



PMZ290UNE

20 V, N-channel Trench MOSFET

14 May 2014

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006-3 (SOT883) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- Very fast switching
- ElectroStatic Discharge (ESD) protection > 2 kV HBM
- Leadless ultra small SMD plastic package: 1.0 × 0.6 × 0.48 mm

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	$T_j = 25\text{ °C}$	-	-	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]	-	1	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 500\text{ mA}; T_j = 25\text{ °C}$	-	290	380	mΩ

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

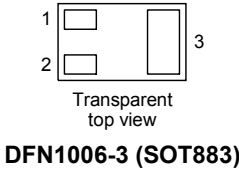
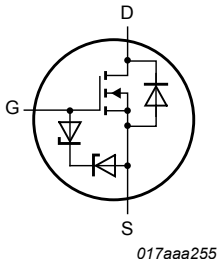


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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>Transparent top view DFN1006-3 (SOT883)</p>	 <p>017aaa255</p>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZ290UNE	DFN1006-3	DFN1006-3: leadless ultra small plastic package; 3 solder lands	SOT883

7. Marking

Table 4. Marking codes

Type number	Marking code
PMZ290UNE	ZS

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	$T_j = 25\text{ °C}$		-	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]	-	1	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	625	mA
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	4	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	360	mW
			[1]	-	715	mW
		$T_{sp} = 25\text{ °C}$		-	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	$T_{amb} = 25\text{ °C}$	[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.

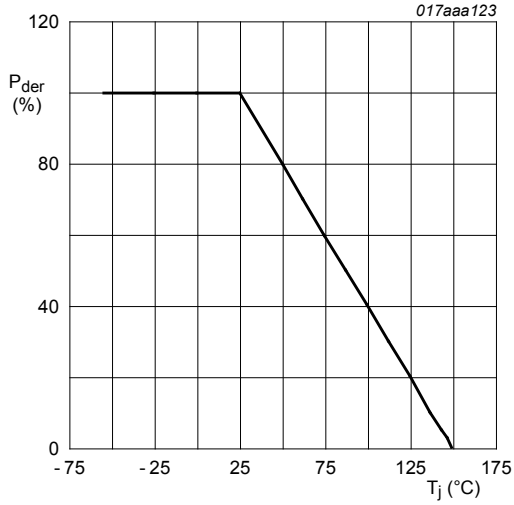


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

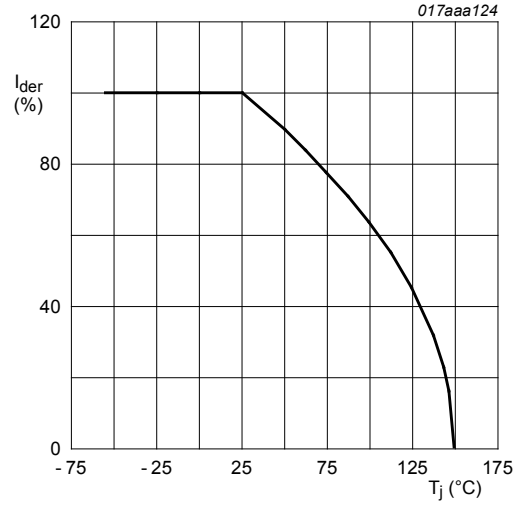
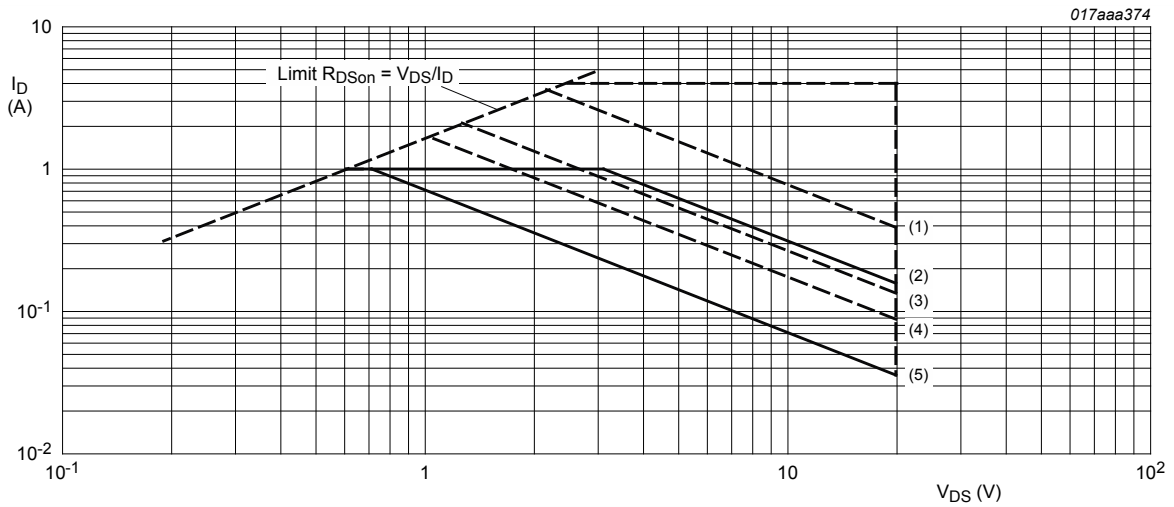


