PMZB290UN

20 V, single N-channel Trench MOSFET

20 January 2016 — Product data sheet

1. General description

N-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

- Fast switching
- Trench MOSFET technology
- Low threshold voltage
- Ultra thin package profile with 0.37 mm height
- ElectroStatic Discharge (ESD) protection: 2 kV HBM

3. Applications

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

4. Quick reference data

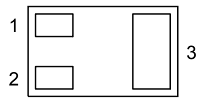
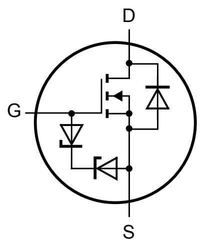
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °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]	-	-	1	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 200 mA; T_j = 25 °C		-	290	350	mΩ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 DFN1006B-3 (SOT883B)	
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB290UN	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
PMZB290UN	0000 0101

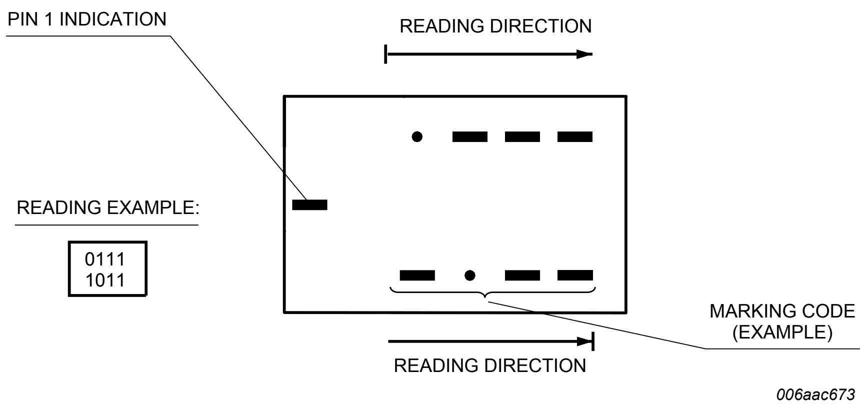


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{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]	-	1	A
		V_{GS} = 4.5 V; T_{amb} = 100 °C	[1]	-	0.6	A
I_{DM}	peak drain current	T_{amb} = 25 °C; single pulse; t_p ≤ 10 µs		-	4	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]	-	0.67	A

