



PMV22EN

30 V, 5.2 A N-channel Trench MOSFET

Rev. 1 — 30 March 2011

Product data sheet

1. Product profile

1.1 General description

N-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

- Logic-level compatible
- Trench MOSFET technology
- Very fast switching

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

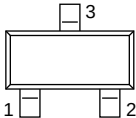
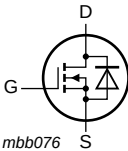
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_{amb} = 25\text{ °C}$	-	-	30	V
V_{GS}	gate-source voltage		-20	-	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	5.2	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5.2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.01; T_j = 25\text{ °C}$	-	17	22	m Ω

[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)	 mbb076
2	S	source		
3	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMV22EN	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

4. Limiting values

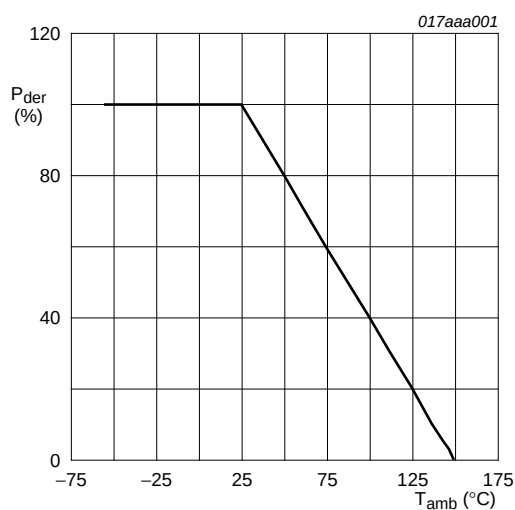
Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	5.2	A
		$V_{GS} = 10\text{ V}$; $T_{amb} = 100\text{ }^{\circ}\text{C}$	[1]	3.3	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^{\circ}\text{C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	20	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	510	mW
			[1]	930	mW
		$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	4170	mW
T_j	junction temperature		-	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]	930	mA

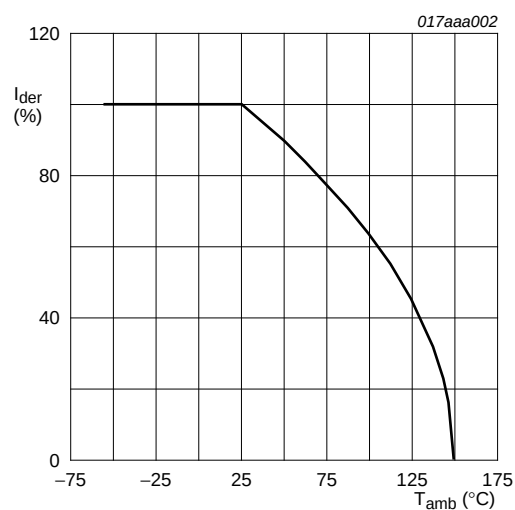
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



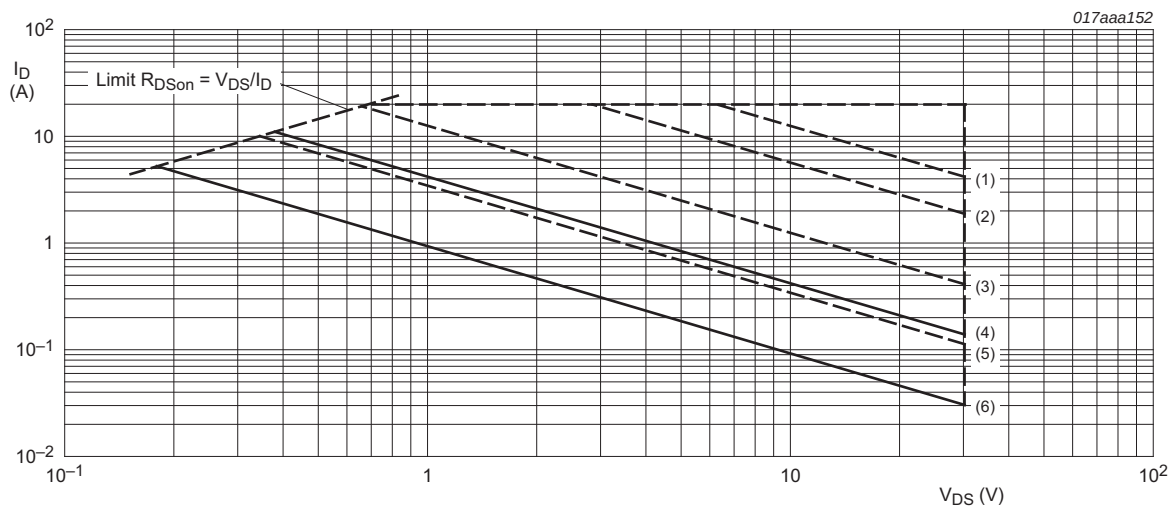
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

