

DATA SHEET



BSR13; BSR14 NPN switching transistors

Product specification
Supersedes data of 1999 Apr 15

2004 Jan 13

NPN switching transistors

BSR13; BSR14

FEATURES

- High current (max. 800 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- Switching and linear applications.

DESCRIPTION

NPN switching transistor in a SOT23 plastic package.
PNP complements: BSR15 and BSR16.

MARKING

TYPE NUMBER	MARKING CODE ⁽¹⁾
BSR13	U7*
BSR14	U8*

Note

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

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

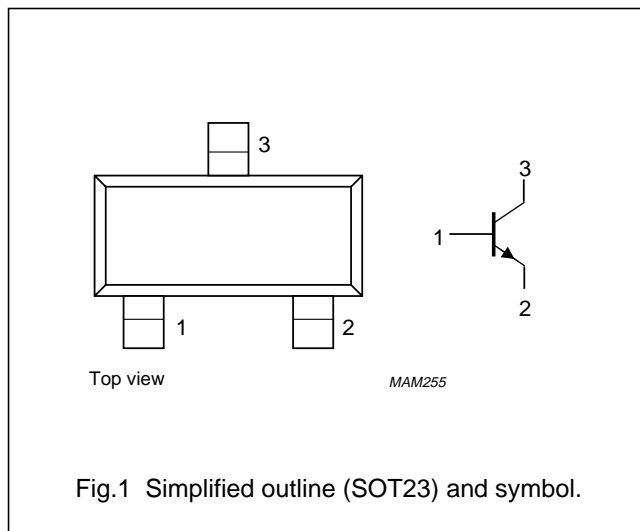


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
BSR13	-	plastic surface mounted package; 3 leads	SOT23
BSR14			

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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			
	BSR13		–	60	V
	BSR14		–	75	V
V _{CEO}	collector-emitter voltage	open base			
	BSR13		–	30	V
	BSR14		–	40	V
V _{EBO}	emitter-base voltage	open collector			
	BSR13		–	5	V
	BSR14		–	6	V
I _C	collector current (DC)		–	800	mA
I _{CM}	peak collector current		–	800	mA
I _{BM}	peak base current		–	200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °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.

CHARACTERISTICST_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I _{CBO}	collector cut-off current BSR13	I _E = 0; V _{CB} = 50 V	–	30	nA
		I _E = 0; V _{CB} = 50 V; T _j = 150 °C	–	10	μA
	collector cut-off current BSR14	I _E = 0; V _{CB} = 60 V	–	10	nA
		I _E = 0; V _{CB} = 60 V; T _j = 150 °C	–	10	μA
I _{EBO}	emitter cut-off current	I _C = 0; V _{EB} = 5 V			
	BSR13		–	30	nA
	BSR14		–	10	nA

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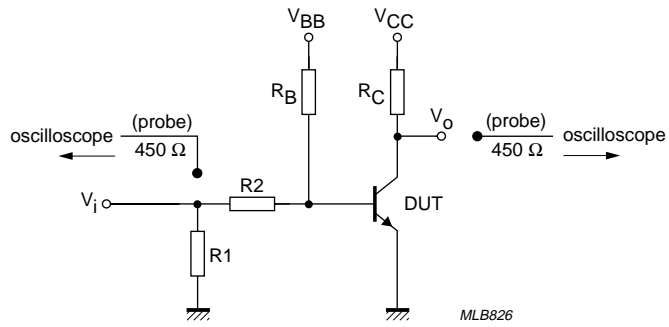
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
h_{FE}	DC current gain	$I_C = 0.1 \text{ mA}; V_{CE} = 10 \text{ V}; \text{note 1}$	35	–	
		$I_C = 1 \text{ mA}; V_{CE} = 10 \text{ V}; \text{note 1}$	50	–	
		$I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V}; \text{note 1}$	75	–	
		$I_C = 150 \text{ mA}; V_{CE} = 10 \text{ V}; \text{note 1}$	100	300	
		$I_C = 150 \text{ mA}; V_{CE} = 1 \text{ V}; \text{note 1}$	50	–	
h_{FE}	DC current gain BSR13 BSR14	$I_C = 500 \text{ mA}; V_{CE} = 10 \text{ V}; \text{note 1}$	30 40	– –	
		$I_C = 150 \text{ mA}; I_B = 15 \text{ mA}$	– –	400 300	mV mV
V_{CEsat}	collector-emitter saturation voltage BSR13 BSR14	$I_C = 150 \text{ mA}; I_B = 15 \text{ mA}$	– –	400 300	mV mV
	collector-emitter saturation voltage BSR13 BSR14	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA}$	– –	1.6 1	V V
V_{BEsat}	base-emitter saturation voltage BSR13 BSR14	$I_C = 150 \text{ mA}; I_B = 15 \text{ mA}$	– 0.6	1.3 1.2	V V
	base-emitter saturation voltage BSR13 BSR14	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA}$	– –	2.6 2	V V
C_c	collector capacitance	$I_E = I_e = 0; V_{CB} = 10 \text{ V}; f = 1 \text{ MHz}$	–	8	pF
f_T	transition frequency BSR13 BSR14	$I_C = 20 \text{ mA}; V_{CE} = 20 \text{ V};$ $f = 100 \text{ MHz}$	250 300	– –	MHz MHz
	Switching times (between 10% and 90% levels); see Fig.2				
t_{on}	turn-on time	$I_{Con} = 150 \text{ mA}; I_{Bon} = 15 \text{ mA};$ $I_{Boff} = -15 \text{ mA}$	–	35	ns
t_d	delay time		–	15	ns
t_r	rise time		–	20	ns
t_{off}	turn-off time		–	250	ns
t_s	storage time		–	200	ns
t_f	fall time		–	60	ns

