



# PMV160UP

20 V, 1.2 A P-channel Trench MOSFET

Rev. 2 — 6 December 2011

Product data sheet

## 1. Product profile

### 1.1 General description

P-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

- 1.8 V  $R_{DSon}$  rated
- Trench MOSFET technology
- Very fast switching

### 1.3 Applications

- Relay driver
- High-side loadswitch
- High-speed line 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	$T_j = 25\text{ °C}$	-	-	-20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-1.2	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -1.2\text{ A}; T_j = 25\text{ °C}$	-	170	210	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>017aaa257</p>
2	S	source		
3	D	drain		



### 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
PMV160UP	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

### 4. Marking

**Table 4. Marking codes**

Type number	Marking code <sup>[1]</sup>
PMV160UP	NH%

[1] % = placeholder for manufacturing site code

## 5. Limiting values

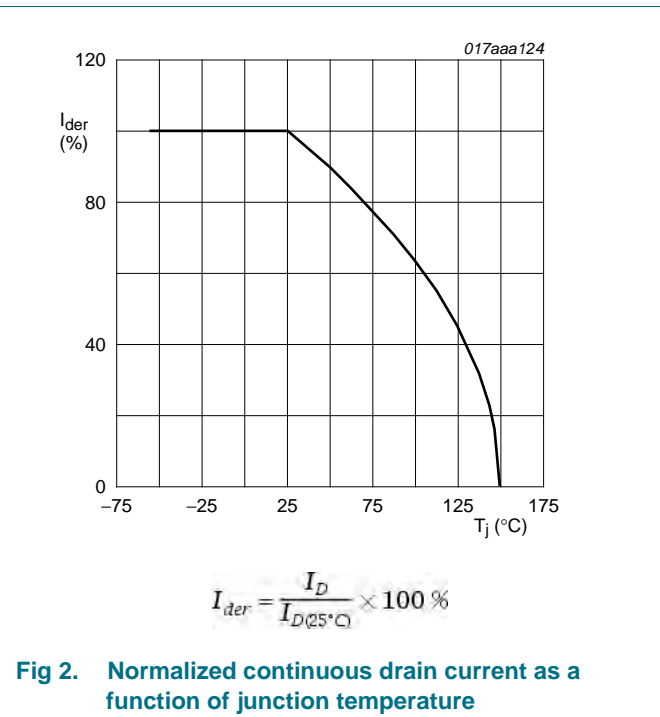
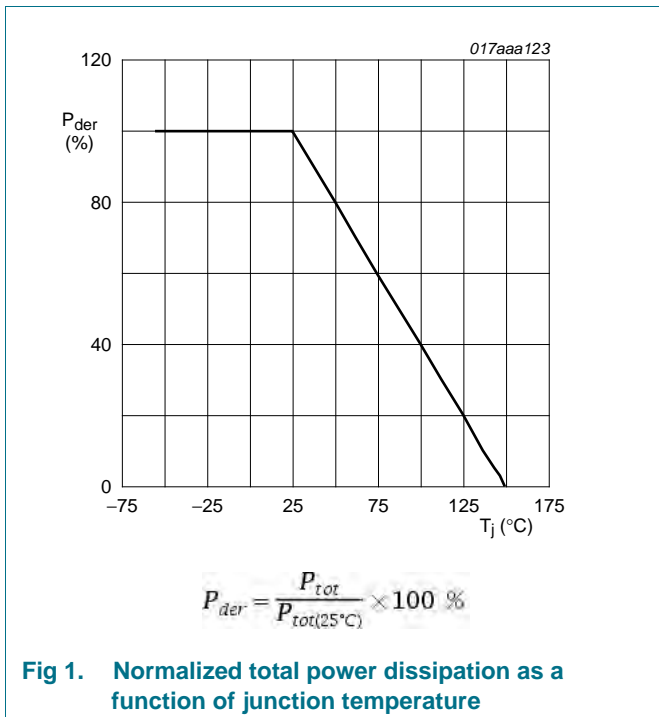
**Table 5. Limiting values**

