

# 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
- $I_D \leq 0.49$  A
- $P_{tot} \leq 0.41$  W
- $R_{DSon} \leq 920$  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

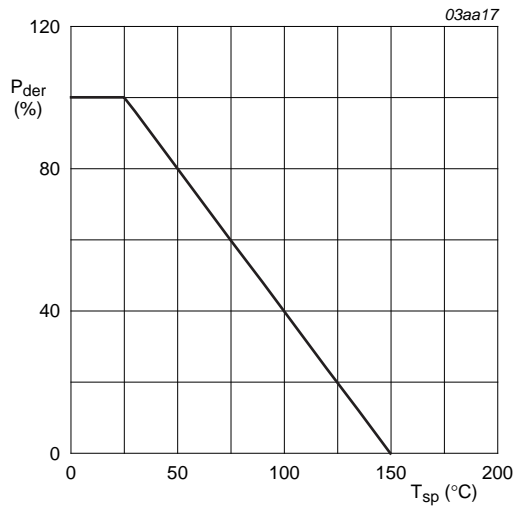
### 4. Limiting values

Table 3. Limiting values

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

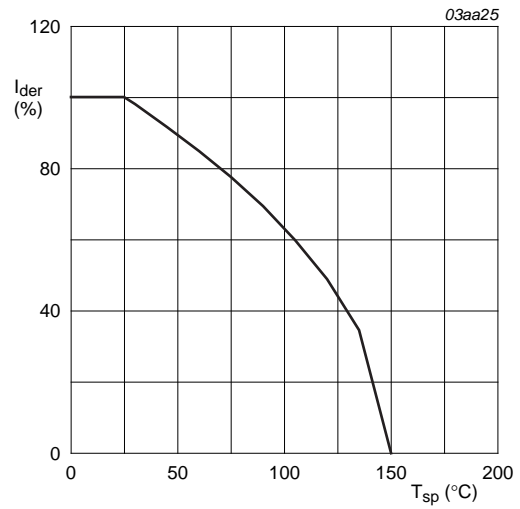
Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	60	V	
$V_{DGR}$	drain-gate voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	60	V	
$V_{GS}$	gate-source voltage		-	$\pm 20$	V	
$I_D$	drain current	$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <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.



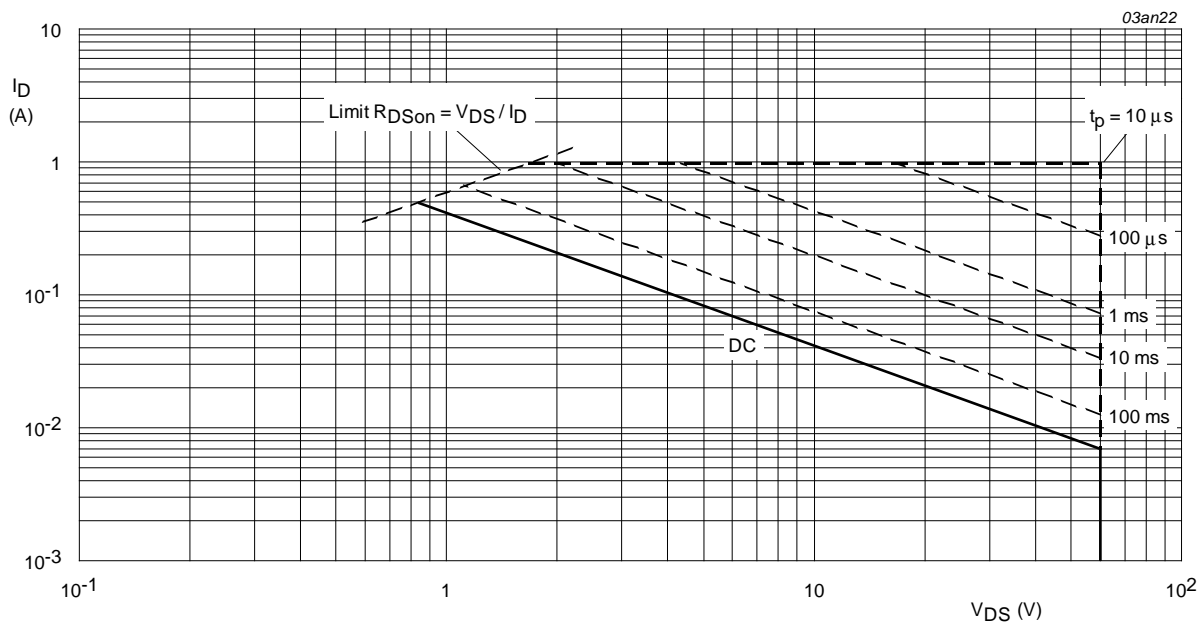
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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	<a href="#">Figure 4</a>	-	-	300	K/W

