



# PMPB200EN

100 V N-channel Trench MOSFET

30 May 2013

Objective data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020MD-6 (SOT1220) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Logic-level compatible
- Very fast switching
- Trench MOSFET technology
- Exposed drain pad for excellent thermal conduction
- Tin-plated 100 % solderable side pads for optical solder inspection

## 3. Applications

- Relay driver
- LED backlight driver
- Low-side loadswitch
- Switching circuits

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$	-	-	100	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]	-	2.6	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 1.5\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	190	235	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>.

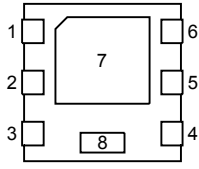
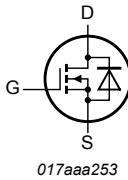


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 <p>Transparent top view <b>DFN2020MD-6 (SOT1220)</b></p>	 <p>017aaa253</p>
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		
7	D	drain		
8	S	source		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMPB200EN	DFN2020MD-6	plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals	SOT1220

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMPB200EN	2D

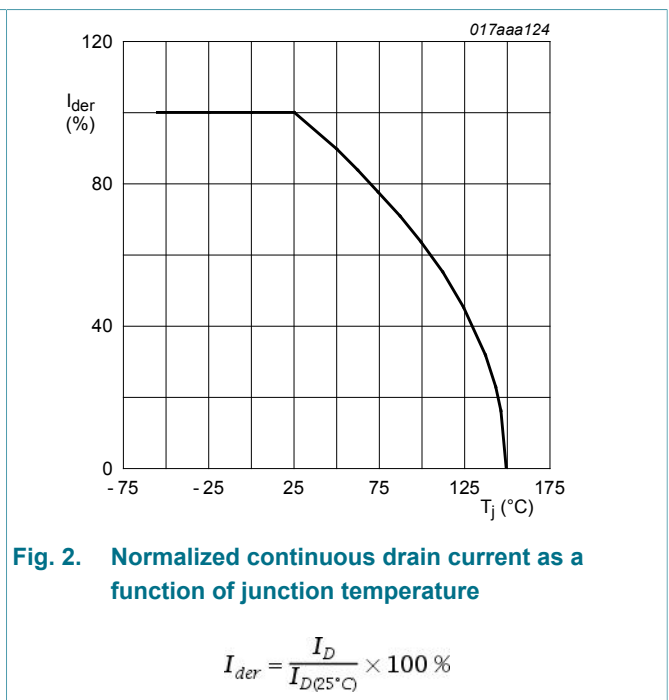
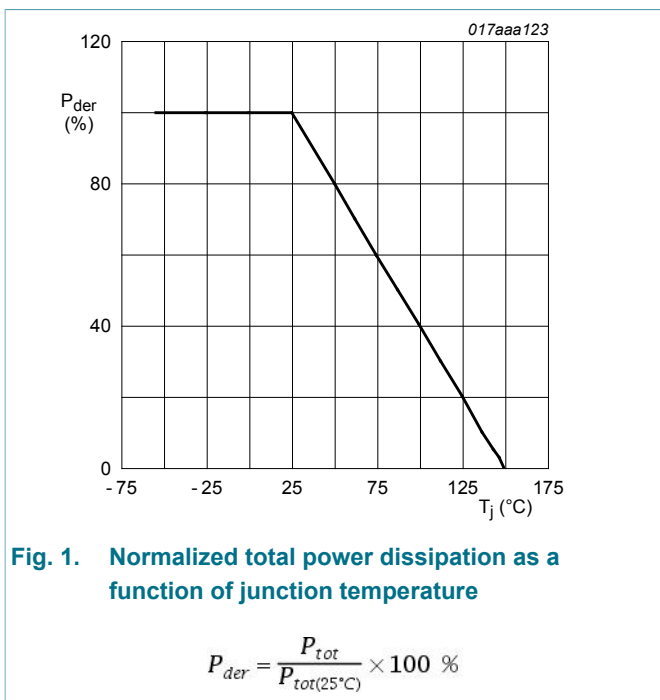
## 8. Limiting values

