

# BSR56; BSR57; BSR58

N-channel FETs

Rev. 3 — 25 June 2014

Product data sheet

## 1. Product profile

### 1.1 General description

Symmetrical silicon N-channel depletion type junction field-effect transistors (FETs) in a plastic microminiature envelope designed for application in thick and thin-film circuits. The transistors are intended for low-power, chopper or switching applications in industrial service.

### 1.2 Features and benefits

- Interchangeable drain and source connections
- Small package

### 1.3 Applications

- Low-power, chopper or switching applications
- Thick and thin-film circuits

### 1.4 Quick reference data

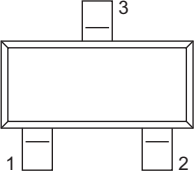

Table 1. Quick reference data

Symbol	Parameter	Conditions	BSR56		BSR57		BSR58		Unit
			Min	Max	Min	Max	Min	Max	
$V_{DS}$	drain-source voltage		-	$\pm 40$	-	$\pm 40$	-	$\pm 40$	V
$I_{DSS}$	drain leakage current	$V_{DS} = 15\text{ V}; V_{GS} = 0\text{ V};$ $T_{mb} = 40\text{ }^{\circ}\text{C}$	-	$>50$	-	$>20$	-	$>8$	mA
			-	-	-	$<100$	-	$<80$	mA
$V_{GSoff}$	gate-source cut-off voltage	$V_{DS} = 15\text{ V};$ $I_D = 0.5\text{ nA}$	$>4$	-	$>2$	-	$>0.8$	-	V
			$<10$	-	$<6$	-	$<4$	-	V
$C_{rs}$	feedback capacitance	$V_{DS} = 0\text{ V}; V_{GS} = -10\text{ V};$ $f = 1\text{ MHz}$	-	$<5$	-	$<5$	-	$<5$	pF
<b>Switching time (<math>V_{DD} = 10\text{ V}; V_{GS} = 0\text{ V}</math>)</b>									
$t_{off}$	turn-off time	$I_D = 20\text{ mA}; V_{GSM} = -10\text{ V}$	-	$<25$	-	-	-	-	ns
		$I_D = 10\text{ mA}; V_{GSM} = -6\text{ V}$	-	-	-	$<50$	-	-	ns
		$I_D = 5\text{ mA}; V_{GSM} = -4\text{ V}$	-	-	-	-	-	$<100$	ns
$P_{tot}$	total power dissipation	$T_{mb} = 40\text{ }^{\circ}\text{C}$	-	250	-	250	-	250	mW
<b>Static characteristics</b>									
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 0\text{ V}; I_D = 0\text{ A}; f = 1\text{ kHz}$	-	$<25$	-	$<40$	-	$<60$	$\Omega$



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain <a href="#">[1]</a>		
2	source <a href="#">[1]</a>		
3	gate		

[1] Drain and source are interchangeable.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSR56	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
BSR57			
BSR58			