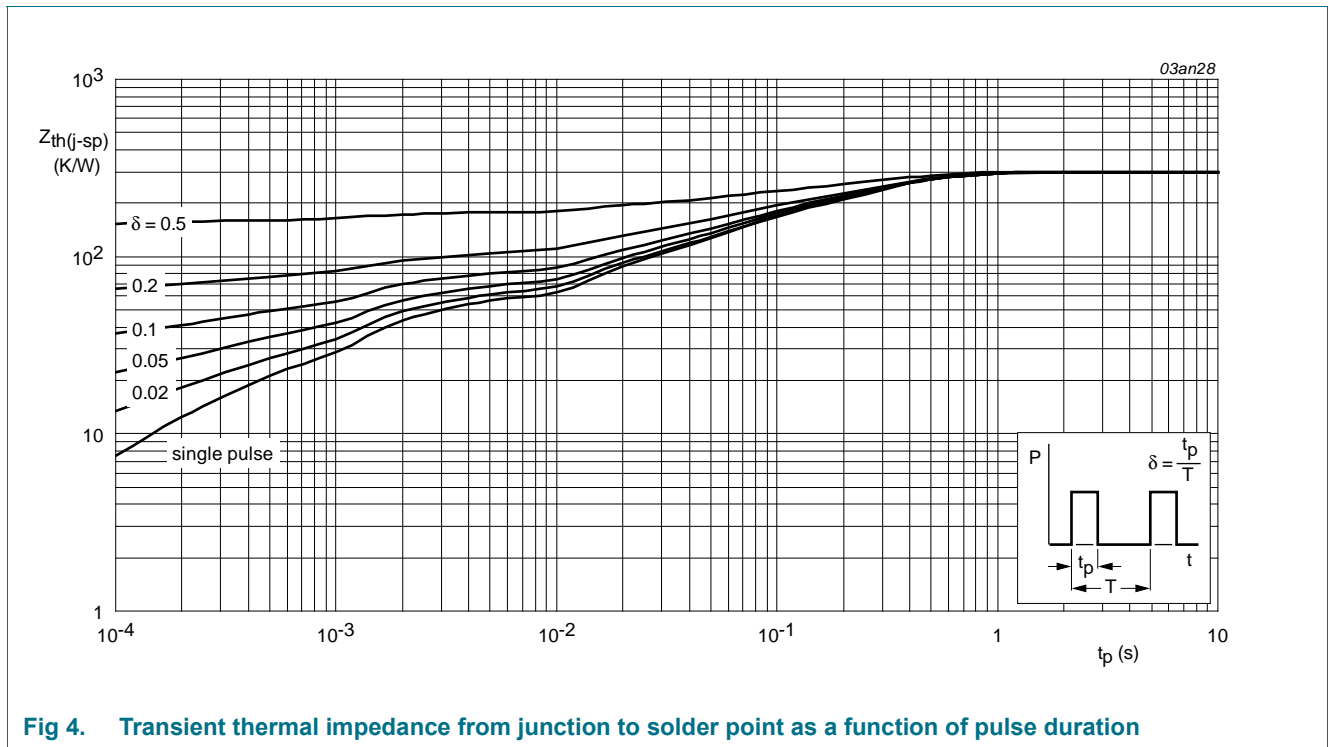
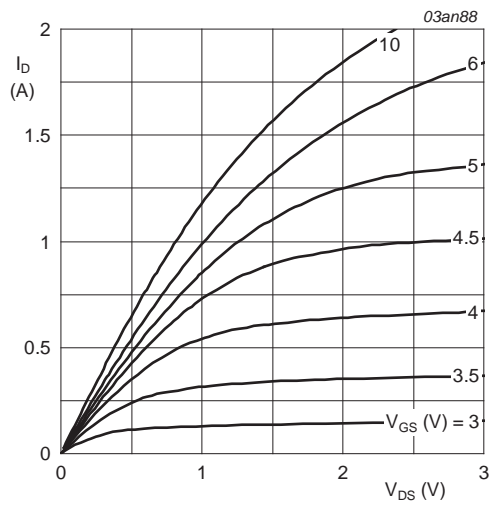


