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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

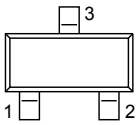
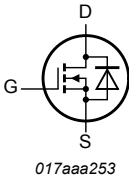
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_{amb} = 25 °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]	-	-	1.5	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 1 A; T_j = 25 °C		-	140	165	mΩ

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

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 TO-236AB (SOT23)	 017aaa253
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 [1]
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 °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]	-	1.5	A
		V_{GS} = 4.5 V; T_{amb} = 25 °C	[1]	-	1	A
		V_{GS} = 4.5 V; T_{amb} = 100 °C	[1]	-	0.9	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	4	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	325	mW
			[1]	-	455	mW
		T_{sp} = 25 °C		-	1140	mW

Symbol	Parameter	Conditions		Min	Max	Unit
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]	-	0.7	A

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

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

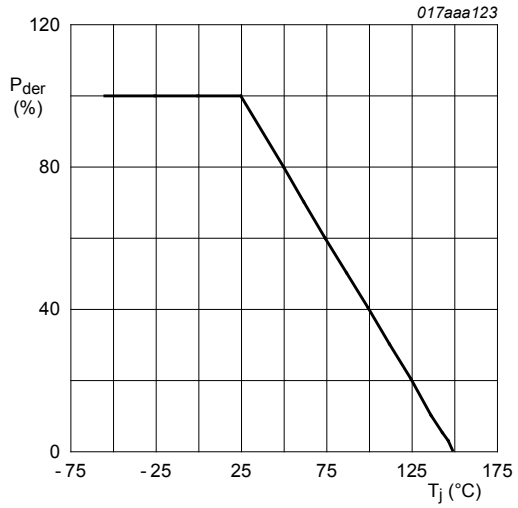


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

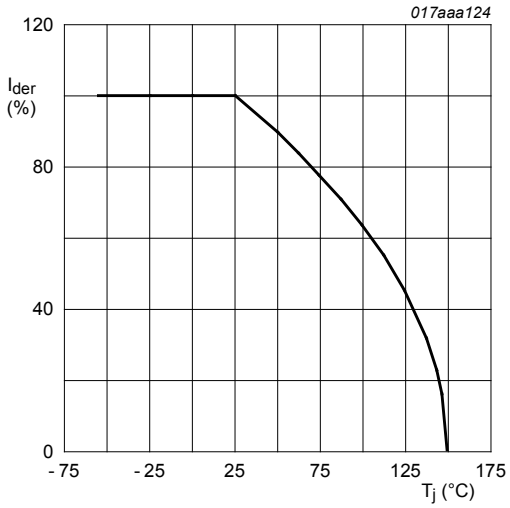
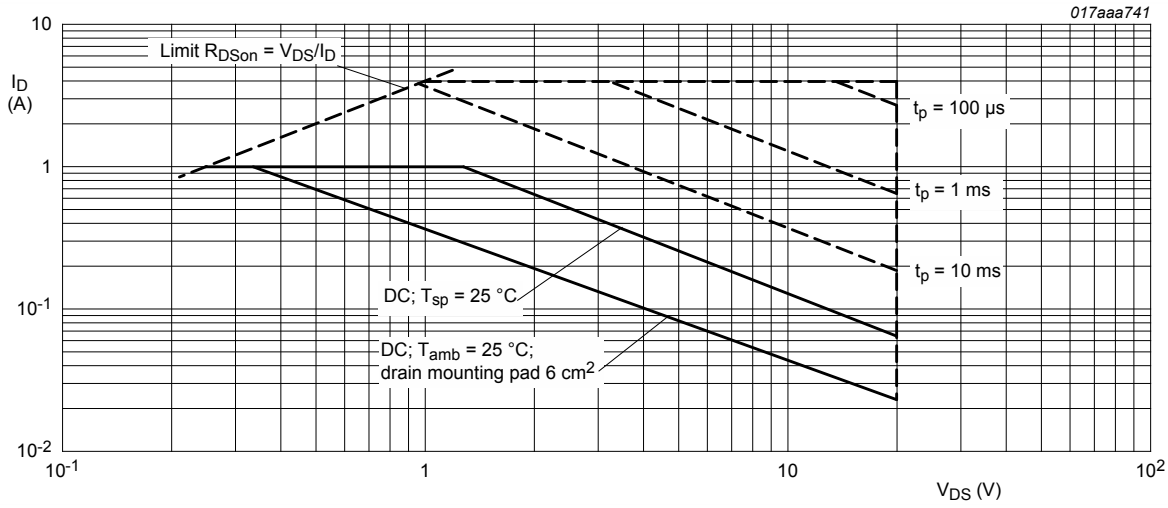