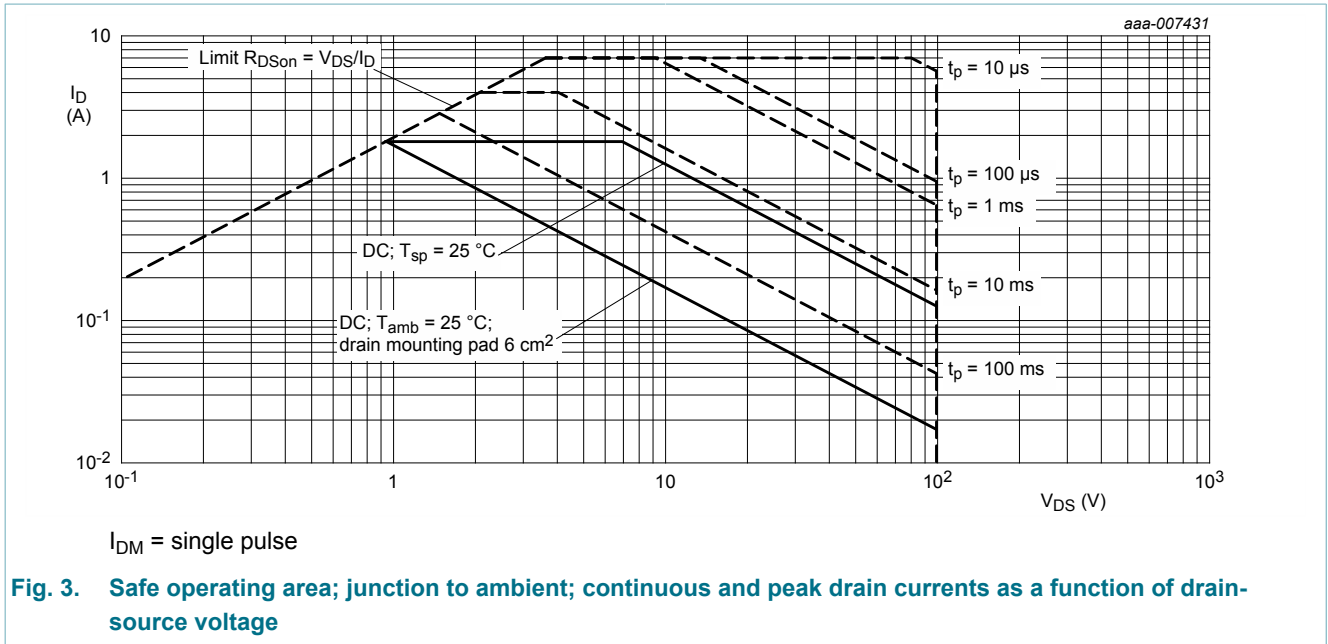
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	100	V
V <sub>GS</sub>	gate-source voltage			-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 25 °C; t ≤ 5 s	[1]	-	2.6	A
		V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 25 °C	[1]	-	1.8	A
		V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 100 °C	[1]	-	1.1	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	7	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[1]	-	1.7	W
		T <sub>amb</sub> = 25 °C; t ≤ 5 s	[1]	-	3.5	W
		T <sub>sp</sub> = 25 °C		-	12.5	W
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
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	1.6	A

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





## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	235	270	K/W
			[2]	-	67	74	K/W
		in free air; $t \leq 5\text{ s}$	[2]	-	33	36	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	5	10	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  $6\text{ cm}^2$ .

