



PMF170XP

20 V, 1 A P-channel Trench MOSFET

29 October 2013

Product data sheet

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.

2. Features and benefits

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

3. Applications

- Relay driver
- High-speed line driver
- High-side loadswitch
- Switching circuits

4. Quick reference data

Table 1. Quick reference data

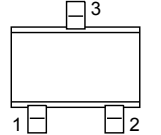
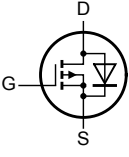
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_J = 25\text{ °C}$	-	-	-20	V
V_{GS}	gate-source voltage		-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-1	A
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -1\text{ A}; T_J = 25\text{ °C}$	-	175	200	m Ω

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SC-70 (SOT323)	 017aaa094
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

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

7. Marking

Table 4. Marking codes

Type number	Marking code
PMF170XP	XD% [1]

[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	$T_j = 25\text{ °C}$	-	-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	

Symbol	Parameter	Conditions		Min	Max	Unit
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]	-	-0.4	A

- [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.

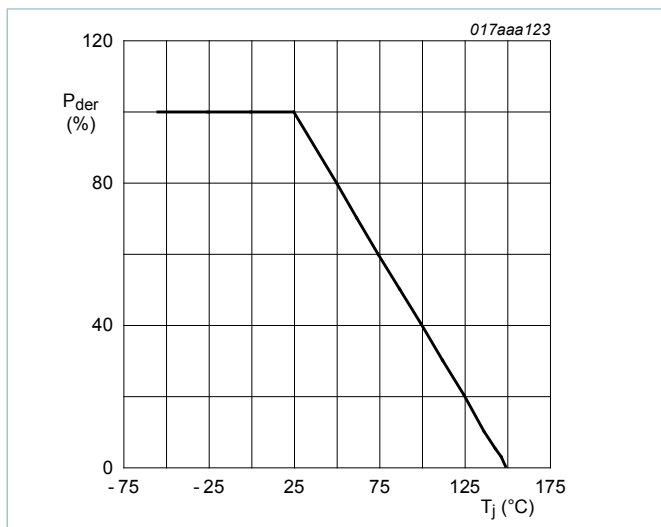


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

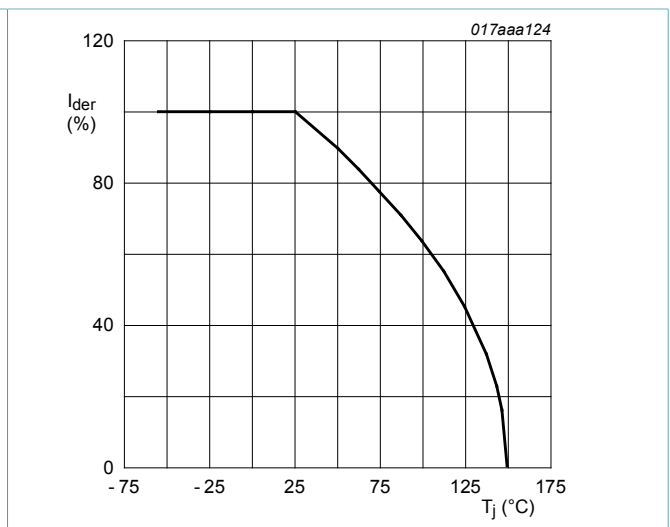
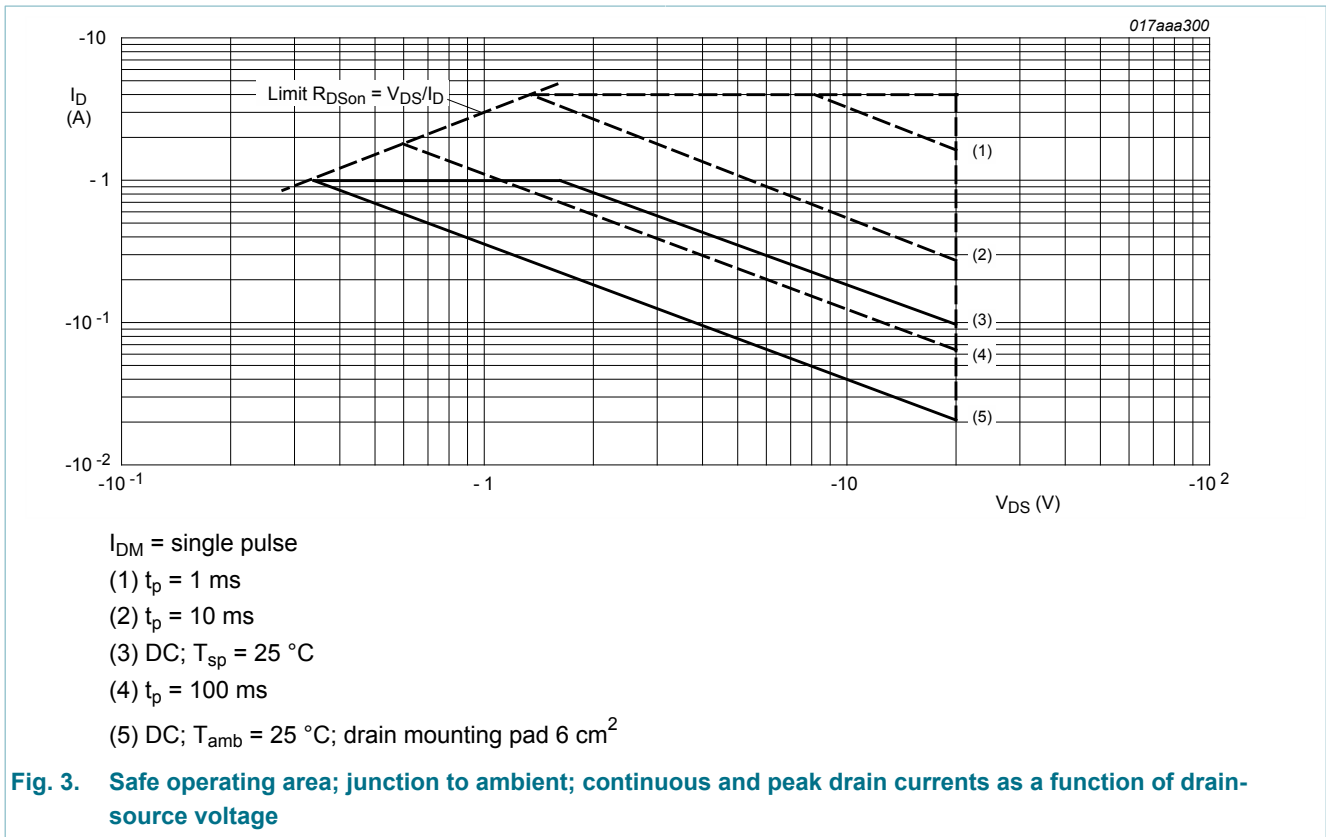


