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# PMV90ENE

30 V, N-channel Trench MOSFET

20 April 2016

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

- Logic level compatible
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection > 2 kV HBM

## 3. Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

## 4. Quick reference data

Table 1. Quick reference data

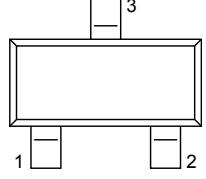
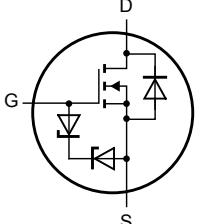
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25^\circ\text{C}$		-	-	30	V
$V_{GS}$	gate-source voltage			-20	-	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25^\circ\text{C}; t \leq 5\text{ s}$	[1]	-	-	3.7	A
<b>Static characteristics</b>							
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 3\text{ A}; T_j = 25^\circ\text{C}$		-	54	72	$\text{m}\Omega$

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

**nexperia**

## 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>	 017aaa255

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV90ENE	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMV90ENE	[1] %GH

[1] % = placeholder for manufacturing site code

## 8. Limiting values

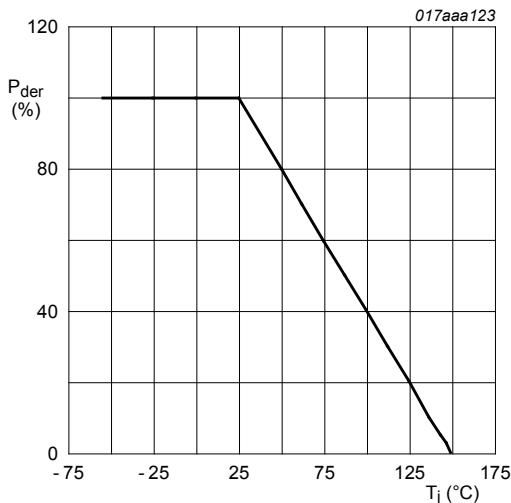
Table 5. Limiting values

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		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25^\circ\text{C}; t \leq 5\text{ s}$	[1]	-	A
		$V_{GS} = 10\text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	A
		$V_{GS} = 10\text{ V}; T_{amb} = 100^\circ\text{C}$	[1]	-	1.9 A
$I_{DM}$	peak drain current	$T_{amb} = 25^\circ\text{C}$ ; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	12	A
$P_{tot}$	total power dissipation	$T_{amb} = 25^\circ\text{C}$	[2]	-	mW

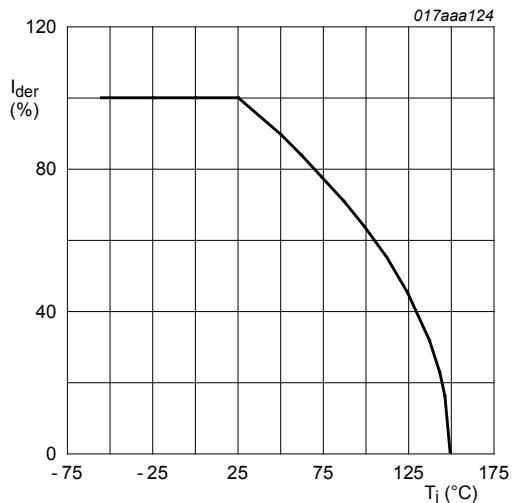
Symbol	Parameter	Conditions		Min	Max	Unit
		$T_{sp} = 25^\circ\text{C}$	[1]	-	1.1	W
				-	4.5	W
$T_j$	junction temperature			-55	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25^\circ\text{C}$	[1]	-	1	A

