



PMF170XP

20 V, 1 A P-channel Trench MOSFET

Rev. 1 — 2 September 2011

Product data sheet

1. Product profile

1.1 General description

P-channel enhancement mode Field-Effect Transistor (FET) in a SOT323 (SC-70) small Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Low R_{DSon}
- Very fast switching
- Trench MOSFET technology

1.3 Applications

- Relay driver
- High-speed line 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		-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-1	A
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -1\text{ A}; T_j = 25\text{ °C}$	-	175	200	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>017aaa094</p>
2	S	source		
3	D	drain		



3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMF170XP	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMF170XP	XD%

[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

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

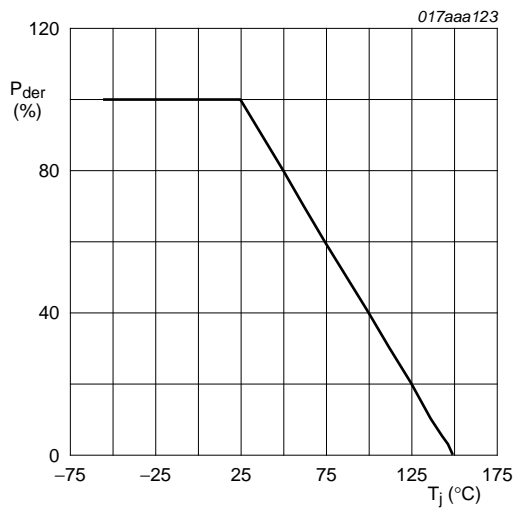
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-20	V
V_{GS}	gate-source voltage		-12	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}$; $T_{amb} = 25\text{ °C}$	[1]	-1	A
		$V_{GS} = -4.5\text{ V}$; $T_{amb} = 100\text{ °C}$	[1]	-0.7	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-4	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	290	mW
			[1]	360	mW
		$T_{sp} = 25\text{ °C}$	-	1670	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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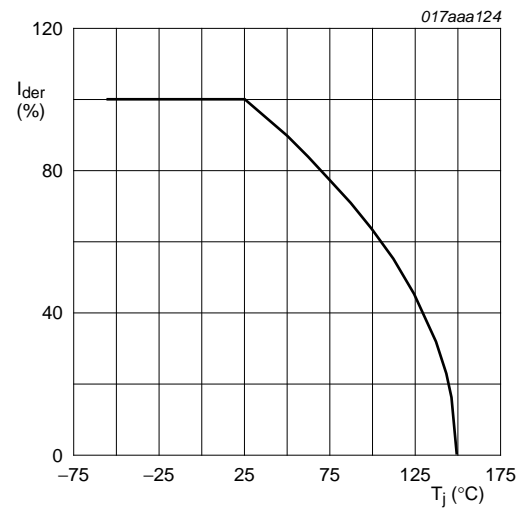
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



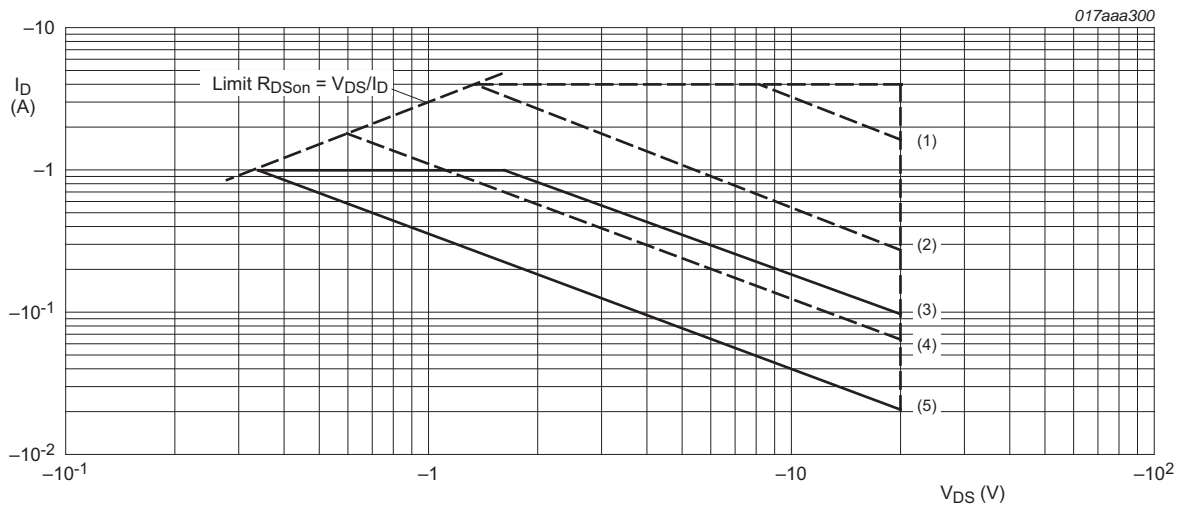
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