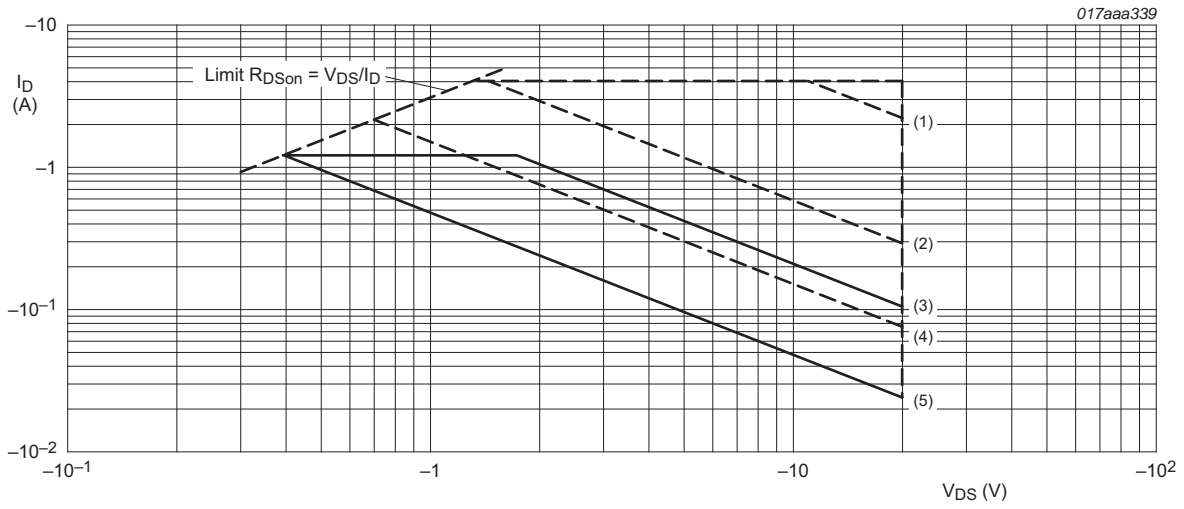
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C	-	-20	V	
V <sub>GS</sub>	gate-source voltage		-8	8	V	
I <sub>D</sub>	drain current	V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> 25 °C	[1]	-	-1.2	A
		V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	-0.8	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs	-	-4	A	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	335	mW
			[1]	-	480	mW
		T <sub>sp</sub> = 25 °C		-	2170	mW
T <sub>j</sub>	junction temperature		-55	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]	-	-0.5	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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.





$I_{DM}$  = single pulse

(1)  $t_p = 1$  ms

(2)  $t_p = 10$  ms

(3) DC;  $T_{sp} = 25$  °C

(4)  $t_p = 100$  ms

(5) DC;  $T_{amb} = 25$  °C; drain mounting pad  $6$  cm<sup>2</sup>

**Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage**

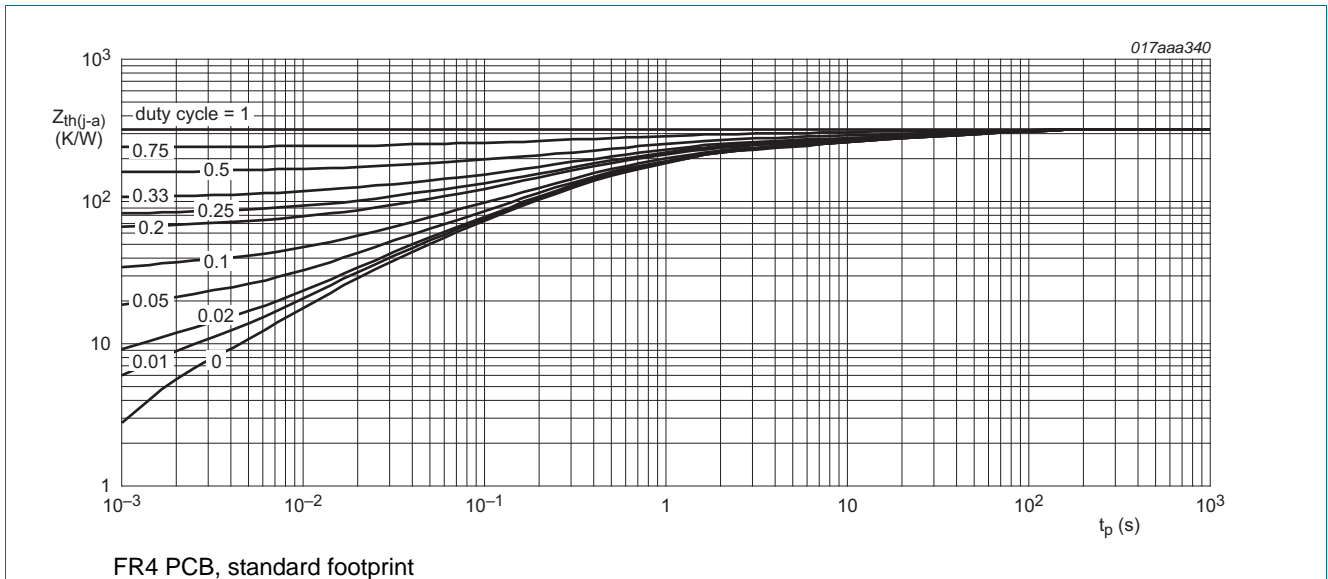
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

