



# PMV41XPA

28 V, P-channel Trench MOSFET

12 July 2023

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
- Trench MOSFET technology
- Very fast switching
- AEC-Q101 qualified

## 3. Applications

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

## 4. Quick reference data

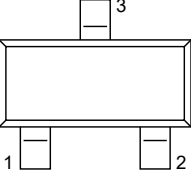
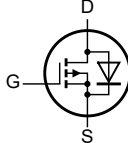
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	-28	V
$V_{GS}$	gate-source voltage		-12	-	12	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-4	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -4\text{ A}; T_j = 25\text{ °C}$	-	41	50	mΩ

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm<sup>2</sup>.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p style="text-align: center;"><b>SOT23</b></p>	 <p style="text-align: center;">017aaa094</p>
2	S	source		
3	D	drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV41XPA	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

## 7. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PMV41XPA	%5H

[1] % = placeholder for manufacturing site code

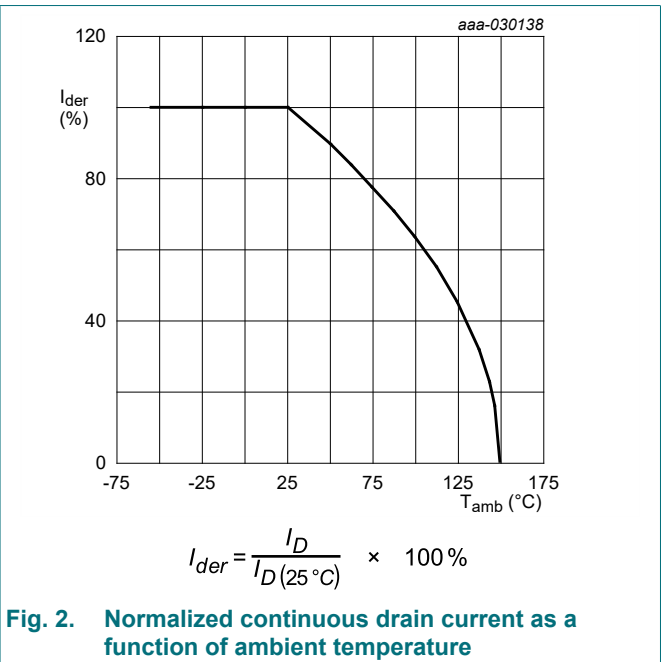
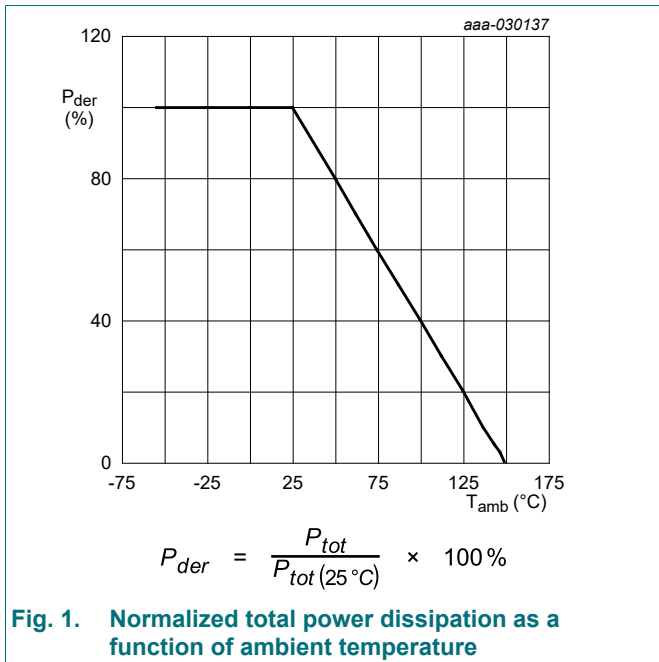
## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	-28	V
V <sub>GS</sub>	gate-source voltage			-12	12	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	-4	A
		V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	-3	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	-38	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	510	mW
			[1]	-	1.2	W
		T <sub>sp</sub> = 25 °C		-	7	W
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>amb</sub> = 25 °C	[1]	-	-1.2	A
<b>Avalanche ruggedness</b>						
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	T <sub>j(initial)</sub> = 25 °C; I <sub>D</sub> = -1.1 A; DUT in avalanche (unclamped)		-	17.5	mJ

- [1] Device mounted on an FR4 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.



