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	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	60	V
I_D	drain current	$T_{sp} = 25$ °C; $V_{GS} = 10$ V; see Figure 1 and 3	-	-	260	mA
P_{tot}	total power dissipation	$T_{sp} = 25$ °C; see Figure 2	-	-	0.56	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10$ V; $I_D = 0.5$ A; $V_{DS} = 48$ V; $T_j = 25$ °C; see Figure 11	-	0.07	-	nC
$Q_{G(tot)}$	total gate charge		-	0.85	-	nC
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5$ V; $I_D = 200$ mA; $T_j = 25$ °C; see Figure 9 and 10	-	3.8	5.3	Ω
		$V_{GS} = 10$ V; $I_D = 500$ mA; $T_j = 25$ °C; see Figure 9 and 10	-	2.8	4.5	Ω

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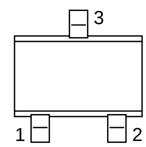
2. Pinning information

Table 2. Pinning information

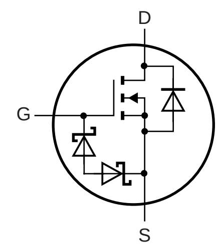
Pin	Symbol	Description
1	G	gate
2	S	source
3	D	drain

Simplified outline



SOT323 (SC-70)

Graphic symbol



3. Ordering information

Table 3. Ordering information

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

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
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

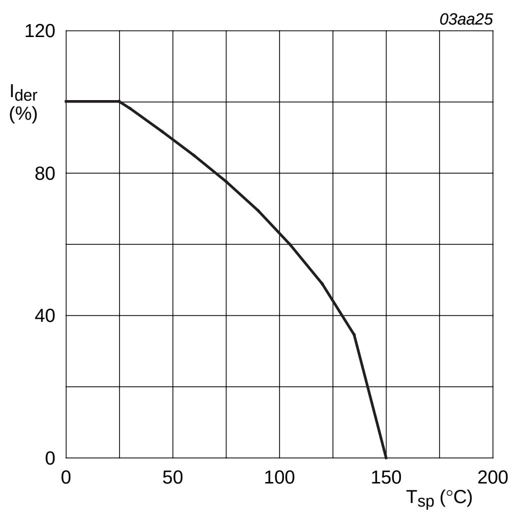
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

Table 5. Limiting values *…continued*

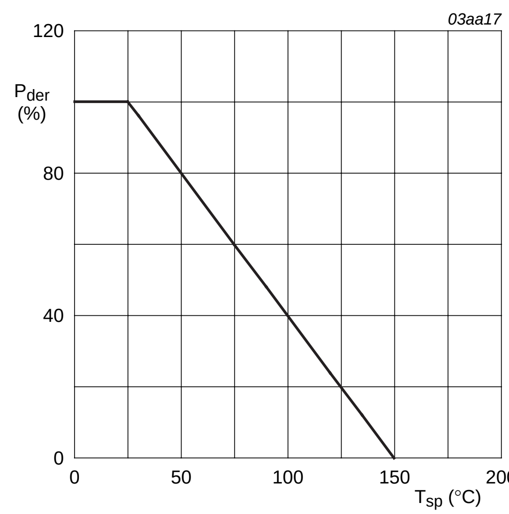
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
Source-drain diode					
I_S	source current	T_{sp} = 25 °C	-	280	mA
I_{SM}	peak source current	T_{sp} = 25 °C; t_p ≤ 10 µs; pulsed	-	560	mA
Electrostatic discharge voltage					
V_{ESD}	electrostatic discharge voltage	HBM; C = 100 pF; R = 1.5 kΩ	-	1	kV



