

PMDPB70EN

30 V, dual N-channel Trench MOSFET

Rev. 1 — 25 April 2012

Product data sheet

1. Product profile

1.1 General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in a small and leadless ultra thin DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Very fast switching
- Trench MOSFET technology
- Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm
- Exposed drain pad for excellent thermal conduction

1.3 Applications

- Charging switch for portable devices
- DC-to-DC converters
- Small brushless DC motor drive
- Power management in battery-driven portables
- Hard disc and computing power management

1.4 Quick reference data

Table 1. Quick reference data

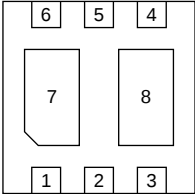
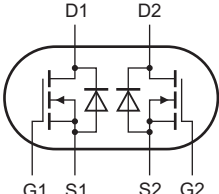
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{DS}	drain-source voltage	$T_j = 25\text{ }^{\circ}\text{C}$	-	-	30	V
V_{GS}	gate-source voltage		-20	-	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t \leq 5\text{ s}$	[1]	-	4.5	A
Static characteristics (per transistor)						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 3.5\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$	-	46	57	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	 Transparent top view DFN2020-6 (SOT1118)	 017aaa254
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		
	Name	Description	Version
PMDPB70EN	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
PMDPB70EN	1M

5. Limiting values

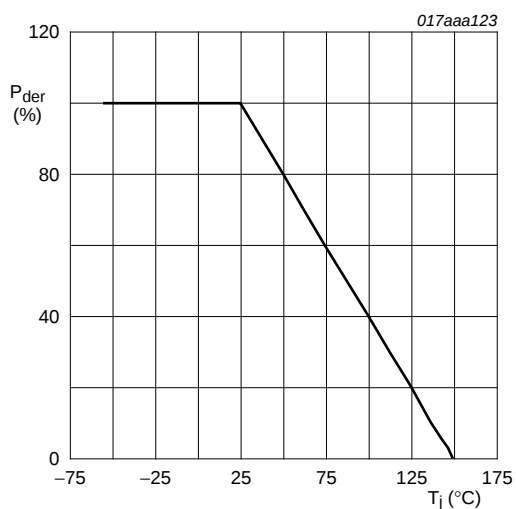
Table 5. Limiting values

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 °C	-	30	V	
V _{GS}	gate-source voltage		-20	20	V	
I _D	drain current	V _{GS} = 10 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	4.5	A
		V _{GS} = 10 V; T _{amb} = 25 °C	[1]	-	3.5	A
		V _{GS} = 10 V; T _{amb} = 100 °C	[1]	-	2.2	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs	-	14	A	
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	510	mW
			[1]	-	1165	mW
		T _{sp} = 25 °C	-	8330	mW	
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	0.7	A
Per device						
T _j	junction temperature		-55	150	°C	
T _{amb}	ambient temperature		-55	150	°C	
T _{stg}	storage temperature		-65	150	°C	

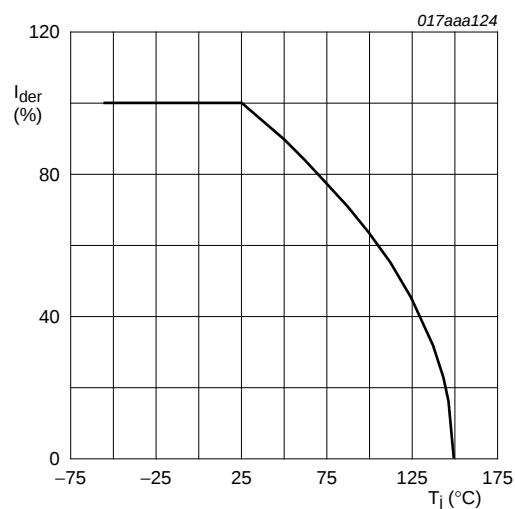
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