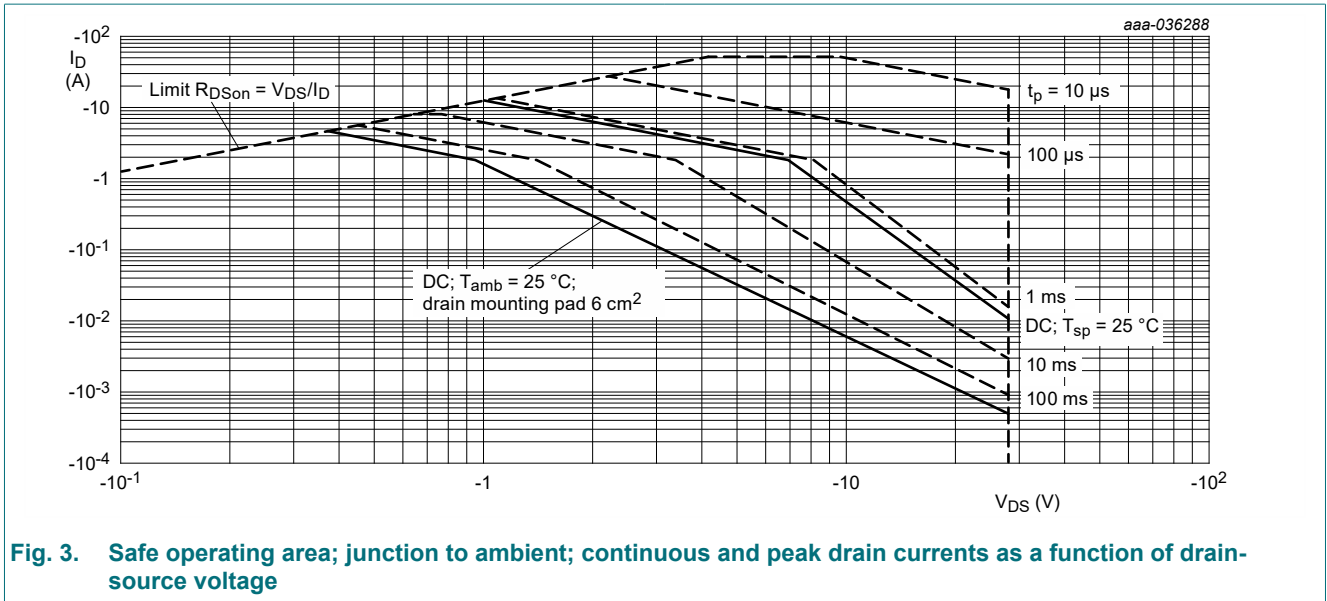


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

## 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
$R_{th(j-sp)}$	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 and mounting pad for drain 6 cm<sup>2</sup>.

