



# PMZB950UPEL

20 V, P-channel Trench MOSFET

5 December 2016

Product data sheet

## 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.

## 2. Features and benefits

- Low leakage current
- Trench MOSFET technology
- Leadless ultra small and ultra thin SMD plastic package: 1.0 × 0.6 × 0.37 mm
- ElectroStatic Discharge (ESD) protection > 1 kV HBM
- Drain-source on-state resistance  $R_{DSon} = 1.02 \Omega$

## 3. Applications

- Relay driver
- High-speed line driver
- High-side load switch
- Switching circuits

## 4. Quick reference data

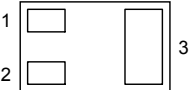
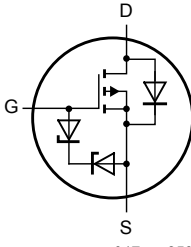
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25 \text{ }^\circ\text{C}$	-	-	-20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = -4.5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	-	-500	mA
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}; I_D = -500 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}$	-	1.02	1.4	$\Omega$

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

### 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>Transparent top view DFN1006B-3 (SOT883B)</p>	 <p>017aaa259</p>
2	S	source		
3	D	drain		

### 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB950UPEL	DFN1006B-3	DFN1006B-3: leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

### 7. Marking

Table 4. Marking codes

Type number	Marking code
PMZB950UPEL	0101 1111

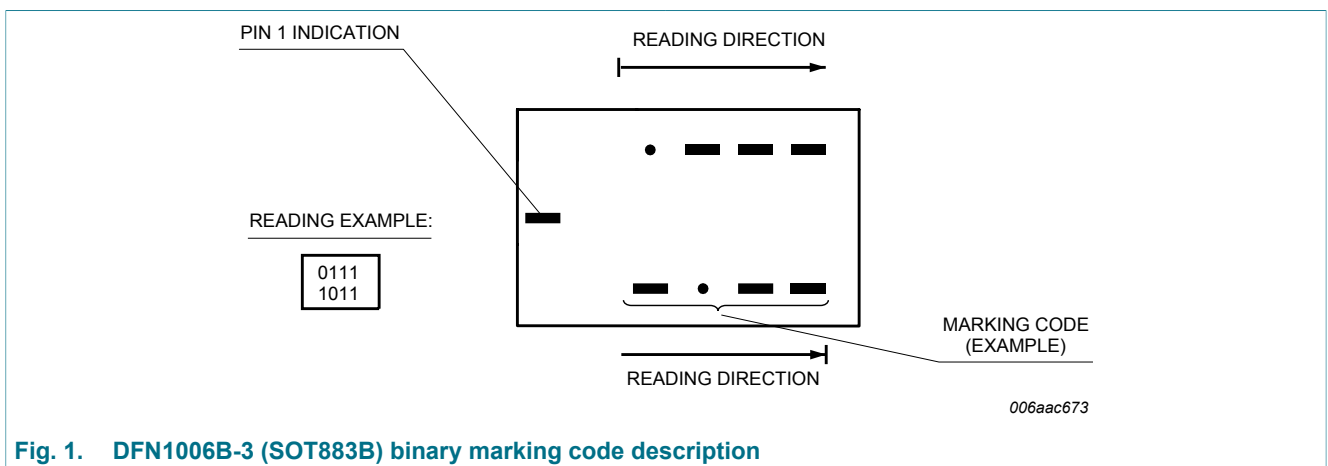


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

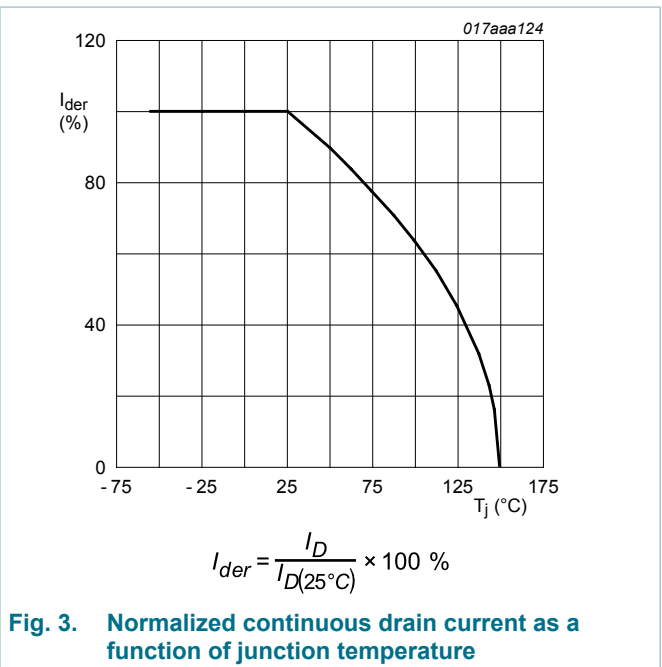
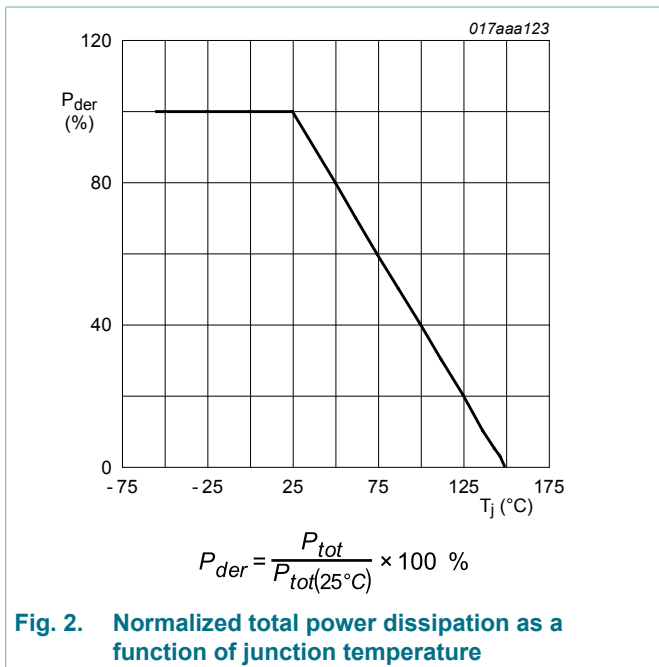
## 8. Limiting values