## 4. Marking

Table 4. Marking codes

Type number	Marking code
BSR56	M4P
BSR57	M5P
BSR58	M6P

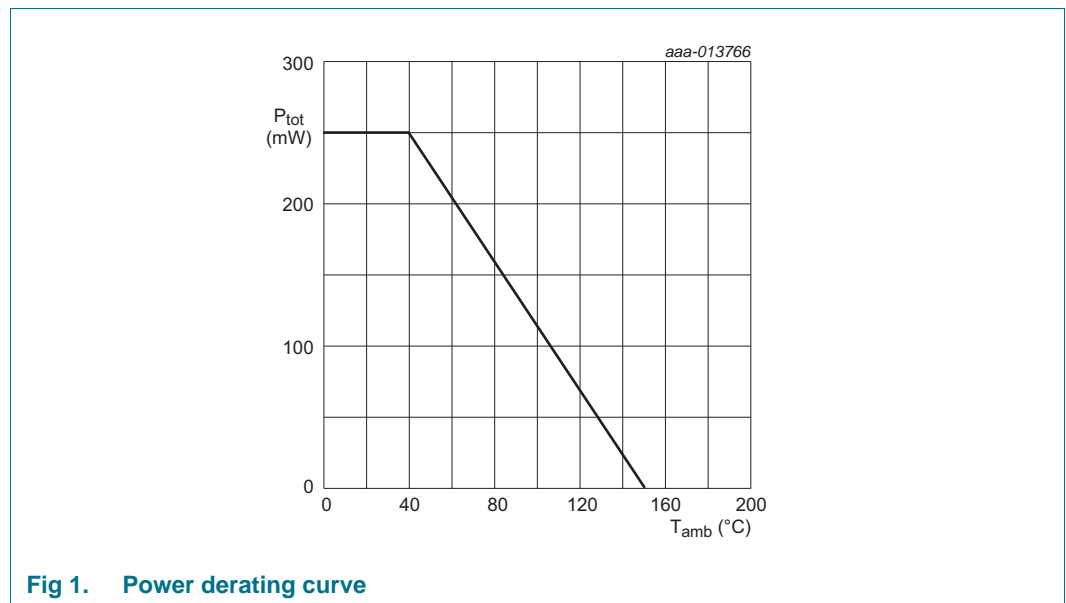
## 5. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage		-	$\pm 40$	V
$V_{GS}$	gate-source voltage		-	-40	V
$V_{DG}$	drain-gate voltage		-	40	V
$I_G$	gate current		-	50	mA
$P_{tot}$	total power dissipation	$T_{amb} = 40\text{ }^\circ\text{C}$ [1]	-	250	mW
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$

[1] Mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.



**Fig 1. Power derating curve**

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1] 430	K/W

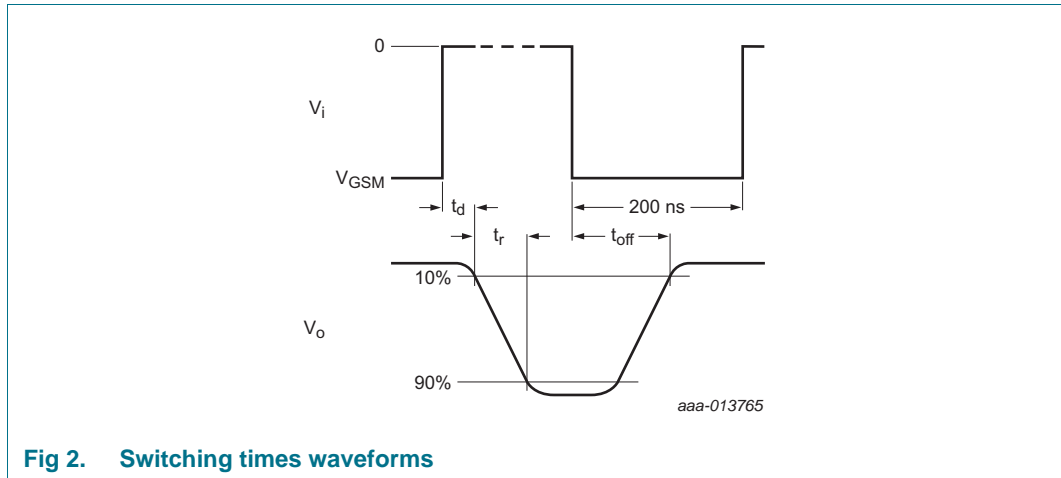
[1] Mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.

