



PMV65XP

20 V, single P-channel Trench MOSFET

12 February 2013

Product data sheet

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.

2. Features and benefits

- Low threshold voltage
- Low on-state resistance
- Trench MOSFET technology

3. Applications

- Low power DC-to-DC converters
- Load switching
- Battery management
- Battery powered portable equipment

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		-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ °C}$	-	-	-4.3	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2.8\text{ A}; T_j = 25\text{ °C}$	-	58	74	m Ω

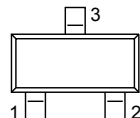
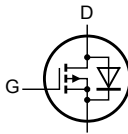


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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-236AB (SOT23)</p>	 <p>017aaa257</p>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV65XP	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code [1]
PMV65XP	%M9

[1] % = placeholder for manufacturing site code

8. Limiting values

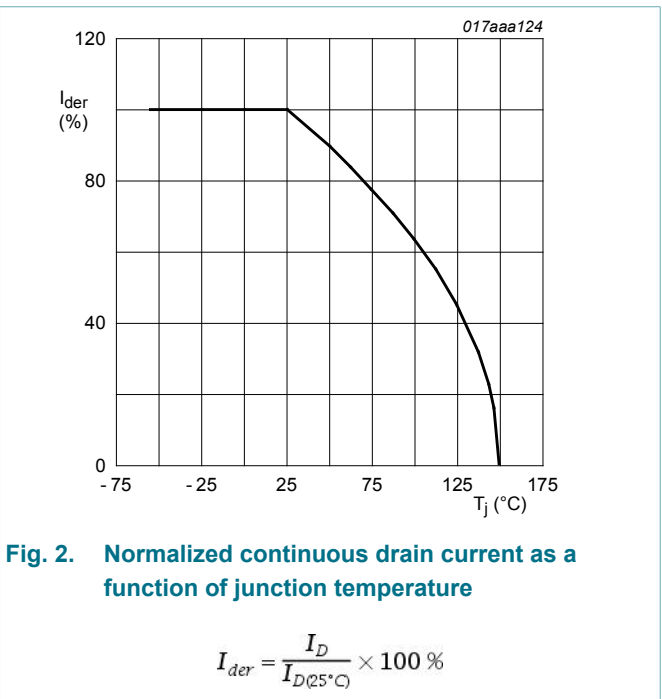
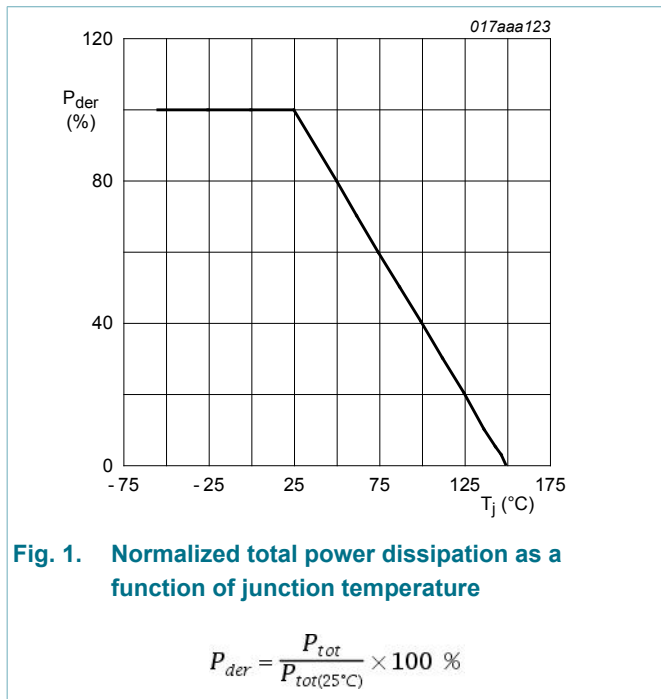
Table 5. Limiting values