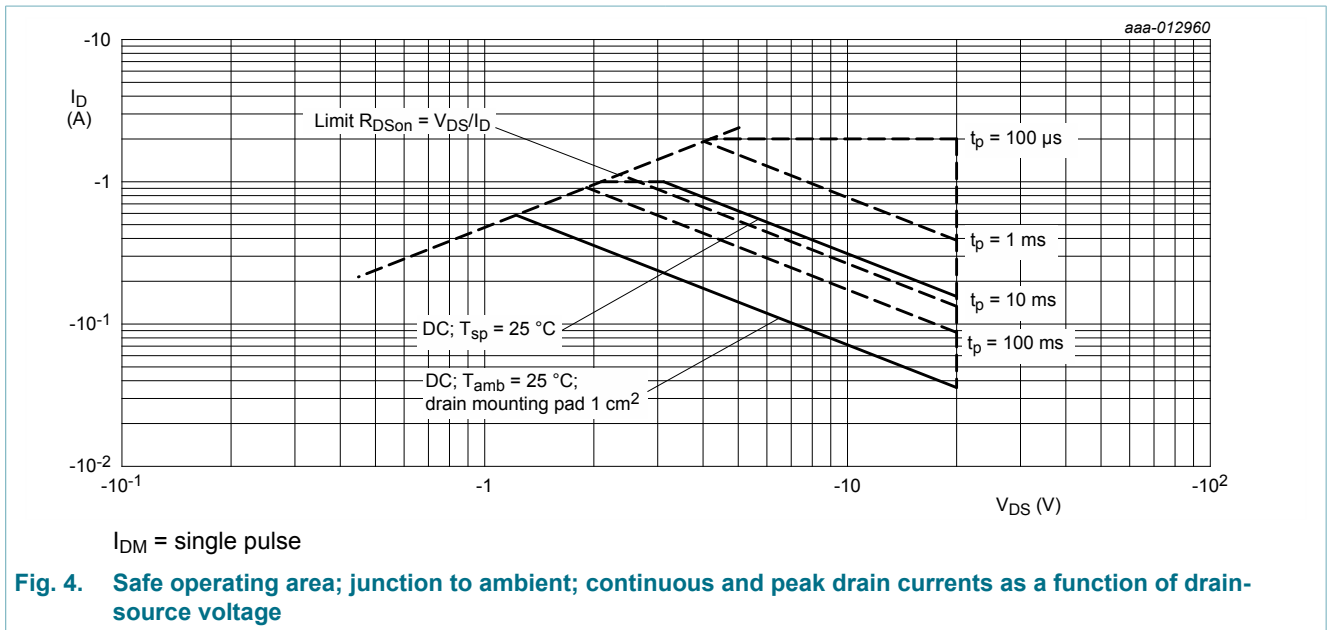
**Table 5. Limiting values**

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		-	-20	V
V <sub>GS</sub>	gate-source voltage			-8	8	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	-500	mA
		V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	-300	mA
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	-2	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	360	mW
			[1]	-	715	mW
		T <sub>sp</sub> = 25 °C		-	2700	mW
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]	-	-350	mA

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





## 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]	-	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  $1\text{ cm}^2$ .