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



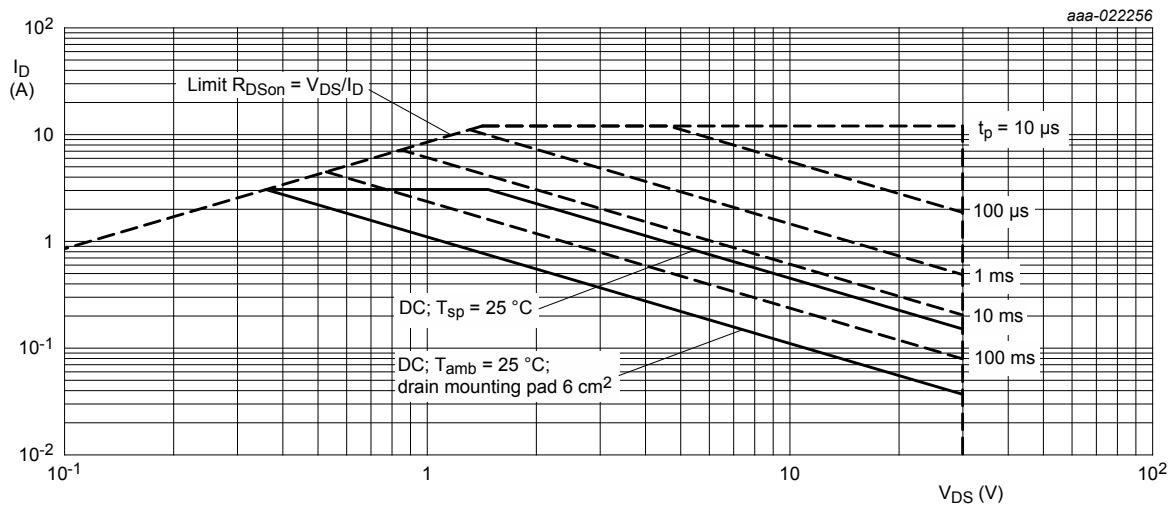
**Fig. 1. Normalized total power dissipation as a function of junction temperature**

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



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

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



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

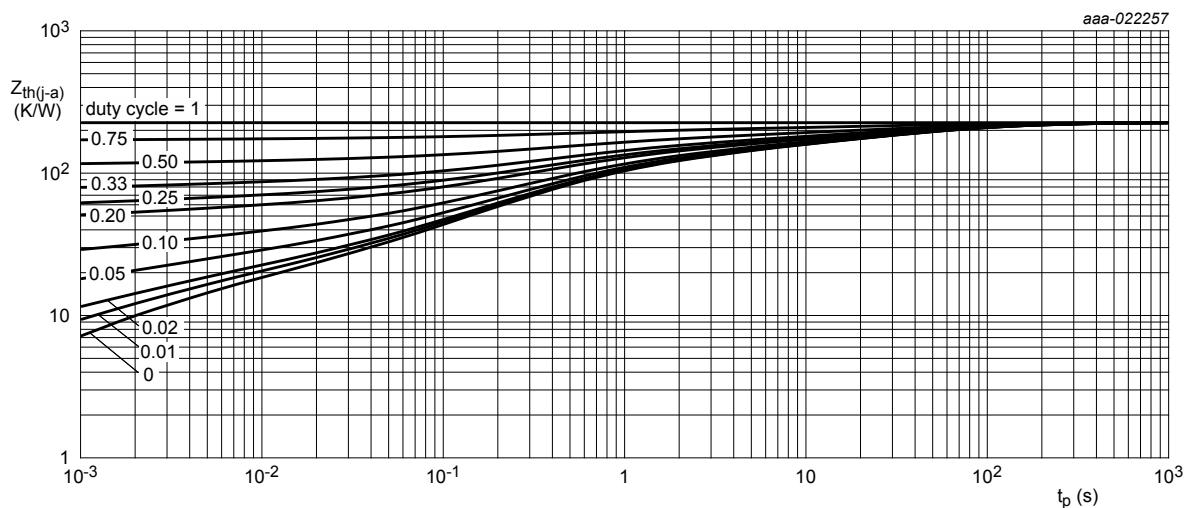
## 9. Thermal characteristics

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]	-	227	270	K/W
			[2]	-	99	115	K/W
		$t \leq 5 \text{ s}$	[2]	-	66	78	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	20	28	K/W