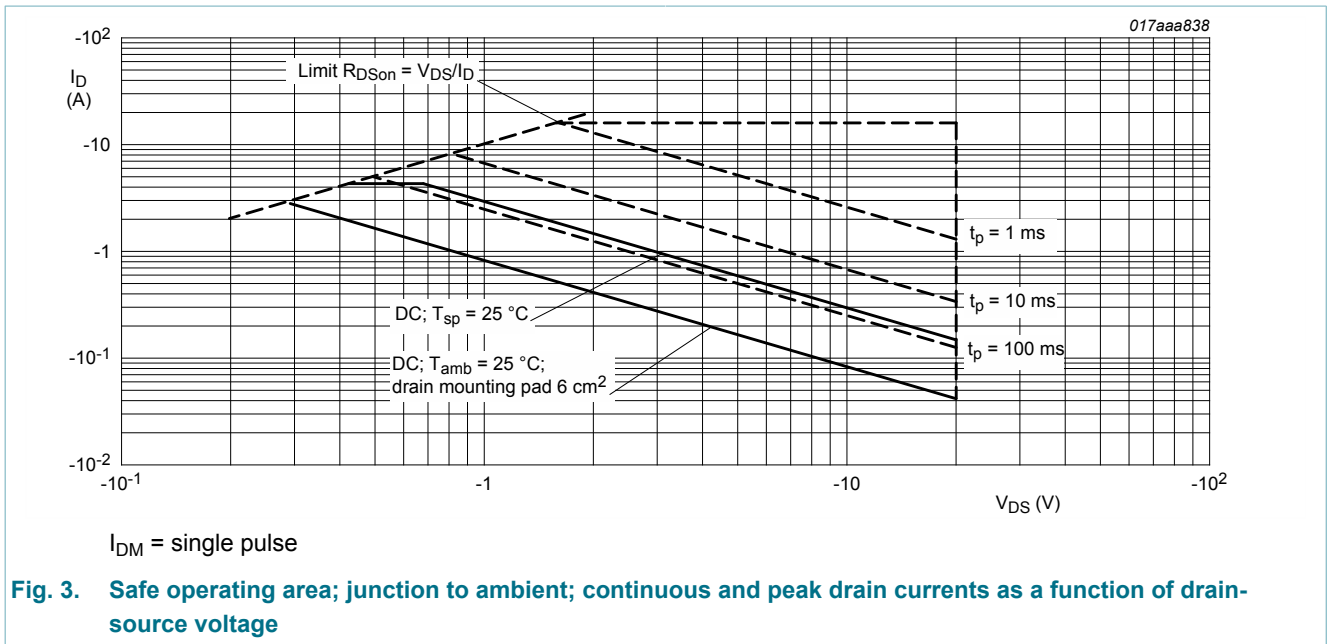
In accordance with the Absolute Maximum Rating System (IEC 60134).

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		-12	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ }^\circ\text{C}$	-	-4.3	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-2.8	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ }^\circ\text{C}$	[1]	-1.8	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^\circ\text{C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-16	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^\circ\text{C}$	[2]	480	mW
			[1]	833	mW
		$T_{sp} = 25\text{ }^\circ\text{C}$	-	4165	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 _{sp} = 25 °C	-	-1.6	A

- [1] Device mounted on an FR4 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.





