



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

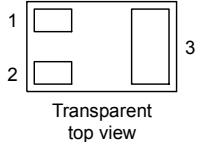
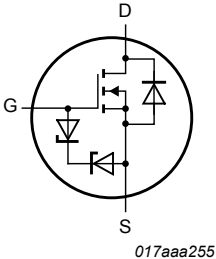
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_J = 25\text{ }^{\circ}\text{C}$		-	-	20	V
V_{GS}	gate-source voltage			-8	-	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	-	1	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 200\text{ mA}; T_J = 25\text{ }^{\circ}\text{C}$		-	290	350	m Ω

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



5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 Transparent top view DFN1006B-3 (SOT883B)	 017aaa255
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

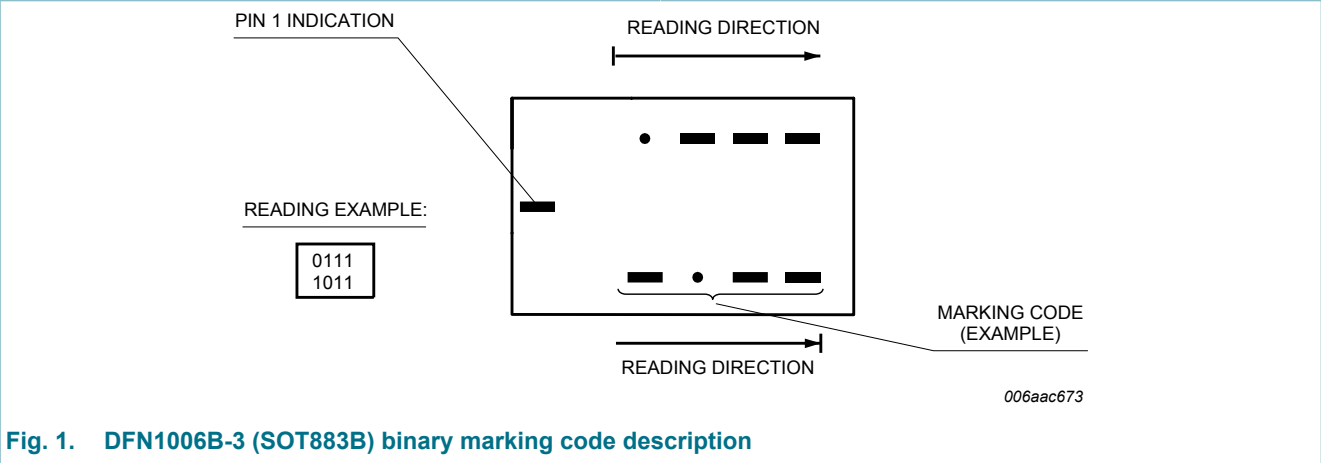


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

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 cm².

