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Team Nexperia



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

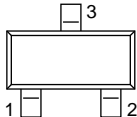
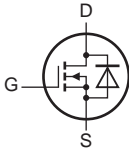
Table 1. Quick reference data

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 Figure 2 ; see Figure 3	-	-	5.9	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$; see Figure 1	-	-	2	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 2.5\text{ V}$; $I_D = 1\text{ A}$; $T_j = 25\text{ °C}$; see Figure 9 ; see Figure 10	-	44	53	mΩ
		$V_{GS} = 4.5\text{ V}$; $I_D = 1.5\text{ A}$; $T_j = 25\text{ °C}$; see Figure 9 ; see Figure 10	-	31	37	mΩ



2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

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

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMV31XN	%M4

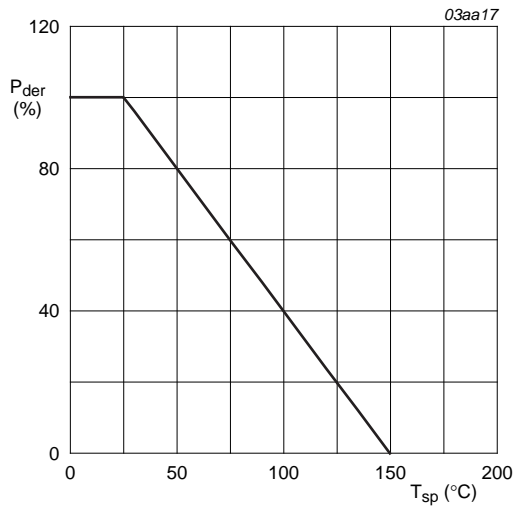
[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

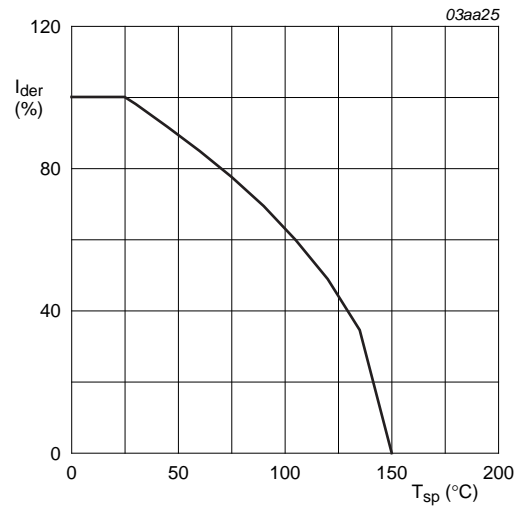
In accordance with the Absolute Maximum Rating System (IEC 60134).

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 Figure 2	-	3.75	A
		$T_{sp} = 25\text{ °C}; V_{GS} = 4.5\text{ V};$ see Figure 2 ; see Figure 3	-	5.9	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ see Figure 3	-	23.7	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C};$ see Figure 1	-	2	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
Source-drain diode					
I_S	source current	$T_{sp} = 25\text{ °C}$	-	1.7	A