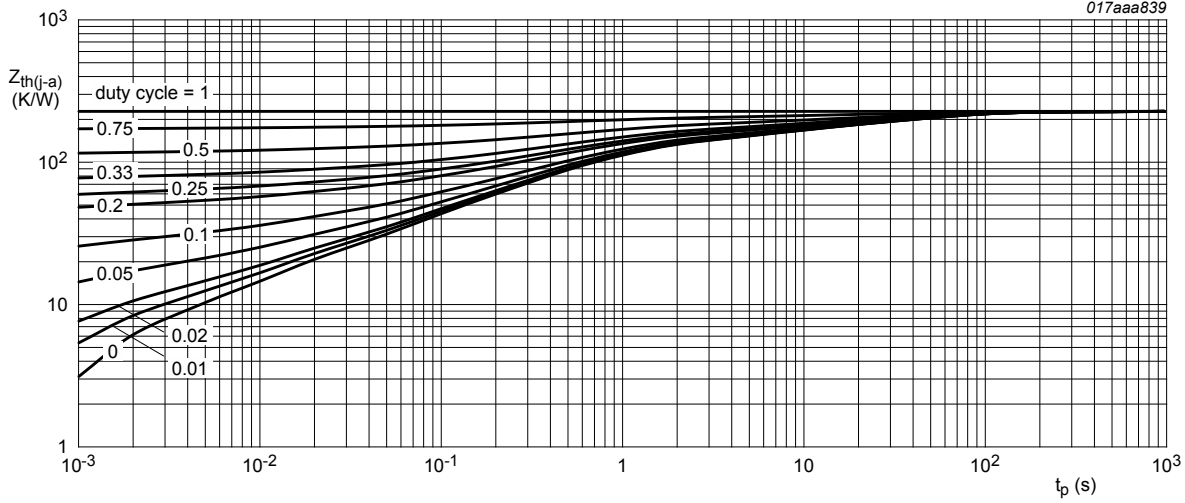
9. Thermal characteristics

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]	-	230	260	K/W
			[2]	-	125	150	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	25	30	K/W

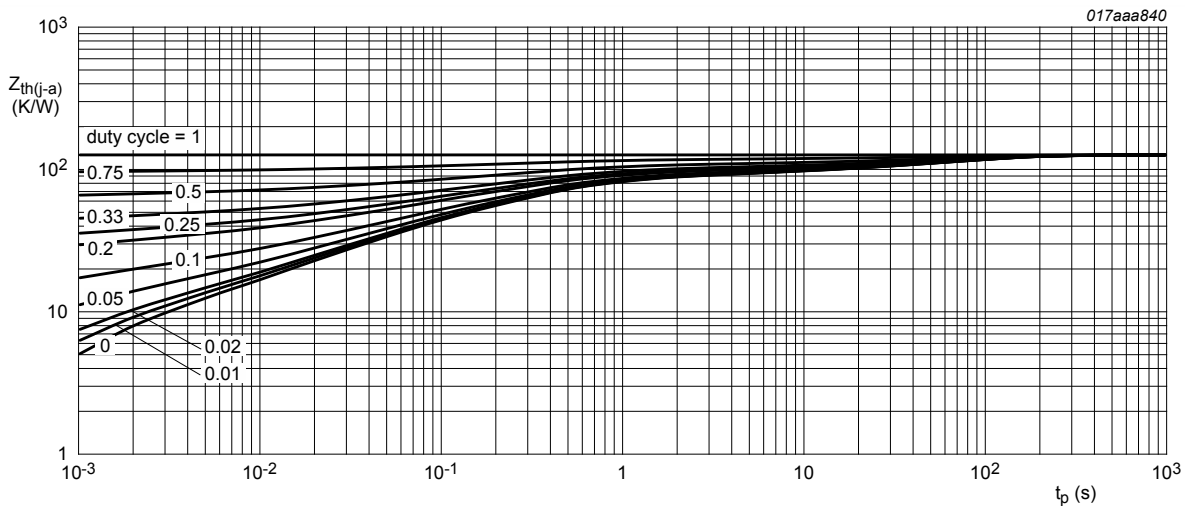
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².



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

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	-0.47	-0.65	-0.9	V
I_{DSS}	drain leakage current	$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-1	μA
		$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	-100	μA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{GSS}	gate leakage current	V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C	-	-	-100	nA
		V _{GS} = 12 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 = -2.8 A; T _j = 25 °C	-	58	74	mΩ
		V _{GS} = -4.5 V; I _D = -2.8 A; T _j = 150 °C	-	82	105	mΩ
		V _{GS} = -2.5 V; I _D = -2.3 A; T _j = 25 °C	-	67	92	mΩ
		V _{GS} = -1.8 V; I _D = -1 A; T _j = 25 °C	-	87	135	mΩ
g _{fs}	forward transconductance	V _{DS} = -10 V; I _D = -2.8 A; T _j = 25 °C	-	15	-	S