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

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

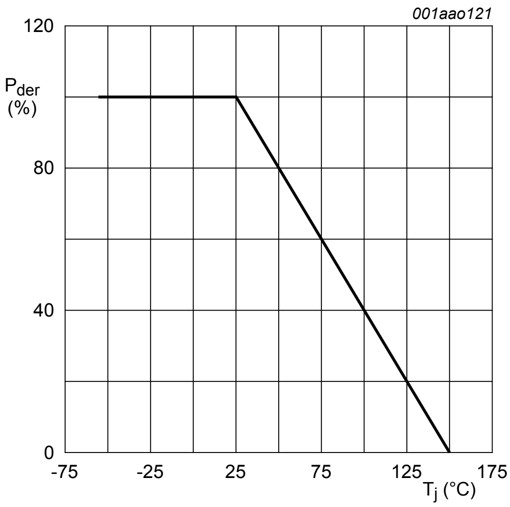


Fig. 2. Normalized total power dissipation as a function of junction temperature

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

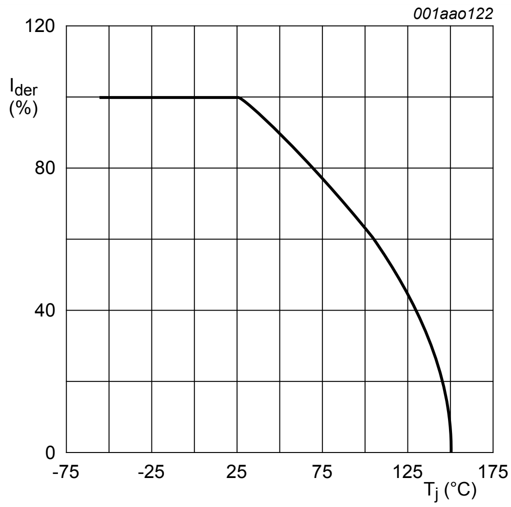
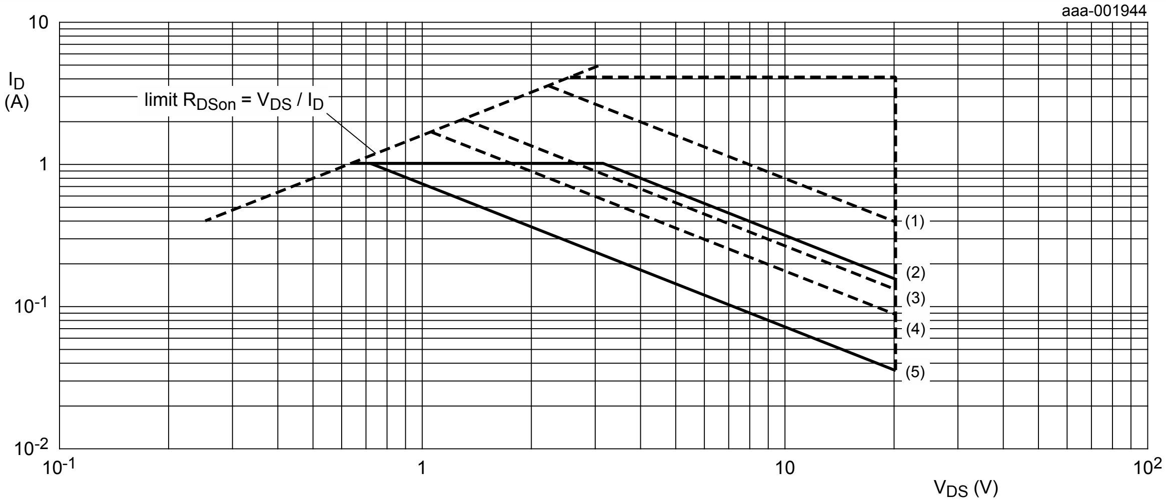


Fig. 3. Normalized continuous drain current as a function of junction temperature

