



**THE DATASHEET OF
PMV160UP,215**





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
Static characteristics						
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 Ω

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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 ^[1]
PMV160UP	NH%

[1] % = placeholder for manufacturing site code

5. Limiting values

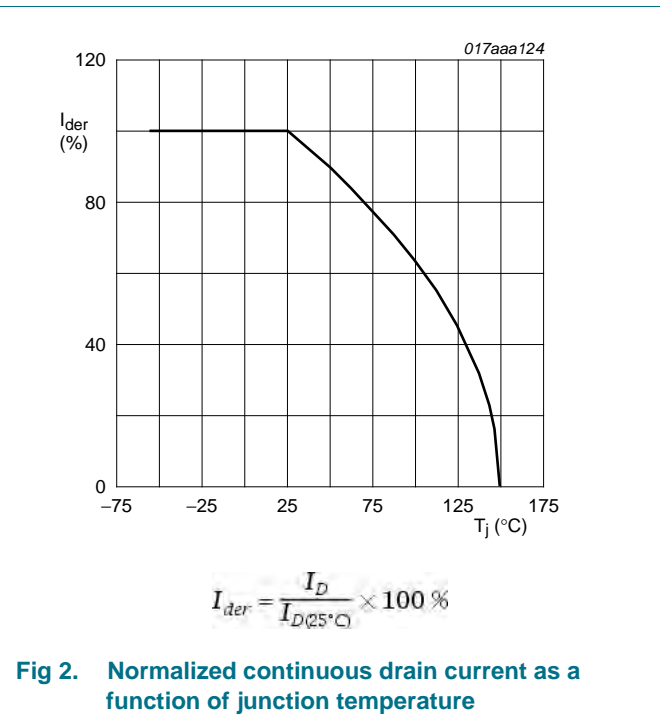
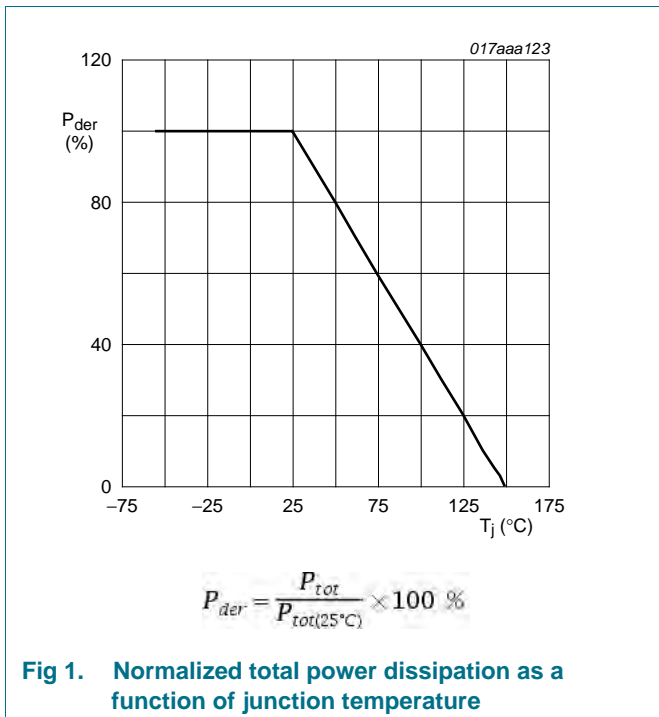
Table 5. Limiting values