Dynamic characteristics

Q _{G(tot)}	total gate charge	V _{DS} = -6 V; I _D = -2.8 A; V _{GS} = -4.5 V; T _j = 25 °C	-	7.7	-	nC
Q _{GS}	gate-source charge		-	1	-	nC
Q _{GD}	gate-drain charge		-	1.65	-	nC
C _{iss}	input capacitance	V _{DS} = -20 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C	-	744	-	pF
C _{oss}	output capacitance		-	65	-	pF
C _{rss}	reverse transfer capacitance		-	53	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = -6 V; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C; I _D = -1 A	-	7	-	ns
t _r	rise time		-	18	-	ns
t _{d(off)}	turn-off delay time		-	135	-	ns
t _f	fall time		-	68	-	ns

Source-drain diode

V _{SD}	source-drain voltage	I _S = -0.9 A; V _{GS} = 0 V; T _j = 25 °C	-	-0.8	-1.2	V
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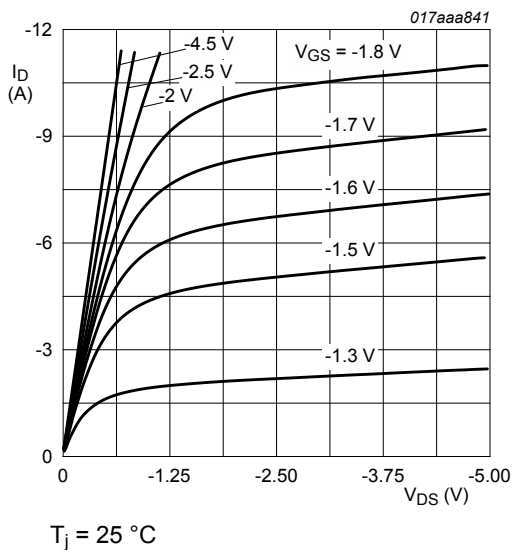


