



# PMV48XP

20 V, 3.5 A P-channel Trench MOSFET

Rev. 1 — 21 December 2010

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

- Logic-level compatible
- Trench MOSFET technology
- Very fast switching

### 1.3 Applications

- High-side loadswitch
- High-speed line driver
- Relay driver
- Switching circuits

### 1.4 Quick reference data

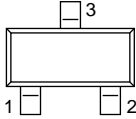
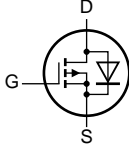
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_{amb} = 25\text{ °C}$	-	-	-20	V
$V_{GS}$	gate-source voltage		-12	-	12	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-3.5	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2.4\text{ A};$ pulsed; $t_p \leq 300\text{ }\mu\text{s}; \bar{d} \leq 0.01;$ $T_j = 25\text{ °C}$	-	48	55	m $\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>SOT23 (TO-236AB)</p>	 <p>017aaa094</p>
2	S	source		
3	D	drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV48XP	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PMV48XP	KN%

[1] % = placeholder for manufacturing site code

## 5. Limiting values

**Table 5. Limiting values**

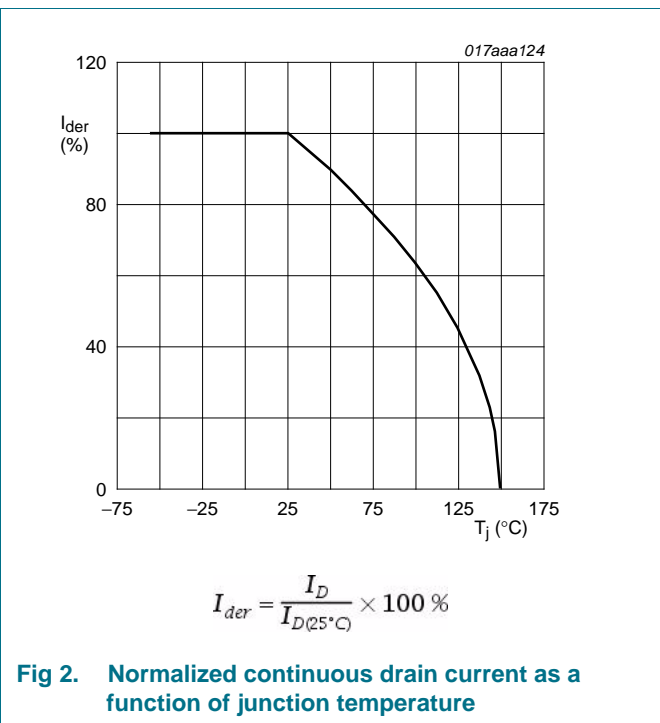
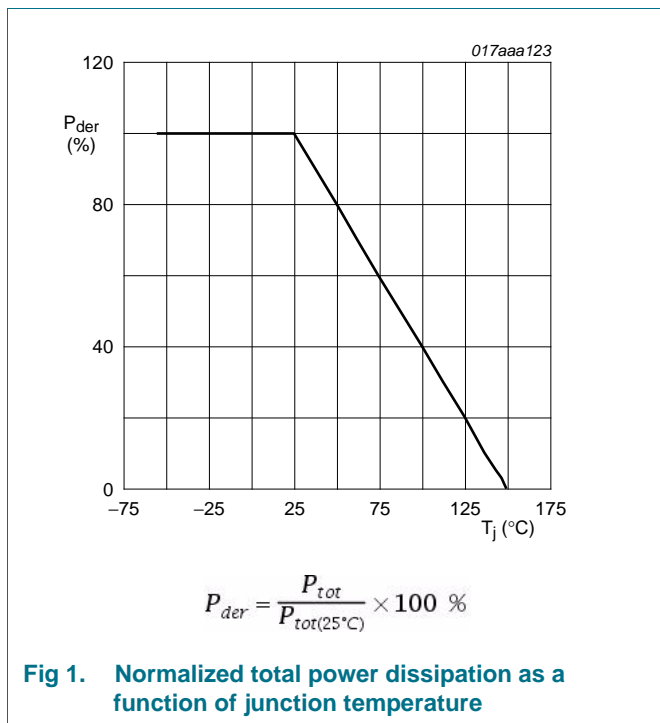
In accordance with the Absolute Maximum Rating System (IEC 60134).