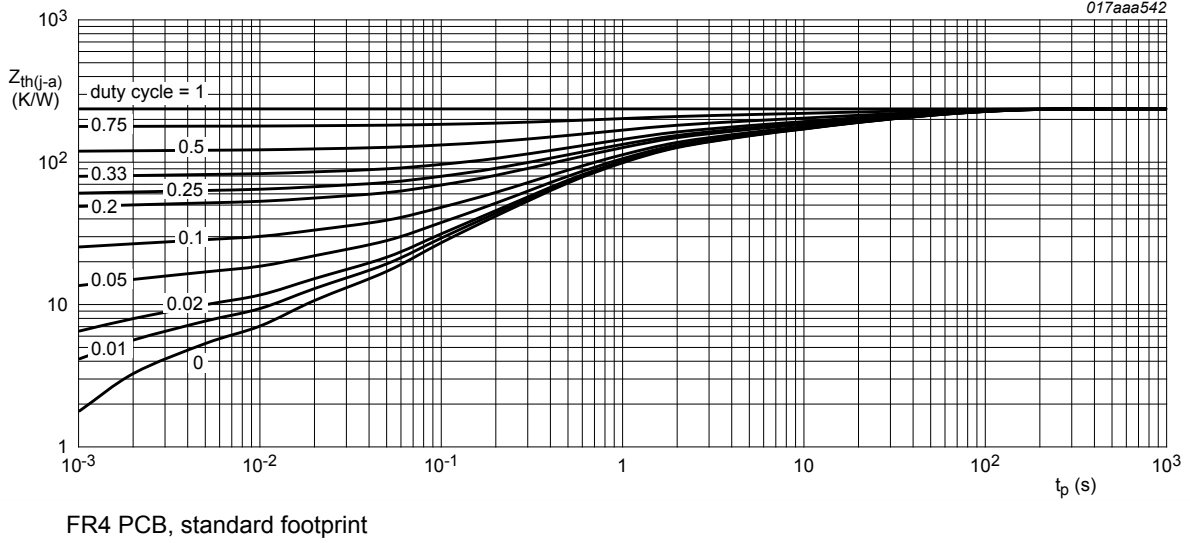


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

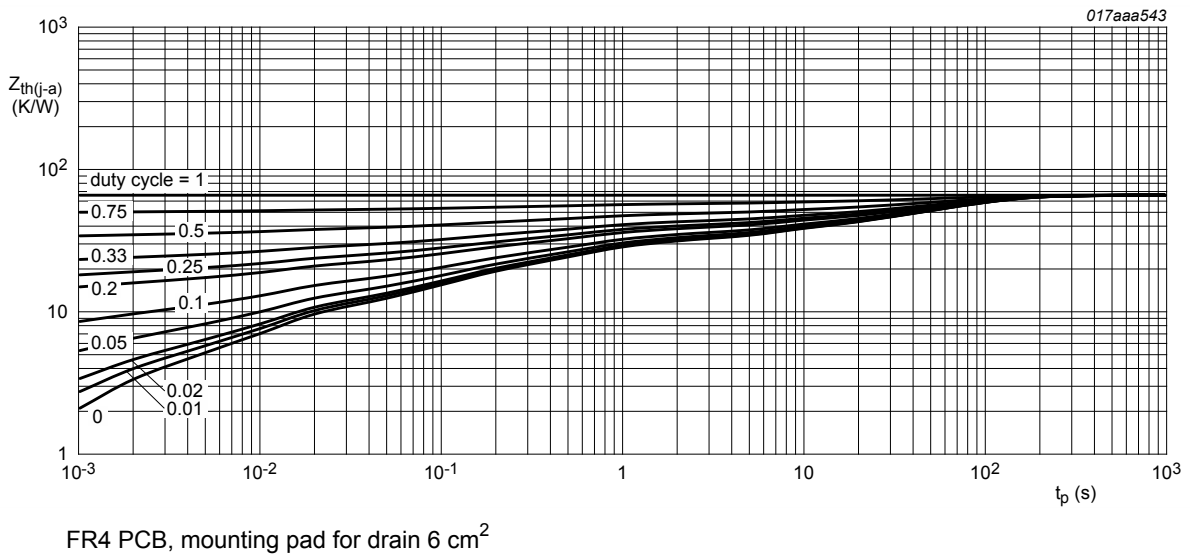
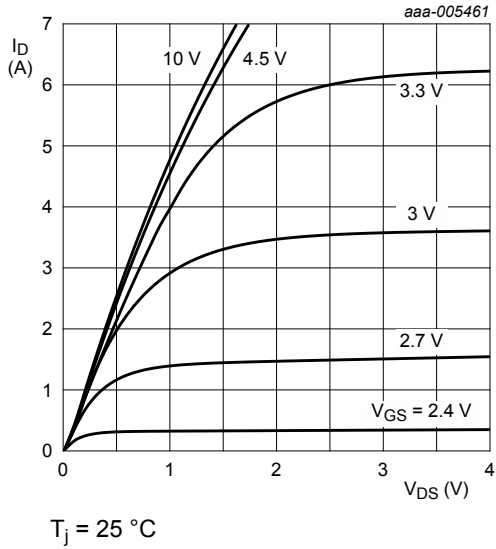


