

PMGD290XN

Dual N-channel μ TrenchMOS™ extremely low level FET

Rev. 01 — 26 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

- $V_{DS} \leq 20 \text{ V}$
- $P_{tot} \leq 0.41 \text{ W}$
- $I_D \leq 0.86 \text{ A}$
- $R_{DSon} \leq 350 \text{ m}\Omega$.

2. Pinning information

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

Pin	Description	Simplified outline	Symbol
1	source (s1)	Top view MSA370	MSD901
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
PMGD290XN	SC-88	Plastic surface mounted package; 6 leads	SOT363

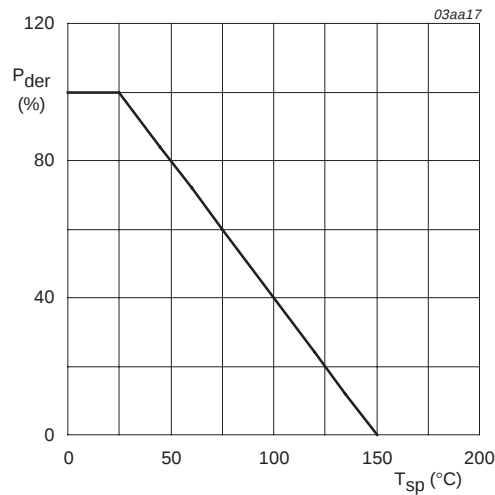
4. Limiting values

Table 3: Limiting values

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

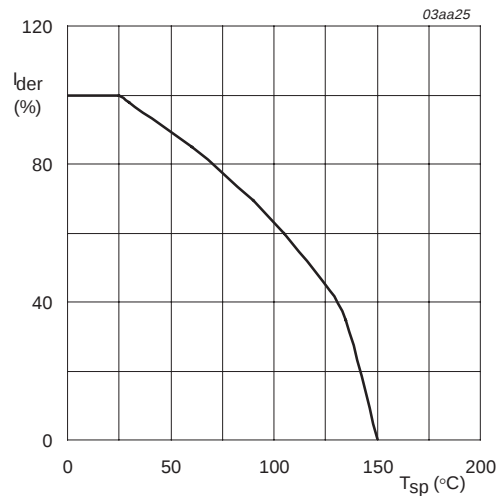
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	20	V
V_{DGR}	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	20	V
V_{GS}	gate-source voltage (DC)		-	± 12	V
I_D	drain current (DC)	$T_{sp} = 25\text{ °C}$; $V_{GS} = 4.5\text{ V}$; Figure 2 and 3	[1] -	0.86	A
		$T_{sp} = 100\text{ °C}$; $V_{GS} = 4.5\text{ V}$; Figure 2	[1] -	0.54	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Figure 3	[1] -	1.72	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$; Figure 1	-	0.41	W
T_{stg}	storage temperature		-55	+150	°C
T_j	junction temperature		-55	+150	°C
Source-drain diode					
I_S	source (diode forward) current (DC)	$T_{sp} = 25\text{ °C}$	[1] -	0.34	A
I_{SM}	peak source (diode forward) current	$T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	[1] -	0.69	A

[1] Single device conducting.



