



PMV90EN

30 V, single N-channel Trench MOSFET

Rev. 1 — 13 February 2012

Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a SOT23 (TO-236AB) small 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	$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	2.1	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 1.9\text{ A}; T_J = 25\text{ °C}$	-	70	84	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>017aaa253</p>
2	S	source		
3	D	drain		



3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMV90EN	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMV90EN	EC%

[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

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

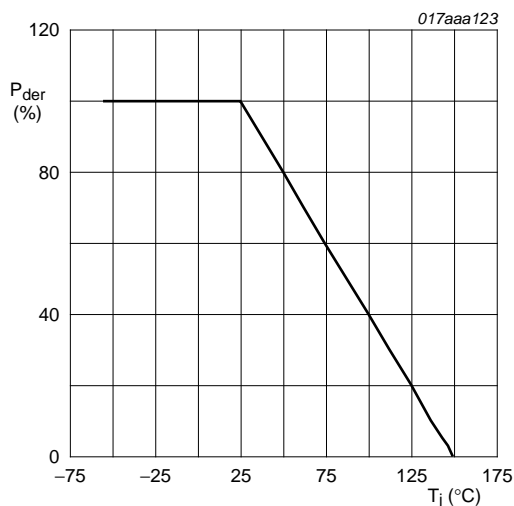
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$ [1]	-	2.1	A
		$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [1]	-	1.9	A
		$V_{GS} = 10\text{ V}; T_{amb} = 100\text{ }^{\circ}\text{C}$ [1]	-	1.2	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^{\circ}\text{C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	7.6	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	310	mW
		[1]	-	455	mW
		$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	2085	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]	-	0.5	A
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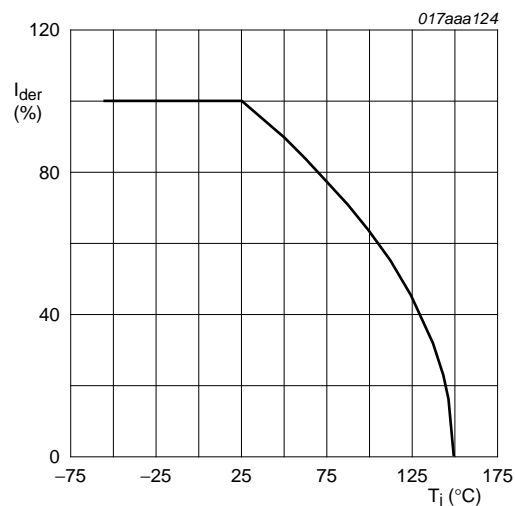
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



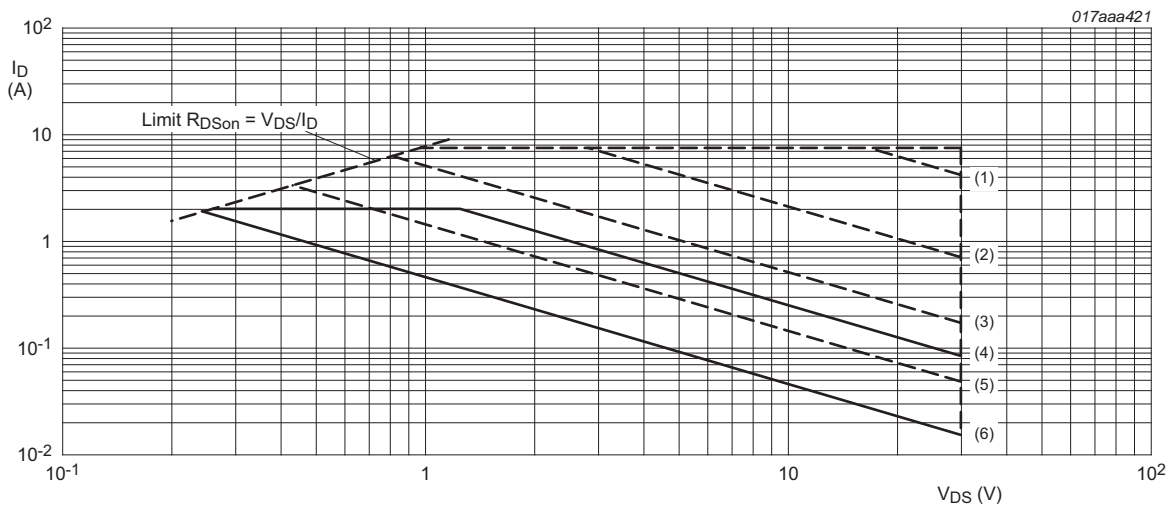
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

