

PH16030L

N-channel TrenchMOS™ logic level FET

Rev. 01 — 24 February 2005

Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS™ technology.

1.2 Features

- Logic level threshold
- SO8 equivalent area footprint
- Low thermal resistance
- Low gate charge.

1.3 Applications

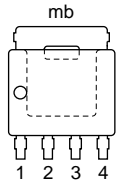
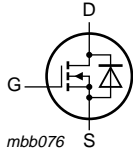
- DC-to-DC converters
- Portable appliances.

1.4 Quick reference data

- $V_{DS} \leq 30$ V
- $R_{DS(on)} \leq 16.9$ m Ω
- $I_D \leq 38$ A
- $Q_{gd} = 2.9$ nC (typ).

2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 3	source		
4	gate		
mb	mounting base; connected to drain		

SOT669 (LFPAK)

PHILIPS

3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
PH16030L	LFAK	plastic single-ended surface mounted package; 4 leads	SOT669

4. Limiting values

Table 3: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

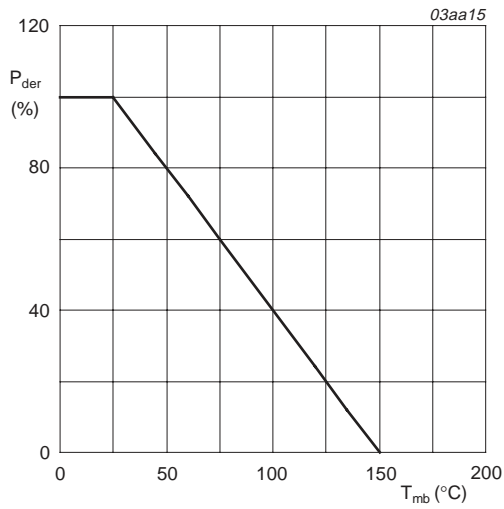
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	30	V
V_{DGR}	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	30	V
V_{GS}	gate-source voltage (DC)		-	± 15	V
I_D	drain current (DC)	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; Figure 2 and 3	-	38	A
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; Figure 2	-	24	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Figure 3	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Figure 1	-	41.6	W
T_{stg}	storage temperature		-55	+150	°C
T_j	junction temperature		-55	+150	°C

Source-drain diode

I_S	source (diode forward) current (DC)	$T_{mb} = 25\text{ °C}$	-	38	A
I_{SM}	peak source (diode forward) current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	100	A

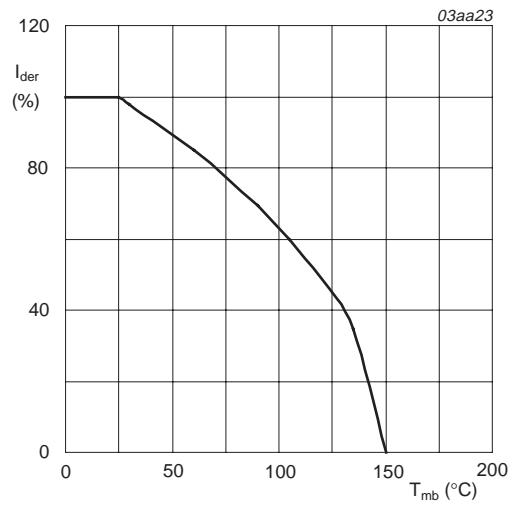
Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 21\text{ A}$; $t_p = 0.1\text{ ms}$; $V_{DD} \leq 25\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; starting at $T_j = 25\text{ °C}$	-	44	mJ
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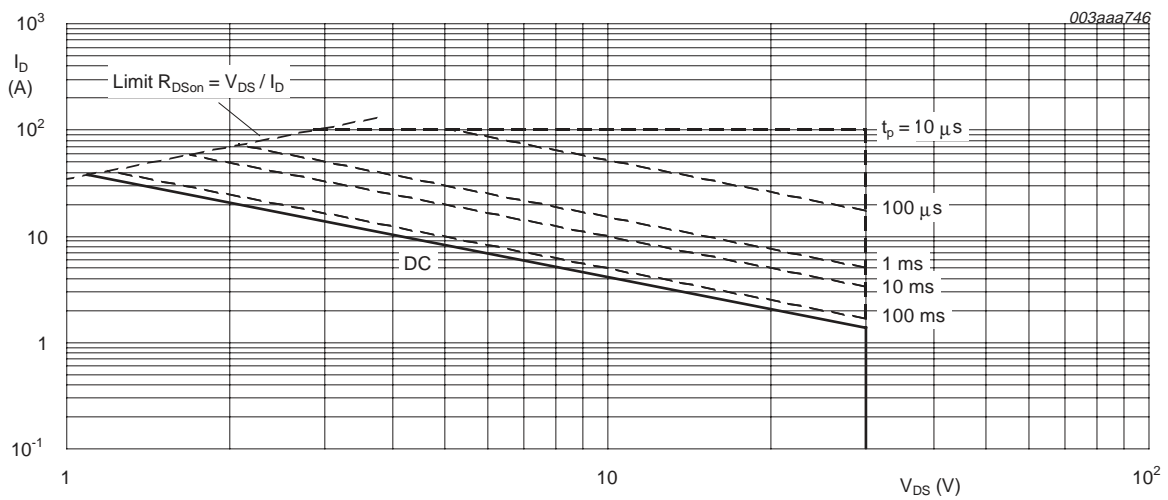
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

