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	Parameter Conditions BSI		R56	BSR57		BSR58		Unit
			Min	Max	Min	Max	Min	Max	-
V <sub>DS</sub>	drain-source voltage		-	±40	-	±40	-	±40	V
I <sub>DSS</sub>	drain leakage current	$V_{DS} = 15 \text{ V}; V_{GS} = 0 \text{ V};$	-	>50	-	>20	-	>8	mA
		$T_{mb} = 40 \ ^{\circ}C$	-	-	-	<100	-	<80	mA
V <sub>GSoff</sub>	gate-source cut-off $V_{DS} = 15 V;$		>4	-	>2	-	>0.8	-	V
voltage		I <sub>D</sub> = 0.5 nA	<10	-	<6	-	<4	-	V
C <sub>rs</sub>	feedback capacitance	$V_{DS} = 0 V; V_{GS} = -10 V;$ f = 1 MHz	-	<5	-	<5	-	<5	pF
Switchin	ig time ( $V_{DD}$ = 10 V; $V_{GS}$	= 0 V)		1					
t <sub>off</sub> 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 <sub>tot</sub>	total power dissipation	$T_{mb} = 40 \ ^{\circ}C$	-	250	-	250	-	250	mW
Static ch	aracteristics	·			•	·	•		-
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 0 V; I_D = 0 A; f = 1 kHz$	-	<25	-	<40	-	<60	Ω



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# 2. Pinning information

Description	Simplified outline Graphic syn
drain	<u>[1]</u>
source	
gate	g → g → sym0
	drain source

[1] Drain and source are interchangeable.

# 3. Ordering information

# Table 3. Ordering information

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

# 4. Marking

# Table 4.Marking codesType numberMarking codeBSR56M4PBSR57M5PBSR58M6P

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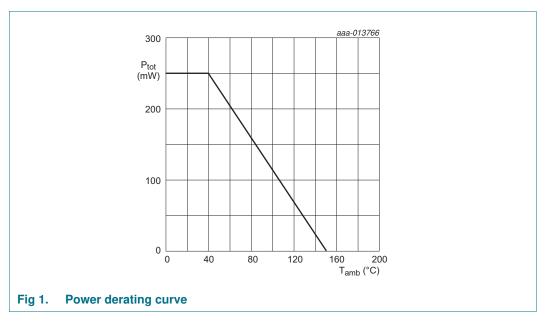
# 5. Limiting values

Table 5.	Limiting	values
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In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	drain-source voltage		-	±40	V
V <sub>GS</sub>	gate-source voltage		-	-40	V
V <sub>DG</sub>	drain-gate voltage		-	40	V
l <sub>G</sub>	gate current		-	50	mA
P <sub>tot</sub>	total power dissipation	$T_{amb} = 40 \ ^{\circ}C$	[1] -	250	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C
Tj	junction temperature		-	150	°C

[1] Mounted on a ceramic substrate,  $8 \text{ mm} \times 10 \text{ mm} \times 0.7 \text{ mm}$ .



# 6. Thermal characteristics

Table 6.	Thermal characteristics			
Symbol	Parameter	Conditions	Тур	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	[1]	430	K/W

[1] Mounted on a ceramic substrate, 8 mm  $\times$  10 mm  $\times$  0.7 mm.

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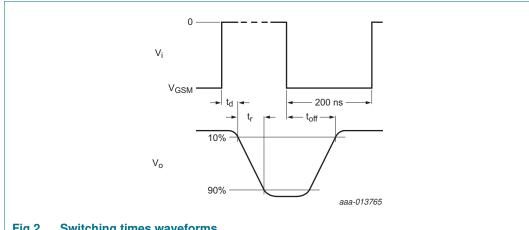
# 7. Characteristics

### Table 7.Characteristics

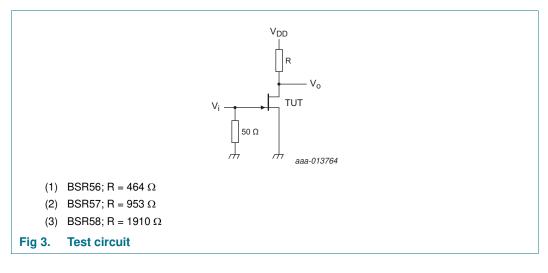
 $T_{amb} = 25 \ ^{\circ}C$  unless otherwise specified.

