NPN Silicon Planar Transistors

BSX 45
BSX 46
BSX 47

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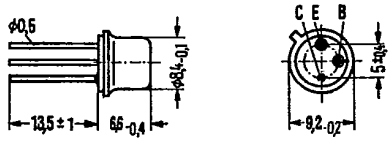
BSX 45, BSX 46, and BSX 47 are epitaxial NPN silicon planar transistors in TO 39 case (5 C 3 DIN 41873). Their collectors are electrically connected to their cases. The transistors are particularly suitable for AF amplifiers and AF switching applications up to 1 A.

Type	Ordering code
BSX 45[1]	Q60218-X45
BSX 45-6	Q60218-X45-V6
BSX 45-10	Q60218-X45-V10
BSX 45-16	Q60218-X45-V16
BSX 46[1]	Q60218-X46
BSX 46-6	Q60218-X46-V6
BSX 46-10	Q60218-X46-V10
BSX 46-16	Q60218-X46-V16
BSX 47[1]	Q60218-X47
BSX 47-6	Q60218-X47-V6
BSX 47-10	Q60218-X47-V10



Approx. weight 1.5 g

Dimensions in mm

Maximum ratings		BSX 45	BSX 46	BSX 47	
Collector-emitter voltage	V_{CEO}	40	60	80	V
Collector-emitter voltage	V_{CES}	80	100	120	V
Emitter-base voltage	V_{EBO}	7	7	7	V
Collector current	I_C	1	1	1	A
Base current	I_B	0.2	0.2	0.2	A
Junction temperature	T_j	200	200	200	°C
Storage temperature range	T_{stg}		−65 to +200		°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	5	5	5	W
Thermal resistance					
Junction to ambient air	R_{thJA}	≦ 200	≦ 200	≦ 200	K/W
Junction to case	R_{thJC}	≦ 35	≦ 35	≦ 35	K/W

Static characteristics (T_{amb} = 25 °C)

Transistors BSX 45, BSX 46, and BSX 47 are grouped according to their DC current gain h_{FE} at I_C = 100 mA and V_{CE} = 1 V. The different groups are marked by figures of the DIN-R 5 standard series.

Type	BSX 45 BSX 46 BSX 47	BSX 45 BSX 46 BSX 47	BSX 45 BSX 46 –	BSX 45 BSX 46 BSX 47
h_{FE} group	6	10	16	
I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
0.1	28 (> 10)	40 (> 15)	90 (> 25)	–
100	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)	< 1
500	25 (> 15)	40 (> 25)	60 (> 35)	0.75 to 1.5
1000	15	20	30	1.3 (< 2)

1) In case of orders without an exact indication of the current amplification wanted, a transistor will be delivered of that current amplification group available at stock.

BSX 45
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Static characteristics (T_{amb} = 25 °C)		**BSX 45**	**BSX 46**	**BSX 47**	
Collector-emitter saturation voltage (I_C = 1 A; h_{FE} = 10)	V_{CEsat}	0.7 (<1)	0.7 (<1)	–	V
Collector-emitter saturation voltage (I_C = 0.5 A; h_{FE} = 20)	V_{CEsat}	–	–	0.5 (<0.9)	V
Collector cutoff current (V_{CES} = 60 V)	I_{CES}	1 (<30)	1 (<30)	–	nA
Collector cutoff current (V_{CES} = 60 V; T_{amb} = 150 °C)	I_{CES}	1 (<10)	1 (<10)	–	µA
Collector cutoff current (V_{CES} = 80 V)	I_{CES}	–	–	<30	nA
Collector cutoff current (V_{CES} = 80 V; T_{amb} = 150 °C)	I_{CES}	–	–	<10	µA
Collector cutoff current (V_{CE} = 60 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	I_{CEX}	<50	<50	–	µA
Collector cutoff current (V_{CE} = 80 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	I_{CEX}	–	–	<50	µA
Emitter cutoff current (V_{EBO} = 5 V)	I_{EBO}	<10	<10	<10	nA
Collector-emitter breakdown voltage (I_{CE} = 50 mA; pulse length = 200 µs; duty cycle 1%)	$V_{(BR)CEO}$	>40	>60	>80	V
Collector-emitter breakdown voltage (I_{CES} = 100 µA)	$V_{(BR)CES}$	>80	>100	>120	V
Emitter-base breakdown voltage (I_{EBO} = 100 µA)	$V_{(BR)EBO}$	>7	>7	>7	V
Dynamic characteristics (T_{amb} = 25 °C)					
Transition frequency (I_C = 50 mA; V_{CE} = 10 V; f = 20 MHz)	f_T	>50	>50	>50	MHz
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	<25	<20	<15	pF
Emitter-base capacitance (V_{EBO} = 0.5 V; f = 1 MHz)	C_{EBO}	<80	<80	<80	pF
Noise figure (I_C = 100 µA; V_{CE} = 10 V; f = 1 kHz; Δf = 200 Hz; R_g = 1 kΩ)	NF	3.5	3.5	3.5	dB
Switching times I_C = 100 mA; I_{B1} approx. $-I_{B2}$ approx. 5 mA	t_{on}	<200	<200	<200	ns
	t_{off}	<850	<850	<850	ns

