

PMPB08R4VP

12 V, P-channel Trench MOSFET

13 October 2020 Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020M-6 (SOT1220-2) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Low threshold voltage
- 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

3. Applications

- Charging switch for portable devices
- DC-to-DC converters
- Power management in battery-driven portable devices
- Computing power management

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-12	V
V_{GS}	gate-source voltage			-8	-	8	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-	-16.7	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -12 A; T_j = 25 °C		-	8.4	9.6	mΩ

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

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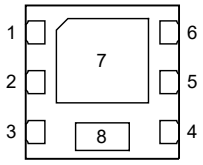
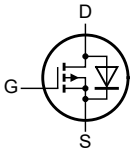
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 Transparent top view **DFN2020M-6 (SOT1220-2)**	 *017aaa094*
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
PMPB08R4VP	DFN2020M-6	plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm	SOT1220-2

7. Marking

Table 4. Marking codes

Type number	Marking code
PMPB08R4VP	ZD

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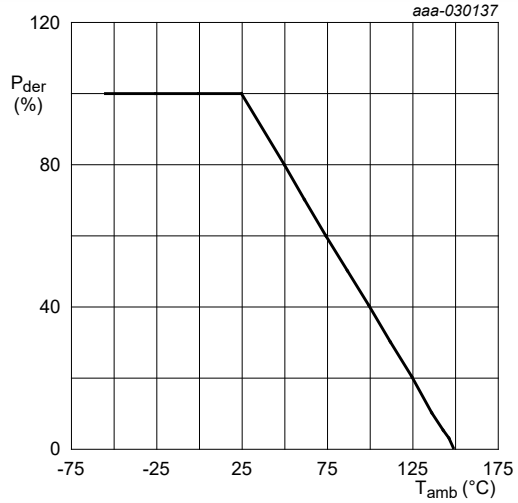
8. Limiting values

Table 5. Limiting values

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

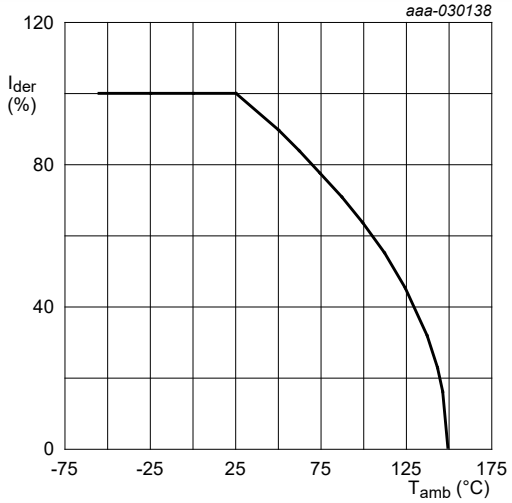
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-12	V
V_{GS}	gate-source voltage			-8	8	V
I_D	drain current	V_{GS} = -4.5 V; T_{amb} = 25 °C; t ≤ 5 s	[1]	-	-16.7	A
		V_{GS} = -4.5 V; T_{amb} = 25 °C	[1]	-	-12	A
		V_{GS} = -4.5 V; T_{amb} = 100 °C	[1]	-	-7.6	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	-48	A
P_{tot}	total power dissipation	T_{amb} = 25 °C; t ≤ 5 s	[1]	-	3.8	W
		T_{amb} = 25 °C	[1]	-	1.9	W
		T_{sp} = 25 °C		-	12.5	W
T_j	junction temperature			-55	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C
Source-drain diode						
I_S	source current	T_{amb} = 25 °C	[1]	-	-1.8	A

