DATA SHEET

BF510 to 513

N-channel silicon field-effect transistors

Product specification

File under Discrete Semiconductors, SC07

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Philips
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PHILIPS

N-channel silicon field-effect transistors
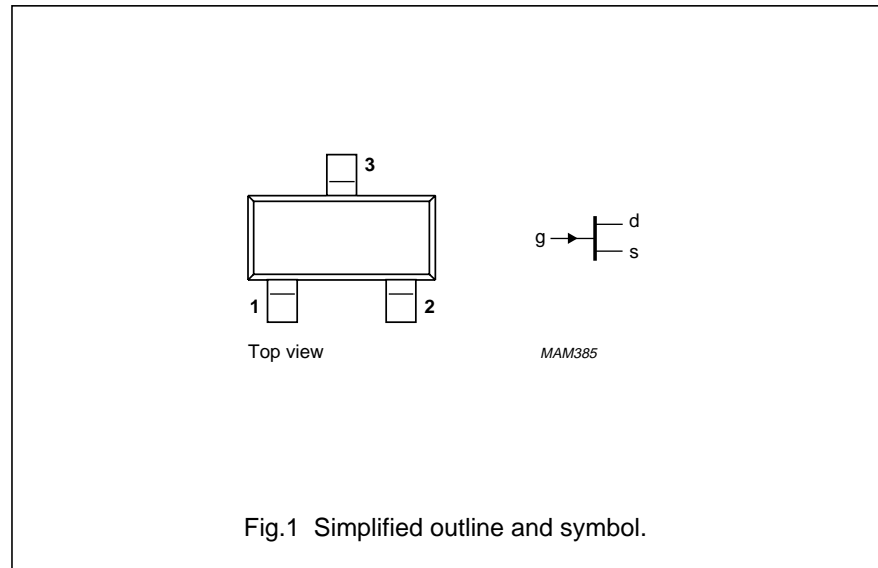
BF510 to 513

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).

PINNING - SOT23

1	=	gate
2	=	drain
3	=	source

MARKING CODE

BF510 = S6p

BF511 = S7p

BF512 = S8p

BF513 = S9p

Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

			BF510	511	512	513	
Drain-source voltage	V_{DS}	max.		20			V
Drain current (DC or average)	I_D	max.		30			mA
Total power dissipation							
up to $T_{amb} = 40\ °C$	P_{tot}	max.		250			mW
Drain current		>	0.7	2.5	6	10	mA
$V_{DS} = 10$ V; $V_{GS} = 0$	I_{DSS}	<	3.0	7.0	12	18	mA
Transfer admittance (common source)							
$V_{DS} = 10$ V; $V_{GS} = 0$; f = 1 kHz	$|y_{fs}|$	>	2.5	4	6	7	mS
Feedback capacitance							
$V_{DS} = 10$ V; $V_{GS} = 0$	C_{rs}	typ.	0.3	0.3	–	–	pF
$V_{DS} = 10$ V; $I_D = 5$ mA	C_{rs}	typ.	–	–	0.3	0.3	pF
Noise figure at optimum source admittance							
$G_S = 1$ mS; $-B_S = 3$ mS; f = 100 MHz							
$V_{DS} = 10$ V; $V_{GS} = 0$	F	typ.	1.5	1.5	–	–	dB
$V_{DS} = 10$ V; $I_D = 5$ mA	F	typ.	–	–	1.5	1.5	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 $T_{amb} = 40$ °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)	$R_{th\ j\text{-}a}$	=	430	K/W

