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# PMZB950UPE

20 V, P-channel Trench MOSFET

28 July 2014

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

- 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  $R_{DS(on)} = 1.02 \Omega$

## 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>						
$R_{DS(on)}$	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>.



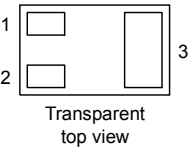
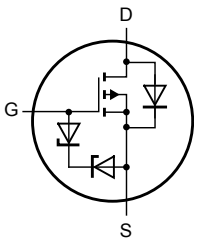
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**5. Pinning information**

Table 2. Pinning information

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

**6. Ordering information**

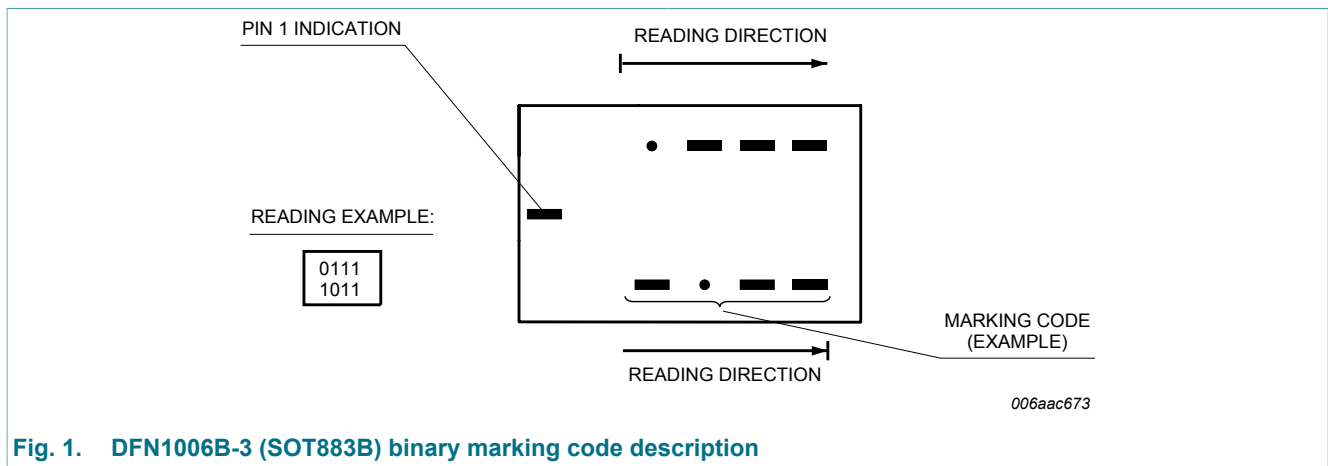
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB950UPE	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
PMZB950UPE	0101 1001



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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 <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.