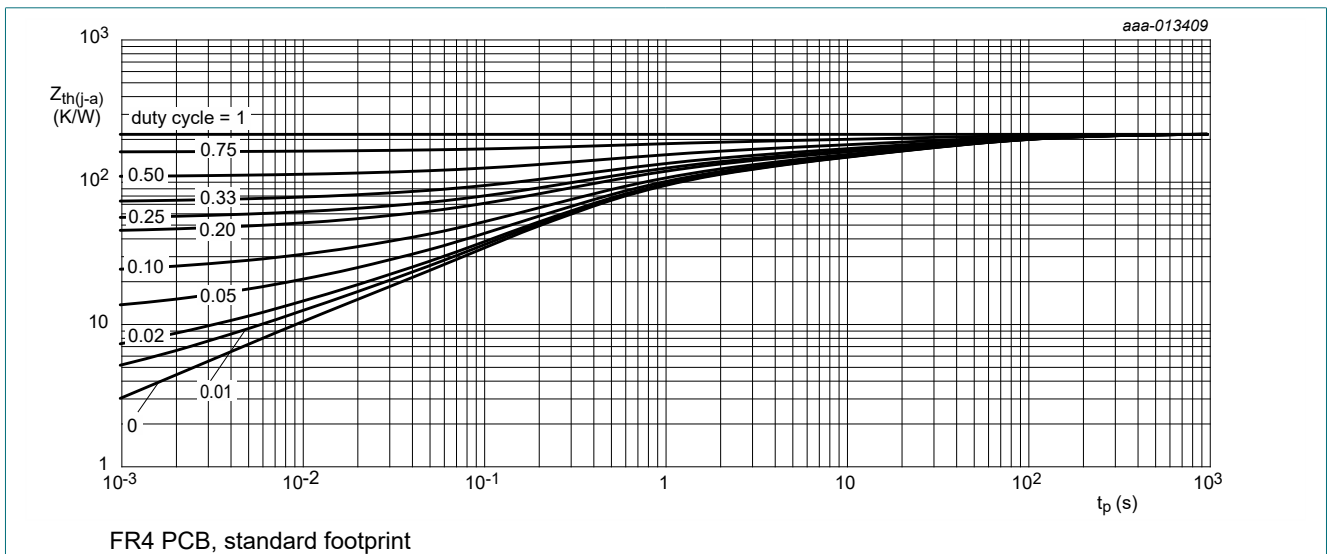


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

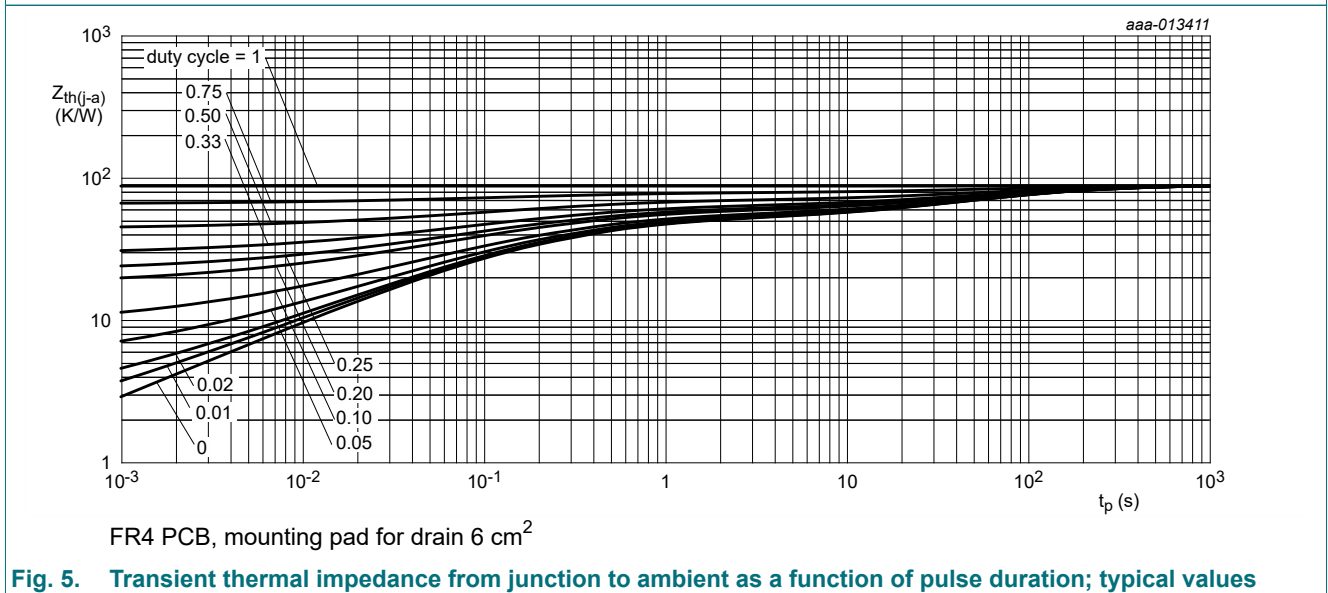


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-28	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu\text{A}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$	-0.45	-0.68	-1	V
$I_{DSS}$	drain leakage current	$V_{DS} = -28 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = -12 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
		$V_{GS} = 12 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}; I_D = -4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	41	50	m $\Omega$
		$V_{GS} = -4.5 \text{ V}; I_D = -4 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	63	80	m $\Omega$
		$V_{GS} = -2.5 \text{ V}; I_D = -2.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	49	64	m $\Omega$
		$V_{GS} = -1.8 \text{ V}; I_D = -0.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	67	105	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -10 \text{ V}; I_D = -4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	12	-	S
$R_G$	gate resistance	$f = 1 \text{ MHz}$	-	5.2	-	$\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -15 \text{ V}; I_D = -4 \text{ A}; V_{GS} = -4.5 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	14	21	nC
$Q_{GS}$	gate-source charge		-	1.9	-	nC
$Q_{GD}$	gate-drain charge		-	3.7	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -15 \text{ V}; f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	1254	-	pF
$C_{oss}$	output capacitance		-	88	-	pF
$C_{rss}$	reverse transfer capacitance		-	77	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -15 \text{ V}; I_D = -4 \text{ A}; V_{GS} = -4.5 \text{ V}; R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	4	-	ns
$t_r$	rise time		-	10	-	ns
$t_{d(off)}$	turn-off delay time		-	42	-	ns
$t_f$	fall time		-	18	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -1.9 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-0.74	-1.2	V
$t_{rr}$	reverse recovery time	$I_S = -1.9 \text{ A}; di_S/dt = 100 \text{ A}/\mu\text{s}; V_{GS} = -4.5 \text{ V}; V_{DS} = -15 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	11.6	-	ns
$Q_r$	recovered charge		-	3.8	-	nC