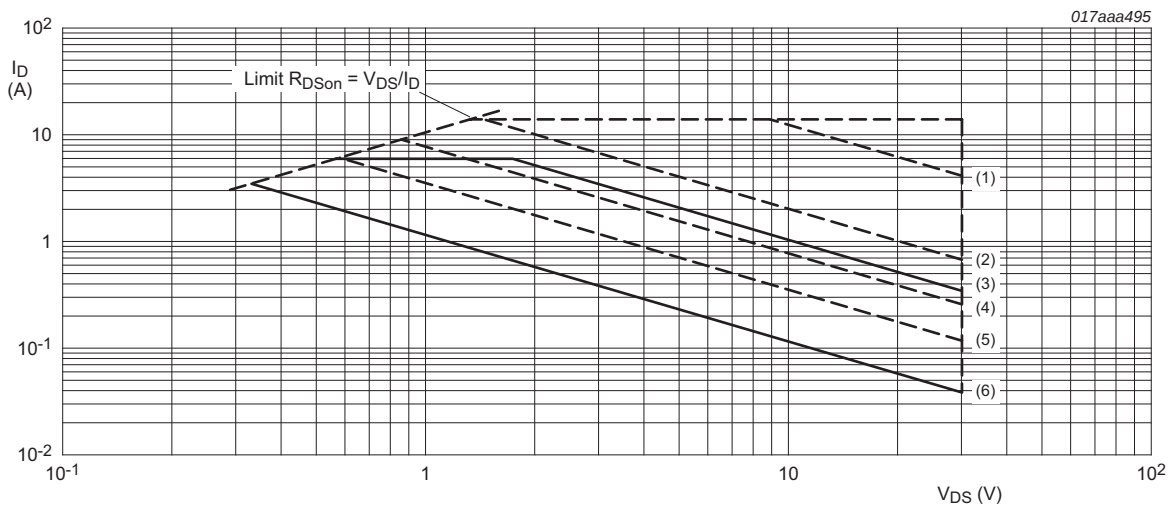
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

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) $t_p = 100 \mu s$
(2) $t_p = 1 ms$
(3) DC; $T_{sp} = 25\text{ }^{\circ}C$
(4) $t_p = 10 ms$
(5) $t_p = 100 ms$
(6) DC; $T_{amb} = 25\text{ }^{\circ}C$; 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
Per transistor						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	213	245 K/W
			[2]	-	93	107 K/W
			[3]	-	55	64 K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	12	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 .
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2 , $t \leq 5\text{ s}$.