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



I_{DM} = single pulse

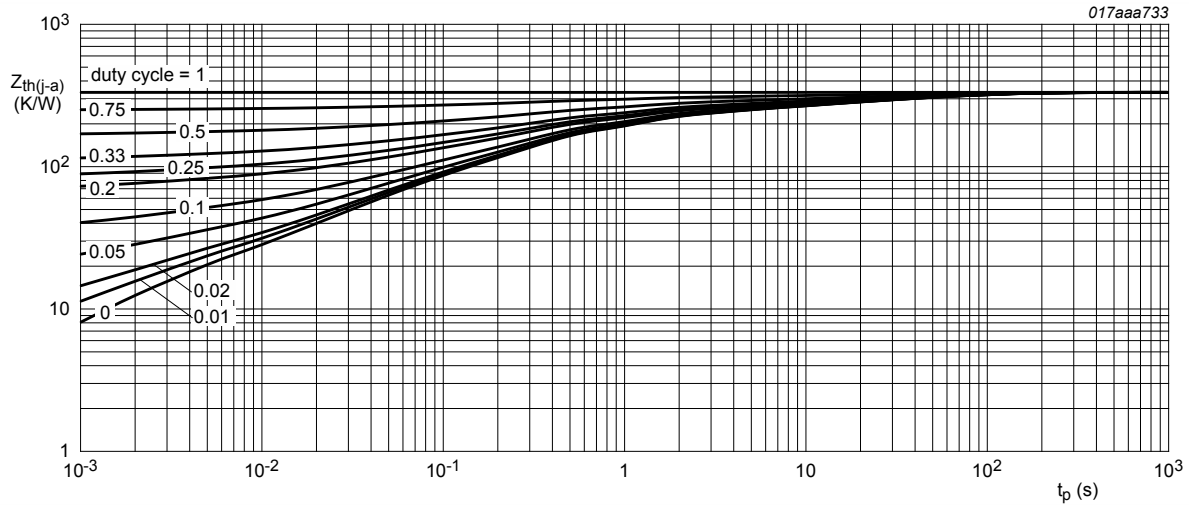
Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. Thermal characteristics

Table 6. Thermal characteristics

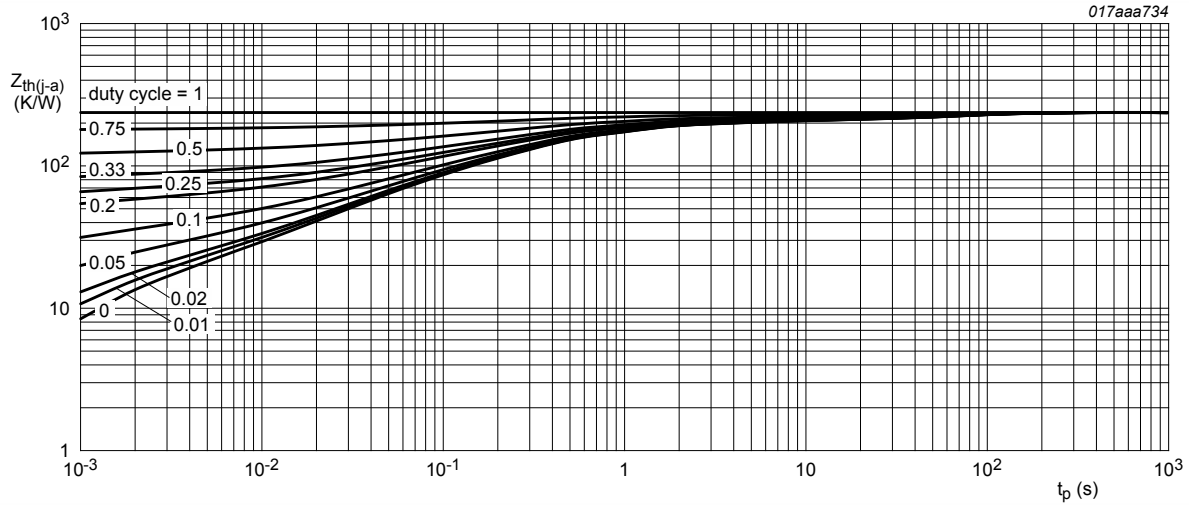
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	333	385	K/W
			[2]	-	240	275	K/W
		in free air; t ≤ 5 s	[2]	-	203	235	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	85	100	K/W

