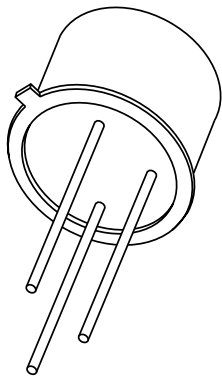


DATA SHEET



BSX20 NPN switching transistor

Product specification
Supersedes data of September 1994
File under Discrete Semiconductors, SC04

1997 May 14

NPN switching transistor

BSX20

FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 15 V).

APPLICATIONS

- High-speed saturated switching (and HF amplifier applications).

DESCRIPTION

NPN switching transistor in a TO-18 metal package.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector, connected to case

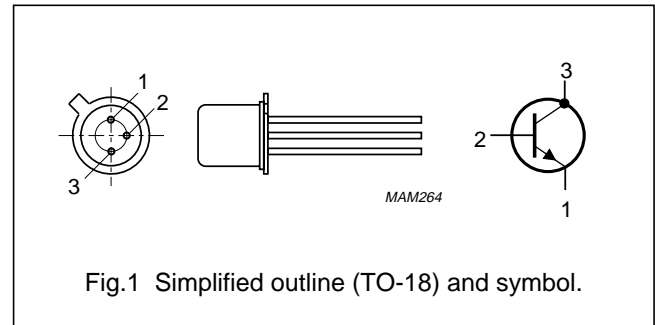


Fig.1 Simplified outline (TO-18) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CB0}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
I_C	collector current (DC)		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	360	mW
h_{FE}	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	40	120	
		$I_C = 100\text{ mA}; V_{CE} = 2\text{ V}$	20	–	
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	500	–	MHz
t_{off}	turn-off time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA}$	–	30	ns

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LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	4.5	V
I_C	collector current (DC)		–	200	mA
I_{CM}	peak collector current	$t \leq 10 \mu s$	–	300	mA
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation		–	360	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	200	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	in free air	480	K/W
$R_{th\ j-c}$	thermal resistance from junction to case		150	K/W

CHARACTERISTICS

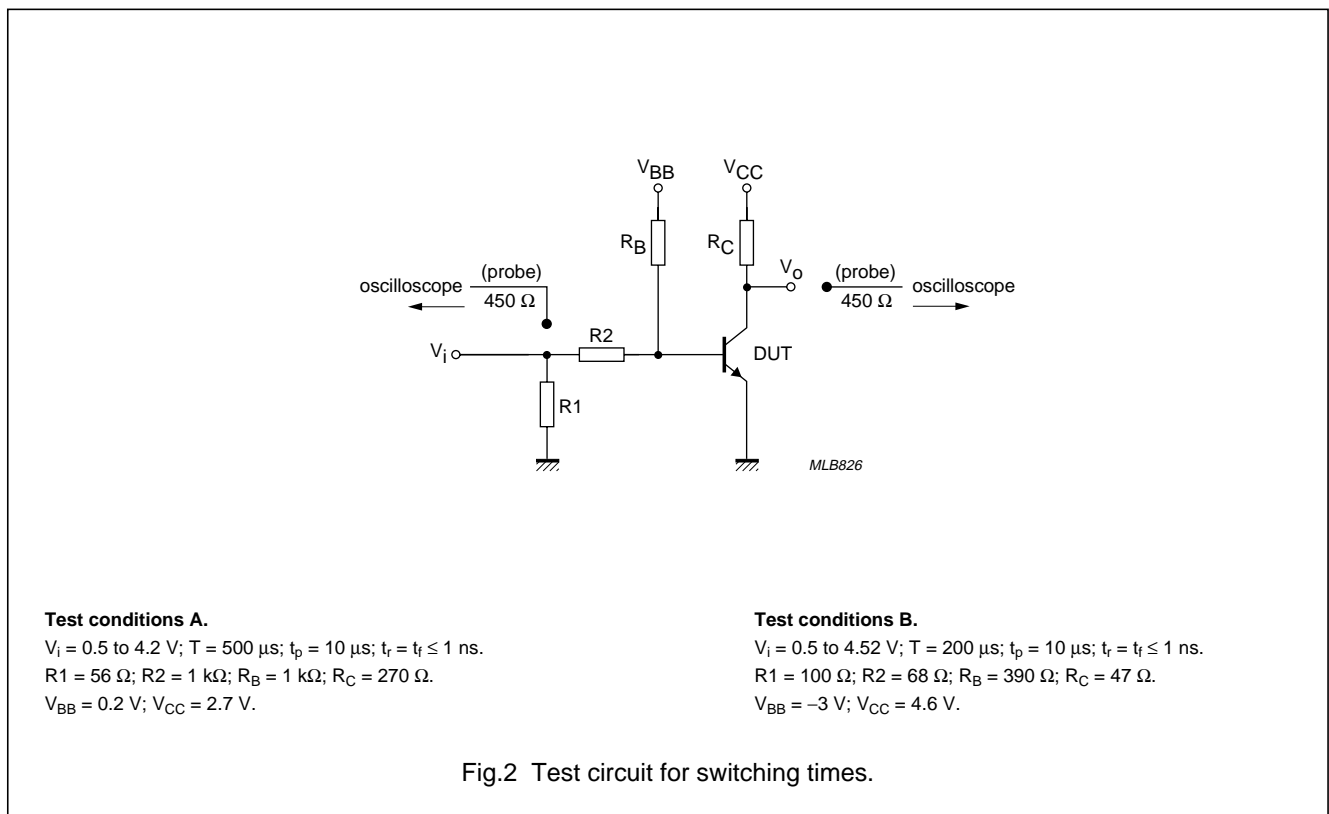
$T_j = 25 \text{ °C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 20 \text{ V}$	–	–	400	nA
		$I_E = 0; V_{CB} = 20 \text{ V}; T_j = 150 \text{ °C}$	–	–	30	μA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 4 \text{ V}$	–	–	100	nA
h_{FE}	DC current gain	$I_C = 10 \text{ mA}; V_{CE} = 1 \text{ V}$	40	–	120	
		$I_C = 10 \text{ mA}; V_{CE} = 1 \text{ V}; T_j = -55 \text{ °C}$	20	–	–	
		$I_C = 100 \text{ mA}; V_{CE} = 2 \text{ V}$	20	–	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.3 \text{ mA}$	–	–	300	mV
		$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$	–	–	250	mV
		$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}$	–	–	600	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$	700	–	850	mV
		$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}$	–	–	1.5	V
C_c	collector capacitance	$I_E = i_e = 0; V_{CB} = 5 \text{ V}; f = 1 \text{ MHz}$	–	–	4	pF
C_e	emitter capacitance	$I_C = i_c = 0; V_{EB} = 1 \text{ V}; f = 1 \text{ MHz}$	–	–	4.5	pF
f_T	transition frequency	$I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V}; f = 100 \text{ MHz}$	500	600	–	MHz

