



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

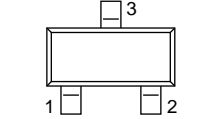
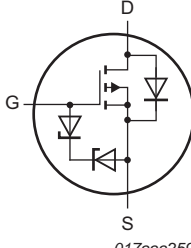
Table 1. Quick reference data

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	 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

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

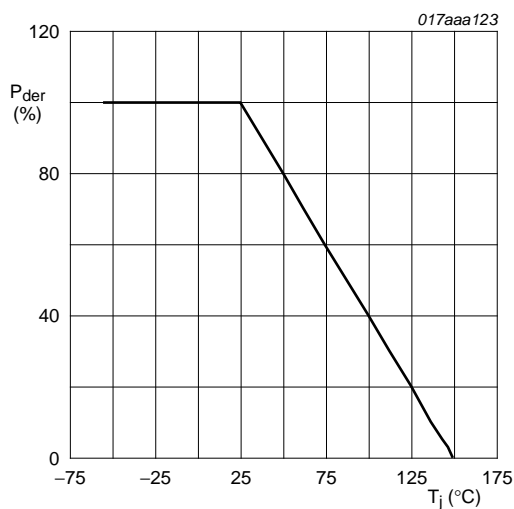
Source-drain diode

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

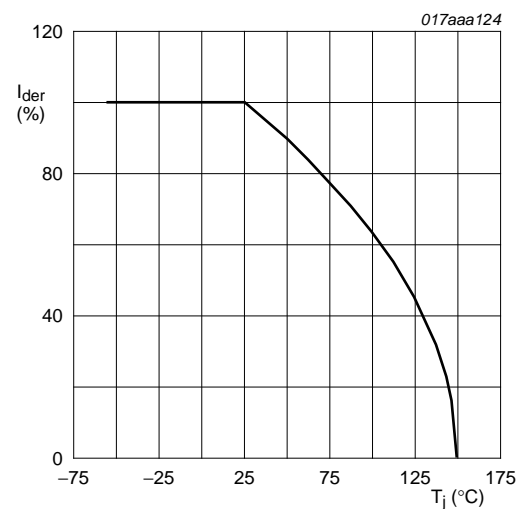
V _{ESD}	electrostatic discharge voltage	HBM [3]	-	2000	V
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- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².
 [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
 [3] Measured between all pins.