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

## 6. Characteristics

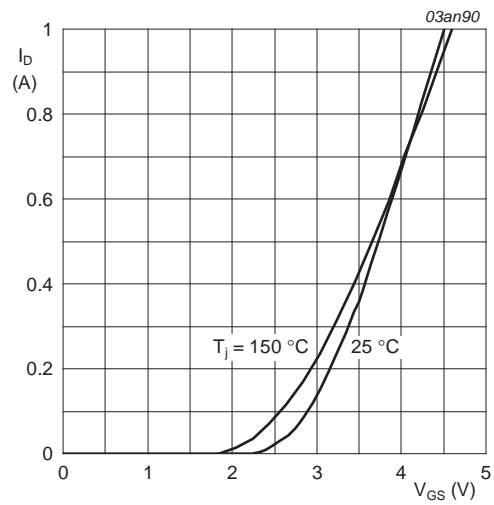
**Table 5. Characteristics**
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

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



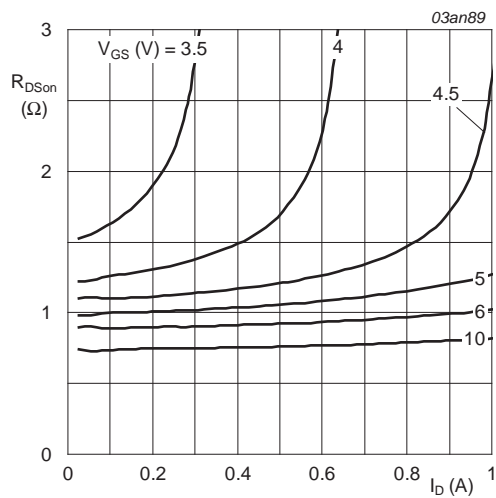
$T_j = 25\text{ }^\circ\text{C}$

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



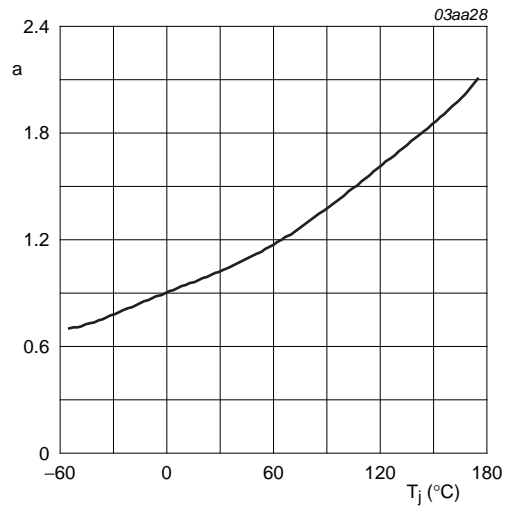
$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DSon}$

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



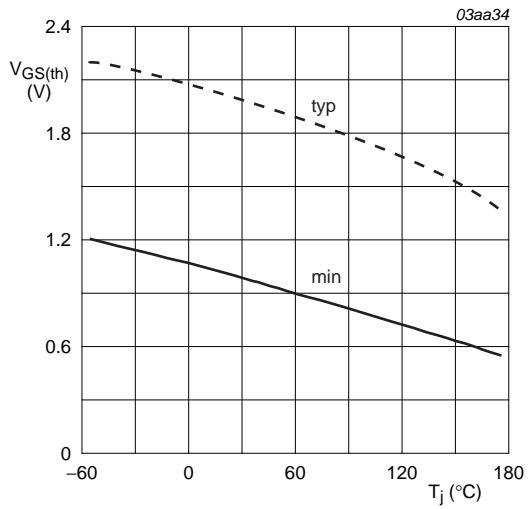
$T_j = 25\text{ }^\circ\text{C}$

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



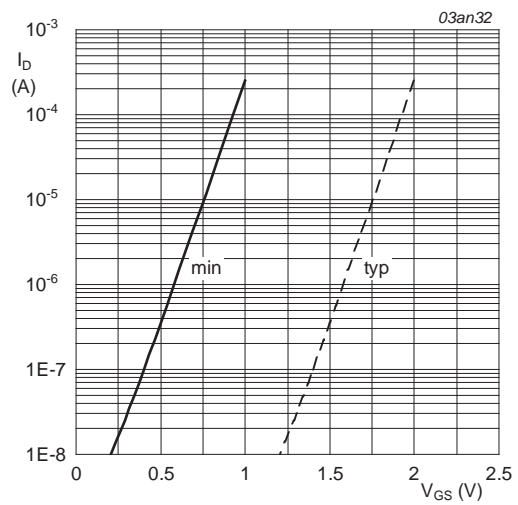
$$a = \frac{R_{DSon}}{R_{DSon(25\text{ }^\circ\text{C})}}$$

