



PMV50UPE

20 V, single P-channel Trench MOSFET

20 July 2012

Product data sheet

1. Product profile

1.1 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.

1.2 Features and benefits

- 3 kV ESD protected
- Trench MOSFET technology
- Low threshold voltage

1.3 Applications

- Relay driver
- High-side loadswitch
- Switching circuits

1.4 Quick reference data

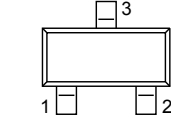
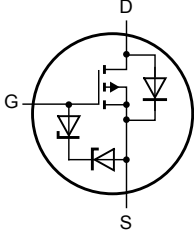
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_J = 25\text{ °C}$		-	-	-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]	-	-	-3.7	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -3.2\text{ A}; T_J = 25\text{ °C}$		-	50	66	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	 TO-236AB (SOT23)	 017aaa259
2	S	source		
3	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV50UPE	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code
PMV50UPE	%CZ

[1] % = placeholder for manufacturing site code

5. Limiting values

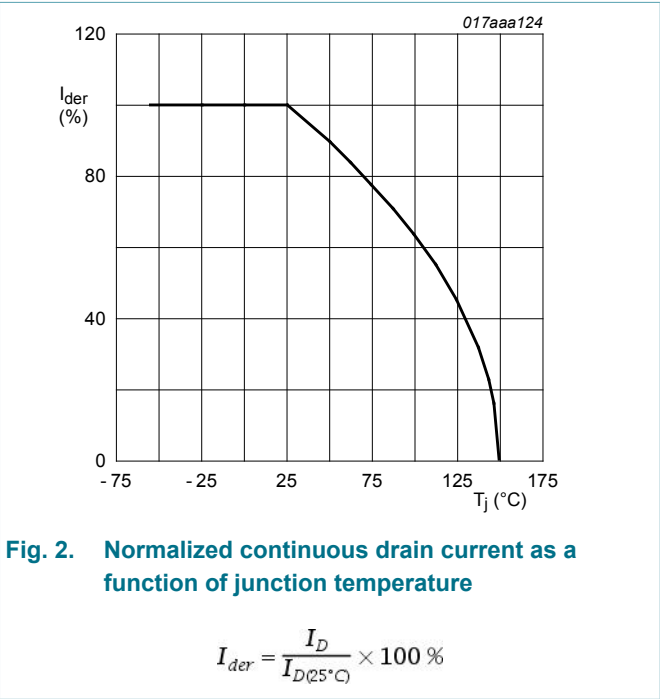
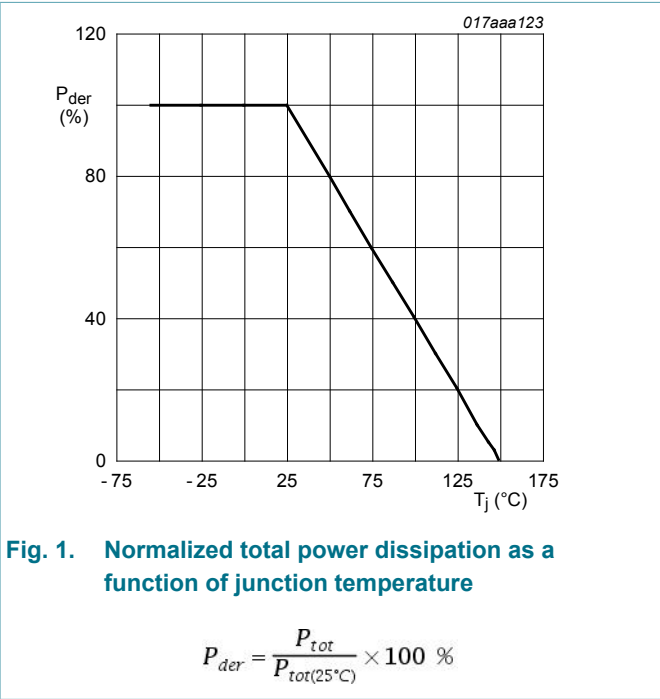
Table 5. Limiting values