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; $T_{sp} = 25^{\circ}\text{C}$

(4) $t_p = 100$ ms

(5) DC; $T_{amb} = 25^{\circ}\text{C}$; drain mounting pad 6 cm^2

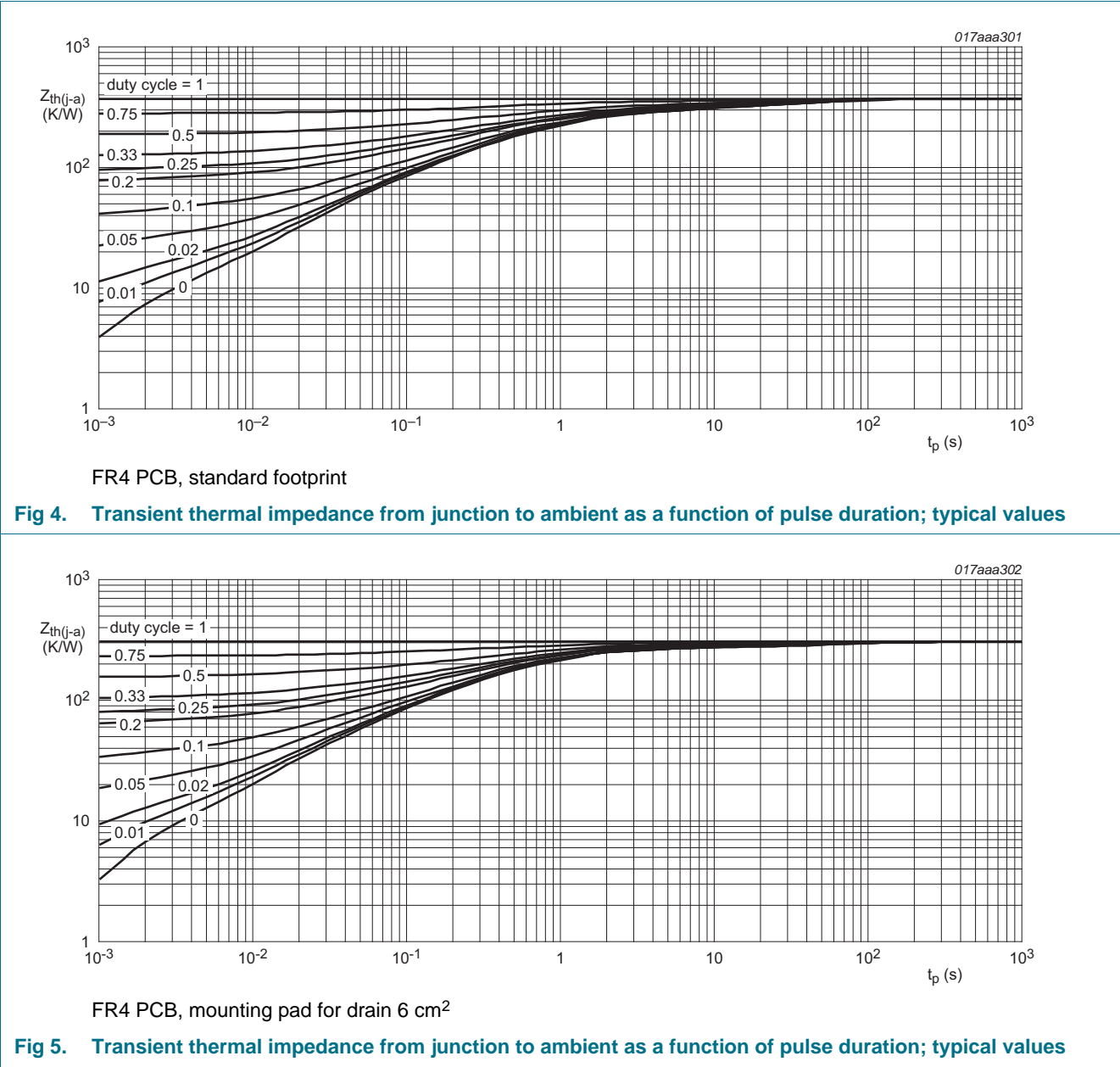
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