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



- I_{DM} = 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 cm²

Fig. 3. 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 cm².

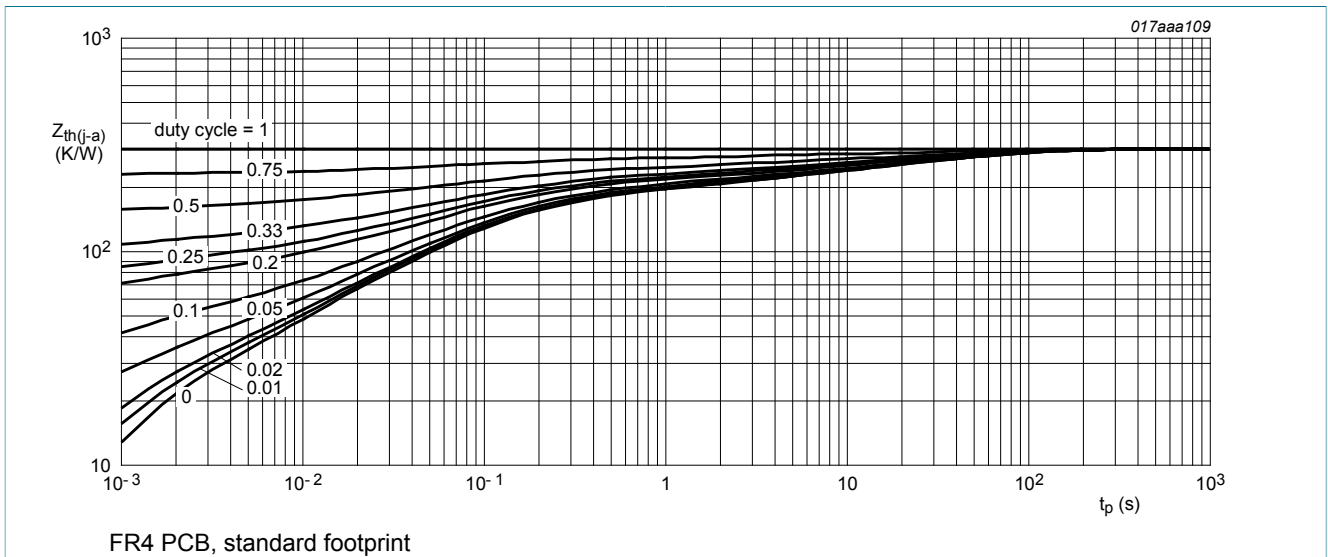


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

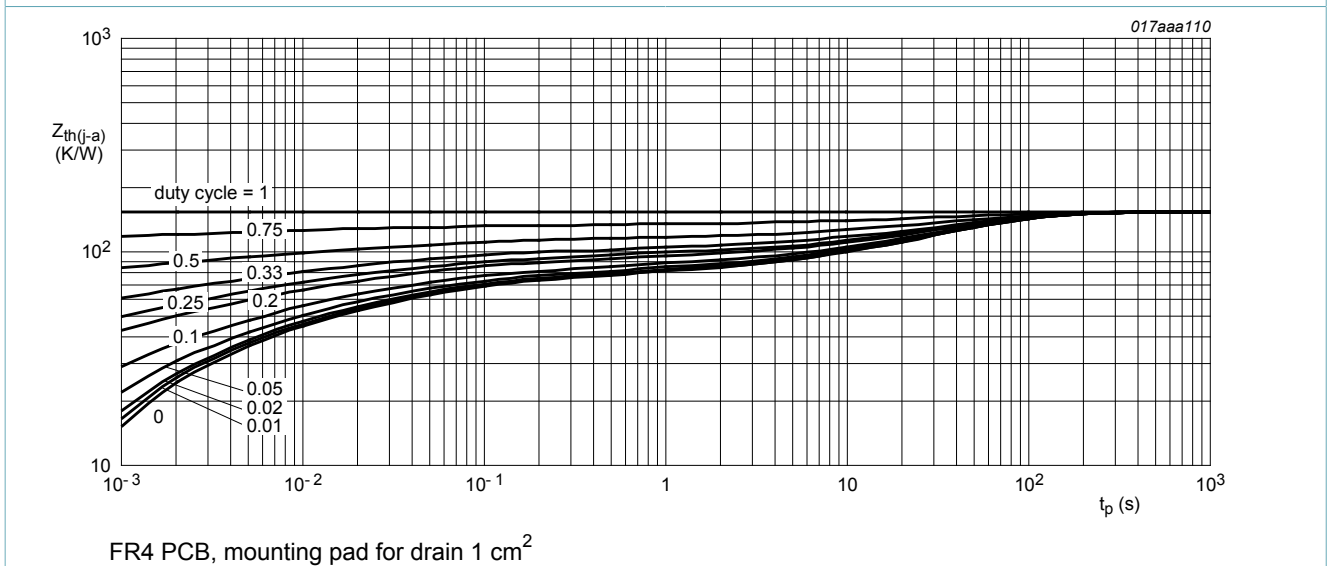


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.5	0.75	0.95	V
I_{DSS}	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	2	μA
		$V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	2	μA
		$V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	500	nA
		$V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	500	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V; I_D = 500 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	290	380	m Ω
		$V_{GS} = 4.5 V; I_D = 500 \text{ mA}; T_j = 150 \text{ }^\circ C$	-	460	610	m Ω
		$V_{GS} = 2.5 V; I_D = 400 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	420	620	m Ω
		$V_{GS} = 1.8 V; I_D = 100 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	600	1100	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	1.6	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V; I_D = 500 \text{ mA}; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$	-	0.45	0.68	nC
Q_{GS}	gate-source charge		-	0.15	-	nC
Q_{GD}	gate-drain charge		-	0.15	-	nC
C_{iss}	input capacitance	$V_{DS} = 10 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	55	83	pF
C_{oss}	output capacitance		-	15	-	pF
C_{rss}	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V; R_L = 250 \Omega; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$	-	6	12	ns
t_r	rise time		-	4	-	ns
$t_{d(off)}$	turn-off delay time		-	86	172	ns
t_f	fall time		-	31	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 300 \text{ mA}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	0.48	0.77	1.2	V

