

# PML260SN

## N-channel TrenchMOS standard level FET

Rev. 02 — 29 May 2006

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a surface-mounted plastic package using TrenchMOS technology.

### 1.2 Features

- Standard level threshold
- Very low thermal impedance
- Low profile and small footprint
- Low on-state resistance

### 1.3 Applications

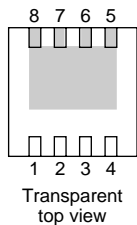
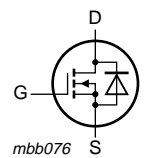
- Primary side switching
- Portable appliances
- DC-to-DC converters

### 1.4 Quick reference data

- $V_{DS} \leq 200$  V
- $I_D \leq 8.8$  A
- $R_{DS(on)} \leq 294$  m $\Omega$
- $Q_{GD} = 4.2$  nC (typ)

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 3	source (S)		
4	gate (G)		
5, 6, 7, 8	drain (D)		

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### 3. Ordering information

**Table 2. Ordering information**

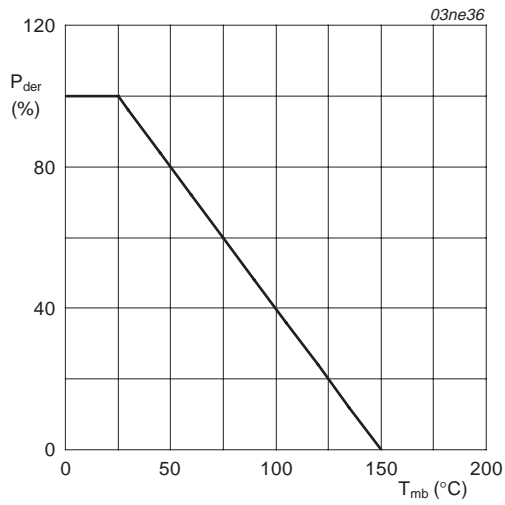
Type number	Package		Version
	Name	Description	
PML260SN	HVSON8	plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3.3 × 3.3 × 0.85 mm	SOT873-1

### 4. Limiting values

**Table 3. Limiting values**

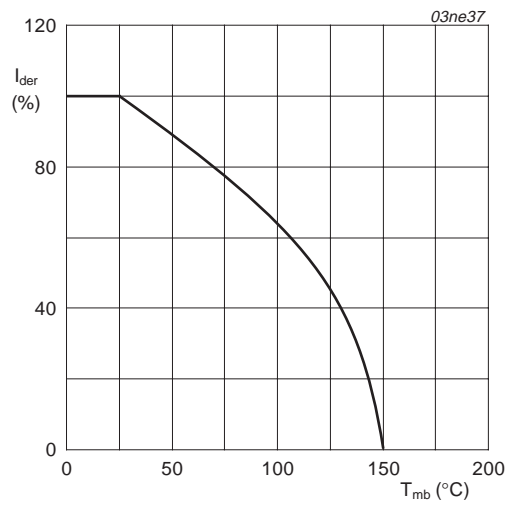
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	200	V
$V_{GS}$	gate-source voltage		-	±20	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 2</a> and <a href="#">3</a>	-	8.8	A
		$T_{mb} = 100\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 2</a>	-	5.5	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ see <a href="#">Figure 3</a>	-	15	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 1</a>	-	50	W
$T_{stg}$	storage temperature		-55	+150	°C
$T_j$	junction temperature		-55	+150	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25\text{ °C}$	-	8.8	A
$I_{SM}$	peak source current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	15	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 3.5\text{ A};$ $t_p = 0.05\text{ ms}; V_{DS} \leq 200\text{ V}; R_{GS} = 50\text{ }\Omega;$ $V_{GS} = 10\text{ V};$ starting at $T_j = 25\text{ °C}$	-	22	mJ