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



I_{DM} is single pulse

(1) t_p = 1 ms

(2) DC; T_{sp} = 25 °C

(3) t_p = 10 ms

(4) t_p = 100 ms

(5) DC; T_{amb} = 25 °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

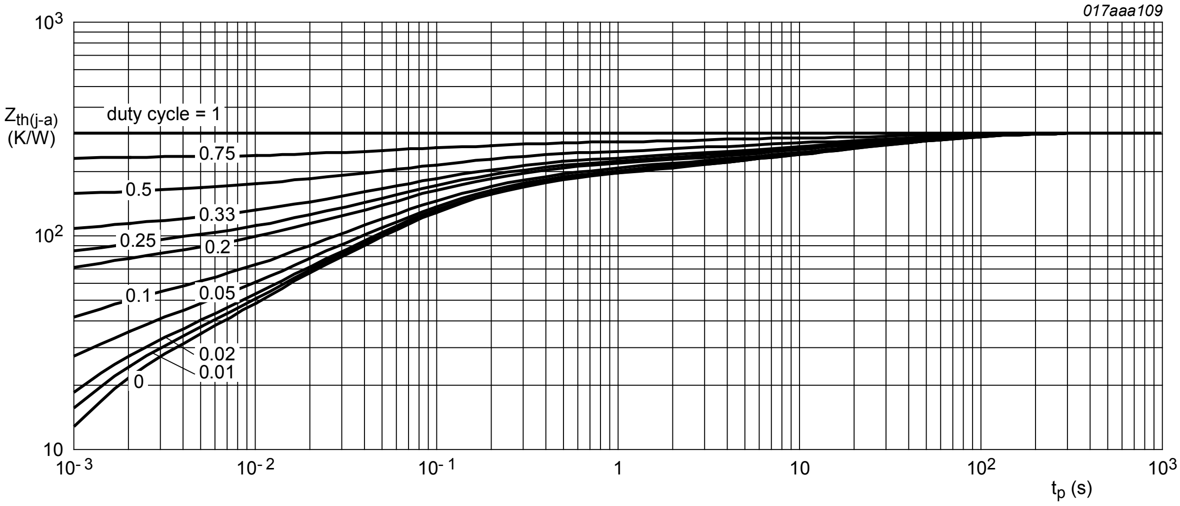
9. Thermal characteristics

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

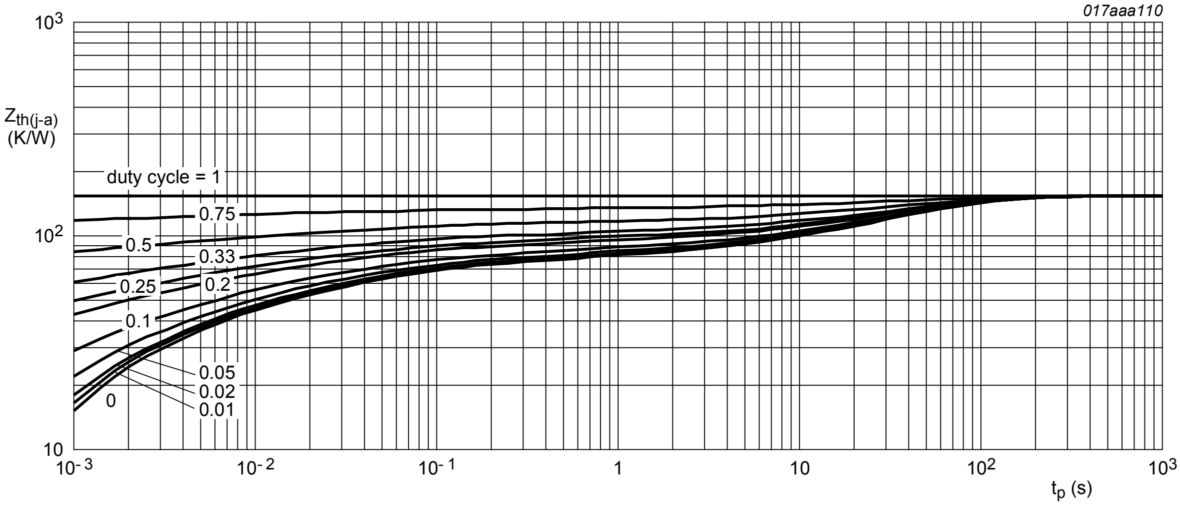
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