Fig 1. Normalized total power dissipation as a function of mounting base temperature



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100\%$$

Fig 2. Normalized continuous drain current as a function of mounting base temperature



$T_{mb} = 25^{\circ}\text{C}$; I_{DM} is single pulse; $V_{GS} = 10\text{ V}$

Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Figure 4	-	-	3	K/W

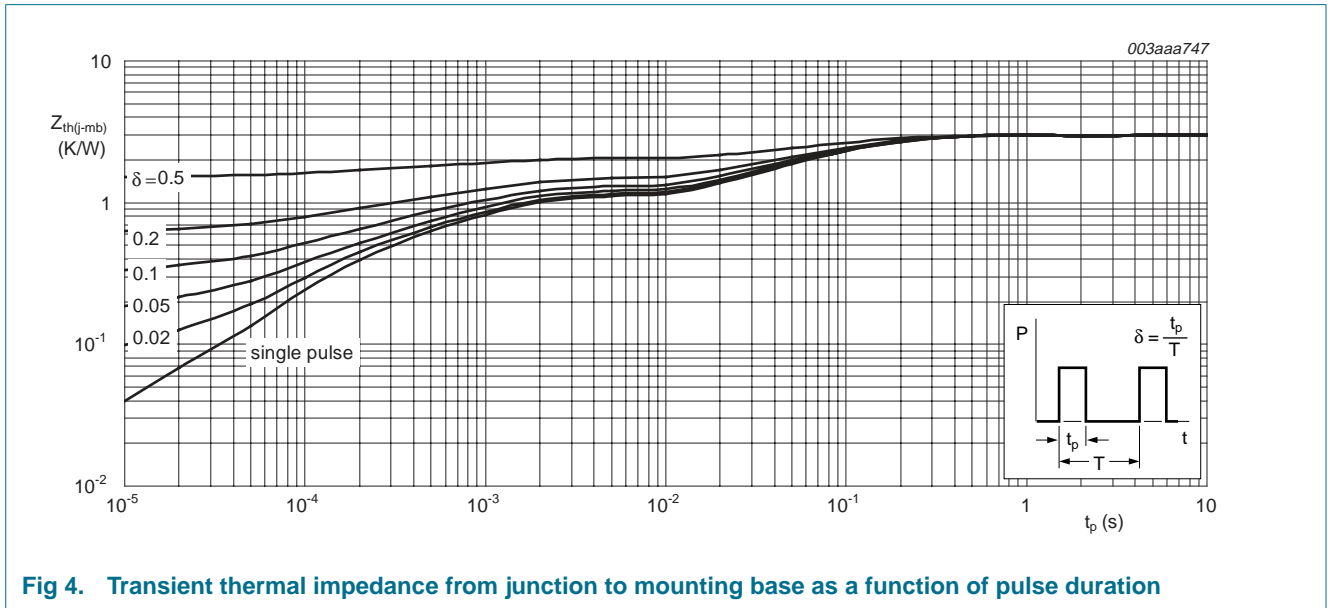
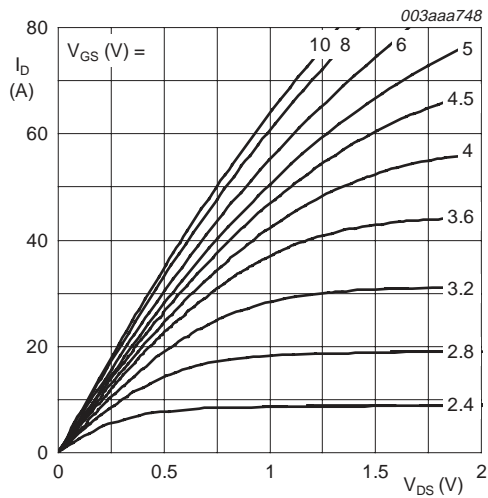


