



# PMV16XN

20 V, N-channel Trench MOSFET

11 November 2014

Product data sheet

## 1. General description

N-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

- Trench MOSFET technology
- Low threshold voltage
- Very fast switching
- Enhanced power dissipation capability of 1200 mW

## 3. Applications

- LED driver
- Power management
- Low-side load switch
- Switching circuits

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25^\circ\text{C}$		-	-	20	V
$V_{GS}$	gate-source voltage			-12	-	12	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}$ ; $T_{amb} = 25^\circ\text{C}$ ; $t \leq 5\text{ s}$	[1]	-	-	8.6	A
<b>Static characteristics</b>							
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}$ ; $I_D = 6.8\text{ A}$ ; $T_j = 25^\circ\text{C}$		-	16	20	$\text{m}\Omega$

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

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## 5. Pinning information

Table 2. Pinning information

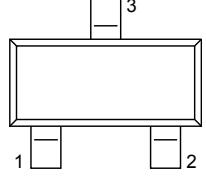
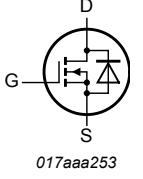
Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain	 <b>TO-236AB (SOT23)</b>	

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV16XN	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 6. Marking

Table 4. Marking codes

Type number	Marking code
PMV16XN	[1] %BZ

[1] % = placeholder for manufacturing site code

## 7. 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	$T_j = 25^\circ\text{C}$		-	20	V
$V_{GS}$	gate-source voltage			-12	12	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25^\circ\text{C}; t \leq 5\text{ s}$	[1]	-	8.6	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	6.8	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100^\circ\text{C}$	[1]	-	4.3	A
$I_{DM}$	peak drain current	$T_{amb} = 25^\circ\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	27	A
$P_{tot}$	total power dissipation	$T_{amb} = 25^\circ\text{C}$	[2]	-	510	mW
			[1]	-	1200	mW
		$T_{sp} = 25^\circ\text{C}$		-	6940	mW
$T_j$	junction temperature			-55	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25^\circ\text{C}$	[1]	-	1.2	A

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

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

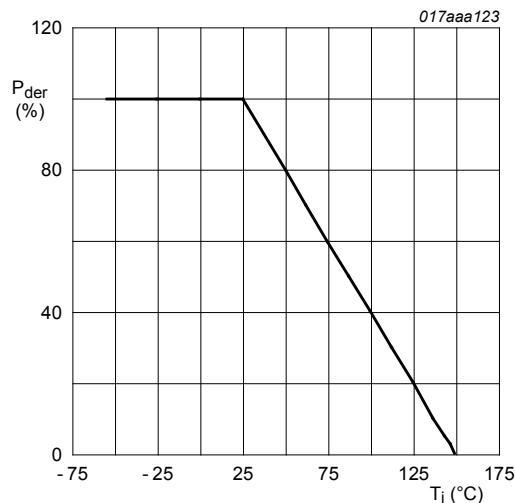


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

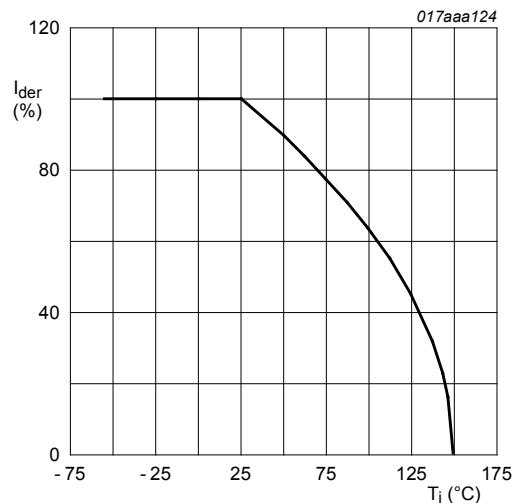
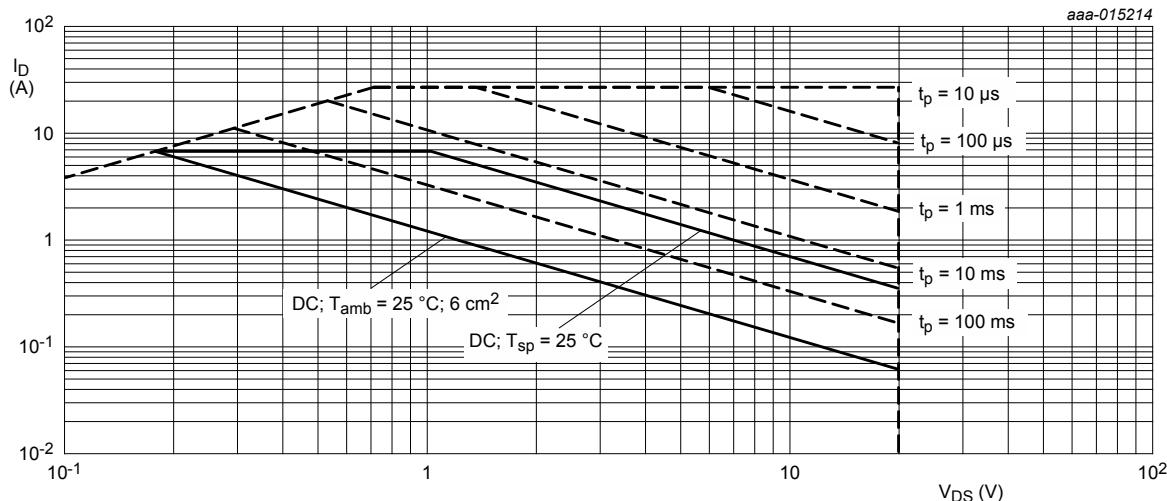


