



PMV120ENEA

60 V, N-channel Trench MOSFET

4 March 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
- AEC-Q101 qualified

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

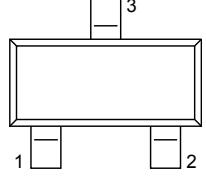
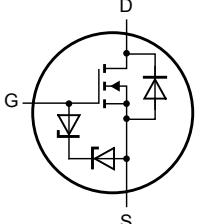
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25^\circ\text{C}$		-	-	60	V
V_{GS}	gate-source voltage			-20	-	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	-	2.1	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 2.1\text{ A}; T_j = 25^\circ\text{C}$		-	96	123	$\text{m}\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 6 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	 TO-236AB (SOT23)	 017aaa255

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV120ENEA	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code
	[1]
PMV120ENEA	DX%

[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	$T_j = 25^\circ\text{C}$	-	60	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	A
		$V_{GS} = 10\text{ V}; T_{amb} = 100^\circ\text{C}$	[1]	-	A
I_{DM}	peak drain current	$T_{amb} = 25^\circ\text{C}$; single pulse; $t_p \leq 10\ \mu\text{s}$	-	8.3	A
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$T_{j(init)} = 25^\circ\text{C}; I_D = 0.3\text{ A}$; DUT in avalanche (unclamped)	-	9	mJ
P_{tot}	total power dissipation	$T_{amb} = 25^\circ\text{C}$	[2]	-	mW

PMV120ENEA

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Symbol	Parameter	Conditions		Min	Max	Unit
			[1]	-	1.05	W
		$T_{sp} = 25^\circ\text{C}$		-	6.4	W
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]	-	0.8	A
ESD maximum rating						
V_{ESD}	electrostatic discharge voltage	HBM	[3]	-	2000	V

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

[3] Measured between all pins.

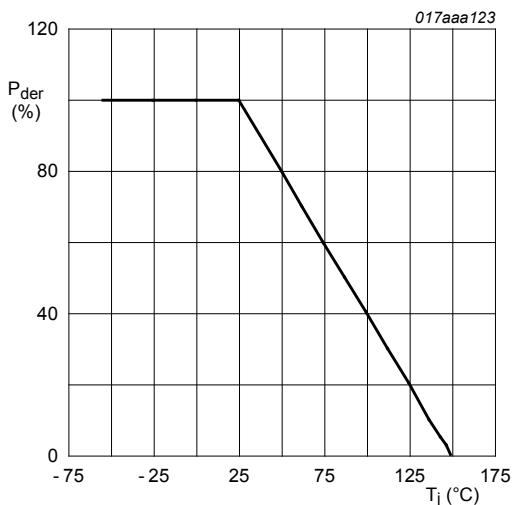


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

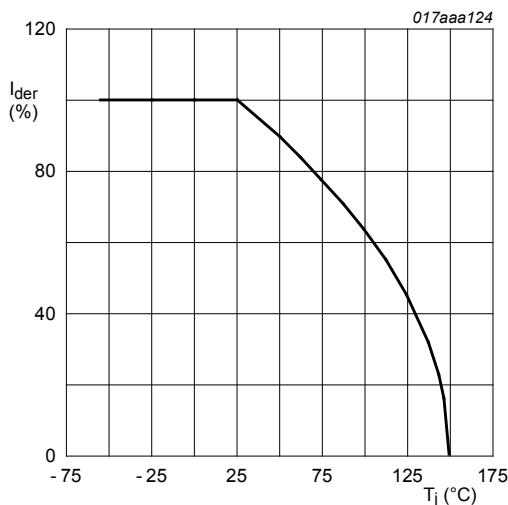


Fig. 2. Normalized continuous drain current as a function of junction temperature

