

# 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

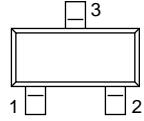
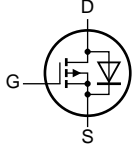
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_{amb} = 25\text{ °C}$	-	-	-20	V
$V_{GS}$	gate-source voltage		-12	-	12	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-3.5	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state 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

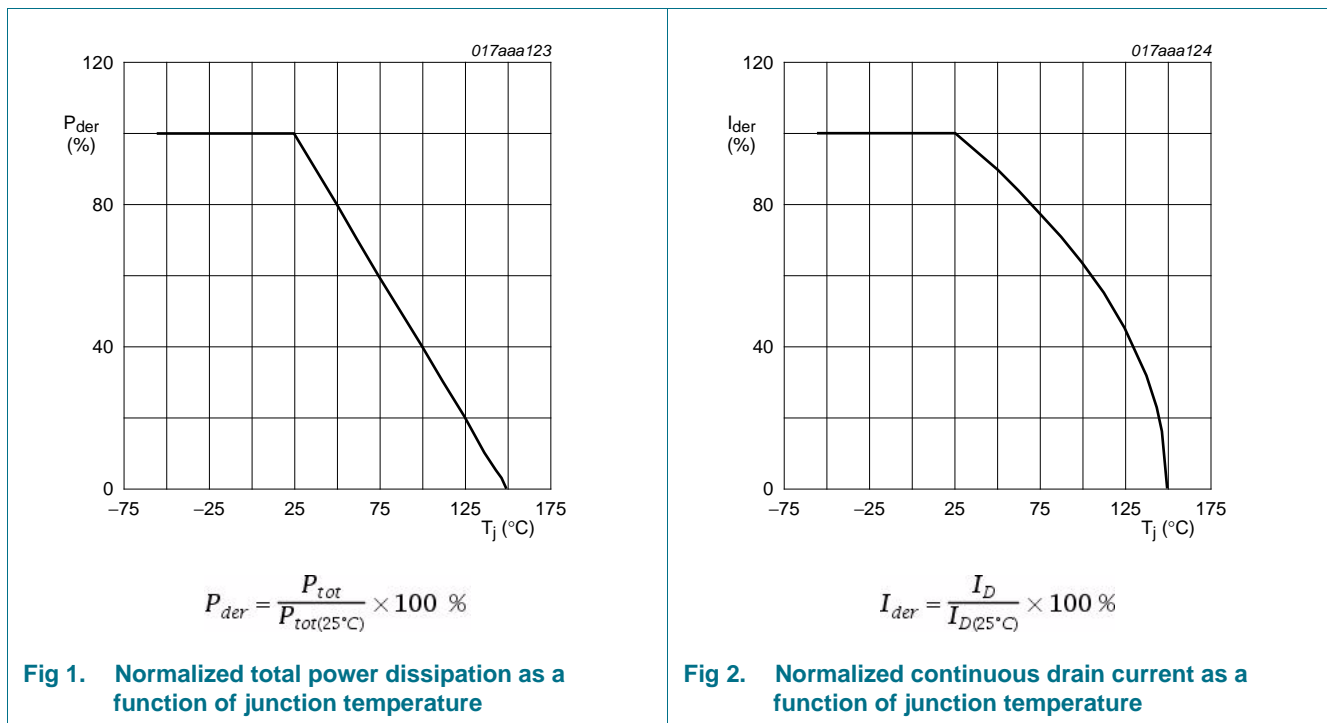
**Table 5. Limiting values**

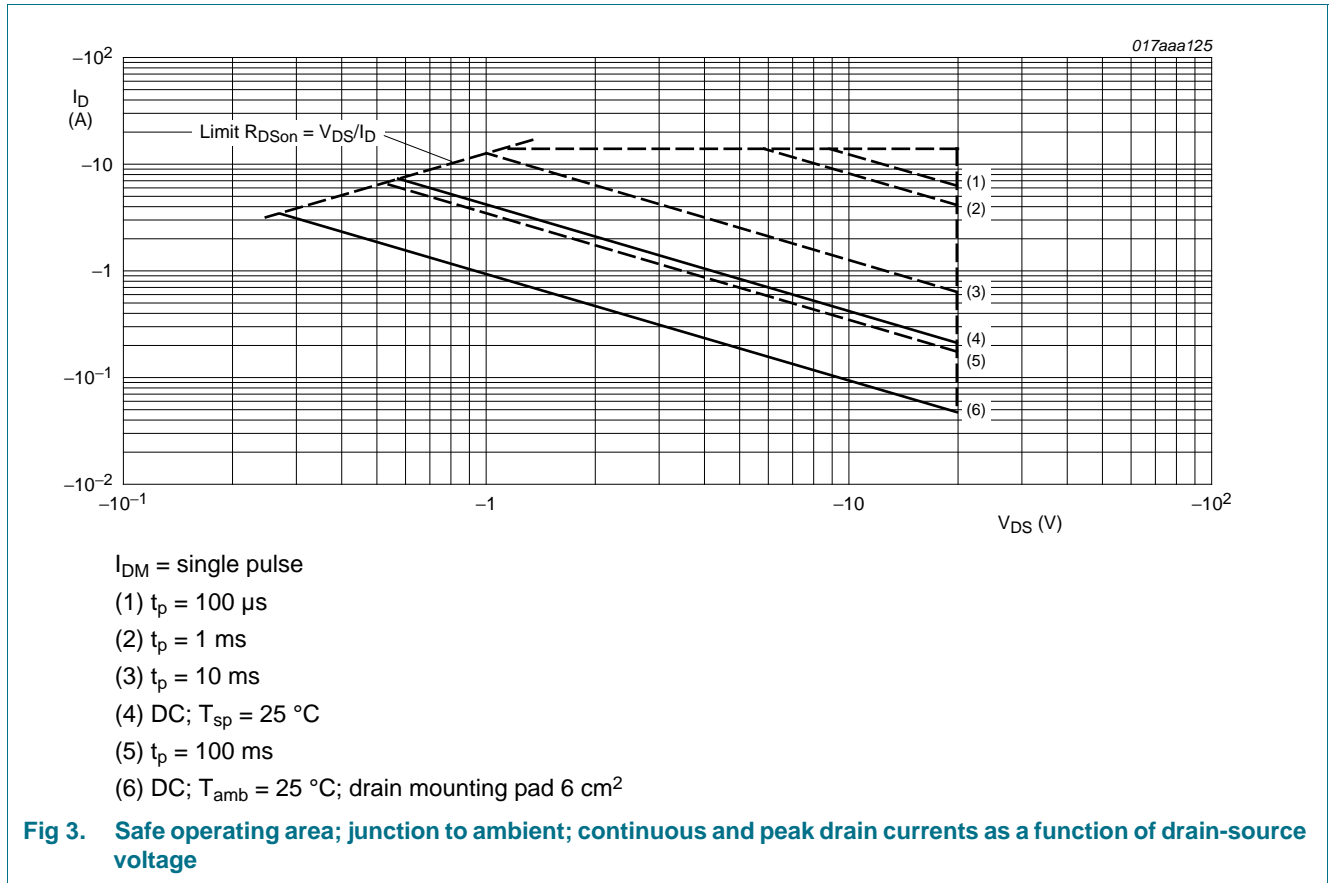
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	-1	A

[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.