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



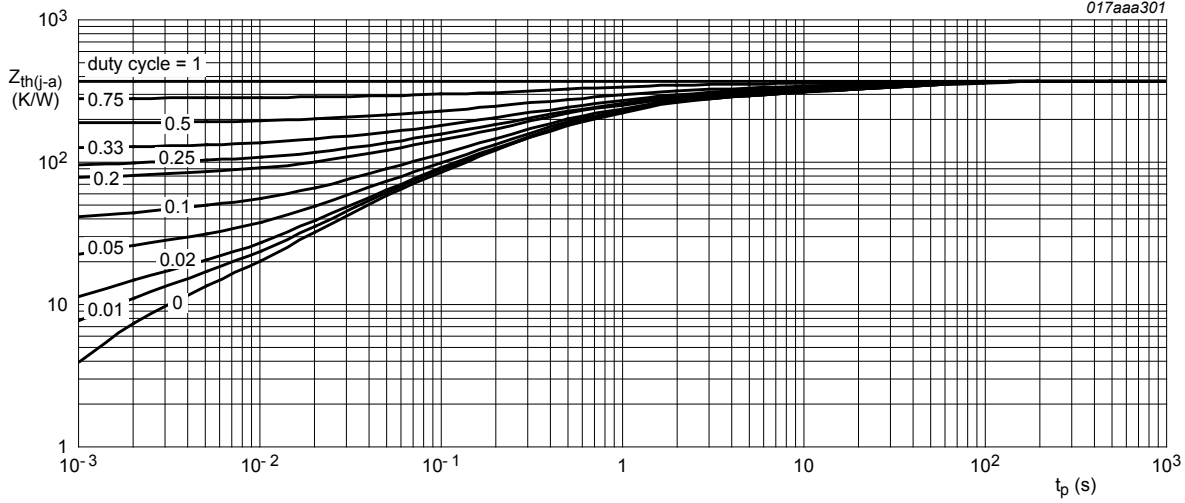
9. Thermal characteristics

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

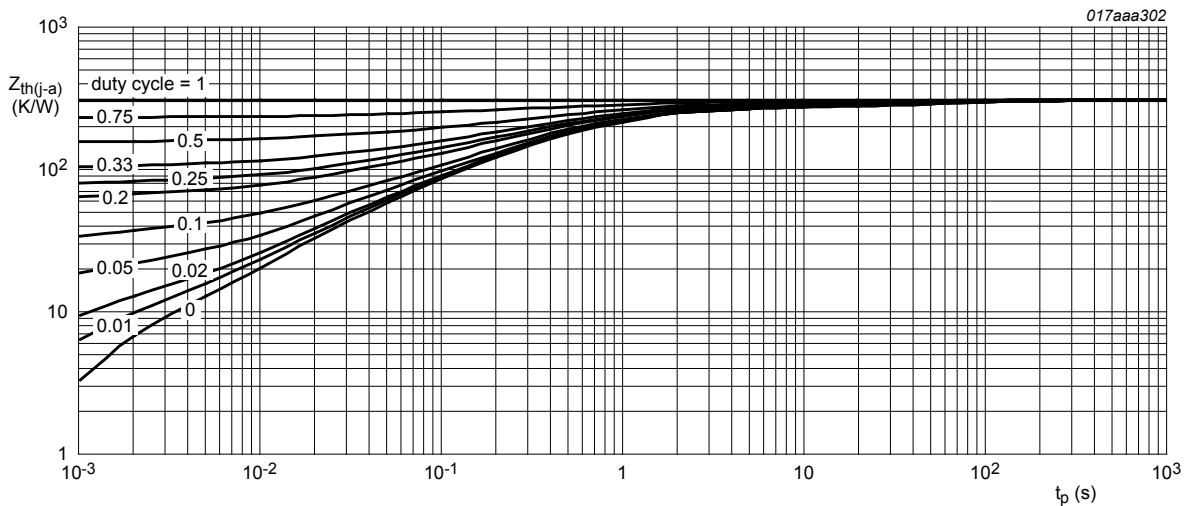
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



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	$I_D = -250 A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	-0.65	-0.9	-1.15	V
I_{DSS}	drain leakage current	$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-1	μA
		$V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	-10	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 _{DS(on)}	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; I _D = -1 A; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C	-	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

