DATA SHEET

PHN1013
N-channel enhancement mode MOS transistor

Objective specification
File under Discrete Semiconductors, SC13b

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Philips Semiconductors

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N-channel enhancement mode MOS transistor

PHN1013

FEATURES

- Very low on-state resistance.

APPLICATIONS

- DC to DC converters
- General purpose switching applications.

DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor using 'trench' technology, in an 8-pin plastic SOT96-1 (SO8) package.

PINNING - SOT96-1 (SO8)

PIN	SYMBOL	DESCRIPTION
1	s	source
2	s	source
3	s	source
4	g	gate
5	d	drain
6	d	drain
7	d	drain
8	d	drain

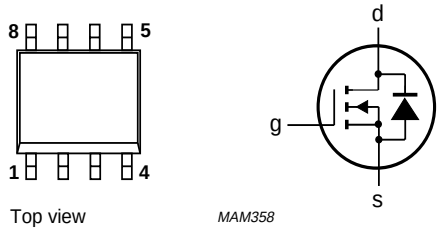


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
V_{DS}	drain-source voltage		30	V
I_D	drain current (DC)		10	A
P_{tot}	total power dissipation		2.5	W
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V	13.5	mΩ
T_j	junction temperature		150	°C

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	30	V
V_{DG}	drain-gate voltage	R_{GS} = 20 kΩ	–	30	V
V_{GS}	gate-source voltage		–	±20	V
I_D	drain current (DC)	T_{amb} = 25 °C; $t_p \leq 10$ s	–	10	A
		T_{amb} = 70 °C; $t_p \leq 10$ s	–	8	A
I_{DM}	peak drain current	T_{amb} = 25 °C	–	50	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	–	2.5	W
		T_{amb} = 70 °C	–	1.6	W
T_{stg}	storage temperature		–55	+150	°C
T_j	operating junction temperature		–55	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	minimum footprint; $t_p \leq 10$ s; note 1	50	K/W

Note

1. Device mounted on an FR4 printed-circuit board.

STATIC CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 250 μA	30	–	–	V
		V_{GS} = 0; I_D = 250 μA; T_j = –55 °C	27	–	–	V
V_{GSth}	gate-source threshold voltage	V_{DS} = V_{GS}; I_D = 250 μA	2.1	3	4	V
		V_{DS} = V_{GS}; I_D = 250 μA; T_j = 150 °C	1.4	–	–	V
		V_{DS} = V_{GS}; I_D = 250 μA; T_j = –55 °C	–	–	4.4	V
I_{DSS}	drain-source leakage current	V_{DS} = 30 V; V_{GS} = 0	–	0.05	10	μA
		V_{DS} = 30 V; V_{GS} = 0; T_j = 150 °C	–	–	500	μA
I_{GSS}	gate leakage current	V_{GS} = ±10 V; V_{DS} = 0	–	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 10 A	–	11	13.5	mΩ
		V_{GS} = 10 V; I_D = 10 A; T_j = 150 °C	–	–	26	mΩ

DYNAMIC CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	forward transconductance	V_{DS} = 25 V; I_D = 10 A	4	8	–	S
C_{iss}	input capacitance	V_{GS} = 0; V_{DS} = 25 V; f = 1 MHz	–	1700	2200	pF
C_{oss}	output capacitance	V_{GS} = 0; V_{DS} = 25 V; f = 1 MHz	–	325	450	pF
C_{rss}	reverse transfer capacitance	V_{GS} = 0; V_{DS} = 25 V; f = 1 MHz	–	214	260	pF
Q_G	total gate charge	V_{GS} = 5 V; V_{DD} = 24 V; I_D = 10 A	–	27	–	nC
Q_{GS}	gate-source charge	V_{GS} = 5 V; V_{DD} = 24 V; I_D = 10 A	–	3.5	–	nC
Q_{GD}	gate-drain charge	V_{GS} = 5 V; V_{DD} = 24 V; I_D = 10 A	–	15	–	nC
Switching times						
$t_{d(on)}$	turn-on delay time	V_{GS} = 5 V; V_{DD} = 25 V; I_D = 10 A; R_{gen} = 10 Ω resistive load	–	25	40	ns
$t_{d(off)}$	turn-off delay time	V_{GS} = 5 V; V_{DD} = 25 V; I_D = 10 A; R_{gen} = 10 Ω resistive load	–	90	130	ns
t_r	rise time	V_{GS} = 5 V; V_{DD} = 25 V; I_D = 10 A; R_{gen} = 10 Ω resistive load	–	75	125	ns
t_f	fall time	V_{GS} = 5 V; V_{DD} = 25 V; I_D = 10 A; R_{gen} = 10 Ω resistive load	–	35	50	ns