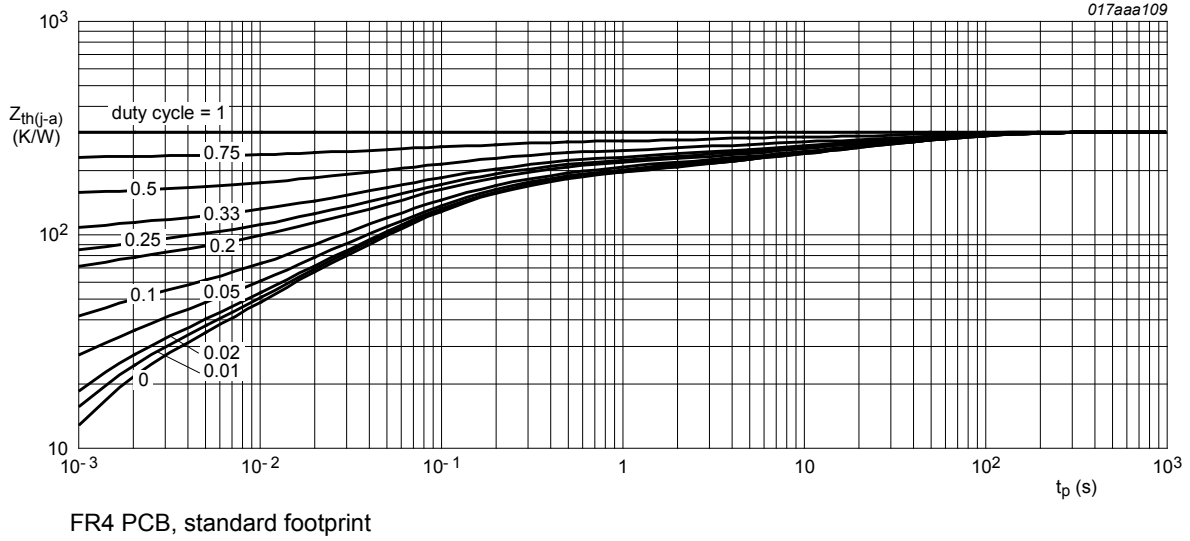


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

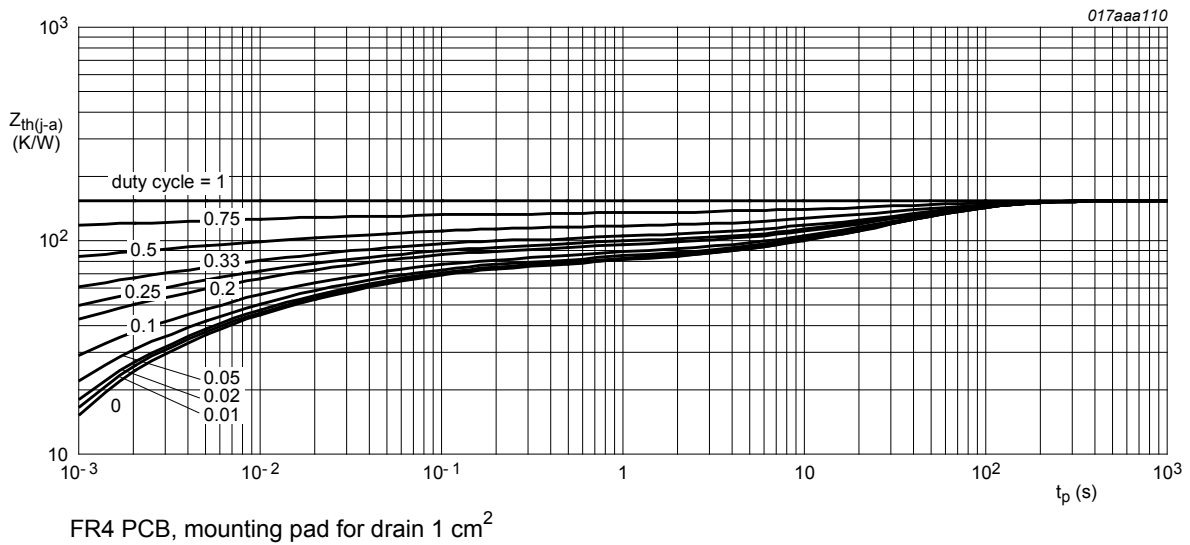


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu A$ ; $V_{DS}=V_{GS}$ ; $T_j = 25 \text{ }^\circ C$	-0.45	-0.7	-0.95	V
$I_{DSS}$	drain leakage current	$V_{DS} = -20 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-1	$\mu A$
		$V_{DS} = -20 V$ ; $V_{GS} = 0 V$ ; $T_j = 150 \text{ }^\circ C$	-	-	-10	$\mu A$
		$V_{DS} = -5 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-25	nA
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	10	$\mu A$
		$V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-10	$\mu A$
		$V_{GS} = -4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-1	$\mu A$
		$V_{GS} = 4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{GS} = 1.8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	50	nA
		$V_{GS} = -1.8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-50	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 V$ ; $I_D = -500 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	1.02	1.4	$\Omega$
		$V_{GS} = -4.5 V$ ; $I_D = -500 \text{ mA}$ ; $T_j = 150 \text{ }^\circ C$	-	1.54	2.1	$\Omega$
		$V_{GS} = -2.5 V$ ; $I_D = -200 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	1.27	2.2	$\Omega$
