



PMV48XPA

20 V, P-channel Trench MOSFET

10 March 2014

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

- Logic-level compatible
- Trench MOSFET technology
- Very fast switching
- AEC-Q101 qualified

3. Applications

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

4. Quick reference data

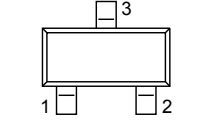
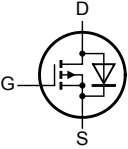
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_{amb} = 25\text{ °C}$		-	-	-20	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	-3.5	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2.4\text{ A}; T_j = 25\text{ °C}$		-	48	55	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 TO-236AB (SOT23)	 017aaa094
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV48XPA	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code
	[1]
PMV48XPA	%DZ

[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 _{amb} = 25 °C		-	-20	V
V _{GS}	gate-source voltage			-12	12	V
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-3.5	A
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-2.2	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-14	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	510	mW
			[1]	-	930	mW
		T _{sp} = 25 °C		-	4150	mW
T _j	junction temperature			-	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 °C	[1]	-	-1	A

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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

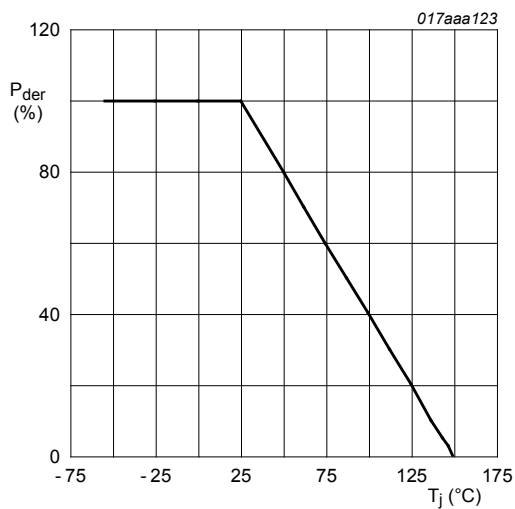


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

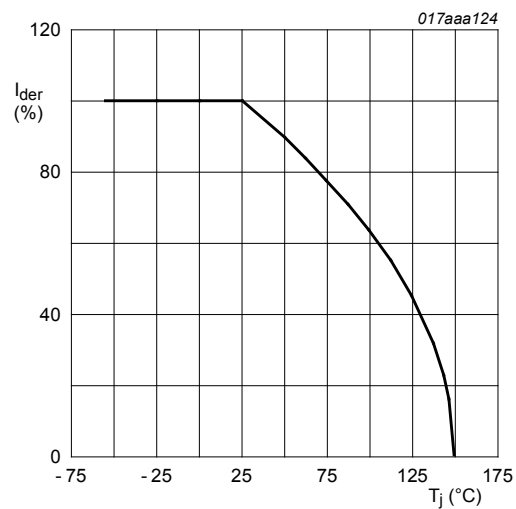
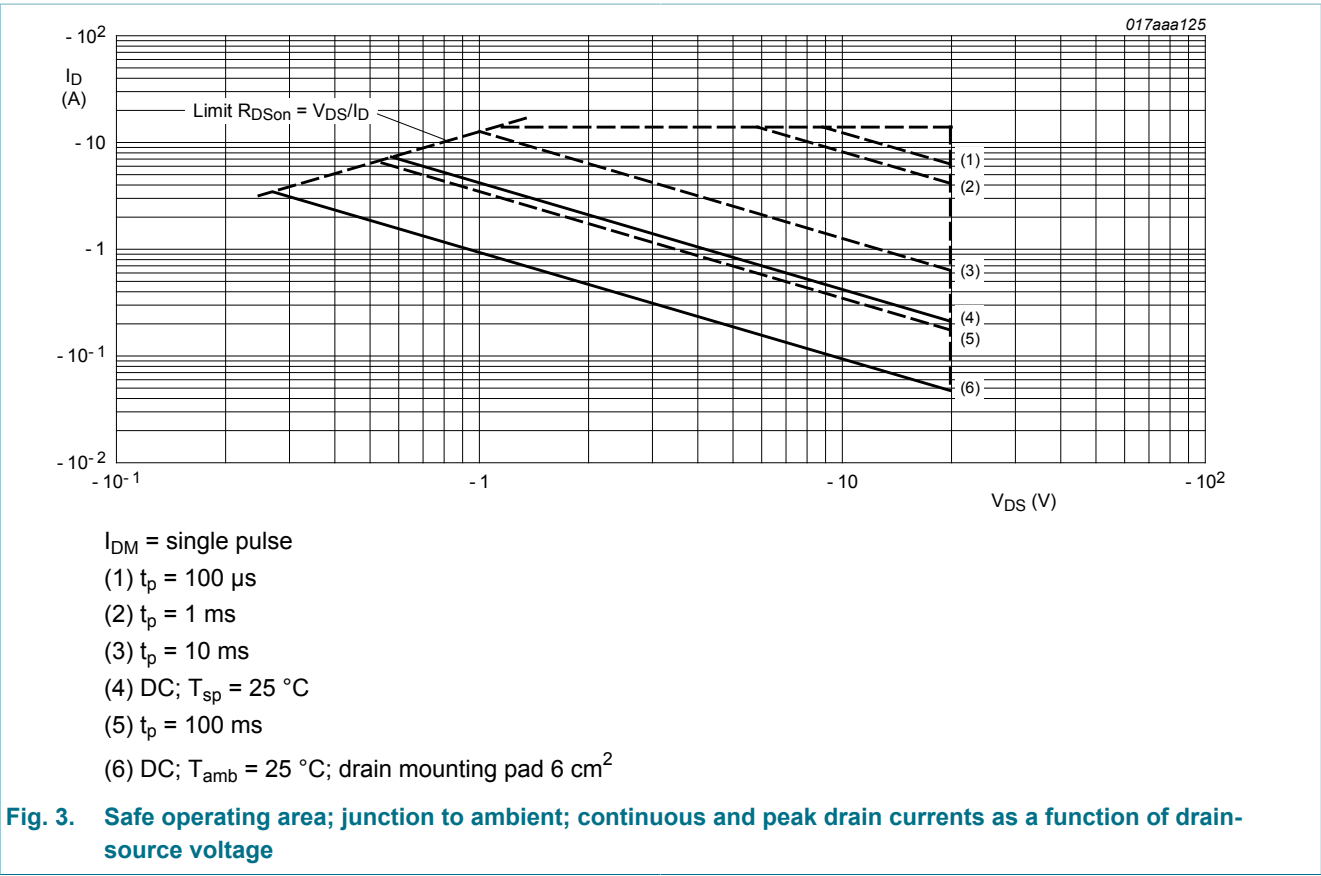


Fig. 2. Normalized continuous drain current as a function of junction temperature

