



PMF250XN

30 V, 0.9 A N-channel Trench MOSFET

Rev. 1 — 7 December 2011

Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT323 (SC-70) 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	$T_j = 25\text{ °C}$	-	-	30	V
V_{GS}	gate-source voltage		-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	0.9	A
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 0.9\text{ A}; T_j = 25\text{ °C}$	-	234	300	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	<p>SOT323 (SC-70)</p>	<p>017aaa253</p>
2	S	source		
3	D	drain		



3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMF250XN	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMF250XN	AZ%

[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

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

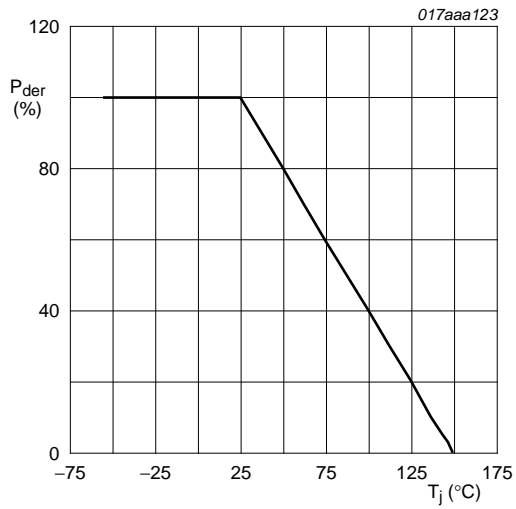
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	30	V
V_{GS}	gate-source voltage		-12	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	0.9	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	0.6	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	3.6	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	275	mW
			[1]	340	mW
		$T_{sp} = 25\text{ °C}$	-	1065	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	$T_{amb} = 25\text{ °C}$	[1]	-	0.4	A
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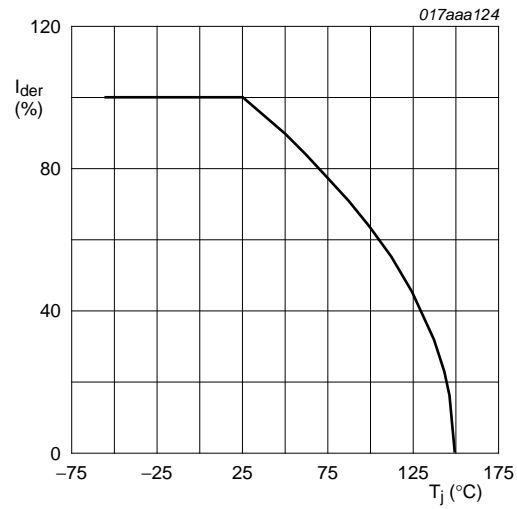
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



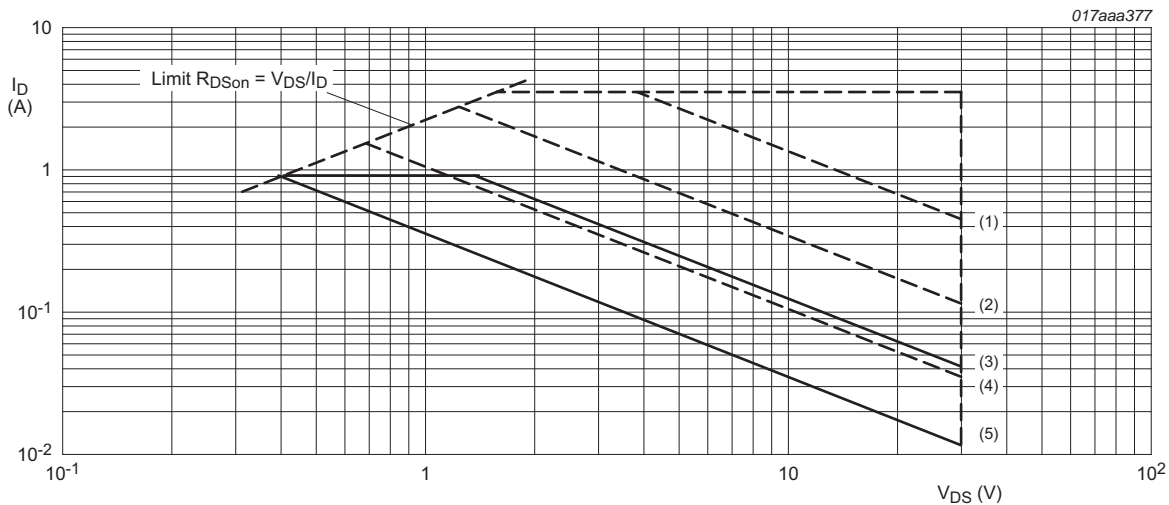
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