[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 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^2

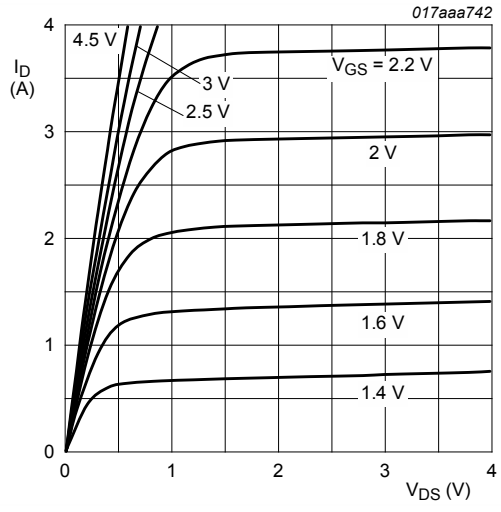
Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

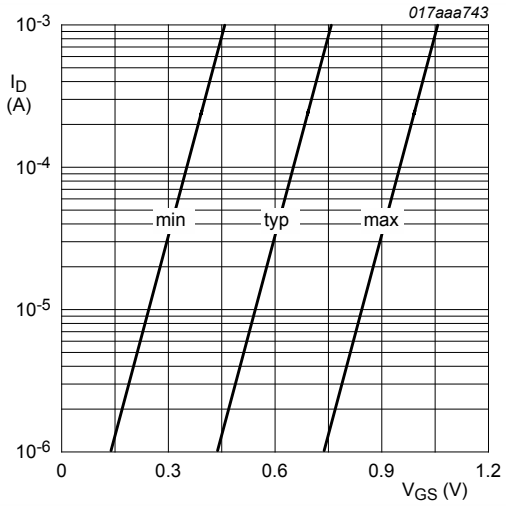
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C		20	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = 250 µA; V_{DS} = V_{GS}; T_j = 25 °C		0.4	0.7	1	V
I_{DSS}	drain leakage current	V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 25 °C		-	-	1	µA
		V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 150 °C		-	-	20	µA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{GSS}	gate leakage current	V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	100	nA
		V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 1 A; T_j = 25 °C		-	140	165	mΩ
		V_{GS} = 4.5 V; I_D = 1 A; T_j = 150 °C		-	208	248	mΩ
		V_{GS} = 2.5 V; I_D = 1 A; T_j = 25 °C		-	175	220	mΩ
		V_{GS} = 1.8 V; I_D = 0.25 A; T_j = 25 °C		-	237	337	mΩ
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 1 A; T_j = 25 °C		-	3.4	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = 10 V; I_D = 1 A; V_{GS} = 4.5 V; T_j = 25 °C		-	1.1	1.65	nC
Q_{GS}	gate-source charge			-	0.15	-	nC
Q_{GD}	gate-drain charge			-	0.3	-	nC
C_{iss}	input capacitance	V_{DS} = 10 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C		-	83	-	pF
C_{oss}	output capacitance			-	37	-	pF
C_{rss}	reverse transfer capacitance			-	26	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 10 V; I_D = 1 A; V_{GS} = 4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C		-	6	-	ns
t_r	rise time			-	12	-	ns
$t_{d(off)}$	turn-off delay time			-	16	-	ns
t_f	fall time			-	8	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 0.7 A; V_{GS} = 0 V; T_j = 25 °C		-	0.8	1.2	V