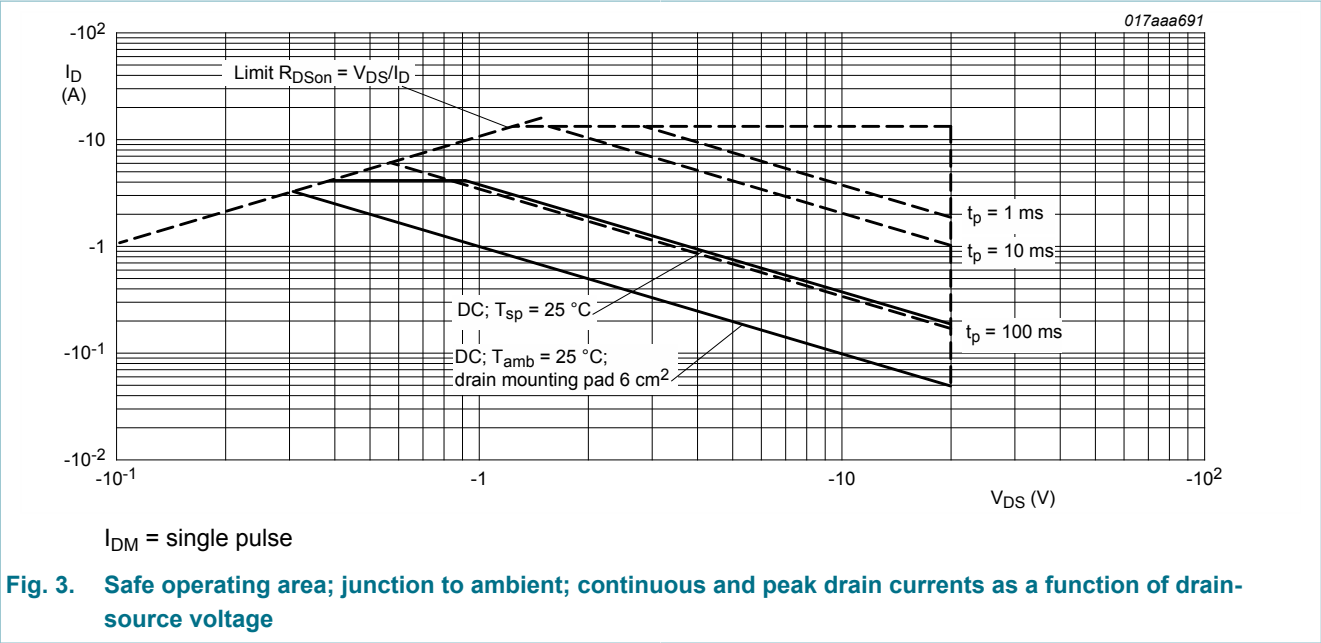
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ }^{\circ}\text{C}$		-	-20	V
V_{GS}	gate-source voltage			-8	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$	[1]	-	-3.7	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	-3.2	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ }^{\circ}\text{C}$	[1]	-	-2	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^{\circ}\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	-12.8	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	-	500	mW

Symbol	Parameter	Conditions		Min	Max	Unit
			[1]	-	955	mW
		T _{sp} = 25 °C		-	3570	mW
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]	-	-1	A
ESD maximum rating						
V _{ESD}	electrostatic discharge voltage	HBM	[3]	-	3000	V

- [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.
- [3] Measured between all pins.





