

# PMDPB30XN

20 V, dual N-channel Trench MOSFET

6 July 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

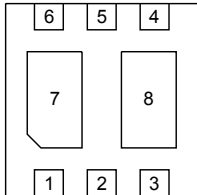
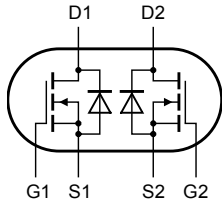
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{DS}$	drain-source voltage	$T_J = 25\text{ }^\circ\text{C}$	-	-	20	V
$V_{GS}$	gate-source voltage		-12	-	12	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}; t \leq 5\text{ s}$	[1]	-	5.3	A
<b>Static characteristics (per transistor)</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 3\text{ A}; T_J = 25\text{ }^\circ\text{C}$	-	32	40	m $\Omega$

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



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 <p>Transparent top view DFN2020-6 (SOT1118)</p>	 <p>017aaa254</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		
	Name	Description	Version
PMDPB30XN	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
PMDPB30XN	1V

## 5. Limiting values

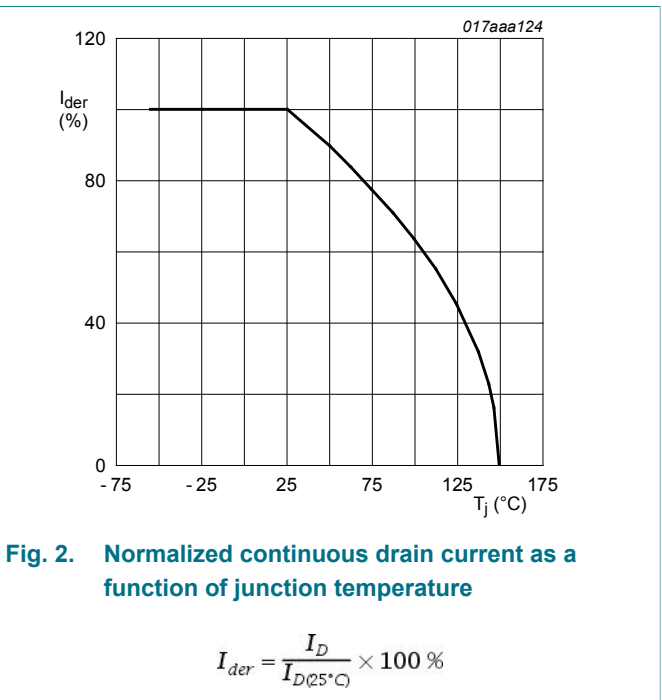
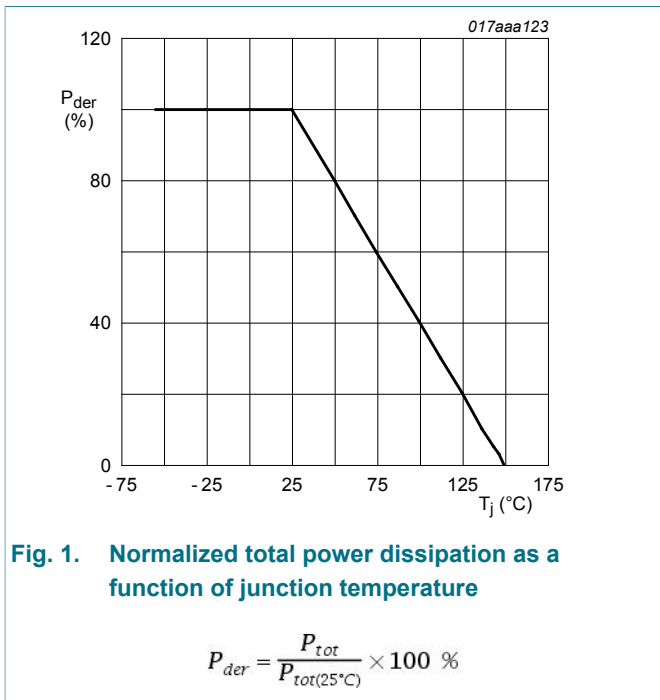
Table 5. Limiting values