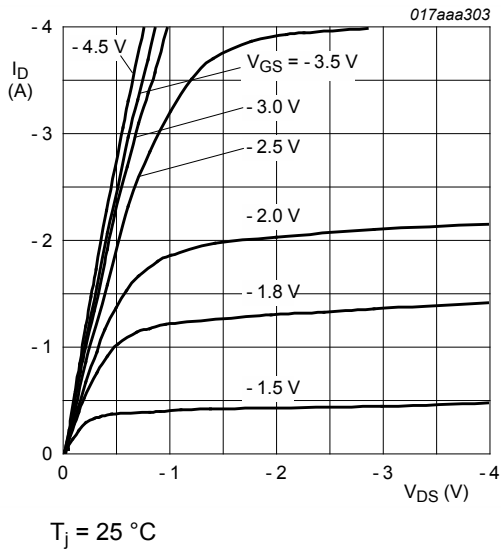
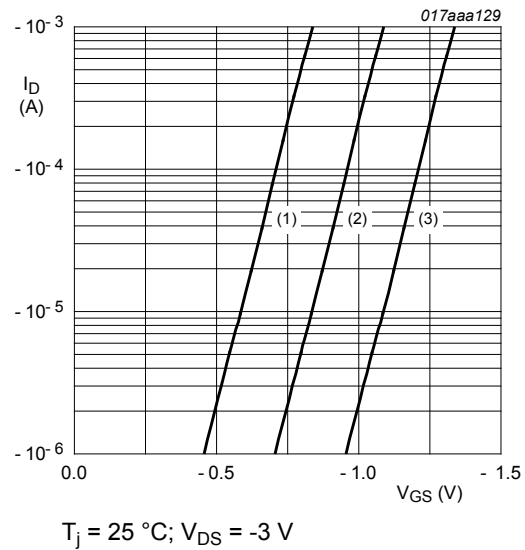
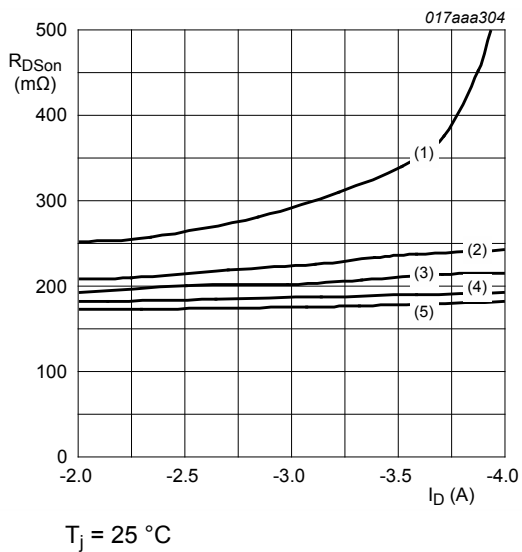


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values



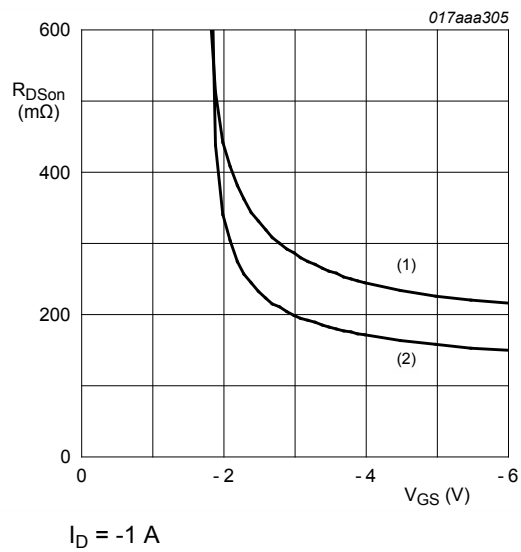
(1) minimum values
(2) typical values
(3) maximum values

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



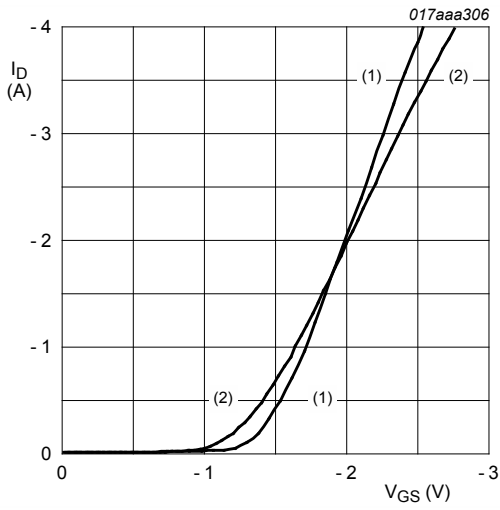
(1) $V_{GS} = -2.5\text{ V}$
(2) $V_{GS} = -3.0\text{ V}$
(3) $V_{GS} = -3.5\text{ V}$
(4) $V_{GS} = -4.0\text{ V}$
(5) $V_{GS} = -4.5\text{ V}$