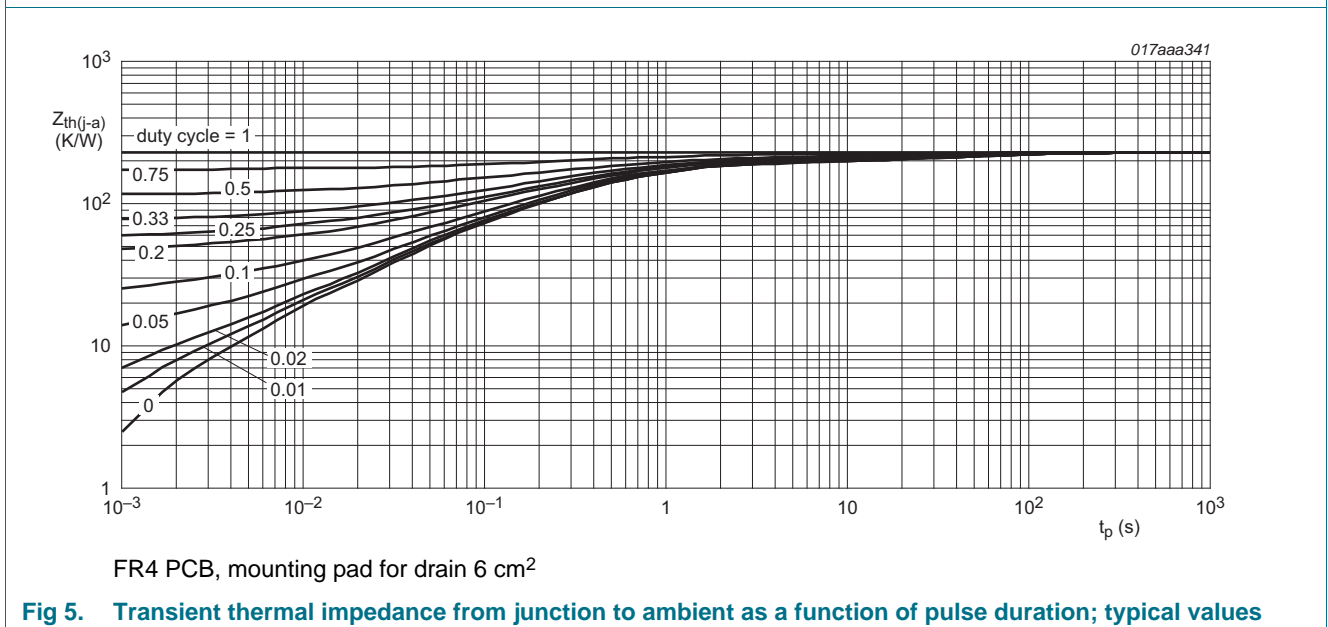
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	[1]	-	325	374	K/W
		[2]	-	227	260	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	50	60	K/W

[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 cm<sup>2</sup>.