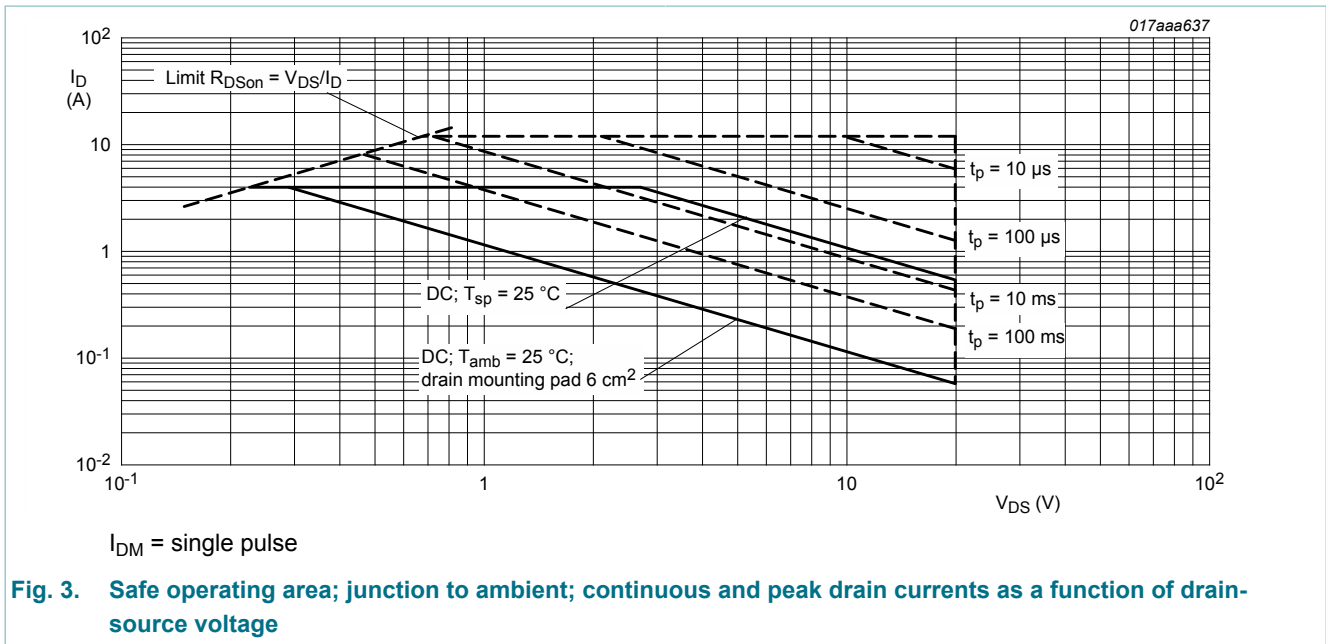
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
<b>Per transistor</b>						
$V_{DS}$	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]	-	5.3	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	4	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	2.6	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$	-	12	A	

Symbol	Parameter	Conditions		Min	Max	Unit
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	490	mW
			[1]	-	1170	mW
		T <sub>sp</sub> = 25 °C		-	8330	mW
<b>Source-drain diode</b>						
I <sub>s</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	1.2	A
<b>Per device</b>						
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	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 cm<sup>2</sup>.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.