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

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



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

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

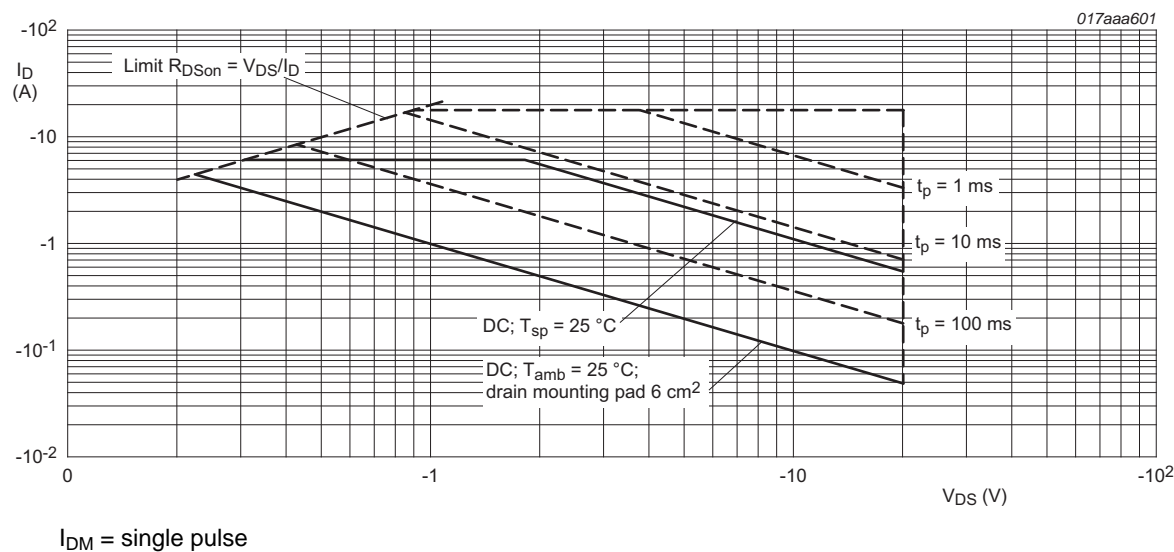


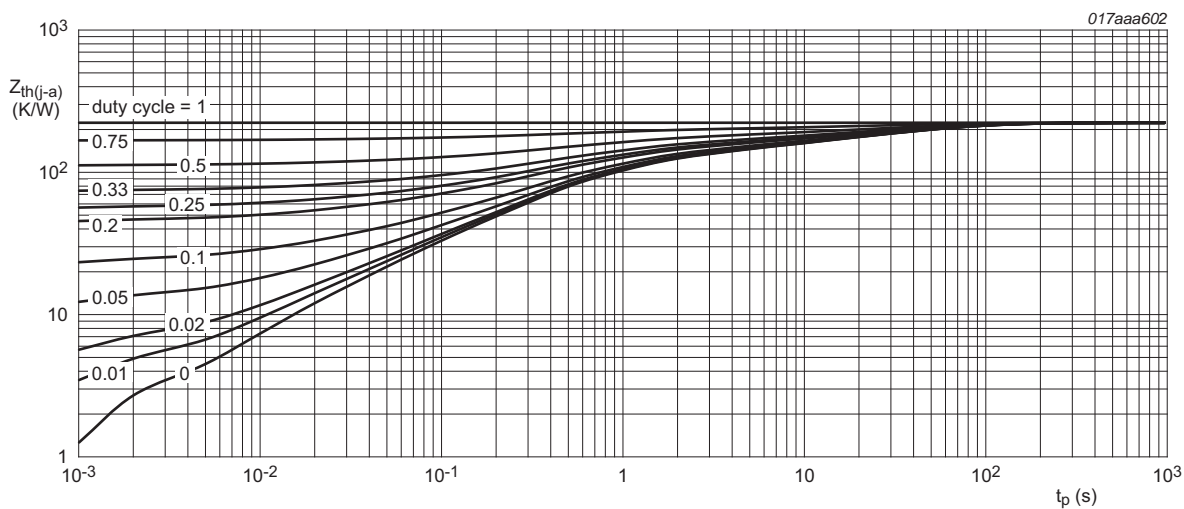
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. Thermal characteristics

Table 6. Thermal characteristics

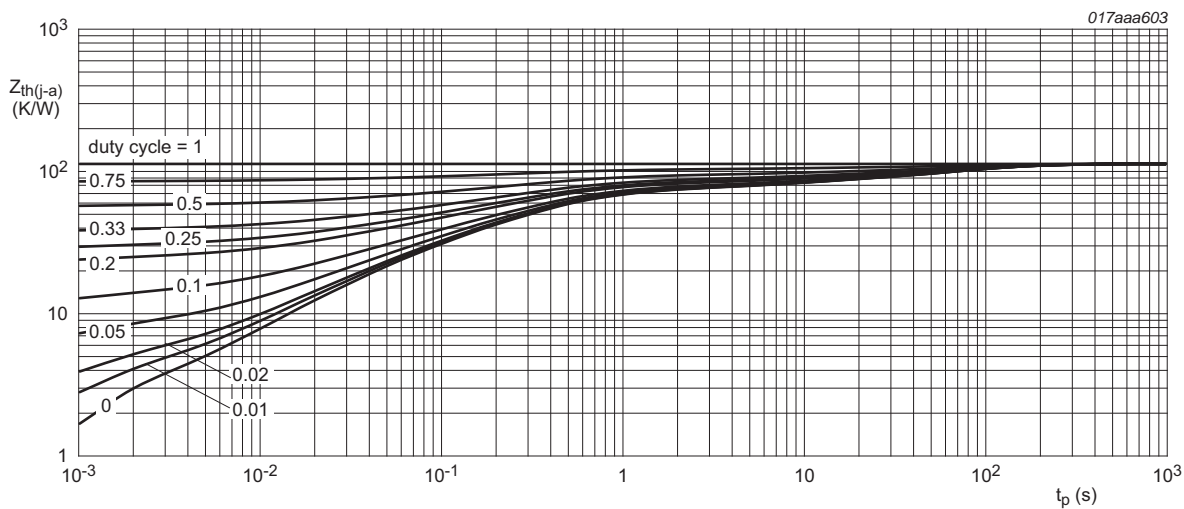
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	222	255 K/W
			[2]	-	111	128 K/W
			[3]	-	74	85 K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	25	30	K/W

