

PH7030L

N-channel TrenchMOS™ logic level FET

Rev. 04. — 7 March 2005

Product data sheet

1. Product profile

1.1 General description

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

1.2 Features

- Low thermal resistance
- Logic level gate drive
- S08 equivalent area footprint
- Low on-state resistance.

1.3 Applications

- DC-to-DC converters
- Portable appliances
- Switched-mode power supplies
- Notebook computers.

1.4 Quick reference data

- $V_{DS} \leq 30$ V
- $R_{DS(on)} \leq 7.9$ m Ω
- $I_D \leq 68$ A
- $P_{tot} \leq 62.5$ W.

2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 3	source	<p style="text-align: center;">SOT669 (LFPAK)</p>	
4	gate		
mb	mounting base; connected to drain		

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3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
PH7030L	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).

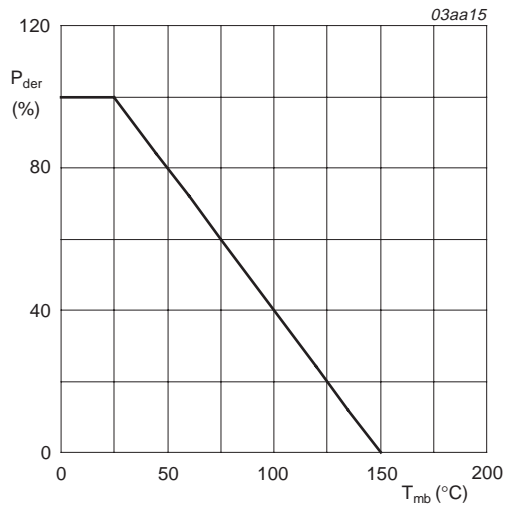
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	30	V
V_{GS}	gate-source voltage (DC)		-	± 20	V
I_D	drain current (DC)	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ Figure 2 and 3	-	68	A
		$T_{mb} = 100\text{ °C}; V_{GS} = 10\text{ V};$ Figure 2	-	43	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ Figure 3	-	220	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C};$ Figure 1	-	62.5	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)	$T_{mb} = 25\text{ °C}$	-	52	A
I_{SM}	peak source (diode forward) current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	150	A

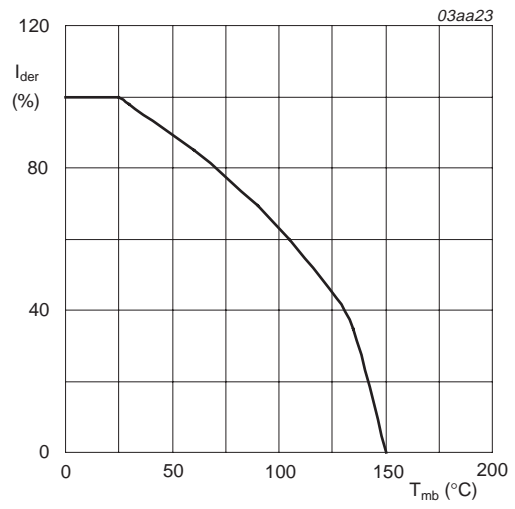
Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 33.9\text{ A};$ $t_p = 0.15\text{ ms}; V_{DD} \leq 30\text{ V}; V_{GS} = 10\text{ V};$ starting at $T_j = 25\text{ °C}$	-	115	mJ
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$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ\text{C})}} \times 100\%$$

