

PH4530L

N-channel TrenchMOS™ logic level FET

Rev. 02 — 26 January 2005

Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode field effect transistor in a plastic package using TrenchMOS™ technology.

1.2 Features

- Low thermal resistance
- Logic level gate drive
- SO8 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

- $V_{DS} \leq 30 \text{ V}$
- $I_D \leq 80 \text{ A}$
- $P_{tot} \leq 62.5 \text{ W}$
- $R_{DSon} \leq 5.7 \text{ m}\Omega$.

2. Pinning information

Table 1: Discrete pinning

Pin	Description	Simplified outline	Symbol
1,2,3	source	<p>Top view</p> <p>SOT669 (LFAK)</p>	<p>mbb076</p>
4	gate		
mb	mounting base; connected to drain		

3. Ordering information

Table 2: Ordering information

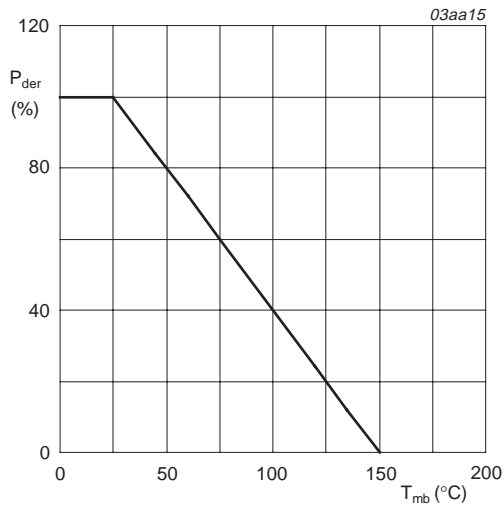
Type number	Package		Version
	Name	Description	
PH4530L	LFPAK	plastic single-ended surface mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 3: Limiting values

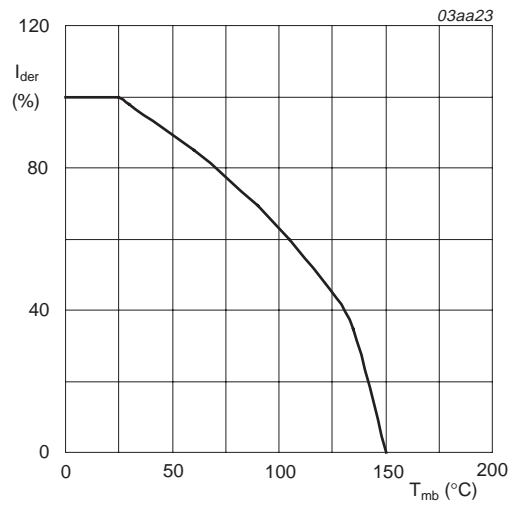
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	-	80	A
		$T_{mb} = 100\text{ °C}; V_{GS} = 10\text{ V};$ Figure 2	-	240	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ Figure 3	-	50.7	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; $I_D = 36.2\text{ A};$ $t_p = 0.24\text{ ms}; V_{DD} \leq 30\text{ V}; V_{GS} = 10\text{ V};$ starting $T_j = 25\text{ °C}$	-	130	mJ