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

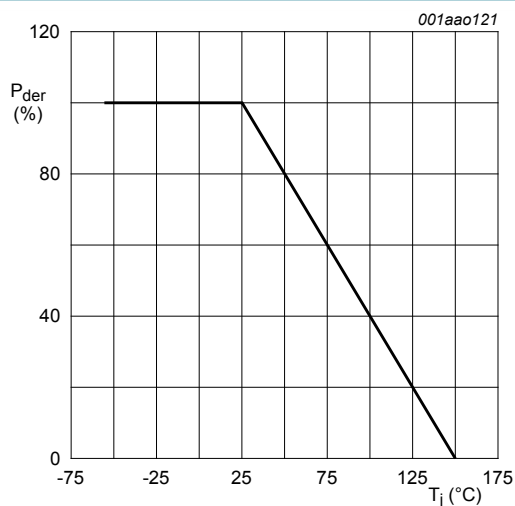


Fig. 2. Normalized total power dissipation as a function of junction temperature

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

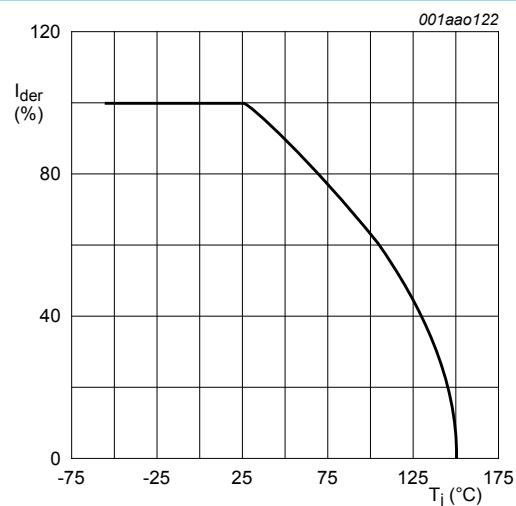
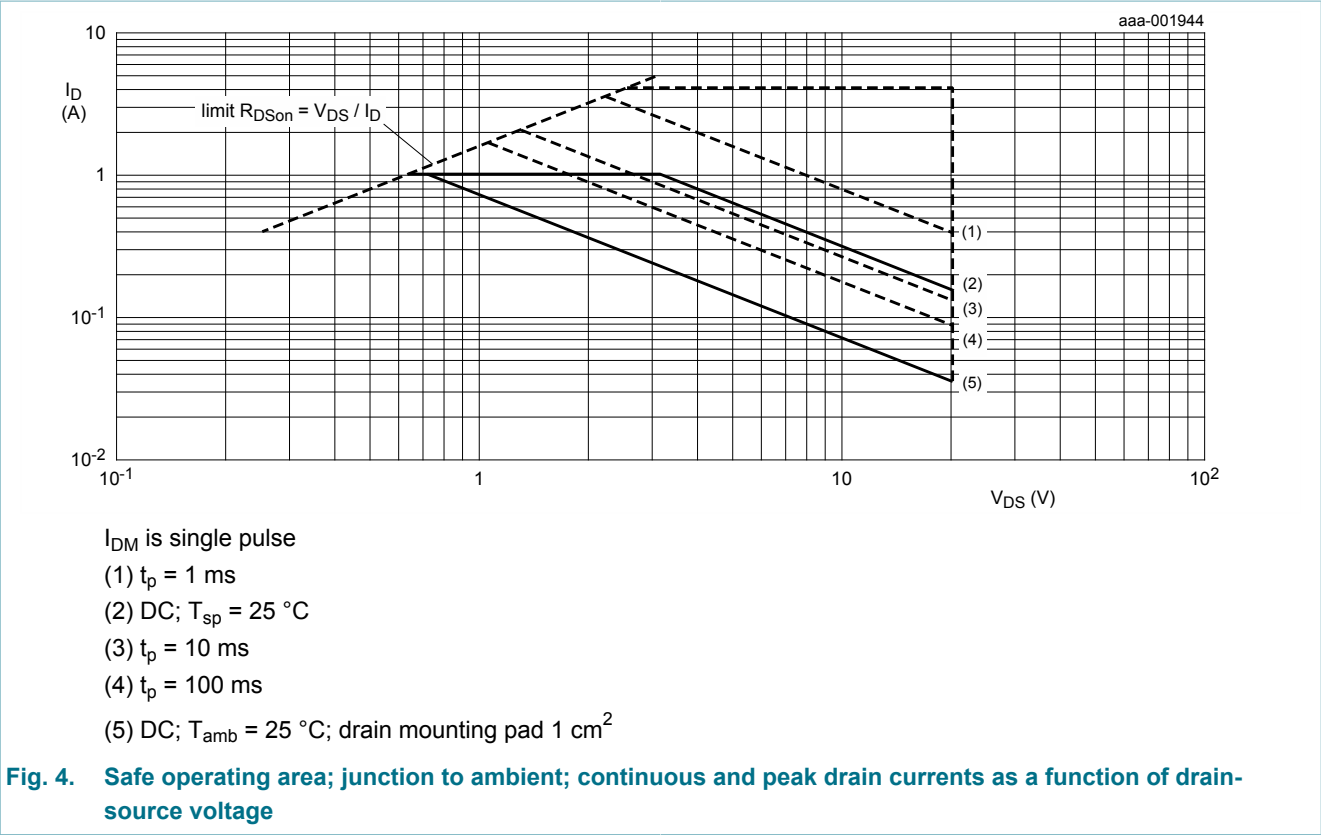


Fig. 3. Normalized continuous drain current as a function of junction temperature