		$V_{GS} = -1.8 V$ ; $I_D = -40 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	1.7	3.3	$\Omega$
		$V_{GS} = -1.5 V$ ; $I_D = -10 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	2.3	5	$\Omega$
		$V_{GS} = -1.2 V$ ; $I_D = -1 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	3.5	-	$\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -10 V$ ; $I_D = -500 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	480	-	mS
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 V$ ; $I_D = -450 \text{ mA}$ ; $V_{GS} = -4.5 V$ ; $T_j = 25 \text{ }^\circ C$	-	1.19	2.1	nC
$Q_{GS}$	gate-source charge		-	0.17	-	nC
$Q_{GD}$	gate-drain charge		-	0.1	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -10 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	43	-	pF
$C_{oss}$	output capacitance		-	14	-	pF
$C_{rss}$	reverse transfer capacitance		-	8	-	pF
$t_{d(on)}$	turn-on delay time		$V_{DS} = -10 V$ ; $I_D = -0.45 \text{ A}$ ; $R_L = 22 \text{ } \Omega$ ; $V_{GS} = -4.5 V$ ; $R_{G(ext)} = 6 \text{ } \Omega$ ; $T_j = 25 \text{ }^\circ C$	-	2.3	-
$t_r$	rise time	-		5	-	ns
$t_{d(off)}$	turn-off delay time	-		13.5	-	ns
$t_f$	fall time	-		6	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -115 \text{ mA}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-0.7	-1.2	V