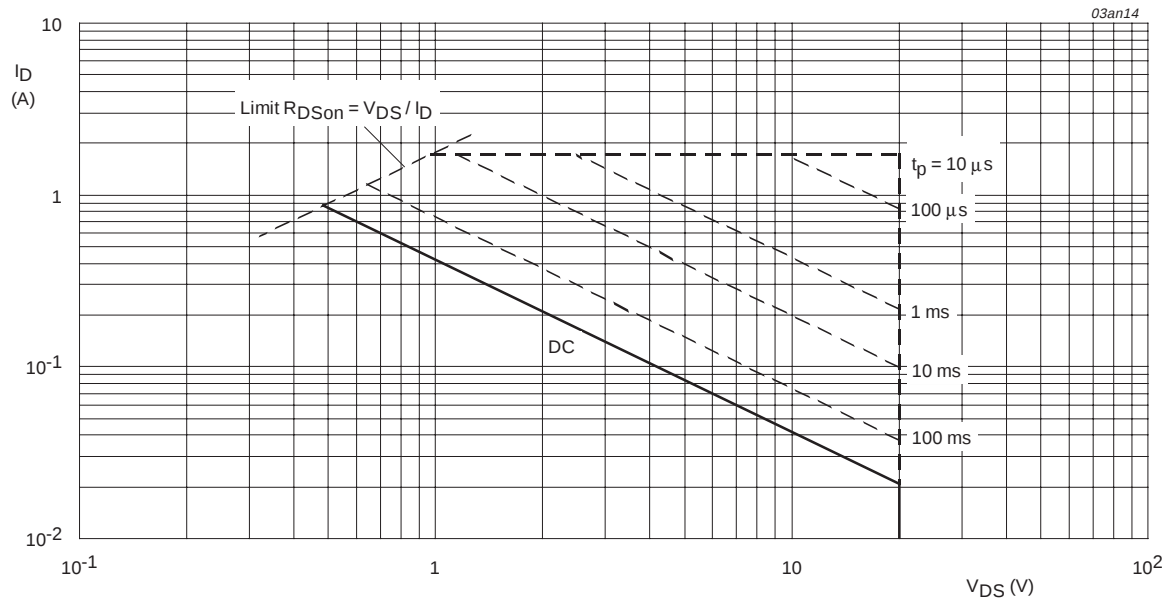
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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.



