

# PMF3800SN

## N-channel TrenchMOS standard level FET

Rev. 03 — 11 November 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

### 1.2 Features and benefits

- Electrostatically robust due to integrated protection diodes
- Saves PCB space due to small footprint
- Suitable for high frequency applications due to fast switching characteristics
- Suitable for logic level gate drive sources

### 1.3 Applications

- High-speed line drivers
- Relay drivers

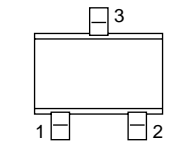
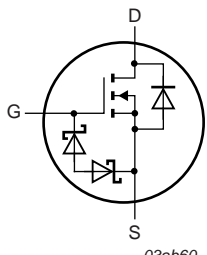
### 1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	-	60	V
$I_D$	drain current	$T_{sp} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 1</a> and <a href="#">3</a>	-	-	260	mA
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	0.56	W
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 0.5\text{ A};$	-	0.07	-	nC
$Q_{G(tot)}$	total gate charge	$V_{DS} = 48\text{ V}; T_j = 25\text{ °C};$ see <a href="#">Figure 11</a>	-	0.85	-	nC
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 200\text{ mA};$ $T_j = 25\text{ °C};$ see <a href="#">Figure 9</a> and <a href="#">10</a>	-	3.8	5.3	$\Omega$
		$V_{GS} = 10\text{ V}; I_D = 500\text{ mA};$ $T_j = 25\text{ °C};$ see <a href="#">Figure 9</a> and <a href="#">10</a>	-	2.8	4.5	$\Omega$

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>SOT323 (SC-70)</p>	 <p>03ab60</p>
2	S	source		
3	D	drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMF3800SN	SC-70	plastic surface-mounted package; 3 leads	SOT323

## 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PMF3800SN	FK*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

Table 5. Limiting values

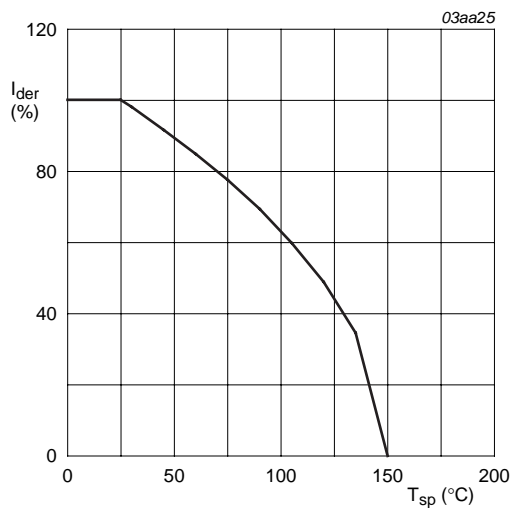
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$	-	60	V
$V_{DGR}$	drain-gate voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	60	V
$V_{GS}$	gate-source voltage		-15	15	V
$I_D$	drain current	$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a>	-	165	mA
		$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a> and <a href="#">3</a>	-	260	mA
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; $t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; see <a href="#">Figure 3</a>	-	560	mA
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	0.56	W
$T_{stg}$	storage temperature		-55	150	°C
$T_j$	junction temperature		-55	150	°C

**Table 5. Limiting values ...continued**

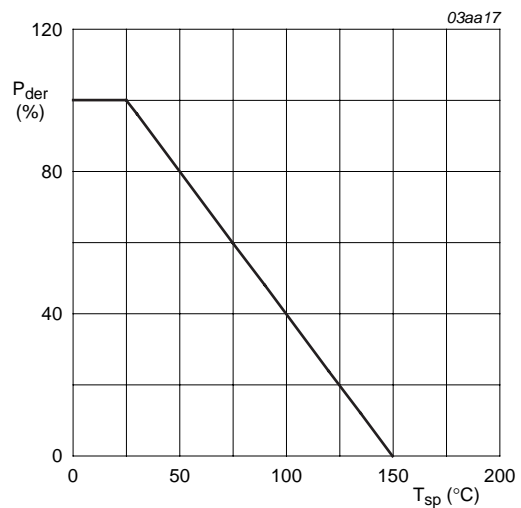
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Source-drain diode</b>					
$I_S$	source current	$T_{sp} = 25\text{ }^\circ\text{C}$	-	280	mA
$I_{SM}$	peak source current	$T_{sp} = 25\text{ }^\circ\text{C}$ ; $t_p \leq 10\text{ }\mu\text{s}$ ; pulsed	-	560	mA
<b>Electrostatic discharge voltage</b>					
$V_{ESD}$	electrostatic discharge voltage	HBM; C = 100 pF; R = 1.5 k $\Omega$	-	1	kV