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

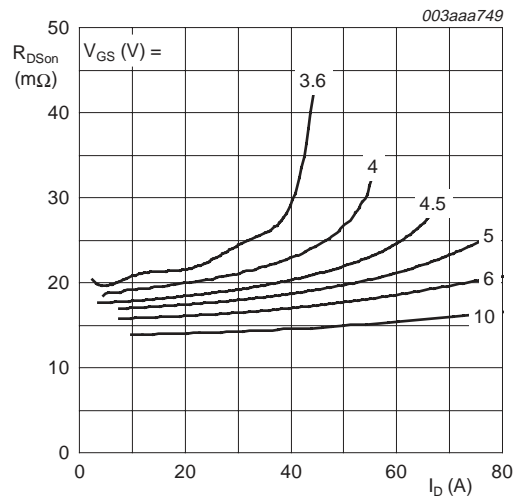
Table 5: Characteristics
T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V T _j = 25 °C T _j = -55 °C	30 27	- -	- -	V V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; Figure 9 and 10 T _j = 25 °C T _j = 150 °C T _j = -55 °C	1 0.6 -	1.5 - -	2 - 2.2	V V V
I _{DSS}	drain-source leakage current	V _{DS} = 30 V; V _{GS} = 0 V T _j = 25 °C T _j = 150 °C	- - -	- - -	1 100	μA μA
I _{GSS}	gate-source leakage current	V _{GS} = ±15 V; V _{DS} = 0 V	-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 15 A; Figure 6 and 8 T _j = 25 °C T _j = 150 °C V _{GS} = 4.5 V; I _D = 15 A; Figure 6 and 8	- - -	14.1 24 18.8	16.9 28.7 23.5	mΩ mΩ mΩ
Dynamic characteristics						
Q _{g(tot)}	total gate charge	I _D = 15 A; V _{DS} = 12 V; V _{GS} = 4.5 V; Figure 11 and 12	-	8.2	-	nC
Q _{gs}	gate-source charge		-	2.3	-	nC
Q _{gs1}	pre-V _{GS(th)} gate-source charge		-	0.9	-	nC
Q _{gs2}	post-V _{GS(th)} gate-source charge		-	1.4	-	nC
Q _{gd}	gate-drain (Miller) charge		-	2.9	-	nC
V _{plat}	plateau voltage		-	2.6	-	V
Q _{g(tot)}	total gate charge	I _D = 0 A; V _{DS} = 0 V; V _{GS} = 4.5 V	-	6.7	-	nC
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 12 V; f = 1 MHz; Figure 14	-	680	-	pF
C _{oss}	output capacitance		-	280	-	pF
C _{rss}	reverse transfer capacitance		-	135	-	pF
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 0 V; f = 1 MHz	-	1090	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; R _L = 1 Ω; V _{GS} = 4.5 V;	-	9	-	ns
t _r	rise time	R _G = 5.6 Ω	-	18	-	ns
t _{d(off)}	turn-off delay time		-	16	-	ns
t _f	fall time		-	33	-	ns
Source-drain diode						
V _{SD}	source-drain (diode forward) voltage	I _S = 15 A; V _{GS} = 0 V; Figure 13	-	0.86	1.2	V
t _{rr}	reverse recovery time	I _S = 15 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V;	-	34	-	ns
Q _r	recovered charge	V _R = 30 V	-	12	-	nC