$T_{sp} = 25$ °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

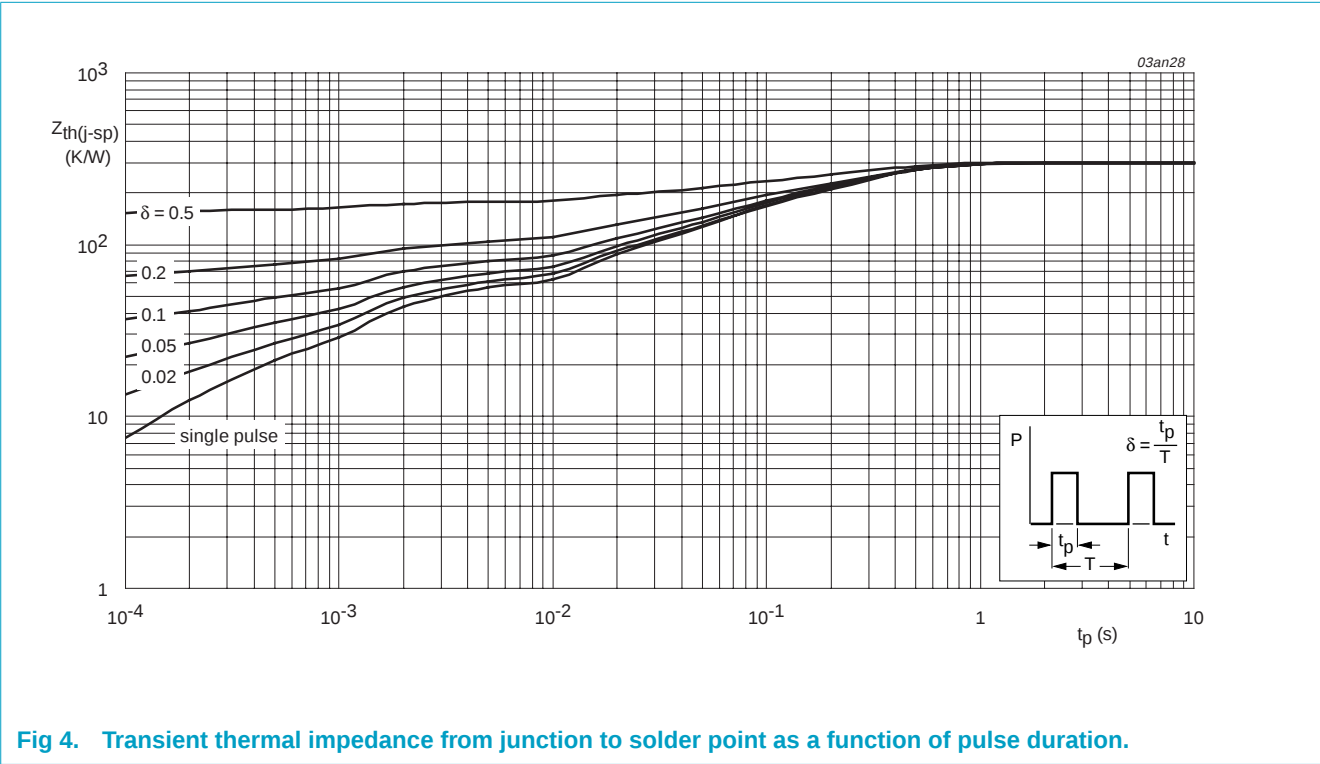


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

6. Characteristics

Table 5: Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 1\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	20	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	18	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\text{ mA}$; $V_{DS} = V_{GS}$; Figure 9				
		$T_j = 25\text{ }^\circ\text{C}$	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	$V_{DS} = 20\text{ V}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	-	-	1	μA
		$T_j = 150\text{ }^\circ\text{C}$	-	-	100	μA
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	$V_{GS} = 4.5\text{ V}$; $I_D = 0.2\text{ A}$; Figure 7 and 8				
		$T_j = 25\text{ }^\circ\text{C}$	-	290	350	m Ω
		$T_j = 150\text{ }^\circ\text{C}$	-	464	560	m Ω
		$V_{GS} = 4.5\text{ V}$; $I_D = 0.66\text{ A}$; Figure 7 and 8	-	295	350	m Ω
		$V_{GS} = 2.5\text{ V}$; $I_D = 0.4\text{ A}$; Figure 7 and 8	-	490	580	m Ω
		$V_{GS} = 2.5\text{ V}$; $I_D = 0.1\text{ A}$; Figure 7 and 8	-	460	550	m Ω
Dynamic characteristics						
$Q_{g(tot)}$	total gate charge	$I_D = 1\text{ A}$; $V_{DD} = 10\text{ V}$; $V_{GS} = 4.5\text{ V}$; Figure 13	-	0.72	-	nC
Q_{gs}	gate-source charge		-	0.18	-	nC
Q_{gd}	gate-drain (Miller) charge		-	0.18	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 20\text{ V}$; $f = 1\text{ MHz}$; Figure 11	-	34	-	pF
C_{oss}	output capacitance		-	12	-	pF
C_{rss}	reverse transfer capacitance		-	8	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DD} = 10\text{ V}$; $R_L = 6\text{ }\Omega$; $V_{GS} = 4.5\text{ V}$; $R_G = 6\text{ }\Omega$	-	5	-	ns
t_r	rise time		-	11	-	ns
$t_{d(off)}$	turn-off delay time		-	11	-	ns
t_f	fall time		-	6	-	ns
Source-drain diode						
V_{SD}	source-drain (diode forward) voltage	$I_S = 0.3\text{ A}$; $V_{GS} = 0\text{ V}$; Figure 12	-	0.8	1.2	V

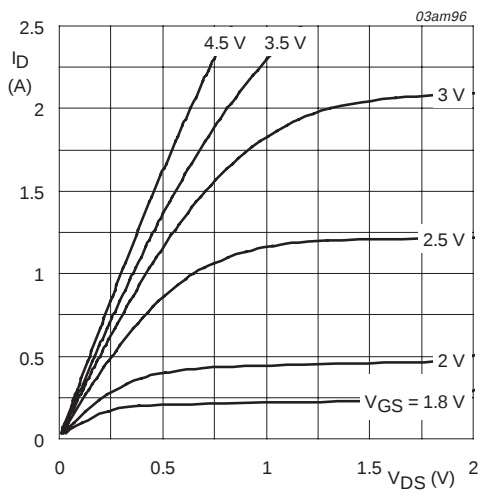


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values.

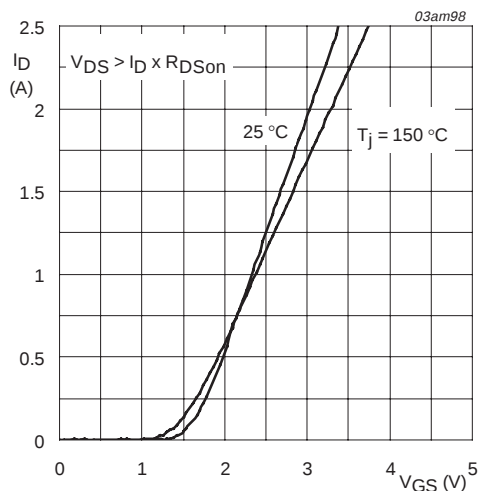


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values.

