



PMV20XNE

30 V, N-channel Trench MOSFET

10 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
- Enhanced power dissipation capability of 1200 mW
- ElectroStatic Discharge (ESD) protection: 2 kV HBM

3. Applications

- Relay driver
- High-speed line driver
- Low-side load switch
- Switching circuits

4. Quick reference data

Table 1. Quick reference data

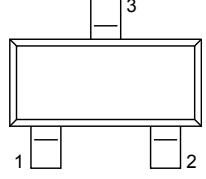
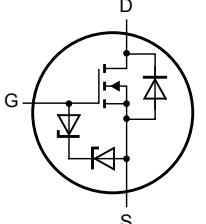
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25^\circ\text{C}$		-	-	30	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25^\circ\text{C}; t \leq 5\text{ s}$	[1]	-	-	7.2	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 5.7\text{ A}; T_j = 25^\circ\text{C}$		-	19	23	$\text{m}\Omega$

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

nexperia

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain	 TO-236AB (SOT23)	 017aaa255

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV20XNE	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code
PMV20XNE	[1] %G9

[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	$T_j = 25^\circ\text{C}$		-	30	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]	-	7.2	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	5.7	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100^\circ\text{C}$	[1]	-	3.6	A
I_{DM}	peak drain current	$T_{amb} = 25^\circ\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	24	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
Source-drain diode						
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, mounting pad for drain 6 cm^2 .

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

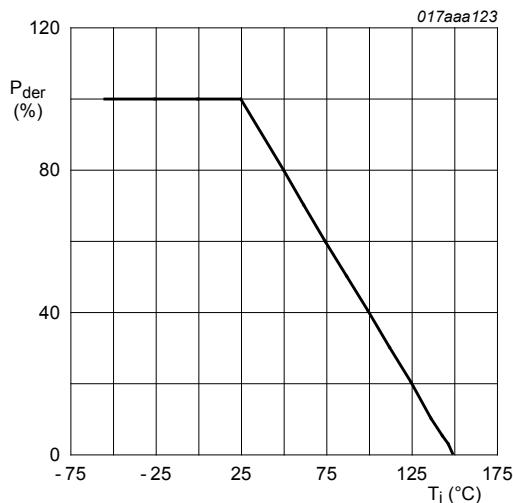


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

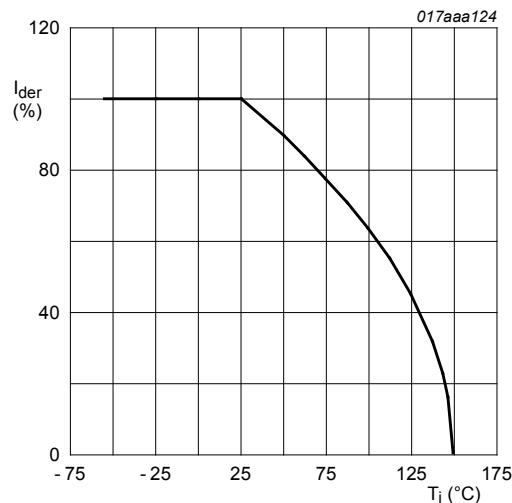
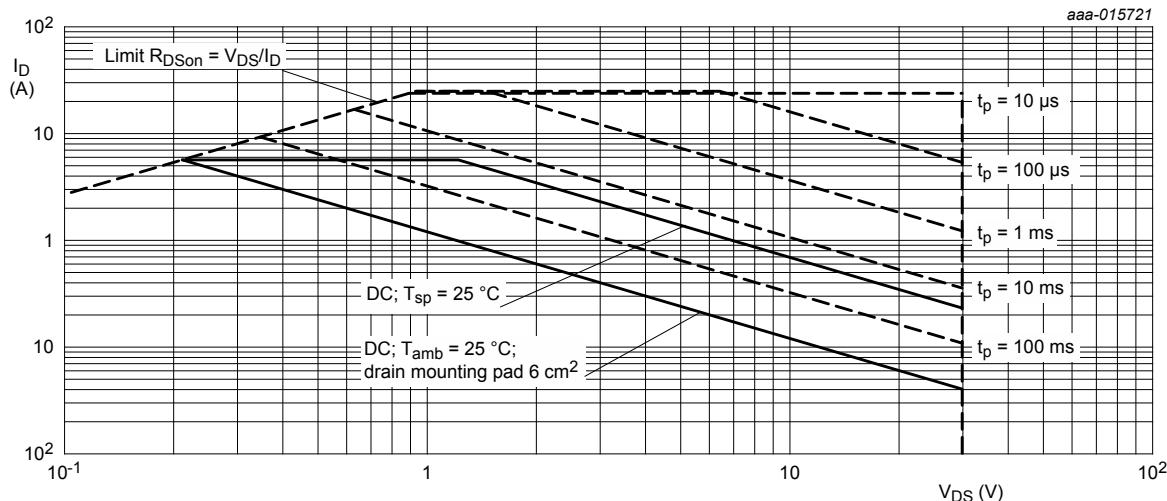


