



# BSR31-Q

60 V, 1 A PNP medium power transistor

10 March 2023

Product data sheet

## 1. General description

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

NPN complement: BSR41-Q

## 2. Features and benefits

- High current
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 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; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.01$ ; $T_{amb} = 25$ °C	100	-	300	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	<p>SOT89</p>	<p>006aaa231</p>
2	C	collector		
3	B	base		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">BSR31-Q</a>	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	<a href="#">SOT89</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BSR31-Q	BR 2

## 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<sup>2</sup>.

## 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<sup>2</sup>.

## 10. Characteristics

Table 7. Characteristics

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

## 11. Test information

### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 12. Package outline

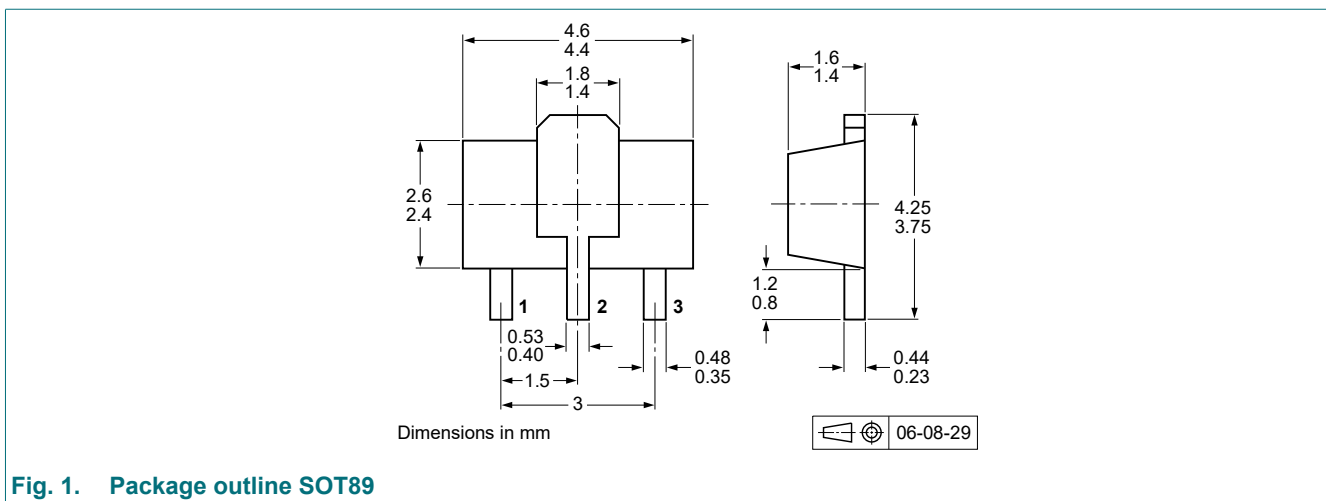


Fig. 1. Package outline SOT89

### 13. Soldering

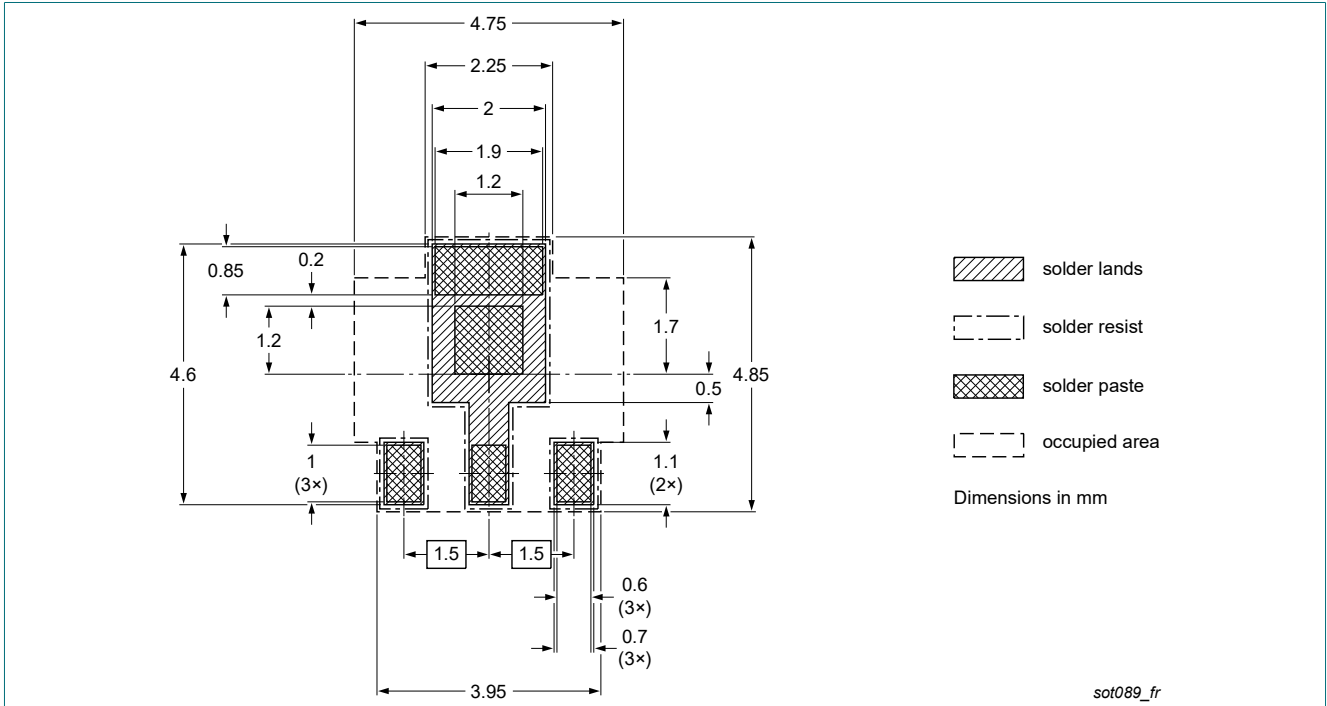


Fig. 2. Reflow soldering footprint for SOT89

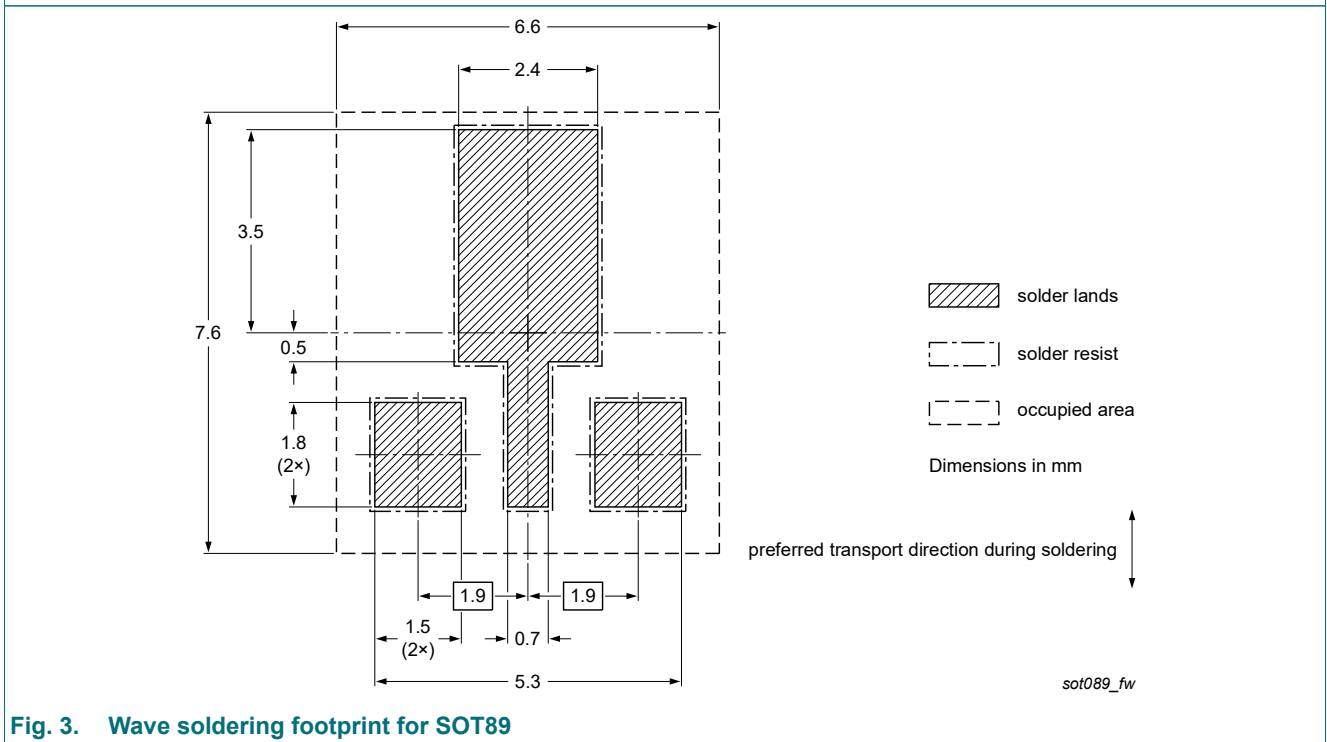


Fig. 3. Wave soldering footprint for SOT89

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSR31-Q v.1	20230310	Product data sheet	-	-

## 15. 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.

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