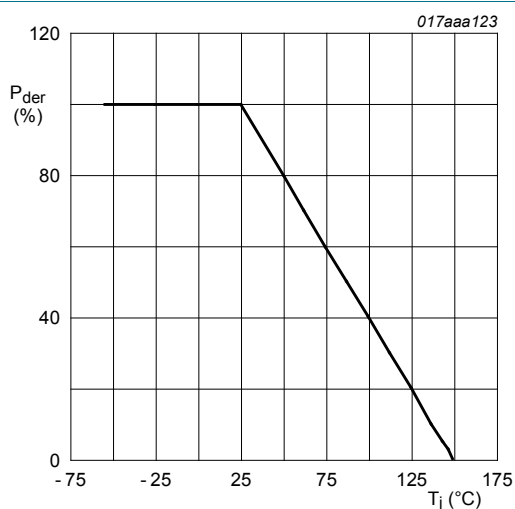


Fig. 2. Normalized total power dissipation as a function of junction temperature

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

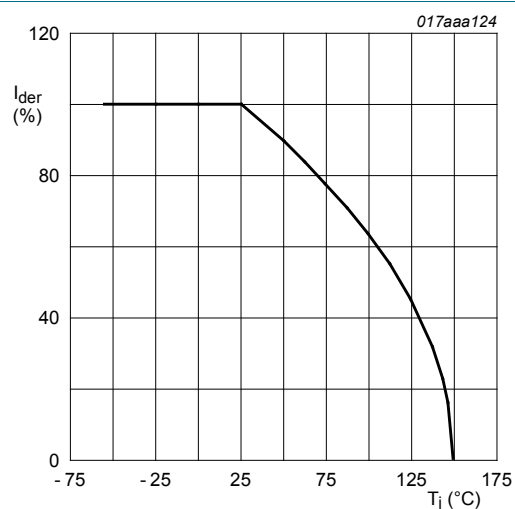


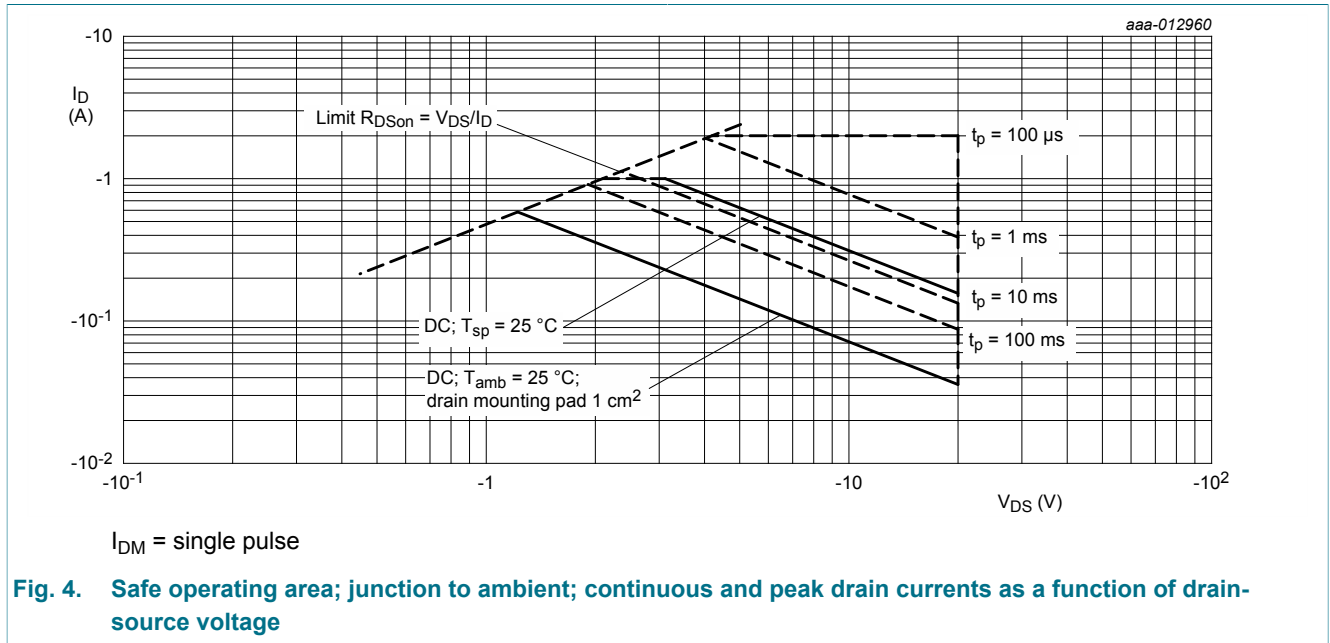
Fig. 3. Normalized continuous drain current as a function of junction temperature

