



# PMV31XN

## N-channel TrenchMOS FET

Rev. 2 — 30 November 2011

Product data sheet

## 1. Product profile

### 1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

### 1.2 Features and benefits

- Very fast switching
- Low threshold voltage
- Trench MOSFET technology

### 1.3 Applications

- Battery-powered motor control
- High-speed switching in set top box power supplies

### 1.4 Quick reference data

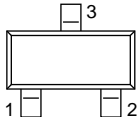
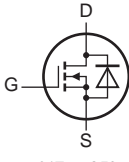
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$	-	-	20	V
$I_D$	drain current	$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 4.5\text{ V}$ ; see <a href="#">Figure 2</a> ; see <a href="#">Figure 3</a>	-	-	5.9	A
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; see <a href="#">Figure 1</a>	-	-	2	W
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 2.5\text{ V}$ ; $I_D = 1\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	44	53	mΩ
		$V_{GS} = 4.5\text{ V}$ ; $I_D = 1.5\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	31	37	mΩ



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT23 (TO-236AB)	 017aaa253
2	S	source		
3	D	drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package			Version
	Name	Description		
PMV31XN	TO-236AB	plastic surface-mounted package; 3 leads		SOT23

## 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PMV31XN	%M4

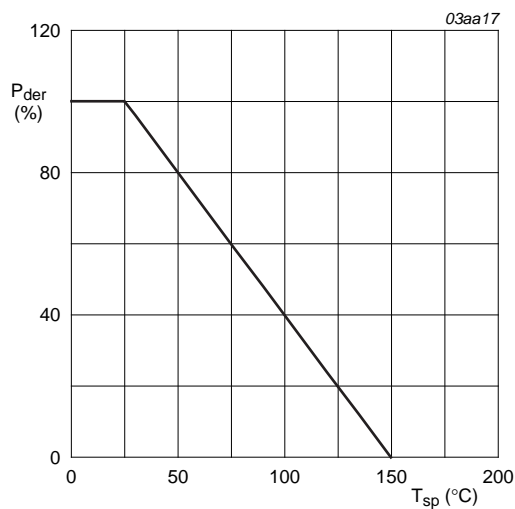
[1] % = placeholder for manufacturing site code

## 5. Limiting values

Table 5. Limiting values

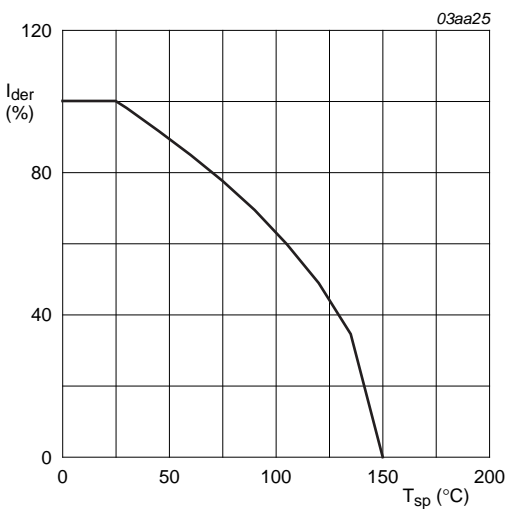
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$	-	20	V
$V_{DGR}$	drain-gate voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	20	V
$V_{GS}$	gate-source voltage		-12	12	V
$I_D$	drain current	$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 4.5\text{ V}$ ; see <a href="#">Figure 2</a>	-	3.75	A
		$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 4.5\text{ V}$ ; see <a href="#">Figure 2</a> ; see <a href="#">Figure 3</a>	-	5.9	A
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; see <a href="#">Figure 3</a>	-	23.7	A
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; see <a href="#">Figure 1</a>	-	2	W
$T_{stg}$	storage temperature		-55	150	°C
$T_j$	junction temperature		-55	150	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{sp} = 25\text{ °C}$	-	1.7	A