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

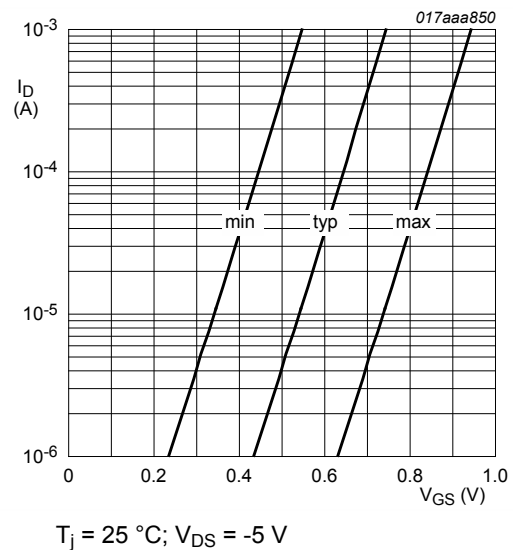


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

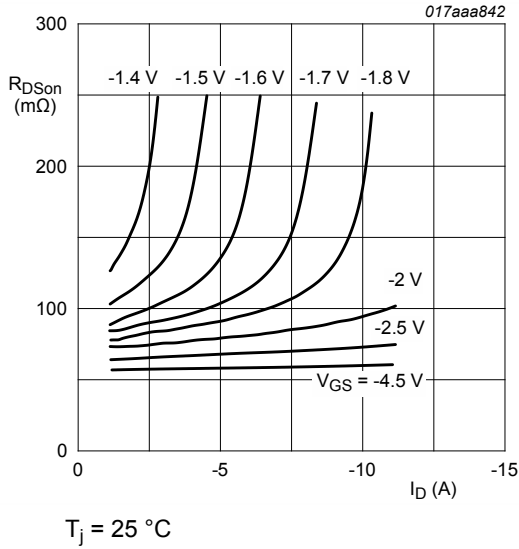


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

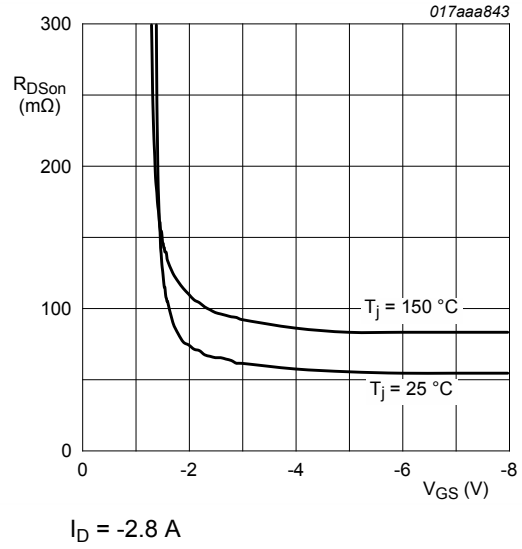


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

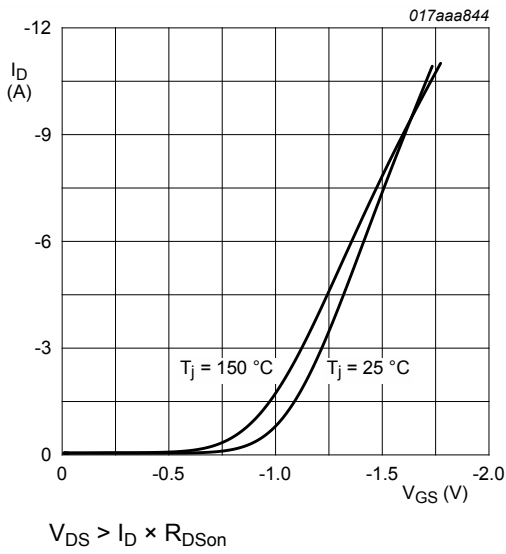


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

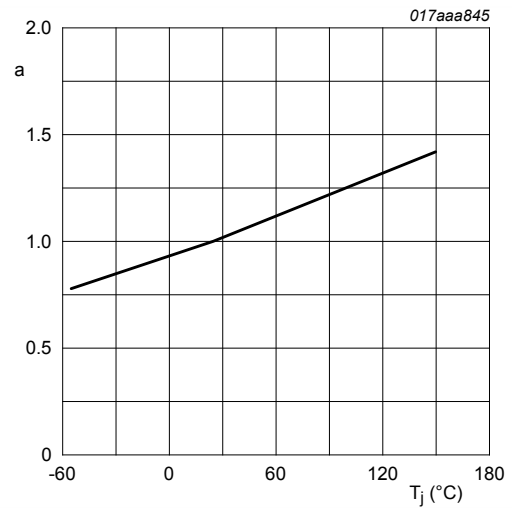


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