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

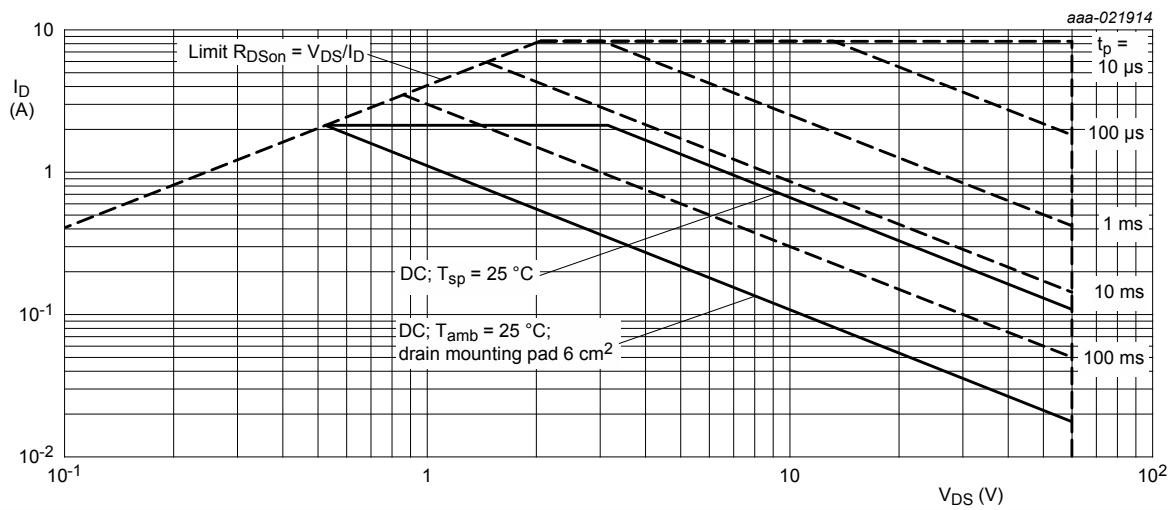


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

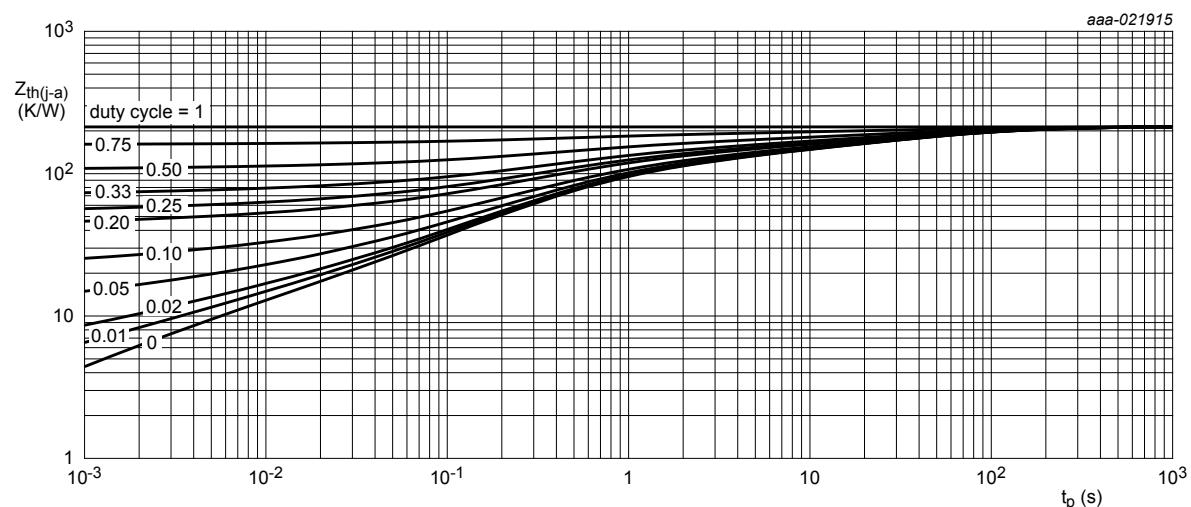
9. Thermal characteristics

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]	-	212	244	K/W
			[2]	-	104	119	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	17	20	K/W