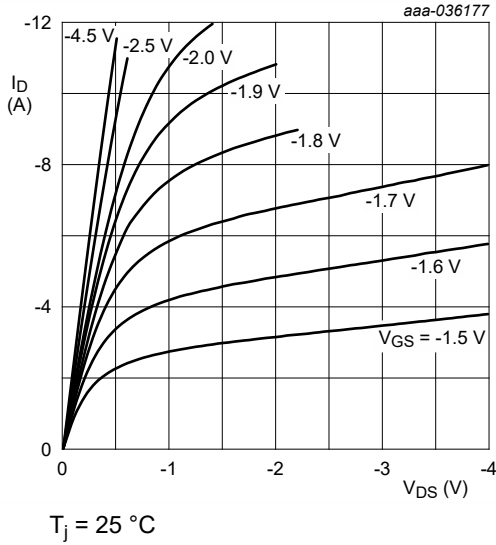


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

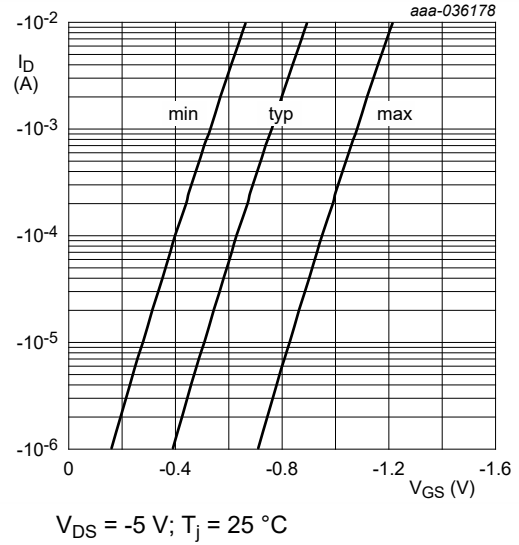


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

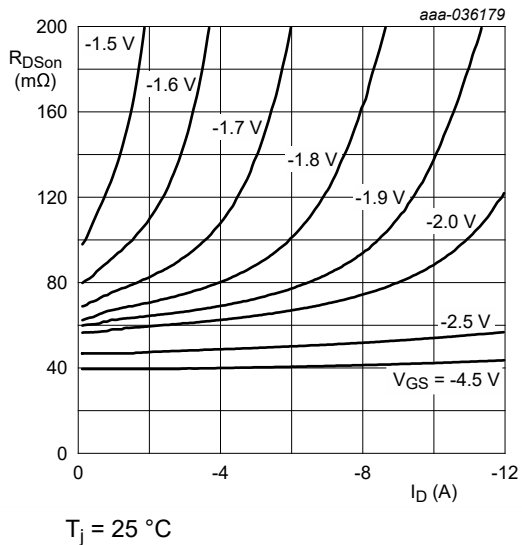


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

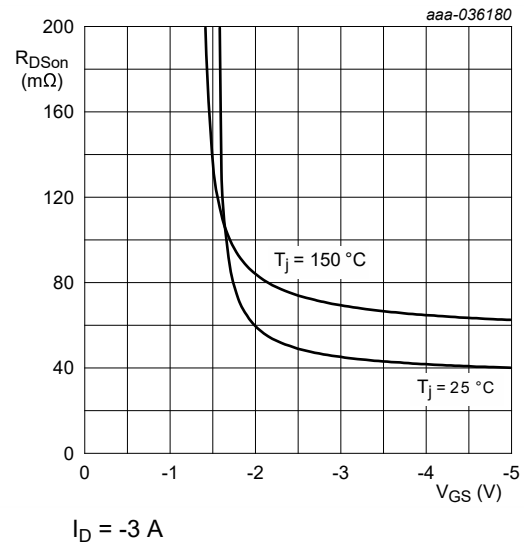


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