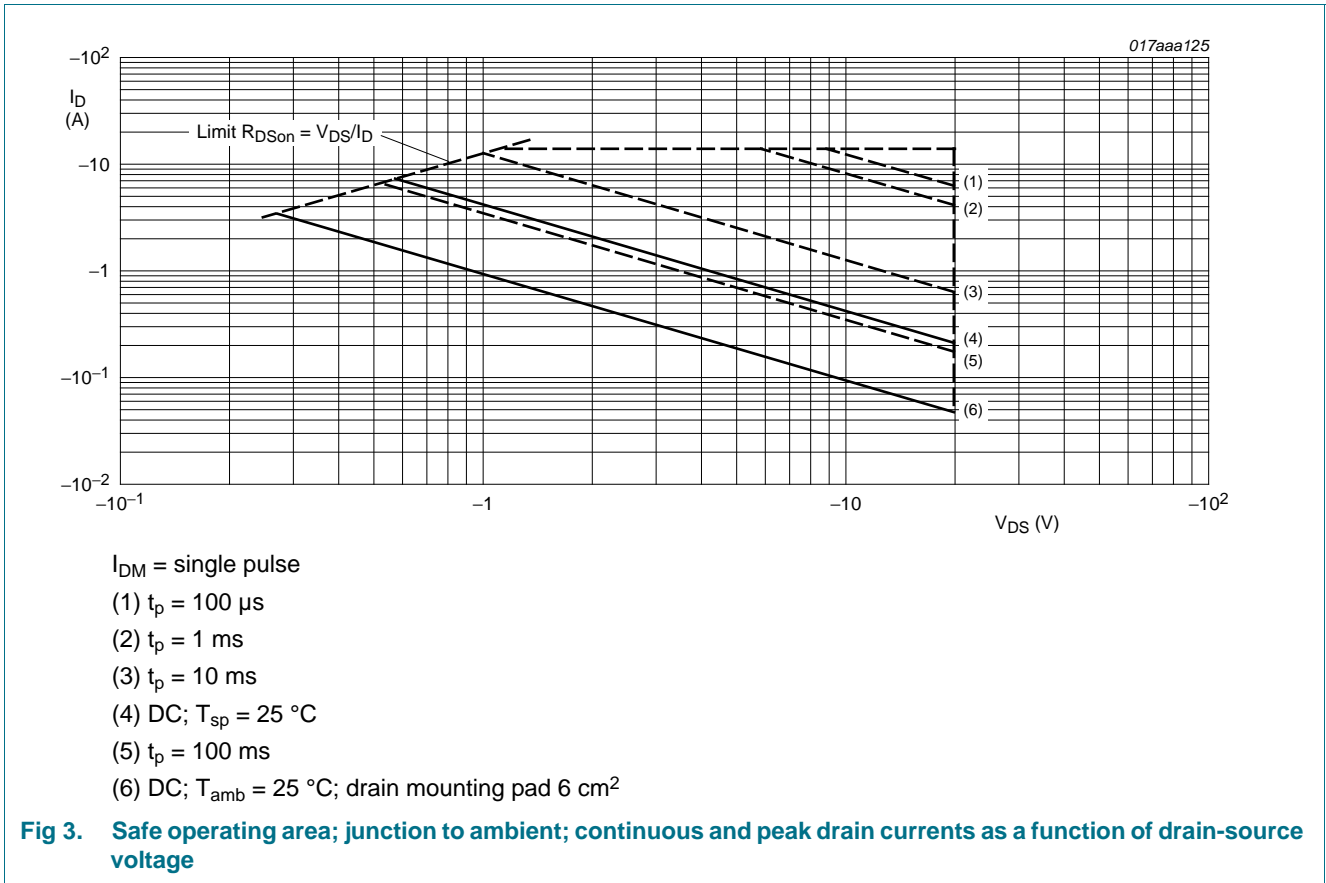
Symbol	Parameter	Conditions	Min	Max	Unit	
V <sub>DS</sub>	drain-source voltage	T <sub>amb</sub> = 25 °C	-	-20	V	
V <sub>GS</sub>	gate-source voltage		-12	12	V	
I <sub>D</sub>	drain current	V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	-3.5	A
		V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	-2.2	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs	-	-14	A	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	510	mW
			[1]	-	930	mW
		T <sub>sp</sub> = 25 °C		-	4150	mW
T <sub>j</sub>	junction temperature		-	150	°C	
T <sub>amb</sub>	ambient temperature		-55	150	°C	
T <sub>stg</sub>	storage temperature		-65	150	°C	

### Source-drain diode

I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	-1	A
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- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.





