

# DATA SHEET

## **BSR56; BSR57; BSR58** N-channel FETs

Product specification  
File under Discrete Semiconductors, SC07

April 1991

## N-channel FETs

## BSR56; BSR57; BSR58

### DESCRIPTION

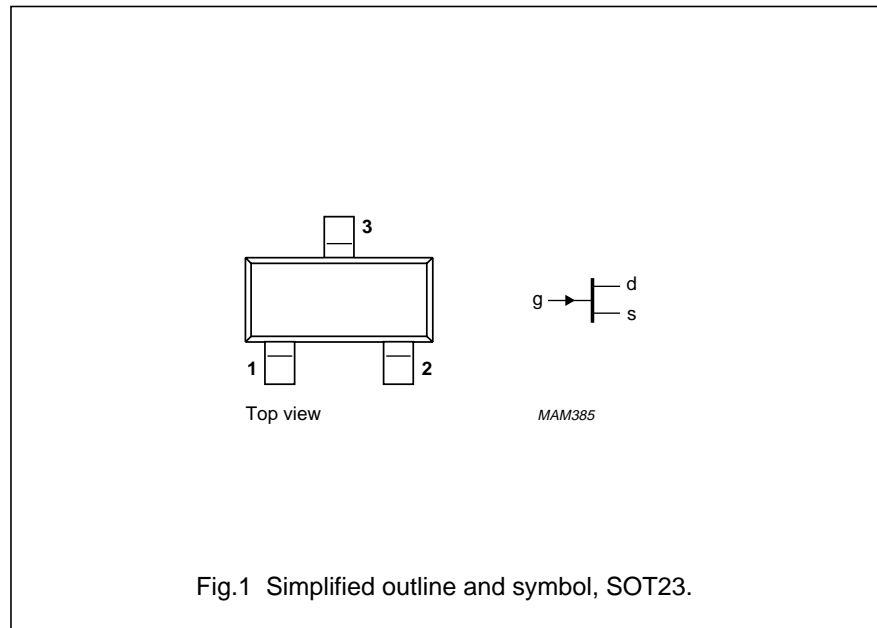
Symmetrical silicon n-channel depletion type junction field-effect transistors in a plastic microminiature envelope intended for application in thick and thin-film circuits. The transistors are intended for low-power, chopper or switching applications in industrial service.

### PINNING

- 1 = drain
- 2 = source
- 3 = gate

### Note

1. Drain and source are interchangeable.



### Marking code

- BSR56 = M4P
- BSR57 = M5P
- BSR58 = M6P

### QUICK REFERENCE DATA

		BSR56	BSR57	BSR58
Drain-source voltage	$\pm V_{DS}$	max. 40	40	40 V
Total power dissipation up to $T_{amb} = 40\text{ }^\circ\text{C}$	$P_{tot}$	max. 250	250	250 mW
Drain current $V_{DS} = 15\text{ V}; V_{GS} = 0$	$I_{DSS}$	> 50	20	8 mA
		< -	100	80 mA
Gate-source cut-off voltage $V_{DS} = 15\text{ V}; I_D = 0.5\text{ nA}$	$-V_{(P)GS}$	> 4	2	0.8 V
		< 10	6	4 V
Drain-source resistance (on) at $f = 1\text{ kHz}$ $I_D = 0; V_{GS} = 0$	$r_{ds\ on}$	< 25	40	60 $\Omega$
Feedback capacitance at $f = 1\text{ MHz}$ $-V_{GS} = 10\text{ V}; V_{DS} = 0$	$C_{rs}$	< 5	5	5 pF
Turn-off time $V_{DD} = 10\text{ V}; V_{GS} = 0$	$I_D = 20\text{ mA}; -V_{GSM} = 10\text{ V}$	$t_{off}$	< 25	- ns
	$I_D = 10\text{ mA}; -V_{GSM} = 6\text{ V}$	$t_{off}$	< -	50 ns
	$I_D = 5\text{ mA}; -V_{GSM} = 4\text{ V}$	$t_{off}$	< -	100 ns

