PH7030AL

N-channel TrenchMOS logic level FET

Rev. 03 — 12 January 2010 **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. This product is designed and qualified for use in computing and consumer applications.

1.2 Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for logic level gate drive sources

1.3 Applications

- Consumer applications
- Desktop Voltage Regulator Module (VRM)
- Notebook Voltage Regulator Module (VRM)

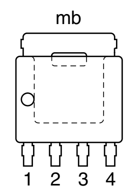
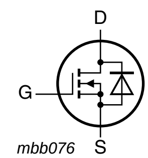
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	30	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1	-	-	76	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2	-	-	51	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5$ V; $I_D = 10$ A; $V_{DS} = 12$ V; see Figure 14 and 15	-	2.9	-	nC
$Q_{G(tot)}$	total gate charge		-	10	-	nC
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 15$ A; $T_j = 25$ °C	-	4.9	7	mΩ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 SOT669 (LFPAK)	
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

3. Ordering information

Table 3. Ordering information

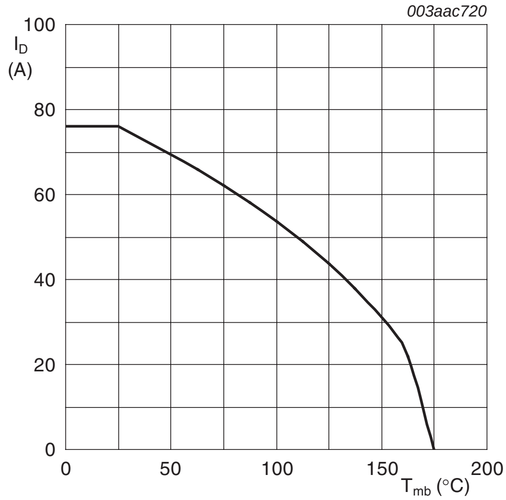
Type number	Package		
	Name	Description	Version
PH7030AL	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

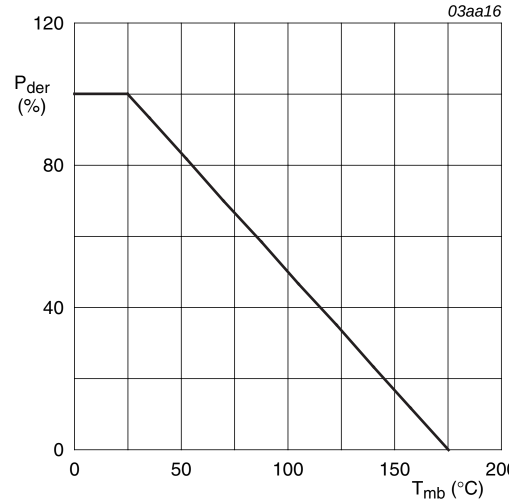
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	T_j ≥ 25 °C; T_j ≤ 175 °C	-	30	V
V_{DGR}	drain-gate voltage	T_j ≥ 25 °C; T_j ≤ 175 °C; R_{GS} = 20 kΩ	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; see Figure 1	-	53	A
		V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1	-	76	A
I_{DM}	peak drain current	t_p ≤ 10 µs; pulsed; T_{mb} = 25 °C; see Figure 3	-	260	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2	-	51	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	T_{mb} = 25 °C	-	65	A
I_{SM}	peak source current	t_p ≤ 10 µs; pulsed; T_{mb} = 25 °C	-	260	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 65 A; V_{sup} ≤ 30 V; R_{GS} = 50 Ω; unclamped	-	21	mJ



