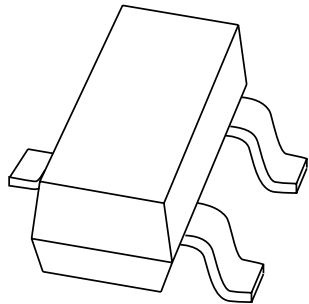


# DATA SHEET



## **BSR12** PNP switching transistor

Product specification

1999 Jul 23

# PNP switching transistor

# BSR12

### FEATURES

- Low current (max. 100 mA)
- Low voltage (max. 15 V).

### APPLICATIONS

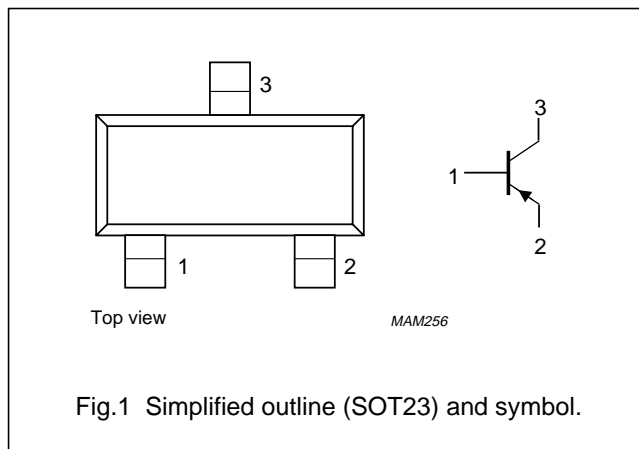
- High-speed, saturated switching applications for industrial service in thick and thin-film circuits.

### DESCRIPTION

PNP switching transistor in a SOT23 plastic package.

### PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



### MARKING

TYPE NUMBER	MARKING CODE
BSR12	B5p

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	-	-15	V
$V_{CEO}$	collector-emitter voltage	open base	-	-15	V
$I_{CM}$	peak collector current		-	-200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	-	250	mW
$T_j$	junction temperature		-	150	$^\circ\text{C}$
$h_{FE}$	DC current gain	$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}$	30	-	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}$	30	120	
$f_T$	transition frequency	$f = 500\text{ MHz}; I_C = -50\text{ mA}; V_{CE} = -10\text{ V}$	1.5	-	GHz
$t_{off}$	turn-off time	$I_{Con} = -30\text{ mA}; I_{Bon} = -3\text{ mA}; I_{Boff} = 3\text{ mA}$	-	30	ns

## PNP switching transistor

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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	–	–15	V
$V_{CEO}$	collector-emitter voltage	open base	–	–15	V
$V_{EBO}$	emitter-base voltage	open collector	–	–3	V
$I_C$	collector current (DC)		–	–100	mA
$I_{CM}$	peak collector current		–	–200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	250	mW
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	500	K/W

**Note**

1. Transistor mounted on a ceramic substrate  $8 \times 10 \times 0.7$  mm.

## PNP switching transistor

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## CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

