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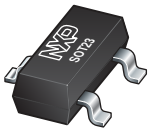


PMV31XN

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

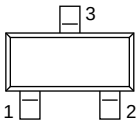
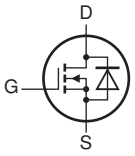
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	20	V
I_D	drain current	$T_{sp} = 25$ °C; $V_{GS} = 4.5$ V; see Figure 2; see Figure 3	-	-	5.9	A
P_{tot}	total power dissipation	$T_{sp} = 25$ °C; see Figure 1	-	-	2	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 2.5$ V; $I_D = 1$ A; $T_j = 25$ °C; see Figure 9; see Figure 10	-	44	53	mΩ
		$V_{GS} = 4.5$ V; $I_D = 1.5$ A; $T_j = 25$ °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		
2	S	source		
3	D	drain		

SOT23 (TO-236AB)

017aaa253

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

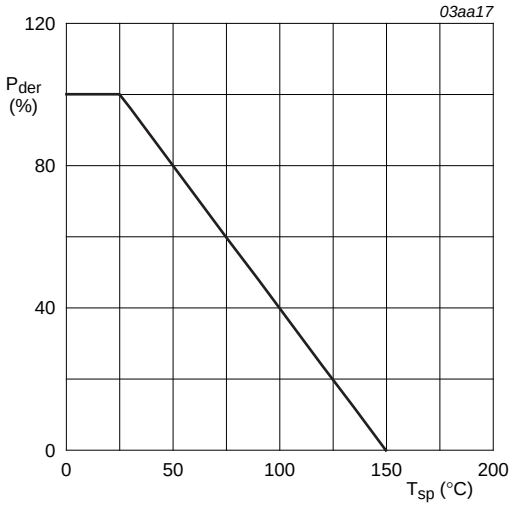
[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

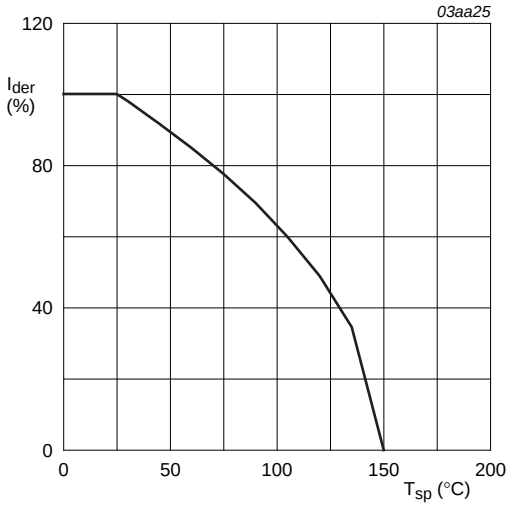
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	20	V
V_{DGR}	drain-gate voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C; $R_{GS} = 20$ kΩ	-	20	V
V_{GS}	gate-source voltage		-12	12	V
I_D	drain current	$T_{sp} = 100$ °C; $V_{GS} = 4.5$ V; see Figure 2	-	3.75	A
		$T_{sp} = 25$ °C; $V_{GS} = 4.5$ V; see Figure 2; see Figure 3	-	5.9	A
I_{DM}	peak drain current	$T_{sp} = 25$ °C; pulsed; $t_p \leq 10$ µs; see Figure 3	-	23.7	A
P_{tot}	total power dissipation	$T_{sp} = 25$ °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	$T_{sp} = 25$ °C	-	1.7	A