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



IDM = single pulse
(1) tp = 100 μs
(2) tp = 1 ms
(3) tp = 10 ms
(4) DC; Tsp = 25 °C
(5) tp = 100 ms
(6) DC; Tamb = 25 °C; drain mounting pad 6 cm²

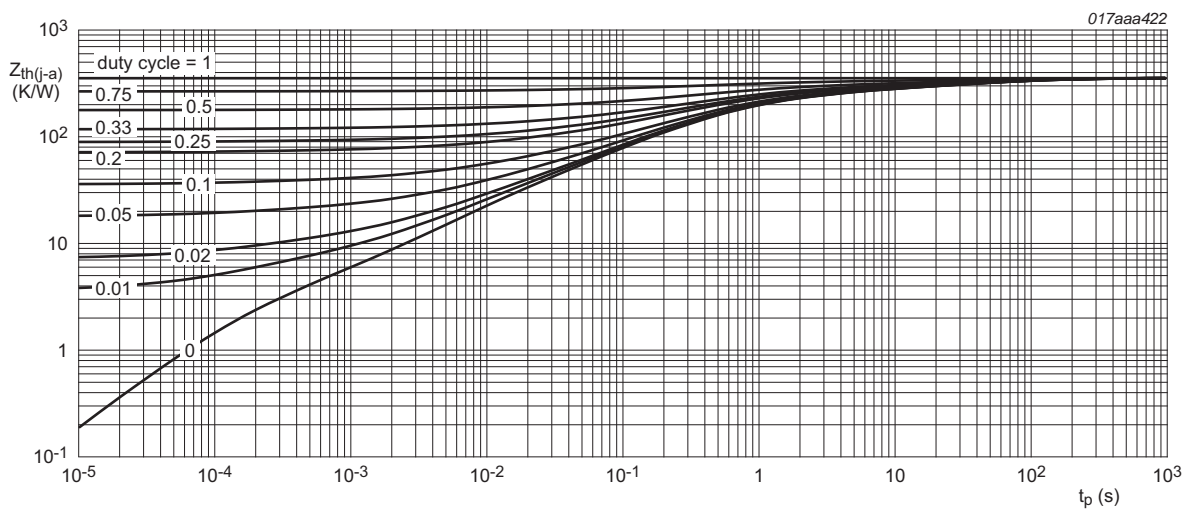
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. Thermal characteristics

Table 6. Thermal characteristics

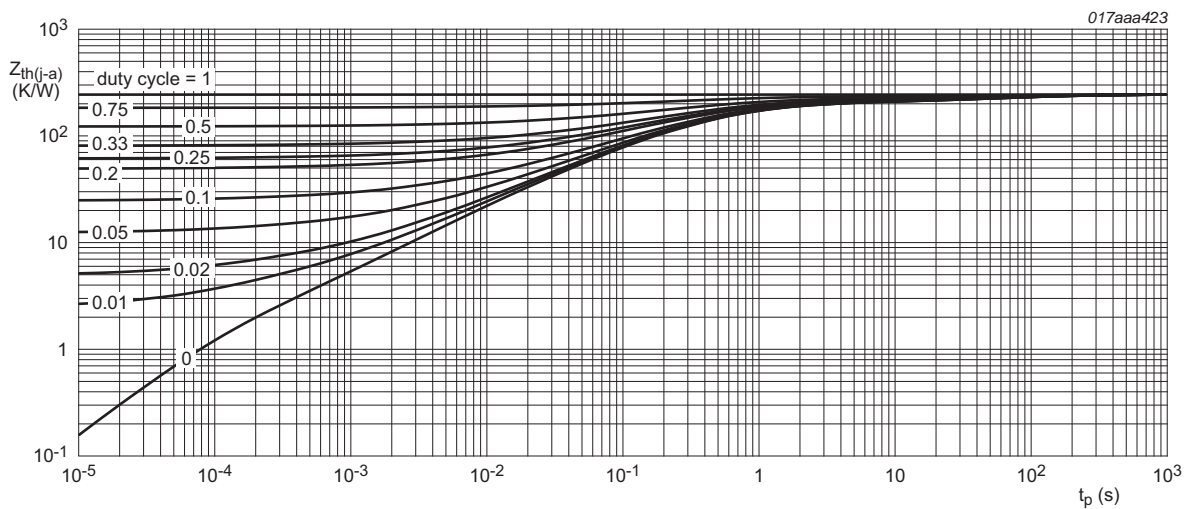
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Rth(j-a)	thermal resistance from junction to ambient	in free air	[1]	-	350	400 K/W
			[2]	-	240	275 K/W
		in free air; t ≤ 5 s	[2]	-	186	215 K/W
Rth(j-sp)	thermal resistance from junction to solder point		-	50	60	K/W