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



I_{DM} = single pulse

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

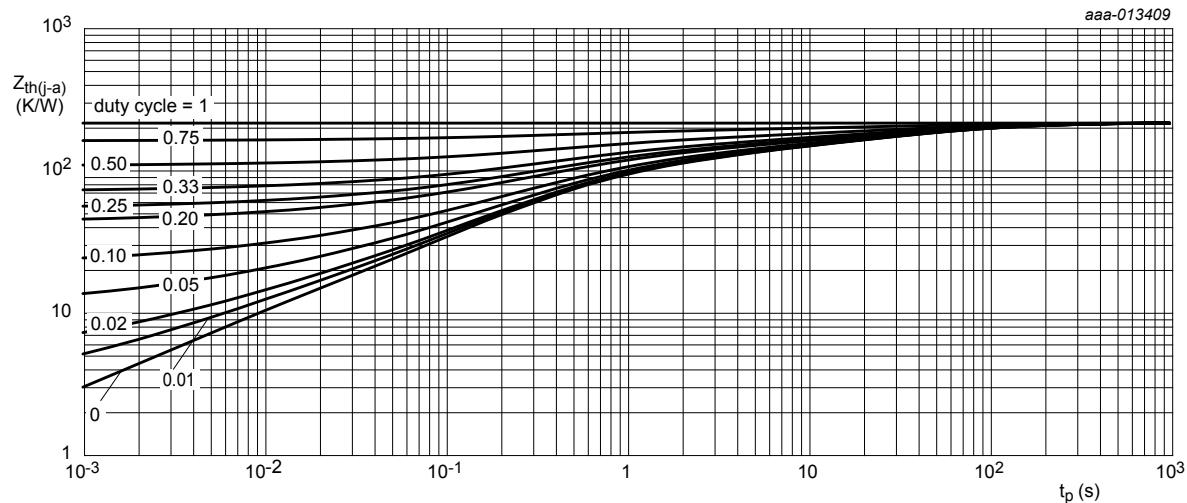
9. Thermal characteristics

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]	-	208	245	K/W
			[2]	-	88	104	K/W
		in free air; $t \leq 5$ s	[2]	-	55	65	K/W

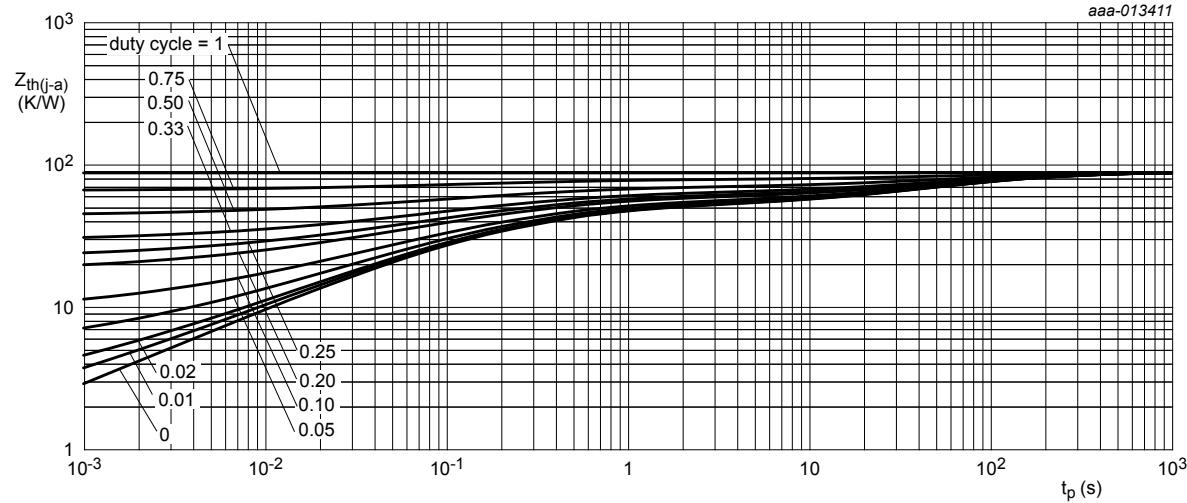
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	13	18	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (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^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^2