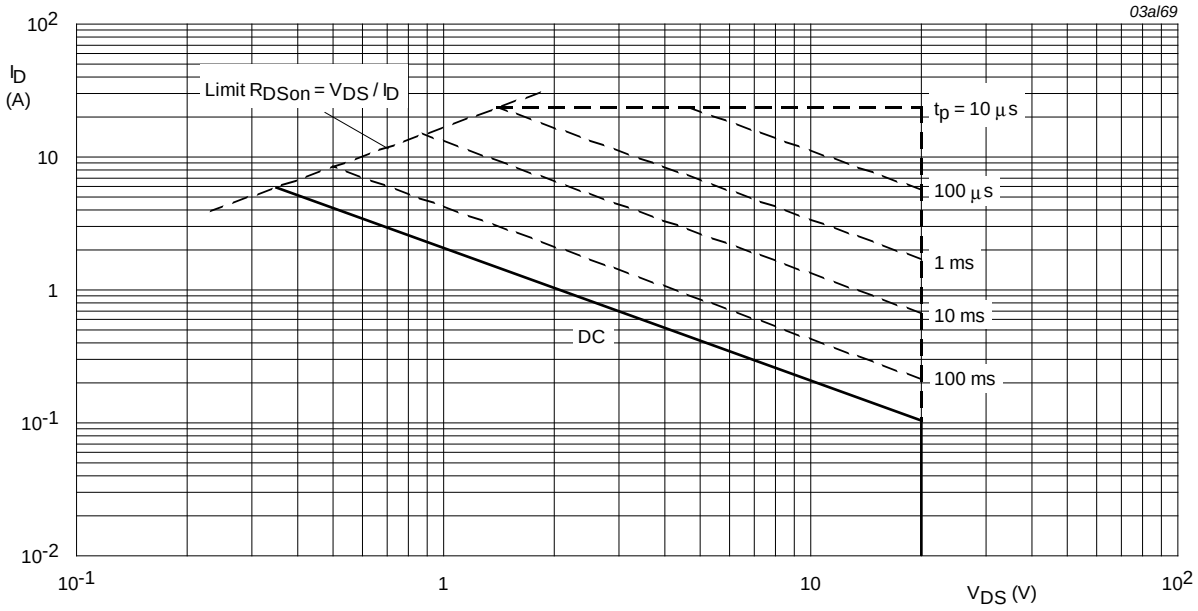
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\ \%$$

Fig 1. Normalized total power dissipation as a function of solder point temperature



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

Fig 2. Normalized continuous drain current 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	-	-	60	K/W

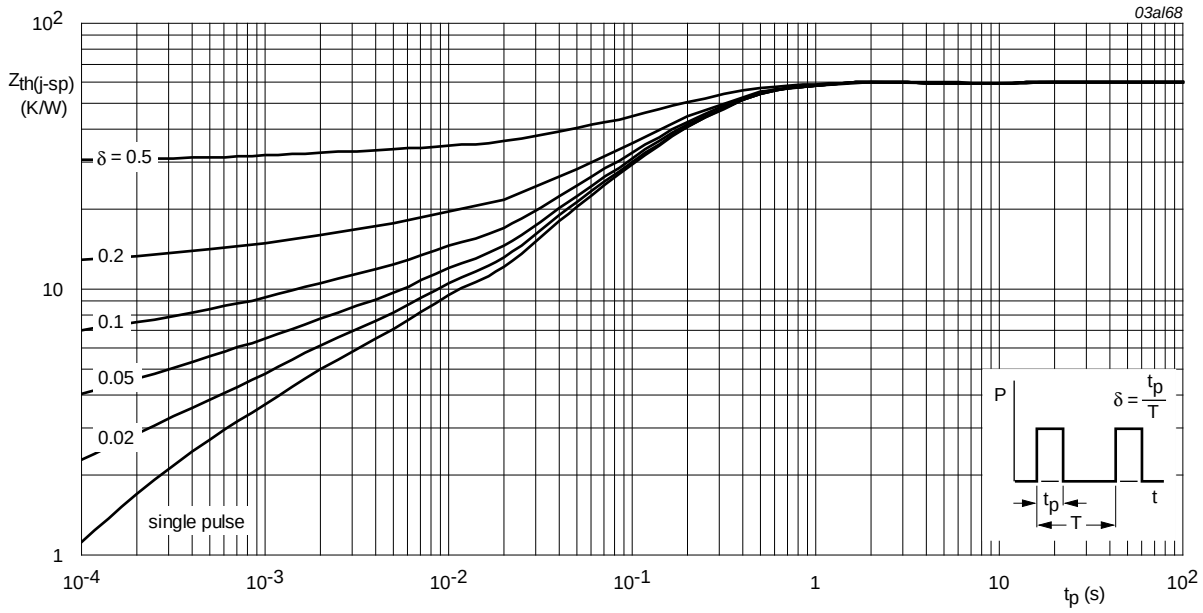
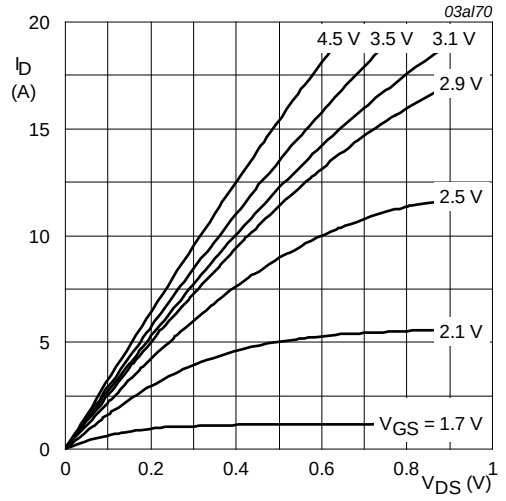