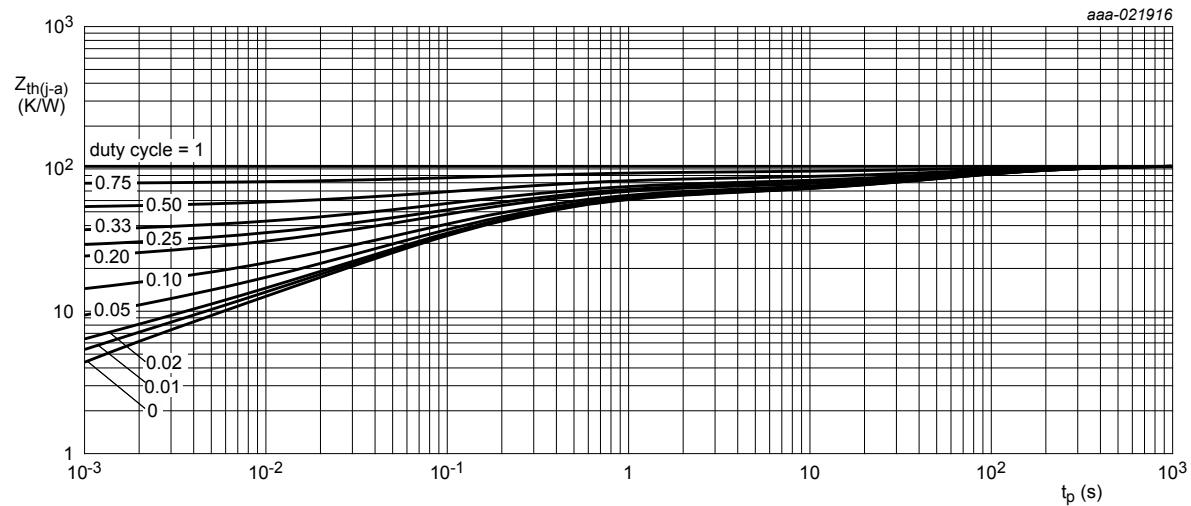
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 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	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		60	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu A$; $V_{DS}=V_{GS}$; $T_j = 25^\circ C$		1.3	1.7	2.7	V
I_{DSS}	drain leakage current	$V_{DS} = 60 V$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	10	μA
		$V_{GS} = -20 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	-10	μA
		$V_{GS} = 10 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	1	μA
		$V_{GS} = -10 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$		-	-	-1	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 V$; $I_D = 2.1 A$; $T_j = 25^\circ C$		-	96	123	$m\Omega$
		$V_{GS} = 10 V$; $I_D = 2.1 A$; $T_j = 150^\circ C$		-	192	246	$m\Omega$
		$V_{GS} = 4.5 V$; $I_D = 1.9 A$; $T_j = 25^\circ C$		-	108	146	$m\Omega$
g_{fs}	forward transconductance	$V_{DS} = 10 V$; $I_D = 0.9 A$; $T_j = 25^\circ C$		-	10.2	-	S
R_G	gate resistance	$f = 1 MHz$		-	10	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$V_{DS} = 30 V$; $I_D = 2.1 A$; $V_{GS} = 10 V$; $T_j = 25^\circ C$		-	5.9	7.4	nC
Q_{GS}	gate-source charge			-	0.6	-	nC
Q_{GD}	gate-drain charge			-	1.1	-	nC
C_{iss}	input capacitance	$V_{DS} = 30 V$; $f = 1 MHz$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	275	-	pF
C_{oss}	output capacitance			-	24	-	pF
C_{rss}	reverse transfer capacitance			-	17	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 V$; $I_D = 2.1 A$; $V_{GS} = 10 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25^\circ C$		-	6.4	-	ns
t_r	rise time			-	8.9	-	ns
$t_{d(off)}$	turn-off delay time			-	15.9	-	ns
t_f	fall time			-	6.3	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	$I_S = 0.8 A$; $V_{GS} = 0 V$; $T_j = 25^\circ C$		-	0.8	1.2	V