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

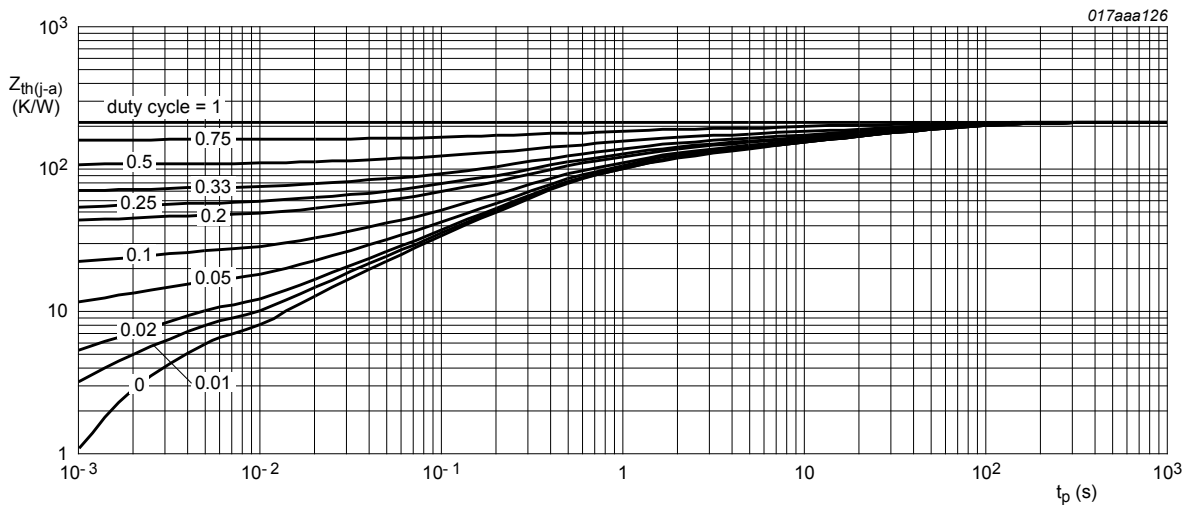


9. Thermal characteristics

Table 6. Thermal characteristics

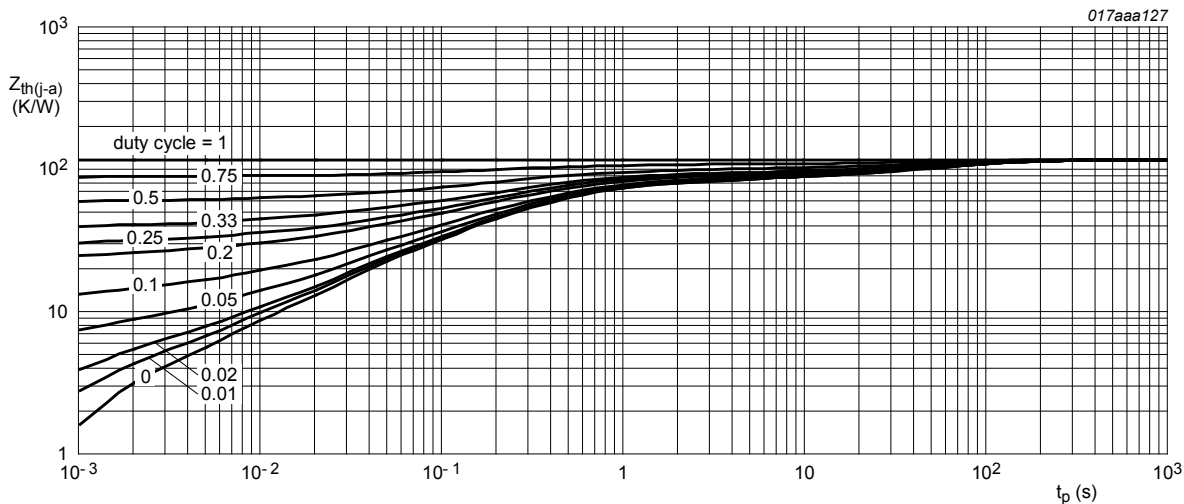
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	213	245	K/W
			[2]	-	117	135	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	25	30	K/W

[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, 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 cm²