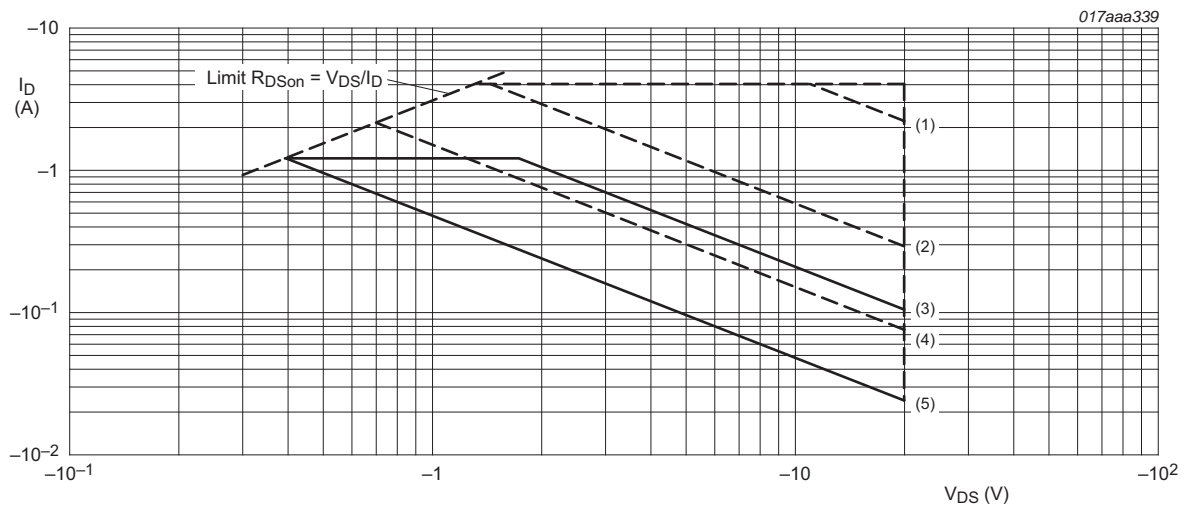
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V _{DS}	drain-source voltage	T _j = 25 °C	-	-20	V	
V _{GS}	gate-source voltage		-8	8	V	
I _D	drain current	V _{GS} = -4.5 V; T _{amb} 25 °C	[1]	-	-1.2	A
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-0.8	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs	-	-4	A	
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	335	mW
			[1]	-	480	mW
		T _{sp} = 25 °C		-	2170	mW
T _j	junction temperature		-55	150	°C	
T _{amb}	ambient temperature		-55	150	°C	
T _{stg}	storage temperature		-65	150	°C	
Source-drain diode						
I _S	source current	T _{amb} = 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 cm².

[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 cm²

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	in free air	[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 cm².