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
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		30	-	-	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	$V_{DS} = 30 V$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	10	μA
		$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	-10	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V$; $I_D = 5.7 A$; $T_j = 25^\circ C$		-	19	23	$m\Omega$
		$V_{GS} = 4.5 V$; $I_D = 5.7 A$; $T_j = 150^\circ C$		-	31	37	$m\Omega$
		$V_{GS} = 2.5 V$; $I_D = 5 A$; $T_j = 25^\circ C$		-	22	30	$m\Omega$
		$V_{GS} = 1.8 V$; $I_D = 1.9 A$; $T_j = 25^\circ C$		-	27	38	$m\Omega$
g_{fs}	forward transconductance	$V_{DS} = 10 V$; $I_D = 2 A$; $T_j = 25^\circ C$		-	11	-	S
R_G	gate resistance	$f = 1 MHz$; $T_j = 25^\circ C$		-	1.8	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$; $I_D = 5 A$; $V_{GS} = 4.5 V$; $T_j = 25^\circ C$		-	12.4	18.6	nC
Q_{GS}	gate-source charge			-	1.2	-	nC
Q_{GD}	gate-drain charge			-	2.1	-	nC
C_{iss}	input capacitance	$V_{DS} = 15 V$; $f = 1 MHz$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	1150	-	pF
C_{oss}	output capacitance			-	110	-	pF
C_{rss}	reverse transfer capacitance			-	85	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 V$; $I_D = 5 A$; $V_{GS} = 4.5 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25^\circ C$		-	8	-	ns
t_r	rise time			-	17	-	ns
$t_{d(off)}$	turn-off delay time			-	33	-	ns
t_f	fall time			-	32	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	$I_S = 1.2 A$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	0.7	1.2	V