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



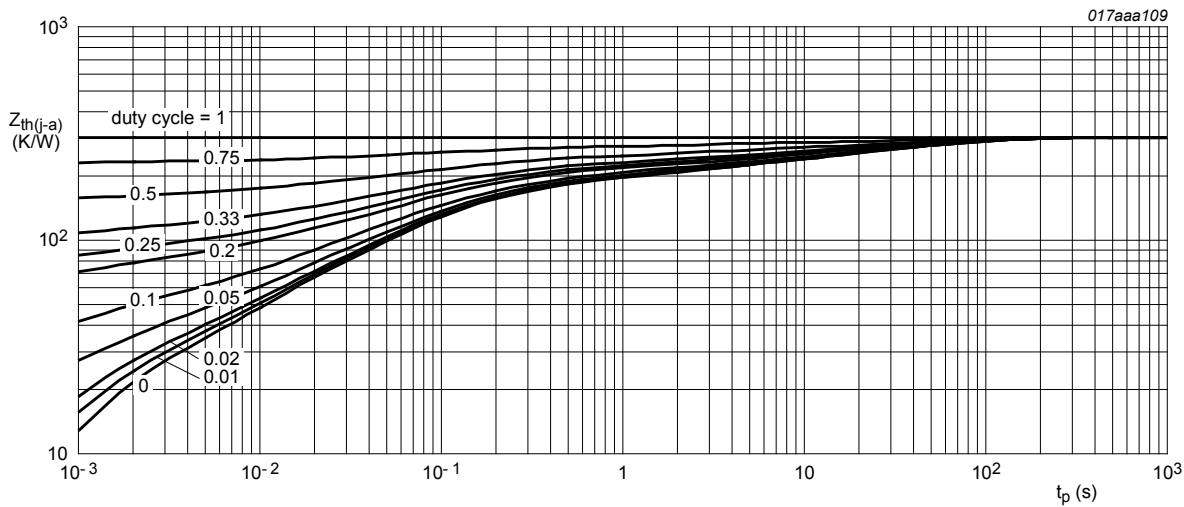
9. Thermal characteristics

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

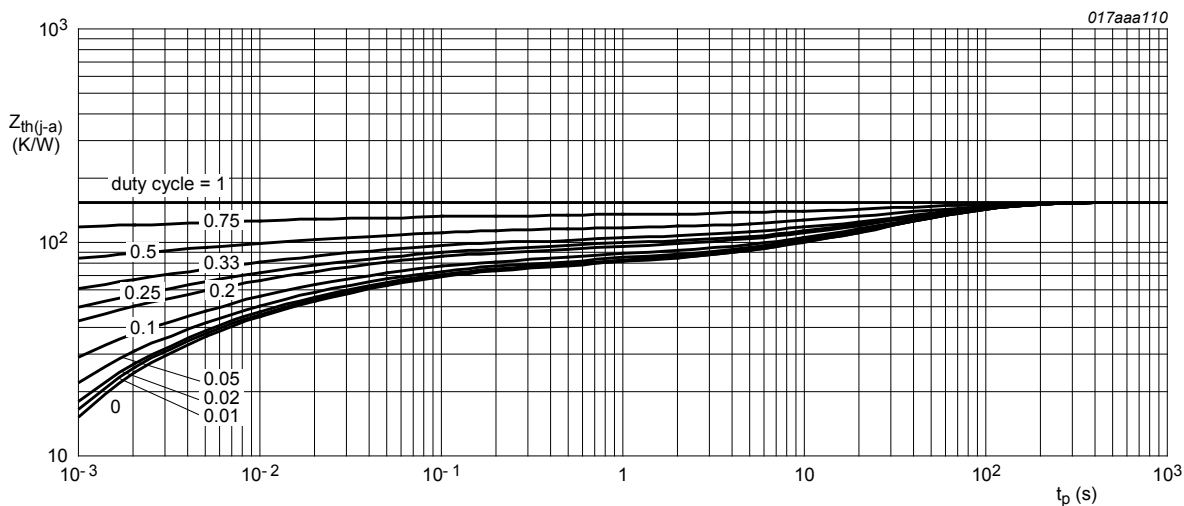
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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



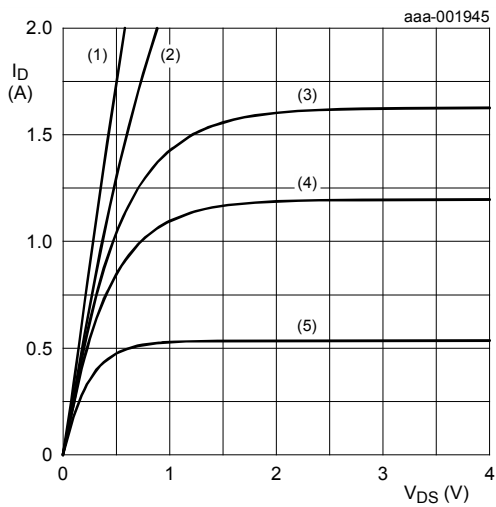
FR4 PCB, mounting pad for drain 1 cm²

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
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