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



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

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



- I_{DM} = single pulse
- (1) $t_p = 1$ ms
- (2) $t_p = 10$ ms
- (3) DC; $T_{sp} = 25$ °C
- (4) $t_p = 100$ ms
- (5) DC; $T_{amb} = 25$ °C; drain mounting pad 6 cm²

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]	-	397	457	K/W
			[2]	-	318	366	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	102	117	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.

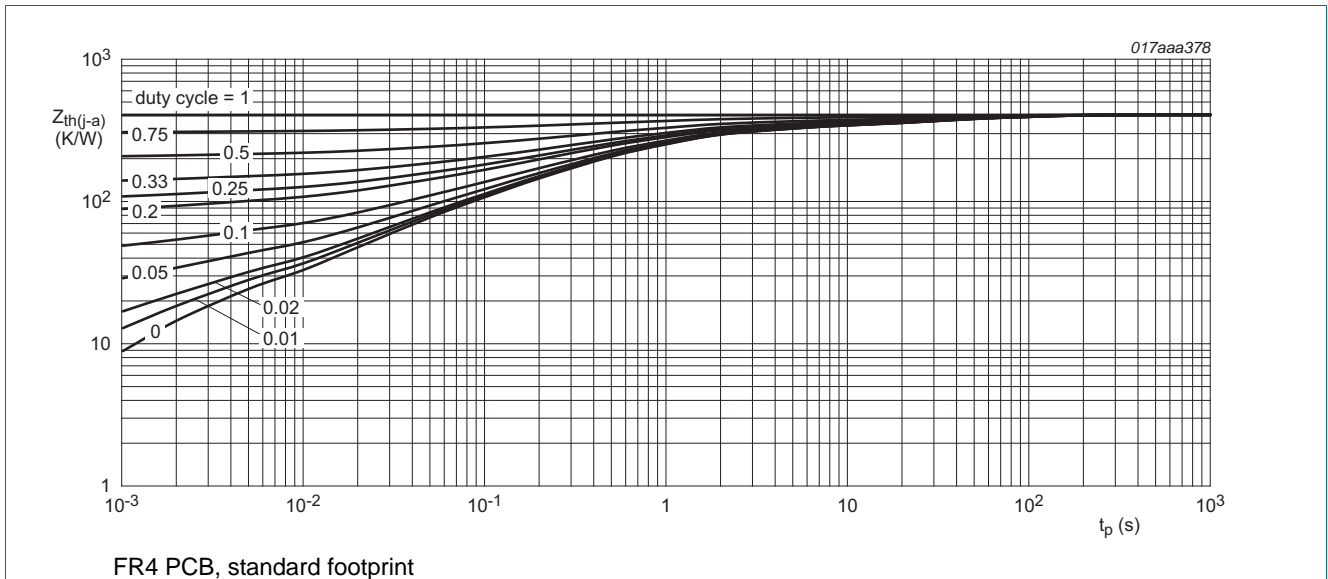


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

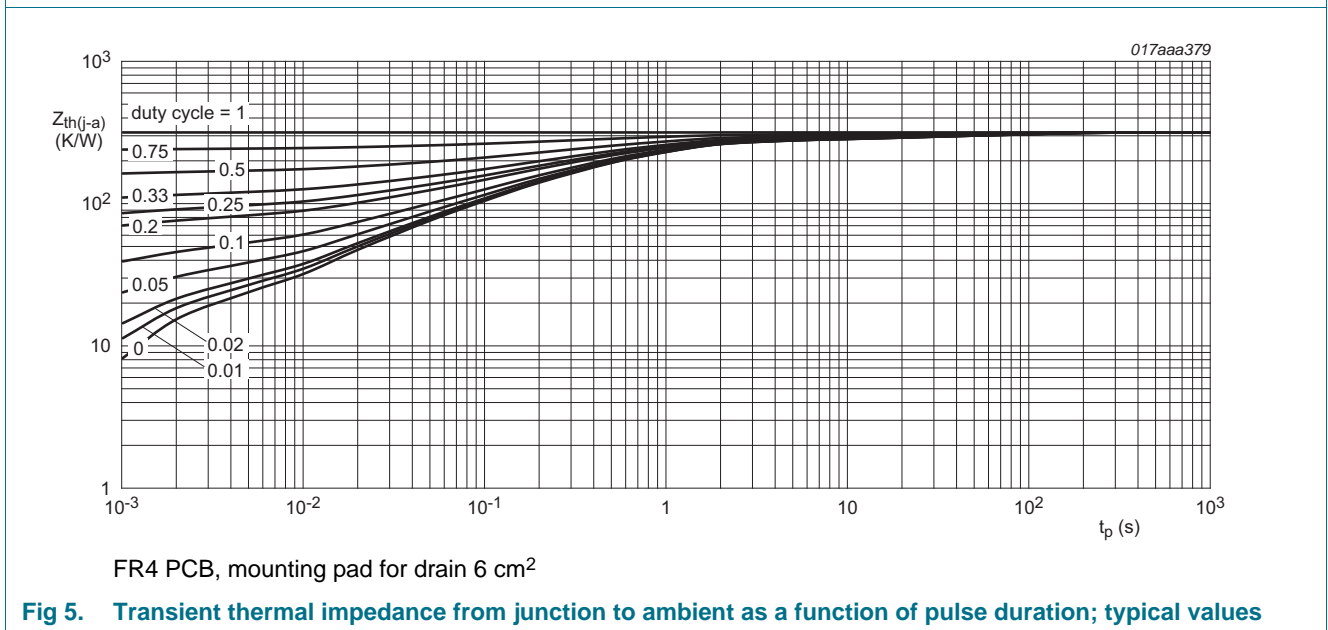


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	30	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu\text{A}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ\text{C}$	0.5	1	1.5	V
I_{DSS}	drain leakage current	$V_{DS} = 30 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	1	μA
		$V_{DS} = 30 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 12 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -12 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}$; $I_D = 0.9 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	234	300	m Ω
		$V_{GS} = 4.5 \text{ V}$; $I_D = 0.9 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	351	450	m Ω
		$V_{GS} = 2.5 \text{ V}$; $I_D = 0.2 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	324	540	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10 \text{ V}$; $I_D = 0.9 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	2	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15 \text{ V}$; $I_D = 0.9 \text{ A}$; $V_{GS} = 4.5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.74	1.1	nC
Q_{GS}	gate-source charge		-	0.26	-	nC
Q_{GD}	gate-drain charge		-	0.22	-	nC
C_{iss}	input capacitance	$V_{DS} = 15 \text{ V}$; $f = 1 \text{ MHz}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	50	-	pF
C_{oss}	output capacitance		-	10	-	pF
C_{rss}	reverse transfer capacitance		-	6	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 \text{ V}$; $V_{GS} = 4.5 \text{ V}$; $R_{G(ext)} = 6 \text{ }^\circ\Omega$; $T_j = 25 \text{ }^\circ\text{C}$; $I_D = 0.9 \text{ A}$	-	8	-	ns
t_r	rise time		-	15	-	ns
$t_{d(off)}$	turn-off delay time		-	11	-	ns
t_f	fall time		-	8	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = -0.3 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.8	1.2	V