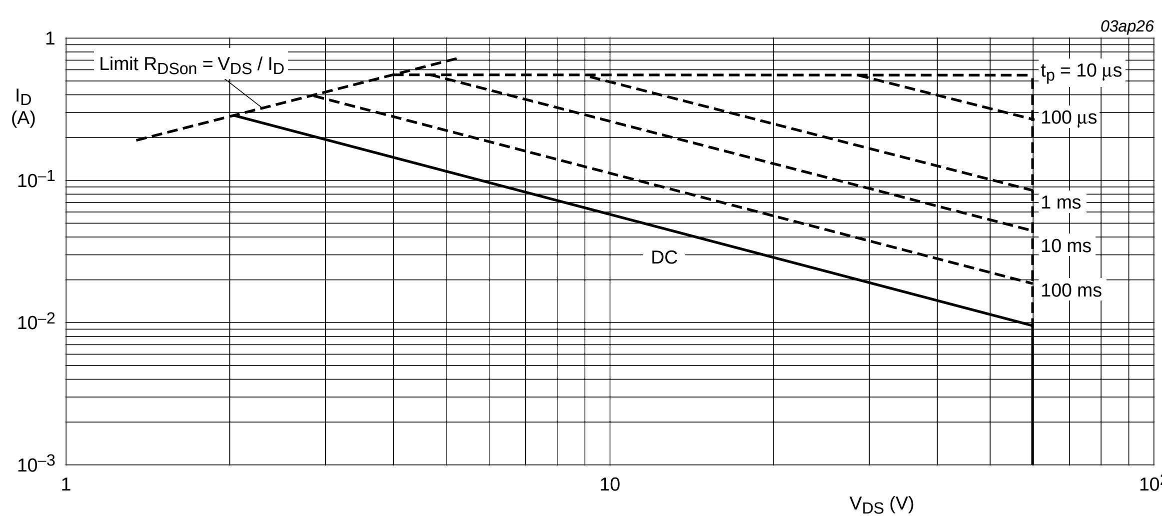
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

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



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

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



$T_{sp} = 25\,°C; I_{DM}$ 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 Figure 4	-	-	220	K/W

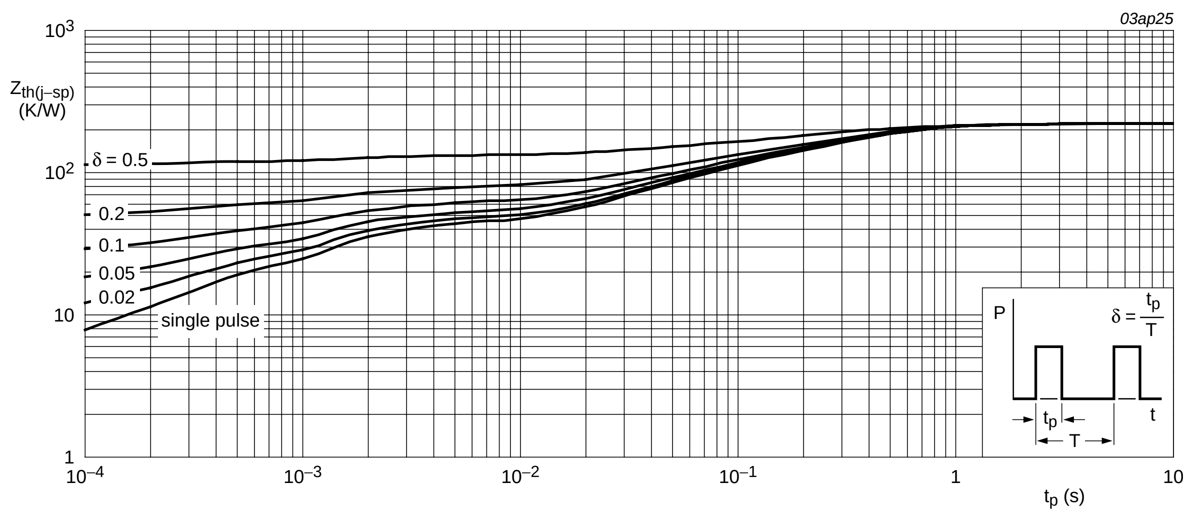
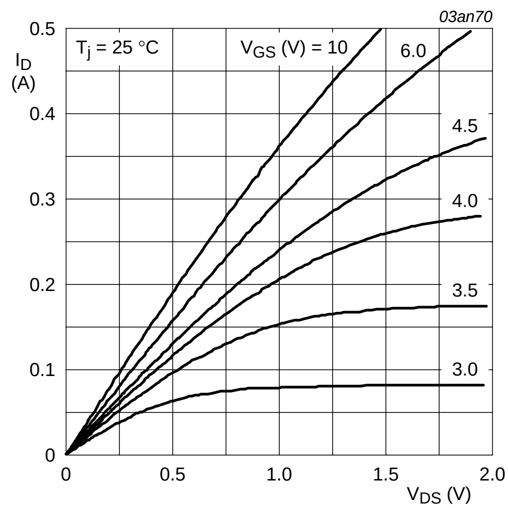


