



PHK5NQ15T

N-channel TrenchMOS standard level FET

Rev. 4 — 23 December 2011

Product data sheet

1. Product profile

1.1 General description

Standard 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, communications, consumer and industrial applications only.

1.2 Features and benefits

- Low conduction losses due to low on-state resistance

1.3 Applications

- DC-to-DC convertors switching
- General purpose switching

1.4 Quick reference data

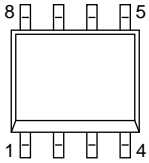
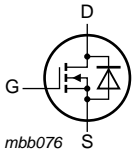
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	-	150	V
I_D	drain current	$T_{sp} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see Figure 1 ; see Figure 3	-	-	5	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C};$ see Figure 2	-	-	6.25	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C};$ see Figure 9 ; see Figure 10	-	56	75	m Ω
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; V_{DS} = 75\text{ V}; T_j = 25\text{ °C};$ see Figure 11	-	12	-	nC



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>SOT96-1 (SO8)</p>	
2	S	source		
3	S	source		
4	G	gate		
5	D	drain		
6	D	drain		
7	D	drain		
8	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PHK5NQ15T	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Limiting values

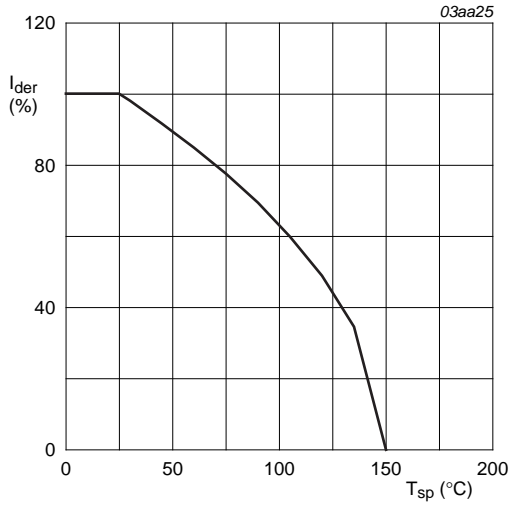
Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	150	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}; R_{GS} = 20\text{ k}\Omega$	-	150	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$T_{sp} = 100\text{ °C}; V_{GS} = 10\text{ V};$ see Figure 1	-	3.23	A
		$T_{sp} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see Figure 1 ; see Figure 3	-	5	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ see Figure 3	-	20	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C};$ see Figure 2	-	6.25	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C

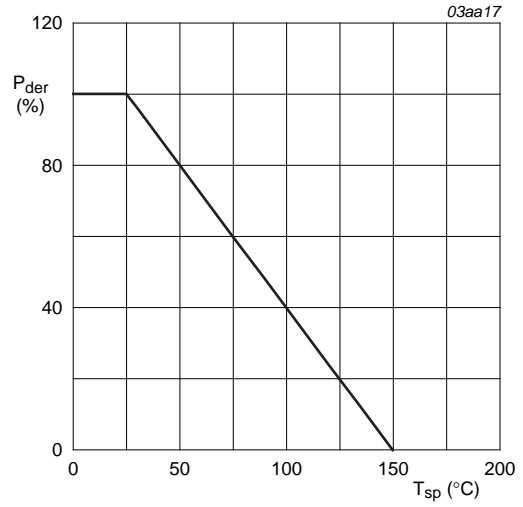
Source-drain diode

I_S	source current	$T_{sp} = 25\text{ °C}$	-	5	A
I_{SM}	peak source current	$T_{sp} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	20	A