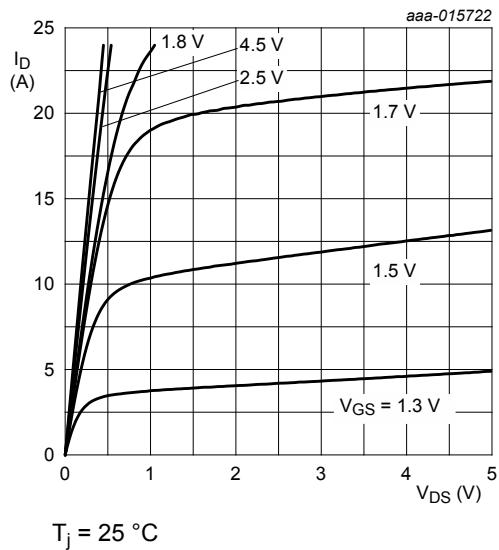


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

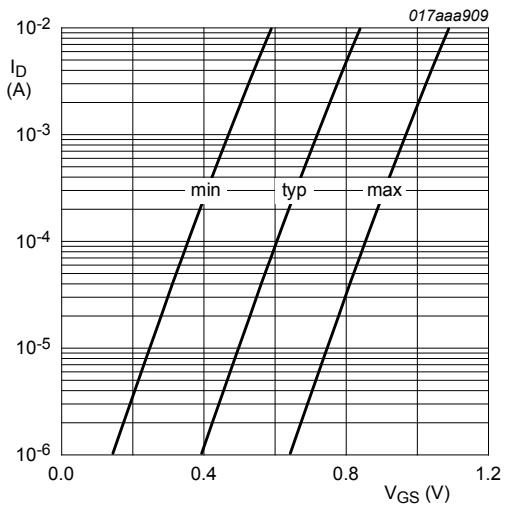


Fig. 7. Subthreshold drain current as a function of gate-source voltage

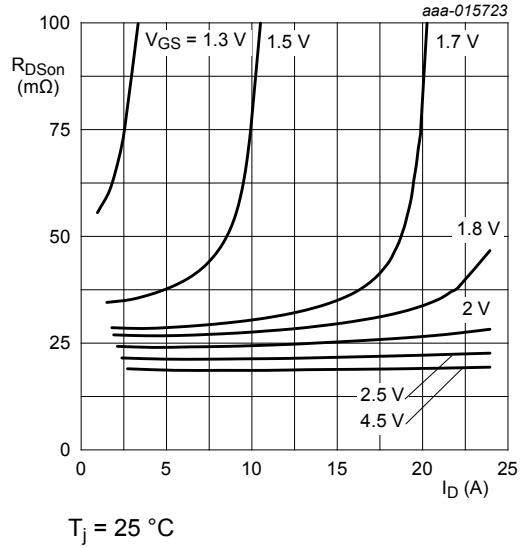


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

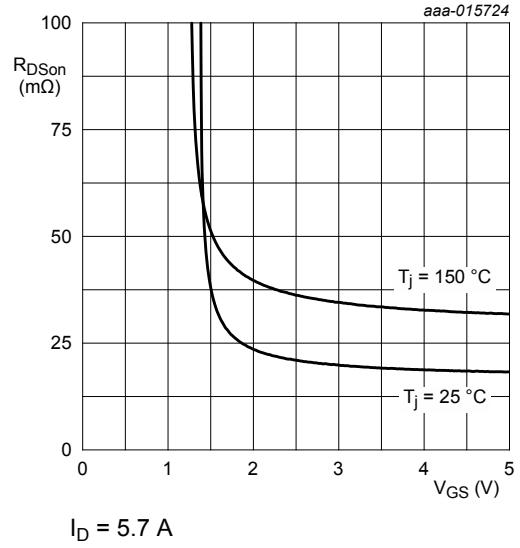
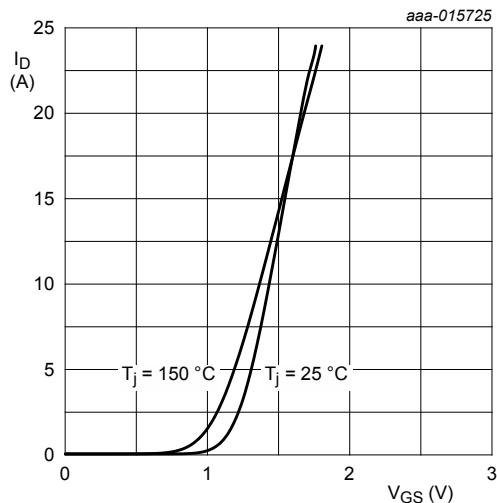