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 μA; V _{GS} = 0 V; T _j = 25 °C		-20	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = -250 μA; V _{DS} = V _{GS} ; T _j = 25 °C		-0.75	-1	-1.25	V
I _{DSS}	drain leakage current	V _{DS} = -20 V; V _{GS} = 0 V; T _{amb} = 25 °C		-	-	-1	μA
I _{GSS}	gate leakage current	V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = -4.5 V; I _D = -2.4 A; T _j = 25 °C		-	48	55	mΩ
		V _{GS} = -4.5 V; I _D = -2.4 A; T _j = 150 °C		-	70	80	mΩ
		V _{GS} = -2.5 V; I _D = -2 A; T _j = 25 °C		-	71	81	mΩ
g _{fs}	forward transconductance	V _{DS} = -12 V; I _D = -2 A; T _j = 25 °C		-	12	-	S
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = -10 V; I _D = -1 A; V _{GS} = -4.5 V; T _j = 25 °C		-	8.5	11	nC
Q _{GS}	gate-source charge			-	1.8	-	nC
Q _{GD}	gate-drain charge			-	1.8	-	nC
C _{iss}	input capacitance	V _{DS} = -10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	1000	-	pF
C _{oss}	output capacitance			-	130	-	pF
C _{rss}	reverse transfer capacitance			-	90	-	pF
t _{d(on)}	turn-on delay time		V _{DS} = -10 V; I _D = -1 A; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	11	-
t _r	rise time			-	13	-	ns
t _{d(off)}	turn-off delay time			-	61	-	ns
t _f	fall time			-	23	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = -2.4 A; V _{GS} = 0 V; T _j = 25 °C		-	-0.82	-1.2	V

