



**THE DATASHEET OF
PMZB670UPE,315**





PMZB670UPE

20 V, single P-channel Trench MOSFET

Rev. 3 — 23 March 2012

Product data sheet

1. Product profile

1.1 General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Very fast switching
- Low threshold voltage
- Trench MOSFET technology
- ESD protection up to 2 kV
- Ultra thin package profile of 0.37 mm

1.3 Applications

- Relay driver
- High-speed line driver
- High-side loadswitch
- Switching circuits

1.4 Quick reference data

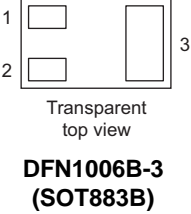
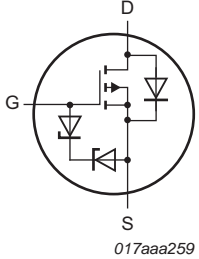
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	-20	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-680	mA
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -400\text{ mA}; T_j = 25\text{ °C}$	-	0.67	0.85	Ω

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB670UPE	DFN1006B-3	Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

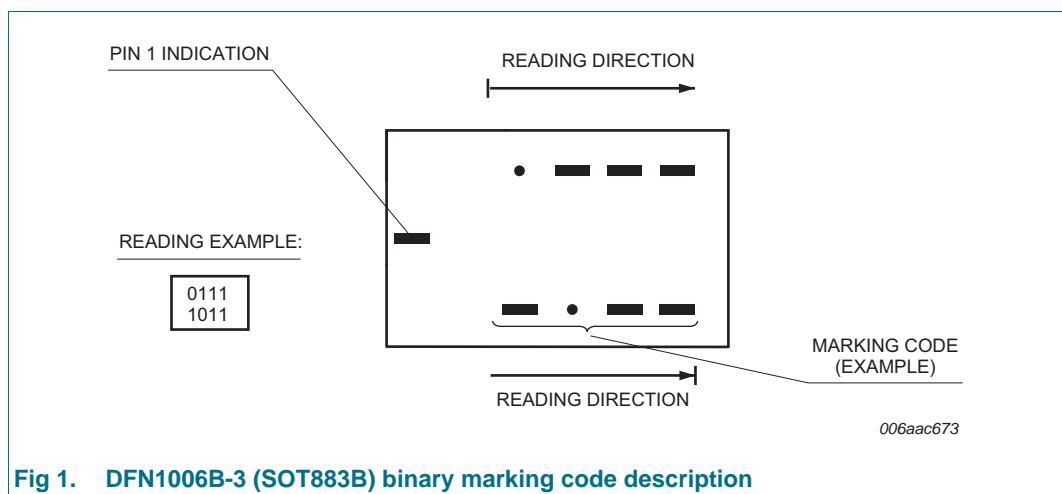
4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMZB670UPE	0000 1011

[1] For DFN1006B-3 (SOT883B) binary marking code description see [Figure 1](#).