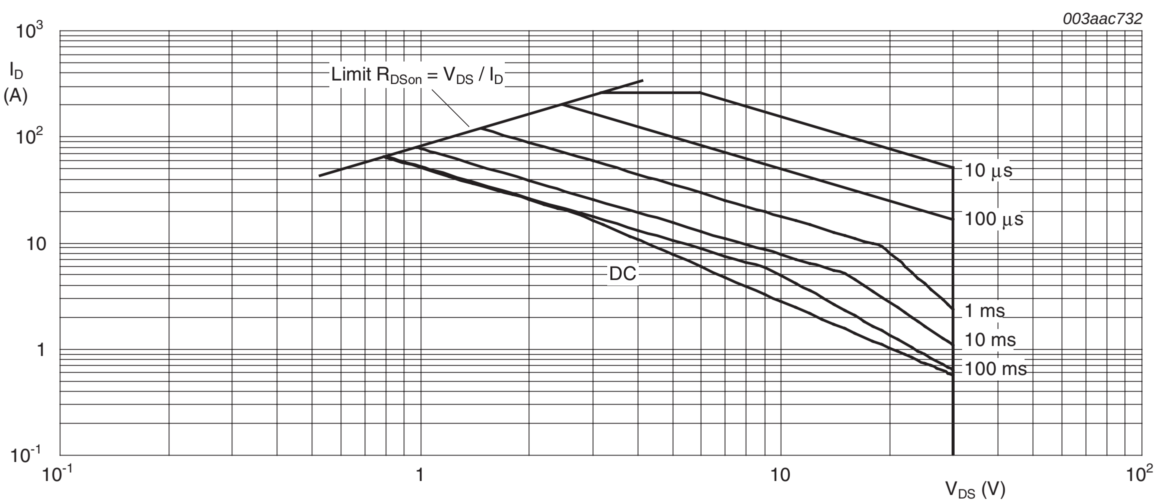
$$V_{GS} \geq 10\,V$$

Fig 1. Continuous drain current as a function of mounting base temperature



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

Fig 2. Normalized total power dissipation as a function of mounting base temperature