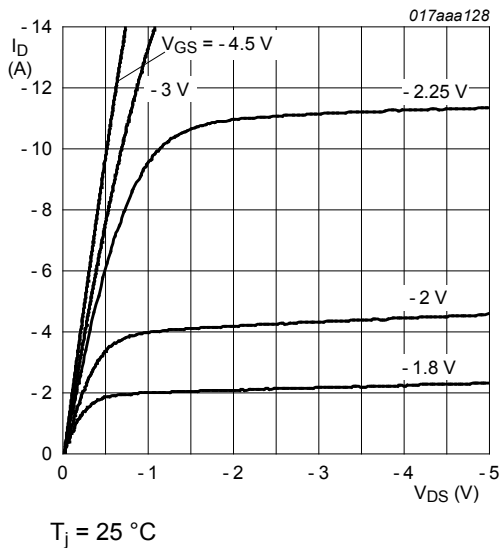


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

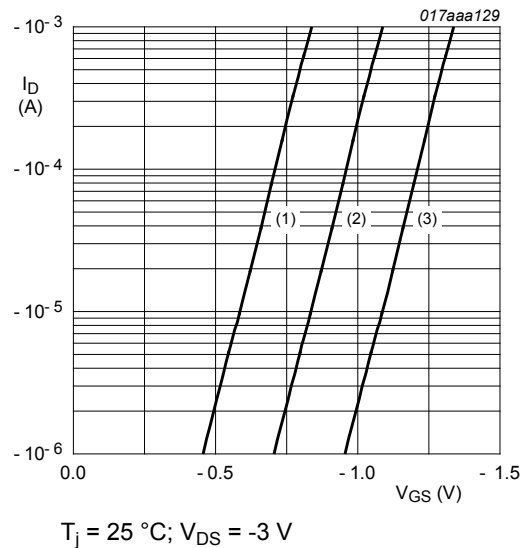


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

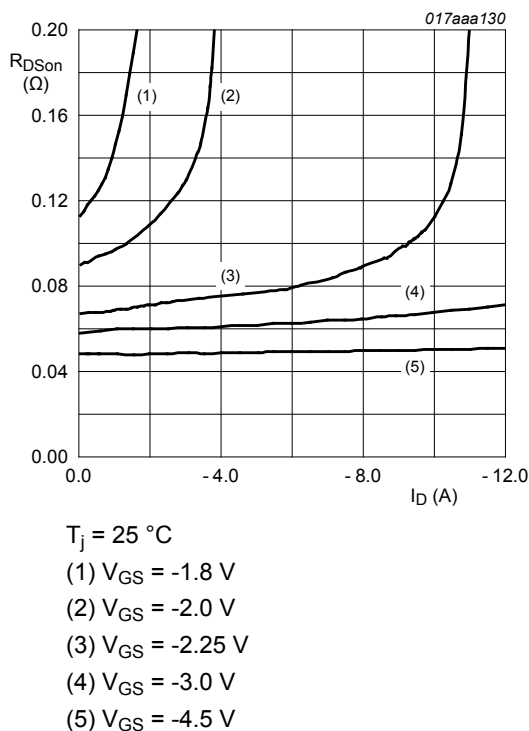


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

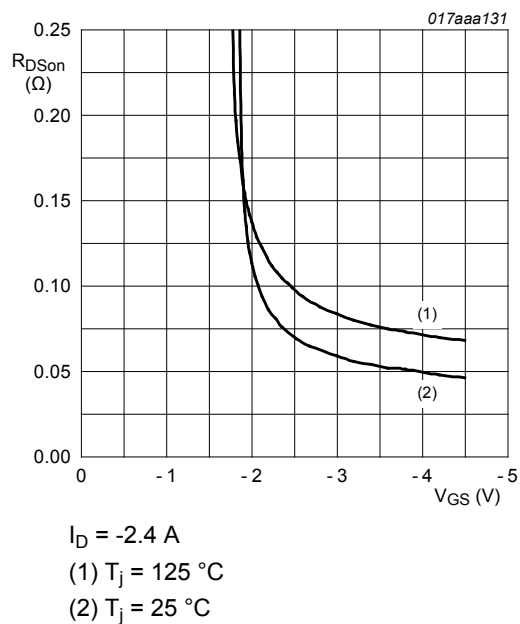
