



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

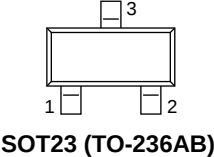
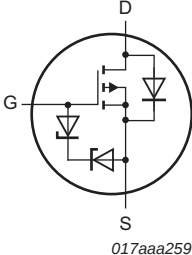
Table 1. Quick reference data

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	$T_j = 25\text{ }^{\circ}\text{C}$	-	-20	V
V_{GS}	gate-source voltage		-8	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$ [1]	-	-5.3	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [1]	-	-4.4	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ }^{\circ}\text{C}$ [1]	-	-2.8	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^{\circ}\text{C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-17.6	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	490	mW
		[1]	-	980	mW
		$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	4150	mW
T_j	junction temperature		-55	150	$^{\circ}\text{C}$
T_{amb}	ambient temperature		-55	150	$^{\circ}\text{C}$
T_{stg}	storage temperature		-65	150	$^{\circ}\text{C}$

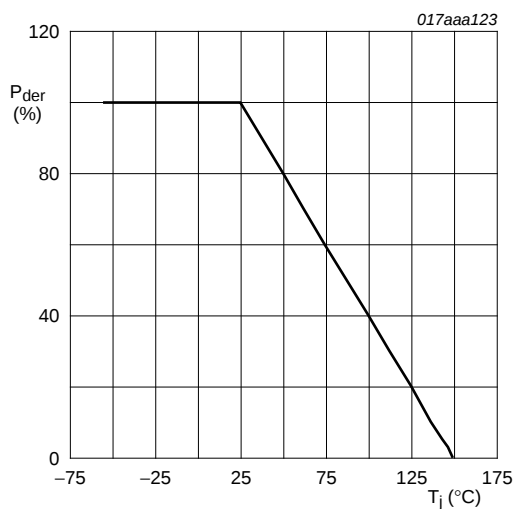
Source-drain diode

I_S	source current	$T_{amb} = 25\text{ }^{\circ}\text{C}$ [1]	-	-1.2	A
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ESD maximum rating

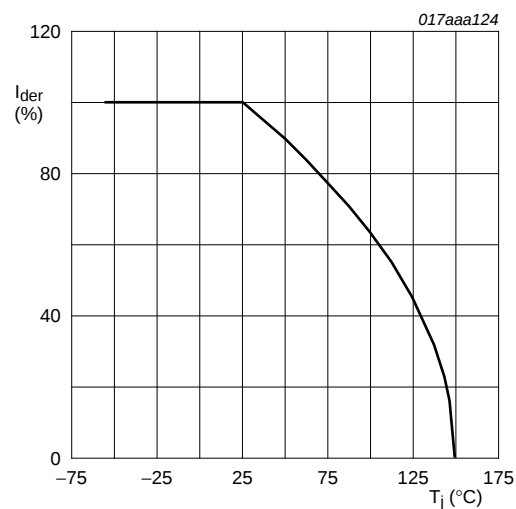
V_{ESD}	electrostatic discharge voltage	HBM [3]	-	2000	V
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- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².
 [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided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

