



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

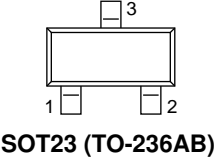
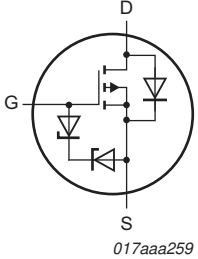
Table 1. Quick reference data

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

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

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>SOT23 (TO-236AB)</p>	 <p>017aaa259</p>
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

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	

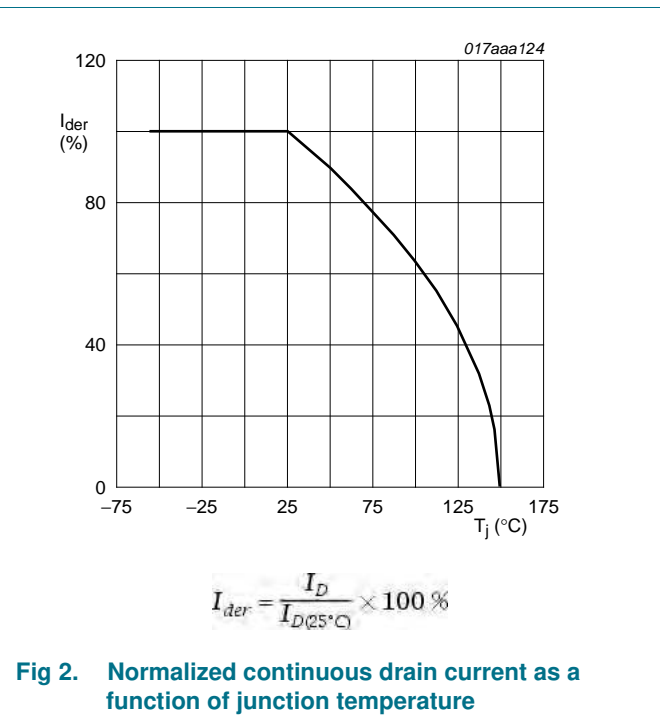
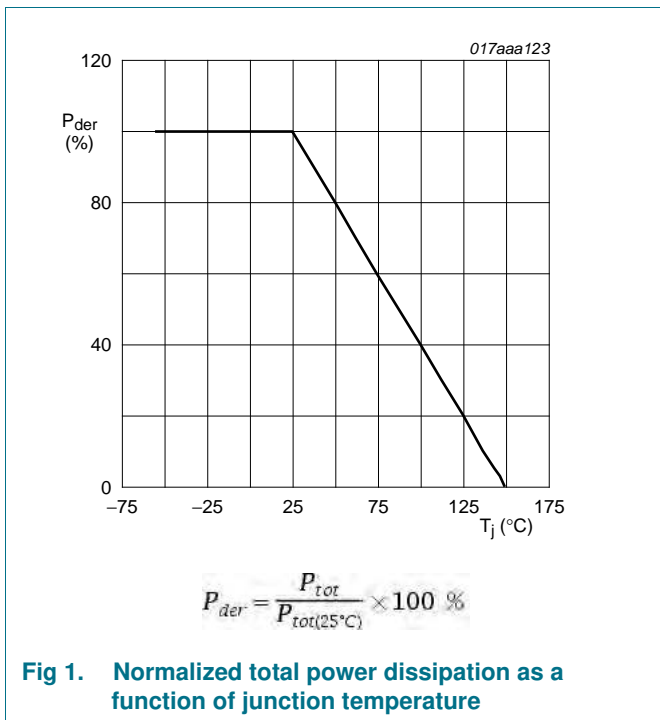
Source-drain diode