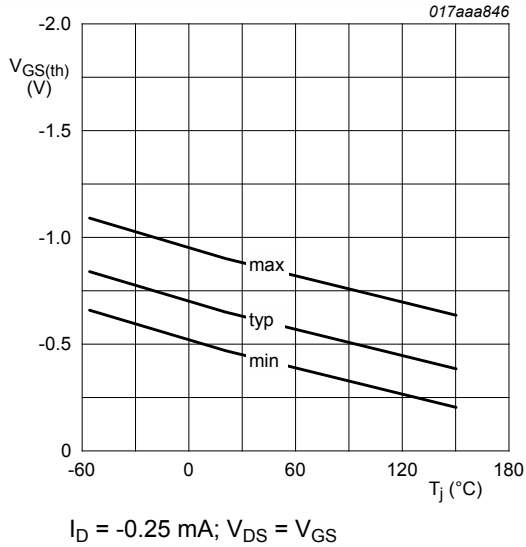


Fig. 12. Gate-source threshold voltage as a function of junction temperature

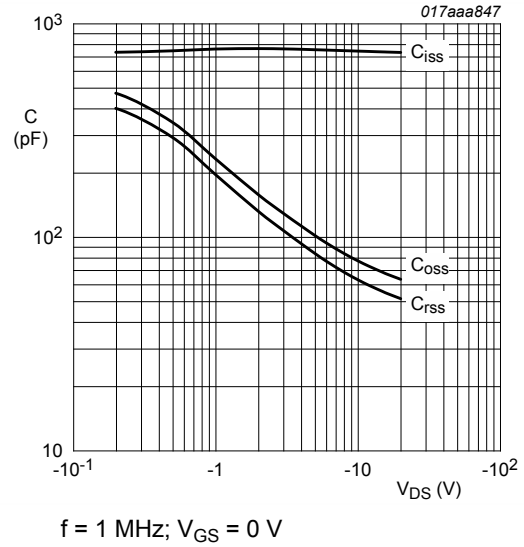


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

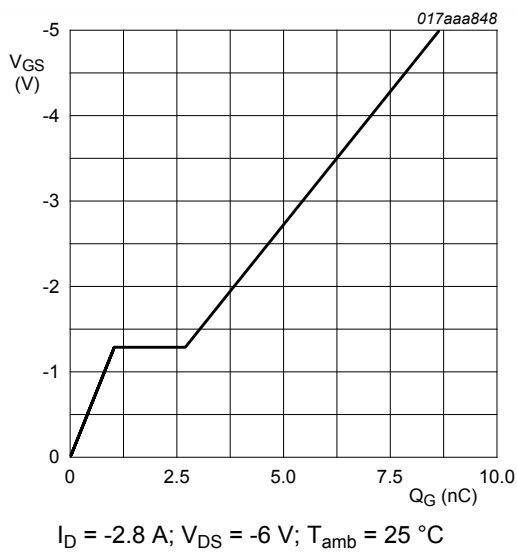


Fig. 14. Gate-source voltage as a function of gate charge; typical values

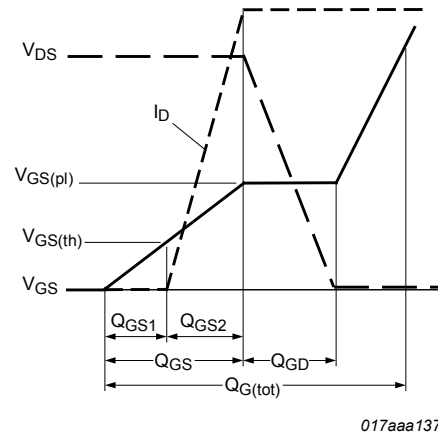
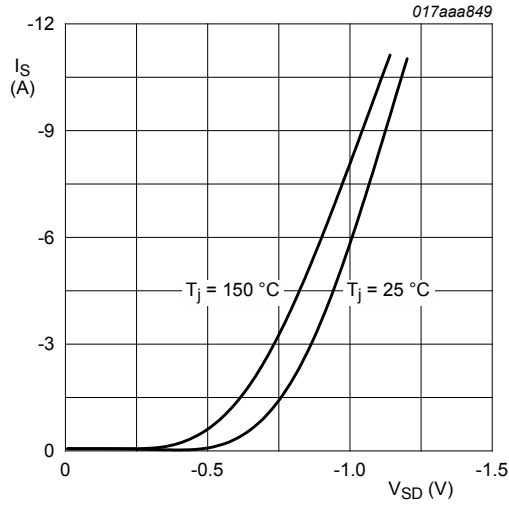


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$
 (1) $T_j = 150\text{ °C}$
 (2) $T_j = 25\text{ °C}$