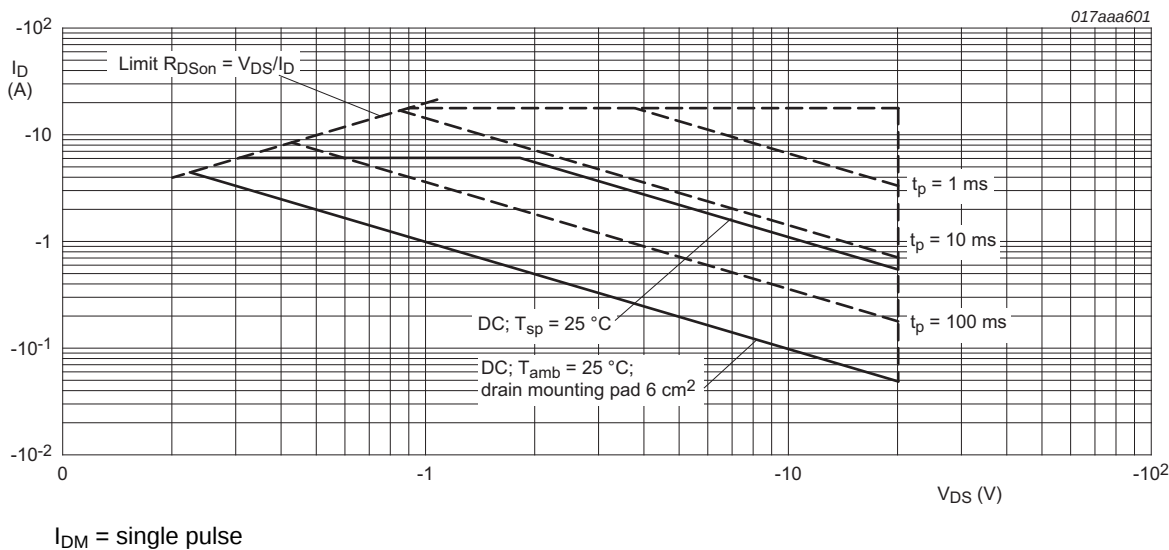


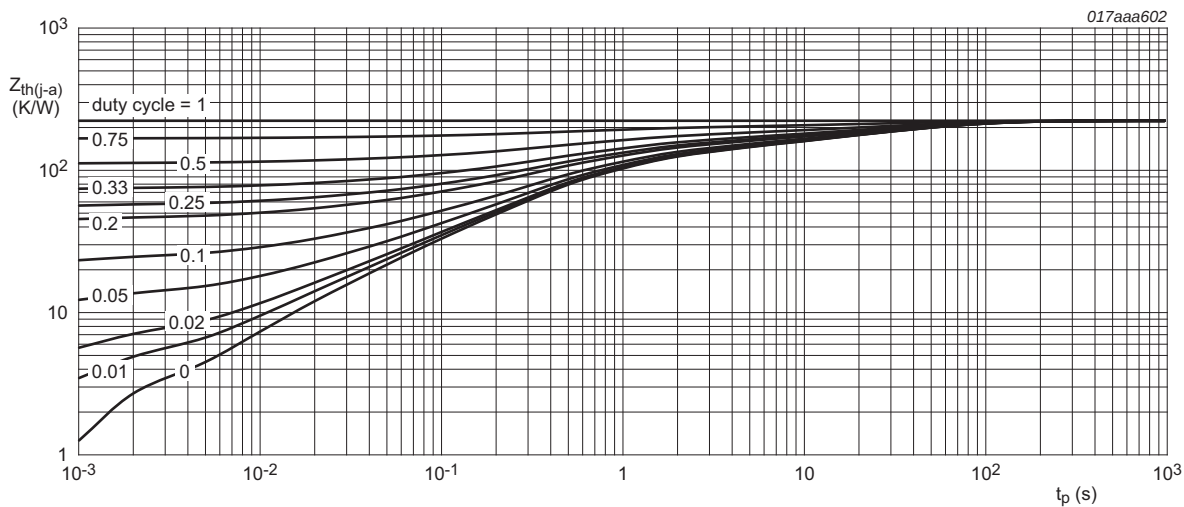
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. Thermal characteristics