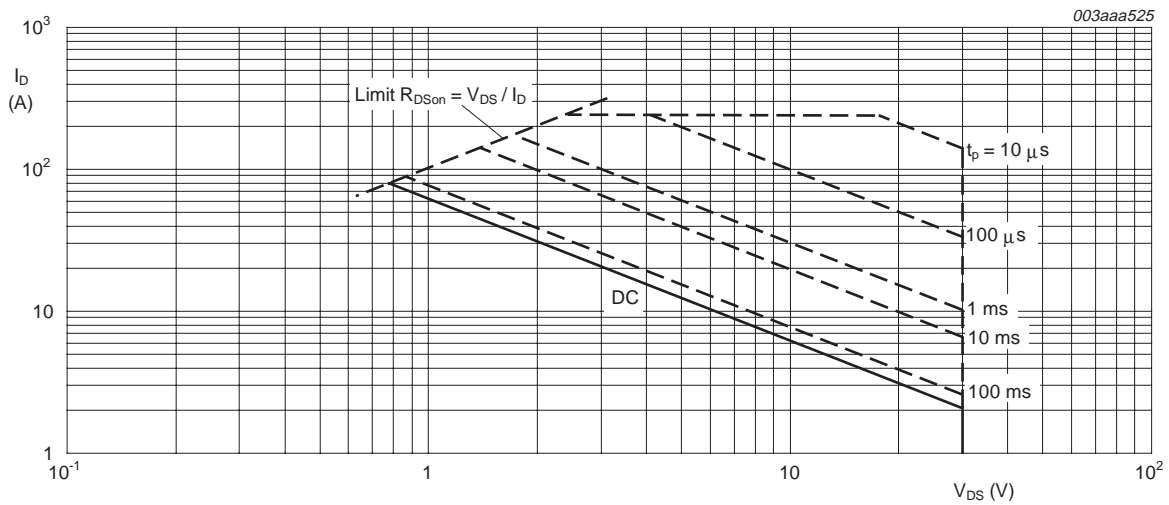
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