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

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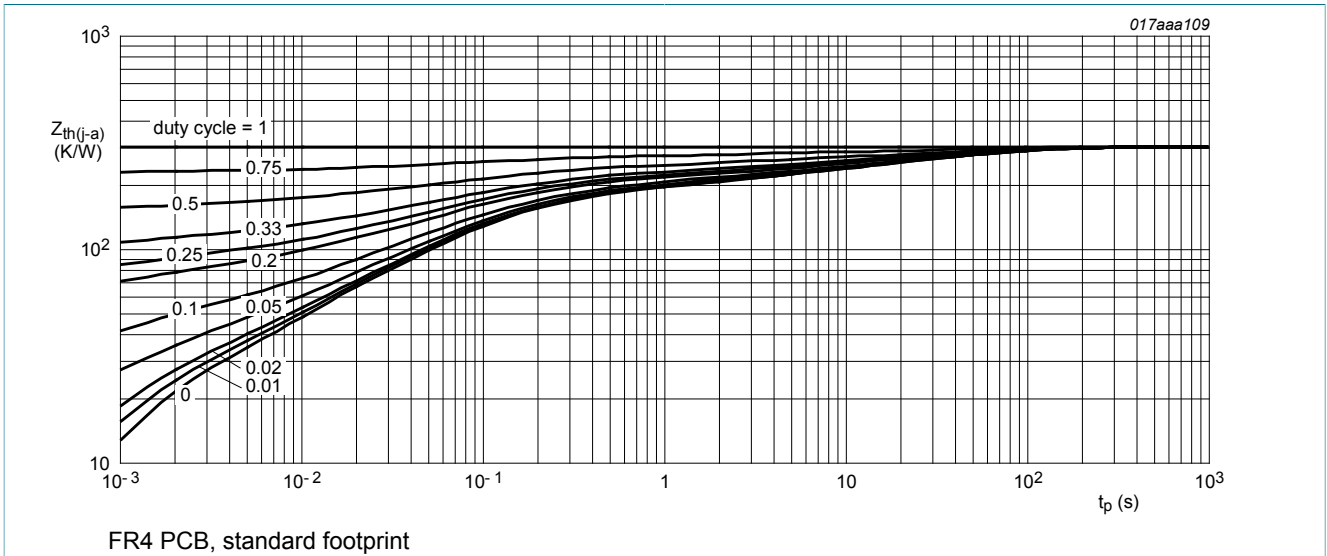
**9. Thermal characteristics**

**Table 6. Thermal characteristics**

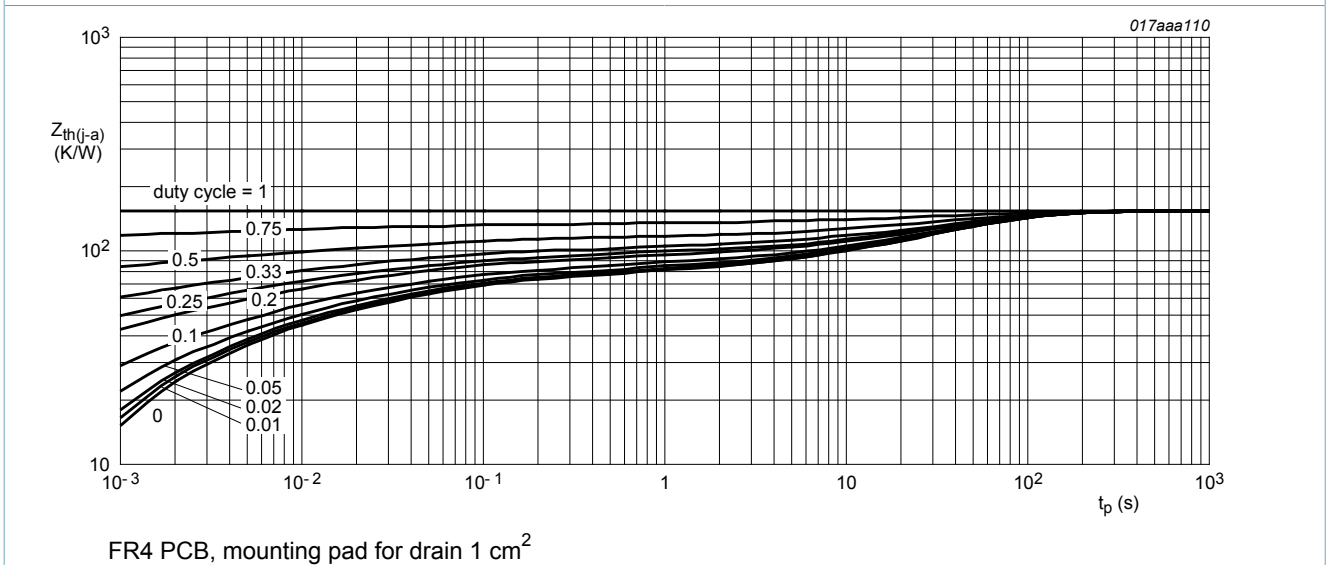
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	305	360	K/W
			[2]	-	150	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	40	K/W

