PMV33UPE

20 V, single P-channel Trench MOSFET

Rev. 1 — 12 June 2012 **Product data sheet**

1. Product profile

1.1 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.

1.2 Features and benefits

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology
- 2 kV ESD protected

1.3 Applications

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

1.4 Quick reference data

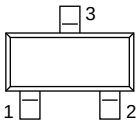
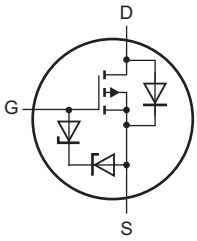
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-20	V
V_{GS}	gate-source voltage			-8	-	8	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-	-5.3	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -3 A; T_j = 25 °C		-	30	36	mΩ

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

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT23 (TO-236AB)	 017aaa259
2	S	source		
3	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV33UPE	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PMV33UPE	EJ%

[1] % = placeholder for manufacturing site code

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5. Limiting values

Table 5. Limiting values

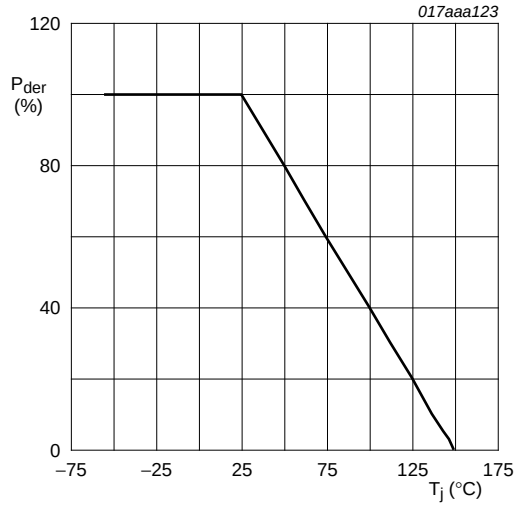
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-20	V
V_{GS}	gate-source voltage			-8	8	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-5.3	A
		V_{GS} = -4.5 V; T_{amb} = 25 °C	[1]	-	-4.4	A
		V_{GS} = -4.5 V; T_{amb} = 100 °C	[1]	-	-2.8	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	-17.6	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	490	mW
			[1]	-	980	mW
		T_{sp} = 25 °C		-	4150	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 °C	[1]	-	-1.2	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, mounting pad for drain 6 cm^2.

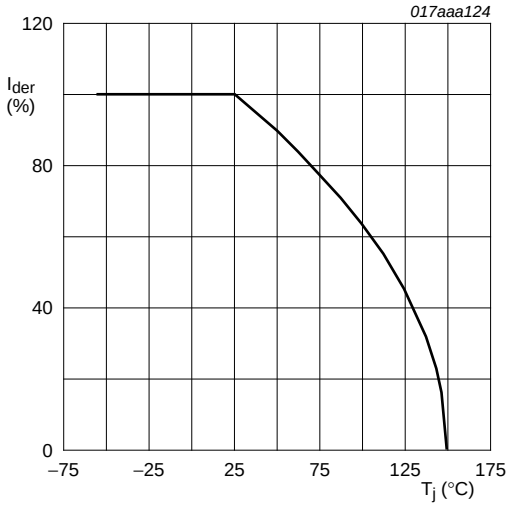
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Measured between all pins.