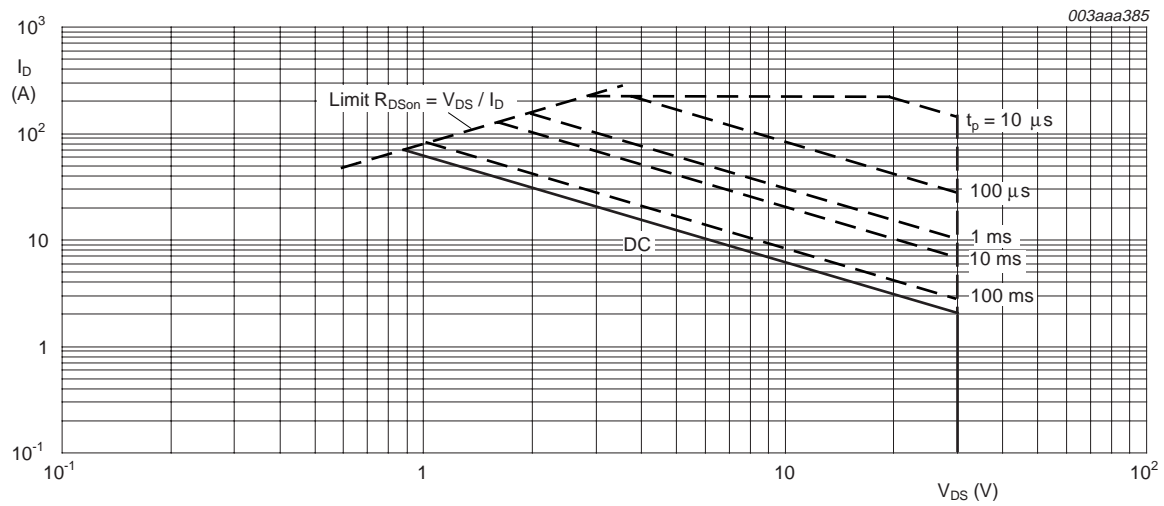
Fig 1. Normalized total power dissipation as a function of mounting base temperature



$$V_{GS} \geq 10\text{ V}$$

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

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	-	-	2	K/W

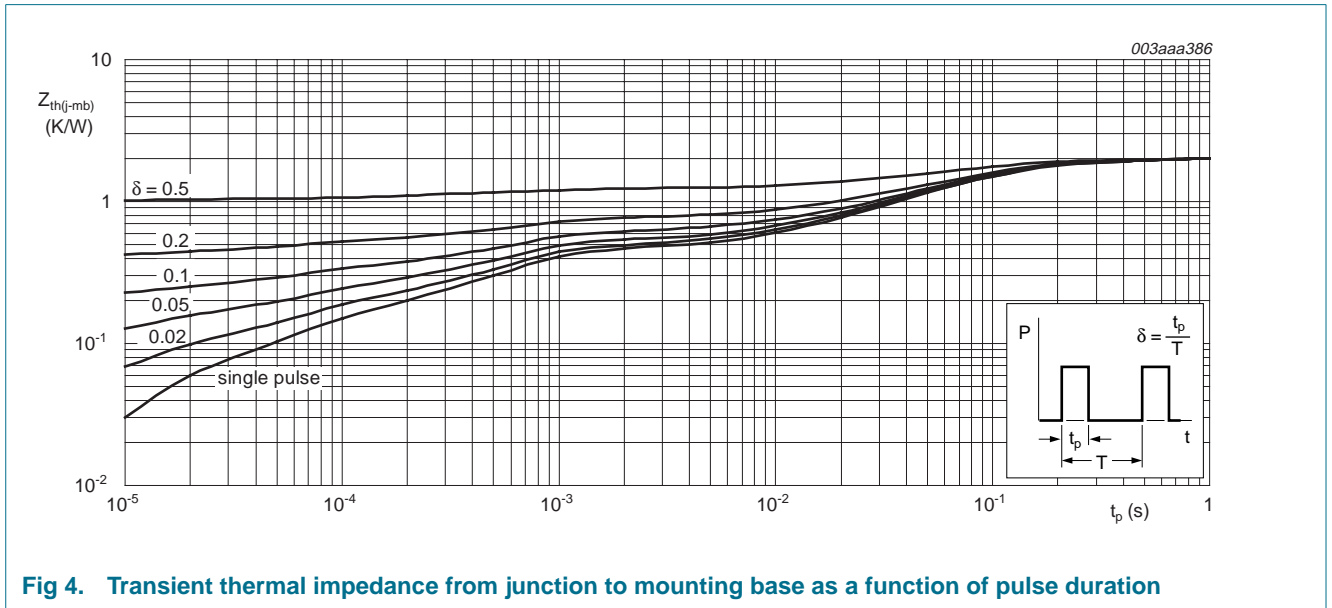
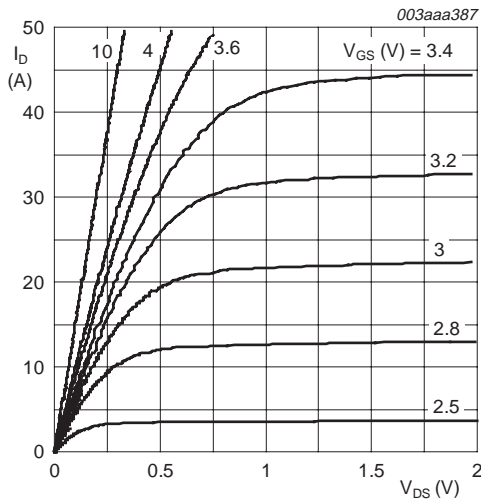


