

# PMGD780SN

Dual N-channel  $\mu$ TrenchMOS standard level FET

Rev. 02 — 19 April 2010

Product data sheet

## 1. Product profile

### 1.1 General description

Dual N-channel enhancement mode field-effect transistor in a small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package using TrenchMOS technology.

### 1.2 Features and benefits

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

### 1.3 Applications

- Driver circuits
- Switching in portable appliances

### 1.4 Quick reference data

- $V_{DS} \leq 60$  V
- $P_{tot} \leq 0.41$  W
- $I_D \leq 0.49$  A
- $R_{DSon} \leq 920$  m $\Omega$

## 2. Pinning information

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

Pin	Description	Simplified outline	Graphic symbol
1	source1 (S1)	<p>SOT363 (SC-88)</p>	<p>msd901</p>
2	gate1 (G1)		
3	drain2 (D2)		
4	source2 (S2)		
5	gate2 (G2)		
6	drain1 (D1)		



### 3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
PMGD780SN	SC-88	plastic surface-mounted package; 6 leads	SOT363

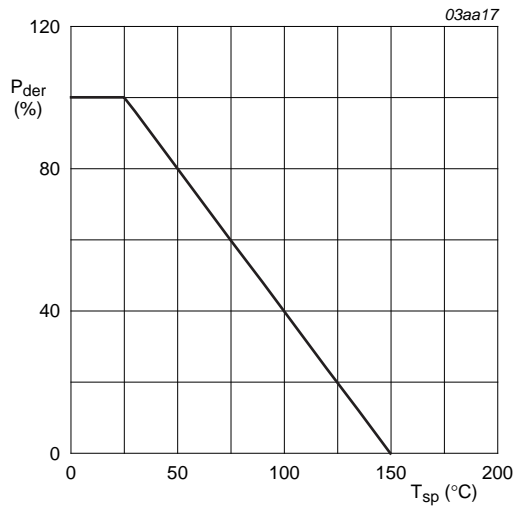
### 4. Limiting values

Table 3. Limiting values

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

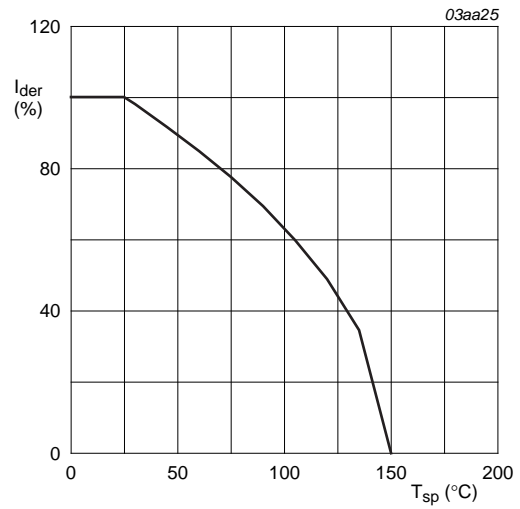
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	60	V
$V_{DGR}$	drain-gate voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	60	V
$V_{GS}$	gate-source voltage		-	$\pm 20$	V
$I_D$	drain current	$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Figure 2</a> and <a href="#">3</a>	[1] -	0.49	A
		$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Figure 2</a>	[1] -	0.31	A
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <a href="#">Figure 3</a>	[1] -	0.99	A
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; <a href="#">Figure 1</a>	-	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 current	$T_{sp} = 25\text{ °C}$	[1] -	0.34	A
$I_{SM}$	peak source current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	[1] -	0.69	A

[1] Single device conducting.