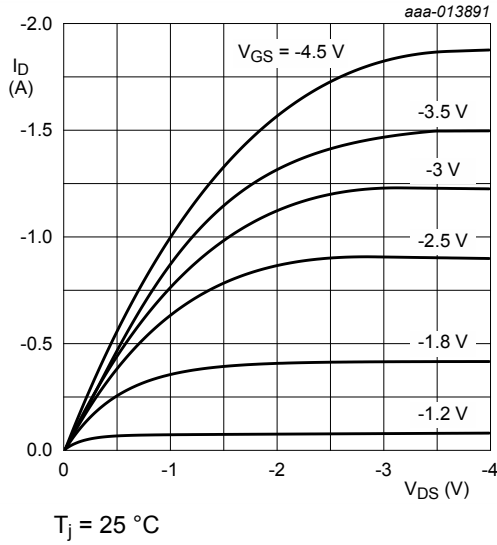


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

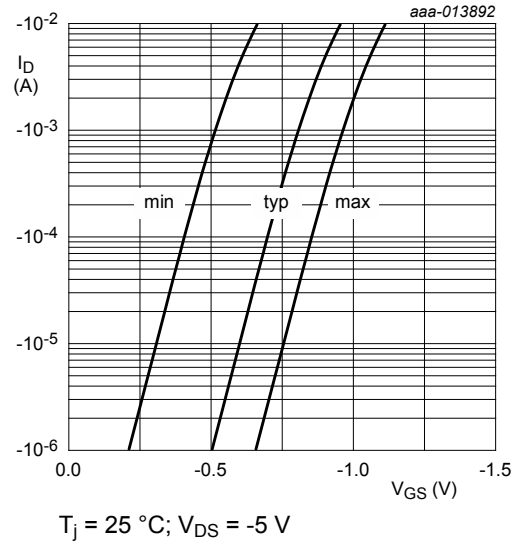


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

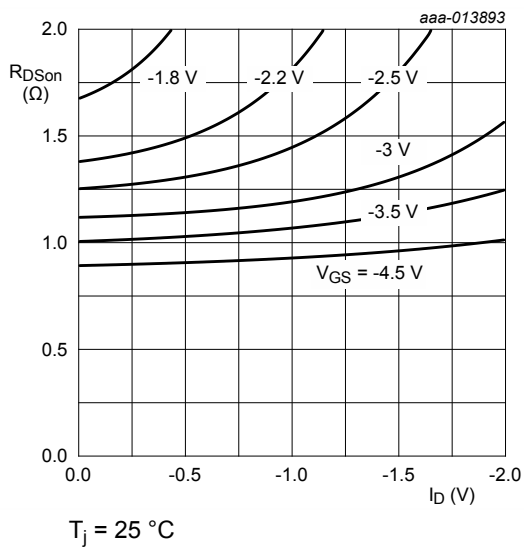


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

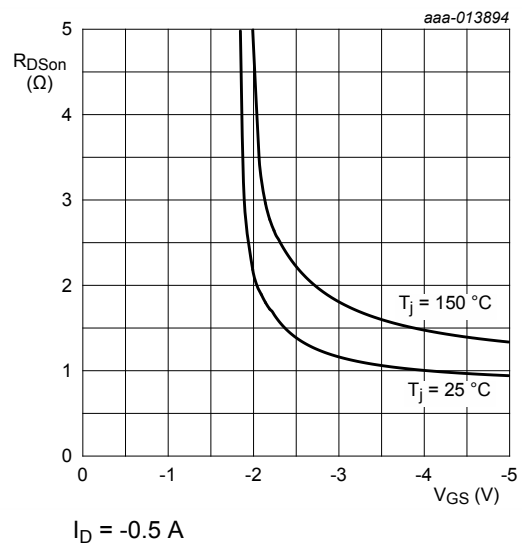
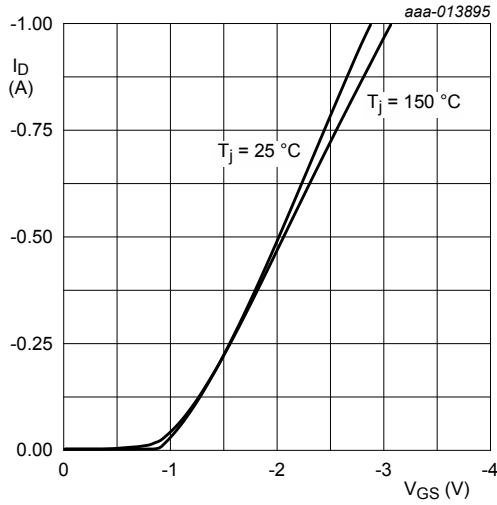
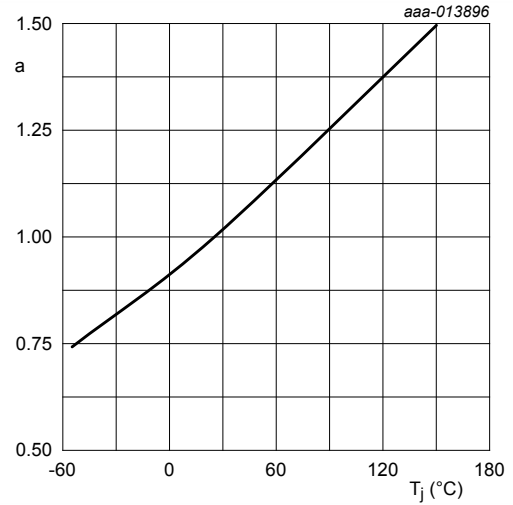