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

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



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

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

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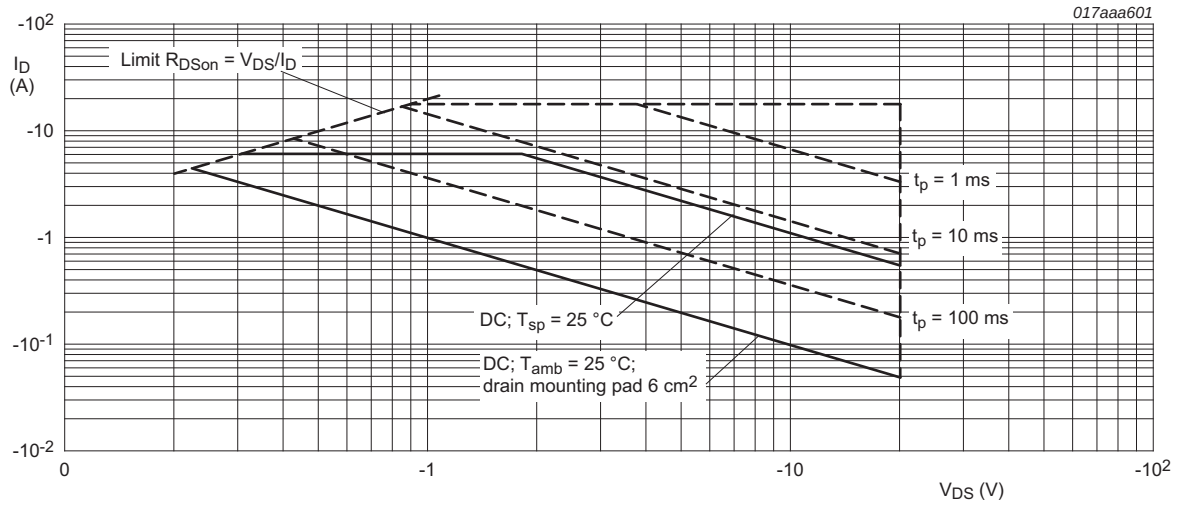

I_{DM} = single pulse

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

6. 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]	-	222	255	K/W
			[2]	-	111	128	K/W
			[3]	-	74	85	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.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2, $t \leq 5$ s.

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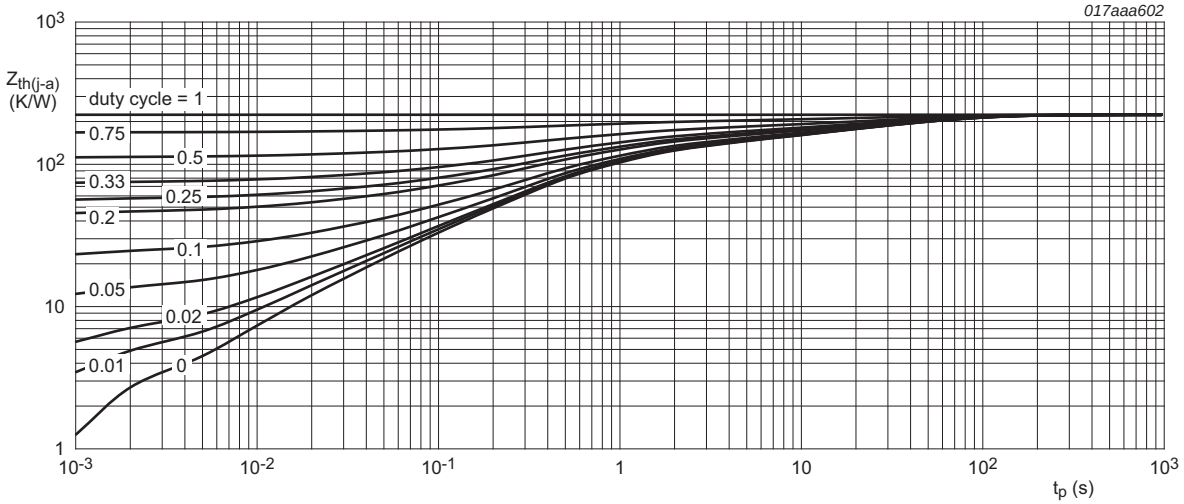
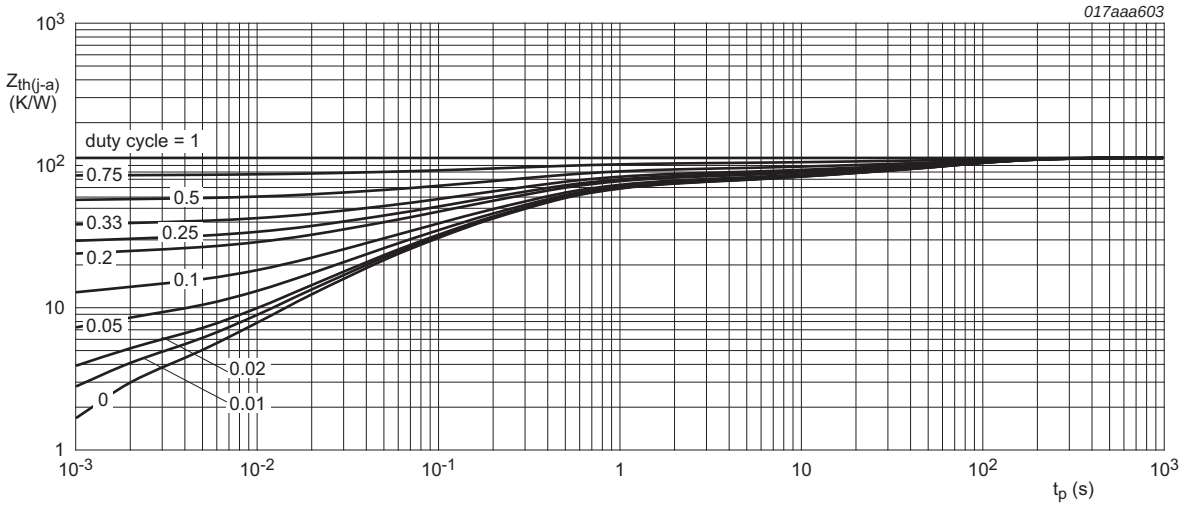