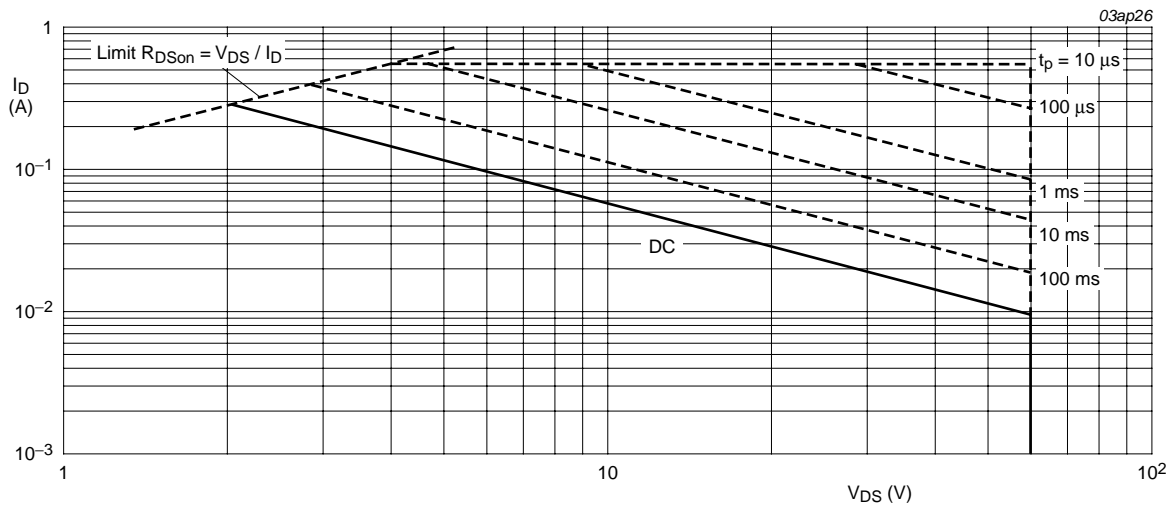
$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

**Fig 1. Normalized continuous drain current as a function of solder point temperature**



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

**Fig 2. Normalized total power dissipation as a function of solder point temperature**



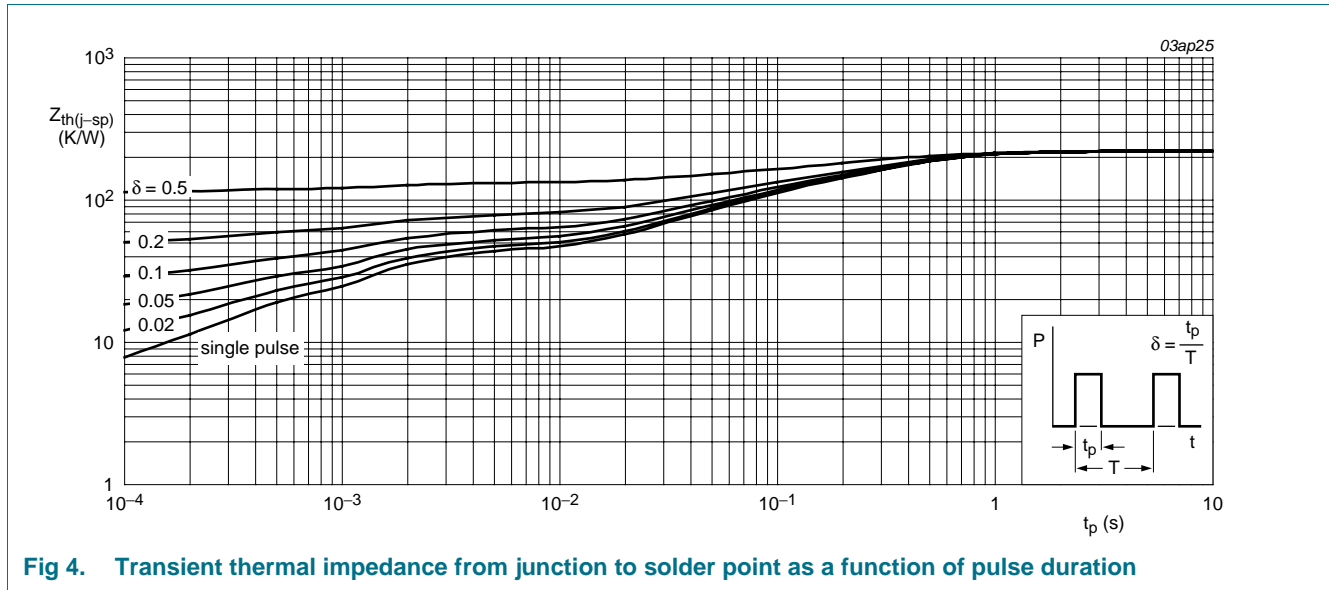
$T_{sp} = 25\text{ }^\circ\text{C}$ ;  $I_{DM}$  is single pulse