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]	-	377	430 K/W
			[2]	-	305	350 K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	65	75	K/W

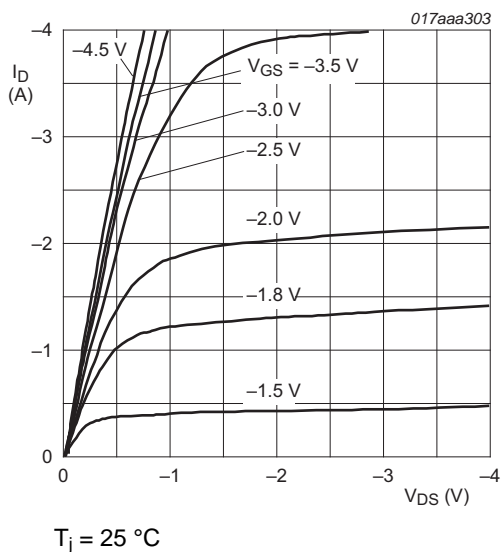
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².



7. Characteristics

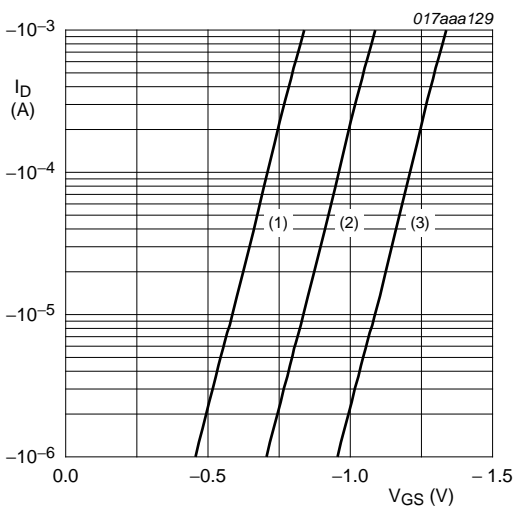
Table 7. Characteristics

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 A; V _{DS} = V _{GS} ; T _j = 25 °C	-0.65	-0.9	-1.15	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
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 = -1 A; T _j = 25 °C	-	175	200	mΩ
		V _{GS} = -4.5 V; I _D = -1 A; T _j = 150 °C	-	250	284	mΩ
		V _{GS} = -2.5 V; I _D = -1 A; T _j = 25 °C	-	240	300	mΩ
g _{fs}	forward transconductance	V _{DS} = -5 V; I _D = -1 A; T _j = 25 °C	-	1.9	-	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	-	2.6	3.9	nC
Q _{GS}	gate-source charge		-	0.63	-	nC
Q _{GD}	gate-drain charge		-	0.53	-	nC
C _{iss}	input capacitance	V _{DS} = -10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C	-	280	-	pF
C _{oss}	output capacitance		-	43	-	pF
C _{rss}	reverse transfer capacitance		-	30	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = -10 V; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C; I _D = -1 A	-	10	-	ns
t _r	rise time		-	16	-	ns
t _{d(off)}	turn-off delay time		-	31	-	ns
t _f	fall time		-	13	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = -0.4 A; V _{GS} = 0 V; T _j = 25 °C	-	-0.7	-1.2	V