Note

1. Mounted on a ceramic substrate of 8 mm $\times$ 10 mm $\times$ 0.7 mm.

STATIC CHARACTERISTICS

$T_{amb} = 25$ °C

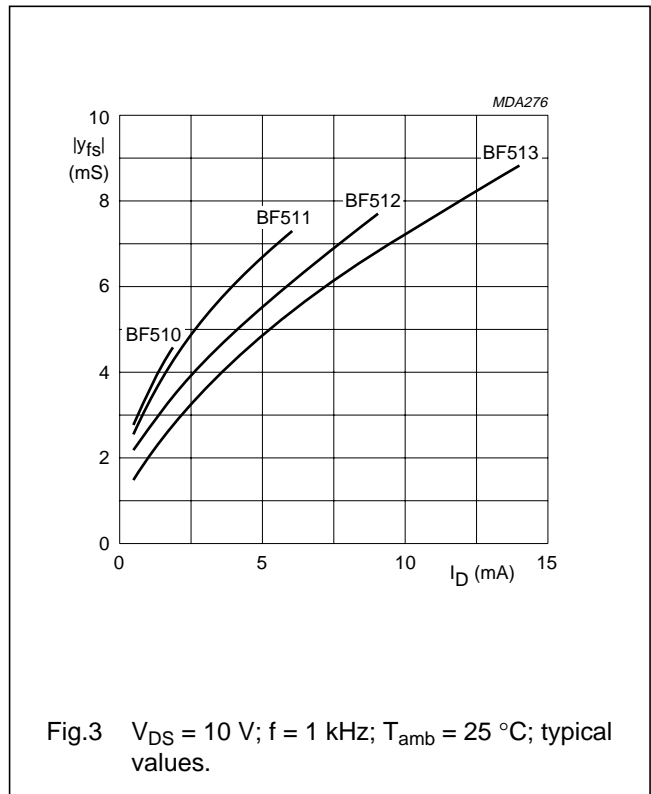|			**BF510**	**511**	**512**	**513**	
Gate cut-off current							
$-V_{GS} = 0.2$ V; $V_{DS} = 0$	$-I_{GSS}$	<	10	10	10	10	nA
Gate-drain breakdown voltage							
$I_S = 0$; $-I_D = 10$ μA	$-V_{(BR)GDO}$	>	20	20	20	20	V
Drain current		>	0.7	2.5	6	10	mA
$V_{DS} = 10$ V; $V_{GS} = 0$	I_{DSS}	<	3.0	7.0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

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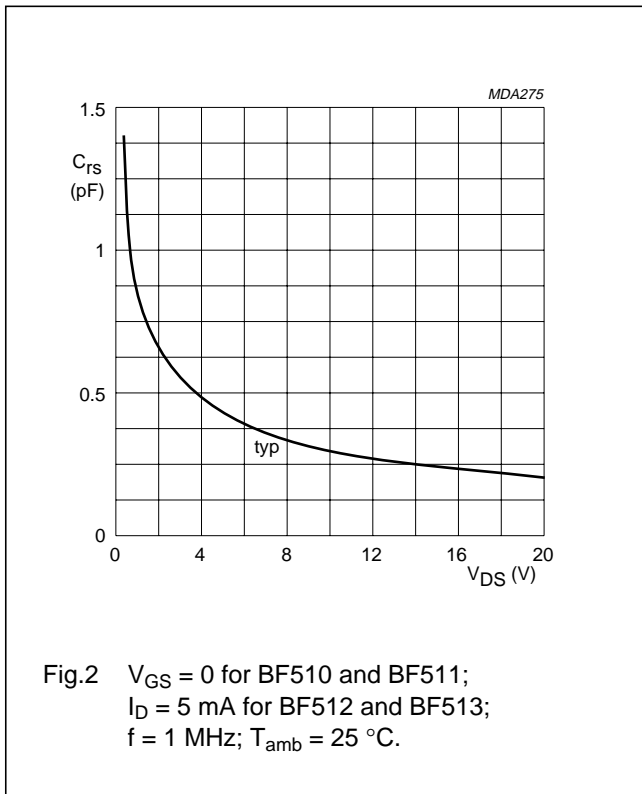**BF510 to 513**

DYNAMIC CHARACTERISTICS

Measuring conditions (common source): $V_{DS} = 10$ V; $V_{GS} = 0$; $T_{amb} = 25$ °C for BF510 and BF511

$V_{DS} = 10$ V; $I_D = 5$ mA; $T_{amb} = 25$ °C for BF512 and BF513

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

Fig.2 $V_{GS} = 0$ for BF510 and BF511;
$I_D = 5$ mA for BF512 and BF513;
f = 1 MHz; $T_{amb} = 25$ °C.

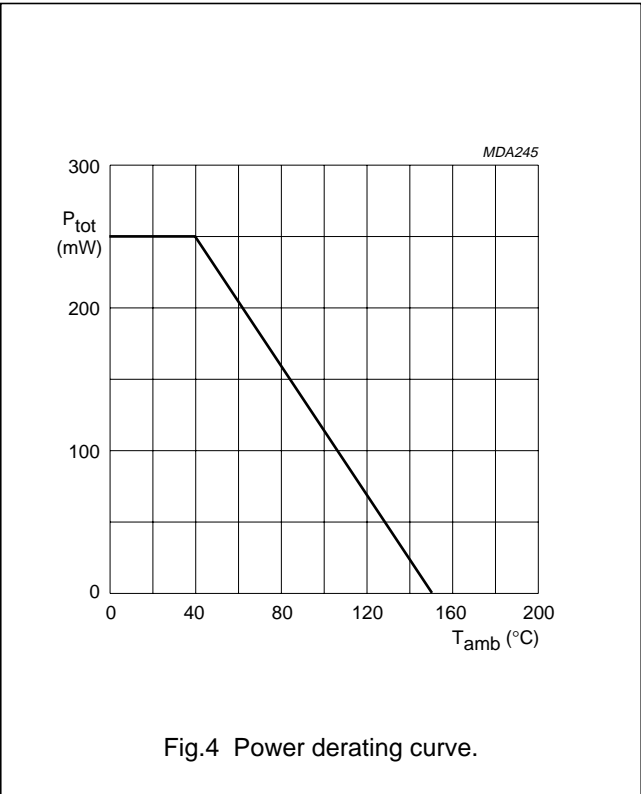Fig.3 $V_{DS} = 10$ V; f = 1 kHz; $T_{amb} = 25$ °C; typical values.