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



(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) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

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

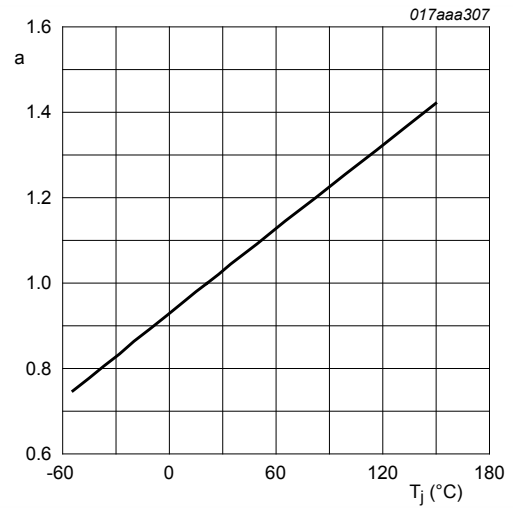
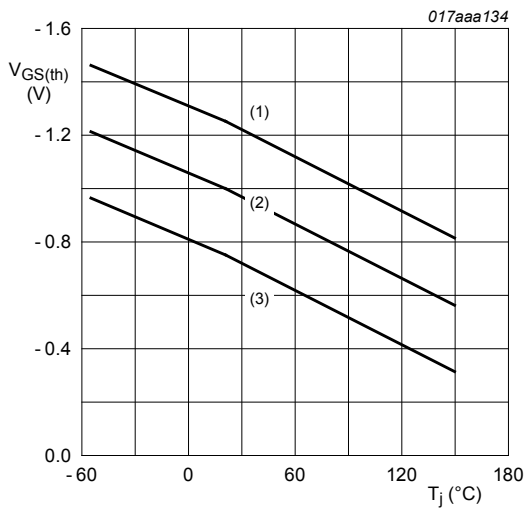


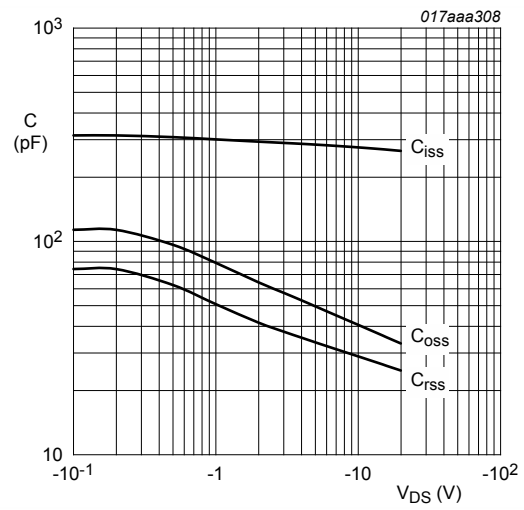
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



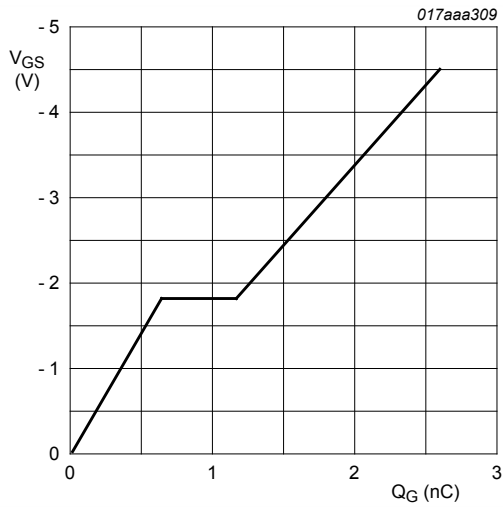
$I_D = -0.25\text{ mA}; V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

