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Kind regards,

Team Nexperia



# PMV65XP

20 V, single P-channel Trench MOSFET

12 February 2013

Product data sheet

## 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.

## 2. Features and benefits

- Low threshold voltage
- Low on-state resistance
- Trench MOSFET technology

## 3. Applications

- Low power DC-to-DC converters
- Load switching
- Battery management
- Battery powered portable equipment

## 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		-12	-	12	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ °C}$	-	-	-4.3	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2.8\text{ A}; T_j = 25\text{ °C}$	-	58	74	m $\Omega$

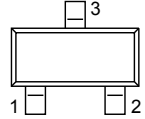
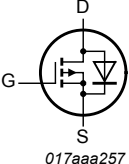


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-236AB (SOT23)</p>	 <p>017aaa257</p>
2	S	source		
3	D	drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV65XP	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 7. Marking

Table 4. Marking codes

Type number	Marking code [1]
PMV65XP	%M9

[1] % = placeholder for manufacturing site code

## 8. Limiting values

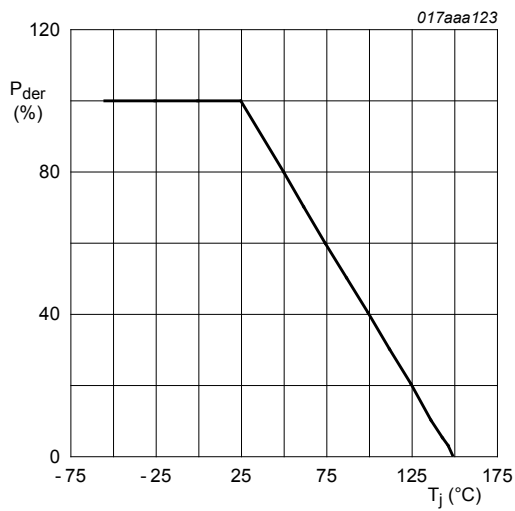
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$	-	-20	V
$V_{GS}$	gate-source voltage		-12	12	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ }^\circ\text{C}$	-	-4.3	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-2.8	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ }^\circ\text{C}$	[1]	-1.8	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ }^\circ\text{C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-16	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ }^\circ\text{C}$	[2]	480	mW
			[1]	833	mW
		$T_{sp} = 25\text{ }^\circ\text{C}$	-	4165	mW

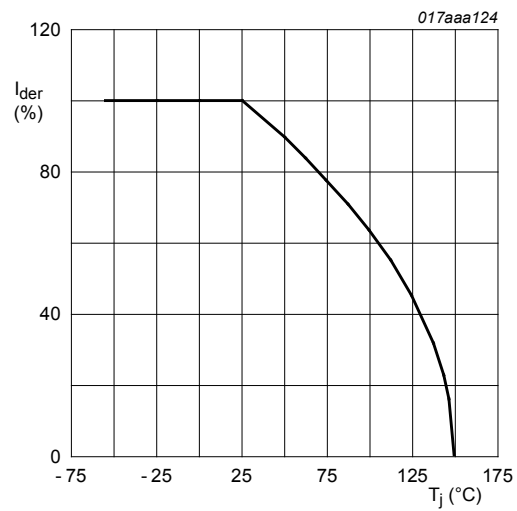
Symbol	Parameter	Conditions	Min	Max	Unit
T <sub>j</sub>	junction temperature		-55	150	°C
T <sub>amb</sub>	ambient temperature		-55	150	°C
T <sub>stg</sub>	storage temperature		-65	150	°C
<b>Source-drain diode</b>					
I <sub>s</sub>	source current	T <sub>sp</sub> = 25 °C	-	-1.6	A

- [1] Device mounted on an FR4 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.