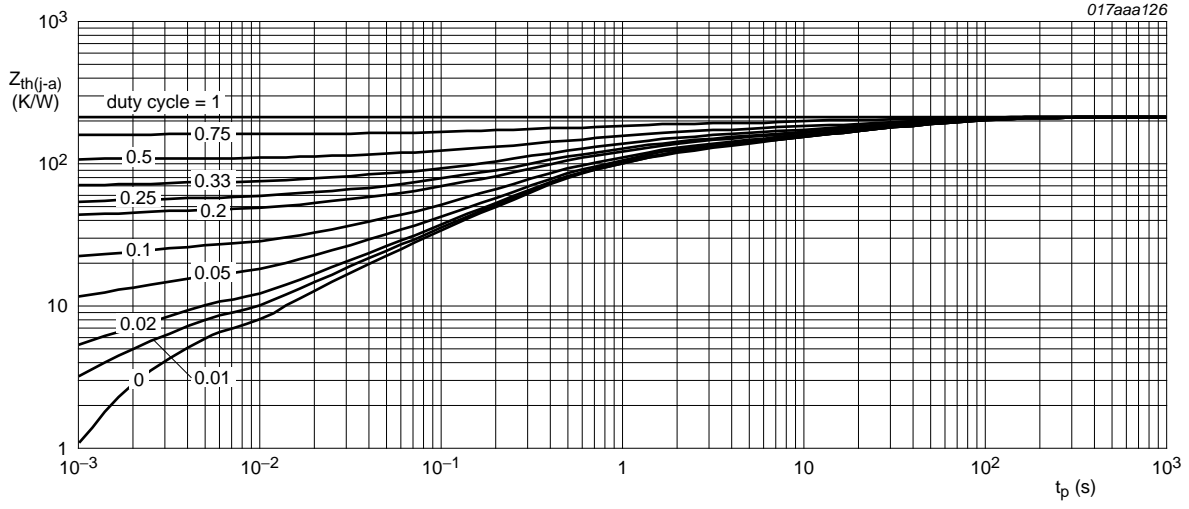
## 6. Thermal characteristics

**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	

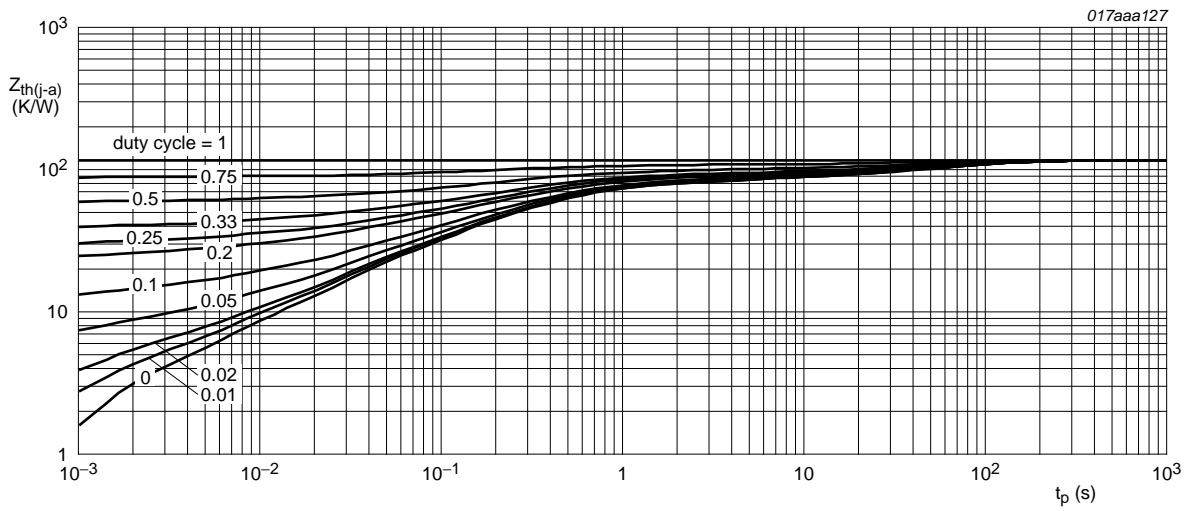
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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