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



I<sub>DM</sub> = single pulse

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

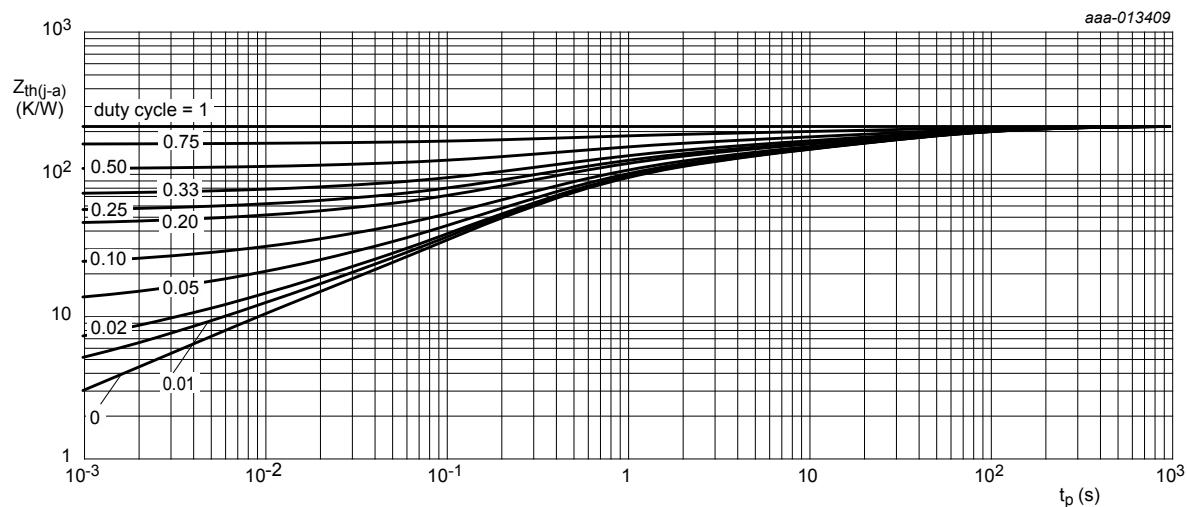
## 8. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	208	245	K/W
			[2]	-	88	104	K/W
	t ≤ 5 s		[2]	-	55	65	K/W