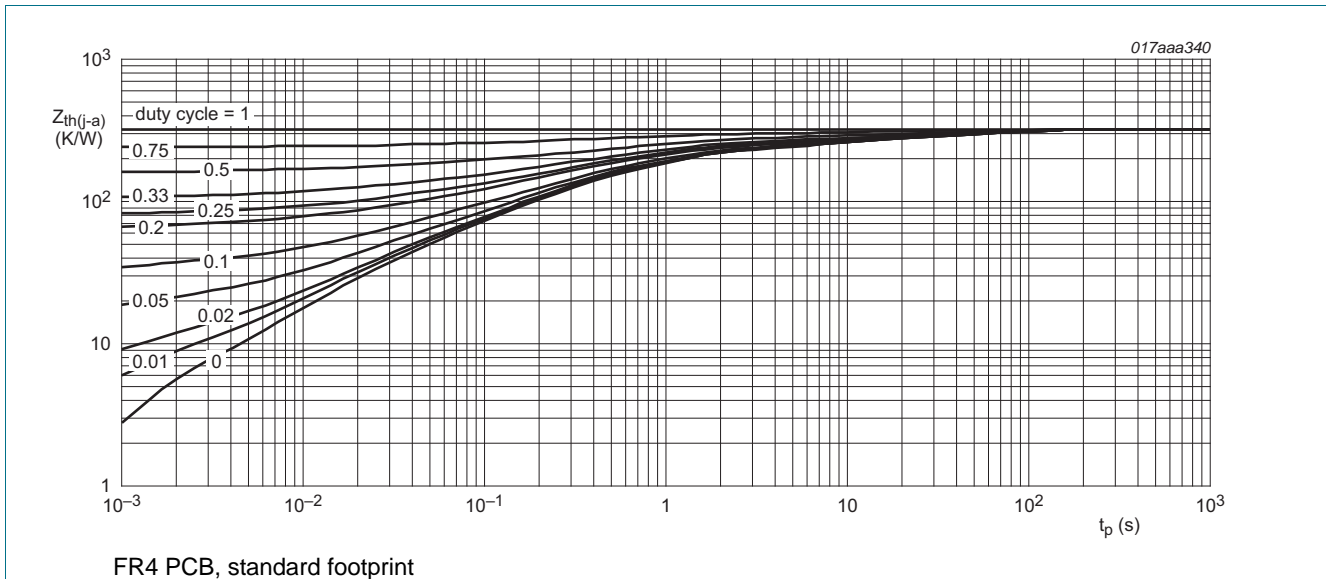


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

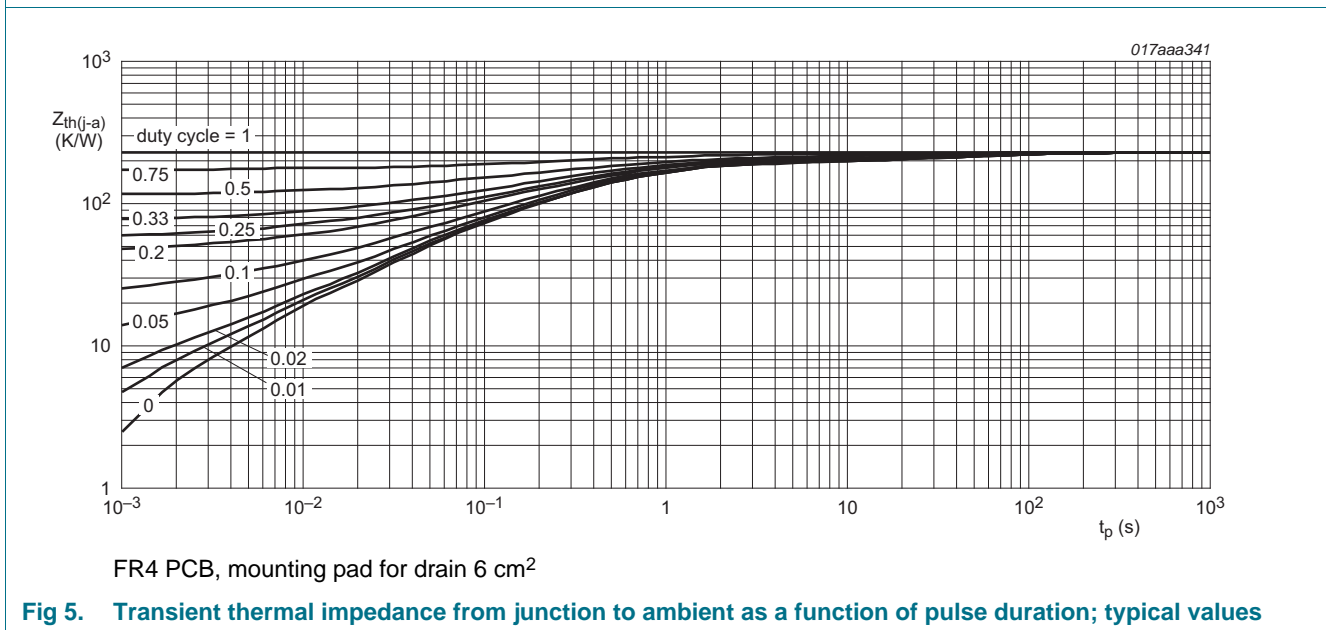
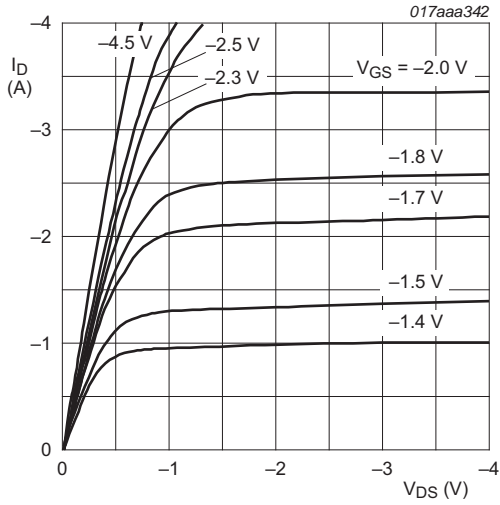


