PMC85XP

30 V P-channel MOSFET with pre-biased NPN transistor

15 May 2013 — Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in Trench MOSFET technology and NPN Resistor-Equipped Transistor (RET) together in a leadless medium power DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Trench MOSFET technology
- NPN transistor built-in bias resistors
- Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm
- Exposed drain pad for excellent thermal conduction

3. Applications

- Charging switch for portable devices
- High-side load switch
- USB port overvoltage protection
- Power management in battery-driven portables
- Hard disk and computing power management

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
P-channel Trench MOSFET							
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-30	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-	-3.4	A
P-channel Trench MOSFET; static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -2.6 A; T_j = 25 °C		-	85	110	mΩ
NPN RET							
V_{CEO}	collector-emitter voltage	T_{amb} = 25 °C; open base		-	-	50	V
I_O	output current			-	-	100	mA

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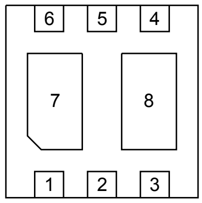
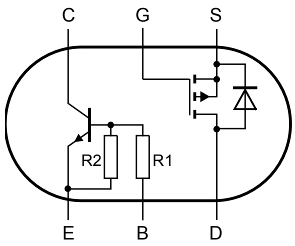
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
NPN RET							
R1	bias resistor 1			3.3	4.7	6.1	kΩ
R2	bias resistor 2			-	47	-	kΩ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 Transparent top view **DFN2020-6 (SOT1118)**	
2	B	base		
3	D	drain		
4	S	source		
5	G	gate		
6	C	collector		
7	C	collector		
8	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMC85XP	DFN2020-6	plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm	SOT1118

7. Marking

Table 4. Marking codes

Type number	Marking code
PMC85XP	1K

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
P-channel Trench MOSFET						
V_{DS}	drain-source voltage	T_j = 25 °C		-	-30	V
V_{GS}	gate-source voltage			-12	12	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-3.4	A
		V_{GS} = -4.5 V; T_{amb} = 25 °C	[1]	-	-2.6	A
		V_{GS} = -4.5 V; T_{amb} = 100 °C	[1]	-	-1.6	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	-8	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	485	mW
			[1]	-	1170	mW
		T_{sp} = 25 °C	[2]	-	8300	mW
P-channel Trench MOSFET; source-drain diode						
I_S	source current	T_{amb} = 25 °C	[1]	-	-1.2	A
NPN RET						
V_{CBO}	collector-base voltage	T_{amb} = 25 °C; open emitter		-	50	V
V_{CEO}	collector-emitter voltage	T_{amb} = 25 °C; open base		-	50	V
V_{EBO}	emitter-base voltage	T_{amb} = 25 °C; open collector		-	10	V
V_I	input voltage	positive		-	30	V
		negative		-	-5	V
I_O	output current			-	100	mA
I_{CM}	peak collector current			-	100	mA
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	465	mW
			[1]	-	985	mW
		T_{sp} = 25 °C	[2]	-	4160	mW
Per device						
T_j	junction temperature			-55	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C