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

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

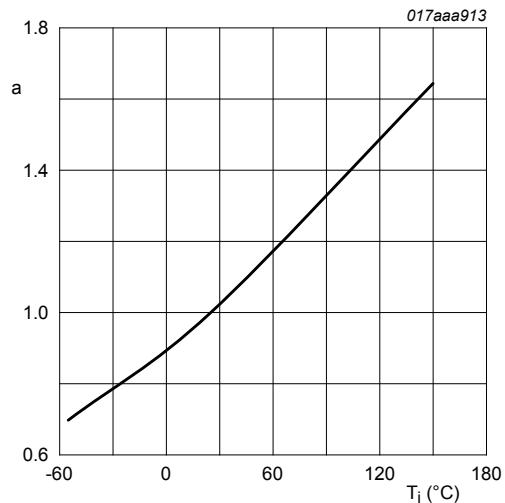
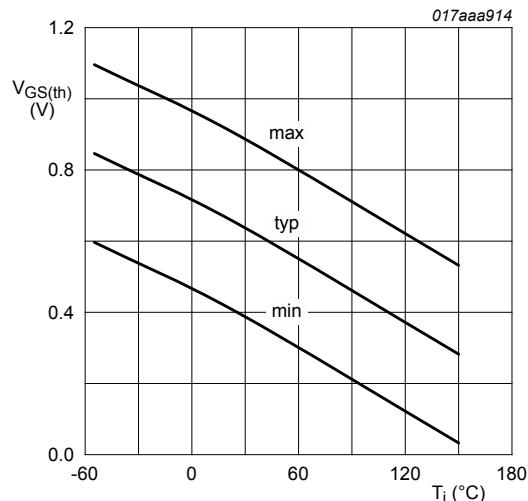


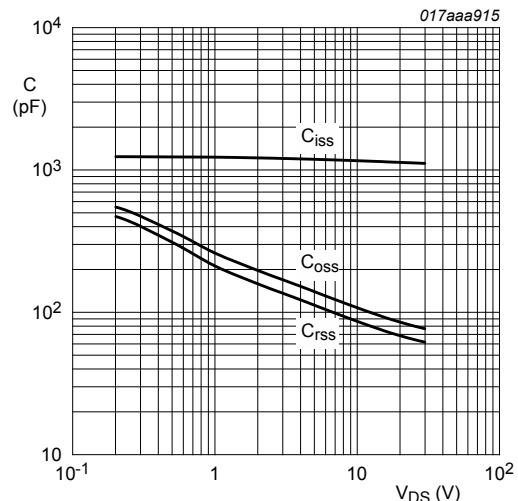
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



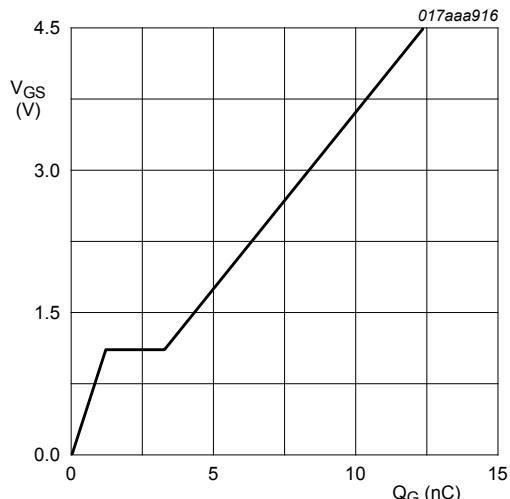
$$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



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

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



$I_D = 5$ A; $V_{DS} = 15$ V; $T_{amb} = 25$ °C

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

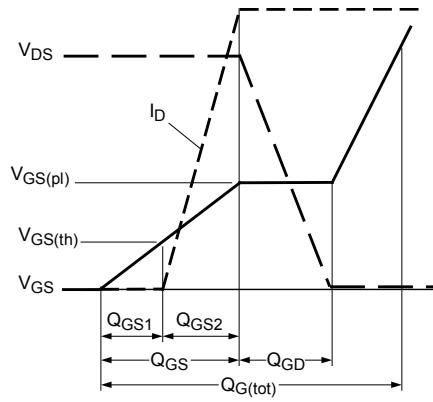
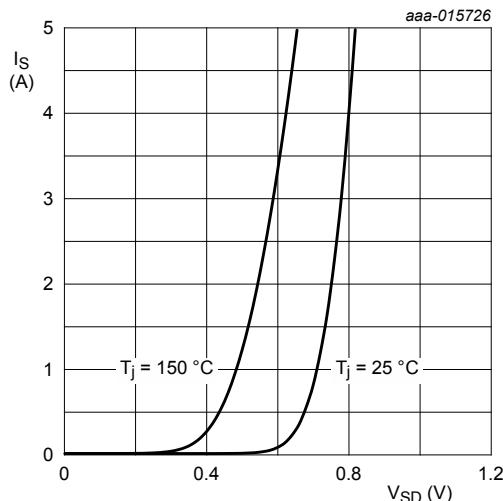