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

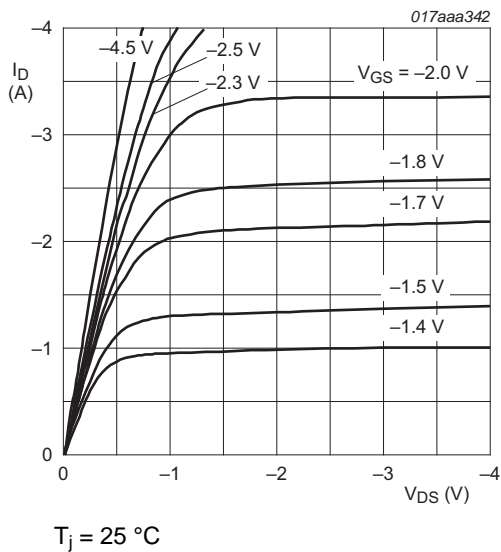


**Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 7. Characteristics

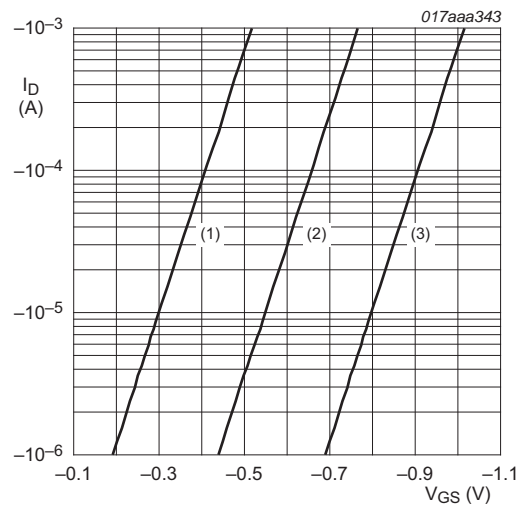
**Table 7. Characteristics**

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	$I_D = -250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.45	-0.7	-0.95	V
$I_{DSS}$	drain leakage current	$V_{DS} = -20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = -20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = -8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
		$V_{GS} = 8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$ ; $I_D = -1.2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	170	210	m $\Omega$
		$V_{GS} = -4.5 \text{ V}$ ; $I_D = -1.2 \text{ A}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	265	328	m $\Omega$
		$V_{GS} = -2.5 \text{ V}$ ; $I_D = -1.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	210	270	m $\Omega$
		$V_{GS} = -1.8 \text{ V}$ ; $I_D = -0.5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	280	380	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -5 \text{ V}$ ; $I_D = -1.2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.7	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$ ; $I_D = -1 \text{ A}$ ; $V_{GS} = -4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.3	4	nC
$Q_{GS}$	gate-source charge		-	1	-	nC
$Q_{GD}$	gate-drain charge		-	0.5	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	365	-	pF
$C_{oss}$	output capacitance		-	42	-	pF
$C_{rss}$	reverse transfer capacitance		-	30	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$ ; $V_{GS} = -4.5 \text{ V}$ ; $R_{G(ext)} = 6 \text{ }^\circ\Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $I_D = -1 \text{ A}$	-	7	-	ns
$t_r$	rise time		-	26	-	ns
$t_{d(off)}$	turn-off delay time		-	35	-	ns
$t_f$	fall time		-	17	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -0.5 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.7	-1.2	V



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

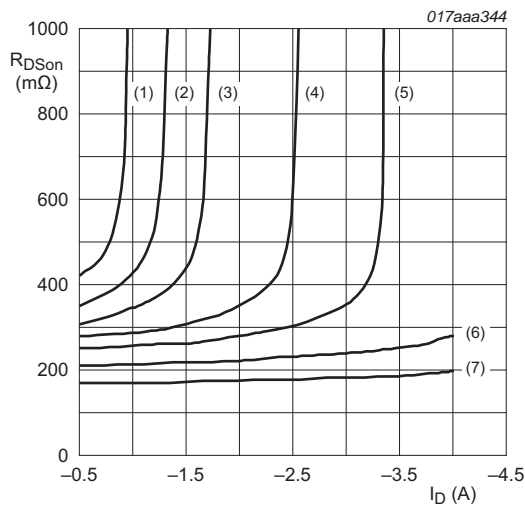
**Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



$T_j = 25\text{ }^\circ\text{C}; V_{DS} = -5\text{ V}$

- (1) minimum values
- (2) typical values
- (3) maximum values

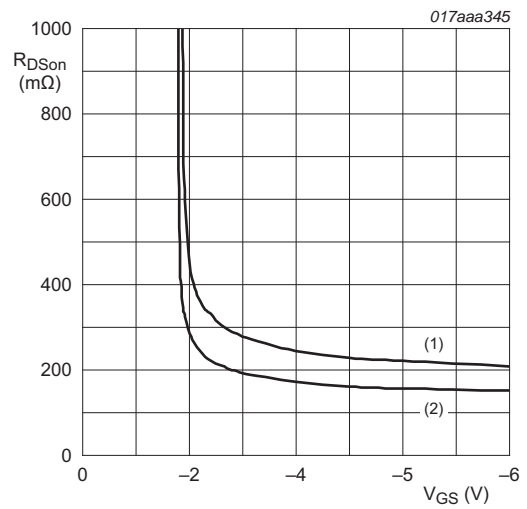
**Fig 7. Sub-threshold drain current as a function of gate-source voltage**



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

- (1)  $V_{GS} = -1.4\text{ V}$
- (2)  $V_{GS} = -1.5\text{ V}$
- (3)  $V_{GS} = -1.6\text{ V}$
- (4)  $V_{GS} = -1.8\text{ V}$
- (5)  $V_{GS} = -2.0\text{ V}$
- (6)  $V_{GS} = -2.5\text{ V}$
- (7)  $V_{GS} = -4.5\text{ V}$