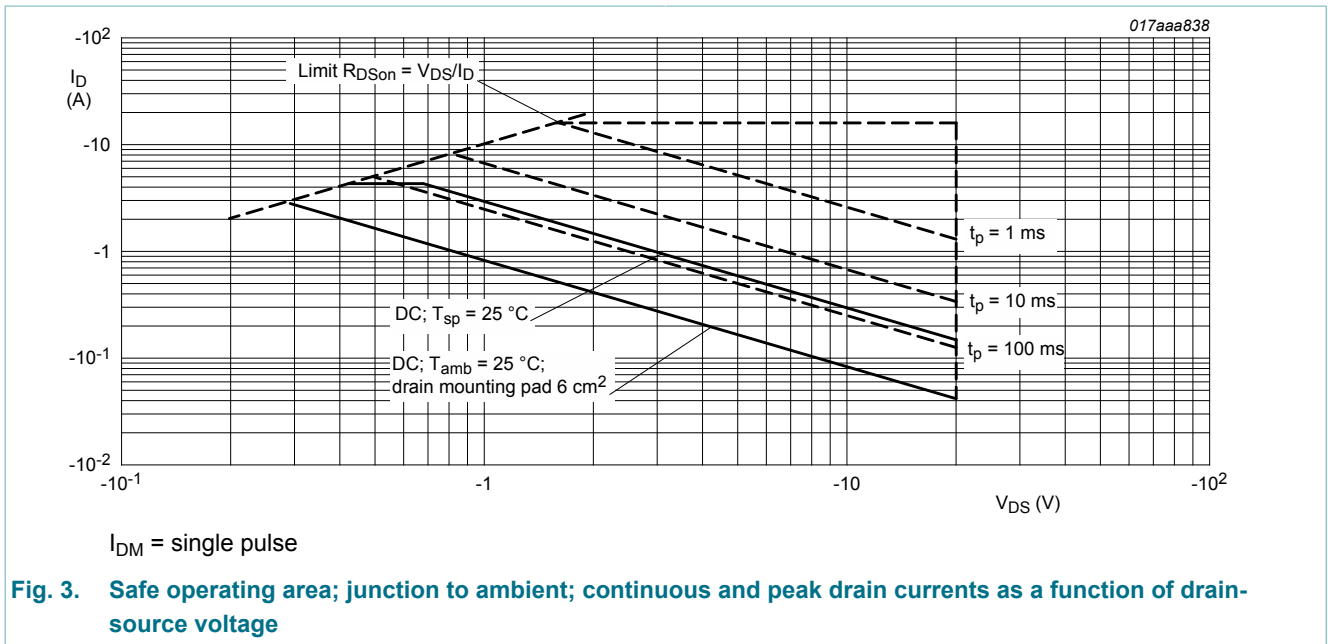
**Fig. 1. Normalized total power dissipation as a function of junction temperature**