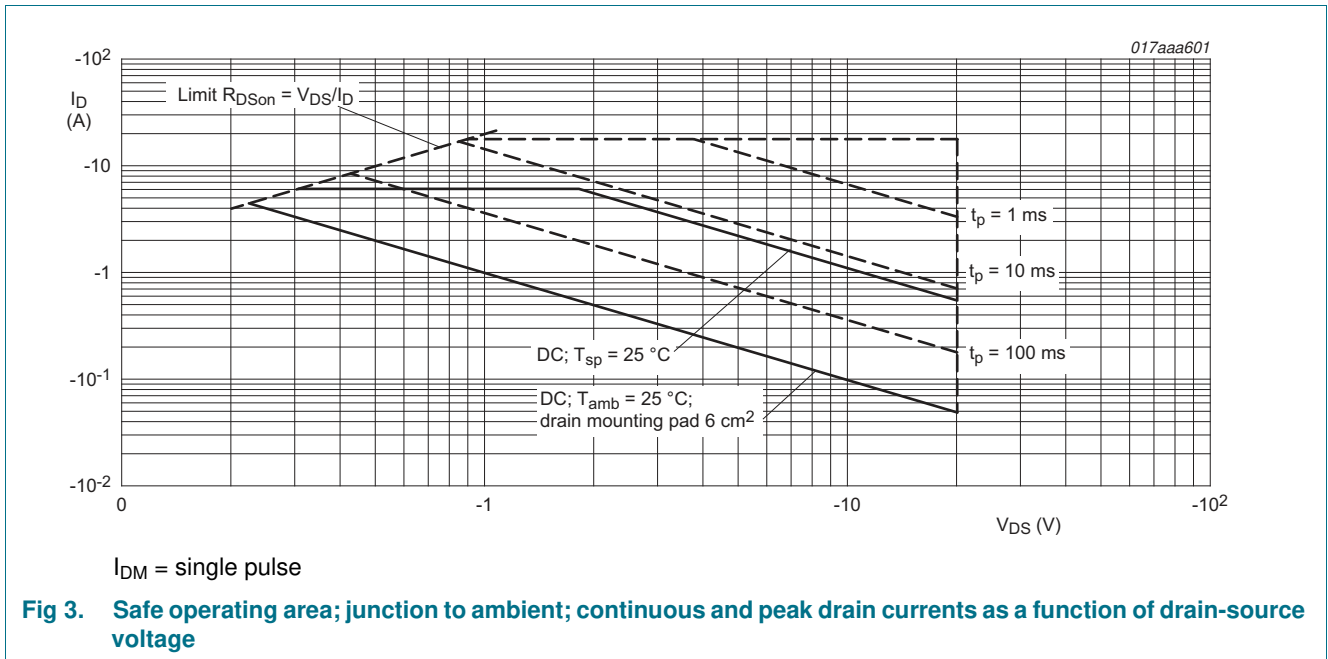
I _S	source current	T _{amb} = 25 °C	[1]	-	-1.2	A
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ESD maximum rating

V _{ESD}	electrostatic discharge voltage	HBM	[3]	-	2000	V
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- [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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [3] Measured between all pins.