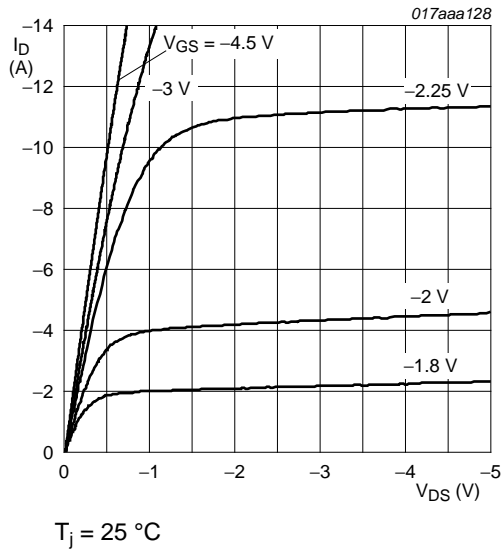


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

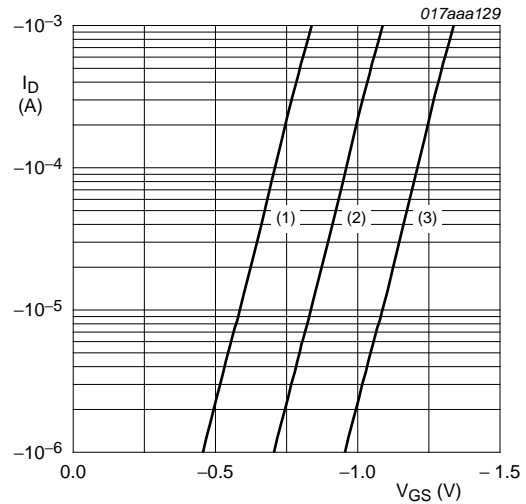


Fig 7. Sub-threshold drain current as a function of gate-source voltage

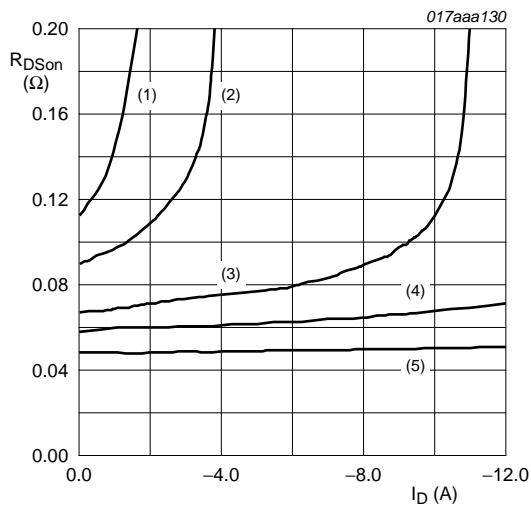


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

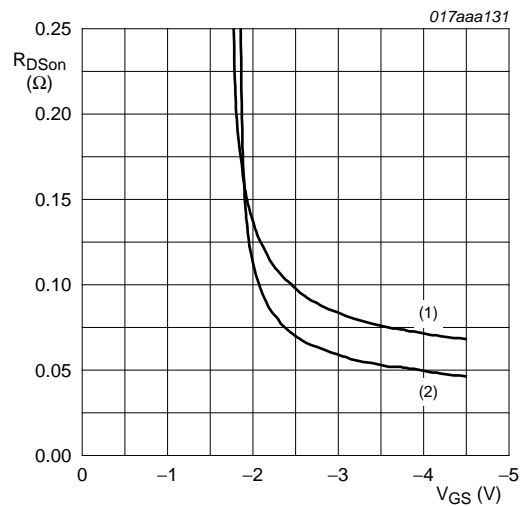
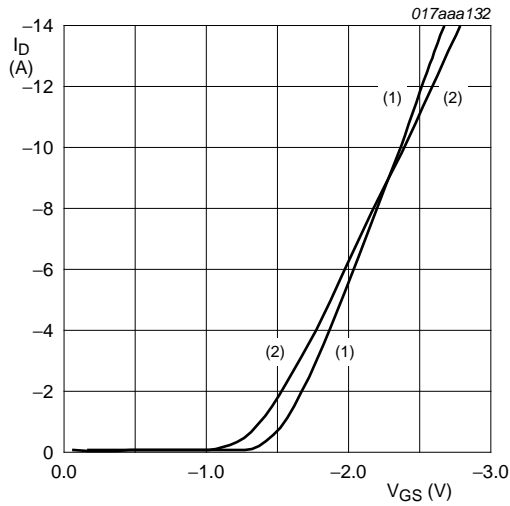
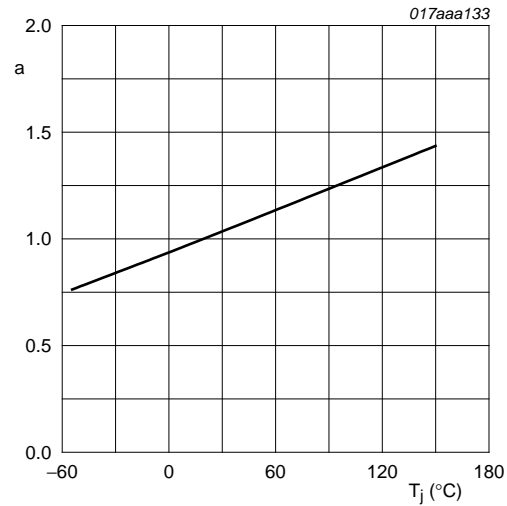


