DATA SHEET

BF510 to 513
N-channel silicon field-effect transistors

Product specification
File under Discrete Semiconductors, SC07

December 1997

Philips
Semiconductors

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

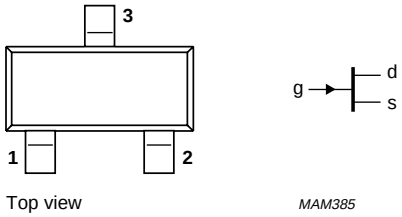


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

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
			BF510	**511**	**512**	**513**	
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	$\lvert y_{fs} \rvert$	>	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

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 × 10 mm × 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							
V_{DS} = 10 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 μA; V_{DS} = 10 V	$-V_{(P)GS}$	typ.	0.8	1.5	2.2	3	V

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	$\lvert y_{fs} \rvert$	>	2.5	4.0	4.0	3.5	mS
V_{GS} = 0 instead of I_D = 5 mA	$\lvert y_{fs} \rvert$	>	–	–	6.0	7.0	mS
Transfer admittance at f = 100 MHz	$\lvert y_{fs} \rvert$	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

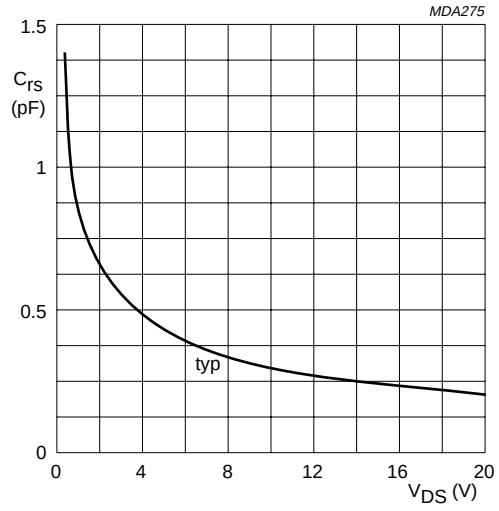


Fig.2 V_{GS} = 0 for BF510 and BF511; I_D = 5 mA for BF512 and BF513; f = 1 MHz; T_{amb} = 25 °C.

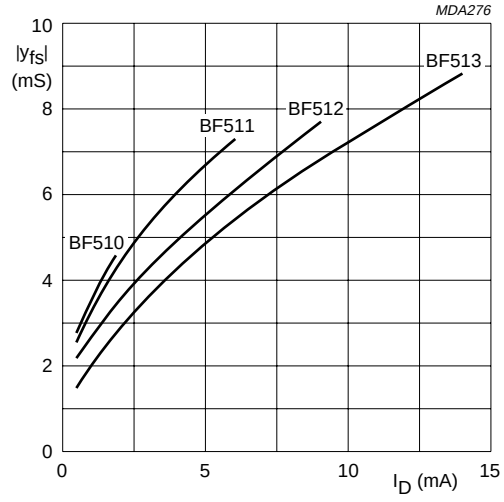


Fig.3 V_{DS} = 10 V; f = 1 kHz; T_{amb} = 25 °C; typical values.

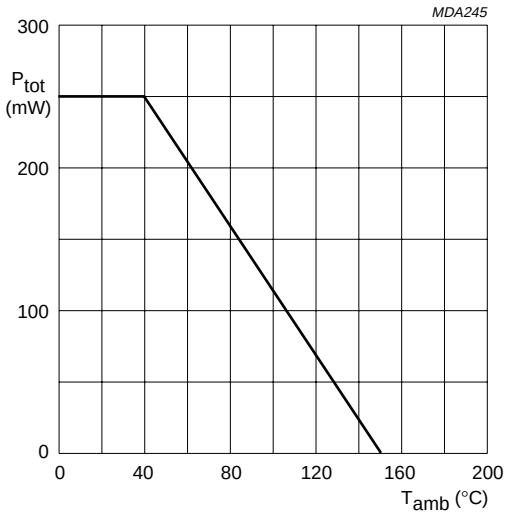
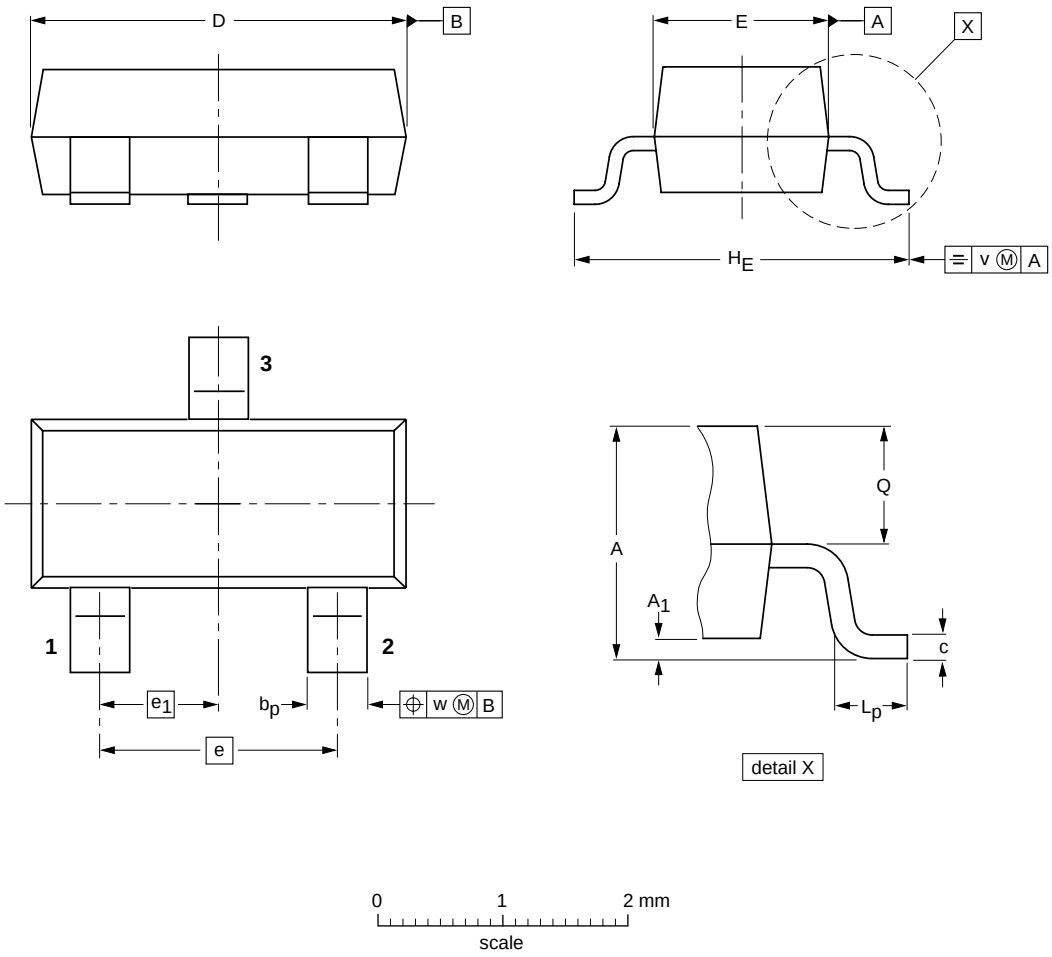


Fig.4 Power derating curve.

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads **SOT23**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max.	b_p	c	D	E	e	e_1	H_E	L_p	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.	

LIFE SUPPORT APPLICATIONS

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