PMFPB8032XP

20 V, 3.7 A / 320 mV VF P-channel MOSFET-Schottky combination

21 December 2012 **Product data sheet**

1. General description

Small-signal P-channel enhancement mode Field-Effect Transistor (FET) using Trench MOSFET technology and ultra low V_F Maximum Efficiency General Application (MEGA) Schottky diode combined in a small and leadless ultra thin DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- 1.8 V R_{DSon} rated for low-voltage gate drive
- Small and leadless ultra thin SMD plastic package: 2 × 2 × 0.65 mm
- Exposed drain pad for excellent thermal conduction
- Integrated ultra low V_F MEGA Schottky diode

3. Applications

- Charging switch for portable devices
- DC-to-DC converters
- Power management in battery-driven portables
- Hard disk and computing power management

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
MOSFET transistor							
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-20	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]	-	-	-3.7	A
Schottky diode							
I_F	forward current	T_{sp} ≤ 105 °C		-	-	2	A
V_R	reverse voltage	T_{amb} = 25 °C		-	-	20	V
MOSFET transistor static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -4.5 V; I_D = -2.7 A; T_j = 25 °C		-	80	102	mΩ

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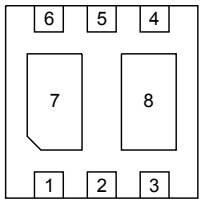
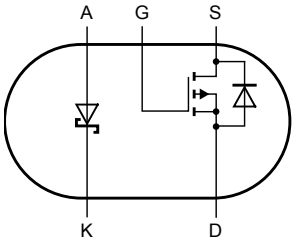
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Schottky diode							
V_F	forward voltage	I_F = 1 A; T_j = 25 °C		-	320	365	mV

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode	 Transparent top view **DFN2020-6 (SOT1118)**	 aaa-003667
2	n.c.	not connected		
3	D	drain		
4	S	source		
5	G	gate		
6	K	cathode		
7	K	cathode		
8	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMFPB8032XP	DFN2020-6	plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm	SOT1118

7. Marking

Table 4. Marking codes

Type number	Marking code
PMFPB8032XP	1X

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
MOSFET transistor						
V_{DS}	drain-source voltage	T_j = 25 °C		-	-20	V

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Symbol	Parameter	Conditions		Min	Max	Unit
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]	-	-3.7	A
		V_{GS} = -4.5 V; T_{amb} = 25 °C	[1]	-	-2.7	A
		V_{GS} = -4.5 V; T_{amb} = 100 °C	[1]	-	-1.7	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	-11	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	485	mW
			[1]	-	1100	mW
		T_{sp} = 25 °C		-	6250	mW
Source-drain diode						
I_S	source current	T_{amb} = 25 °C	[1]	-	-1.1	A
Schottky diode						
V_R	reverse voltage	T_{amb} = 25 °C		-	20	V
I_F	forward current	T_{sp} ≤ 105 °C		-	2	A
I_{FRM}	repetitive peak forward current	t_p ≤ 1 ms; δ ≤ 0.25 ; T_{amb} = 25 °C		-	7	A
I_{FSM}	non-repetitive peak forward current	t_p = 8 ms; $T_{j(init)}$ = 25 °C; square wave		-	18	A
		t_p = 8 ms; $T_{j(init)}$ = 25 °C; half-sine wave	[3]	-	25	A
P_{tot}	total power dissipation	T_{amb} = 25 °C	[2]	-	480	mW
			[1]	-	1190	mW
		T_{sp} = 25 °C		-	6250	mW
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 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[3] Calculated from square-wave measurements.

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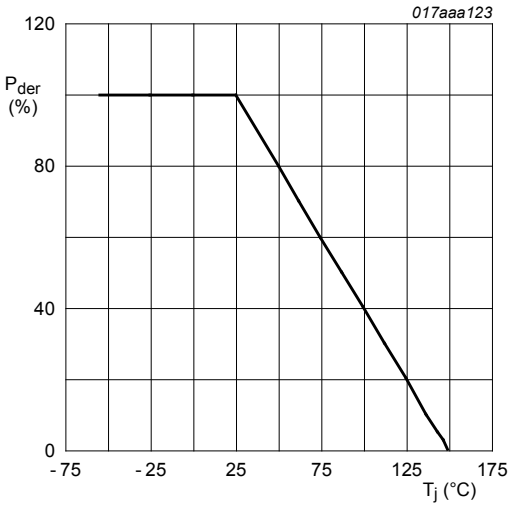


Fig. 1. MOSFET transistor: Normalized total power dissipation as a function of junction temperature