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



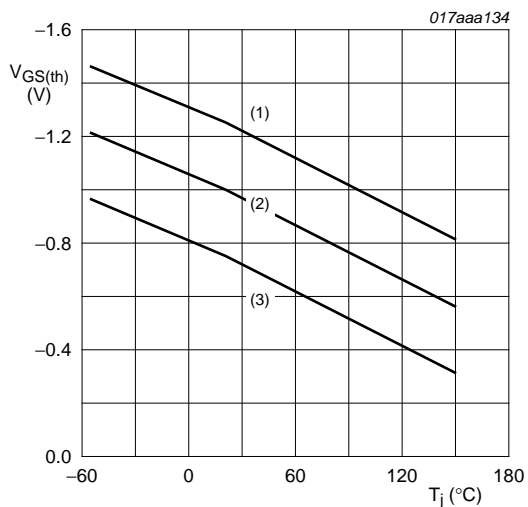
$V_{DS} > I_D \times R_{DS(on)}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

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



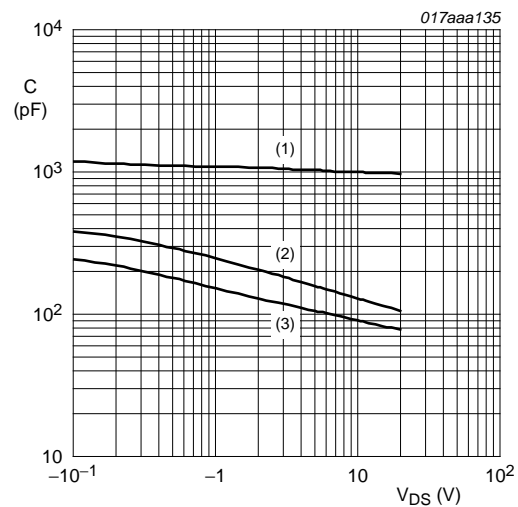
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

**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

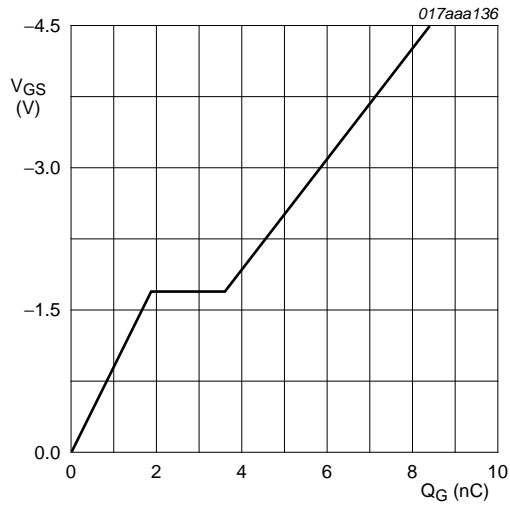
**Fig 12. Gate-source threshold voltage as a function of junction temperature**