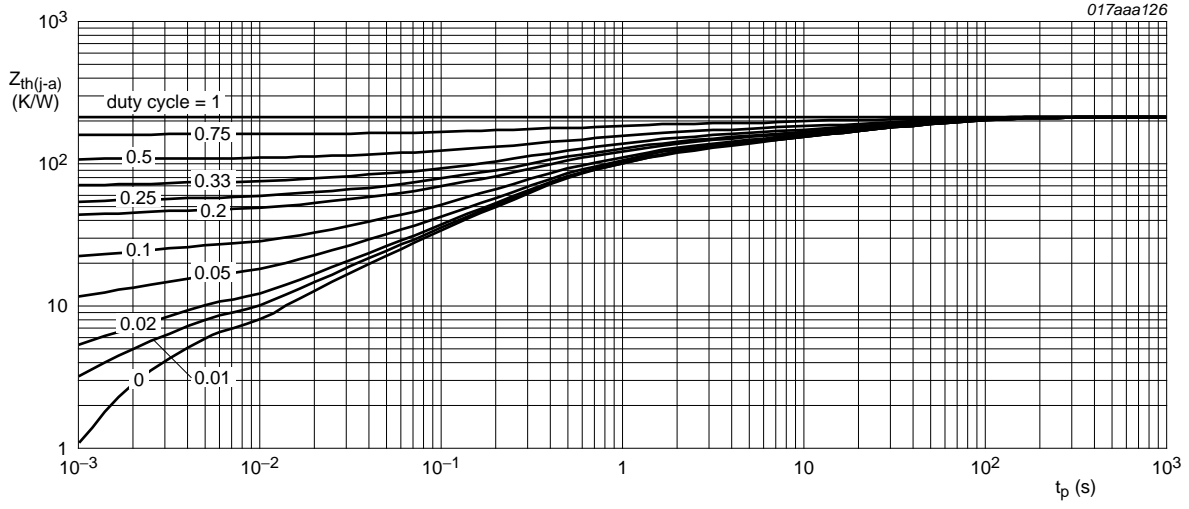
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	213	245	K/W
			[2]	-	117	135	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	25	30	K/W	

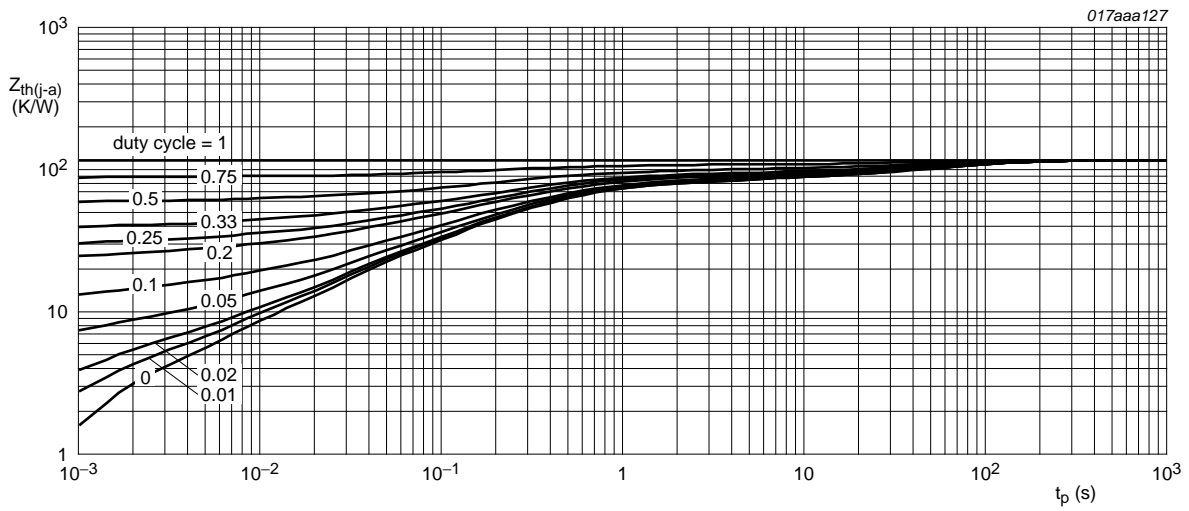
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $6 \text{ cm}^2$ .



