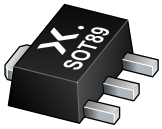


BSR31

60 V, 1 A PNP medium power transistor

8 October 2024 **Product data sheet**

1. General description

PNP medium power transistor in a SOT89 Surface-Mounted Device (SMD) plastic package.

NPN complement: BSR41

2. Features and benefits

- High current
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity

3. Applications

- Linear voltage regulators
- High-side switches
- Battery-driven devices
- MOSFET drivers
- Amplifiers

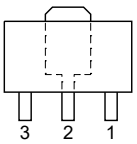
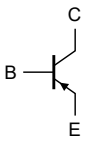
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-60	V
I_C	collector current			-	-	-1	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	-2	A
h_{FE}	DC current gain	V_{CE} = -5 V; I_C = -100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		100	-	300	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter		
2	C	collector		
3	B	base		

SOT89

006aaa231

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSR31	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code
BSR31	BR2

8. Limiting values

Table 5. 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		-	-70	V
V_{CEO}	collector-emitter voltage	open base		-	-60	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current			-	-1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-2	A
I_{BM}	peak base current			-	-200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	1.35	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	93	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	13	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current (emitter open)	V_{CB} = -60 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-100	nA
		V_{CB} = -60 V; I_E = 0 A; T_j = 150 °C		-	-	-50	µA
I_{EBO}	emitter-base cut-off current (collector open)	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	-100	nA
h_{FE}	DC current gain	V_{CE} = -5 V; I_C = -100 µA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		30	-	-	
		V_{CE} = -5 V; I_C = -100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		100	-	300	
		V_{CE} = -5 V; I_C = -500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		50	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -150 mA; I_B = -15 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		-	-	-0.25	V
		I_C = -500 mA; I_B = -50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		-	-	-0.5	V
V_{BEsat}	base-emitter saturation voltage	I_C = -150 mA; I_B = -15 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		-	-	-1	V
		I_C = -500 mA; I_B = -50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.01; T_{amb} = 25 °C		-	-	-1.2	V
f_T	transition frequency	V_{CE} = -10 V; I_C = -50 mA; f = 100 MHz; T_{amb} = 25 °C		100	-	-	MHz