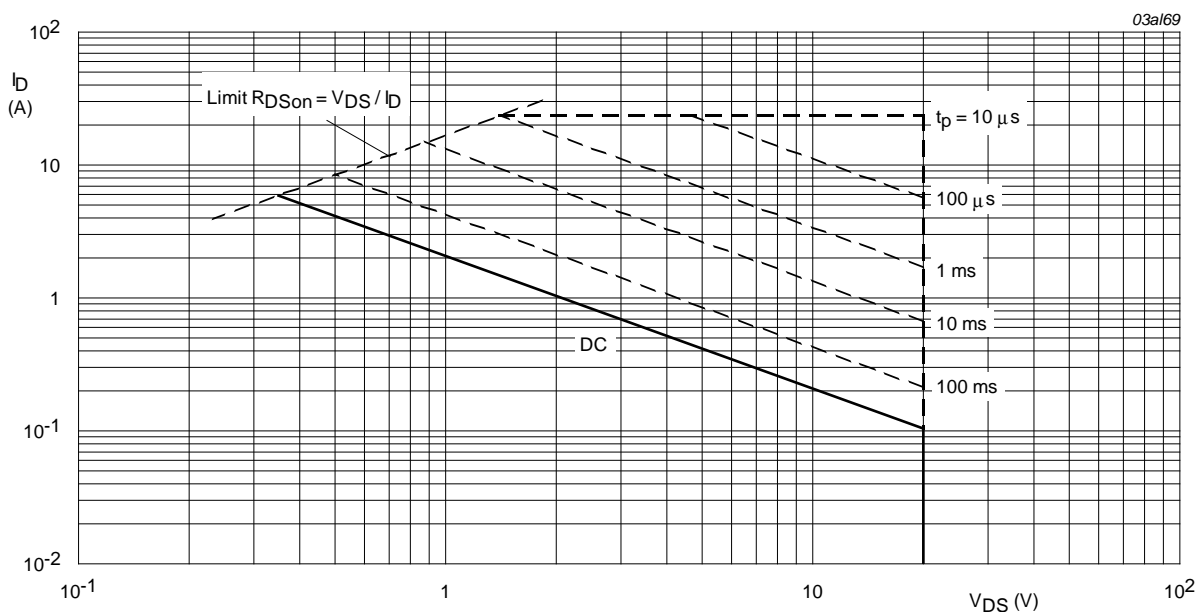
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