6. Thermal characteristics

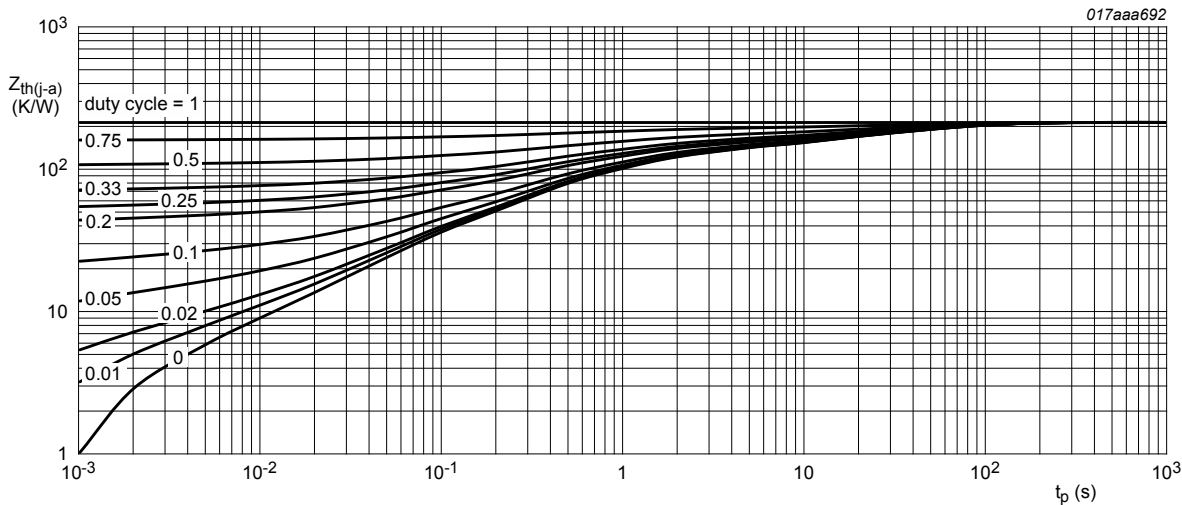
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	218	250	K/W
			[2]	-	114	130	K/W
			[3]	-	80	92	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	30	35	K/W

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

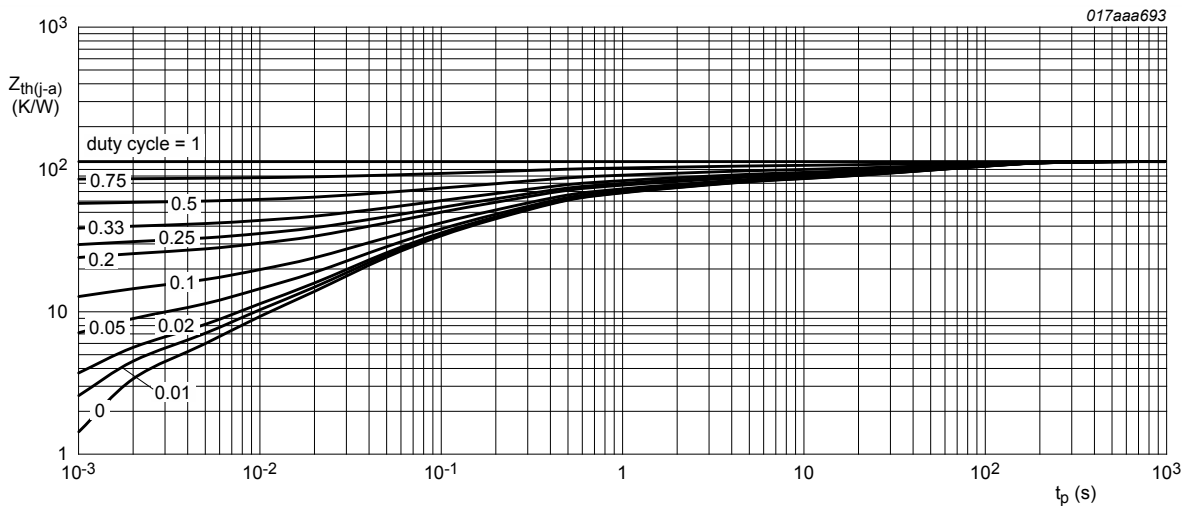
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2 .

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2 , $t \leq 5\text{ s}$.