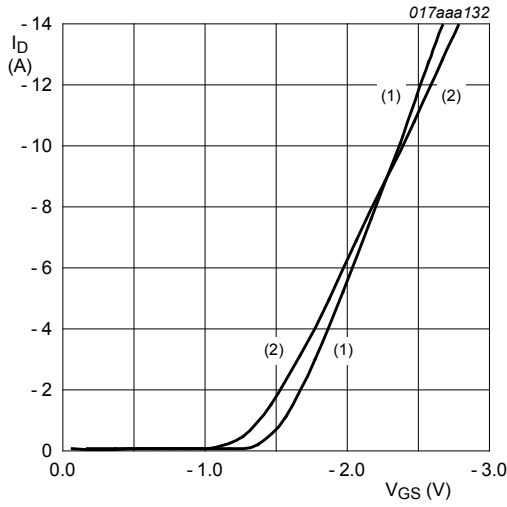


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



$$V_{DS} > I_D \times R_{DS(on)}$$

(1) $T_j = 25\text{ °C}$

(2) $T_j = 150\text{ °C}$

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

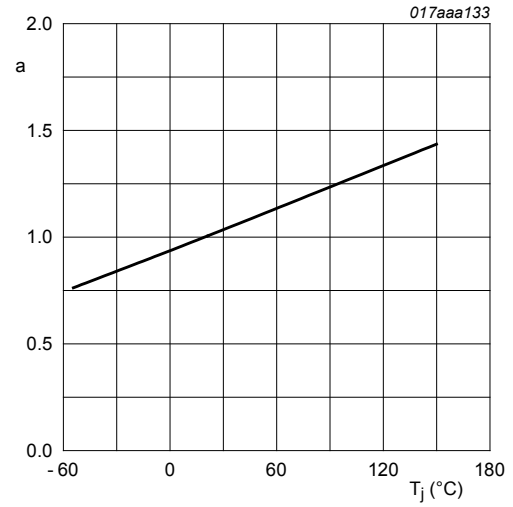
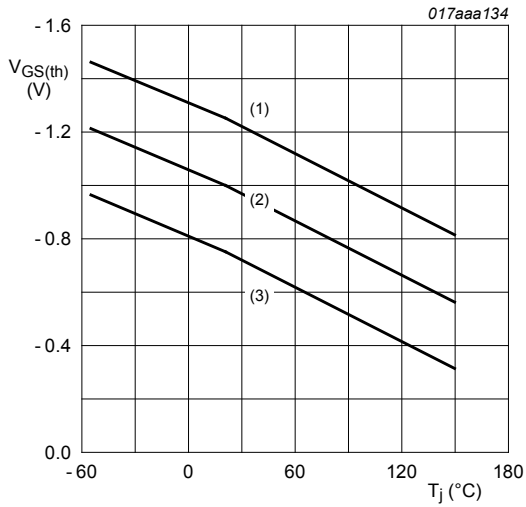


