



PH3075L

N-channel TrenchMOS™ logic level FET

Rev. 01 — 25 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
- 175 °C rated
- Very low on-state resistance
- Surface mounted package.

1.3 Applications

- DC-to-DC converters
- DC motor speed control.
- General purpose power switching

1.4 Quick reference data

- $V_{DS} \leq 75 \text{ V}$
- $R_{DS(on)} \leq 28 \text{ m}\Omega$
- $I_D \leq 30 \text{ A}$
- $Q_{gd} = 9 \text{ nC (typ.)}$.

2. Pinning information

Table 1: Pinning

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

SOT669 (LFAK)

3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
PH3075L	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)	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	75	V
V_{DGR}	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	75	V
V_{GS}	gate-source voltage (DC)		-	± 15	V
I_D	drain current (DC)	$T_{mb} = 25\text{ °C}$; $V_{GS} = 5\text{ V}$; Figure 2 and 3	-	30	A
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 5\text{ V}$; Figure 2	-	21	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Figure 3	-	120	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Figure 1	-	75	W
T_{stg}	storage temperature		-55	+175	°C
T_j	junction temperature		-55	+175	°C

Source-drain diode

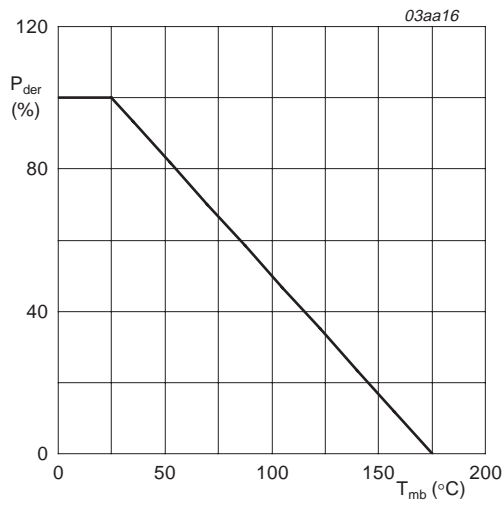
I_S	source (diode forward) current (DC)	$T_{mb} = 25\text{ °C}$	-	30	A
I_{SM}	peak source (diode forward) current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	120	A

Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 30\text{ A}$; $V_{DD} \leq 75\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$ starting at $T_j = 25\text{ °C}$	-	89	mJ
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 3\text{ A}$; $V_{DD} \leq 75\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$	[1] - [2]	0.89	mJ

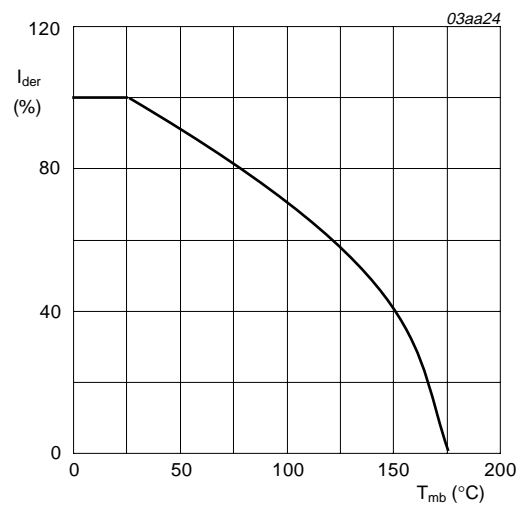
[1] Duty cycle is limited by the maximum junction temperature.

[2] Repetitive avalanche failure is not determined simply by thermal effects. Repetitive avalanche transients should only be applied for short bursts, not every switching cycle.



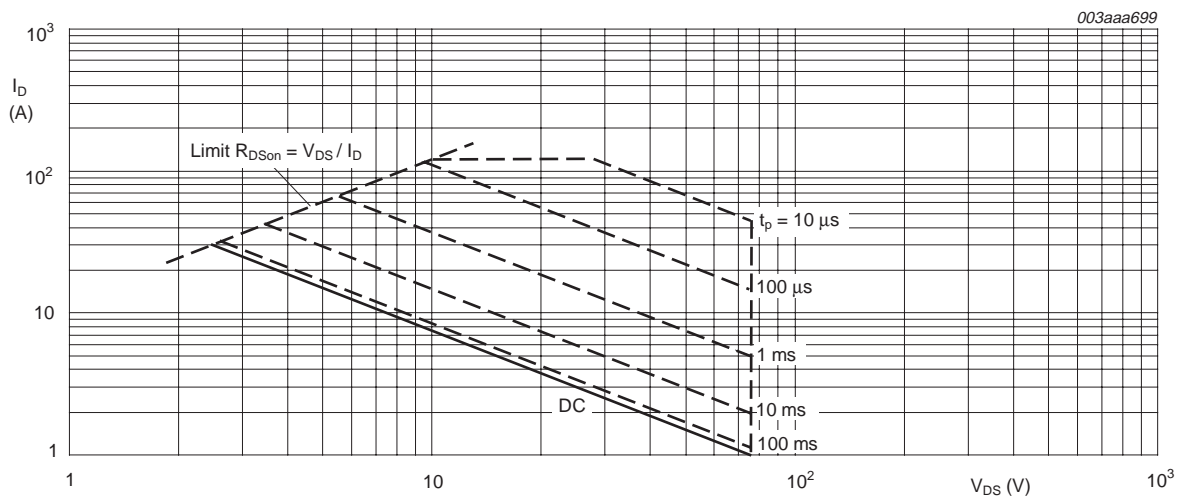
$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100\%$$