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

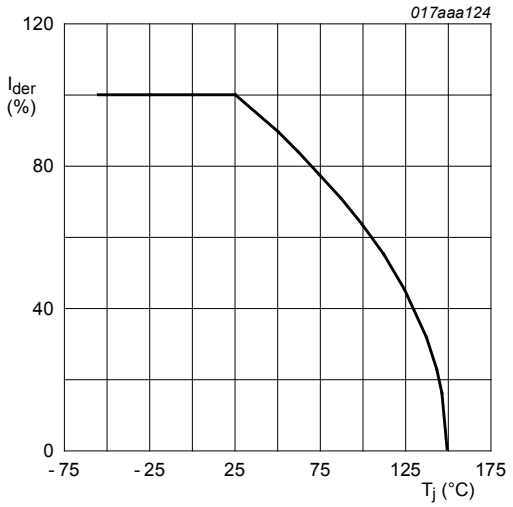
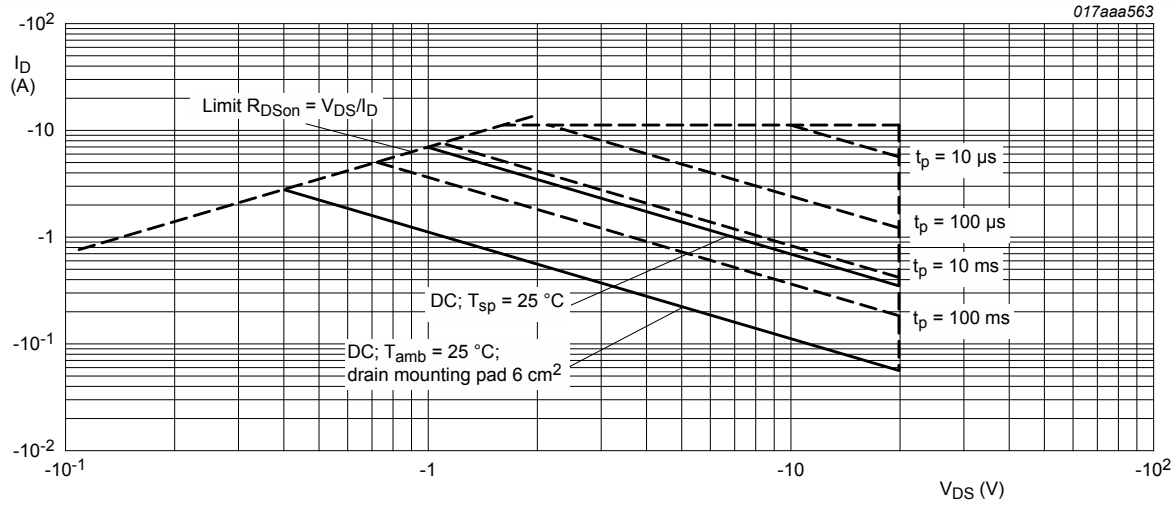


Fig. 2. MOSFET transistor: Normalized continuous drain current as a function of junction temperature

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



I_{DM} = single pulse

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

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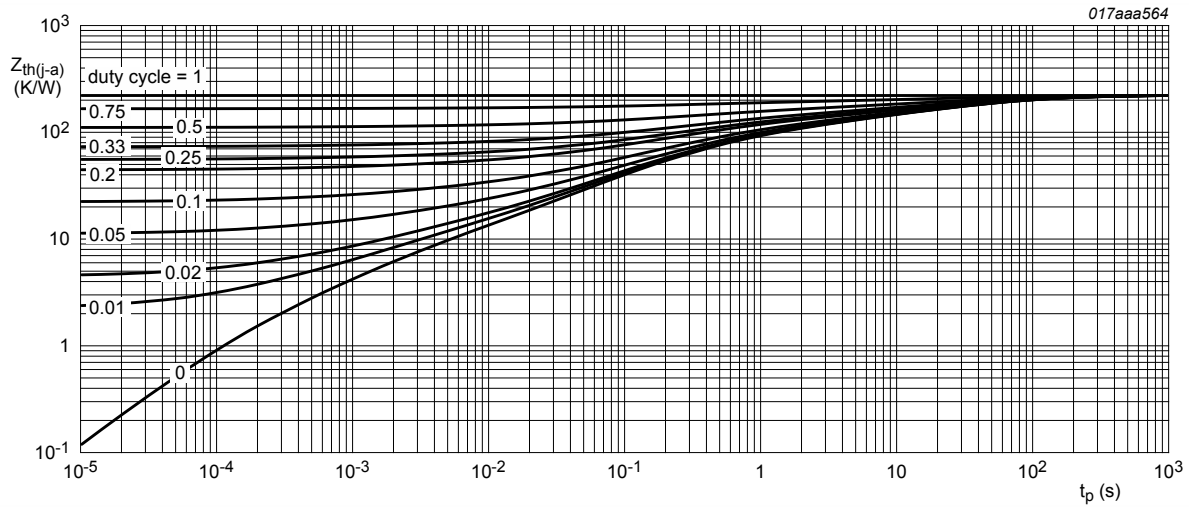
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
MOSFET transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	225	260	K/W
			[2]	-	99	115	K/W
		in free air; t ≤ 5 s	[2]	-	54	62	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	16	20	K/W
Schottky diode							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	260	K/W
			[2]	-	-	105	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	20	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.