FR4 PCB, standard footprint

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

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7. 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	-0.45	-0.7	-0.95	V
I_{DSS}	drain leakage current	V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 °C	-	-	-1	µA
		V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 °C	-	-	-15	µA
I_{GSS}	gate leakage current	V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 °C	-	-	-10	µA
		V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 °C	-	-	-10	µA
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -3 A; T_j = 25 °C	-	30	36	mΩ
		V_{GS} = -4.5 V; I_D = -3 A; T_j = 150 °C	-	43	51	mΩ
		V_{GS} = -2.5 V; I_D = -3 A; T_j = 25 °C	-	38	47	mΩ
		V_{GS} = -1.8 V; I_D = -3 A; T_j = 25 °C	-	51	65	mΩ
g_{fs}	forward transconductance	V_{DS} = -10 V; I_D = -4.4 A; T_j = 25 °C	-	16	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	V_{DS} = -10 V; I_D = -4.4 A; V_{GS} = -4.5 V; T_j = 25 °C	-	14.7	22.1	nC
Q_{GS}	gate-source charge		-	2.6	-	nC
Q_{GD}	gate-drain charge		-	2.5	-	nC
C_{iss}	input capacitance	V_{DS} = -10 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C	-	1820	-	pF
C_{oss}	output capacitance		-	208	-	pF
C_{rss}	reverse transfer capacitance		-	146	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -10 V; I_D = -4.4 A; V_{GS} = -4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C	-	11	-	ns
t_r	rise time		-	30	-	ns
$t_{d(off)}$	turn-off delay time		-	83	-	ns
t_f	fall time		-	39	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = -1.2 A; V_{GS} = 0 V; T_j = 25 °C	-	-0.7	-1.2	V

