

# PMGD370XN

Dual N-channel  $\mu$ TrenchMOS™ extremely low level FET

Rev. 01 — 27 February 2004

Product data

## 1. Product profile

### 1.1 Description

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

### 1.2 Features

- Surface mounted package
- Dual device
- Low on-state resistance
- Footprint 40% smaller than SOT23
- Fast switching
- Low threshold voltage.

### 1.3 Applications

- Driver circuits
- Switching in portable appliances.

### 1.4 Quick reference data

- $V_{DS} \leq 30$  V
- $I_D \leq 0.74$  A
- $P_{tot} \leq 0.41$  W
- $R_{DSon} \leq 440$  m $\Omega$ .

## 2. Pinning information

Table 1: Pinning - SOT363 (SC-88), simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1	source (s1)	<p>Top view <span style="float: right;">MSA370</span></p>	<p style="text-align: right;">MSD901</p>
2	gate (g1)		
3	drain (d2)		
4	source (s2)		
5	gate (g2)		
6	drain (d1)		

**SOT363 (SC-88)**



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### 3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
PMGD370XN	SC-88	Plastic surface mounted package; 6 leads	SOT363

### 4. Limiting values

Table 3: Limiting values

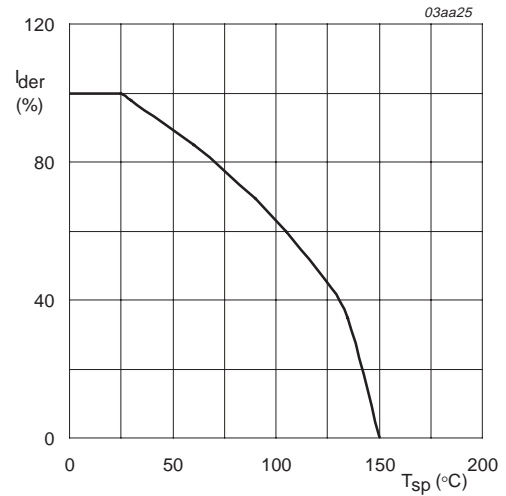
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	30	V
$V_{DGR}$	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	30	V
$V_{GS}$	gate-source voltage (DC)		-	$\pm 12$	V
$I_D$	drain current (DC)	$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 4.5\text{ V}$ ; <b>Figure 2 and 3</b>	-	0.74	A
		$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 4.5\text{ V}$ ; <b>Figure 2</b>	-	0.47	A
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <b>Figure 3</b>	-	1.49	A
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; <b>Figure 1</b>	-	0.41	W
$T_{stg}$	storage temperature		-55	+150	$^{\circ}\text{C}$
$T_j$	junction temperature		-55	+150	$^{\circ}\text{C}$
<b>Source-drain diode</b>					
$I_S$	source (diode forward) current (DC)	$T_{sp} = 25\text{ °C}$	-	0.34	A
$I_{SM}$	peak source (diode forward) current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	0.69	A



