



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

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

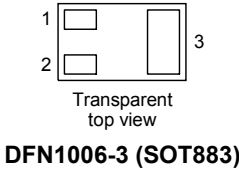
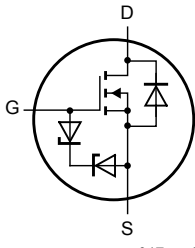


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>Transparent top view 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	$T_j = 25\text{ }^\circ\text{C}$		-	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
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ }^\circ\text{C}$	[1]	-	625	mA
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ }^\circ\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	4	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ }^\circ\text{C}$	[2]	-	360	mW
			[1]	-	715	mW
		$T_{sp} = 25\text{ }^\circ\text{C}$		-	2700	mW
$T_j$	junction temperature			-55	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature			-55	150	$^\circ\text{C}$
$T_{stg}$	storage temperature			-65	150	$^\circ\text{C}$
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-	680	mA
<b>ESD maximum rating</b>						
$V_{ESD}$	electrostatic discharge voltage	HBM	[3]	-	2000	V

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

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

[3] Measured between all pins.



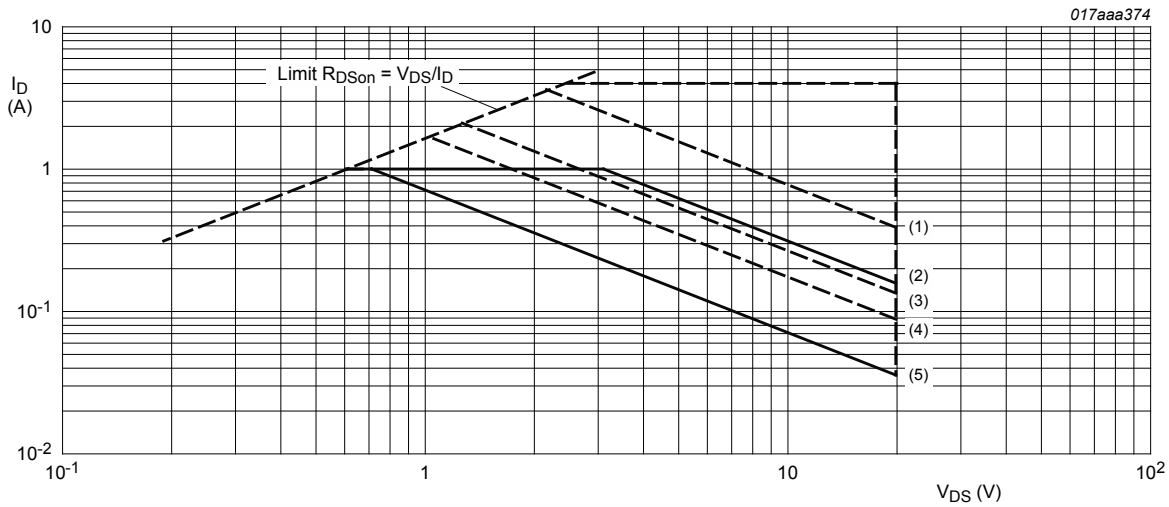
Fig. 1. Normalized total power dissipation as a function of junction temperature

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



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;  $T_{sp} = 25^{\circ}\text{C}$
- (3)  $t_p = 10$  ms
- (4)  $t_p = 100$  ms
- (5) DC;  $T_{amb} = 25^{\circ}\text{C}$ ; drain mounting pad  $1\text{ cm}^2$

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 <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	305	360	K/W
			[2]	-	150	175	K/W
R <sub>th(j-sp)</sub>	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<sup>2</sup>.