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



**Fig. 2. Normalized continuous drain current as a function of junction temperature**

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



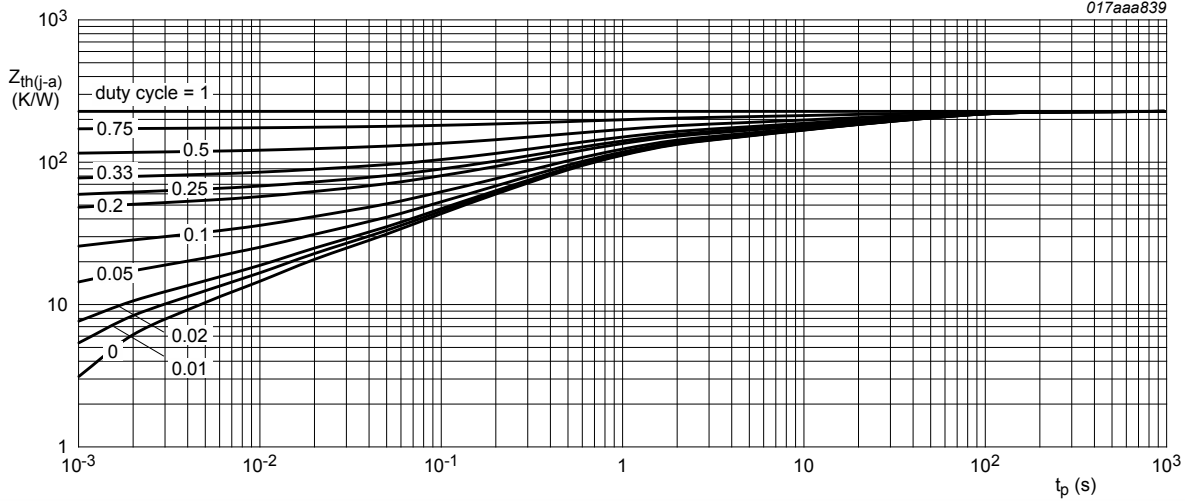
## 9. Thermal characteristics

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]	-	230	260	K/W
			[2]	-	125	150	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	25	30	K/W

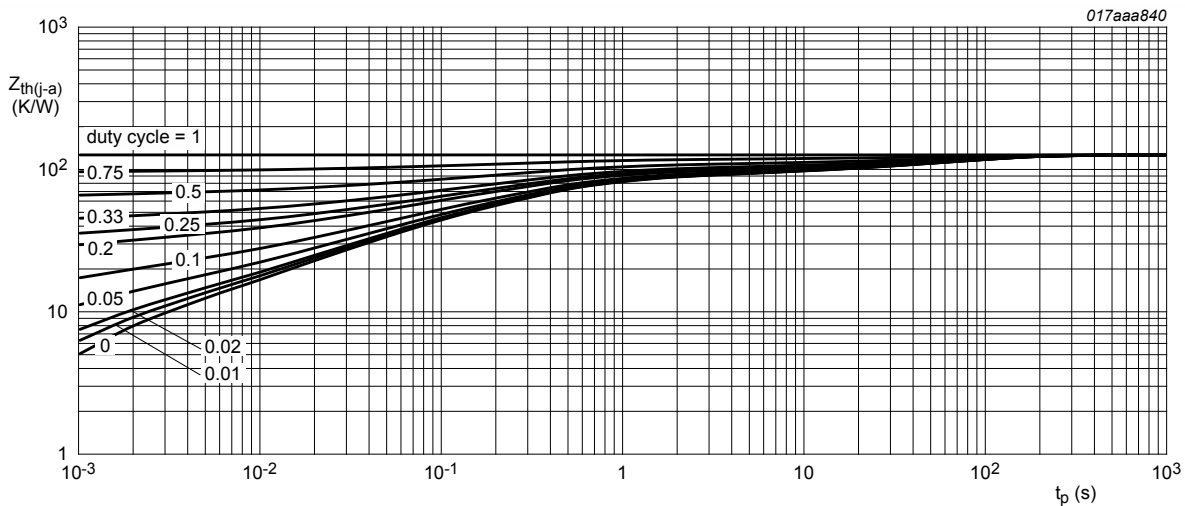
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	-0.47	-0.65	-0.9	V
$I_{DSS}$	drain leakage current	$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-1	$\mu A$
		$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	-100	$\mu A$

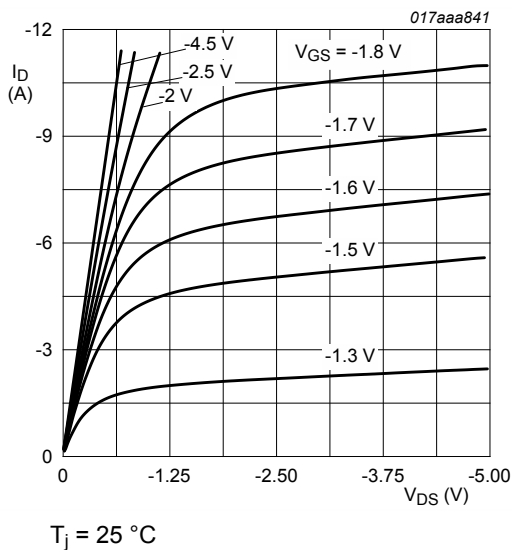
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = -12 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	-100	nA
		V <sub>GS</sub> = 12 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	100	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -2.8 A; T <sub>j</sub> = 25 °C	-	58	74	mΩ
		V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -2.8 A; T <sub>j</sub> = 150 °C	-	82	105	mΩ
		V <sub>GS</sub> = -2.5 V; I <sub>D</sub> = -2.3 A; T <sub>j</sub> = 25 °C	-	67	92	mΩ
		V <sub>GS</sub> = -1.8 V; I <sub>D</sub> = -1 A; T <sub>j</sub> = 25 °C	-	87	135	mΩ
g <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = -10 V; I <sub>D</sub> = -2.8 A; T <sub>j</sub> = 25 °C	-	15	-	S