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



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

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



I_{DM} = single pulse

(1) $t_p = 100\ \mu\text{s}$

(2) $t_p = 1\ \text{ms}$

(3) $t_p = 10\ \text{ms}$

(4) DC; $T_{sp} = 25^{\circ}\text{C}$

(5) $t_p = 100\ \text{ms}$

(6) DC; $T_{amb} = 25^{\circ}\text{C}$; drain mounting pad $6\ \text{cm}^2$

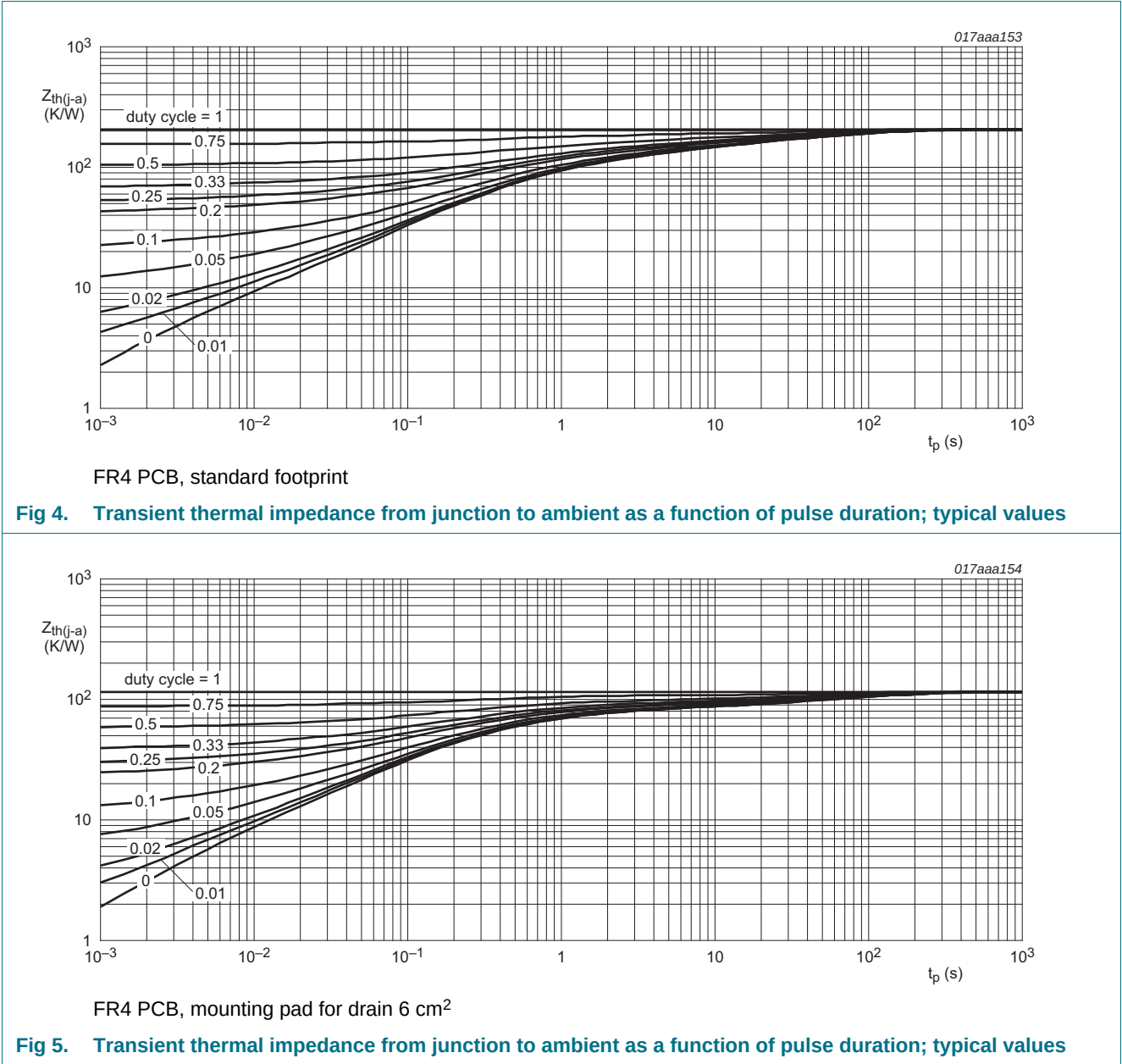
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	207	245	K/W
			[2]	116	135	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	20	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.