Table 6. Thermal characteristics

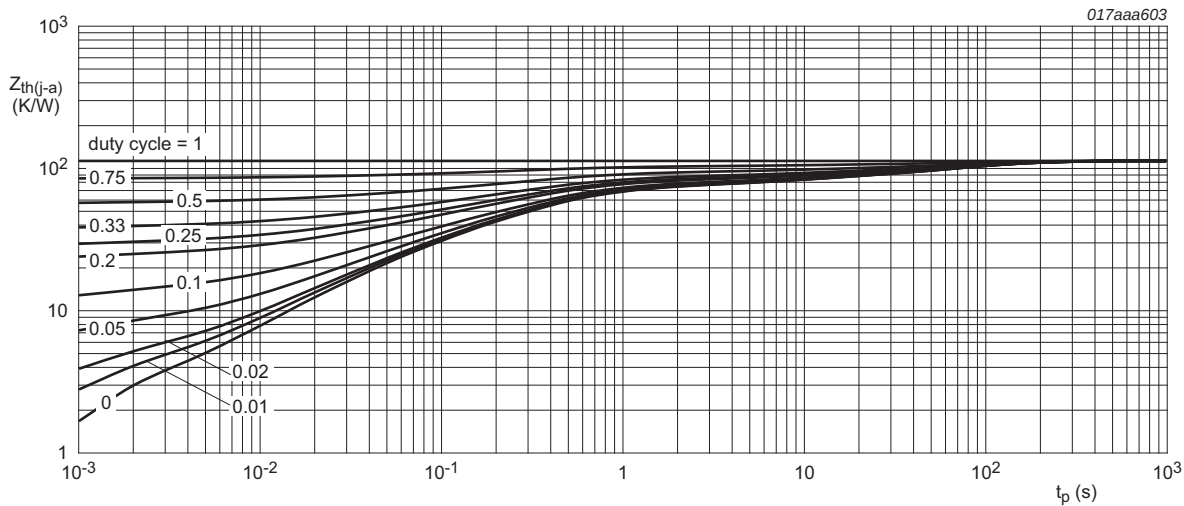
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	222	255 K/W
			[2]	-	111	128 K/W
			[3]	-	74	85 K/W
R _{th(j-sp)}	thermal resistance from junction to solder point		-	25	30	K/W