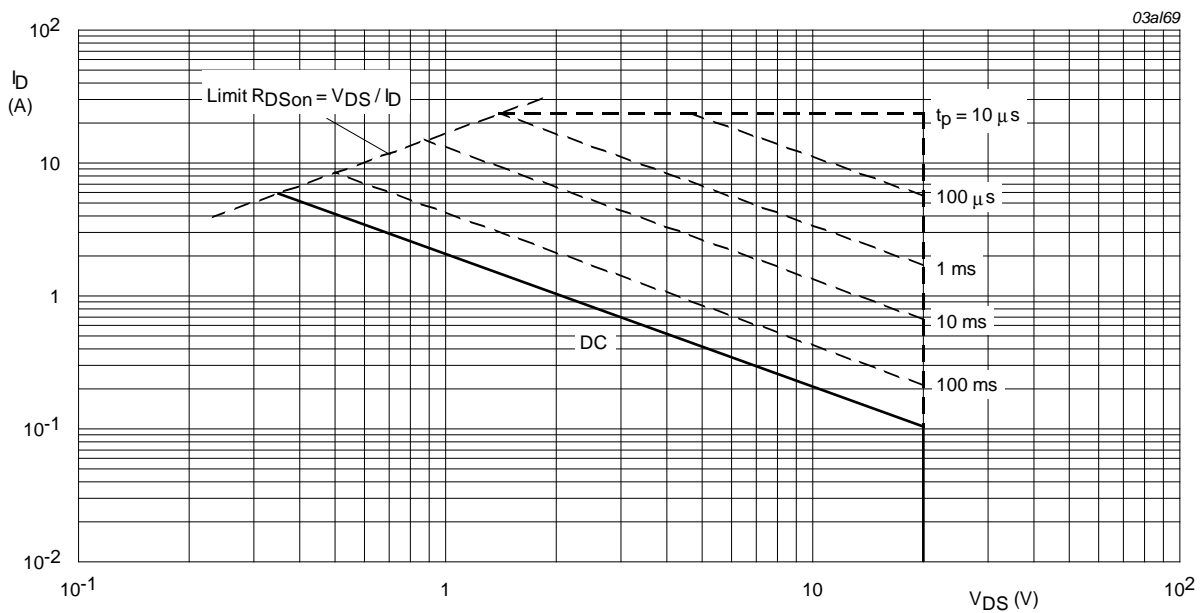
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



$T_{sp} = 25^{\circ}C; I_{DM}$ 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	-	-	60	K/W

