



PMDPB56XN

30 V, dual N-channel Trench MOSFET

Rev. 1 — 16 May 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

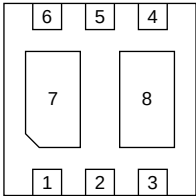
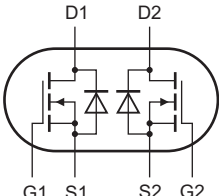
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	30	V
V_{GS}	gate-source voltage		-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}$; $T_{amb} = 25\text{ °C}$; $t \leq 5\text{ s}$	[1]	-	4	A
Static characteristics (per transistor)						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}$; $I_D = 3.1\text{ A}$; $T_j = 25\text{ °C}$	-	55	73	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	S1	source TR1	 Transparent top view SOT1118 (DFN2020-6)	 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
PMDPB56XN	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
PMDPB56XN	1N

5. Limiting values

Table 5. Limiting values

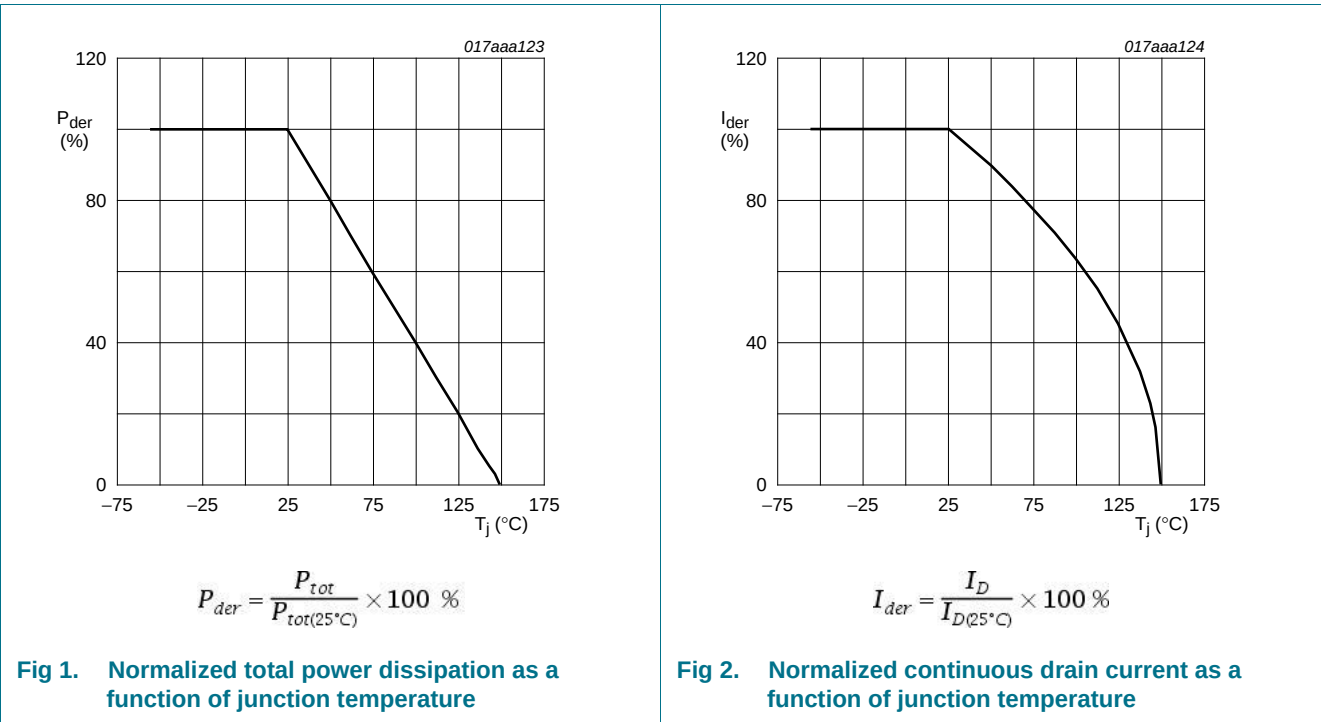
In accordance with the Absolute Maximum Rating System (IEC 60134).