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

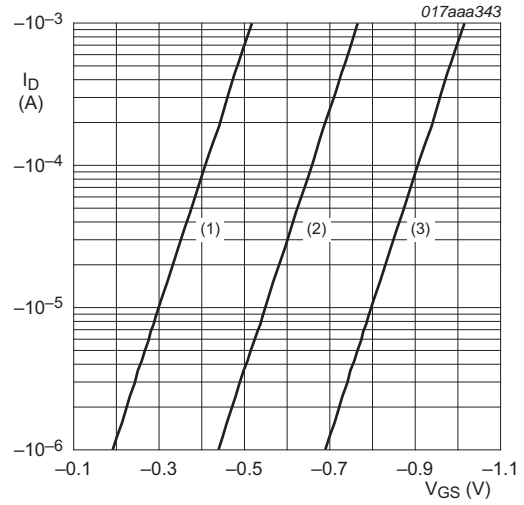
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	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	μA
		$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	μA
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 Ω
		$V_{GS} = -4.5 \text{ V}$; $I_D = -1.2 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	265	328	m Ω
		$V_{GS} = -2.5 \text{ V}$; $I_D = -1.1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	210	270	m Ω
		$V_{GS} = -1.8 \text{ V}$; $I_D = -0.5 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	280	380	m Ω
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
Dynamic characteristics						
$Q_{G(tot)}$	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
Source-drain diode						
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



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

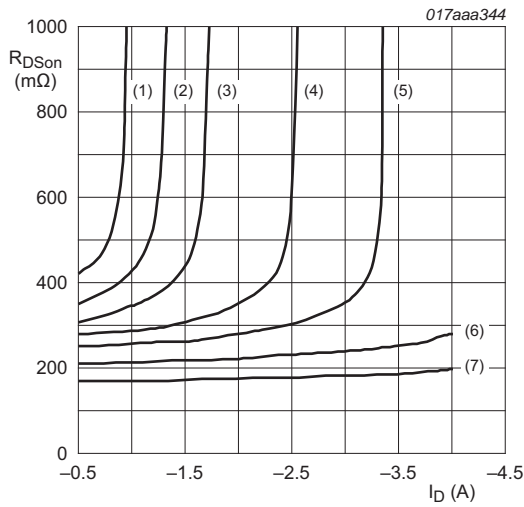
Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



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

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

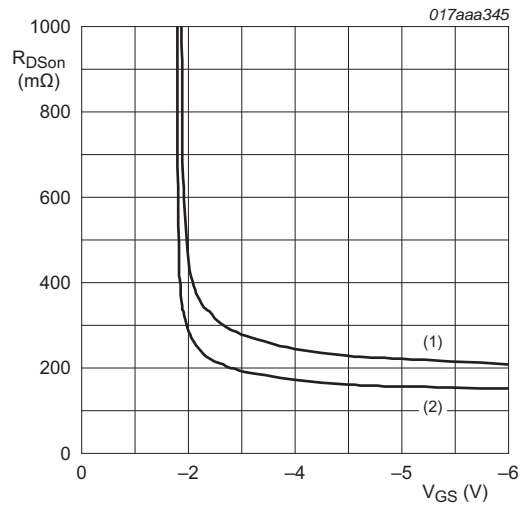
Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

- (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) $V_{GS} = -4.5\text{ V}$

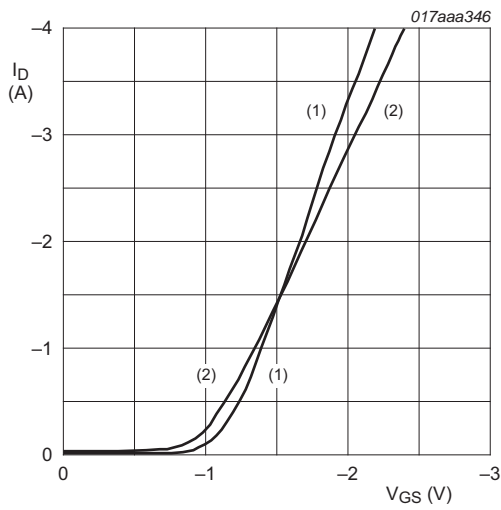
Fig 8. Drain-source on-state resistance as a function of drain current; typical values



$I_D = -2.5\text{ A}$

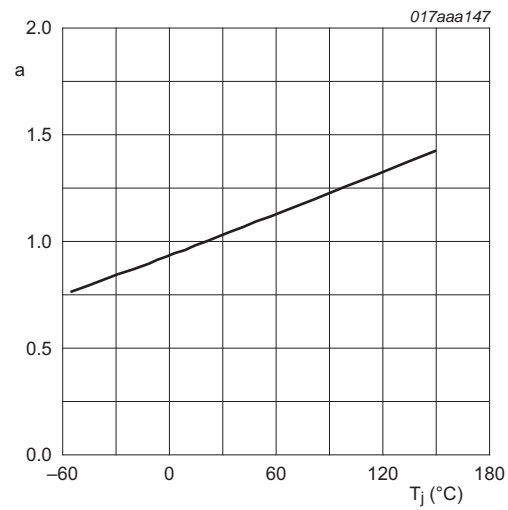
- (1) $T_j = 150\text{ }^\circ\text{C}$
- (2) $T_j = 25\text{ }^\circ\text{C}$