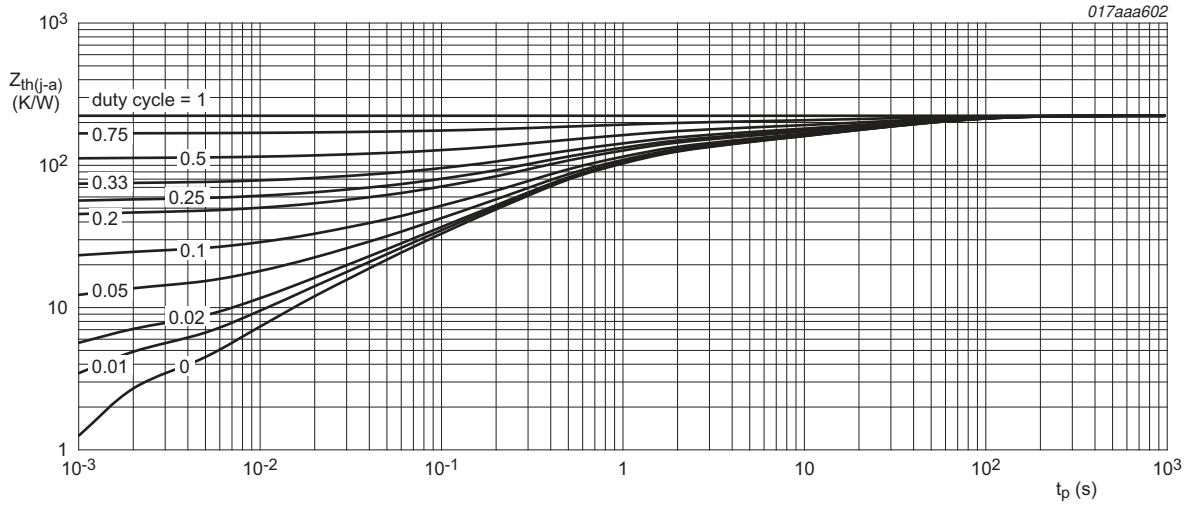


6. Thermal characteristics

Table 6. Thermal characteristics

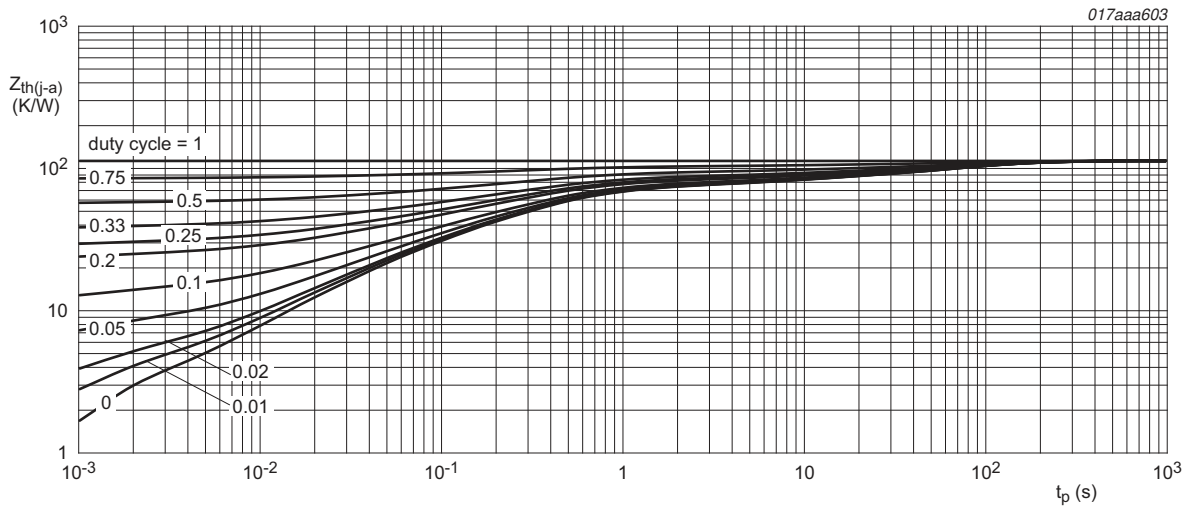
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	222	255	K/W
			[2]	-	111	128	K/W
			[3]	-	74	85	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	25	30	K/W	

- [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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm², t ≤ 5 s.



