

# PMV170UN

20 V, single N-channel Trench MOSFET

3 August 2012

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

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology

### 1.3 Applications

- Relay driver
- High-speed line driver
- Low-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	$T_{amb} = 25\text{ °C}$	-	-	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]	-	1.5	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 1\text{ A}; T_J = 25\text{ °C}$	-	140	165	m $\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.

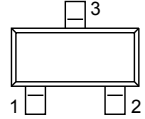
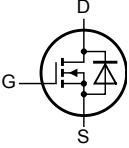


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## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-236AB (SOT23)</p>	 <p>017aaa253</p>
2	S	source		
3	D	drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV170UN	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMV170UN	EG%

[1] % = placeholder for manufacturing site code

## 5. Limiting values

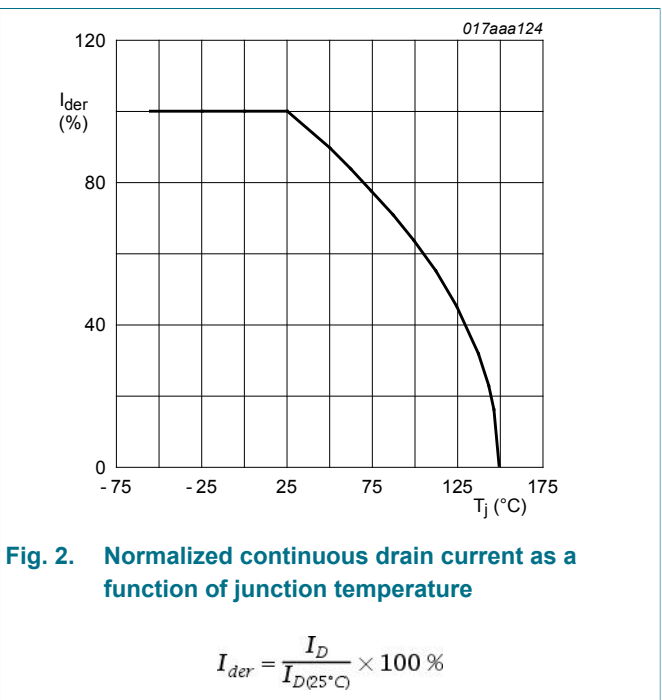
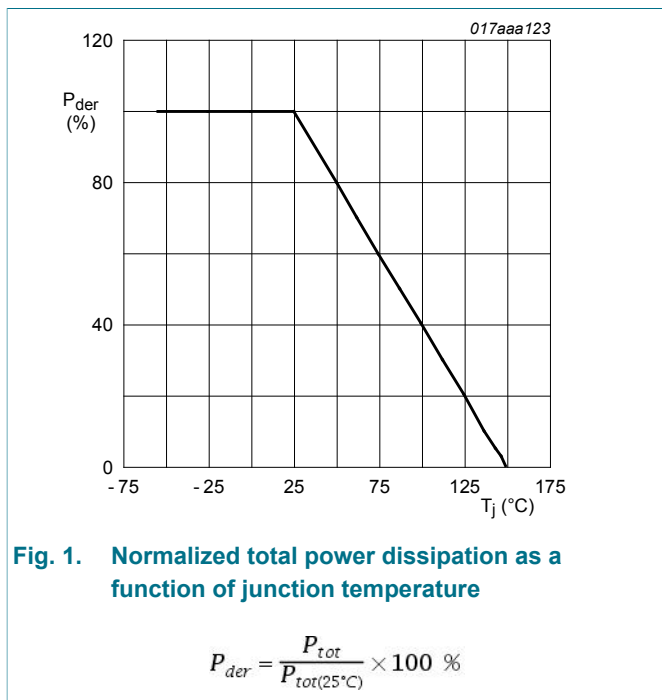
Table 5. Limiting values