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



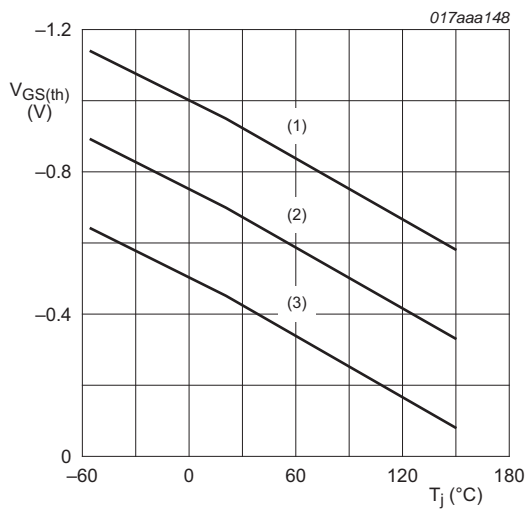
$V_{DS} > I_D \times R_{DS(on)}$
 (1) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

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



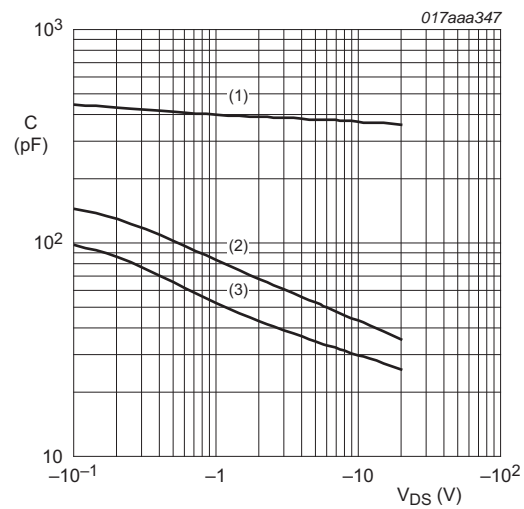
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{°C})}}$$

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



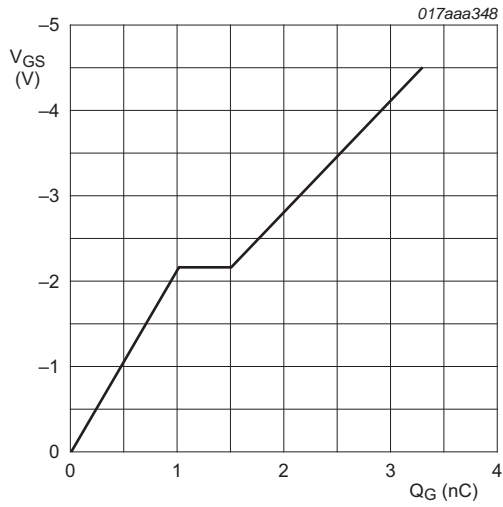
$I_D = -0.25\text{ mA}$; $V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

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

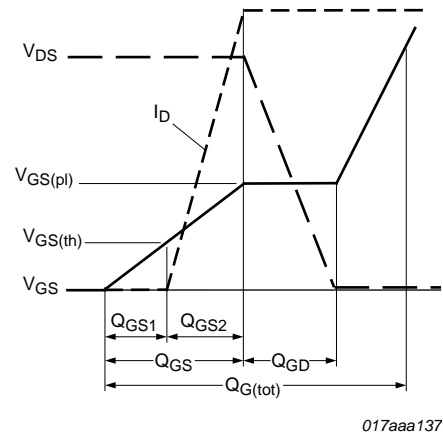
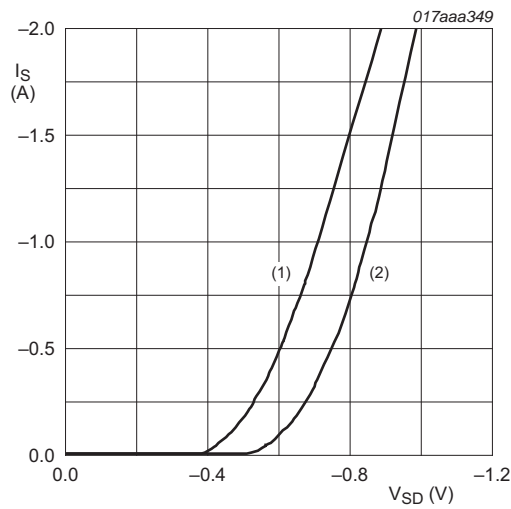