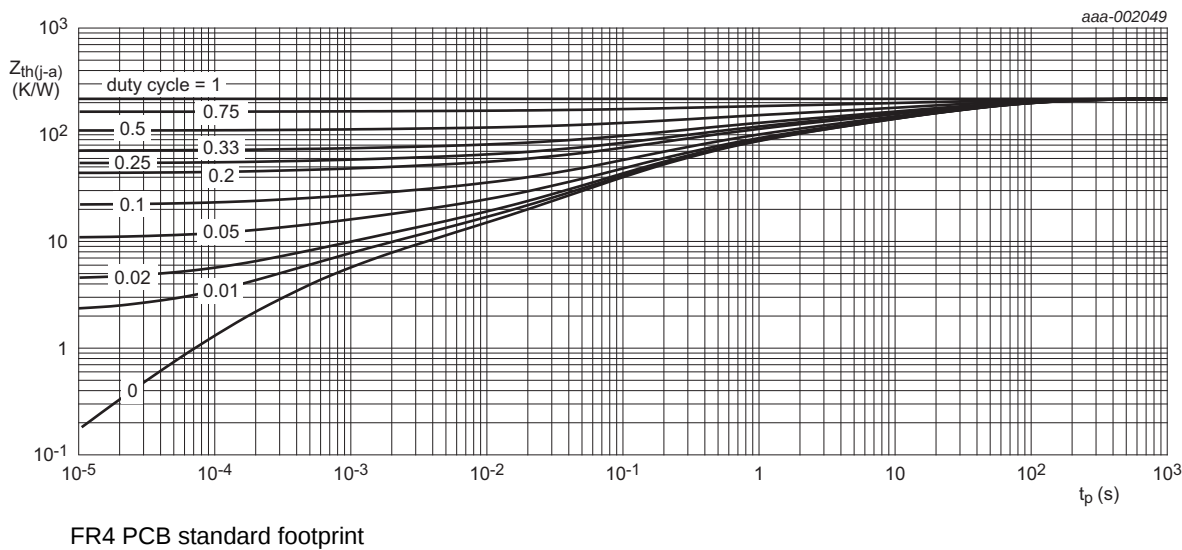


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

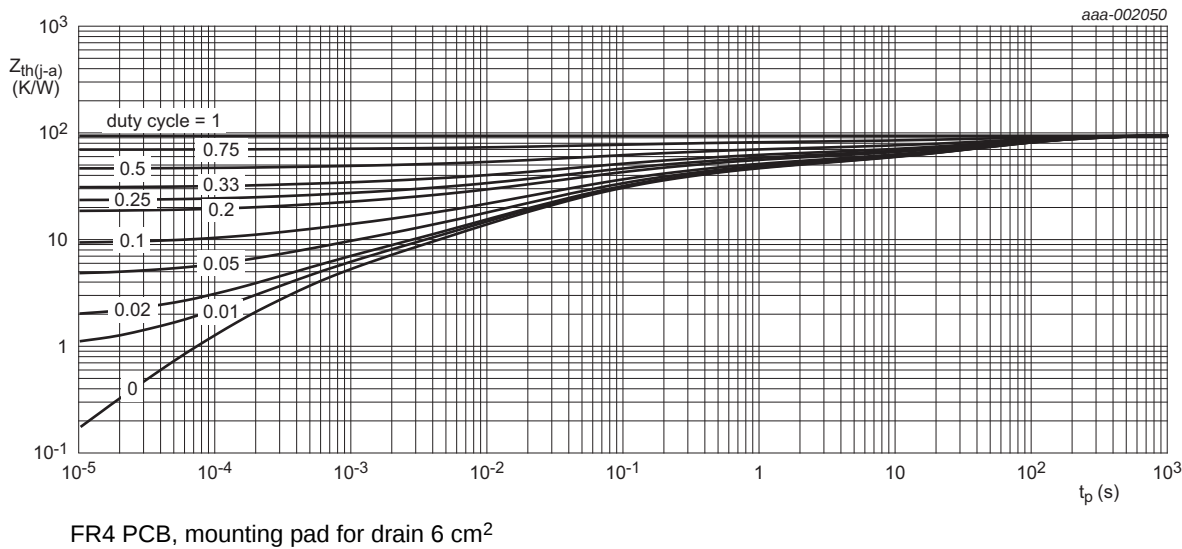


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics (per transistor)						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$; $V_{GS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	30	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250\ \mu\text{A}$; $V_{DS} = V_{GS}$; $T_j = 25\ ^\circ\text{C}$	1	1.5	2.5	V
I_{DSS}	drain leakage current	$V_{DS} = 30\ \text{V}$; $V_{GS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	-	1	μA
		$V_{DS} = 30\ \text{V}$; $V_{GS} = 0\ \text{V}$; $T_j = 150\ ^\circ\text{C}$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 20\ \text{V}$; $V_{DS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -20\ \text{V}$; $V_{DS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\ \text{V}$; $I_D = 3.5\ \text{A}$; $T_j = 25\ ^\circ\text{C}$	-	46	57	m Ω
		$V_{GS} = 10\ \text{V}$; $I_D = 3.5\ \text{A}$; $T_j = 150\ ^\circ\text{C}$	-	76	94	m Ω
		$V_{GS} = 4.5\ \text{V}$; $I_D = 2.8\ \text{A}$; $T_j = 25\ ^\circ\text{C}$	-	67	88	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10\ \text{V}$; $I_D = 3.5\ \text{A}$; $T_j = 25\ ^\circ\text{C}$	-	6.4	-	S
Dynamic characteristics (per transistor)						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15\ \text{V}$; $I_D = 3.5\ \text{A}$; $V_{GS} = 10\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	3	4.5	nC
Q_{GS}	gate-source charge		-	0.52	-	nC
Q_{GD}	gate-drain charge		-	0.4	-	nC
C_{iss}	input capacitance	$V_{DS} = 15\ \text{V}$; $f = 1\ \text{MHz}$; $V_{GS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	130	-	pF
C_{oss}	output capacitance		-	33	-	pF
C_{rss}	reverse transfer capacitance		-	14	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15\ \text{V}$; $I_D = 3.5\ \text{A}$; $V_{GS} = 10\ \text{V}$; $R_{G(ext)} = 6\ \Omega$; $T_j = 25\ ^\circ\text{C}$	-	3	-	ns
t_r	rise time		-	16	-	ns
$t_{d(off)}$	turn-off delay time		-	15	-	ns
t_f	fall time		-	5	-	ns
Source-drain diode (per transistor)						
V_{SD}	source-drain voltage	$I_S = 0.7\ \text{A}$; $V_{GS} = 0\ \text{V}$; $T_j = 25\ ^\circ\text{C}$	-	0.8	1.2	V