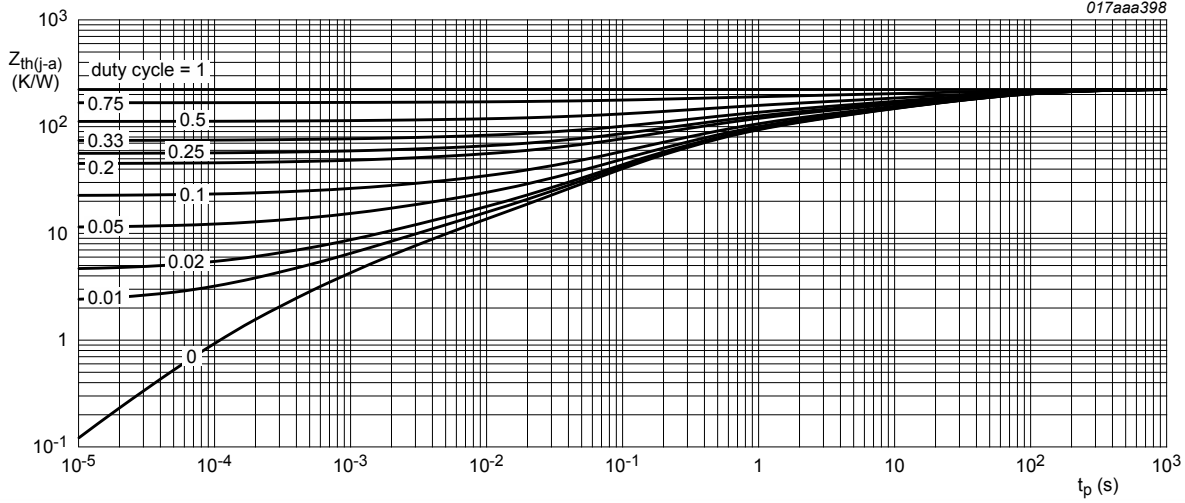
## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	223	256	K/W
			[2]	-	93	107	K/W
		in free air; $t \leq 5\text{ s}$	[2]	-	55	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	10	15	K/W

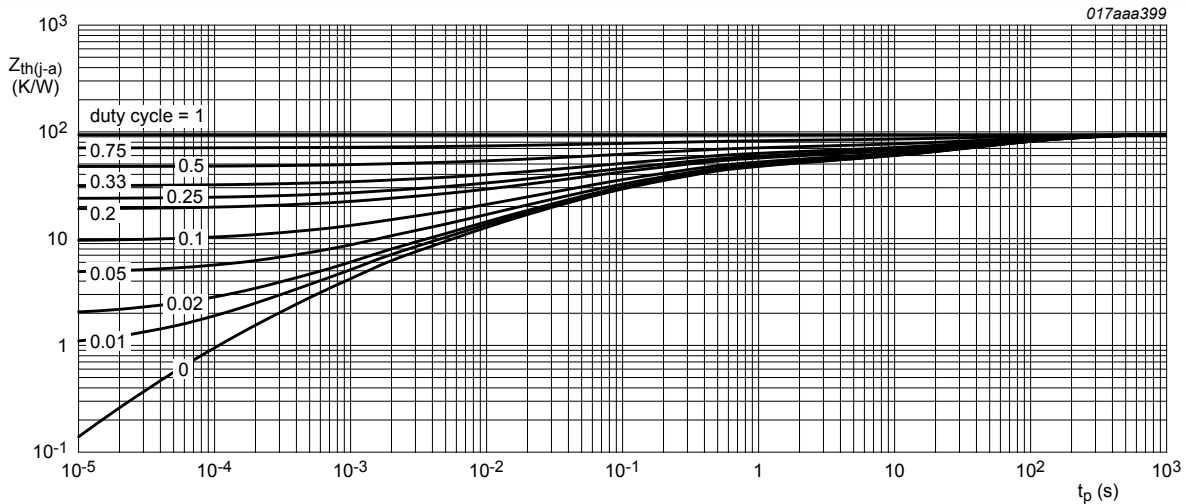
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



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 cm<sup>2</sup>

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
<b>Static characteristics (per transistor)</b>						
$V_{(BR)DSS}$	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	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.4	0.65	0.9	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	11	$\mu A$