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



$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$

Fig. 1. Normalized total power dissipation as a function of ambient temperature



$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

Fig. 2. Normalized continous drain current as a function of ambient temperature

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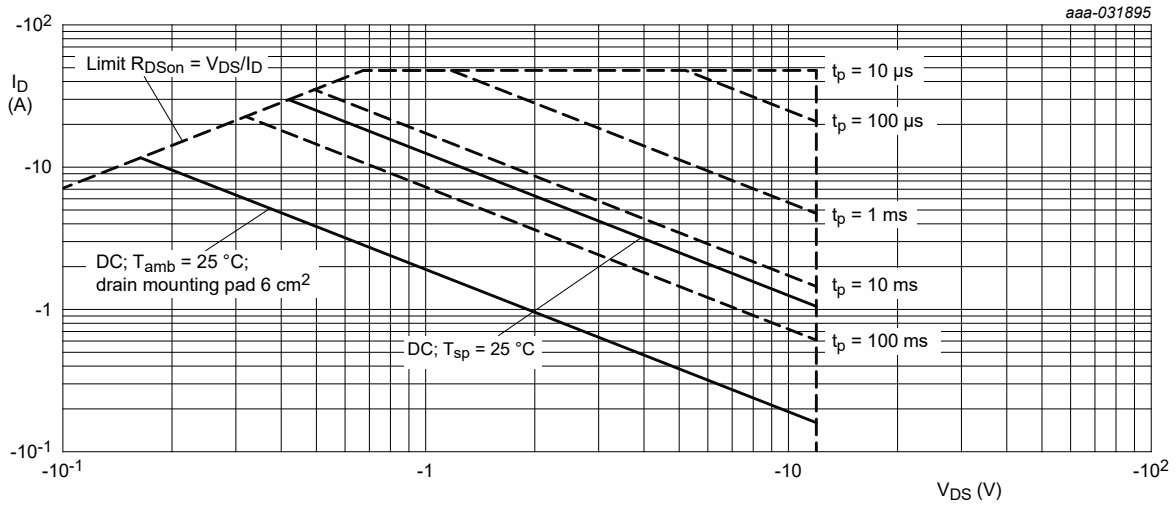

Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

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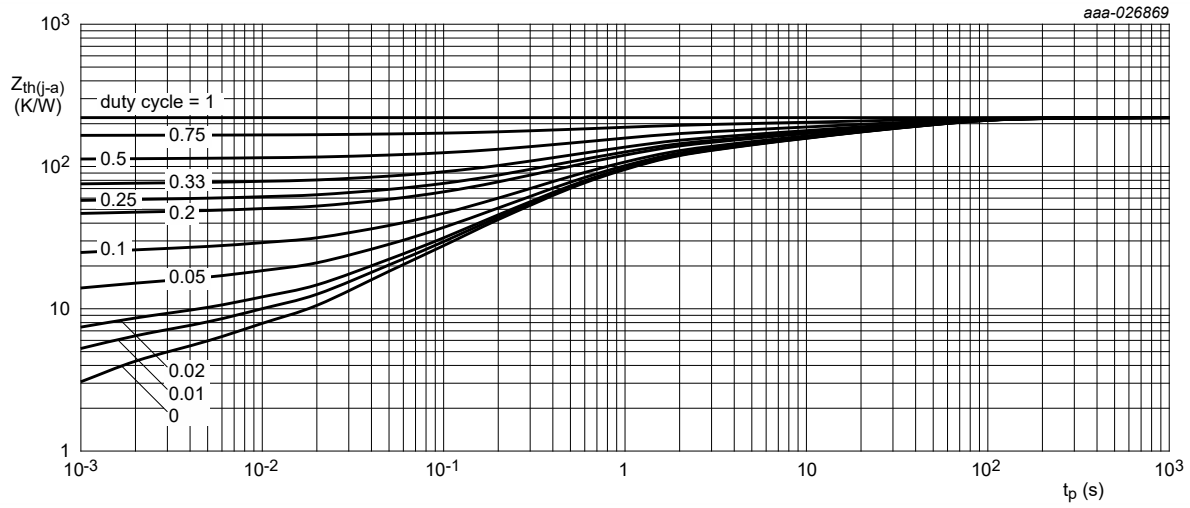
9. Thermal characteristics