Note

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

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MLB826

$V_i = 9.5 \text{ V}$; $T = 500 \mu\text{s}$; $t_p = 10 \mu\text{s}$; $t_r = t_f \leq 3 \text{ ns}$.
 $R_1 = 68 \Omega$; $R_2 = 325 \Omega$; $R_B = 325 \Omega$; $R_C = 160 \Omega$.
 $V_{BB} = -3.5 \text{ V}$; $V_{CC} = 29.5 \text{ V}$.
 Oscilloscope: input impedance $Z_i = \geq 100 \Omega$.

Fig.2 Test circuit for switching times.

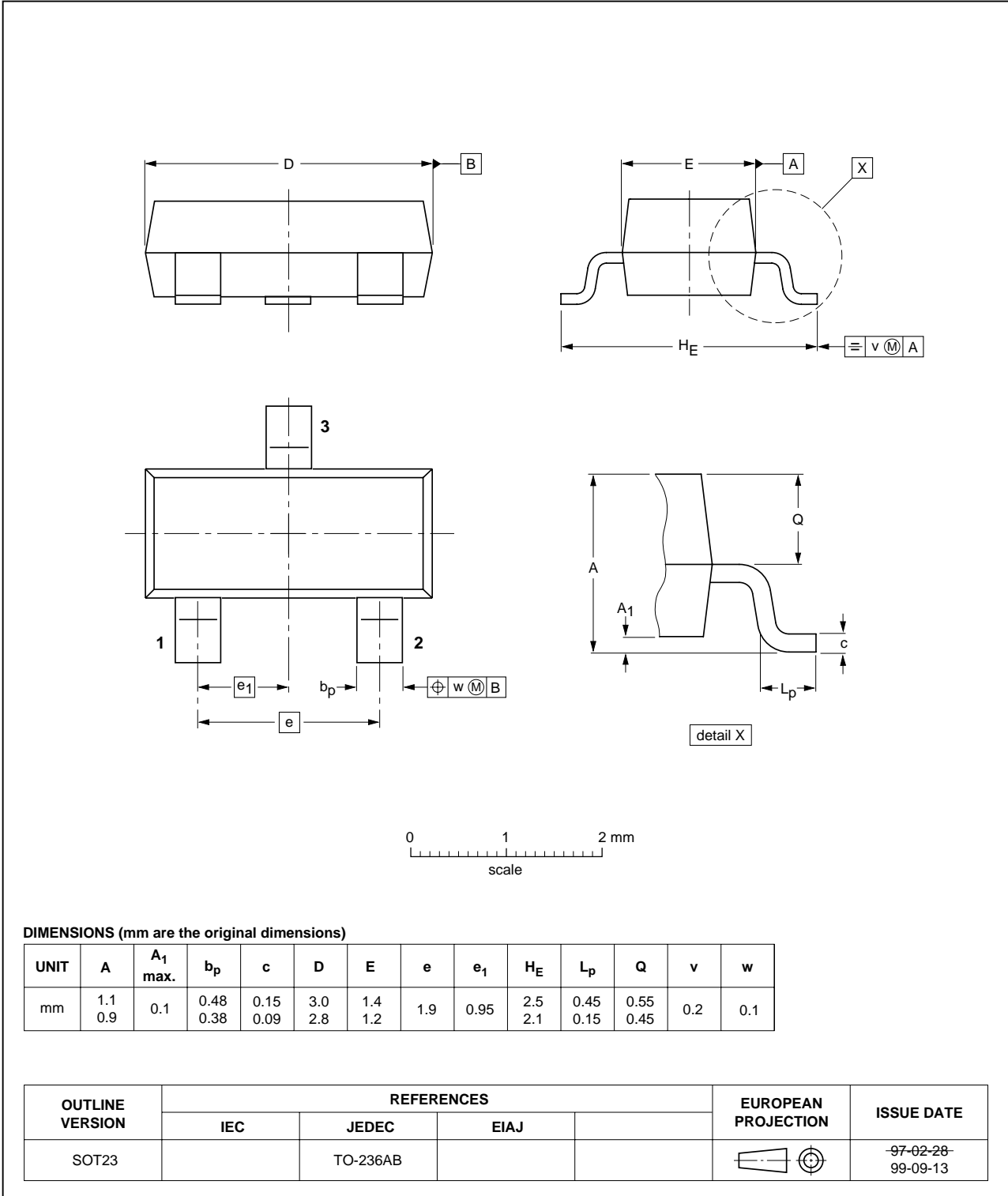
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



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DATA SHEET STATUS

LEVEL	DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾⁽³⁾	DEFINITION
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