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



$T_{mb} = 25^\circ C$; 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

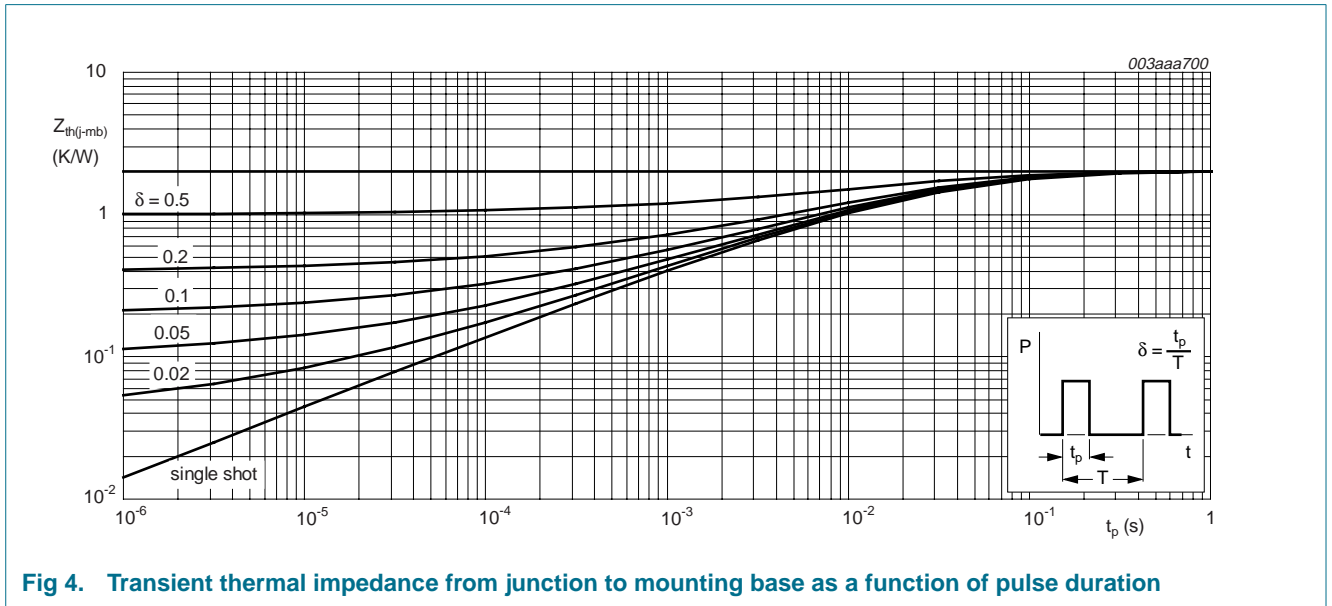
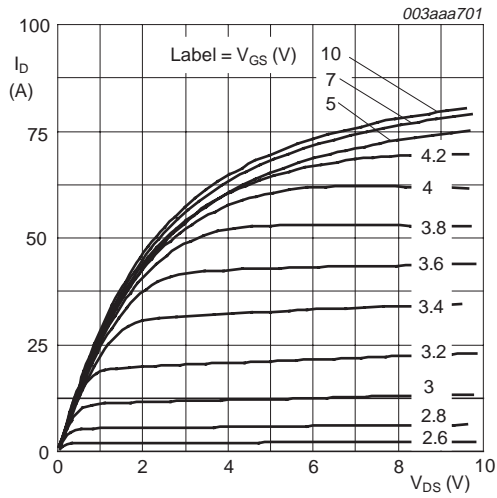