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

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

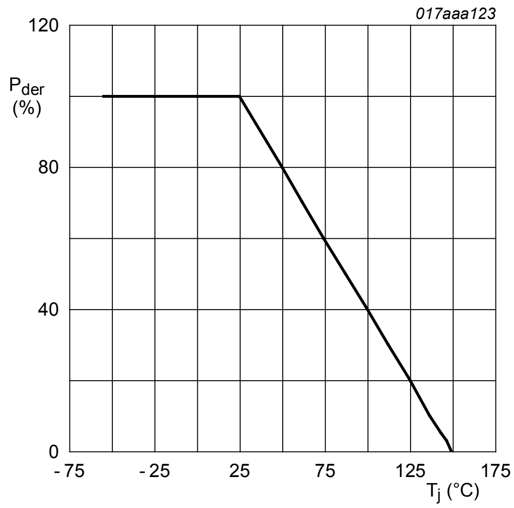


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

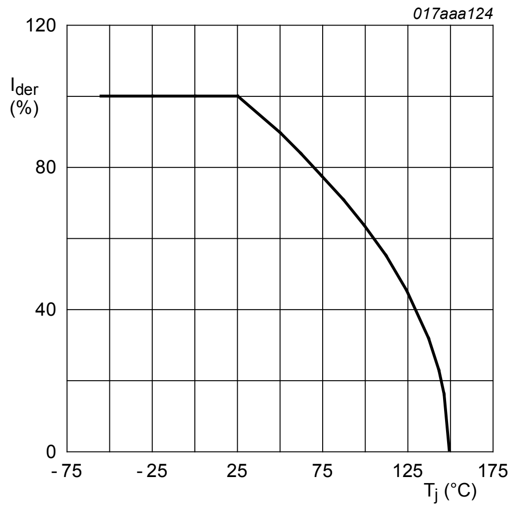
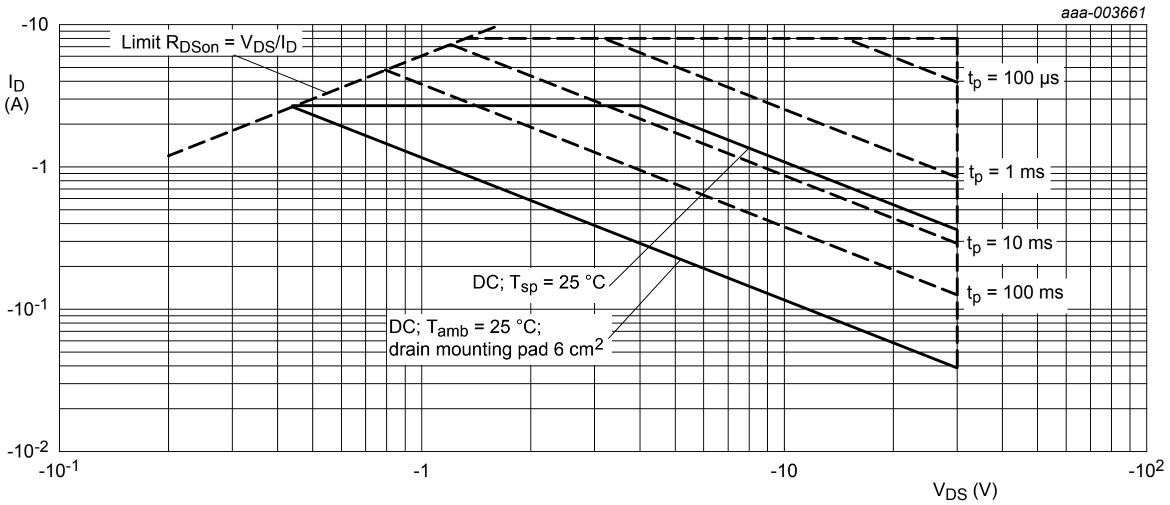


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



I_{DM} = single pulse

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

9. Thermal characteristics

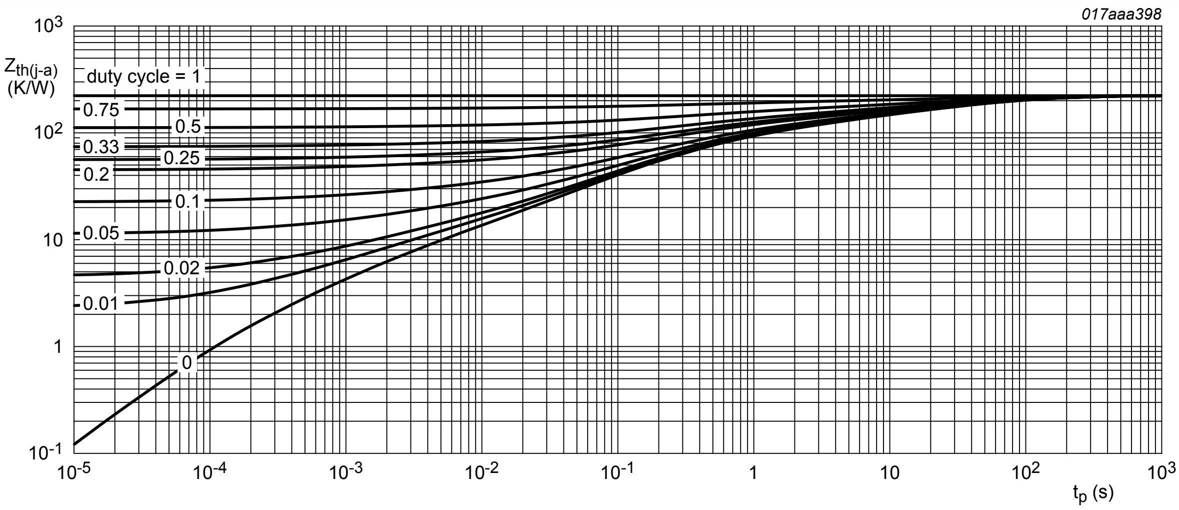
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
P-channel Trench MOSFET							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	223	256	K/W
			[2]	-	93	107	K/W
		t ≤ 5 s; in free air	[2]	-	55	63	K/W