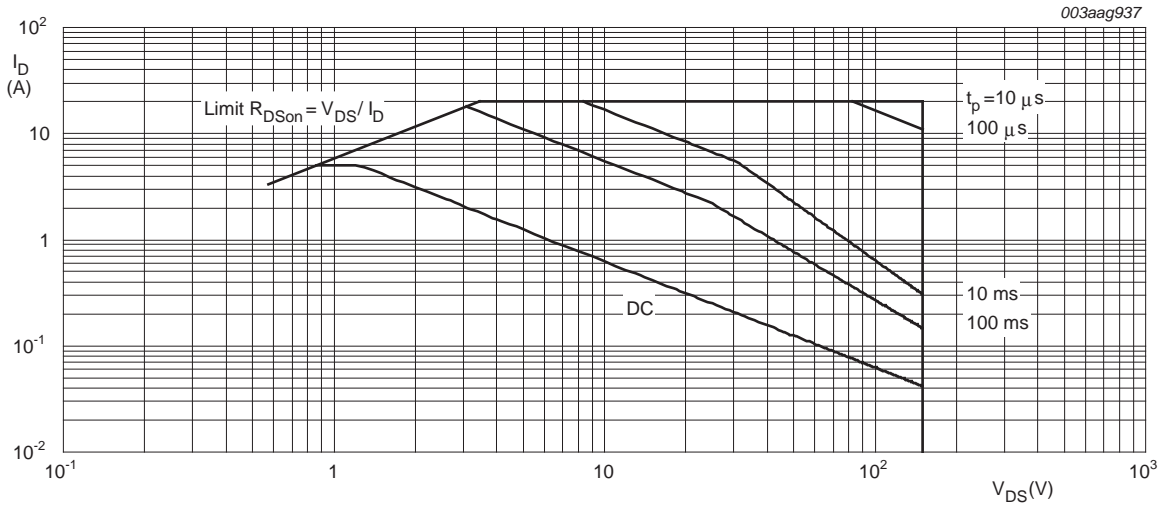
$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

Fig 1. Normalized continuous drain current as a function of solder point temperature



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

Fig 2. Normalized total power dissipation as a function of solder point temperature



$T_{mb} = 25^\circ\text{C}$; I_{DM} is a 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
$R_{th(j-sp)}$	thermal resistance from junction to solder point	see Figure 4	-	-	20	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; mounted on printed-circuit board	-	70	-	K/W