**Dynamic characteristics**

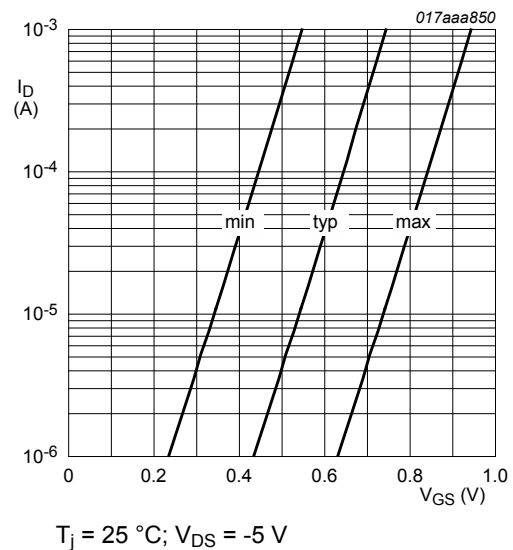
Q <sub>G(tot)</sub>	total gate charge	V <sub>DS</sub> = -6 V; I <sub>D</sub> = -2.8 A; V <sub>GS</sub> = -4.5 V; T <sub>j</sub> = 25 °C	-	7.7	-	nC
Q <sub>GS</sub>	gate-source charge		-	1	-	nC
Q <sub>GD</sub>	gate-drain charge		-	1.65	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = -20 V; f = 1 MHz; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	744	-	pF
C <sub>oss</sub>	output capacitance		-	65	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	53	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = -6 V; V <sub>GS</sub> = -4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C; I <sub>D</sub> = -1 A	-	7	-	ns
t <sub>r</sub>	rise time		-	18	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	135	-	ns
t <sub>f</sub>	fall time		-	68	-	ns

**Source-drain diode**

V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = -0.9 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-0.8	-1.2	V
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**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**