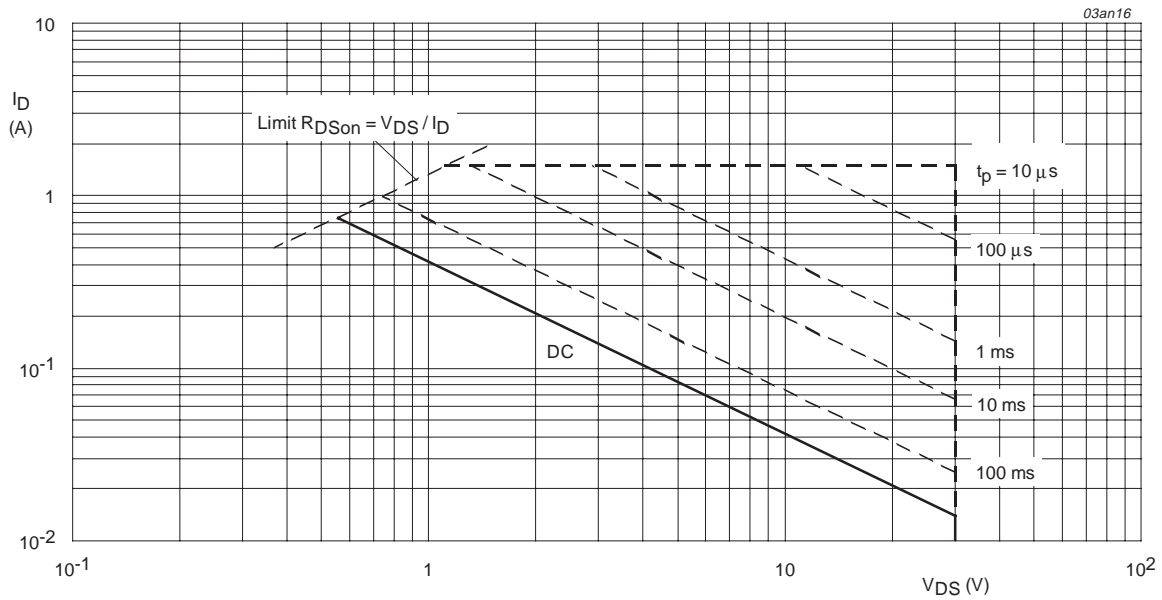
$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100\%$$

Fig 1. Normalized total power dissipation as a function of solder point temperature.



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

Fig 2. Normalized continuous drain current as a function of solder point temperature.



$T_{sp} = 25^\circ C$ ;  $I_{DM}$  is single pulse;  $V_{GS} = 4.5 V$

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
$R_{th(j-sp)}$	thermal resistance from junction to solder point	Figure 4	-	-	300	K/W

#### 5.1 Transient thermal impedance

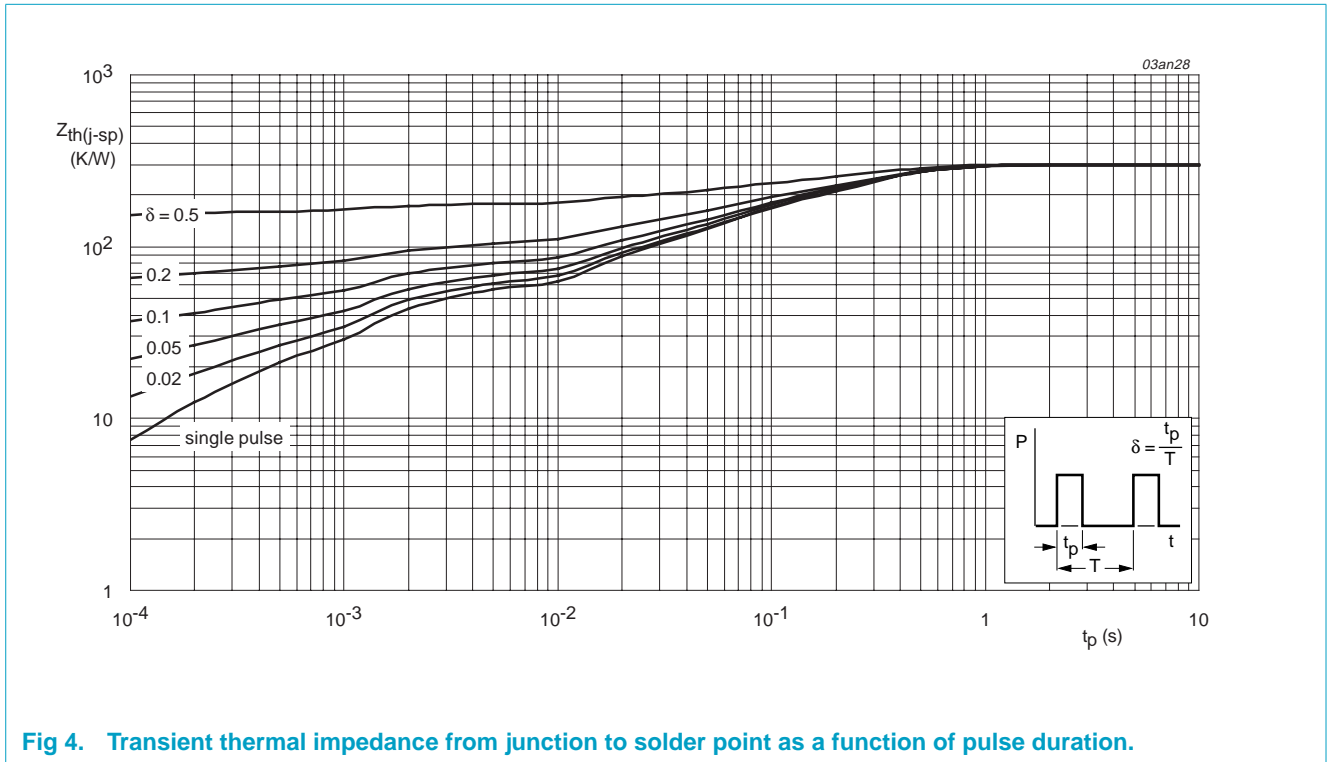
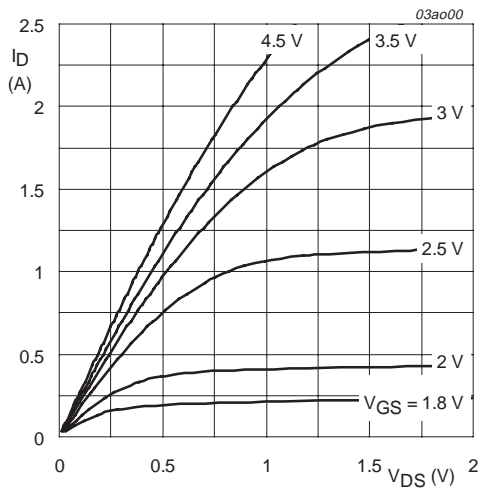