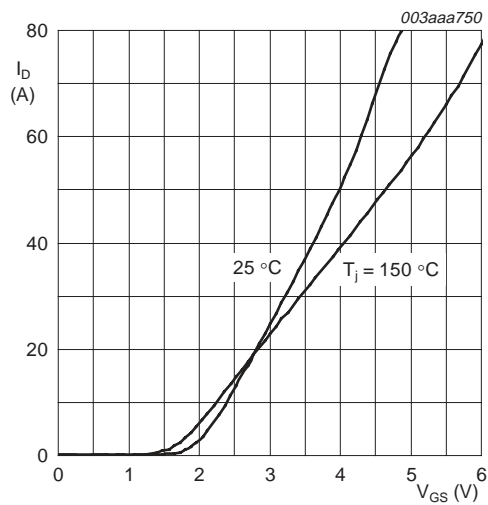
$T_j = 25\text{ }^\circ\text{C}$

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values



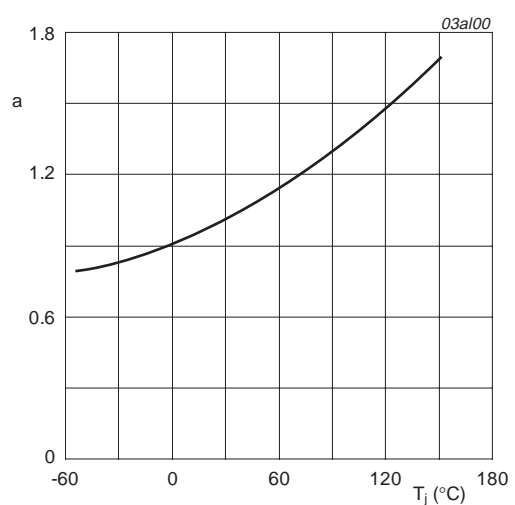
$T_j = 25\text{ }^\circ\text{C}$

Fig 6. Drain-source on-state resistance as a function of drain current; typical values



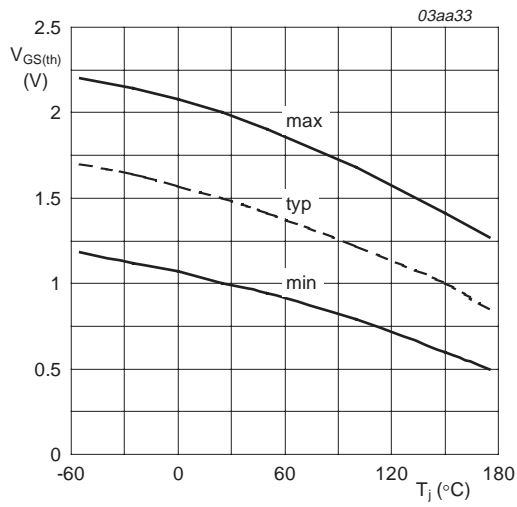
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DS(on)}$

Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



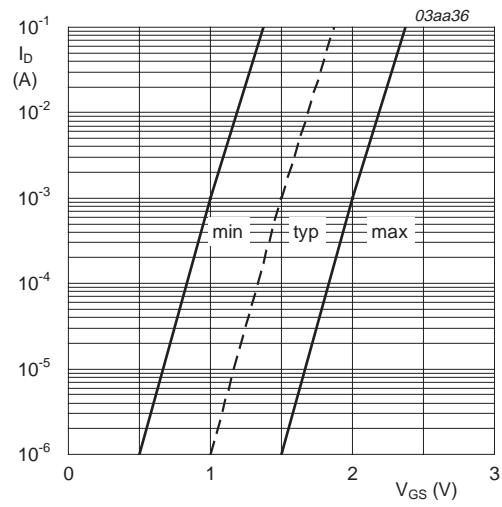
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{ }^\circ\text{C})}}$$