Table 6. Thermal characteristics

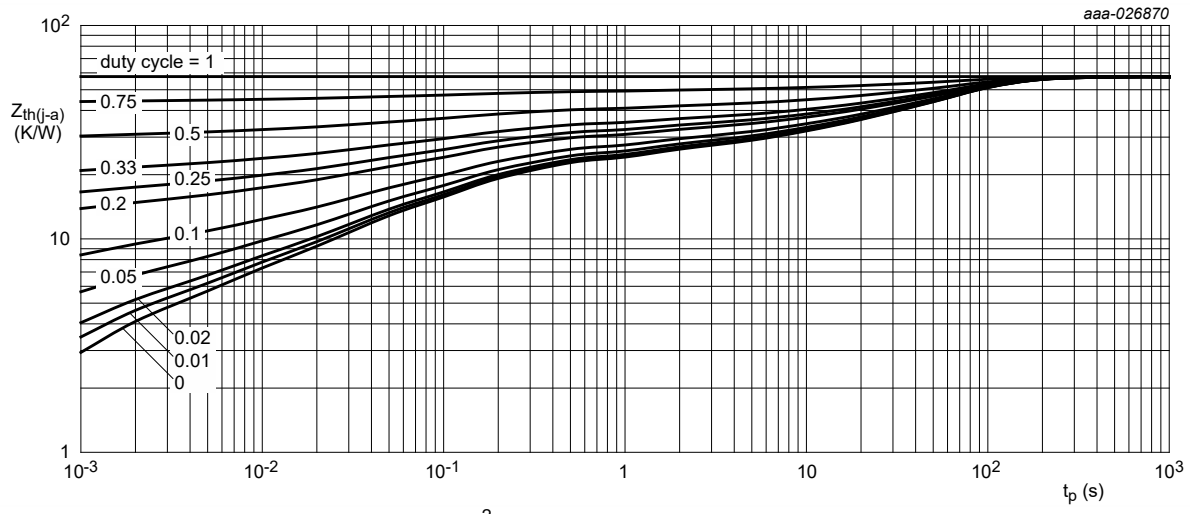
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	223	256	K/W
			[2]	-	57	66	K/W
		in free air, t ≤ 5 s	[2]	-	29	33	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	6	10	K/W

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



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^2

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

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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V; T_j = 25 °C		-12	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = -250 µA; V_{DS}=V_{GS}; T_j = 25 °C		-0.47	-0.65	-0.9	V
I_{DSS}	drain leakage current	V_{DS} = -12 V; V_{GS} = 0 V; T_j = 25 °C		-	-	-1	µA
I_{GSS}	gate leakage current	V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	-100	nA
		V_{GS} = 8 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 = -12 A; T_j = 25 °C		-	8.4	9.6	mΩ
		V_{GS} = -4.5 V; I_D = -12 A; T_j = 150 °C		-	12	14	mΩ
		V_{GS} = -2.5 V; I_D = -8 A; T_j = 25 °C		-	11.5	14	mΩ
		V_{GS} = -1.8 V; I_D = -2 A; T_j = 25 °C		-	16	20	mΩ
g_{fs}	forward transconductance	V_{DS} = -5 V; I_D = -12 A; T_j = 25 °C		-	39	-	S
R_G	gate resistance	f = 1 MHz		-	13.2	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -6 V; I_D = -10 A; V_{GS} = -4.5 V; T_j = 25 °C		-	27	40	nC
Q_{GS}	gate-source charge			-	3.4	-	nC
Q_{GD}	gate-drain charge			-	7.6	-	nC
C_{iss}	input capacitance	V_{DS} = -6 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C		-	2200	-	pF
C_{oss}	output capacitance			-	509	-	pF
C_{rss}	reverse transfer capacitance			-	454	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -6 V; I_D = -10 A; V_{GS} = -4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C		-	4	-	ns
t_r	rise time			-	15	-	ns
$t_{d(off)}$	turn-off delay time			-	149	-	ns
t_f	fall time			-	100	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = -1.8 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.6	-1.2	V