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

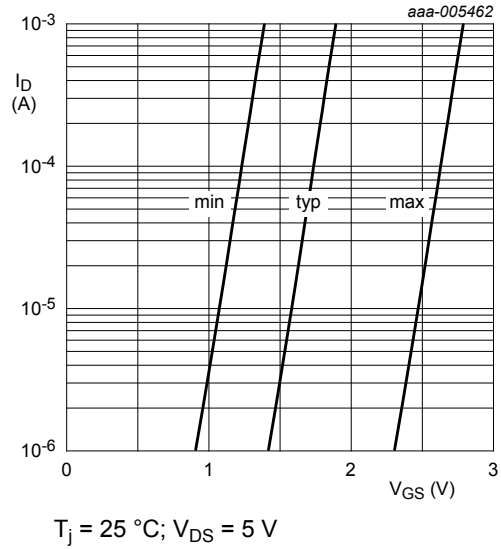
## 10. Characteristics

Table 7. Characteristics

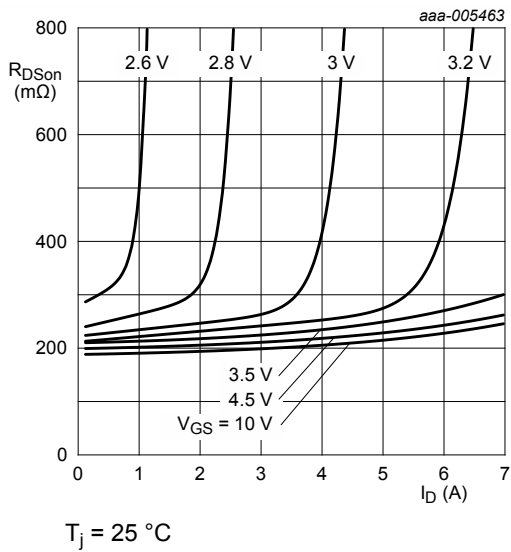
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	100	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu\text{A}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$	1.3	1.7	2.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 1.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	190	235	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 1.5 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	420	520	m $\Omega$
		$V_{GS} = 4.5 \text{ V}; I_D = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	200	270	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 \text{ V}; I_D = 1.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	5	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 80 \text{ V}; I_D = 1.5 \text{ A}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	7.4	10	nC
$Q_{GS}$	gate-source charge		-	0.7	-	nC
$Q_{GD}$	gate-drain charge		-	1.9	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 80 \text{ V}; f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	315	475	pF
$C_{oss}$	output capacitance		-	35	-	pF
$C_{rss}$	reverse transfer capacitance		-	25	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50 \text{ V}; I_D = 1.5 \text{ A}; V_{GS} = 10 \text{ V}; R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	4	-	ns
$t_r$	rise time		-	5	-	ns
$t_{d(off)}$	turn-off delay time		-	11	-	ns
$t_f$	fall time		-	3	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 1.6 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.8	1.2	V



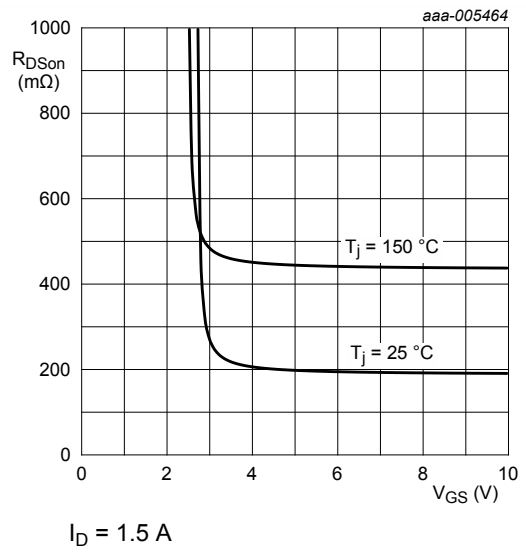
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



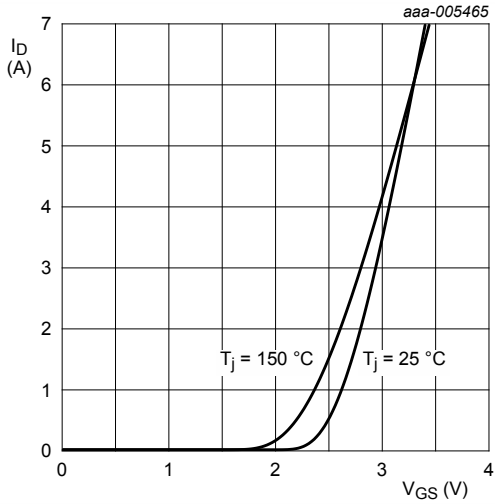
**Fig. 7. Subthreshold drain current as a function of gate-source voltage**