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

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>	-	-	60	K/W

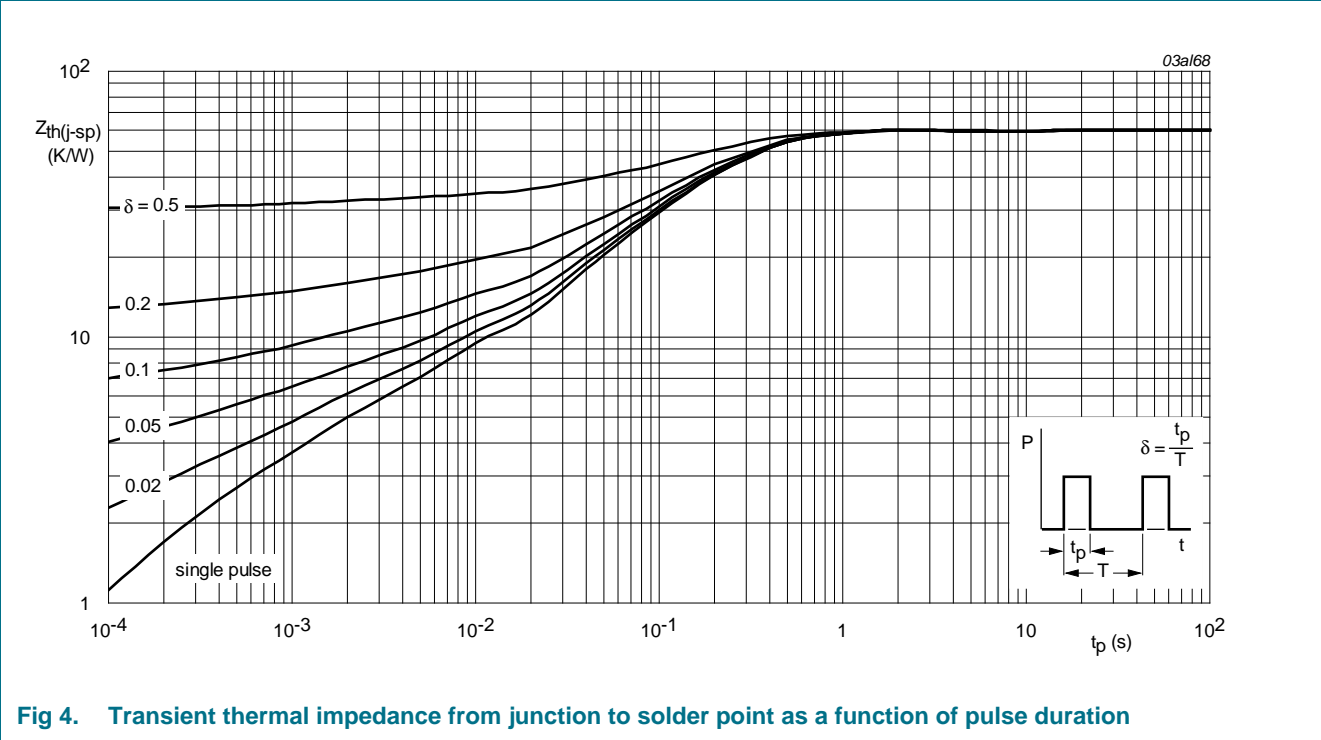


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

## 7. Characteristics

**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	I <sub>D</sub> = 250 μA; V <sub>GS</sub> = 0 V; T <sub>J</sub> = -55 °C	18	-	-	V
		I <sub>D</sub> = 250 μA; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C	20	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = -55 °C; see <a href="#">Figure 8</a>	-	-	1.8	V
		I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = 150 °C; see <a href="#">Figure 8</a>	0.35	-	-	V
		I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = 25 °C; see <a href="#">Figure 8</a>	0.5	-	1.5	V
I <sub>DSS</sub>	drain leakage current	V <sub>DS</sub> = 20 V; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 150 °C	-	-	100	μA
		V <sub>DS</sub> = 20 V; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C	-	-	1	μA
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = 12 V; V <sub>DS</sub> = 0 V; T <sub>J</sub> = 25 °C	-	10	100	nA
		V <sub>GS</sub> = -12 V; V <sub>DS</sub> = 0 V; T <sub>J</sub> = 25 °C	-	10	100	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 2.5 V; I <sub>D</sub> = 1 A; T <sub>J</sub> = 25 °C; see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	44	53	mΩ
		V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 1.5 A; T <sub>J</sub> = 25 °C; see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	31	37	mΩ
Dynamic characteristics						
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 6 A; V <sub>DS</sub> = 10 V; V <sub>GS</sub> = 4.5 V; T <sub>J</sub> = 25 °C; see <a href="#">Figure 11</a>	-	5.8	-	nC
Q <sub>GS</sub>	gate-source charge		-	1.4	-	nC
Q <sub>GD</sub>	gate-drain charge		-	1.7	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 20 V; V <sub>GS</sub> = 0 V; f = 1 MHz; T <sub>J</sub> = 25 °C; see <a href="#">Figure 12</a>	-	410	-	pF
C <sub>oss</sub>	output capacitance		-	115	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	80	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 10 V; R <sub>L</sub> = 10 Ω; V <sub>GS</sub> = 4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>J</sub> = 25 °C	-	10	-	ns
t <sub>r</sub>	rise time		-	15	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	25	-	ns
t <sub>f</sub>	fall time		-	12	-	ns
Source-drain diode						
V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 1.5 A; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C; see <a href="#">Figure 13</a>	-	0.75	1.2	V