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

7. Characteristics

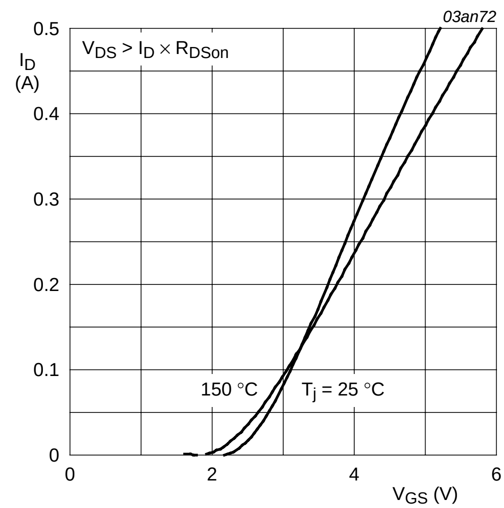
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 µA; V_{GS} = 0 V; T_j = -55 °C	55	-	-	V
		I_D = 10 µA; V_{GS} = 0 V; T_j = 25 °C	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C; see Figure 7 and 8	0.6	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 7 and 8	-	-	3.5	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 7 and 8	1	2	3.3	V
I_{DSS}	drain leakage current	V_{DS} = 48 V; V_{GS} = 0 V; T_j = 25 °C	-	-	1	µA
		V_{DS} = 48 V; V_{GS} = 0 V; T_j = 150 °C	-	-	10	µA
I_{GSS}	gate leakage current	V_{GS} = -10 V; V_{DS} = 0 V; T_j = 25 °C	-	50	500	nA
		V_{GS} = 10 V; V_{DS} = 0 V; T_j = 25 °C	-	50	500	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 500 mA; T_j = 150 °C; see Figure 9 and 10	-	5.2	8.4	Ω
		V_{GS} = 4.5 V; I_D = 200 mA; T_j = 25 °C; see Figure 9 and 10	-	3.8	5.3	Ω
		V_{GS} = 10 V; I_D = 500 mA; T_j = 25 °C; see Figure 9 and 10	-	2.8	4.5	Ω
$V_{(BR)GSS}$	gate-source breakdown voltage	V_{DS} = 0 V; T_j = 25 °C; I_G = -1 mA	16	22	-	V
		T_j = 25 °C; I_G = 1 mA; V_{DS} = 0 V	16	22	-	V
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 0.5 A; V_{DS} = 48 V; V_{GS} = 10 V; T_j = 25 °C; see Figure 11	-	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 MHz; T_j = 25 °C; see Figure 12	-	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 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 50 Ω	-	-	-	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 Ω; R_{GS} = 50 Ω; T_j = 25 °C; R_L = 250 Ω	-	9	-	ns
t_{on}	turn-on time		-	3	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 300 mA; V_{GS} = 0 V; T_j = 25 °C; see Figure 13	-	0.93	1.5	V
t_{rr}	reverse recovery time	I_S = 300 mA; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 25 V; T_j = 25 °C	-	30	-	ns
Q_r	recovered charge		-	30	-	nC