Fig.4 Power derating curve.

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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23

0   1   2 mm
scale

DIMENSIONS (mm are the original dimensions)

UNIT	A	A₁ max.	bₚ	c	D	E	e	e₁	H_E	Lₚ	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
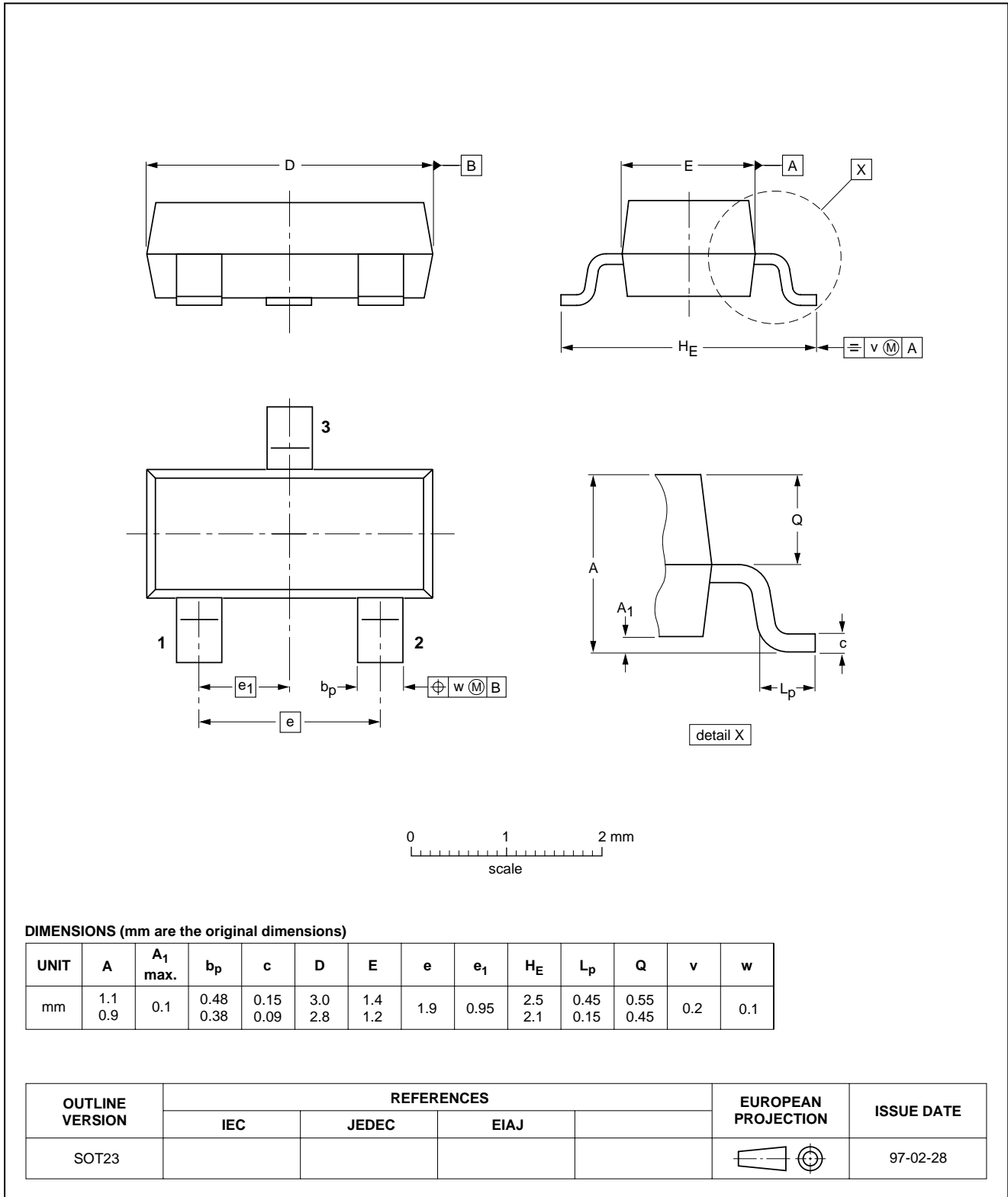
DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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