FR4 PCB, standard footprint

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



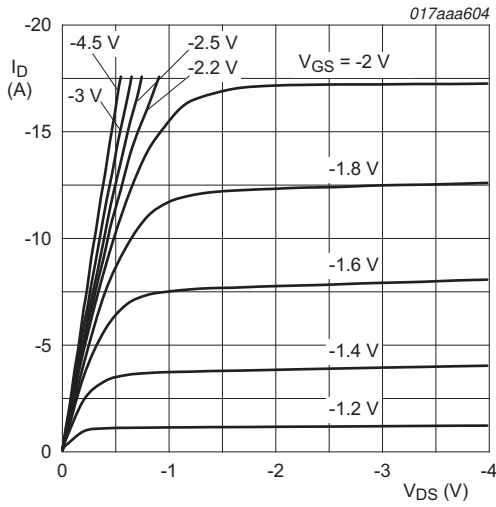
FR4 PCB, mounting pad for drain 6 cm²

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

7. Characteristics

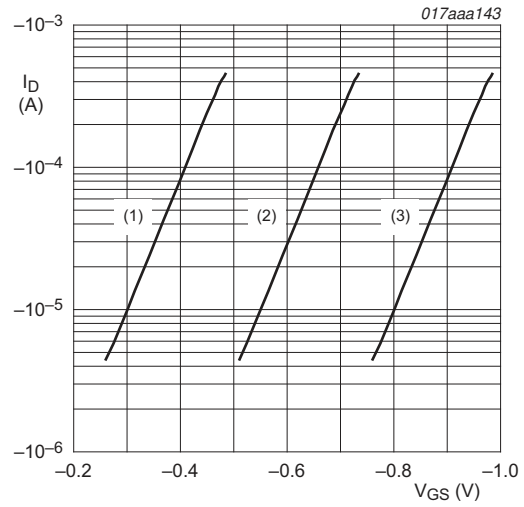
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	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	-0.7	-0.95	V
I_{DSS}	drain leakage current	$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	μA
		$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-15	μA
I_{GSS}	gate leakage current	$V_{GS} = -8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-10	μA
		$V_{GS} = 8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-10	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$; $I_D = -3 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	30	36	m Ω
		$V_{GS} = -4.5 \text{ V}$; $I_D = -3 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	43	51	m Ω
		$V_{GS} = -2.5 \text{ V}$; $I_D = -3 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	38	47	m Ω
		$V_{GS} = -1.8 \text{ V}$; $I_D = -3 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	51	65	m Ω
g_{fs}	forward transconductance	$V_{DS} = -10 \text{ V}$; $I_D = -4.4 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	16	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$; $I_D = -4.4 \text{ A}$; $V_{GS} = -4.5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	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	$V_{DS} = -10 \text{ V}$; $f = 1 \text{ MHz}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	1820	-	pF
C_{oss}	output capacitance		-	208	-	pF
C_{rss}	reverse transfer capacitance		-	146	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$; $I_D = -4.4 \text{ A}$; $V_{GS} = -4.5 \text{ V}$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	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	$I_S = -1.2 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.7	-1.2	V



$T_j = 25\text{ }^\circ\text{C}$

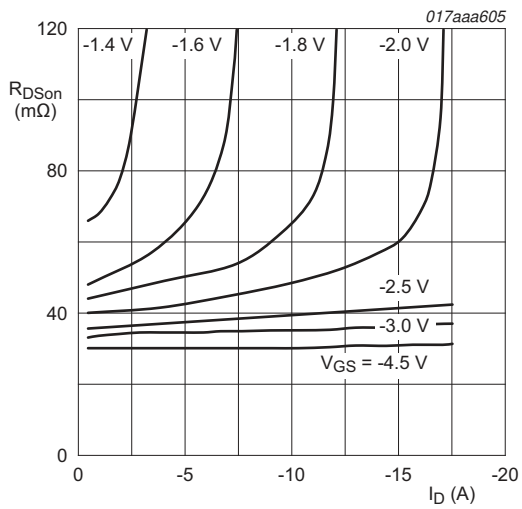
Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



$T_j = 25\text{ }^\circ\text{C}; V_{DS} = -3\text{ V}$

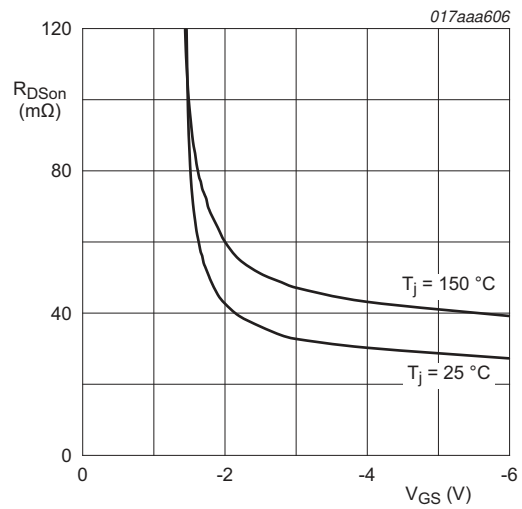
- (1) minimum values
- (2) typical values
- (3) maximum values