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

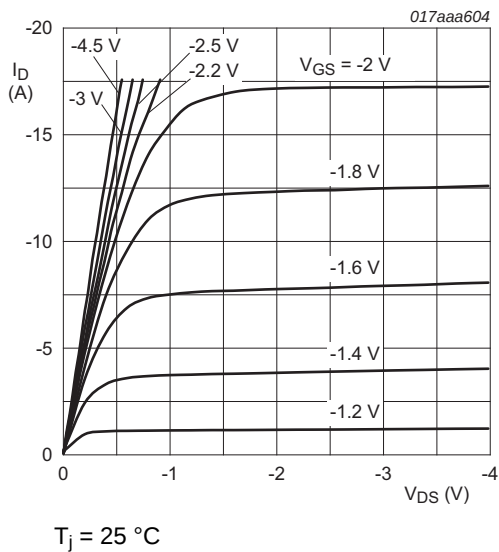


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

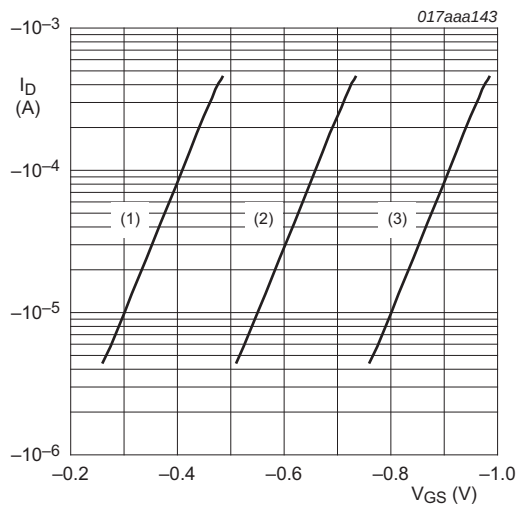


Fig 7. Sub-threshold drain current as a function of gate-source voltage

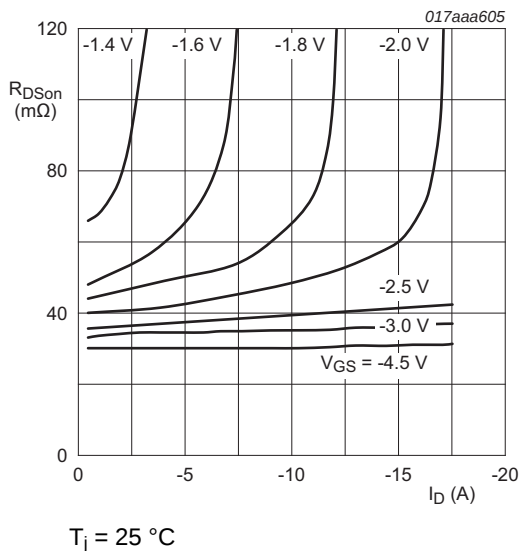


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

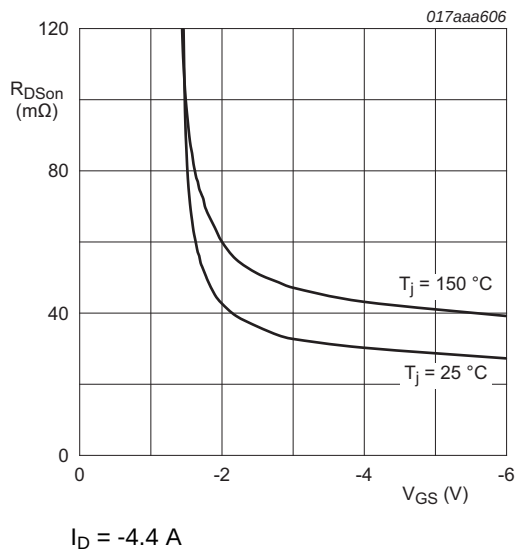


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