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

7. Characteristics

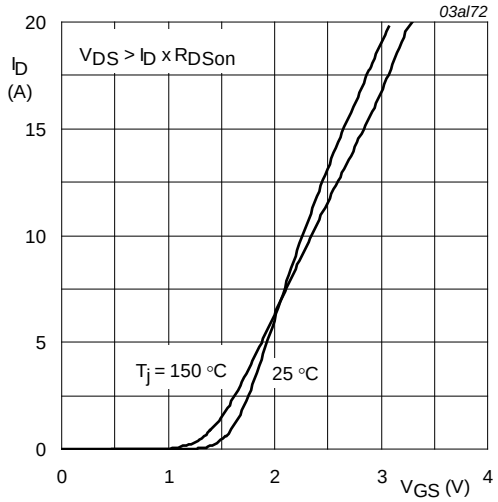
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C	18	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C	20	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 8	-	-	1.8	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C; see Figure 8	0.35	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 8	0.5	-	1.5	V
I_{DSS}	drain leakage current	V_{DS} = 20 V; V_{GS} = 0 V; T_j = 150 °C	-	-	100	µA
		V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 °C	-	-	1	µA
I_{GSS}	gate leakage current	V_{GS} = 12 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
		V_{GS} = -12 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 2.5 V; I_D = 1 A; T_j = 25 °C; see Figure 9; see Figure 10	-	44	53	mΩ
		V_{GS} = 4.5 V; I_D = 1.5 A; T_j = 25 °C; see Figure 9; see Figure 10	-	31	37	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 6 A; V_{DS} = 10 V; V_{GS} = 4.5 V; T_j = 25 °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 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °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 V; R_L = 10 Ω; V_{GS} = 4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °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 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 13	-	0.75	1.2	V



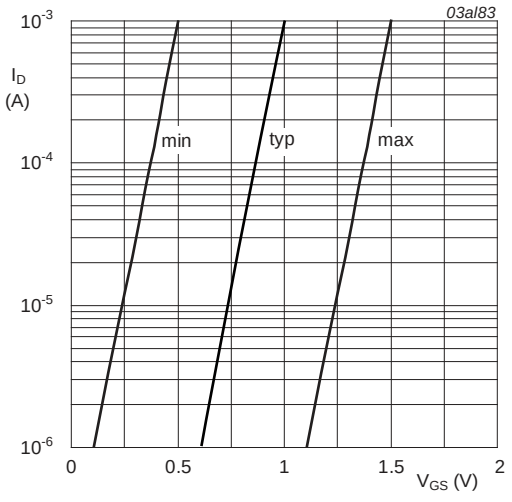
$T_j = 25°C$

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



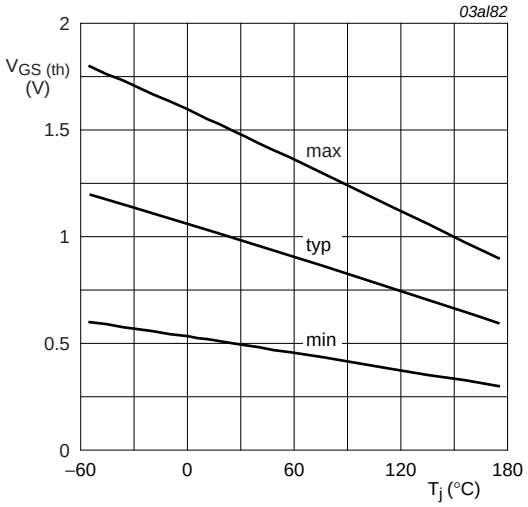
$T_j = 25°C$ and $150°C; V_{DS} > I_D \times R_{DSon}$