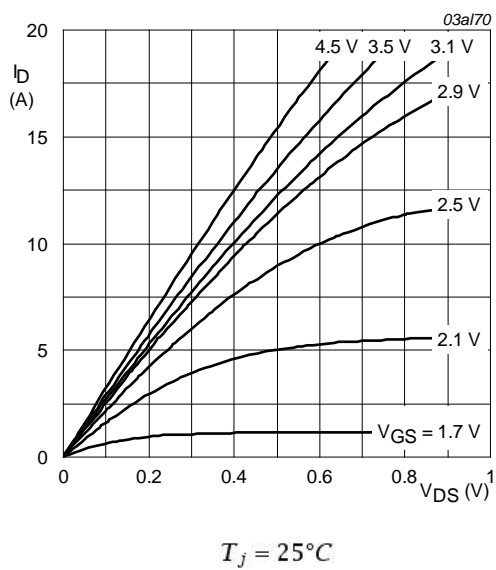


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

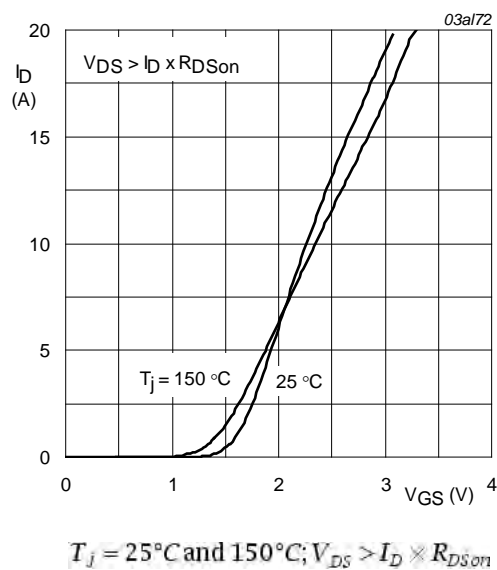


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

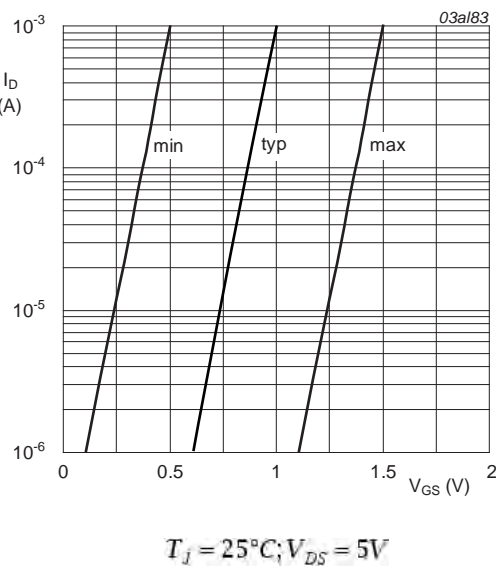


Fig 7. Sub-threshold drain current as a function of gate-source voltage

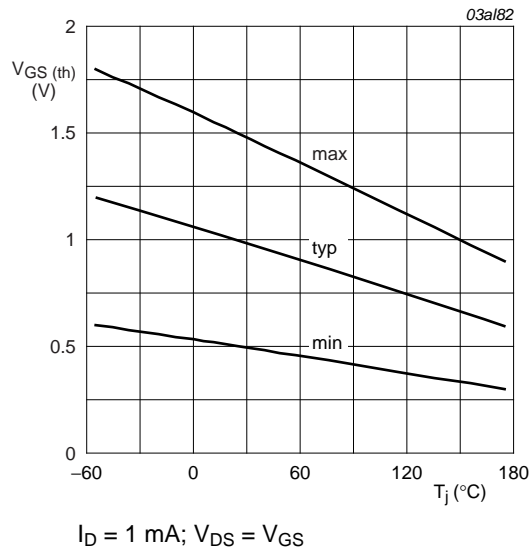


Fig 8. Gate-source threshold voltage as a function of junction temperature

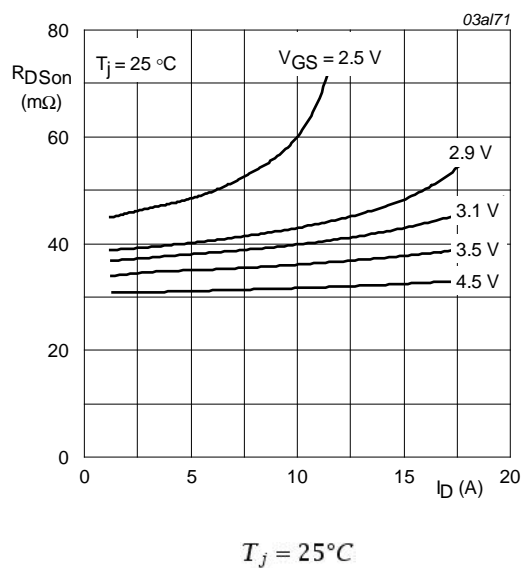


Fig 9. Drain-source on-state resistance as a function of drain current; typical values