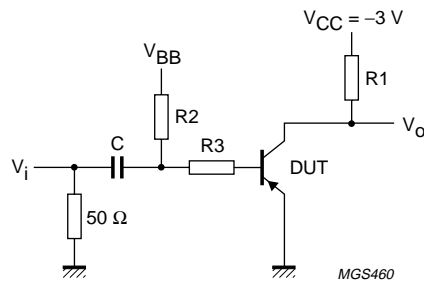
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = -10\text{ V}$	–	–	–50	nA
		$I_E = 0; V_{CB} = -10\text{ V}; T_{amb} = 125\text{ }^{\circ}\text{C}$	–	–	–5	$\mu\text{A}$
$I_{CES}$	collector cut-off current	$V_{BE} = 0; V_{CE} = -10\text{ V}$	–	–	–50	nA
$V_{(BR)CBO}$	breakdown voltage	$I_E = 0; I_C = -10\text{ }\mu\text{A}$	–15	–	–	V
$V_{(BR)CES}$	breakdown voltage	$V_{BE} = 0; I_C = -10\text{ }\mu\text{A}$	–15	–	–	V
$V_{(BR)EBO}$	breakdown voltage	$I_C = 0; I_E = -100\text{ }\mu\text{A}$	–3	–	–	V
$V_{CEOsust}$	collector-emitter sustaining voltage	$I_B = 0; I_C = -10\text{ mA}$	–15	–	–	V
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}; \text{note 1}$	–	–	–130	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}; \text{note 1}$	–	–180	–270	mV
		$I_C = -100\text{ mA}; I_B = -10\text{ mA}; \text{note 1}$	–	–	–450	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}; \text{note 1}$	–725	–	–920	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}; \text{note 1}$	–800	–	–1150	mV
		$I_C = -100\text{ mA}; I_B = -10\text{ mA}; \text{note 1}$	–900	–	–1500	mV
$h_{FE}$	DC current gain	$I_C = -1\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	–	
		$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	–	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	120	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}; T_{amb} = 55\text{ }^{\circ}\text{C}; \text{note 1}$	30	–	–	
		$I_C = -100\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	20	–	–	
$f_T$	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 500\text{ MHz}$	1.5	–	–	GHz
$C_c$	collector capacitance	$I_E = I_e = 0; V_{CB} = -5\text{ V}$	–	–	4.5	pF
$C_e$	emitter capacitance	$I_C = I_c = 0; V_{EB} = -0.5\text{ V}$	–	–	6	pF
<b>Switching time (see Fig.2)</b>						
$t_{on}$	turn-on time	$V_i = -6.85\text{ V}; V_{BB} = 0\text{ V}; I_{Con} = -30\text{ mA}; I_{Bon} = -3.0\text{ mA}$	–	–	20	ns
$t_{off}$	turn-off time	$V_i = 11.7\text{ V}; V_{BB} = -9.85\text{ V}; I_{Con} = -30\text{ mA}; I_{Bon} = -3\text{ mA}; I_{Boff} = 3\text{ mA}$	–	–	30	ns

## Note

1. Pulse test:  $t_p = 300\text{ }\mu\text{s}; \delta = 0.01$ .

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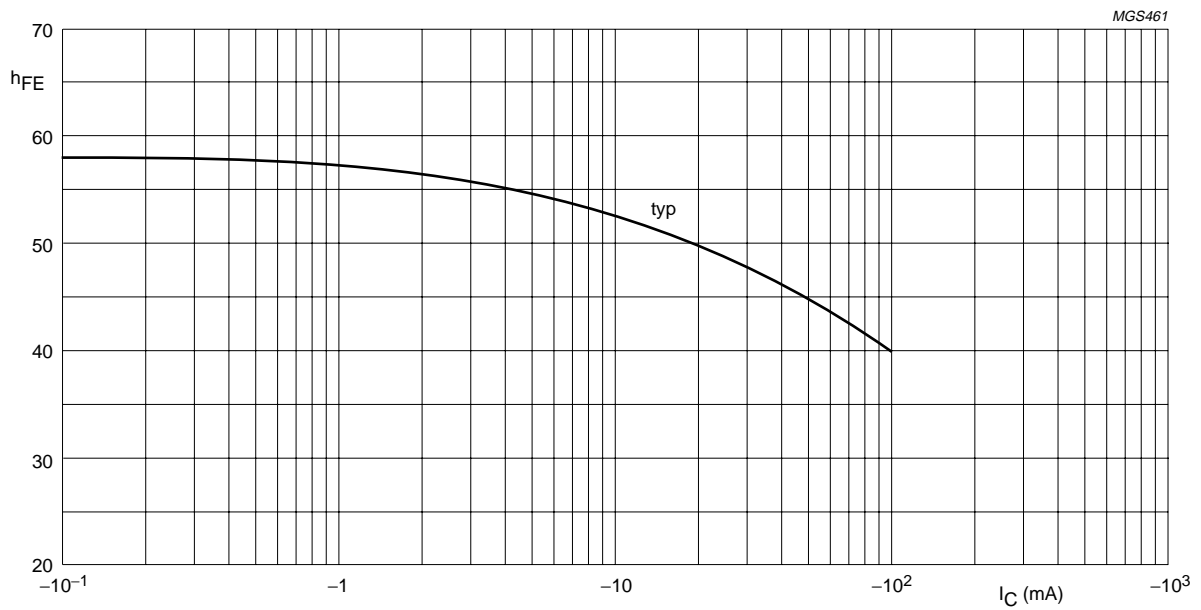


R1 = 94 Ω; R2 = 1 kΩ; R3 = 2 kΩ; C = 0.1 μF.