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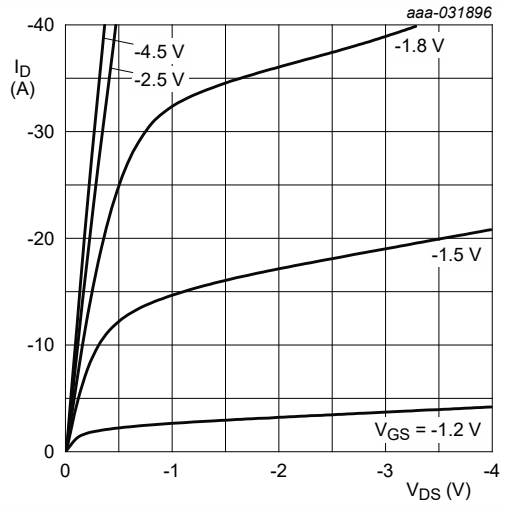
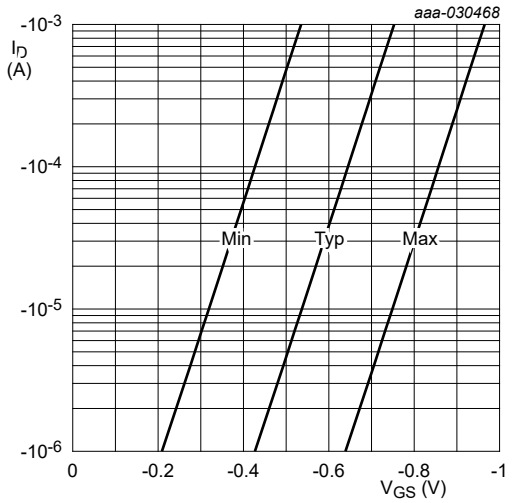