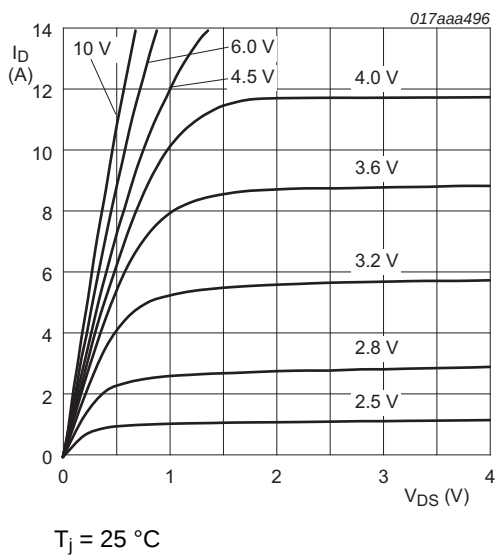


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

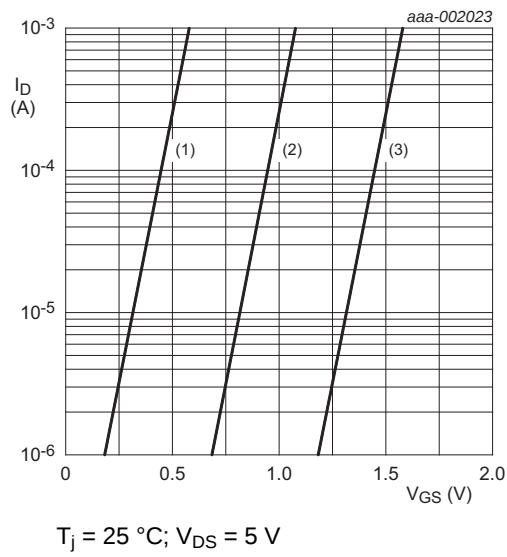


Fig 7. Sub-threshold drain current as a function of gate-source voltage

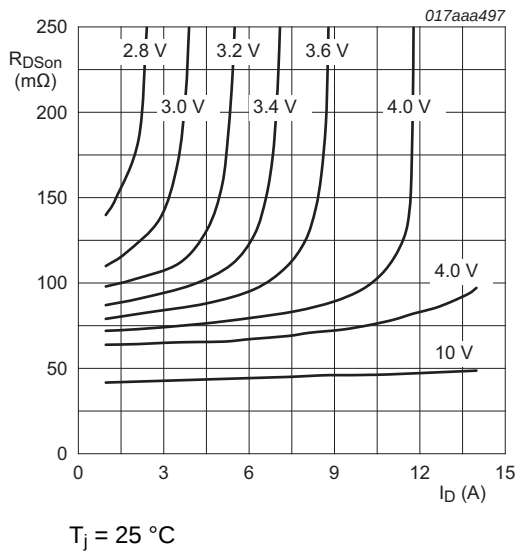


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