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

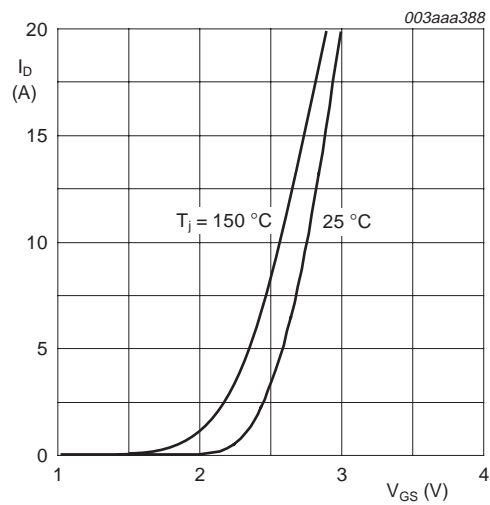
Table 5: Characteristics
T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V	30	-	-	V	
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; Figure 9					
		T _j = 25 °C	1	1.5	2	V	
I _{DSS}	drain-source leakage current	V _{DS} = 30 V; V _{GS} = 0 V	T _j = 150 °C	0.6	-	-	V
			T _j = 25 °C	-	0.06	1	μA
I _{GSS}	gate-source leakage current	V _{GS} = ±15 V; V _{DS} = 0 V	-	20	100	nA	
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 10 A; Figure 7 and 8	T _j = 25 °C	-	6.9	7.9	mΩ
			T _j = 150 °C	-	11.7	13.2	mΩ
			V _{GS} = 4.5 V; I _D = 10 A;	-	9.6	11	mΩ
			V _{GS} = 5 V; I _D = 10 A;	-	8.7	10	mΩ
Dynamic characteristics							
Q _{g(tot)}	total gate charge	I _D = 20 A; V _{DS} = 10 V; V _{GS} = 5 V; Figure 13	-	12	-	nC	
Q _{gs}	gate-source charge		-	4.1	-	nC	
Q _{gd}	gate-drain (Miller) charge		-	3.2	-	nC	
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 10 V; f = 1 MHz; Figure 11	-	1362	-	pF	
C _{oss}	output capacitance		-	544	-	pF	
C _{rss}	reverse transfer capacitance		-	260	-	pF	
t _{d(on)}	turn-on delay time	V _{DD} = 10 V; I _D = 10 A;	-	24	-	ns	
t _r	rise time	V _{GS} = 4.5 V; R _G = 4.7 Ω	-	38	-	ns	
t _{d(off)}	turn-off delay time		-	34	-	ns	
t _f	fall time		-	21	-	ns	
Source-drain diode							
V _{SD}	source-drain (diode forward) voltage	I _S = 10 A; V _{GS} = 0 V; Figure 12	-	0.81	1.2	V	
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _R = 20 V	-	11	-	ns	