$T_j = 25\text{ }^{\circ}\text{C}$
(1) $V_{GS} = 4.5\text{ V}$
(2) $V_{GS} = 2.5\text{ V}$
(3) $V_{GS} = 2.0\text{ V}$
(4) $V_{GS} = 1.8\text{ V}$
(5) $V_{GS} = 1.5\text{ V}$

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

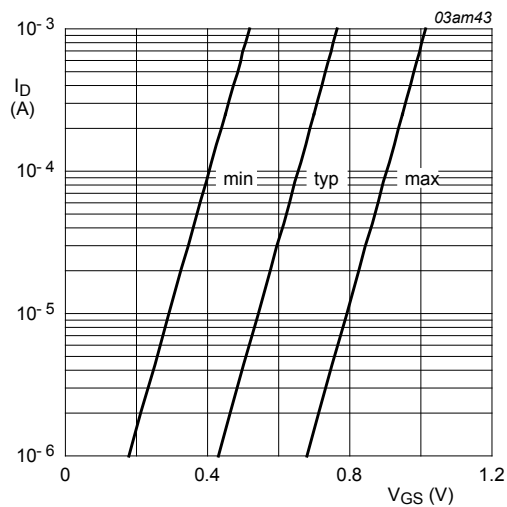
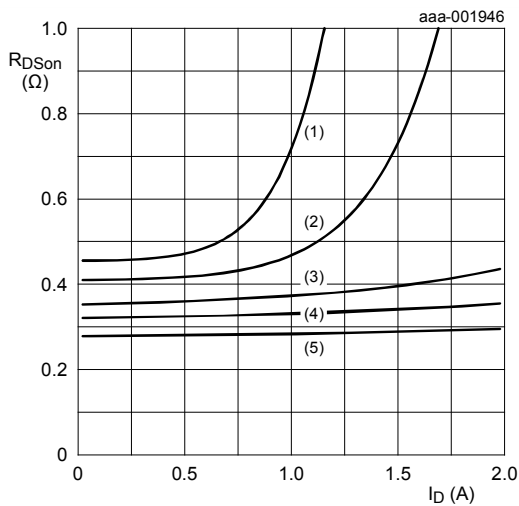


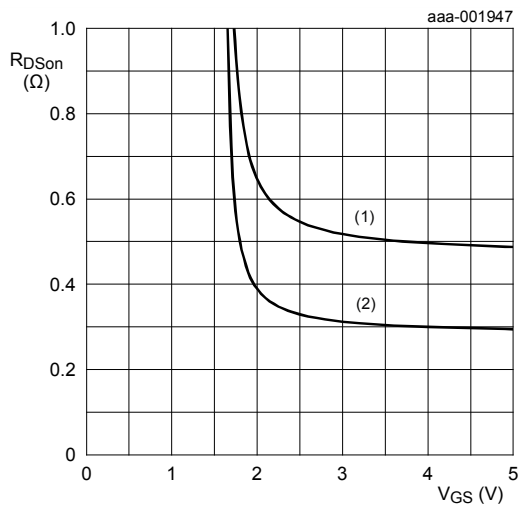
Fig. 8. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$



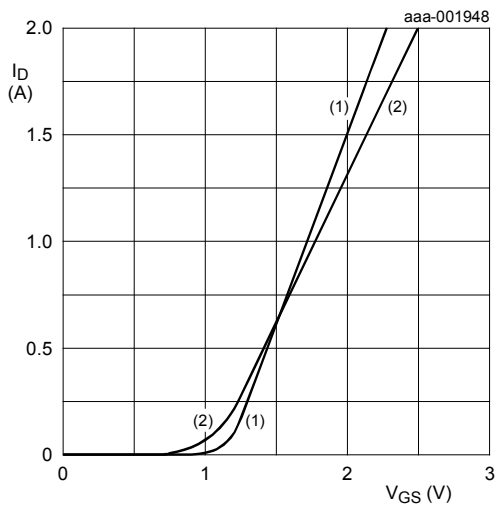
$T_j = 25\text{ }^{\circ}\text{C}$
(1) $V_{GS} = 1.8\text{ V}$
(2) $V_{GS} = 2\text{ V}$
(3) $V_{GS} = 2.5\text{ V}$
(4) $V_{GS} = 3\text{ V}$
(5) $V_{GS} = 4.5\text{ V}$

