DATA SHEET

PN4416; PN4416A
N-channel field-effect transistor

Product specification
File under Discrete Semiconductors, SC07

December 1997

Philips
Semiconductors

PHILIPS

N-channel field-effect transistor PN4416; PN4416A

FEATURES

- Low noise
- Interchangeability of drain and source connections
- High gain.

DESCRIPTION

N-channel symmetrical silicon junction FETs in a SOT54 envelope. These devices are intended for use in VHF/UHF amplifiers, oscillators and mixers.

PINNING - SOT54 (TO-92).

PIN	DESCRIPTION
1	gate
2	source
3	drain

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage				
	PN4416		–	30	V
	PN4416A		–	35	V
I_{DSS}	drain current	V_{DS} = 15 V; V_{GS} = 0	5	15	mA
P_{tot}	total power dissipation	up to T_{amb} = 25 °C	–	400	mW
$V_{GS(off)}$	gate-source cut-off voltage	V_{DS} = 15 V; I_D = 1 nA			
	PN4416		–	–6	V
	PN4416A		–2.5	–6	V
$\lvert Y_{fs} \rvert$	common-source transfer admittance	V_{DS} = 15 V; V_{GS} = 0; f = 1 kHz	4.5	7.5	mS

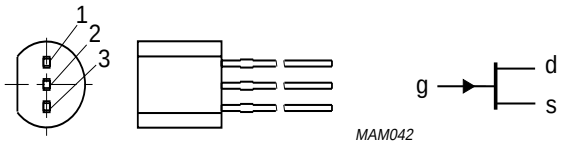


Fig.1 Simplified outline and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage				
	PN4416		–	30	V
	PN4416A		–	35	V
V_{GSO}	gate-source voltage				
	PN4416		–	–30	V
	PN4416A		–	–35	V
V_{GDO}	gate-drain voltage				
	PN4416		–	–30	V
	PN4416A		–	–35	V
I_G	DC forward gate current		–	10	mA
P_{tot}	total power dissipation	up to T_{amb} = 25 °C (note 1)	–	400	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}a}$	from junction to ambient (note 1)	350 K/W

Note

1. Mounted on a printed-circuit board, maximum lead length 4 mm, mounting pad for drain leads 10 mm^2.

STATIC CHARACTERISTICS

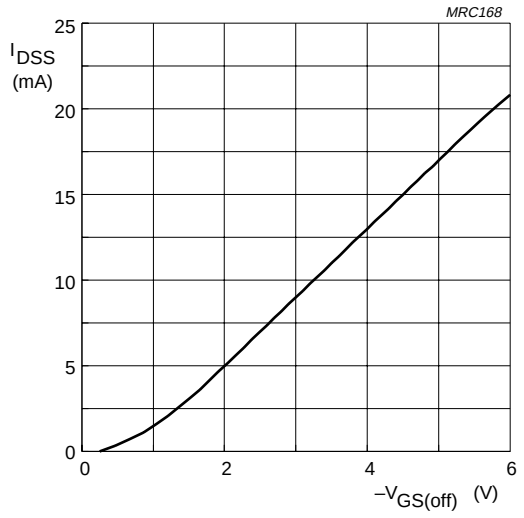
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)GSS}$	gate-source breakdown voltage	V_{DS} = 0; I_G = −1 μA			
	PN4416		–30	–	V
	PN4416A		–35	–	V
I_{GSS}	reverse gate leakage current	V_{DS} = 0; V_{GS} = –15 V	–	–1	nA
I_{DSS}	drain current	V_{DS} = 15 V; V_{GS} = 0	5	15	mA
V_{GSS}	gate-source forward voltage	V_{DS} = 0; I_G = 1 mA	–	1	V
$V_{GS(off)}$	gate-source cut-off voltage	V_{DS} = 15 V; I_D = 1 nA			
	PN4416		–	–6	V
	PN4416A		–2.5	–6	V
$\lvert Y_{fs} \rvert$	common source transfer admittance	V_{DS} = 15 V; V_{GS} = 0	4.5	7.5	mS
$\lvert Y_{os} \rvert$	common source output admittance	V_{DS} = 15 V; V_{GS} = 0			
	PN4416		–	50	μS
	PN4416A		–	50	μS