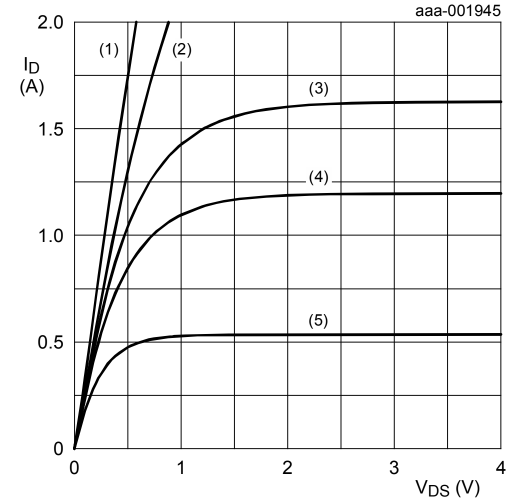
FR4 PCB, mounting pad for drain 1 cm^2

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
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 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		0.45	0.7	0.95	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		-	-	100	µA
I_{GSS}	gate leakage current	V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	5	µA
		V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 °C		-	-	-5	µA
		V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 °C		-	-	1	µA
		V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 °C		-	-	-1	µA
		V_{GS} = 2.5 V; V_{DS} = 0 V; T_j = 25 °C		-	-	100	nA
		V_{GS} = -2.5 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 = 200 mA; T_j = 25 °C		-	290	350	mΩ
		V_{GS} = 4.5 V; I_D = 200 mA; T_j = 150 °C		-	460	560	mΩ
		V_{GS} = 2.5 V; I_D = 100 mA; T_j = 25 °C		-	360	450	mΩ
		V_{GS} = 1.8 V; I_D = 75 mA; T_j = 25 °C		-	460	650	mΩ
g_{fs}	forward transconductance	V_{DS} = 5 V; I_D = 200 mA; T_j = 25 °C		-	5.8	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = 10 V; I_D = 1 A; V_{GS} = 4.5 V; T_j = 25 °C		-	0.89	1.2	nC
Q_{GS}	gate-source charge			-	0.13	-	nC
Q_{GD}	gate-drain charge			-	0.18	-	nC
C_{iss}	input capacitance	V_{DS} = 20 V; f = 1 MHz; V_{GS} = 0 V; T_j = 25 °C		-	45	68	pF
C_{oss}	output capacitance			-	11	-	pF
C_{rss}	reverse transfer capacitance			-	7	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 10 V; R_L = 10 Ω; V_{GS} = 4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C		-	4.5	9	ns
t_r	rise time			-	10	-	ns
$t_{d(off)}$	turn-off delay time			-	18.5	37	ns
t_f	fall time			-	5	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 300 mA; V_{GS} = 0 V; T_j = 25 °C		-	0.75	1.2	V



T_j = 25 °C

(1) V_{GS} = 4.5 V

(2) V_{GS} = 2.5 V

(3) V_{GS} = 2.0 V

(4) V_{GS} = 1.8 V

(5) V_{GS} = 1.5 V

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

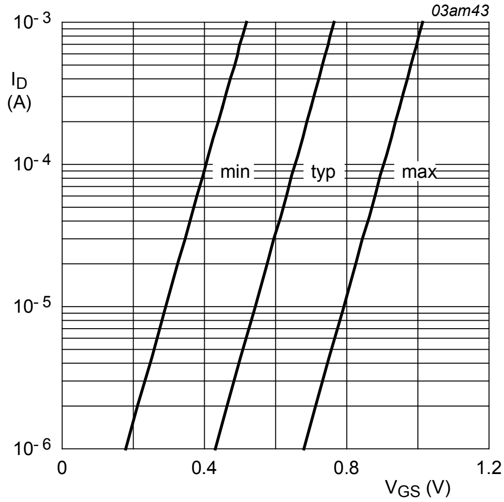
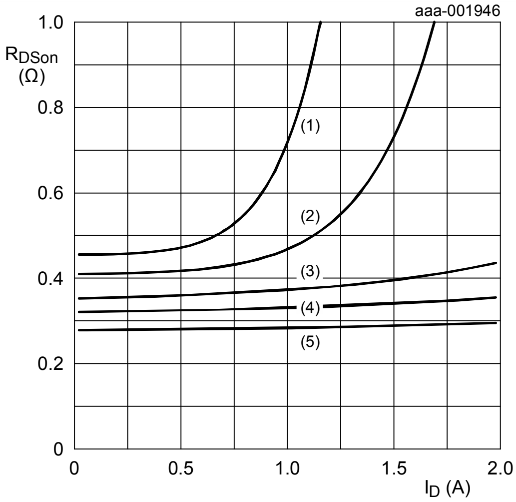