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

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



T_{mb} = 25 °C; I_{DM} is single pulse

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

5.1 Transient thermal impedance

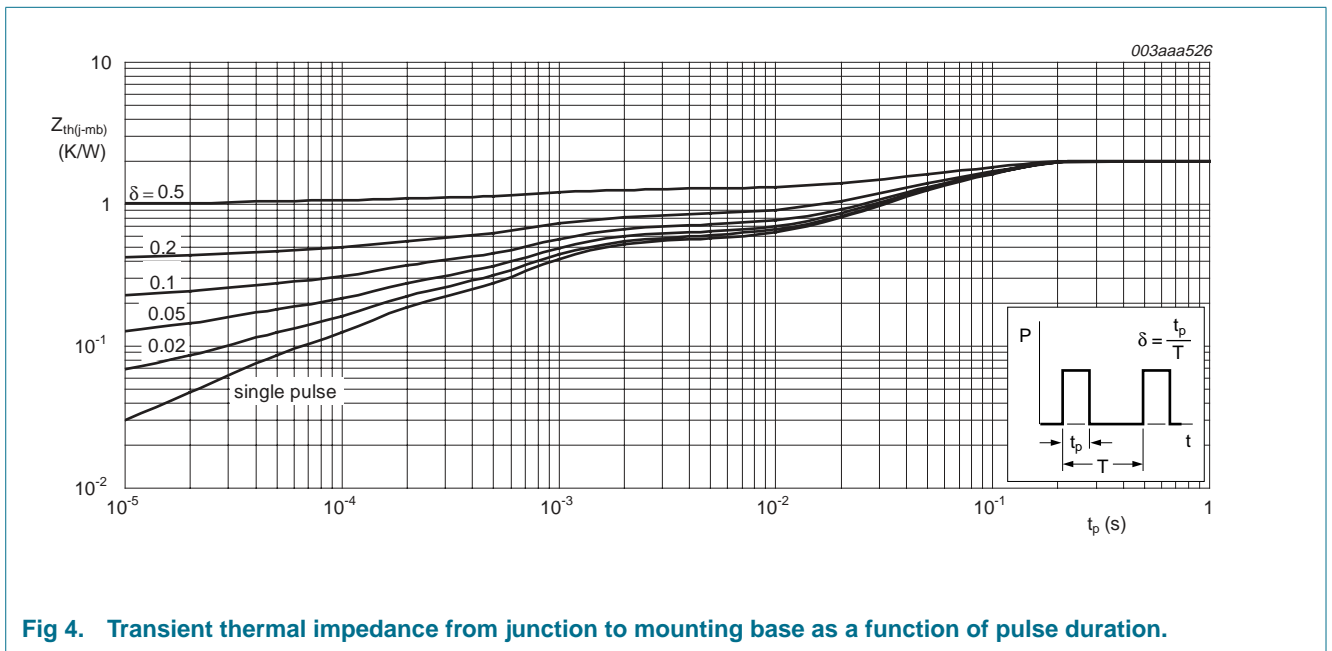


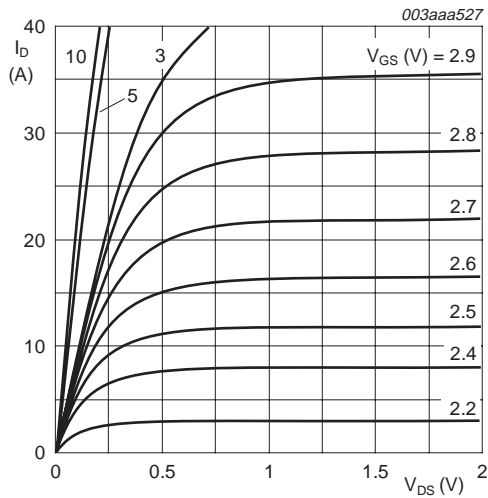
Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration.

6. Characteristics

Table 5: Characteristics

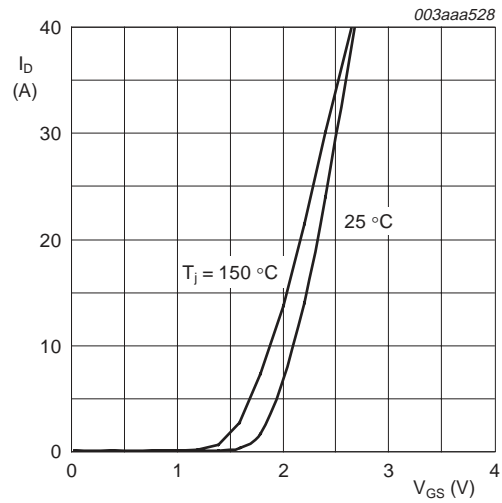
$T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$; $V_{GS} = 0\ \text{V}$	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ \text{mA}$; $V_{DS} = V_{GS}$; Figure 9	1	1.5	2	V
I_{DSS}	drain-source leakage current	$V_{DS} = 30\ \text{V}$; $V_{GS} = 0\ \text{V}$ $T_j = 25\text{ °C}$	-	0.06	1	μA
			-	-	500	μA
			-	-	500	μA
I_{GSS}	gate-source leakage current	$V_{GS} = \pm 15\ \text{V}$; $V_{DS} = 0\ \text{V}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ \text{V}$; $I_D = 15\ \text{A}$; Figure 7 and 8 $T_j = 25\text{ °C}$	-	4.8	5.7	m Ω
			-	8.2	9.7	m Ω
		$V_{GS} = 5\ \text{V}$; $I_D = 15\ \text{A}$; Figure 7 and 8	-	5.8	7.2	m Ω
			-	5.8	7.2	m Ω
Dynamic characteristics						
$Q_{g(tot)}$	total gate charge	$I_D = 25\ \text{A}$; $V_{DS} = 10\ \text{V}$; $V_{GS} = 5\ \text{V}$; Figure 13	-	23.5	-	nC
Q_{gs}	gate-source charge		-	5.8	-	nC
Q_{gd}	gate-drain (Miller) charge		-	6.5	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\ \text{V}$; $V_{DS} = 10\ \text{V}$; $f = 1\ \text{MHz}$; Figure 11	-	1972	-	pF
C_{oss}	output capacitance		-	769	-	pF
C_{rss}	reverse transfer capacitance		-	304	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\ \text{V}$; $I_D = 25\ \text{A}$; $V_{GS} = 5\ \text{V}$; $R_G = 4.7\ \Omega$	-	22	-	ns
t_r	rise time		-	40	-	ns
$t_{d(off)}$	turn-off delay time		-	48	-	ns
t_f	fall time		-	18	-	ns
Source-drain diode						
V_{SD}	source-drain (diode forward) voltage	$I_S = 15\ \text{A}$; $V_{GS} = 0\ \text{V}$; Figure 12	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 20\ \text{A}$; $di_S/dt = -100\ \text{A}/\mu\text{s}$; $V_{GS} = 0\ \text{V}$	-	38	-	ns