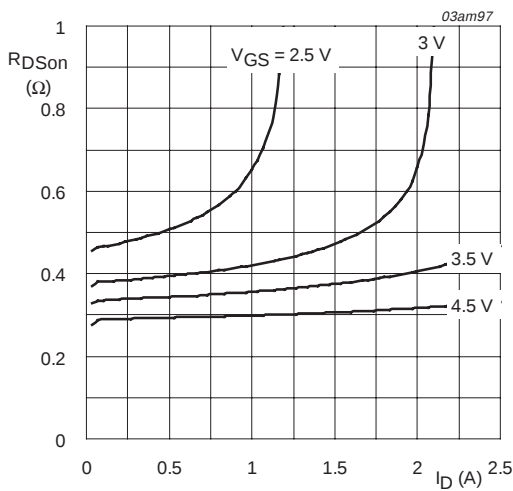


Fig 7. Drain-source on-state resistance as a function of drain current; typical values.

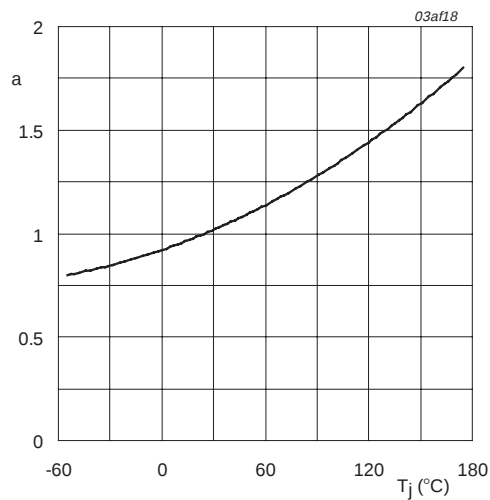
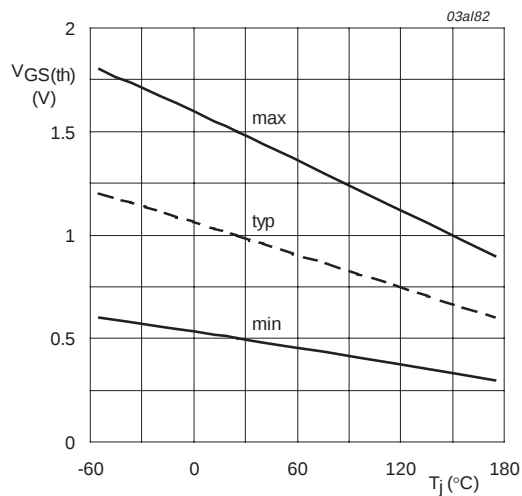
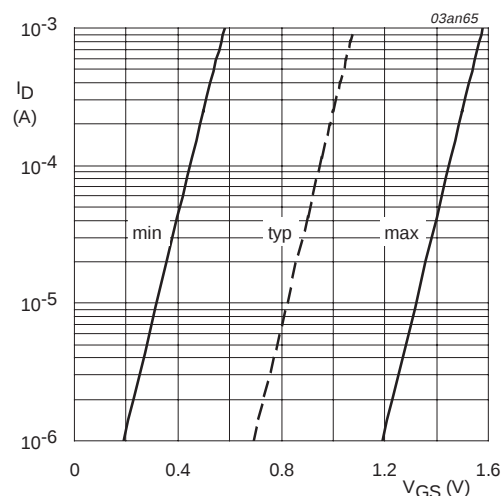


Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature.



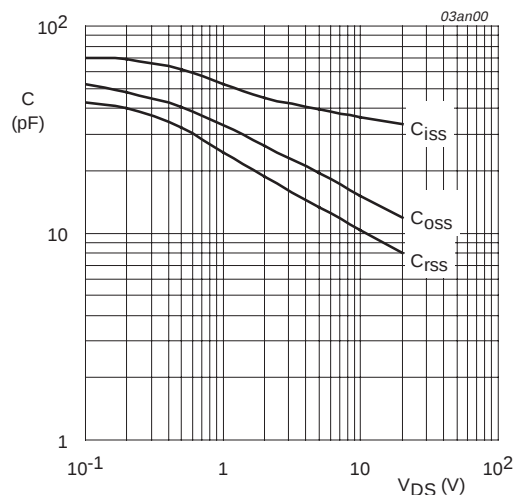
$I_D = 0.25 \text{ mA}$; $V_{DS} = V_{GS}$