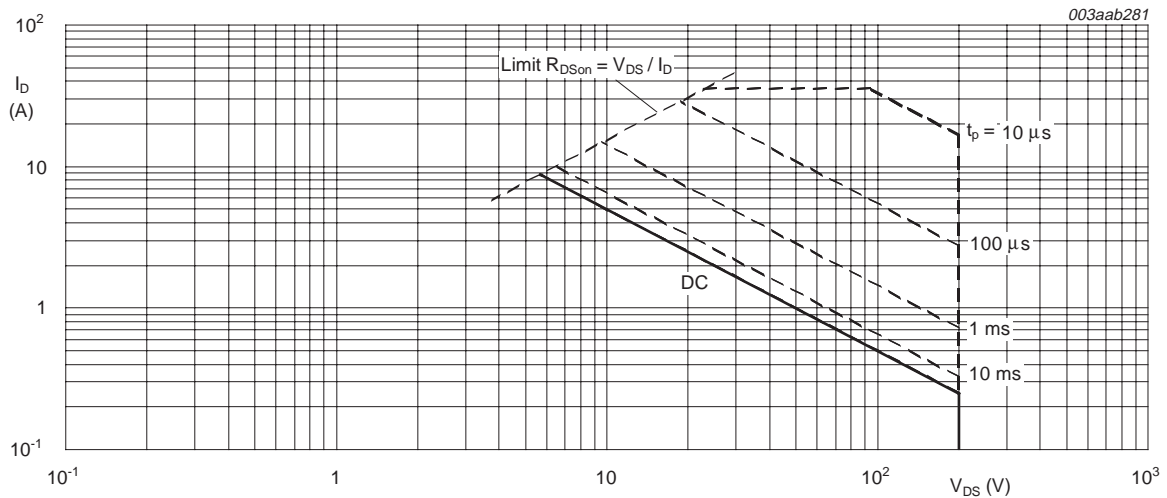
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



$T_{mb} = 25^{\circ}C$ ;  $I_{DM}$  is single pulse;  $V_{GS} = 10V$

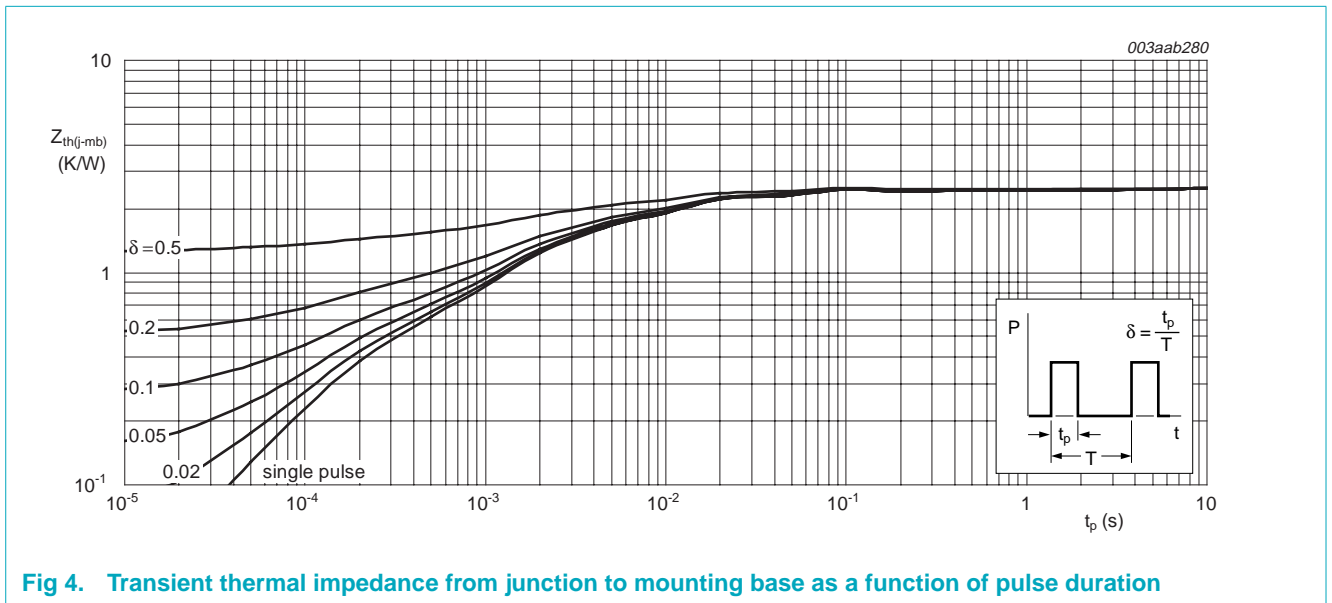
Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

### 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	see <a href="#">Figure 4</a>	-	-	2.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint	[1]	-	60	-

[1] Mounted on a printed-circuit board; vertical in still air.