4.1 Binary marking code description



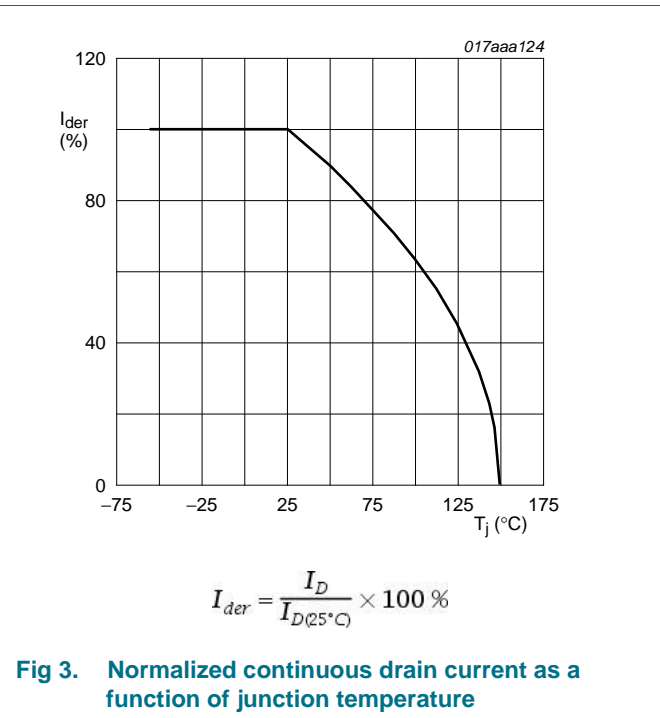
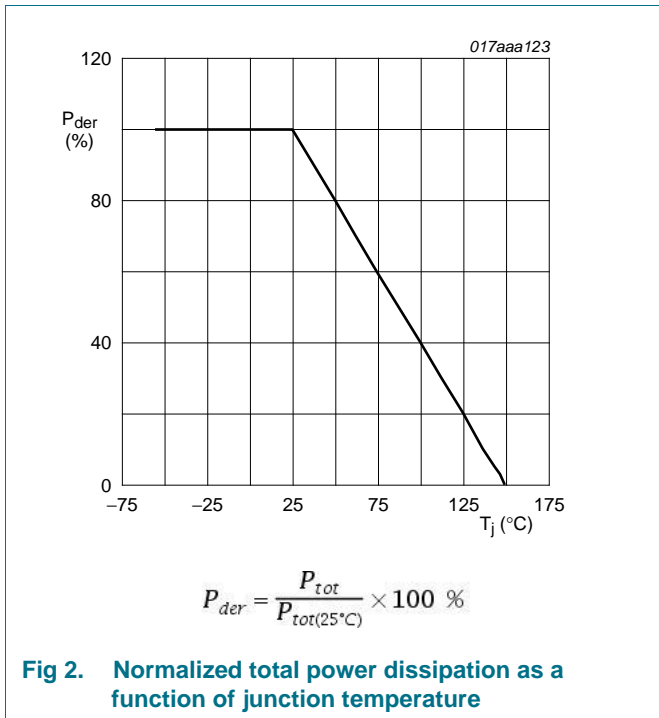
5. Limiting values

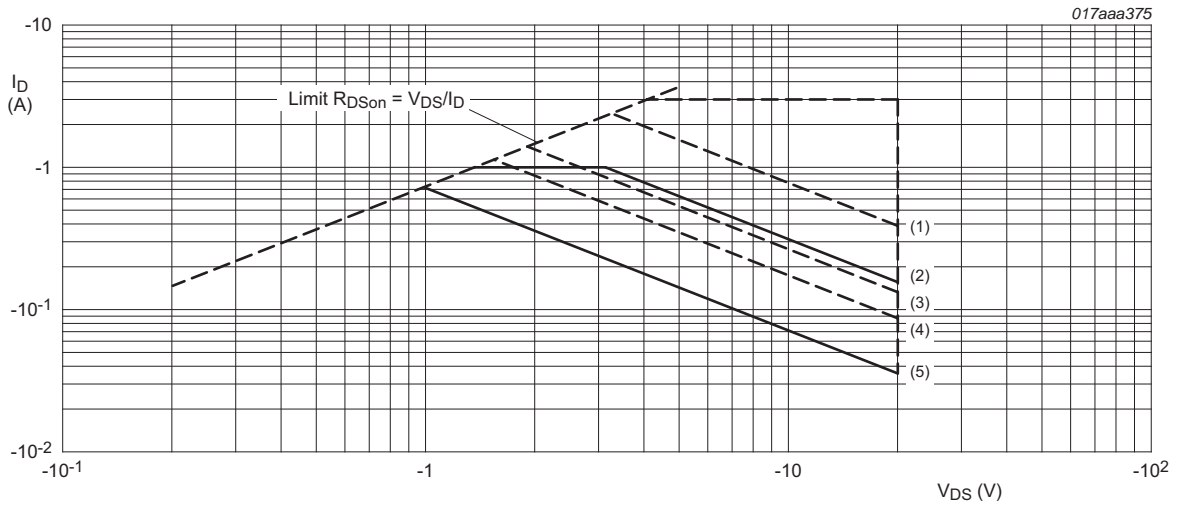
Table 5. Limiting values

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	-	-20	V	
V _{GS}	gate-source voltage		-8	8	V	
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-680	mA
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-425	mA
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs	-	-2.7	A	
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	360	mW
			[1]	-	715	mW
		T _{sp} = 25 °C		-	2700	mW
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]	-	-680	mA
ESD maximum rating						
V _{ESD}	electrostatic discharge voltage	HBM	[3]	-	2000	V