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



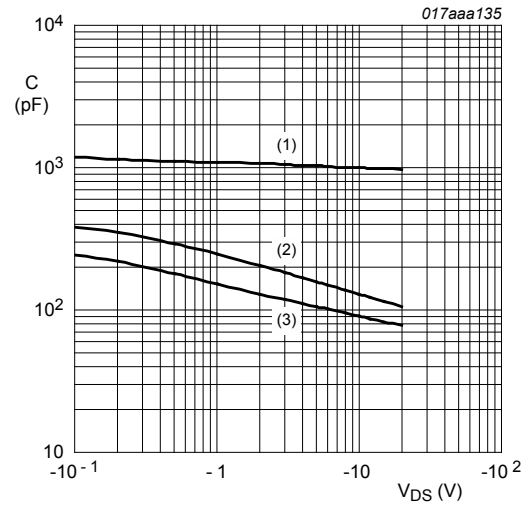
$$I_D = -0.25\text{ mA}; V_{DS} = V_{GS}$$

(1) maximum values

(2) typical values

(3) minimum values

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



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

(1) C_{iss}

(2) C_{oss}

(3) C_{rss}

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

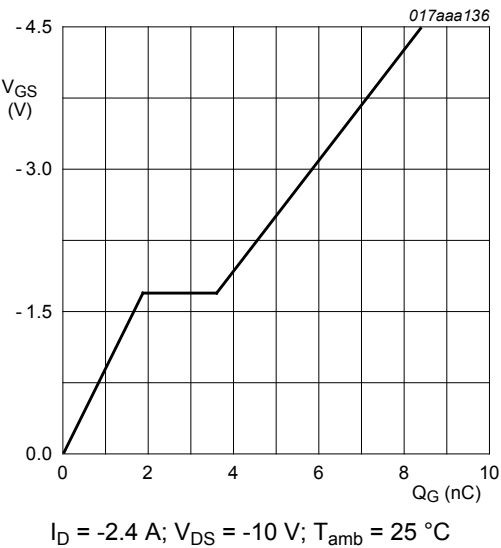


Fig. 14. Gate-source voltage as a function of gate charge; typical values

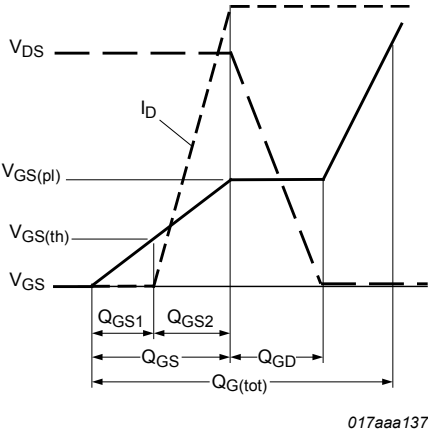
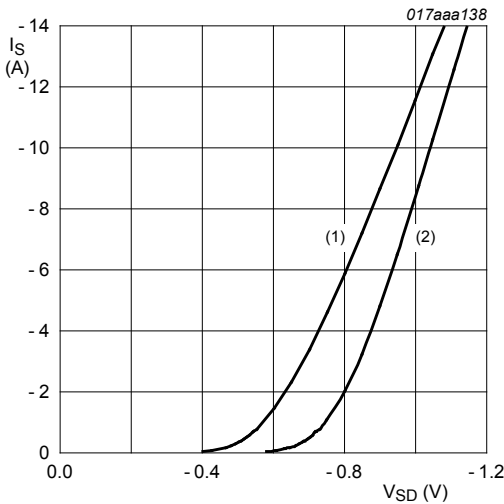