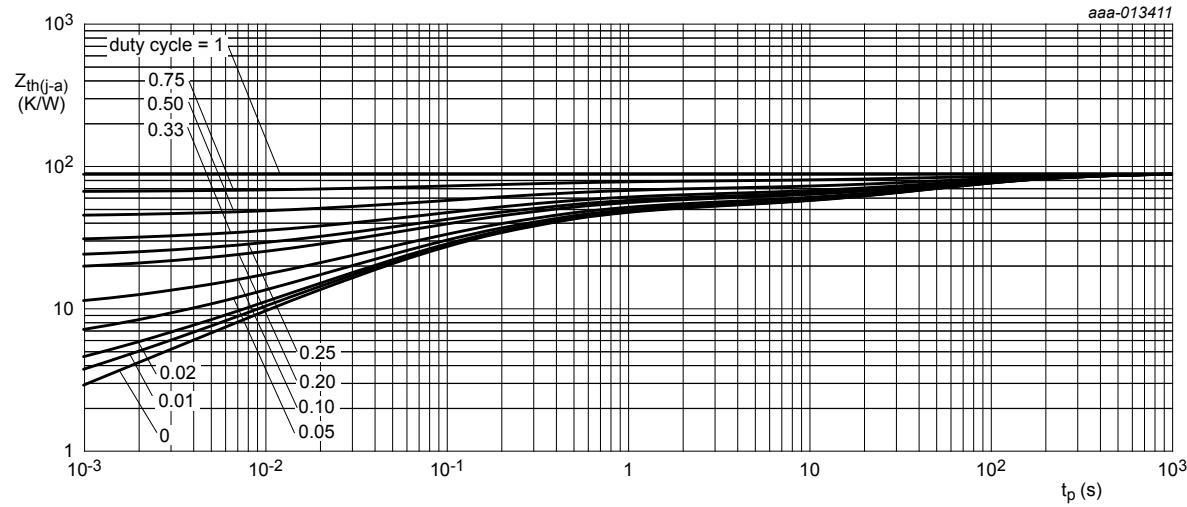
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	13	18	K/W

[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 and 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**



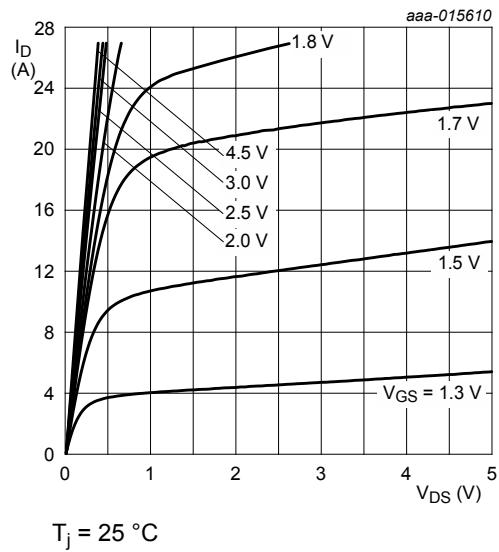
FR4 PCB, mounting pad for drain  $6 \text{ cm}^2$