6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu A$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	30	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250\ \mu A$; $V_{DS} = V_{GS}$; $T_j = 25\ ^\circ C$	1	1.5	2.5	V
I_{DSS}	drain leakage current	$V_{DS} = 30\ V$; $V_{GS} = 0\ V$; $T_{amb} = 25\ ^\circ C$	-	-	1	μA
		$V_{DS} = 30\ V$; $V_{GS} = 0\ V$; $T_{amb} = 150\ ^\circ C$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 20\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	100	nA
		$V_{GS} = -20\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\ V$; $I_D = 5.2\ A$; pulsed; $t_p \leq 300\ \mu s$; $\delta \leq 0.01$; $T_j = 25\ ^\circ C$	-	17	22	m Ω
		$V_{GS} = 10\ V$; $I_D = 5.2\ A$; pulsed; $t_p \leq 300\ \mu s$; $\delta \leq 0.01$; $T_j = 150\ ^\circ C$	-	27	34	m Ω
		$V_{GS} = 4.5\ V$; $I_D = 4.5\ A$; pulsed; $t_p \leq 300\ \mu s$; $\delta \leq 0.01$; $T_j = 25\ ^\circ C$	-	22	29	m Ω
g_{fs}	forward transconductance	$V_{DS} = 5\ V$; $I_D = 3\ A$; pulsed; $t_p \leq 300\ \mu s$; $\delta \leq 0.01$; $T_j = 25\ ^\circ C$	-	12	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 3\ A$; $V_{DS} = 15\ V$; $V_{GS} = 10\ V$; $T_j = 25\ ^\circ C$	-	8.6	13	nC
Q_{GS}	gate-source charge		-	1.2	-	nC
Q_{GD}	gate-drain charge		-	1.3	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\ V$; $V_{DS} = 15\ V$; $f = 1\ MHz$; $T_j = 25\ ^\circ C$	-	480	-	pF
C_{oss}	output capacitance		-	110	-	pF
C_{rss}	reverse transfer capacitance		-	52	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15\ V$; $V_{GS} = 10\ V$; $R_{G(ext)} = 6\ \Omega$; $T_j = 25\ ^\circ C$; $I_D = 3\ A$	-	4	-	ns
t_r	rise time		-	15	-	ns
$t_{d(off)}$	turn-off delay time		-	100	-	ns
t_f	fall time		-	40	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 0.93\ A$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	-	0.72	1.2	V