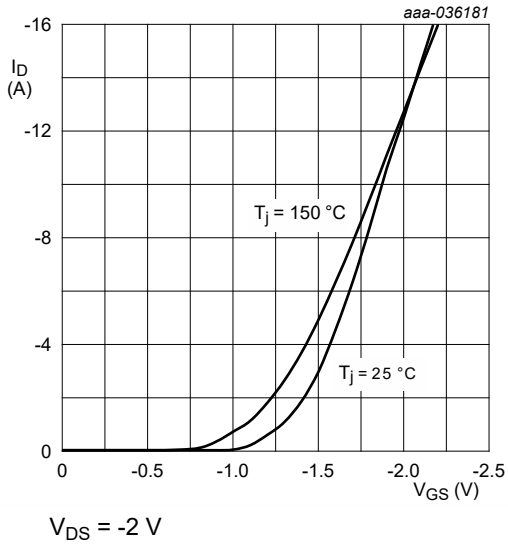


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

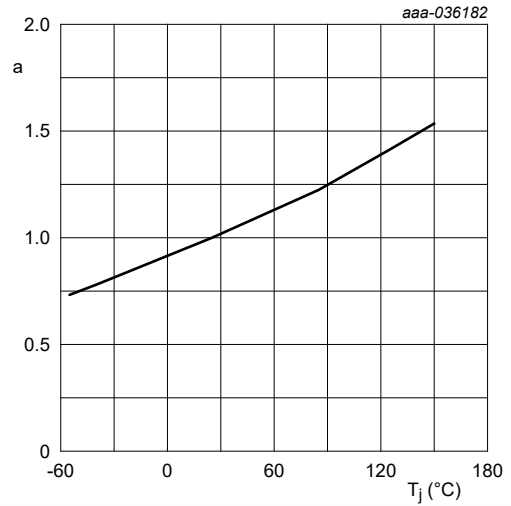


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

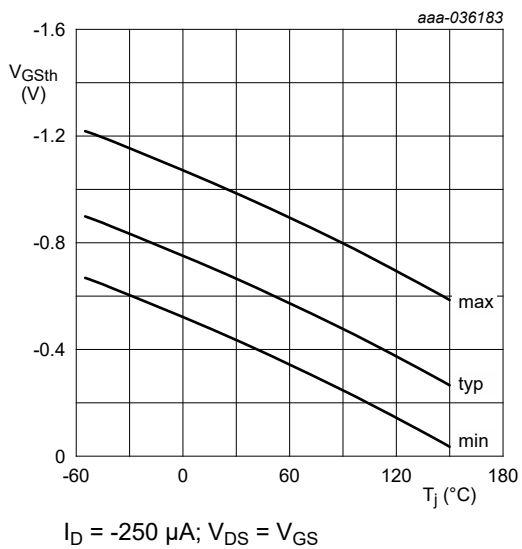


Fig. 12. Gate-source threshold voltage as a function of junction temperature

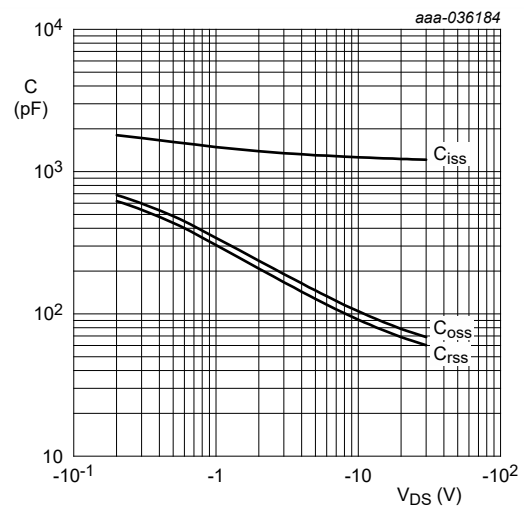
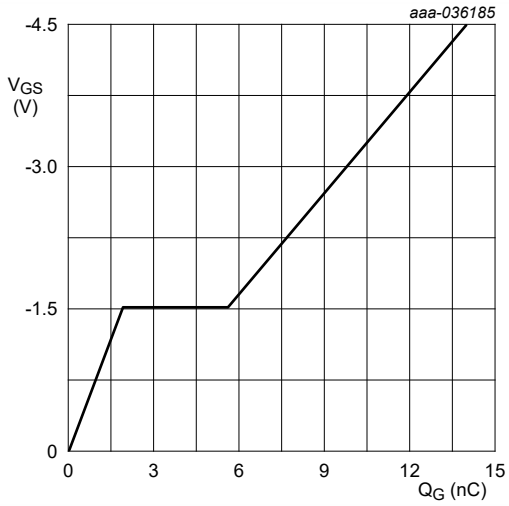


