



PMDPB70XPE

20 V dual P-channel Trench MOSFET

Rev. 1 — 20 June 2012

Product data sheet

1. Product profile

1.1 General description

Dual small-signal P-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Very fast switching
- Trench MOSFET technology
- 2 kV ElectroStatic Discharge (ESD) protection

1.3 Applications

- Relay driver
- High-speed line driver
- High-side load switch
- Switching circuits

1.4 Quick reference data

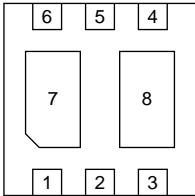
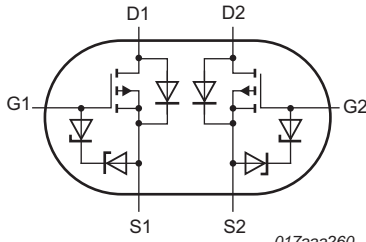
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	-20	V
V_{GS}	gate-source voltage		-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	-4.2	A
Static characteristics (per transistor)						
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2\text{ A}; T_j = 25\text{ °C}$	-	66	79	m Ω

[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	S1	source TR1	 <p>Transparent top view</p> <p>DFN2020-6 (SOT1118)</p>	 <p>017aaa260</p>
2	G1	gate TR1		
3	D2	drain TR2		
4	S2	source TR2		
5	G2	gate TR2		
6	D1	drain TR1		
7	D1	drain TR1		
8	D2	drain TR2		

3. Ordering information

Table 3. Ordering information

Type number	Package		Description	Version
	Name			
PMDPB70XPE	DFN2020-6		plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals	SOT1118

4. Marking

Table 4. Marking codes

Type number	Marking code
PMDPB70XPE	2B

5. Limiting values

Table 5. Limiting values

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

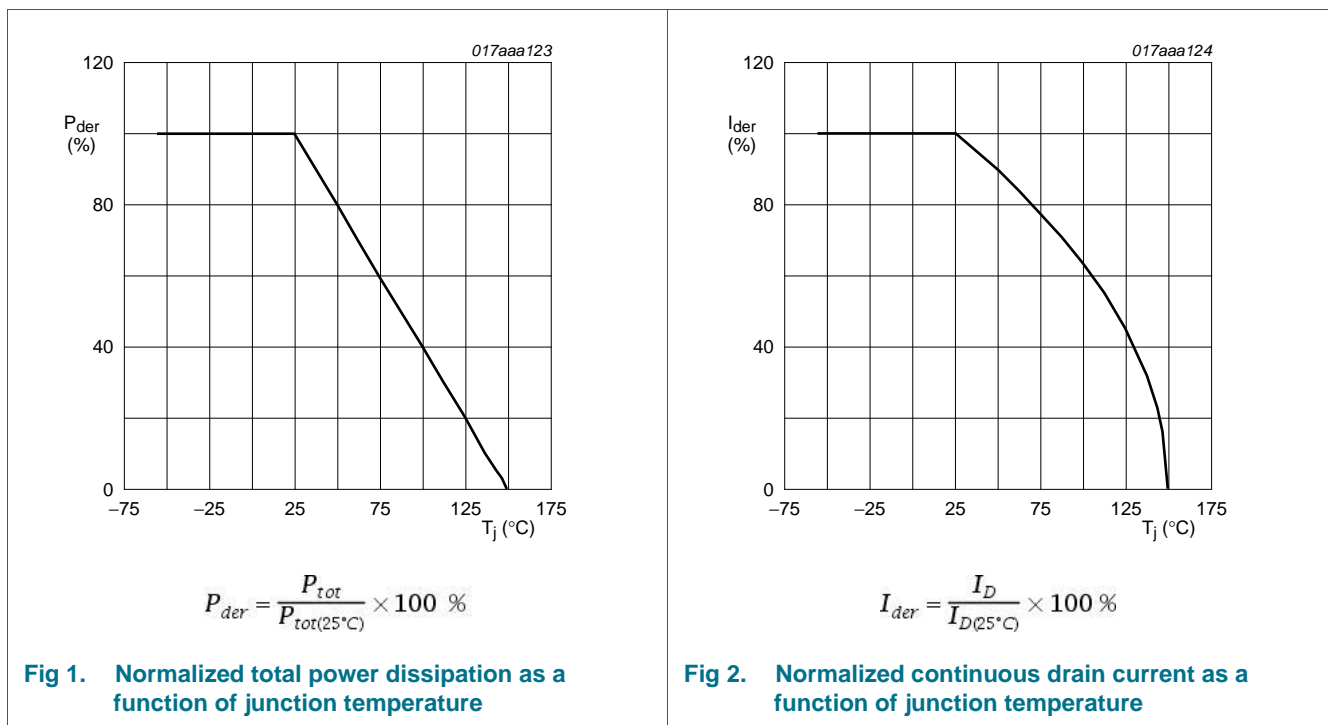
Symbol	Parameter	Conditions	Min	Max	Unit	
Per transistor						
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-20	V	
V_{GS}	gate-source voltage		-12	12	V	
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	-4.2	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-3	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	-2.1	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-12	A	
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	515	mW
			[1]	-	1210	mW
		$T_{sp} = 25\text{ °C}$		-	8330	mW
Source-drain diode						
I_S	source current	$T_{amb} = 25\text{ °C}$	[1]	-	-1.3	A