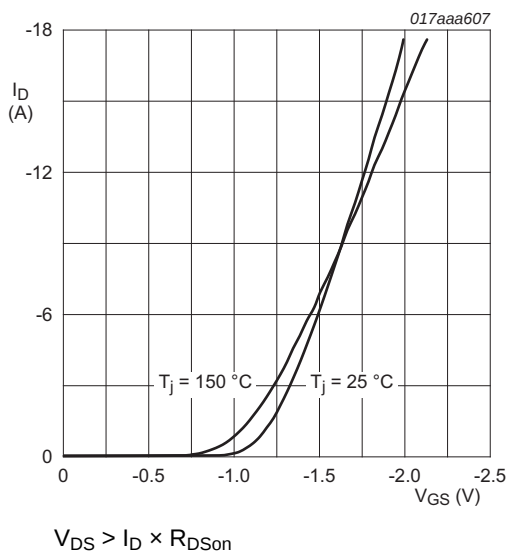


Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

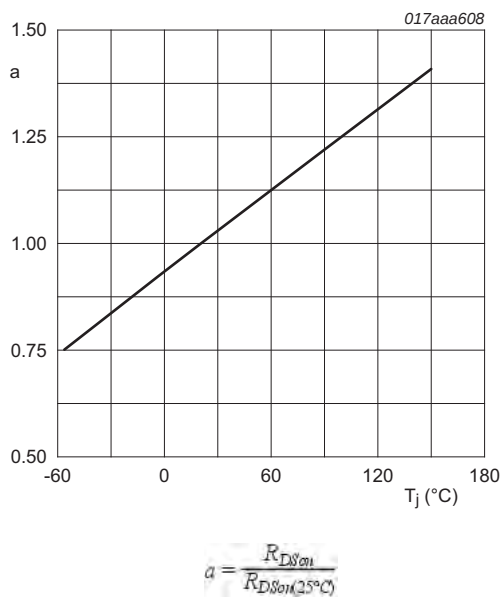


Fig 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

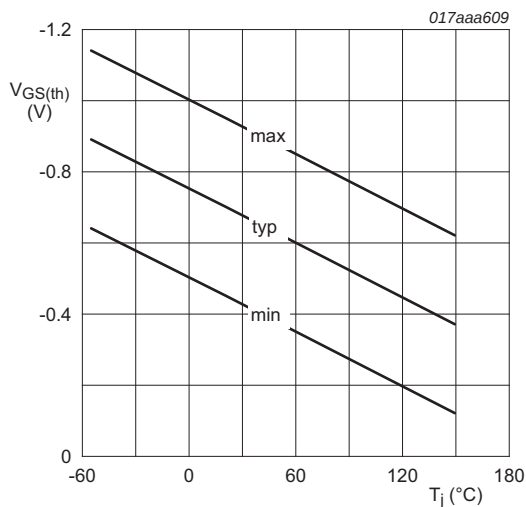


Fig 12. Gate-source threshold voltage as a function of junction temperature

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

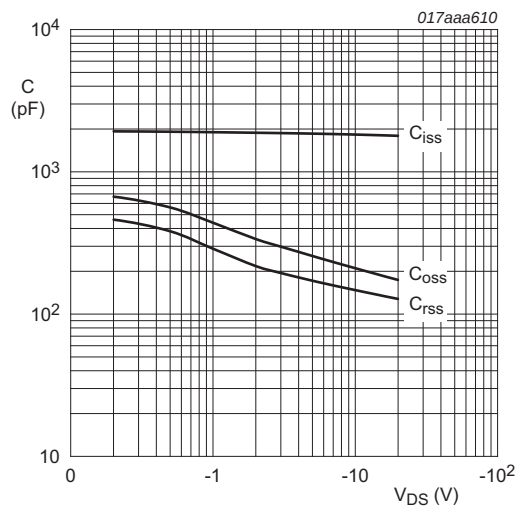


Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

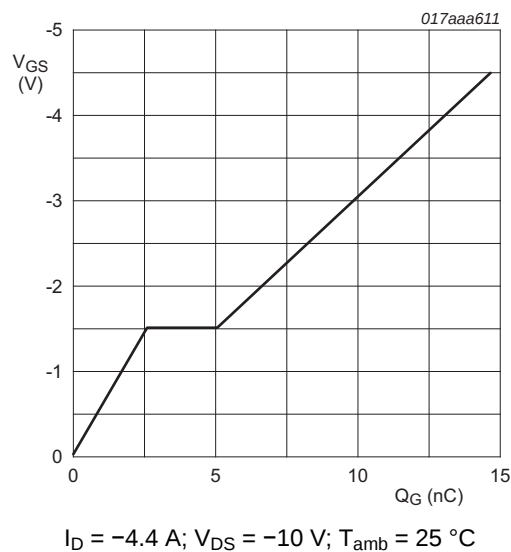


Fig 14. Gate-source voltage as a function of gate charge; typical values

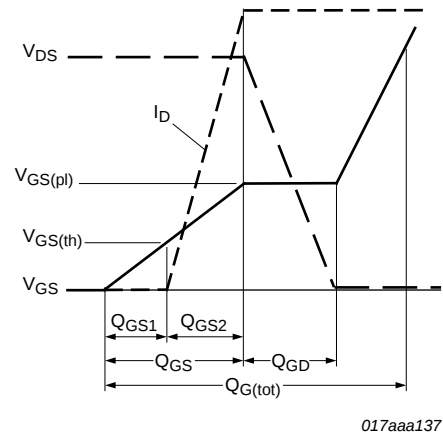


Fig 15. Gate charge waveform definitions

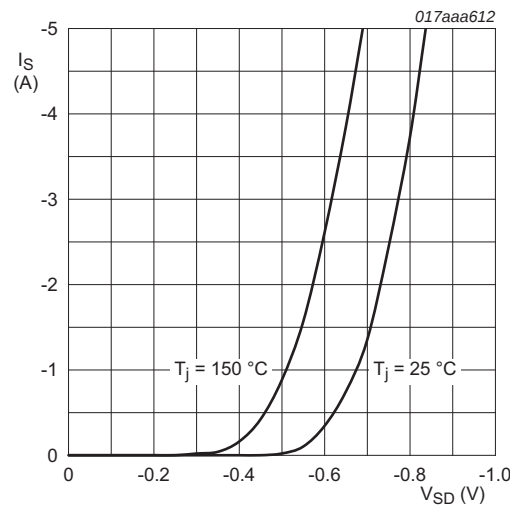


Fig 16. Source current as a function of source-drain voltage; typical values

8. Test information

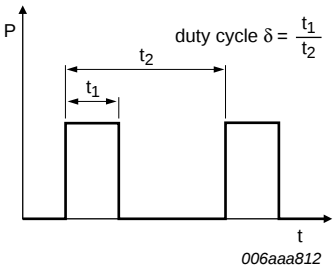