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

11. Test information

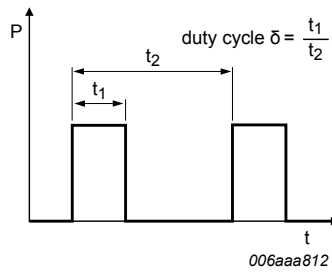


Fig. 17. Duty cycle definition

12. Package outline

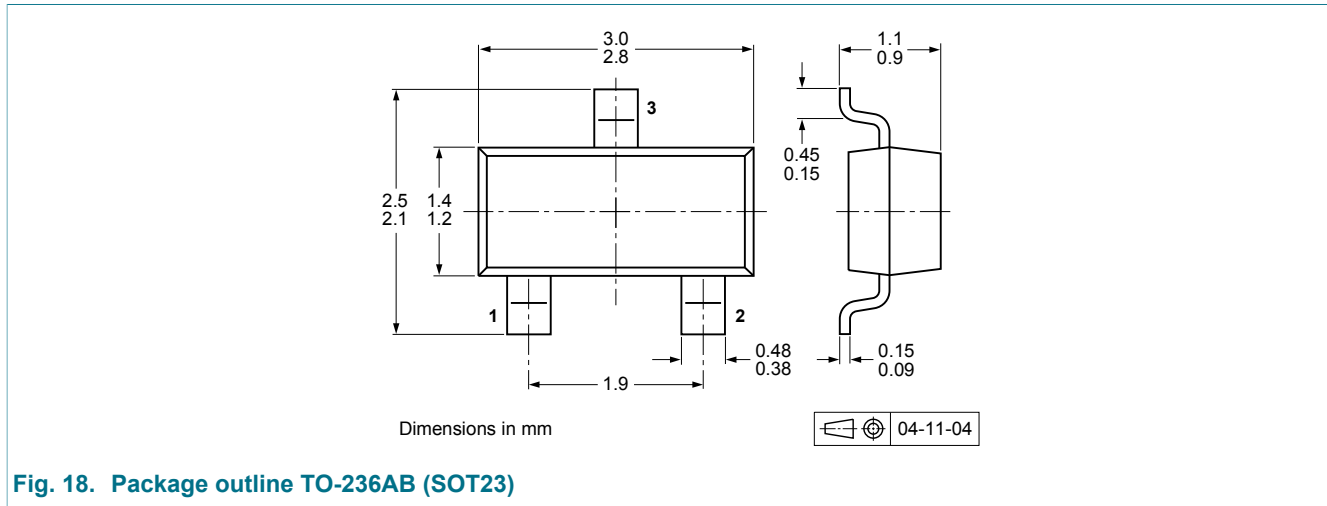


Fig. 18. Package outline TO-236AB (SOT23)