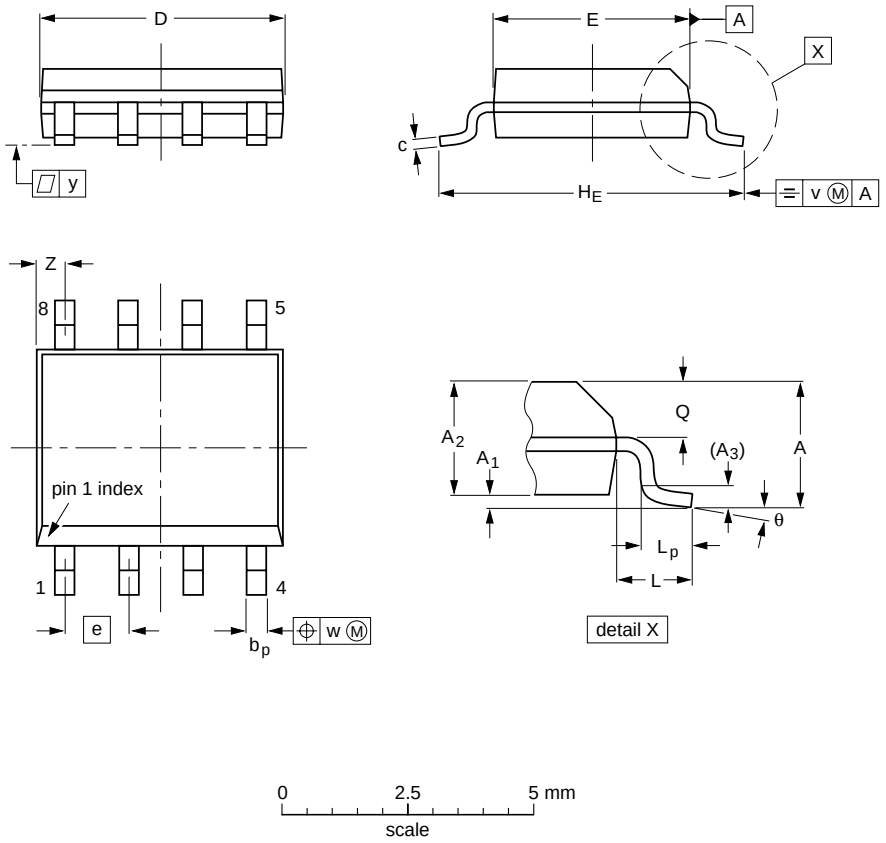
REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
I_{DR}	continuous reverse drain current	T_{amb} = 25 °C; $t_p \leq 10$ s	–	10	A
I_{DRM}	pulsed reverse drain current		–	50	A
V_{SD}	source-drain diode forward voltage	I_F = 10 A; V_{GS} = 0	0.95	1.2	V
		I_F = 50 A; V_{GS} = 0	1	–	V
t_{rr}	reverse recovery time	I_F = 10 A; di/dt = –100 A/µs; V_{GS} = –10 V; V_R = 25 V	50	–	ns
Q_{rr}	reverse recovery charge	I_F = 10 A; di/dt = –100 A/µs; V_{GS} = –10 V; V_R = 25 V	0.1	–	µC

PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				~~95-02-04~~ 97-05-22

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.
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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