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

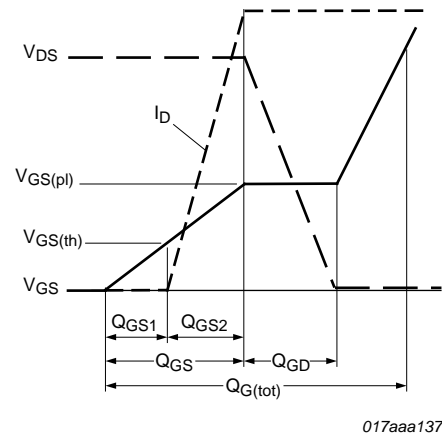
**Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**



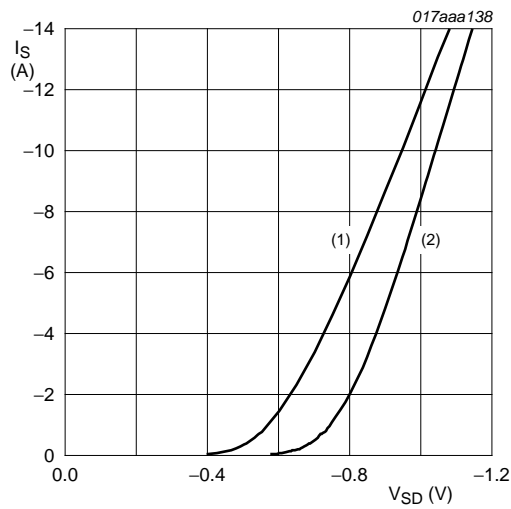


$I_D = -2.4 \text{ A}; V_{DS} = -10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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



**Fig 15. Gate charge waveform definitions**



$V_{GS} = 0 \text{ V}$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$   
 (2)  $T_j = 25 \text{ }^\circ\text{C}$