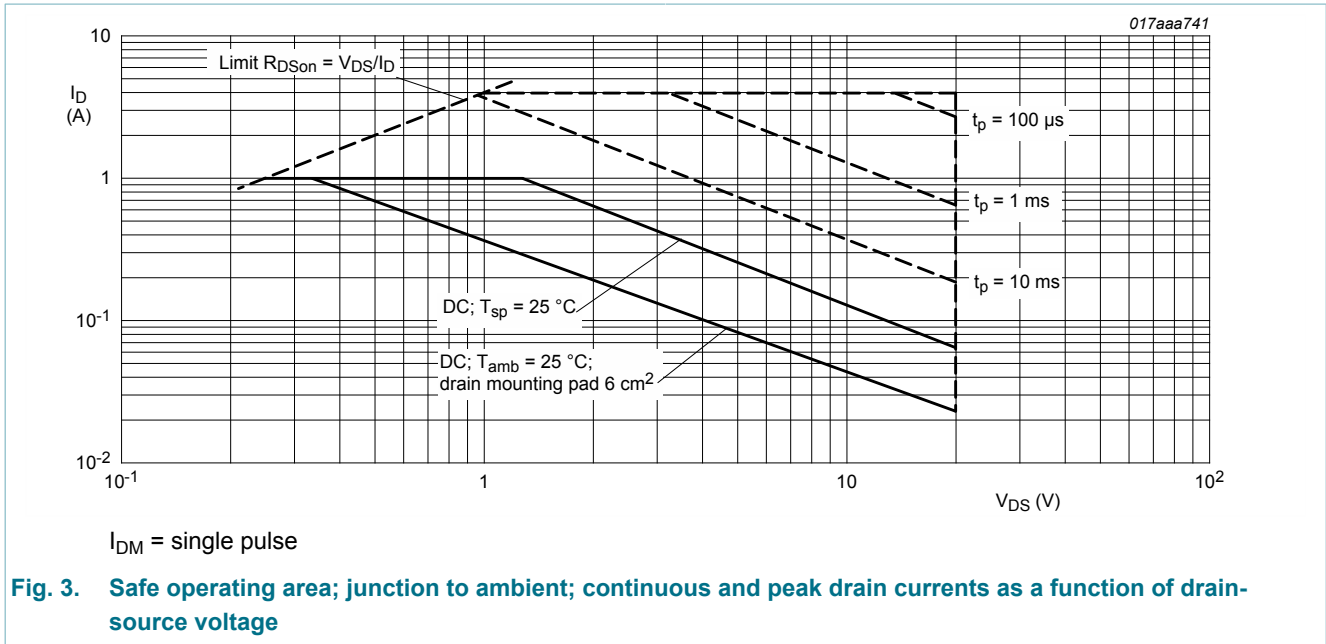
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_{amb} = 25\text{ °C}$		-	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]	-	1.5	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	1	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	0.9	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	4	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	325	mW
			[1]	-	455	mW
		$T_{sp} = 25\text{ °C}$		-	1140	mW

Symbol	Parameter	Conditions		Min	Max	Unit
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
I <sub>s</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	0.7	A

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.





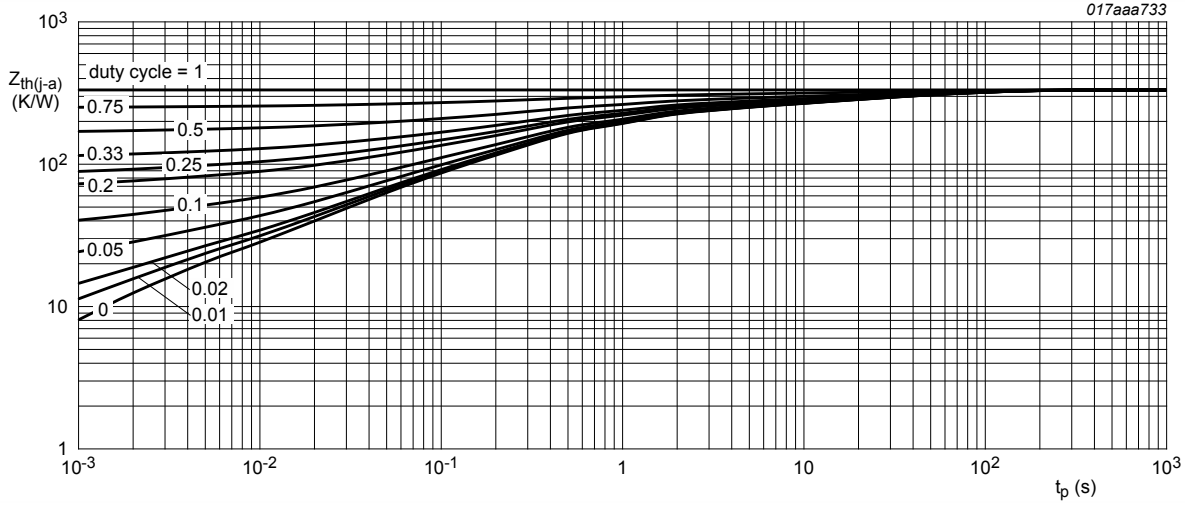
## 6. Thermal characteristics

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]	-	333	385	K/W
			[2]	-	240	275	K/W
		in free air; $t \leq 5 \text{ s}$	[2]	-	203	235	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	85	100	K/W