FR4 PCB, standard footprint

Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for drain 6 cm<sup>2</sup>

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.75	-1	-1.25	V
$I_{DSS}$	drain leakage current	$V_{DS} = -20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = -12 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$ ; $I_D = -2.4 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.01$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	48	55	m $\Omega$
		$V_{GS} = -4.5 \text{ V}$ ; $I_D = -2.4 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.01$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	70	80	m $\Omega$
		$V_{GS} = -2.5 \text{ V}$ ; $I_D = -2 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.01$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	71	81	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -12 \text{ V}$ ; $I_D = -2 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.01$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	12	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = -1 \text{ A}$ ; $V_{DS} = -10 \text{ V}$ ; $V_{GS} = -4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	8.5	11	nC
$Q_{GS}$	gate-source charge		-	1.8	-	nC
$Q_{GD}$	gate-drain charge		-	1.8	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = -10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	1000	-	pF
$C_{oss}$	output capacitance		-	130	-	pF
$C_{rss}$	reverse transfer capacitance		-	90	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$ ; $V_{GS} = -4.5 \text{ V}$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $I_D = -1 \text{ A}$	-	11	-	ns
$t_r$	rise time		-	13	-	ns
$t_{d(off)}$	turn-off delay time		-	61	-	ns
$t_f$	fall time		-	23	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -2.4 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.01$	-	-0.82	-1.2	V