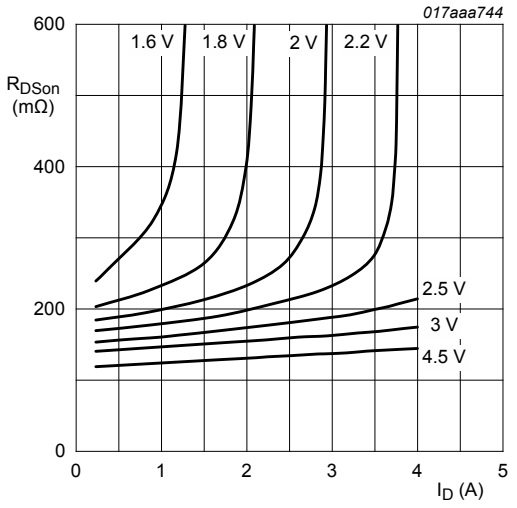
T_j = 25 °C

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



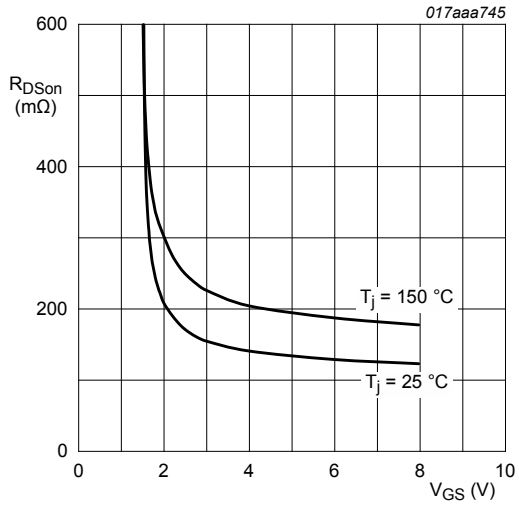
T_j = 25 °C; V_{DS} = 5 V

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



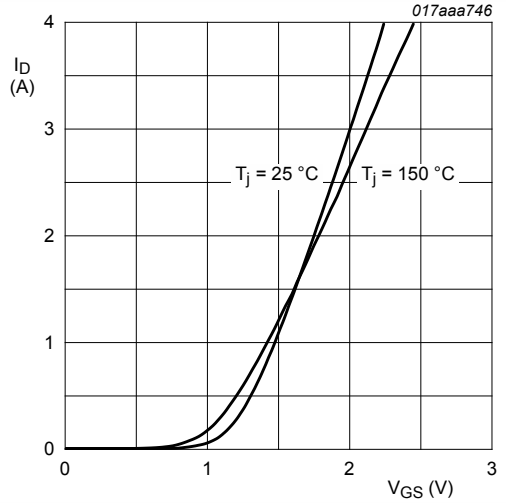
T_j = 25 °C

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



I_D = 1 A

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



$V_{DS} > I_D \times R_{DSon}$

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

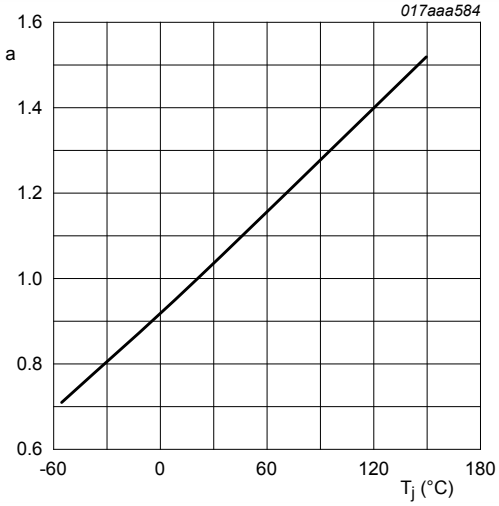
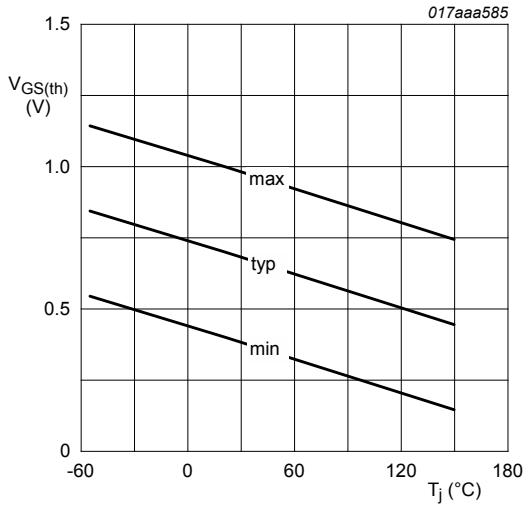


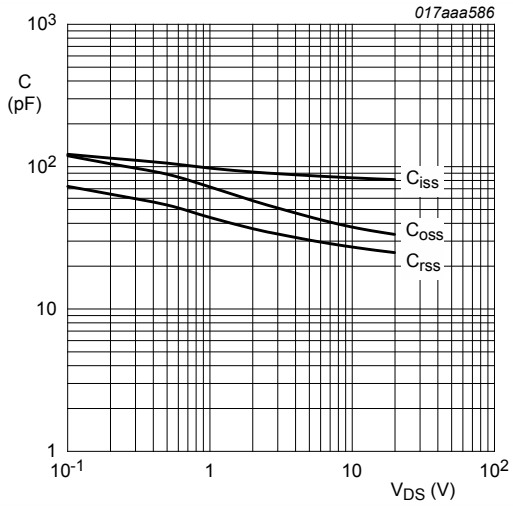
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$