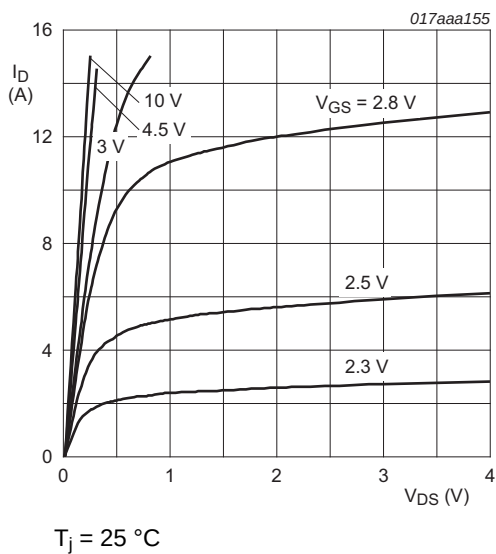


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

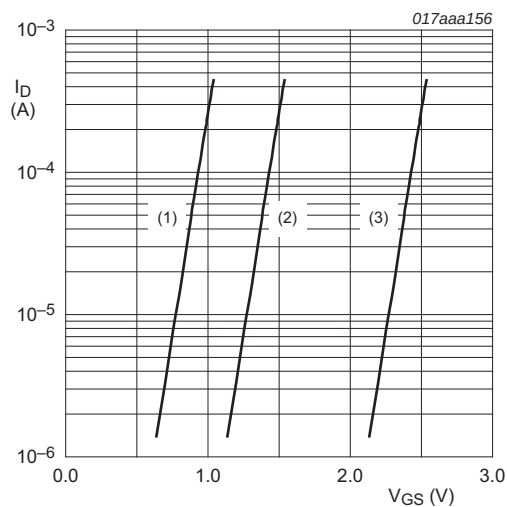


Fig 7. Sub-threshold drain current as a function of gate-source voltage

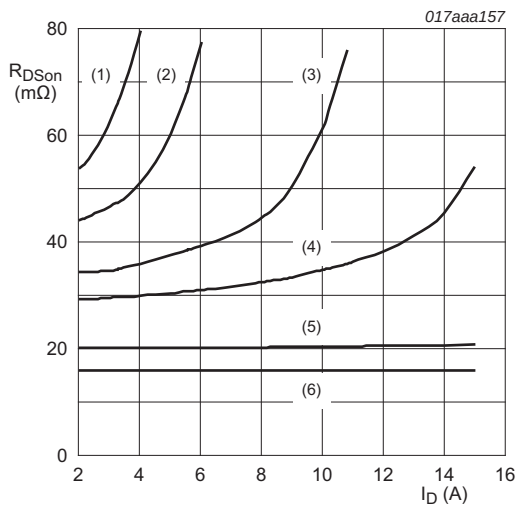


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

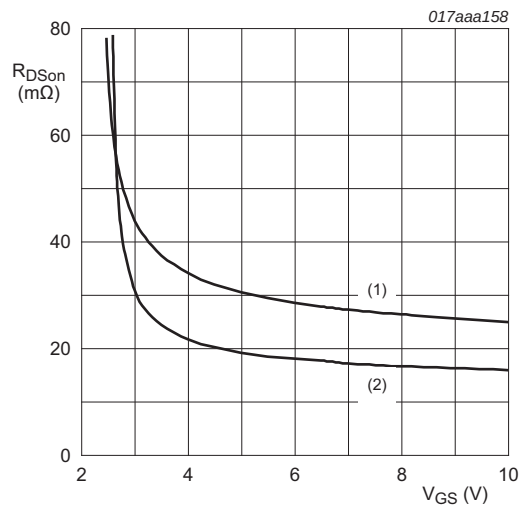
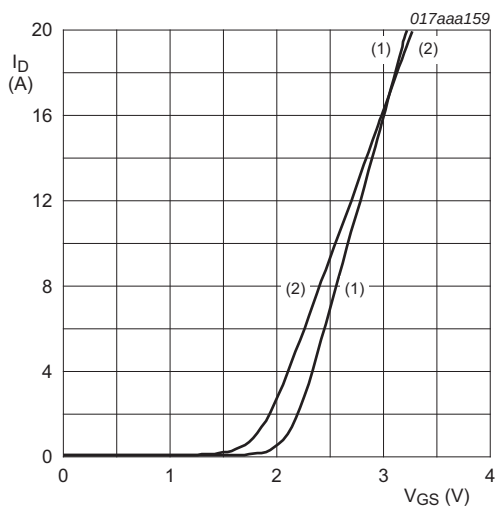
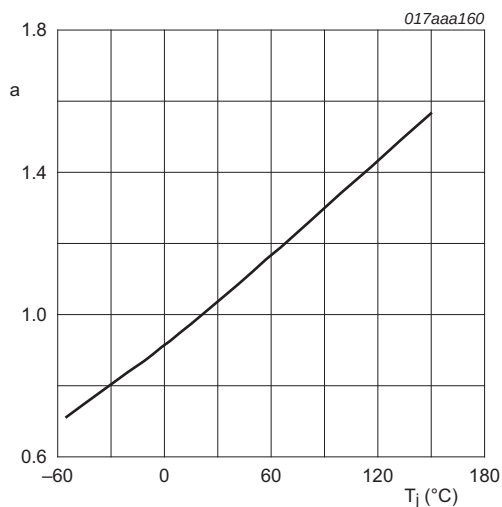


