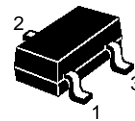


SMALL SIGNAL NPN TRANSISTORS

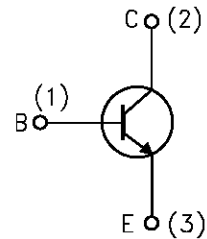
Type	Marking
BSR13	U7
BSR14	U8

- SILICON EPITAXIAL PLANAR NPN TRANSISTORS
- MINIATURE PLASTIC PACKAGE FOR APPLICATION IN SURFACE MOUNTING CIRCUITS
- MEDIUM CURRENT AF AMPLIFICATION AND SWITCHING
- PNP COMPLEMENTS ARE RESPECTIVELY BSR15 AND BSR16



SOT-23

INTERNAL SCHEMATIC DIAGRAM



SC08960

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BSR13	BSR14	
V_{CBO}	Collector-Emitter Voltage ($V_{BE} = 0$)	60	75	V
V_{CEO}	Collector-Emitter Voltage ($I_B = 0$)	30	40	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	5	6	V
I_{CM}	Collector Peak Current	0.8		A
P_{tot}	Total Dissipation at $T_c = 25^\circ\text{C}$	310		mW
T_{stg}	Storage Temperature	-65 to 150		$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	150		$^\circ\text{C}$

BSR13/BSR14

THERMAL DATA

$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	400	$^{\circ}\text{C}/\text{W}$
---------------	-------------------------------------	-----	-----	-----------------------------

• Mounted on a ceramic substrate area = 15 x 15 x 0.5 mm

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector Cut-off Current	$V_{CE} = 60\text{ V}$ $V_{BE} = -3\text{ V}$ for BSR14			10	nA
I_{BEX}	Base Cut-off Current	$V_{CE} = 60\text{ V}$ $V_{BE} = -3\text{ V}$ for BSR14			20	nA
I_{CBO}	Collector Cut-off Current ($I_E = 0$)	$V_{CB} = \text{rated } V_{CBO}$ for BSR13 for BSR14 $V_{CB} = \text{rated } V_{CBO}$ $T_j = 150^{\circ}\text{C}$ for BSR13 for BSR14			30 10 10 10	nA nA μA μA
I_{EBO}	Emitter Cut-off Current ($I_C = 0$)	$V_{EB} = 3\text{ V}$ for BSR13 for BSR14			30 15	nA nA
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ($I_B = 0$)	$I_C = 10\text{ mA}$ for BSR13 for BSR14	30 40			V V
$V_{(BR)CBO}^*$	Collector-Base Breakdown Voltage ($I_B = 0$)	$I_C = 10\text{ }\mu\text{A}$ for BSR13 for BSR14	60 75			V V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_C = 0$)	$I_E = 10\text{ }\mu\text{A}$ for BSR13 for BSR14	5 6			V V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ for BSR13 for BSR14 $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$ for BSR13 for BSR14			0.4 0.3 1.6 1	V V V V
$V_{BE(sat)}^*$	Collector-Base Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ for BSR13 for BSR14 $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$ for BSR13 for BSR14	0.6		1.3 1.2 2.6 2	V V V V
h_{FE}^*	DC Current Gain	$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$ $I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$ for BSR13 for BSR14	35 50 75 100 50 30 40		300	
f_T	Transition Frequency	$I_C = 20\text{ mA}$ $V_{CE} = 20\text{ V}$ $f = 100\text{ MHz}$ for BSR13 for BSR14	250 300			MHz MHz
C_{CB}	Collector Base Capacitance	$I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$			8	pF

