

# DATA SHEET

## **BF510 to 513** N-channel silicon field-effect transistors

Product specification  
File under Discrete Semiconductors, SC07

December 1997

N-channel silicon field-effect transistors

BF510 to 513

DESCRIPTION

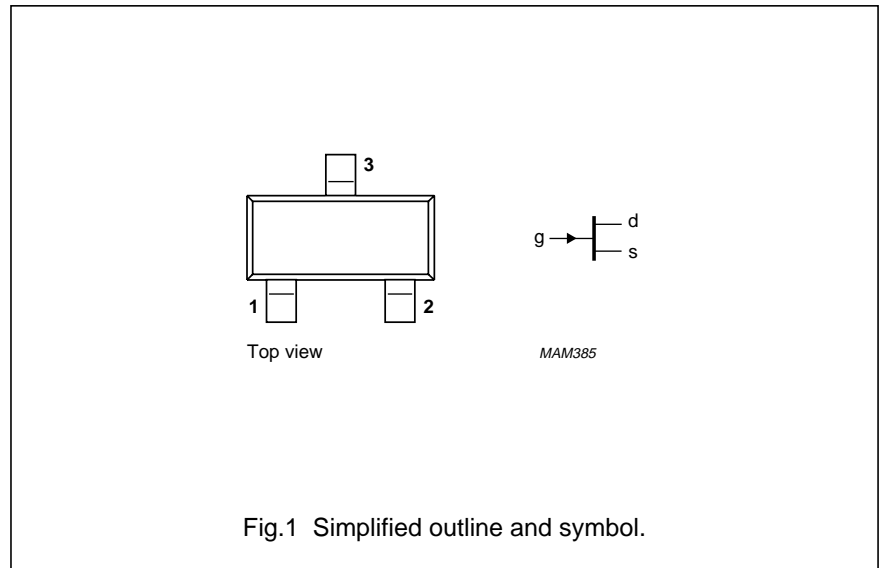
Asymmetrical N-channel planar epitaxial junction field-effect transistors in the miniature plastic envelope intended for applications up to the v.h.f. range in hybrid thick and thin-film circuits. Special features are the low feedback capacitance and the low noise figure. These features make the product very suitable for applications such as the r.f. stages in f.m. portables (BF510), car radios (BF511) and mains radios (BF512) or the mixer stage (BF513).

MARKING CODE

- BF510 = S6p
- BF511 = S7p
- BF512 = S8p
- BF513 = S9p

PINNING - SOT23

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



QUICK REFERENCE DATA

Drain-source voltage	$V_{DS}$	max.	20	V		
Drain current (DC or average)	$I_D$	max.	30	mA		
Total power dissipation up to $T_{amb} = 40\text{ }^\circ\text{C}$	$P_{tot}$	max.	250	mW		
			<b>BF510</b>	<b>511</b>	<b>512</b>	<b>513</b>
Drain current		>	0.7	2.5	6	10
$V_{DS} = 10\text{ V}; V_{GS} = 0$	$I_{DSS}$	<	3.0	7.0	12	18
						mA
Transfer admittance (common source) $V_{DS} = 10\text{ V}; V_{GS} = 0; f = 1\text{ kHz}$	$ y_{fs} $	>	2.5	4	6	7
						mS
Feedback capacitance $V_{DS} = 10\text{ V}; V_{GS} = 0$	$C_{rs}$	typ.	0.3	0.3	–	–
$V_{DS} = 10\text{ V}; I_D = 5\text{ mA}$	$C_{rs}$	typ.	–	–	0.3	0.3
						pF
Noise figure at optimum source admittance $G_S = 1\text{ mS}; -B_S = 3\text{ mS}; f = 100\text{ MHz}$	F	typ.	1.5	1.5	–	–
$V_{DS} = 10\text{ V}; V_{GS} = 0$	F	typ.	–	–	1.5	1.5
$V_{DS} = 10\text{ V}; I_D = 5\text{ mA}$						dB