Symbol	Parameter	Conditions	BS	R56	BSR57		BSR58		Unit
			Min	Max	Min	Max	Min	Max	-
I <sub>GSS</sub>	gate-source cut-off current		-	1.0	-	1.0	-	1.0	nA
I <sub>DSX</sub>	drain cut-off current		-	1.0	-	1.0	-	1.0	nA
V <sub>(BR)GSS</sub>	gate-source breakdown voltage	$  I_G = -1 \ \mu A; \\ V_{DS} = 0 \ V $	-	>40	-	>40	-	>40	V
V <sub>GSoff</sub>	gate-source cut-off	V <sub>DS</sub> = 15 V;	>4	-	>2	-	>0.8	-	V
	voltage	I <sub>D</sub> = 0.5 nA	<10	-	<6	-	<4	-	V
ID	drain current	$V_{DS} = 15 \text{ V}; V_{GS} = 0 \text{ V}$	-	>50	-	>20	-	>8	mA
			-	-	-	<100	-	<80	mA
C <sub>rs</sub>	feedback capacitance		-	<5	-	<5	-	<5	pF
R <sub>DSon</sub>	drain-source on-state resistance		-	<25	-	<40	-	<60	Ω
V <sub>DSon</sub> drain-sou voltage	drain-source on-state	$V_{GS} = 0 V; I_D = 20 mA$	-	<750	-	-	-	-	mV
	voltage	$V_{GS} = 0 V; I_D = 10 mA$	-	-	-	<500	-	-	mV
		$V_{GS} = 0 V; I_D = 5 mA$	-	-	-	-	-	<400	mV
Switching	times ( $V_{DD} = 10 \text{ V}; \text{ V}_{GS} =$	0 V)							_
t <sub>d</sub>	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 <sub>r</sub>	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 <sub>off</sub>	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

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#### Fig 2. Switching times waveforms



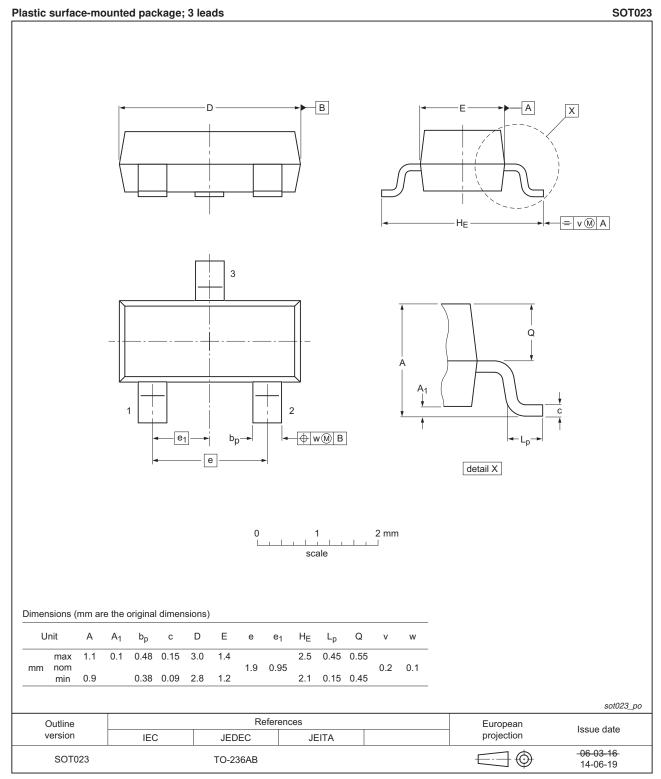
#### Table 8. **Test data**

Туре	Р	ulse generato	or	Oscilloscope		
	δ	t <sub>r</sub> , t <sub>f</sub>	Zo	Ci	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

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# 8. Package outline



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

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# 9. Revision history

	• •					
Document ID	Release date	Data sheet status	Change notice	Supersedes		
BSR56_57_58 v.3	20140625	Product data sheet	-	BSR56_57_58_CNV_2		
Modifications:		• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.				
	<ul> <li>Legal texts have</li> </ul>	we been adapted to the new c	ompany name where	e appropriate.		
BSR56_57_58_CNV_2	19910401	Product specification	-	-		

#### Table 9. Revision history

# **10. Legal information**

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Document status[1][2]	Product status <sup>[3]</sup>	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.
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