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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

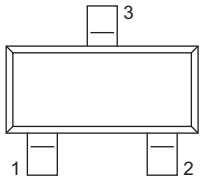
1.4 Quick reference data

Table 1. Quick reference data

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

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain [1]		
2	source [1]		
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		-	±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 °C [1]	-	250	mW
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		-	150	°C

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

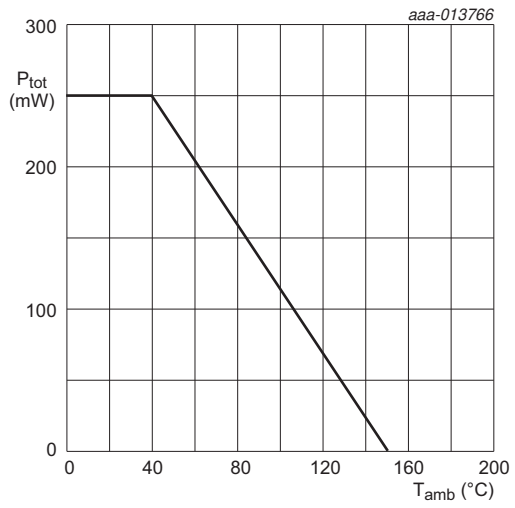


Fig 1. Power derating curve

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 °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 V; V_{GS} = −20 V	-	1.0	-	1.0	-	1.0	nA
I_{DSX}	drain cut-off current	V_{DS} = 15 V; V_{GS} = −10 V	-	1.0	-	1.0	-	1.0	nA
$V_{(BR)GSS}$	gate-source breakdown voltage	I_G = −1 μA; V_{DS} = 0 V	-	>40	-	>40	-	>40	V
V_{GSoff}	gate-source cut-off voltage	V_{DS} = 15 V; I_D = 0.5 nA	>4	-	>2	-	>0.8	-	V
			<10	-	<6	-	<4	-	V
I_D	drain current	V_{DS} = 15 V; V_{GS} = 0 V	-	>50	-	>20	-	>8	mA
			-	-	-	<100	-	<80	mA
C_{rs}	feedback capacitance	V_{DS} = 0 V; V_{GS} = −10 V; f = 1 MHz	-	<5	-	<5	-	<5	pF
R_{DSon}	drain-source on-state resistance	V_{GS} = 0 V; I_D = 0 A; f = 1 kHz	-	<25	-	<40	-	<60	Ω
V_{DSon}	drain-source on-state voltage	V_{GS} = 0 V; I_D = 20 mA	-	<750	-	-	-	-	mV
		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 V; V_{GS} = 0 V)									
t_d	delay time	I_D = 20 mA; V_{GSM} = 10 V	-	<6	-	-	-	-	ns
		I_D = 10 mA; V_{GSM} = 6 V	-	-	-	<6	-	-	ns
		I_D = 5 mA; V_{GSM} = 4 V	-	-	-	-	-	<10	ns
t_r	rise time	I_D = 20 mA; V_{GSM} = 10 V	-	<3	-	-	-	-	ns
		I_D = 10 mA; V_{GSM} = 6 V	-	-	-	<4	-	-	ns
		I_D = 5 mA; V_{GSM} = 4 V	-	-	-	-	-	<10	ns
t_{off}	turn-off time	I_D = 20 mA; V_{GSM} = 10 V	-	<25	-	-	-	-	ns
		I_D = 10 mA; V_{GSM} = 6 V	-	-	-	<50	-	-	ns
		I_D = 5 mA; V_{GSM} = 4 V	-	-	-	-	-	<100	ns

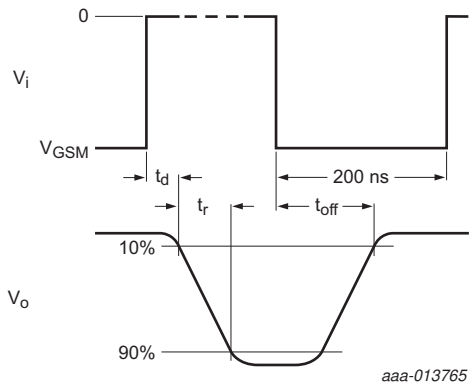
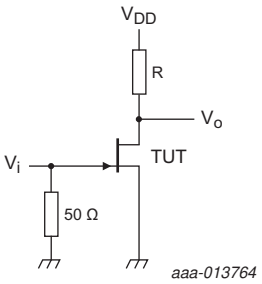