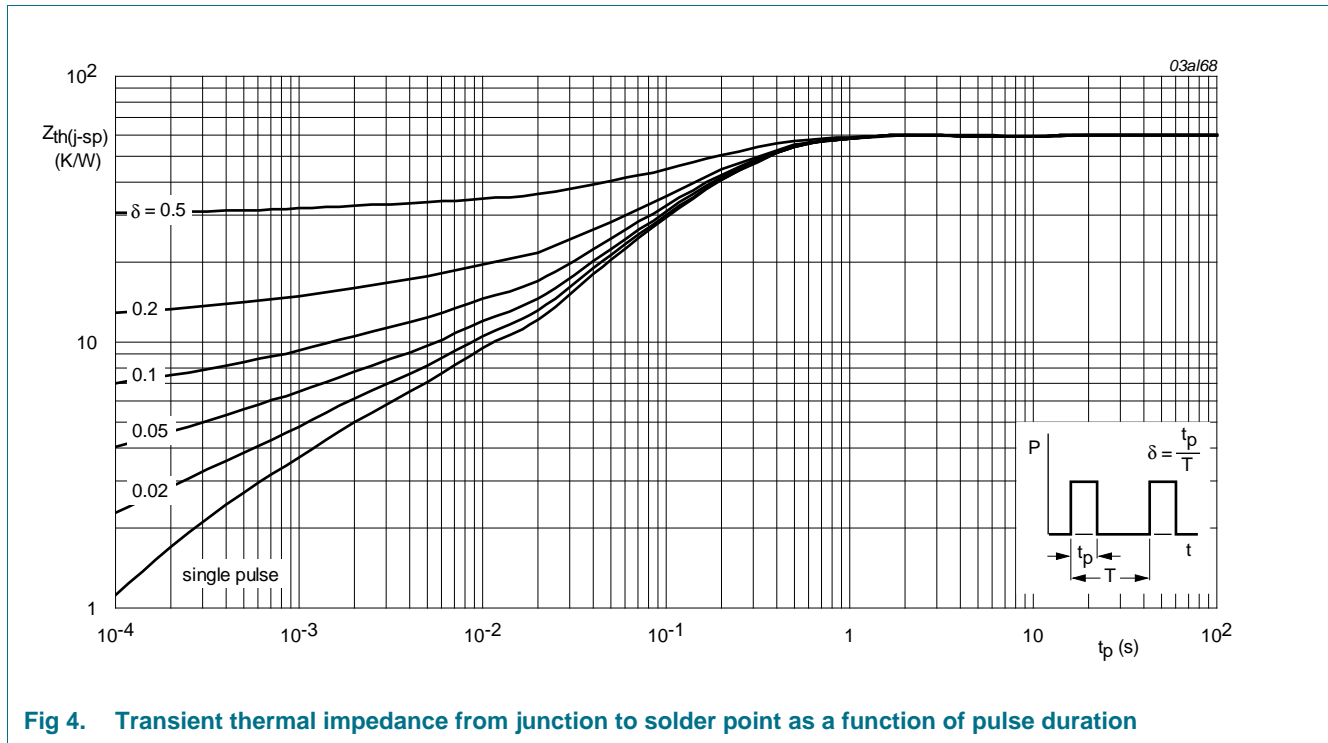


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	18	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	20	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 8	-	-	1.8	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ }^\circ\text{C};$ see Figure 8	0.35	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 8	0.5	-	1.5	V
I_{DSS}	drain leakage current	$V_{DS} = 20 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$	-	-	100	μA
		$V_{DS} = 20 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 12 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
		$V_{GS} = -12 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 2.5 \text{ V}; I_D = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 9 ; see Figure 10	-	44	53	m Ω
		$V_{GS} = 4.5 \text{ V}; I_D = 1.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 9 ; see Figure 10	-	31	37	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 6 \text{ A}; V_{DS} = 10 \text{ V}; V_{GS} = 4.5 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 11	-	5.8	-	nC
Q_{GS}	gate-source charge		-	1.4	-	nC
Q_{GD}	gate-drain charge		-	1.7	-	nC
C_{iss}	input capacitance	$V_{DS} = 20 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 12	-	410	-	pF
C_{oss}	output capacitance		-	115	-	pF
C_{rss}	reverse transfer capacitance		-	80	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 \text{ V}; R_L = 10 \text{ } \Omega; V_{GS} = 4.5 \text{ V};$ $R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	10	-	ns
t_r	rise time		-	15	-	ns
$t_{d(off)}$	turn-off delay time		-	25	-	ns
t_f	fall time		-	12	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 1.5 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 13	-	0.75	1.2	V