* Pulsed: Pulse duration = 300 μs , duty cycle $\leq 2\%$

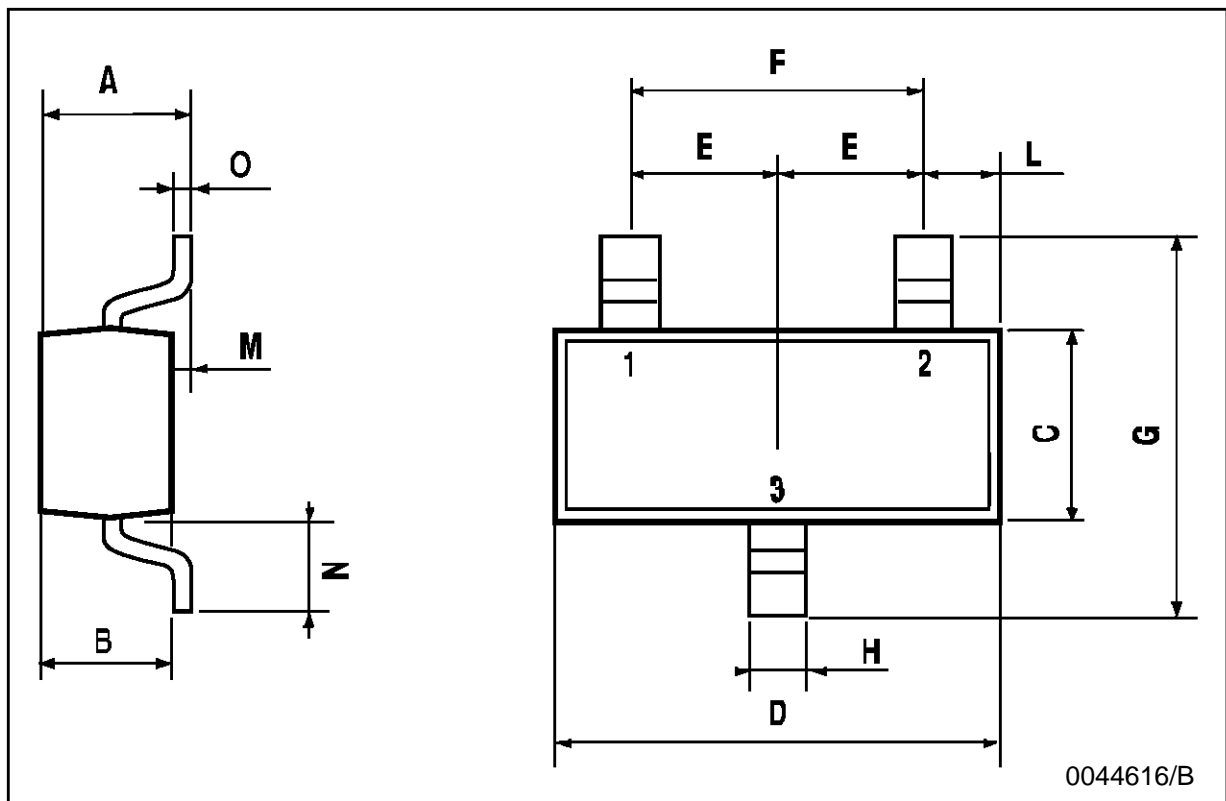
ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
h_{ie}^*	Input Impedance	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ for BSR14 $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$	2 0.25		8 1.25	$K\Omega$ $K\Omega$
h_{re}^*	Reverse Voltage Ratio	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ for BSR14 $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$			8 4	10^{-4} 10^{-4}
h_{fe}^*	Small Signal Current Gain	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ for BSR14 $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$	50 75		300 375	
h_{oe}^*	Output Admittance	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ for BSR14 $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$	5 25		35 200	μS μS
t_d	Delay Time	$I_C = -150\text{ mA}$ $V_{BE} = -0.5\text{ V}$ $I_{B1} = 15\text{ mA}$ for BSR14 only			10	ns
t_r	Rise Time				25	ns
t_s	Storage Time	$I_C = 150\text{ mA}$ $I_{B1} = -I_{B2} = 15\text{ mA}$ for BSR14 only			225	ns
t_f	Fall Time				60	ns

* Pulsed: Pulse duration = 300 μs , duty cycle $\leq 2\%$

SOT-23 MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.85		1.1	33.4		43.3
B	0.65		0.95	25.6		37.4
C	1.20		1.4	47.2		55.1
D	2.80		3	110.2		118
E	0.95		1.05	37.4		41.3
F	1.9		2.05	74.8		80.7
G	2.1		2.5	82.6		98.4
H	0.38		0.48	14.9		18.8
L	0.3		0.6	11.8		23.6
M	0		0.1	0		3.9
N	0.3		0.65	11.8		25.6
O	0.09		0.17	3.5		6.7



0044616/B

Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1995 SGS-THOMSON Microelectronics - Printed in Italy - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A