Fig 2. Switching times waveforms



(1) BSR56; R = 464 Ω

(2) BSR57; R = 953 Ω

(3) BSR58; R = 1910 Ω

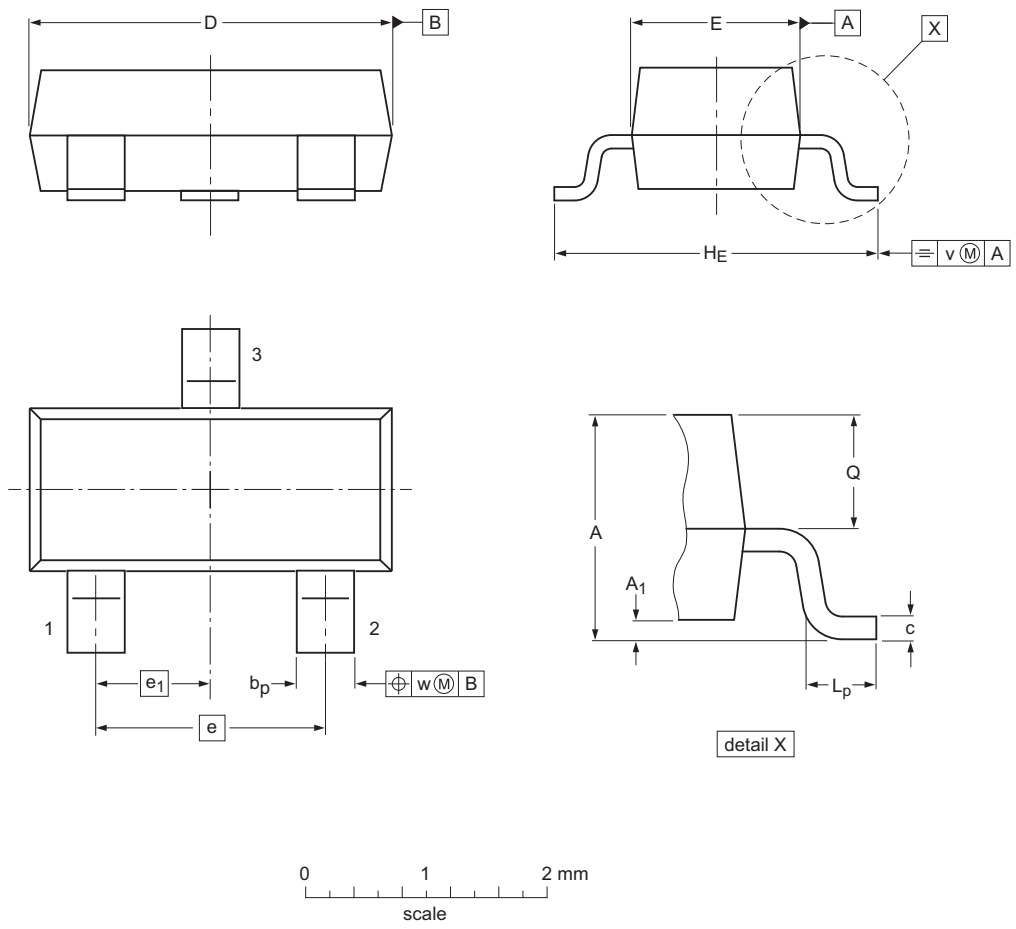
Fig 3. Test circuit

Table 8. Test data

Type	Pulse generator			Oscilloscope		
	δ	t_r, t_f	Z_o	C_i	t_r	R_i
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**



Dimensions (mm are the original dimensions)

Unit		A	A_1	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	max	1.1	0.1	0.48	0.15	3.0	1.4			2.5	0.45	0.55		
	nom							1.9	0.95				0.2	0.1
	min	0.9		0.38	0.09	2.8	1.2			2.1	0.15	0.45		

sot023_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT023		TO-236AB				~~06-03-16~~ 14-06-19

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

9. Revision history

Table 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. • Legal texts have been adapted to the new company name where appropriate.			
BSR56_57_58_CNV_2	19910401	Product specification	-	-

10. Legal information

10.1 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 URL http://www.nxp.com.

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12. Contents

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