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

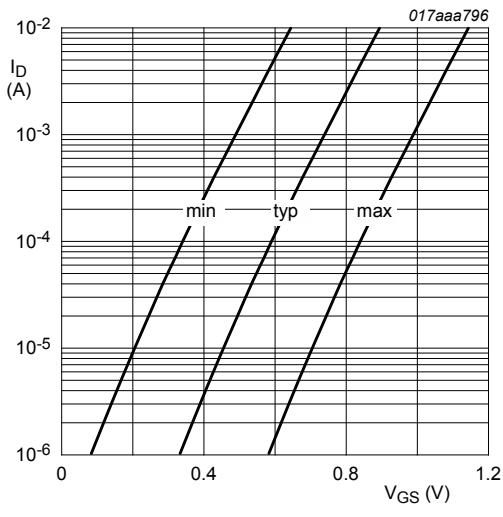
## 9. Characteristics

**Table 7. Characteristics**

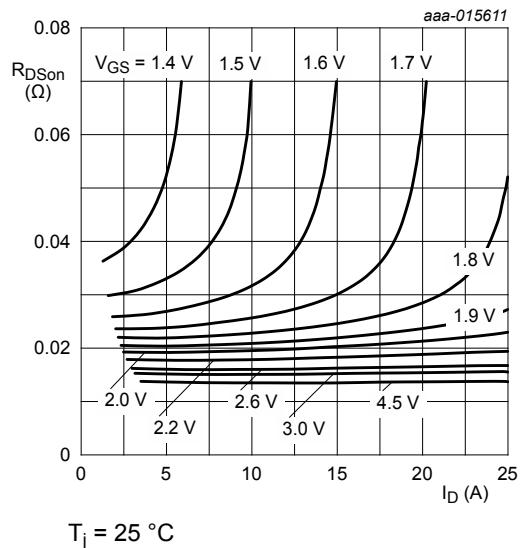
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25^\circ C$		0.4	0.65	0.9	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	-	1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 12 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	100	nA
		$V_{GS} = -12 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	-100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 V$ ; $I_D = 6.8 A$ ; $T_j = 25^\circ C$		-	16	20	$m\Omega$
		$V_{GS} = 4.5 V$ ; $I_D = 6.8 A$ ; $T_j = 150^\circ C$		-	23	29	$m\Omega$
		$V_{GS} = 2.5 V$ ; $I_D = 6.0 A$ ; $T_j = 25^\circ C$		-	18	24	$m\Omega$
		$V_{GS} = 1.8 V$ ; $I_D = 2.1 A$ ; $T_j = 25^\circ C$		-	22	33	$m\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 V$ ; $I_D = 2 A$ ; $T_j = 25^\circ C$		-	12	-	S
$R_G$	gate resistance	$f = 1 MHz$		-	2	-	$\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$ ; $I_D = 7.3 A$ ; $V_{GS} = 4.5 V$ ; $T_j = 25^\circ C$		-	13.4	20.2	nC
$Q_{GS}$	gate-source charge			-	1.5	-	nC
$Q_{GD}$	gate-drain charge			-	2.6	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 10 V$ ; $f = 1 MHz$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	1240	-	pF
$C_{oss}$	output capacitance			-	145	-	pF
$C_{rss}$	reverse transfer capacitance			-	125	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V$ ; $I_D = 7.3 A$ ; $V_{GS} = 4.5 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25^\circ C$		-	9	-	ns
$t_r$	rise time			-	24	-	ns
$t_{d(off)}$	turn-off delay time			-	31	-	ns
$t_f$	fall time			-	36	-	ns
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$I_S = 1.2 A$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	0.65	1.2	V



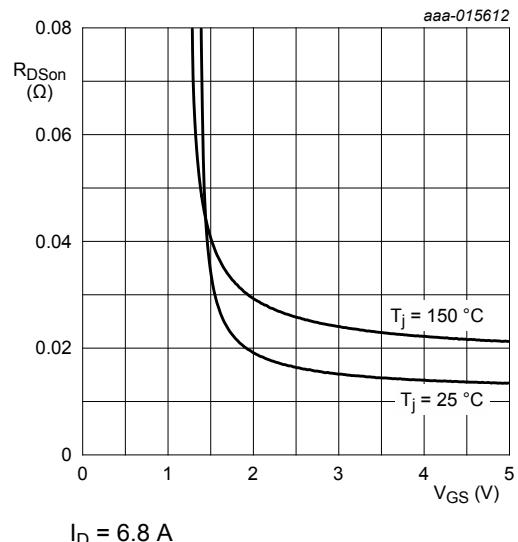
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



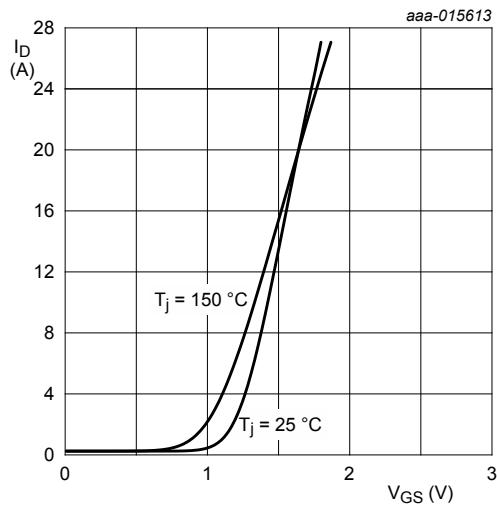
**Fig. 7. Sub-threshold drain current as a function of gate-source voltage**