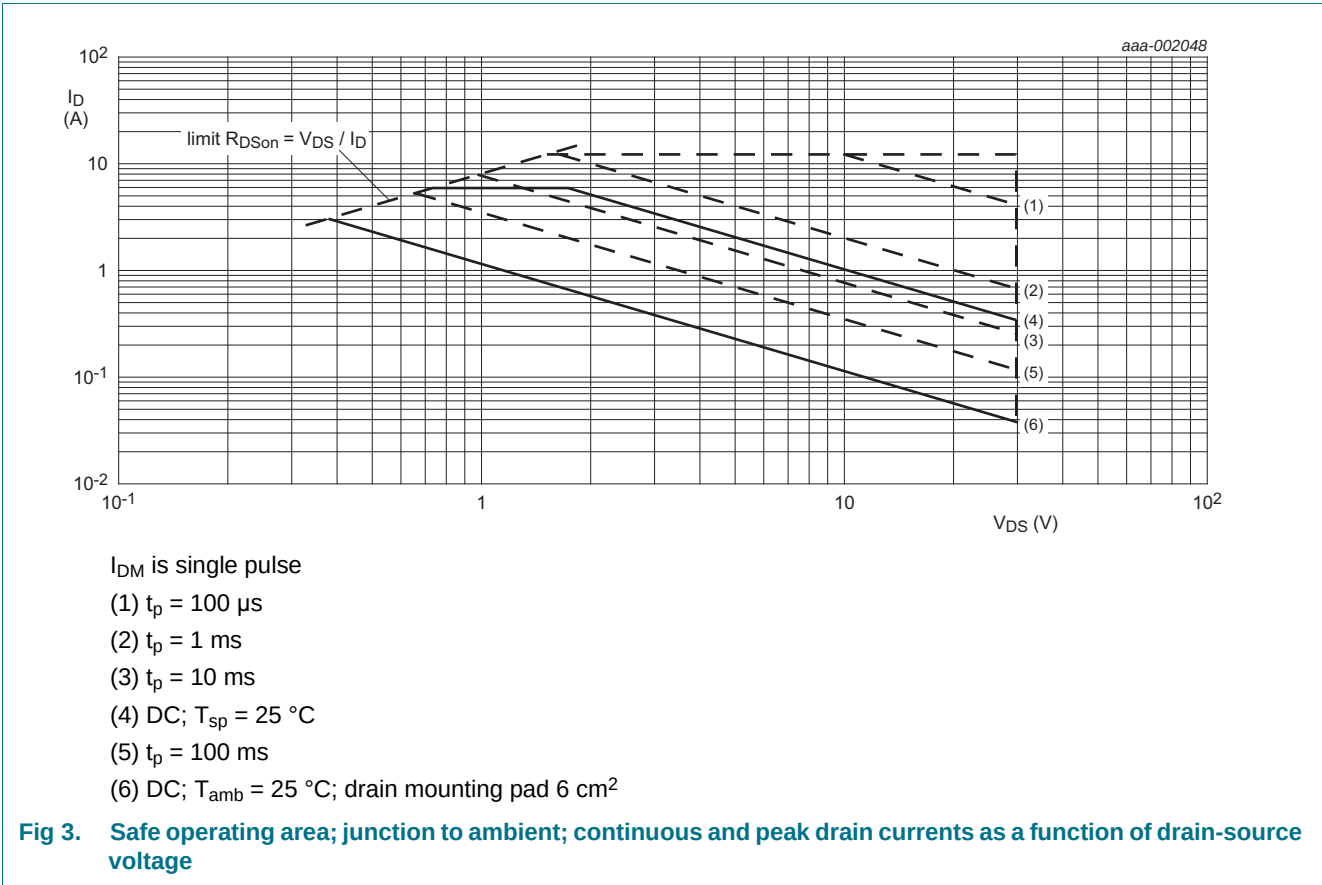
Symbol	Parameter	Conditions	Min	Max	Unit	
Per transistor						
V _{DS}	drain-source voltage	T _j = 25 °C	-	30	V	
V _{GS}	gate-source voltage		-12	12	V	
I _D	drain current	V _{GS} = 4.5 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	4	A
		V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	3.1	A
		T _{amb} = 100 °C	[1]	-	1.9	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs	-	12.4	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]	-	1.2	A

Table 5. Limiting values ...continued
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
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.