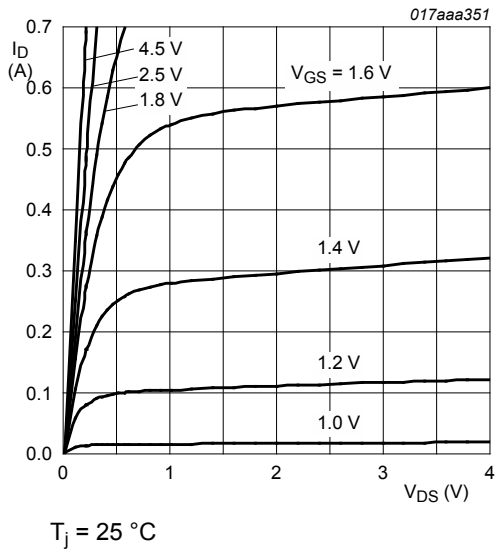


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

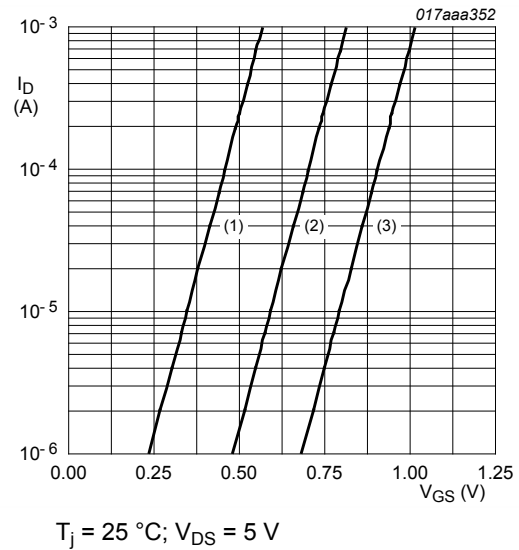


Fig. 7. Sub-threshold drain current as a function of gate-source voltage
 $T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$
 (1) minimum values
 (2) typical values
 (3) maximum values

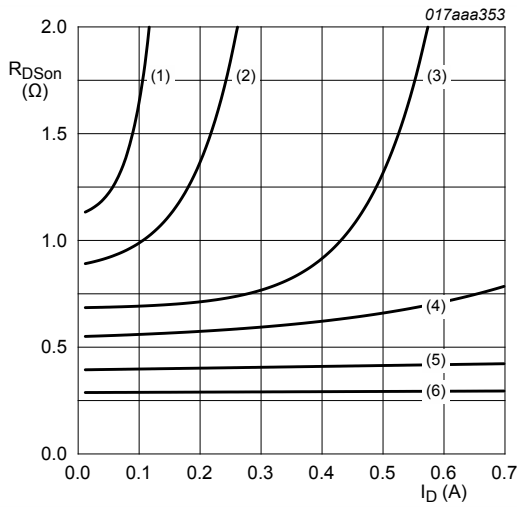


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values
 $T_j = 25\text{ }^\circ\text{C}$
 (1) $V_{GS} = 1.3\text{ V}$
 (2) $V_{GS} = 1.4\text{ V}$
 (3) $V_{GS} = 1.6\text{ V}$
 (4) $V_{GS} = 1.8\text{ V}$
 (5) $V_{GS} = 2.5\text{ V}$
 (6) $V_{GS} = 4.5\text{ V}$

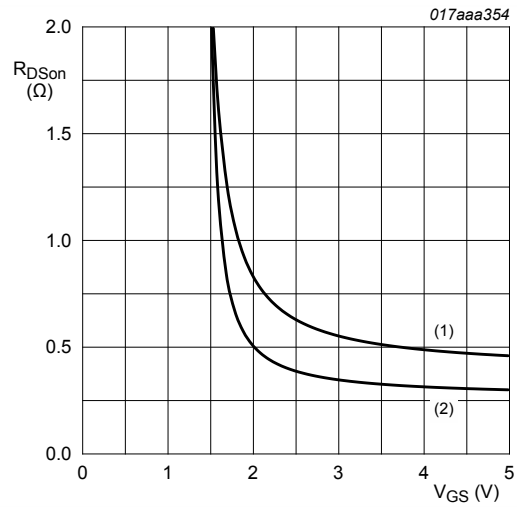
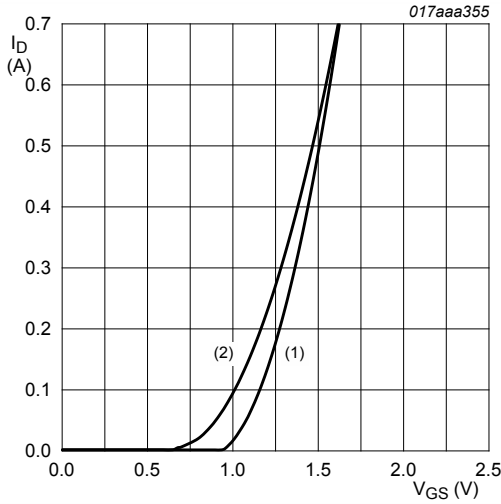