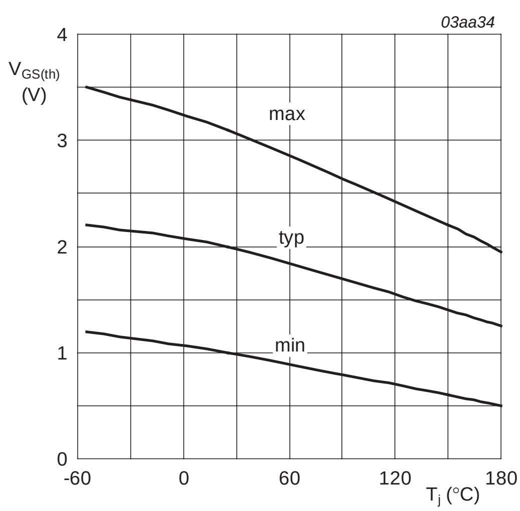
$T_j = 25\,°C$

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



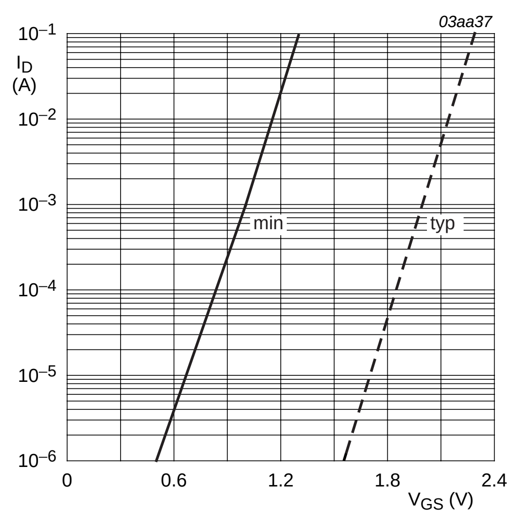
$V_{DS} > I_D \times R_{DSon}$

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



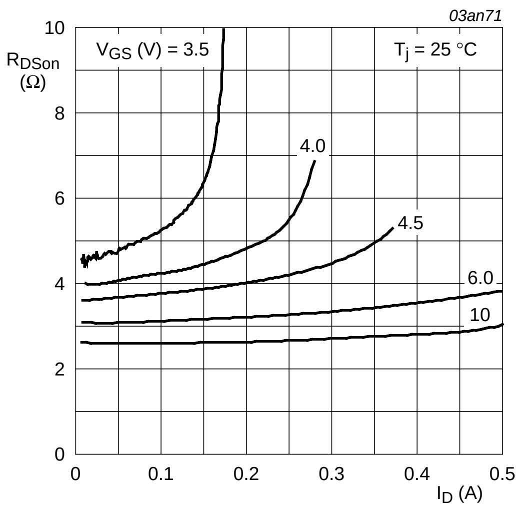
$I_D = 1\,mA; V_{DS} = V_{GS}$

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



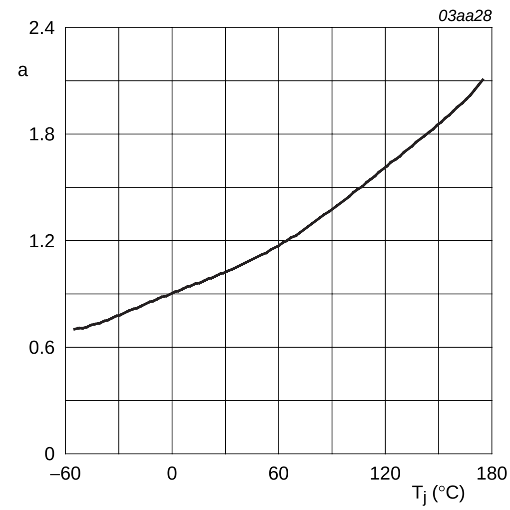
$T_j = 25\,°C; V_{DS} = 5\,V$

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



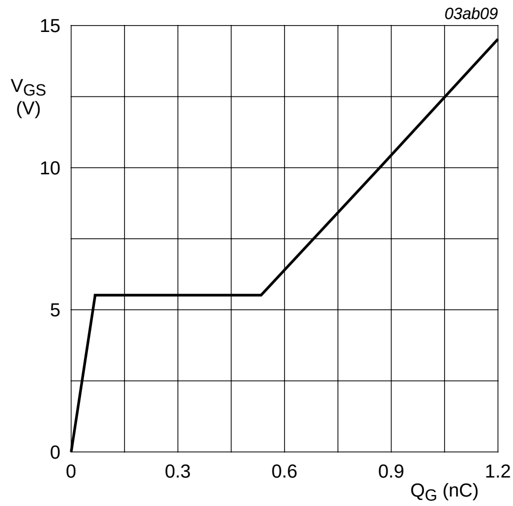
$T_j = 25\,°C$

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



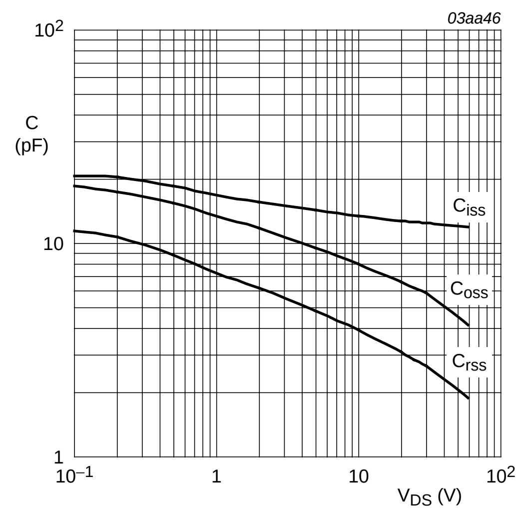
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