- [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 , $t \leq 5\text{ s}$.



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	$I_D = -250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 ^\circ C$	-0.45	-0.7	-0.95	V
I_{DSS}	drain leakage current	$V_{DS} = -20 V$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-	-	-1	μA
		$V_{DS} = -20 V$; $V_{GS} = 0 V$; $T_j = 150 ^\circ C$	-	-	-15	μA
I_{GSS}	gate leakage current	$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	-	-10	μA
		$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	-	-10	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5 V$; $I_D = -3 A$; $T_j = 25 ^\circ C$	-	30	36	m Ω
		$V_{GS} = -4.5 V$; $I_D = -3 A$; $T_j = 150 ^\circ C$	-	43	51	m Ω
		$V_{GS} = -2.5 V$; $I_D = -3 A$; $T_j = 25 ^\circ C$	-	38	47	m Ω
		$V_{GS} = -1.8 V$; $I_D = -3 A$; $T_j = 25 ^\circ C$	-	51	65	m Ω
g_{fs}	forward transconductance	$V_{DS} = -10 V$; $I_D = -4.4 A$; $T_j = 25 ^\circ C$	-	16	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 V$; $I_D = -4.4 A$; $V_{GS} = -4.5 V$; $T_j = 25 ^\circ C$	-	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	$V_{DS} = -10 V$; $f = 1 MHz$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-	1820	-	pF
C_{oss}	output capacitance		-	208	-	pF
C_{rss}	reverse transfer capacitance		-	146	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 V$; $I_D = -4.4 A$; $V_{GS} = -4.5 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 ^\circ C$	-	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	$I_S = -1.2 A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-	-0.7	-1.2	V