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

## 6. Characteristics

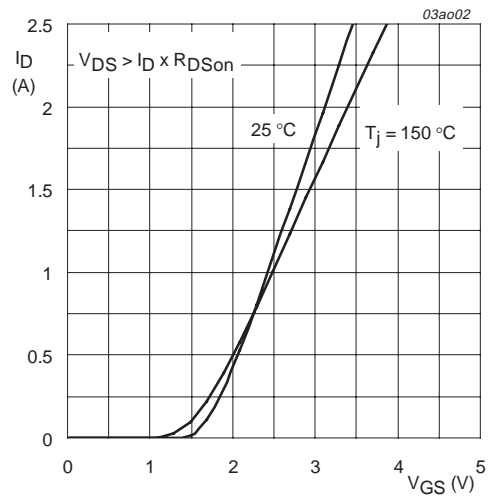
**Table 5: Characteristics**
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 1\text{ }\mu\text{A}$ ; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	30	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\text{ mA}$ ; $V_{DS} = V_{GS}$ ; <b>Figure 9</b>				
		$T_j = 25\text{ }^\circ\text{C}$	0.5	1	1.5	V
		$T_j = 150\text{ }^\circ\text{C}$	0.35	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	-	-	1.8	V
$I_{DSS}$	drain-source leakage current	$V_{DS} = 30\text{ V}$ ; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	-	-	1	$\mu\text{A}$
		$T_j = 150\text{ }^\circ\text{C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate-source leakage current	$V_{GS} = \pm 12\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}$ ; $I_D = 0.2\text{ A}$ ; <b>Figure 7 and 8</b>				
		$T_j = 25\text{ }^\circ\text{C}$	-	370	440	m $\Omega$
		$T_j = 150\text{ }^\circ\text{C}$	-	629	748	m $\Omega$
		$V_{GS} = 2.5\text{ V}$ ; $I_D = 0.1\text{ A}$ ; <b>Figure 7 and 8</b>	-	550	650	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{g(tot)}$	total gate charge	$I_D = 1\text{ A}$ ; $V_{DD} = 15\text{ V}$ ; $V_{GS} = 4.5\text{ V}$ ; <b>Figure 13</b>	-	0.65	-	nC
$Q_{gs}$	gate-source charge		-	0.14	-	nC
$Q_{gd}$	gate-drain (Miller) charge		-	0.18	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 25\text{ V}$ ; $f = 1\text{ MHz}$ ; <b>Figure 11</b>	-	37	-	pF
$C_{oss}$	output capacitance		-	8.5	-	pF
$C_{rss}$	reverse transfer capacitance		-	5.5	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DD} = 15\text{ V}$ ; $R_L = 15\text{ }\Omega$ ; $V_{GS} = 4.5\text{ V}$ ; $R_G = 6\text{ }\Omega$	-	6.5	-	ns
$t_r$	rise time		-	9.5	-	ns
$t_{d(off)}$	turn-off delay time		-	14	-	ns
$t_f$	fall time		-	5.5	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain (diode forward) voltage	$I_S = 0.3\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; <b>Figure 12</b>	-	0.78	1.2	V