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	$I_D = -250\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250\text{ }\mu\text{A}$; $V_{DS} = V_{GS}$; $T_j = 25\text{ }^\circ\text{C}$	-0.47	-0.6	-0.9	V
I_{DSS}	drain leakage current	$V_{DS} = -20\text{ V}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	-1	μA
		$V_{DS} = -20\text{ V}$; $V_{GS} = 0\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$	-	-	-10	μA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GSS}	gate leakage current	$V_{GS} = -8 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^{\circ}\text{C}$	-	-	10	μA
		$V_{GS} = 8 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^{\circ}\text{C}$	-	-	10	μA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}; I_D = -3.2 \text{ A}; T_j = 25 \text{ }^{\circ}\text{C}$	-	50	66	$\text{m}\Omega$
		$V_{GS} = -4.5 \text{ V}; I_D = -3.2 \text{ A}; T_j = 150 \text{ }^{\circ}\text{C}$	-	73	96	$\text{m}\Omega$
		$V_{GS} = -2.5 \text{ V}; I_D = -2.1 \text{ A}; T_j = 25 \text{ }^{\circ}\text{C}$	-	57	81	$\text{m}\Omega$
		$V_{GS} = -1.8 \text{ V}; I_D = -2.1 \text{ A}; T_j = 25 \text{ }^{\circ}\text{C}$	-	70	110	$\text{m}\Omega$
g_{fs}	forward transconductance	$V_{DS} = -5 \text{ V}; I_D = -3.2 \text{ A}; T_j = 25 \text{ }^{\circ}\text{C}$	-	18	-	S

Dynamic characteristics

$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}; I_D = -3.2 \text{ A}; V_{GS} = -4.5 \text{ V}; T_j = 25 \text{ }^{\circ}\text{C}$	-	10.5	15.7	nC
Q_{GS}	gate-source charge		-	2.2	-	nC
Q_{GD}	gate-drain charge		-	2.7	-	nC
C_{iss}	input capacitance	$V_{DS} = -10 \text{ V}; f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^{\circ}\text{C}$	-	24	-	pF
C_{oss}	output capacitance		-	106	-	pF
C_{rss}	reverse transfer capacitance		-	14.6	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}; I_D = -3.2 \text{ A}; V_{GS} = -4.5 \text{ V}; R_{G(ext)} = 6 \text{ }\Omega; T_j = 25 \text{ }^{\circ}\text{C}$	-	400	-	ns
t_r	rise time		-	700	-	ns
$t_{d(off)}$	turn-off delay time		-	2180	-	ns
t_f	fall time		-	8800	-	ns

Source-drain diode

V_{SD}	source-drain voltage	$I_S = -1 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^{\circ}\text{C}$	-	-0.8	-1.2	V
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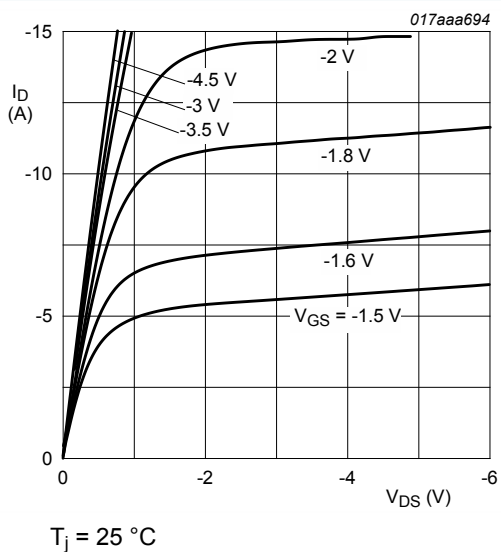