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	10	15	K/W
NPN RET							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	233	270	K/W
			[2]	-	110	127	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	25	30	K/W

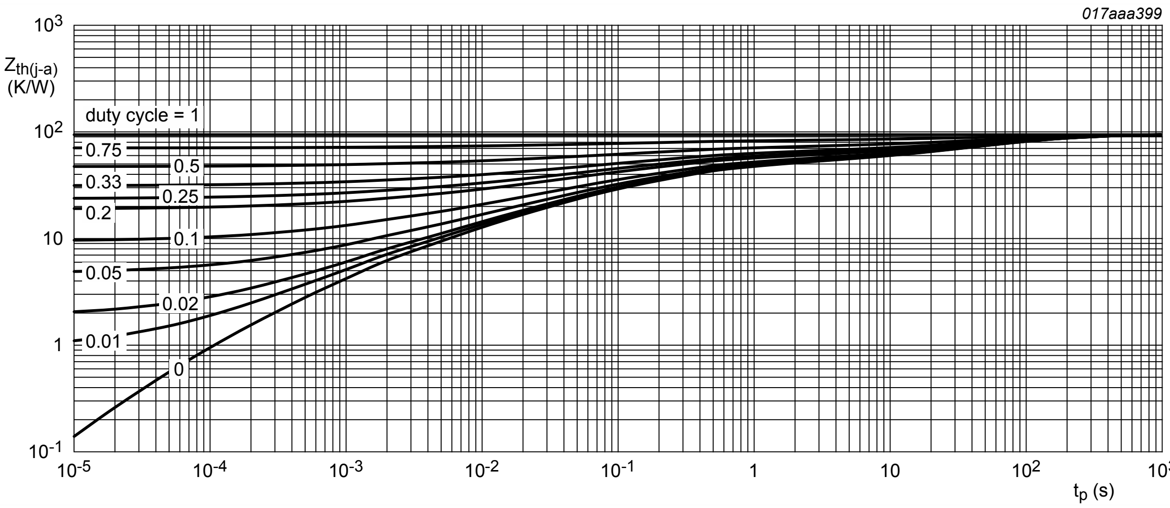
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper; tin-plated and standard footprint.

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



FR4 PCB, standard footprint

Fig. 4. P-channel Trench MOSFET: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for drain 6 cm^2

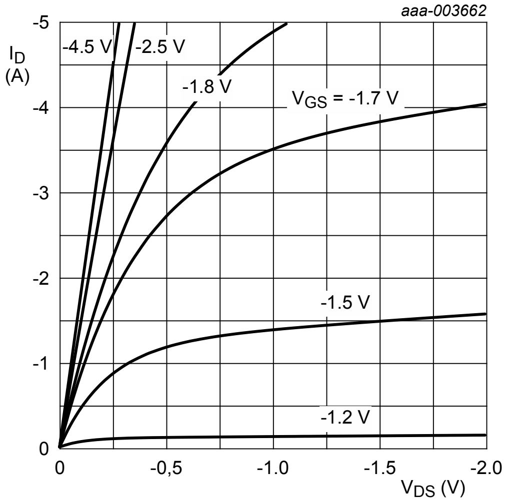
Fig. 5. P-channel Trench MOSFET: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