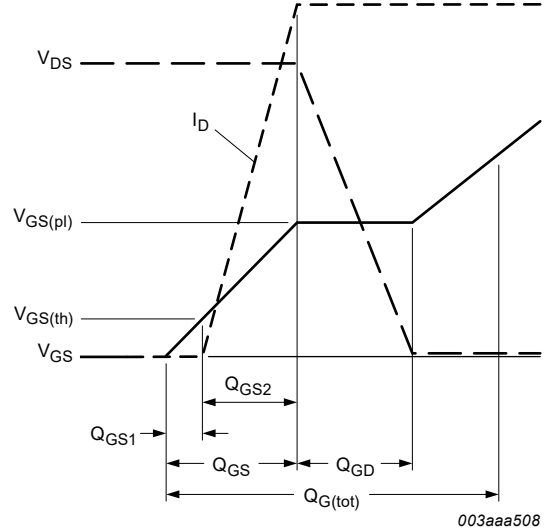
Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values





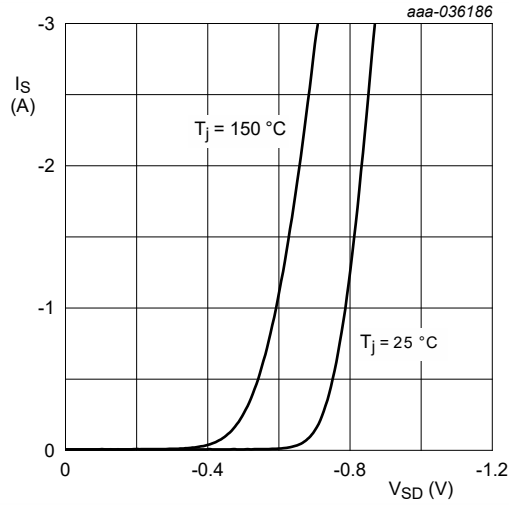
$V_{DS} = -15\text{ V}; I_D = -4\text{ A}; T_j = 25\text{ }^\circ\text{C}$