13. Soldering

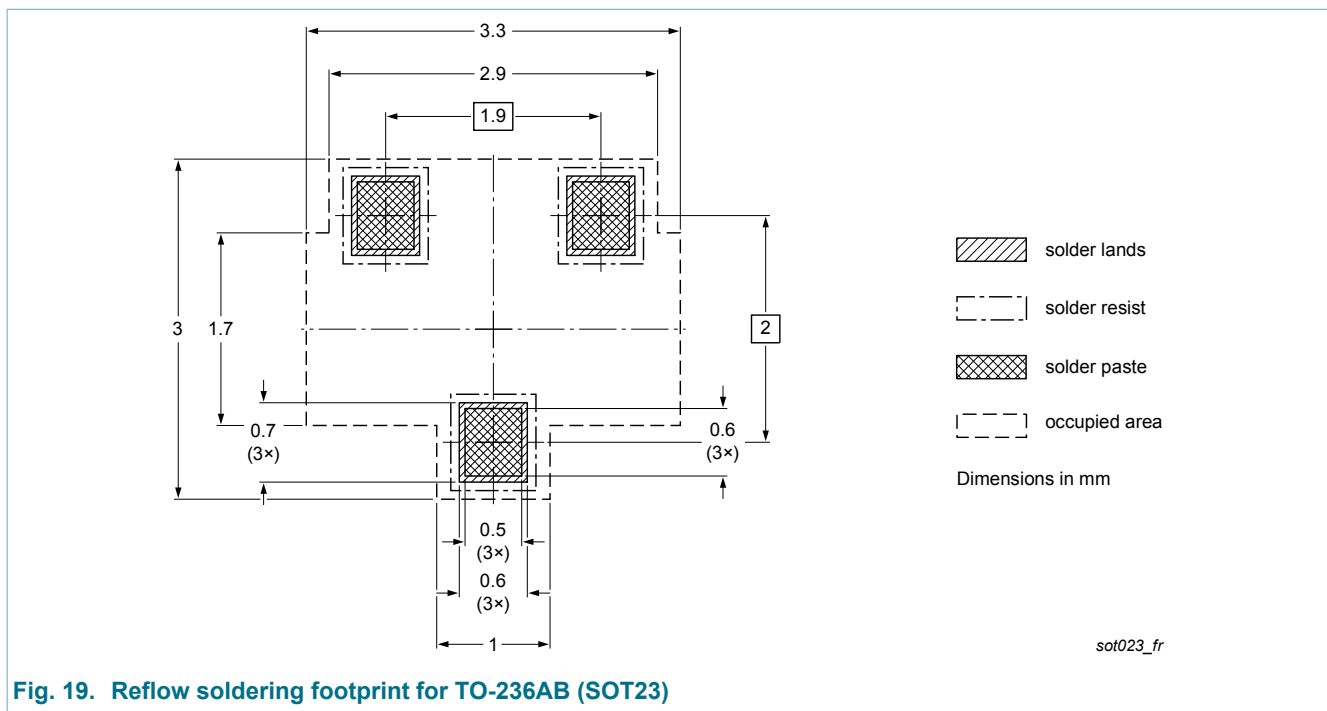


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

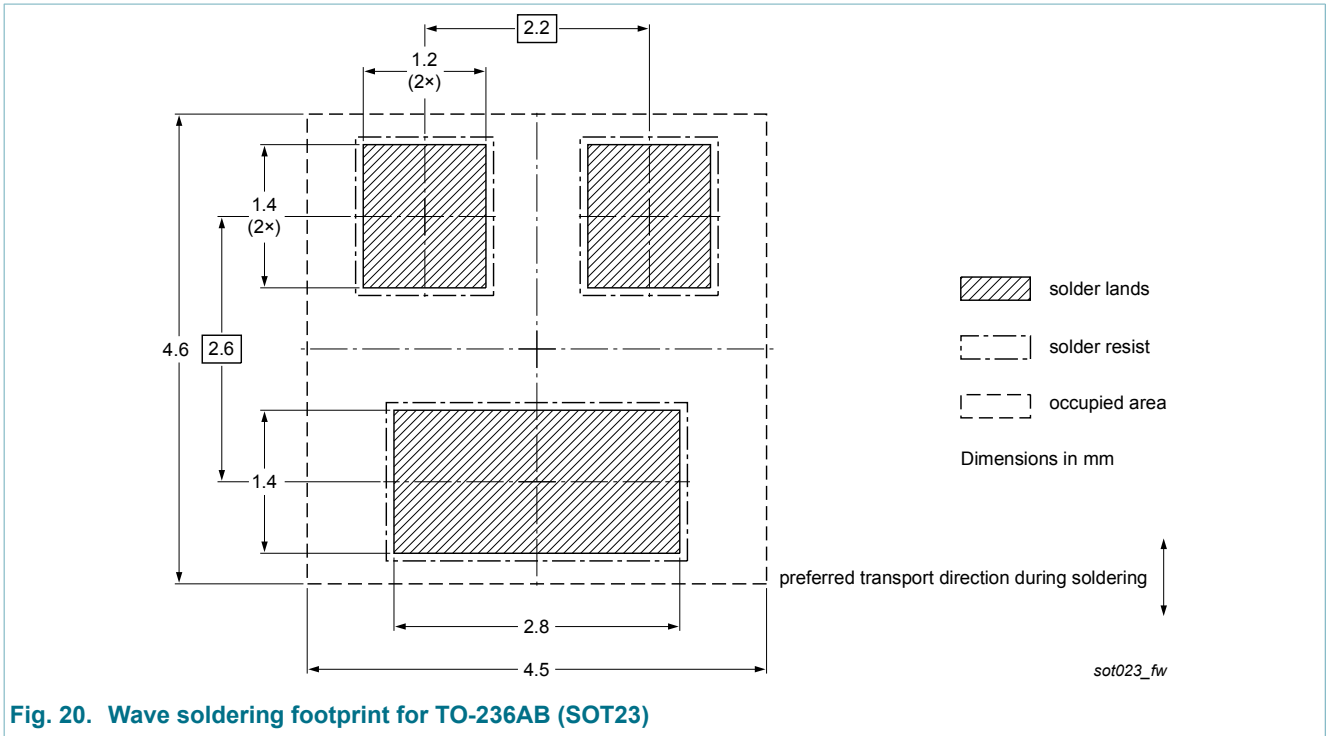


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV65XP v.2	20130212	Product data sheet	-	PMV65XP v.1
Modifications:	<ul style="list-style-type: none"> • Pinning information corrected 			
PMV65XP v.1	20120921	Product data sheet	-	-

15. Legal information

15.1 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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