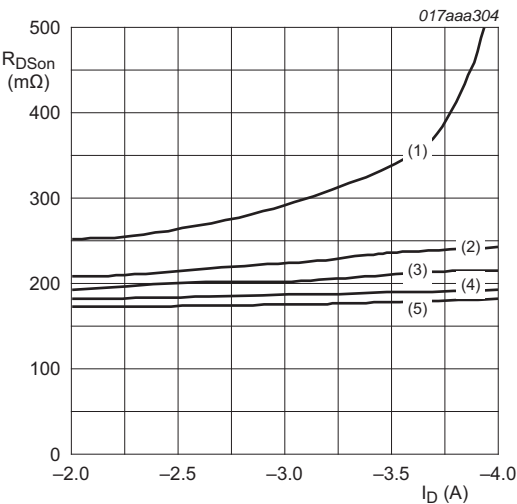
T_j = 25 °C

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



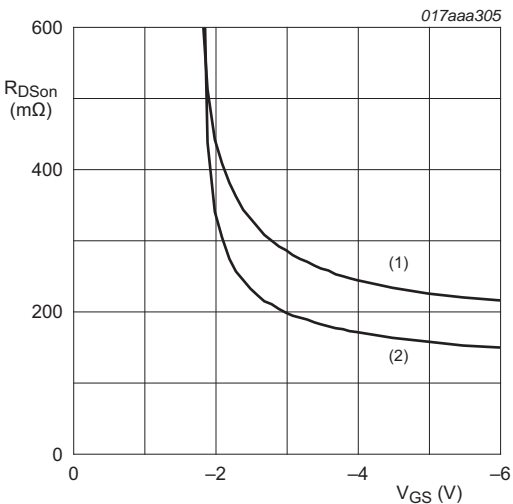
T_j = 25 °C; V_{DS} = -3 V
(1) minimum values
(2) typical values
(3) maximum values

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



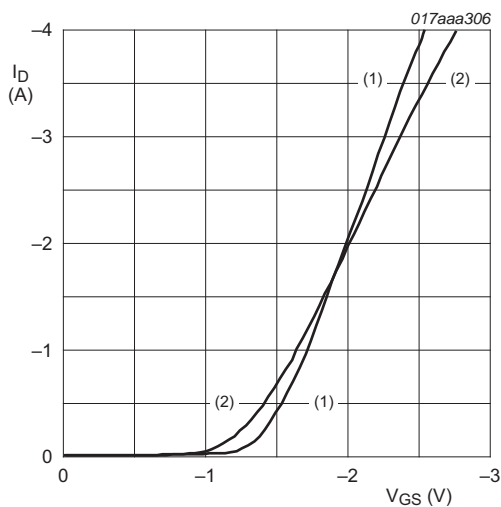
T_j = 25 °C
(1) V_{GS} = -2.5 V
(2) V_{GS} = -3.0 V
(3) V_{GS} = -3.5 V
(4) V_{GS} = -4.0 V
(5) V_{GS} = -4.5 V

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



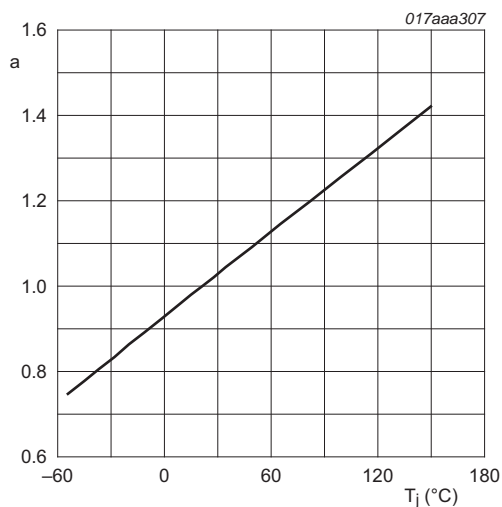
I_D = -1 A
(1) T_j = 150 °C
(2) T_j = 25 °C