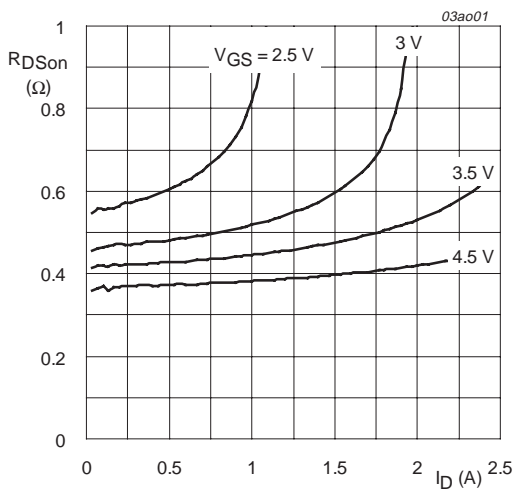
$T_j = 25\text{ }^\circ\text{C}$

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



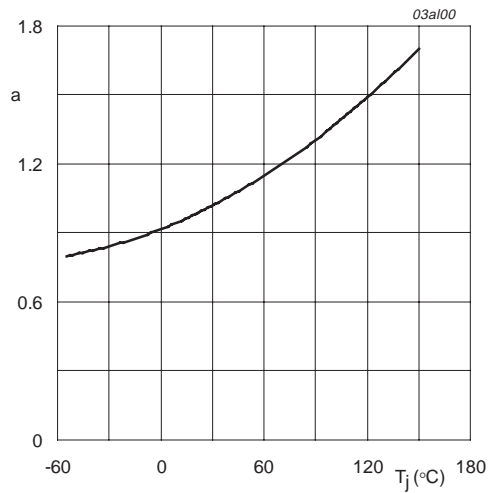
$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DSon}$

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



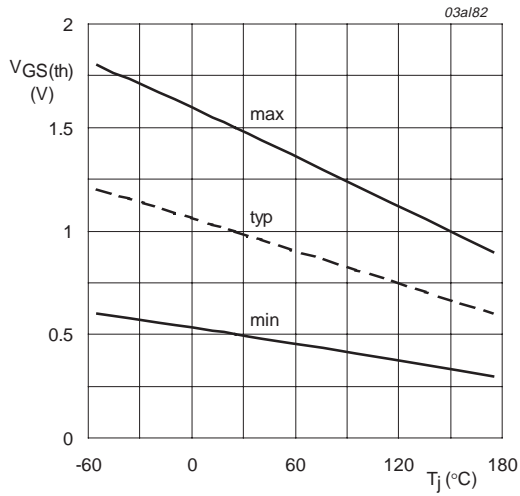
$T_j = 25\text{ }^\circ\text{C}$

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



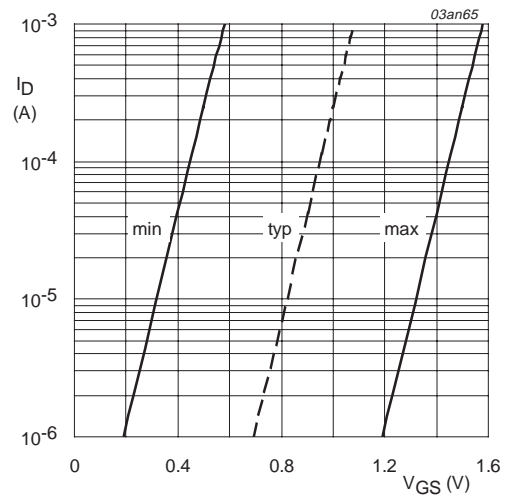
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