FR4 PCB, standard footprint

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

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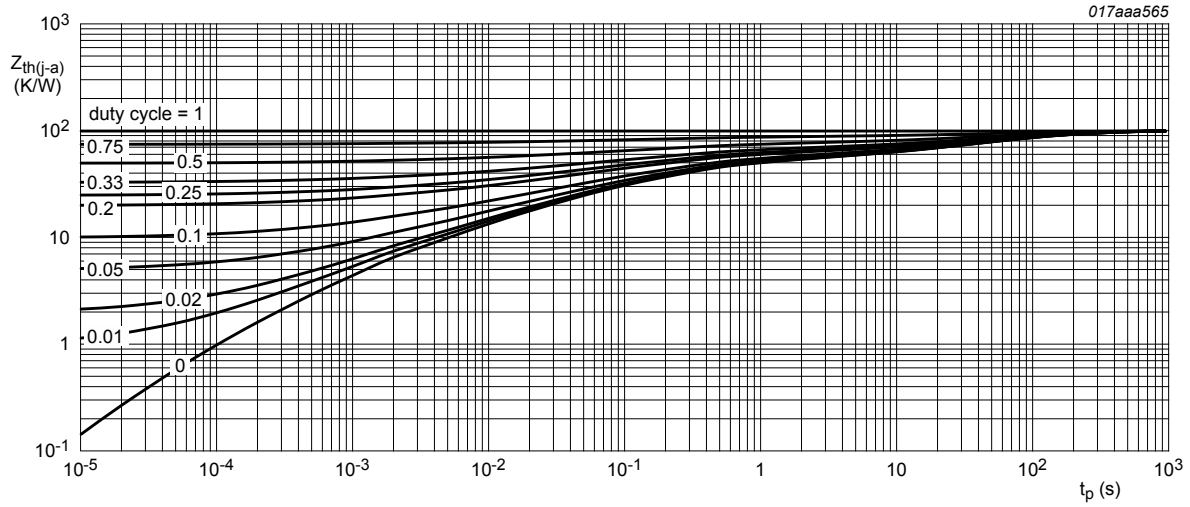
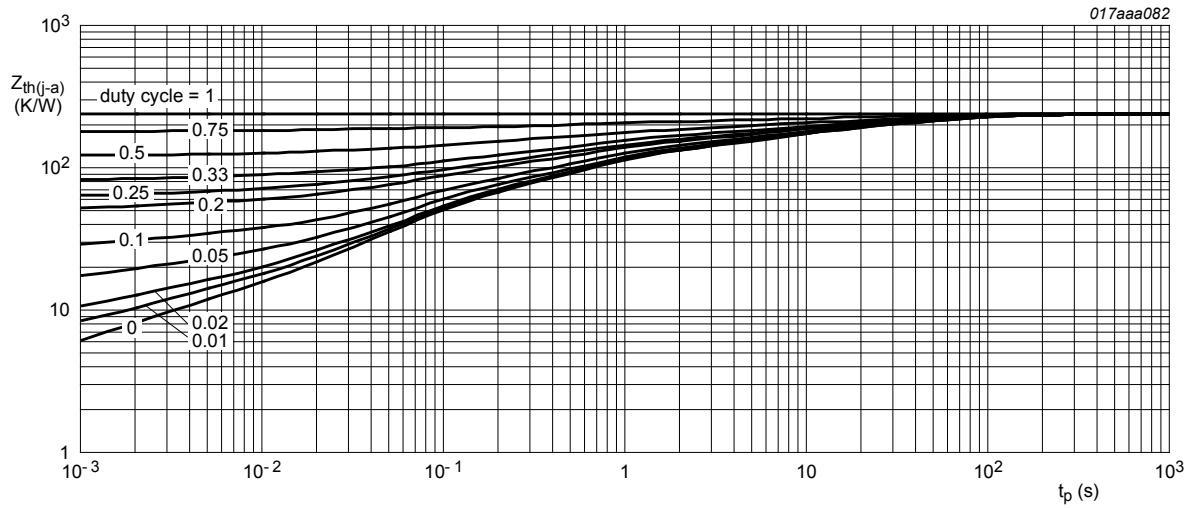