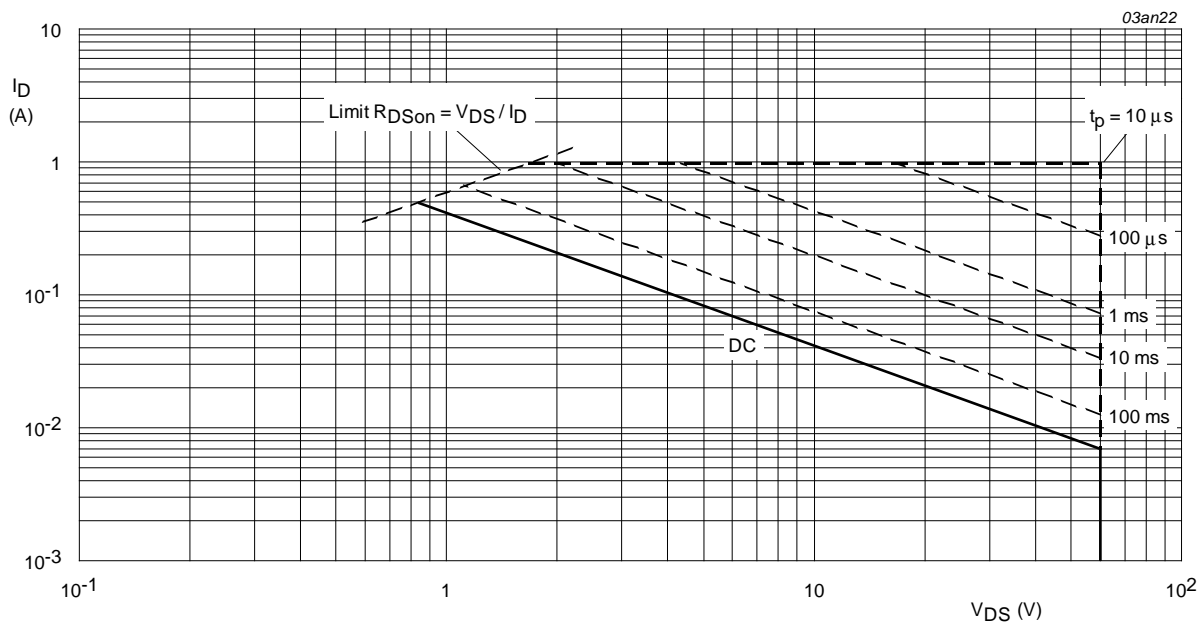
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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<sub>sp</sub> = 25 °C; I<sub>DM</sub> is single pulse; V<sub>GS</sub> = 10 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

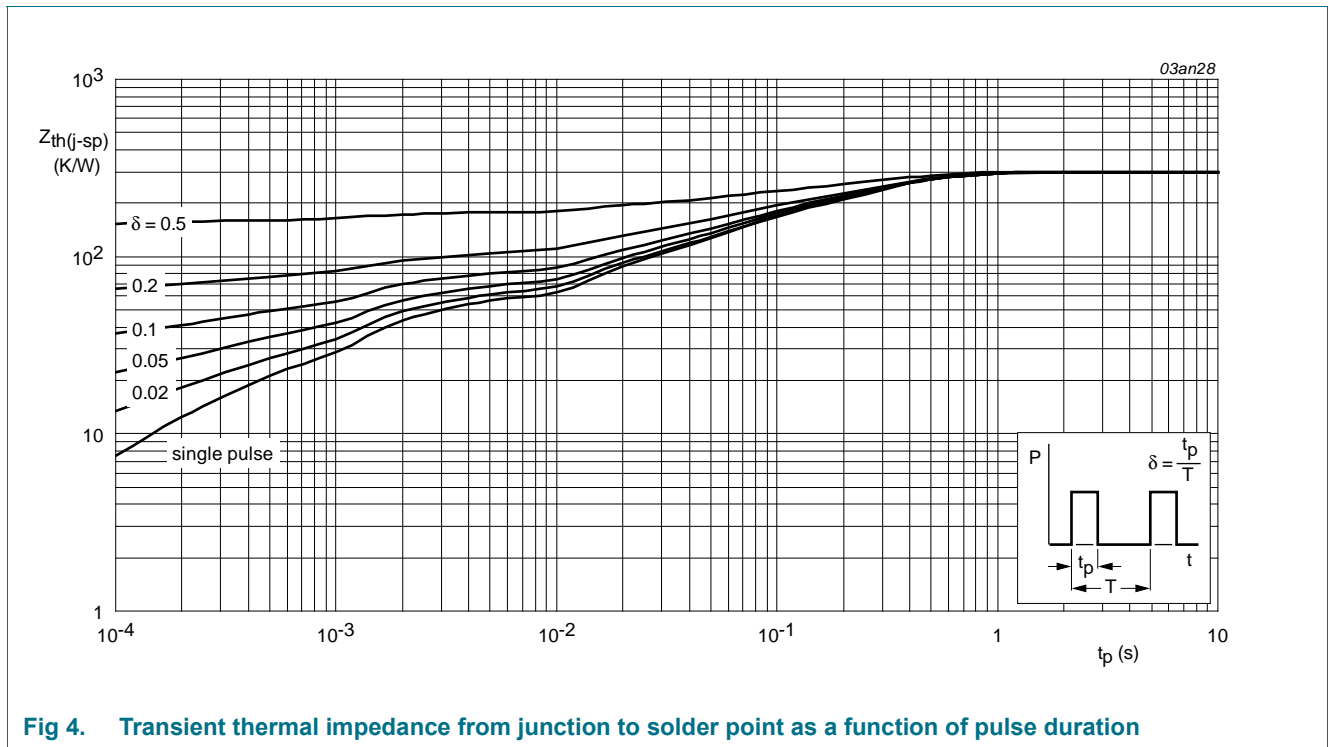
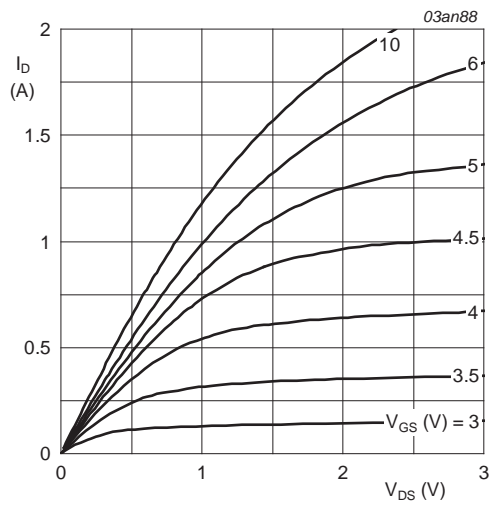