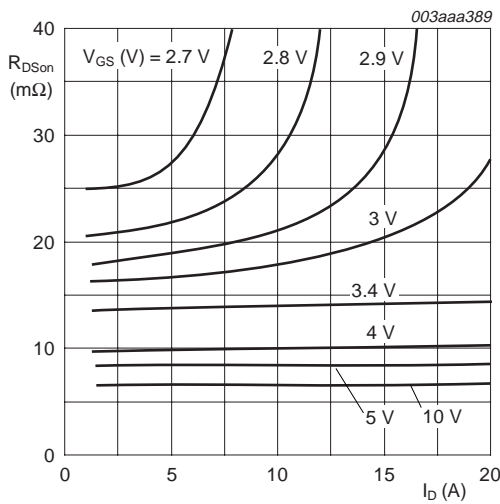
$T_j = 25\text{ }^\circ\text{C}$

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



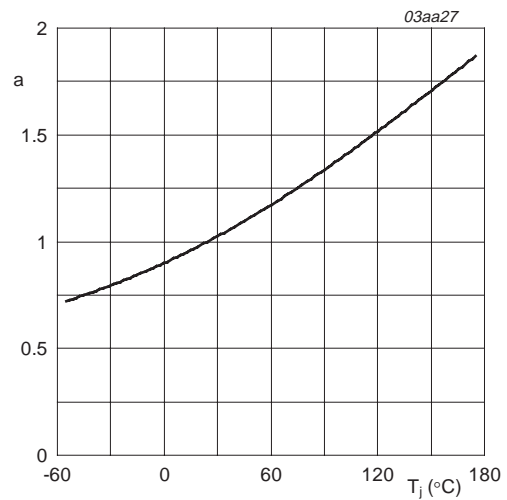
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DSon}$

Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values



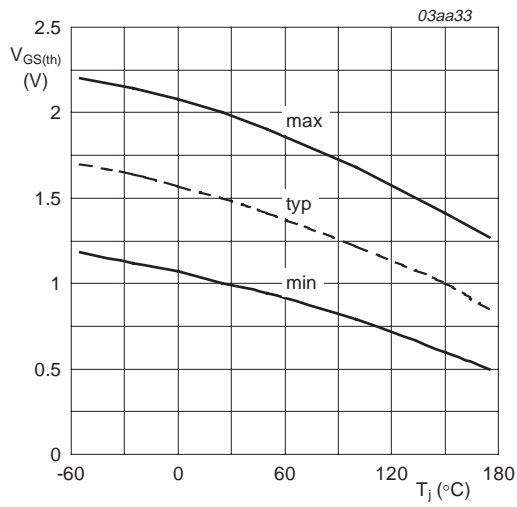
$T_j = 25\text{ }^\circ\text{C}$

Fig 7. Drain-source on-state resistance as a function of drain current; typical values



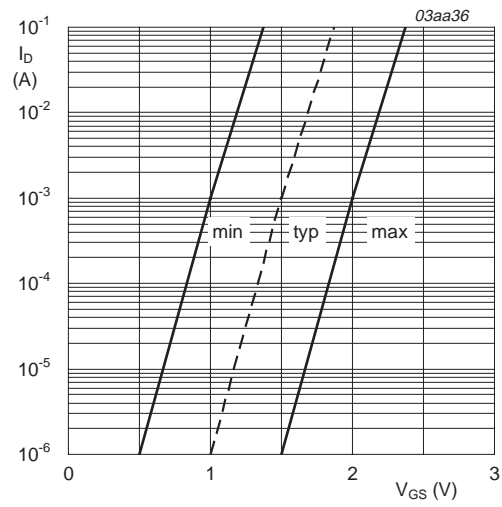
$$a = \frac{R_{DSon}}{R_{DSon}(25\text{ }^\circ\text{C})}$$