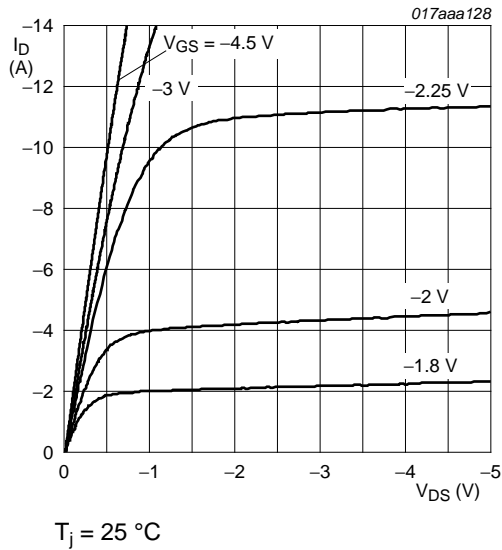


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

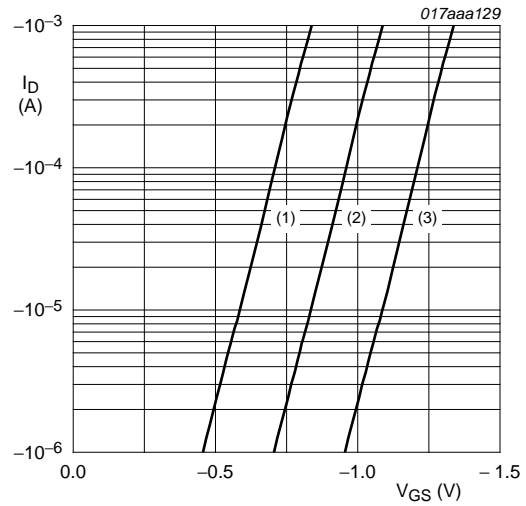


Fig 7. Sub-threshold drain current as a function of gate-source voltage

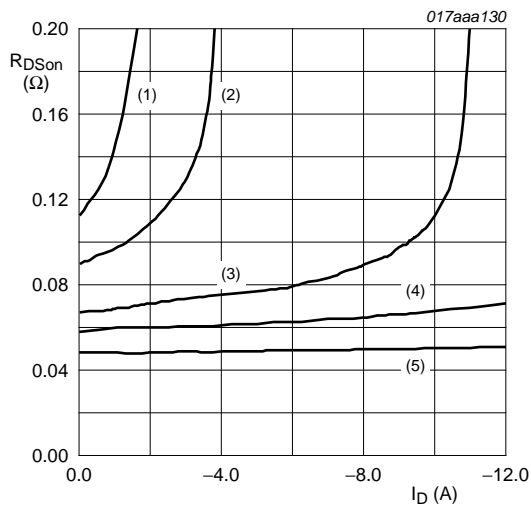


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

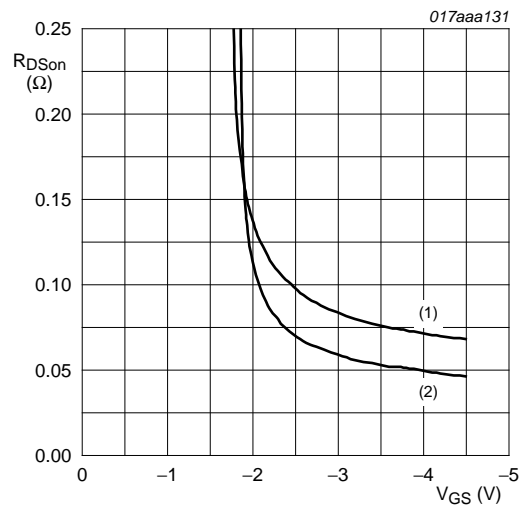
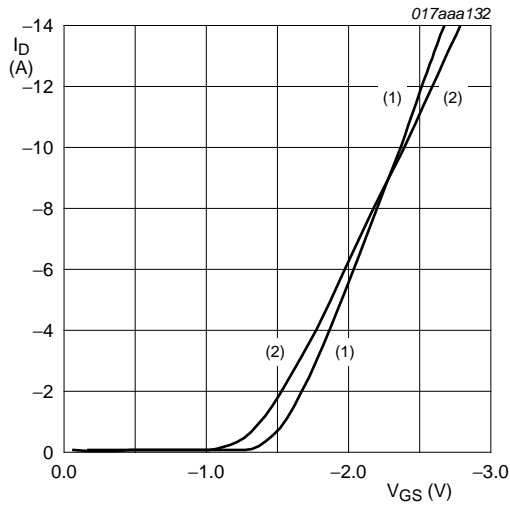
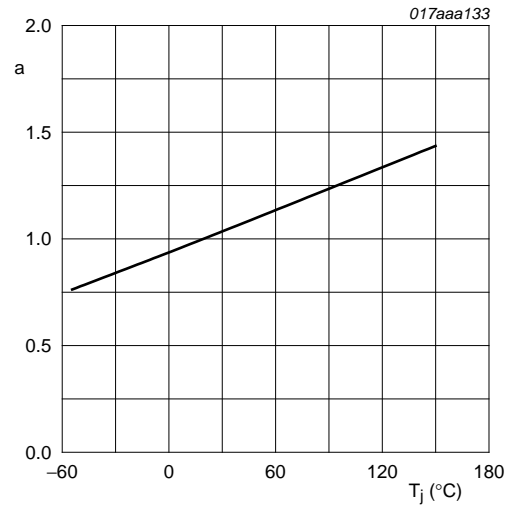


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



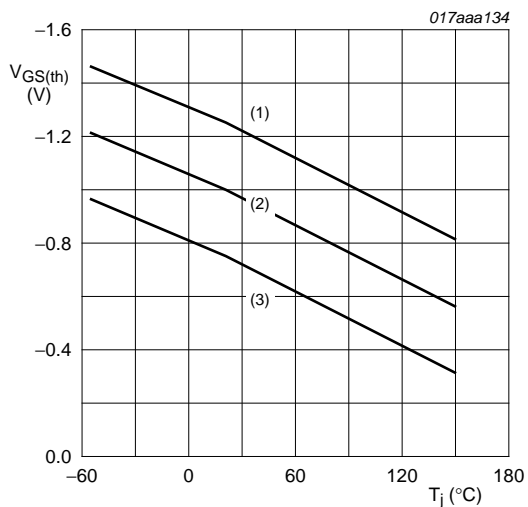
$V_{DS} > I_D \times R_{DS(on)}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values



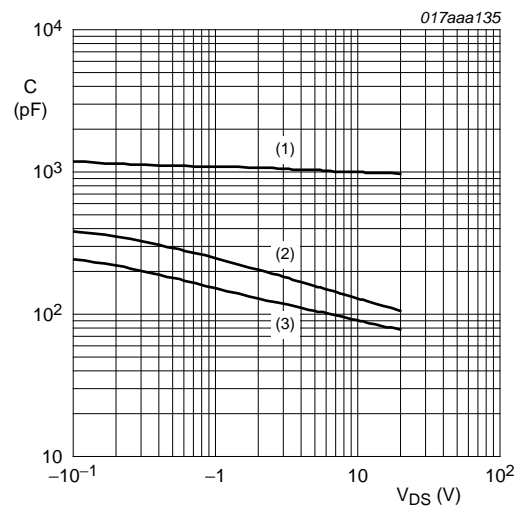
$$a = \frac{R_{DS(on)}}{R_{DS(on)@25^\circ\text{C}}}$$

Fig 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values



$I_D = -0.25\text{ mA}$ ;  $V_{DS} = V_{GS}$   
 (1) maximum values  
 (2) typical values  
 (3) minimum values