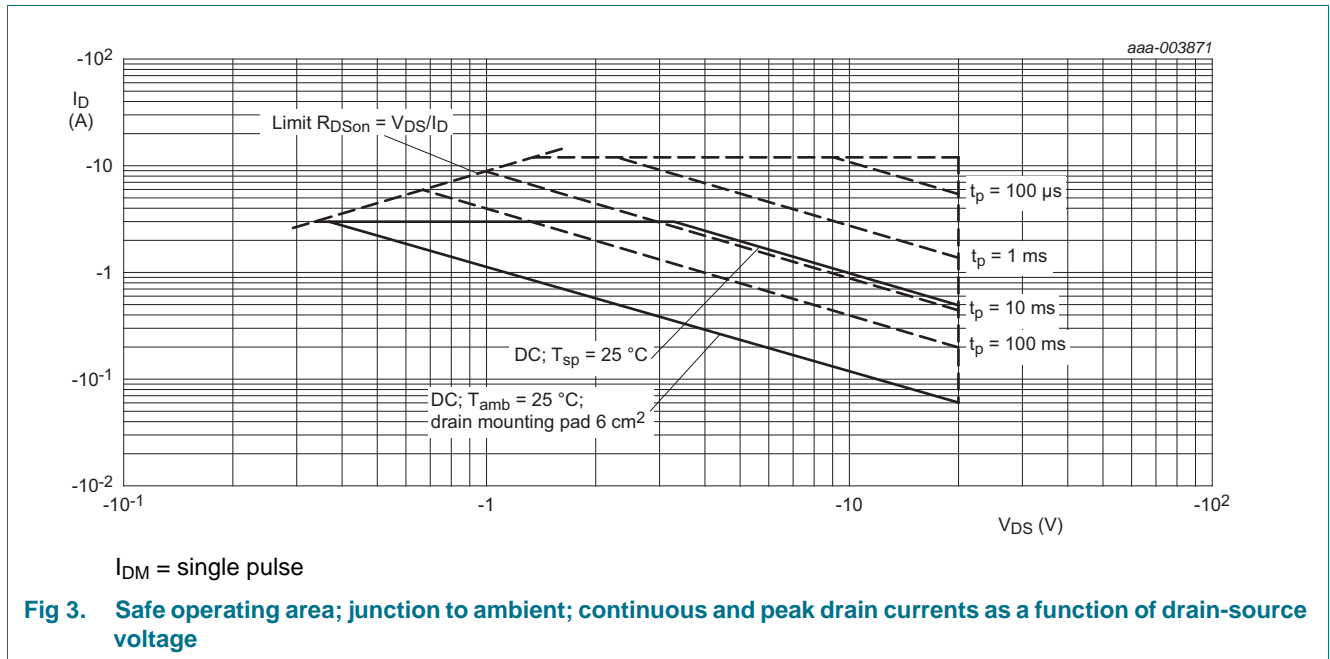
Table 5. Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
ESD maximum rating					
V _{ESD}	electrostatic discharge voltage	HBM; C = 100 pF; R = 1.5 kΩ	[3]	-	2000 V
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, mounting pad for drain 6 cm².
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [3] Measured between all pins.