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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switching times (between 10% and 90% levels)						
t_{on}	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA};$ see Fig.2, test conditions A	–	–	10	ns
t_d	delay time		–	–	4	ns
t_r	rise time		–	–	6	ns
t_{off}	turn-off time		–	–	30	ns
t_s	storage time		–	–	15	ns
t_f	fall time		–	–	15	ns
t_{on}	turn-on time	$I_{Con} = 100\text{ mA}; I_{Bon} = 40\text{ mA}; I_{Boff} = -20\text{ mA};$ see Fig.2, test conditions B	–	–	13	ns
t_d	delay time		–	–	3	ns
t_r	rise time		–	–	10	ns
t_{off}	turn-off time		–	–	35	ns
t_s	storage time		–	–	25	ns
t_f	fall time		–	–	10	ns



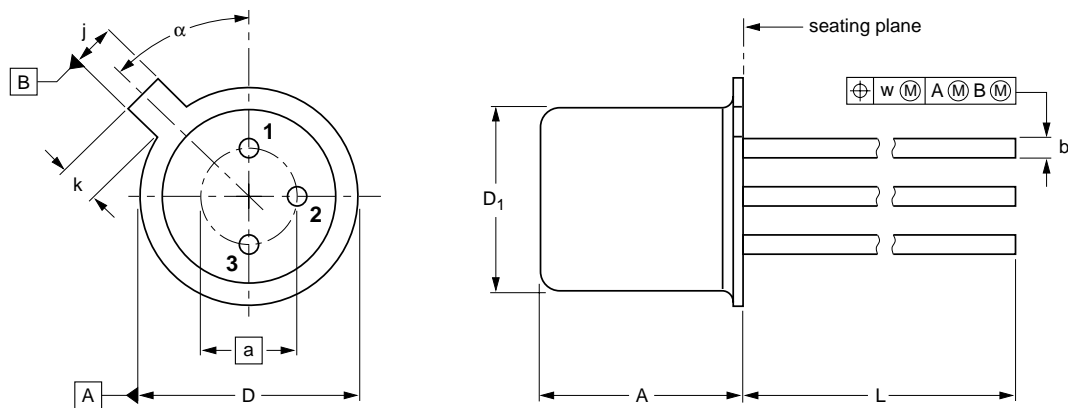
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PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT18/13



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	a	b	D	D ₁	j	k	L	w	α
mm	5.31 4.74	2.54	0.47 0.41	5.45 5.30	4.70 4.55	1.03 0.94	1.1 0.9	15.0 12.7	0.40	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT18/13	B11/C7 type 3	TO-18				97-04-18

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DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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Printed in The Netherlands

117047/00/02/pp8

Date of release: 1997 May 14

Document order number: 9397 750 02312

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