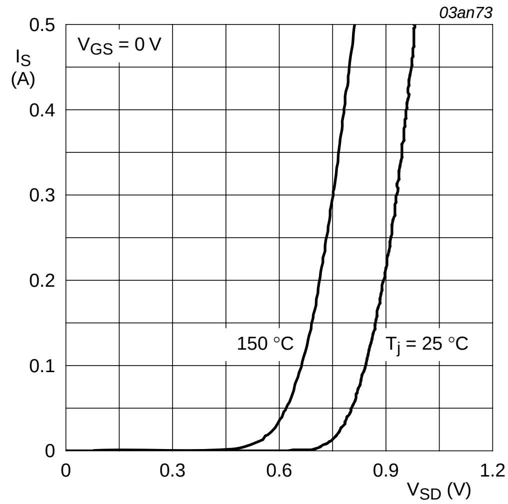
$I_D = 0.5A; V_{DS} = 48\,V$

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

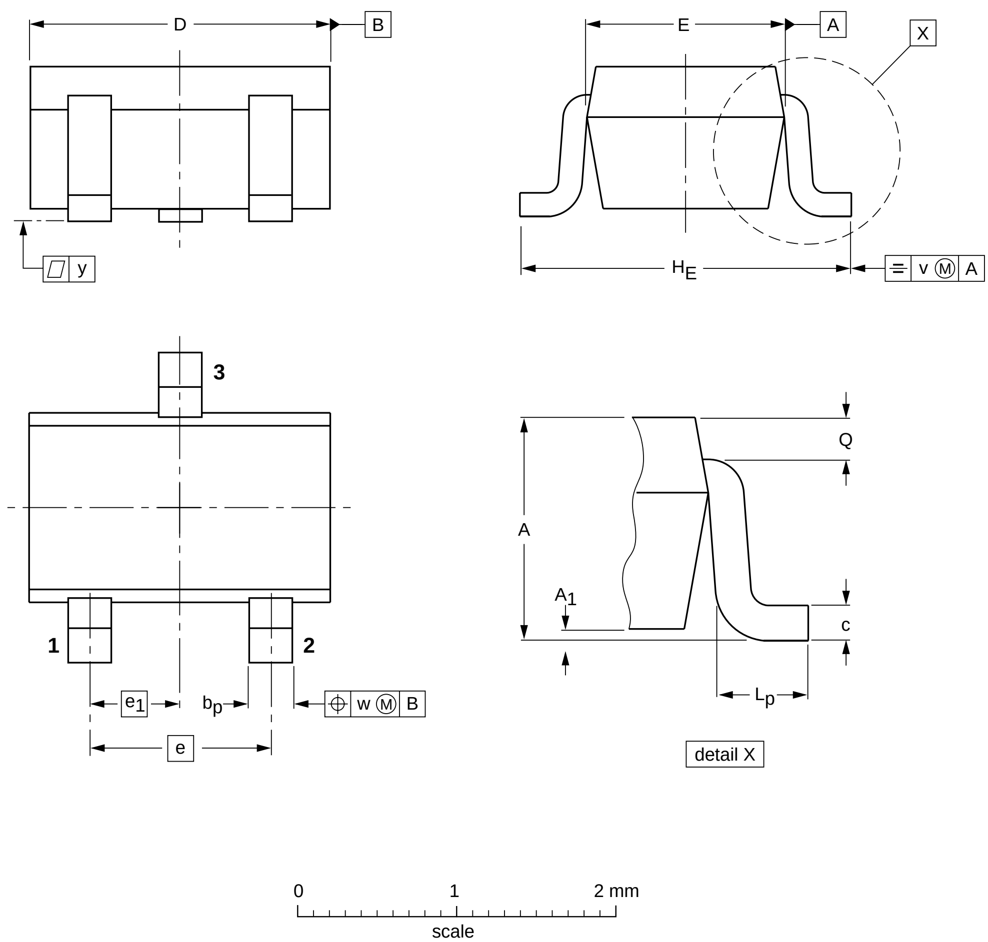


$V_{GS} = 0\,V$

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

8. Package outline

Plastic surface-mounted package; 3 leads **SOT323**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT323			SC-70			~~04-11-04~~ 06-03-16

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:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Maximum value added for $V_{GS(th)}$ @ T_j = 25 °C in Characteristics table.			
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 [1][2]	Product status[3]	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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11. Contact information

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12. Contents

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