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
		in free air; $t \leq 5 s$	[2]	-	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 $6 cm^2$.

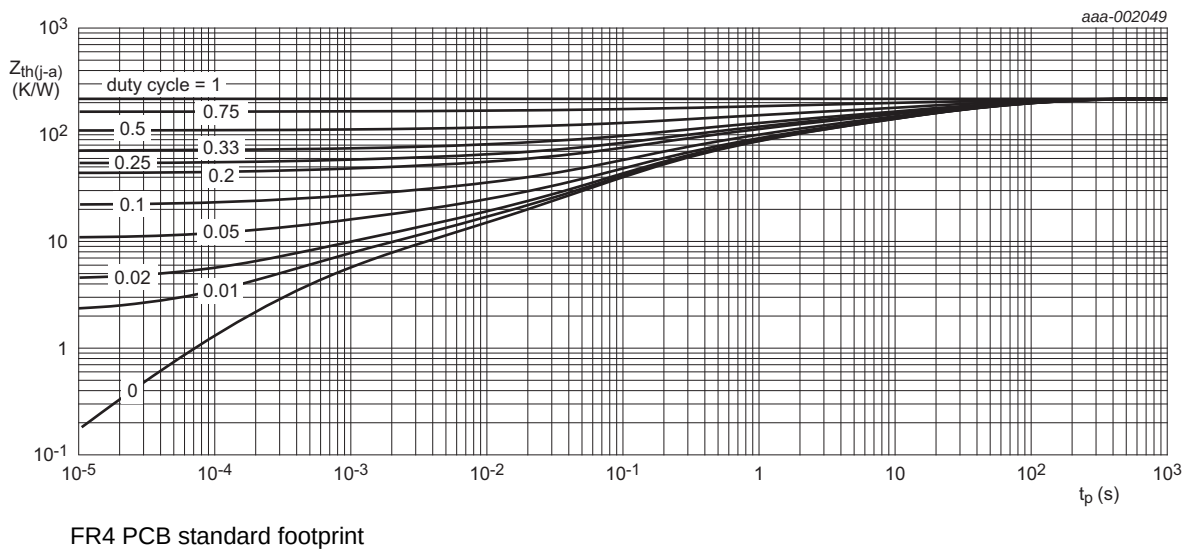


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

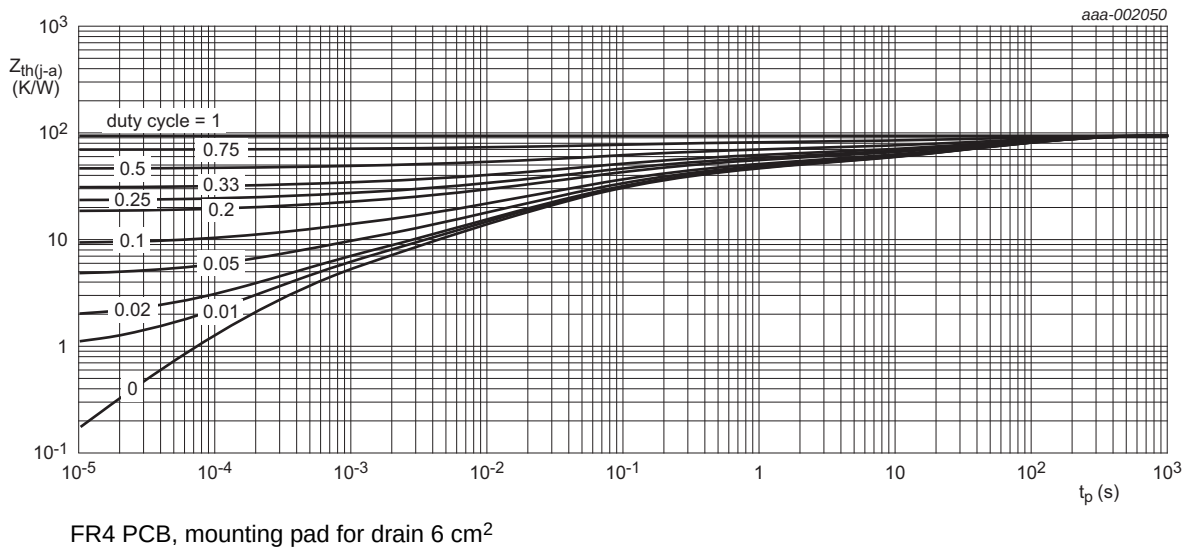
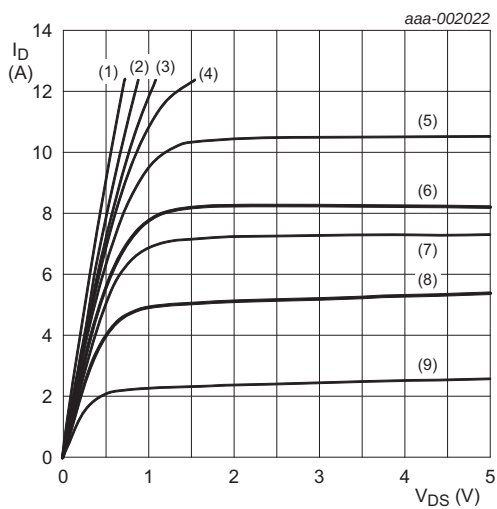


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

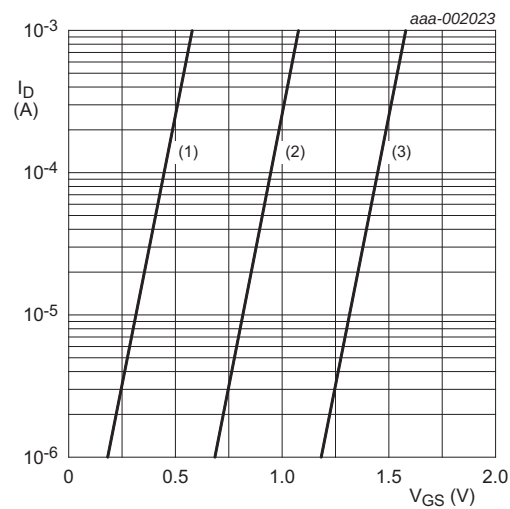
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics (per transistor)						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	30	-	-	V
V _{GStH}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS} ; T _j = 25 °C	0.5	1	1.5	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _j = 25 °C	-	-	1	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _j = 150 °C	-	-	20	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 = 3.1 A; T _j = 25 °C	-	55	73	mΩ
		V _{GS} = 4.5 V; I _D = 3.1 A; T _j = 150 °C	-	93	123	mΩ
		V _{GS} = 2.5 V; I _D = 0.8 A; T _j = 25 °C	-	86	124	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 3.1 A; T _j = 25 °C	-	18	-	S
Dynamic characteristics (per transistor)						
Q _{G(tot)}	total gate charge	V _{DS} = 15 V; I _D = 3.1 A; V _{GS} = 4.5 V; T _j = 25 °C	-	1.9	2.9	nC
Q _{GS}	gate-source charge		-	0.41	-	nC
Q _{GD}	gate-drain charge		-	0.62	-	nC
C _{iSS}	input capacitance	V _{DS} = 15 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C	-	170	-	pF
C _{oSS}	output capacitance		-	35	-	pF
C _{rSS}	reverse transfer capacitance		-	15	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; I _D = 3.1 A; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C	-	8	-	ns
t _r	rise time		-	17	-	ns
t _{d(off)}	turn-off delay time		-	12	-	ns
t _f	fall time		-	11	-	ns
Source-drain diode (per transistor)						
V _{SD}	source-drain voltage	I _S = 1.2 A; V _{GS} = 0 V; T _j = 25 °C	-	0.8	1.2	V