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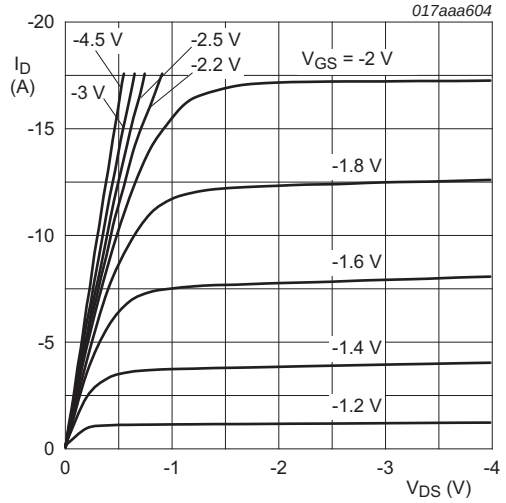
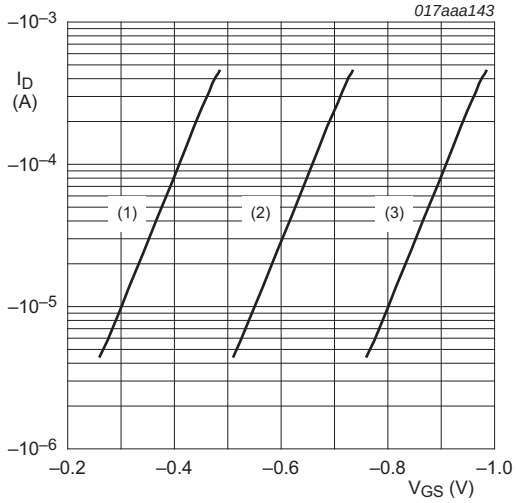