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



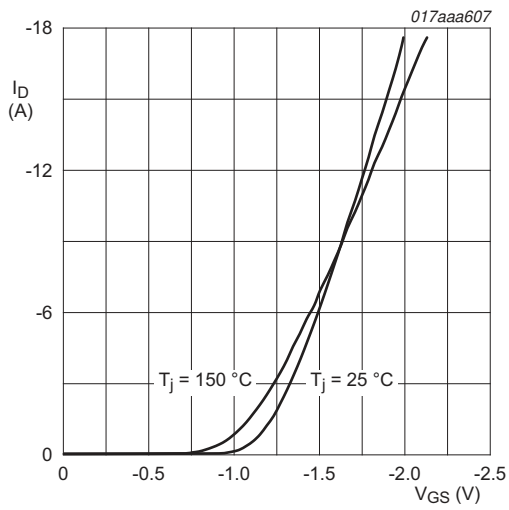
$T_j = 25\text{ }^\circ\text{C}$

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



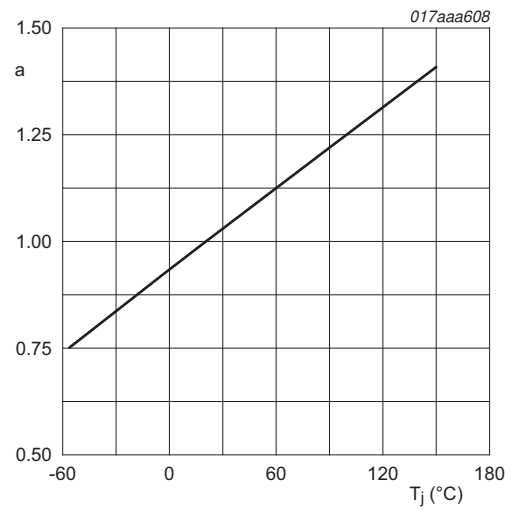
$I_D = -4.4\text{ A}$

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



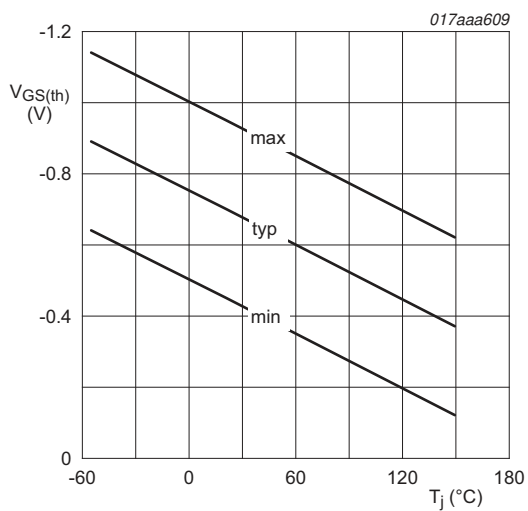
$$V_{DS} > I_D \times R_{DS(on)}$$

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



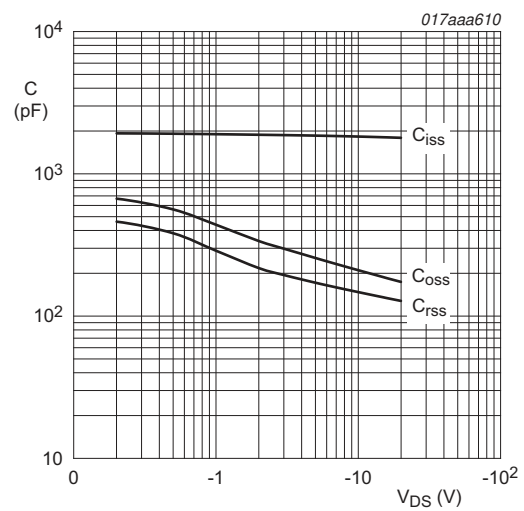
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ C)}}$$

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



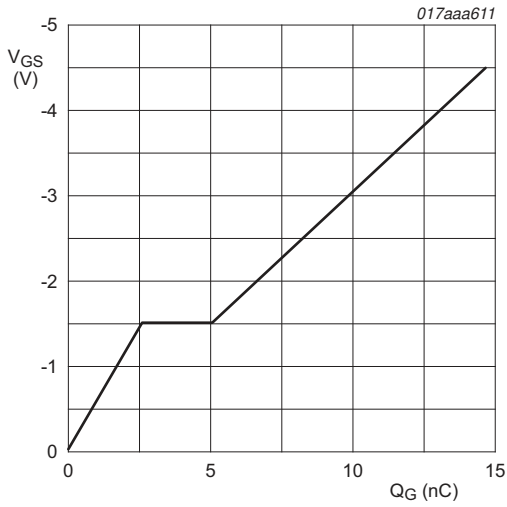
$$I_D = -0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



$I_D = -4.4 \text{ A}; V_{DS} = -10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