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



$I_D = -1.0$ A; $V_{DS} = -10$ V; $T_{amb} = 25$ °C

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

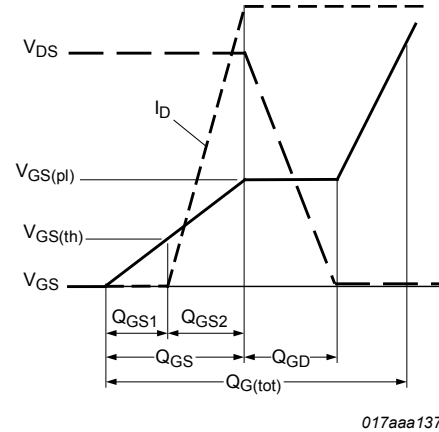
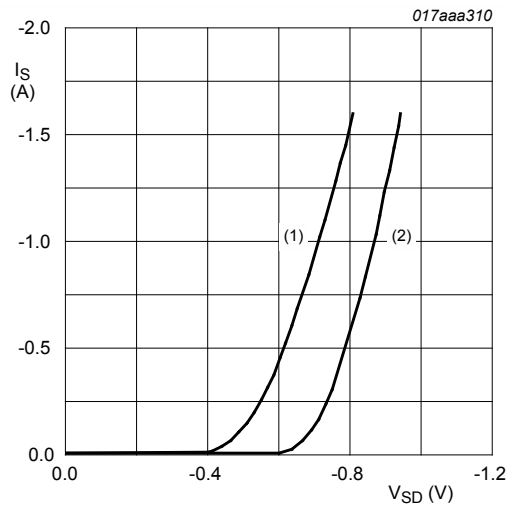


Fig. 15. Gate charge waveform definitions



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

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

11. Test information

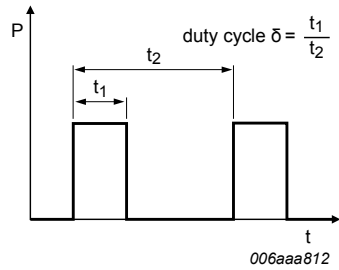


Fig. 17. Duty cycle definition

12. Package outline

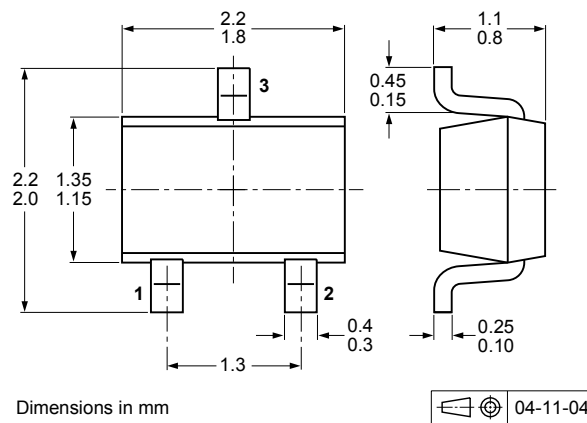


Fig. 18. Package outline SC-70 (SOT323)