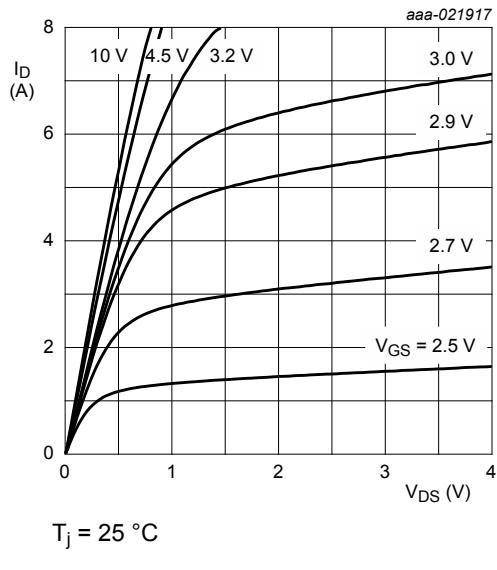


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

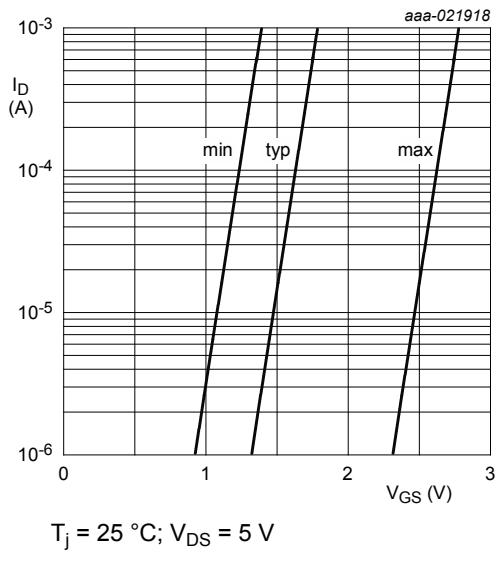


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

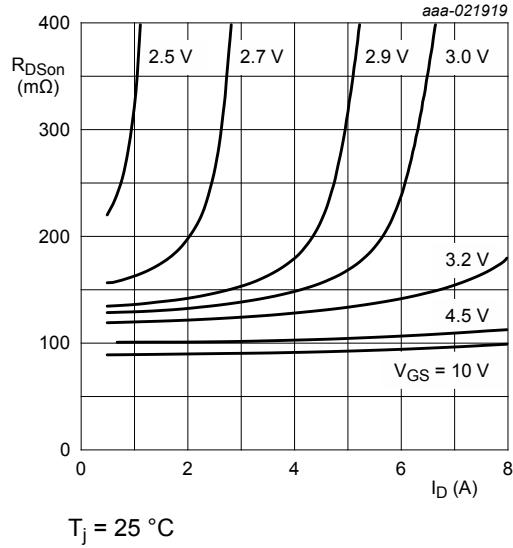


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

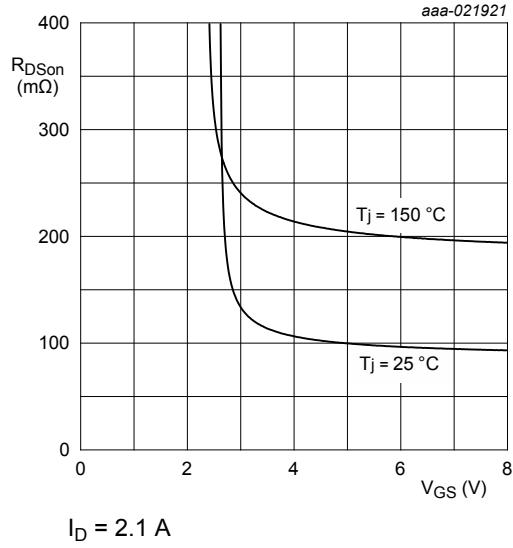
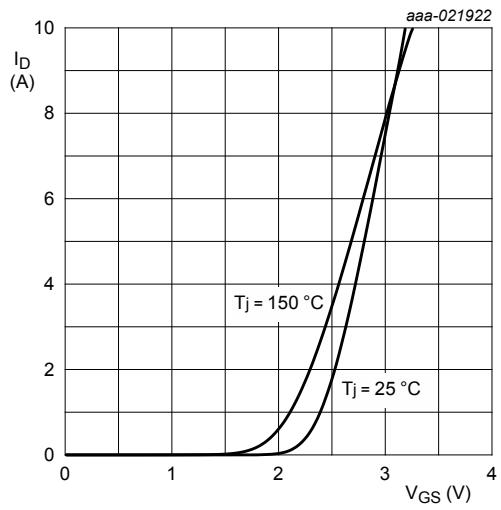