DYNAMIC CHARACTERISTICS

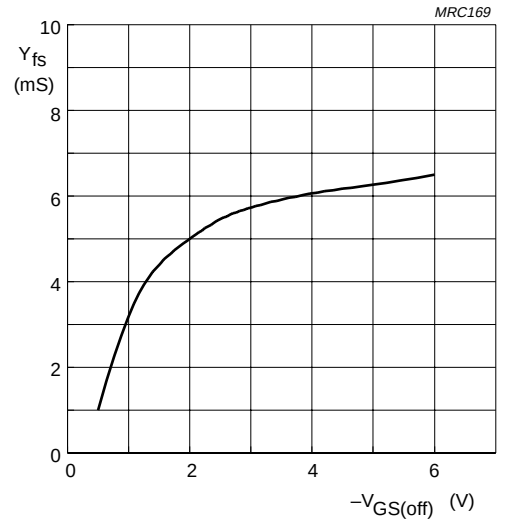
T_j = 25 °C; V_{DS} = 15 V; V_{GS} = 0.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
C_{is}	input capacitance	f = 1 MHz	–	–	4	pF
C_{os}	output capacitance	f = 1 MHz	–	–	2	pF
C_{rs}	feedback capacitance	f = 1 MHz	–	–	0.8	pF
g_{is}	common source input conductance	f = 100 MHz	–	–	100	µS
		f = 400 MHz	–	–	1	mS
g_{fs}	common source transfer conductance	f = 100 MHz	–	5.2	–	mS
		f = 400 MHz	4	5	–	mS
g_{rs}	common source feedback conductance	f = 100 MHz	–	–8	–	µS
		f = 400 MHz	–	–100	–	µS
g_{os}	common source output conductance	f = 100 MHz	–	–	75	µS
		f = 400 MHz	–	–	100	µS
V_n	equivalent input noise voltage	f = 100 Hz	–	5	–	nV/√Hz



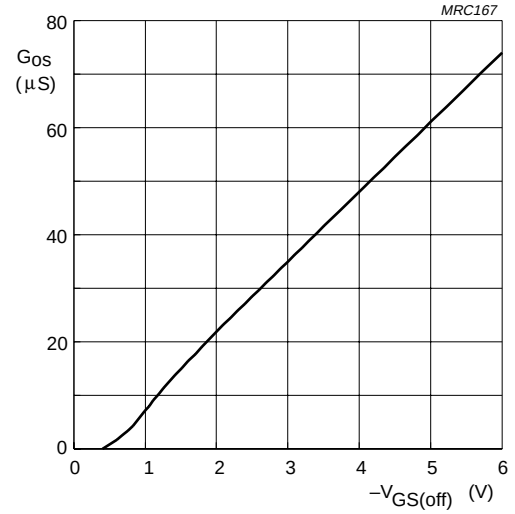
V_{DS} = 15 V; T_j = 25 °C.

Fig.2 Drain current as a function of gate-source cut-off voltage; typical values.



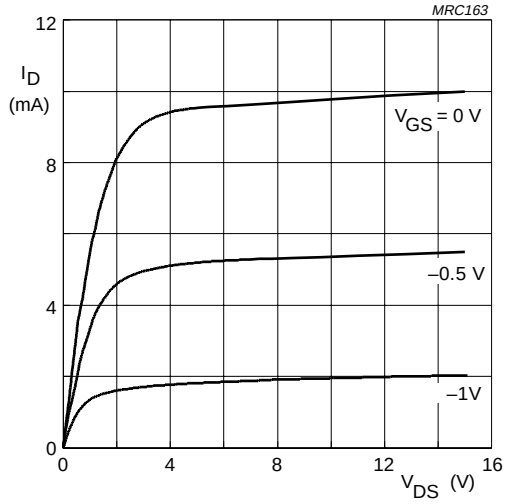
V_{DS} = 15 V; T_j = 25 °C.

Fig.3 Common source transfer admittance as a function of gate-source cut-off voltage; typical values.



