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 °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]	-	-	-3.7	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -3.2 A; T_j = 25 °C		-	50	66	mΩ

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

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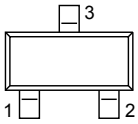
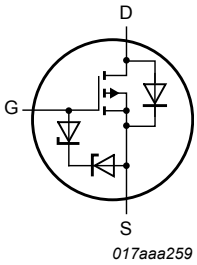
2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 TO-236AB (SOT23)	
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 [1]
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 °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]	-	-3.7	A
		V_{GS} = -4.5 V; T_{amb} = 25 °C	[1]	-	-3.2	A
		V_{GS} = -4.5 V; T_{amb} = 100 °C	[1]	-	-2	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	-12.8	A
P_{tot}	total power dissipation	T_{amb} = 25 °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 cm^2.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[3] Measured between all pins.

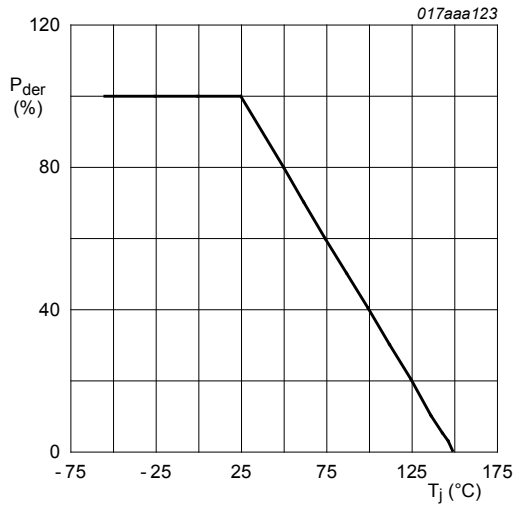


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

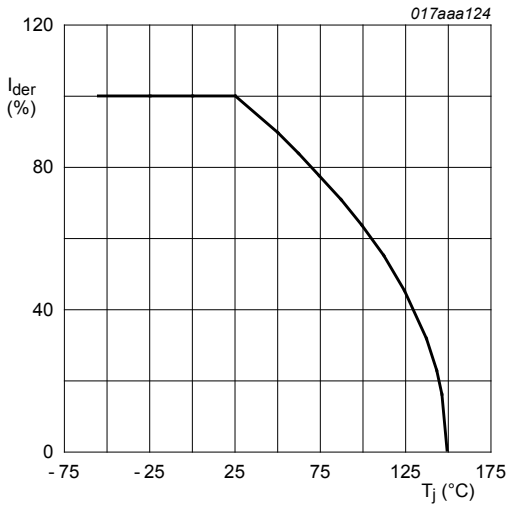
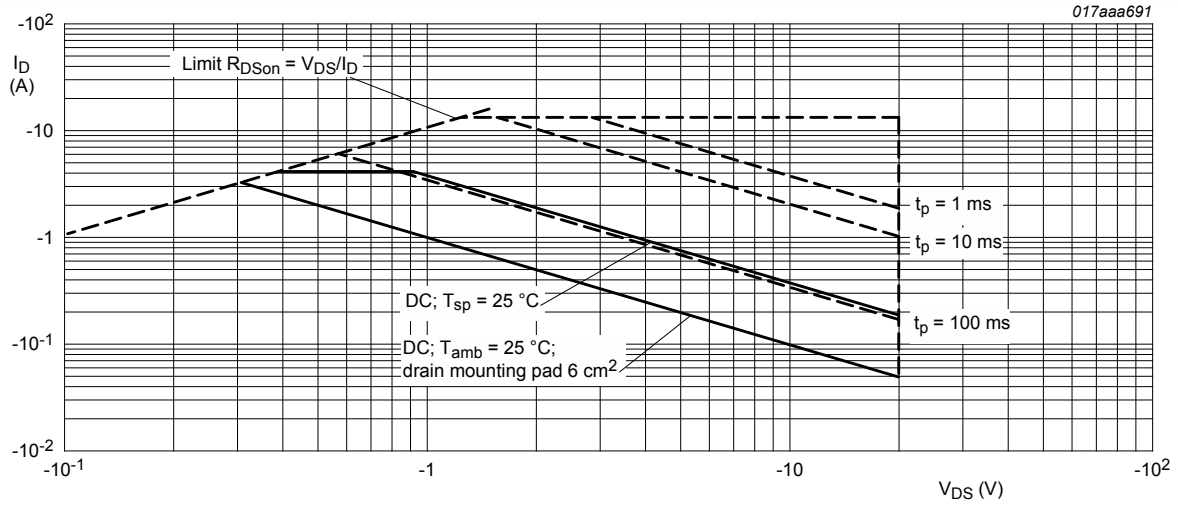