[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.



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 μA; V _{GS} = 0 V; T _j = 25 °C	30	-	-	V
V _{GStH}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS} ; T _j = 25 °C	1	1.5	2.5	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _{amb} = 25 °C	-	-	1	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _{amb} = 150 °C	-	-	10	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 1.9 A; T _j = 25 °C	-	70	84	mΩ
		V _{GS} = 10 V; I _D = 1.9 A; T _j = 150 °C	-	109	130	mΩ
		V _{GS} = 4.5 V; I _D = 1.6 A; T _j = 25 °C	-	90	115	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 1.9 A; T _j = 25 °C	-	5.7	-	S
Dynamic characteristics						
Q _{G(tot)}	total gate charge	V _{DS} = 15 V; I _D = 1.9 A; V _{GS} = 10 V; T _j = 25 °C	-	2.6	4	nC
Q _{GS}	gate-source charge		-	0.42	-	nC
Q _{GD}	gate-drain charge		-	0.34	-	nC
C _{iSS}	input capacitance	V _{DS} = 15 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C	-	132	-	pF
C _{oSS}	output capacitance		-	31	-	pF
C _{rSS}	reverse transfer capacitance		-	13	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; I _D = 1.9 A; V _{GS} = 10 V; R _{G(ext)} = 6 Ω; T _j = 25 °C	-	3	-	ns
t _r	rise time		-	8	-	ns
t _{d(off)}	turn-off delay time		-	15	-	ns
t _f	fall time		-	5	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 0.5 A; V _{GS} = 0 V; T _j = 25 °C	-	0.7	1.2	V