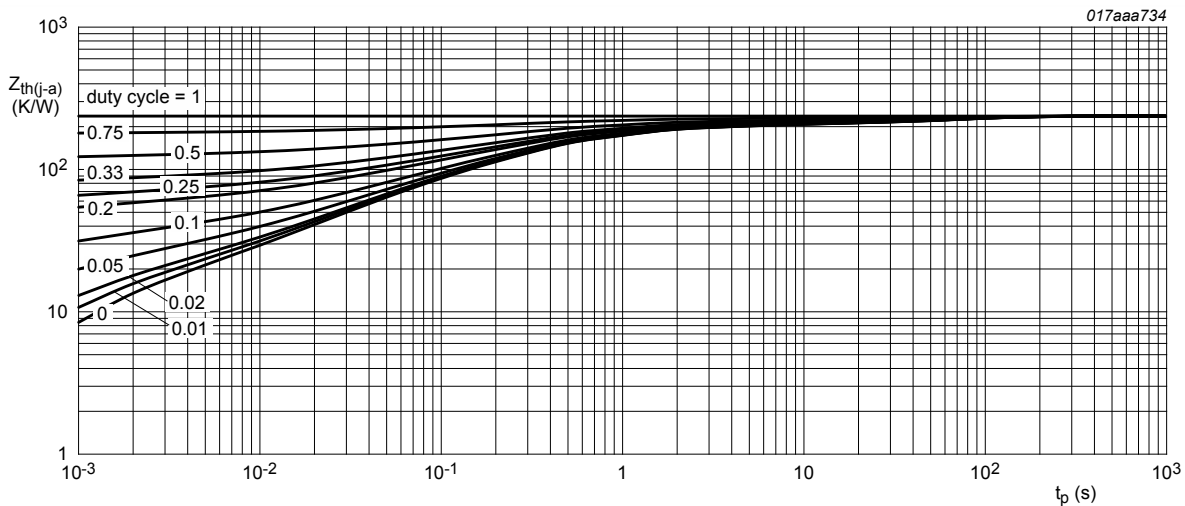
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $6 \text{ cm}^2$ .



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 cm<sup>2</sup>

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
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.4	0.7	1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 150 \text{ }^\circ C$	-	-	20	$\mu A$

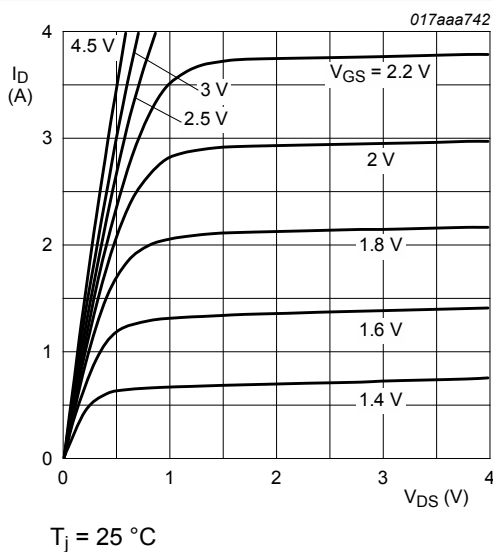
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = 8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	100	nA
		V <sub>GS</sub> = -8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	100	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 1 A; T <sub>j</sub> = 25 °C	-	140	165	mΩ
		V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 1 A; T <sub>j</sub> = 150 °C	-	208	248	mΩ
		V <sub>GS</sub> = 2.5 V; I <sub>D</sub> = 1 A; T <sub>j</sub> = 25 °C	-	175	220	mΩ
		V <sub>GS</sub> = 1.8 V; I <sub>D</sub> = 0.25 A; T <sub>j</sub> = 25 °C	-	237	337	mΩ
g <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 1 A; T <sub>j</sub> = 25 °C	-	3.4	-	S