Fig 17. Duty cycle definition

9. Package outline

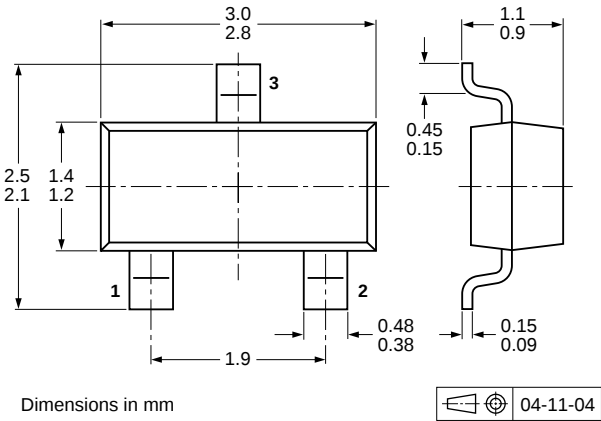


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

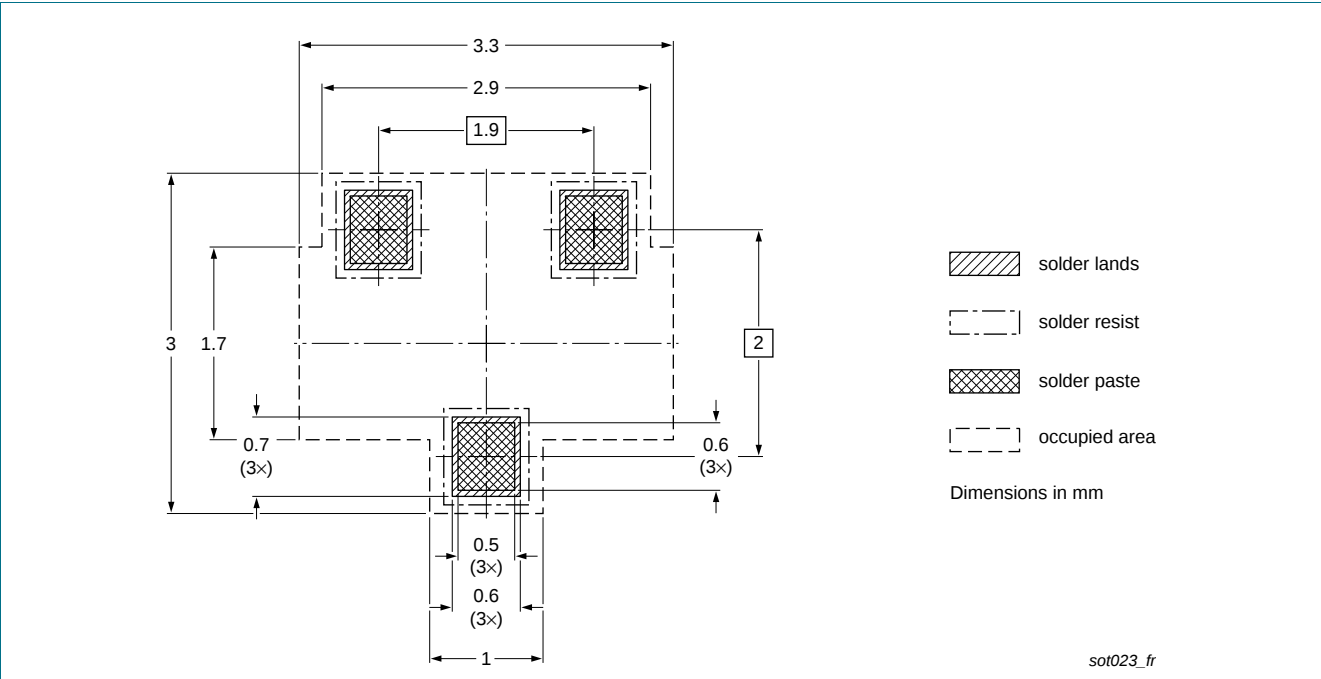


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

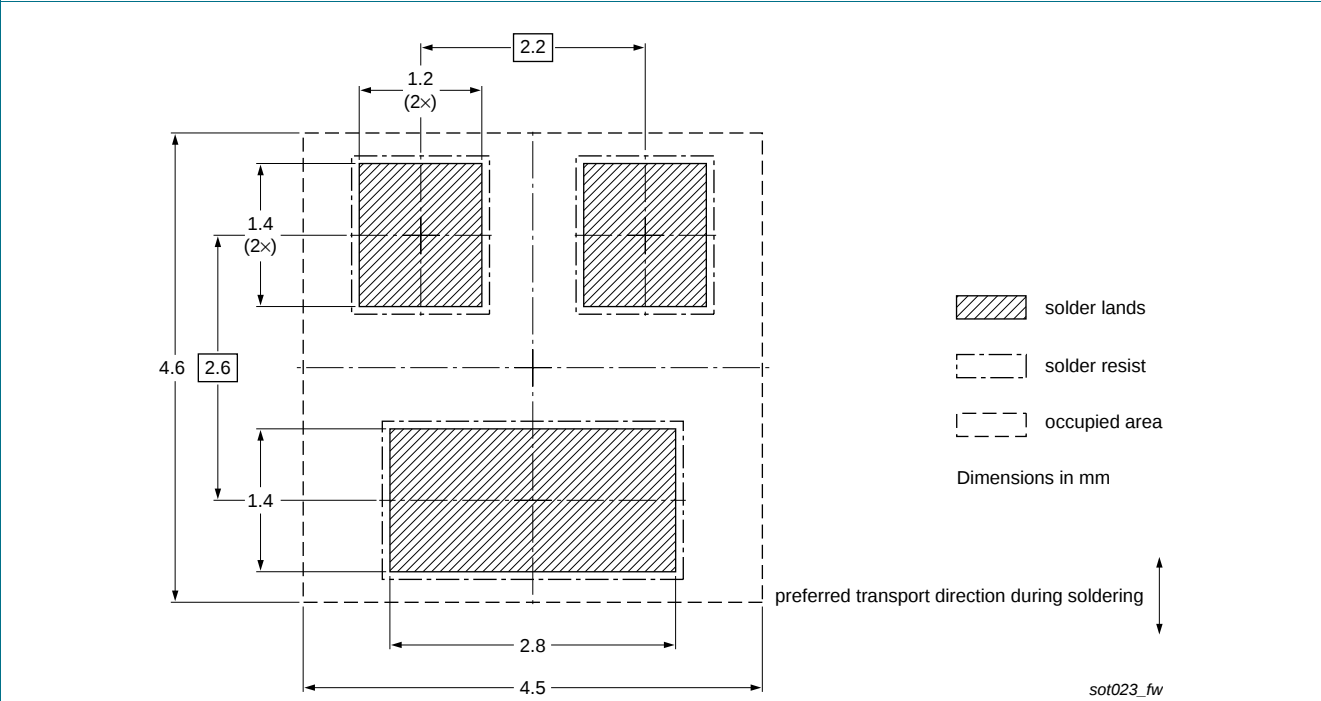


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

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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