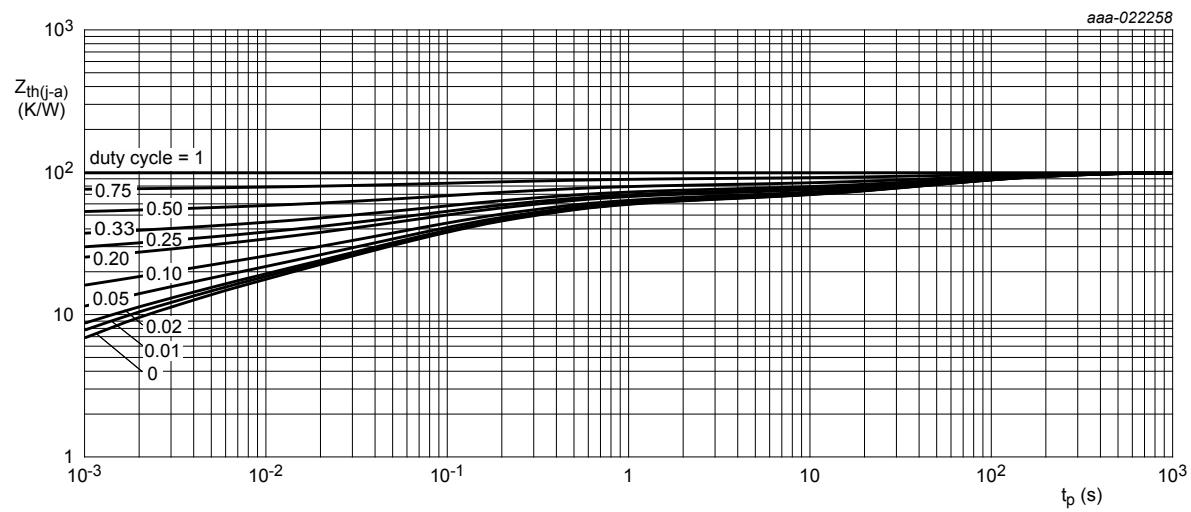
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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



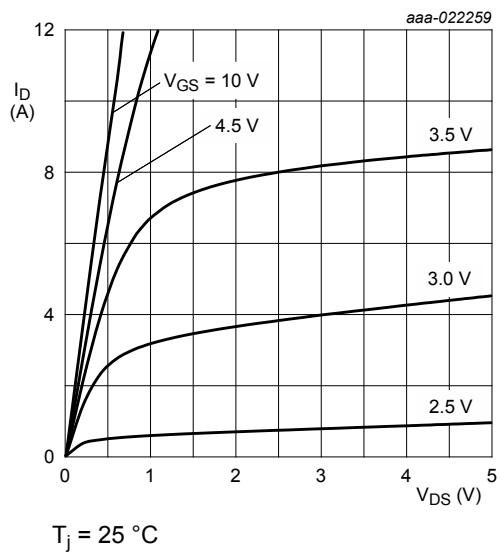
FR4 PCB, mounting pad for drain  $6 \text{ cm}^2$