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



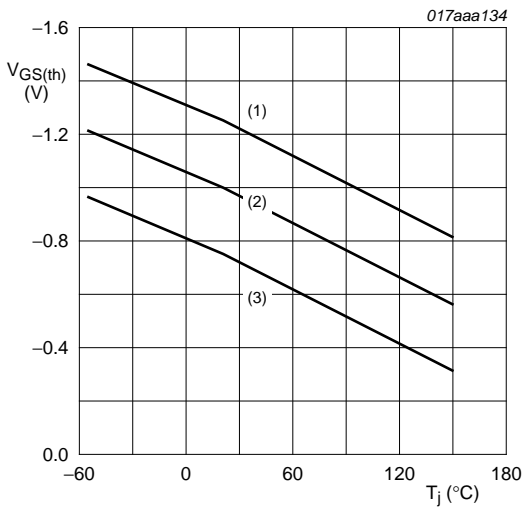
$V_{DS} > I_D \times R_{DS(on)}$
(1) $T_j = 25\text{ }^{\circ}\text{C}$
(2) $T_j = 150\text{ }^{\circ}\text{C}$

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



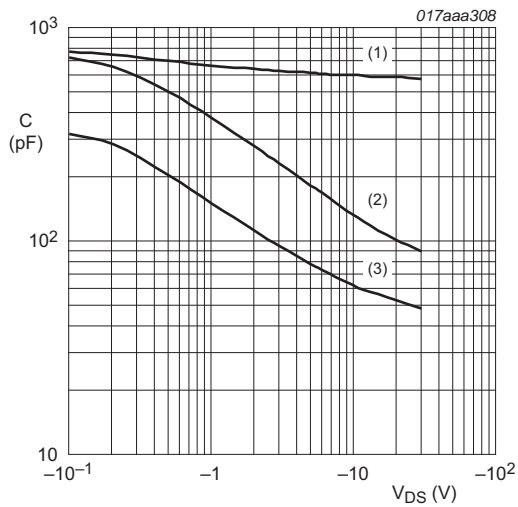
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^{\circ}\text{C})}}$$

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



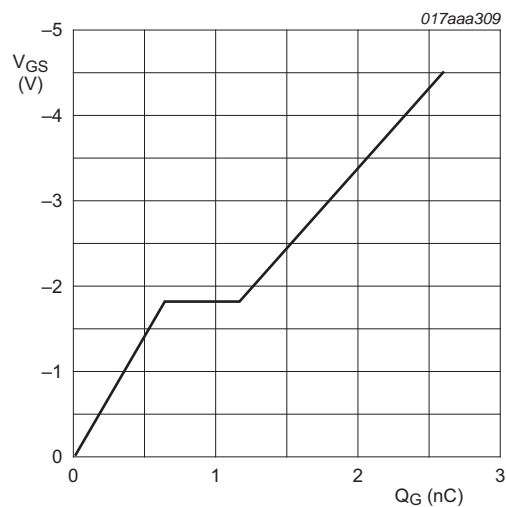
$I_D = -0.25\text{ mA}$; $V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

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



$I_D = -1.0\text{ A}$; $V_{DS} = -10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

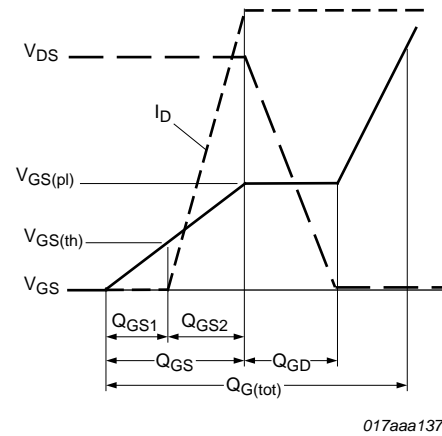
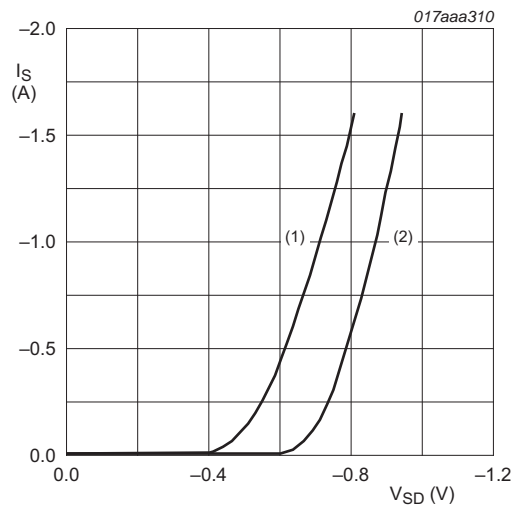