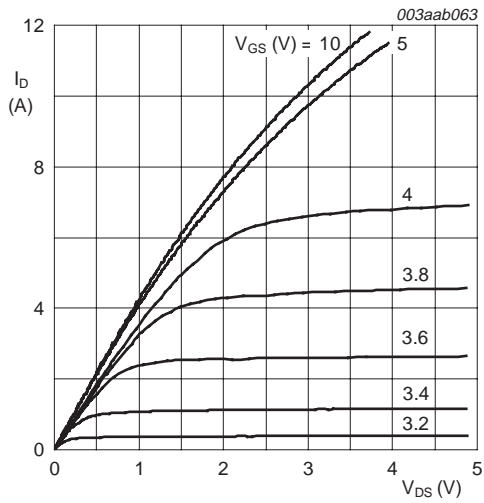


## 6. Characteristics

**Table 5. Characteristics**

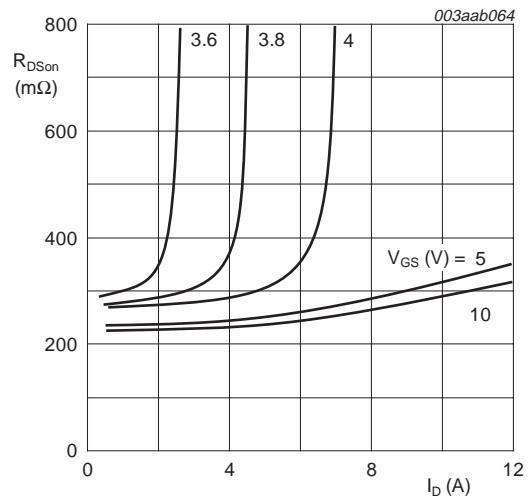
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$ ; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ °C}$	200	-	-	V
		$T_j = -55\text{ °C}$	178	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\text{ mA}$ ; $V_{DS} = V_{GS}$ ; see <a href="#">Figure 9</a> and <a href="#">10</a>				
		$T_j = 25\text{ °C}$	2	3	4	V
		$T_j = 150\text{ °C}$	1.2	-	-	V
		$T_j = -55\text{ °C}$	-	-	4.4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 160\text{ V}$ ; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ °C}$	-	-	1	$\mu\text{A}$
		$T_j = 150\text{ °C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	10	100	nA
$R_G$	gate resistance	$f = 1\text{ MHz}$	-	0.6	-	$\Omega$
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 2.6\text{ A}$ ; see <a href="#">Figure 6</a> and <a href="#">8</a>				
		$T_j = 25\text{ °C}$	-	250	294	m $\Omega$
		$T_j = 150\text{ °C}$	-	550	647	m $\Omega$
		$V_{GS} = 6\text{ V}$ ; $I_D = 2.5\text{ A}$	-	263	309	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 2.6\text{ A}$ ; $V_{DS} = 100\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 11</a> and <a href="#">12</a>	-	13.3	-	nC
$Q_{GS}$	gate-source charge		-	2.4	-	nC
$Q_{GS1}$	pre- $V_{GS(th)}$ gate-source charge		-	1.15	-	nC
$Q_{GS2}$	post- $V_{GS(th)}$ gate-source charge		-	1.25	-	nC
$Q_{GD}$	gate-drain charge		-	4.2	-	nC
$V_{GS(pl)}$	gate-source plateau voltage		-	4.2	-	V
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 30\text{ V}$ ; $f = 1\text{ MHz}$ ; see <a href="#">Figure 14</a>	-	657	-	pF
$C_{oss}$	output capacitance		-	74	-	pF
$C_{riss}$	reverse transfer capacitance		-	25	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 100\text{ V}$ ; $R_L = 100\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $R_G = 5.6\text{ }\Omega$	-	7	-	ns
$t_r$	rise time		-	11	-	ns
$t_{d(off)}$	turn-off delay time		-	19	-	ns
$t_f$	fall time		-	7	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 3.2\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; see <a href="#">Figure 13</a>	-	0.8	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 3.2\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ; $V_{GS} = 0\text{ V}$ ;	-	101	-	ns
$Q_r$	recovered charge	$V_R = 120\text{ V}$	-	267	-	nC