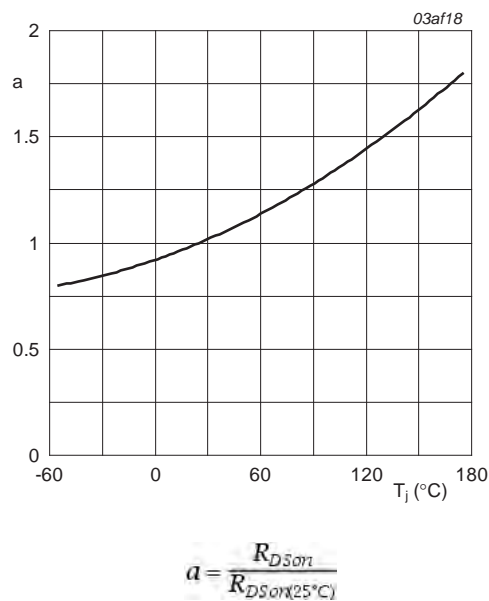


Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature

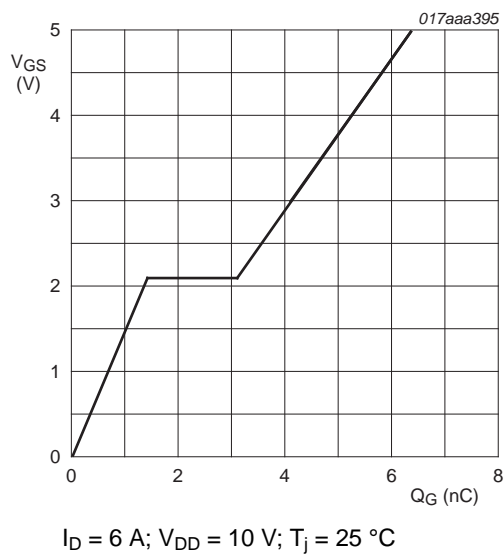


Fig 11. Gate-source voltage as a function of gate charge; typical values

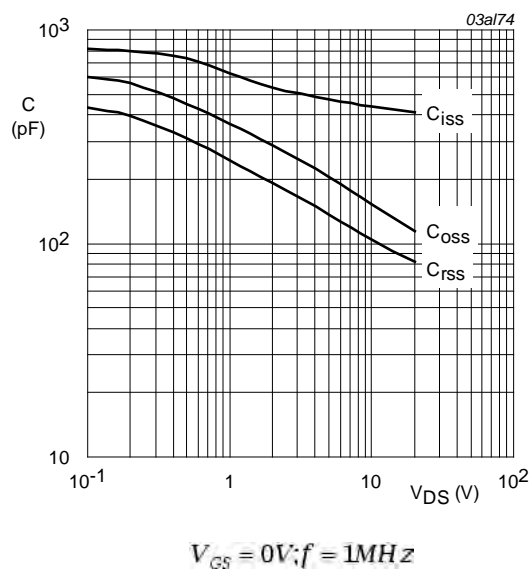
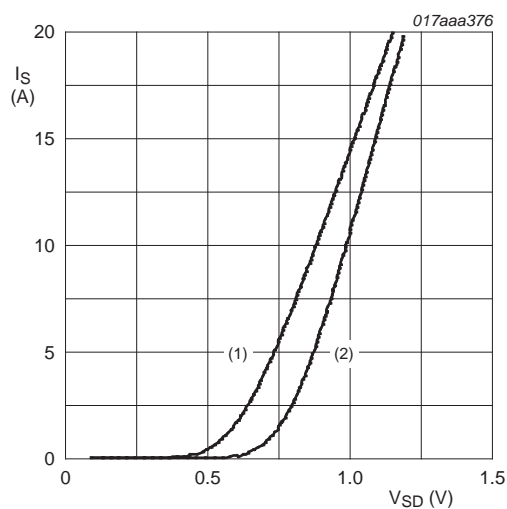


Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$$V_{DS} > I_D \times R_{DS(on)}$$