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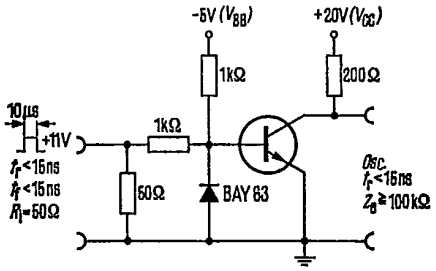
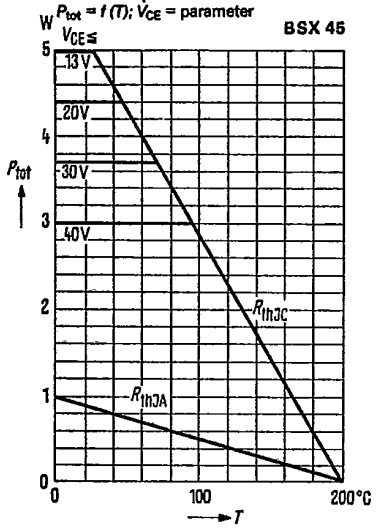
Test circuit for switching times



Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; V_{CE} = parameter



Total perm. power dissipation versus temperature
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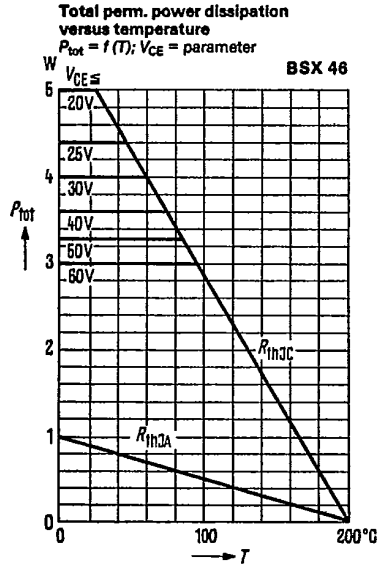
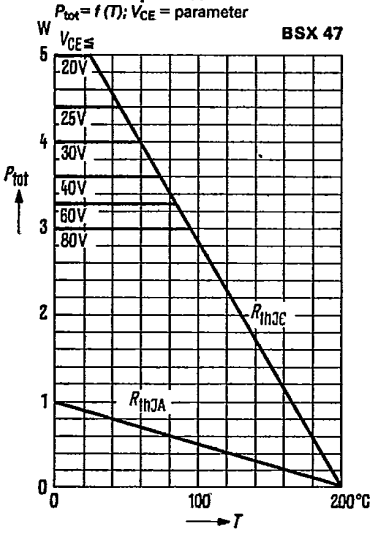


Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; V_{CE} = parameter



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Permissible pulse load
$\frac{K}{W}$ $r_{thJC} = f(t)$; v = parameter
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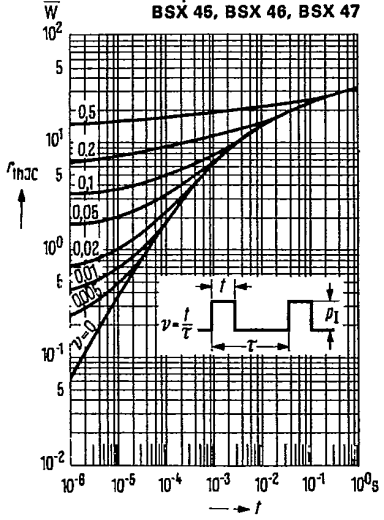
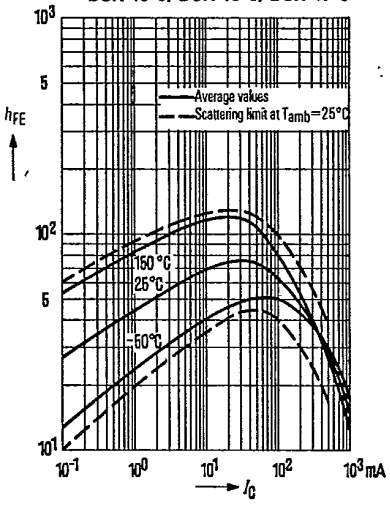
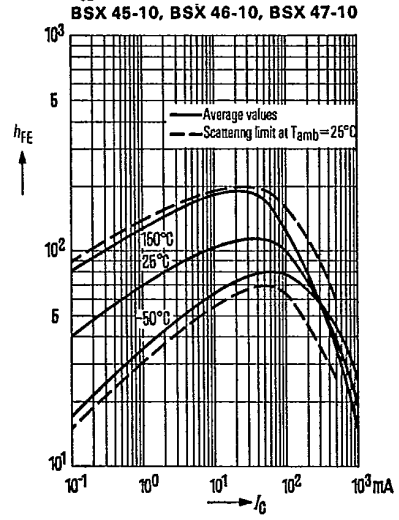


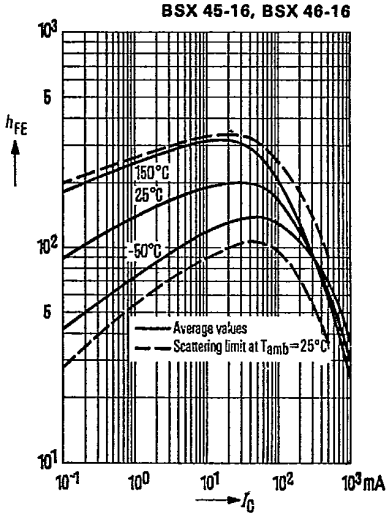
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX 45-6, BSX 46-6, BSX 47-6



DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX 45-10, BSX 46-10, BSX 47-10

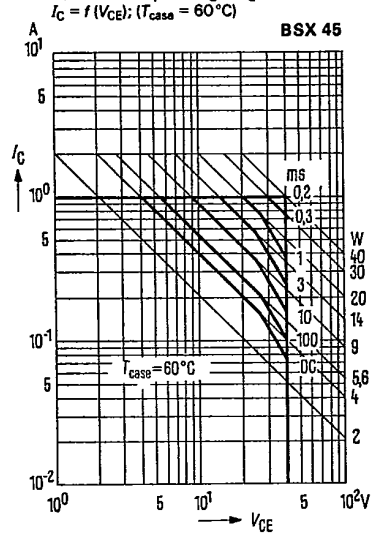


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX 45-16, BSX 46-16

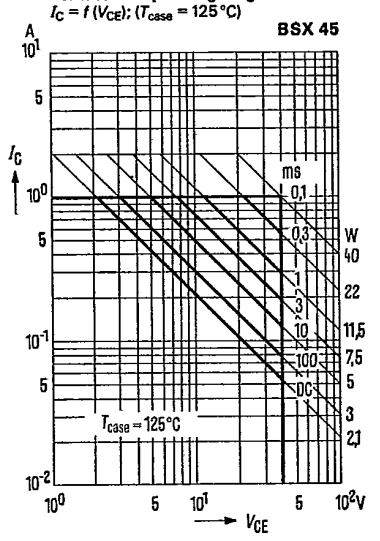


BSX 45
BSX 46

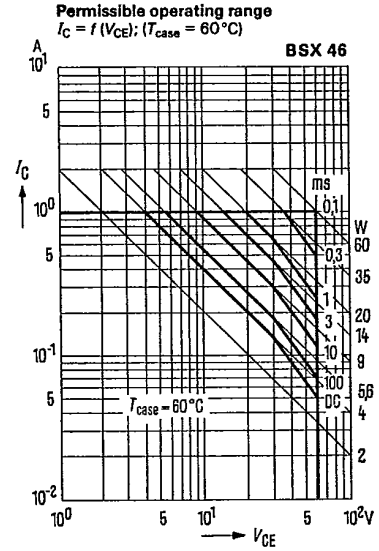
Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 60 °C)