T_j = 25 °C

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



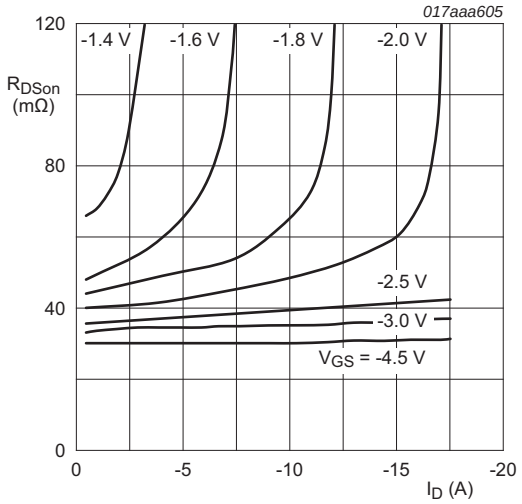
T_j = 25 °C; V_{DS} = -3 V

(1) minimum values

(2) typical values

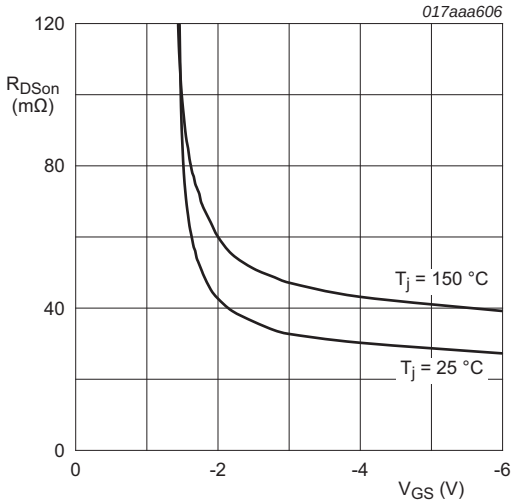
(3) maximum values

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



T_j = 25 °C

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



I_D = -4.4 A

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

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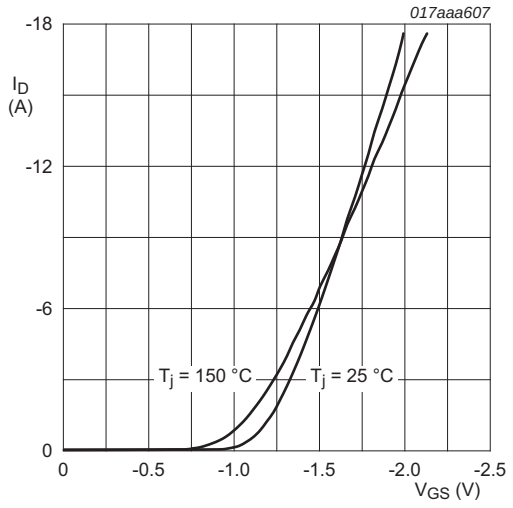
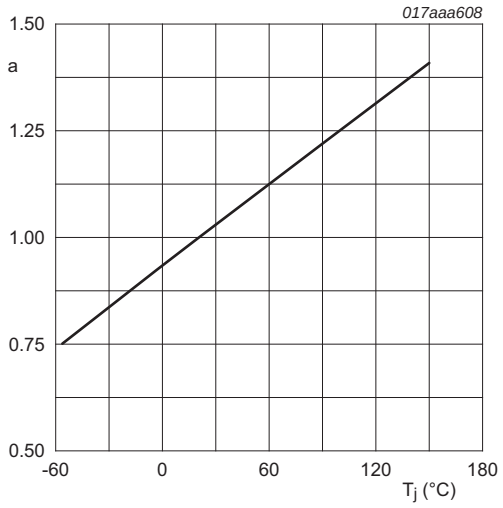


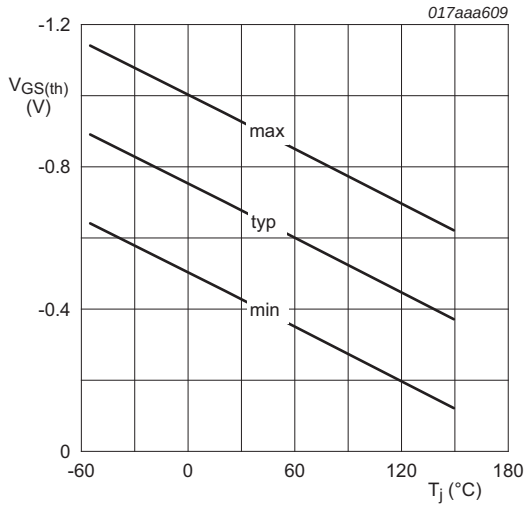
$V_{DS} > I_D \times R_{DSon}$

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



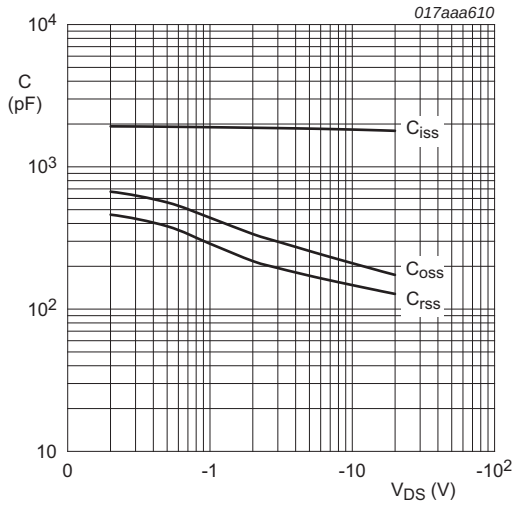
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



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

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



f = 1 MHz; V_{GS} = 0 V

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

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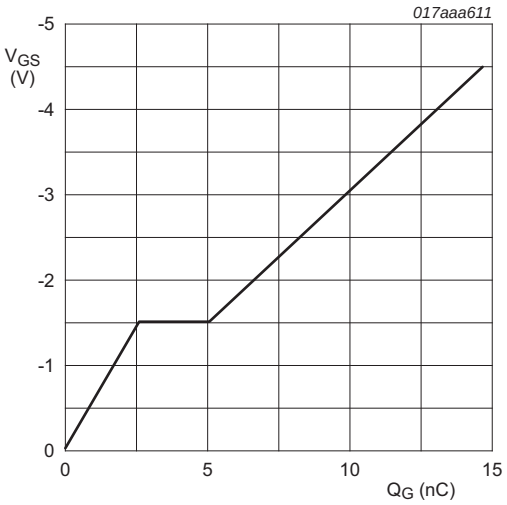