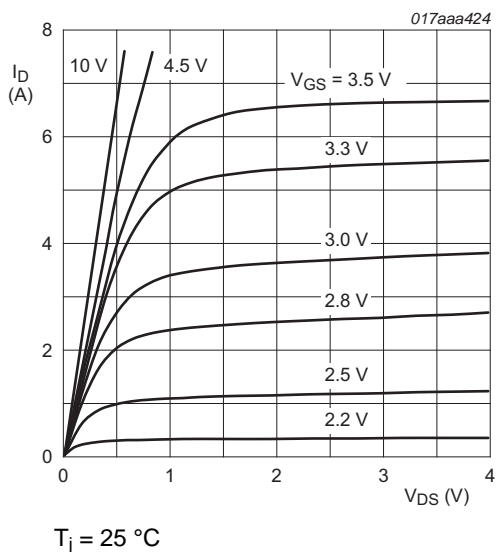


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

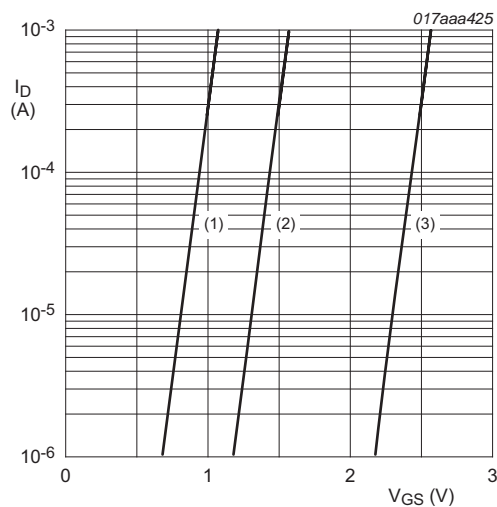


Fig 7. Sub-threshold drain current as a function of gate-source voltage

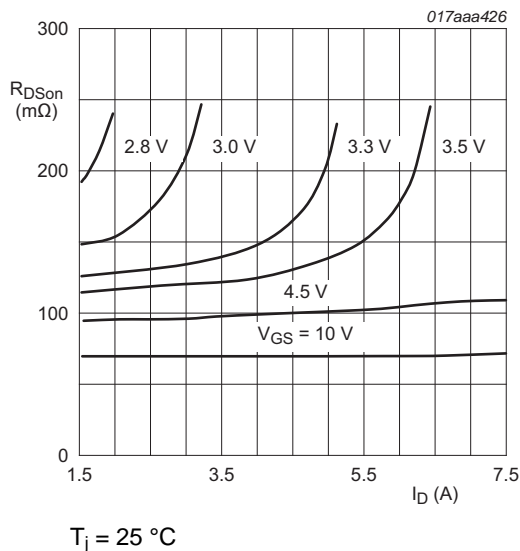


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

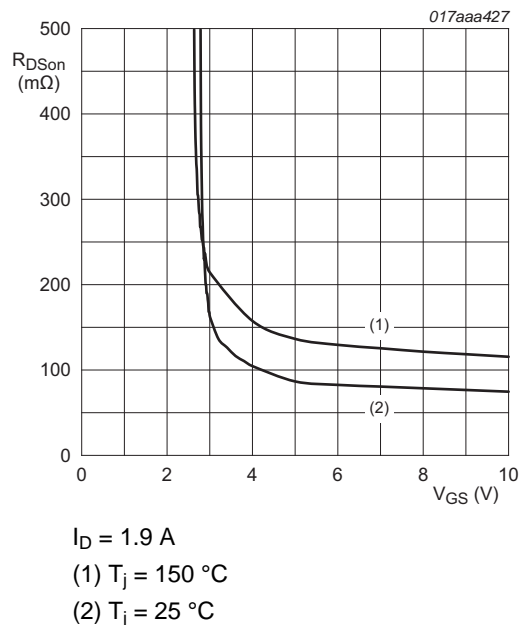
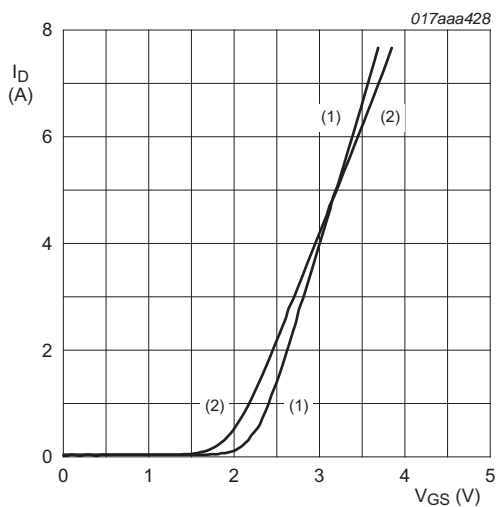
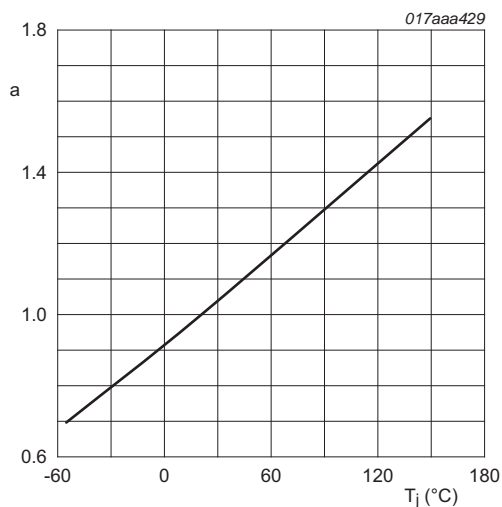