$$T_{mb} = 25\,°C; I_{DM} \text{ is single pulse}$$

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	1.4	2.45	K/W

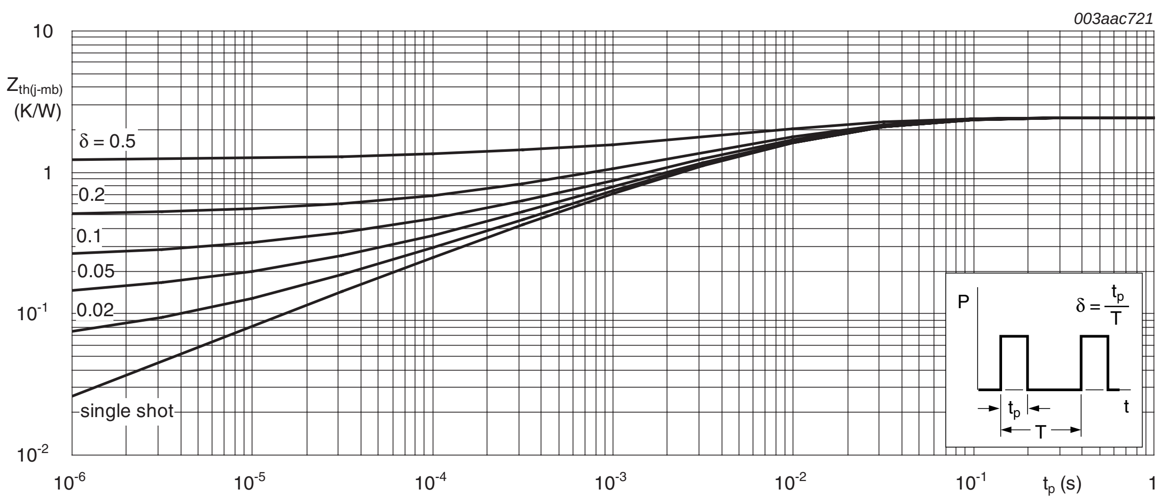


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

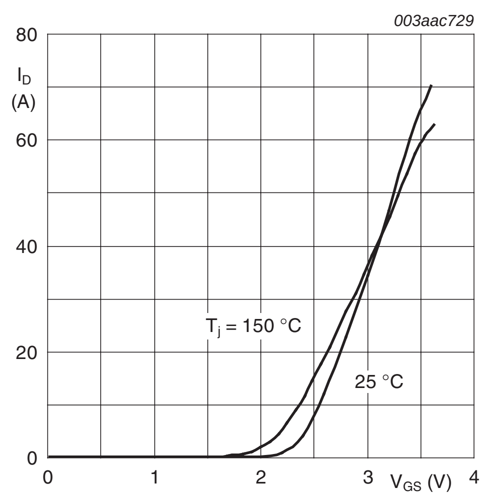
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 20 A; V_{GS} = 0 V; T_j = 25 °C; t_{av} = 100 ns	35	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C	30	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 11 and 12	1.3	1.7	2.15	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C; see Figure 12	0.65	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 12	-	-	2.45	V
I_{DSS}	drain leakage current	V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 °C	-	-	1	µA
		V_{DS} = 30 V; V_{GS} = 0 V; T_j = 150 °C	-	-	100	µA
I_{GSS}	gate leakage current	V_{GS} = 16 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
		V_{GS} = -16 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 15 A; T_j = 25 °C	-	6.97	9.1	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 150 °C; see Figure 13	-	-	12.2	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C	-	4.9	7	mΩ
R_G	gate resistance	f = 1 MHz	-	0.6	1.5	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 10 A; V_{DS} = 12 V; V_{GS} = 4.5 V; see Figure 14 and 15	-	10	-	nC
		I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V	-	20	-	nC
		I_D = 10 A; V_{DS} = 12 V; V_{GS} = 10 V; see Figure 14 and 15	-	22	-	nC
Q_{GS}	gate-source charge	I_D = 10 A; V_{DS} = 12 V; V_{GS} = 4.5 V; see Figure 14 and 15	-	3.7	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	2.1	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	1.6	-	nC
Q_{GD}	gate-drain charge		-	2.9	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	V_{DS} = 12 V; see Figure 14 and 15	-	2.6	-	V
C_{iss}	input capacitance	V_{DS} = 12 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 16	-	1270	-	pF
C_{oss}	output capacitance		-	255	-	pF
C_{rss}	reverse transfer capacitance		-	145	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 12 V; R_L = 0.5 Ω; V_{GS} = 4.5 V; $R_{G(ext)}$ = 4.7 Ω	-	24	-	ns
t_r	rise time		-	39	-	ns
$t_{d(off)}$	turn-off delay time		-	30	-	ns
t_f	fall time		-	11	-	ns

Table 6. Characteristics *…continued*

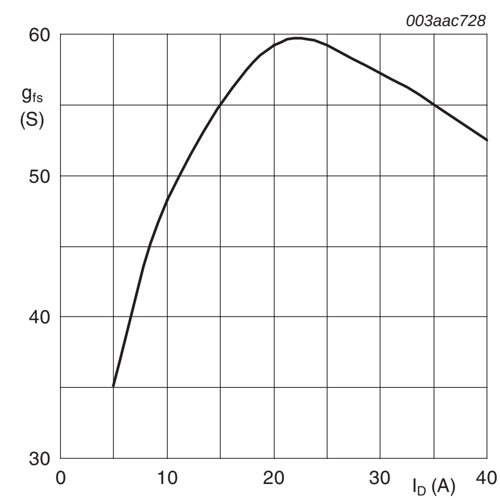
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 17	-	0.88	1.2	V
t_{rr}	reverse recovery time	I_S = 20 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 20 V	-	30	-	ns
Q_r	recovered charge		-	22	-	nC

[1] Tested to JEDEC standards where applicable.