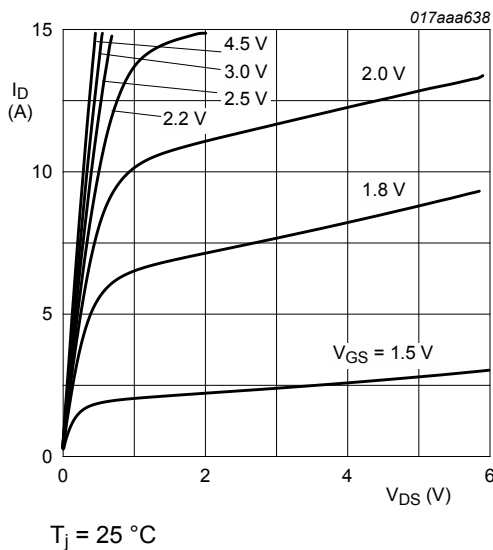
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = 12 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	100	nA
		V <sub>GS</sub> = -12 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	100	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 3 A; T <sub>j</sub> = 25 °C	-	32	40	mΩ
		V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 3 A; T <sub>j</sub> = 150 °C	-	55	69	mΩ
		V <sub>GS</sub> = 2.5 V; I <sub>D</sub> = 1.4 A; T <sub>j</sub> = 25 °C	-	40	53	mΩ
		V <sub>GS</sub> = 1.8 V; I <sub>D</sub> = 1.4 A; T <sub>j</sub> = 25 °C	-	60	75	mΩ
g <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = 5 V; I <sub>D</sub> = 3 A; T <sub>j</sub> = 25 °C	-	12	-	S

**Dynamic characteristics (per transistor)**

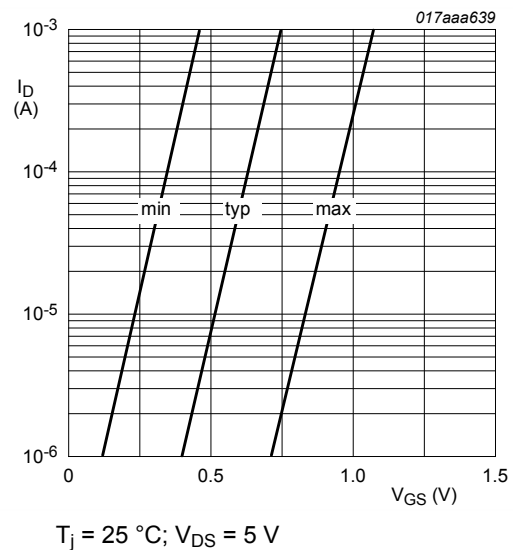
Q <sub>G(tot)</sub>	total gate charge	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 3 A; V <sub>GS</sub> = 4.5 V; T <sub>j</sub> = 25 °C	-	14.4	21.7	nC
Q <sub>GS</sub>	gate-source charge		-	1.1	-	nC
Q <sub>GD</sub>	gate-drain charge		-	1.5	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 10 V; f = 1 MHz; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	660	-	pF
C <sub>oss</sub>	output capacitance		-	87	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	74	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 3 A; V <sub>GS</sub> = 4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C	-	4	-	ns
t <sub>r</sub>	rise time		-	15	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	40	-	ns
t <sub>f</sub>	fall time		-	16	-	ns

**Source-drain diode (per transistor)**

V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 1.2 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	0.8	1.2	V
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**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**