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



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

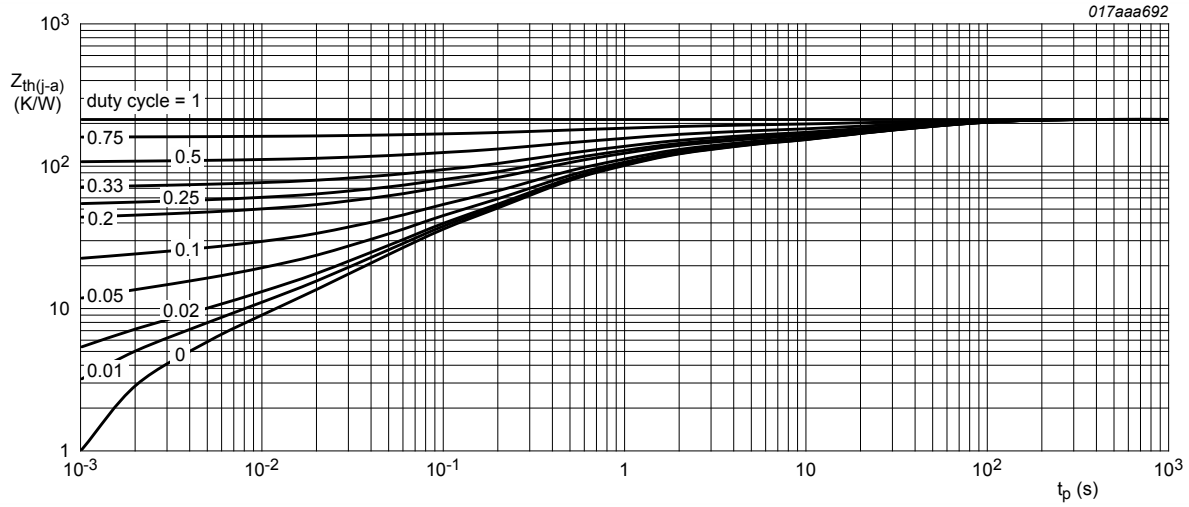
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	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.

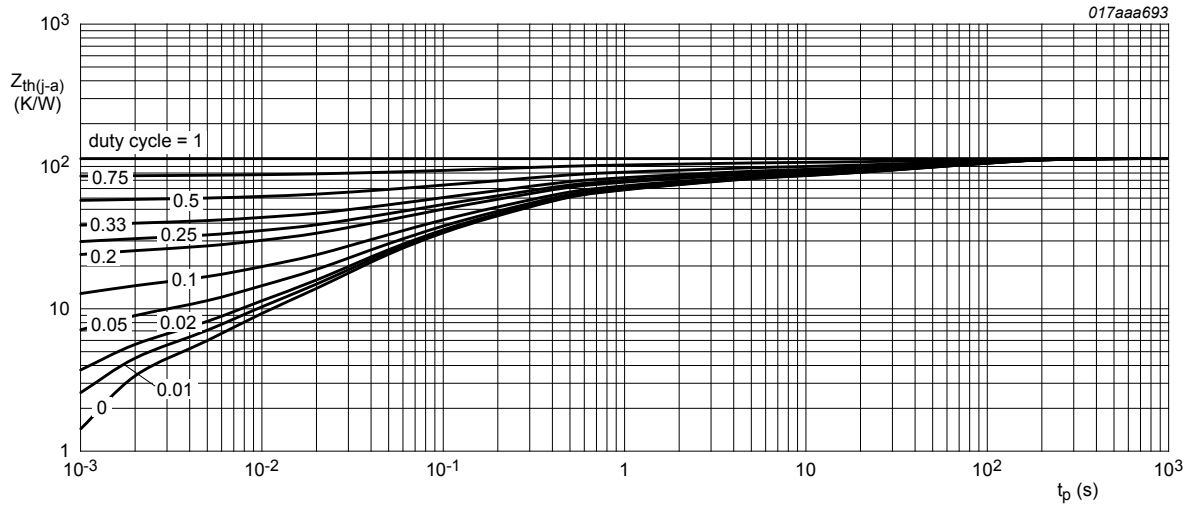
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2.