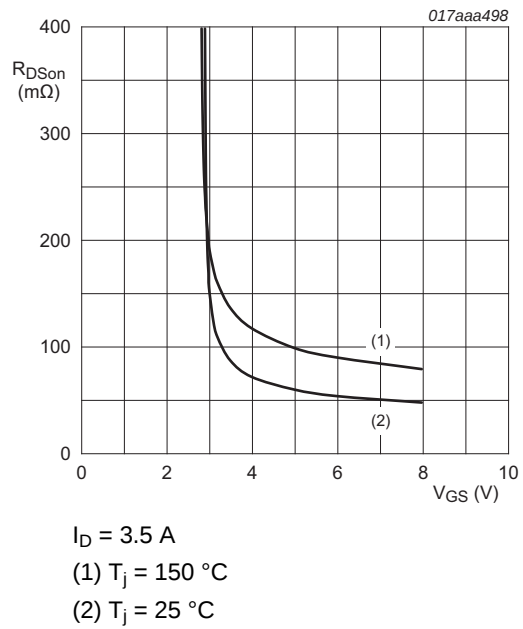
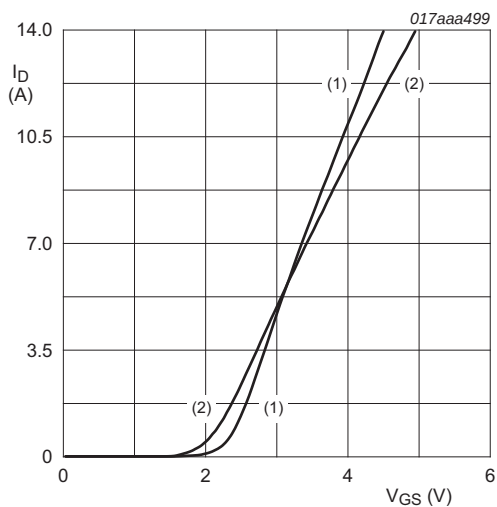
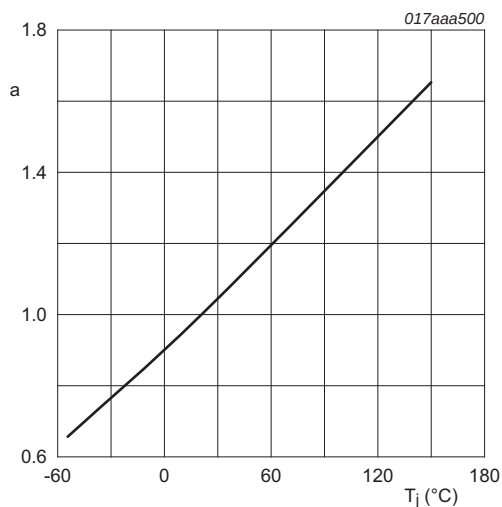


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



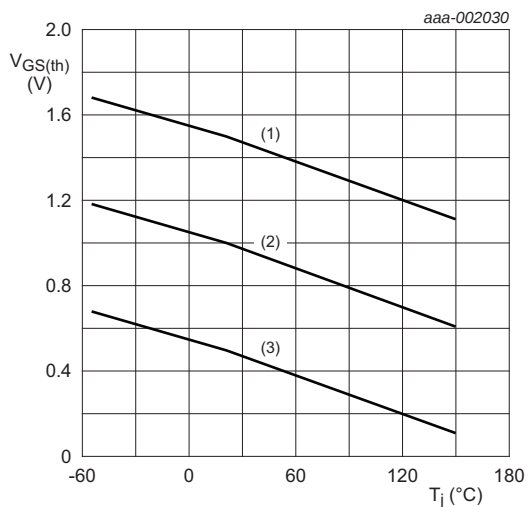
$V_{DS} > I_D \times R_{DSon}$
(1) $T_j = 25\text{ °C}$
(2) $T_j = 150\text{ °C}$