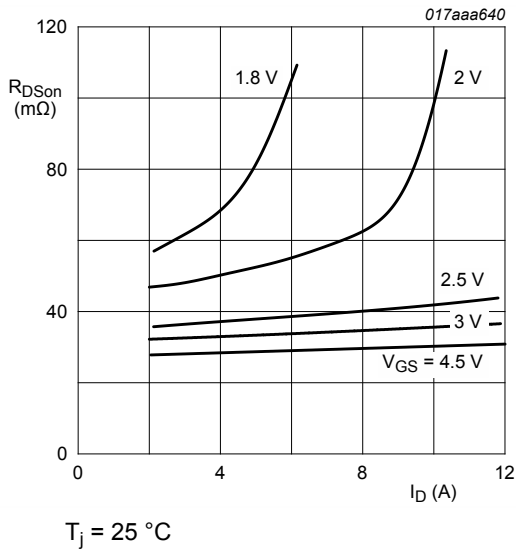


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

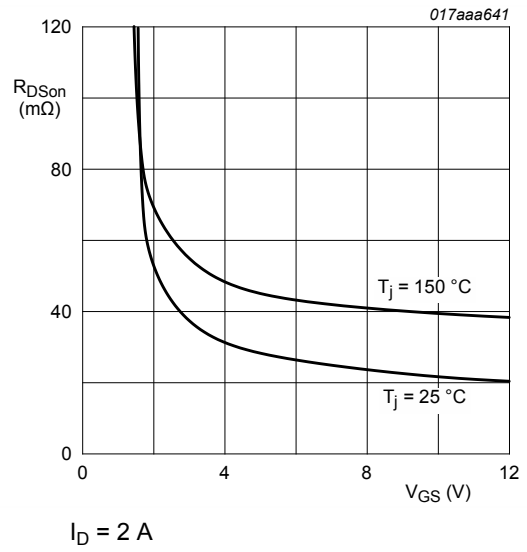


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

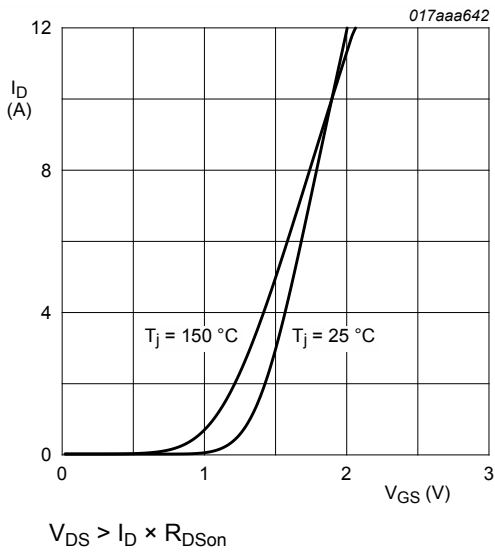


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

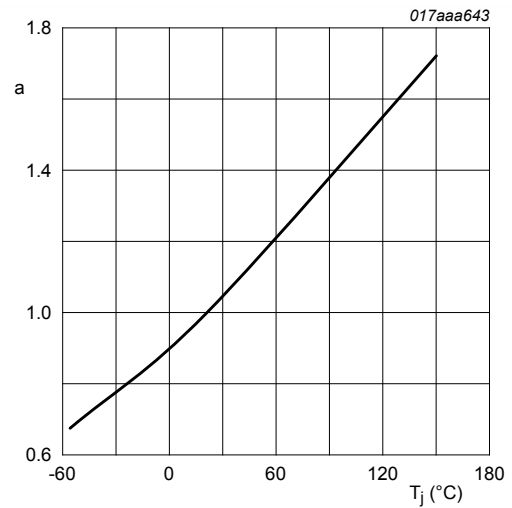
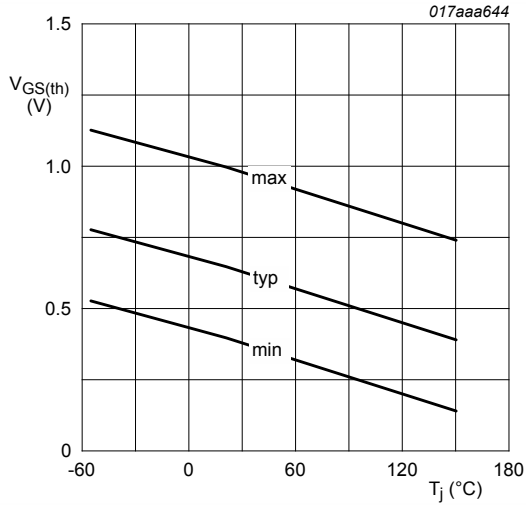


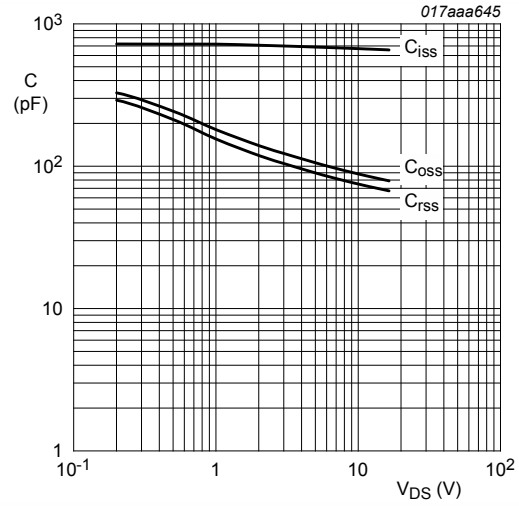
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