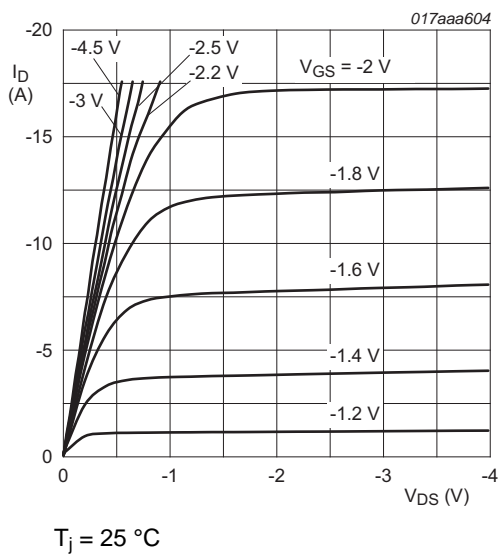


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

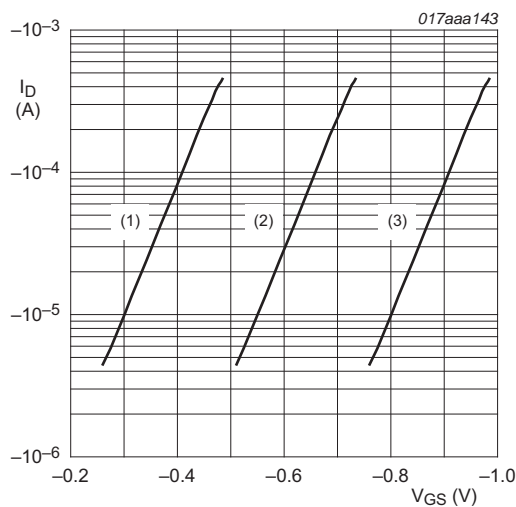


Fig 7. Sub-threshold drain current as a function of gate-source voltage

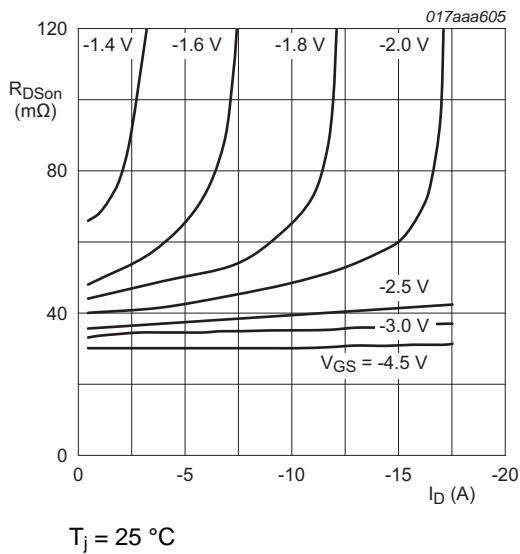


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