I_D = −4.4 A; V_{DS} = −10 V; T_{amb} = 25 °C

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

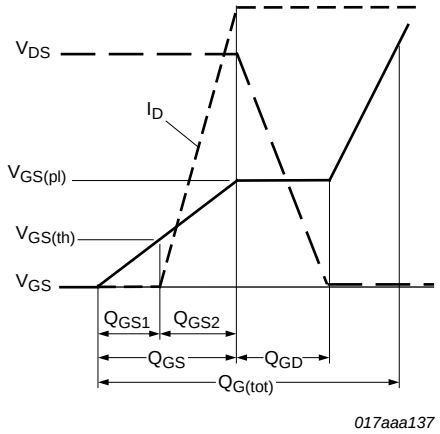
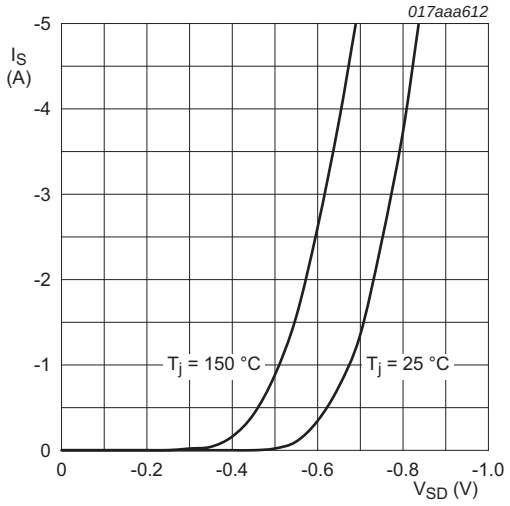


Fig 15. Gate charge waveform definitions



V_{GS} = 0 V

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

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8. Test information

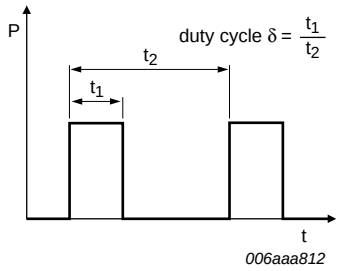

Fig 17. Duty cycle definition

9. Package outline

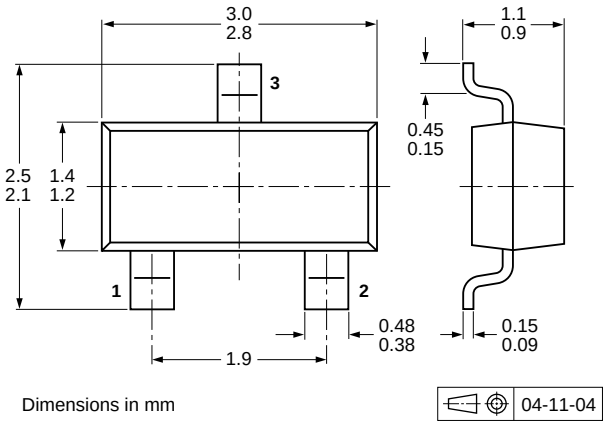

Fig 18. Package outline SOT23 (TO-236AB)