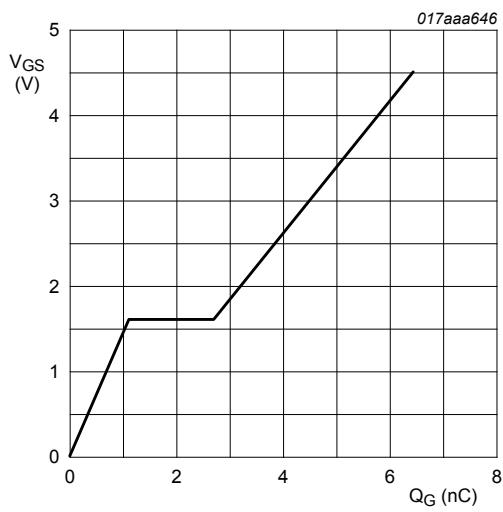
$I_D = 0.25$  mA;  $V_{DS} = V_{GS}$

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



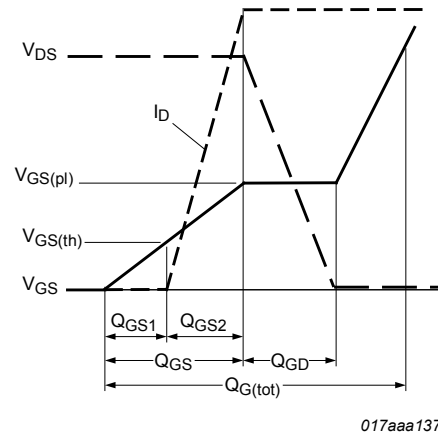
$f = 1$  MHz;  $V_{GS} = 0$  V

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



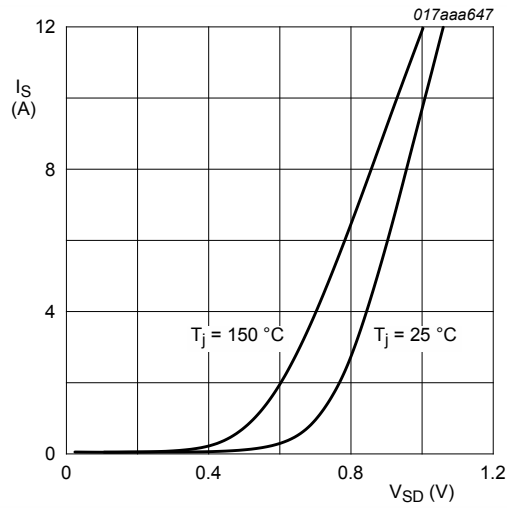
$I_D = 3$  A;  $V_{DS} = 10$  V;  $T_{amb} = 25$  °C

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



**Fig. 15. Gate charge waveform definitions**





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

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

### 8. Test information

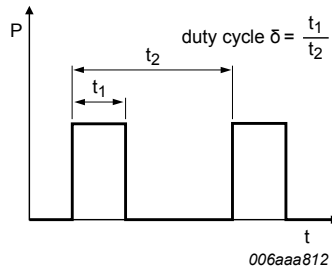


Fig. 17. Duty cycle definition

### 9. Package outline

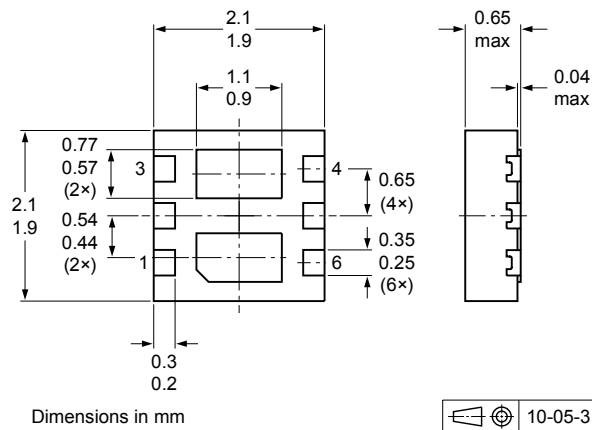


Fig. 18. DFN2020-6 (SOT1118)