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

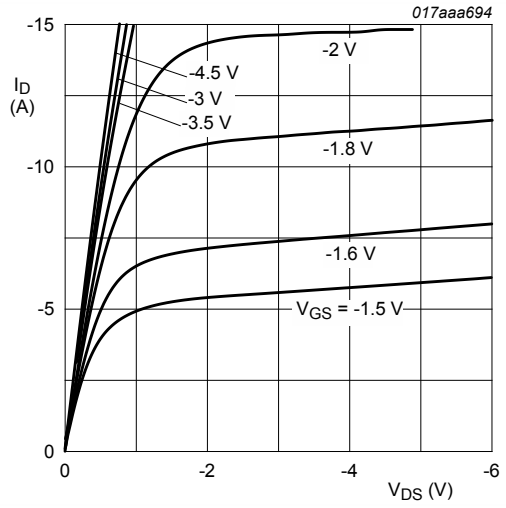
Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

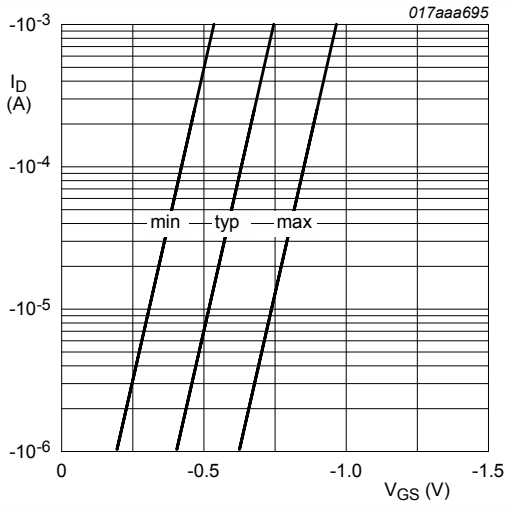
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V; T_j = 25 °C		-20	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = -250 µA; V_{DS} = V_{GS}; T_j = 25 °C		-0.47	-0.6	-0.9	V
I_{DSS}	drain leakage current	V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 °C		-	-	-1	µA
		V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 °C		-	-	-10	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		-	-	10	µA
		V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	10	µA
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -3.2 A; T_j = 25 °C		-	50	66	mΩ
		V_{GS} = -4.5 V; I_D = -3.2 A; T_j = 150 °C		-	73	96	mΩ
		V_{GS} = -2.5 V; I_D = -2.1 A; T_j = 25 °C		-	57	81	mΩ
		V_{GS} = -1.8 V; I_D = -2.1 A; T_j = 25 °C		-	70	110	mΩ
g_{fs}	forward transconductance	V_{DS} = -5 V; I_D = -3.2 A; T_j = 25 °C		-	18	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -10 V; I_D = -3.2 A; V_{GS} = -4.5 V; T_j = 25 °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 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °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 V; I_D = -3.2 A; V_{GS} = -4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °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 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.8	-1.2	V