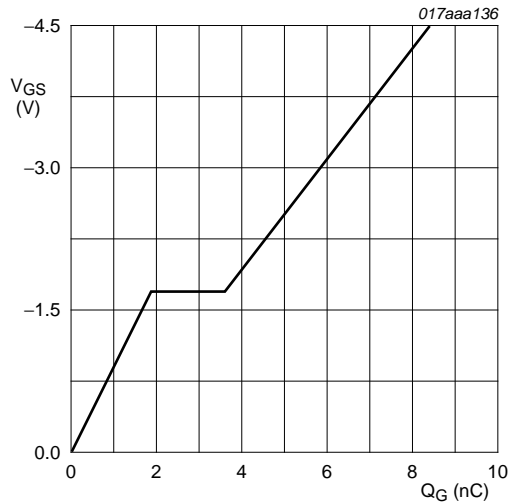
Fig 12. Gate-source threshold voltage as a function of junction temperature



$f = 1\text{ MHz}$ ;  $V_{GS} = 0\text{ V}$   
 (1)  $C_{iss}$   
 (2)  $C_{oss}$   
 (3)  $C_{rss}$

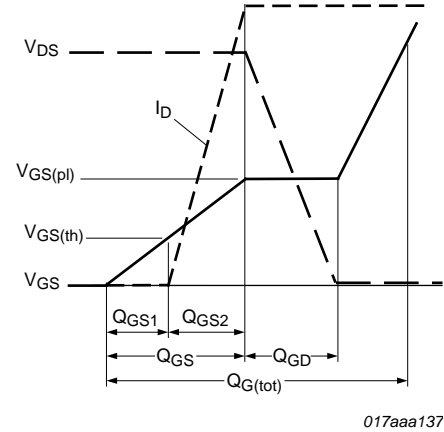
Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