## 7. Characteristics

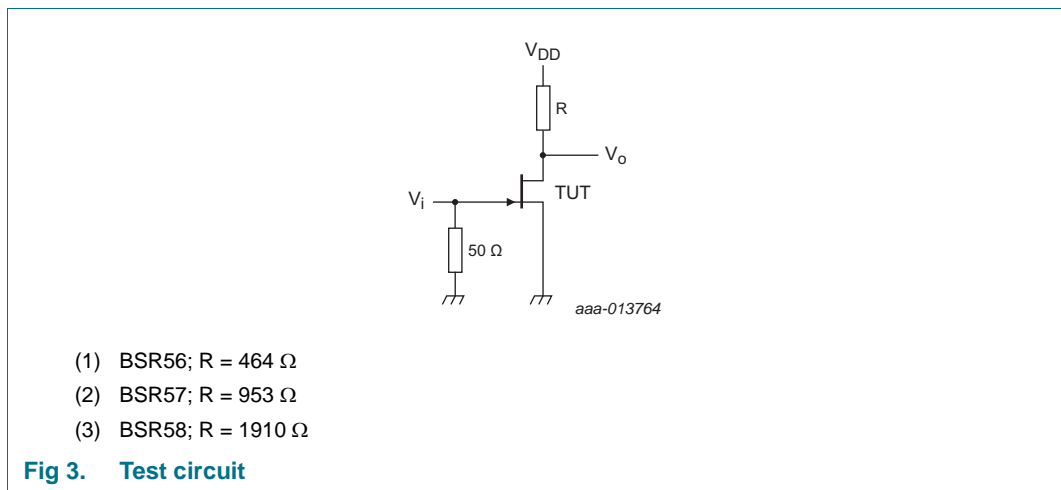
**Table 7. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	BSR56		BSR57		BSR58		Unit
			Min	Max	Min	Max	Min	Max	
$I_{GSS}$	gate-source cut-off current	$V_{DS} = 0\text{ V}; V_{GS} = -20\text{ V}$	-	1.0	-	1.0	-	1.0	nA
$I_{DSX}$	drain cut-off current	$V_{DS} = 15\text{ V}; V_{GS} = -10\text{ V}$	-	1.0	-	1.0	-	1.0	nA
$V_{(BR)GSS}$	gate-source breakdown voltage	$I_G = -1\text{ }\mu\text{A}; V_{DS} = 0\text{ V}$	-	>40	-	>40	-	>40	V
$V_{GSoff}$	gate-source cut-off voltage	$V_{DS} = 15\text{ V}; I_D = 0.5\text{ nA}$	>4	-	>2	-	>0.8	-	V
			<10	-	<6	-	<4	-	V
$I_D$	drain current	$V_{DS} = 15\text{ V}; V_{GS} = 0\text{ V}$	-	>50	-	>20	-	>8	mA
			-	-	-	<100	-	<80	mA
$C_{rs}$	feedback capacitance	$V_{DS} = 0\text{ V}; V_{GS} = -10\text{ V}; f = 1\text{ MHz}$	-	<5	-	<5	-	<5	pF
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 0\text{ V}; I_D = 0\text{ A}; f = 1\text{ kHz}$	-	<25	-	<40	-	<60	$\Omega$
$V_{DSon}$	drain-source on-state voltage	$V_{GS} = 0\text{ V}; I_D = 20\text{ mA}$	-	<750	-	-	-	-	mV
		$V_{GS} = 0\text{ V}; I_D = 10\text{ mA}$	-	-	-	<500	-	-	mV
		$V_{GS} = 0\text{ V}; I_D = 5\text{ mA}$	-	-	-	-	-	<400	mV
<b>Switching times (<math>V_{DD} = 10\text{ V}; V_{GS} = 0\text{ V}</math>)</b>									
$t_d$	delay time	$I_D = 20\text{ mA}; V_{GSM} = 10\text{ V}$	-	<6	-	-	-	-	ns
		$I_D = 10\text{ mA}; V_{GSM} = 6\text{ V}$	-	-	-	<6	-	-	ns
		$I_D = 5\text{ mA}; V_{GSM} = 4\text{ V}$	-	-	-	-	-	<10	ns
$t_r$	rise time	$I_D = 20\text{ mA}; V_{GSM} = 10\text{ V}$	-	<3	-	-	-	-	ns
		$I_D = 10\text{ mA}; V_{GSM} = 6\text{ V}$	-	-	-	<4	-	-	ns
		$I_D = 5\text{ mA}; V_{GSM} = 4\text{ V}$	-	-	-	-	-	<10	ns
$t_{off}$	turn-off time	$I_D = 20\text{ mA}; V_{GSM} = 10\text{ V}$	-	<25	-	-	-	-	ns
		$I_D = 10\text{ mA}; V_{GSM} = 6\text{ V}$	-	-	-	<50	-	-	ns
		$I_D = 5\text{ mA}; V_{GSM} = 4\text{ V}$	-	-	-	-	-	<100	ns



**Fig 2. Switching times waveforms**



**Fig 3. Test circuit**

**Table 8. Test data**

Type	Pulse generator			Oscilloscope		
	δ	t <sub>r</sub> , t <sub>f</sub>	Z <sub>o</sub>	C <sub>i</sub>	t <sub>r</sub>	R <sub>i</sub>
BSR56	0.02	≤ 1 ns	50 Ω	≤ 2.5 pF	≤ 0.75 ns	≥ 1 MΩ
BSR57	0.02	≤ 1 ns	50 Ω	≤ 2.5 pF	≤ 0.75 ns	≥ 1 MΩ
BSR58	0.02	≤ 1 ns	50 Ω	≤ 2.5 pF	≤ 0.75 ns	≥ 1 MΩ