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### RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	$\pm V_{DS}$	max.	40 V
Drain-gate voltage	$V_{DGO}$	max.	40 V
Gate-source voltage	$-V_{GSO}$	max.	40 V
Forward gate current	$I_{GF}$	max.	50 mA
Total power dissipation up to $T_{amb} = 40\text{ °C}$ (note 1)	$P_{tot}$	max.	250 mW
Storage temperature range	$T_{stg}$		-65 to +150 °C
Junction temperature	$T_j$	max.	150 °C

### THERMAL RESISTANCE

From junction to ambient (note 1)	$R_{th\ j-a}$	=	430 K/W
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### Notes

1. Mounted on a ceramic substrate of 8 mm × 10 mm × 0.7 mm.

### CHARACTERISTICS

$T_j = 25\text{ °C}$  unless otherwise specified

Gate-source cut-off current $V_{DS} = 0\text{ V}; -V_{GS} = 20\text{ V}$	$-I_{GSS}$	max.	1.0 nA
Drain cut-off current $V_{DS} = 15\text{ V}; -V_{GS} = 10\text{ V}$	$I_{DSX}$	max.	1.0 nA

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Drain current $V_{DS} = 15\text{ V}; V_{GS} = 0$	$I_{DSS} >$	50	20	8 mA
	$I_{DSS} <$	–	100	80 mA
Gate-source breakdown voltage $-I_G = 1\text{ }\mu\text{A}; V_{DS} = 0$	$-V_{(BR)GSS} >$	40	40	40 V
Gate-source cut-off voltage $I_D = 0,5\text{ nA}; V_{DS} = 15\text{ V}$	$-V_{(P)GS} >$	4	2	0.8 V
	$-V_{(P)GS} <$	10	6	4 V
Drain-source voltage (on) $I_D = 20\text{ mA}; V_{GS} = 0$ $I_D = 10\text{ mA}; V_{GS} = 0$ $I_D = 5\text{ mA}; V_{GS} = 0$	$V_{DSon} <$	750	–	– mV
	$V_{DSon} <$	–	500	– mV
	$V_{DSon} <$	–	–	400 mV
Drain-source resistance (on) at $f = 1\text{ kHz}$ $I_D = 0; V_{GS} = 0; T_a = 25\text{ °C}$	$r_{ds\ on} <$	25	40	60 $\Omega$
Feedback capacitance at $f = 1\text{ MHz}$ $-V_{GS} = 10\text{ V}; V_{DS} = 0$	$C_{rss} <$	5	5	5 pF

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Switching times

$V_{DD} = 10\text{ V}$ ;  $V_{GS} = 0$   
 Conditions  $I_D$  and  $-V_{GSM}$

Delay time

Rise time

Turn-off time

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$I_D$	=	20	10	5 mA
$-V_{GSM}$	=	10	6	4 V
Delay time	$t_d$	< 6	< 6	< 10 ns
Rise time	$t_r$	< 3	< 4	< 10 ns
Turn-off time	$t_{off}$	< 25	< 50	< 100 ns

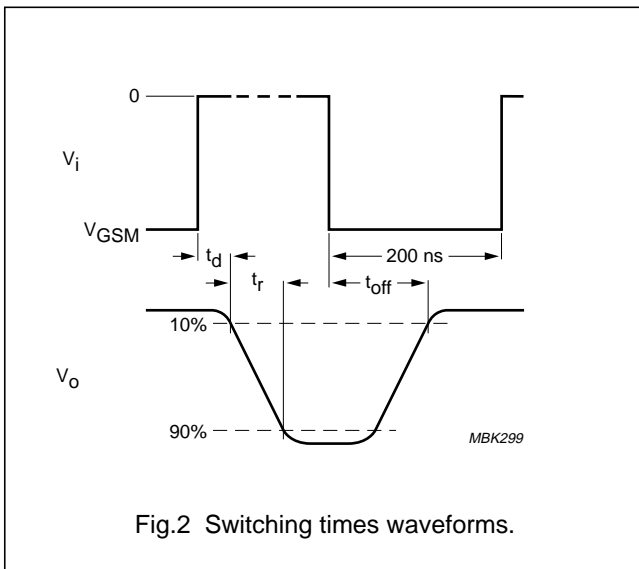


Fig.2 Switching times waveforms.