Fig 15. Gate charge waveform definitions



$V_{GS} = 0$ 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

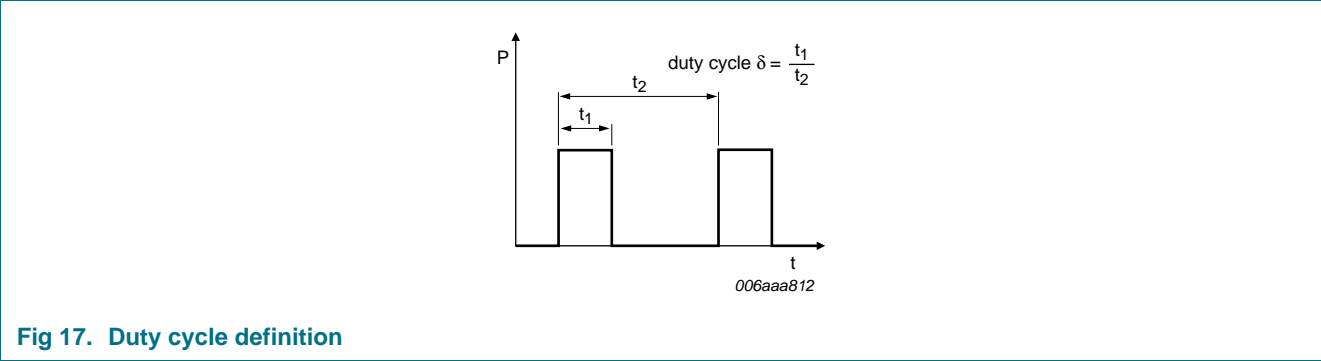


Fig 17. Duty cycle definition

9. Package outline

Plastic surface-mounted package; 3 leads

SOT23

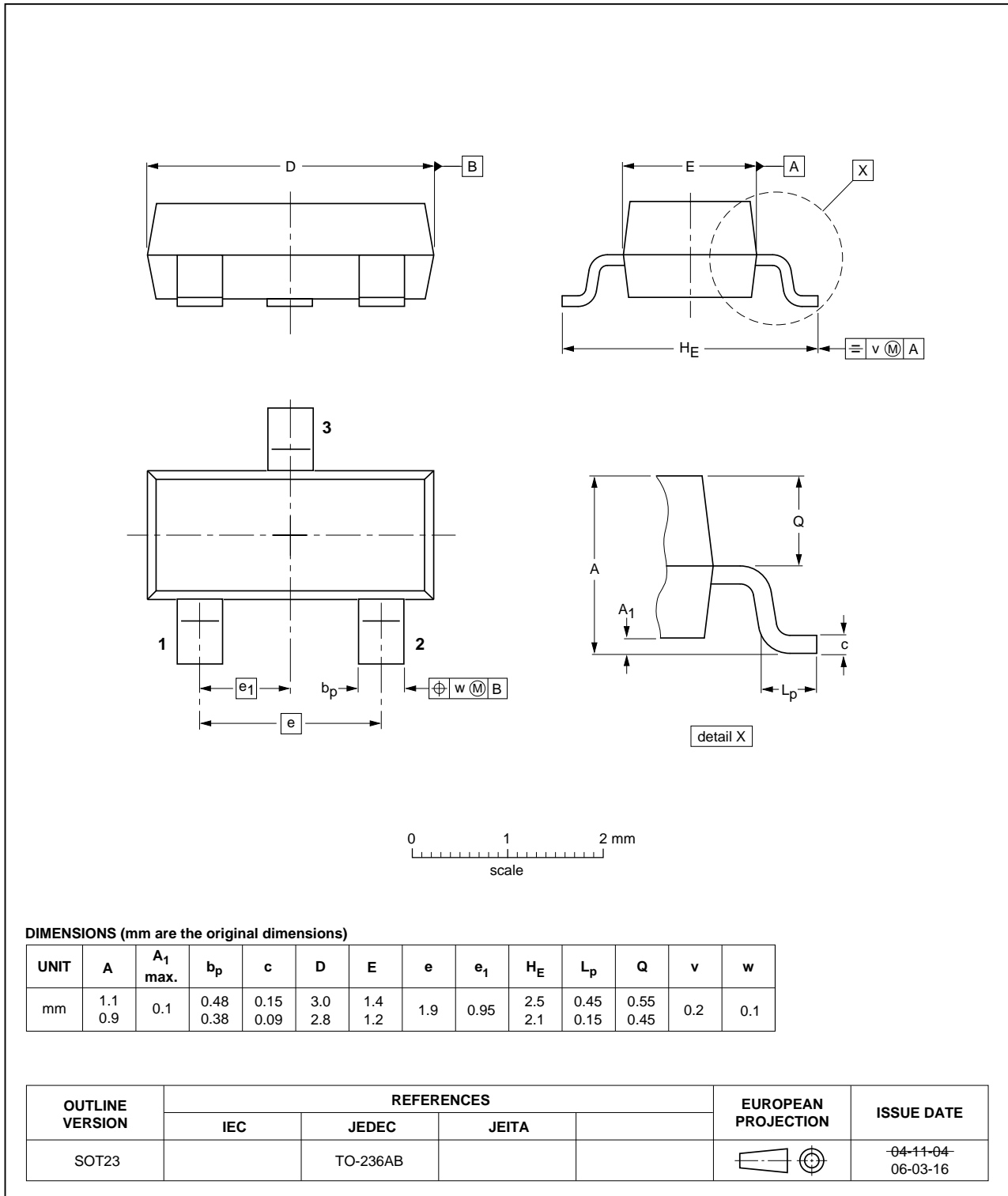