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

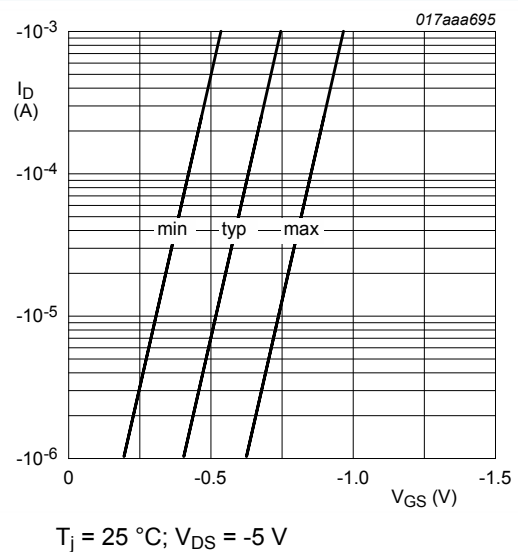


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

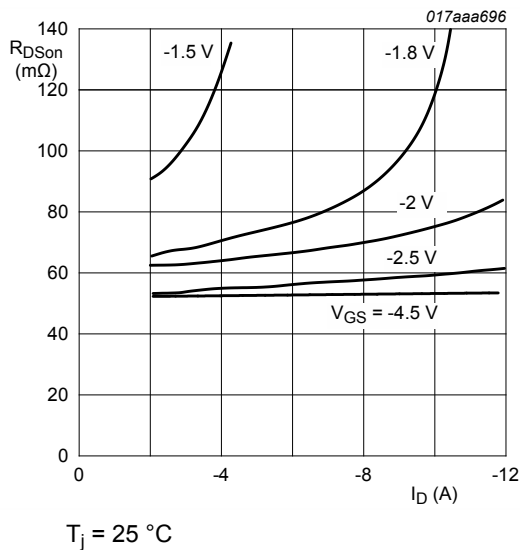


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

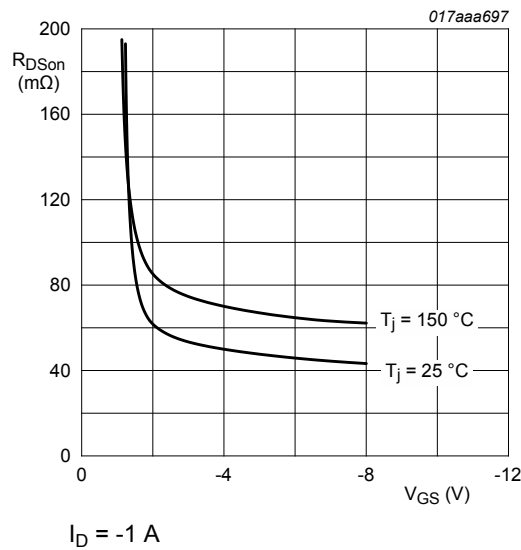


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

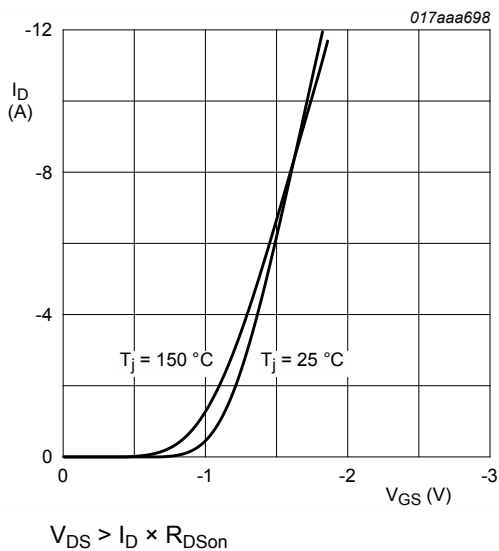


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

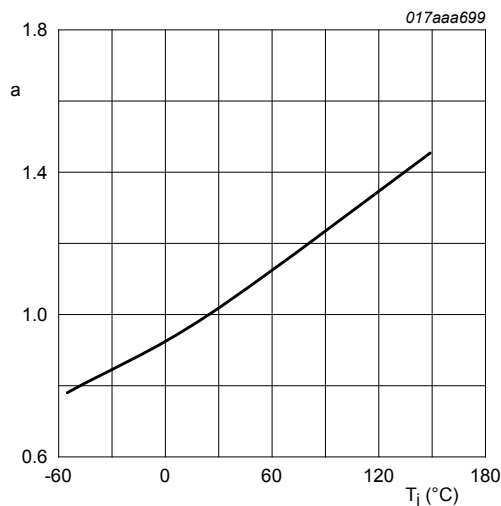