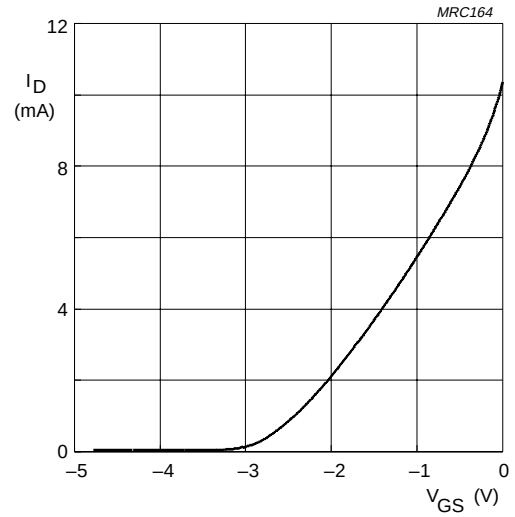
V_{DS} = 15 V; T_j = 25 °C.

Fig.4 Common source output conductance as a function of gate-source cut-off voltage; typical values.



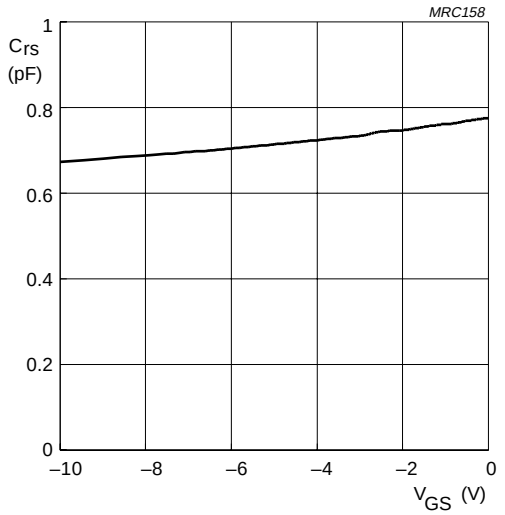
T_j = 25 °C.

Fig.5 Typical output characteristics.



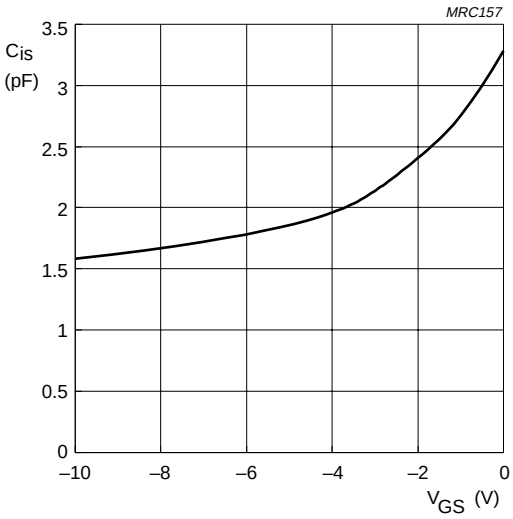
V_{DS} = 15 V; T_j = 25 °C.

Fig.6 Typical input characteristics.



V_{DS} = 15 V; T_j = 25 °C.

Fig.7 Typical feedback capacitance.



V_{DS} = 15 V; T_j = 25 °C.

Fig.8 Typical input capacitance.

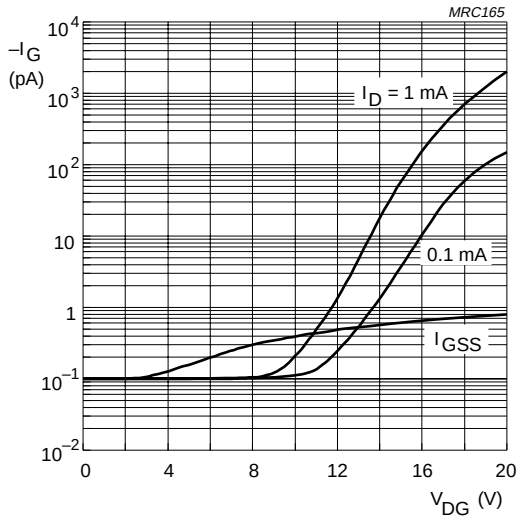


Fig.9 Gate current as a function of drain-gate voltage, typical values.