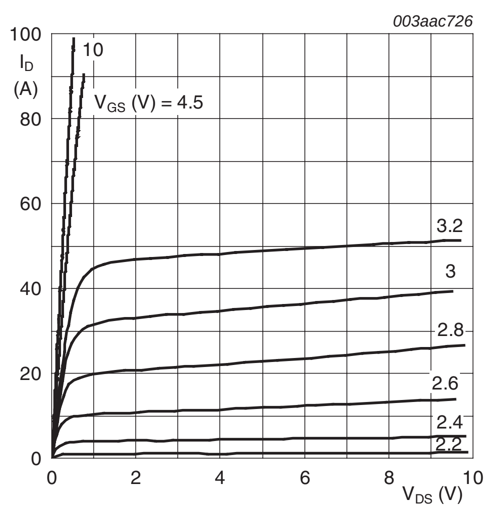
$$V_{DS} = 10\,V$$

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



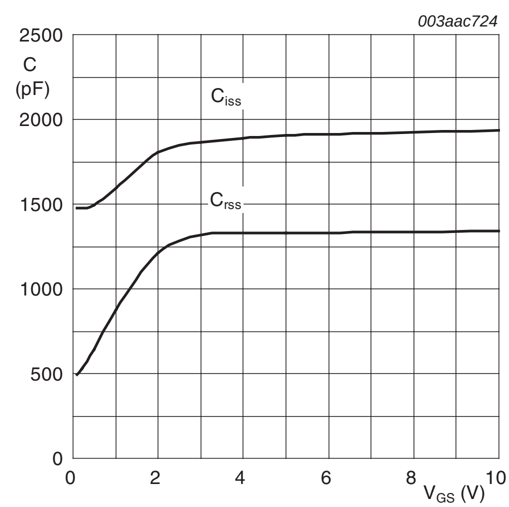
$$T_j = 25\,°C; V_{DS} = 15\,V$$

Fig 6. Forward transconductance as a function of drain current; typical values



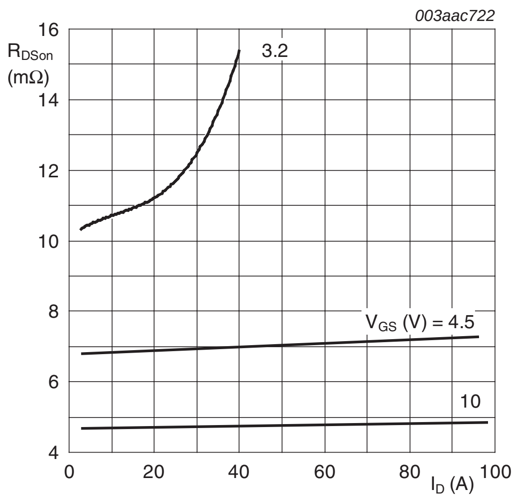
$$T_j = 25\,°C; t_p = 300\,\mu s$$

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



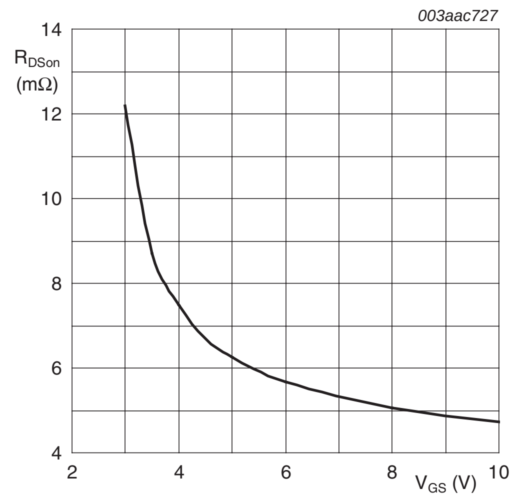
$$V_{DS} = 0\,V; f = 1\,MHz$$

Fig 8. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



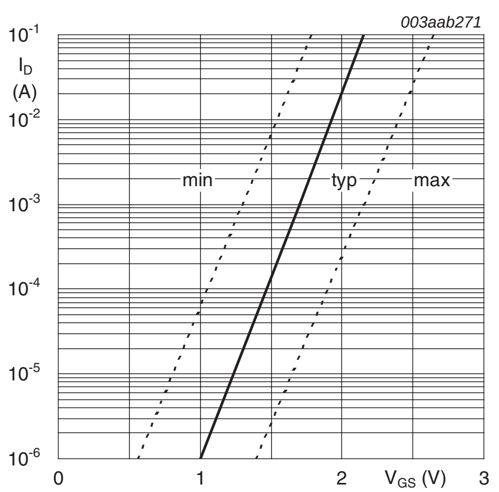
$T_j = 25\,°C; t_p = 300\,\mu s$

Fig 9. Drain-source on-state resistance as a function of drain current; typical values



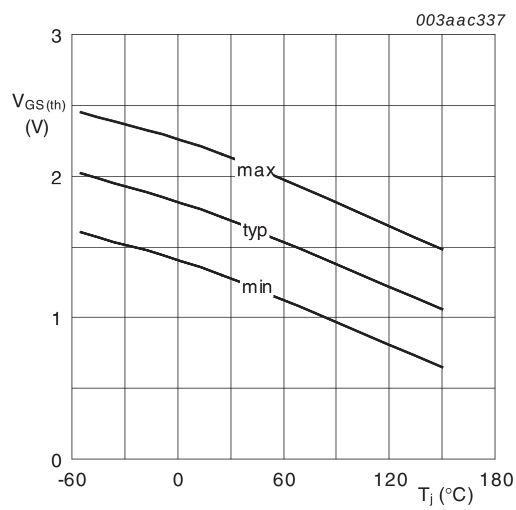
$T_j = 25\,°C; I_D = 15A$

Fig 10. Drain-source on-state resistance as a function of gate-source voltage; typical values