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



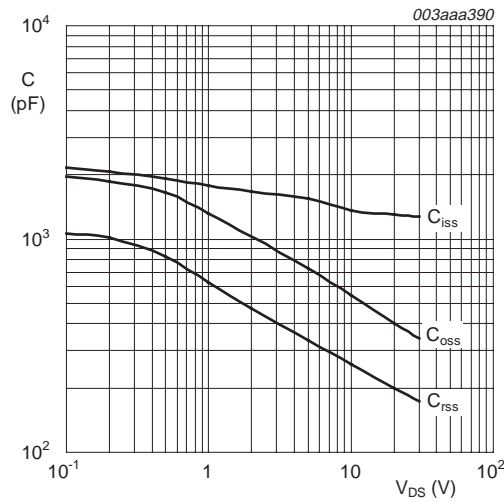
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



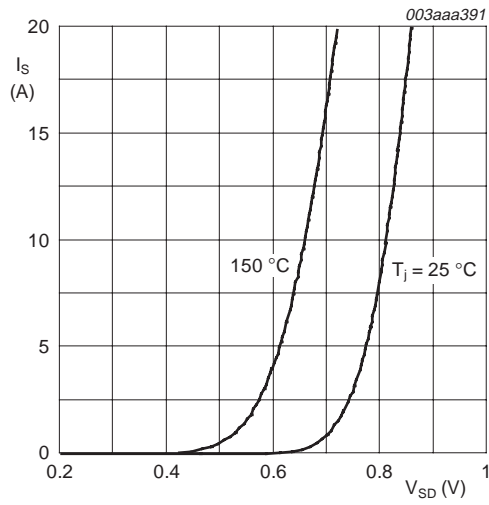
$T_j = 25 \text{ °C}; V_{DS} = 5 \text{ V}$

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



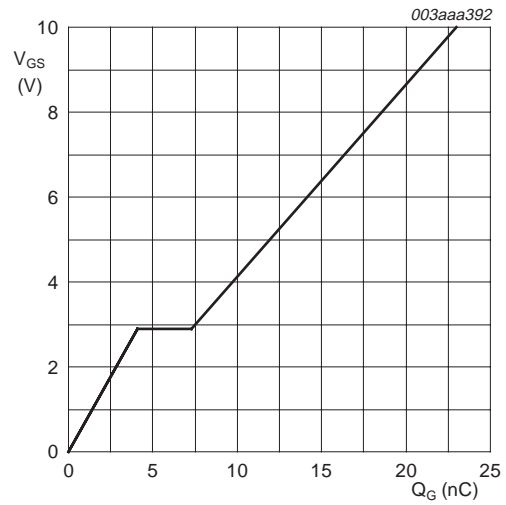
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