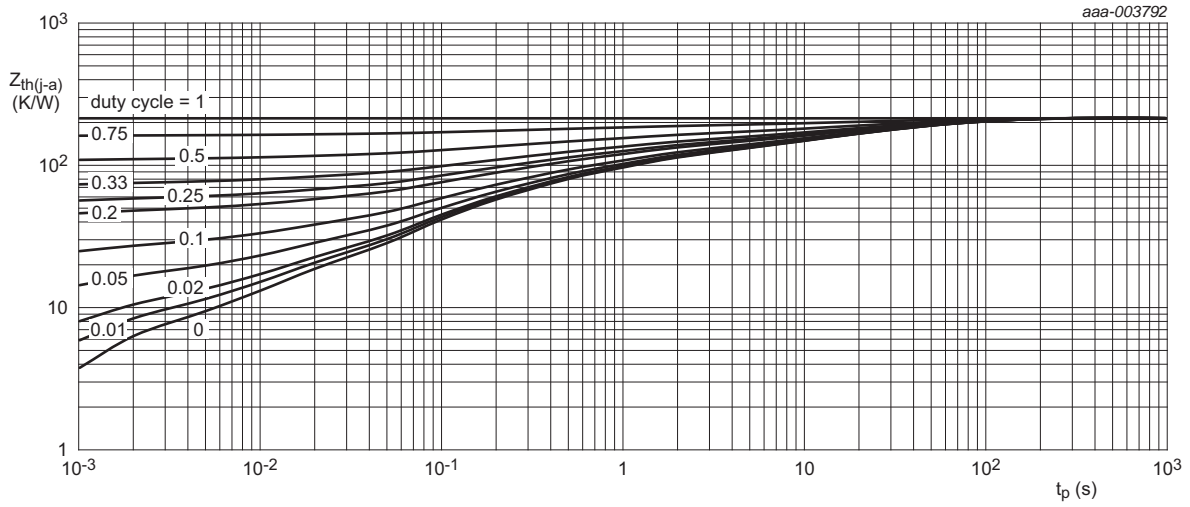
6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	212	244	K/W
			[2]	-	90	104	K/W
		in free air; $t \leq 5 \text{ s}$	[2]	-	55	64	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	11	15	K/W	

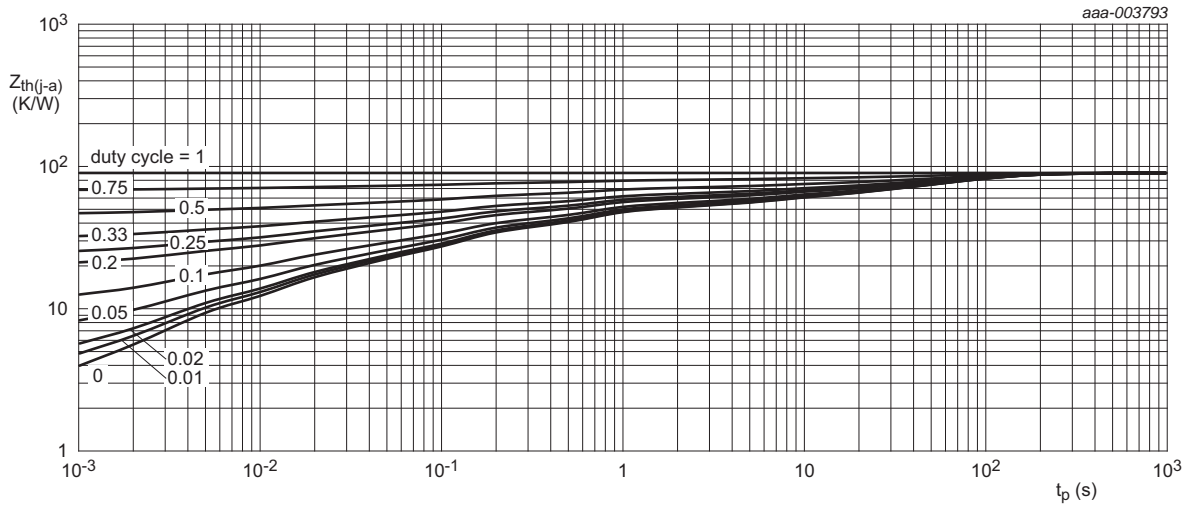
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