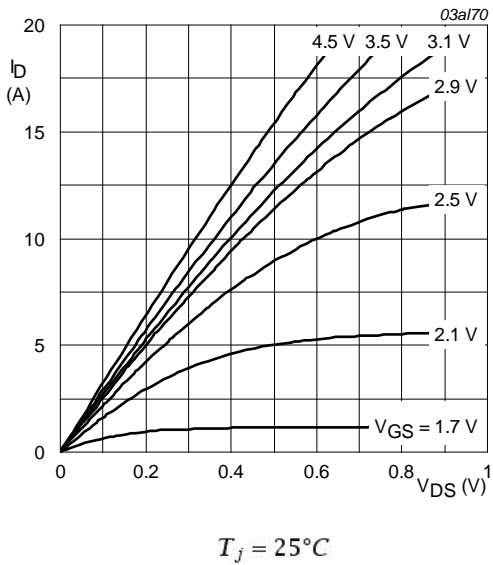


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

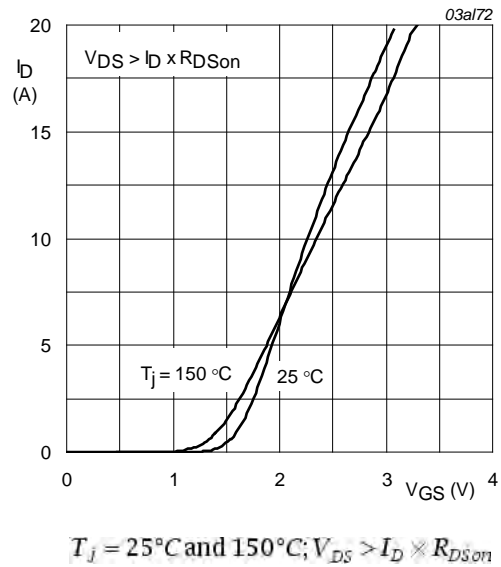


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

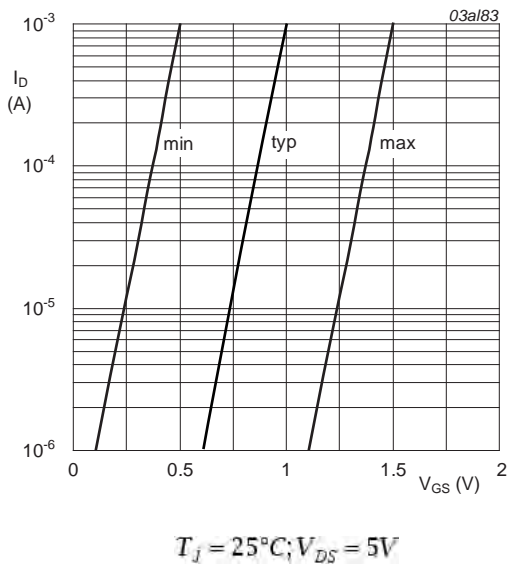


Fig 7. Sub-threshold drain current as a function of gate-source voltage

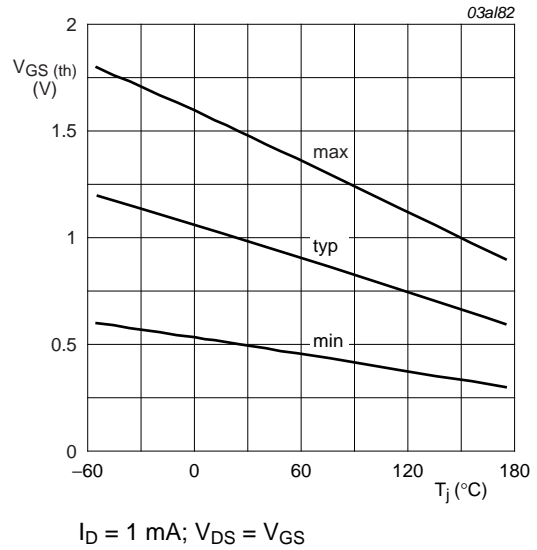
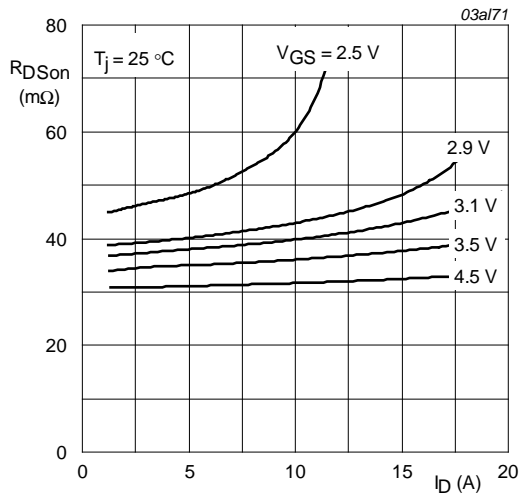
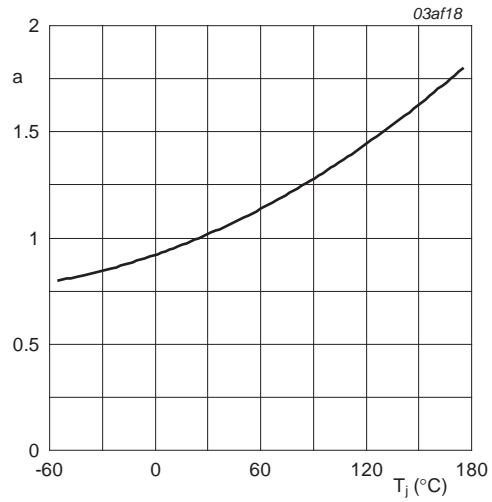