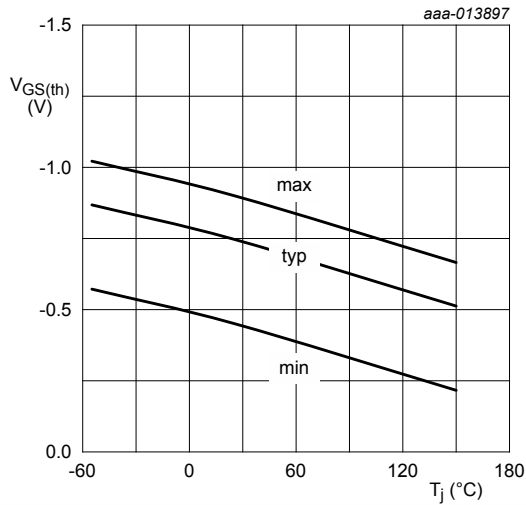
Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values



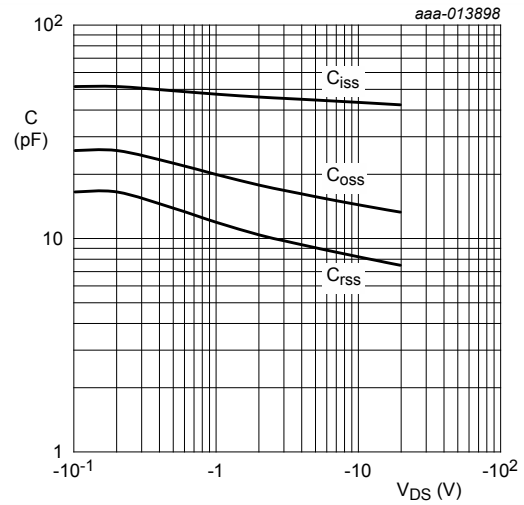
**Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