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

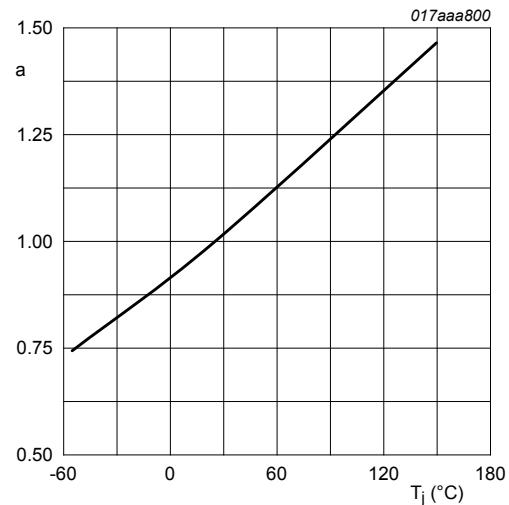


**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**



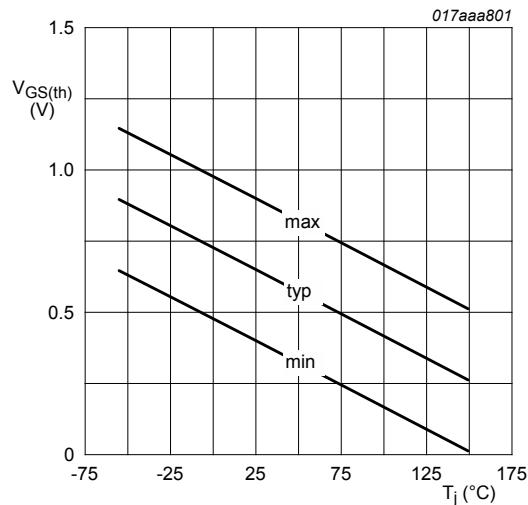
$$V_{DS} > I_D \times R_{DSon}$$

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

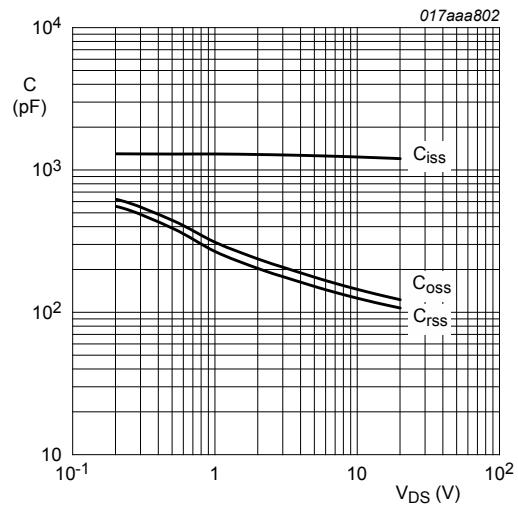


**Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

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



**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**

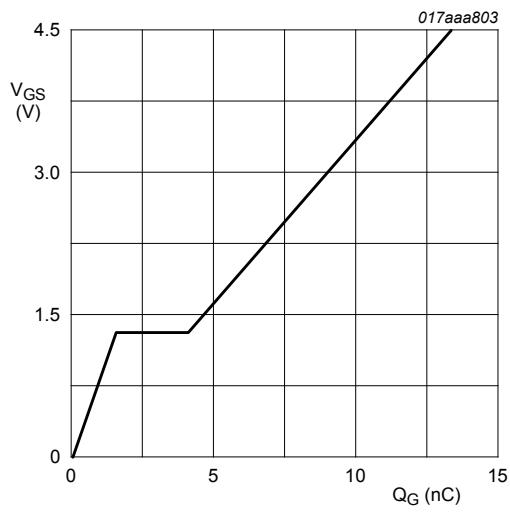


Fig. 14. Gate-source voltage as a function of gate charge; typical values

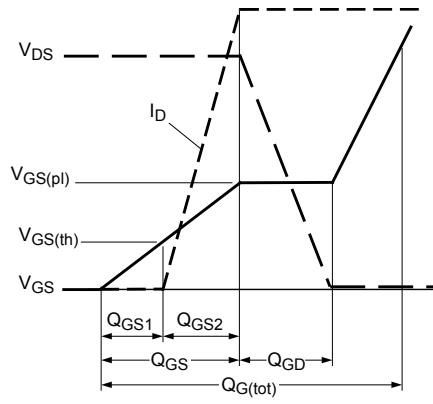