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





I_{DM} = single pulse

(1) $t_p = 1 \text{ ms}$

(2) DC; $T_{sp} = 25 \text{ °C}$

(3) $t_p = 10 \text{ ms}$

(4) $t_p = 100 \text{ ms}$

(5) DC; $T_{amb} = 25 \text{ °C}$; drain mounting pad 1 cm^2

Fig 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. 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]	-	305	360	K/W
			[2]	-	150	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	40	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 1 cm².

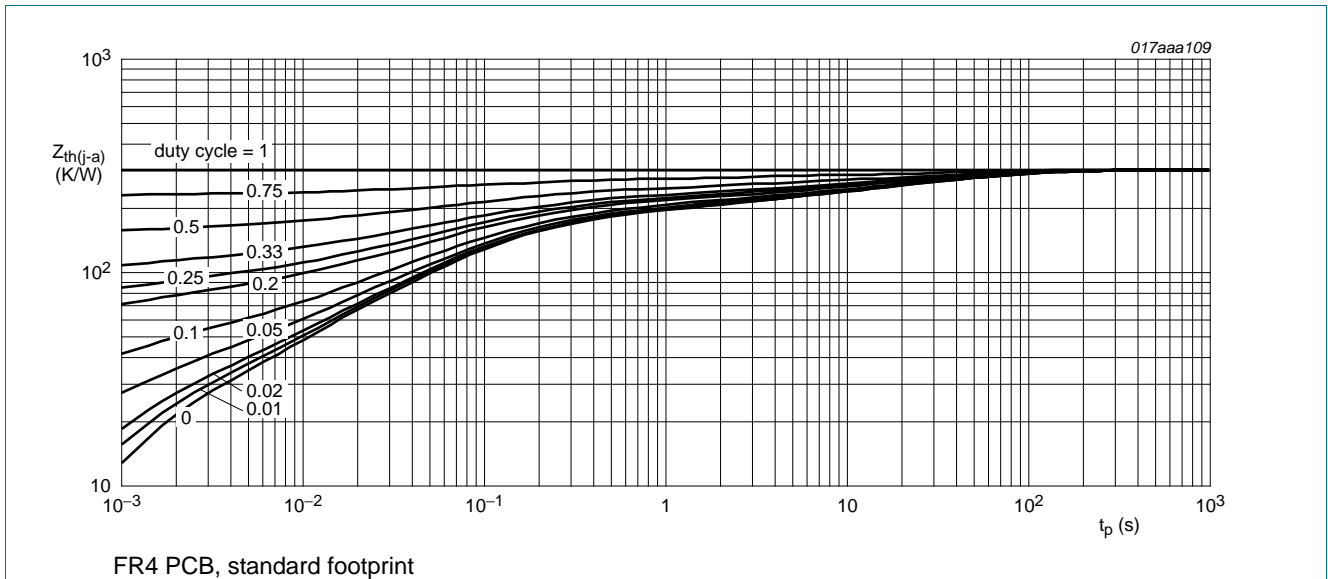


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

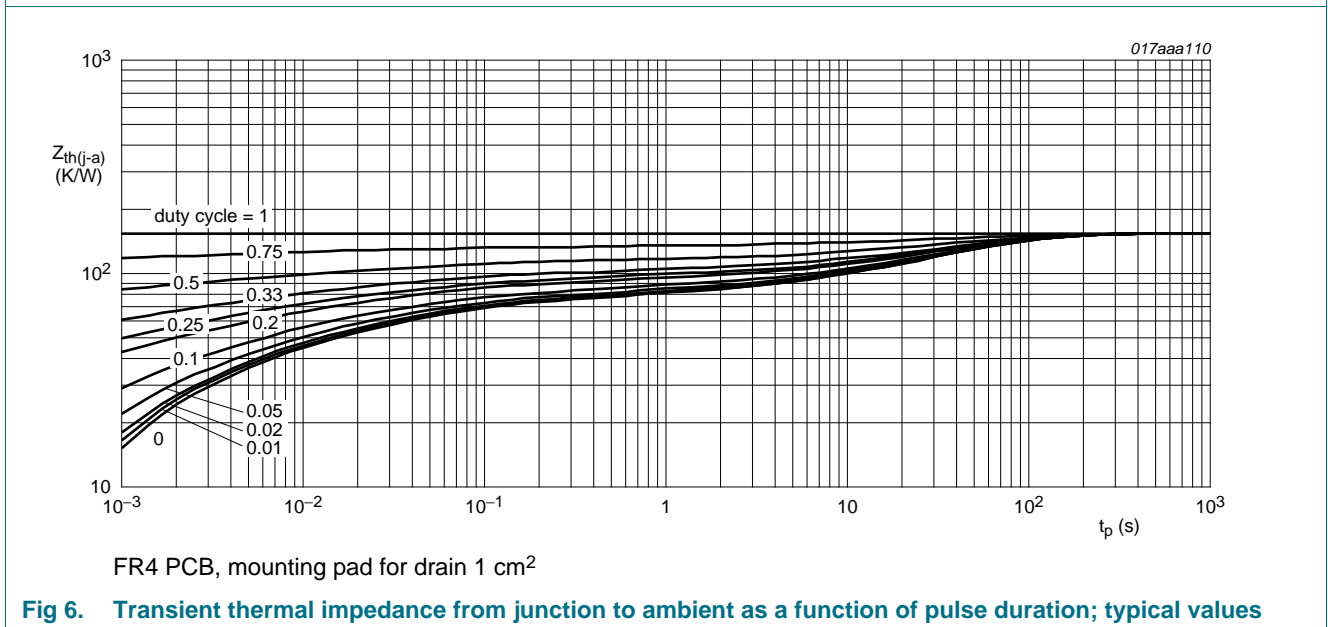
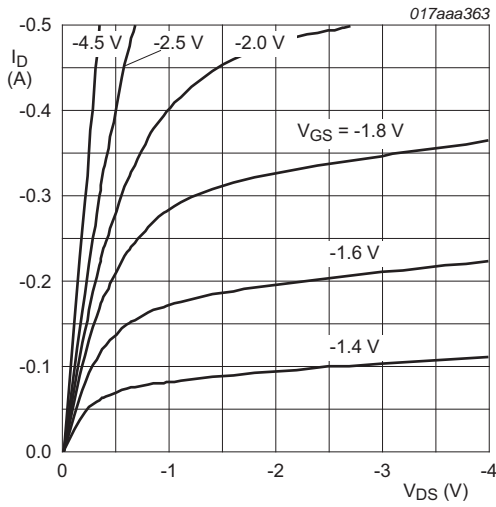