8. Package outline

Plastic surface-mounted package; 3 leads

SOT023

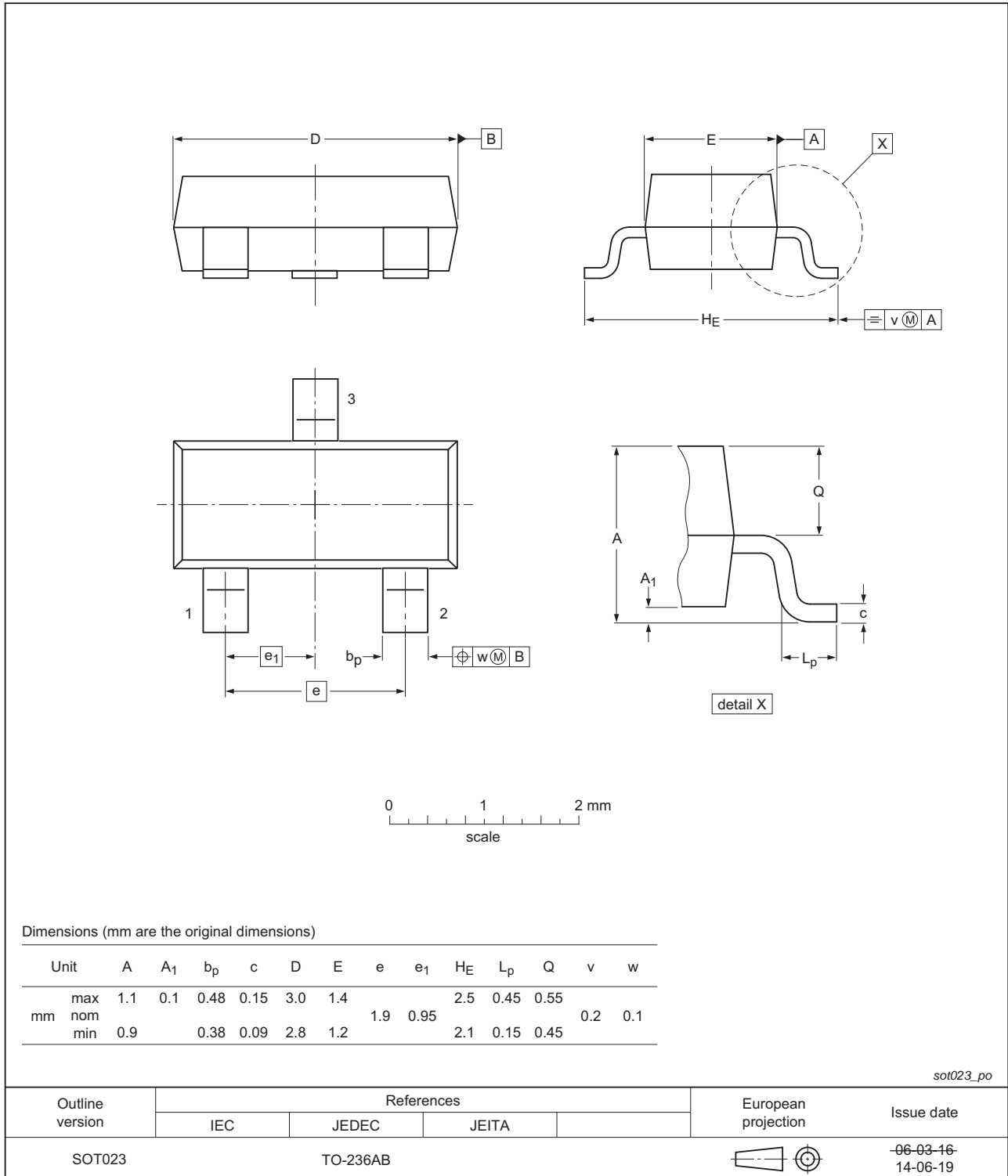


Fig 4. Package outline SOT23 (TO-236AB)