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature



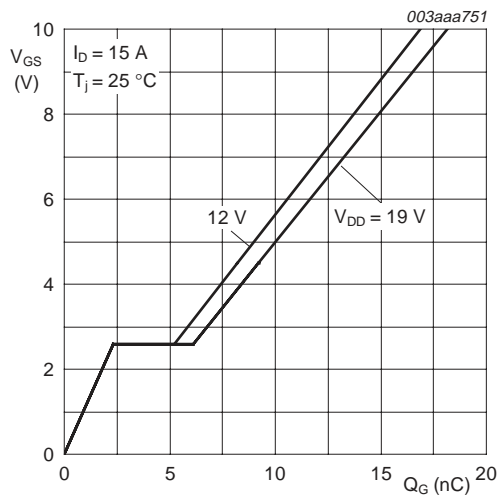
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

Fig 9. Gate-source threshold voltage as a function of junction temperature



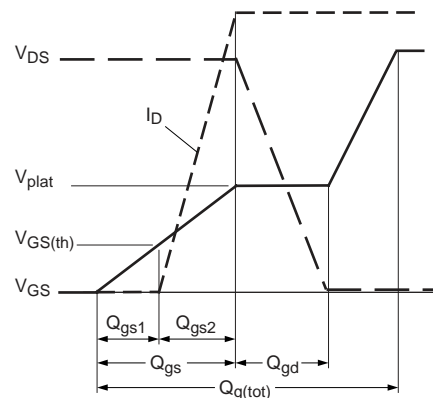
$T_j = 25 \text{ °C}; V_{DS} = 5 \text{ V}$

Fig 10. Sub-threshold drain current as a function of gate-source voltage



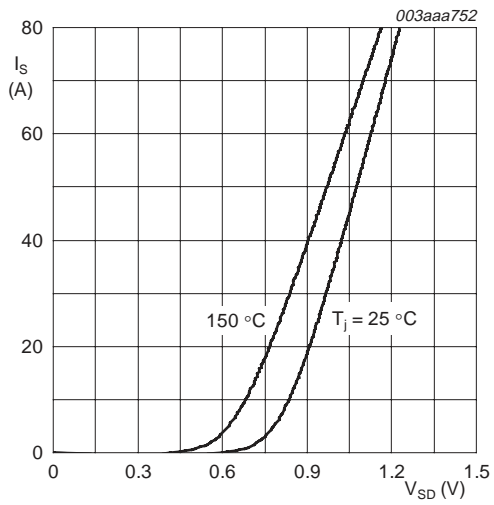
$I_D = 15 \text{ A}; V_{DS} = 12 \text{ V and } 19 \text{ V}$

Fig 11. Gate-source voltage as a function of gate charge; typical values



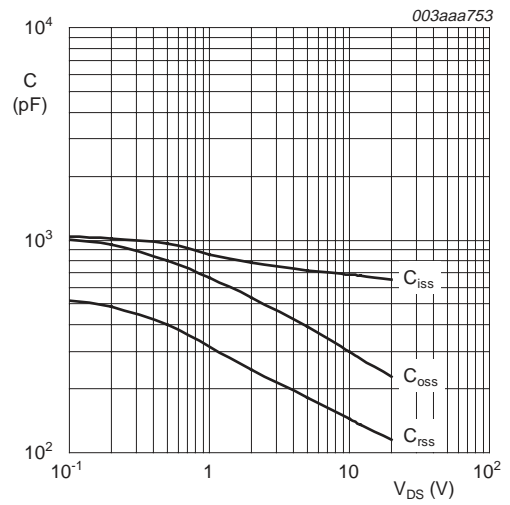
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Fig 12. Gate charge waveform definitions