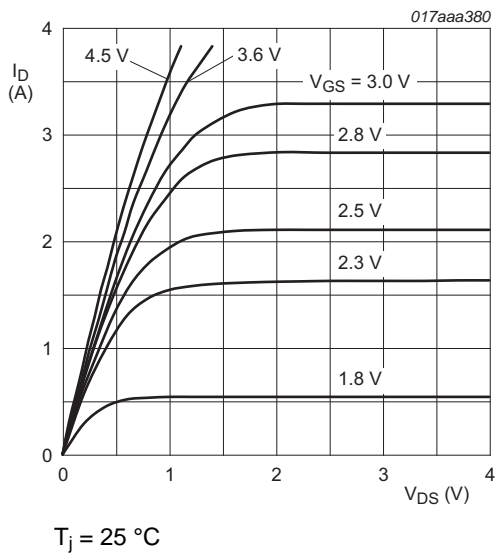


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

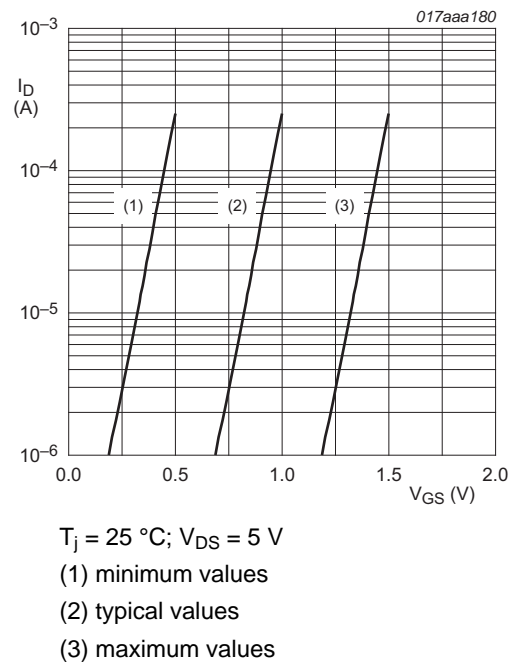
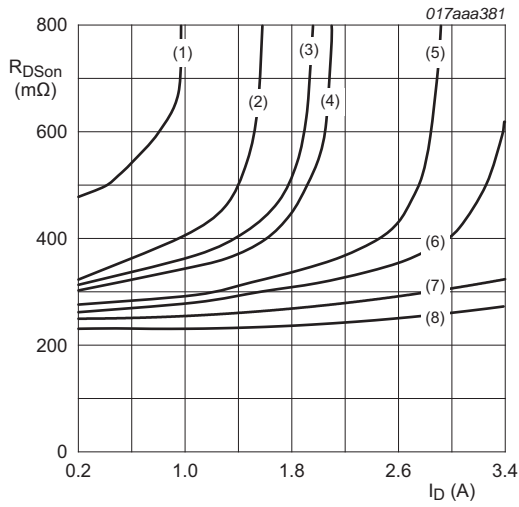


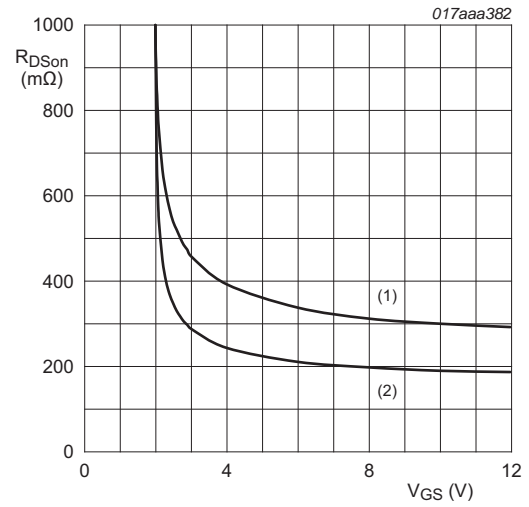
Fig 7. Sub-threshold drain current as a function of gate-source voltage



$T_j = 25\text{ }^\circ\text{C}$

- (1) $V_{GS} = 2.0\text{ V}$
- (2) $V_{GS} = 2.3\text{ V}$
- (3) $V_{GS} = 2.4\text{ V}$
- (4) $V_{GS} = 2.5\text{ V}$
- (5) $V_{GS} = 2.8\text{ V}$
- (6) $V_{GS} = 3.0\text{ V}$
- (7) $V_{GS} = 3.6\text{ V}$
- (8) $V_{GS} = 4.5\text{ V}$