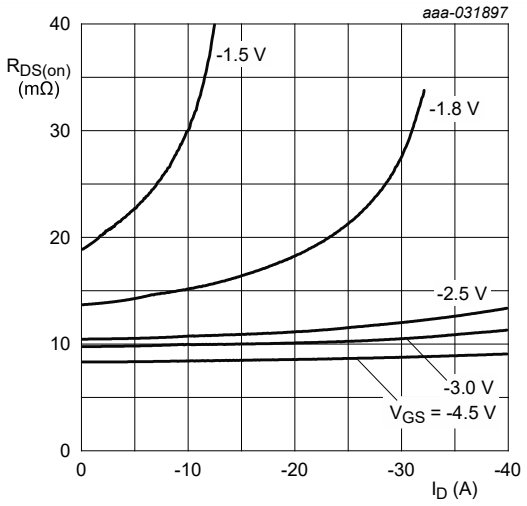
T_j = 25 °C

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



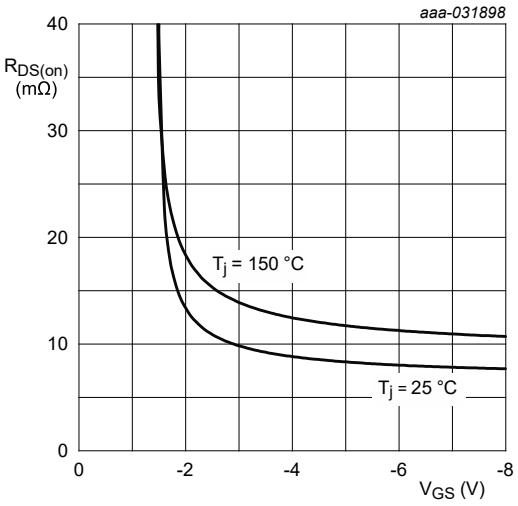
T_j = 25 °C; V_{DS} = -5 V

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



T_j = 25 °C

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



I_D = -12 A

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

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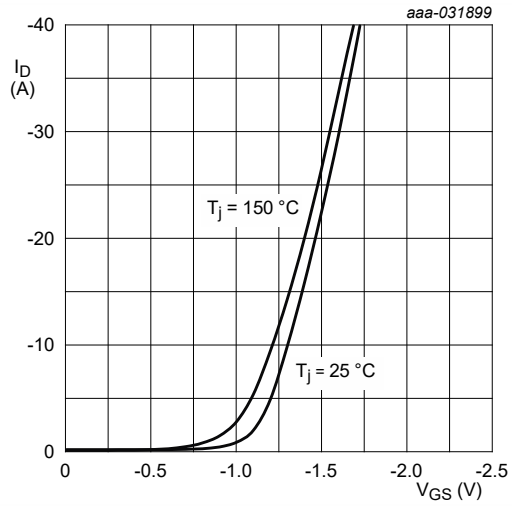
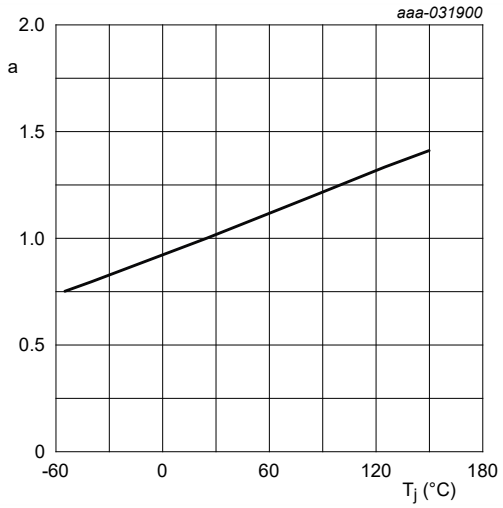


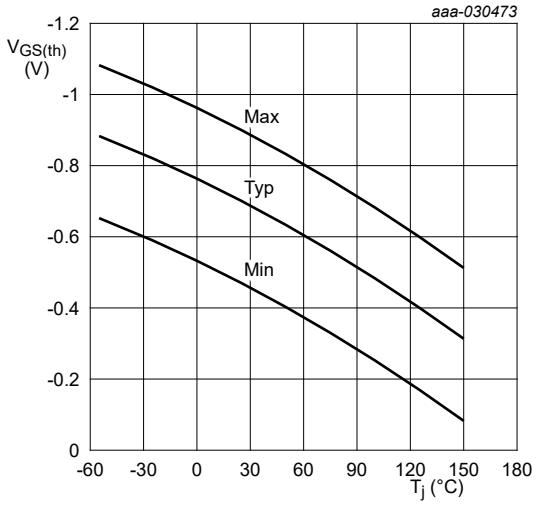
V_{DS} = -5 V

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



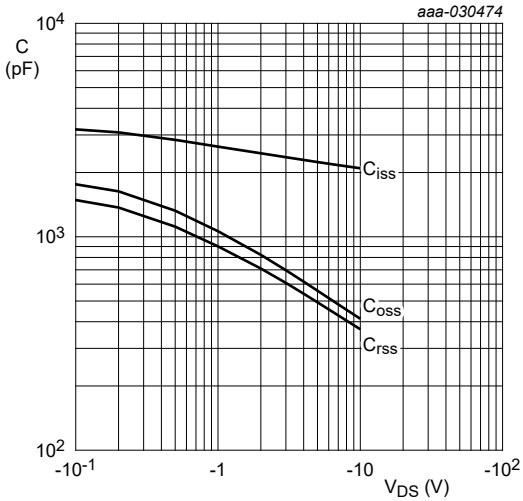
$$a = \frac{R_{DSon}}{R_{DSon(25\,°C)}}$$