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**RATINGS**

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

Drain-source voltage	$V_{DS}$	max.	20 V
Drain-gate voltage (open source)	$V_{DGO}$	max.	20 V
Drain current (DC or average)	$I_D$	max.	30 mA
Gate current	$\pm I_G$	max.	10 mA
Total power dissipation up to $T_{amb} = 40\text{ }^\circ\text{C}$ (note 1)	$P_{tot}$	max.	250 mW
Storage temperature range	$T_{stg}$		-65 to + 150 $^\circ\text{C}$
Junction temperature	$T_j$	max.	150 $^\circ\text{C}$

**THERMAL RESISTANCE**

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

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

**STATIC CHARACTERISTICS** $T_{amb} = 25\text{ }^\circ\text{C}$ 

			BF510	511	512	513
Gate cut-off current						
$-V_{GS} = 0.2\text{ V}; V_{DS} = 0$	$-I_{GSS}$	<	10	10	10	10 nA
Gate-drain breakdown voltage						
$I_S = 0; -I_D = 10\text{ }\mu\text{A}$	$-V_{(BR)GDO}$	>	20	20	20	20 V
Drain current						
$V_{DS} = 10\text{ V}; V_{GS} = 0$	$I_{DSS}$	>	0.7	2.5	6	10 mA
		<	3.0	7.0	12	18 mA
Gate-source cut-off voltage						
$I_D = 10\text{ }\mu\text{A}; V_{DS} = 10\text{ V}$	$-V_{(P)GS}$	typ.	0.8	1.5	2.2	3 V

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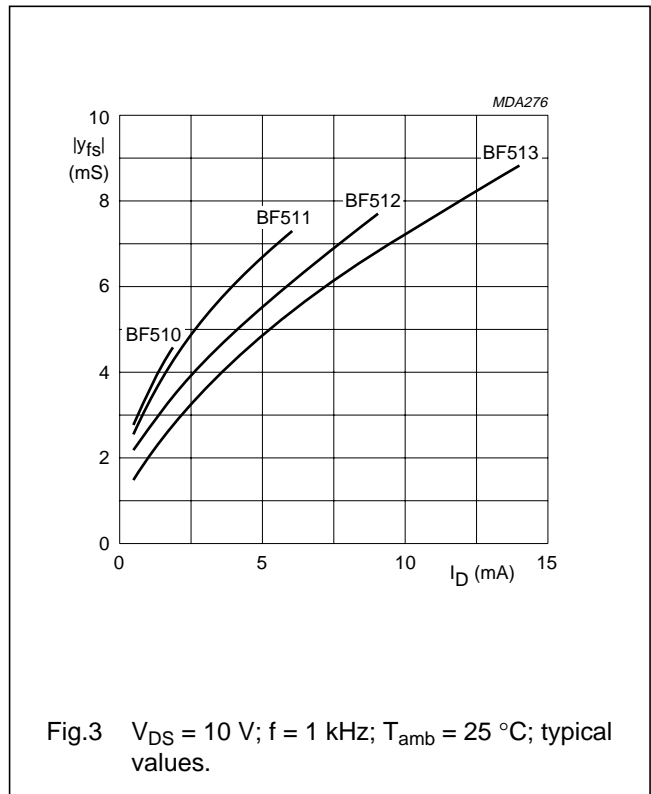
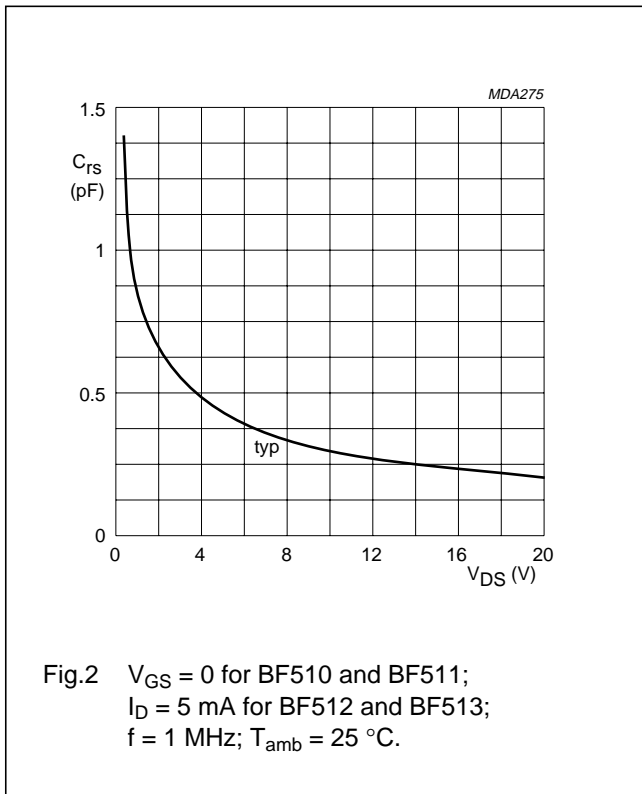
BF510 to 513