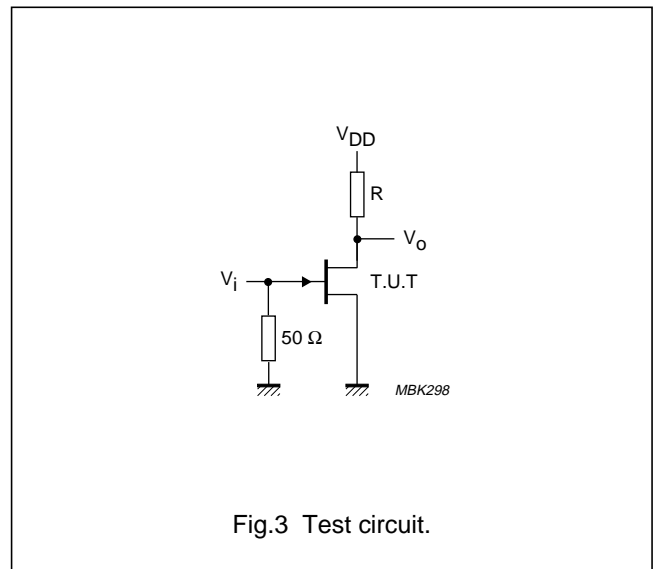


Fig.3 Test circuit.

BSR56;  $R = 464\ \Omega$

BSR57;  $R = 953\ \Omega$

BSR58;  $R = 1910\ \Omega$

Pulse generator

$t_r = t_f \leq 1\text{ ns}$

$\delta = 0.02$

$Z_o = 50\ \Omega$

Oscilloscope

$t_r \leq 0.75\text{ ns}$

$R_i \geq 1\text{ M}\Omega$

$C_i \leq 2.5\text{ pF}$

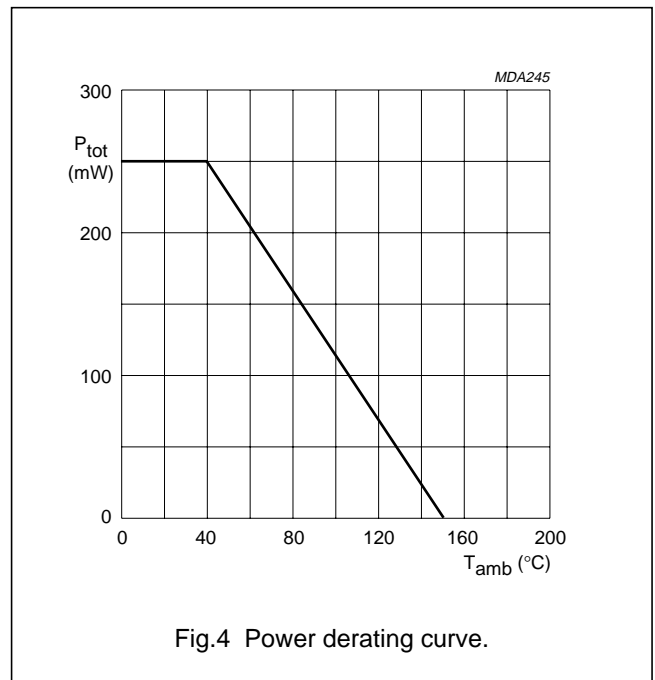


Fig.4 Power derating curve.