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



$I_D = 800\text{ mA}$
(1) $T_j = 150\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$

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



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

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

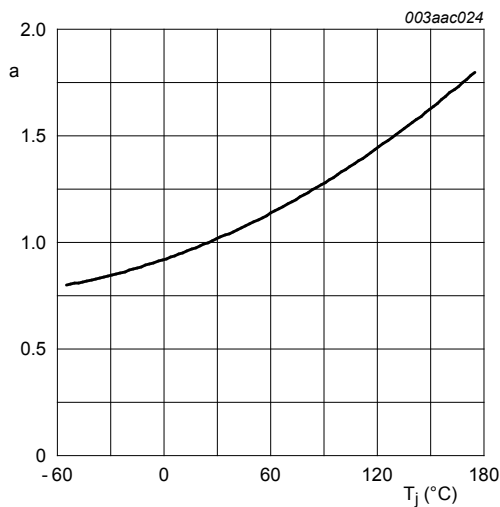
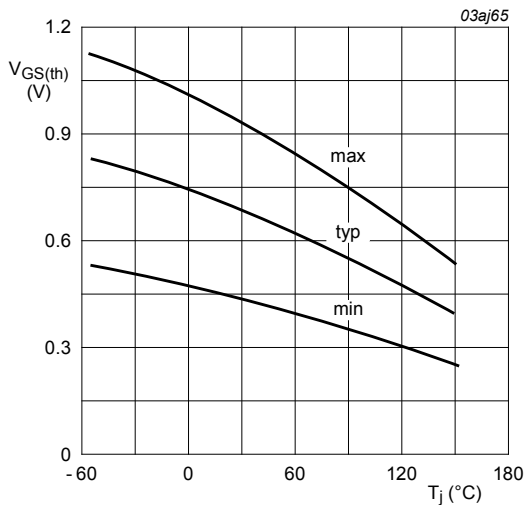