[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

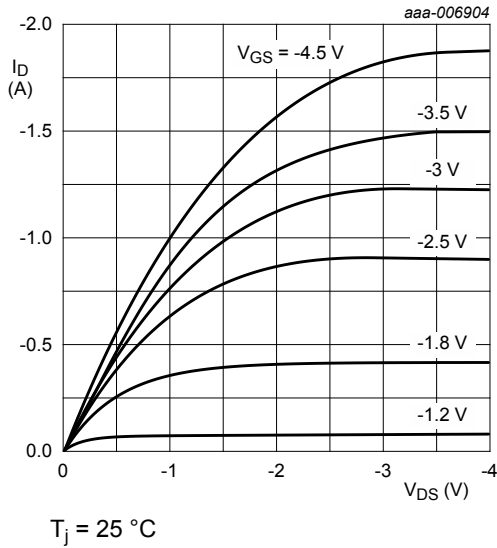
Table 7. Characteristics

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	$\mu A$
$I_{GSS}$	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	$\mu A$
$R_{DSon}$	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	-	ns
$t_r$	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

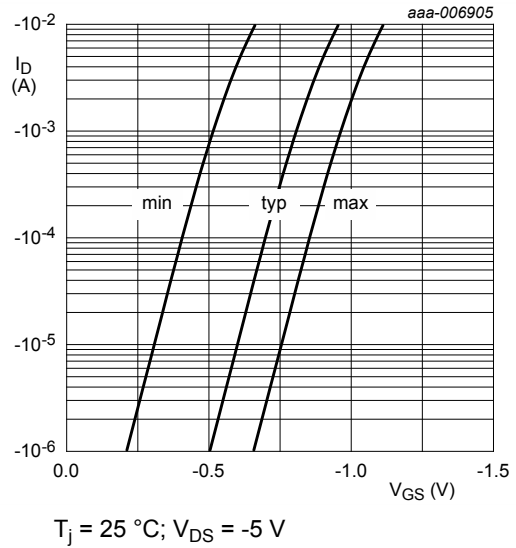
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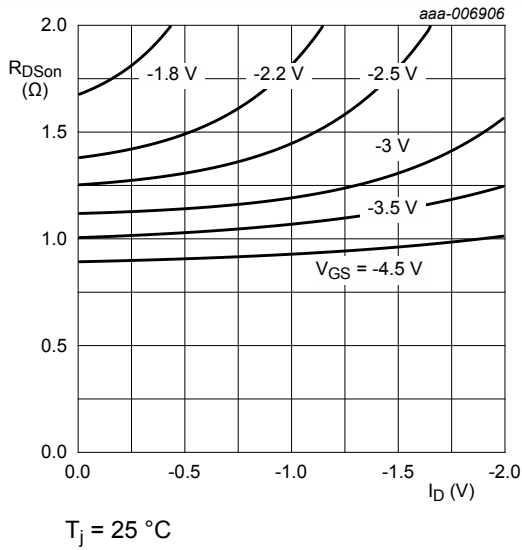
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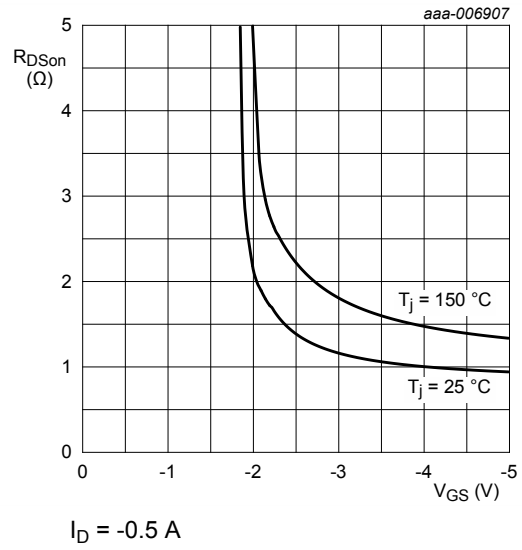
**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