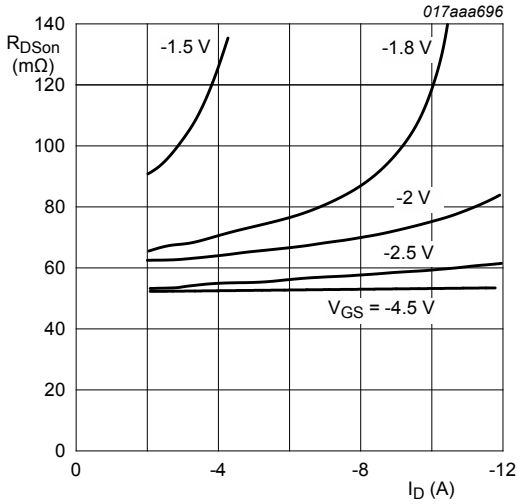
T_j = 25 °C

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



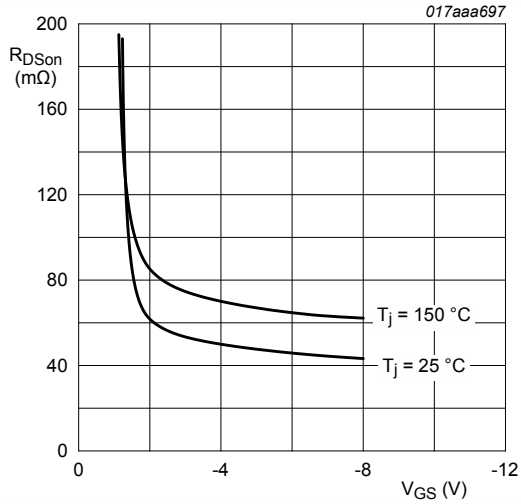
T_j = 25 °C; V_{DS} = -5 V

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



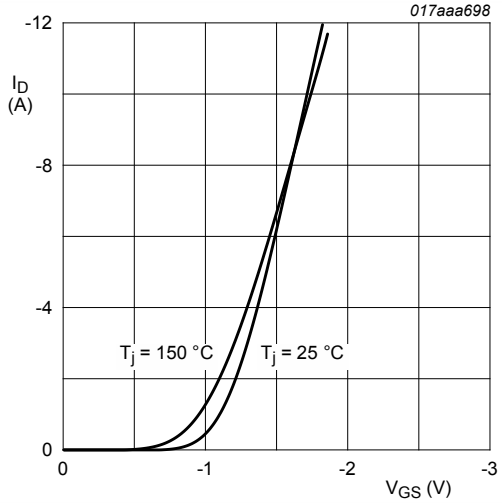
T_j = 25 °C

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

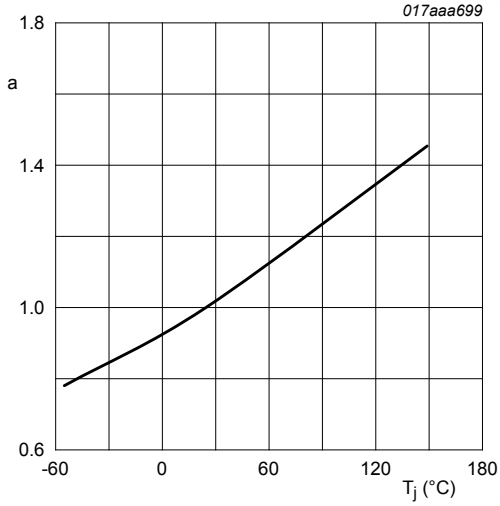
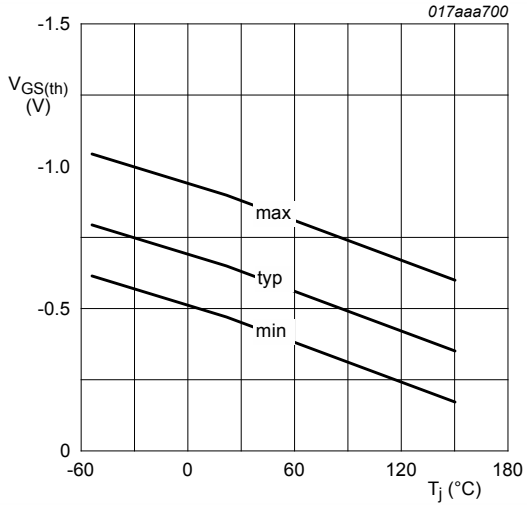


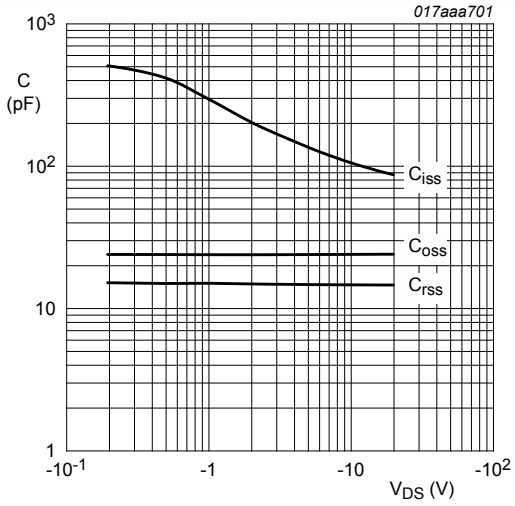
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