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values
 $I_D = 400\text{ mA}$
 (1) $T_j = 150\text{ }^\circ\text{C}$
 (2) $T_j = 25\text{ }^\circ\text{C}$



$$V_{DS} > I_D \times R_{DS(on)}$$

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

Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

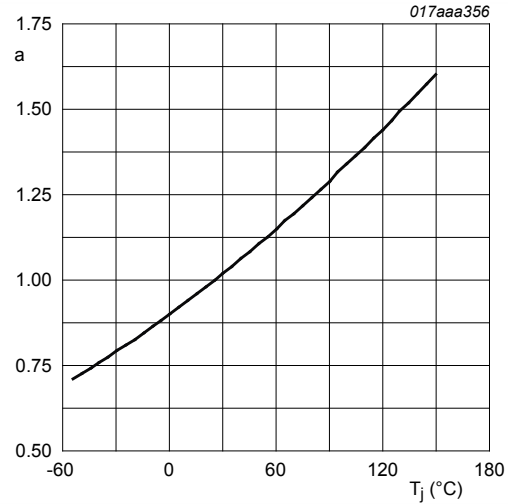
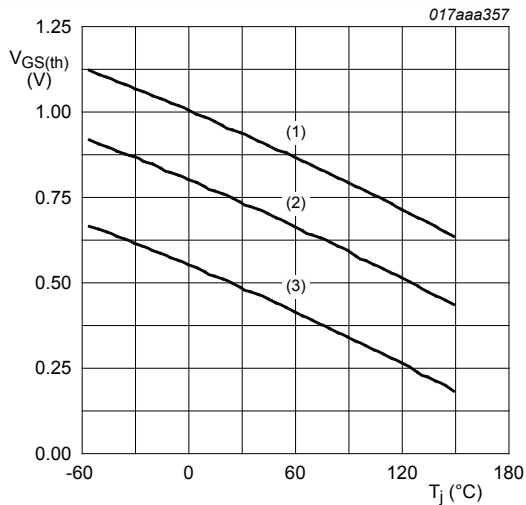


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

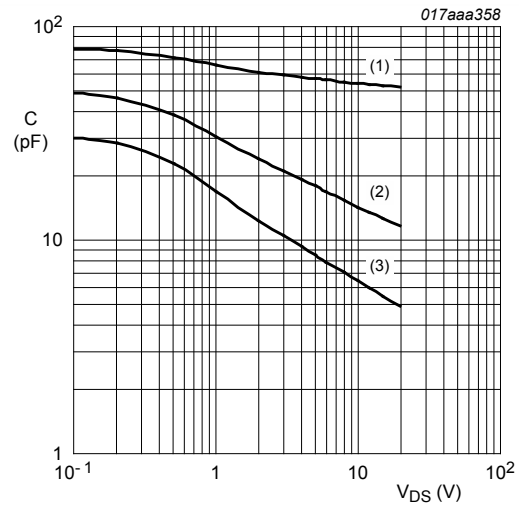
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{°C})}}$$



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

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

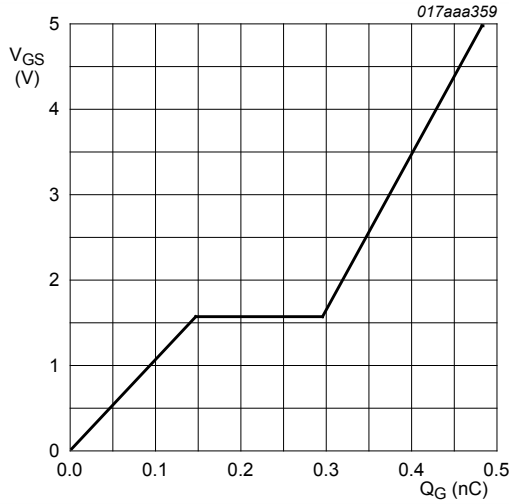
Fig. 12. Gate-source threshold voltage as a function of junction temperature



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

- (1) C_{iss}
- (2) C_{oss}
- (3) C_{riss}

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



$I_D = 0.5 \text{ A}; V_{DS} = 10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 14. Gate-source voltage as a function of gate charge; typical values