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

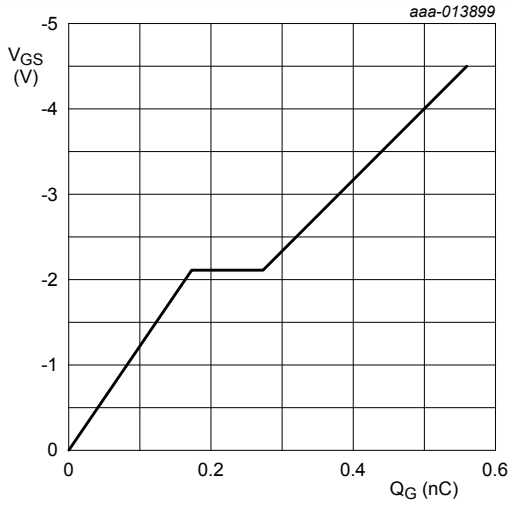


**Fig. 13. Gate-source threshold voltage as a function of junction temperature**



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





$I_D = -0.45$  A;  $V_{DS} = -10$  V;  $T_{amb} = 25$  °C

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

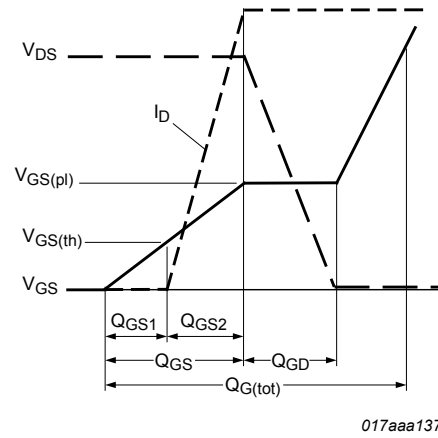
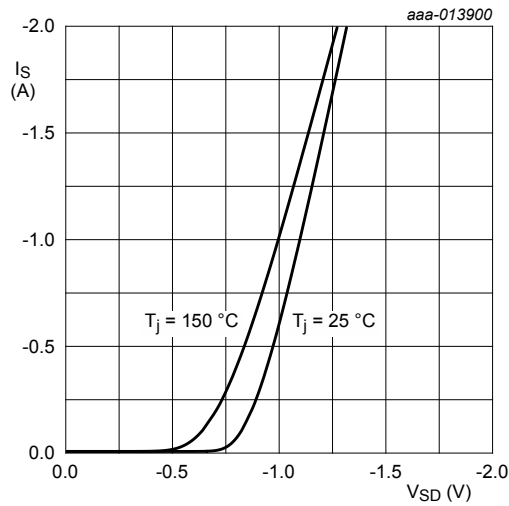


Fig. 16. MOSFET transistor: Gate charge waveform definitions

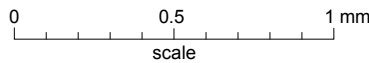
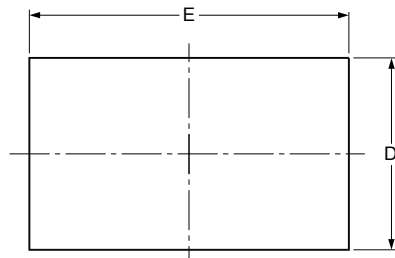
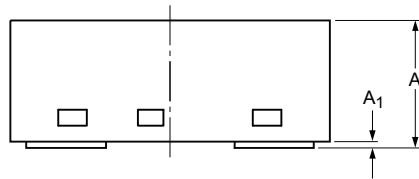
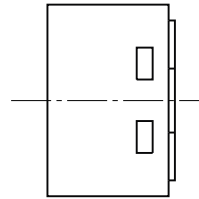
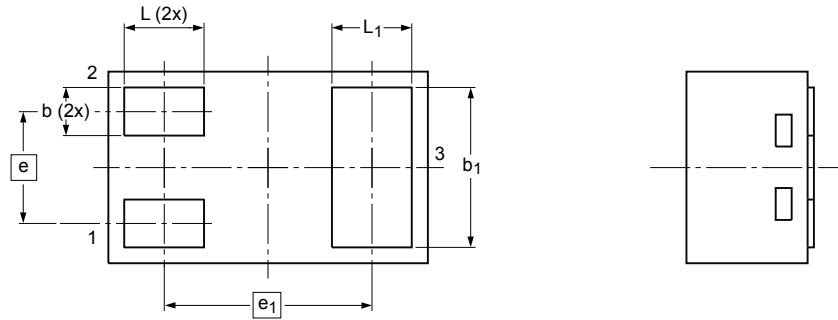


$V_{GS} = 0$  V

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

### 11. Package outline

Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm SOT883B



Dimensions

Unit	A <sup>(1)</sup>	A <sub>1</sub>	b	b <sub>1</sub>	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	max 0.40	0.04	0.20	0.55	0.65	1.05			0.30	0.30
	nom 0.37		0.15	0.50	0.60	1.00	0.35	0.65	0.25	0.25
	min 0.34		0.12	0.47	0.55	0.95			0.22	0.22