Fig 8. Gate-source threshold voltage as a function of junction temperature



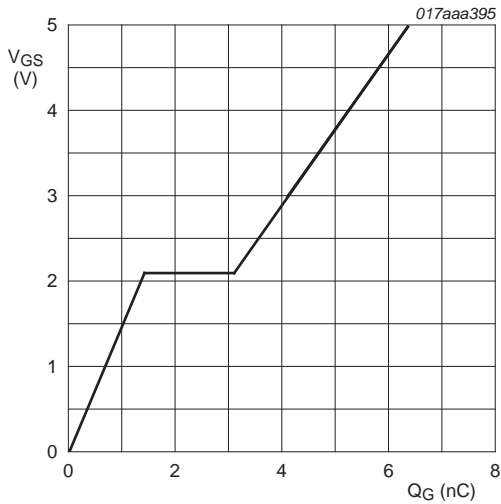
$T_j = 25\text{ }^\circ\text{C}$

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



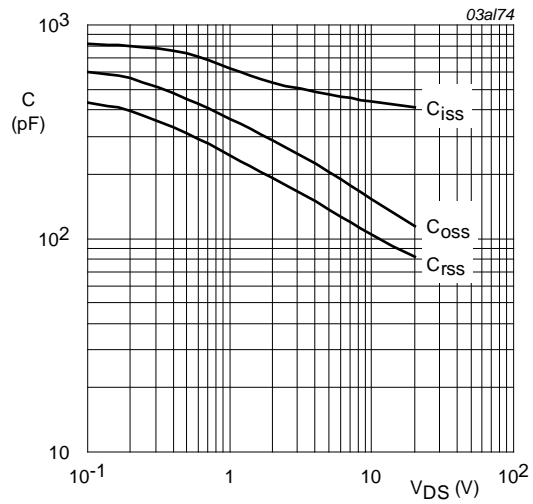
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

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



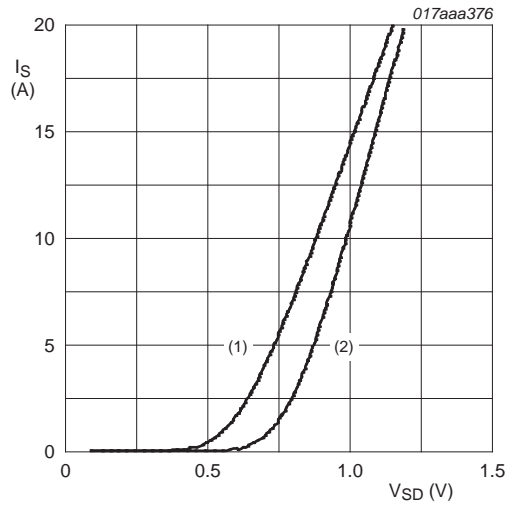
$I_D = 6\text{ A}; V_{DD} = 10\text{ V}; T_j = 25\text{ }^\circ\text{C}$