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



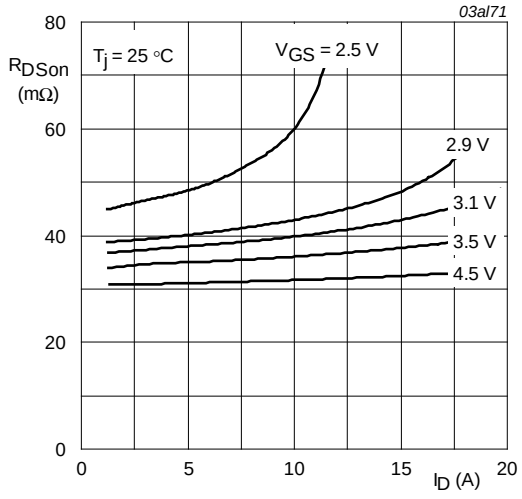
$T_j = 25°C; V_{DS} = 5V$

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



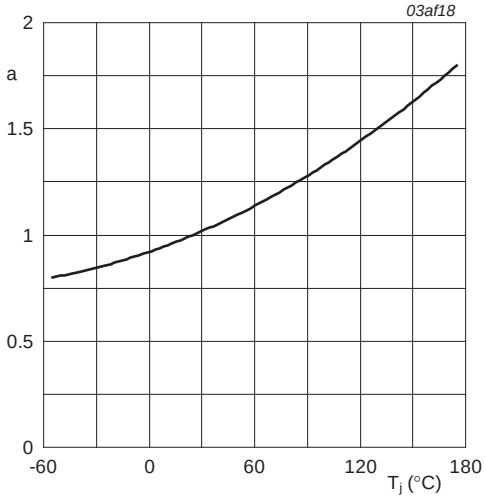
I_D = 1 mA; $V_{DS} = V_{GS}$

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



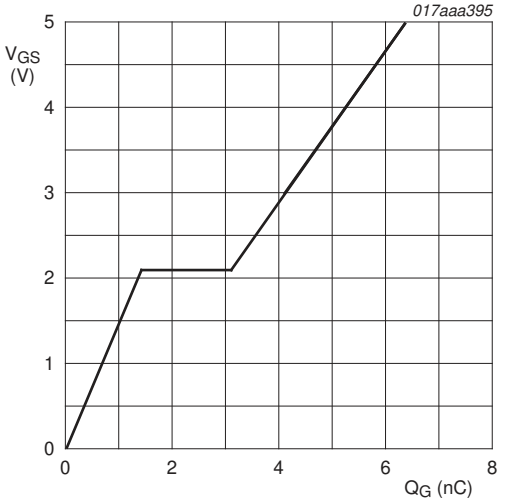
$T_j = 25°C$

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



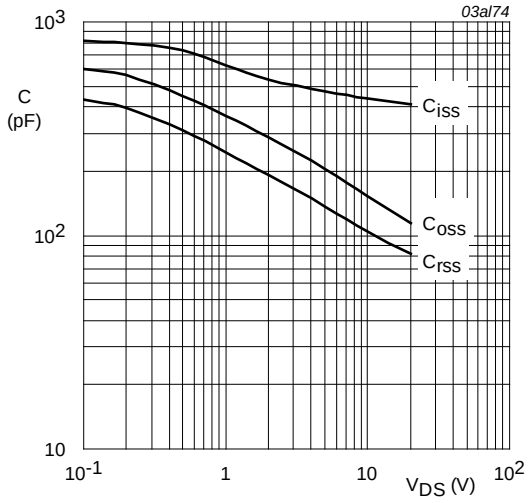
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



