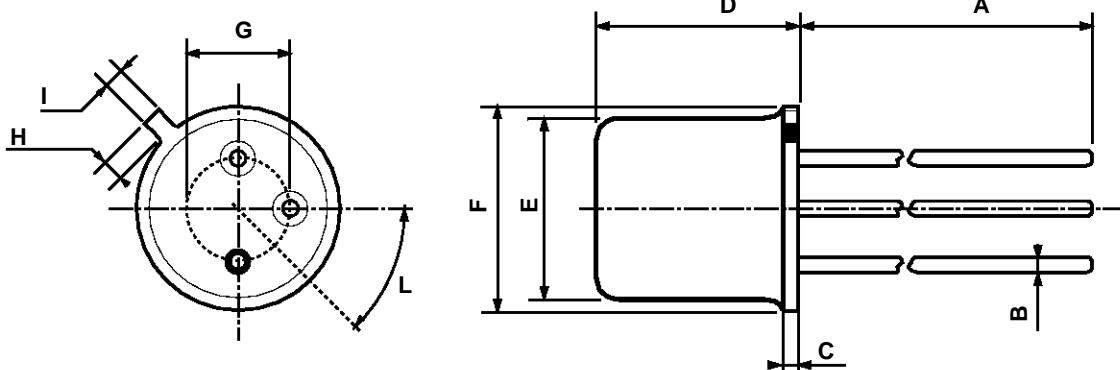
## BSX20

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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