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

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

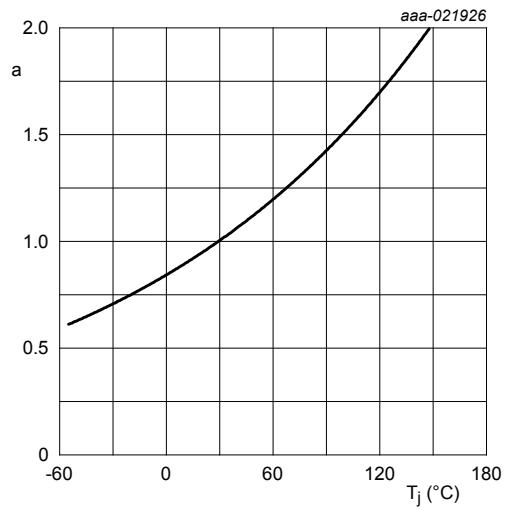
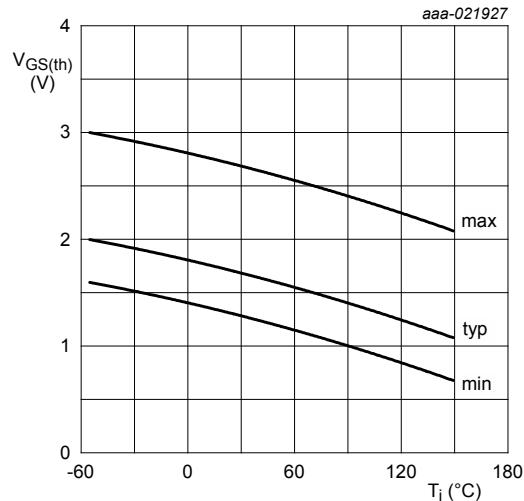


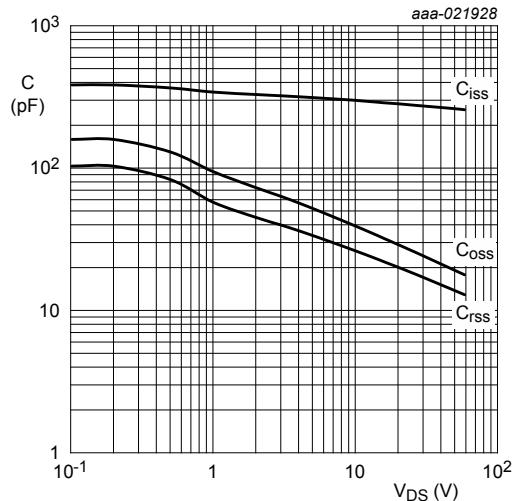
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



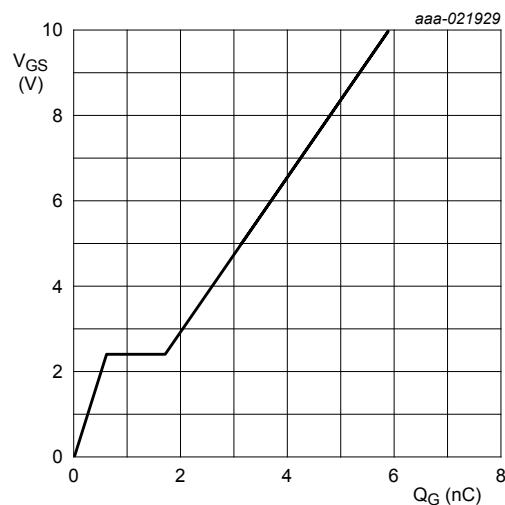
$$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



$I_D = 2.1$ A; $V_{DS} = 30$ V; $T_{amb} = 25$ °C

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

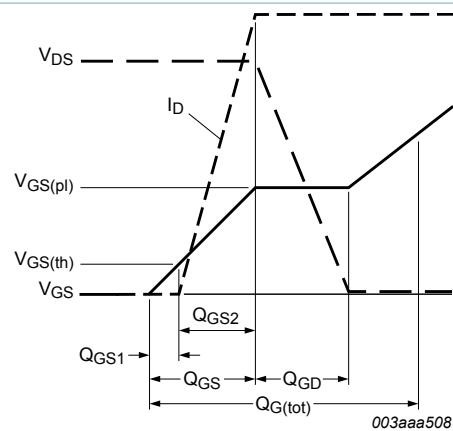
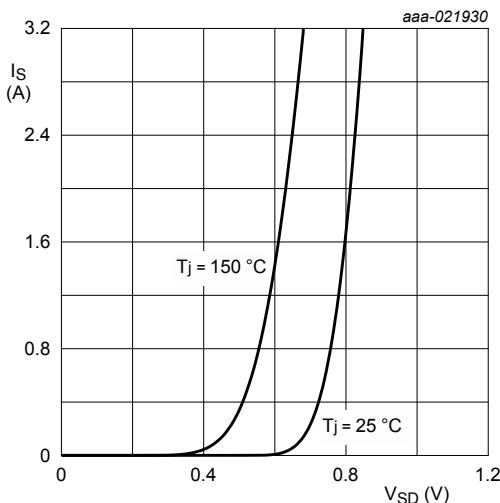