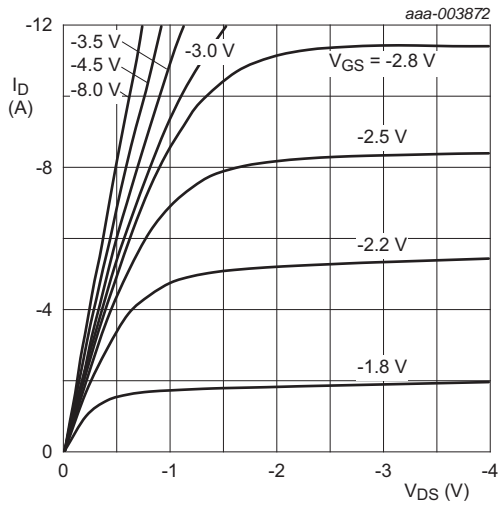
FR4 PCB, mounting pad for drain 6 cm²

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

7. Characteristics

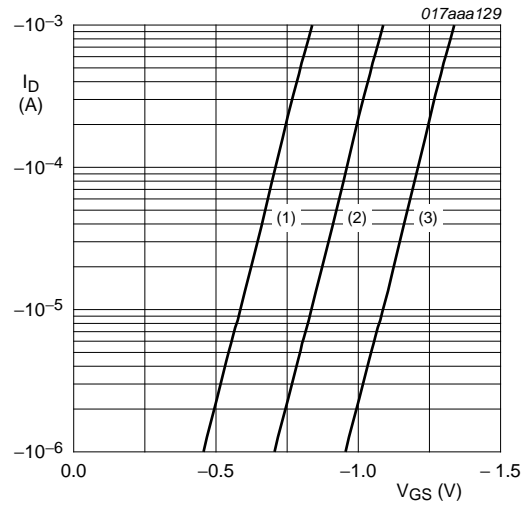
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics (per transistor)						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu\text{A}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ\text{C}$	-0.75	-1	-1.25	V
I_{DSS}	drain leakage current	$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	μA
		$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	μA
I_{GSS}	gate leakage current	$V_{GS} = 12 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	10	μA
		$V_{GS} = -12 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-10	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$; $I_D = -2 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	66	79	m Ω
		$V_{GS} = -4.5 \text{ V}$; $I_D = -2 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	94	112	m Ω
		$V_{GS} = -2.5 \text{ V}$; $I_D = -1.5 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	98	123	m Ω
g_{fs}	forward transconductance	$V_{DS} = -10 \text{ V}$; $I_D = -2 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	7.3	-	S
Dynamic characteristics (per transistor)						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$; $I_D = -2 \text{ A}$; $V_{GS} = -4.5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	5	7.5	nC
Q_{GS}	gate-source charge		-	1.1	-	nC
Q_{GD}	gate-drain charge		-	1.1	-	nC
C_{iss}	input capacitance	$V_{DS} = -10 \text{ V}$; $f = 1 \text{ MHz}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	600	-	pF
C_{oss}	output capacitance		-	103	-	pF
C_{rss}	reverse transfer capacitance		-	77	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$; $I_D = -2 \text{ A}$; $V_{GS} = -4.5 \text{ V}$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	7	-	ns
t_r	rise time		-	16	-	ns
$t_{d(off)}$	turn-off delay time		-	33	-	ns
t_f	fall time		-	15	-	ns
Source-drain diode (per transistor)						
V_{SD}	source-drain voltage	$I_S = -0.5 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.7	-1.2	V