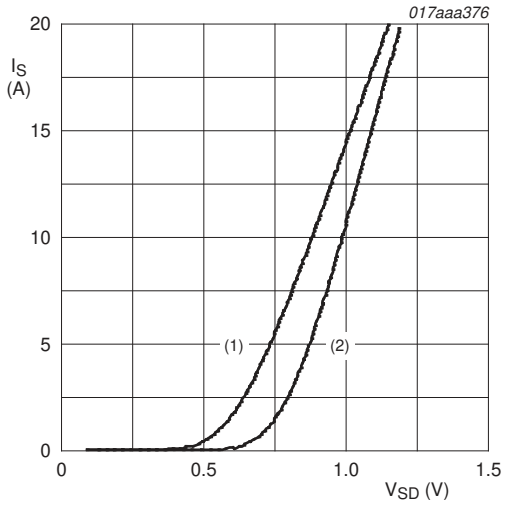
I_D = 6 A; V_{DD} = 10 V; T_j = 25 °C

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



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

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



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

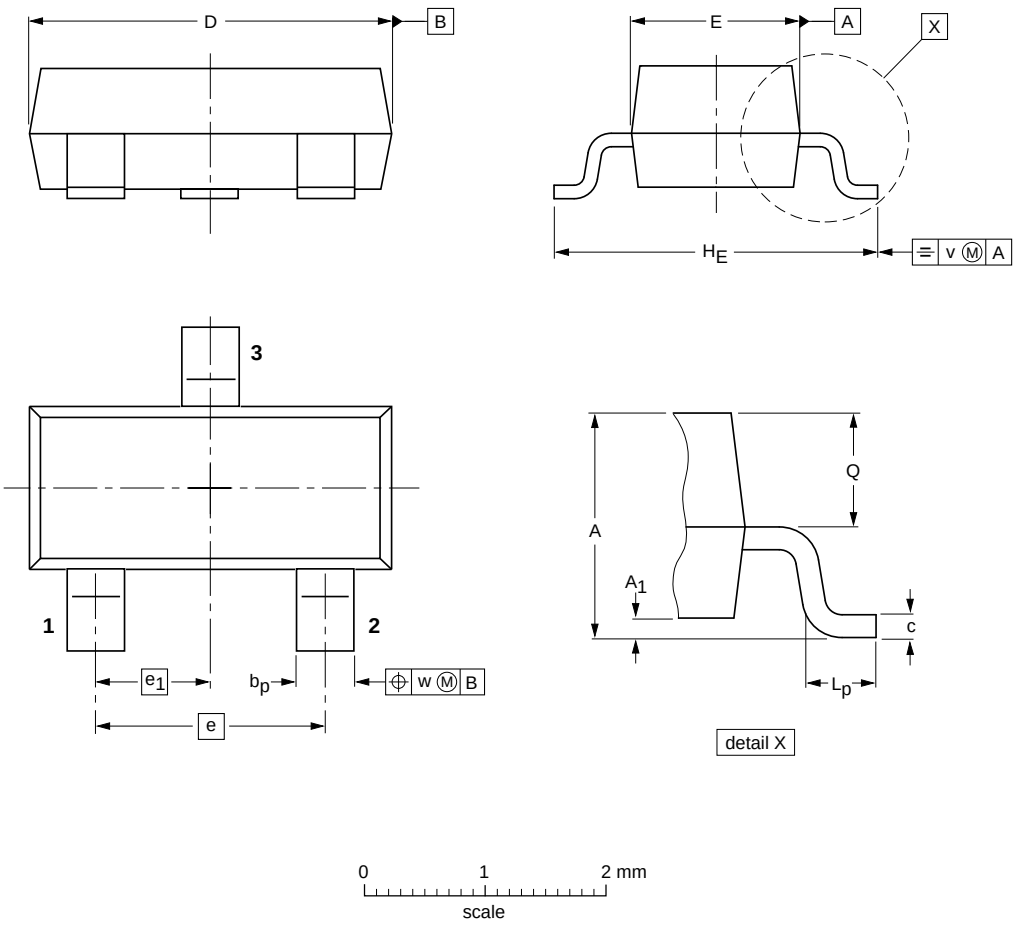
(1) T_j = 25 °C

(2) T_j = 150 °C

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

8. Package outline

Plastic surface-mounted package; 3 leads **SOT23**



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 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT23		TO-236AB				~~04-11-04~~ 06-03-16