### 10. Soldering

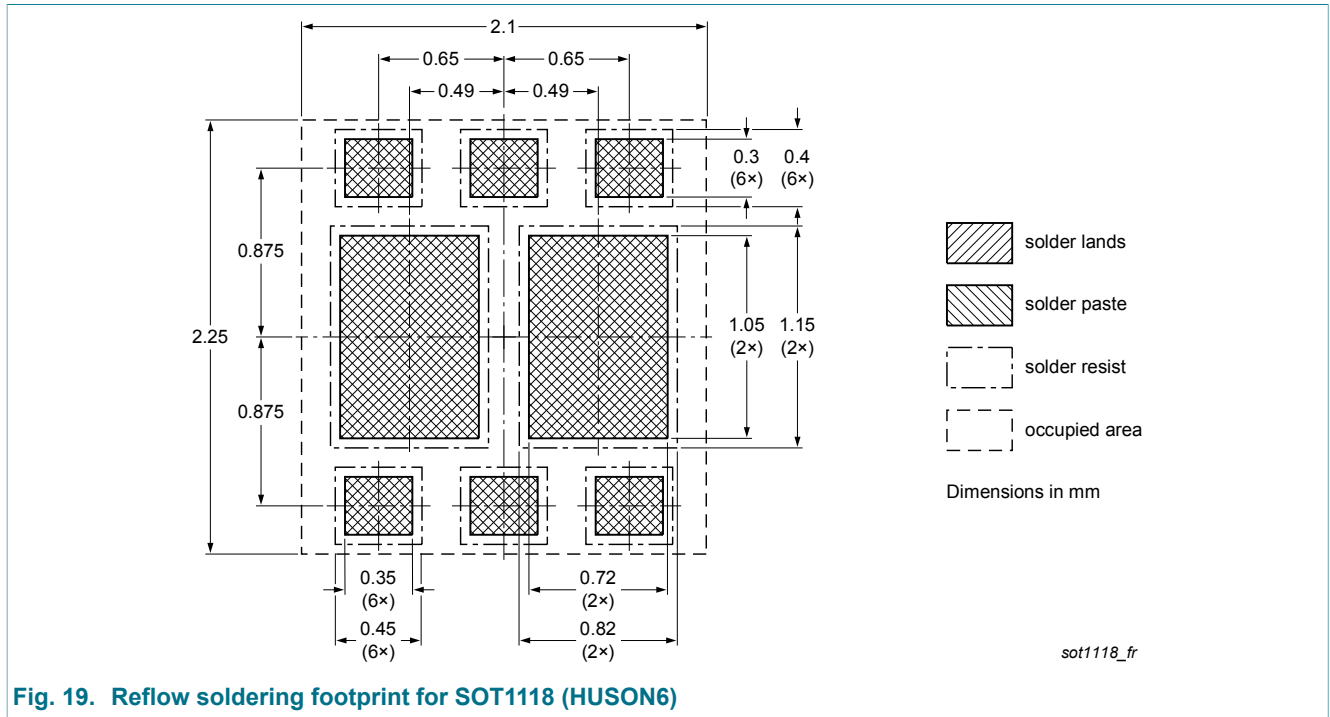


Fig. 19. Reflow soldering footprint for SOT1118 (HUSON6)

### 11. Revision history

Table 8. Revision history

Document ID	Release date	Document status	Change notice	Supersedes
PMDPB30XN v.1	20120706	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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- [2] The term 'short data sheet' is explained in section "Definitions".
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### 13. Contents

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

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Date of release: 6 July 2012

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