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

8. Package outline

Plastic surface-mounted package; 3 leads

SOT23

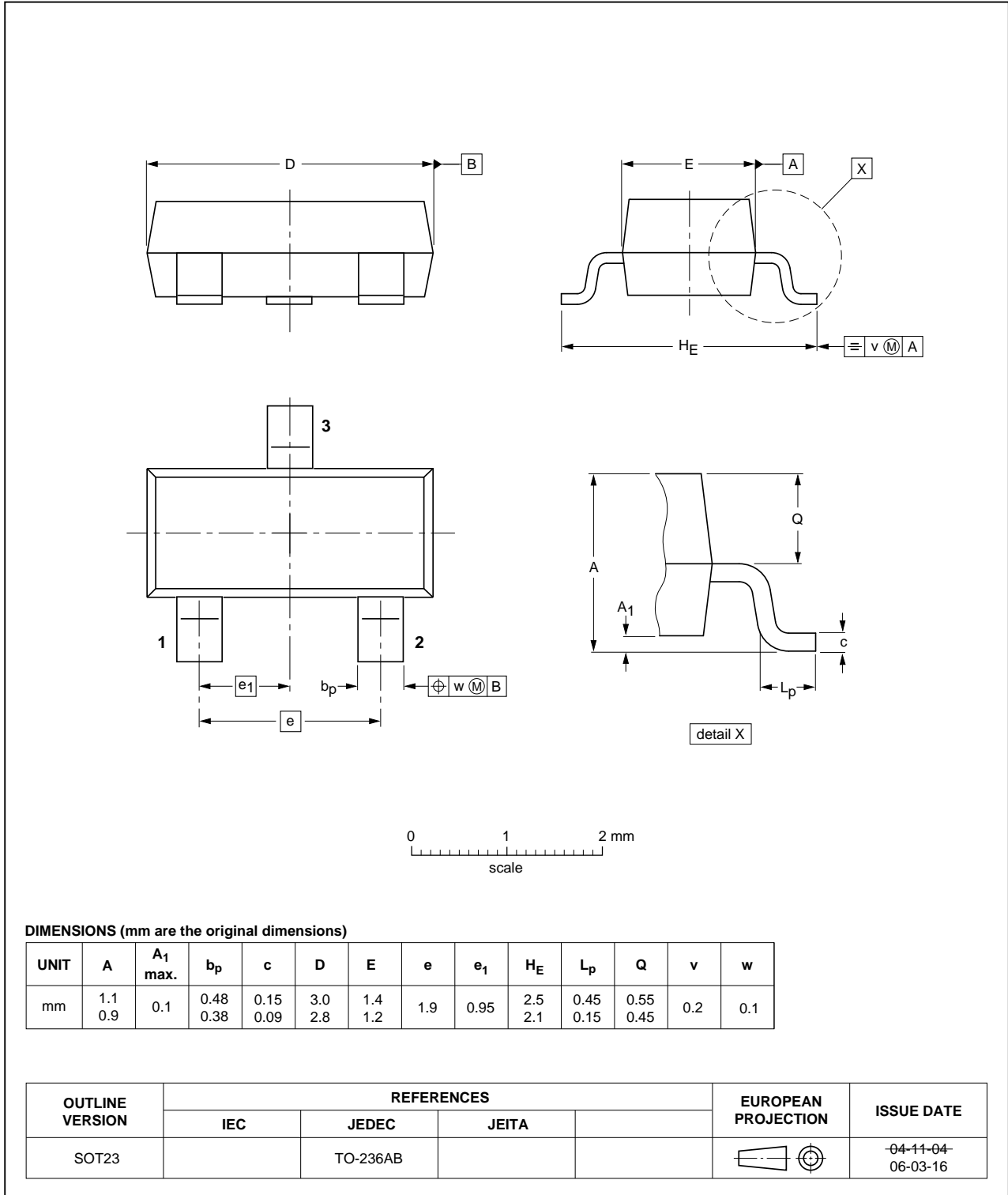


Fig 17. Package outline SOT23 (TO-236AB)