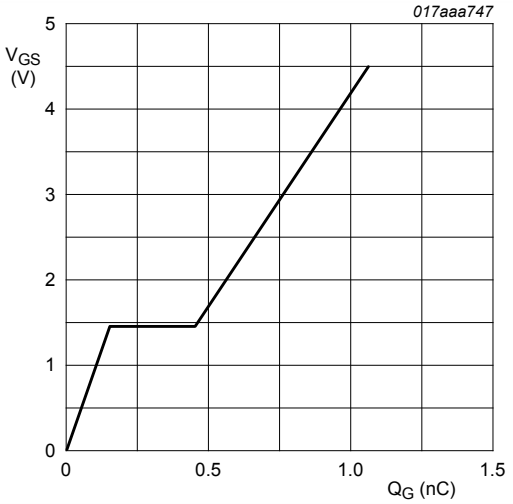
I_D = 0.25 mA; V_{DS} = V_{GS}

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



f = 1 MHz; V_{GS} = 0 V

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



I_D = 1 A; V_{DS} = 15 V; T_{amb} = 25 °C

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

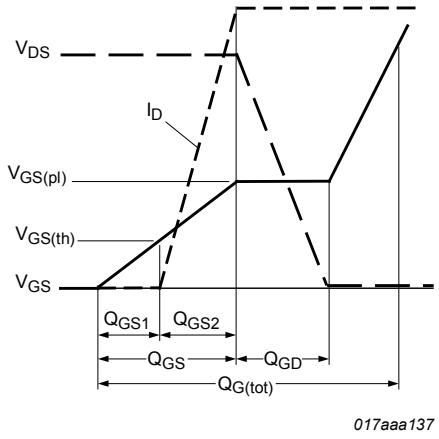
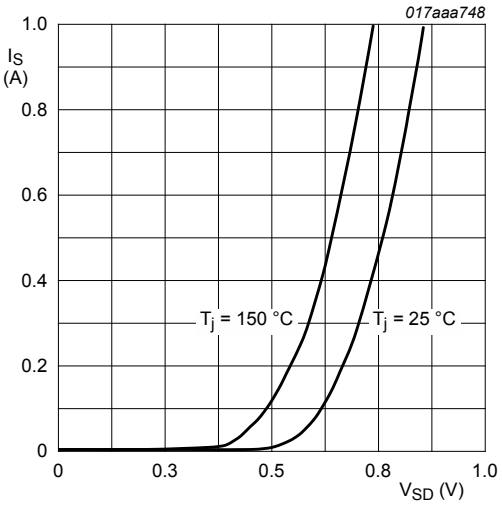


Fig. 15. Gate charge waveform definitions



V_{GS} = 0 V

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

8. Test information

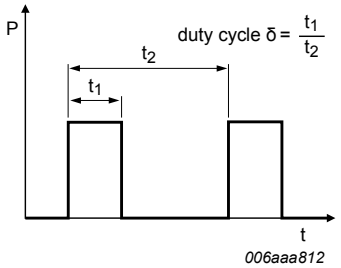


Fig. 17. Duty cycle definition

9. Package outline

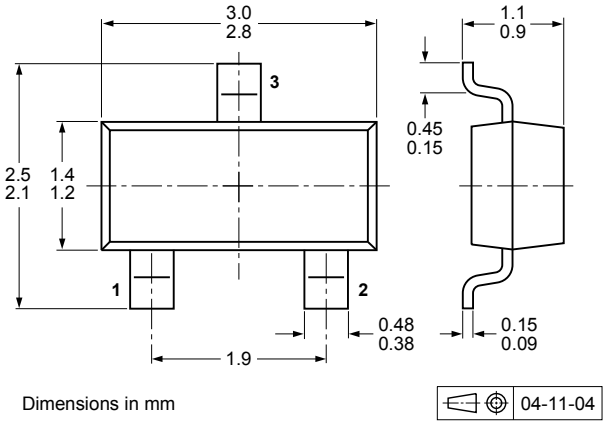


Fig. 18. TO-236AB (SOT23)