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

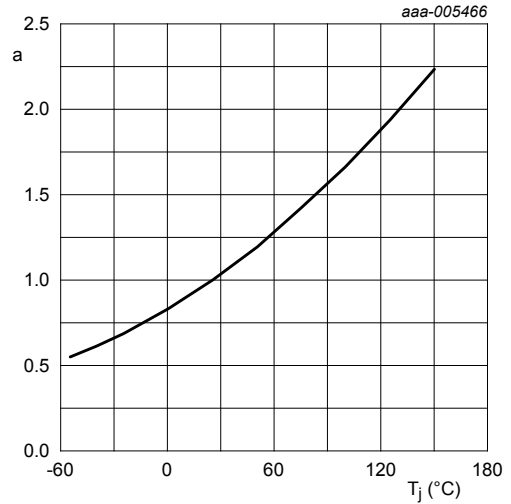


**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**



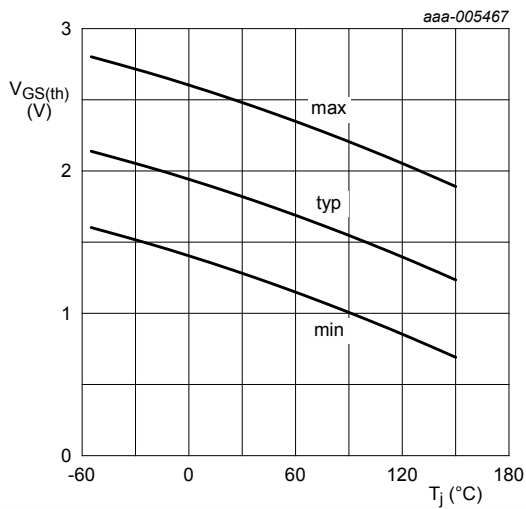
$$V_{DS} > I_D \times R_{DS(on)}$$

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



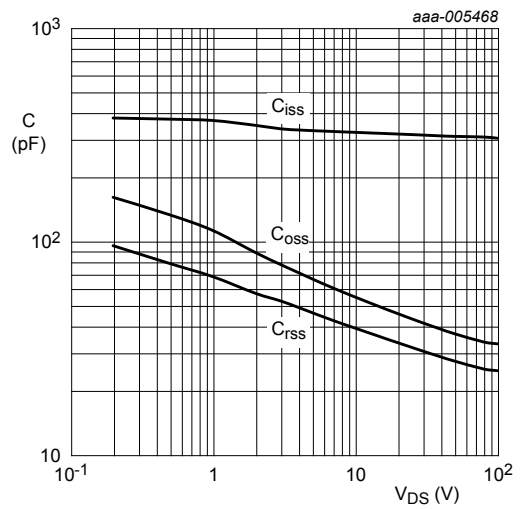
**Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

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



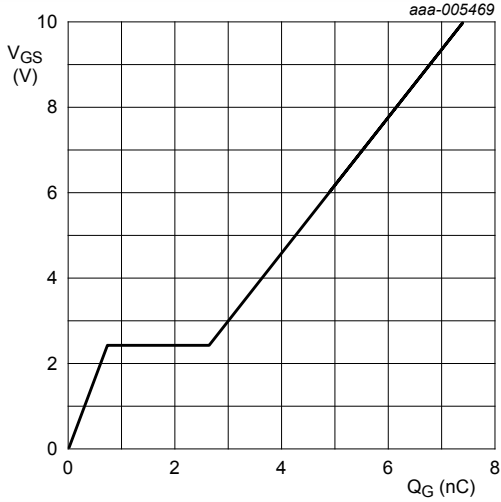
$$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



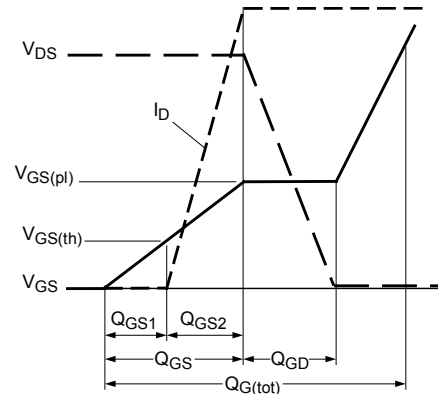
$$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$$