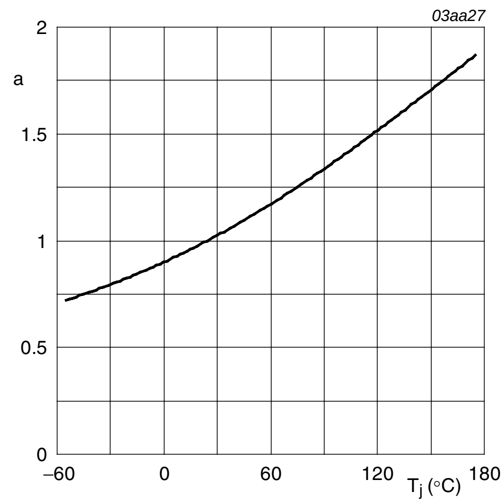
$T_j = 25\,°C; V_{DS} = 5\,V$

Fig 11. Sub-threshold drain current as a function of gate-source voltage



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

Fig 12. Gate-source threshold voltage as a function of junction temperature



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

Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

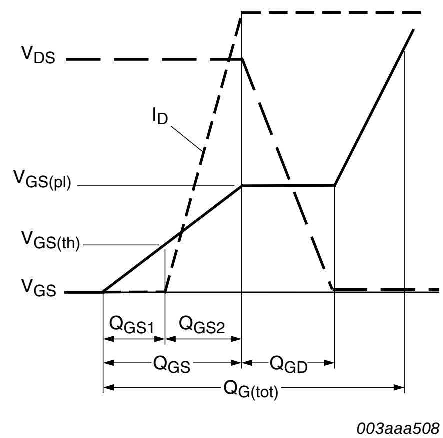
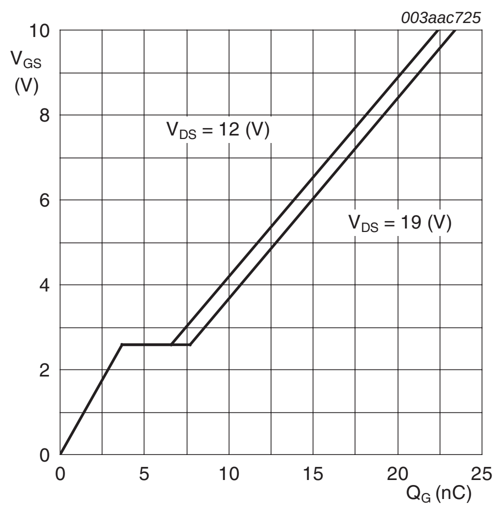
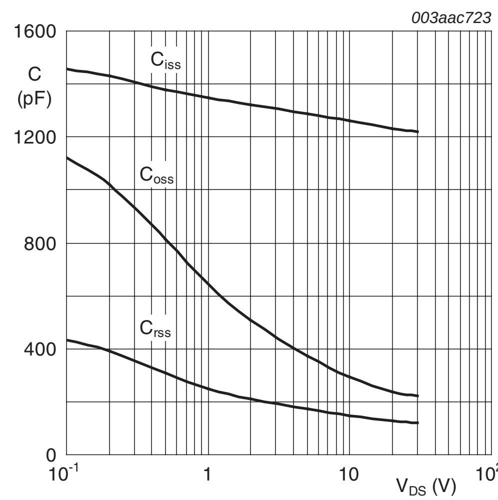