**Dynamic characteristics**

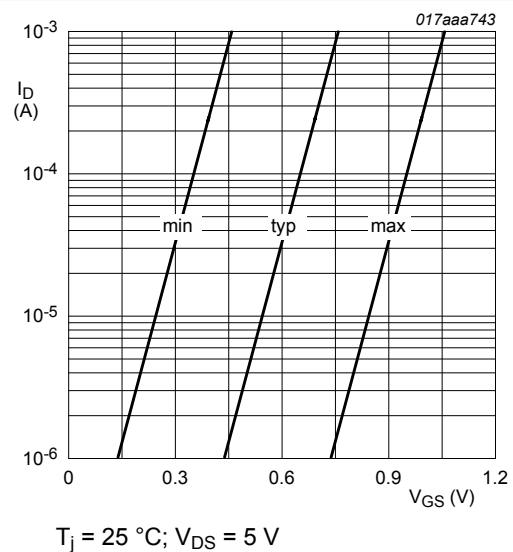
Q <sub>G(tot)</sub>	total gate charge	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 1 A; V <sub>GS</sub> = 4.5 V; T <sub>j</sub> = 25 °C	-	1.1	1.65	nC
Q <sub>GS</sub>	gate-source charge		-	0.15	-	nC
Q <sub>GD</sub>	gate-drain charge		-	0.3	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 10 V; f = 1 MHz; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	83	-	pF
C <sub>oss</sub>	output capacitance		-	37	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	26	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 1 A; V <sub>GS</sub> = 4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C	-	6	-	ns
t <sub>r</sub>	rise time		-	12	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	16	-	ns
t <sub>f</sub>	fall time		-	8	-	ns

**Source-drain diode**

V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 0.7 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	0.8	1.2	V
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**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**