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

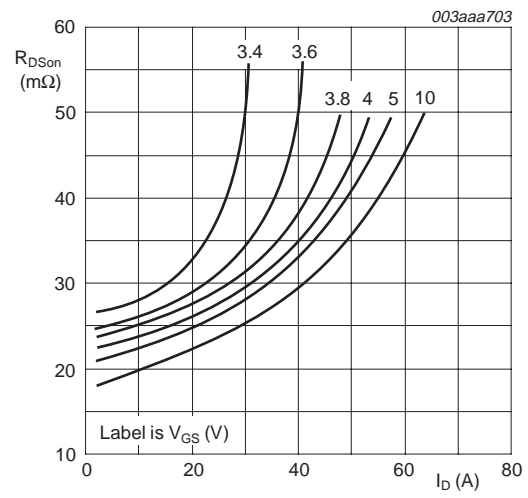
Table 5: Characteristics
T_j = 25 °C unless otherwise specified.

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	75	-	-	V
		T _j = -55 °C	70	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; Figure 9 and 10				
		T _j = 25 °C	1	1.5	2	V
		T _j = 175 °C	0.5	-	-	V
		T _j = -55 °C	-	-	2.3	V
I _{DSS}	drain-source leakage current	V _{DS} = 75 V; V _{GS} = 0 V				
		T _j = 25 °C	-	-	1	μA
		T _j = 175 °C	-	-	500	μA
I _{GSS}	gate-source leakage current	V _{GS} = ±15 V; V _{DS} = 0 V	-	2	100	nA
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 5 V; I _D = 15 A; Figure 6 and 8				
		T _j = 25 °C	-	25	30	mΩ
		T _j = 175 °C	-	-	72	mΩ
		V _{GS} = 4.5 V; I _D = 15 A; Figure 6 and 8	-	-	34	mΩ
		V _{GS} = 10 V; I _D = 15 A; Figure 6 and 8	-	23	28	mΩ
Dynamic characteristics						
Q _{g(tot)}	total gate charge	I _D = 25 A; V _{DD} = 60 V; V _{GS} = 5 V; Figure 11	-	19	-	nC
Q _{gs}	gate-source charge		-	5	-	nC
Q _{gd}	gate-drain (Miller) charge		-	9	-	nC
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz; Figure 12	-	1550	2070	pF
C _{oss}	output capacitance		-	150	179	pF
C _{rss}	reverse transfer capacitance		-	60	80	pF
t _{d(on)}	turn-on delay time	V _{DD} = 30 V; R _L = 1.2 Ω; V _{GS} = 5 V; R _G = 10 Ω	-	16	-	ns
t _r	rise time		-	106	-	ns
t _{d(off)}	turn-off delay time		-	51	-	ns
t _f	fall time		-	83	-	ns
Source-drain diode						
V _{SD}	source-drain (diode forward) voltage	I _S = 15 A; V _{GS} = 0 V; Figure 13	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs;	-	100	-	ns
Q _r	recovered charge	V _{GS} = -10 V; V _R = 30 V	-	115	-	nC