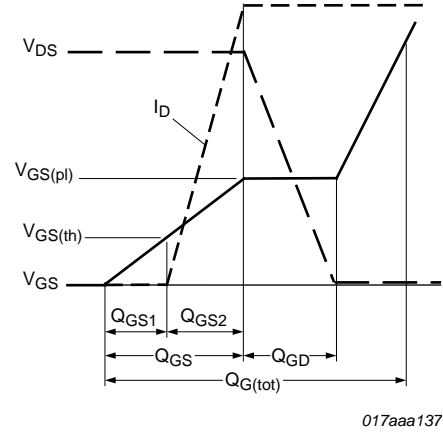
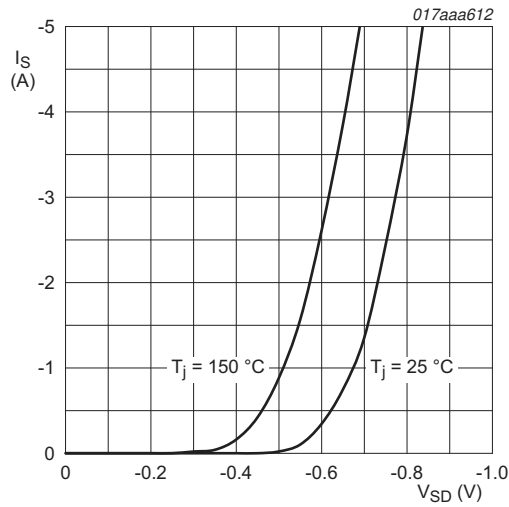