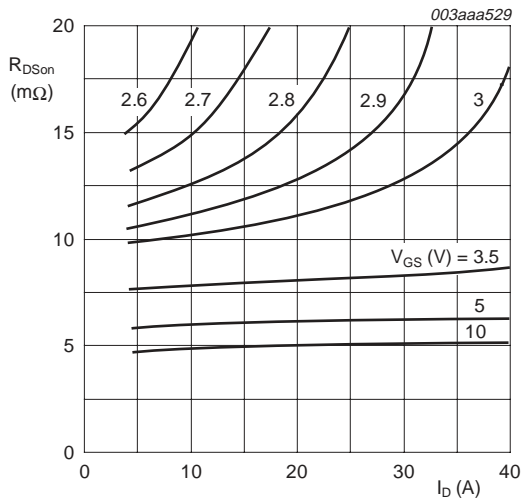
T_j = 25 °C

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



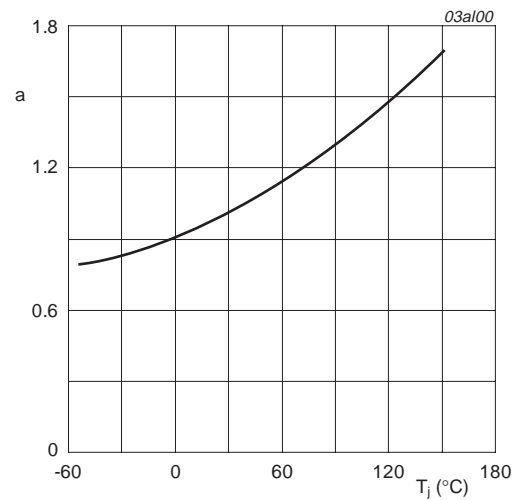
T_j = 25 °C and 150 °C; V_{DS} > I_D × R_{DSon}

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



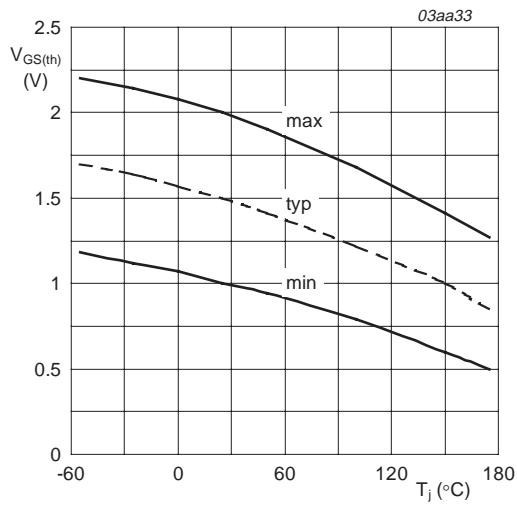
T_j = 25 °C

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



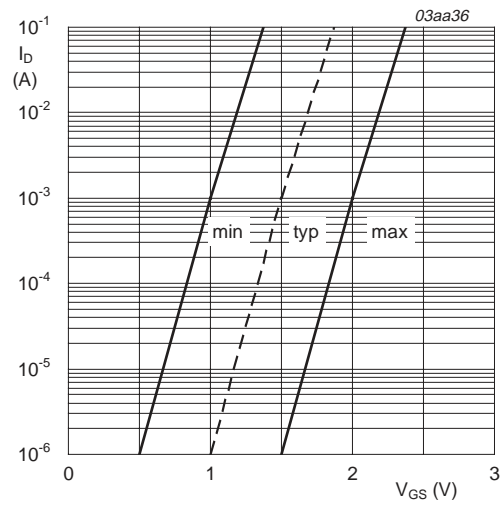
$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}C)}$$