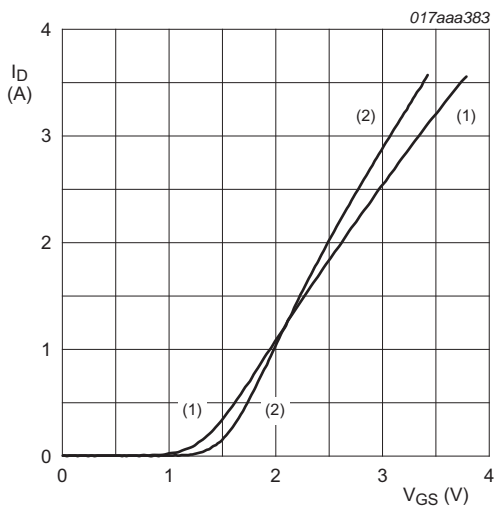
Fig 8. Drain-source on-state resistance as a function of drain current; typical values



$I_D = 0.9\text{ A}$

- (1) $T_j = 150\text{ }^\circ\text{C}$
- (2) $T_j = 25\text{ }^\circ\text{C}$

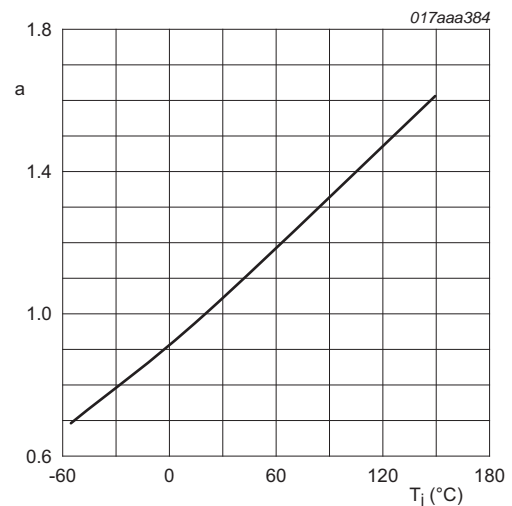
Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

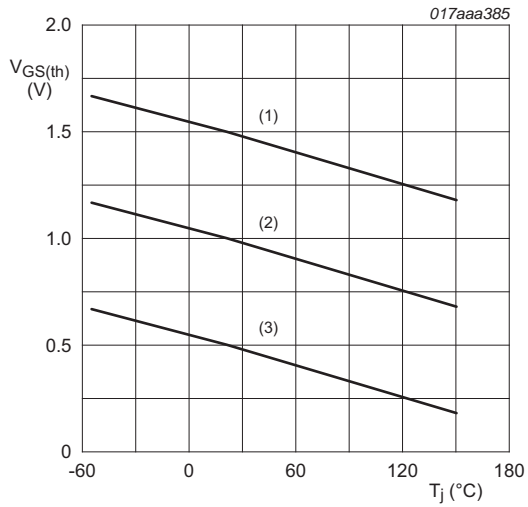
- (1) $T_j = 25\text{ }^\circ\text{C}$
- (2) $T_j = 150\text{ }^\circ\text{C}$

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



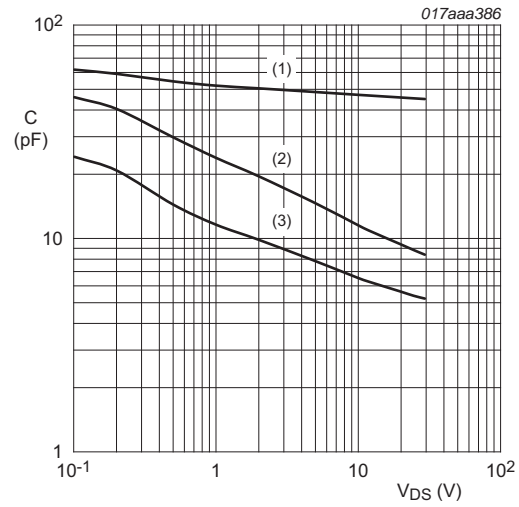
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