Fig 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

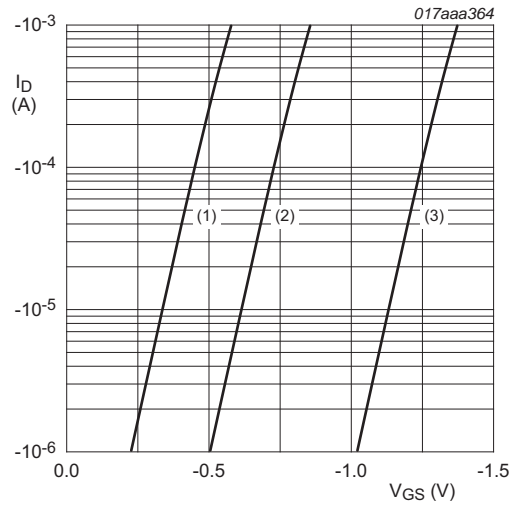
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu\text{A}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ\text{C}$	-0.5	-0.9	-1.3	V
I_{DSS}	drain leakage current	$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	μA
		$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-2	μA
		$V_{GS} = -8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-2	μA
		$V_{GS} = 4.5 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-0.5	μA
		$V_{GS} = -4.5 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-0.5	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$; $I_D = -400 \text{ mA}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.67	0.85	Ω
		$V_{GS} = -4.5 \text{ V}$; $I_D = -400 \text{ mA}$; $T_j = 150 \text{ }^\circ\text{C}$	-	1.1	1.4	Ω
		$V_{GS} = -2.5 \text{ V}$; $I_D = -200 \text{ mA}$; $T_j = 25 \text{ }^\circ\text{C}$	-	1.2	1.5	Ω
		$V_{GS} = -1.8 \text{ V}$; $I_D = -10 \text{ mA}$; $T_j = 25 \text{ }^\circ\text{C}$	-	1.8	2.8	Ω
g_{fs}	forward transconductance	$V_{DS} = -10 \text{ V}$; $I_D = -200 \text{ mA}$; $T_j = 25 \text{ }^\circ\text{C}$	-	610	-	mS
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$; $I_D = -400 \text{ mA}$; $V_{GS} = -4.5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.76	1.14	nC
Q_{GS}	gate-source charge		-	0.28	-	nC
Q_{GD}	gate-drain charge		-	0.18	-	nC
C_{iss}	input capacitance	$V_{DS} = -10 \text{ V}$; $f = 1 \text{ MHz}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	58	87	pF
C_{oss}	output capacitance		-	21	-	pF
C_{rss}	reverse transfer capacitance		-	12	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$; $R_L = 250 \Omega$; $V_{GS} = -4.5 \text{ V}$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	18	36	ns
t_r	rise time		-	30	-	ns
$t_{d(off)}$	turn-off delay time		-	80	160	ns
t_f	fall time		-	72	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = -300 \text{ mA}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-0.48	-0.84	-1.2	V



$T_j = 25\text{ °C}$

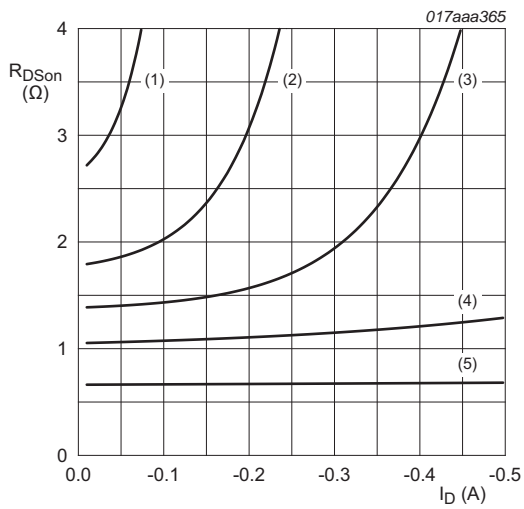
Fig 7. Output characteristics: drain current as a function of drain-source voltage; typical values



$T_j = 25\text{ °C}; V_{DS} = -5\text{ V}$

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

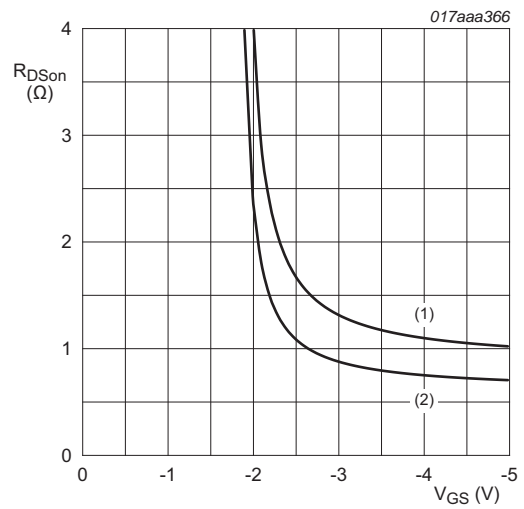
Fig 8. Sub-threshold drain current as a function of gate-source voltage



$T_j = 25\text{ °C}$

- (1) $V_{GS} = -1.5\text{ V}$
- (2) $V_{GS} = -1.8\text{ V}$
- (3) $V_{GS} = -2.0\text{ V}$
- (4) $V_{GS} = -2.5\text{ V}$
- (5) $V_{GS} = -4.5\text{ V}$