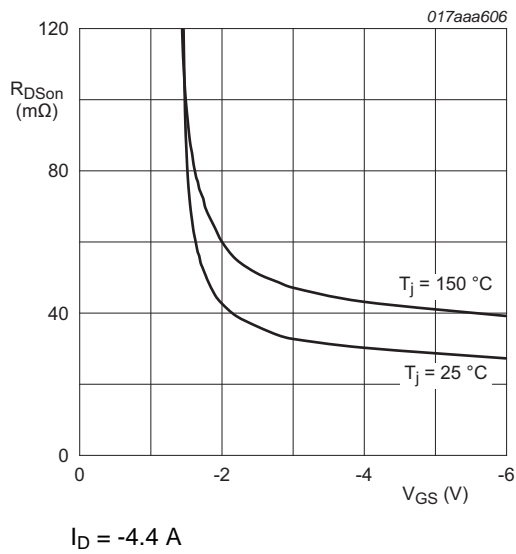


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

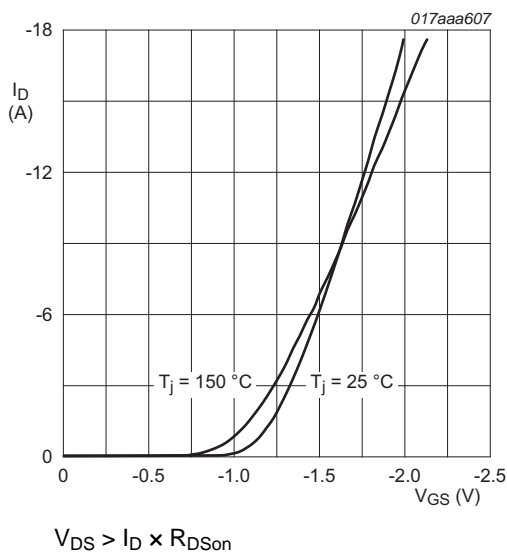


Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

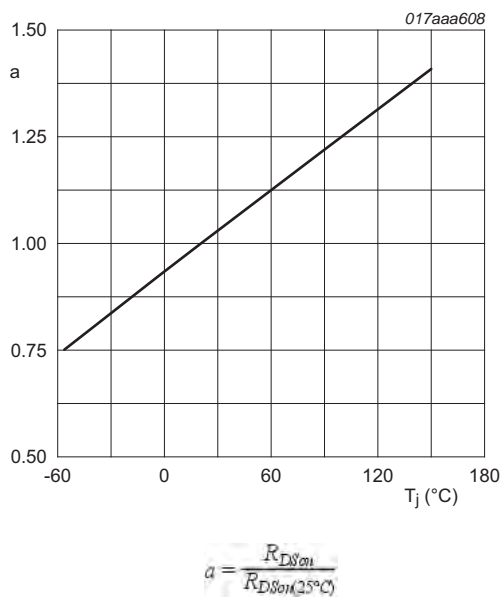
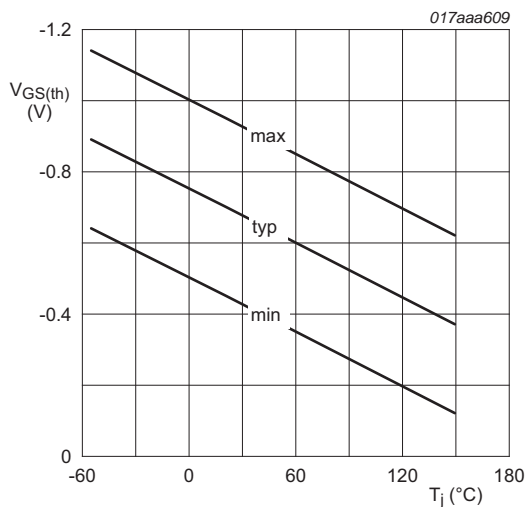
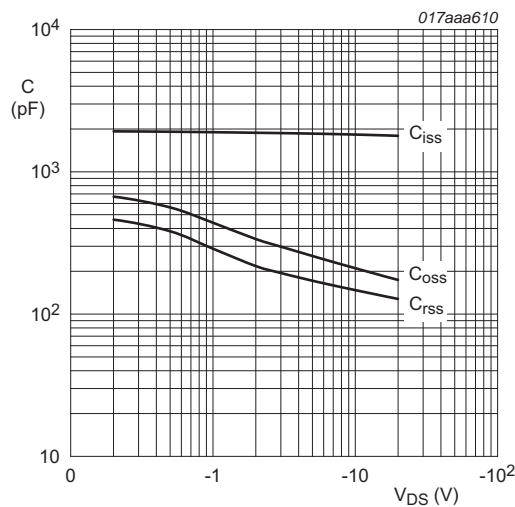