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



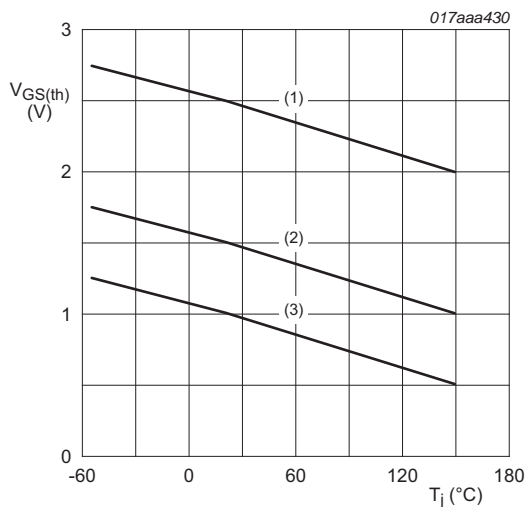
$V_{DS} > I_D \times R_{DS(on)}$
(1) $T_j = 25\text{ }^{\circ}\text{C}$
(2) $T_j = 150\text{ }^{\circ}\text{C}$

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



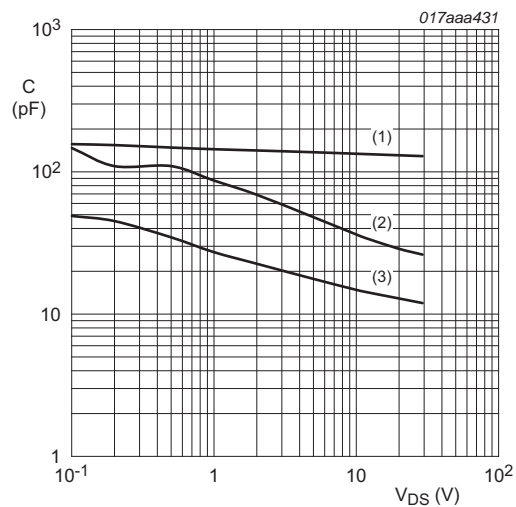
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^{\circ}\text{C})}}$$

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



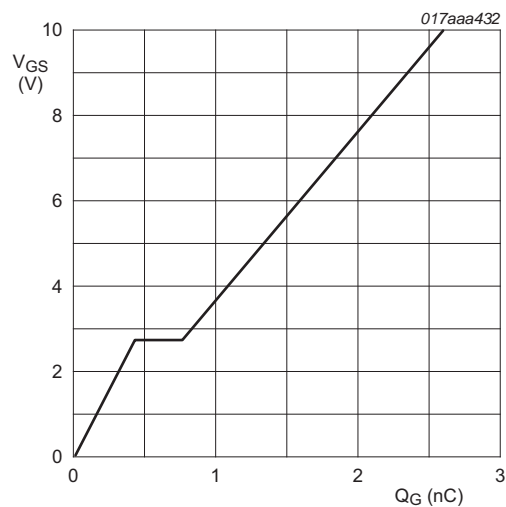
$I_D = 0.25\text{ mA}$; $V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

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



$I_D = 1.9\text{ A}$; $V_{DS} = 15\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

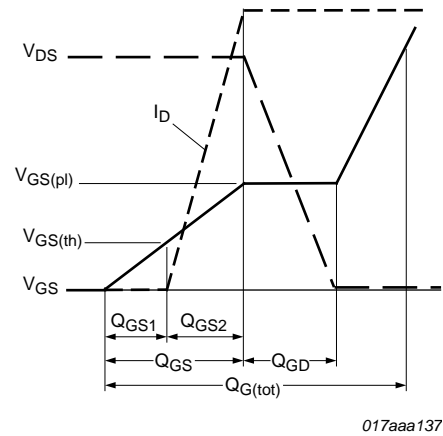
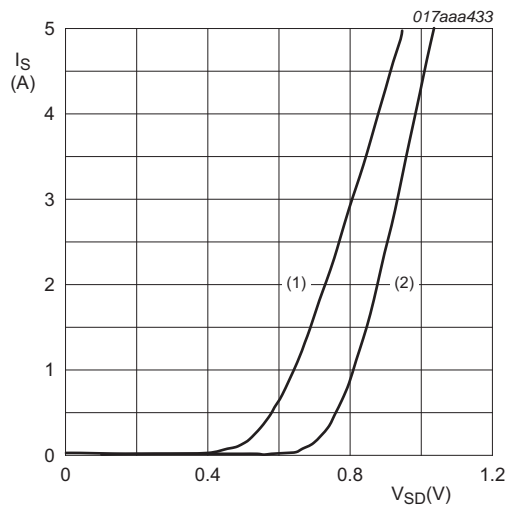