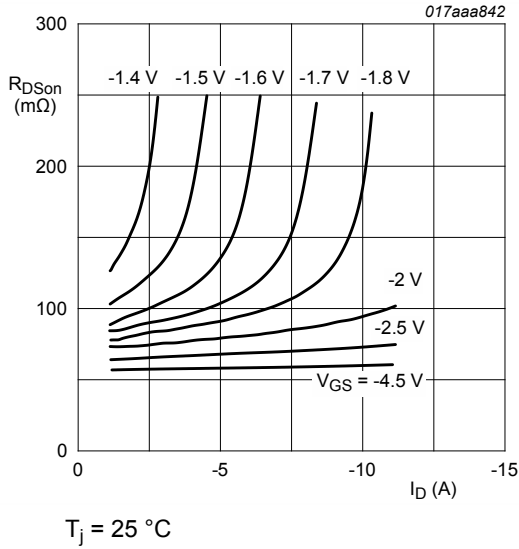


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

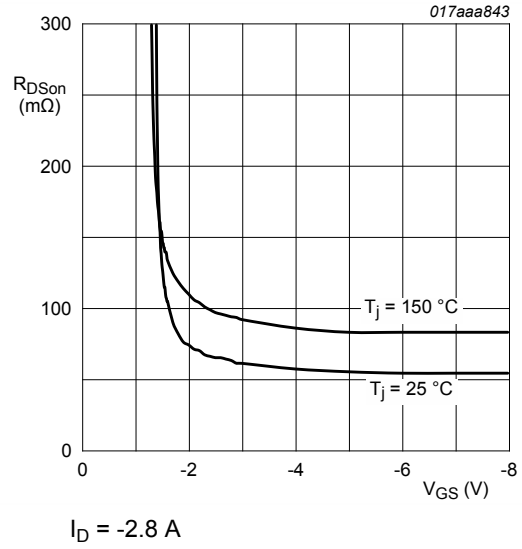


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

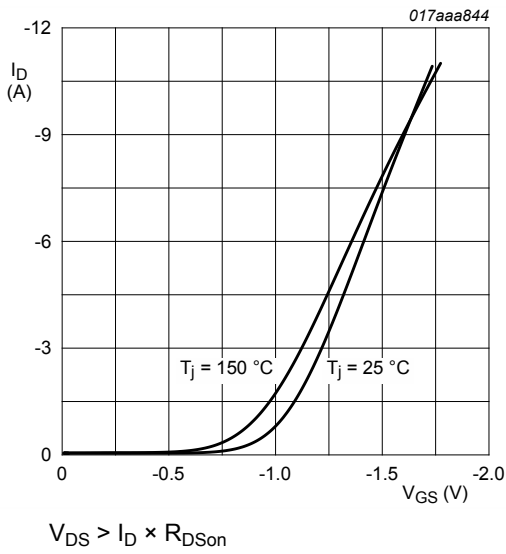


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

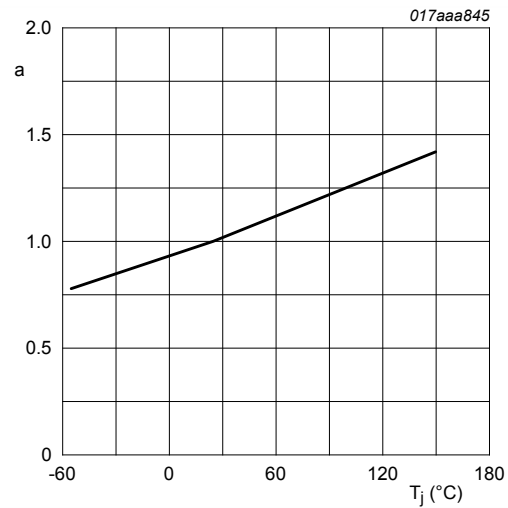


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