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

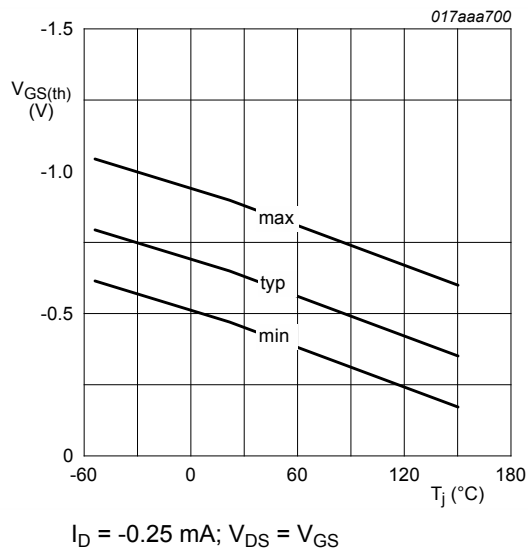


Fig. 12. Gate-source threshold voltage as a function of junction temperature

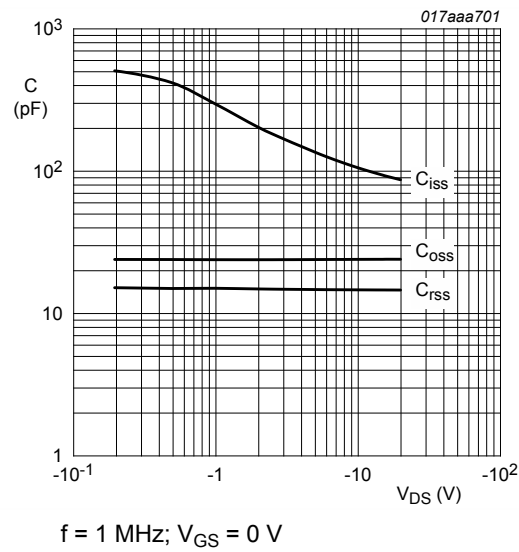


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

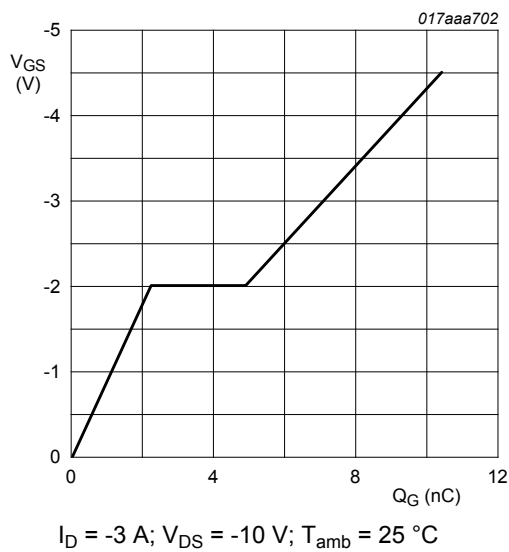


Fig. 14. Gate-source voltage as a function of gate charge; typical values

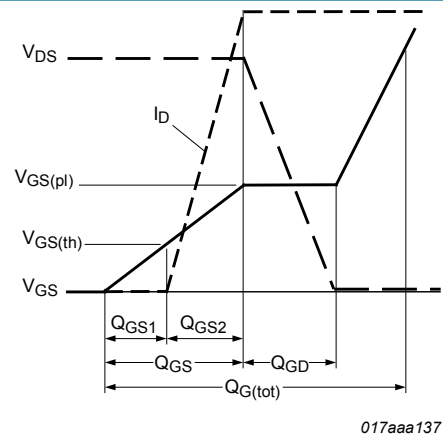
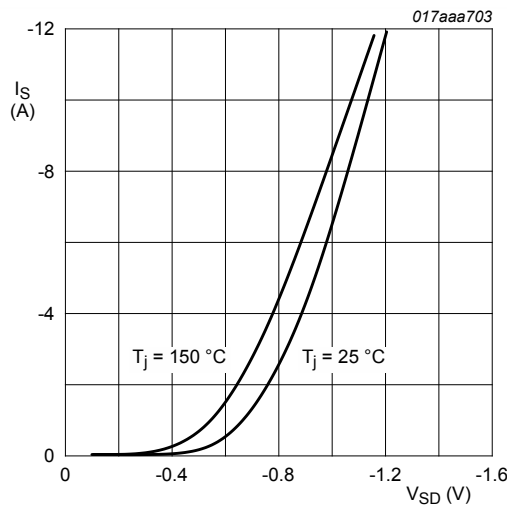


