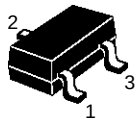
SGS-THOMSON MICROELECTRONICS

BSR13
BSR14

SMALL SIGNAL NPN TRANSISTORS

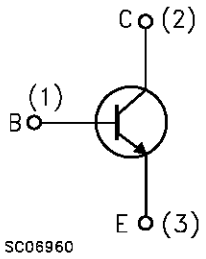
Type	Marking
BSR13	U7
BSR14	U8

- 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



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 °C	310		mW
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

THERMAL DATA

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

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

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector Cut-off Current	V_{CE} = 60 V V_{BE} = -3 V for **BSR14**			10	nA
I_{BEX}	Base Cut-off Current	V_{CE} = 60 V V_{BE} = -3 V for **BSR14**			20	nA
I_{CBO}	Collector Cut-off Current (I_E = 0)	V_{CB} = rated V_{CBO} for **BSR13** for **BSR14** V_{CB} = rated V_{CBO} T_j = 150 °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 V for **BSR13** for **BSR14**			 30 15	 nA nA
$V_{(BR)CEO}$*	Collector-Emitter Breakdown Voltage (I_B = 0)	I_C = 10 mA for **BSR13** for **BSR14**	 30 40			 V V
$V_{(BR)CBO}$*	Collector-Base Breakdown Voltage (I_B = 0)	I_C = 10 µA for **BSR13** for **BSR14**	 60 75			 V V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage (I_C = 0)	I_E = 10 µA for **BSR13** for **BSR14**	 5 6			 V V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 150 mA I_B = 15 mA for **BSR13** for **BSR14** I_C = 500 mA I_B = 50 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 mA I_B = 15 mA for **BSR13** for **BSR14** I_C = 500 mA I_B = 50 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 mA V_{CE} = 10 V I_C = 1 mA V_{CE} = 10 V I_C = 10 mA V_{CE} = 10 V I_C = 150 mA V_{CE} = 10 V I_C = 150 mA V_{CE} = 1 V I_C = 500 mA V_{CE} = 10 V for **BSR13** for **BSR14**	35 50 75 100 50 30 40		 300	
f_T	Transition Frequency	I_C = 20 mA V_{CE} = 20V f = 100MHz for **BSR13** for **BSR14**	 250 300			 MHz MHz
C_{CB}	Collector Base Capacitance	I_E = 0 V_{CB} = 10 V f = 1 MHz			8	pF

∗ Pulsed: Pulse duration = 300 µs, duty cycle ≤ 2 %

ELECTRICAL CHARACTERISTICS (Continued)

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

* Pulsed: Pulse duration = 300 µs, duty cycle ≤ 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