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

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	see <a href="#">Figure 4</a>	-	-	220	K/W

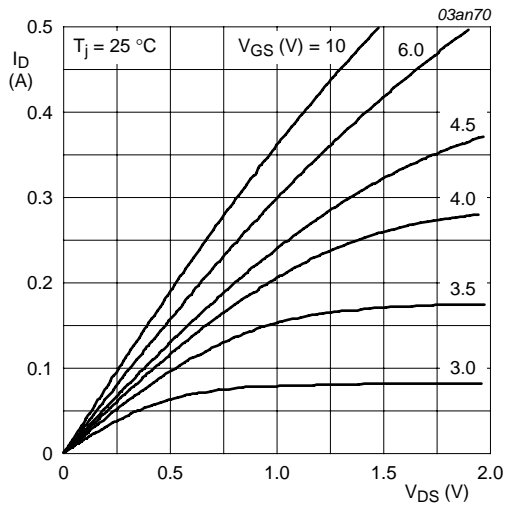


**Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration**

## 7. Characteristics

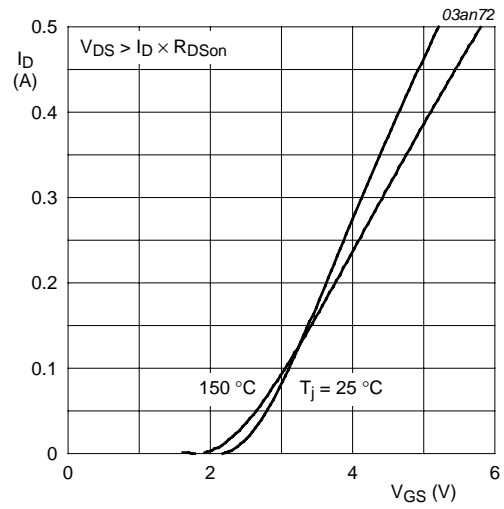
**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	55	-	-	V
		$I_D = 10 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ }^\circ C$ ; see <a href="#">Figure 7</a> and <a href="#">8</a>	0.6	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$ ; see <a href="#">Figure 7</a> and <a href="#">8</a>	-	-	3.5	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 7</a> and <a href="#">8</a>	1	2	3.3	V
$I_{DSS}$	drain leakage current	$V_{DS} = 48 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 48 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = -10 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	50	500	nA
		$V_{GS} = 10 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	50	500	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 500 \text{ mA}; T_j = 150 \text{ }^\circ C$ ; see <a href="#">Figure 9</a> and <a href="#">10</a>	-	5.2	8.4	$\Omega$
		$V_{GS} = 4.5 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 9</a> and <a href="#">10</a>	-	3.8	5.3	$\Omega$
		$V_{GS} = 10 V; I_D = 500 \text{ mA}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 9</a> and <a href="#">10</a>	-	2.8	4.5	$\Omega$
$V_{(BR)GSS}$	gate-source breakdown voltage	$V_{DS} = 0 V; T_j = 25 \text{ }^\circ C; I_G = -1 \text{ mA}$	16	22	-	V
		$T_j = 25 \text{ }^\circ C; I_G = 1 \text{ mA}; V_{DS} = 0 V$	16	22	-	V
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 0.5 \text{ A}; V_{DS} = 48 V; V_{GS} = 10 V;$ $T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 11</a>	-	0.85	-	nC
$Q_{GS}$	gate-source charge		-	0.55	-	nC
$Q_{GD}$	gate-drain charge		-	0.07	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 10 V; V_{GS} = 0 V; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 12</a>	-	13	40	pF
$C_{oss}$	output capacitance		-	8	30	pF
$C_{rss}$	reverse transfer capacitance		-	4	10	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50 V; R_L = 250 \text{ } \Omega; V_{GS} = 10 V;$ $R_{G(ext)} = 50 \text{ } \Omega$	-	-	-	ns
$t_r$	rise time		-	-	-	ns
$t_{d(off)}$	turn-off delay time		-	-	-	ns
$t_f$	fall time		-	-	-	ns
$t_{off}$	turn-off time	$V_{DS} = 50 V; V_{GS} = 10 V; R_{G(ext)} = 50 \text{ } \Omega;$ $R_{GS} = 50 \text{ } \Omega; T_j = 25 \text{ }^\circ C; R_L = 250 \text{ } \Omega$	-	9	-	ns
$t_{on}$	turn-on time		-	3	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 300 \text{ mA}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 13</a>	-	0.93	1.5	V
$t_{rr}$	reverse recovery time	$I_S = 300 \text{ mA}; di_S/dt = -100 \text{ A}/\mu s;$ $V_{GS} = 0 V; V_{DS} = 25 V; T_j = 25 \text{ }^\circ C$	-	30	-	ns
$Q_r$	recovered charge		-	30	-	nC