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25°C; V_{DS} = 5V$



T_j = 25 °C

(1) V_{GS} = 1.8 V

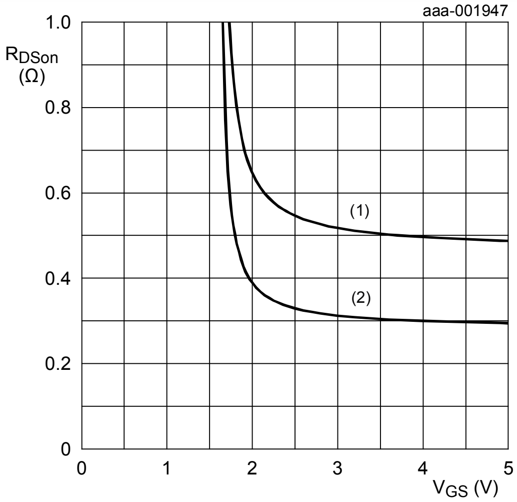
(2) V_{GS} = 2 V

(3) V_{GS} = 2.5 V

(4) V_{GS} = 3 V

(5) V_{GS} = 4.5 V

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

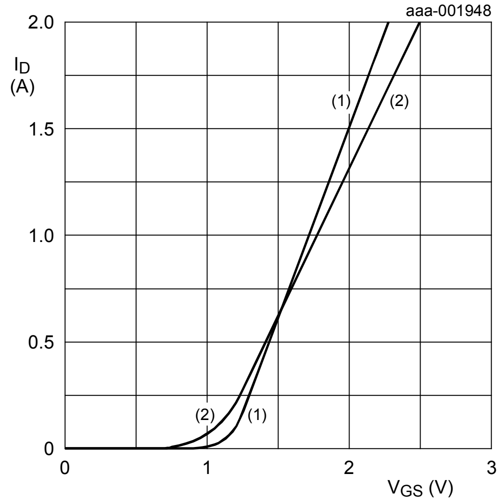


I_D = 800 mA

(1) T_j = 150 °C

(2) T_j = 25 °C

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



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

(1) T_j = 25 °C

(2) T_j = 150 °C

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

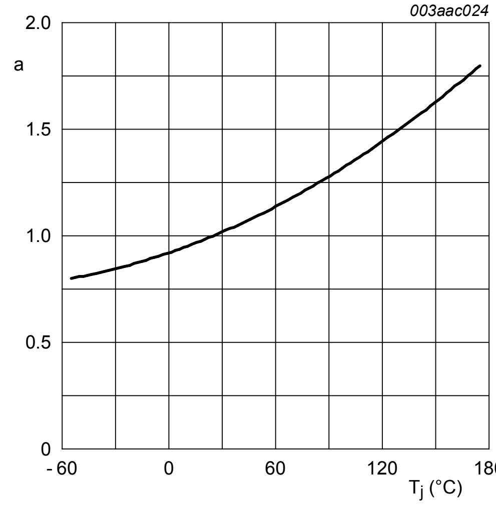
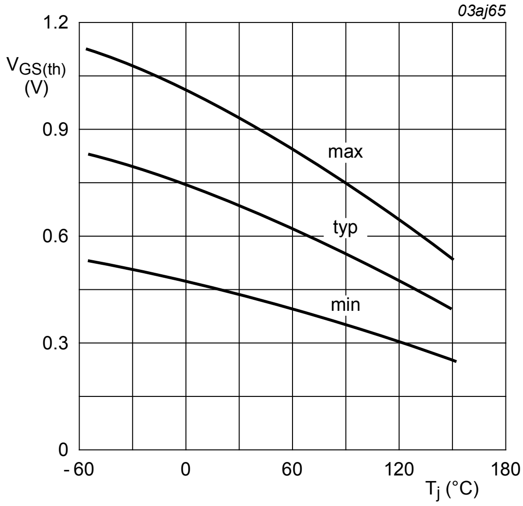