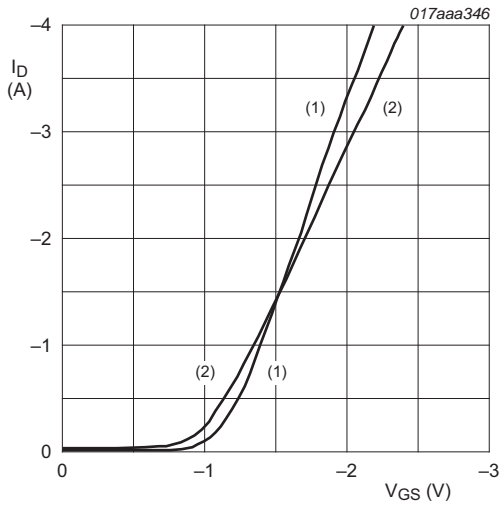
**Fig 8. Drain-source on-state resistance as a function of drain current; typical values**



$I_D = -2.5\text{ A}$

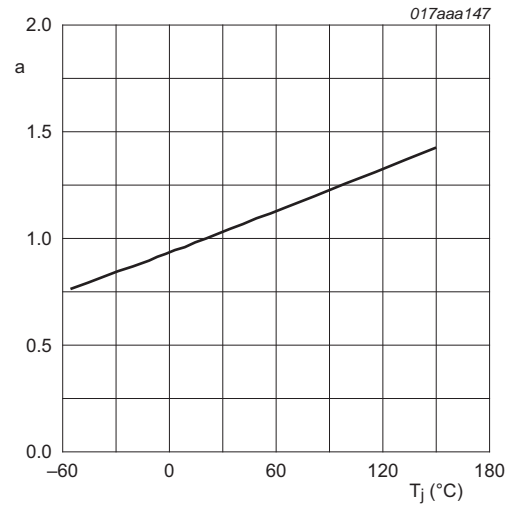
- (1)  $T_j = 150\text{ }^\circ\text{C}$
- (2)  $T_j = 25\text{ }^\circ\text{C}$

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



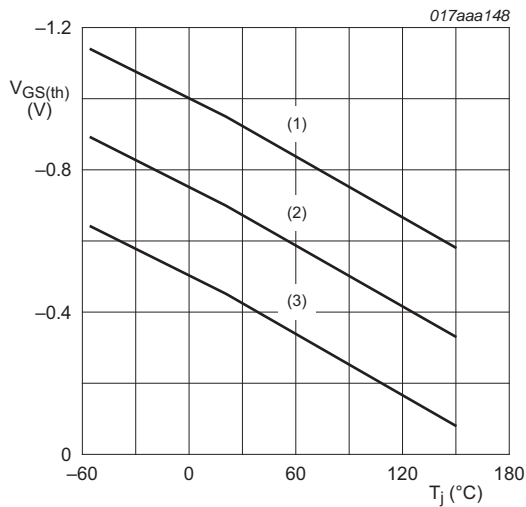
$V_{DS} > I_D \times R_{DS(on)}$   
 (1)  $T_j = 25\text{ }^\circ\text{C}$   
 (2)  $T_j = 150\text{ }^\circ\text{C}$

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



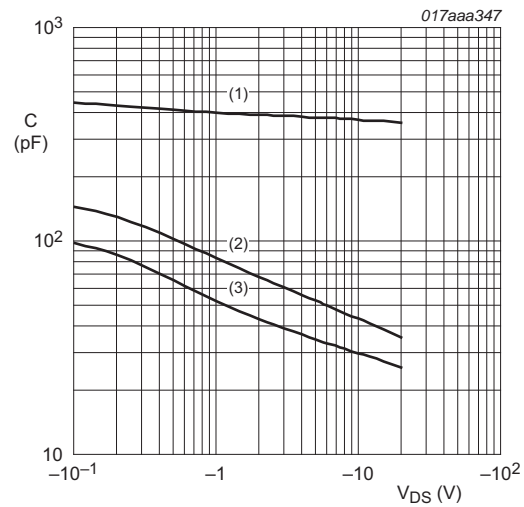
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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

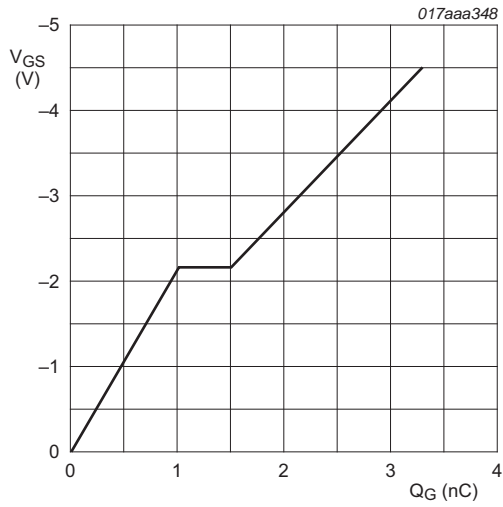
Fig 12. Gate-source threshold voltage as a function of junction temperature



