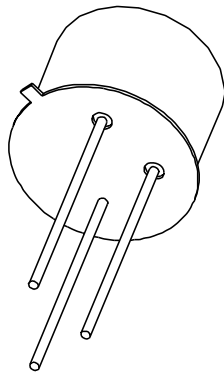


DATA SHEET



BSX59; BSX61 NPN switching transistors

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

1997 May 22

NPN switching transistors

BSX59; BSX61

FEATURES

- High current (max. 1 A)
- Low voltage (max. 45 V).

APPLICATIONS

- High-speed switching in industrial applications.

DESCRIPTION

NPN switching transistor in a TO-39 metal package.

PINNING

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

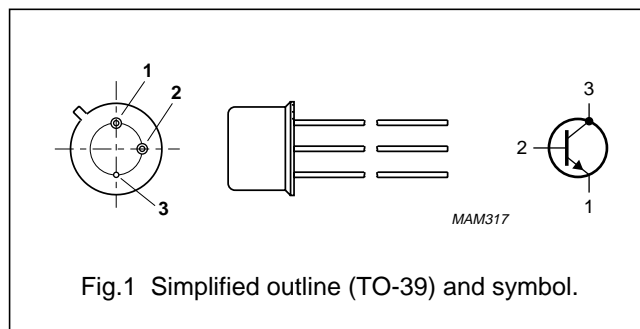


Fig.1 Simplified outline (TO-39) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	70	V
V_{CEO}	collector-emitter voltage	open base	–	45	V
I_C	collector current (DC)		–	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	800	mW
h_{FE}	DC current gain	$I_C = 50\text{ mA}; V_{CE} = 1\text{ V}$	30	–	
f_T	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	250	–	MHz
t_{off}	turn-off time	$I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA}; I_{Boff} = -50\text{ mA}$	–	60	ns
	BSX59			100	ns
	BSX61				

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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	–	70	V
V_{CEO}	collector-emitter voltage	open base	–	45	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)		–	1	A
I_{CM}	peak collector current		–	1	A
I_{BM}	peak base current		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	800	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	220	K/W
$R_{th\ j-c}$	thermal resistance from junction to case		43	K/W

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CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 40\text{ V}$	–	–	500	nA
		$I_E = 0; V_{CB} = 40\text{ V}; T_j = 150\text{ °C}$	–	–	300	μA
I_{EBO}	emitter cut-off current BSX59 BSX61	$I_C = 0; V_{EB} = 4\text{ V}$	–	–	300	nA
			–	–	500	nA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 4\text{ V}; T_j = 150\text{ °C}$	–	–	50	μA
h_{FE}	DC current gain	$I_C = 150\text{ mA}; V_{CE} = 1\text{ V}$	30	–	–	
		$I_C = 500\text{ mA}; V_{CE} = 1\text{ V}$	30	–	90	
		$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	20	–	–	
V_{CEsat}	collector-emitter saturation voltage BSX59	$I_C = 150\text{ mA}; I_B = 15\text{ mA}$	–	–	300	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	–	–	500	mV
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	–	–	1	V
V_{CEsat}	collector-emitter saturation voltage BSX61	$I_C = 150\text{ mA}; I_B = 15\text{ mA}$	–	–	500	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	–	–	700	mV
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	–	–	1.3	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 150\text{ mA}; I_B = 15\text{ mA}$	–	–	1	V
V_{BEsat}	base-emitter saturation voltage BSX59 BSX61	$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	0.85	–	1.2	V
			0.7	–	1.3	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	–	–	1.8	V
C_c	collector capacitance	$I_E = I_C = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz}$	–	6	10	pF
C_e	emitter capacitance	$I_C = I_E = 0; V_{EB} = 500\text{ mV}; f = 1\text{ MHz}$	–	36	50	pF
f_T	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	250	–	–	MHz
Switching times (between 10% and 90% levels)						
t_{on}	turn-on time BSX59 BSX61	$I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA};$ $I_{Boff} = -50\text{ mA}$	–	17	35	ns
			–	18	50	ns
t_{off}	turn-off time BSX59 BSX61	$I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA};$ $I_{Boff} = -50\text{ mA}$	–	45	60	ns
			–	70	100	ns

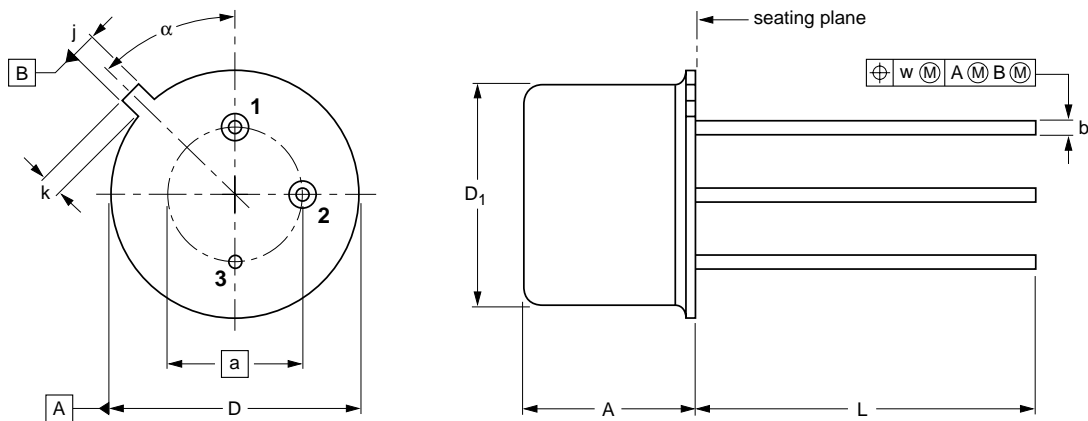
NPN switching transistors

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PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT5/11



DIMENSIONS (mm are the original dimensions)

UNIT	A	a	b	D	D ₁	j	k	L	w	α
mm	6.60 6.35	5.08	0.48 0.41	9.39 9.08	8.33 8.18	0.85 0.75	0.95 0.75	14.2 12.7	0.2	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT5/11		TO-39				97-04-11

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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

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Printed in The Netherlands

117047/00/02/pp8

Date of release: 1997 May 22

Document order number: 9397 750 02038

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