Fig 15. Gate charge waveform definitions



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

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

8. Test information

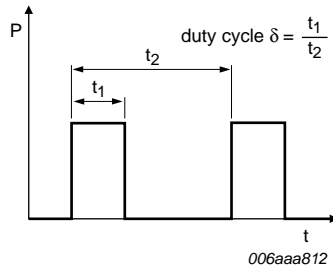


Fig 17. Duty cycle definition

9. Package outline

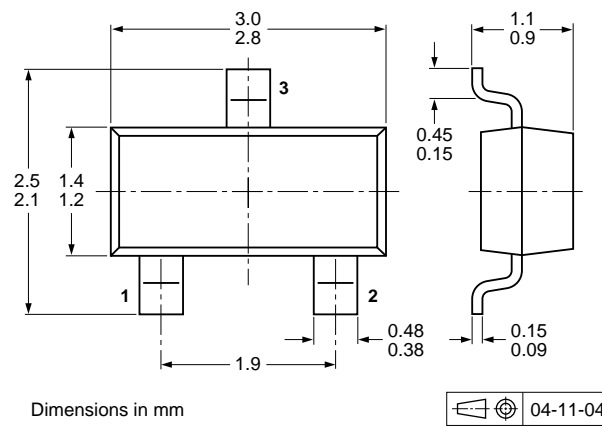


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

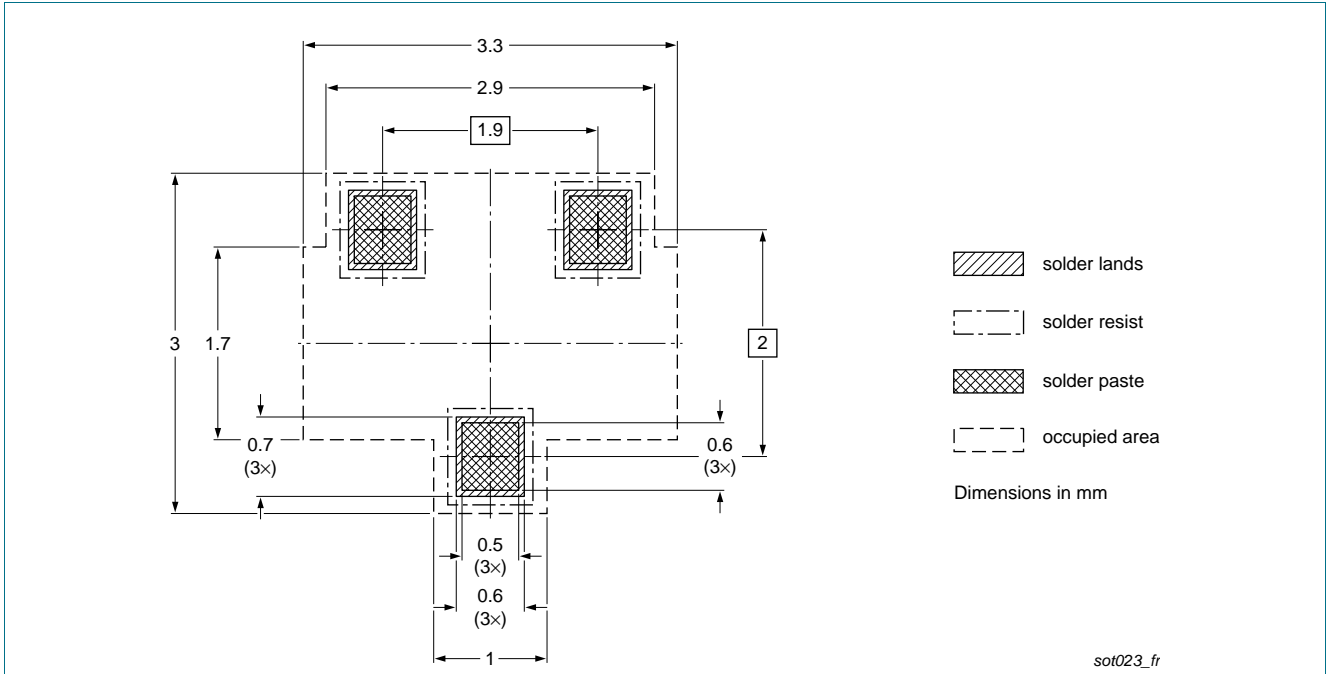


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

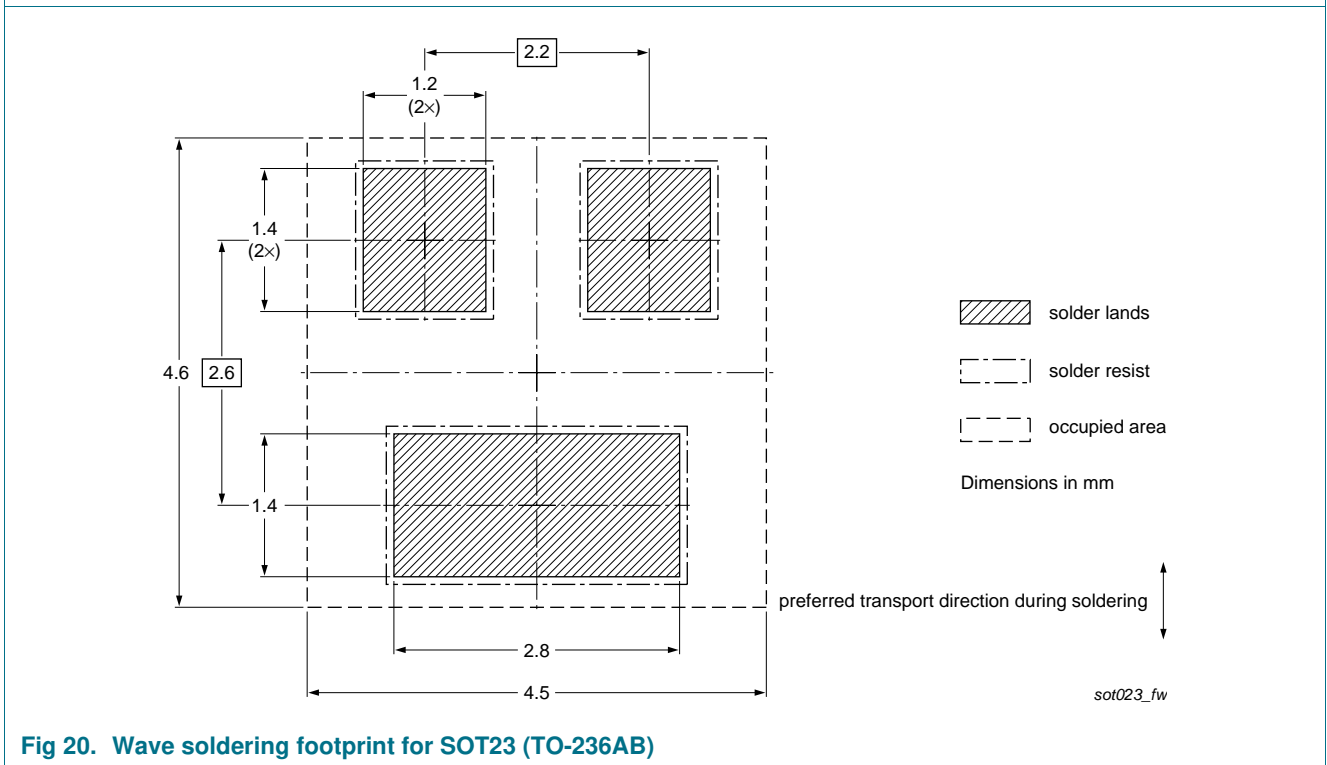


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

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

12. Legal information

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.

[2] The term 'short data sheet' is explained in section "Definitions".

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