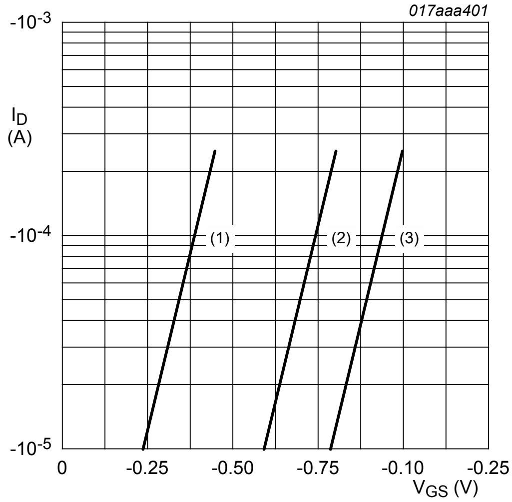
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
P-channel Trench MOSFET; static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V; T_j = 25 °C		-30	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = -250 mA; V_{DS} = V_{GS}; T_j = 25 °C		-0.45	-0.78	-1	V
I_{DSS}	drain leakage current	V_{DS} = -30 V; V_{GS} = 0 V; T_{amb} = 25 °C		-	-	-1	µA
		V_{DS} = -30 V; V_{GS} = 0 V; T_{amb} = 150 °C		-	-	-11	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 = -2.6 A; T_j = 25 °C		-	85	110	mΩ
		V_{GS} = -4.5 V; I_D = -2.6 A; T_j = 150 °C		-	133	173	mΩ
		V_{GS} = -2.5 V; I_D = -1.5 A; T_j = 25 °C		-	105	140	mΩ
g_{fs}	transfer conductance	V_{DS} = -10 V; I_D = -2.6 A; T_j = 25 °C		-	10	-	S
P-channel Trench MOSFET; dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -15 V; I_D = -2.6 A; V_{GS} = -4.5 V; T_j = 25 °C		-	5.2	7.8	nC
Q_{GS}	gate-source charge			-	1.1	-	nC
Q_{GD}	gate-drain charge			-	0.95	-	nC
C_{iss}	input capacitance	V_{DS} = -15 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C		-	680	-	pF
C_{oss}	output capacitance			-	54	-	pF

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
C_{rss}	reverse transfer capacitance			-	40	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -15 V; I_D = -2.6 A; $R_{G(ext)}$ = 6 Ω; V_{GS} = -4.5 V; T_j = 25 °C		-	3	-	ns
t_r	rise time			-	15	-	ns
$t_{d(off)}$	turn-off delay time			-	112	-	ns
t_f	fall time			-	48	-	ns
P-channel Trench MOSFET; source-drain diode							
V_{SD}	source-drain voltage	I_S = -1.2 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.8	-1.2	V
NPN RET							
I_{CBO}	collector-base cut-off current	V_{CB} = 50 V; I_E = 0 A; T_j = 25 °C		-	-	100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 30 V; I_B = 0 A; T_j = 25 °C		-	-	1	μA
		V_{CE} = 30 V; I_B = 0 A; T_j = 150 °C		-	-	50	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_j = 25 °C		-	-	170	μA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 10 mA; T_j = 25 °C		100	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 5 mA; I_B = 0.25 mA; T_j = 25 °C		-	-	100	mV
$V_{I(off)}$	off-state input voltage	I_C = 100 μA; V_{CE} = 5 V; T_j = 25 °C		-	0.6	0.5	V
$V_{I(on)}$	on-state input voltage	I_C = 5 mA; V_{CE} = 0.3 V; T_j = 25 °C		1.3	0.9	-	V
R1	bias resistor 1			3.3	4.7	6.1	kΩ
R2	bias resistor 2			-	47	-	kΩ
R2/R1	bias resistor ratio			8	10	12	
C_C	collector capacitance	I_E = 0 A; i_e = 0 A; f = 1 MHz; T_j = 25 °C; V_{CB} = 10 V		-	-	2.5	pF