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

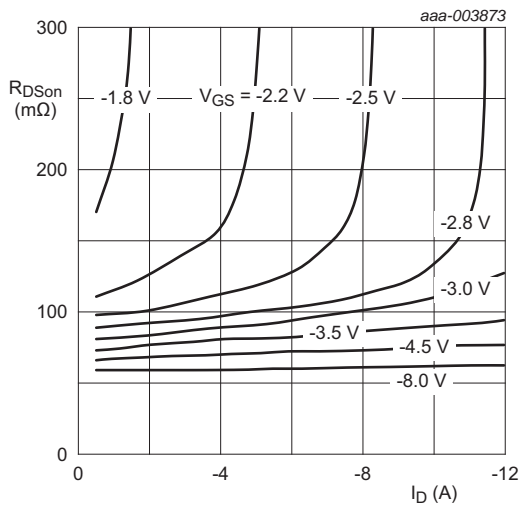
Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



$T_j = 25\text{ }^\circ\text{C}; V_{DS} = -3\text{ V}$

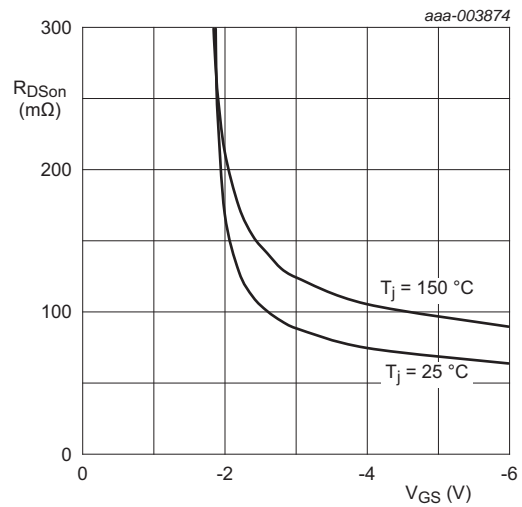
- (1) minimum values
- (2) typical values
- (3) maximum values