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

## 6. Characteristics

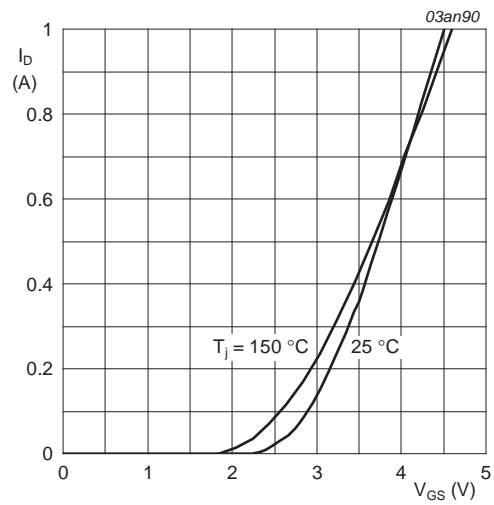
**Table 5. Characteristics**
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ $T_j = 25\text{ }^\circ\text{C}$	60	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	55	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; <a href="#">Figure 9</a> $T_j = 25\text{ }^\circ\text{C}$	1	2	2.5	V
		$T_j = 150\text{ }^\circ\text{C}$	0.6	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	-	-	3.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 60\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ $T_j = 25\text{ }^\circ\text{C}$	-	0.05	1	$\mu\text{A}$
		$T_j = 150\text{ }^\circ\text{C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 20\ \text{V}$ ; $V_{DS} = 0\ \text{V}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ \text{V}$ ; $I_D = 0.3\ \text{A}$ ; <a href="#">Figure 7</a> and <a href="#">8</a> $T_j = 25\text{ }^\circ\text{C}$	-	780	920	m $\Omega$
		$T_j = 150\text{ }^\circ\text{C}$	-	1445	1700	m $\Omega$
		$V_{GS} = 4.5\ \text{V}$ ; $I_D = 0.075\ \text{A}$ ; <a href="#">Figure 7</a> and <a href="#">8</a>	-	1100	1400	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 1\ \text{A}$ ; $V_{DD} = 30\ \text{V}$ ; $V_{GS} = 10\ \text{V}$ ; <a href="#">Figure 13</a>	-	1.05	-	nC
$Q_{GS}$	gate-source charge		-	0.2	-	nC
$Q_{GD}$	gate-drain charge		-	0.22	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\ \text{V}$ ; $V_{DS} = 30\ \text{V}$ ; $f = 1\ \text{MHz}$ ; <a href="#">Figure 11</a>	-	23	-	pF
$C_{oss}$	output capacitance		-	5	-	pF
$C_{rss}$	reverse transfer capacitance		-	3.5	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DD} = 30\ \text{V}$ ; $R_L = 30\ \Omega$ ; $V_{GS} = 10\ \text{V}$ ; $R_G = 6\ \Omega$	-	2	-	ns
$t_r$	rise time		-	4	-	ns
$t_{d(off)}$	turn-off delay time		-	5	-	ns
$t_f$	fall time		-	2.2	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 0.3\ \text{A}$ ; $V_{GS} = 0\ \text{V}$ ; <a href="#">Figure 12</a>	-	0.83	1.2	V