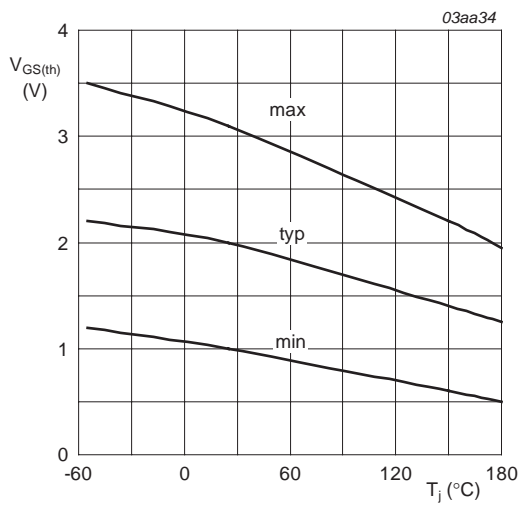
$T_j = 25\text{ }^\circ\text{C}$

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



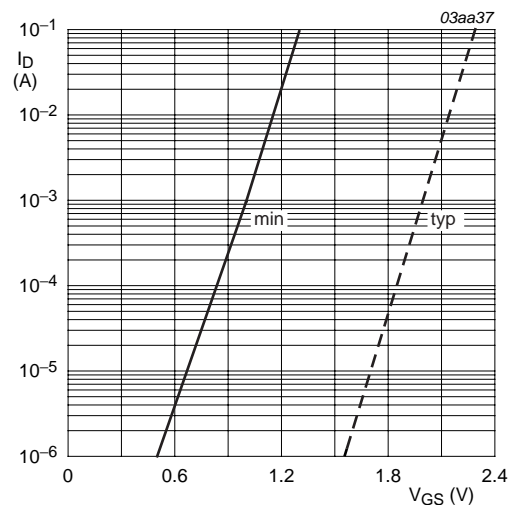
$V_{DS} > I_D \times R_{DSon}$

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



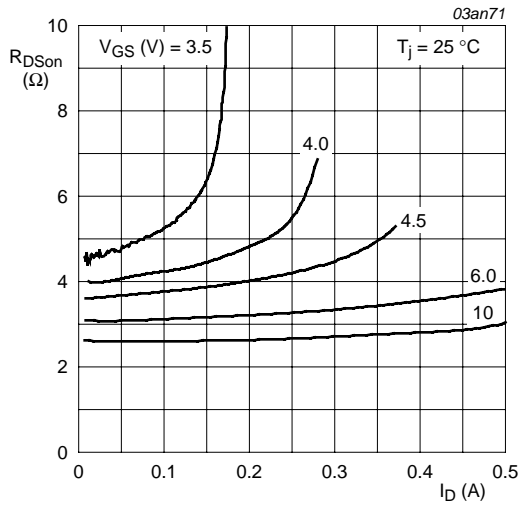
$I_D = 1\text{ mA}; V_{DS} = V_{GS}$

Fig 7. Gate-source threshold voltage as a function of junction temperature