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

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

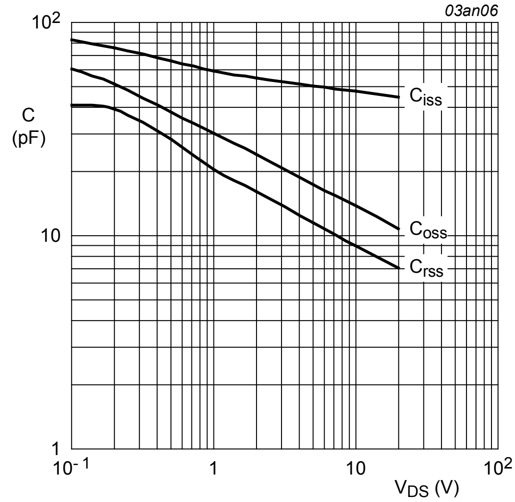


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

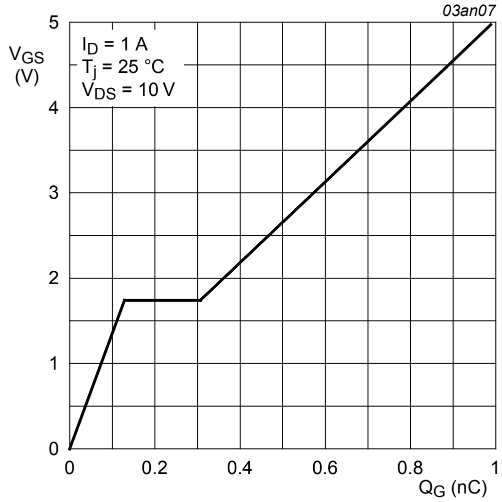


Fig. 15. Gate-source voltage as a function of gate charge; typical values

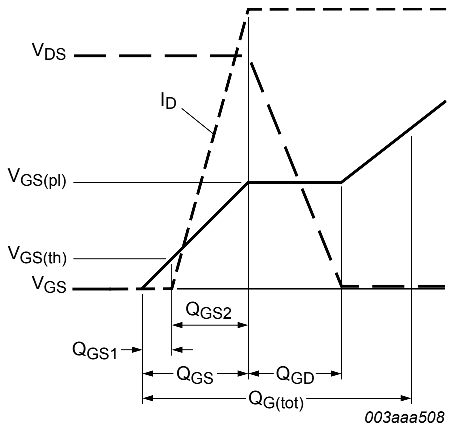
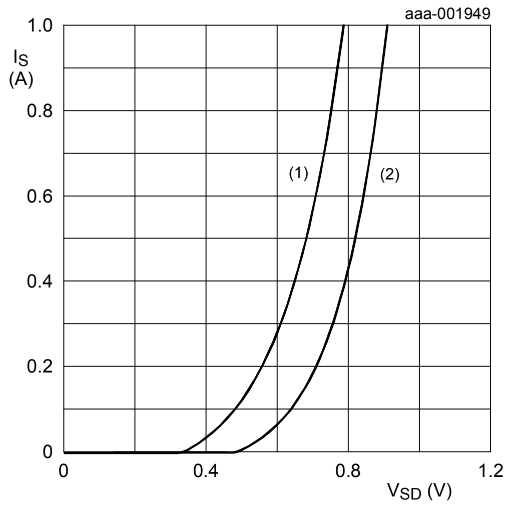