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



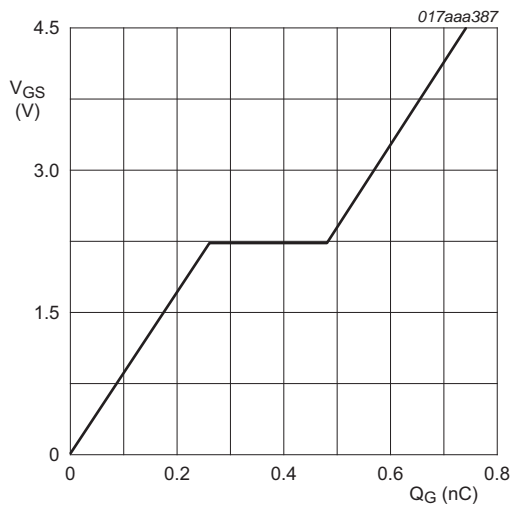
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

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



$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$
 (1) C_{iss}
 (2) C_{oss}
 (3) C_{rss}

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



$I_D = 0.9 \text{ A}; V_{DS} = 15 \text{ V}; T_{amb} = 25 \text{ }^{\circ}C$

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

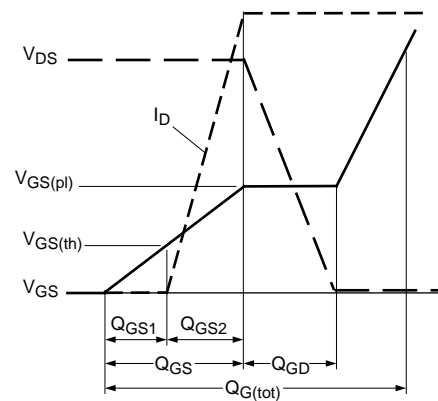
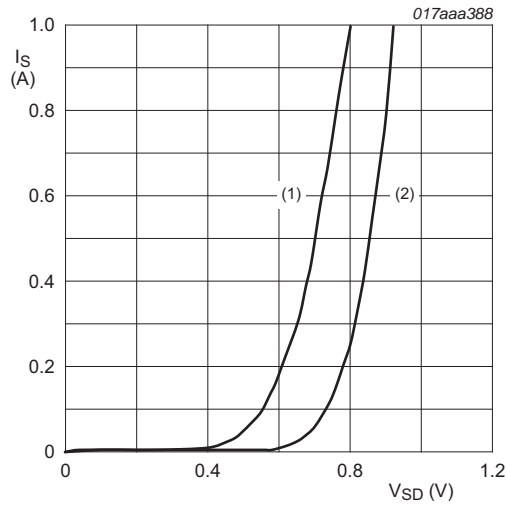