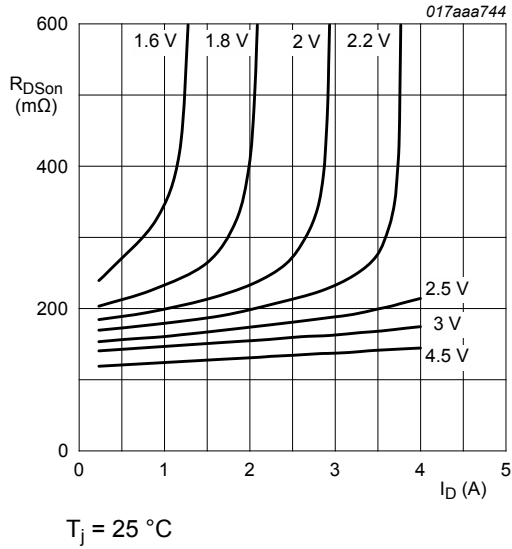


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

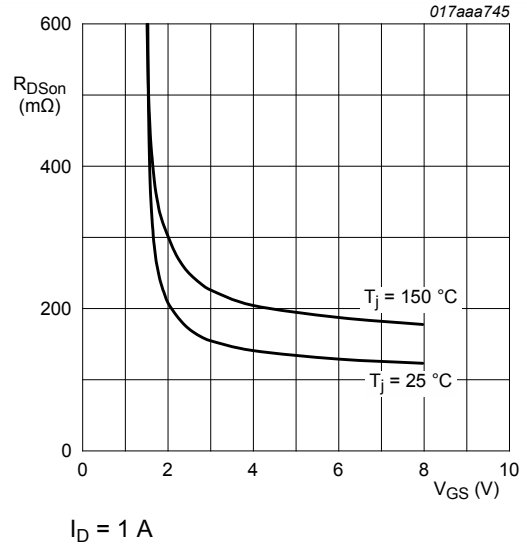


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

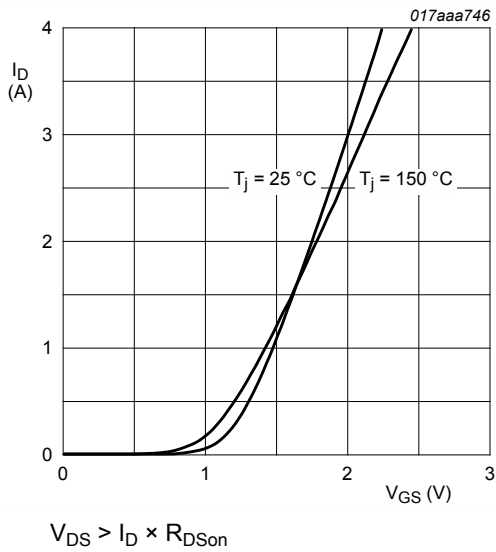


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

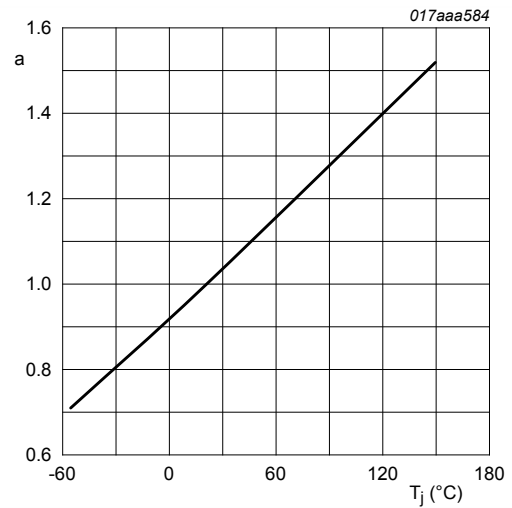


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

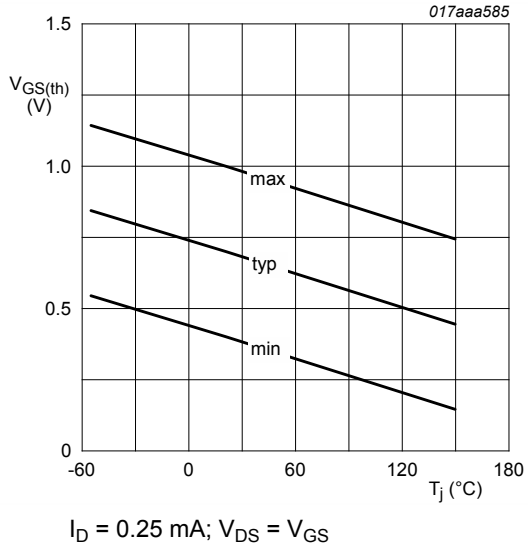


Fig. 12. Gate-source threshold voltage as a function of junction temperature

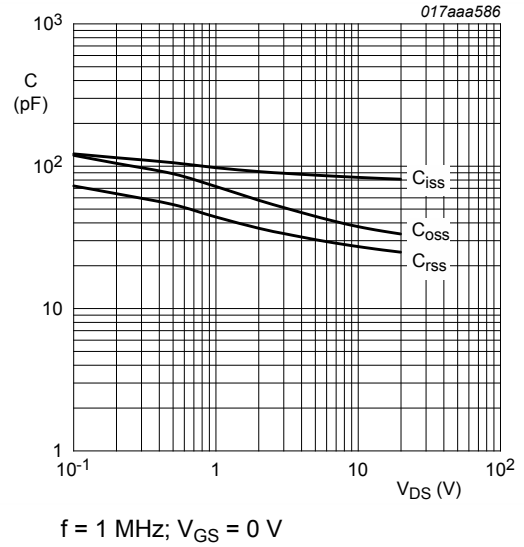