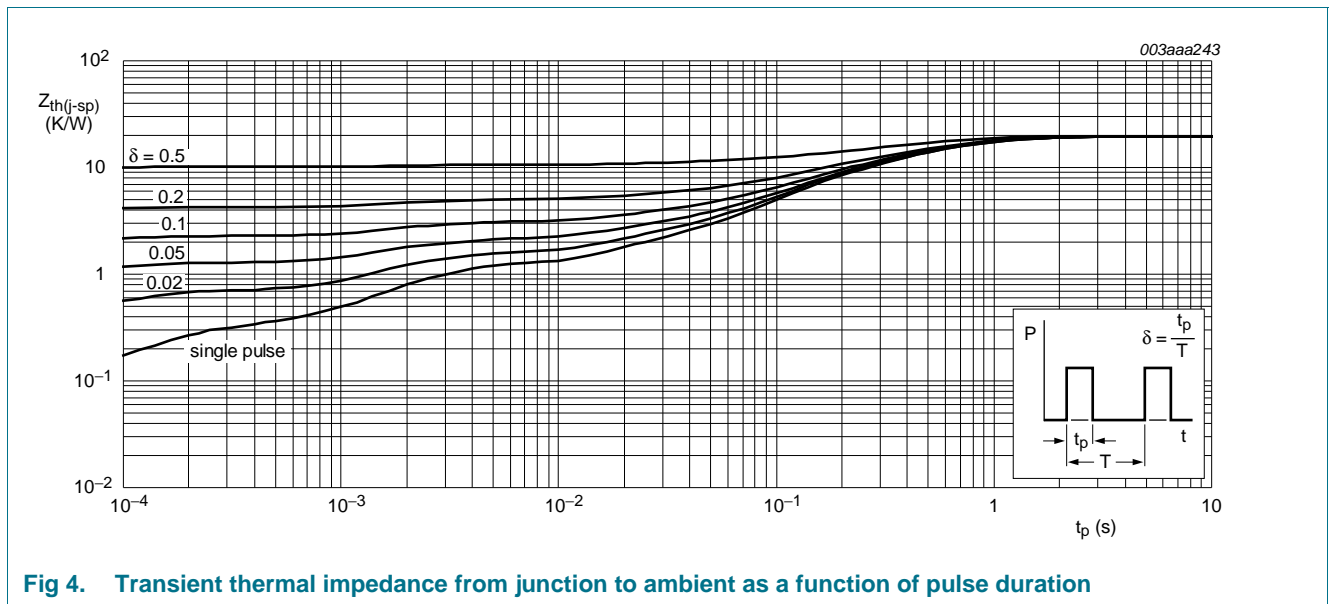


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	134	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	150	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 8	-	-	4.5	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ }^\circ\text{C};$ see Figure 8	1.2	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 8	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 120 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	1	μA
		$V_{DS} = 120 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 150 \text{ }^\circ\text{C};$ see Figure 9 ; see Figure 10	-	129	173	m Ω
		$V_{GS} = 5 \text{ V}; I_D = 3 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	60	80	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 9 ; see Figure 10	-	56	75	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 5 \text{ A}; V_{DS} = 75 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 11	-	29	-	nC
Q_{GS}	gate-source charge		-	3	-	nC
Q_{GD}	gate-drain charge		-	12	-	nC
C_{iss}	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 12	-	1150	-	pF
C_{oss}	output capacitance		-	187	-	pF
C_{rss}	reverse transfer capacitance		-	61	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 75 \text{ V}; R_L = 15 \text{ } \Omega; V_{GS} = 10 \text{ V};$ $R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}; I_D = 5 \text{ A}$	-	12	-	ns
t_r	rise time		-	12	-	ns
$t_{d(off)}$	turn-off delay time		-	35	-	ns
t_f	fall time		-	18	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 5 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 13	-	0.8	1.2	V
t_{rr}	reverse recovery time	$I_S = 5 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s}; V_{GS} = 0 \text{ V};$ $V_{DS} = 90 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	87	-	ns
Q_r	recovered charge		-	162	-	nC