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



I_D = -250 µA ; V_{DS} = V_{GS}

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



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

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

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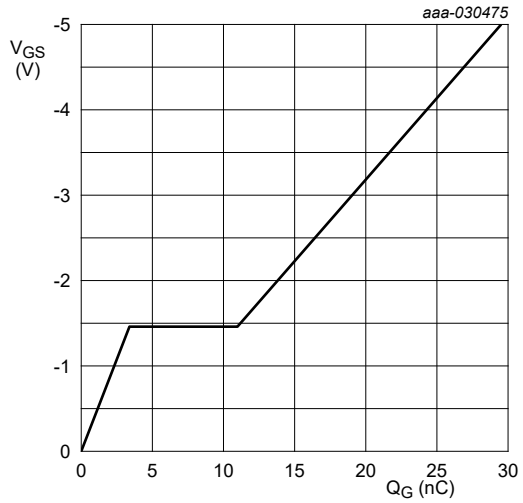


T_j = 25 °C; I_D = -9 A; V_{DS} = -6 V

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

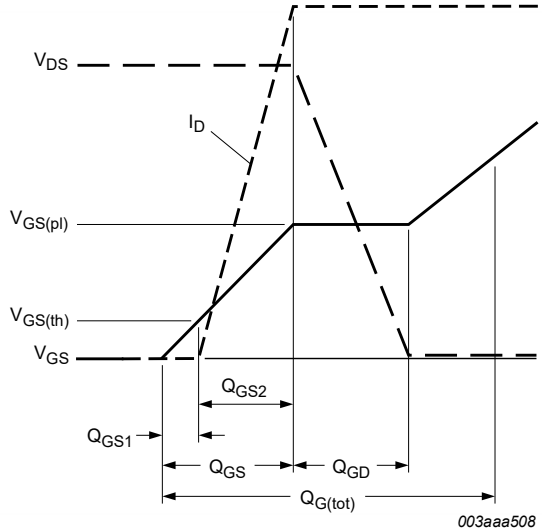
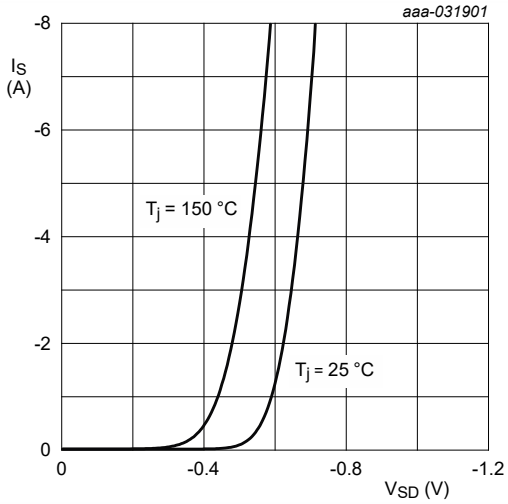