Fig. 16. Gate charge waveform definitions



V_{GS} = 0 V

(1) T_j = 150 °C

(2) T_j = 25 °C

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

11. Test information

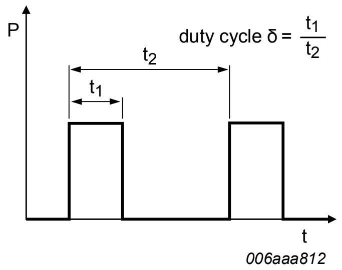


Fig. 18. Duty cycle definition

12. Package outline

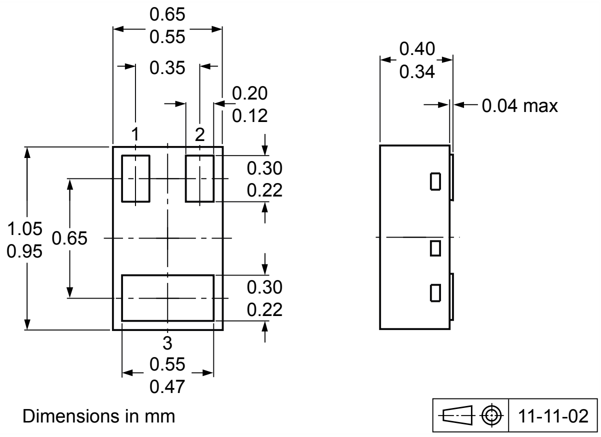


Fig. 19. Package outline DFN1006B-3 (SOT883B)

13. Soldering

Footprint information for reflow soldering **SOT883B**

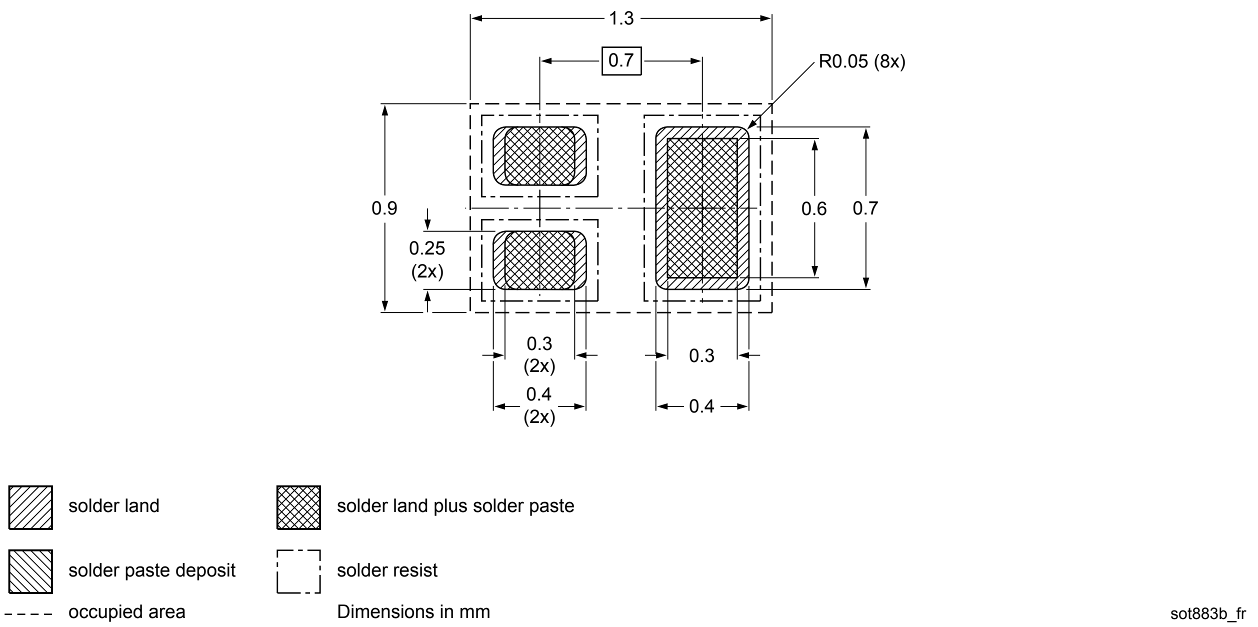


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZB290UN v.2	20160120	Product data sheet	-	PMZB290UN v.1
Modifications:	• values for gate leakage current and forward transconductance changed			
PMZB290UN v.1	20120511	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.

[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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16. Contents

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Date of release: 20 January 2016