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

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values



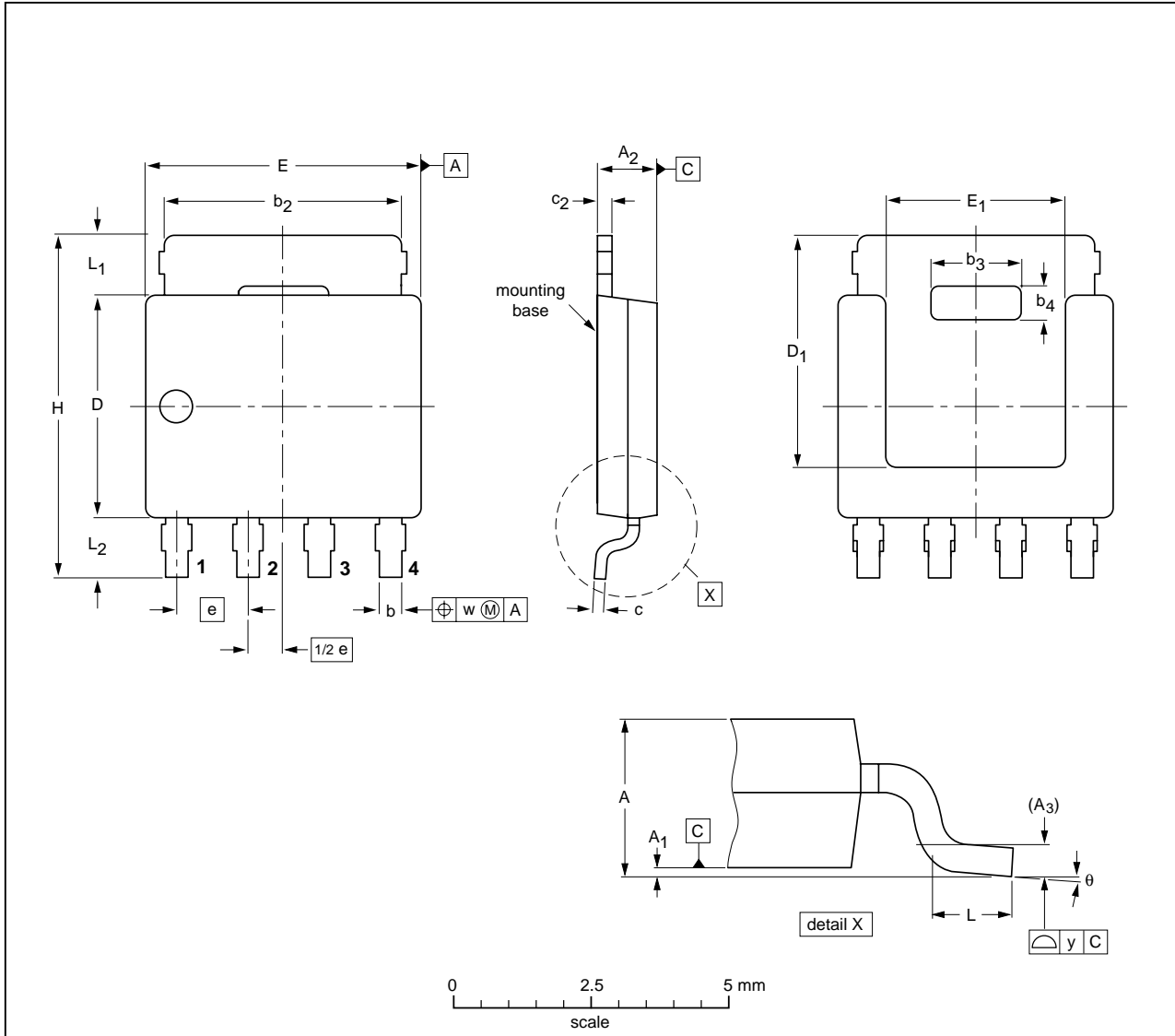
$I_D = 20\text{ A}$; $V_{DD} = 10\text{ V}$

Fig 13. Gate-source voltage as a function of gate charge; 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 14. Package outline SOT669 (LPAK)

8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PH7030L_4	20050307	Product data sheet	-	9397 750 14206	PH7030L-03
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors. Table 5 “Characteristics”: R_{DSon} data added. 				
PH7030L-03	20040304	Product data		9397 750 12944	PH7030L-02
Modifications:	<ul style="list-style-type: none"> Table 5 “Characteristics”, t_r data revised. 				
PH7030L-02	20030918	Product data		9397 750 11946	PH7030L-01
Modifications:	<ul style="list-style-type: none"> Section 3 “Ordering information” added. Section 1.4 “Quick reference data” and Table 3 “Limiting values”, I_D data revised. Section 1.4 “Quick reference data” and Table 5 “Characteristics”, R_{DSon} data revised. Section 4 “Limiting values”, V_{GS} data revised. Table 5 “Characteristics”, $Q_{g(tot)}$, Q_{gs}, Q_{gd}, and V_{SD} data revised. Figure 3, 4, 7, 8 and 13 updated. 				
PH7030L-01	20030502	Product data	-	9397 750 11405	-

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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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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13. Contact information

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Date of release: 7 March 2005
Document number: 9397 750 14206

Published in The Netherlands