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

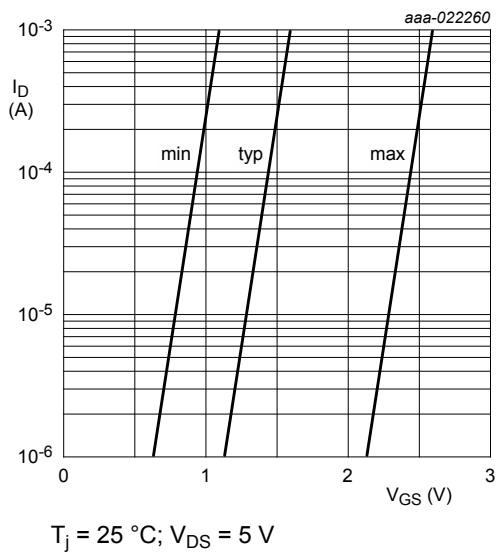
## 10. Characteristics

Table 7. Characteristics

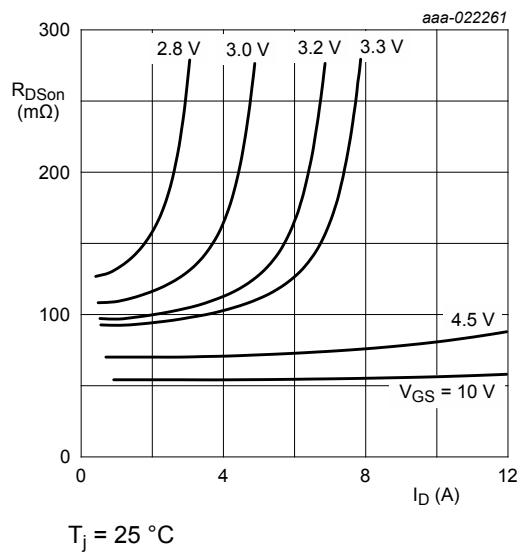
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		30	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A$ ; $V_{DS}=V_{GS}$ ; $T_j = 25^\circ C$		1	1.5	2.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 V$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	-	1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	10	$\mu A$
		$V_{GS} = -20 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	-10	$\mu A$
		$V_{GS} = 10 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	2	$\mu A$
		$V_{GS} = -10 V$ ; $V_{DS} = 0 V$ ; $T_j = 25^\circ C$		-	-	-2	$\mu A$
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 V$ ; $I_D = 3 A$ ; $T_j = 25^\circ C$		-	54	72	$m\Omega$
		$V_{GS} = 10 V$ ; $I_D = 3 A$ ; $T_j = 150^\circ C$		-	88	118	$m\Omega$
		$V_{GS} = 4.5 V$ ; $I_D = 2.6 A$ ; $T_j = 25^\circ C$		-	70	100	$m\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 V$ ; $I_D = 3 A$ ; $T_j = 25^\circ C$		-	9	-	S
$R_G$	gate resistance	$f = 1 MHz$		-	11.5	-	$\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15 V$ ; $I_D = 3 A$ ; $V_{GS} = 10 V$ ; $T_j = 25^\circ C$		-	3.6	5.5	nC
$Q_{GS}$	gate-source charge			-	0.4	-	nC
$Q_{GD}$	gate-drain charge			-	0.7	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 15 V$ ; $f = 1 MHz$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	160	-	pF
$C_{oss}$	output capacitance			-	33	-	pF
$C_{rss}$	reverse transfer capacitance			-	26	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 V$ ; $I_D = 3 A$ ; $V_{GS} = 10 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25^\circ C$		-	6	-	ns
$t_r$	rise time			-	6	-	ns
$t_{d(off)}$	turn-off delay time			-	11	-	ns
$t_f$	fall time			-	4	-	ns
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$I_S = 1 A$ ; $V_{GS} = 0 V$ ; $T_j = 25^\circ C$		-	0.8	1.2	V



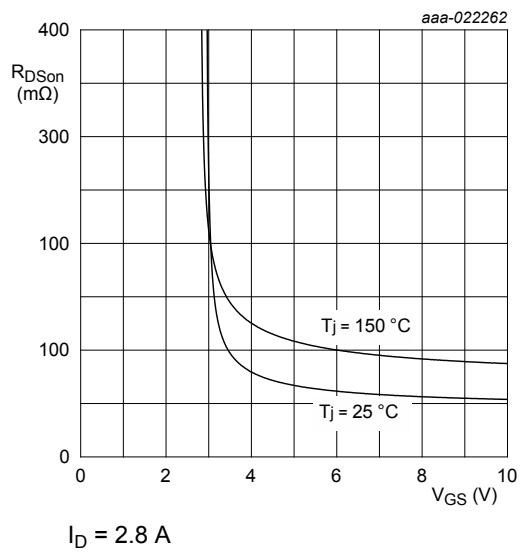
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



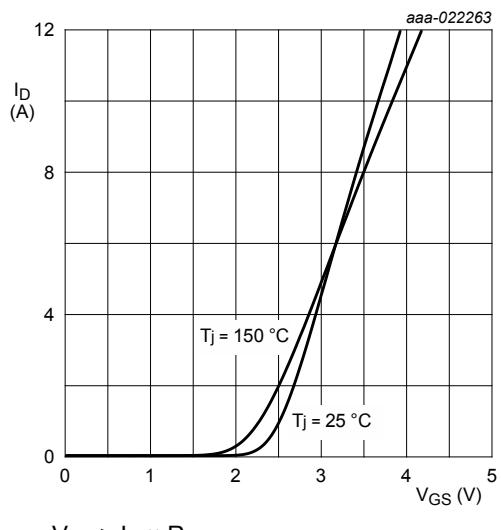
**Fig. 7. Sub-threshold drain current as a function of gate-source voltage**