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



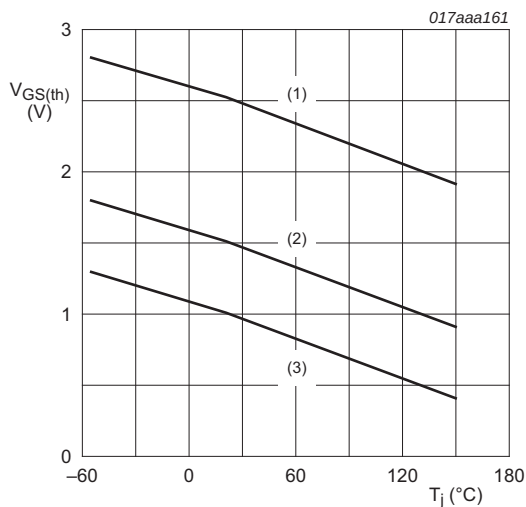
$V_{DS} > I_D \times R_{DSon}$
(1) $T_j = 25\text{ }^{\circ}\text{C}$
(2) $T_j = 150\text{ }^{\circ}\text{C}$

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



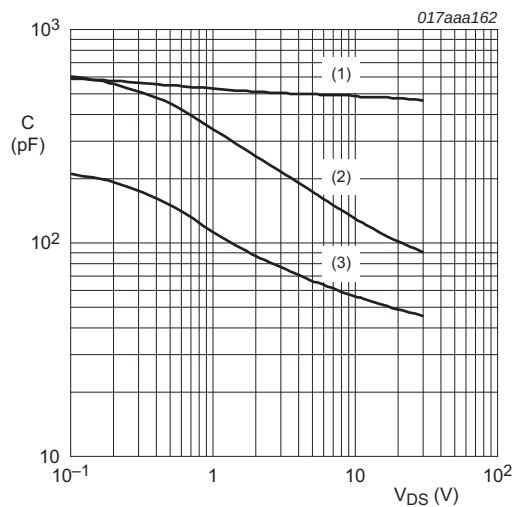
$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}\text{C})}$$

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



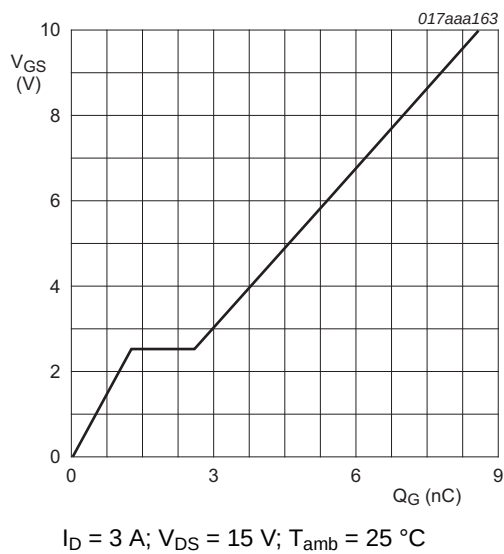
$I_D = 0.25\text{ mA}$; $V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

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



$I_D = 3\text{ A}$; $V_{DS} = 15\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