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

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

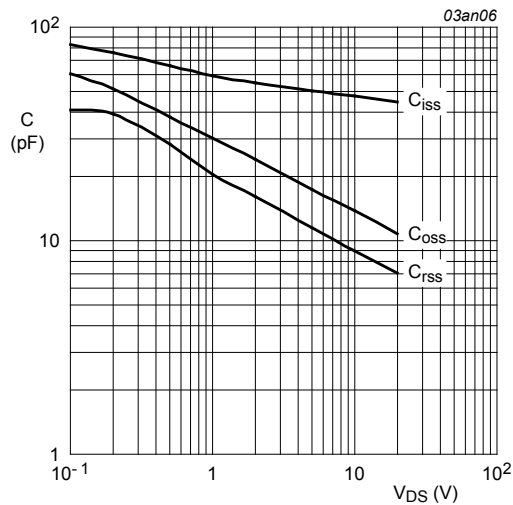


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

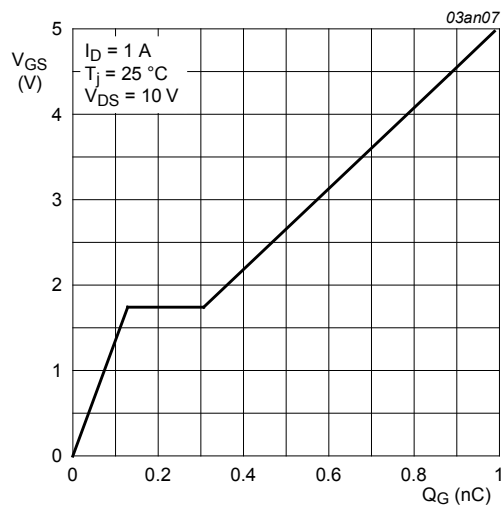


Fig. 15. Gate-source voltage as a function of gate charge; typical values

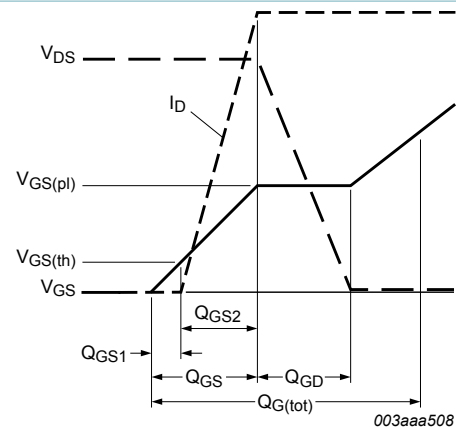
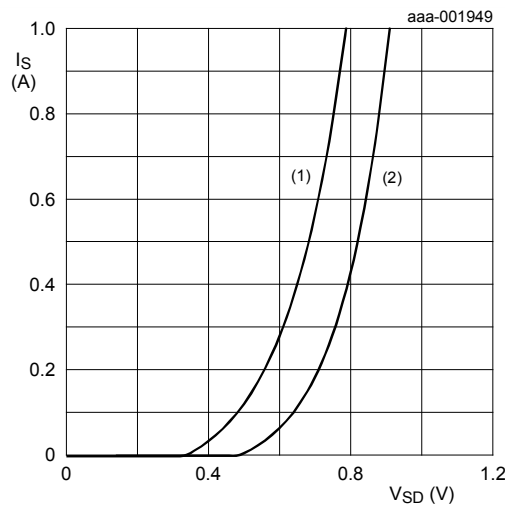


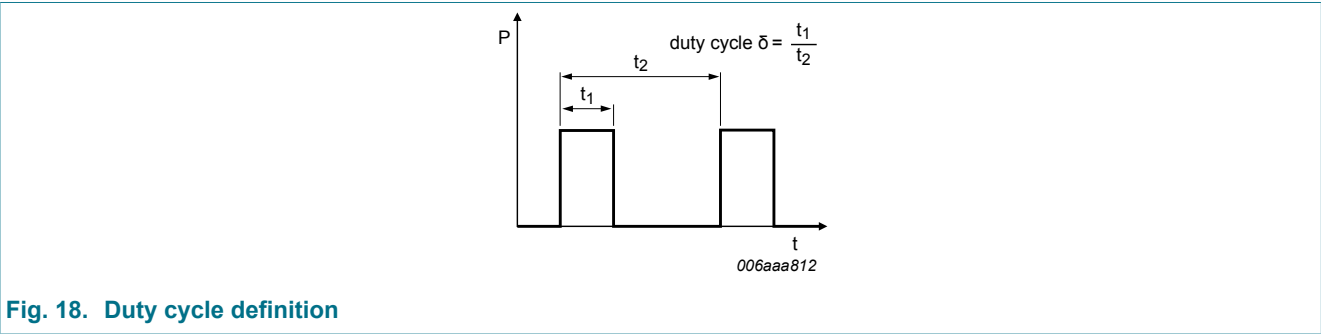
Fig. 16. Gate charge waveform definitions



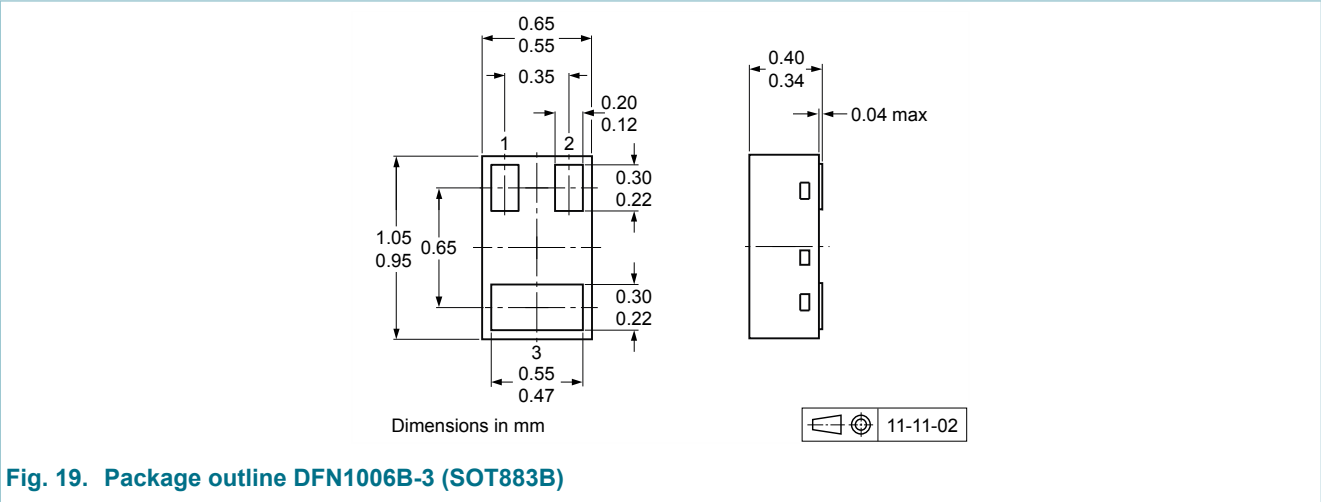
$V_{GS} = 0$ V
(1) $T_j = 150$ °C
(2) $T_j = 25$ °C