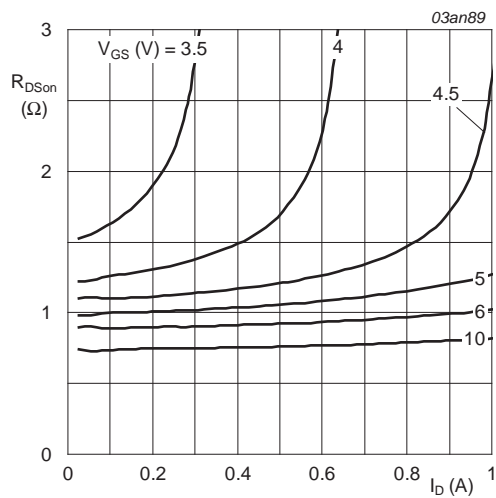
$T_j = 25\text{ °C}$

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



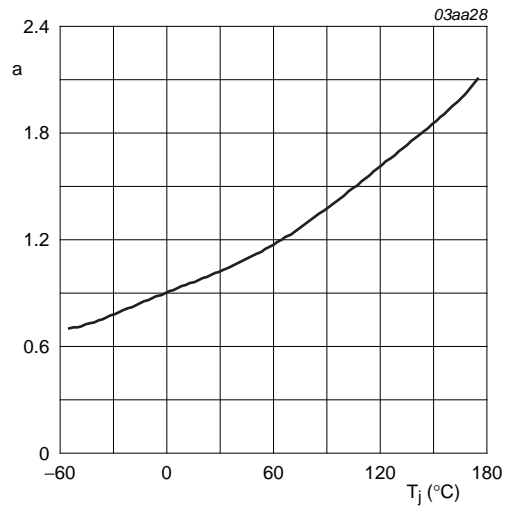
$T_j = 25\text{ °C}$  and  $150\text{ °C}$ ;  $V_{DS} > I_D \times R_{DSon}$

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



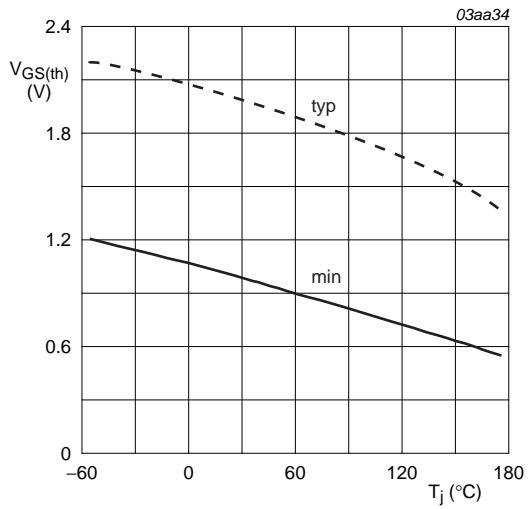
$T_j = 25\text{ °C}$

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



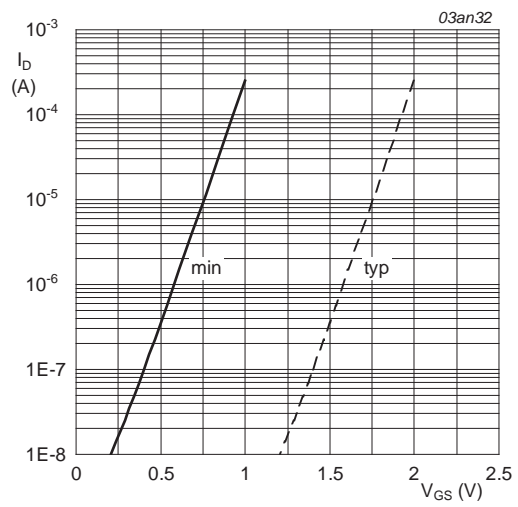
$$a = \frac{R_{DSon}}{R_{DSon(25\text{ °C})}}$$