13. Soldering

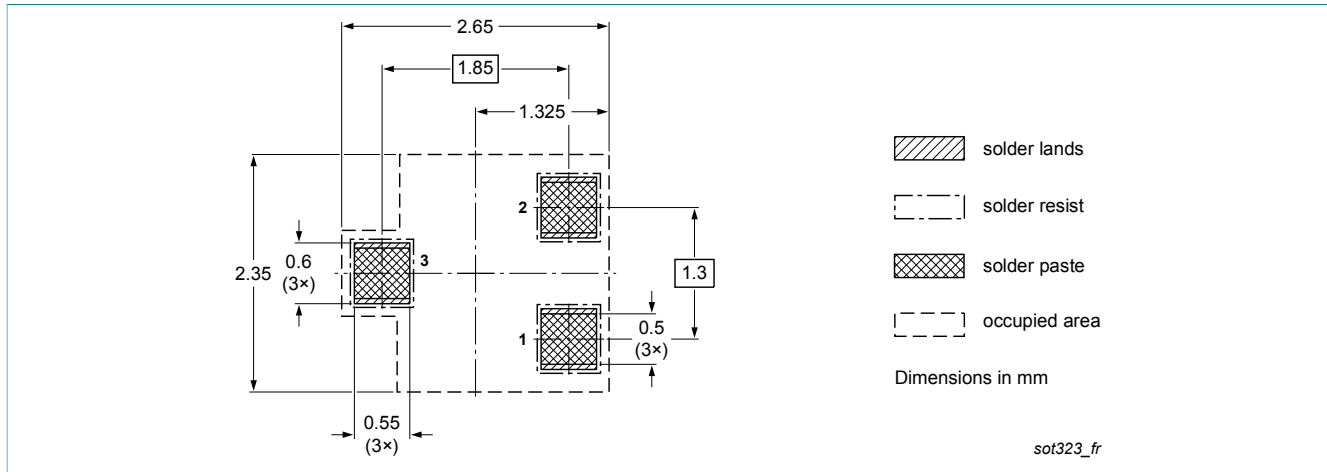


Fig. 19. Reflow soldering footprint for SC-70 (SOT323)

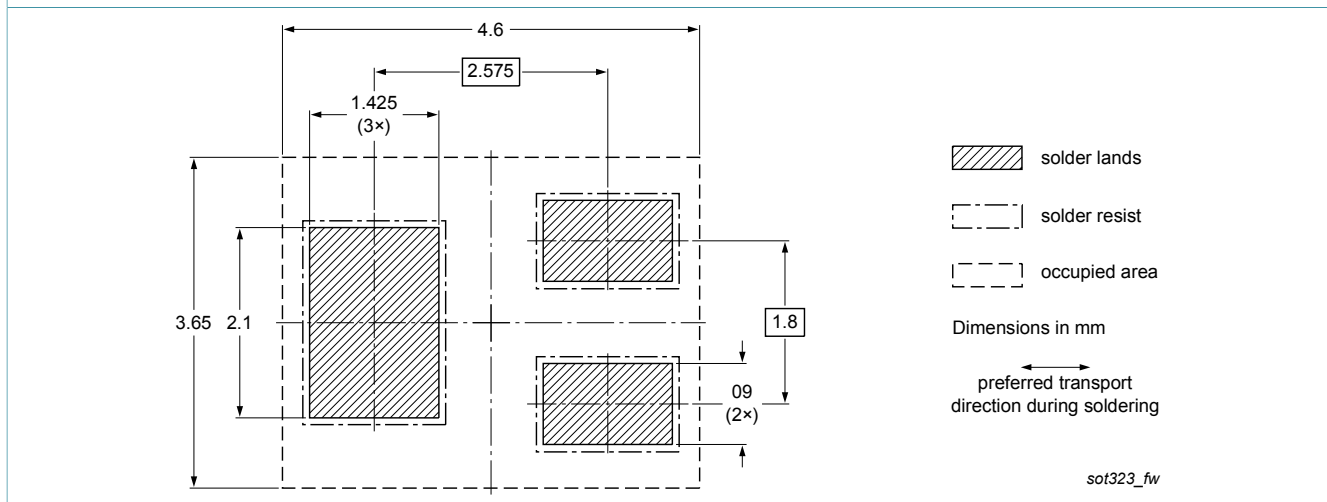


Fig. 20. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMF170XP v.2	20131029	Product data sheet	-	PMF170XP v.1
Modifications:	<ul style="list-style-type: none">• Figure 13 corrected			
PMF170XP v.1	20110902	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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