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



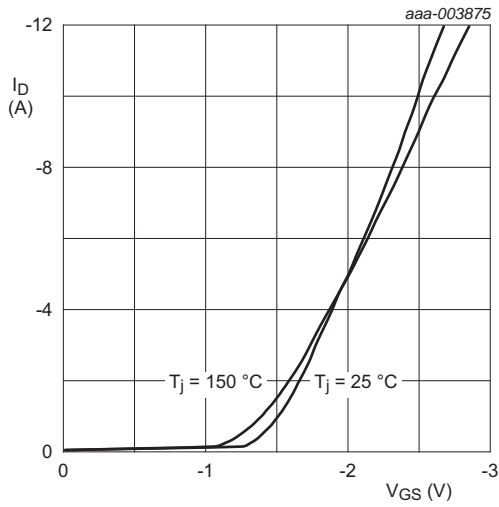
$T_j = 25\text{ }^\circ\text{C}$

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



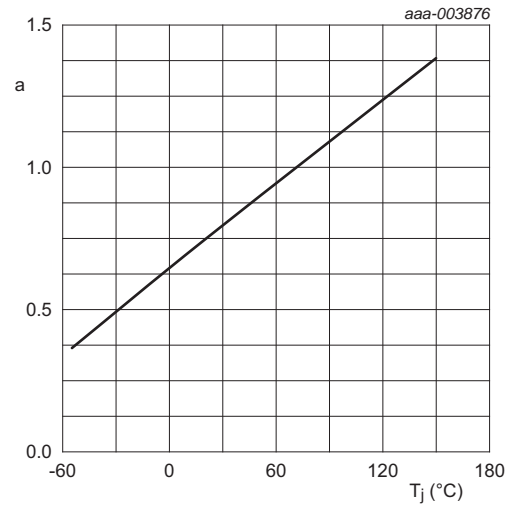
$I_D = -2\text{ A}$

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



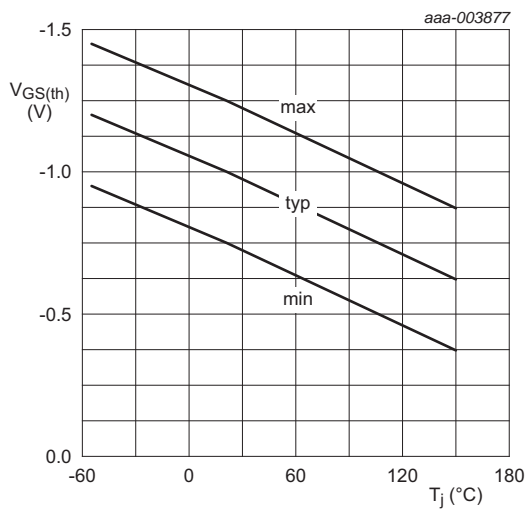
$$V_{DS} > I_D \times R_{DS(on)}$$

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



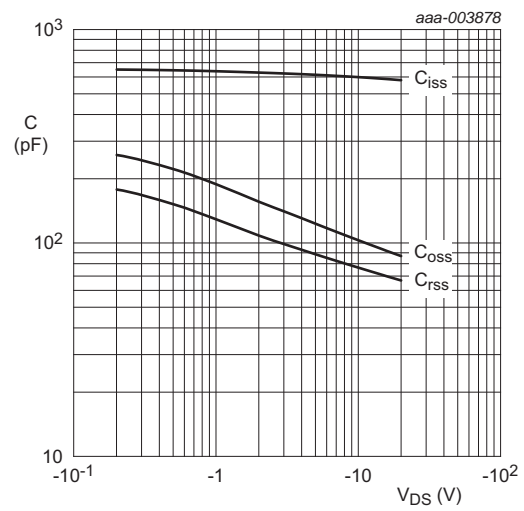
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ C)}}$$

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



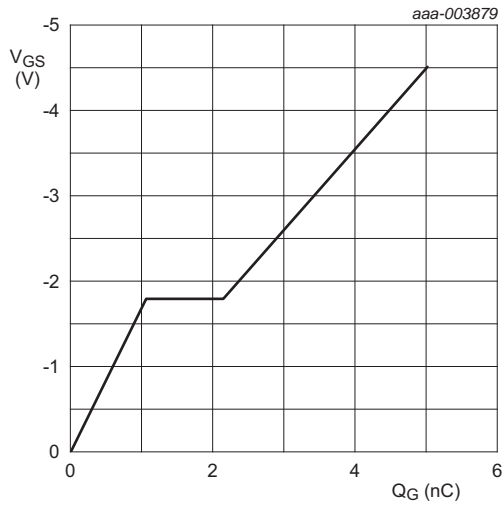
$$I_D = -0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



$$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$$

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



$I_D = -2 \text{ A}; V_{DS} = -10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

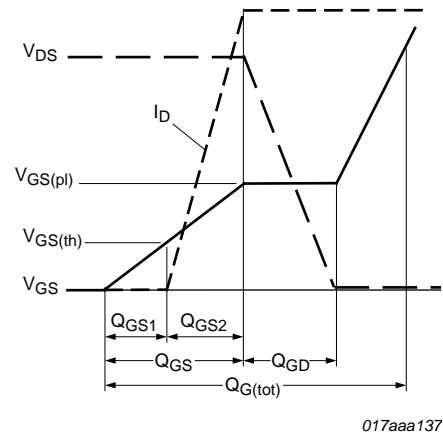
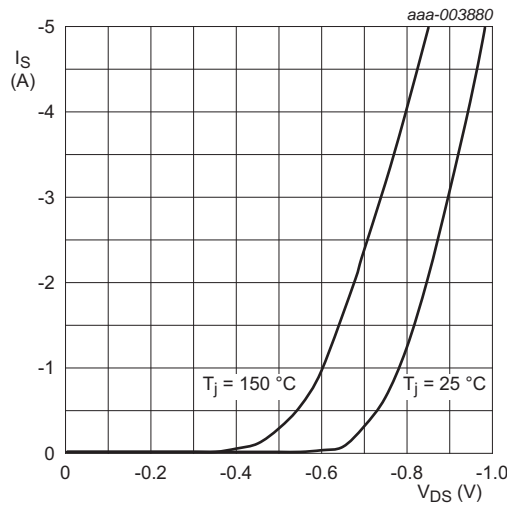