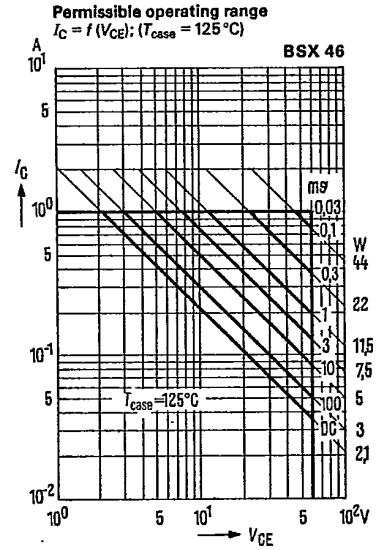
Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 125 °C)



Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 60 °C)



Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 125 °C)



The permissible operating ranges apply to single pulses ($\vartheta = 0$). For pulse sequences the power dissipation has to be reduced in accordance with the diagram "permissible pulse load".

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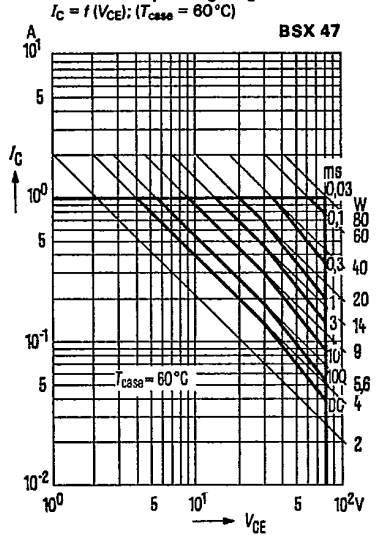
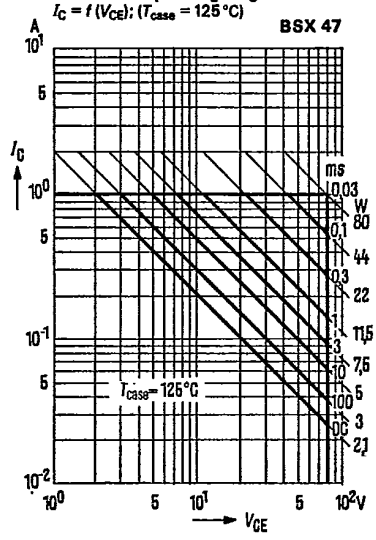
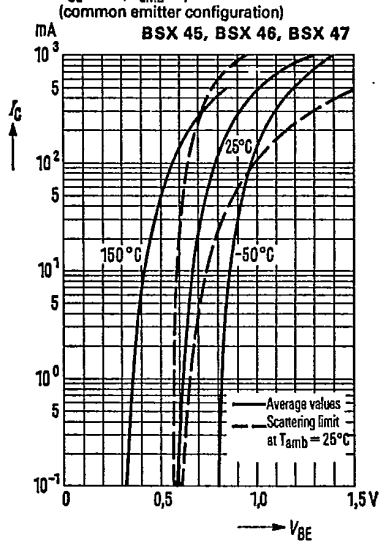
Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 60 °C)



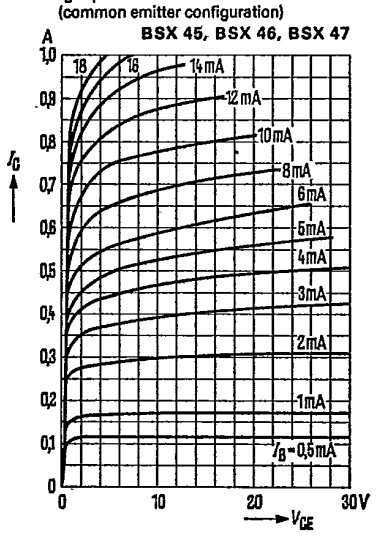
Permissible operating range
$I_C = f(V_{CE})$; (T_{case} = 125 °C)



Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; T_{amb} = parameter
(common emitter configuration)



Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)



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Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)
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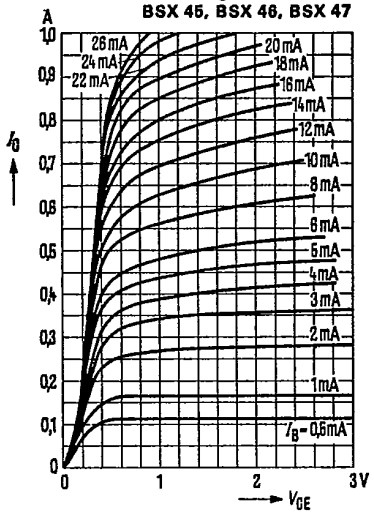
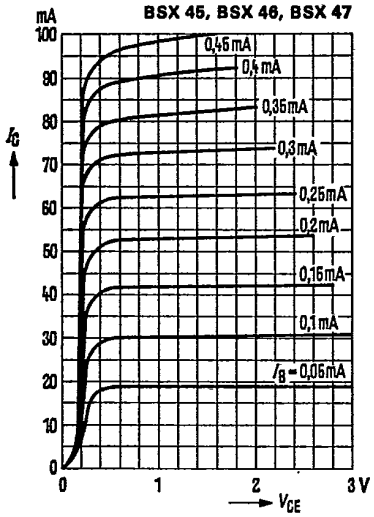
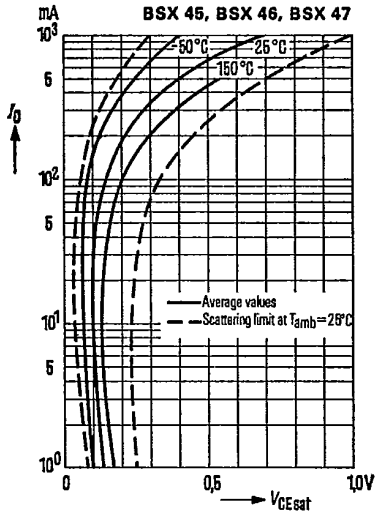


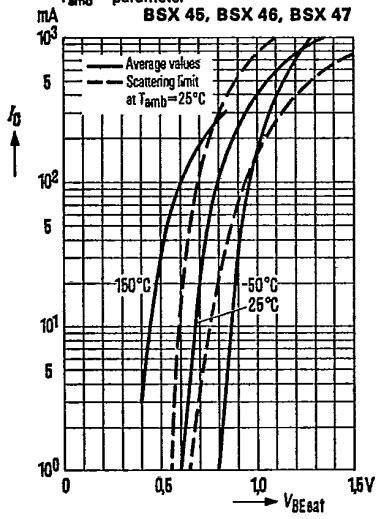
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)
BSX 45, BSX 46, BSX 47



Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
BSX 45, BSX 46, BSX 47



Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; $V_{CE} = 1$ V;
T_{amb} = parameter
BSX 45, BSX 46, BSX 47



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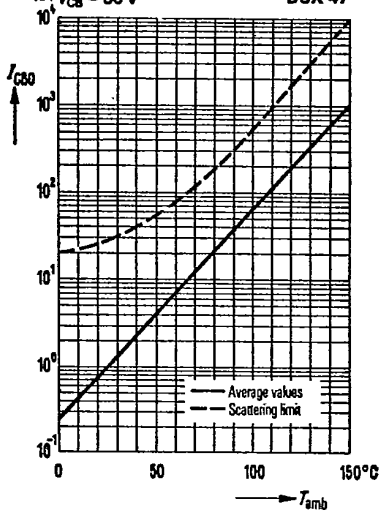
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$
V_{CB} = 60 V BSX 45, BSX 46
V_{CB} = 80 V BSX 47



Transition frequency $f_T = f(I_C)$
$V_{CE} \leq 10$ V
BSX 45, BSX 46, BSX 47