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

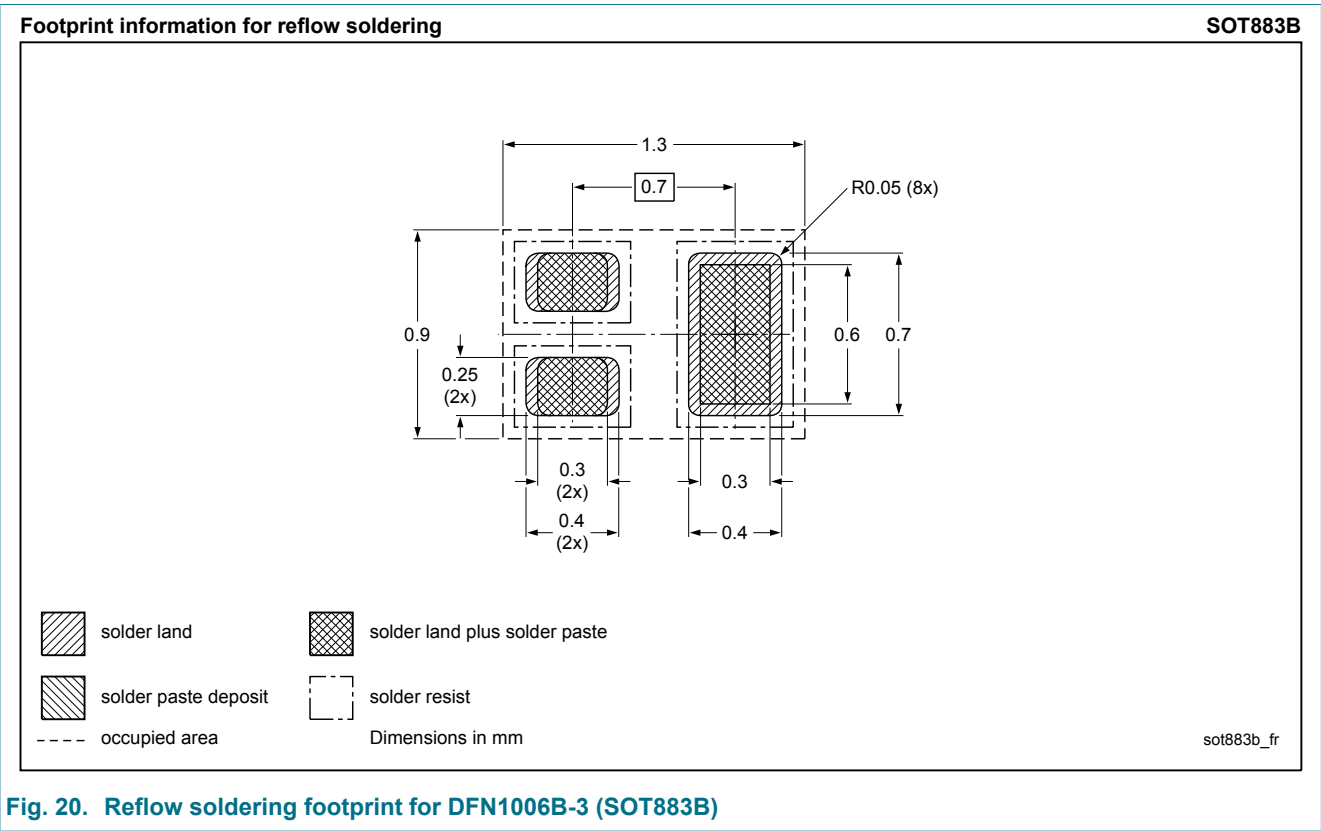
11. Test information



12. Package outline



13. Soldering



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

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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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