- (1) $V_{GS} = 4.5\text{ V}$
- (2) $V_{GS} = 3.6\text{ V}$
- (3) $V_{GS} = 3.2\text{ V}$
- (4) $V_{GS} = 3.0\text{ V}$
- (5) $V_{GS} = 2.8\text{ V}$
- (6) $V_{GS} = 2.6\text{ V}$
- (7) $V_{GS} = 2.5\text{ V}$
- (8) $V_{GS} = 2.3\text{ V}$
- (9) $V_{GS} = 2.0\text{ V}$

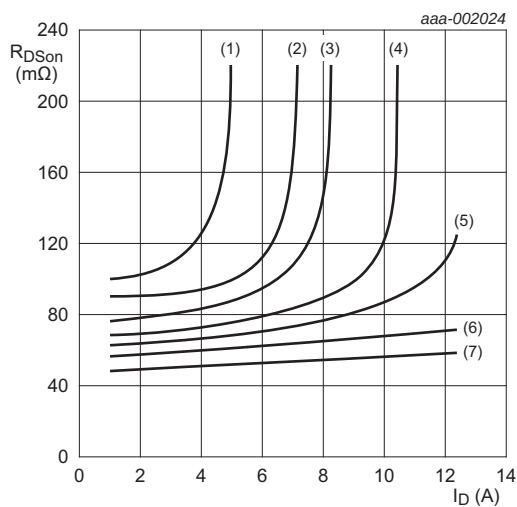
Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$

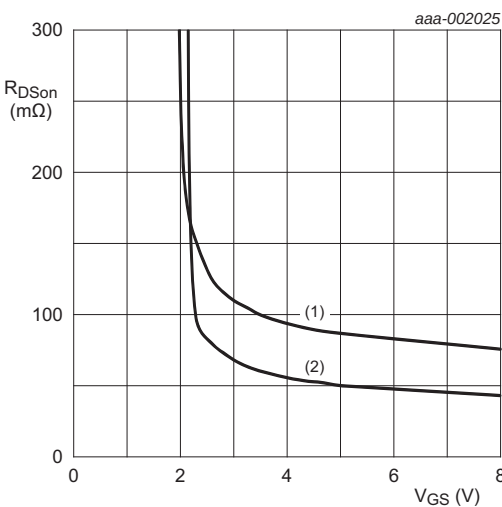
- (1) minimum values
- (2) typical values
- (3) maximum values

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



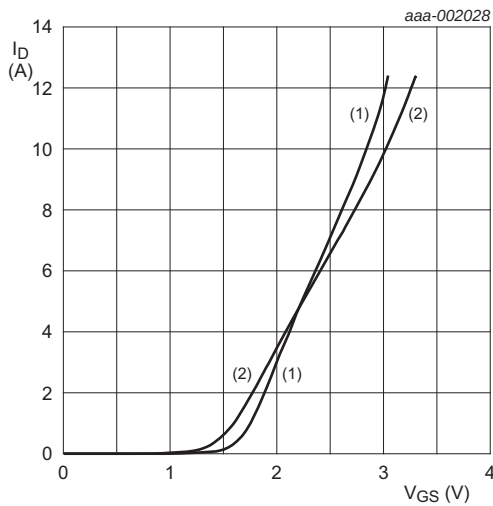
$T_j = 25^\circ\text{C}$
(1) $V_{GS} = 2.3\text{ V}$
(2) $V_{GS} = 2.5\text{ V}$
(3) $V_{GS} = 2.6\text{ V}$
(4) $V_{GS} = 2.8\text{ V}$
(5) $V_{GS} = 3.0\text{ V}$
(6) $V_{GS} = 3.6\text{ V}$
(7) $V_{GS} = 4.5\text{ V}$