Fig. 15. MOSFET transistor: Gate charge waveform definitions

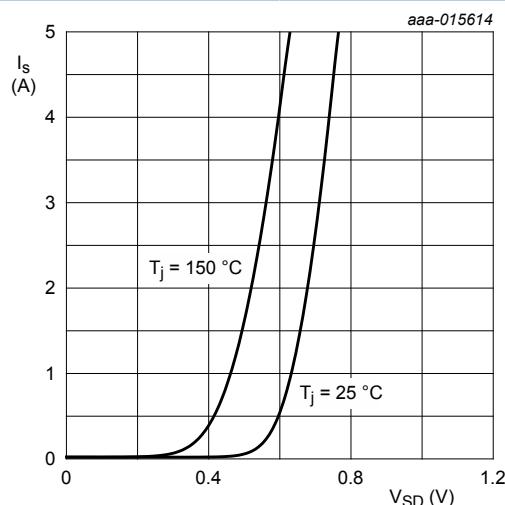


Fig. 16. Source current as a function of source-drain voltage; typical values

## 10. Test information

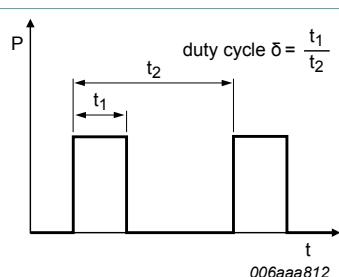
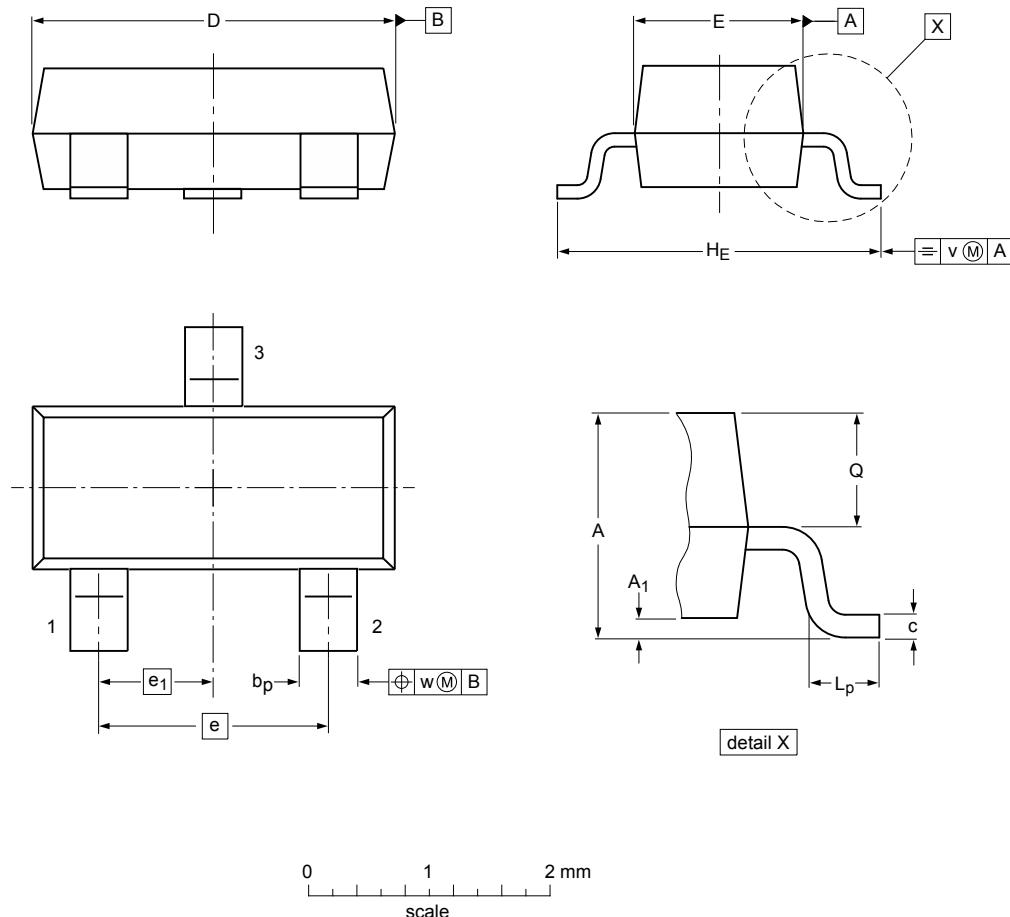


Fig. 17. Duty cycle definition

## 11. Package outline

Plastic surface-mounted package; 3 leads

SOT23



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w
mm	max	1.1	0.1	0.48	0.15	3.0	1.4		2.5	0.45	0.55		
mm	nom							1.9	0.95			0.2	0.1
mm	min	0.9		0.38	0.09	2.8	1.2		2.1	0.15	0.45		

sot23\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT23		TO-236AB				14-06-19 14-09-22