FR4 PCB, mounting pad for drain 6 cm^2

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



FR4 PCB, standard footprint

Fig. 6. Schottky diode: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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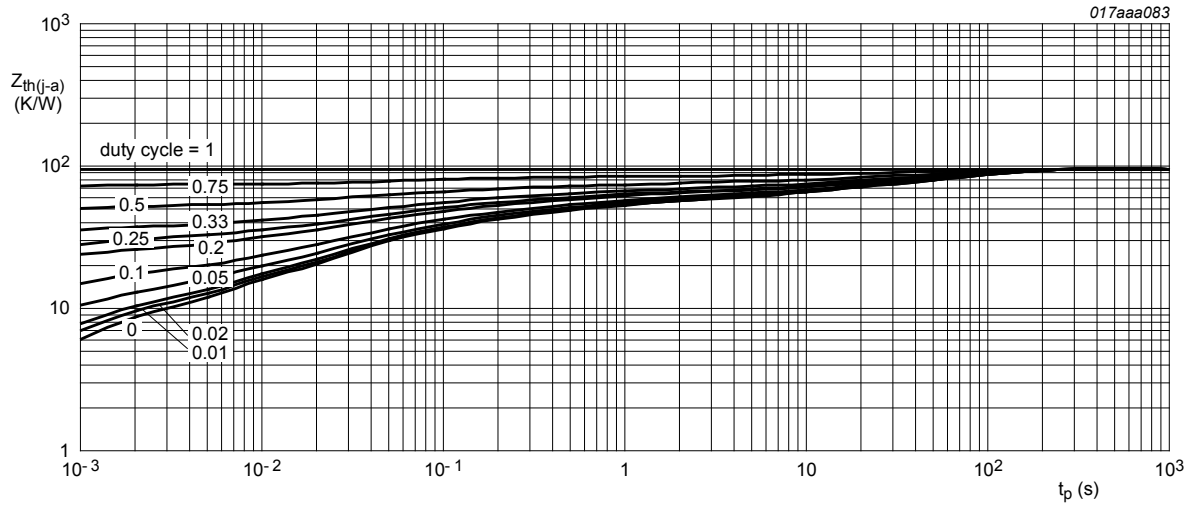

FR4 PCB, mounting pad for cathode 6 cm^2

Fig. 7. Schottky diode: 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
MOSFET transistor static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V; T_j = 25 °C		-20	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = -250 µA; V_{DS} = V_{GS}; T_j = 25 °C		-0.4	-0.6	-1	V
I_{DSS}	drain leakage current	V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 °C		-	-	-1	µA
		V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 °C		-	-	-10	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 = -2.7 A; T_j = 25 °C		-	80	102	mΩ
		V_{GS} = -4.5 V; I_D = -2.7 A; T_j = 150 °C		-	116	148	mΩ
		V_{GS} = -2.5 V; I_D = -2.5 A; T_j = 25 °C		-	95	125	mΩ
		V_{GS} = -1.8 V; I_D = -1.1 A; T_j = 25 °C		-	120	156	mΩ
g_{fs}	transfer conductance	V_{DS} = -10 V; I_D = -2.7 A; T_j = 25 °C		-	15	-	S
MOSFET transistor dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -10 V; I_D = -2.7 A; V_{GS} = -4.5 V; T_j = 25 °C		-	5.7	8.6	nC
Q_{GS}	gate-source charge			-	0.7	-	nC
Q_{GD}	gate-drain charge			-	0.96	-	nC