Fig. 15. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0$ V

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

11. Test information

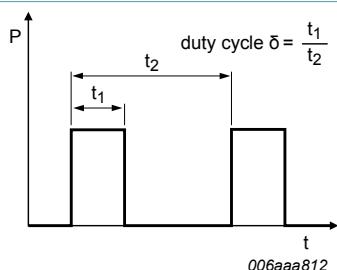
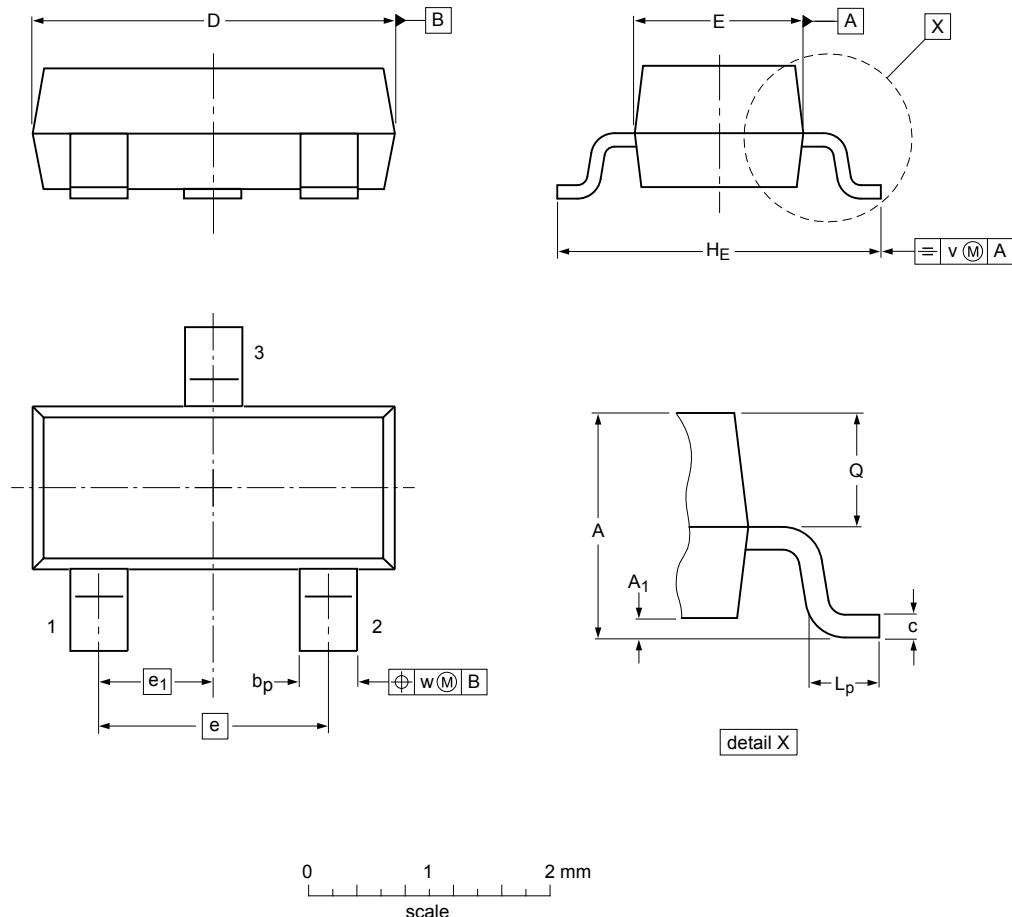


Fig. 17. Duty cycle definition

12. Package outline

Plastic surface-mounted package; 3 leads

SOT23



Dimensions (mm are the original dimensions)

Unit	A	A ₁	b _p	c	D	E	e	e ₁	H _E	L _p	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)