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10. Soldering

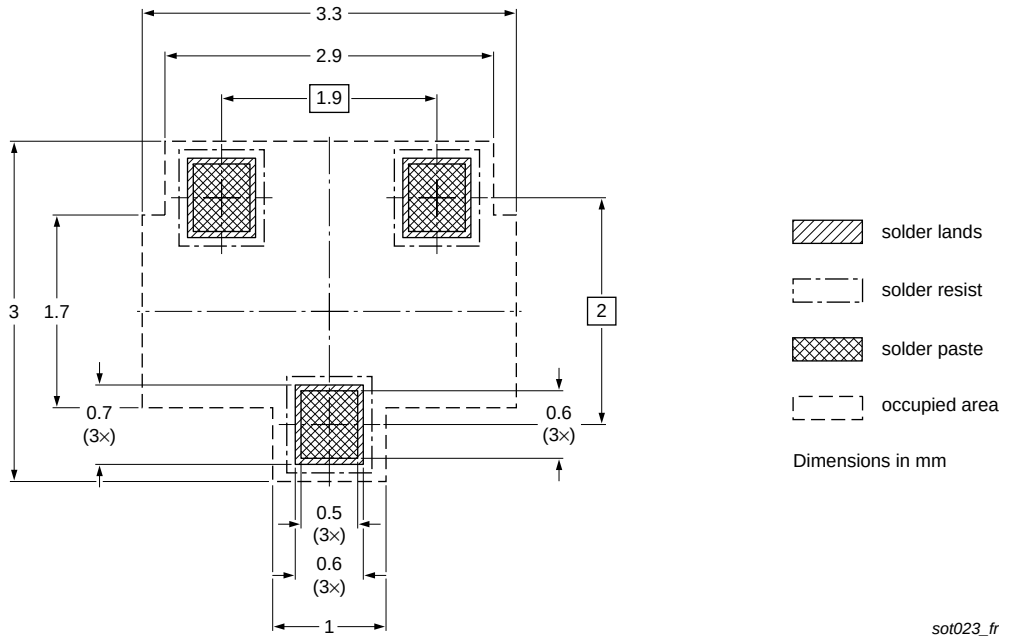

Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

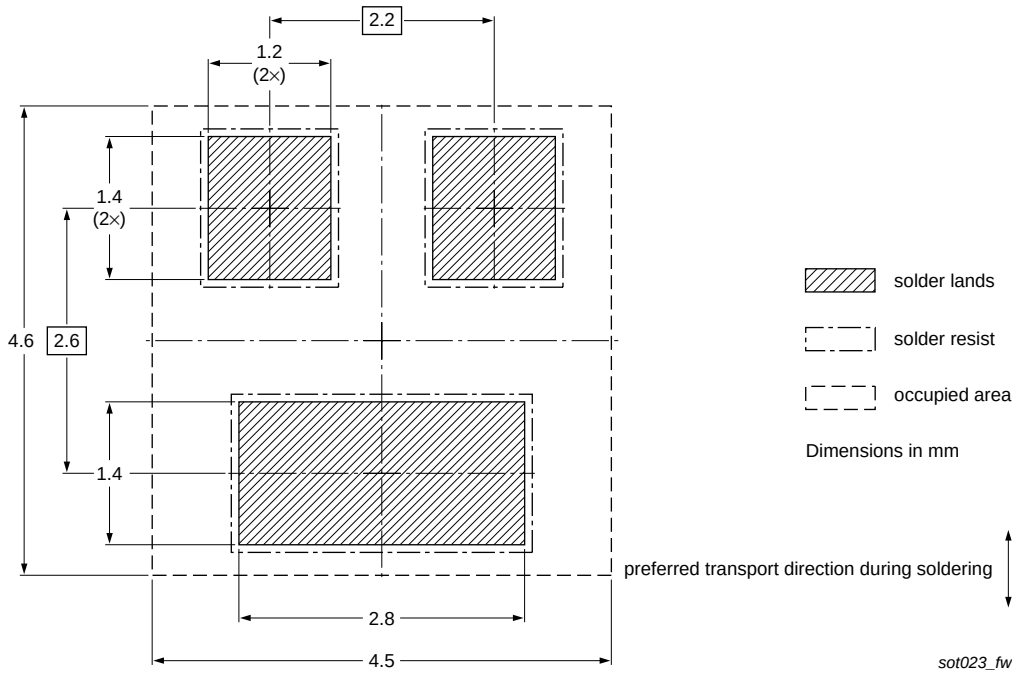

Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

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11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV33UPE v.1	20120612	Product data sheet	-	-

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12.1 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.

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For more information, please visit: http://www.nxp.com

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Date of release: 12 June 2012
Document identifier: PMV33UPE