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



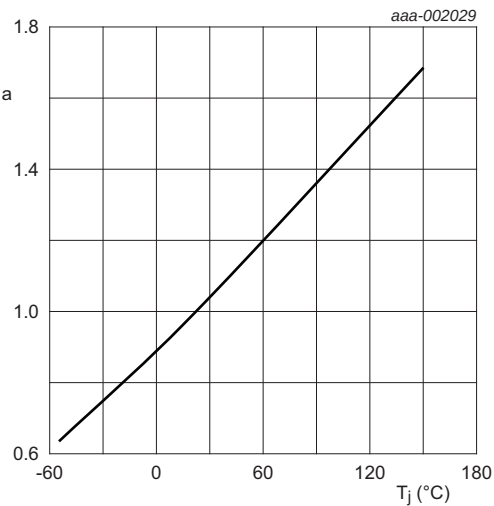
$I_D = 3.1\text{ A}$
(1) $T_j = 150^\circ\text{C}$
(2) $T_j = 25^\circ\text{C}$

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



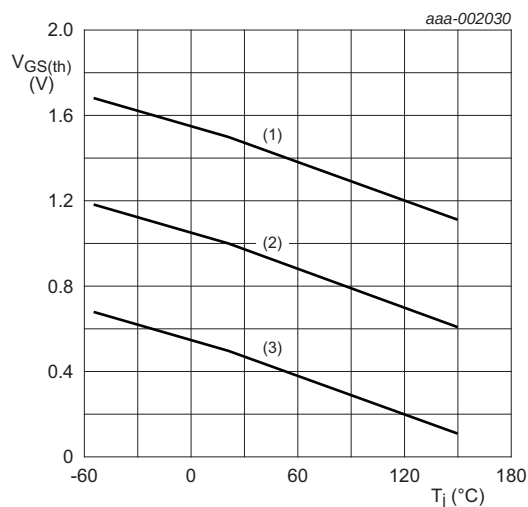
$V_{DS} > I_D \times R_{DS(on)}$
(1) $T_j = 25^\circ\text{C}$
(2) $T_j = 150^\circ\text{C}$

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



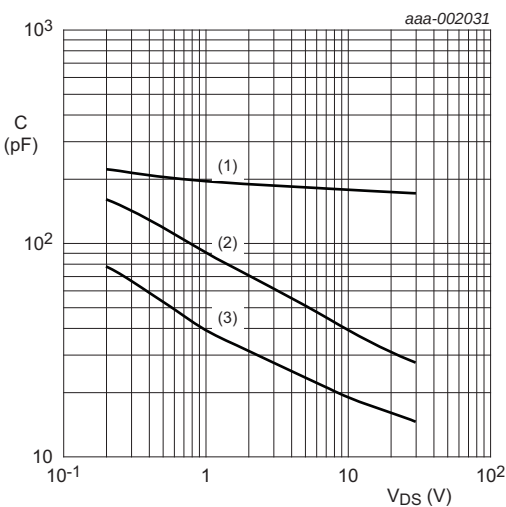
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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



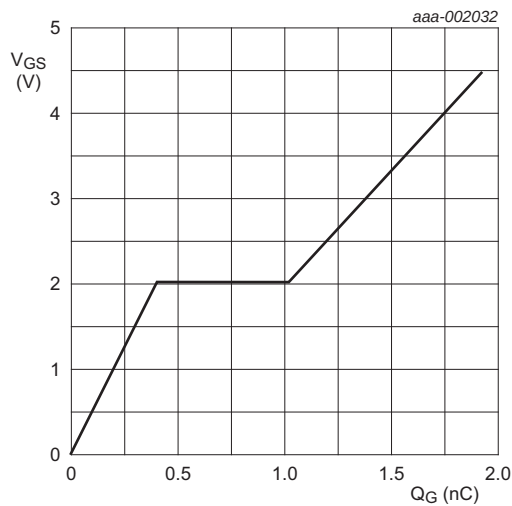
$I_D = 3.1\text{ A}$; $V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