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



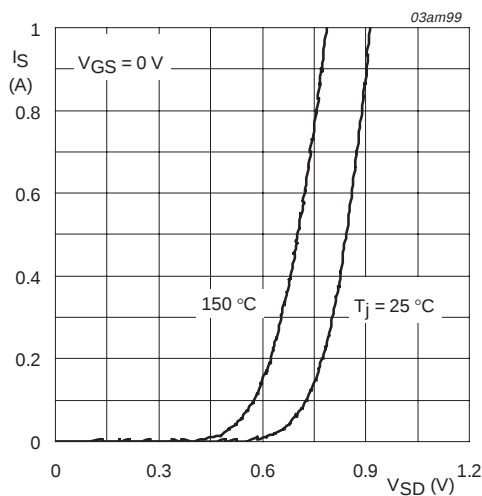
$T_j = 25 \text{ °C}$; $V_{DS} = 5 \text{ V}$

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



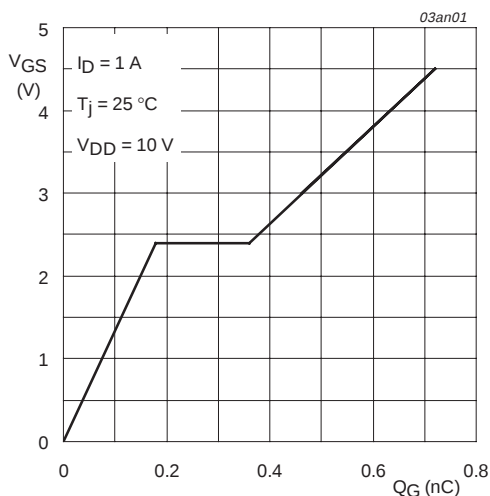
$V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$