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





$I_D = -1.0$  A;  $V_{DS} = -10$  V;  $T_{amb} = 25$  °C

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

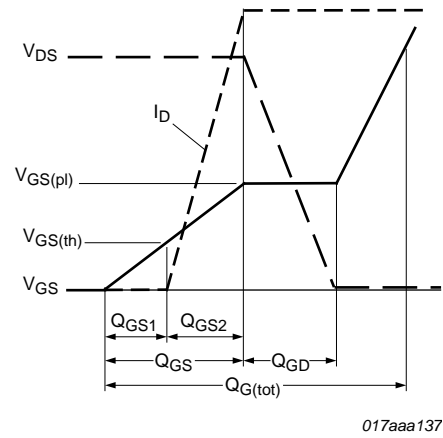
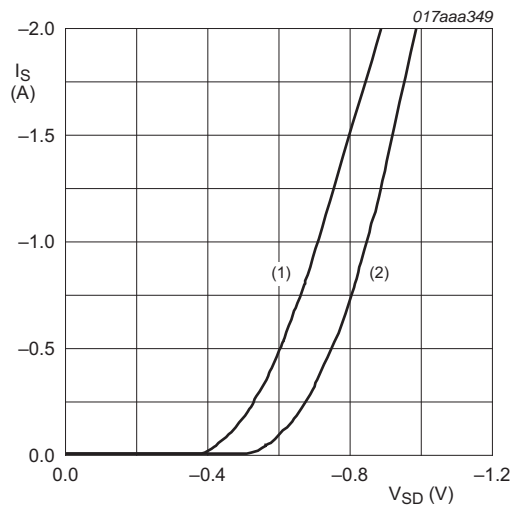


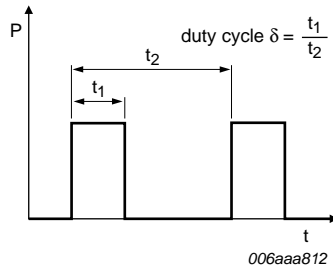
Fig 15. Gate charge waveform definitions



$V_{GS} = 0$  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. Test information**