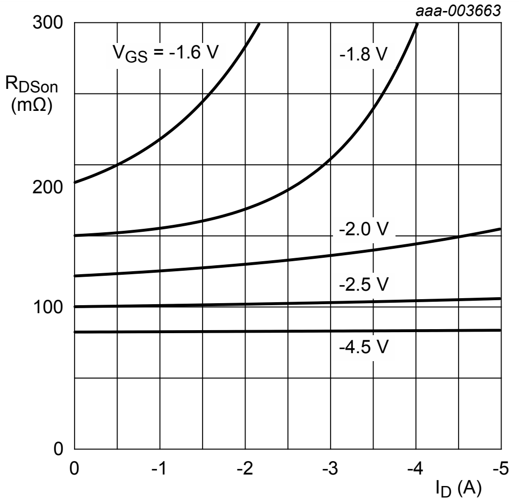
T_j = 25 °C

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



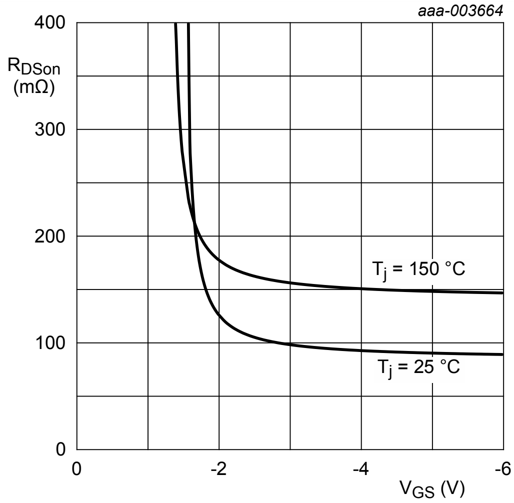
T_j = 25 °C; V_{DS} = −5 V
(1) minimum values
(2) typical values
(3) maximum values

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



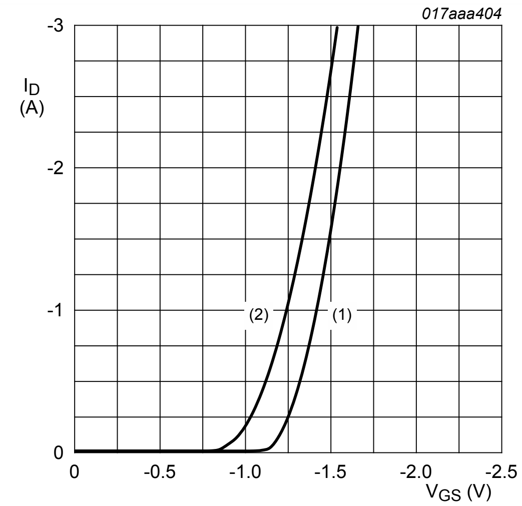
T_j = 25 °C

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



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

(1) T_j = 25 °C

(2) T_j = 150 °C

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

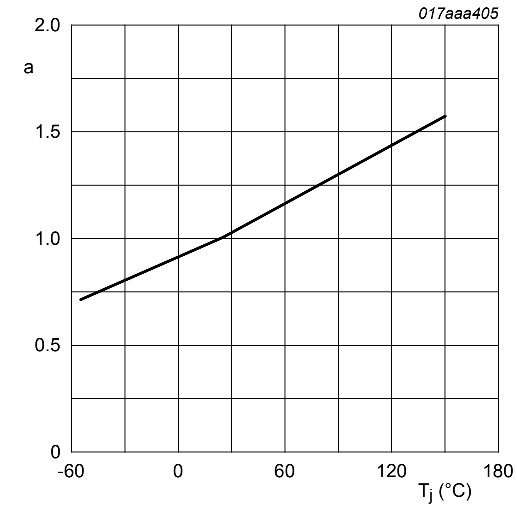
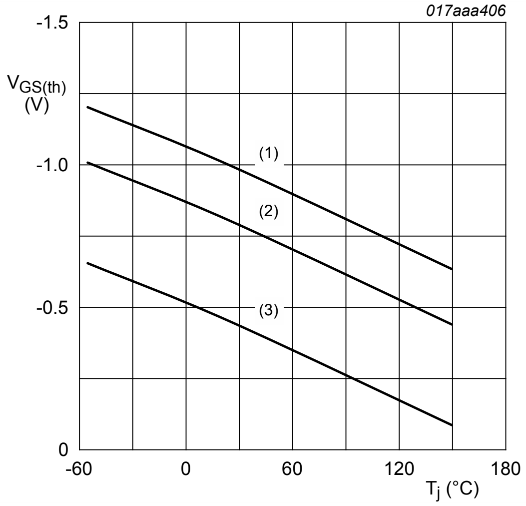