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$
(1) $T_j = 150\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$

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

11. Test information

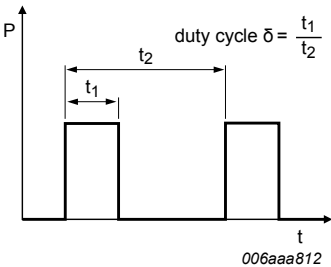


Fig. 17. Duty cycle definition

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

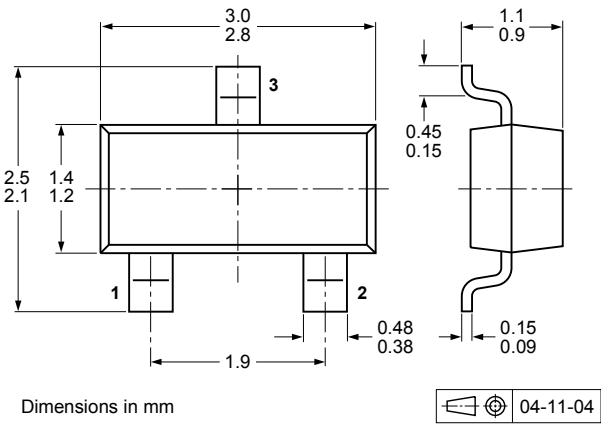


Fig. 18. Package outline TO-236AB (SOT23)