(1)  $T_j = 25\text{ °C}$

(2)  $T_j = 150\text{ °C}$

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



8. Package outline

Plastic surface-mounted package; 3 leadsSOT23

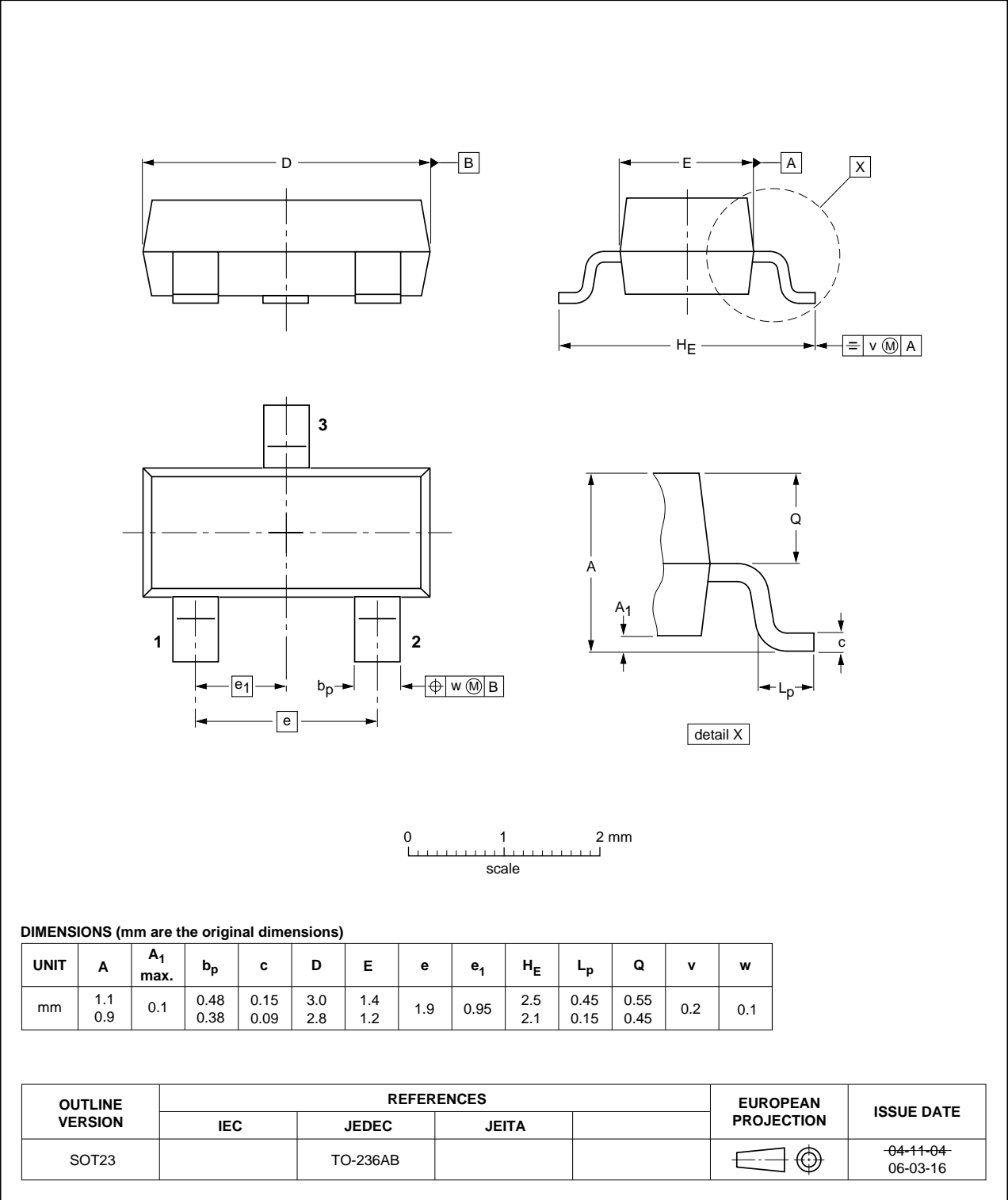


Fig 14. Package outline SOT23 (TO-236AB)