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



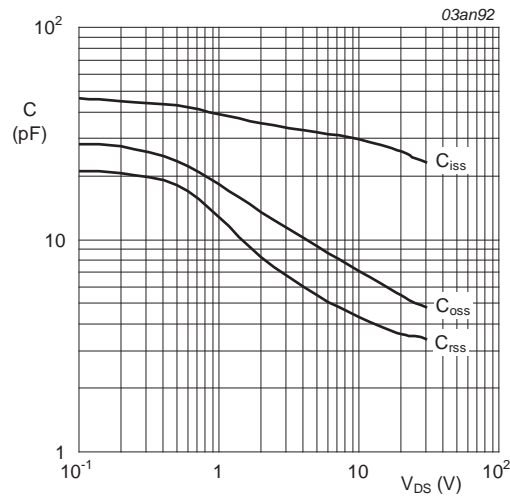
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



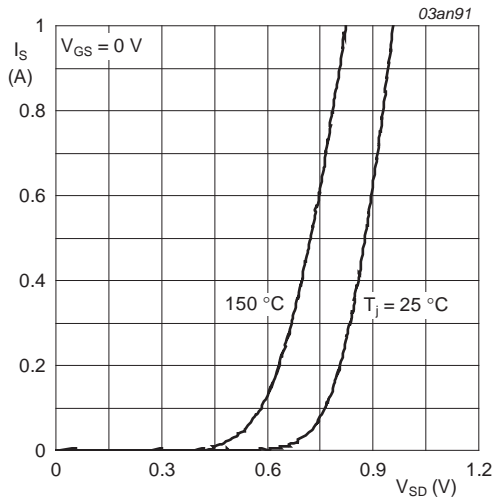
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 5 \text{ V}$

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



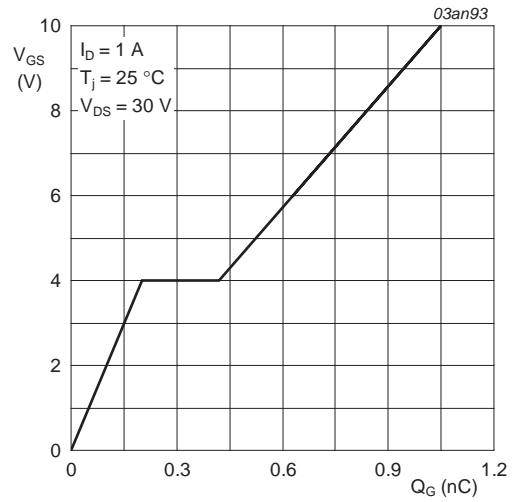
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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