Fig 14. Gate charge waveform definitions



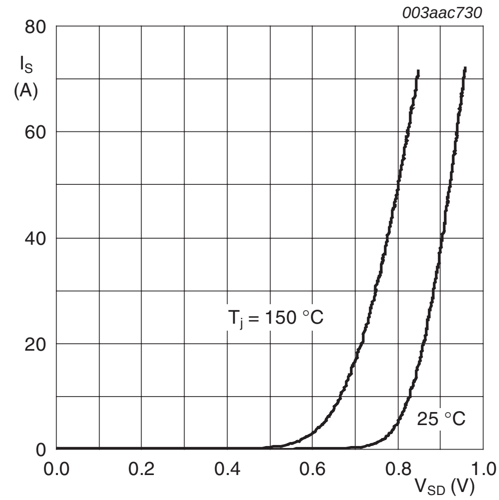
$$T_j = 25°C; I_D = 10A$$

Fig 15. Gate-source voltage as a function of gate charge; typical values



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

Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

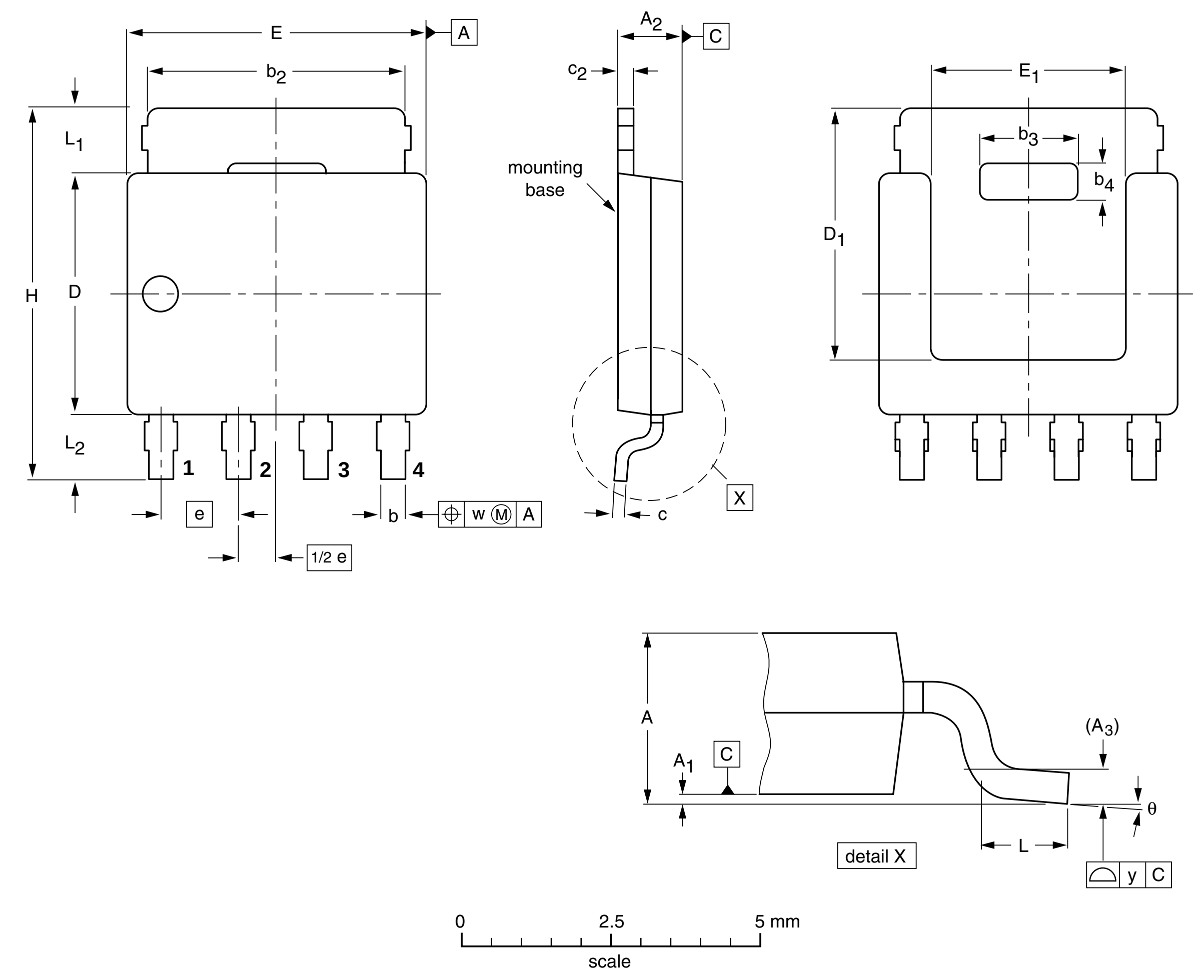


$V_{GS} = 0\,V$

Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (LFPAK); 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				~~04-10-13~~ 06-03-16

Fig 18. Package outline SOT669 (LFPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PH7030AL_3	20100112	Product data sheet	-	PH7030AL_2
Modifications:	• Various changes to content.			
PH7030AL_2	20090121	Product data sheet	-	PH7030AL_1
PH7030AL_1	20080819	Preliminary data sheet	-	-

9. Legal information

9.1 Data sheet status

Document status [1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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11. Contents

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