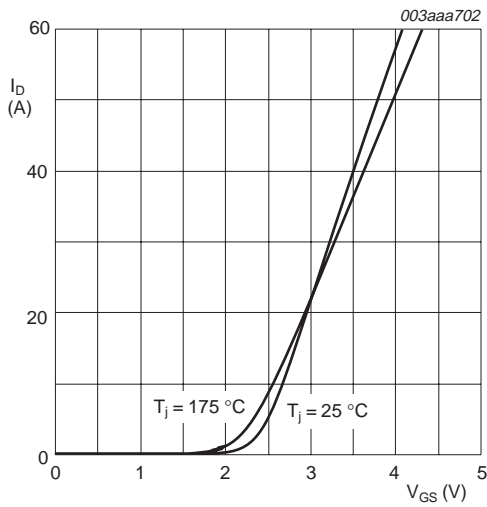
T_j = 25 °C

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



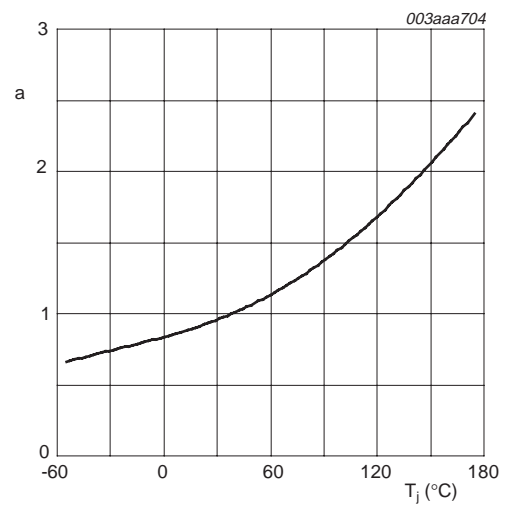
T_j = 25 °C

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



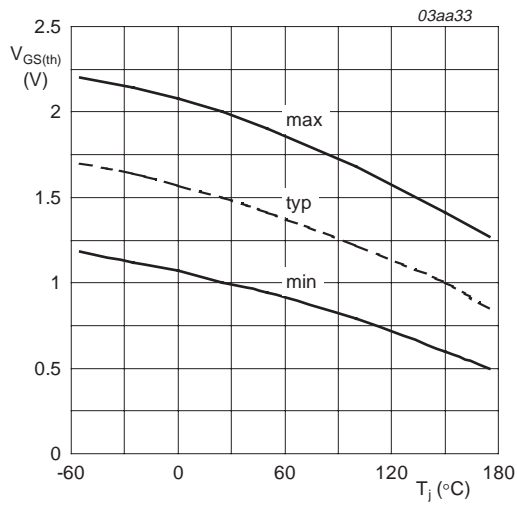
T_j = 25 °C and 175 °C; V_{DS} > I_D × R_{DSon}

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



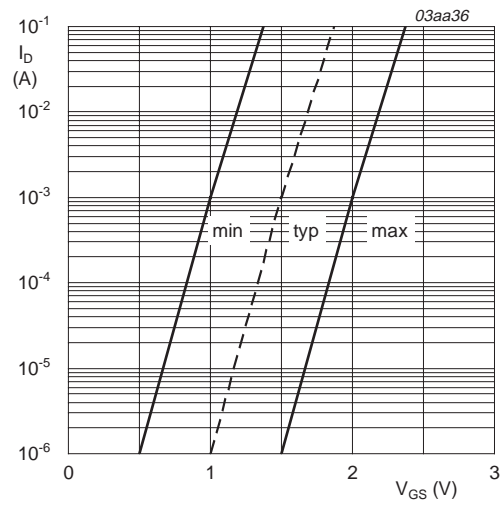
$$a = \frac{R_{DSon}}{R_{DSon(25\text{ }^\circ\text{C})}}$$

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



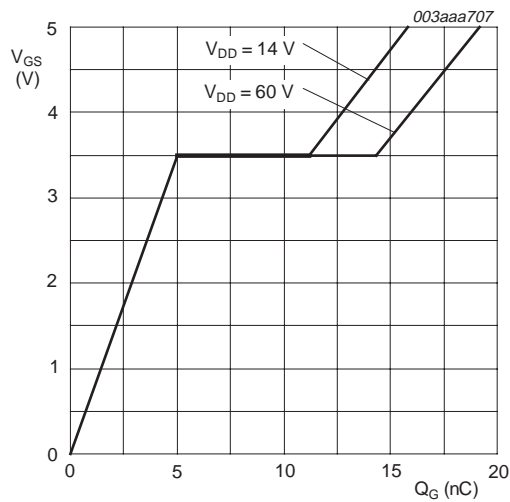
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



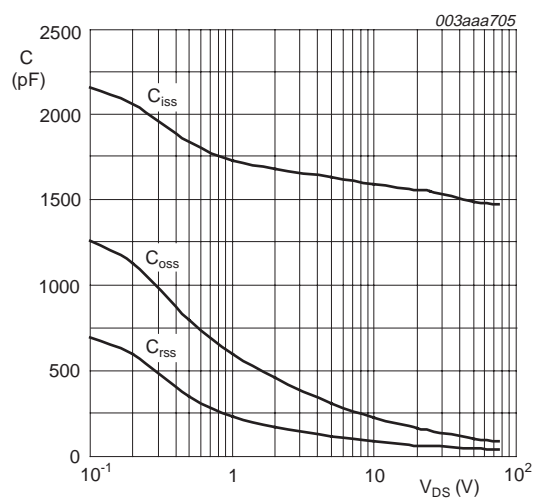
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = V_{GS}$

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



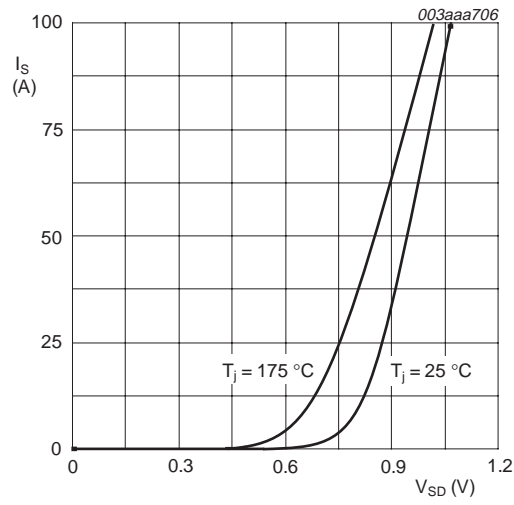
$I_D = 25 \text{ A}; V_{DD} = 14 \text{ V and } 60 \text{ V}$