Fig 15. Gate charge waveform definitions



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

8. Test information

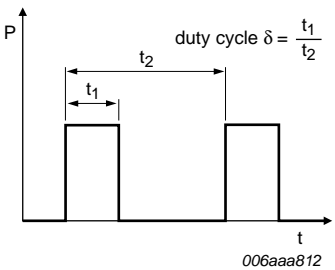


Fig 17. Duty cycle definition

9. Package outline

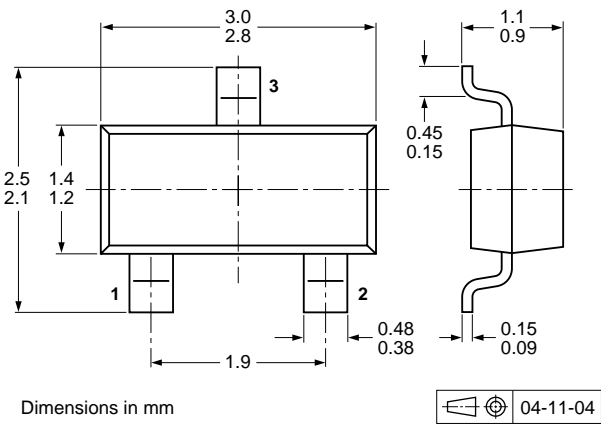


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

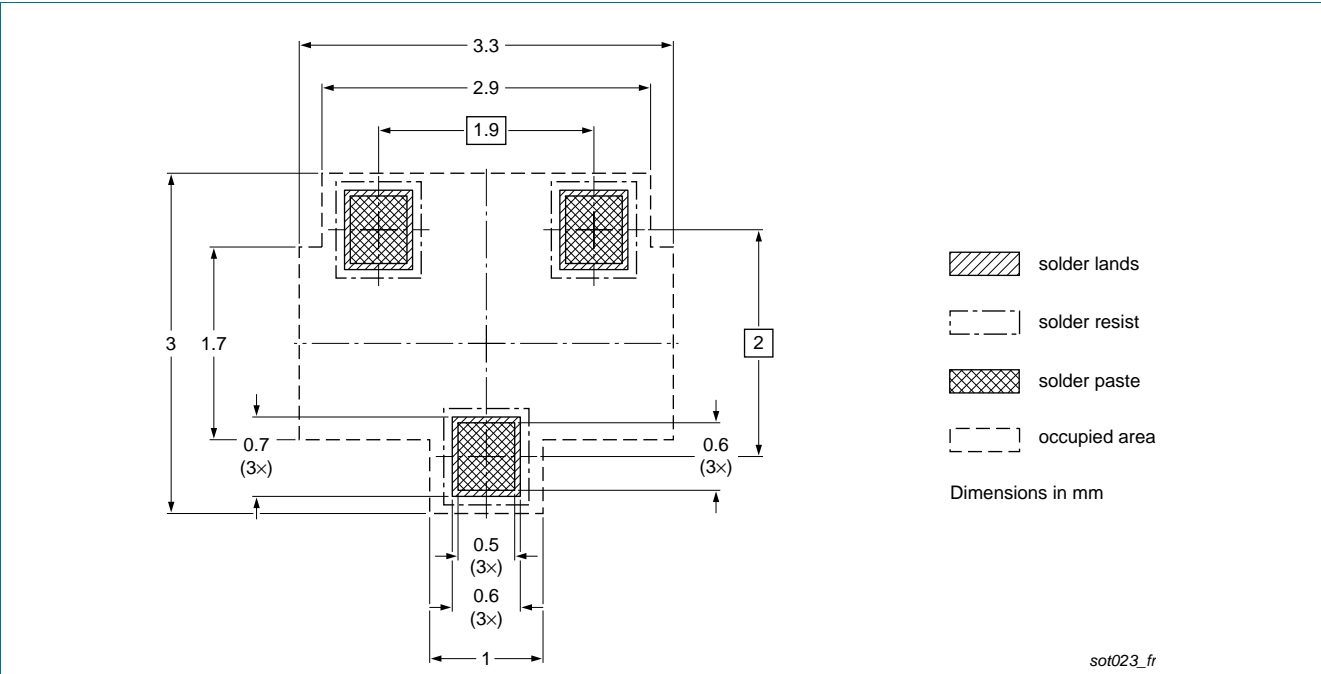