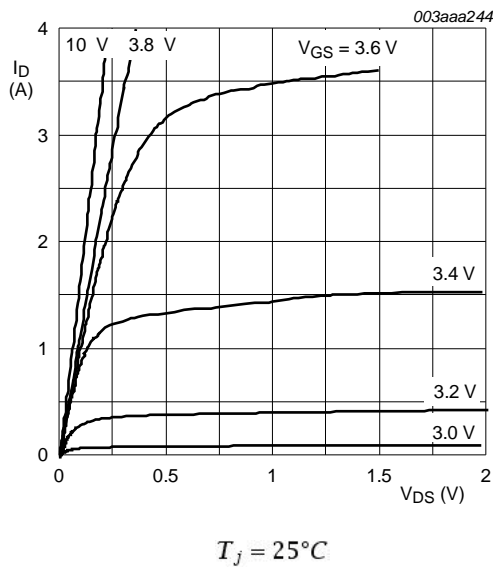


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

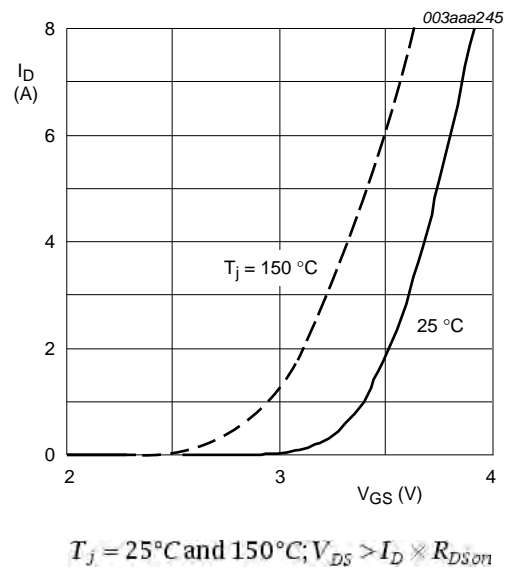


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

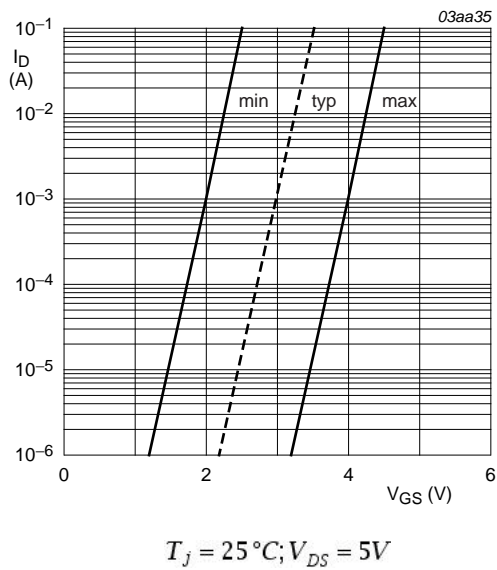


Fig 7. Sub-threshold drain current as a function of gate-source voltage

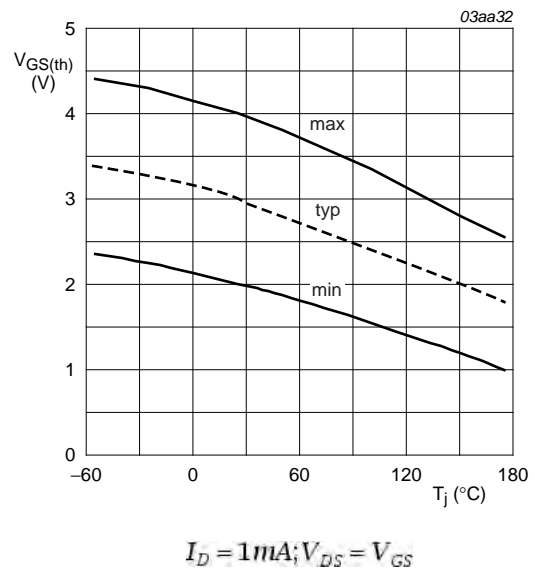


Fig 8. Gate-source threshold voltage as a function of junction temperature

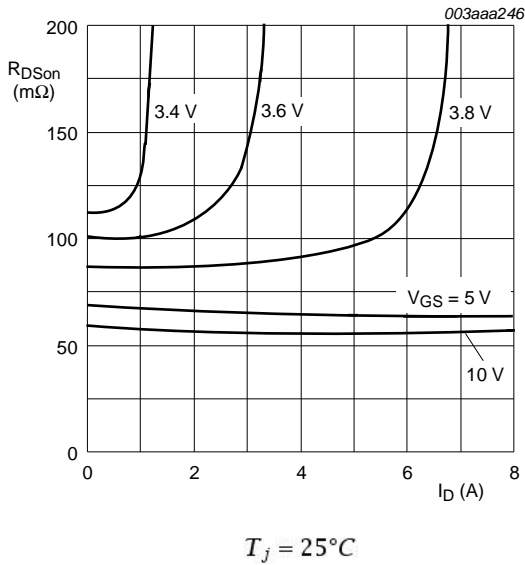


Fig 9. Drain-source on-state resistance as a function of drain current; typical values