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



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

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$T_j = 25\text{ °C}$ and 175 °C ; $V_{GS} = 0\text{ V}$

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

7. Package outline

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

SOT669

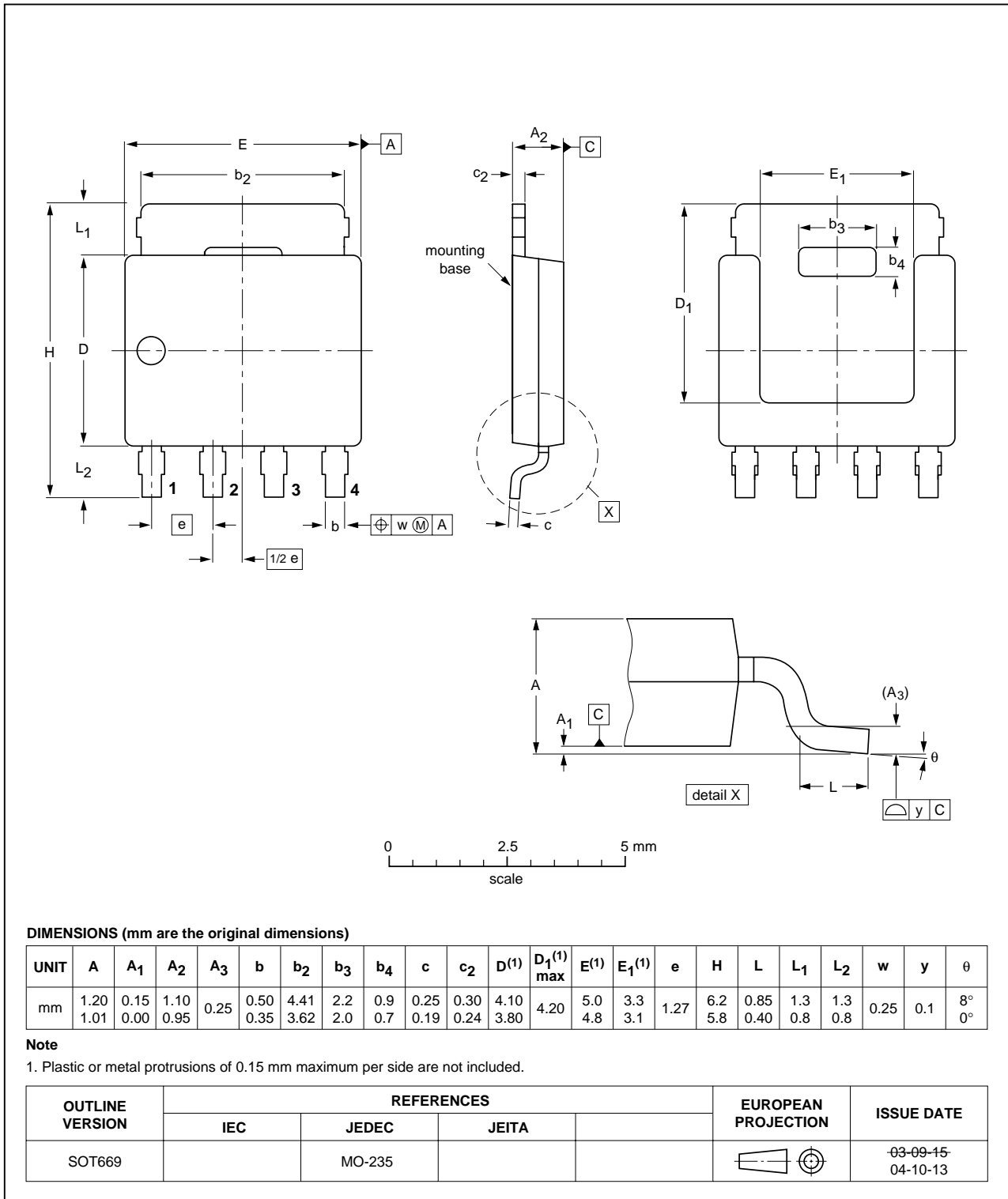


Fig 14. Package outline SOT669 (LPAK)

8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PH3075L_1	20050225	Product data sheet	-	9397 750 14603	-

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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