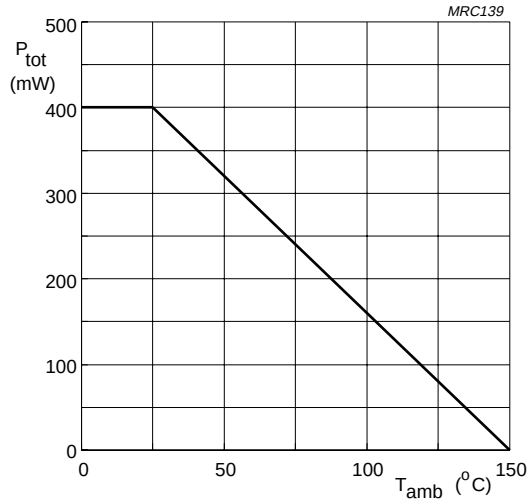
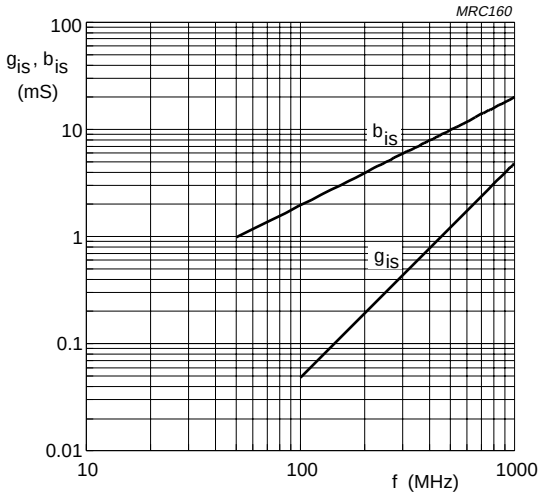
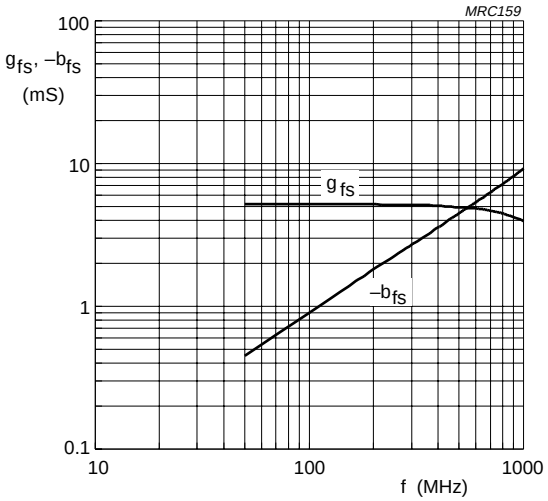


Fig.10 Power derating curve.



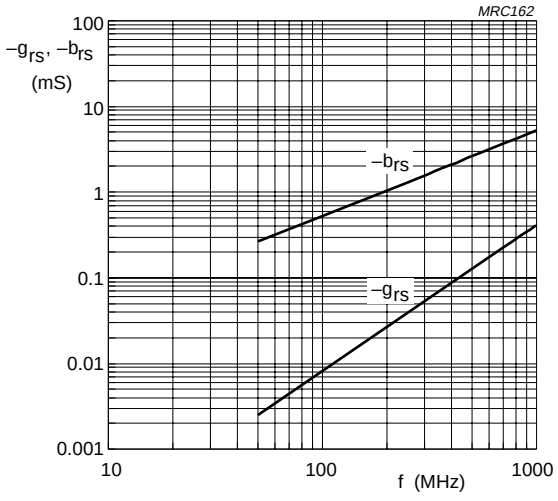
V_{DS} = 15 V; V_{GS} = 0; T_{amb} = 25 °C.

Fig.11 Common source input conductance; typical values.



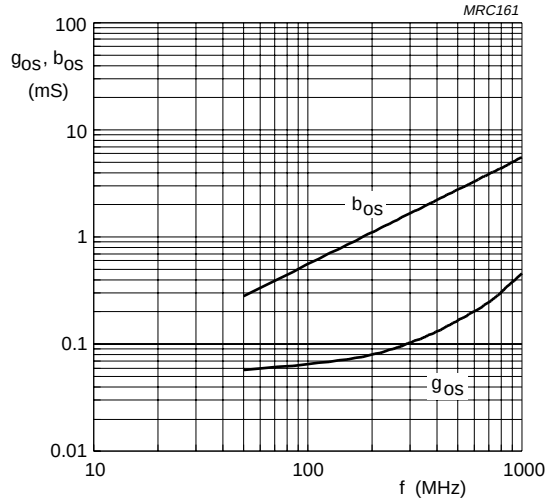
V_{DS} = 15 V; V_{GS} = 0; T_{amb} = 25 °C.

Fig.12 Common source transfer conductance; typical values.



V_{DS} = 15 V; V_{GS} = 0; T_{amb} = 25 °C.