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

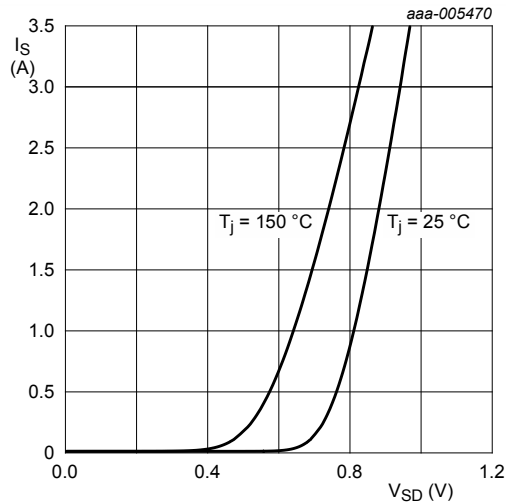


$I_D = 1.5 \text{ A}; V_{DS} = 80 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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



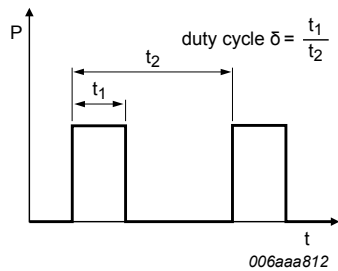
**Fig. 15. Gate charge waveform definitions**



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

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

### 11. Test information



**Fig. 17. Duty cycle definition**

## 12. Package outline

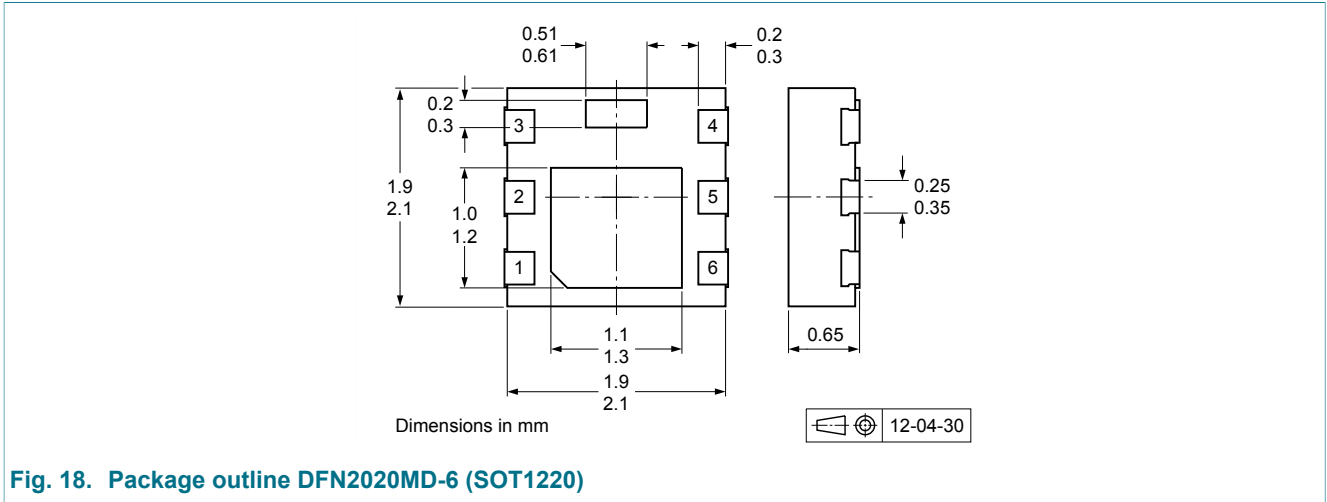


Fig. 18. Package outline DFN2020MD-6 (SOT1220)