DYNAMIC CHARACTERISTICS

**Measuring conditions (common source):**  $V_{DS} = 10\text{ V}; V_{GS} = 0; T_{amb} = 25\text{ }^\circ\text{C}$  for BF510 and BF511  
 $V_{DS} = 10\text{ V}; I_D = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$  for BF512 and BF513

**y-parameters (common source)**

		BF510	511	512	513
Input capacitance at $f = 1\text{ MHz}$	$C_{is}$	< 5	5	5	5 pF
Input conductance at $f = 100\text{ MHz}$	$g_{is}$	typ. 100	90	60	50 $\mu\text{S}$
Feedback capacitance at $f = 1\text{ MHz}$	$C_{rs}$	typ. 0.4	0.4	0.4	0.4 pF
		< 0.5	0.5	0.5	0.5 pF
Transfer admittance at $f = 1\text{ kHz}$ $V_{GS} = 0$ instead of $I_D = 5\text{ mA}$	$ y_{fs} $	> 2.5	4.0	4.0	3.5 mS
		> -	-	6.0	7.0 mS
Transfer admittance at $f = 100\text{ MHz}$	$ y_{fs} $	typ. 3.5	5.5	5.0	5.0 mS
Output capacitance at $f = 1\text{ MHz}$	$C_{os}$	< 3	3	3	3 pF
Output conductance at $f = 1\text{ MHz}$	$g_{os}$	< 60	80	100	120 $\mu\text{S}$
Output conductance at $f = 100\text{ MHz}$	$g_{os}$	typ. 35	55	70	90 $\mu\text{S}$
<b>Noise figure</b> at optimum source admittance					
$G_S = 1\text{ mS}; -B_S = 3\text{ mS};$					
$f = 100\text{ MHz}$	F	typ. 1.5	1.5	1.5	1.5 dB



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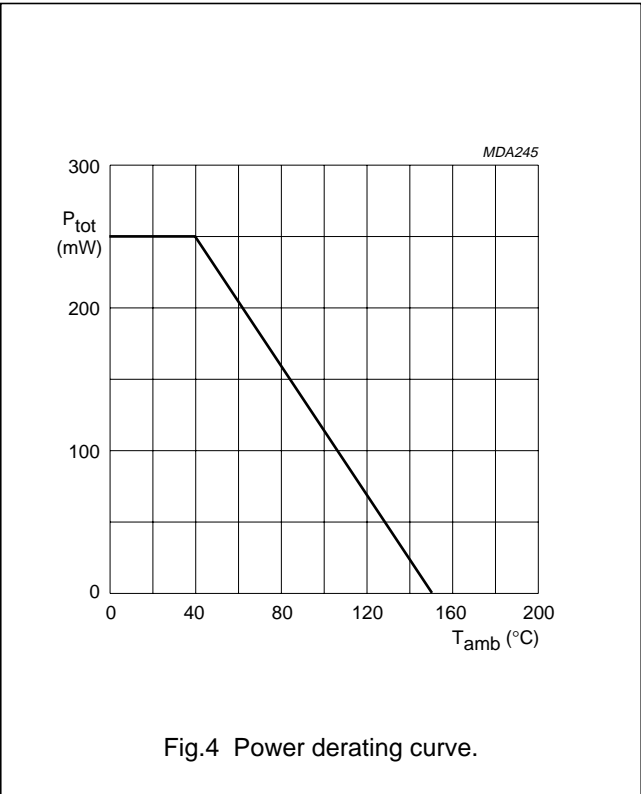


Fig.4 Power derating curve.