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

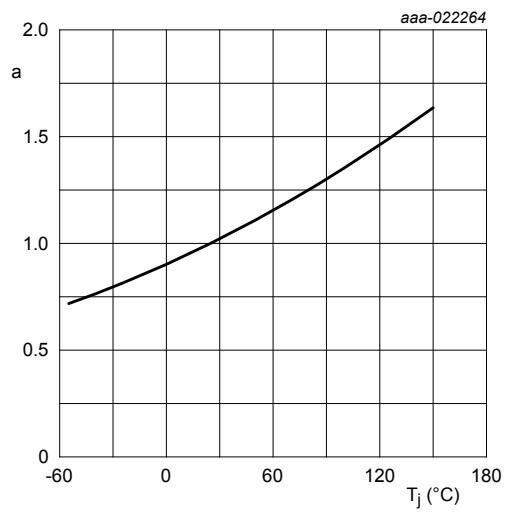


**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**



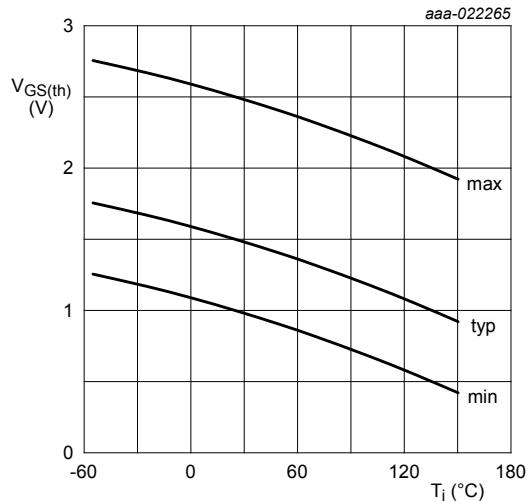
$$V_{DS} > I_D \times R_{DSon}$$

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



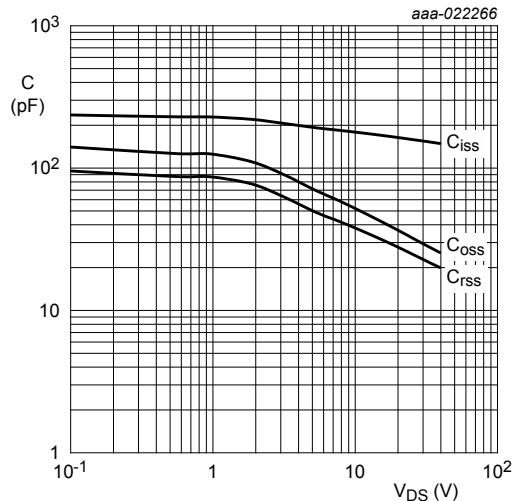
**Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

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



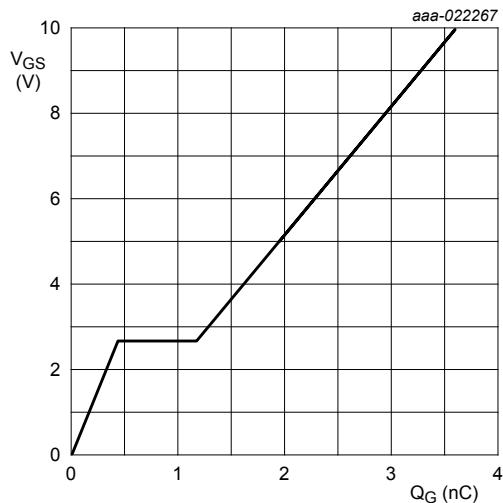
$$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$$

**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**



$I_D = 3$  A;  $V_{DS} = 15$  V;  $T_{amb} = 25$  °C

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

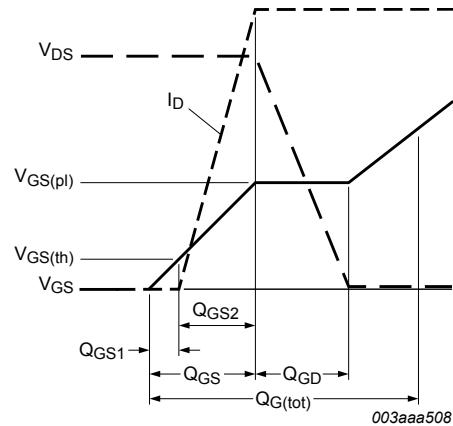
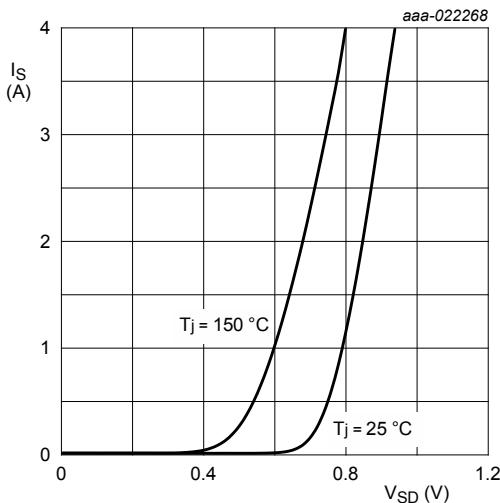