9. Soldering

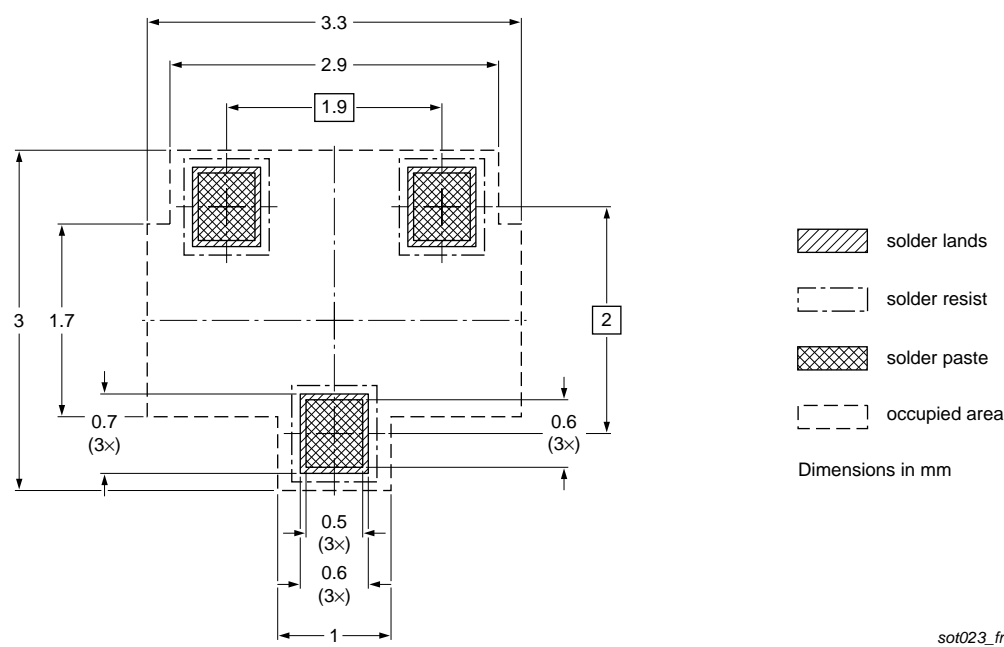


Fig 15. Reflow soldering footprint for SOT23 (TO-236AB)

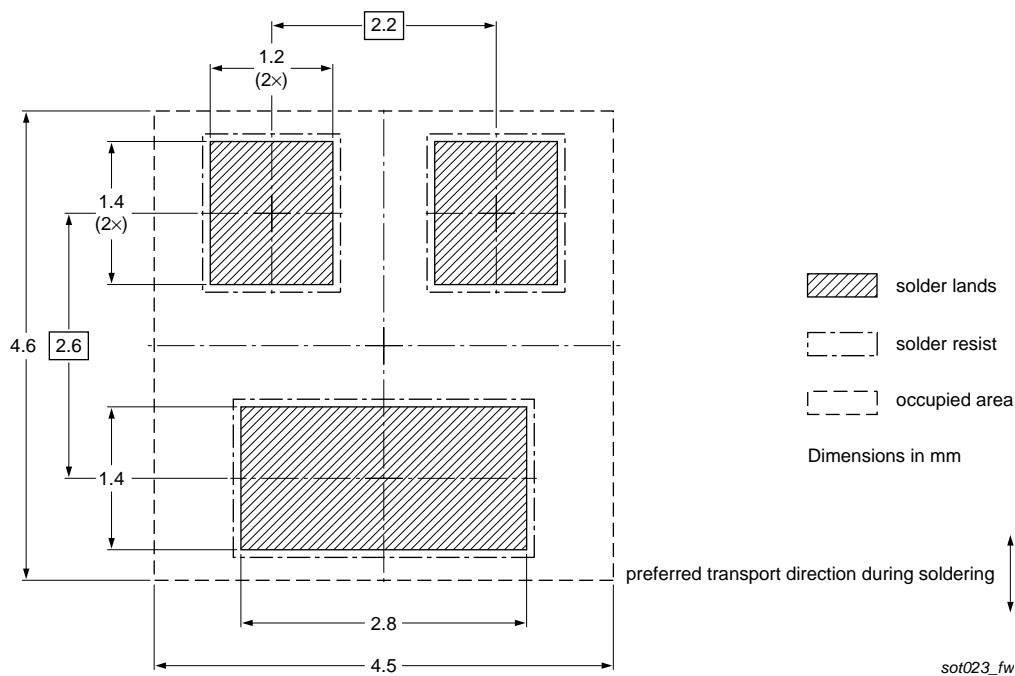


Fig 16. Wave soldering footprint for SOT23 (TO-236AB)

## 10. Revision history

**Table 8.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV31XN v.2	20111130	Product data sheet	-	PMV31XN v.1
Modifications:	<ul style="list-style-type: none"><li>• The format of this document 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="#">1 "Product profile"</a>: updated</li><li>• <a href="#">5 "Limiting values"</a>: <math>V_{DSR}</math> drain-source voltage redefined to <math>V_{DGR}</math> drain-gate voltage</li><li>• <a href="#">14 "Package outline SOT23 (TO-236AB)"</a>: updated</li><li>• <a href="#">9 "Soldering"</a>: added</li><li>• <a href="#">11 "Legal information"</a>: updated</li></ul>			
PMV31XN v.1	20030226	Product data sheet	-	-

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### 11.1 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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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