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

## 12. Soldering

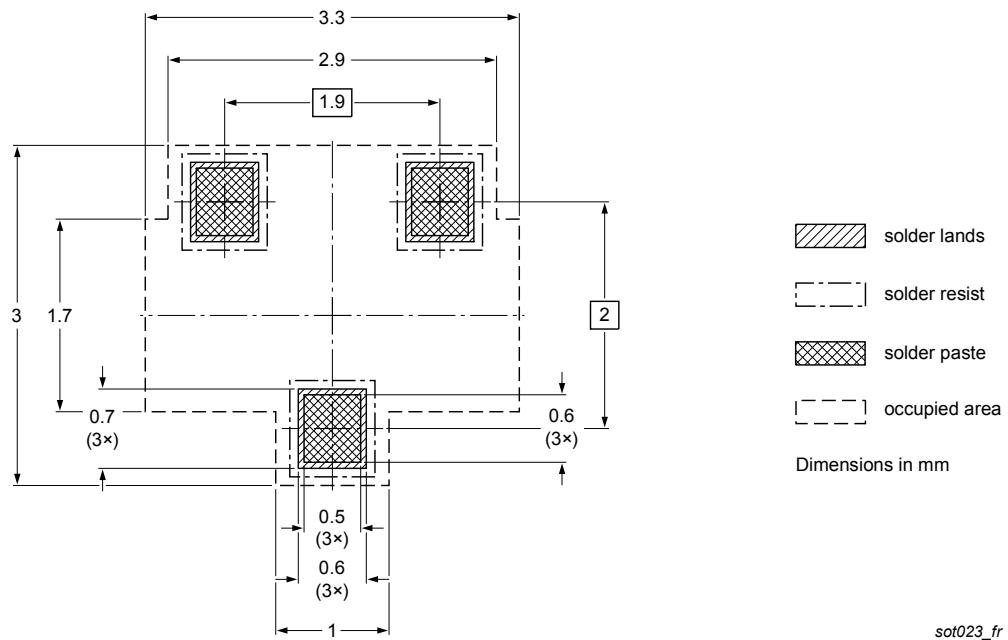


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

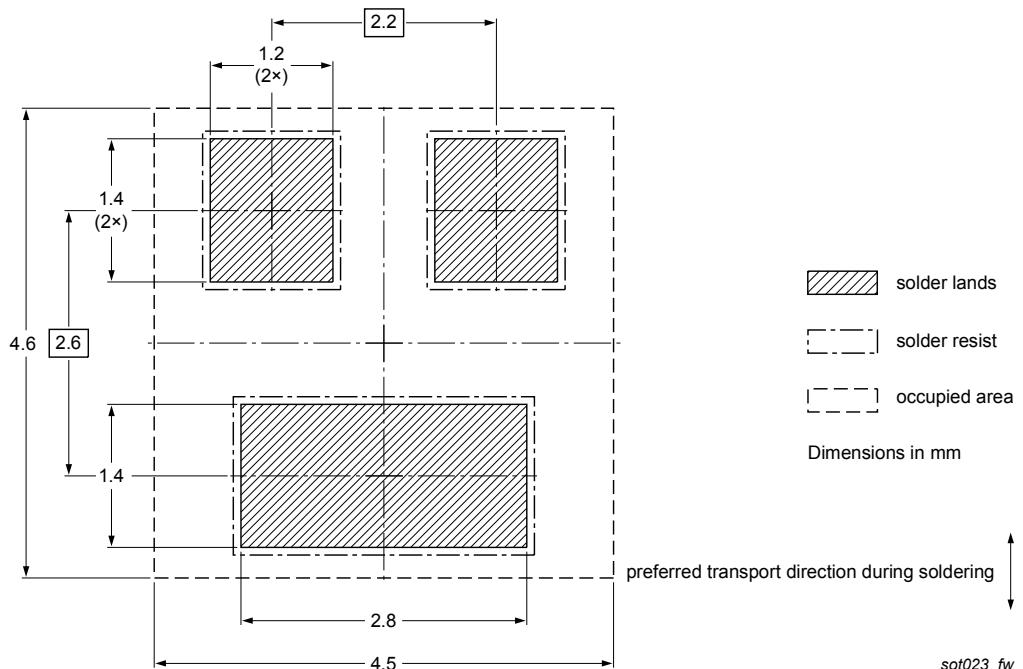


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

## 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV16XN v.1	20141111	Product data sheet	-	-

## 14. Legal information

### 14.1 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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Date of release: 11 November 2014

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