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

9. Soldering

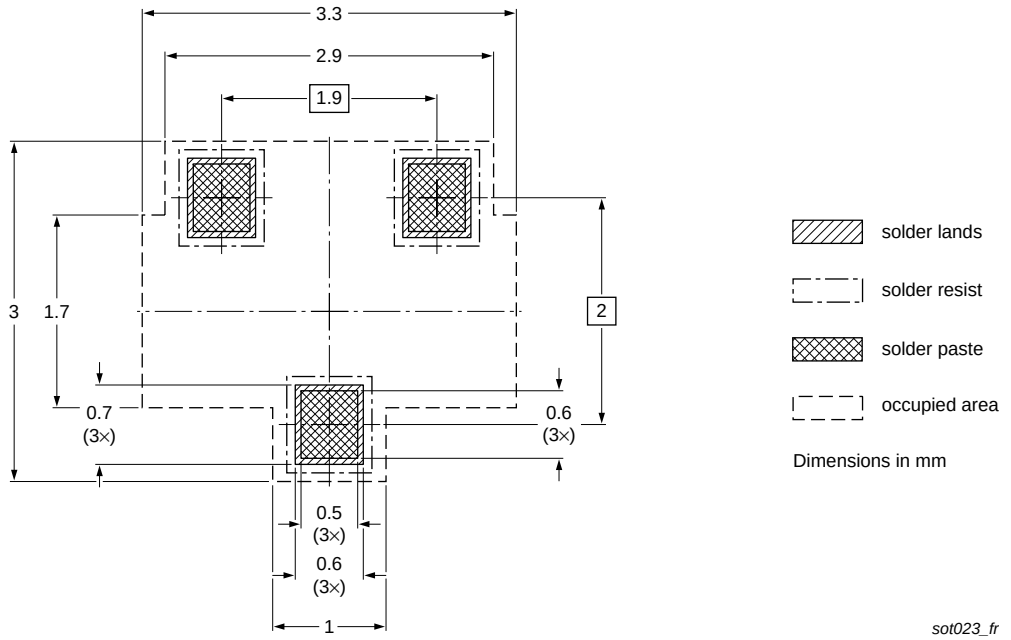


Fig 15. Reflow soldering footprint for SOT23 (TO-236AB)

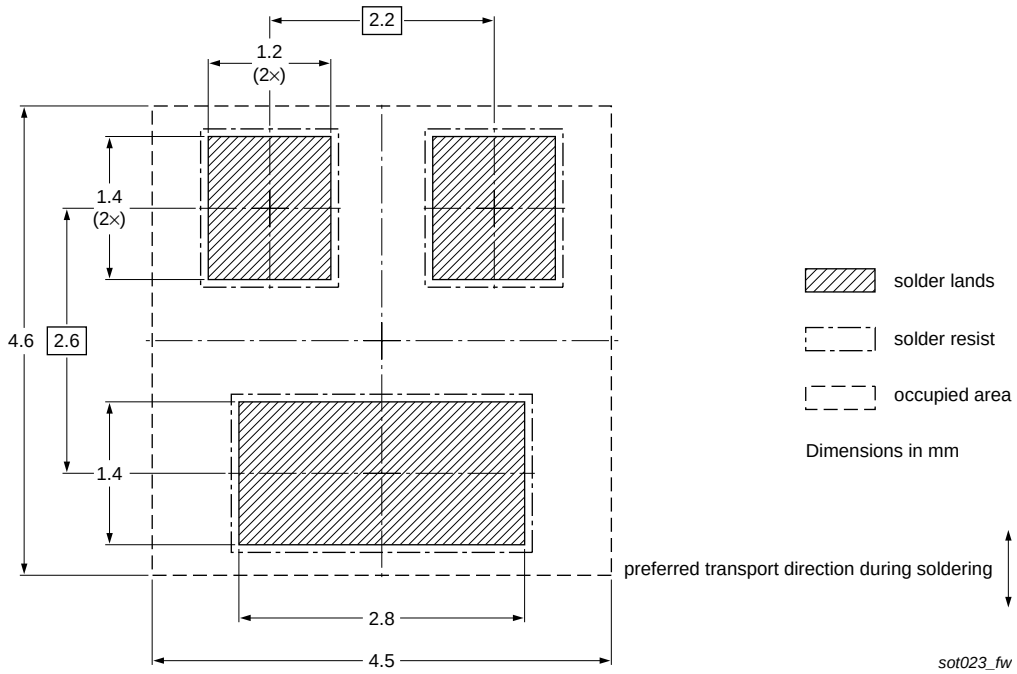


Fig 16. Wave soldering footprint for SOT23 (TO-236AB)

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:	• 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".

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13. Contents

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