9. Soldering

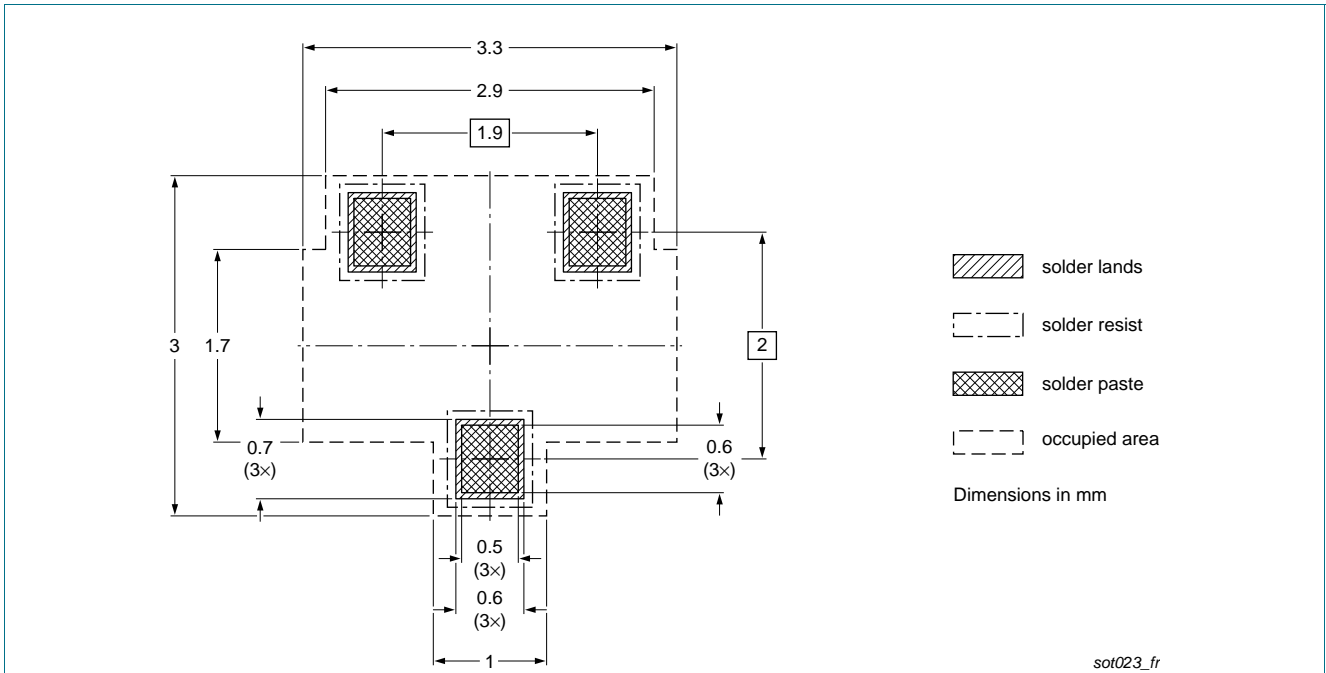


Fig 18. Reflow soldering footprint for SOT23 (TO-236AB)

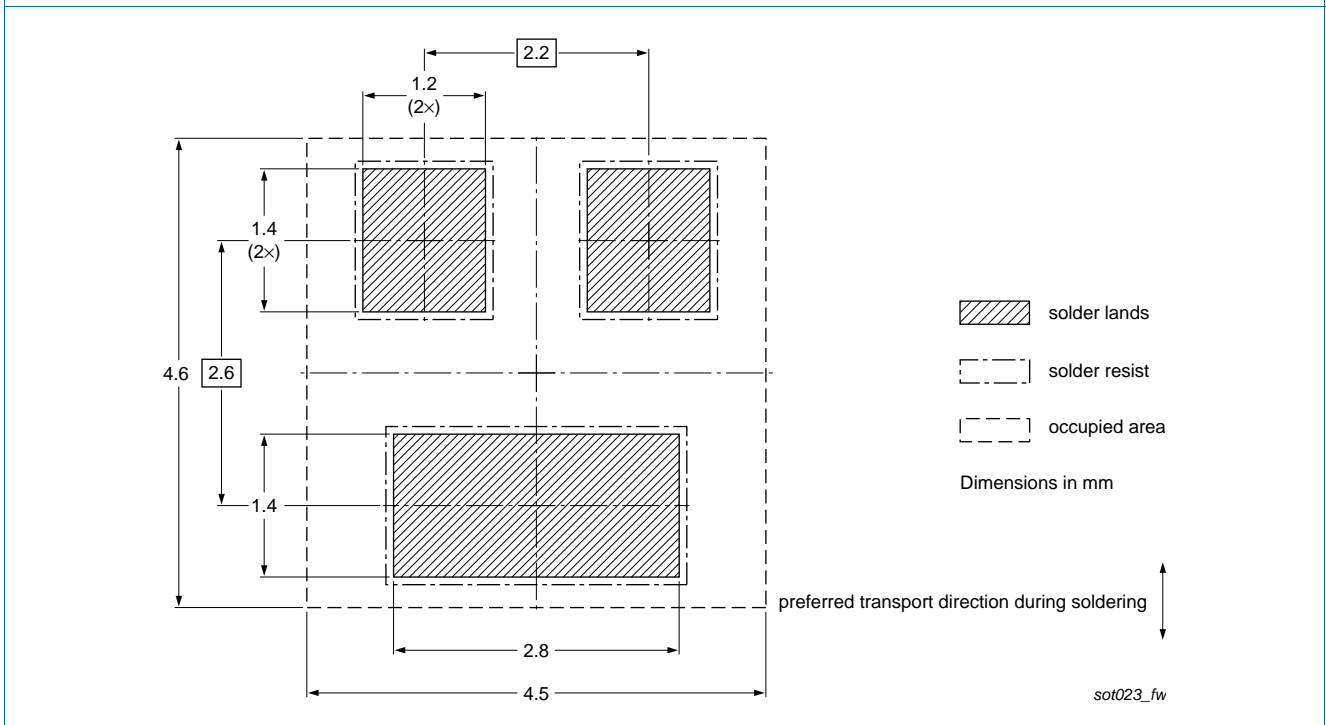


Fig 19. Wave soldering footprint for SOT23 (TO-236AB)

## 10. Revision history

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**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.

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

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Date of release: 21 December 2010

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