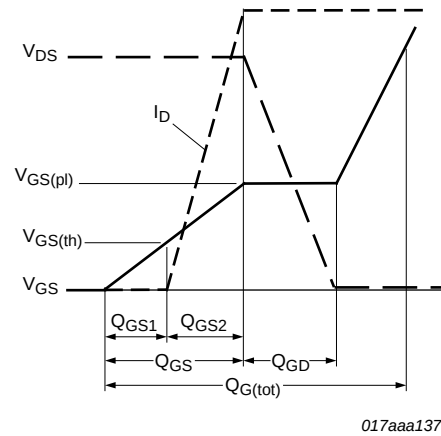
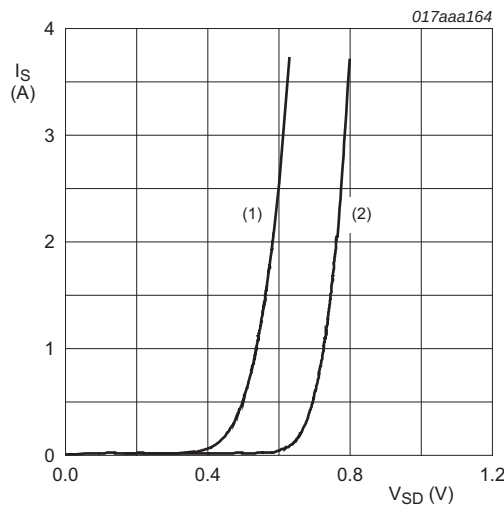