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



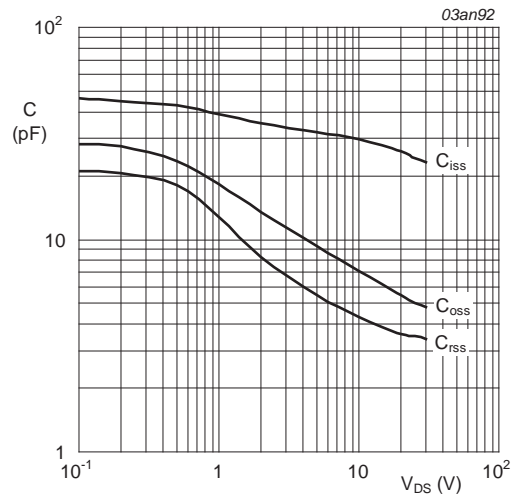
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



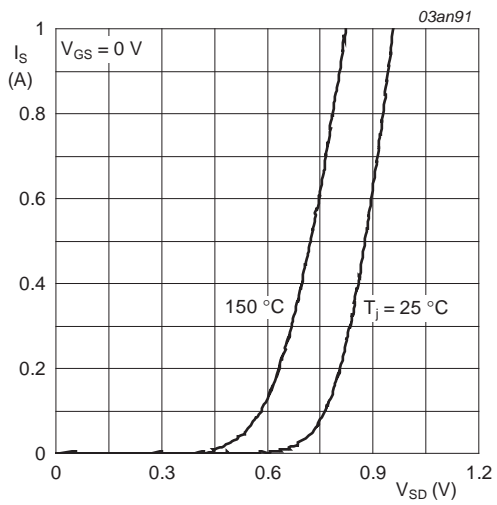
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 5 \text{ V}$

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



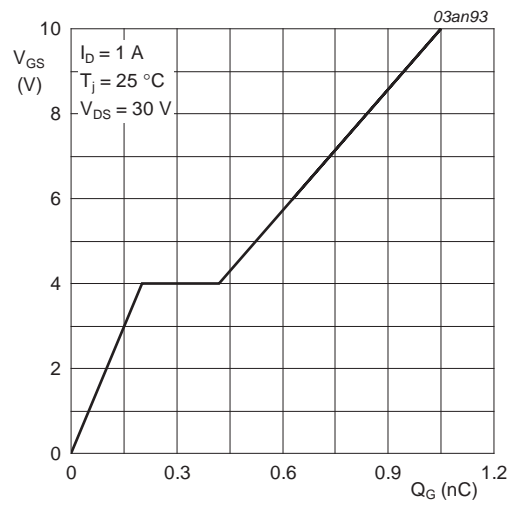
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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