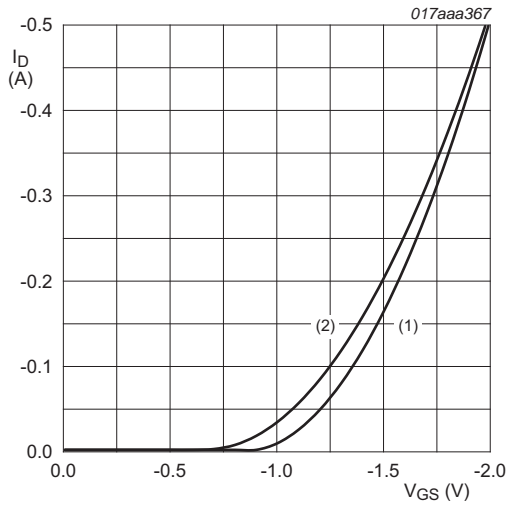
Fig 9. Drain-source on-state resistance as a function of drain current; typical values



$I_D = -400\text{ mA}$

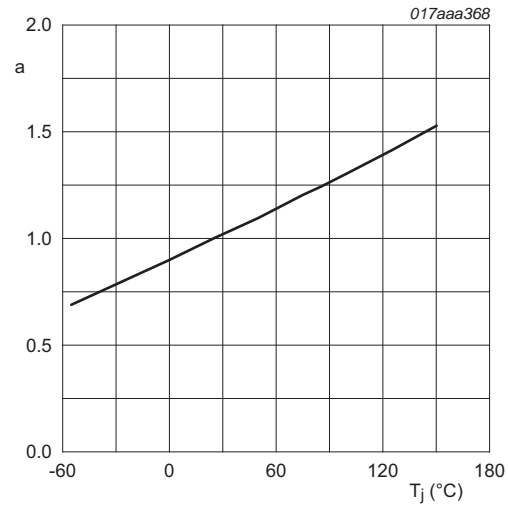
- (1) $T_j = 150\text{ °C}$
- (2) $T_j = 25\text{ °C}$

Fig 10. Drain-source on-state resistance as a function of gate-source voltage; typical values



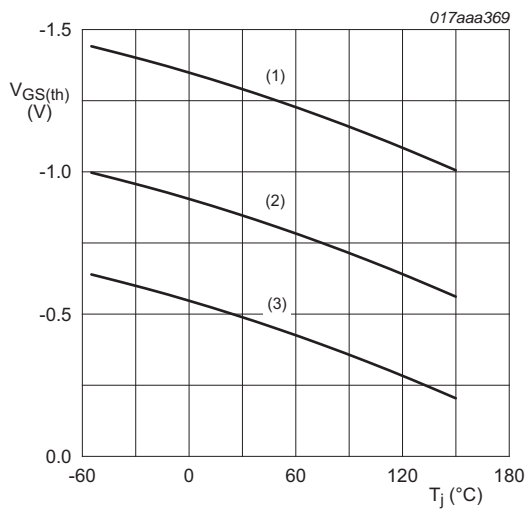
$V_{DS} > I_D \times R_{DS(on)}$
 (1) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

Fig 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values



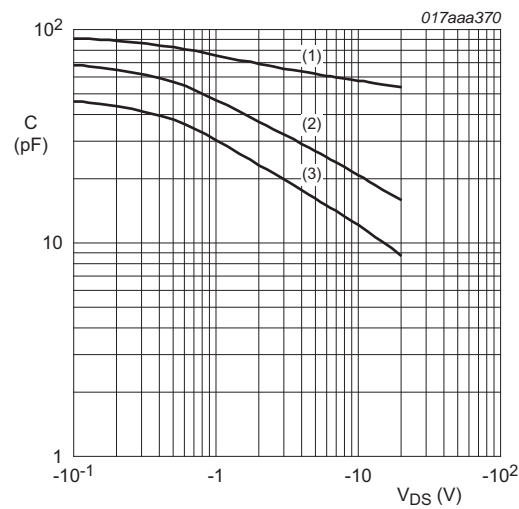
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{ °C})}}$$

Fig 12. Normalized drain-source on-state resistance as a function of ambient temperature; typical values