Fig 15. Gate charge waveform definitions



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

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

8. Test information



Fig 17. Duty cycle definition

9. Package outline

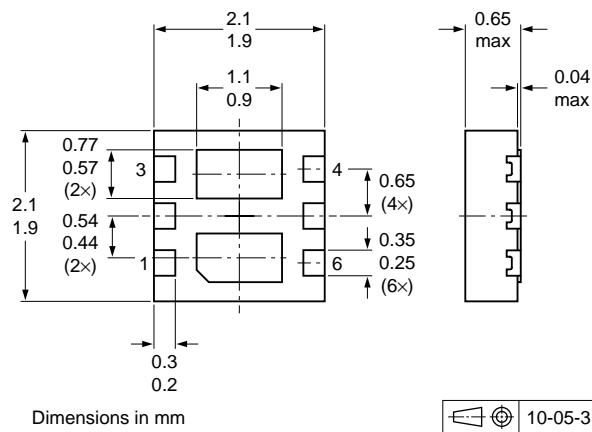


Fig 18. Package outline DFN2020-6 (SOT1118)

10. Soldering

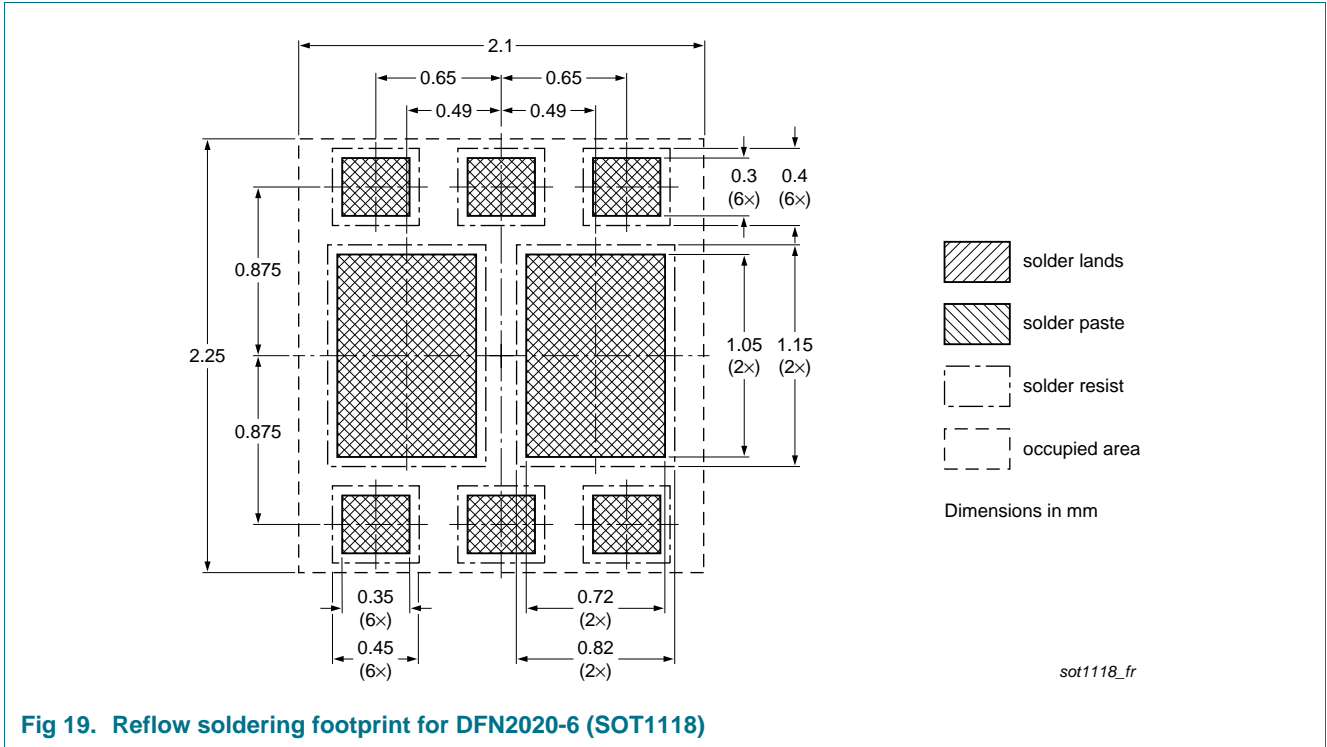


Fig 19. Reflow soldering footprint for DFN2020-6 (SOT1118)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMDPB70XPE v.1	20120620	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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