**Fig 17. Duty cycle definition**

9. Package outline

Plastic surface-mounted package; 3 leads

SOT23

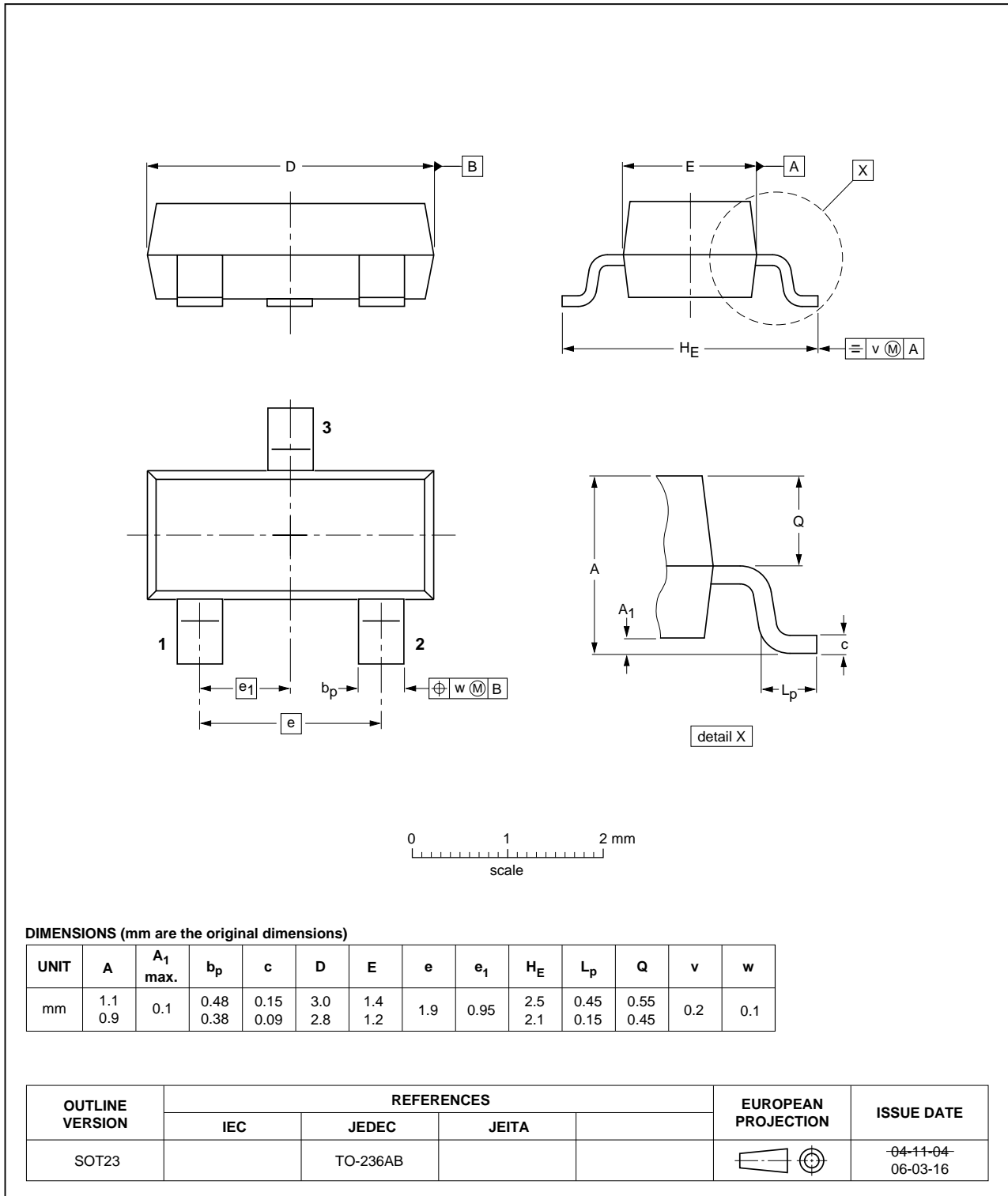


Fig 18. Package outline SOT23 (TO-236AB)