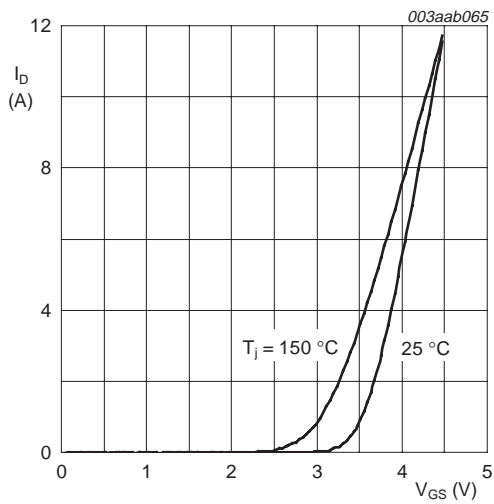
$T_j = 25^\circ\text{C}$

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



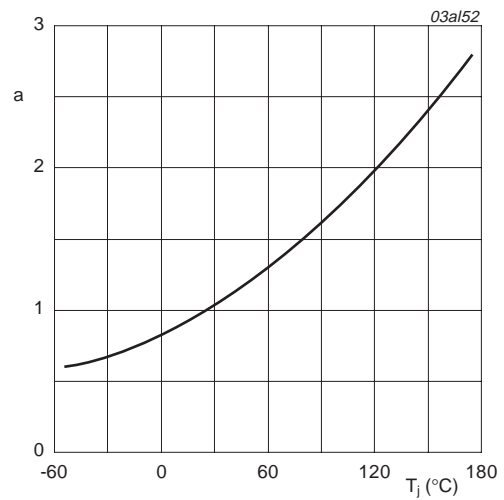
$T_j = 25^\circ\text{C}$

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



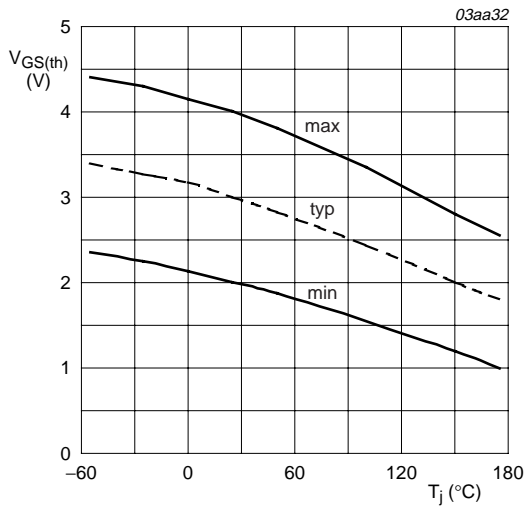
$T_j = 25^\circ\text{C}$  and  $150^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DS(on)}$

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



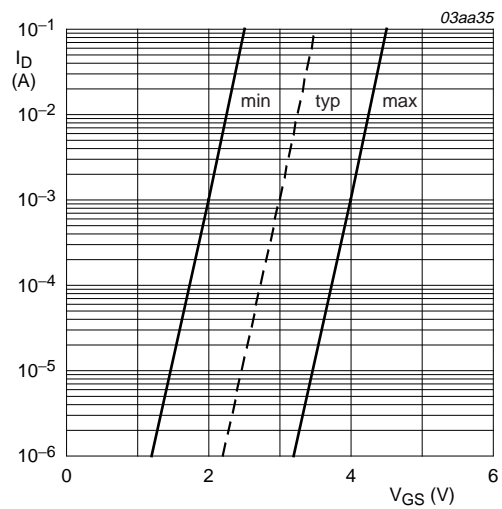
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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



