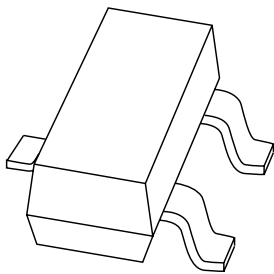


# DATA SHEET



## **BSR15; BSR16** PNP switching transistors

Product data sheet  
Supersedes data of 1999 Apr 15

2004 Jan 13

PNP switching transistors

BSR15; BSR16

FEATURES

- High current (max. 600 mA)
- Low voltage (max. 60 V).

APPLICATIONS

- Medium power switching.

DESCRIPTION

PNP switching transistor in a SOT23 plastic package.  
NPN complements: BSR13 and BSR14.

MARKING

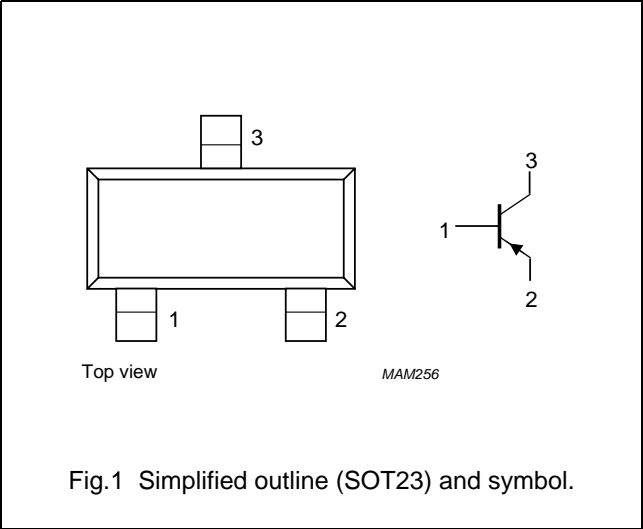
TYPE NUMBER	MARKING CODE <sup>(1)</sup>
BSR15	T7*
BSR16	T8*

Note

1.   \* = p : Made in Hong Kong.  
      \* = t : Made in Malaysia.  
      \* = W : Made in China.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
BSR15	—	plastic surface mounted package; 3 leads	SOT23
BSR16			

## PNP switching transistors

## BSR15; BSR16

**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–60	V
$V_{CEO}$	collector-emitter voltage	open base	–	–40	V
	BSR15		–	–60	V
	BSR16				
$V_{EBO}$	emitter-base voltage	open collector	–	–5	V
$I_C$	collector current (DC)		–	–600	mA
$I_{CM}$	peak collector current		–	–800	mA
$I_{BM}$	peak base 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
$T_{amb}$	operating ambient temperature		–65	+150	°C

**THERMAL CHARACTERISTICS**

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

**Note**

1. Transistor mounted on an FR4 printed-circuit board.

## PNP switching transistors

## BSR15; BSR16

## CHARACTERISTICS

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

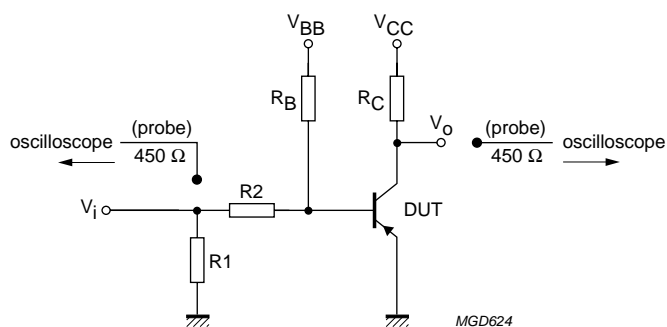
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current BSR15	$I_E = 0; V_{CB} = -50\text{ V}$	–	–20	nA
		$I_E = 0; V_{CB} = -50\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	–	–20	$\mu\text{A}$
	collector cut-off current BSR16	$I_E = 0; V_{CB} = -50\text{ V}$	–	–10	nA
		$I_E = 0; V_{CB} = -50\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	–	–10	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = -5\text{ V}$	–	–50	nA
$h_{FE}$	DC current gain BSR15	$I_C = -0.1\text{ mA}; V_{CE} = -10\text{ V}$	35	–	
	BSR16		75	–	
	DC current gain BSR15	$I_C = -1\text{ mA}; V_{CE} = -10\text{ V}$	50	–	
	BSR16		100	–	
	DC current gain BSR15	$I_C = -10\text{ mA}; V_{CE} = -10\text{ V}$	75	–	
	BSR16		100	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -150\text{ mA}; I_B = -15\text{ mA}$	–	–400	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	–	–1.6	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -150\text{ mA}; I_B = -15\text{ mA}$	–	–1.3	V
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	–	–2.6	V
$C_c$	collector capacitance	$I_E = I_B = 0; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$	–	8	pF
$C_e$	emitter capacitance	$I_C = I_E = 0; V_{EB} = -2\text{ V}; f = 1\text{ MHz}$	–	30	pF
$f_T$	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -20\text{ V}; f = 100\text{ MHz}$	200	–	MHz
<b>Switching times (between 10% and 90% levels); (see Fig.2)</b>					
$t_{on}$	turn-on time	$I_{Con} = -150\text{ mA}; I_{Bon} = -15\text{ mA};$ $I_{Boff} = 15\text{ mA}$	–	40	ns
$t_d$	delay time		–	12	ns
$t_r$	rise time		–	30	ns
$t_{off}$	turn-off time		–	365	ns
$t_s$	storage time		–	300	ns
$t_f$	fall time		–	65	ns

## Note

1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

## PNP switching transistors

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$V_i = -9.5 \text{ V}$ ;  $T = 500 \text{ } \mu\text{s}$ ;  $t_p = 10 \text{ } \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 68 \text{ } \Omega$ ;  $R_2 = 325 \text{ } \Omega$ ;  $R_B = 325 \text{ } \Omega$ ;  $R_C = 160 \text{ } \Omega$ .  
 $V_{BB} = 3.5 \text{ V}$ ;  $V_{CC} = -29.5 \text{ V}$ .  
 Oscilloscope: input impedance  $Z_i = 50 \text{ } \Omega$ .

Fig.2 Test circuit for switching times.

PNP switching transistors

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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23

The diagrams illustrate the SOT23 package outline. The top view shows dimensions D (width) and B (lead width). The side view shows dimensions E (lead length), A (height), H<sub>E</sub> (lead height), and A<sub>1</sub> (lead thickness). The bottom view shows dimensions 1, 2, 3 (lead positions), e<sub>1</sub>, b<sub>p</sub>, e (lead spacing), and w (lead width). The detail X shows the lead profile with dimensions Q (lead height), c (lead thickness), and L<sub>p</sub> (lead length). The scale bar indicates 0 to 2 mm.

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	JEITA			
SOT23		TO-236AB				04-11-04 06-03-16

## PNP switching transistors

## BSR15; BSR16

## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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## **Customer notification**

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

## **Contact information**

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Printed in The Netherlands

R75/04/pp8

Date of release: 2004 Jan 13

Document order number: 9397 750 12421

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