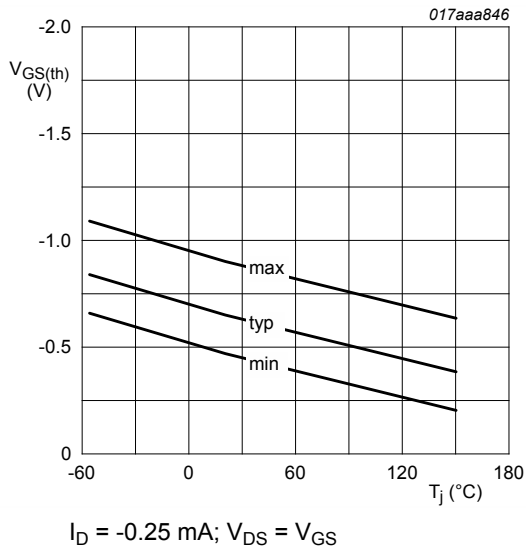


Fig. 12. Gate-source threshold voltage as a function of junction temperature

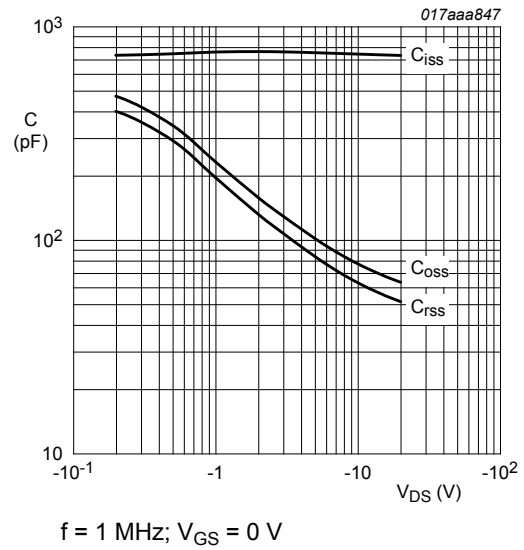


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

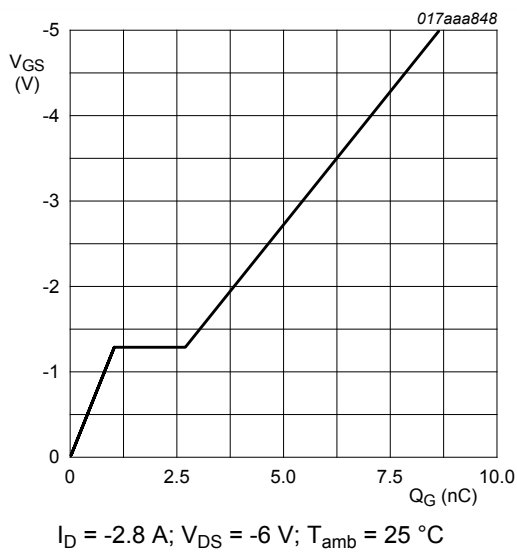


Fig. 14. Gate-source voltage as a function of gate charge; typical values

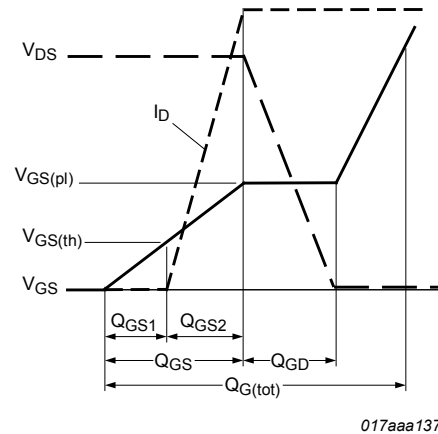
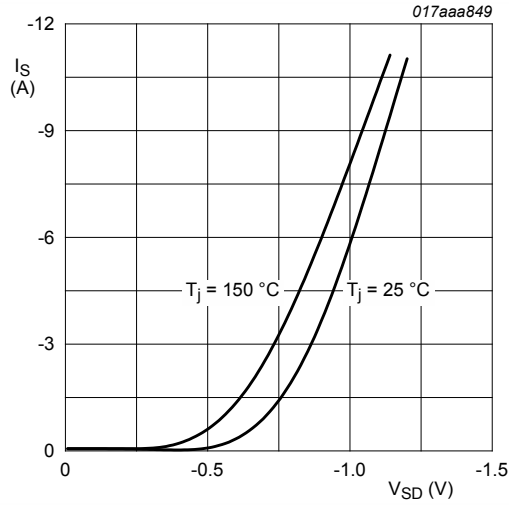