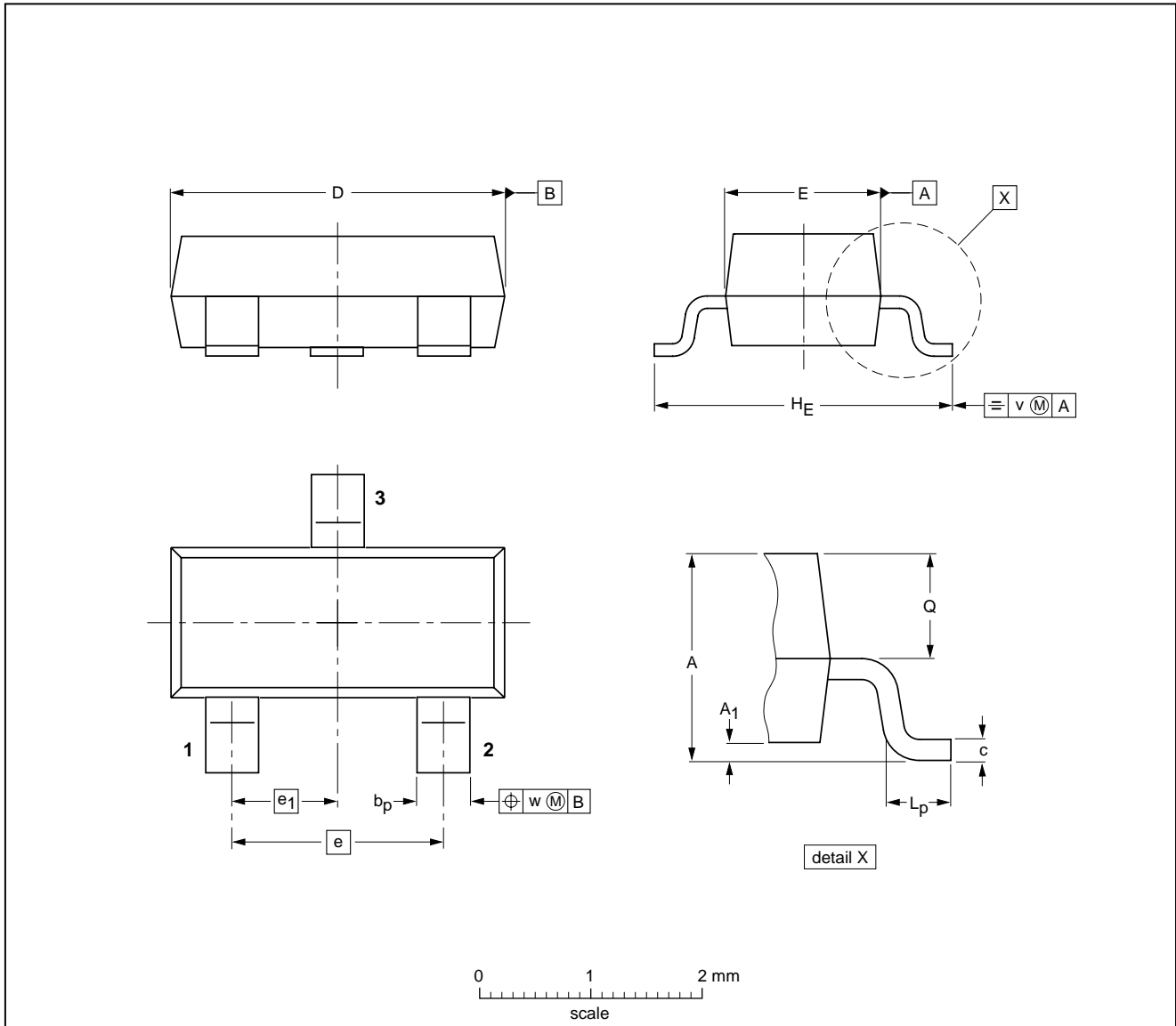
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28

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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Short-form specification	The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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