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



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

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 leads

SOT23

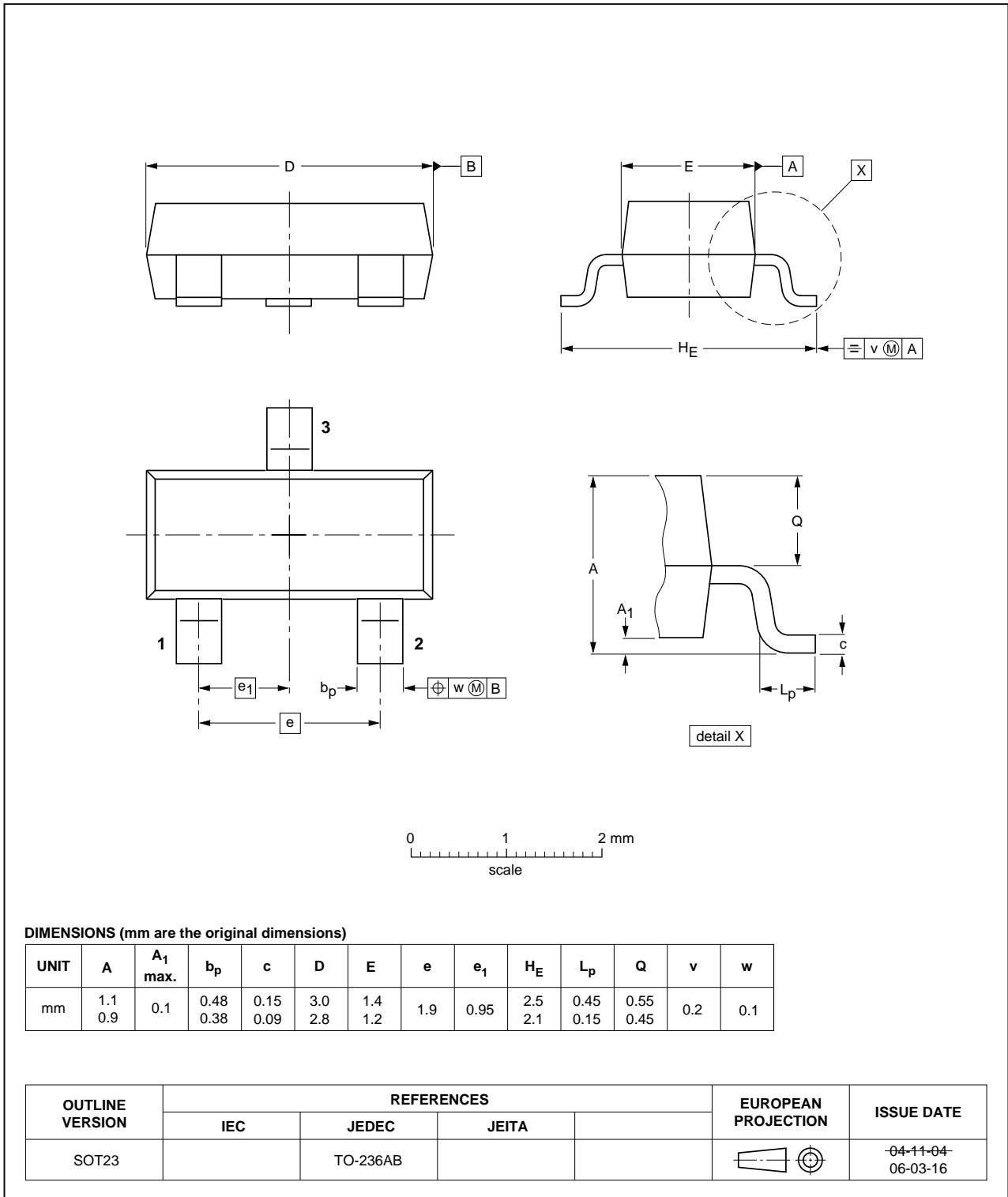


Fig 14. Package outline SOT23 (TO-236AB)

9. Soldering

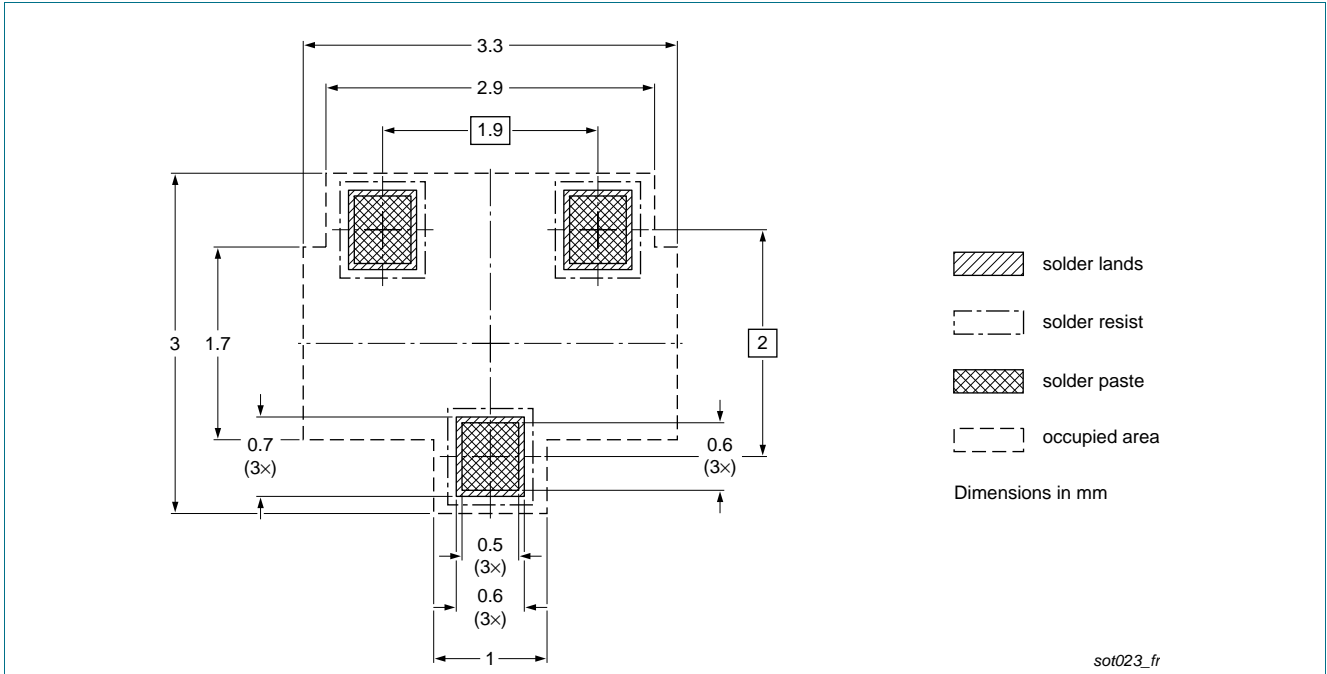


Fig 15. Reflow soldering footprint for SOT23 (TO-236AB)