13. Soldering

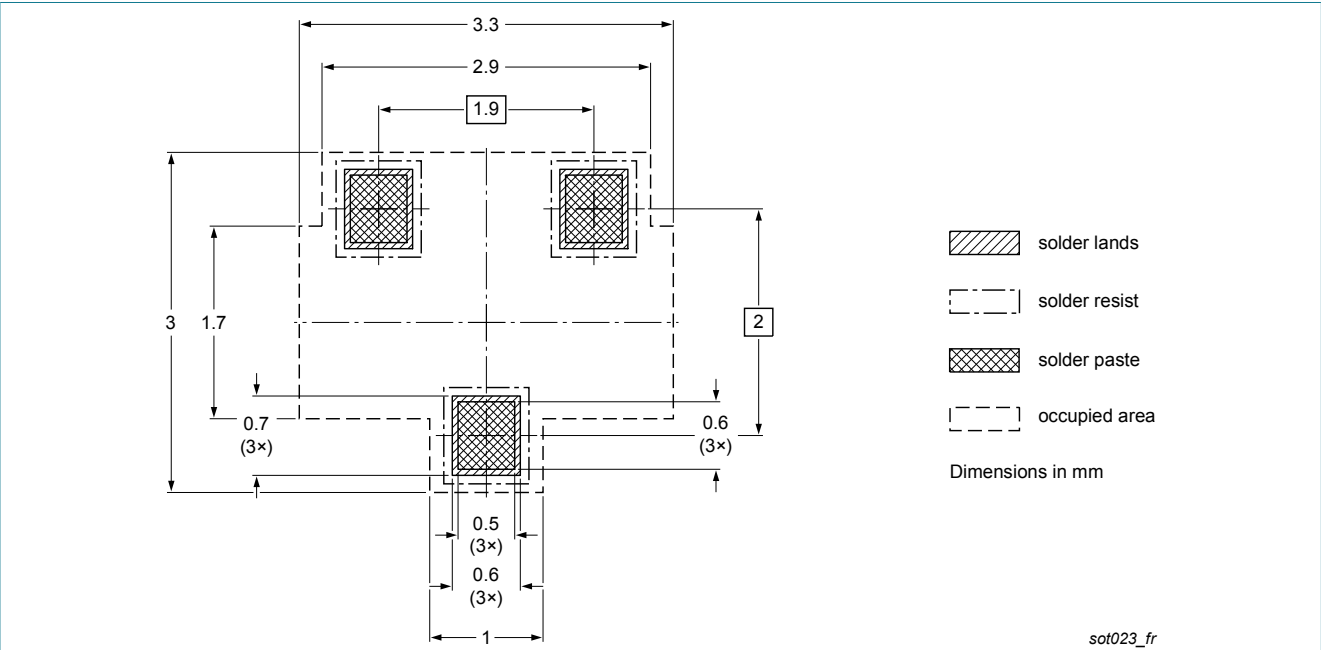


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

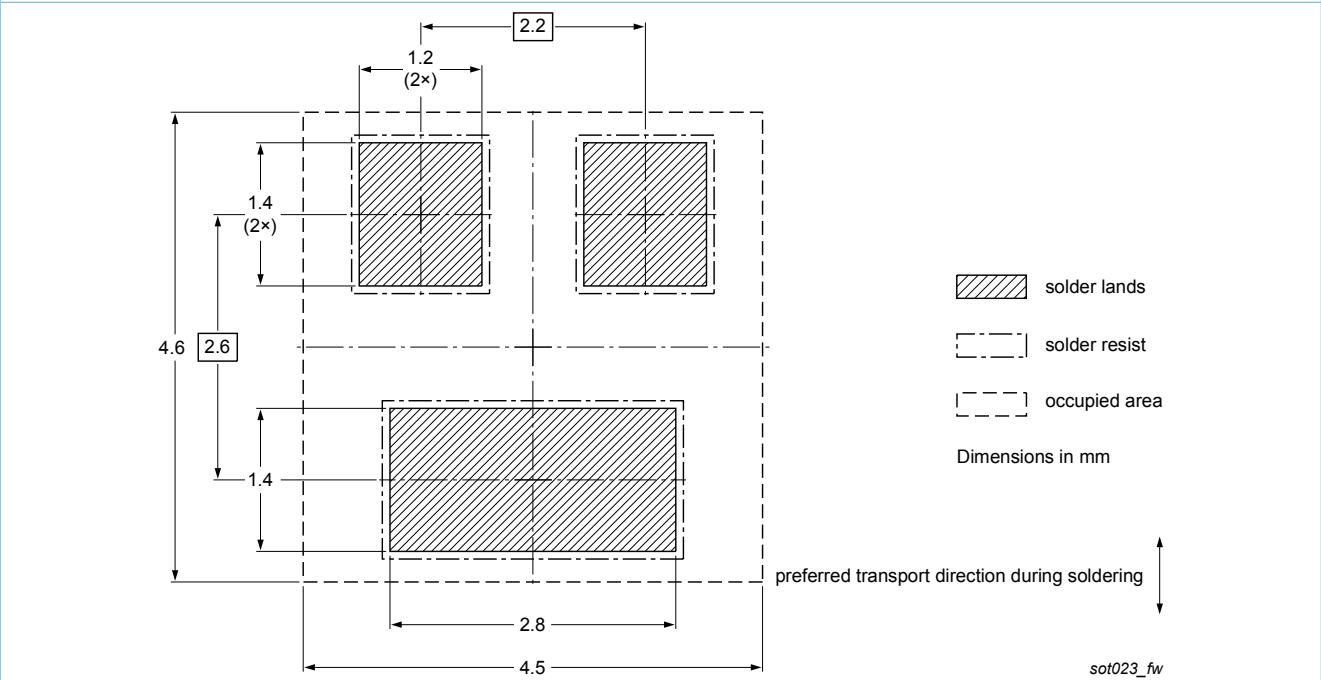


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV48XPA v.1	20140310	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.
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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 3

9 Thermal characteristics 4

10 Characteristics 6

11 Test information 10

11.1 Quality information 10

12 Package outline 10

13 Soldering 11

14 Revision history 12

15 Legal information 13

15.1 Data sheet status 13

15.2 Definitions 13

15.3 Disclaimers 13

15.4 Trademarks 14

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Date of release: 10 March 2014

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