13. Soldering

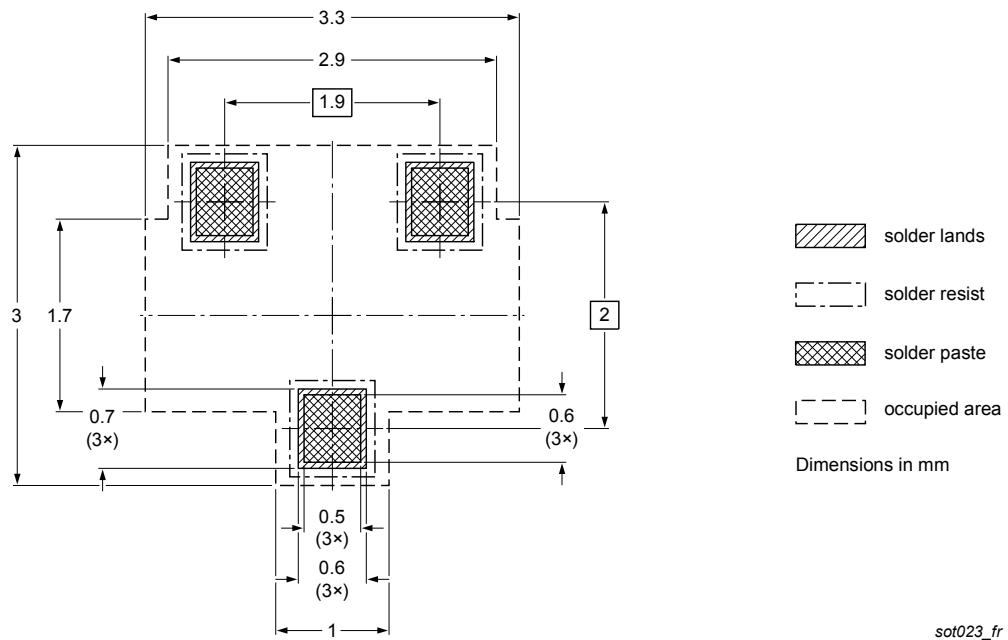


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

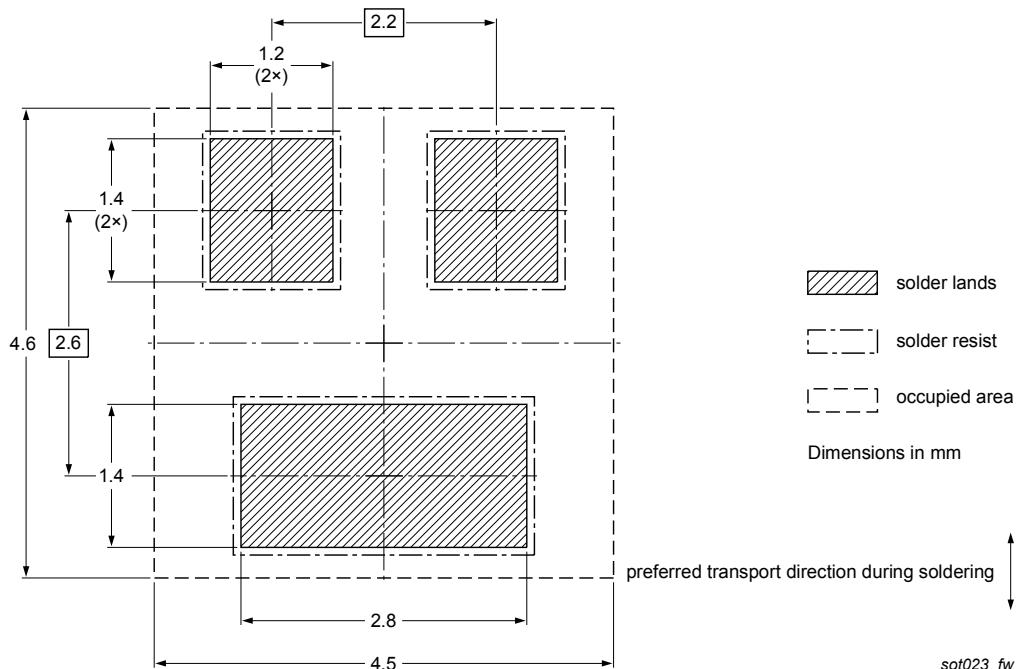


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV20XNE v.1	20141110	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.

- [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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