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

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



$I_D = 1\text{ A}$ ;  $V_{DD} = 30\text{ V}$

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



7. Package outline

Plastic surface-mounted package; 6 leads

SOT363

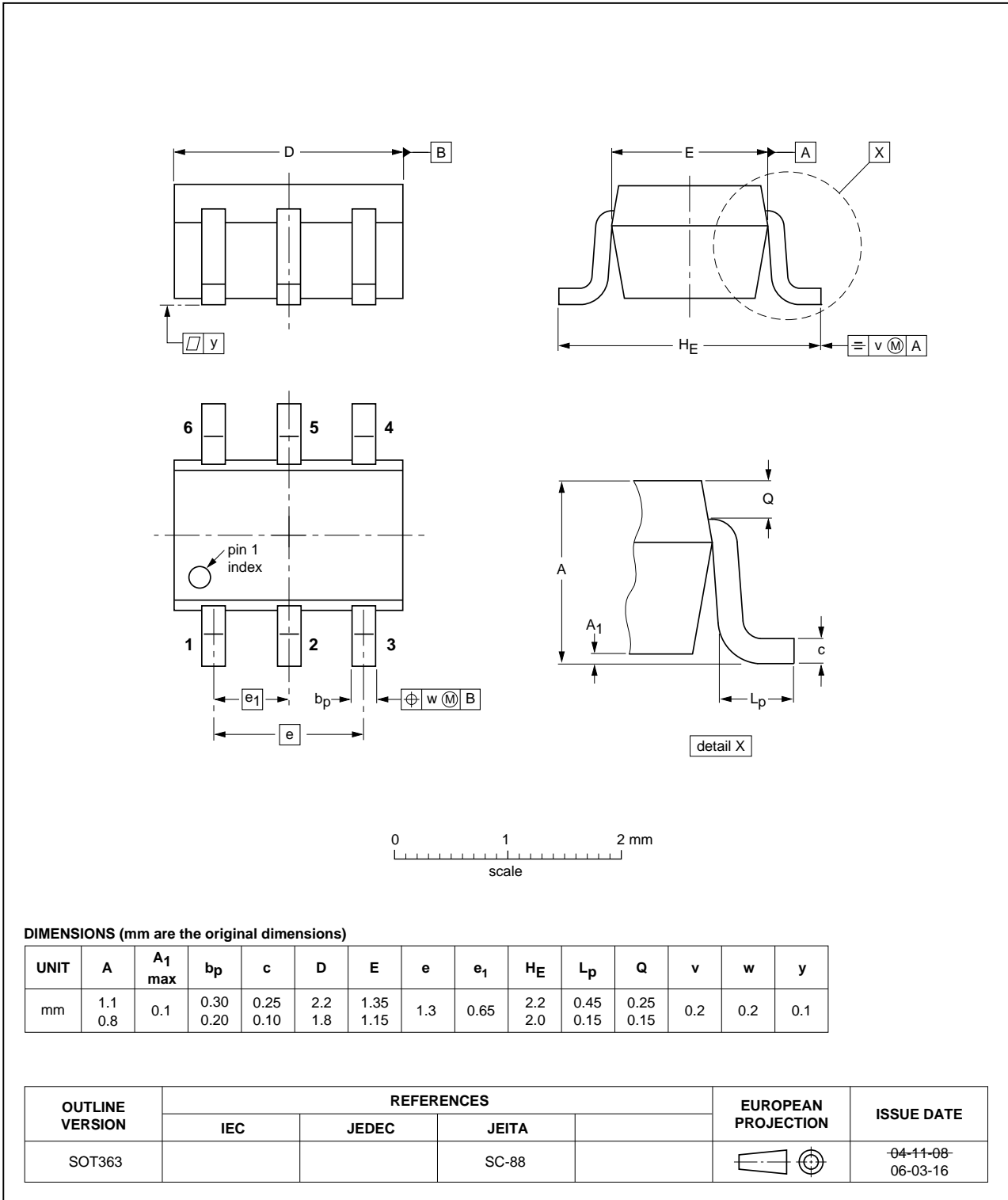


Fig 14. Package outline SOT363 (SC-88)

8. Soldering

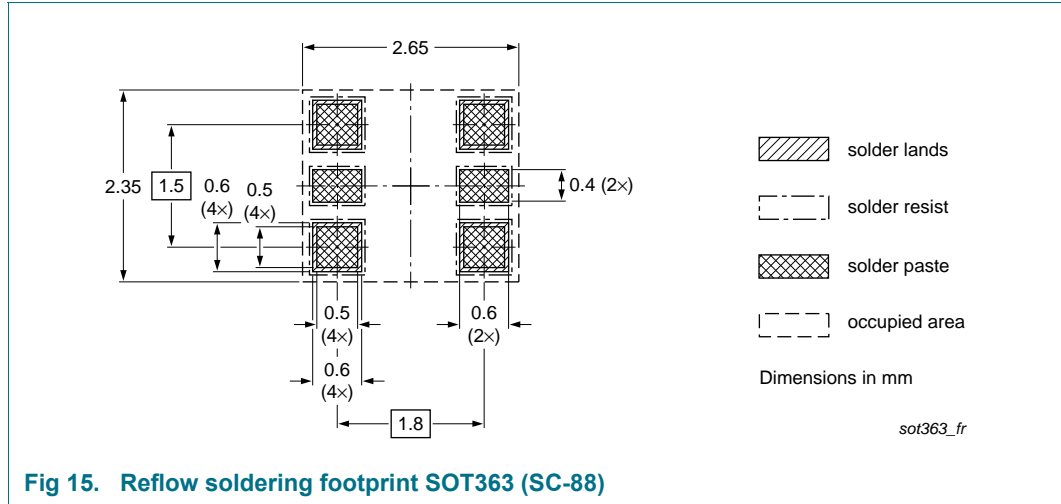


Fig 15. Reflow soldering footprint SOT363 (SC-88)

## 9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMGD780SN_2	20100419	Product data sheet	-	PMGD780SN_1
Modifications:		<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li><li><a href="#">Table 5 "Characteristics"</a>: added <math>V_{GS(th)}</math> maximum value at condition <math>T_j = 25\text{ }^\circ\text{C}</math></li><li><a href="#">Section 10 "Legal information"</a>: updated</li></ul>		
PMGD780SN_1	20040211	Product data	-	-

## 10. Legal information

### 10.1 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".

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