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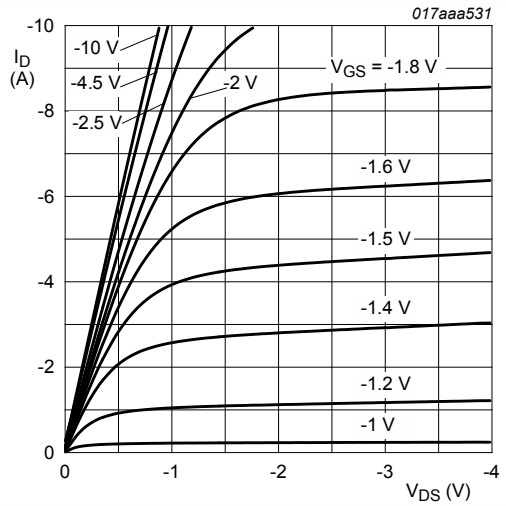
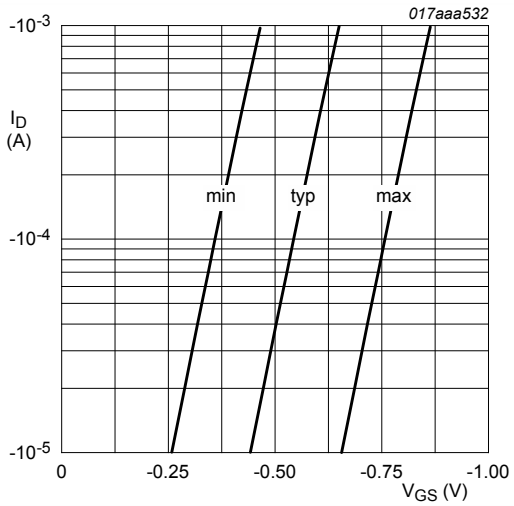
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
C_{iss}	input capacitance	V_{DS} = -10 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C		-	550	-	pF
C_{oss}	output capacitance			-	63	-	pF
C_{rss}	reverse transfer capacitance			-	53	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -10 V; I_D = -2.4 A; V_{GS} = -4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C		-	6	-	ns
t_r	rise time			-	14	-	ns
$t_{d(off)}$	turn-off delay time			-	120	-	ns
t_f	fall time			-	50	-	ns
MOSFET transistor source-drain diode							
V_{SD}	source-drain voltage	I_S = -1.1 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.8	-1.2	V
Schottky diode							
V_F	forward voltage	I_F = 100 mA; T_j = 25 °C		-	225	275	mV
		I_F = 500 mA; T_j = 25 °C		-	285	335	mV
		I_F = 1 A; T_j = 25 °C		-	320	365	mV
I_R	reverse current	V_R = 5 V; T_j = 25 °C		-	65	220	µA
		V_R = 5 V; T_j = 125 °C		-	13	50	mA
		V_R = 10 V; T_j = 25 °C		-	110	400	µA
		V_R = 20 V; T_j = 25 °C		-	230	700	µA
C_d	diode capacitance	V_R = 5 V; f = 1 MHz; T_j = 25 °C		-	60	70	pF



T_j = 25 °C

Fig. 8. MOSFET transistor: Output characteristics: drain current as a function of drain-source voltage; typical values



T_j = 25 °C; V_{DS} = -5 V

Fig. 9. MOSFET transistor: Subthreshold drain current as a function of gate-source voltage

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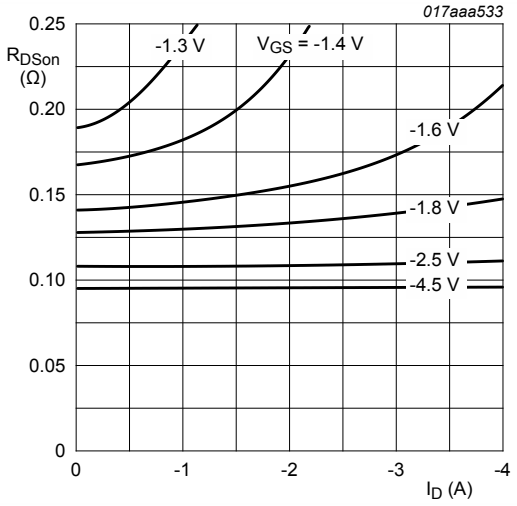
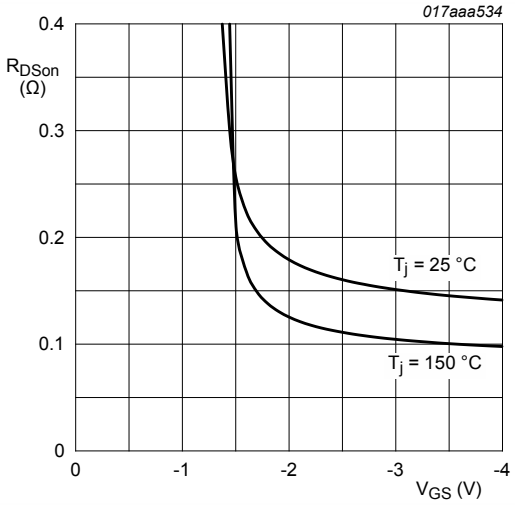


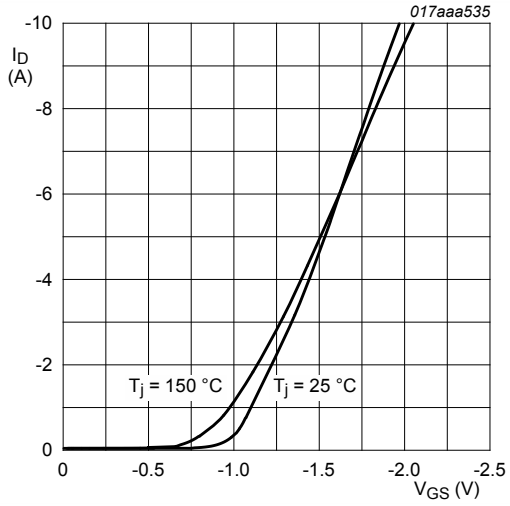
T_j = 25 °C

Fig. 10. MOSFET transistor: Drain-source on-state resistance as a function of drain current; typical values