**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**



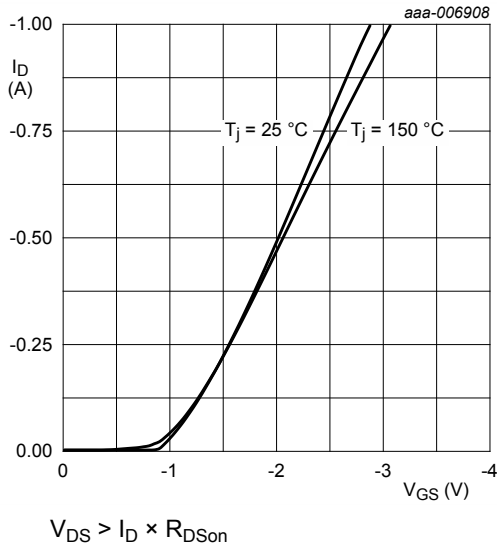
**Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values**



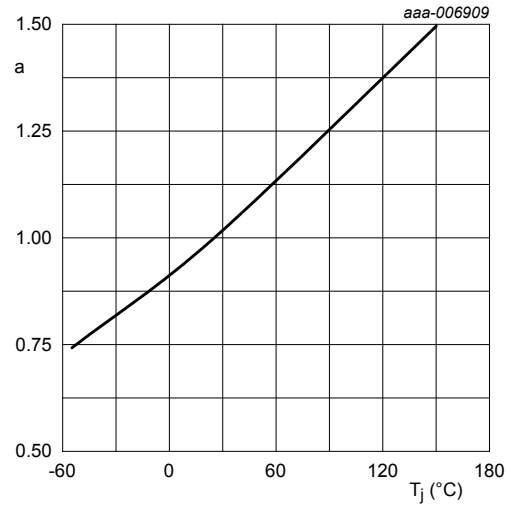
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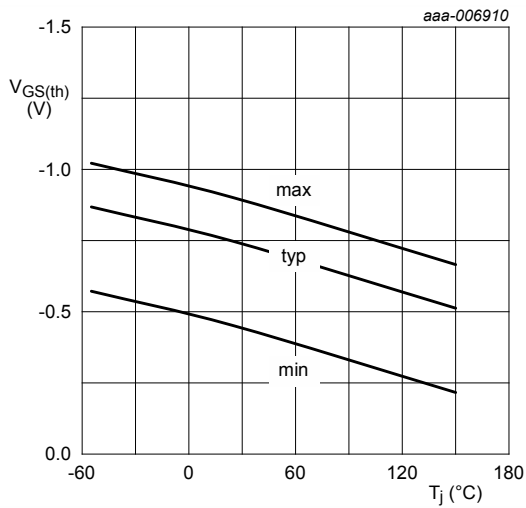


**Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



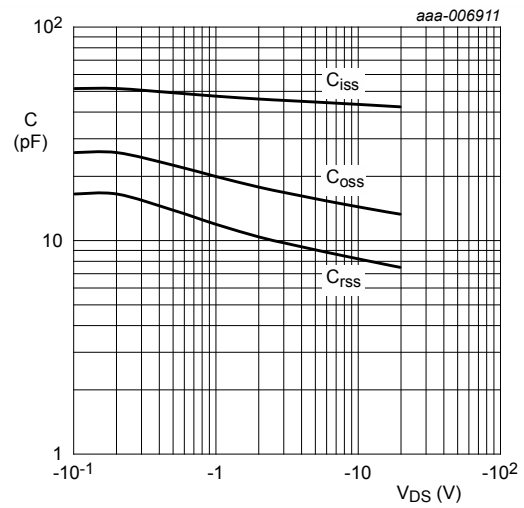
**Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$



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

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



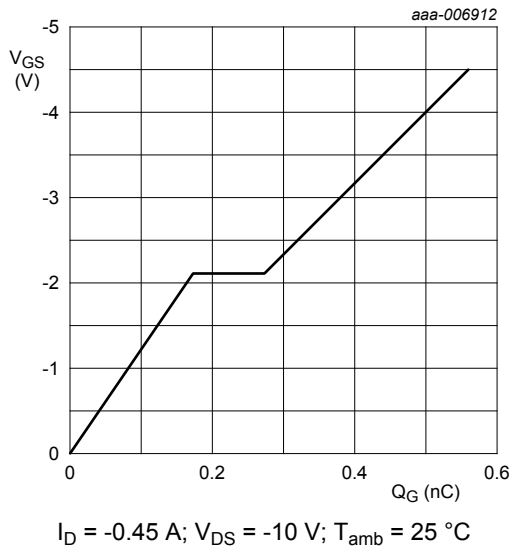
$f = 1\text{ MHz}$ ;  $V_{GS} = 0\text{ V}$