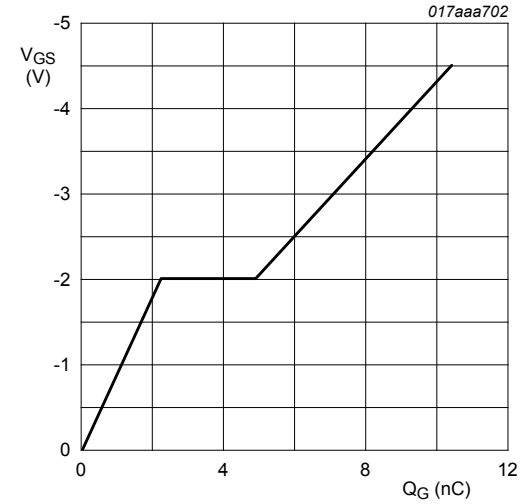
I_D = -0.25 mA; V_{DS} = V_{GS}

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 = -3 A; V_{DS} = -10 V; T_{amb} = 25 °C

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

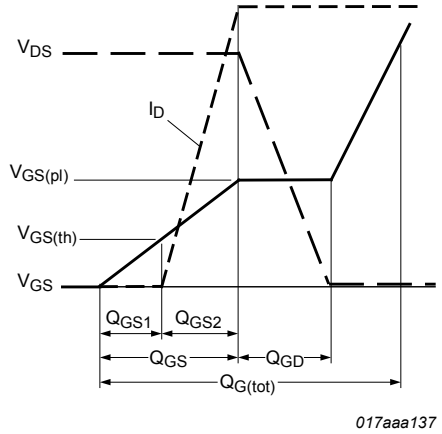
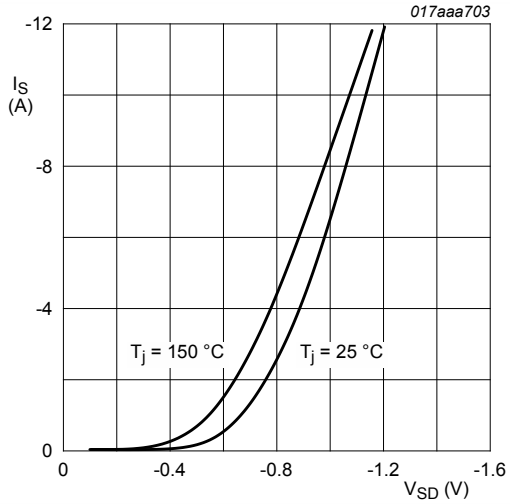


Fig. 15. Gate charge waveform definitions



V_{GS} = 0 V

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

8. Test information

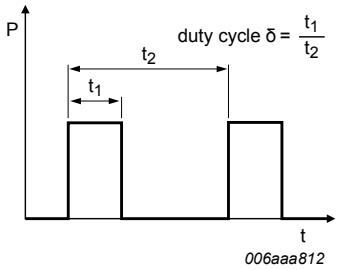


Fig. 17. Duty cycle definition

9. Package outline

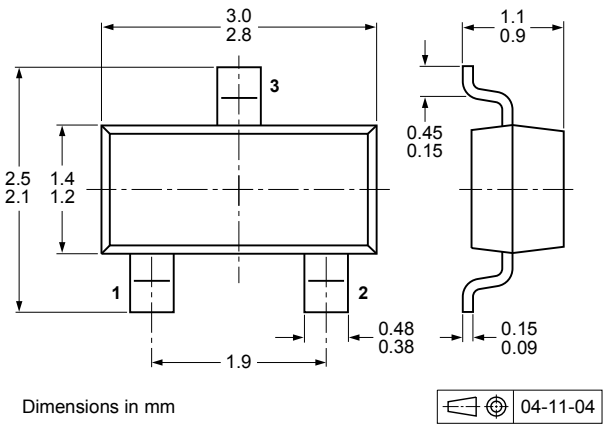


Fig. 18. TO-236AB (SOT23)