Fig 15. Gate charge waveform definitions



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

7. Package outline

Plastic surface-mounted package; 3 leads

SOT23

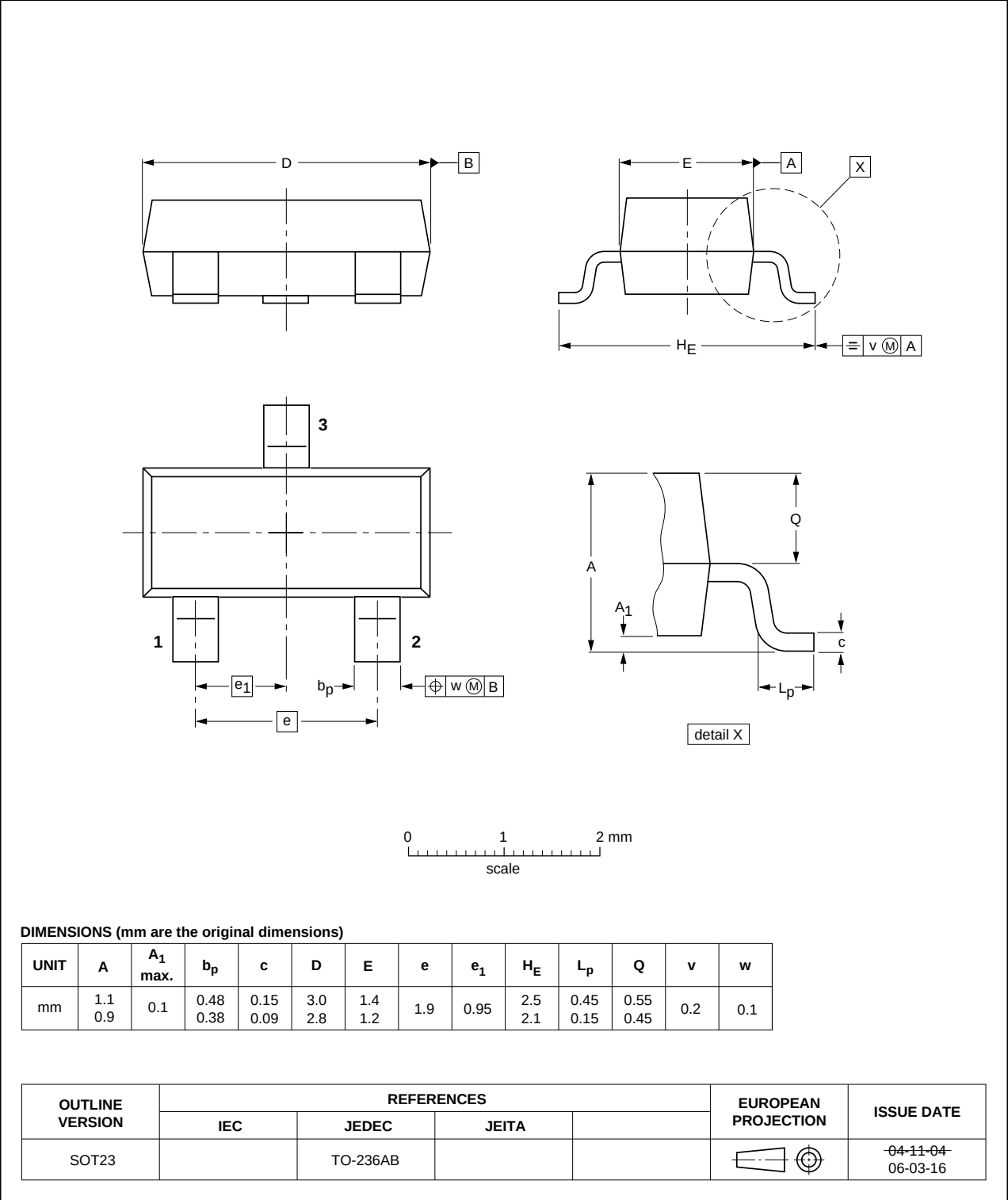


Fig 17. Package outline SOT23 (TO-236AB)