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; $V_{DD} = 10$ V

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

7. Package outline

Plastic surface mounted package; 6 leads SOT363

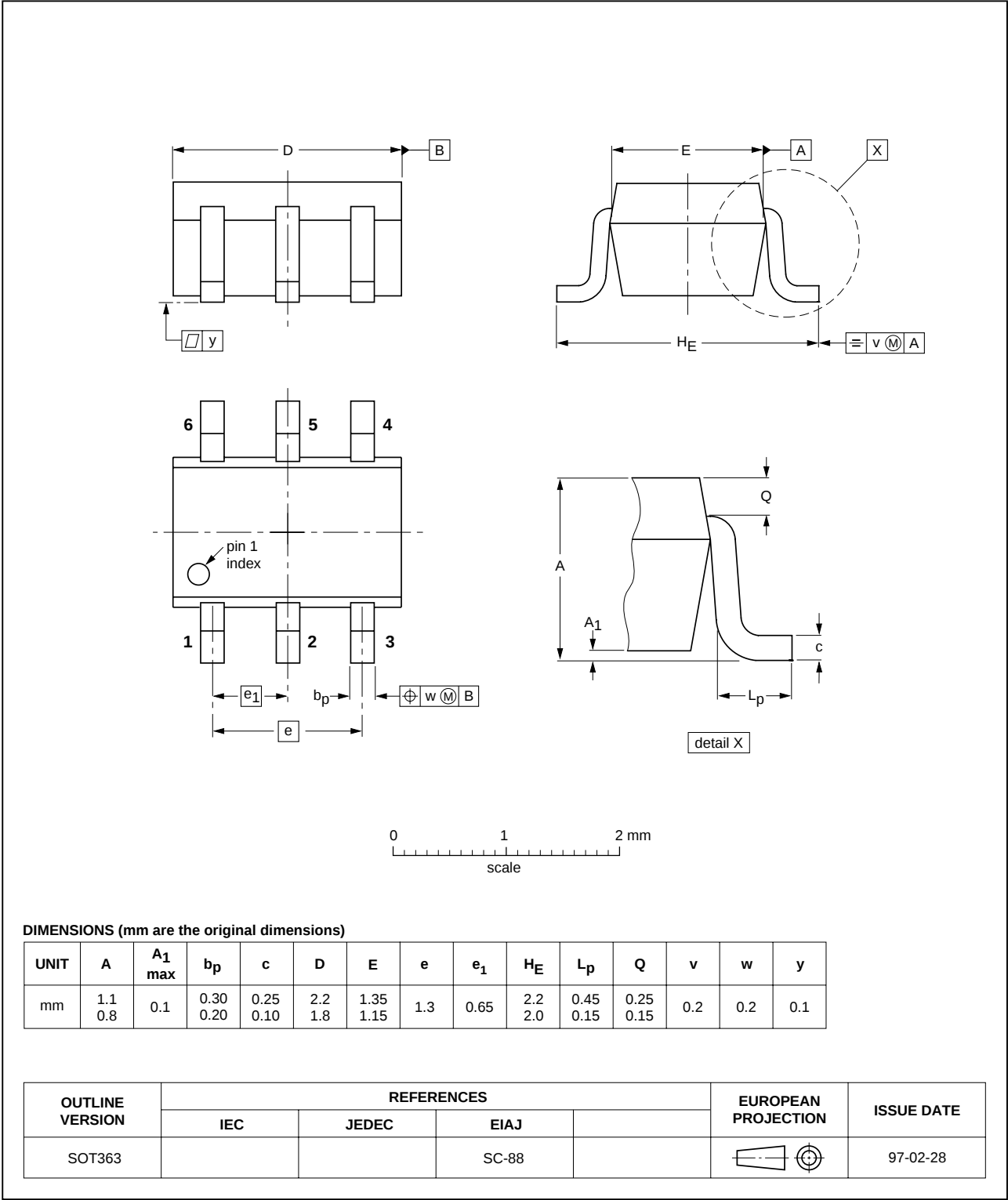
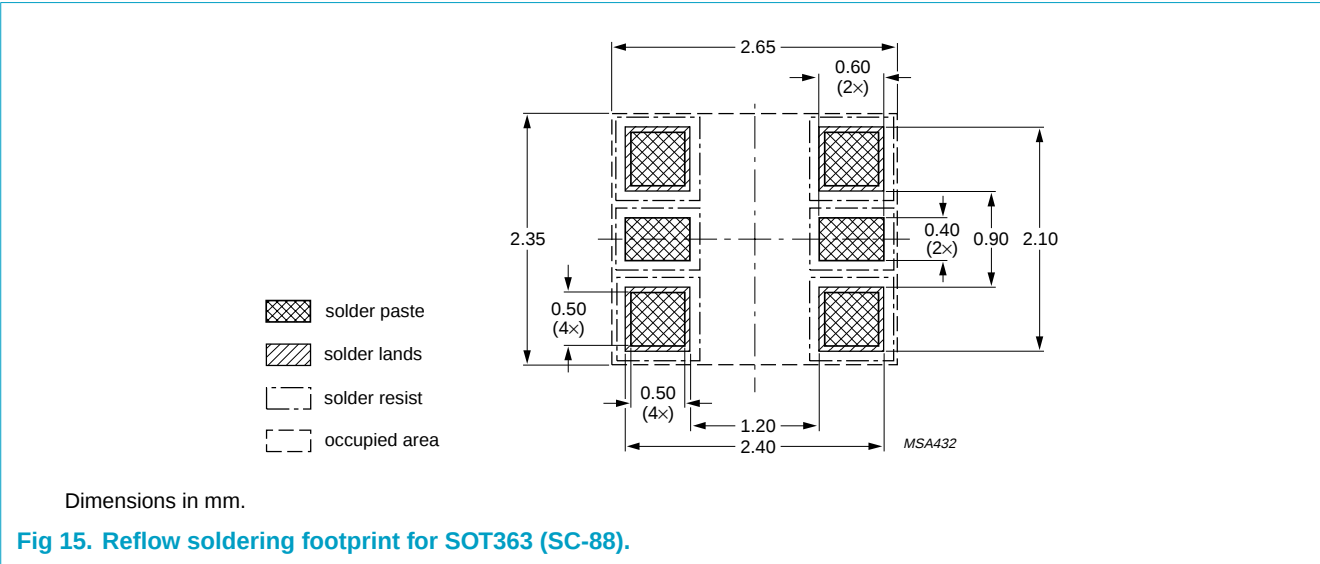


Fig 14. SOT363 (SC-88).

8. Soldering



9. Revision history

Table 6: Revision history

Rev	Date	CPCN	Description
01	20040226	-	Product data (9397 750 12762).

10. 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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