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



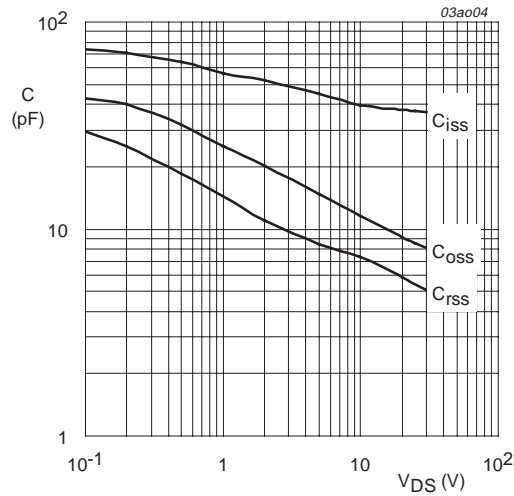
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



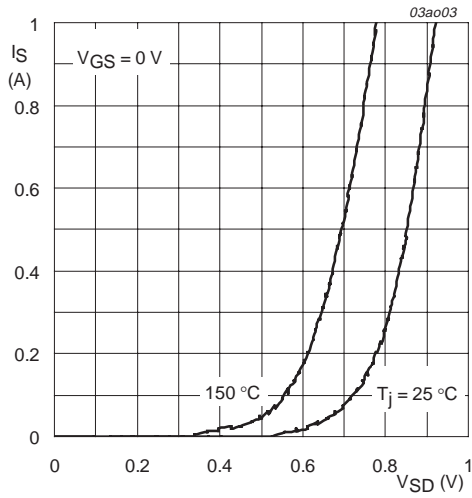
$T_j = 25 \text{ }^{\circ}C; V_{DS} = 5 \text{ V}$

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



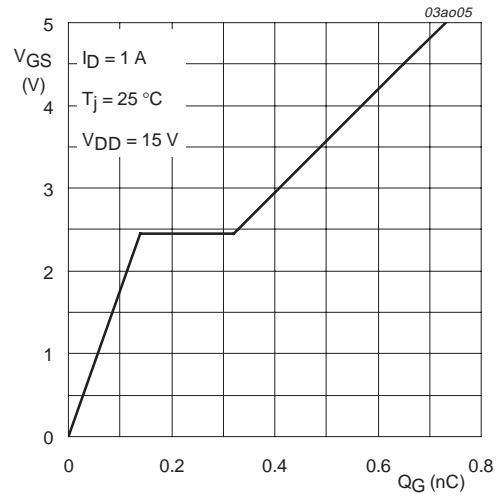
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