Fig. 15. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0$  V

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

## 11. Test information

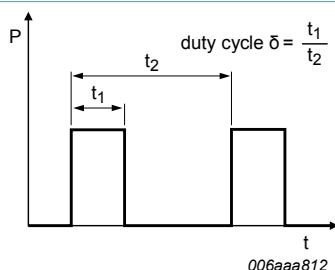
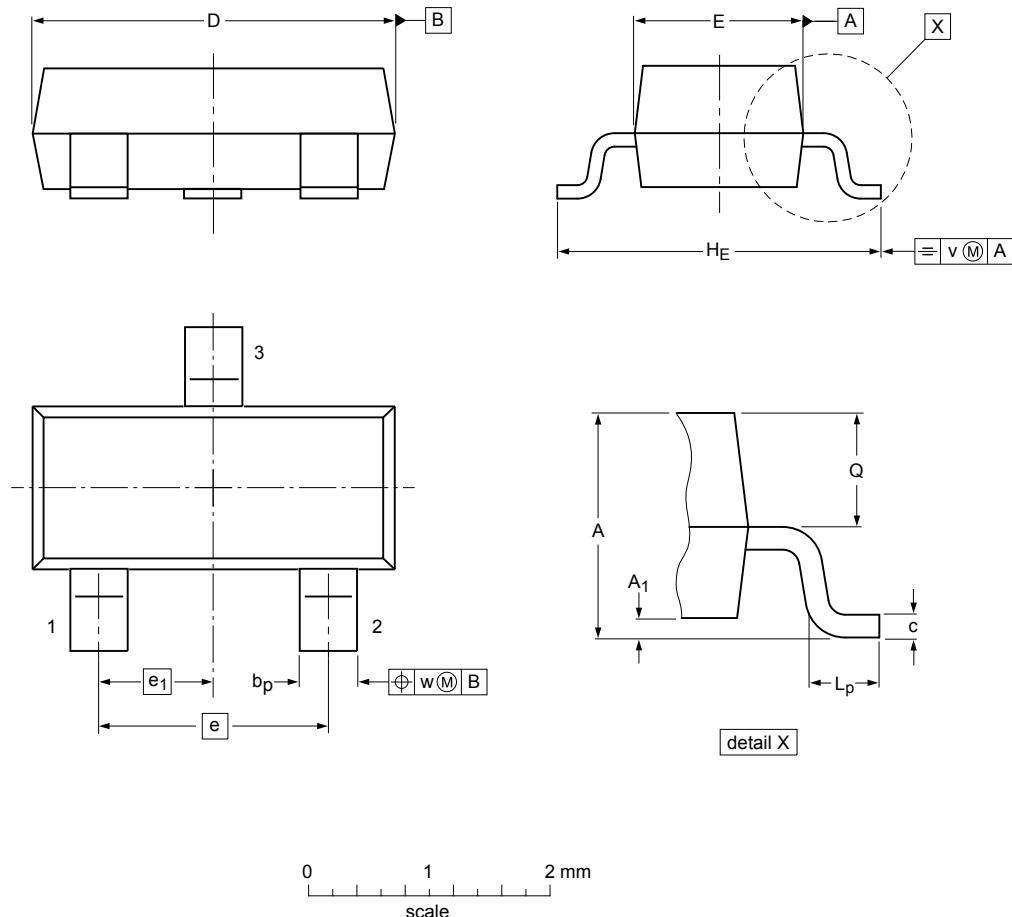


Fig. 17. Duty cycle definition

## 12. Package outline

Plastic surface-mounted package; 3 leads

SOT23



Dimensions (mm are the original dimensions)

Unit	A	A <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)