Fig. 15. Gate charge waveform definitions



V_{GS} = 0 V

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

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11. Test information

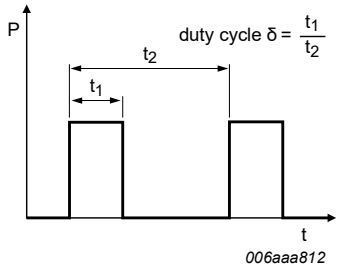

Fig. 17. Duty cycle definition

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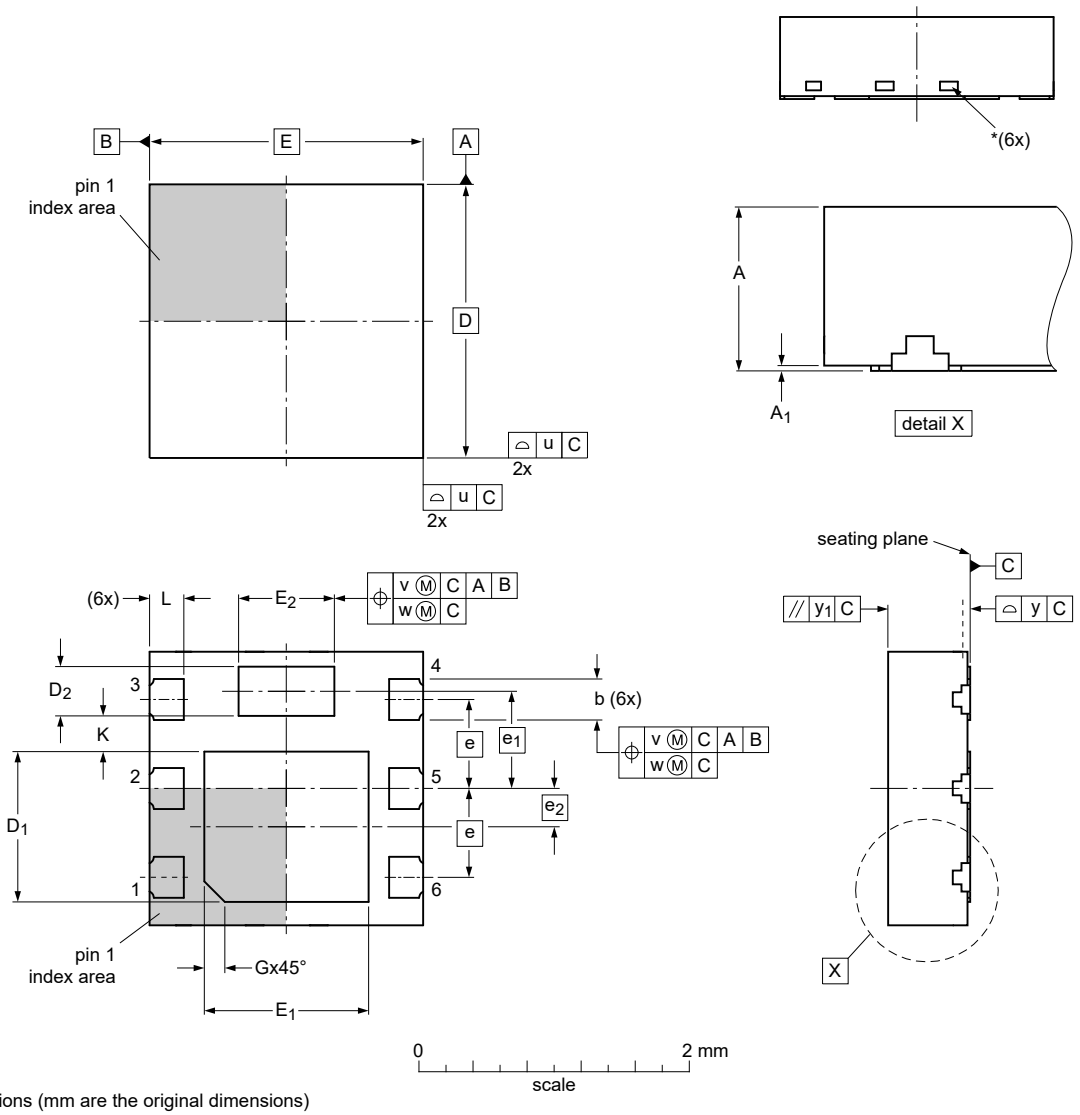
12. Package outline

DFN2020M-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm **SOT1220-2**



Dimensions (mm are the original dimensions)

Unit		A	A_1	b	D	D_1	D_2	E	E_1	E_2	e	e_1	e_2	G	K	L	u	v	w	y	y_1
mm	min	0.55	0	0.25		1.0	0.31		1.1	0.6					0.2	0.20					
	nom	0.60	0.02	0.30	2	1.1	0.36	2	1.2	0.7	0.65	0.71	0.28	0.15 (ref)		0.25	0.05	0.1	0.05	0.05	0.05
	max	0.65	0.04	0.35		1.2	0.41		1.3	0.8						0.30					

Note
1. Dimension A is including plating thickness.
2. * Visible depend upon used manufacturing technology.

sot1220-2_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1220-2		---				~~20-03-31~~ 20-04-01

Fig. 18. Package outline DFN2020M-6 (SOT1220-2)