Fig 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values



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

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

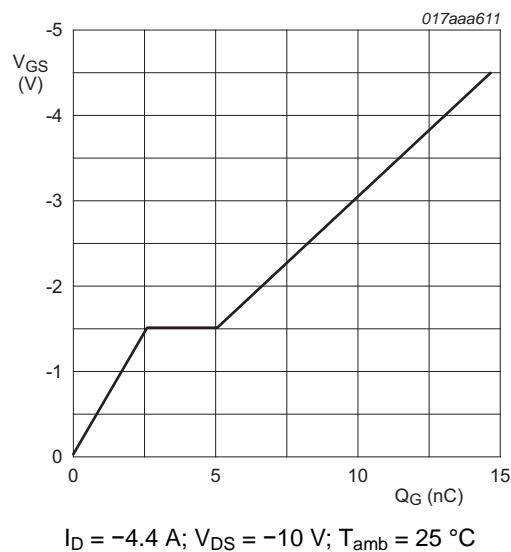


Fig 14. Gate-source voltage as a function of gate charge; typical values

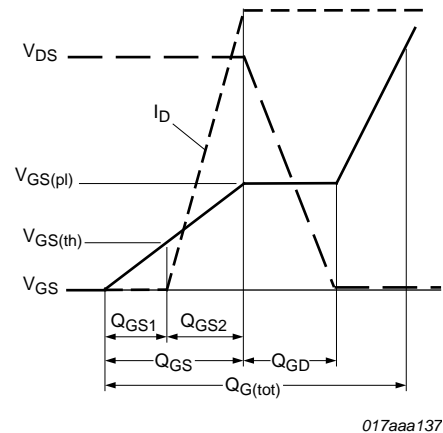


Fig 15. Gate charge waveform definitions

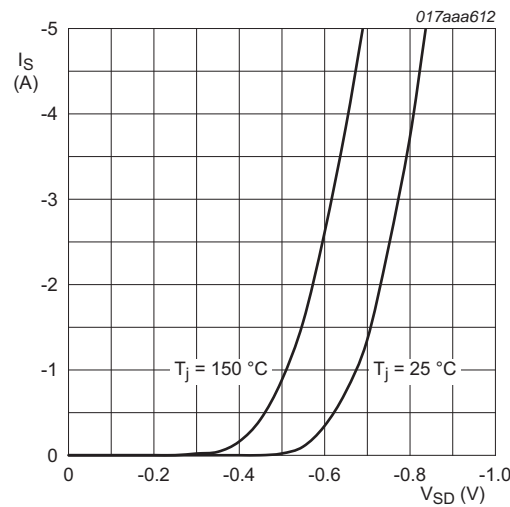


Fig 16. Source current as a function of source-drain voltage; typical values

8. Test information

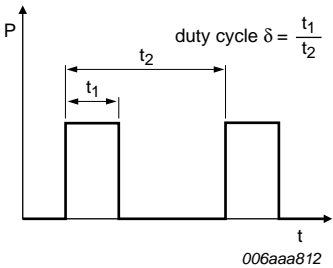


Fig 17. Duty cycle definition

9. Package outline

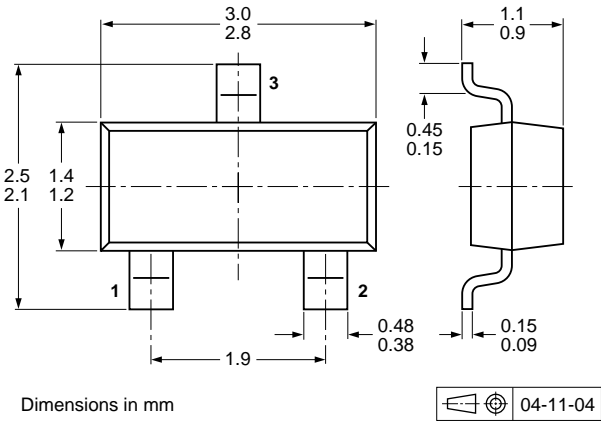