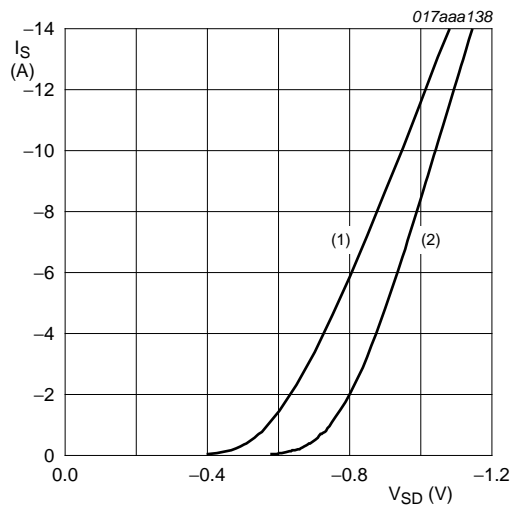


$I_D = -2.4$  A;  $V_{DS} = -10$  V;  $T_{amb} = 25$  °C

**Fig 14. Gate-source voltage as a function of gate charge; typical values**



**Fig 15. Gate charge waveform definitions**



$V_{GS} = 0$  V  
 (1)  $T_j = 150$  °C  
 (2)  $T_j = 25$  °C

**Fig 16. Source current as a function of source-drain voltage; typical values**

## 8. Package outline

Plastic surface-mounted package; 3 leads

SOT23

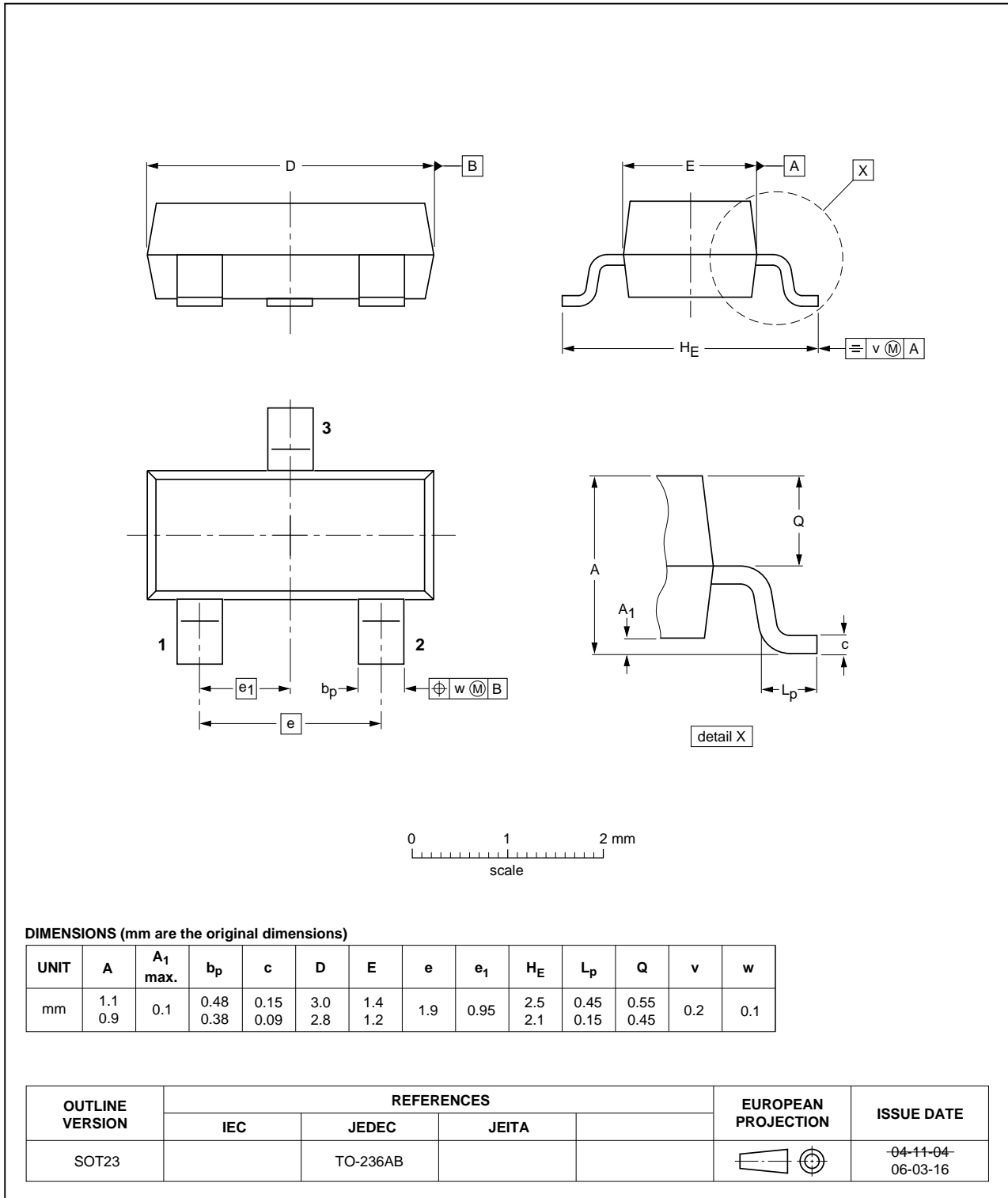


Fig 17. Package outline SOT23 (TO-236AB)