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



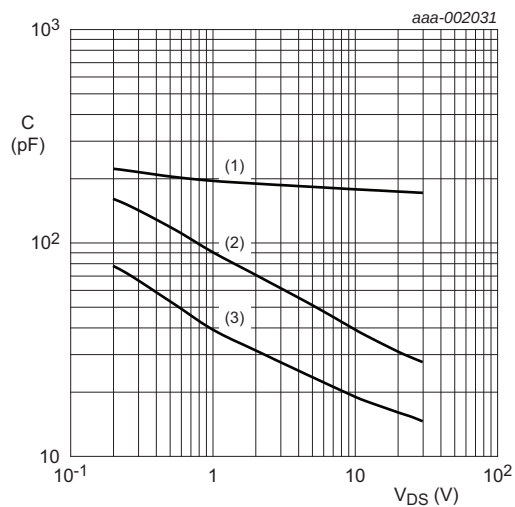
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ C)}}$$

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



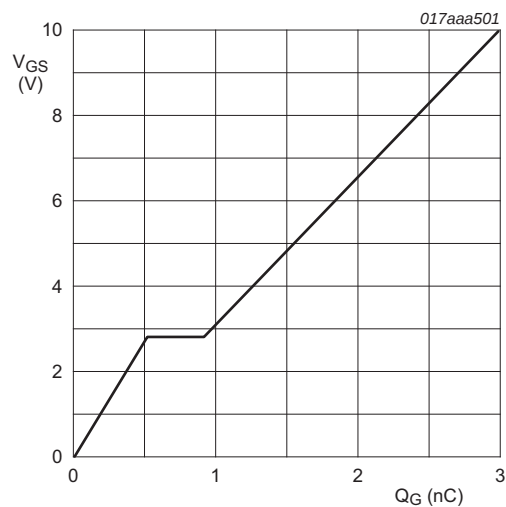
$I_D = 3.1\text{ A}; V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

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



$I_D = 3.5\text{ A}$; $V_{DS} = 15\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

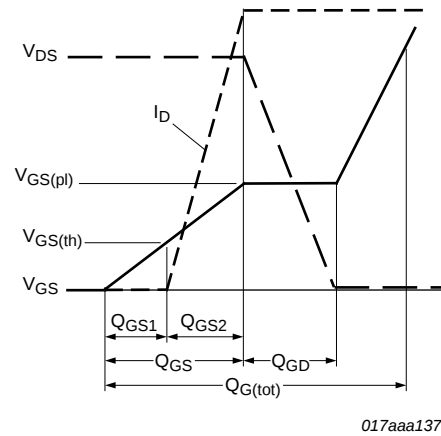
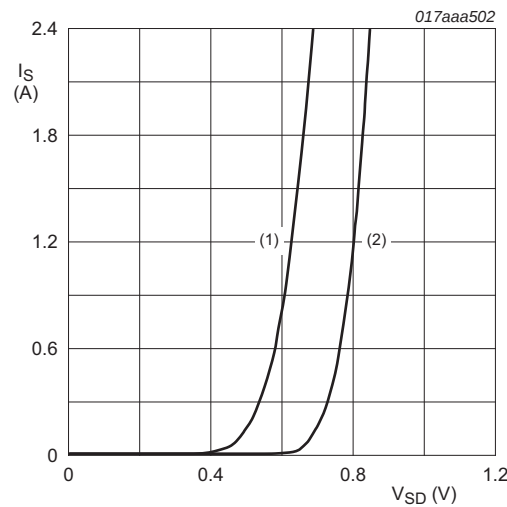


Fig 15. Gate charge waveform definitions



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

(1) $T_{amb} = 150\text{ }^{\circ}\text{C}$

(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

8. Test information

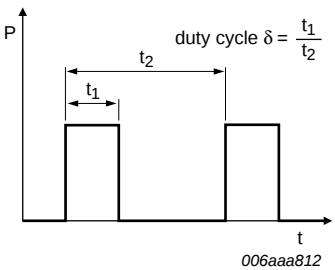


Fig 17. Duty cycle definition

9. Package outline

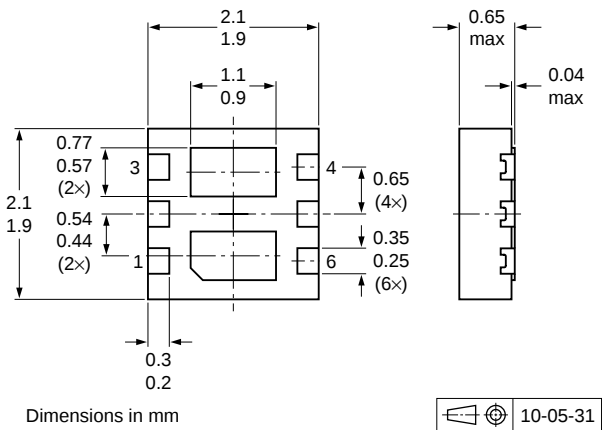


Fig 18. Package outline SOT1118 (DFN2020-6)