Fig.13 Common source feedback conductance; typical values.



V_{DS} = 15 V; V_{GS} = 0; T_{amb} = 25 °C.

Fig.14 Common source output conductance; typical values.

SPICE parameters for PN4416

September 1992; version 1.0.

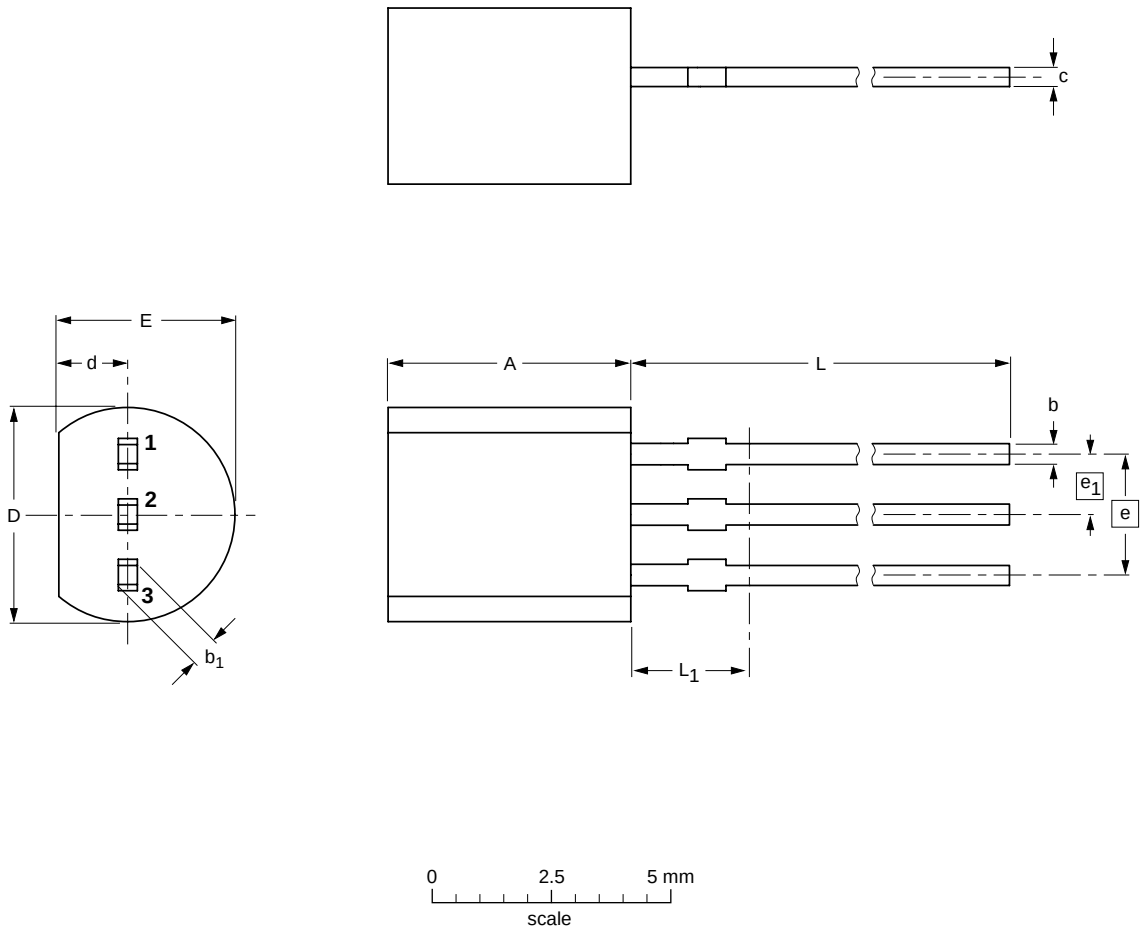
1	VTO = –3.553	V
2	BETA = 792.6	$\mu A/V^2$
3	LAMBDA = 18.46	m/V
4	RD = 7.671	Ω
5	RS = 7.671	Ω
6	IS = 333.4	aA
7	CGSO = 2.920	pF
8	CGDO = 2.261	pF
9	PB = 1.090	V
10 (note 1)	FC = 500.0	m

Note

1. Parameter not extracted; default value.

PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1(1)
mm	5.2 5.0	0.48 0.40	0.66 0.56	0.45 0.40	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT54		TO-92	SC-43			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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