### 13. Soldering

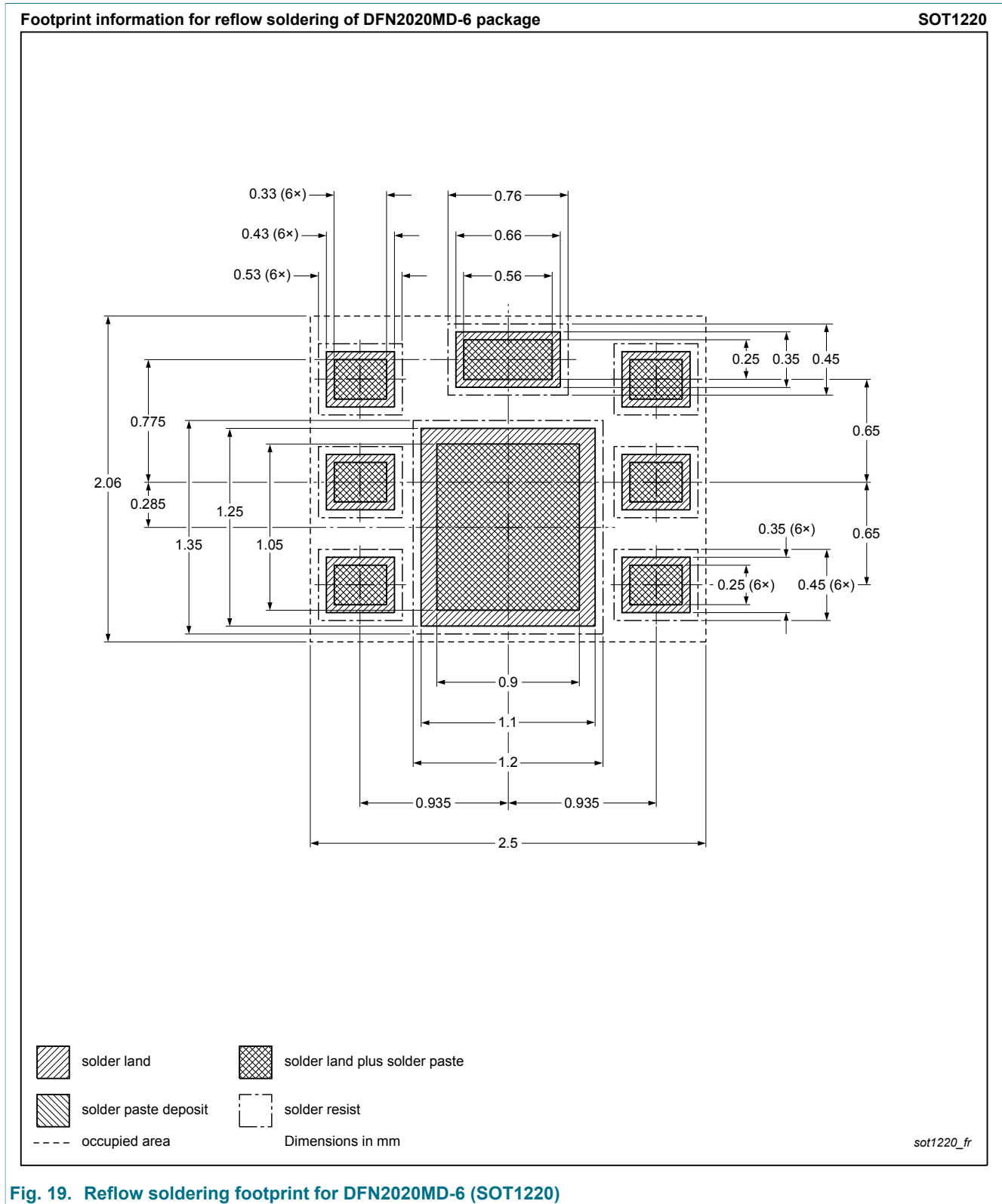


Fig. 19. Reflow soldering footprint for DFN2020MD-6 (SOT1220)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMPB200EN v.1	20130530	Objective data sheet	-	-

## 15. Legal information

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Document status [1][2]	Product status [3]	Definition
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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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## 16. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	2
6	Ordering information .....	2
7	Marking .....	2
8	Limiting values .....	3
9	Thermal characteristics .....	4
10	Characteristics .....	6
11	Test information .....	9
12	Package outline .....	10
13	Soldering .....	11
14	Revision history .....	12
15	Legal information .....	13
15.1	Data sheet status .....	13
15.2	Definitions .....	13
15.3	Disclaimers .....	13
15.4	Trademarks .....	14

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 Date of release: 30 May 2013