I_D = -3 A

Fig. 11. MOSFET transistor: Drain-source on-state resistance as a function of gate-source voltage; typical values



$V_{DS} > I_D \times R_{DSon}$

Fig. 12. MOSFET transistor: Transfer characteristics: drain current as a function of gate-source voltage; typical values

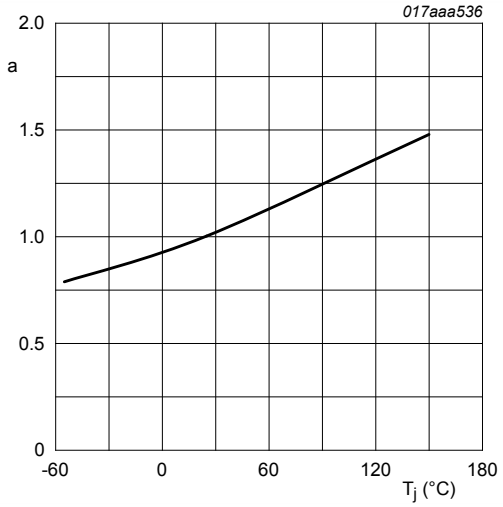


Fig. 13. MOSFET transistor: Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

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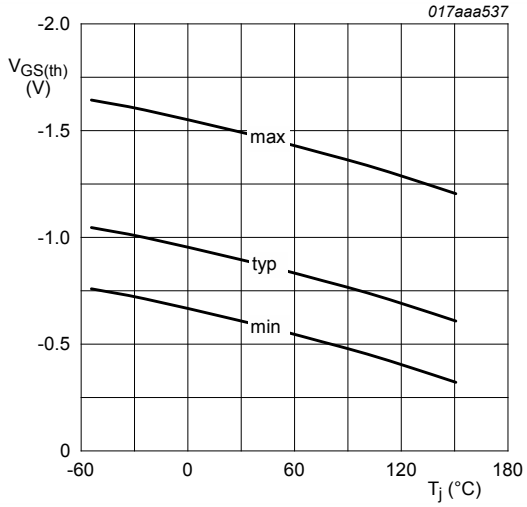
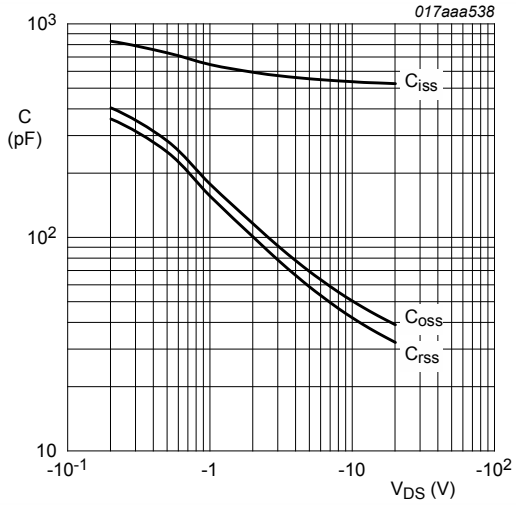


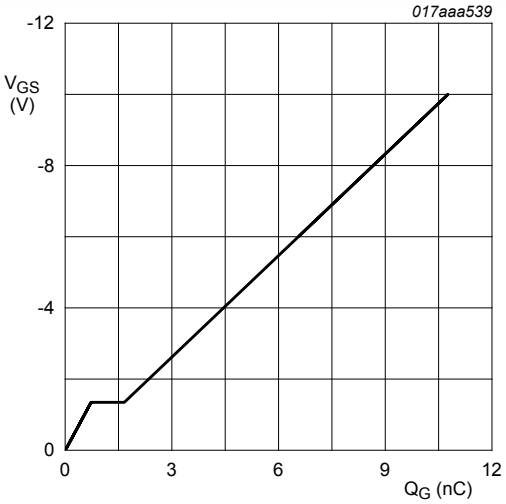
I_D = -0.25 mA; V_{DS} = V_{GS}

Fig. 14. MOSFET transistor: Gate-source threshold voltage as a function of junction temperature



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

Fig. 15. MOSFET transistor: 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. 16. MOSFET transistor: Gate-source voltage as a function of gate charge; typical values