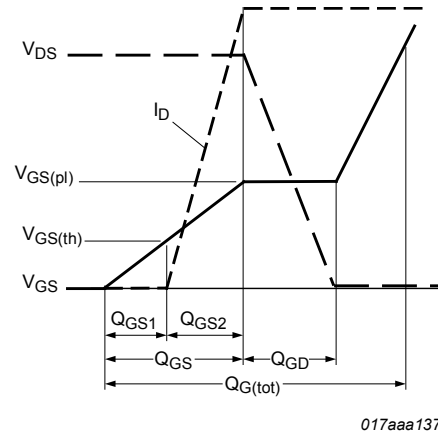
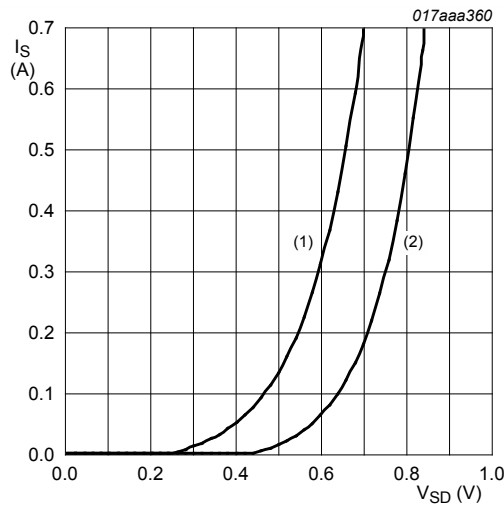


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0 \text{ V}$
 (1) $T_j = 150 \text{ }^\circ\text{C}$
 (2) $T_j = 25 \text{ }^\circ\text{C}$

Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

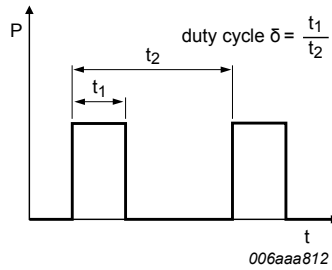


Fig. 17. Duty cycle definition

12. Package outline

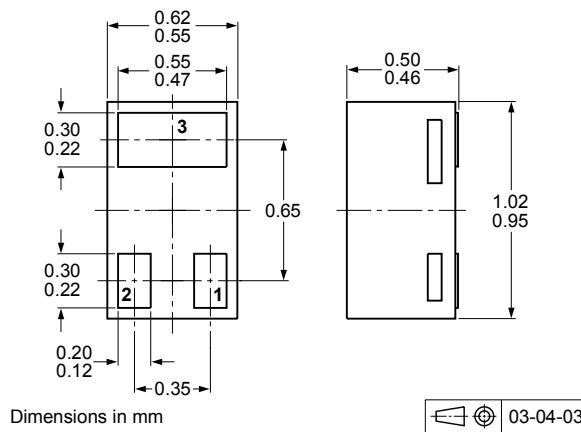


Fig. 18. Package outline DFN1006-3 (SOT883)

13. Soldering

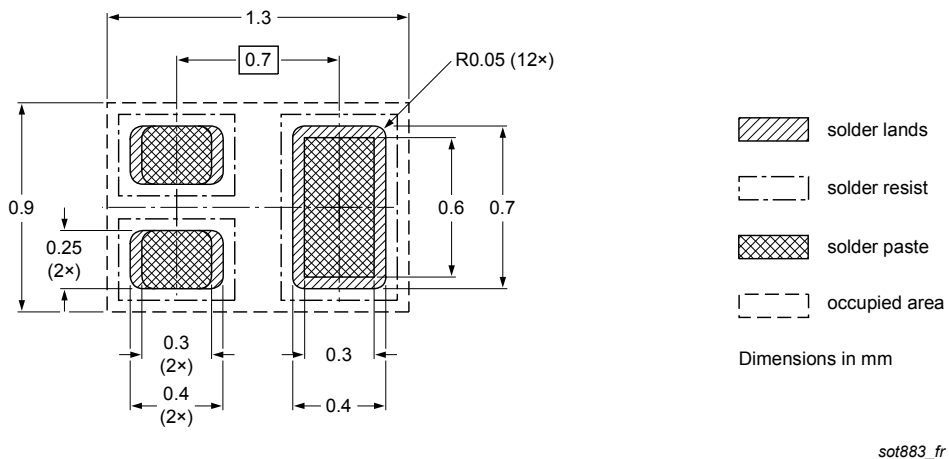


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZ290UNE v.1	20140514	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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