$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{GS} = 0\text{ V}$

Fig 13. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values



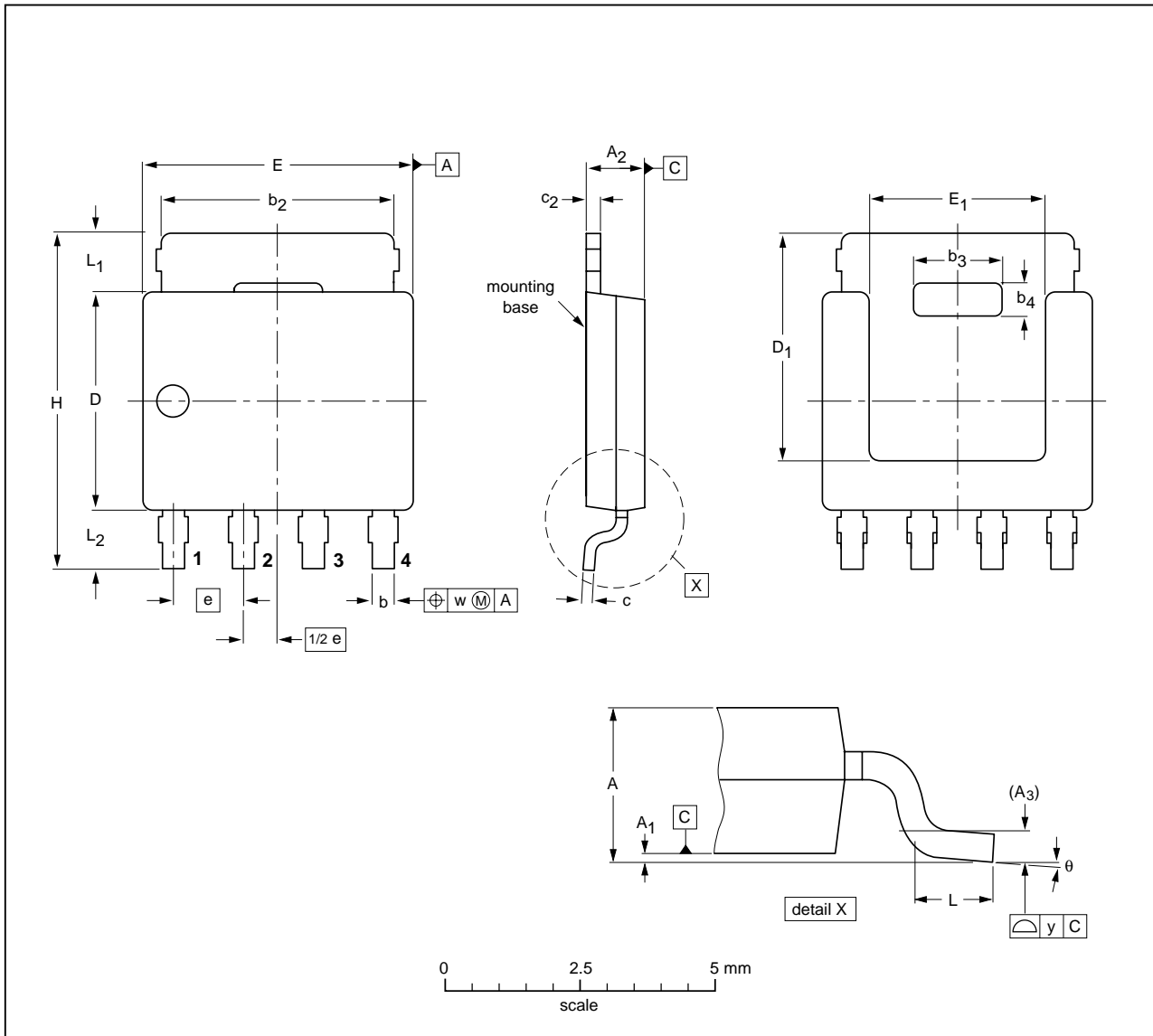
$V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$

Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

7. Package outline

Plastic single-ended surface mounted package (LPAK); 4 leads

SOT669



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	A ₂	A ₃	b	b ₂	b ₃	b ₄	c	c ₂	D ⁽¹⁾	D ₁ ⁽¹⁾ max	E ⁽¹⁾	E ₁ ⁽¹⁾	e	H	L	L ₁	L ₂	w	y	θ
mm	1.20 1.01	0.15 0.00	1.10 0.95	0.25	0.50 0.35	4.41 3.62	2.2 2.0	0.9 0.7	0.25 0.19	0.30 0.24	4.10 3.80	4.20	5.0 4.8	3.3 3.1	1.27	6.2 5.8	0.85 0.40	1.3 0.8	1.3 0.8	0.25	0.1	8° 0°

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT669		MO-235				03-09-15 04-10-13

Fig 15. Package outline SOT669 (LPAK)

8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PH16030L_1	20050224	Product data sheet	-	9397 750 14431	-

9. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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