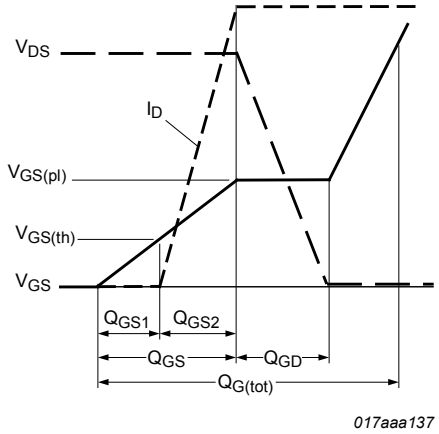


Fig. 17. MOSFET transistor: Gate charge waveform definitions

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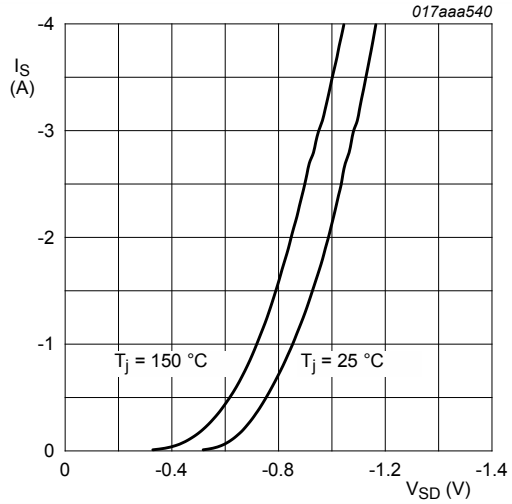
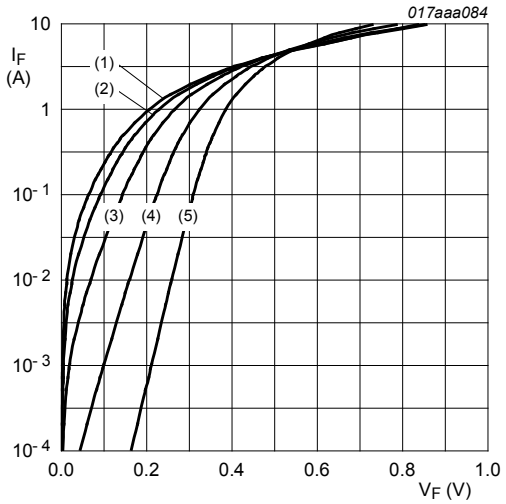


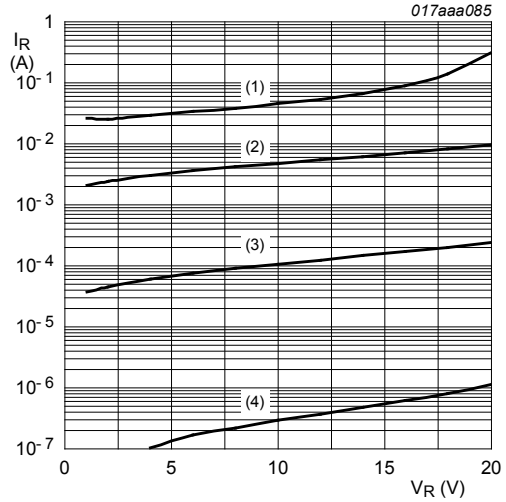
V_{GS} = 0 V

Fig. 18. MOSFET transistor: Source current as a function of source-drain voltage; typical values



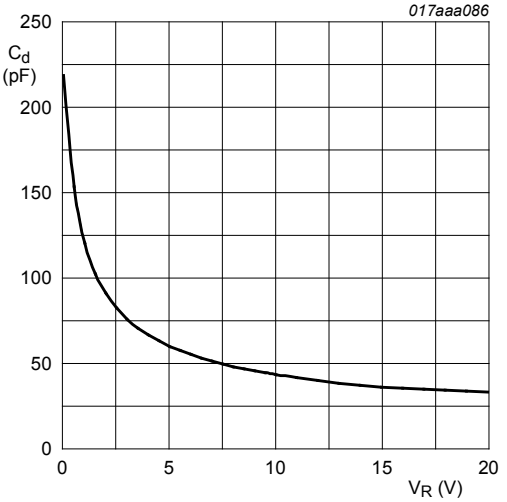
(1) T_j = 150 °C
(2) T_j = 125 °C
(3) T_j = 85 °C
(4) T_j = 25 °C
(5) T_j = −40 °C

Fig. 19. Schottky diode: Forward current as a function of forward voltage; typical values



(1) T_j = 125 °C
(2) T_j = 85 °C
(3) T_j = 25 °C
(4) T_j = −40 °C

Fig. 20. Schottky diode: Reverse current as a function of reverse voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig. 21. Schottky diode: Diode capacitance as a function of reverse voltage; typical values