### 10. Soldering

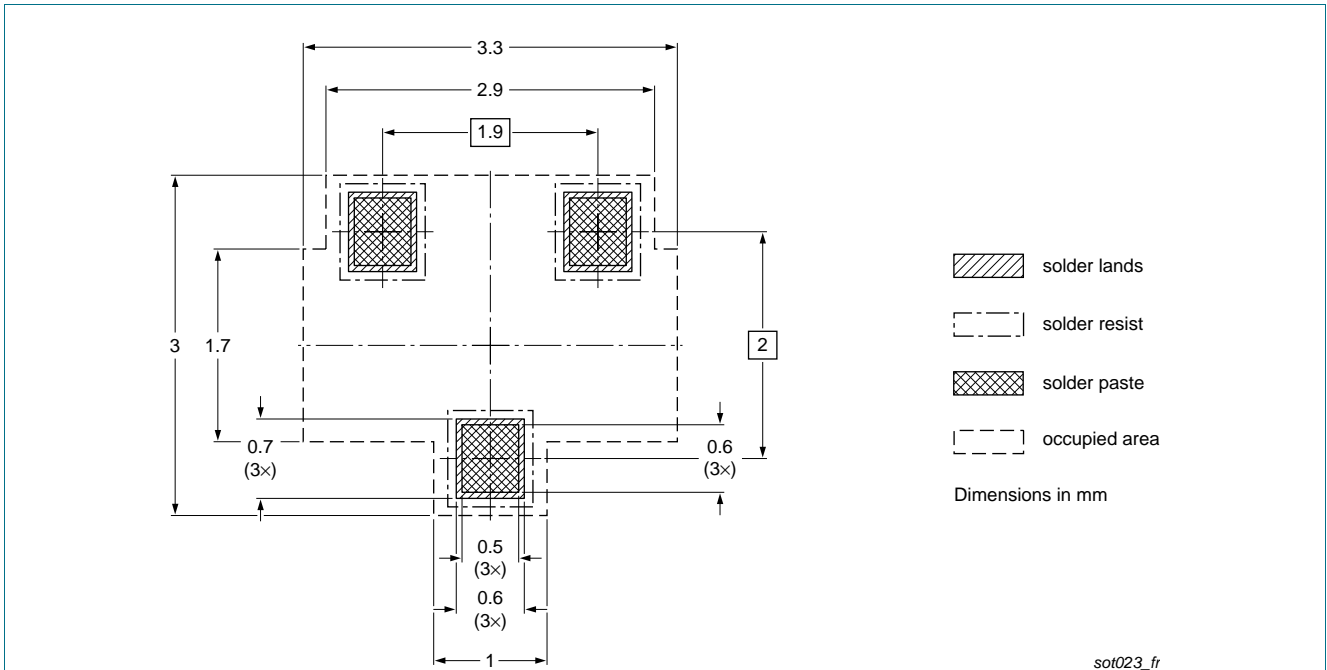


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

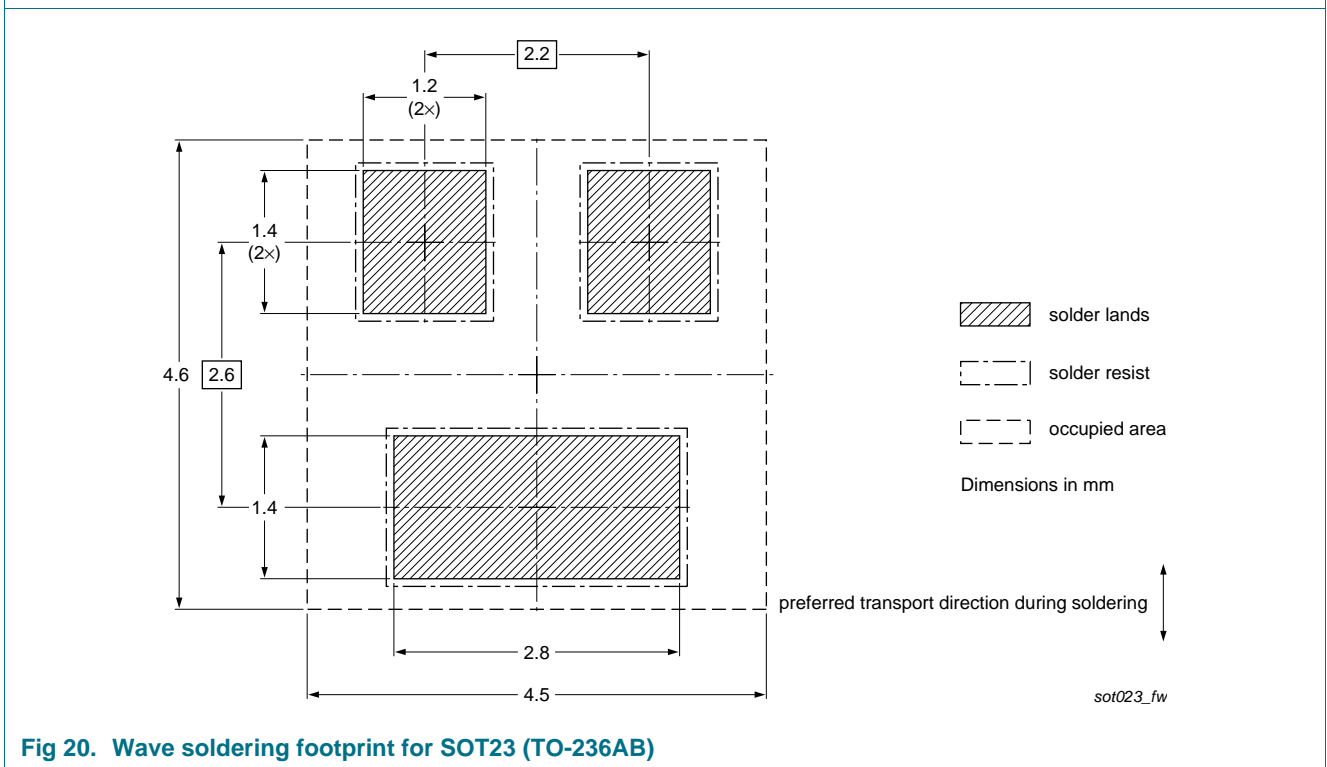


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

## 11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV160UP v.2	20111206	Product data sheet	-	PMV160UP v.1
Modifications:	• <a href="#">7 "Characteristics"</a> : $V_{GSth}$ condition is corrected			
PMV160UP v.1	20110907	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <a href="#">[1]</a> <a href="#">[2]</a>	Product status <a href="#">[3]</a>	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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## 14. Contents

<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>2</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>3</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>5</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>6</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>10</b>
<b>9</b>	<b>Package outline</b> . . . . .	<b>11</b>
<b>10</b>	<b>Soldering</b> . . . . .	<b>12</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>13</b>
<b>12</b>	<b>Legal information</b> . . . . .	<b>14</b>
12.1	Data sheet status . . . . .	14
12.2	Definitions . . . . .	14
12.3	Disclaimers . . . . .	14
12.4	Trademarks . . . . .	15
<b>13</b>	<b>Contact information</b> . . . . .	<b>15</b>

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