Fig. 15. Gate charge waveform definitions



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

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

8. Test information

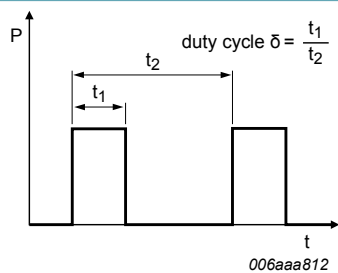


Fig. 17. Duty cycle definition

9. Package outline

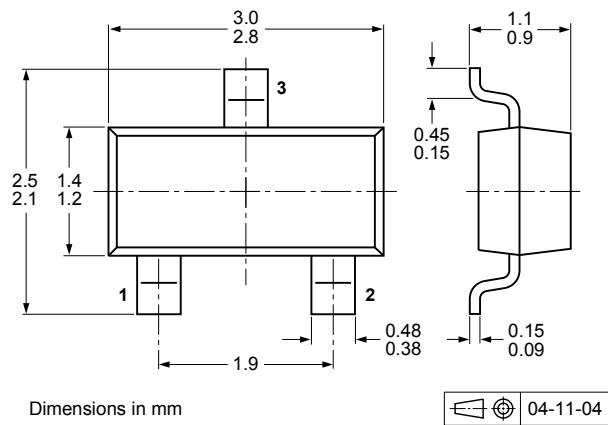


Fig. 18. TO-236AB (SOT23)

