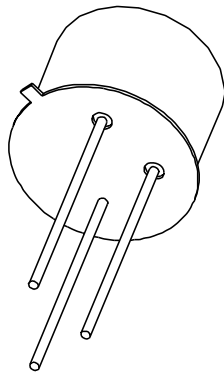


# DATA SHEET



## **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

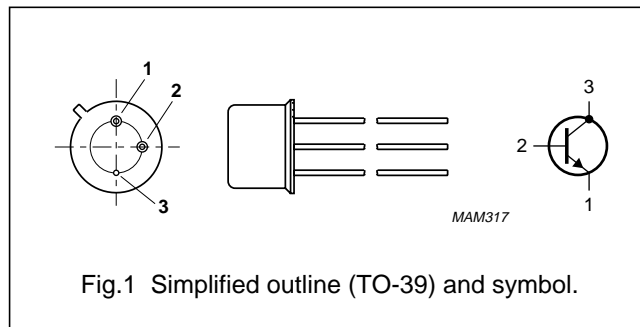


Fig.1 Simplified outline (TO-39) and symbol.

### 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	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	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	$I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA}; I_{Boff} = -50\text{ mA}$			
	BSX59		–	60	ns
	BSX61		–	100	ns

## NPN switching transistors

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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

## NPN switching transistors

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## CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$  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
		$I_E = 0; V_{CB} = 40\text{ V}; T_j = 150\text{ }^\circ\text{C}$	–	–	300	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current BSX59 BSX61	$I_C = 0; V_{EB} = 4\text{ V}$	–	–	300	nA
			–	–	500	nA
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 4\text{ V}; T_j = 150\text{ }^\circ\text{C}$	–	–	50	$\mu\text{A}$
$h_{FE}$	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	$I_E = i_e = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz}$	–	6	10	pF
$C_e$	emitter capacitance	$I_C = i_c = 0; V_{EB} = 500\text{ mV}; f = 1\text{ MHz}$	–	36	50	pF
$f_T$	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	250	–	–	MHz
<b>Switching times (between 10% and 90% levels)</b>						
$t_{on}$	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

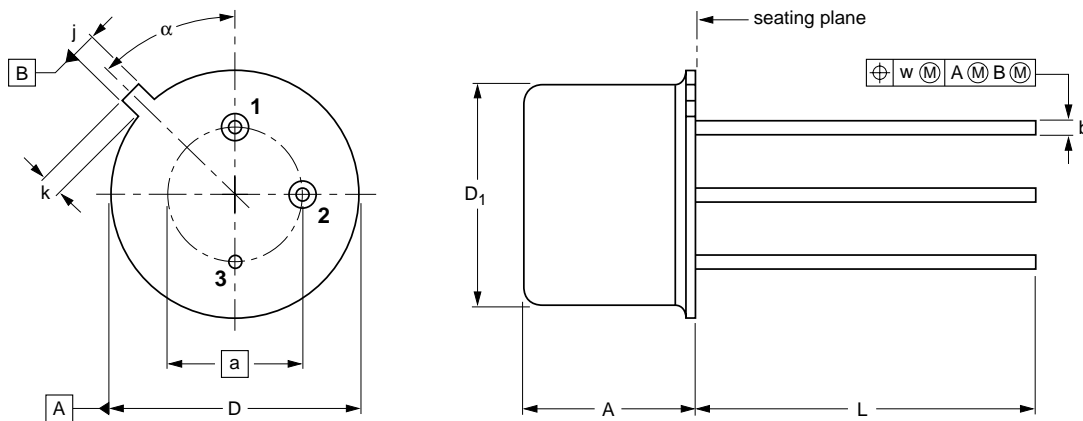
NPN switching transistors

BSX59; BSX61

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT5/11



DIMENSIONS (mm are the original dimensions)

UNIT	A	a	b	D	D <sub>1</sub>	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

## NPN switching transistors

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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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