Fig. 15. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0$ V

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

11. Test information

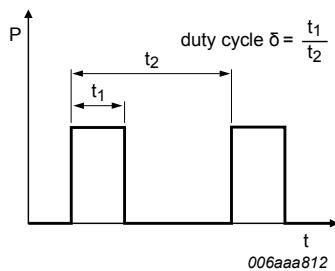


Fig. 17. Duty cycle definition

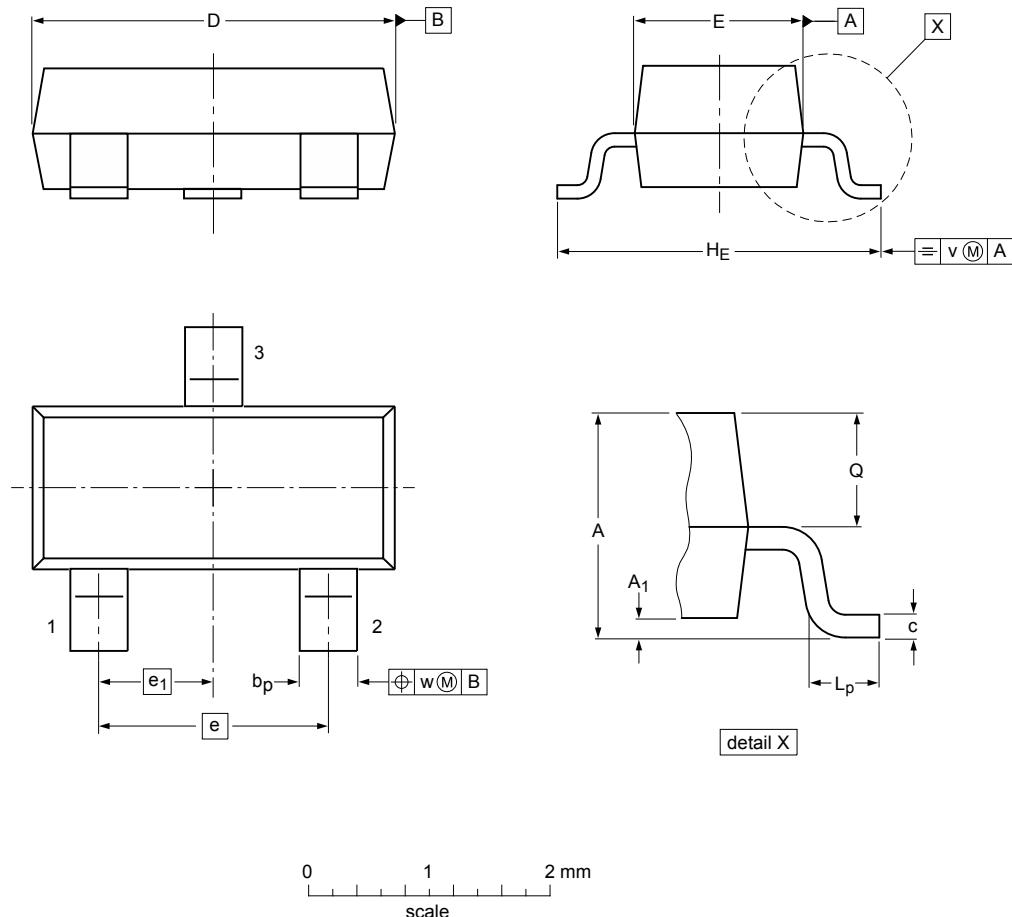
11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