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



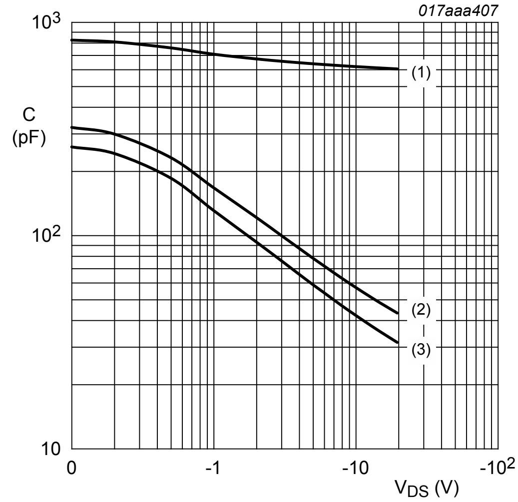
I_D = -0.25 mA; $V_{DS} = V_{GS}$

(1) maximum values

(2) typical values

(3) minimum values

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



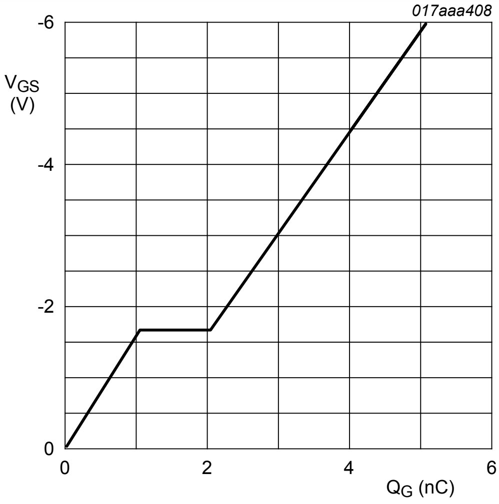
f = 1 MHz; V_{GS} = 0 V

(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



$I_D = -3.3$ A; $V_{DS} = -10$ V; $T_{amb} = 25$ °C

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

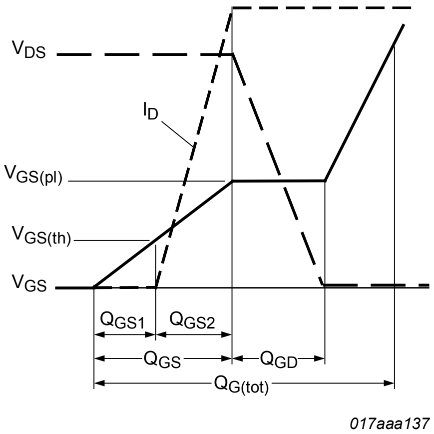
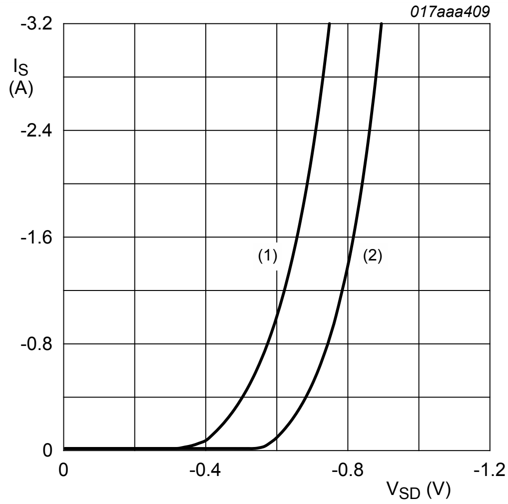