10. Soldering

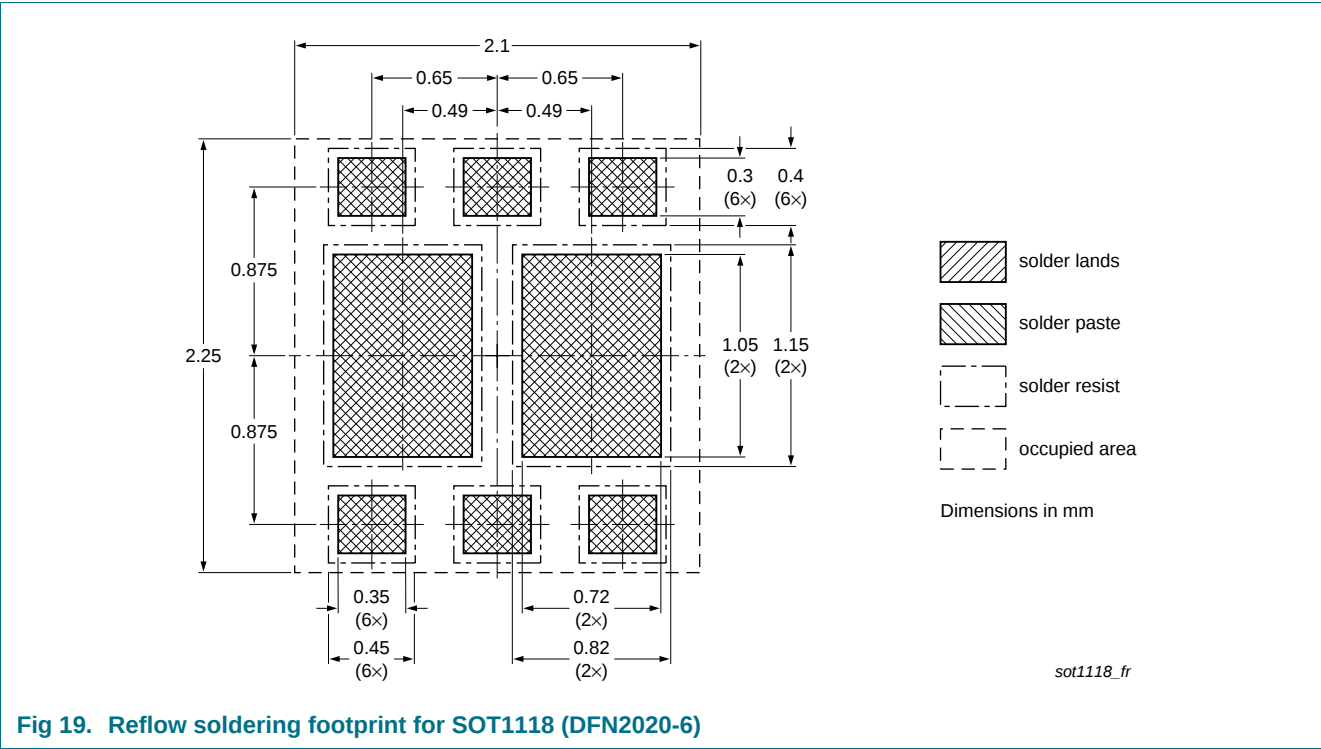


Fig 19. Reflow soldering footprint for SOT1118 (DFN2020-6)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMDPB70EN v.1	20120425	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.

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Date of release: 25 April 2012

Document identifier: PMDPB70EN

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