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

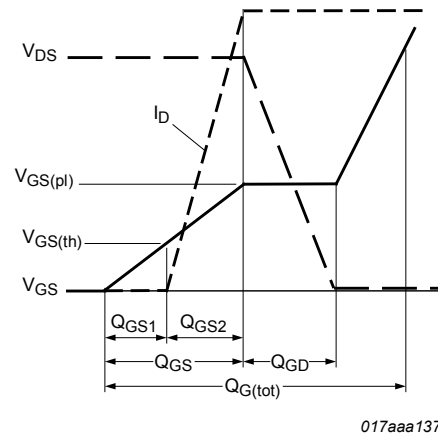
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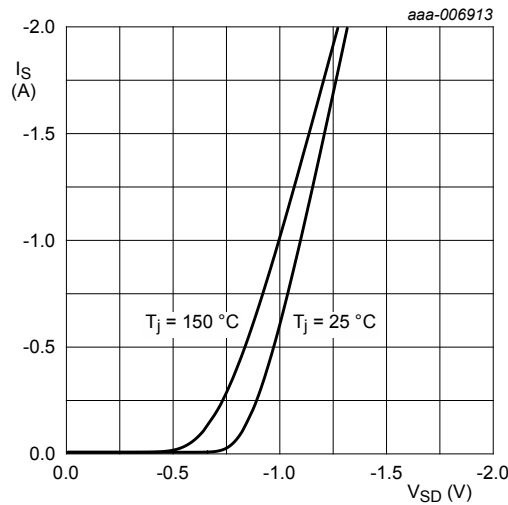
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**Fig. 15. Gate-source voltage as a function of gate charge; typical values**



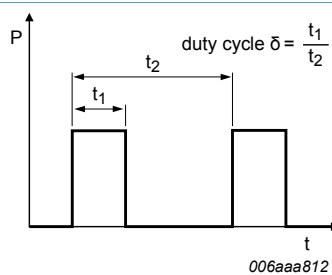
**Fig. 16. MOSFET transistor: Gate charge waveform definitions**



$V_{GS} = 0$  V

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

**11. Test information**



**Fig. 18. Duty cycle definition**

## 12. Package outline

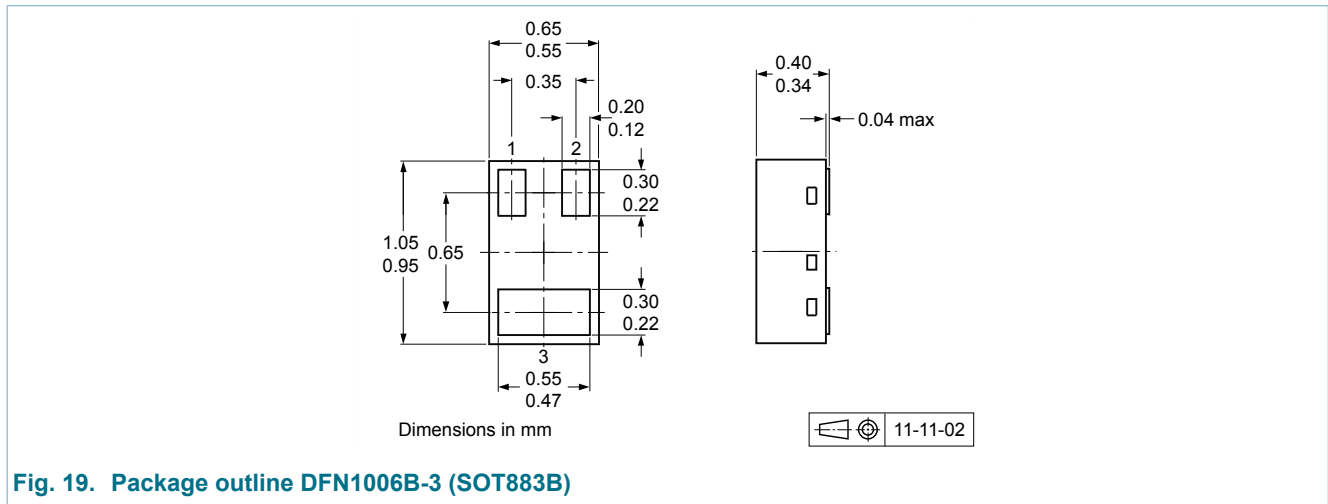


Fig. 19. Package outline DFN1006B-3 (SOT883B)