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



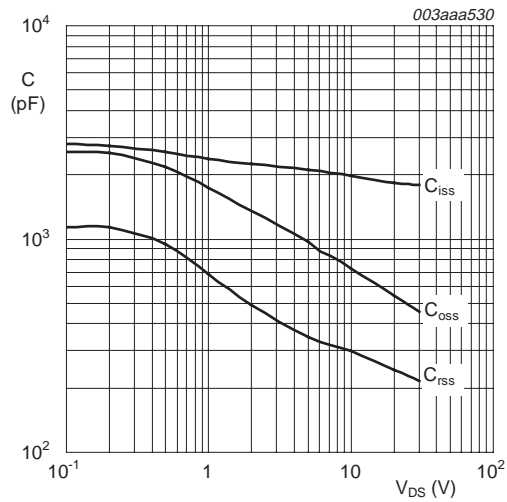
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



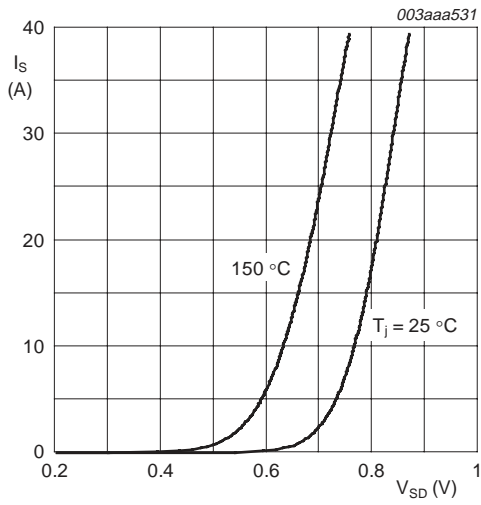
$T_j = 25 \text{ °C}; V_{DS} = 5 \text{ V}$

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



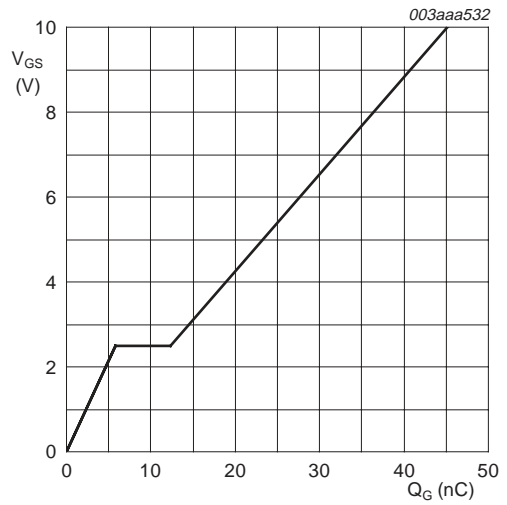
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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.