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

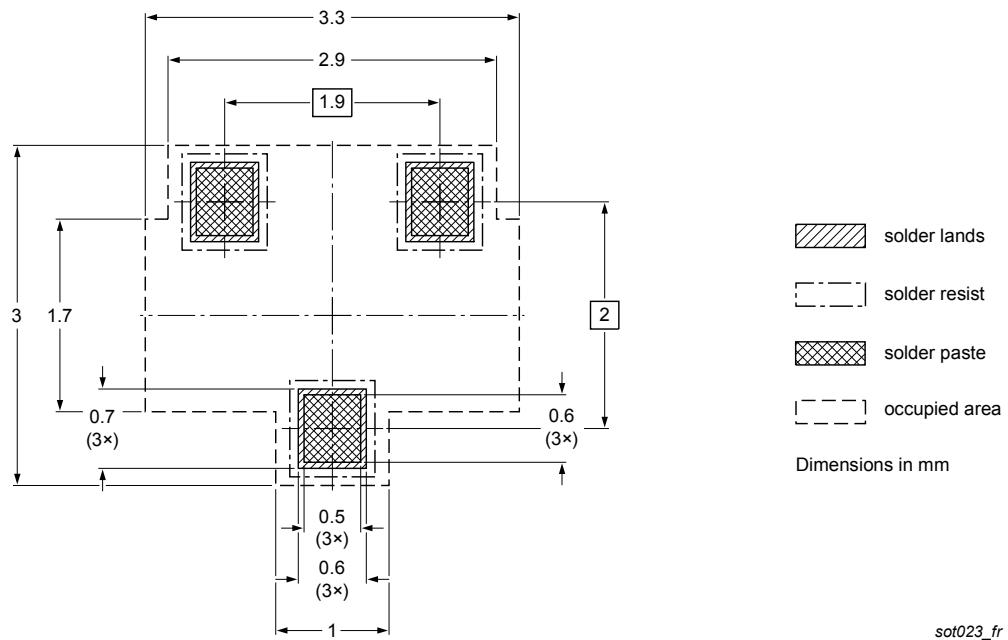


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

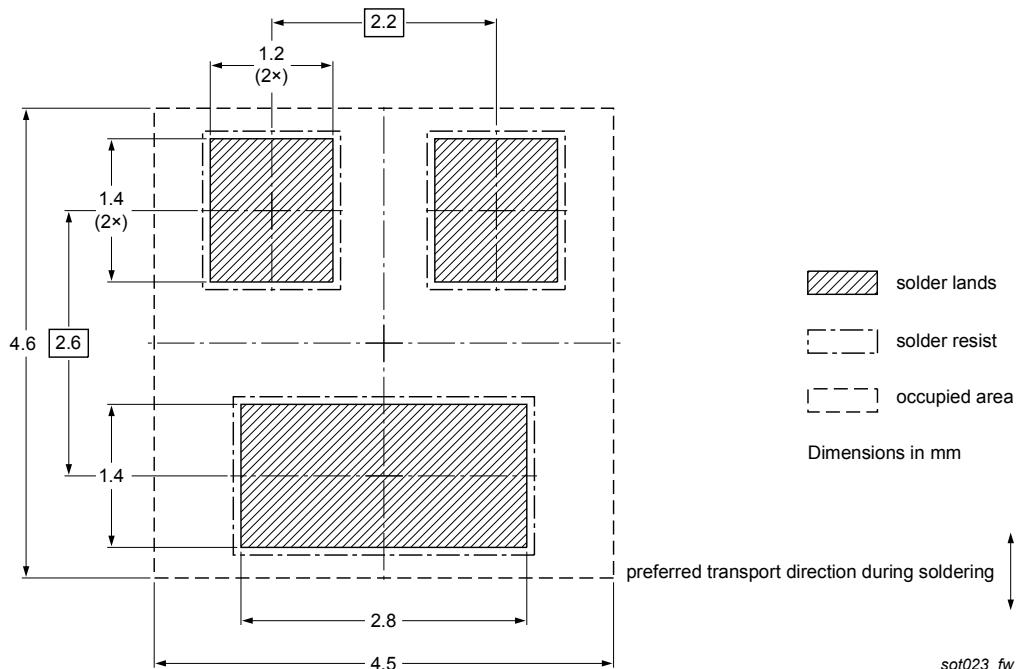


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV120ENEA v.1	20160304	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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