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



003aaa508

Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

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

## 11. Test information



Fig. 17. Duty cycle definition

### 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

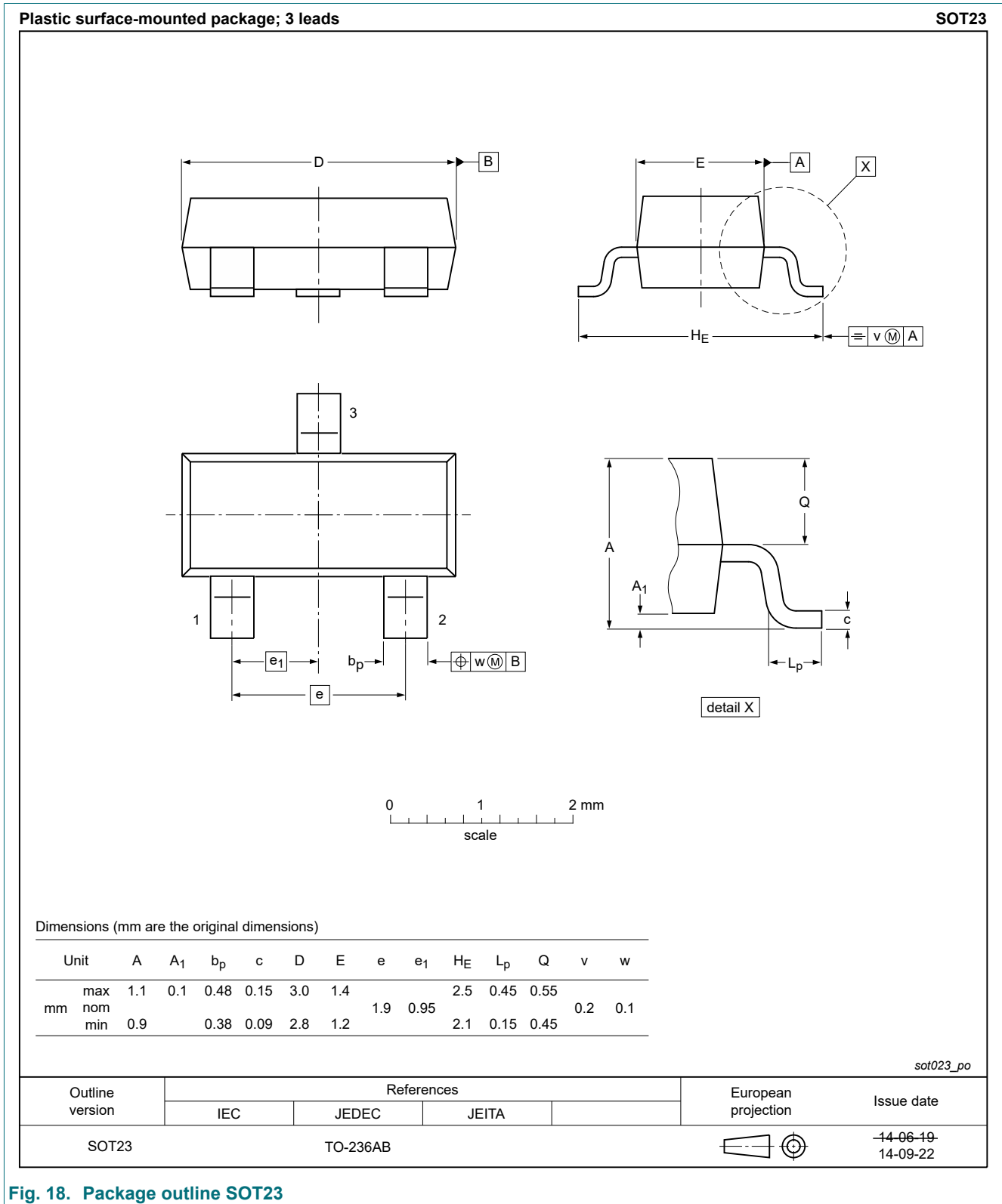


Fig. 18. Package outline SOT23

### 13. Soldering

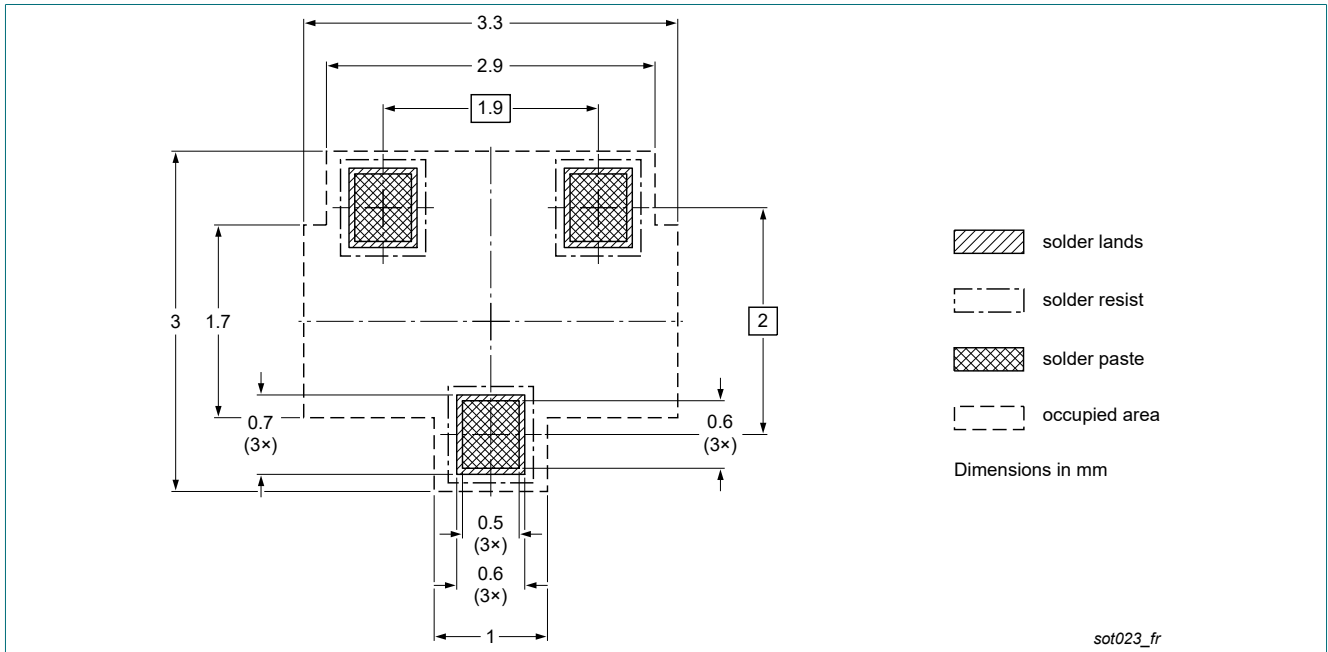


Fig. 19. Reflow soldering footprint for SOT23

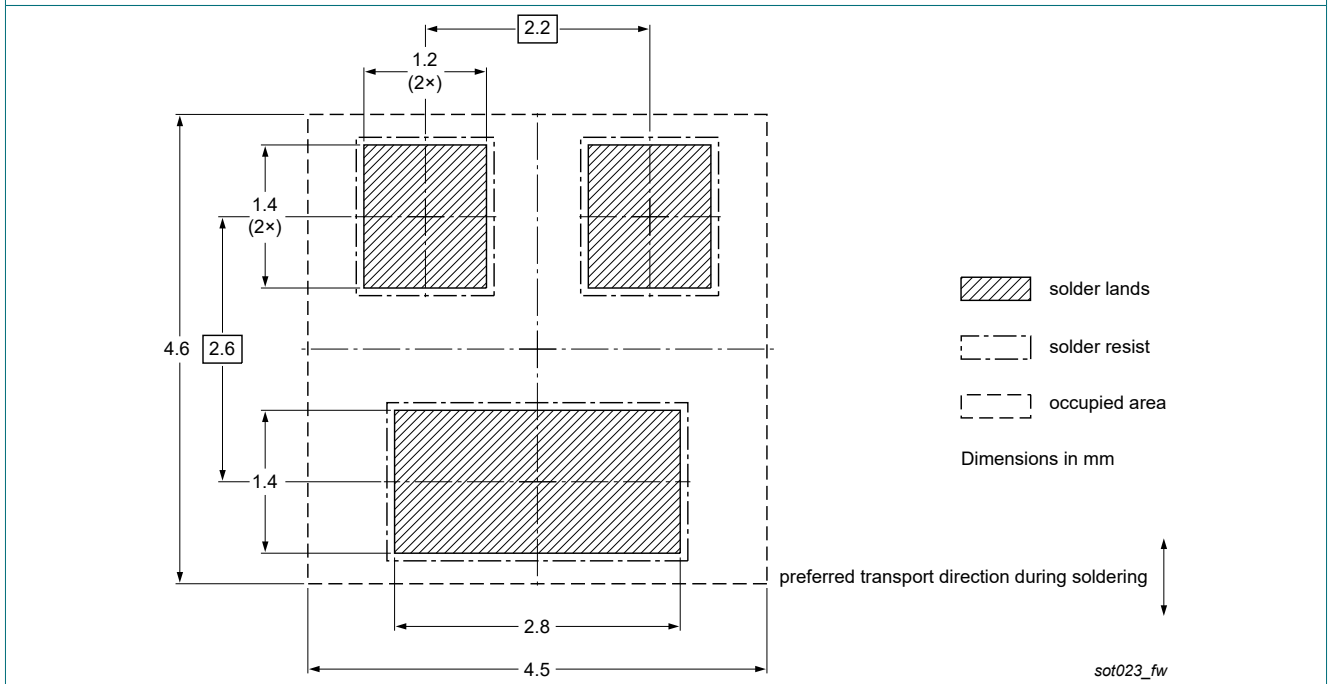


Fig. 20. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV41XPA v.2	20230712	Product data sheet	-	PMV41XPA v.1
Modifications:	• Change $I_D$ condition for one $R_{DSon}$ parameter			
PMV41XPA v.1	20230306	Product data sheet	-	-

## 15. Legal information

### 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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## Contents

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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.....	3
9. Thermal characteristics.....	5
10. Characteristics.....	6
11. Test information.....	10
12. Package outline.....	11
13. Soldering.....	12
14. Revision history.....	13
15. Legal information.....	14

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