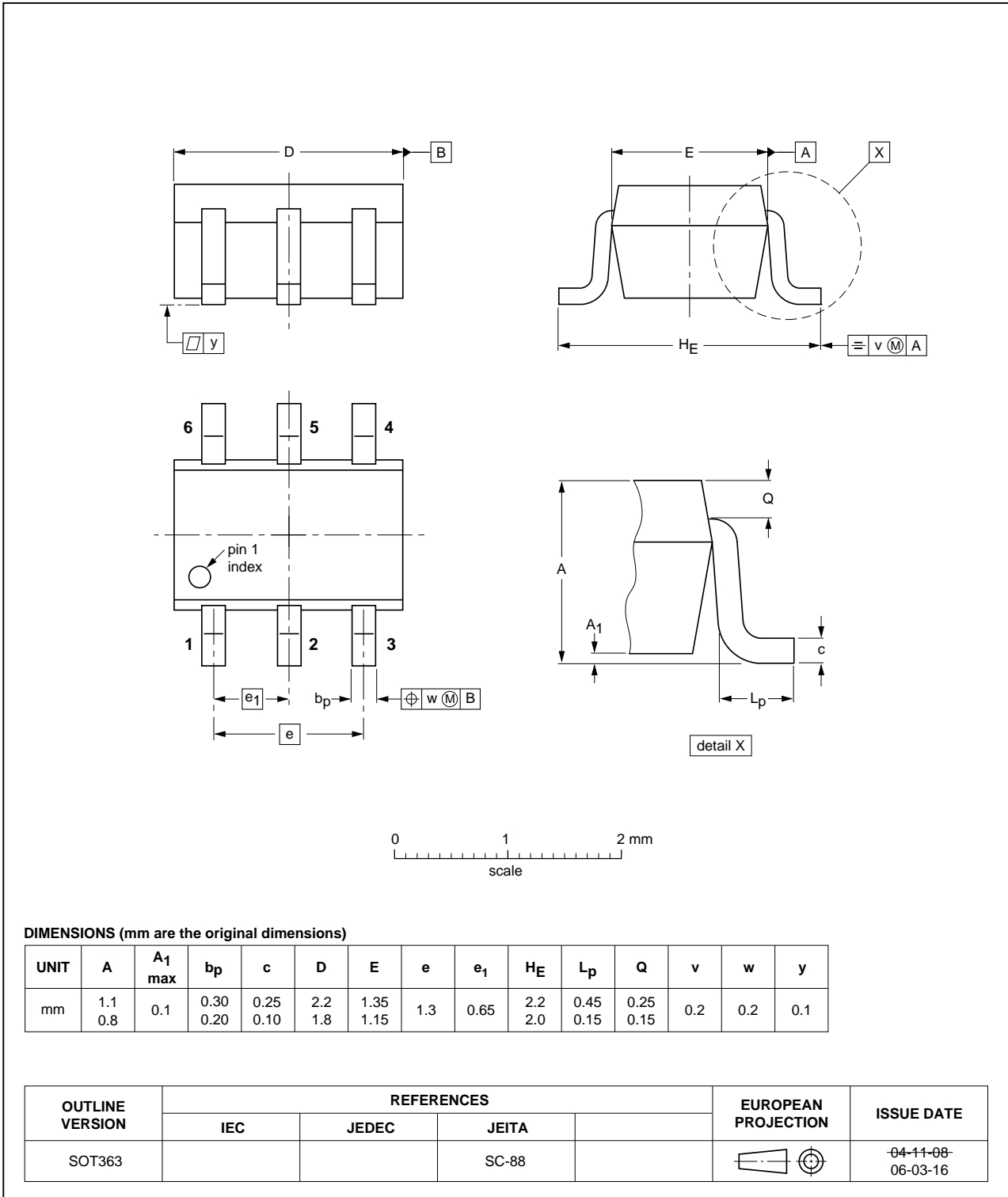


Fig 14. Package outline SOT363 (SC-88)

8. Soldering

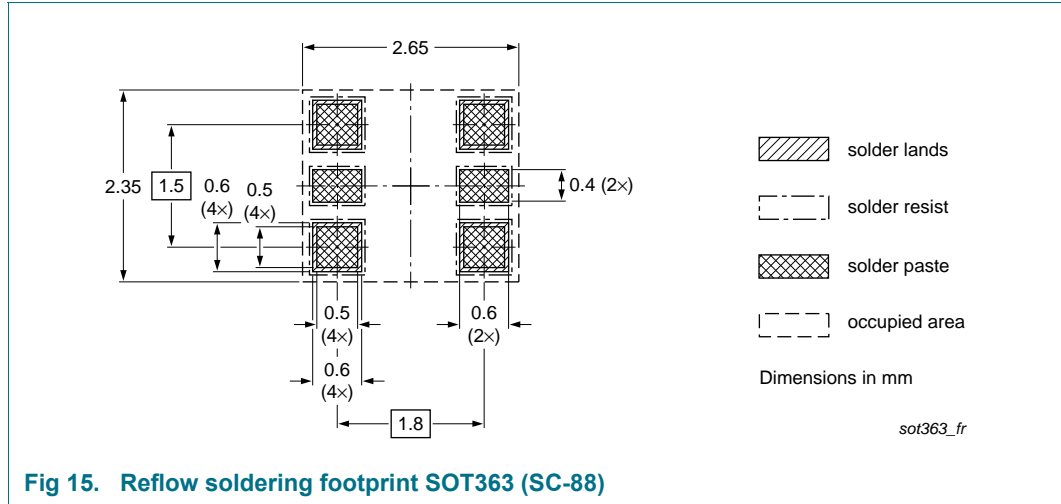


Fig 15. Reflow soldering footprint SOT363 (SC-88)

## 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".

[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.nxp.com>.

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