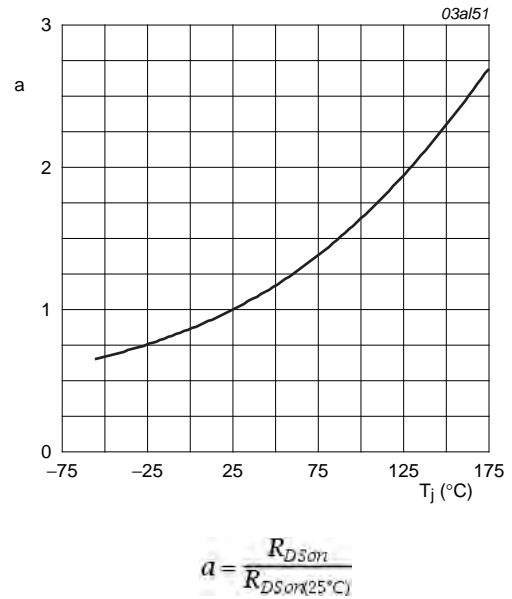


Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature

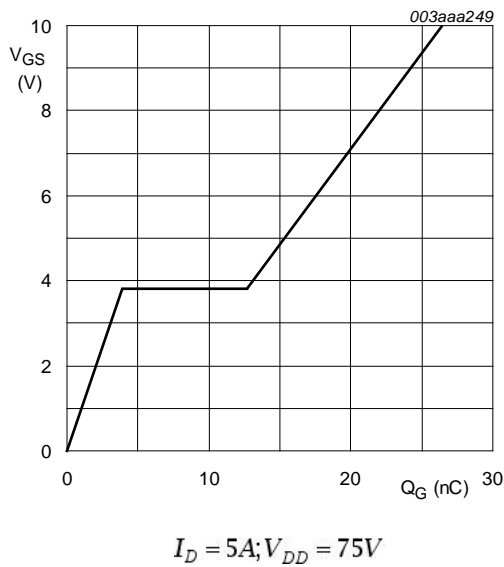


Fig 11. Gate-source voltage as a function of gate charge; typical values

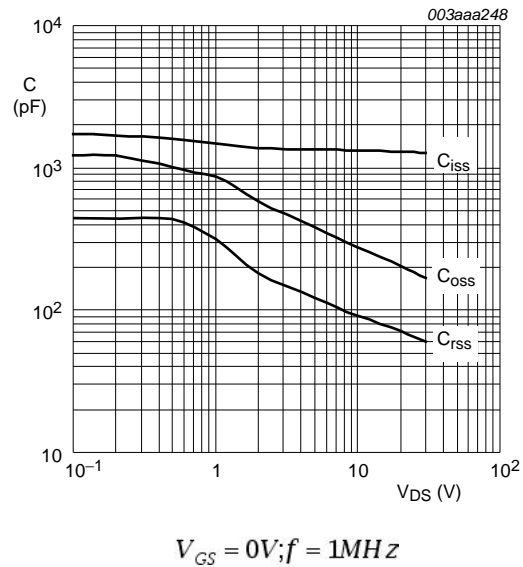


Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

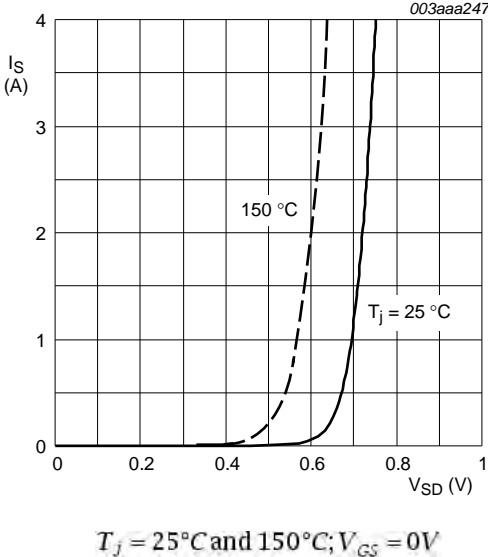


Fig 13. Source current as a function of source-drain voltage; typical values

7. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1