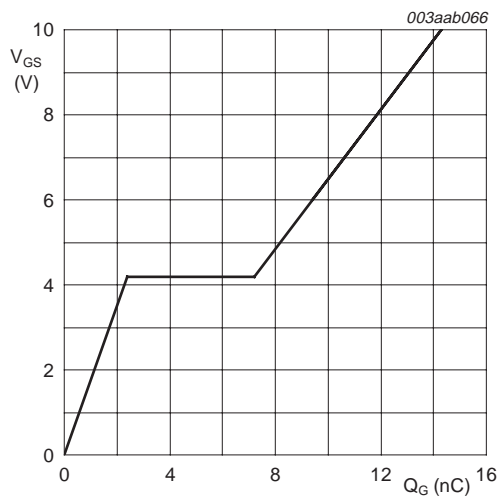
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



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

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



$I_D = 2.6 \text{ A}; V_{DS} = 100 \text{ V}$

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

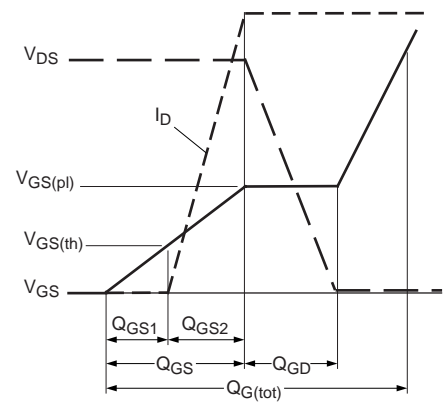
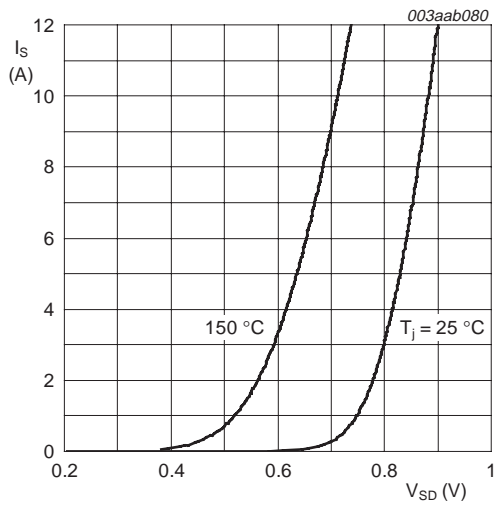
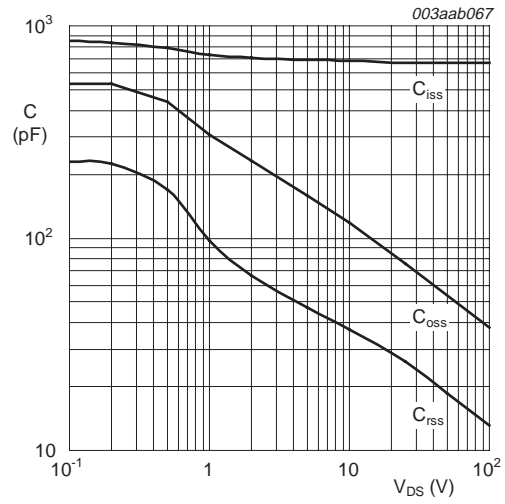


Fig 12. Gate charge waveform definitions



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

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



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

**Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**



7. Package outline

HVSON8: plastic thermal enhanced very thin small outline package; no leads;  
8 terminals; body 3.3 × 3.3 × 0.85 mm