10. Soldering

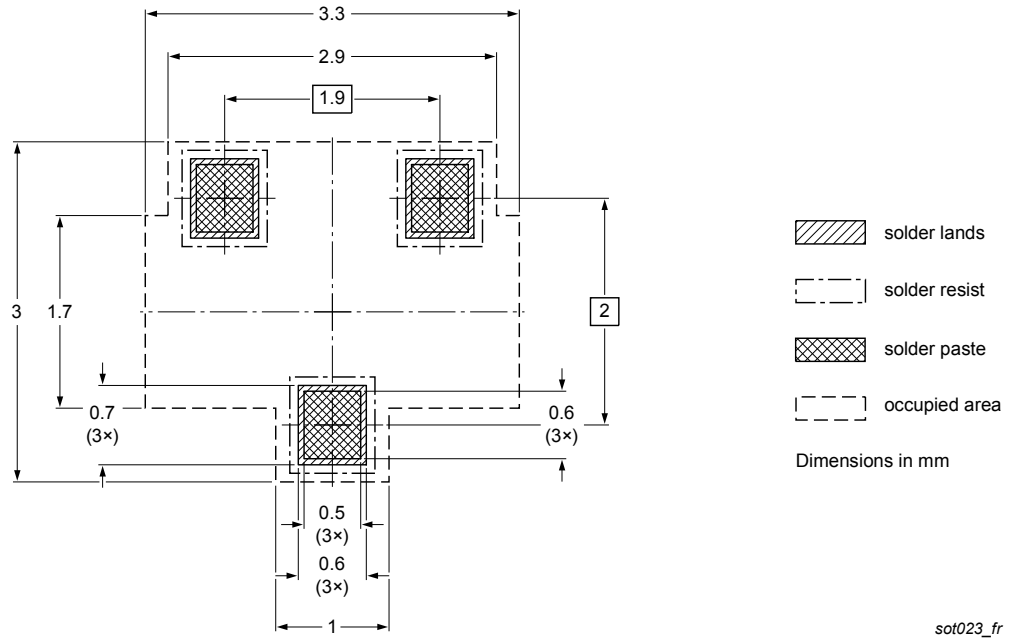


Fig. 19. Reflow soldering footprint for SOT23 (TO-236AB)

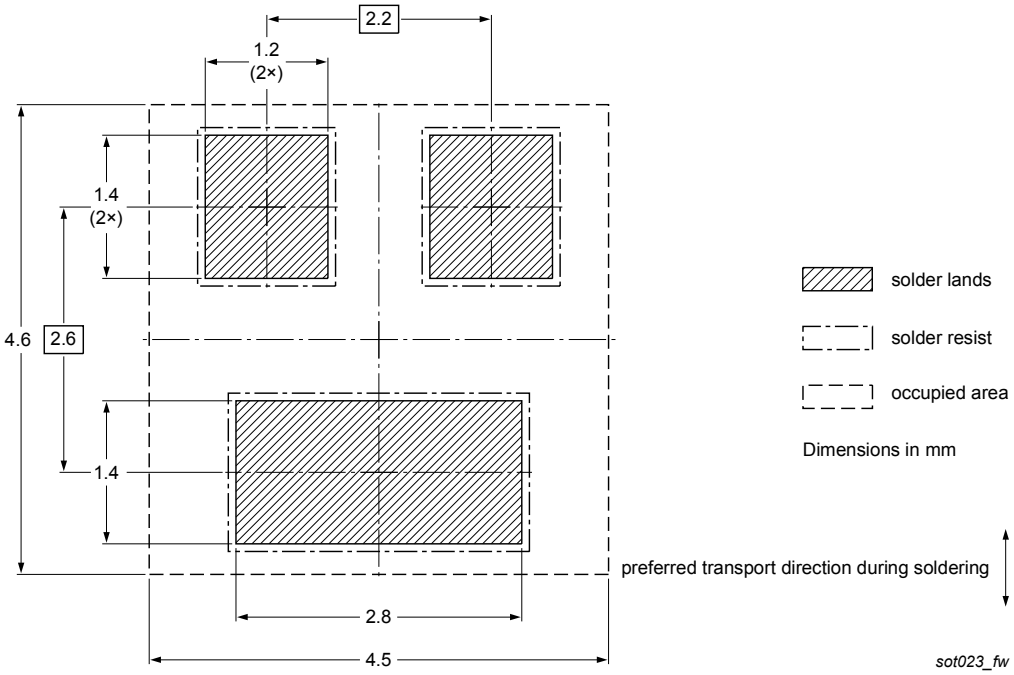


Fig. 20. Wave soldering footprint for SOT23 (TO-236AB)

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.

[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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