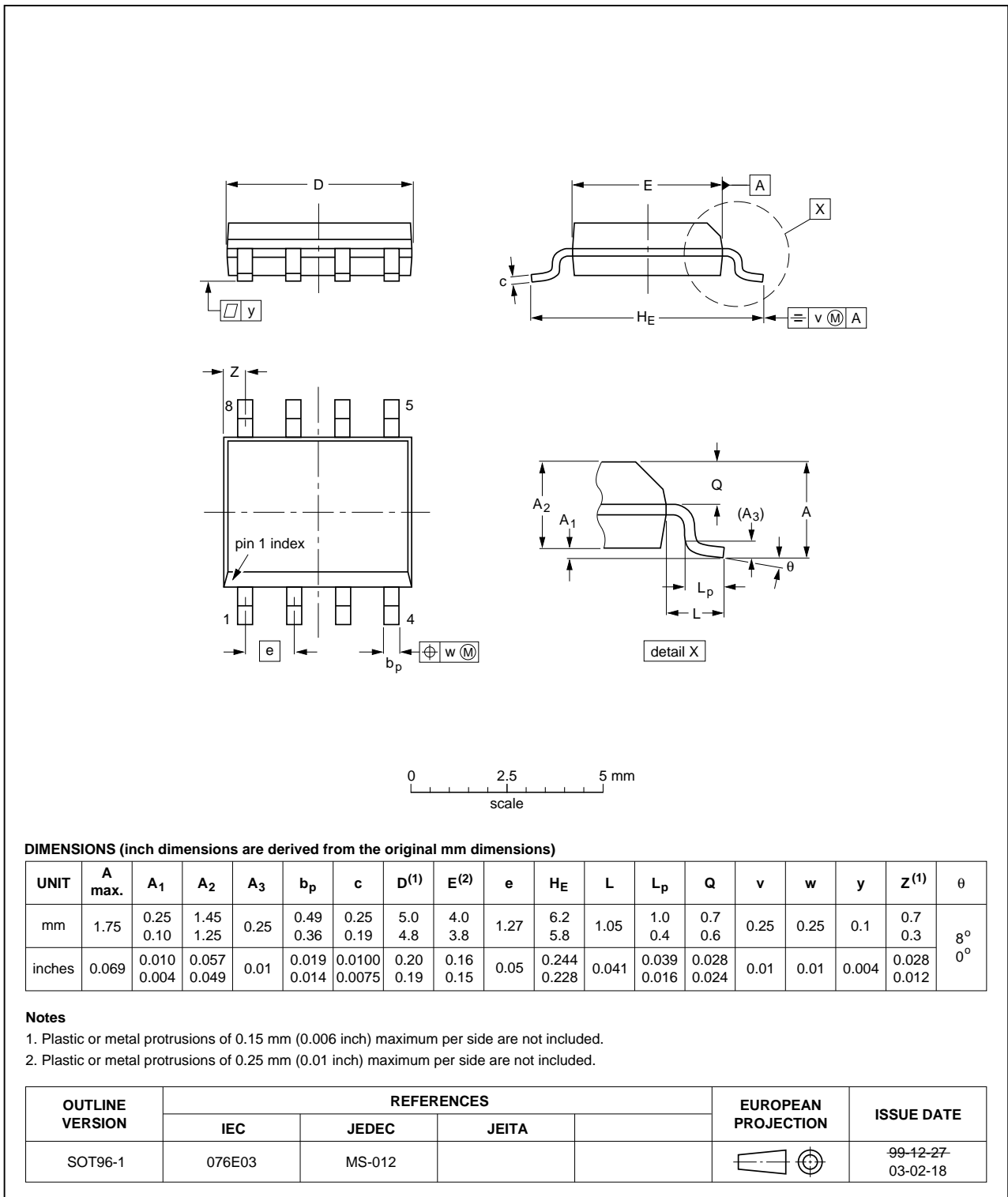


Fig 14. Package outline SOT96-1 (SO8)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHK5NQ15T v.4	20111223	Product data sheet	-	PHK5NQ15T v.3
Modifications:	• Various changes to content.			
PHK5NQ15T v.3	20111121	Product data sheet	-	PHK5NQ15T v.2

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.

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

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