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

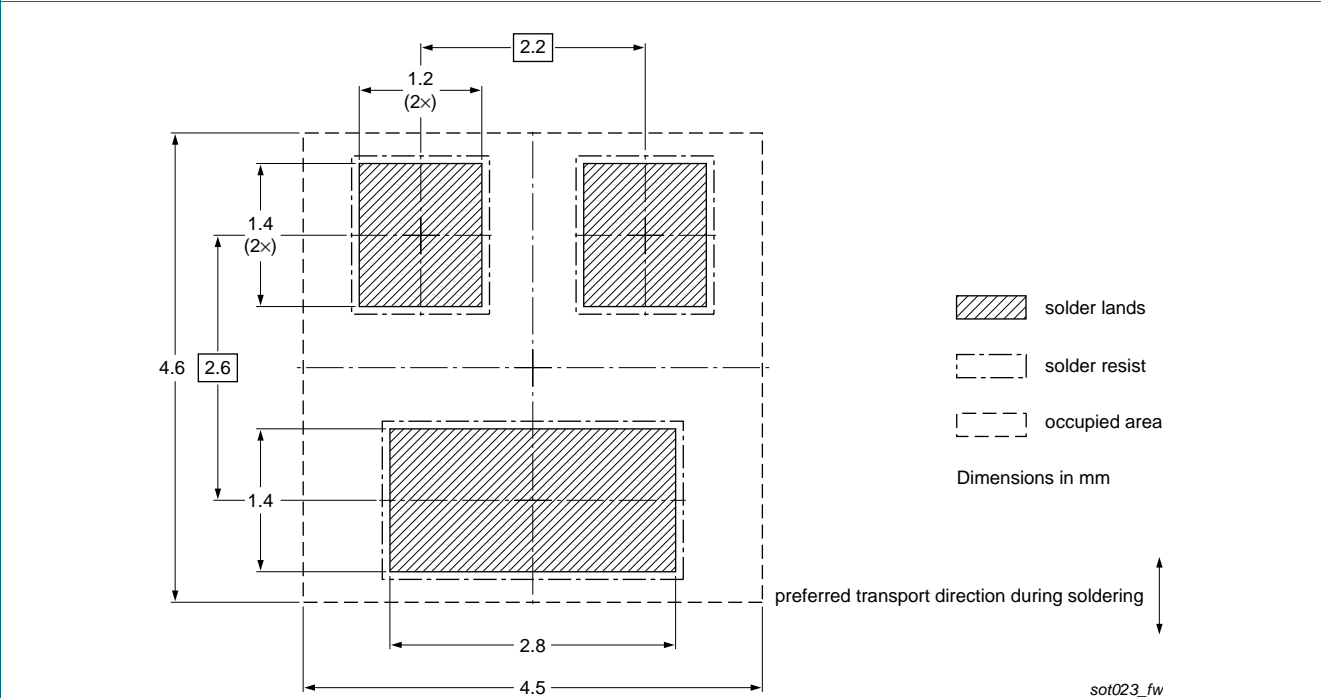


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMV90EN v.1	20120213	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.

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

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