$T_j = 25$  °C and  $150$  °C;  $V_{GS} = 0$  V

**Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.**



$I_D = 1$  A;  $V_{DD} = 15$  V

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



7. Package outline

Plastic surface mounted package; 6 leads

SOT363

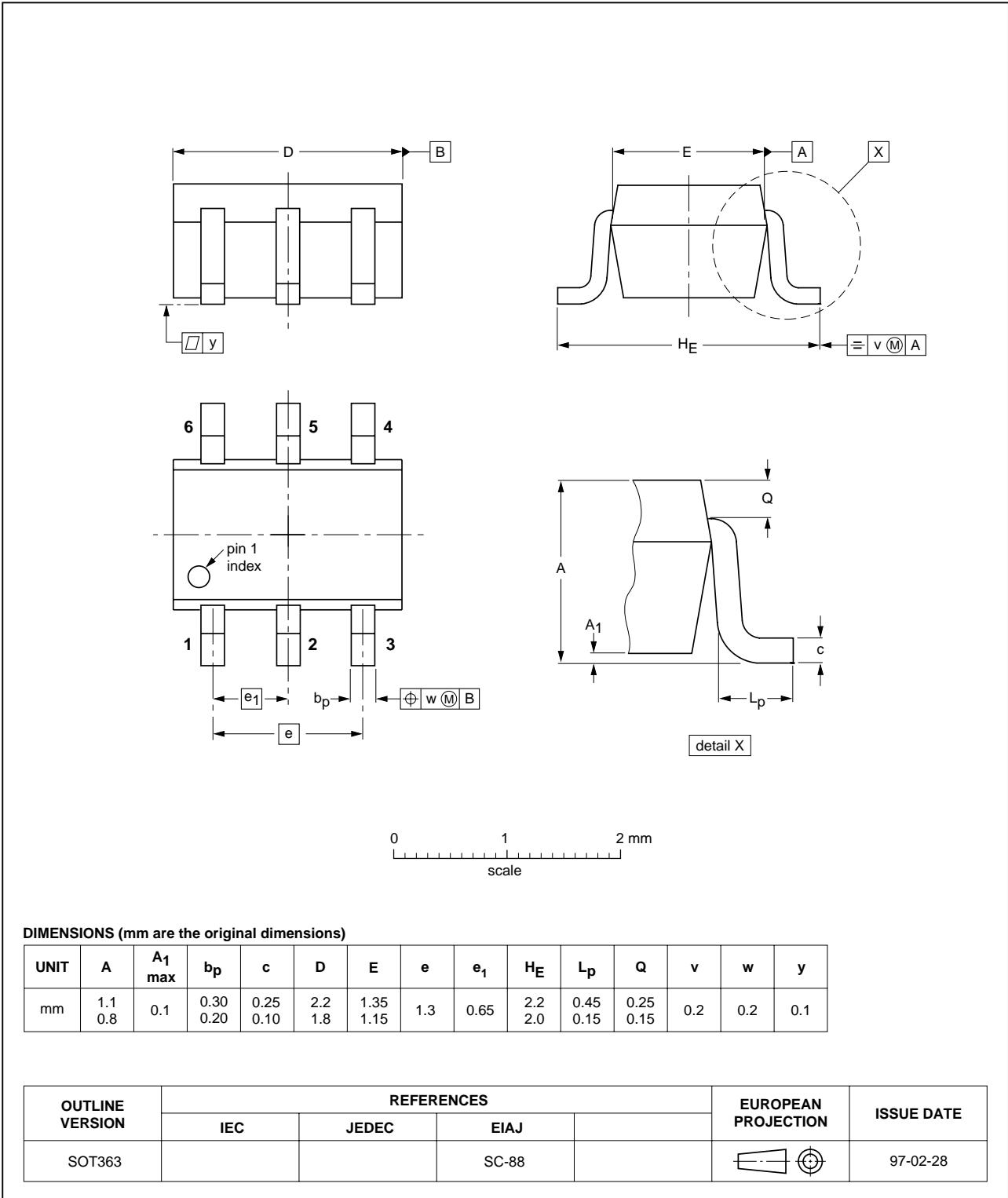


Fig 14. SOT363 (SC-88).

## 8. Revision history

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Table 6: Revision history

Rev	Date	CPCN	Description
01	20040227	-	Product data (9397 750 12761).

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## 9. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2][3]</sup>	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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## Contents

<b>1</b>	<b>Product profile</b> .....	<b>1</b>
1.1	Description .....	1
1.2	Features .....	1
1.3	Applications .....	1
1.4	Quick reference data .....	1
<b>2</b>	<b>Pinning information</b> .....	<b>1</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Limiting values</b> .....	<b>2</b>
<b>5</b>	<b>Thermal characteristics</b> .....	<b>4</b>
5.1	Transient thermal impedance .....	4
<b>6</b>	<b>Characteristics</b> .....	<b>5</b>
<b>7</b>	<b>Package outline</b> .....	<b>9</b>
<b>8</b>	<b>Revision history</b> .....	<b>10</b>
<b>9</b>	<b>Data sheet status</b> .....	<b>11</b>
<b>10</b>	<b>Definitions</b> .....	<b>11</b>
<b>11</b>	<b>Disclaimers</b> .....	<b>11</b>
<b>12</b>	<b>Trademarks</b> .....	<b>11</b>

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