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



$I_D = 3.1\text{ A}$; $V_{DS} = 15\text{ V}$; $T_{amb} = 25\text{ °C}$

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

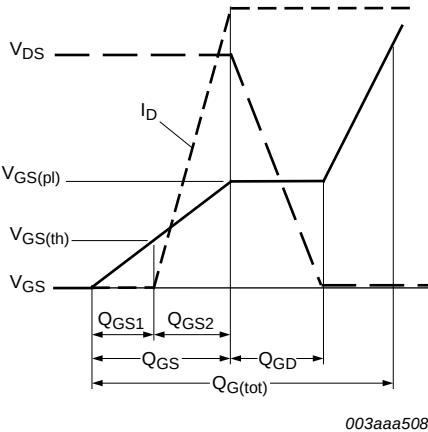
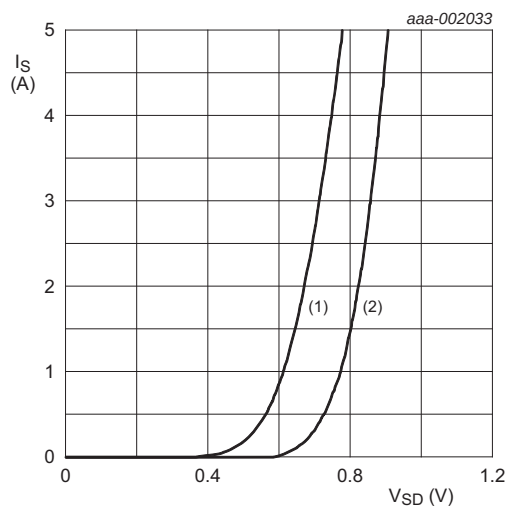