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

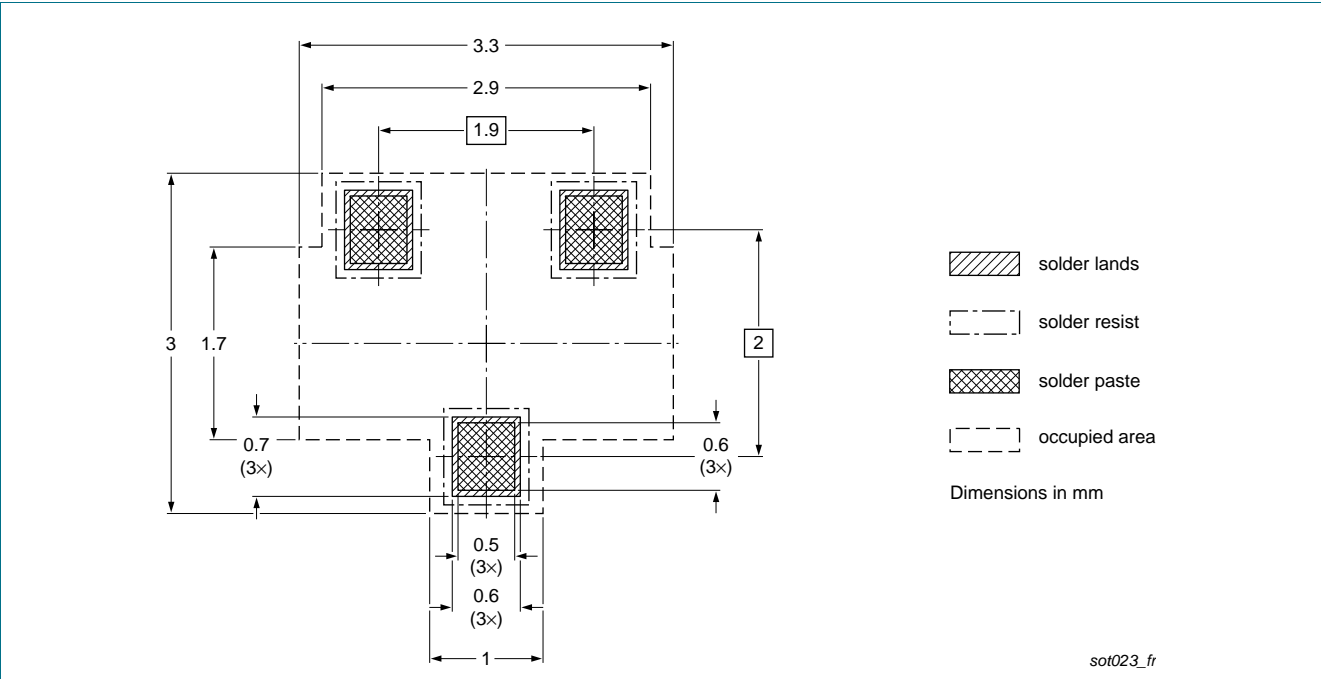


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

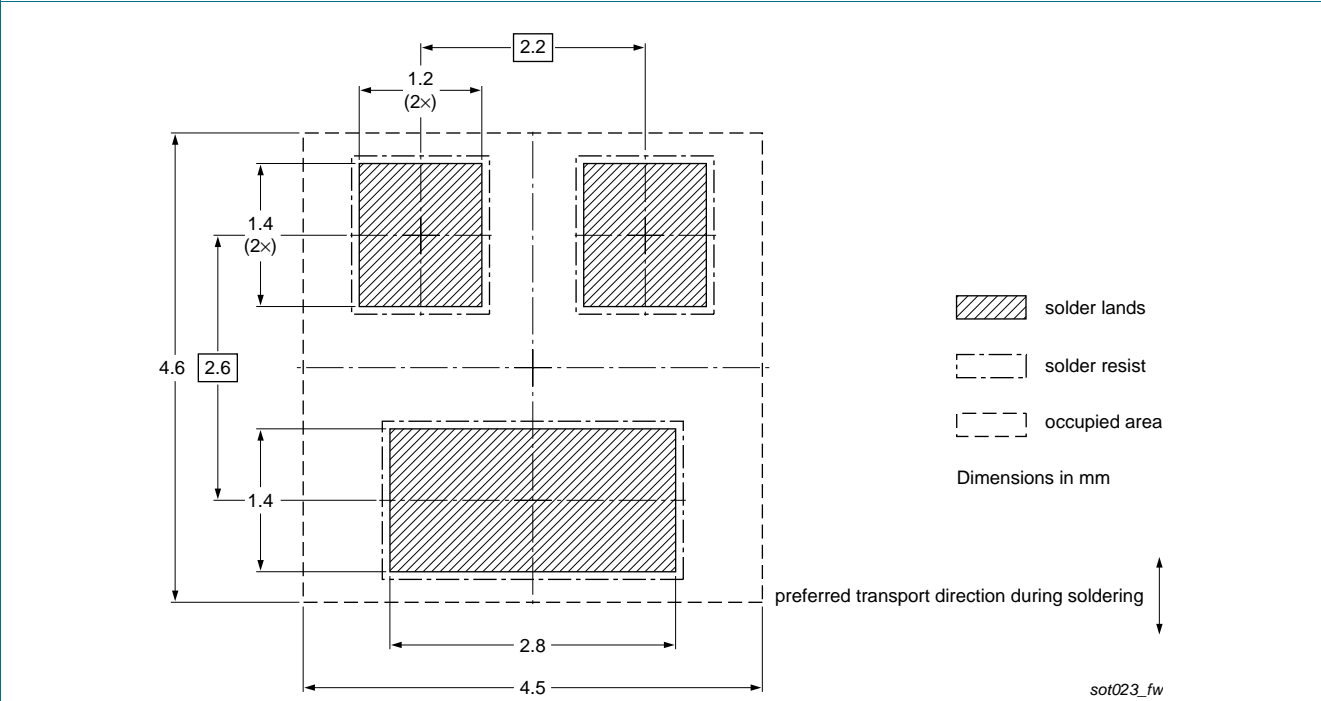


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

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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14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Marking	2
5	Limiting values	3
6	Thermal characteristics	4
7	Characteristics	6
8	Test information	10
9	Package outline	10
10	Soldering	11
11	Revision history	12
12	Legal information	13
12.1	Data sheet status	13
12.2	Definitions	13
12.3	Disclaimers	13
12.4	Trademarks	14
13	Contact information	14