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

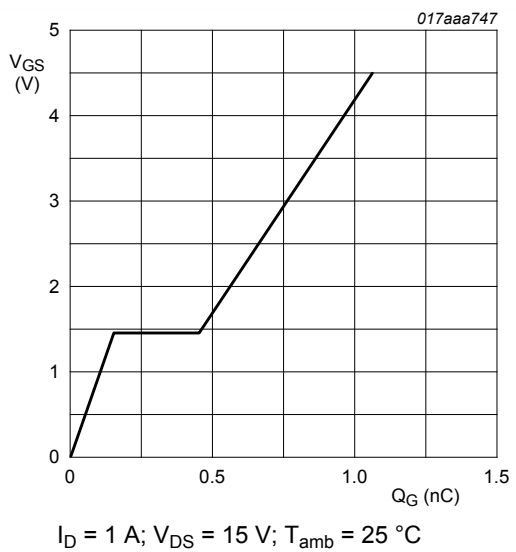


Fig. 14. Gate-source voltage as a function of gate charge; typical values

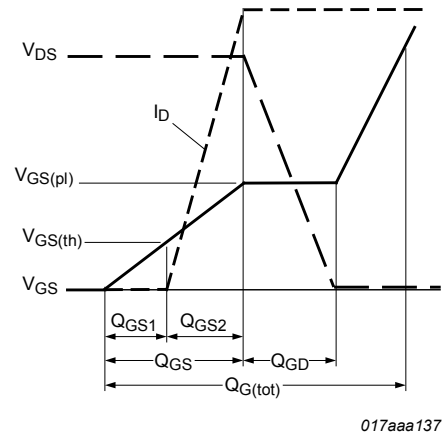
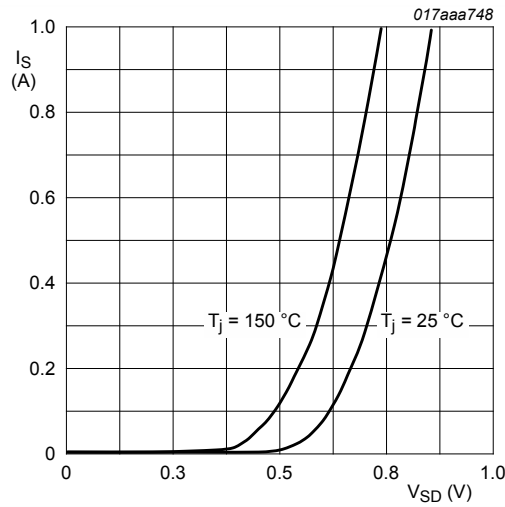


Fig. 15. Gate charge waveform definitions





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

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

### 8. Test information

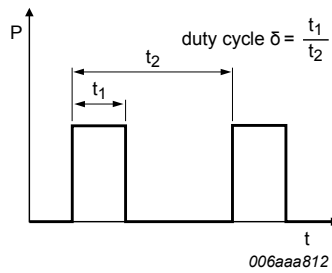


Fig. 17. Duty cycle definition

### 9. Package outline

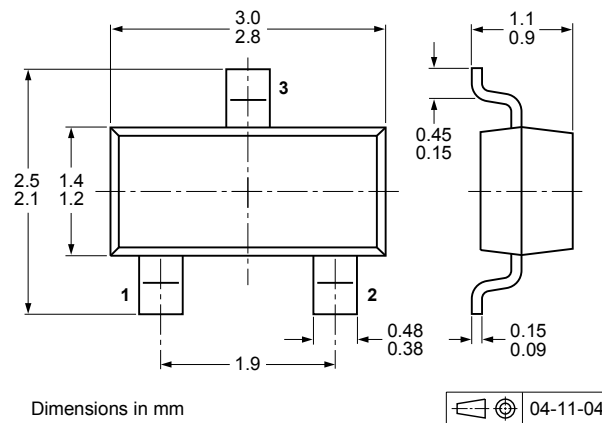


Fig. 18. TO-236AB (SOT23)