Fig 15. Gate charge waveform definitions



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

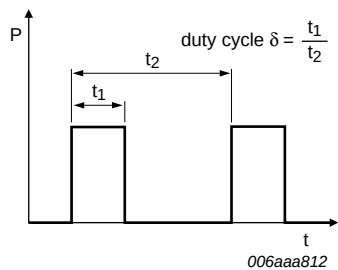
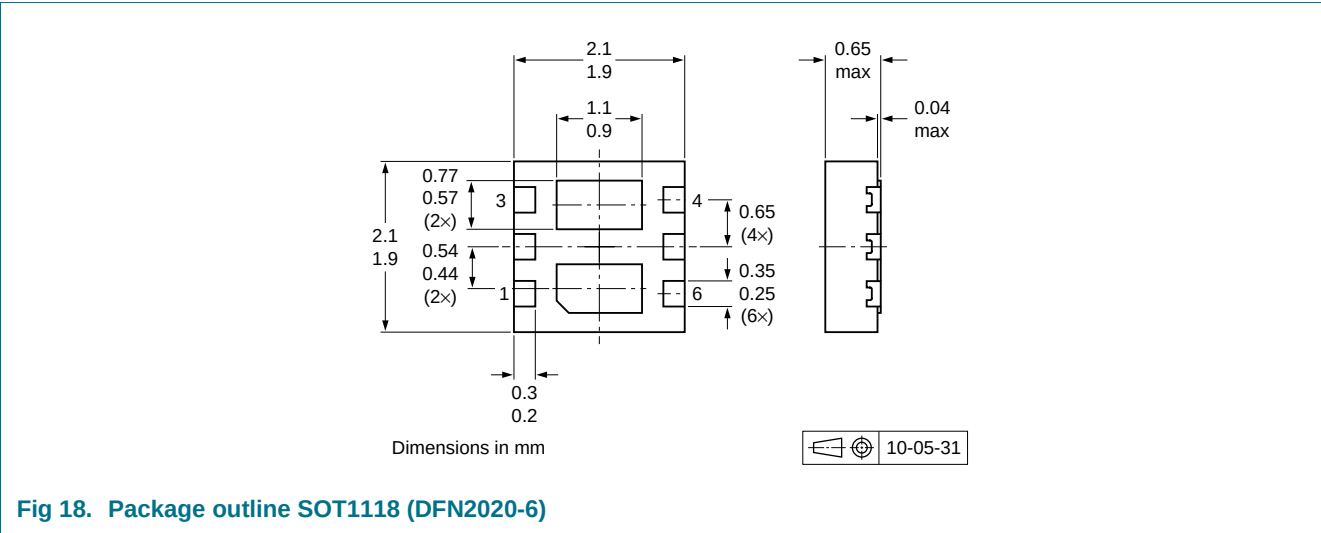
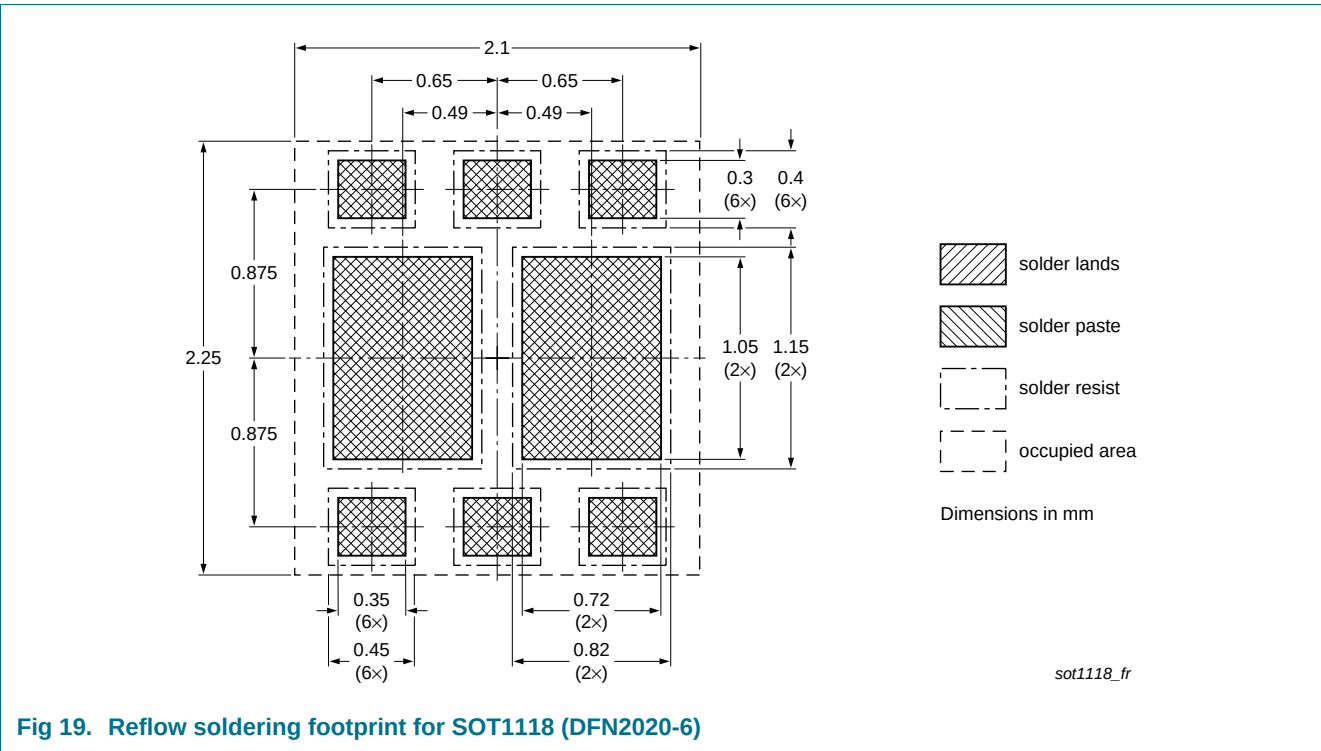


Fig 17. Duty cycle definition

9. Package outline



10. Soldering



11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMDPB56XN v.1	20120516	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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14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Marking	2
5	Limiting values	2
6	Thermal characteristics	4
7	Characteristics	6
8	Test information	10
9	Package outline	11
10	Soldering	11
11	Revision history	12
12	Legal information	13
12.1	Data sheet status	13
12.2	Definitions	13
12.3	Disclaimers	13
12.4	Trademarks	14
13	Contact information	14

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