## 13. Soldering

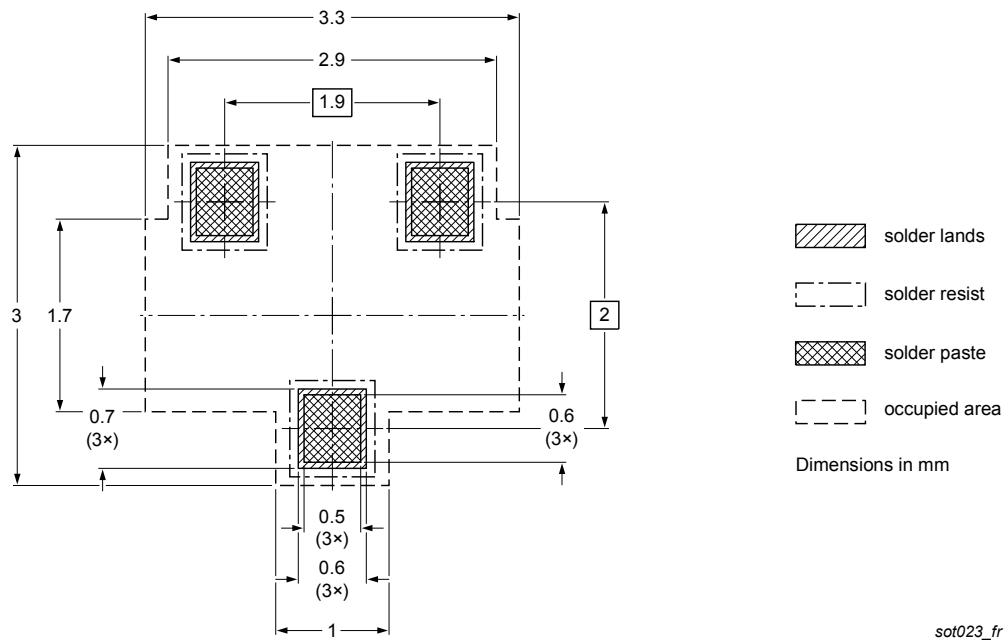


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

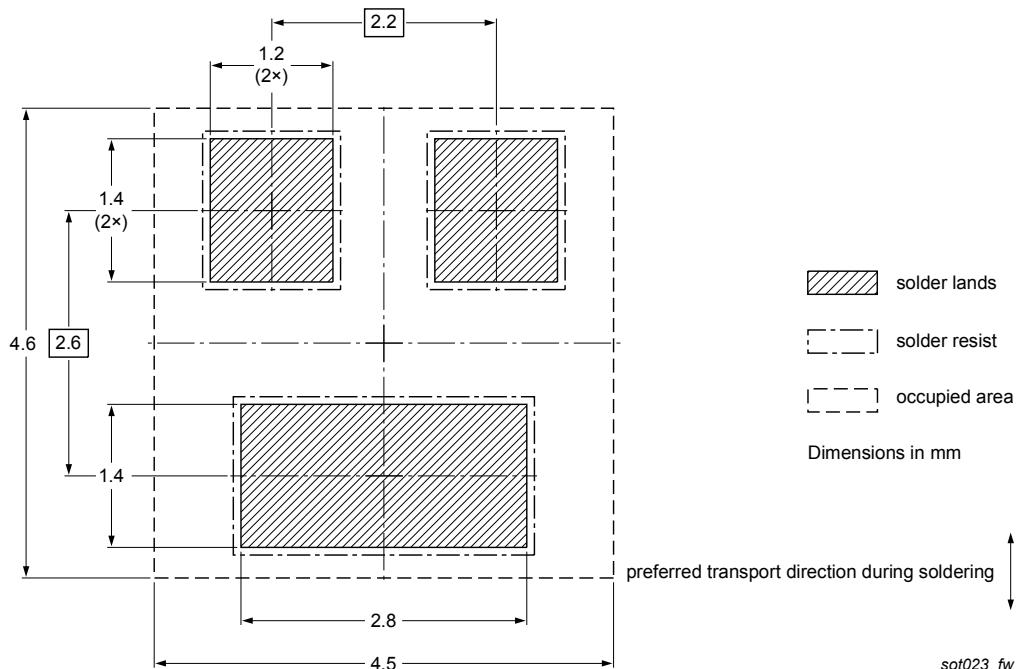


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV90ENE v.1	20160420	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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## 16. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	2
6	Ordering information .....	2
7	Marking .....	2
8	Limiting values .....	2
9	Thermal characteristics .....	5
10	Characteristics .....	7
11	Test information .....	10
12	Package outline .....	11
13	Soldering .....	12
14	Revision history .....	13
15	Legal information .....	14
15.1	Data sheet status .....	14
15.2	Definitions .....	14
15.3	Disclaimers .....	14
15.4	Trademarks .....	15

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