Fig. 15. Gate charge waveform definitions



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

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

### 11. Test information

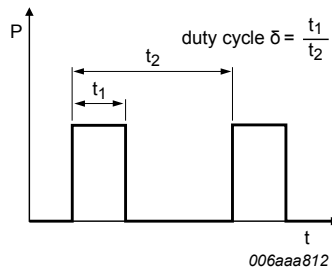


Fig. 17. Duty cycle definition

## 12. Package outline

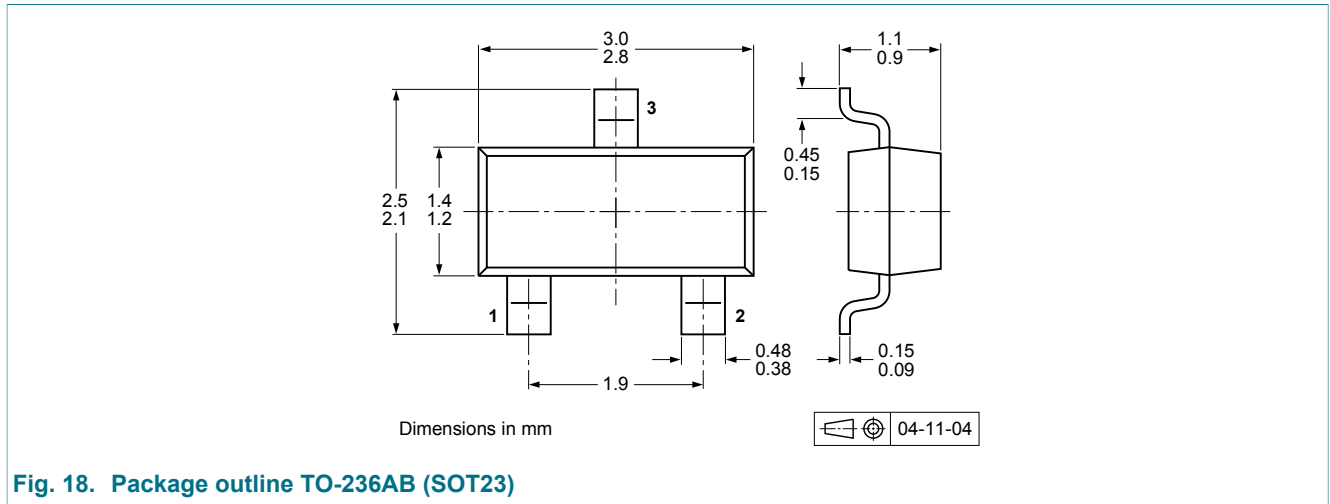


Fig. 18. Package outline TO-236AB (SOT23)