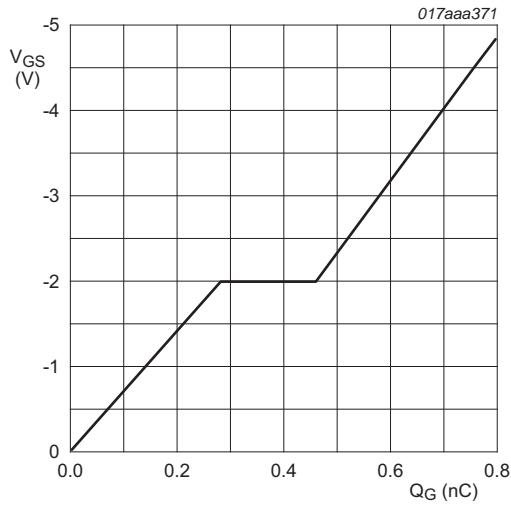
$I_D = -0.25\text{ mA}$; $V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

Fig 13. 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 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$I_D = -0.4$ A; $V_{DD} = -10$ V; $T_{amb} = 25$ °C

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

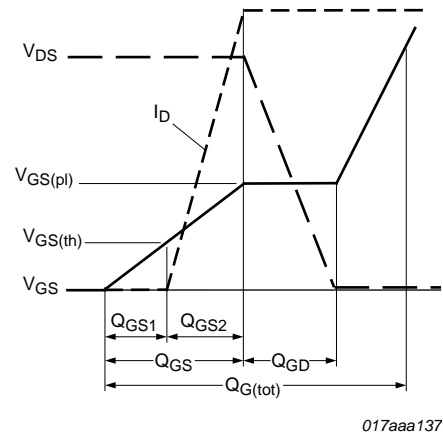
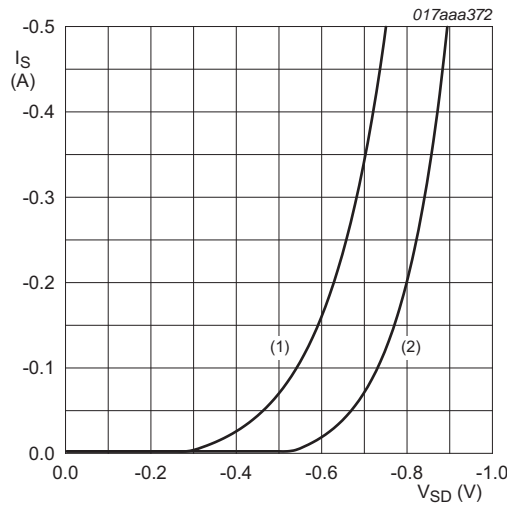


Fig 16. Gate charge waveform definitions



$V_{GS} = 0$ V
 (1) $T_{amb} = 150$ °C
 (2) $T_{amb} = 25$ °C

Fig 17. Source current as a function of source-drain voltage; typical values

8. Test information

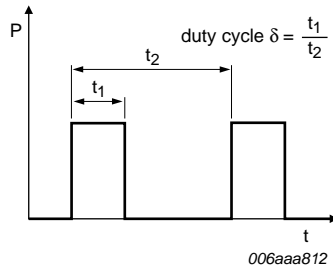


Fig 18. Duty cycle definition

9. Package outline

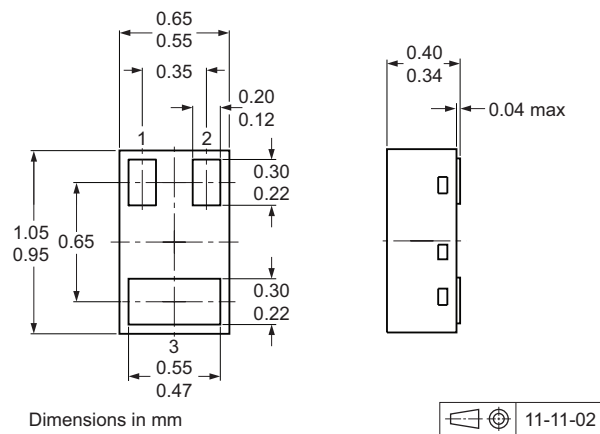


Fig 19. Package outline DFN1006B-3 (SOT883B)