8. Soldering

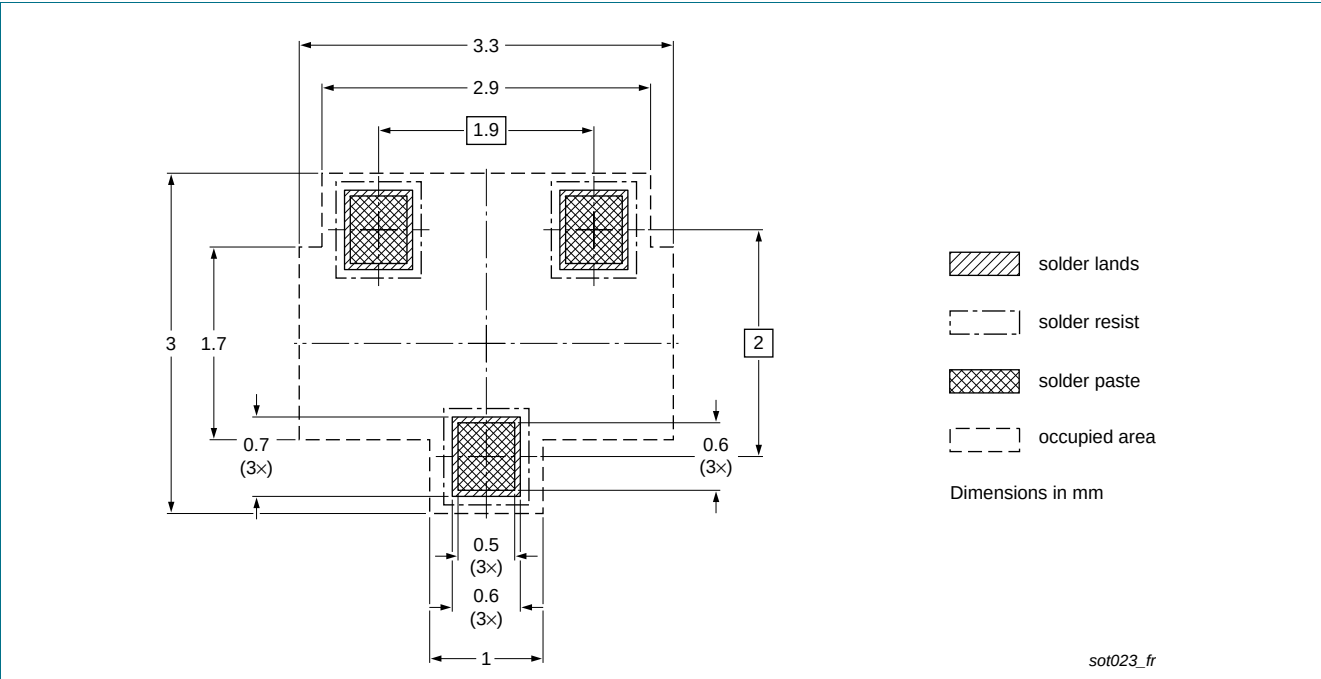


Fig 18. Reflow soldering footprint for SOT23 (TO-236AB)

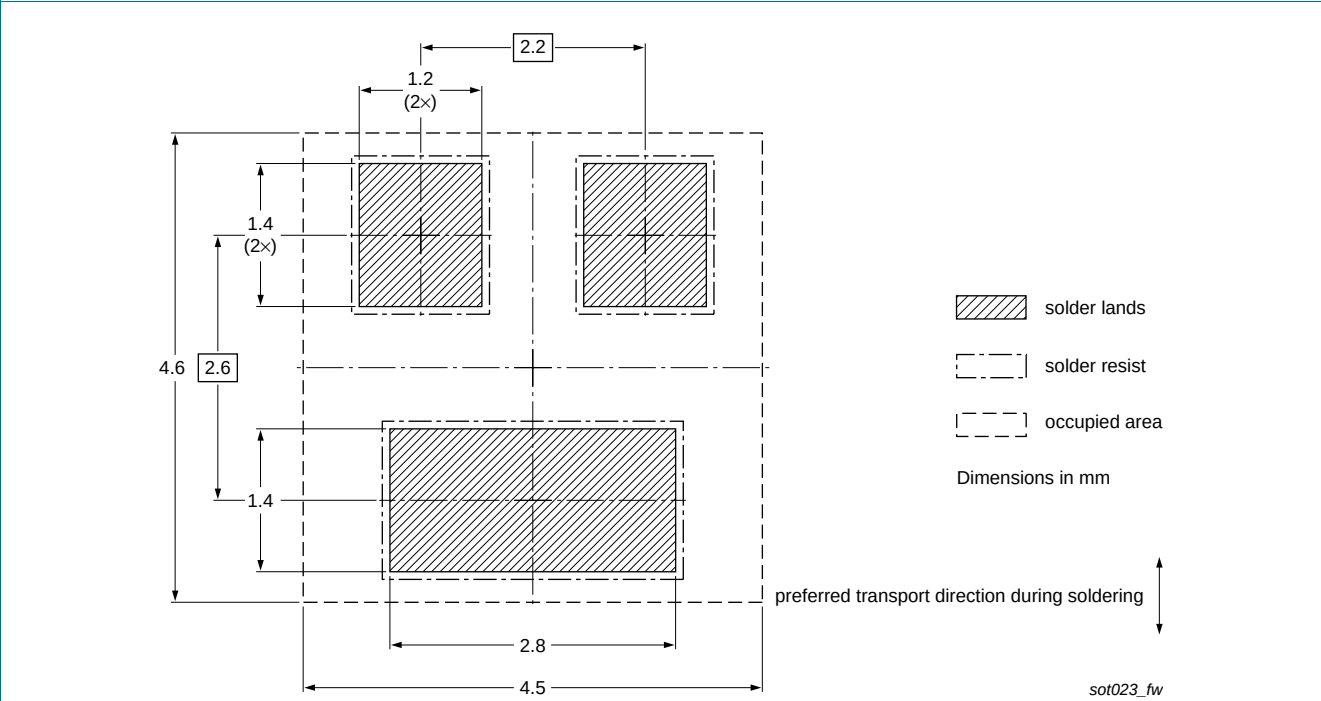


Fig 19. Wave soldering footprint for SOT23 (TO-236AB)

9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV22EN v.1	20110330	Product data sheet	-	-

10. Legal information

10.1 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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[2] The term 'short data sheet' is explained in section "Definitions".

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Date of release: 30 March 2011

Document identifier: PMV22EN