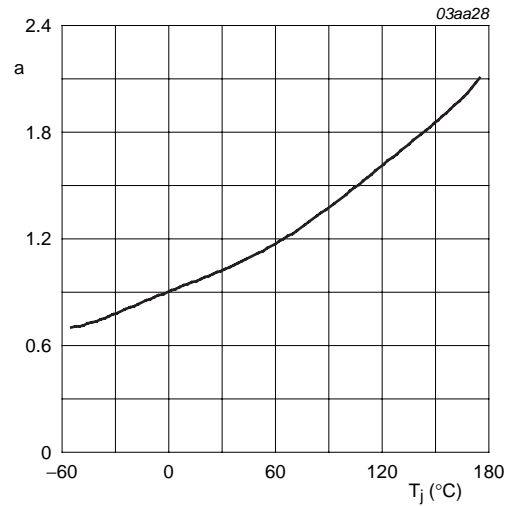
$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$

Fig 8. Sub-threshold drain current as a function of gate-source voltage



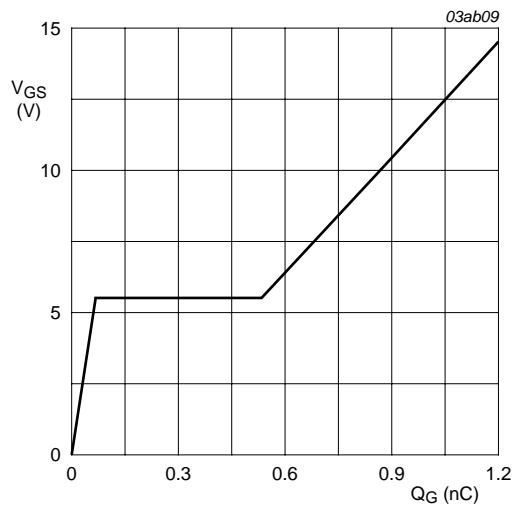
$T_j = 25^\circ C$

Fig 9. Drain-source on-state resistance as a function of drain current; typical values



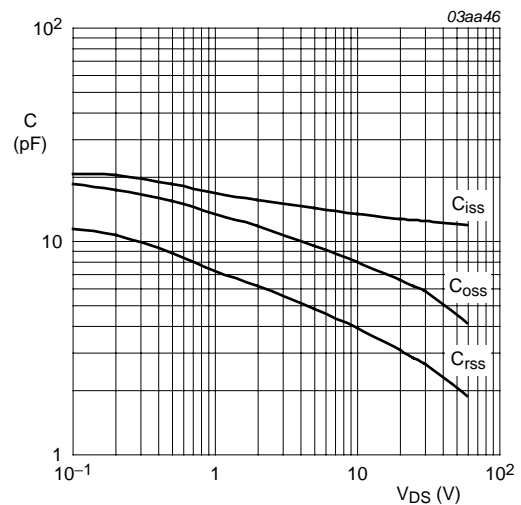
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ C)}}$$

Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature



$I_D = 0.5 A; V_{DS} = 48 V$

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



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

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

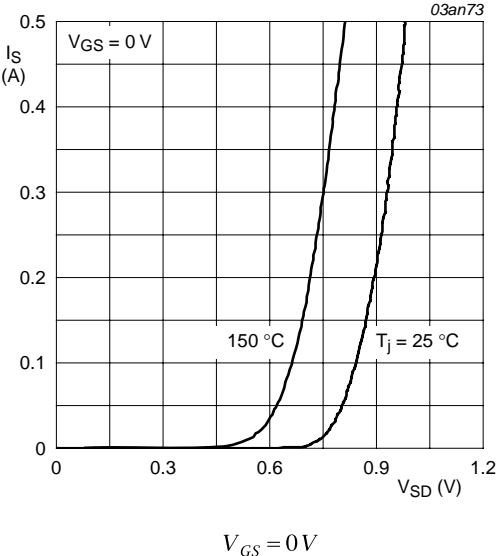


Fig 13. Source current as a function of source-drain voltage; typical values



### 8. Package outline

Plastic surface-mounted package; 3 leads

SOT323

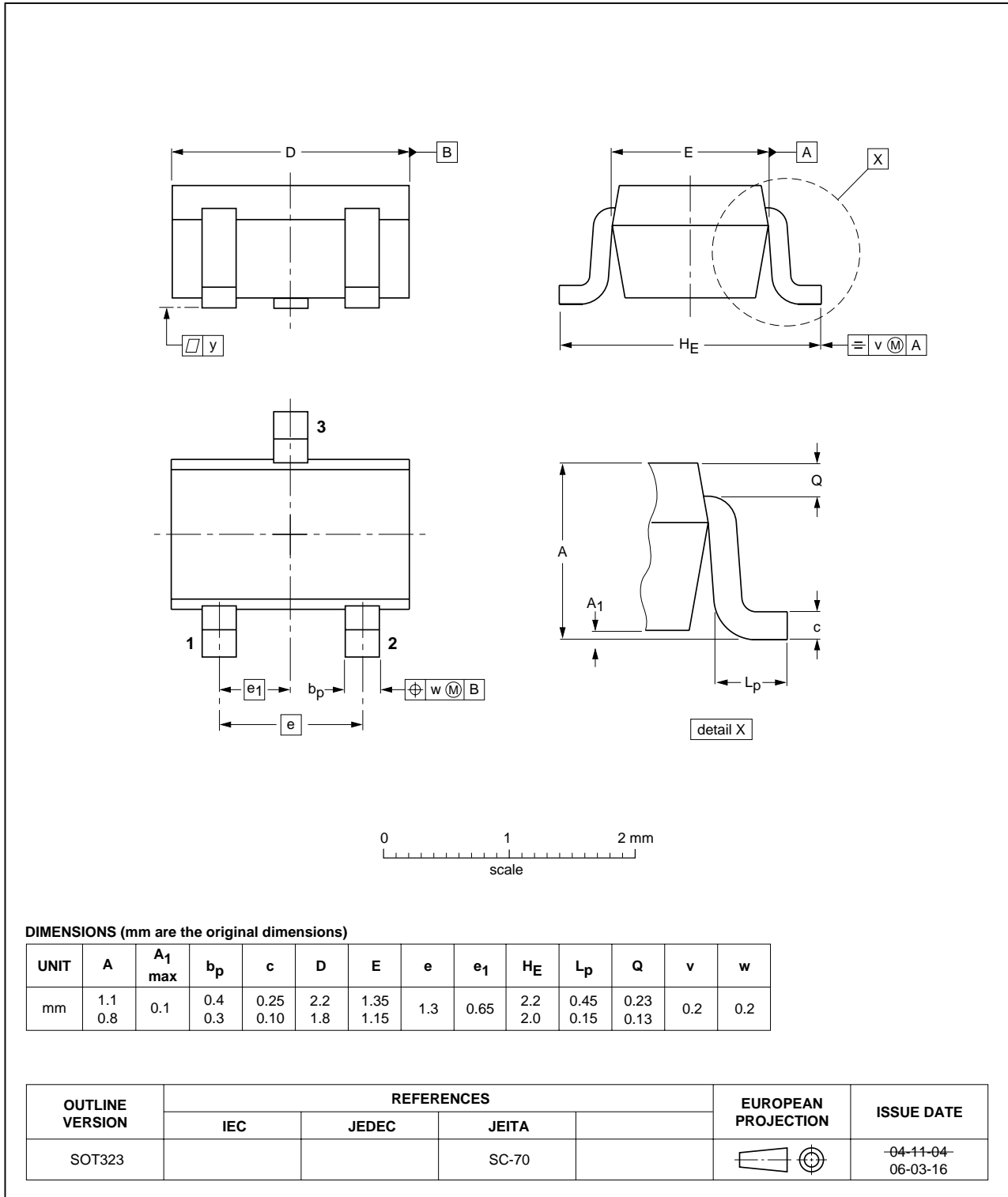


Fig 14. Package outline SOT323 (SC-70)

## 9. Revision history

**Table 8. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMF3800SN_3	20091111	Product data sheet	-	PMF3800SN_2
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>Maximum value added for <math>V_{GS(th)}</math> @ <math>T_j = 25\text{ °C}</math> in Characteristics table.</li> </ul>		
PMF3800SN_2 (9397 750 15218)	20050701	Product data sheet	-	PMF3800SN_1
PMF3800SN_1 (9397 750 14255)	20050208	Product data sheet	-	-

## 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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