Pulse generator: Pulse duration  $t_p = 400$  ns. Rise time  $t_r < 1$  ns. Output impedance  $Z_O = 50$  Ω.

Sampling scope: Rise time  $t_r < 1$  ns. Input impedance  $Z_i = 100$  kΩ.

Fig.2 Test circuit for switching times.

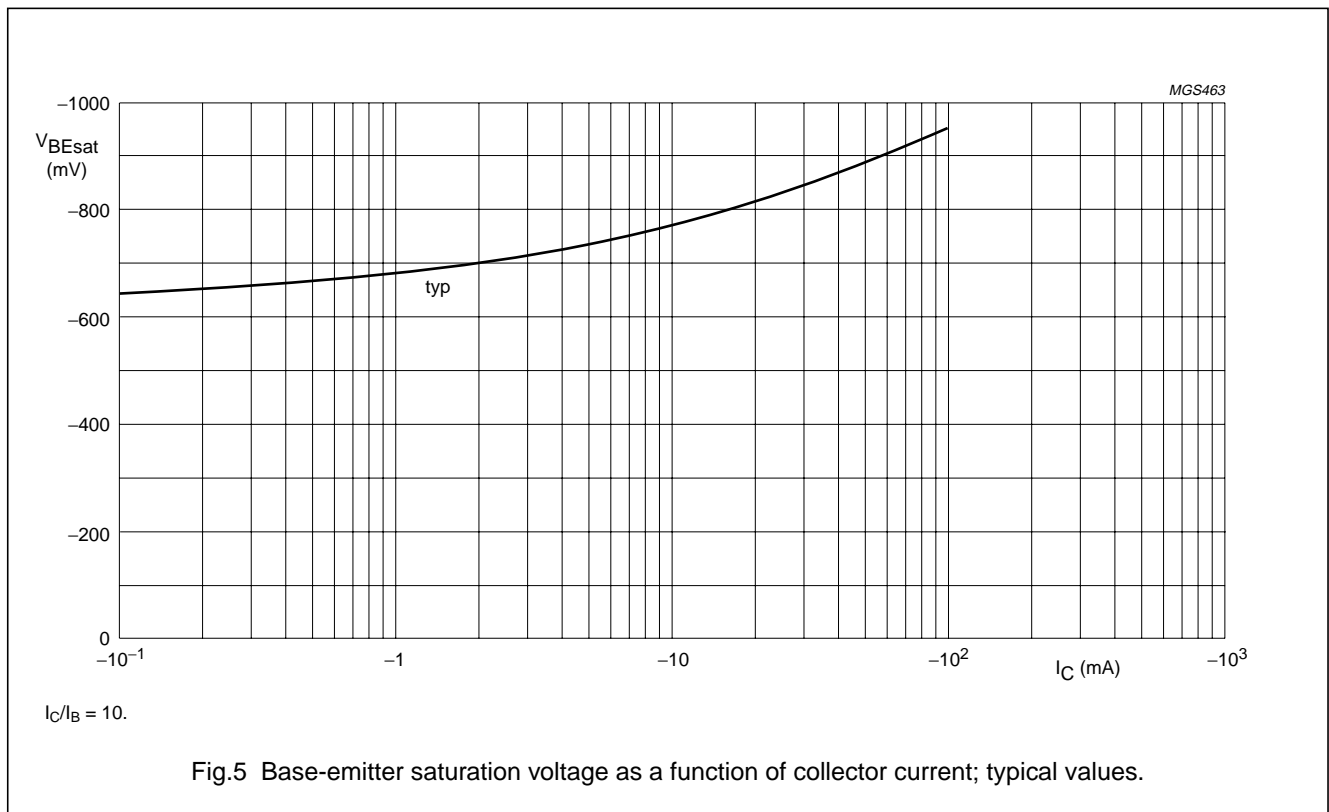
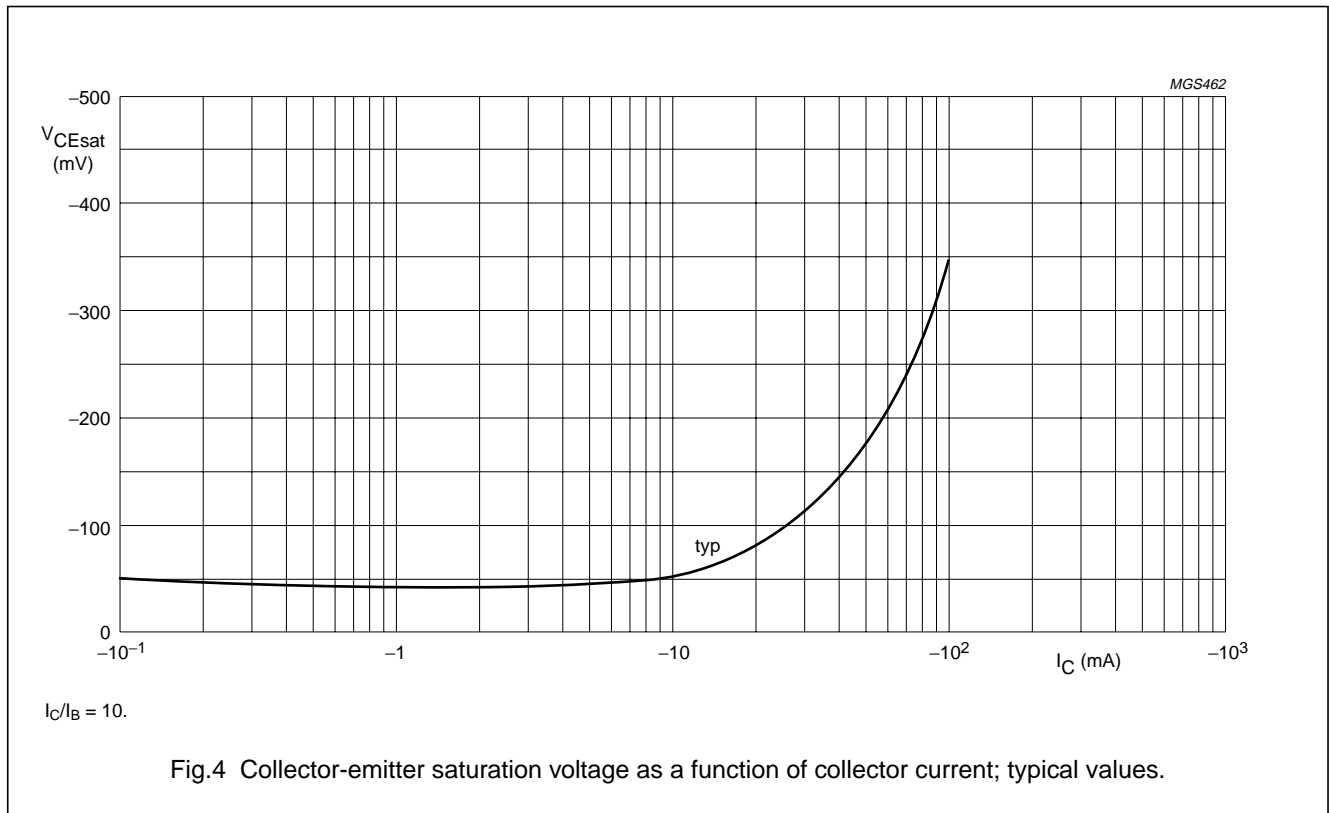


$V_{CE} = -1$  V;  $T_{amb} = 25^\circ\text{C}$ .

Fig.3 DC current gain; typical values.