Fig 15. Gate charge waveform definitions



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

8. Test information

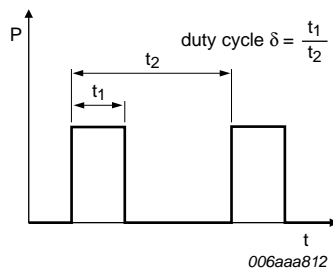


Fig 17. Duty cycle definition

9. Package outline

Plastic surface-mounted package; 3 leads

SOT323

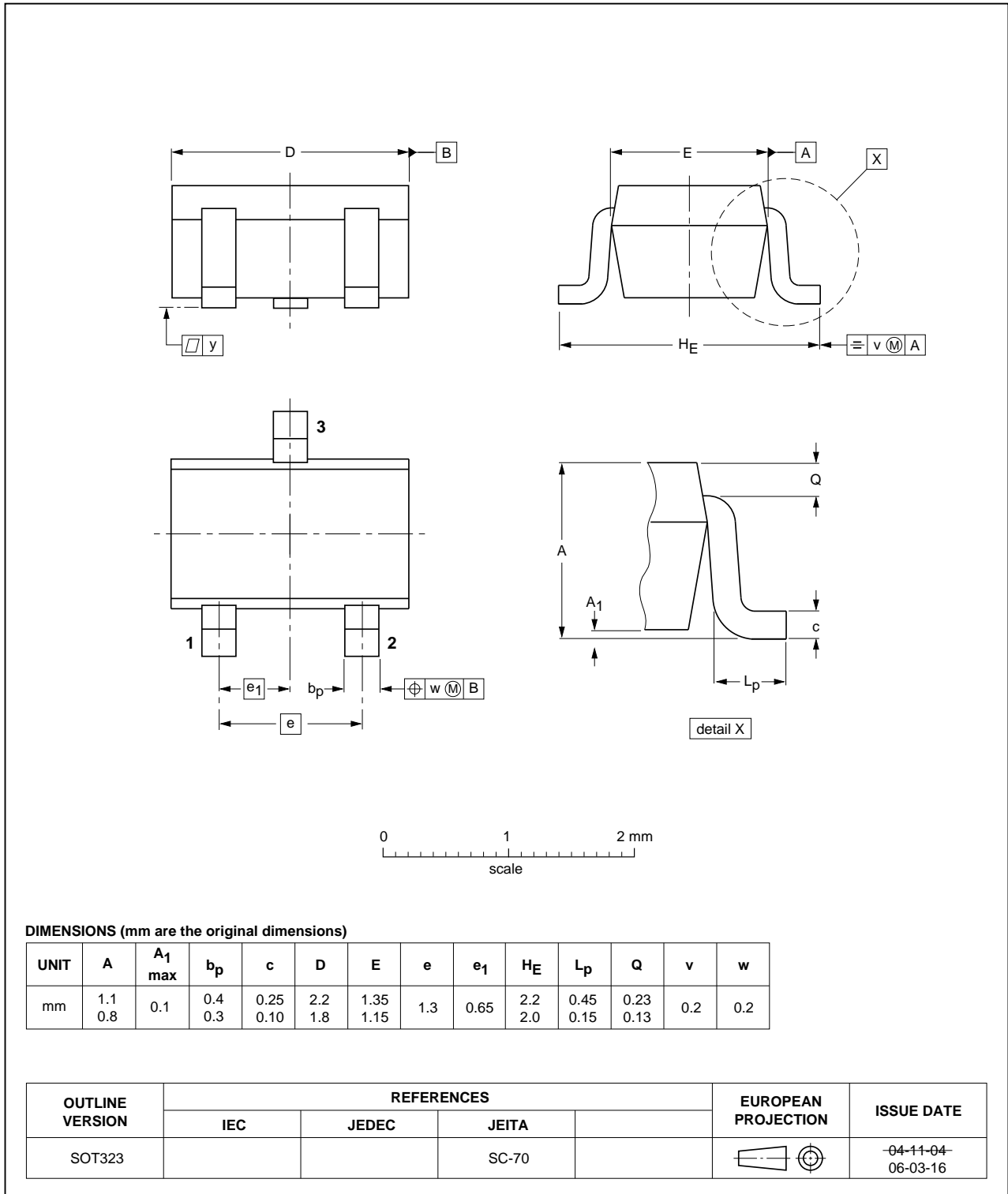


Fig 18. Package outline SOT323 (SC-70)