11. Package outline

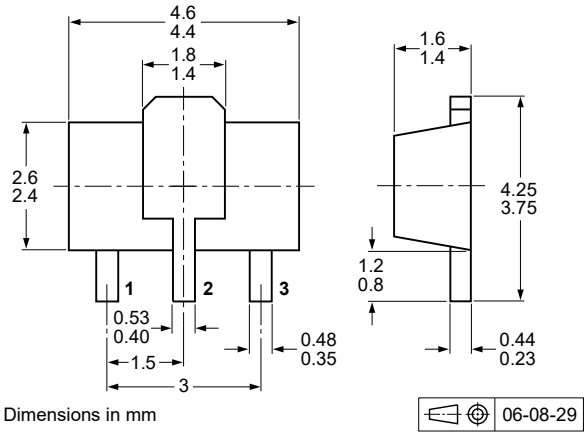


Fig. 1. Package outline SOT89

12. Soldering

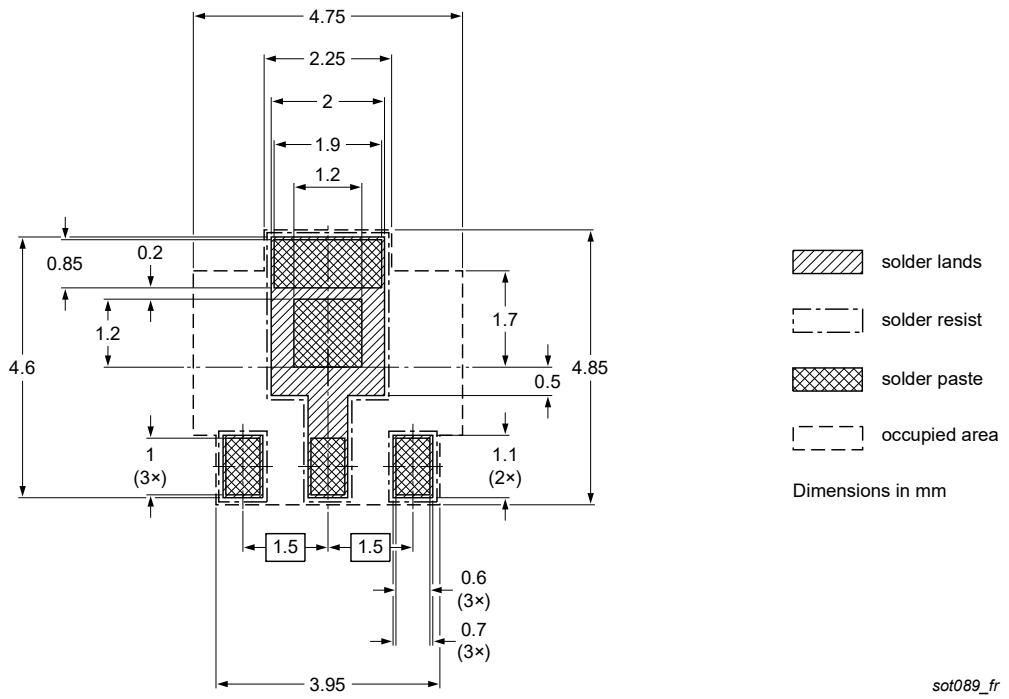


Fig. 2. Reflow soldering footprint for SOT89

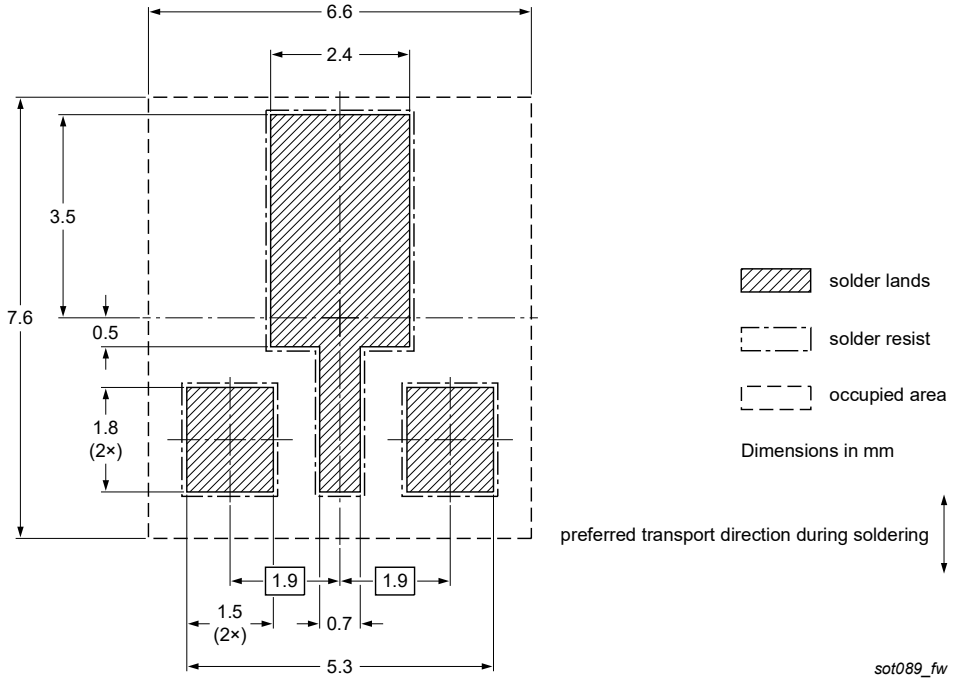


Fig. 3. Wave soldering footprint for SOT89

13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSR31 v.4	20241008	Product data sheet	-	BSR31 v.3
Modifications:	• Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
BSR31 v.3	20230310	Product data sheet	-	BSR30_31_33 v.2
BSR30_31_33 v.2	20041213	Product data sheet	-	BSR30_31_33 v.1
BSR30_31_33 v.1	19990426	Product data sheet	-	-

14. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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