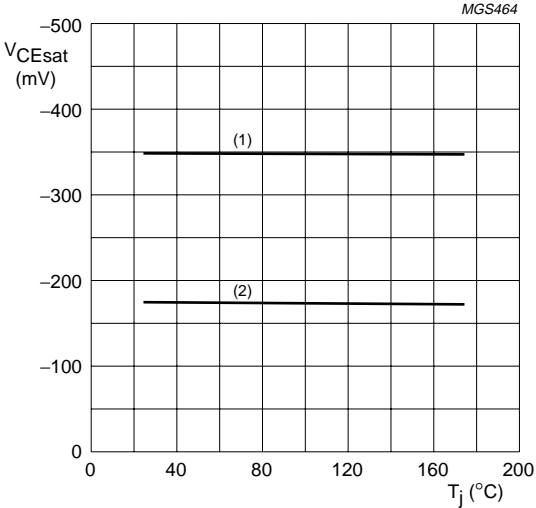
PNP switching transistor

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- (1) I<sub>C</sub> = 100 mA; I<sub>B</sub> = 10 mA
- (2) I<sub>C</sub> = 50 mA and I<sub>B</sub> = 5 mA.

Fig.6 Collector-emitter saturation voltage as a function of junction temperature; typical values.

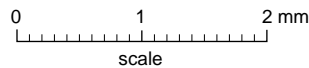
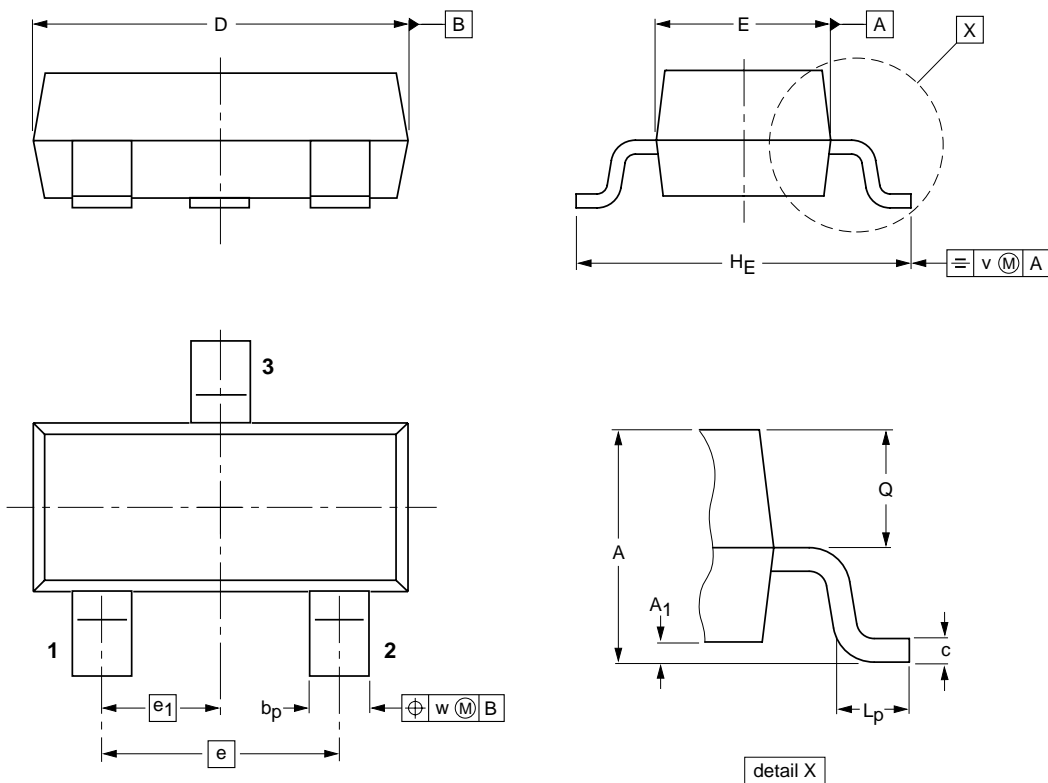
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28



## PNP switching transistor

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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>	
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**NOTES**

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**NOTES**

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