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

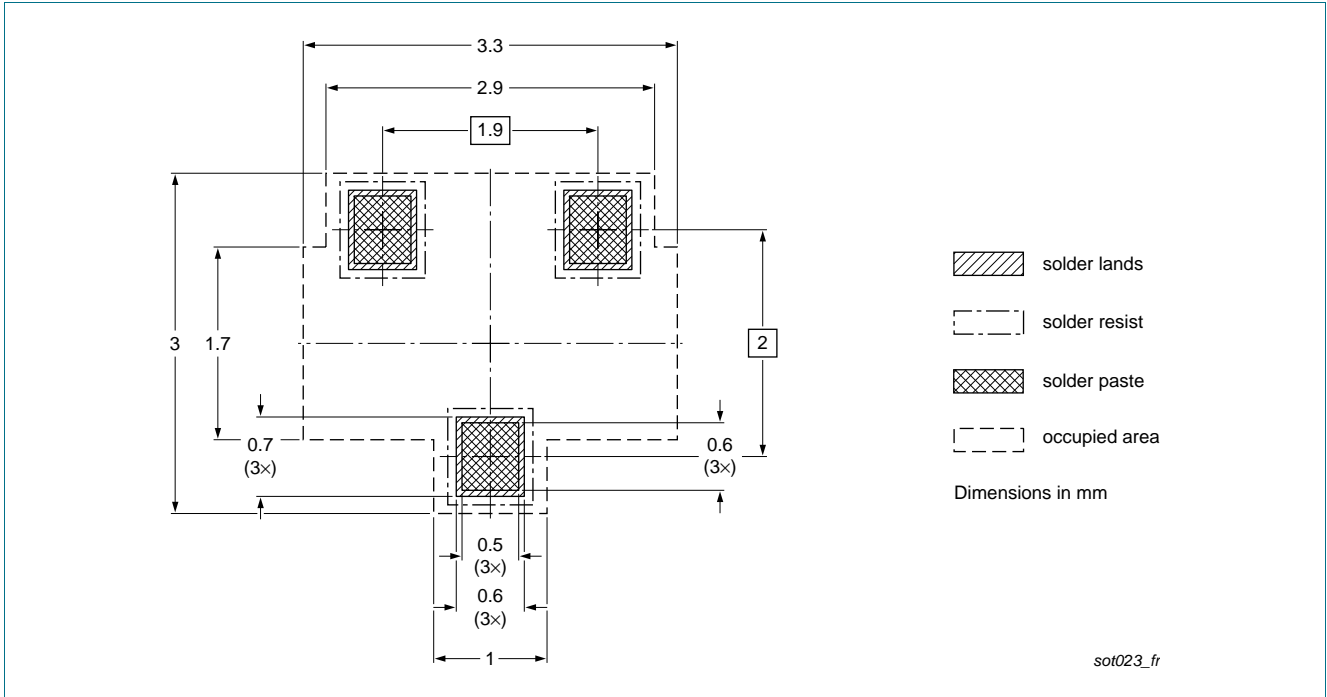


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

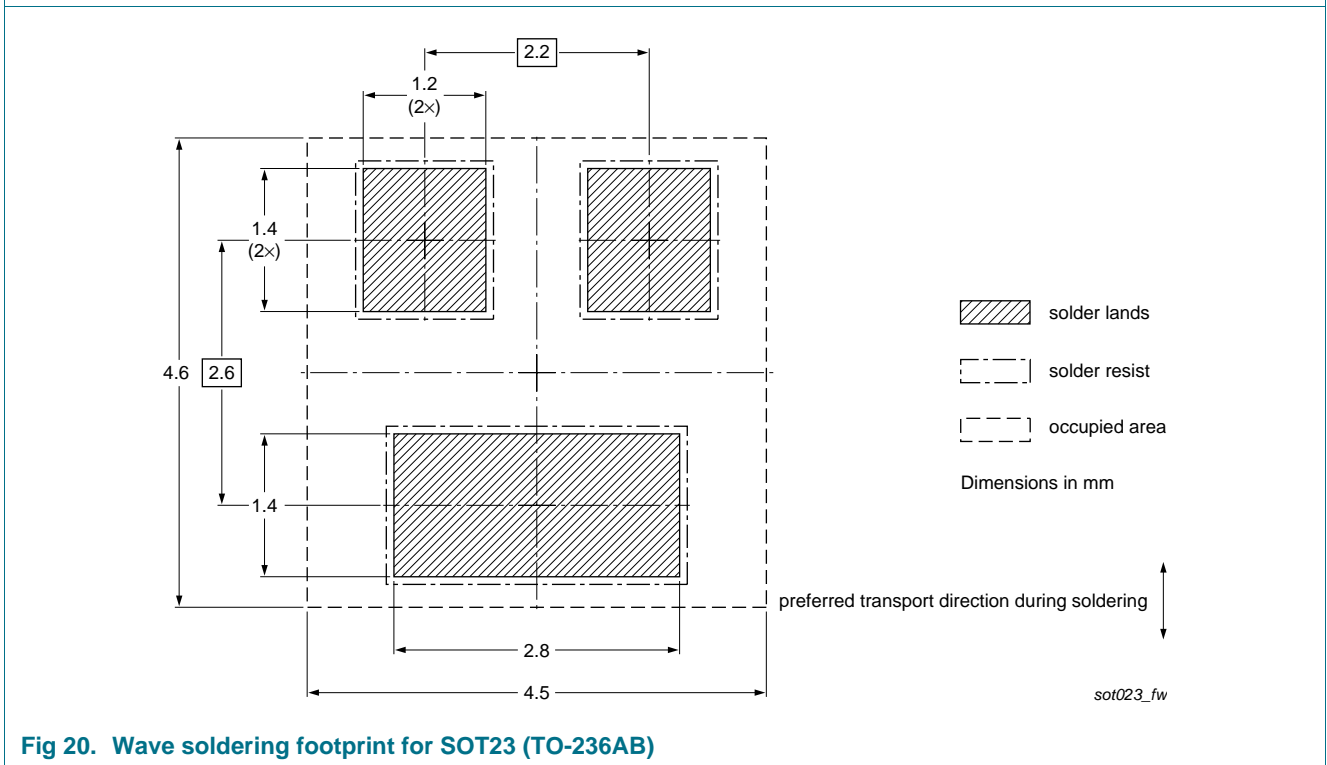


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

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:	• 7 "Characteristics" : V_{GSth} condition is corrected			
PMV160UP v.1	20110907	Product data sheet	-	-

12. Legal information

12.1 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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14. Contents

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

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