10. Soldering

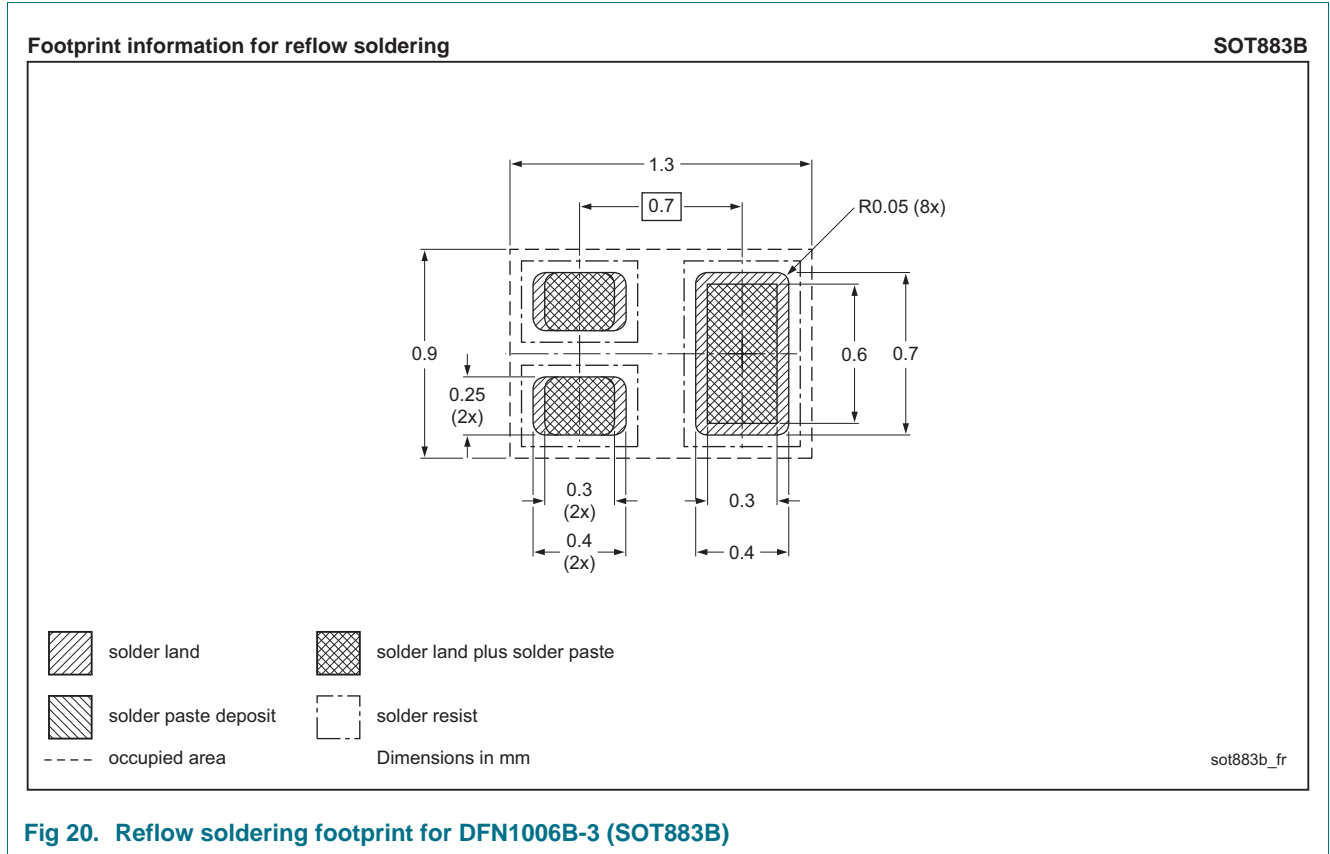


Fig 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMZB670UPE v.3	20120323	Product data sheet	-	PMZB670UPE v.2
Modifications:	• 1.2 "Features and benefits" is corrected.			
PMZB670UPE v.2	20120207	Product data sheet	-	PMZB670UPE v.1
PMZB670UPE v.1	20120131	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.

[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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