10. Soldering

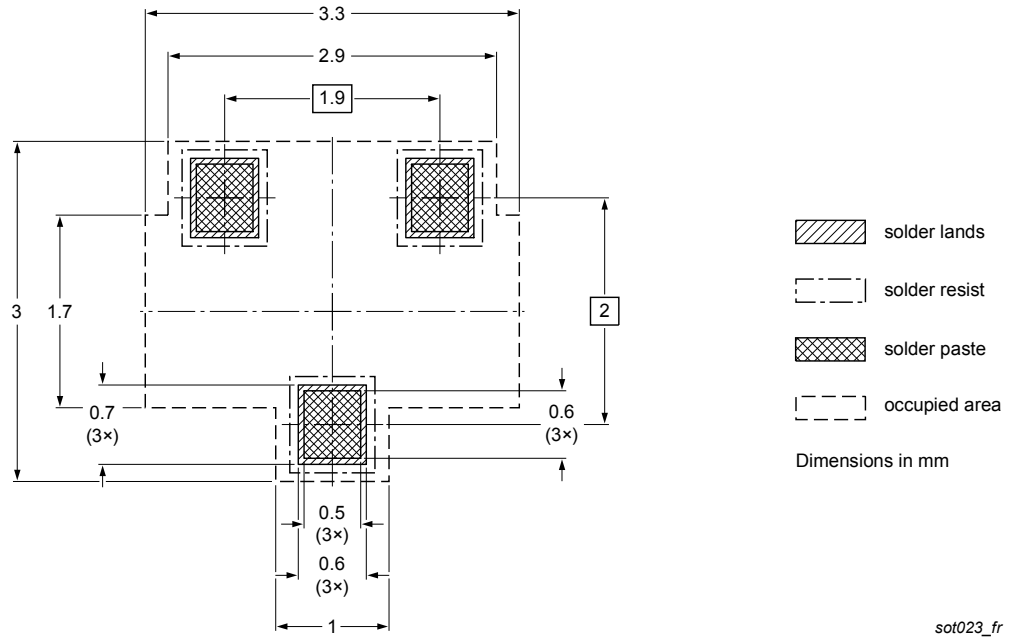


Fig. 19. Reflow soldering footprint for SOT23 (TO-236AB)

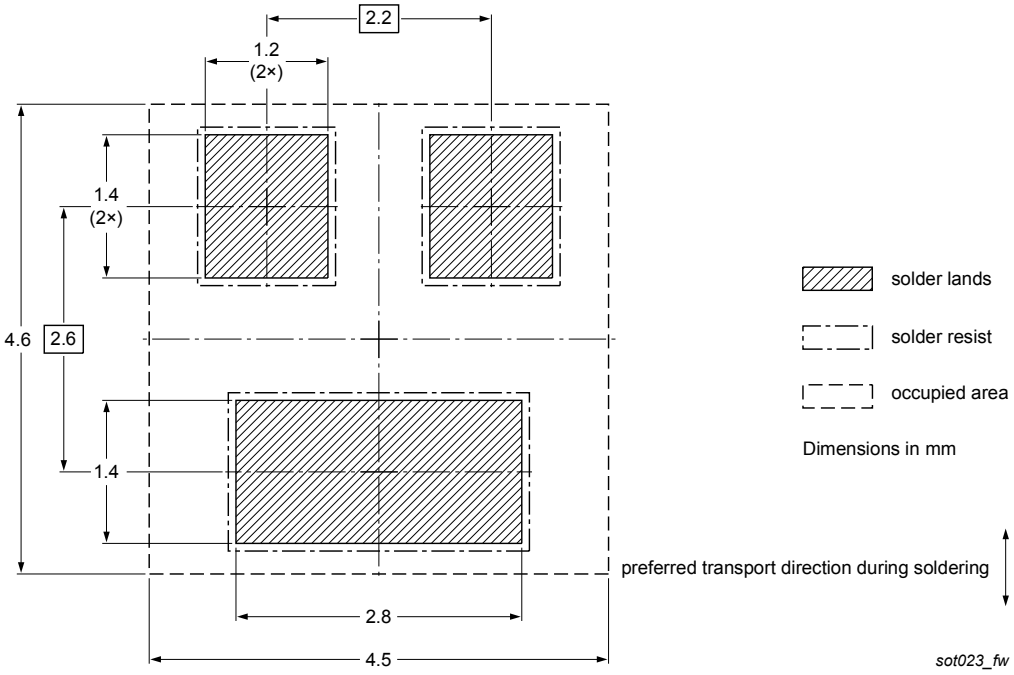


Fig. 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
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.

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13. Contents

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Date of release: 20 July 2012

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