SOT873-1

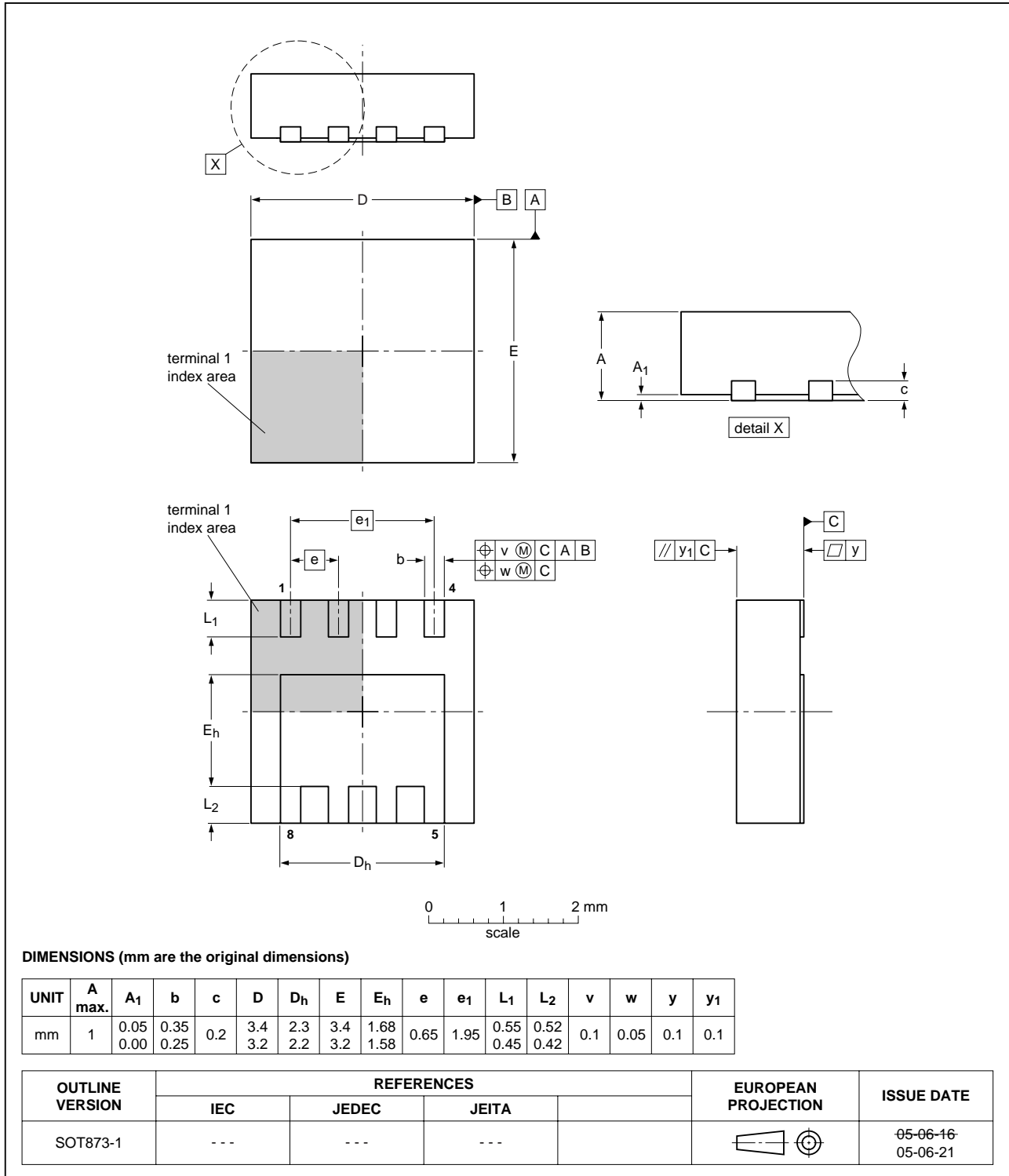


Fig 15. Package outline SOT873-1 (HVSON8)

## 8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PML260SN_2	20060529	Product data sheet	-	PML260SN_1
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li></ul>			
PML260SN_1	20051222	Preliminary data sheet	-	-

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### 9.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.semiconductors.philips.com>.

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