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0$ V

(1) $T_{amb} = 150$ °C

(2) $T_{amb} = 25$ °C

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

11. Test information

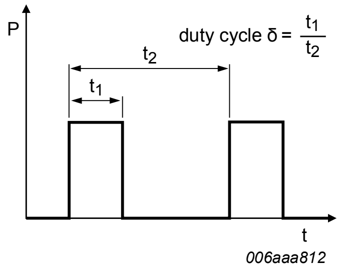


Fig. 17. Duty cycle definition

12. Package outline

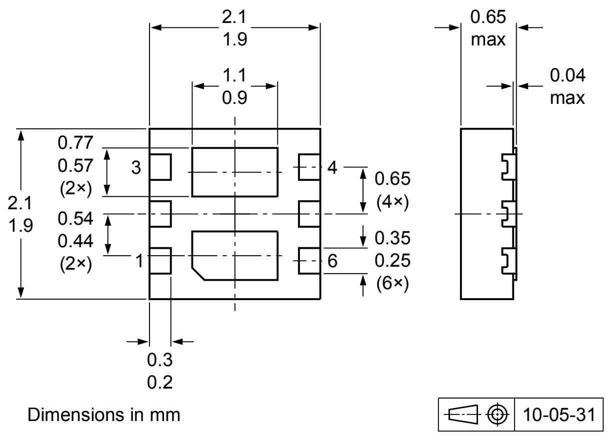


Fig. 18. Package outline DFN2020-6 (SOT1118)

13. Soldering

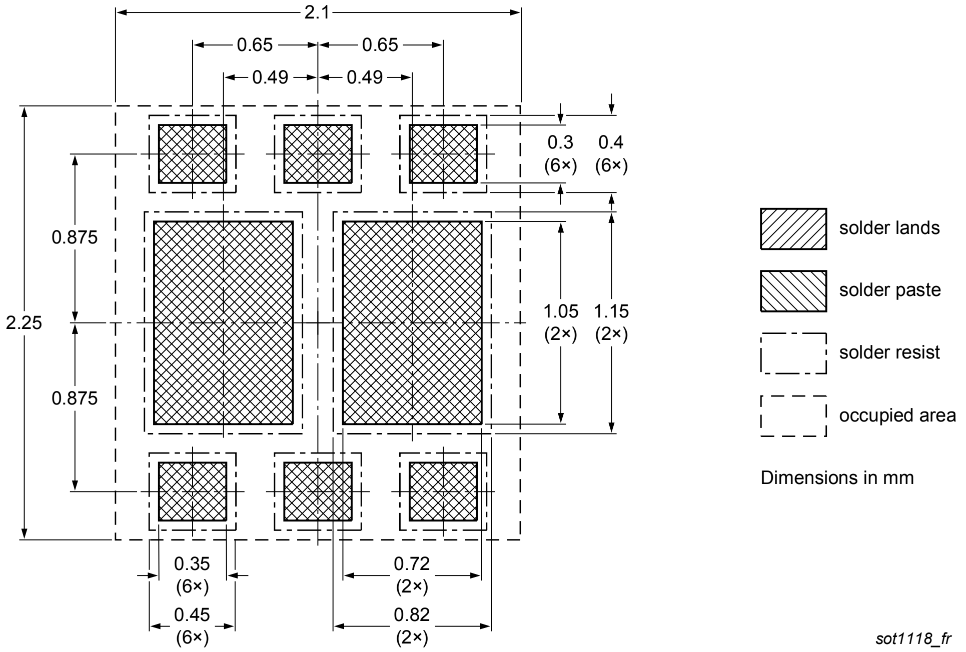


Fig. 19. Reflow soldering footprint for DFN2020-6 (SOT1118)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMC85XP v.2	20130515	Product data sheet	-	PMC85XP v.1
Modifications:	• Pinning information: graphic symbol corrected			
PMC85XP v.1	20120524	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.

[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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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16. Contents

For more information, please visit: http://www.nexperia.com
For sales office addresses, please send an email to: salesaddresses@nexperia.com
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EPlast1.ru

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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