### 10. Soldering

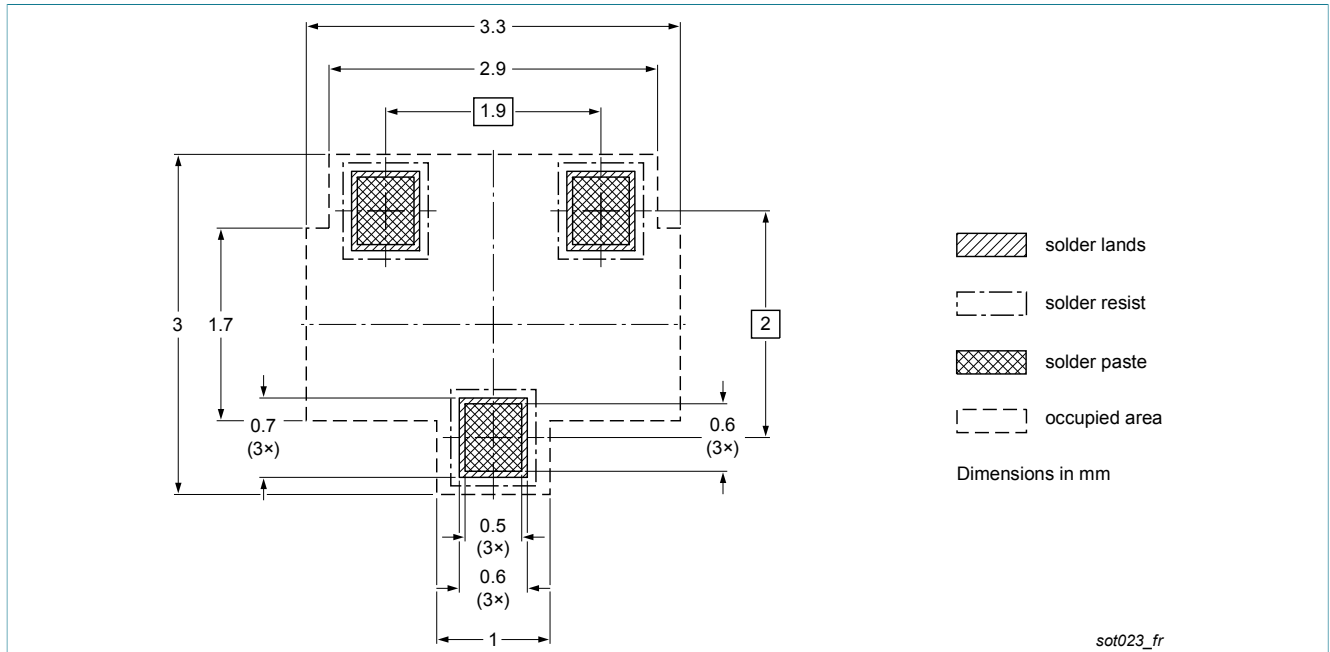


Fig. 19. Reflow soldering footprint for SOT23 (TO-236AB)

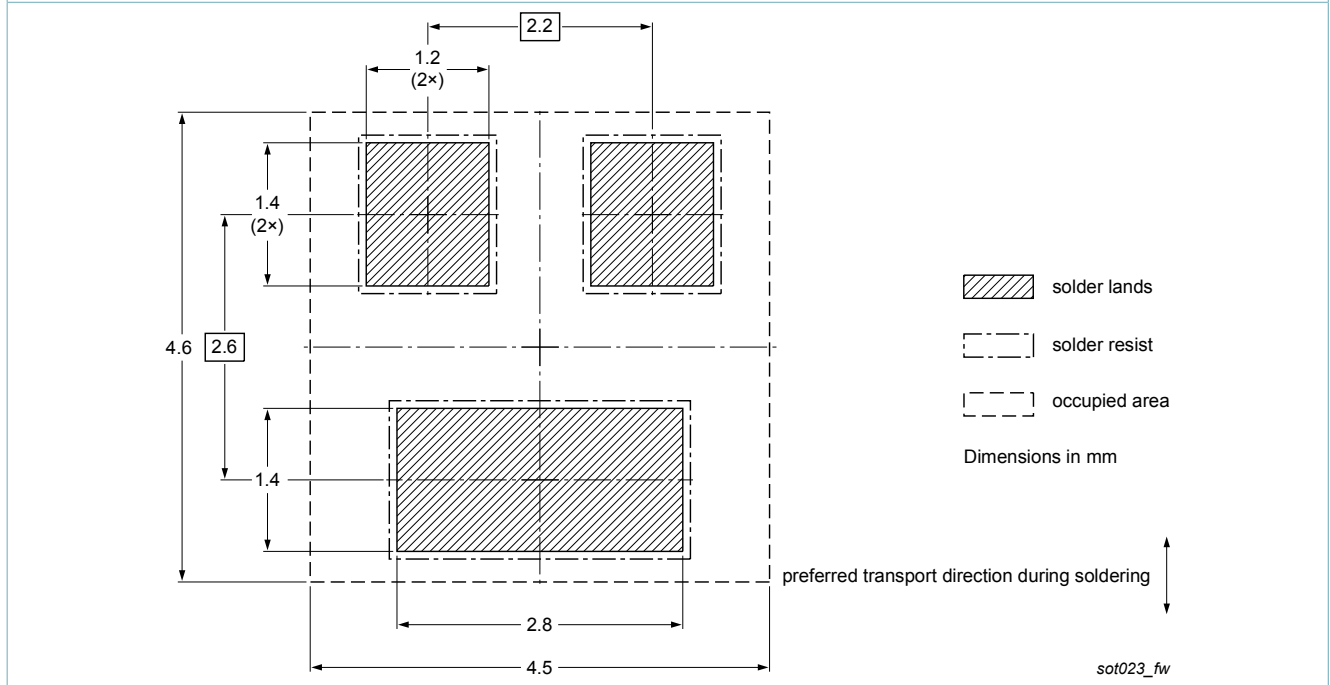


Fig. 20. Wave soldering footprint for SOT23 (TO-236AB)

## 11. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV170UN v.1	20120803	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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Date of release: 3 August 2012

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