## 13. Soldering

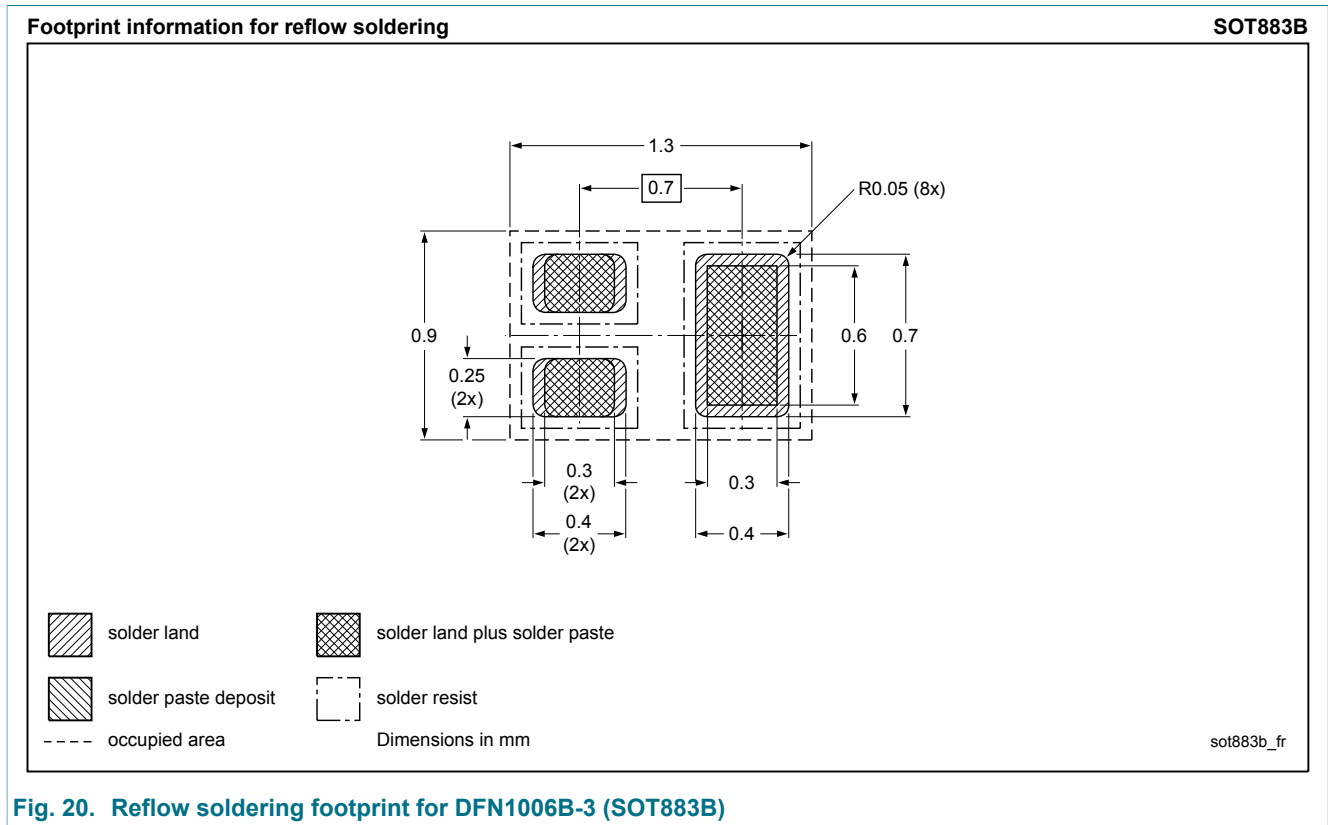


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZB950UPE v.1	20140728	Product data sheet	-	-

## 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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