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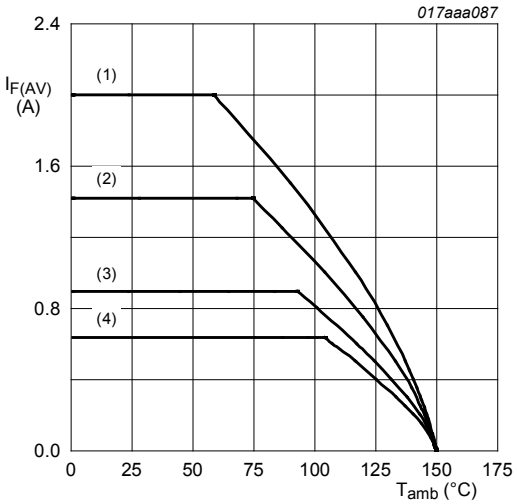

FR4 PCB, mounting pad for cathode 6 cm^2

T_j = 150 °C

(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

Fig. 22. Schottky diode: Average forward current as a function of ambient temperature; typical values

11. Test information

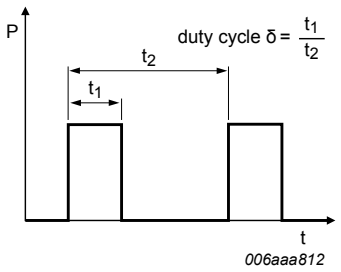

Fig. 23. Duty cycle definition

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12. Package outline

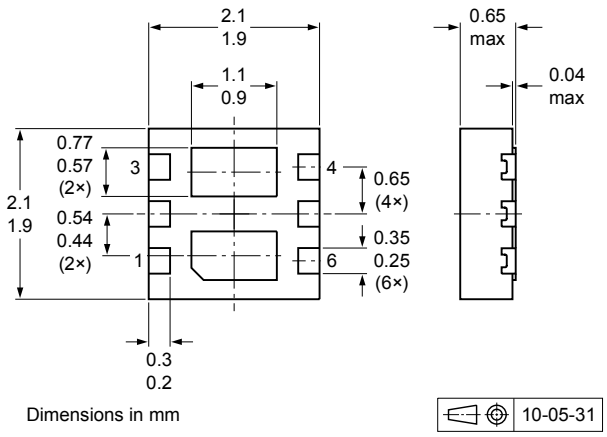

Fig. 24. Package outline DFN2020-6 (SOT1118)

13. Soldering

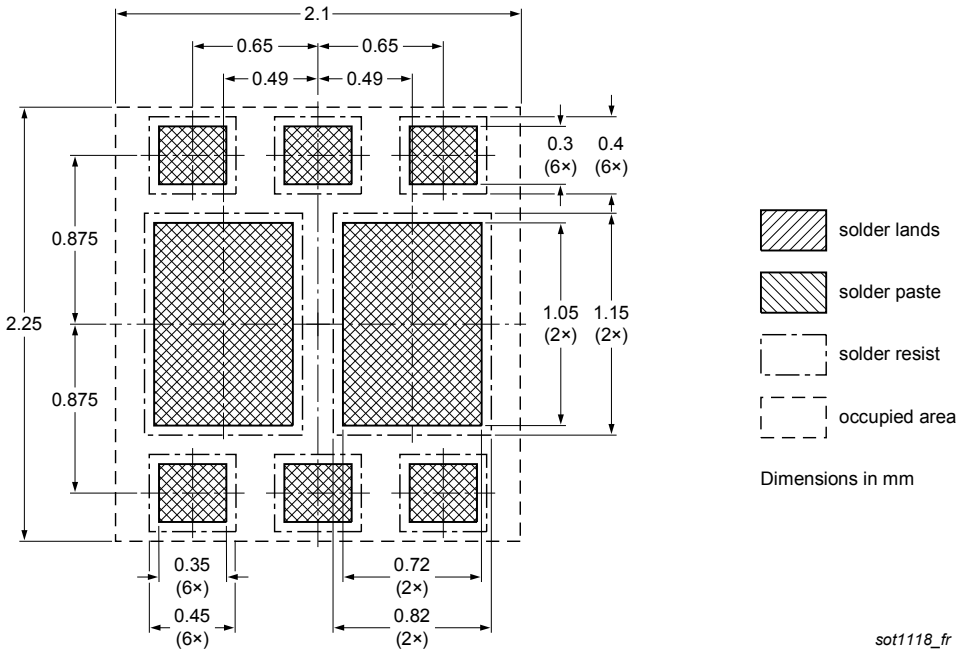

Fig. 25. Reflow soldering footprint for DFN2020-6 (SOT1118)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMFPB8032XP v.1	20121221	Product data sheet	-	-

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15. Legal information

15.1 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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