## 9. Soldering

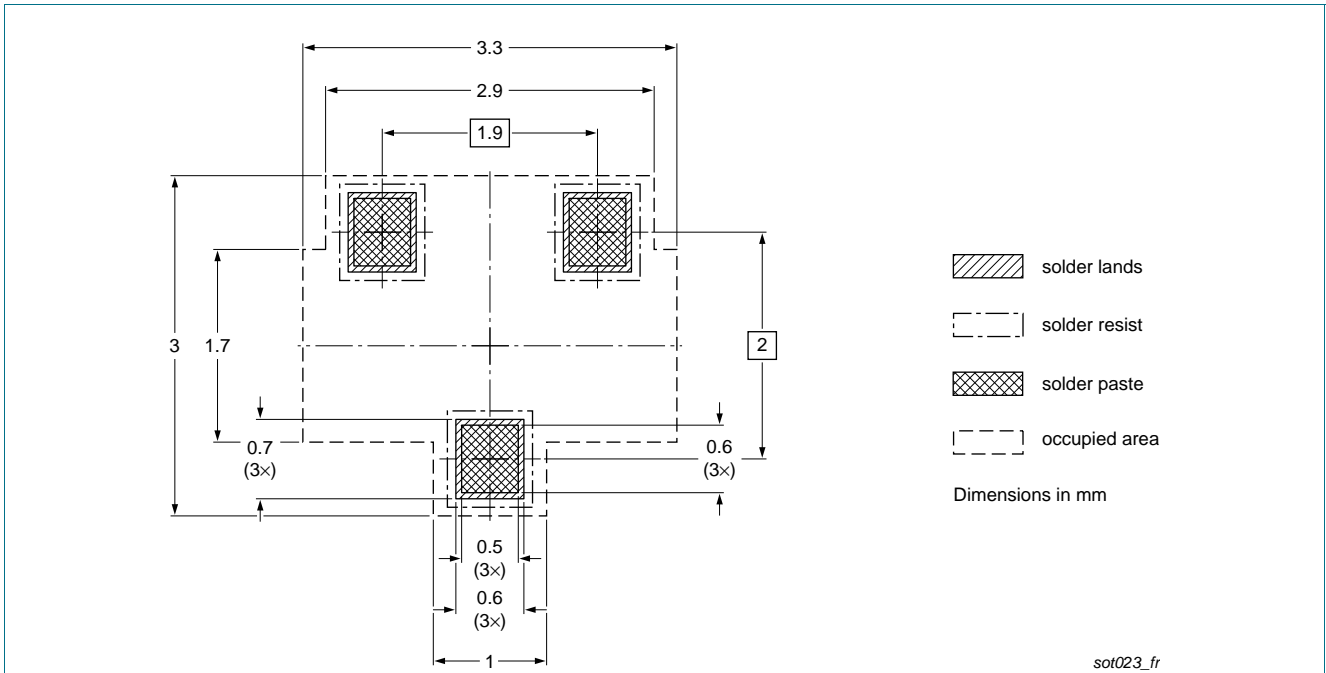


Fig 18. Reflow soldering footprint for SOT23 (TO-236AB)

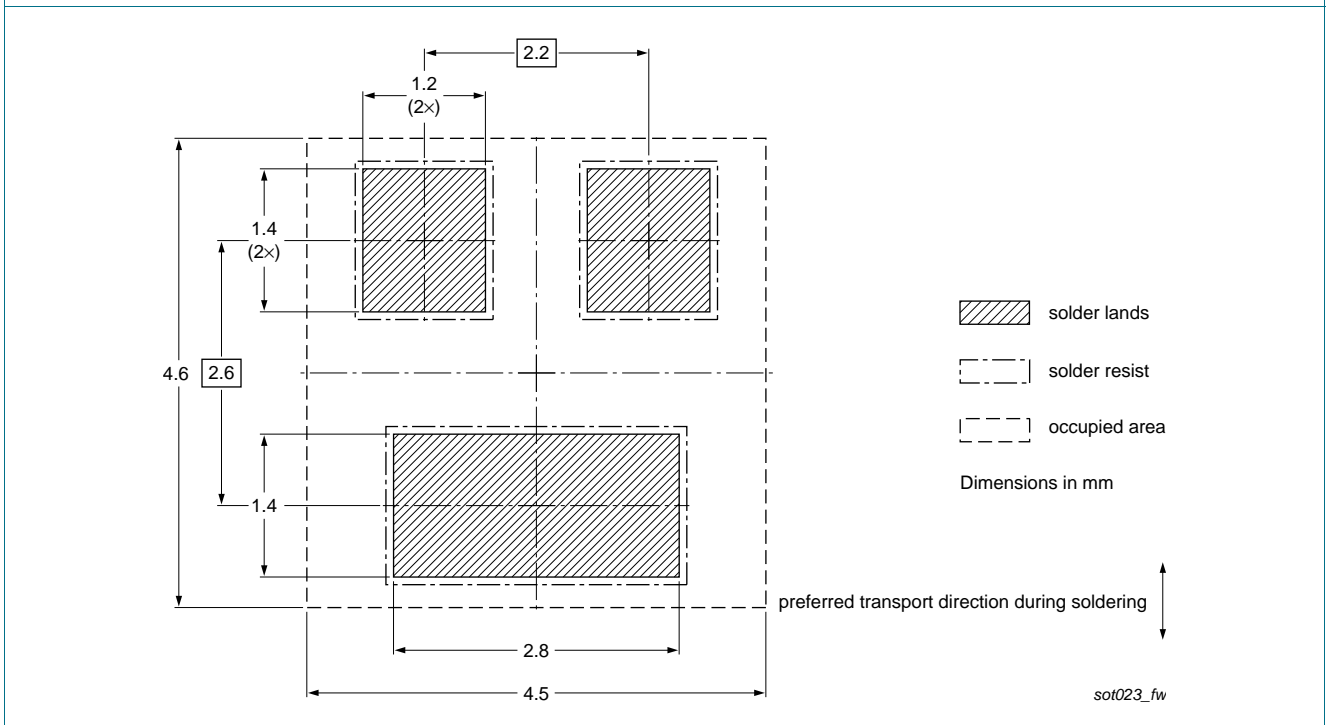


Fig 19. Wave soldering footprint for SOT23 (TO-236AB)

## 10. Revision history

**Table 8.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV48XP v.1	20101221	Product data sheet	-	-

## 11. Legal information

### 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.

[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.nexperia.com>.

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