10. Soldering

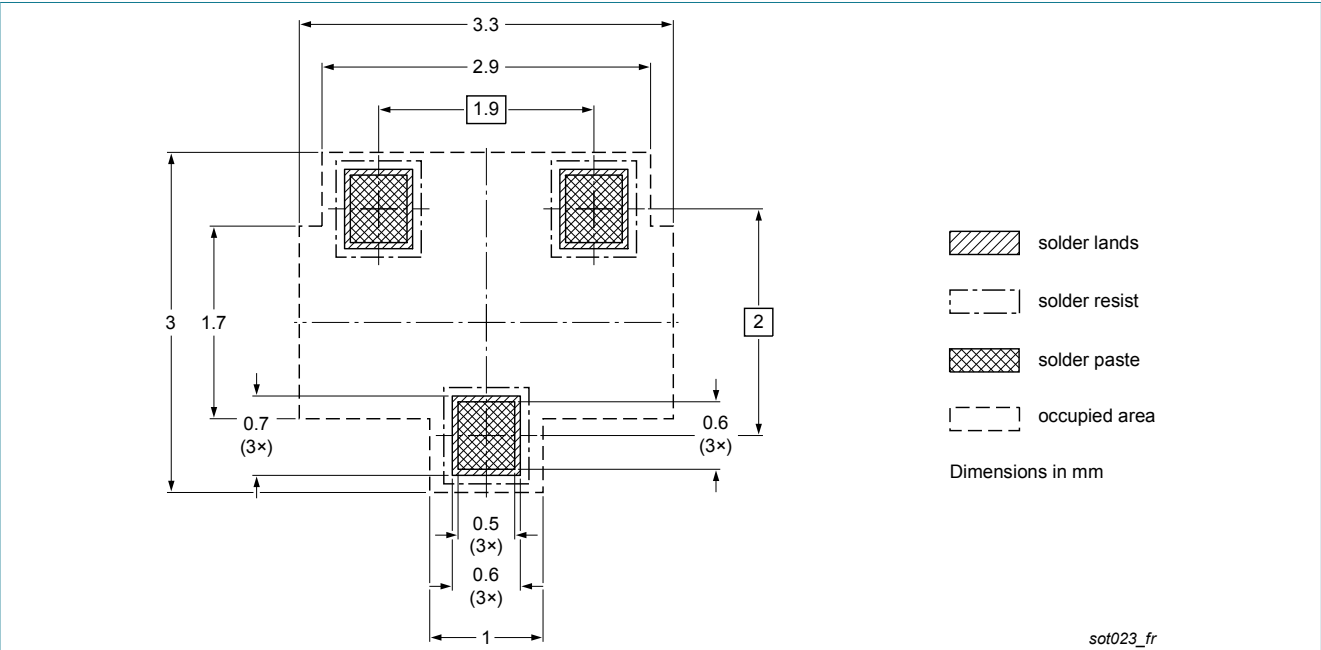


Fig. 19. Reflow soldering footprint for SOT23 (TO-236AB)

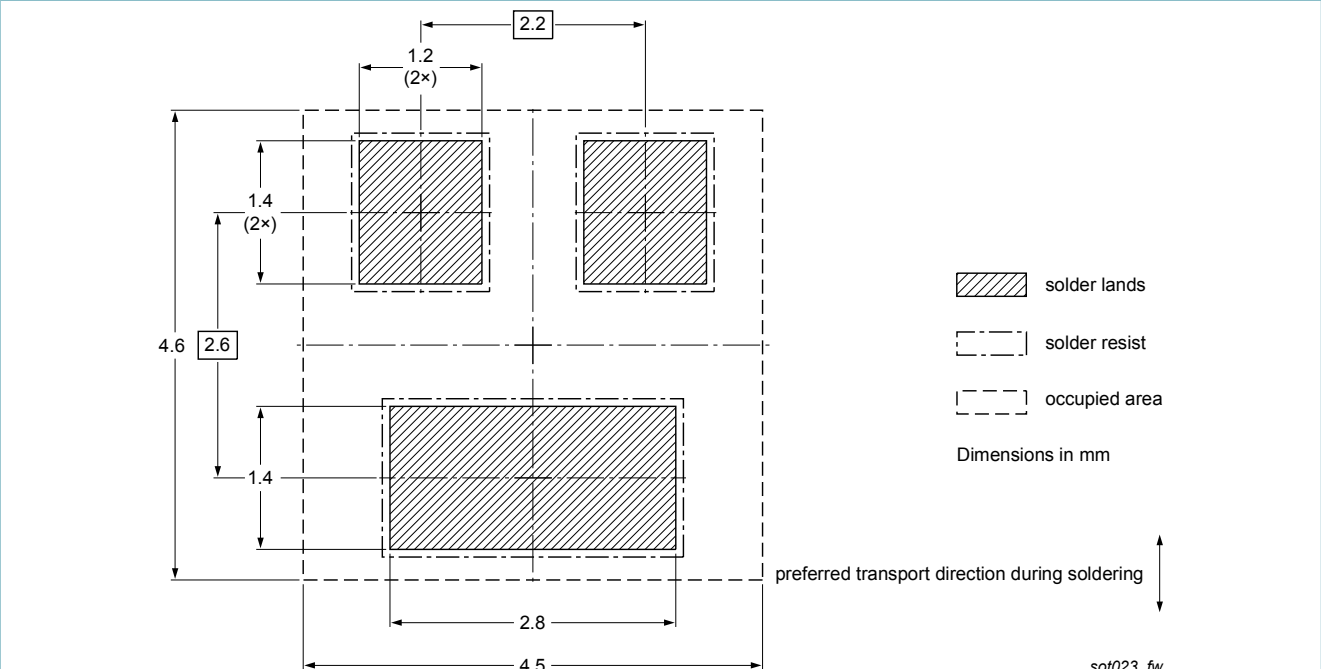


Fig. 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV50UPE v.1	20120720	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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