Fig 15. Gate charge waveform definitions



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

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

8. Test information

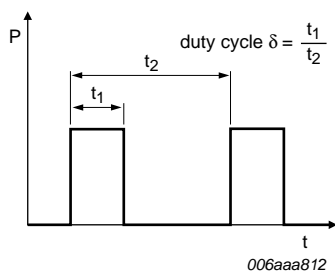


Fig 17. Duty cycle definition

9. Package outline

Plastic surface-mounted package; 3 leadsSOT323

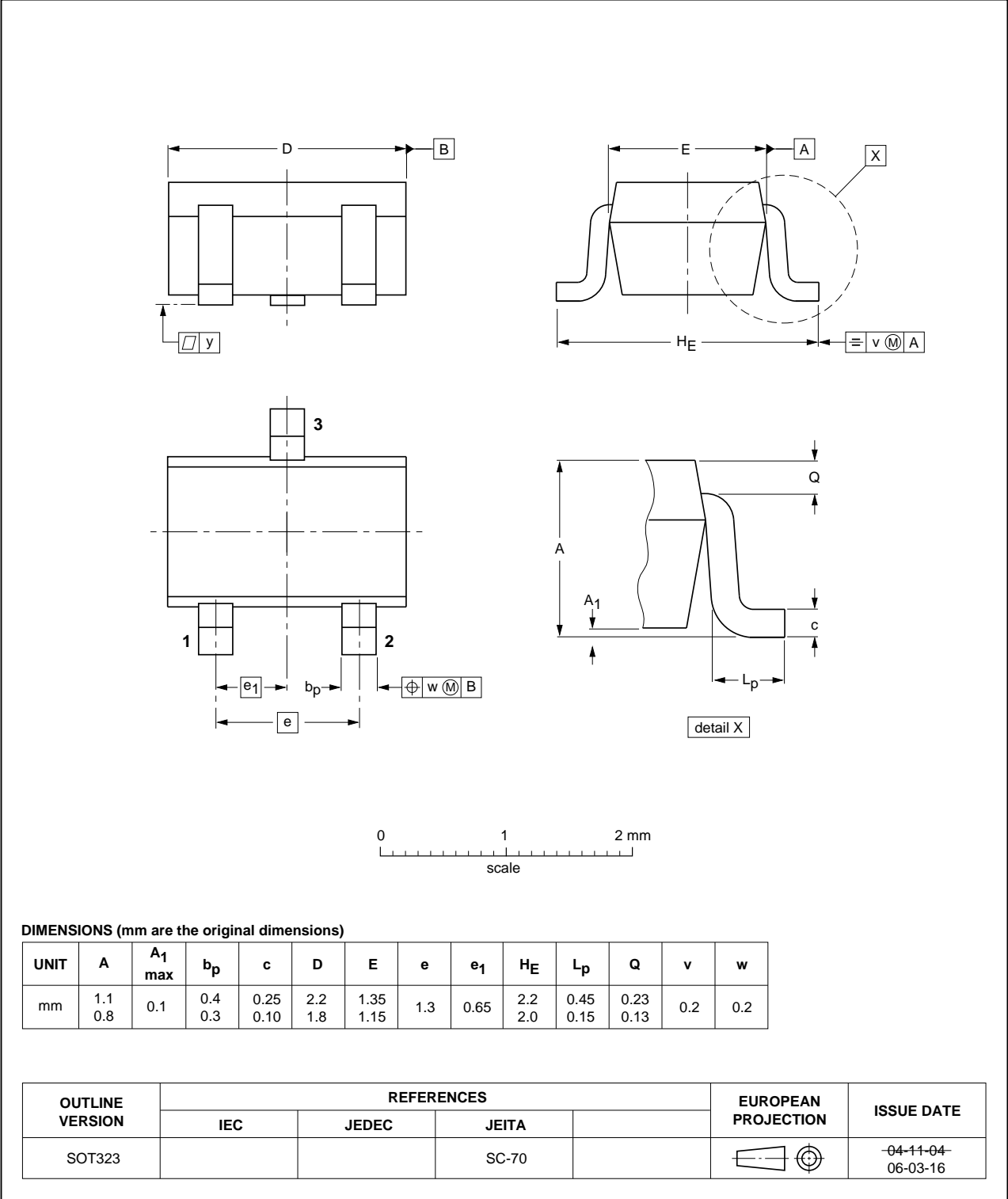
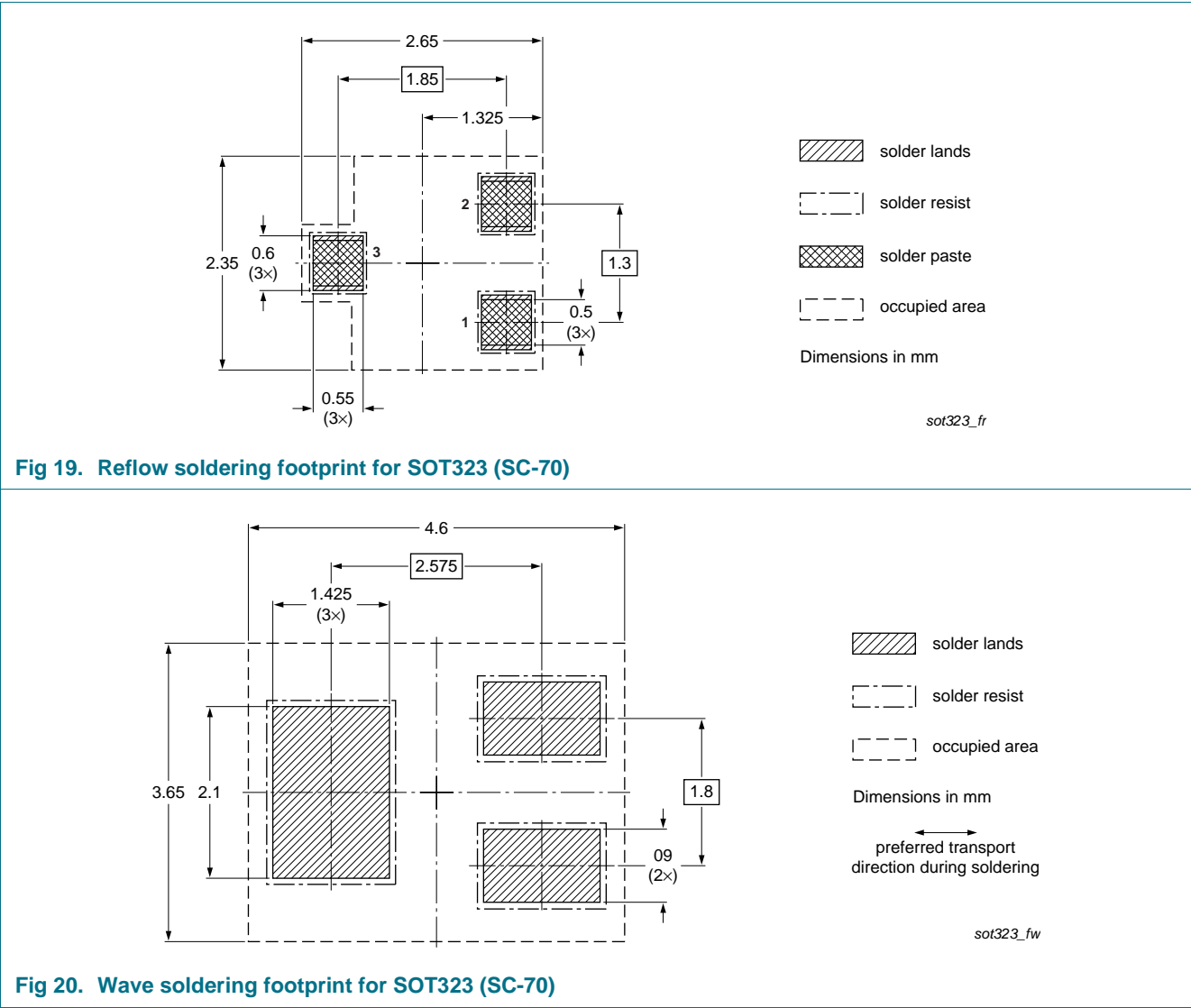


Fig 18. Package outline SOT323 (SC-70)

10. Soldering



11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMF170XP v.1	20110902	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.
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