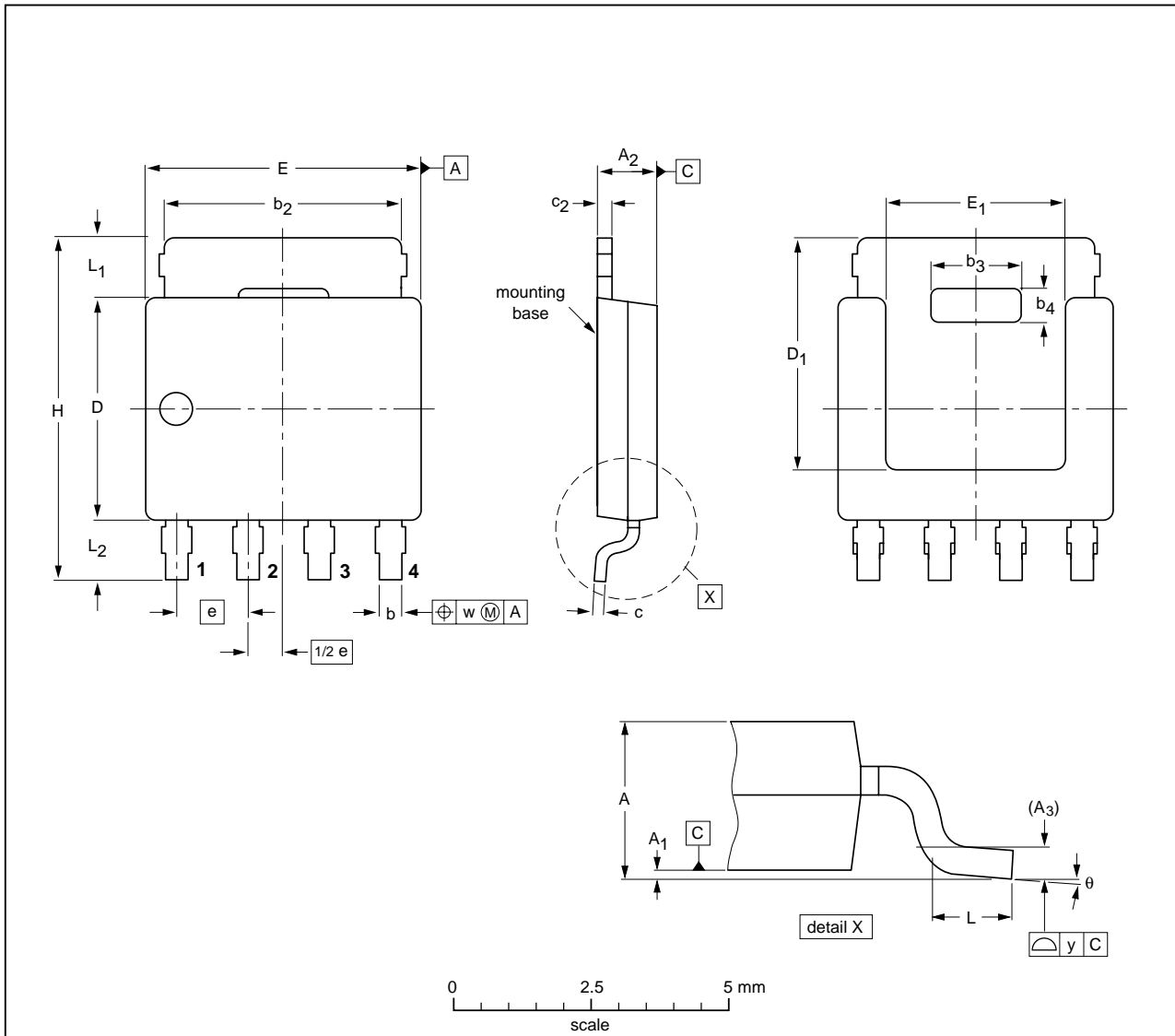
$I_D = 25\text{ A}$; $V_{DD} = 10\text{ V}$

Fig 13. Gate-source voltage as a function of gate charge; typical values.

7. Package outline

Plastic single-ended surface mounted package (LFAK); 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. SOT669 (LFAK) package outline.

8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PH4530L_2	20050126	Product data sheet	-	9397 750 14031	PH4530L_1
Modifications:					<ul style="list-style-type: none"> • Section 1.4 "Quick reference data" I_D and R_{DSon} values updated • Table 3 "Limiting values" I_D and I_{DM} values updated • Figure 3, Figure 6, Figure 11 and Figure 13 updated • Table 5 "Characteristics" R_{DSon}, $Q_{g(tot)}$, Q_{gs}, Q_{gd}, C_{iss}, C_{oss} and C_{rss} values updated.
PH4530L_1	20040304	Preliminary data sheet	-	9397 750 12813	-

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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