## 13. Soldering

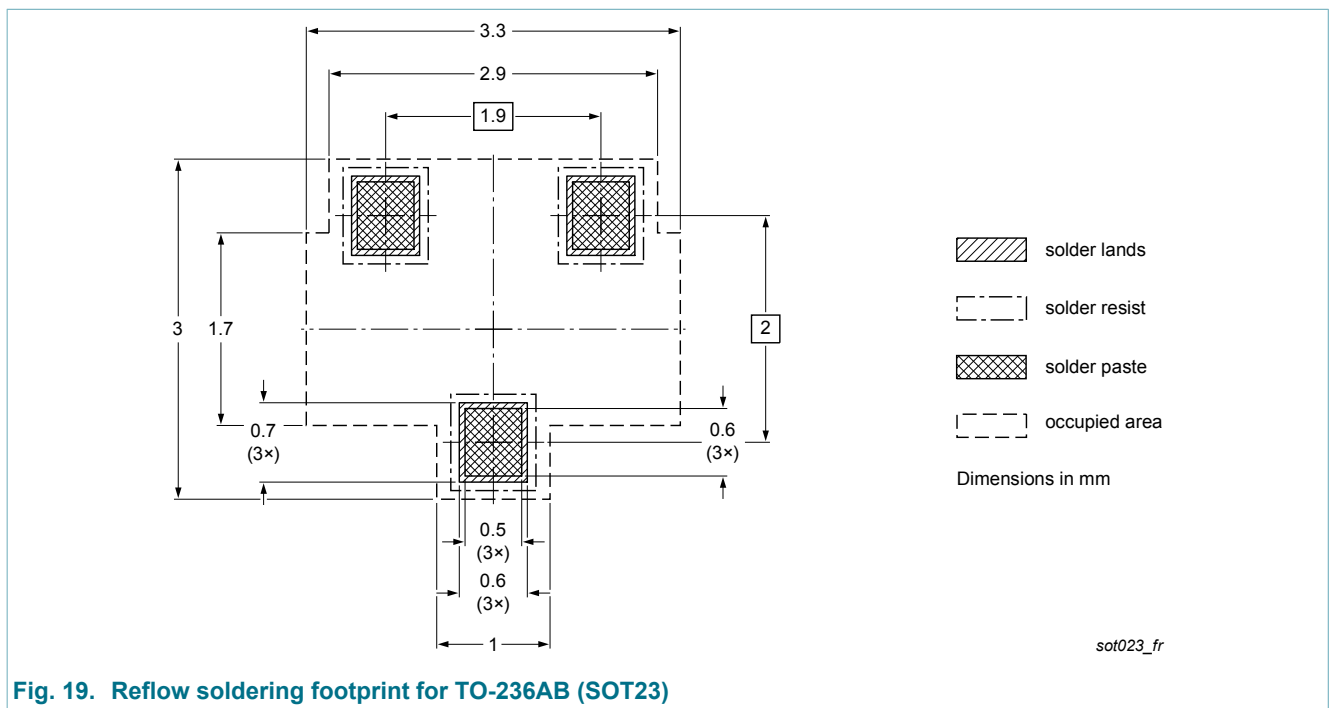


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

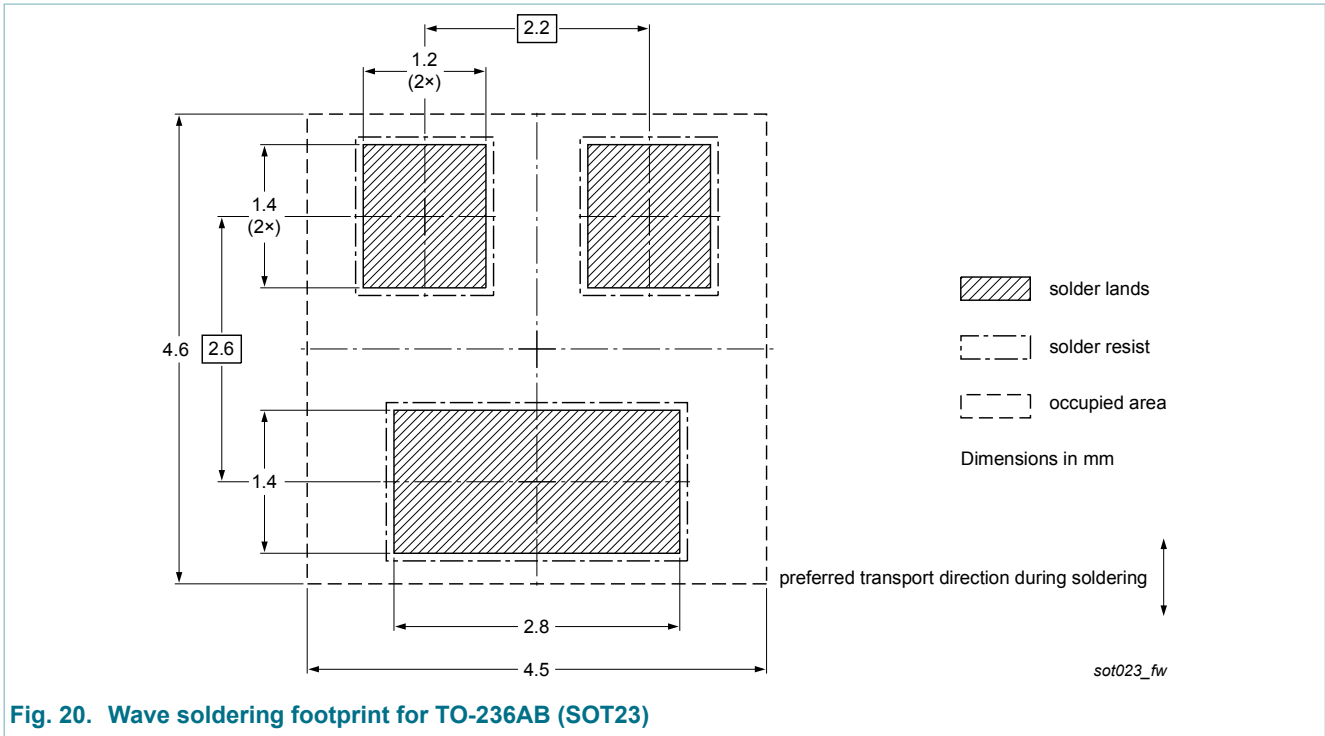


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV65XP v.2	20130212	Product data sheet	-	PMV65XP v.1
Modifications:	<ul style="list-style-type: none"> <li>Pinning information corrected</li> </ul>			
PMV65XP v.1	20120921	Product data sheet	-	-

## 15. Legal information

### 15.1 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.

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