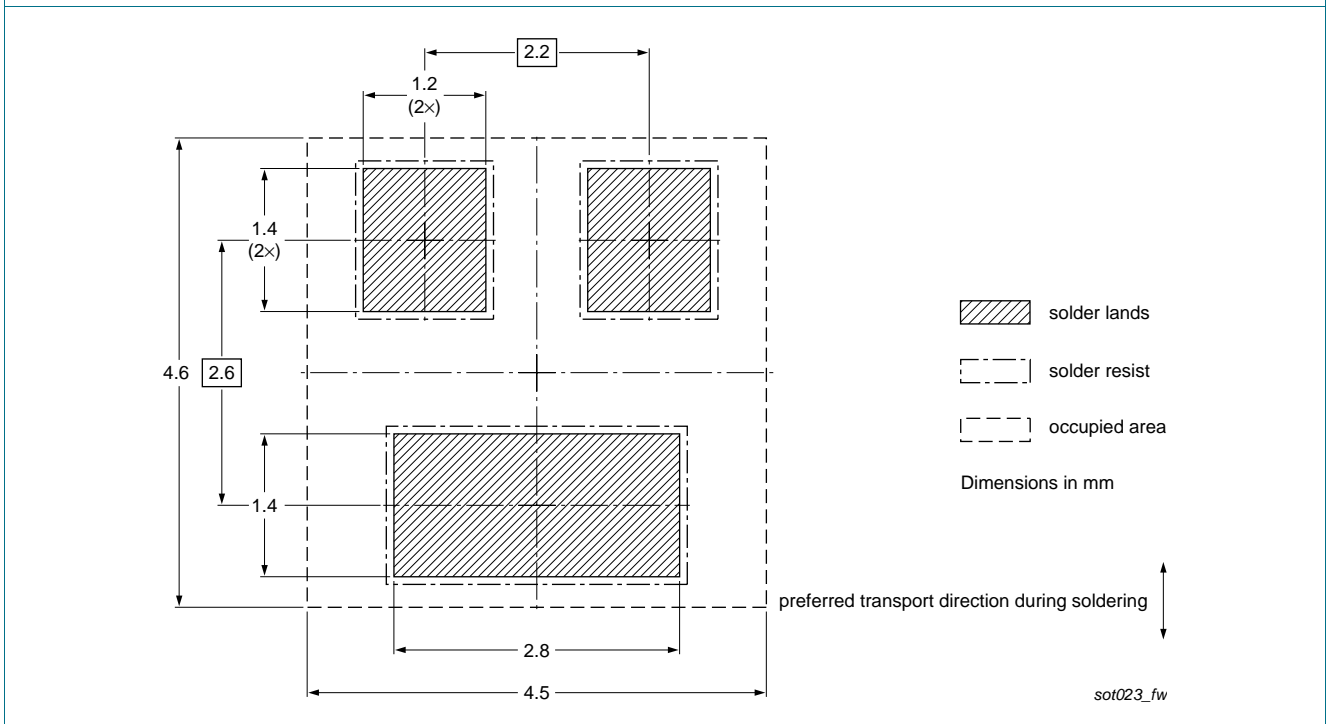


Fig 16. Wave soldering footprint for SOT23 (TO-236AB)

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"> • The format of this document 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. • 1 "Product profile": updated • 5 "Limiting values": V_{DSR} drain-source voltage redefined to V_{DGR} drain-gate voltage • 14 "Package outline SOT23 (TO-236AB)": updated • 9 "Soldering": added • 11 "Legal information": updated 			
PMV31XN v.1	20030226	Product data sheet	-	-

11. Legal information

11.1 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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