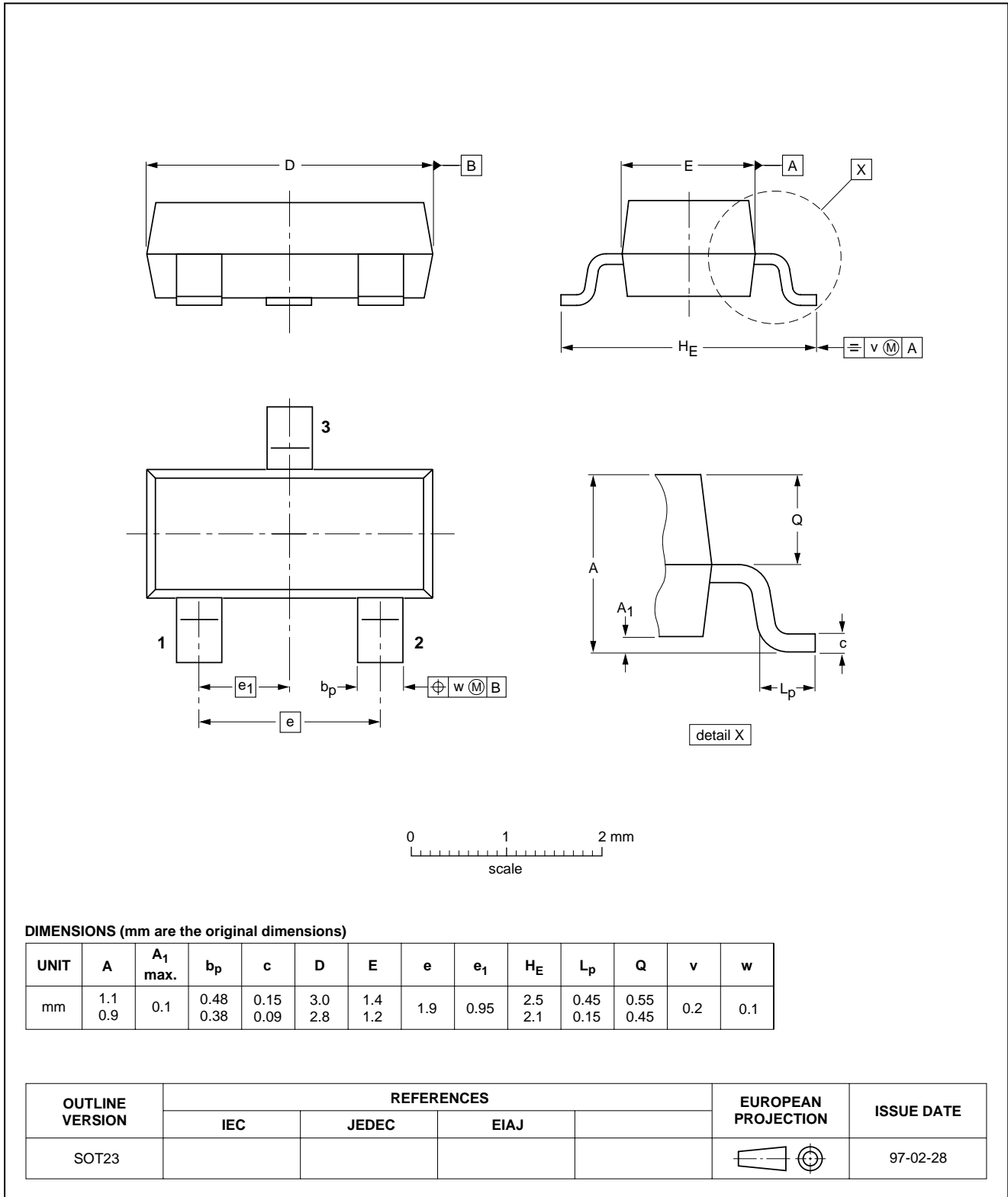
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



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BF510 to 513

**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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