10. Soldering

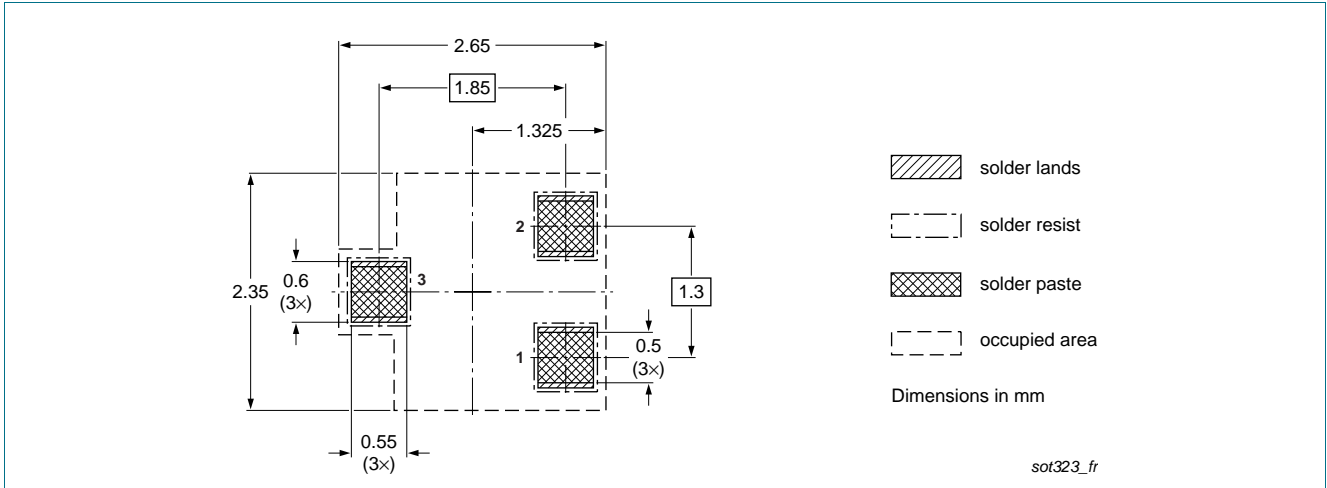


Fig 19. Reflow soldering footprint for SOT323 (SC-70)

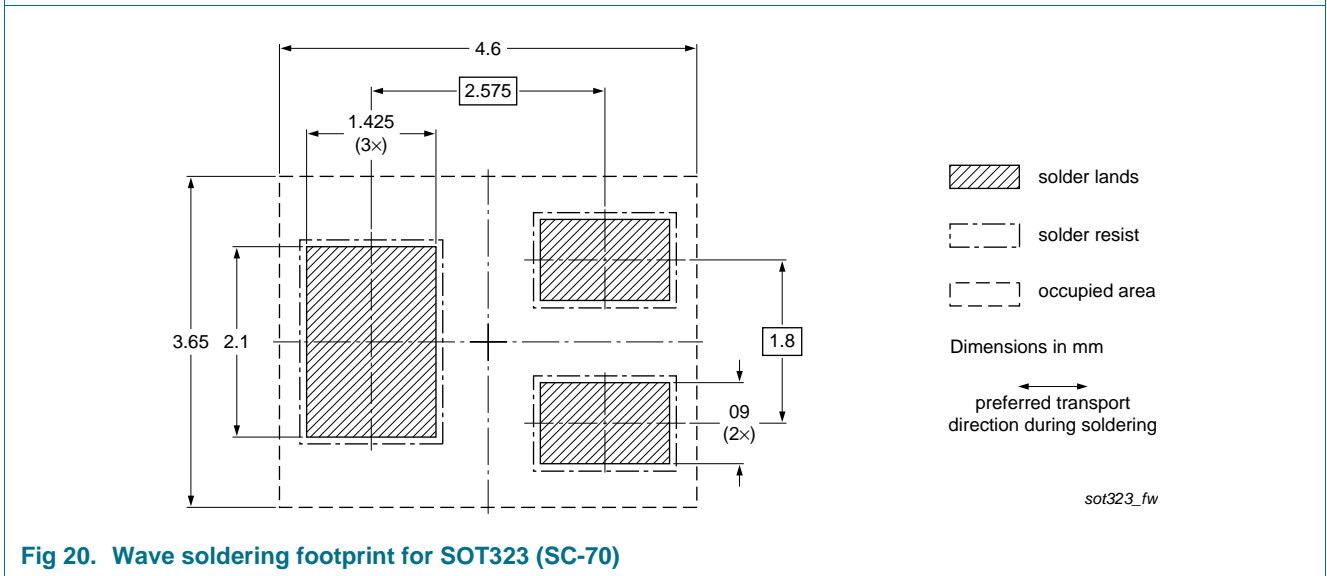


Fig 20. Wave soldering footprint for SOT323 (SC-70)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMF250XN v.1	20111207	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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