Note

1. Including plating thickness

sot883b\_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT883B					-11-11-02- 12-01-03

Fig. 18. Package outline DFN1006B-3 (SOT883B)

## 12. Soldering

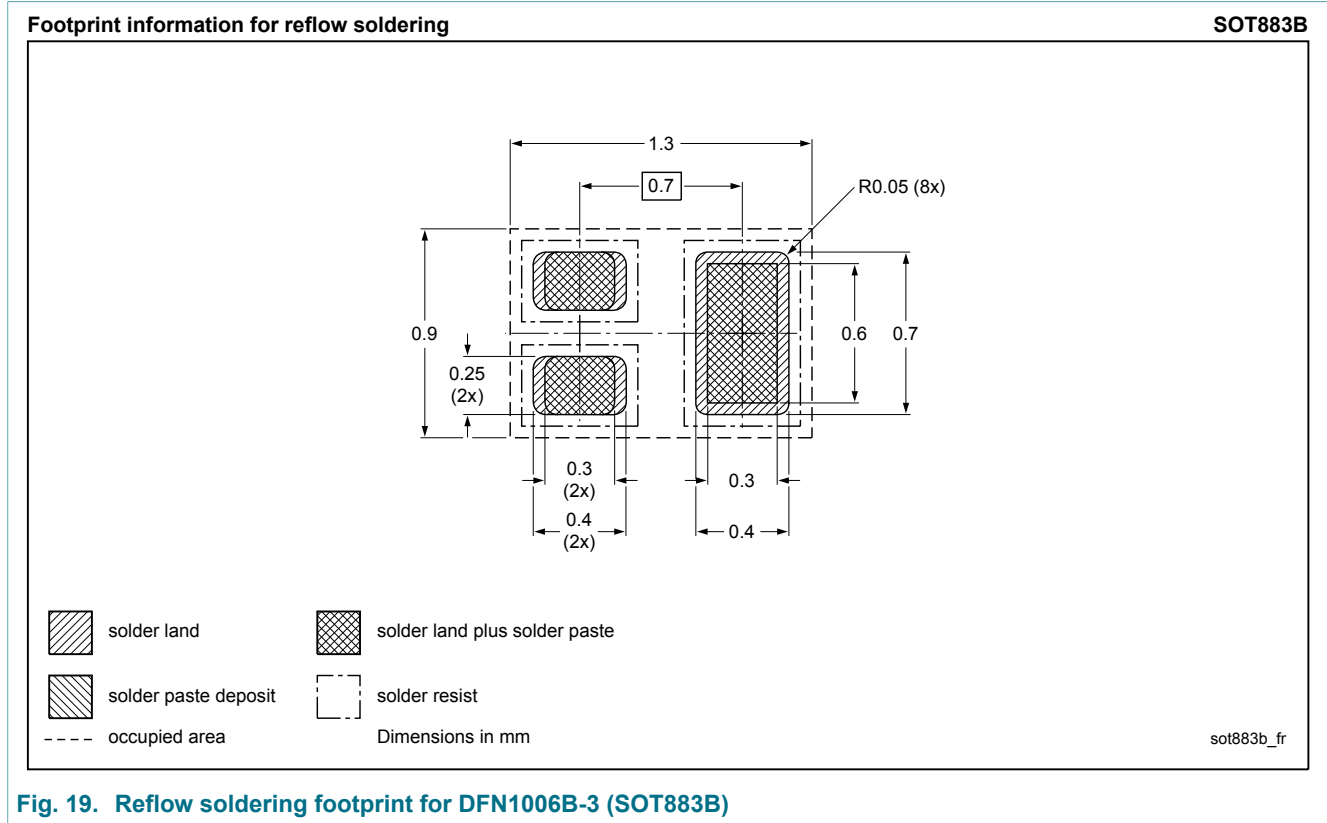


Fig. 19. Reflow soldering footprint for DFN1006B-3 (SOT883B)

### 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZB950UPEL v.1	20161205	Product data sheet	-	-

## 14. Legal information

### Data sheet status

Document status <sup>[1] [2]</sup>	Product status <sup>[3]</sup>	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.
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Date of release: 05 December 2016

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