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13. Soldering

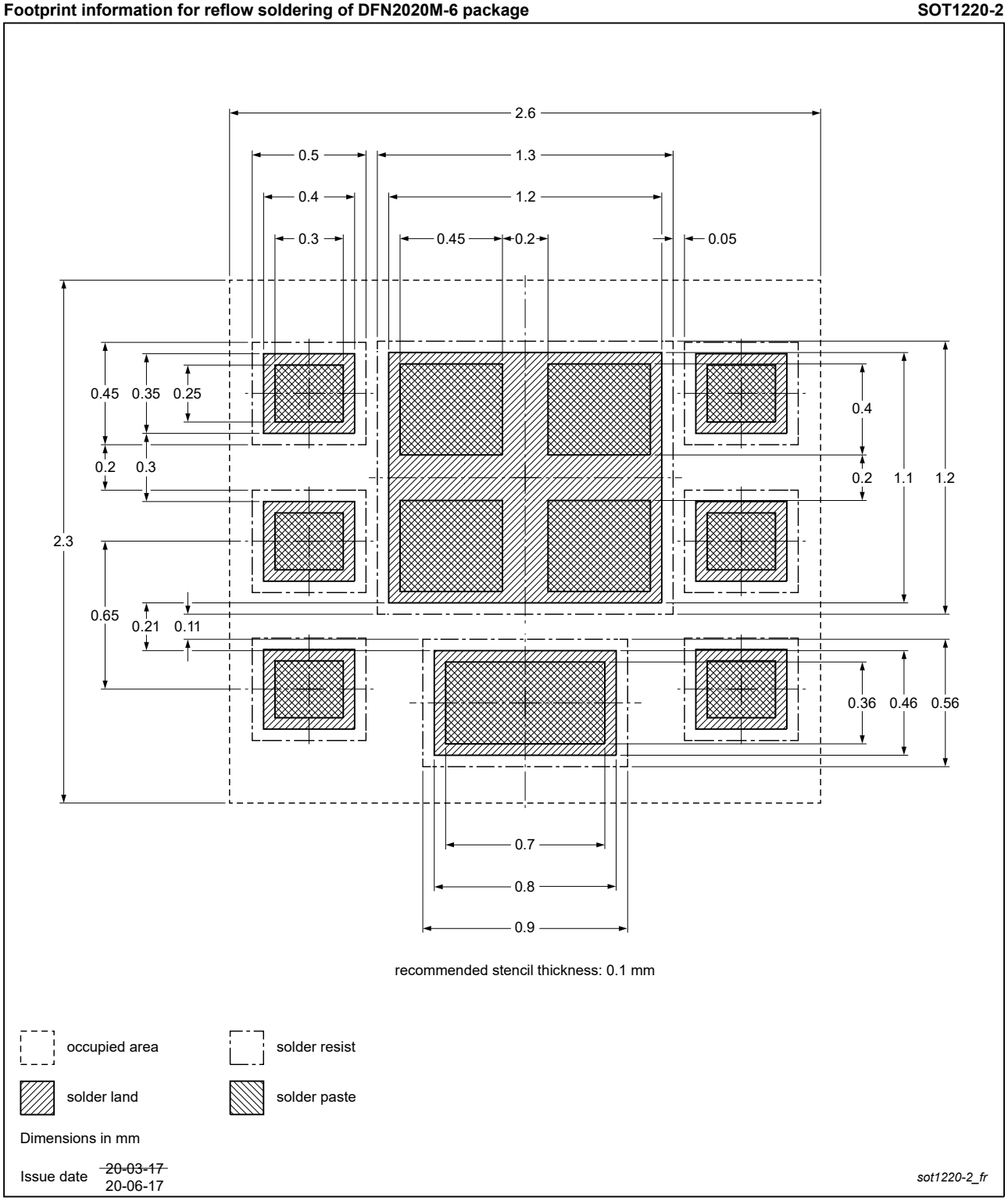

Fig. 19. Reflow soldering footprint for DFN2020M-6 (SOT1220-2)

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14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMPB08R4VP v.1	20201013	Product data sheet	-	-

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15. Legal information

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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