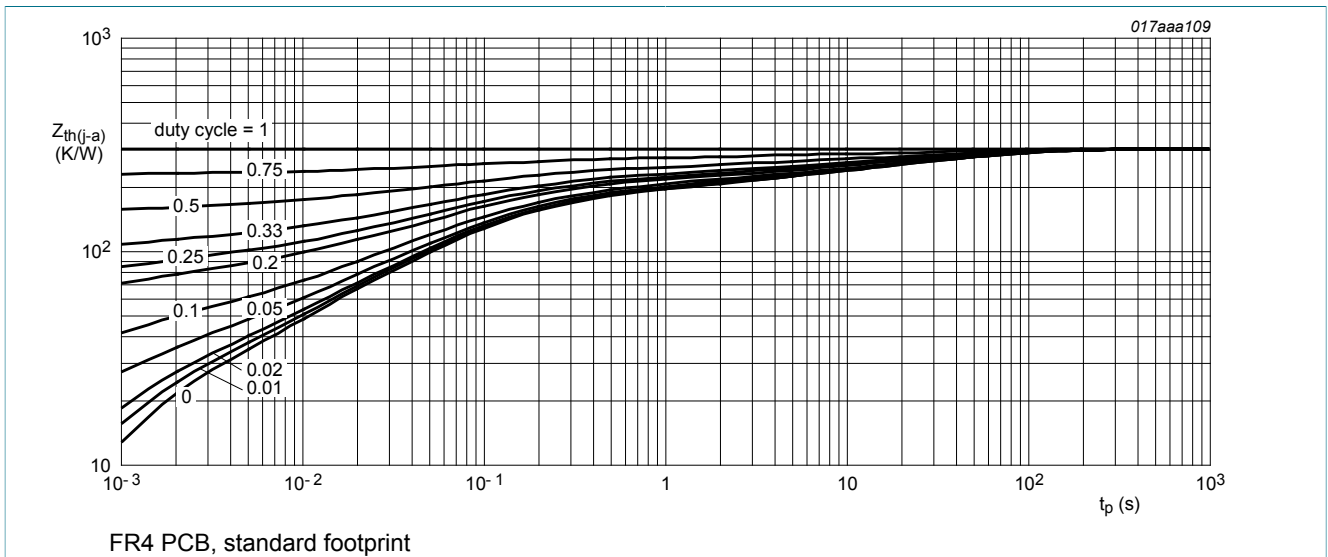


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

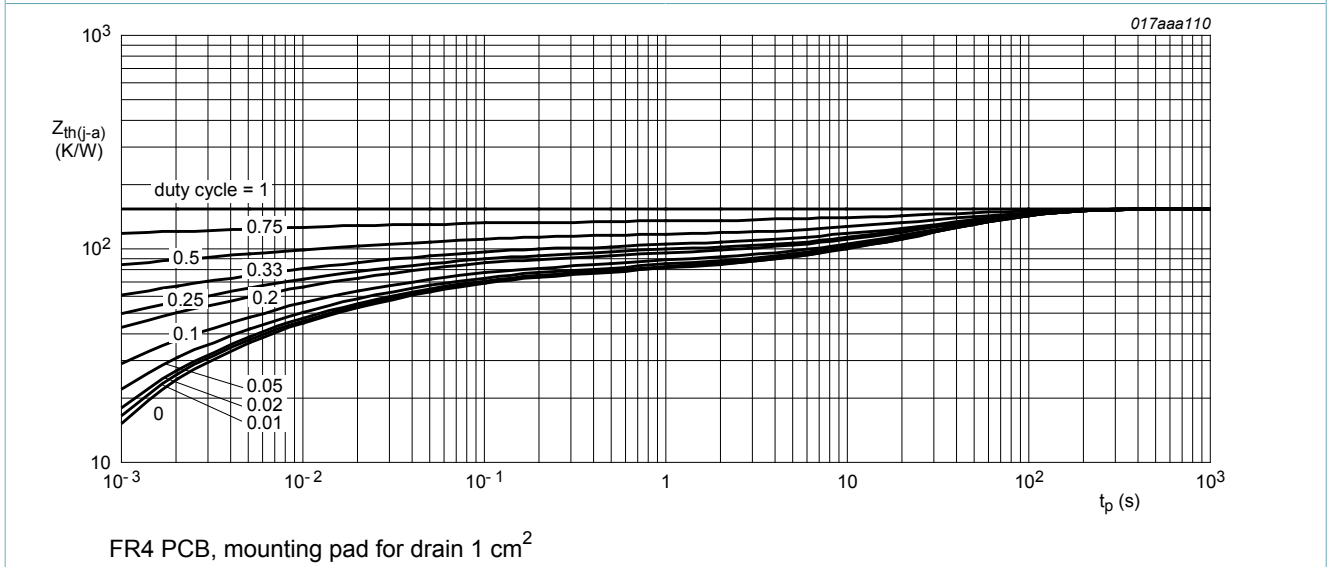
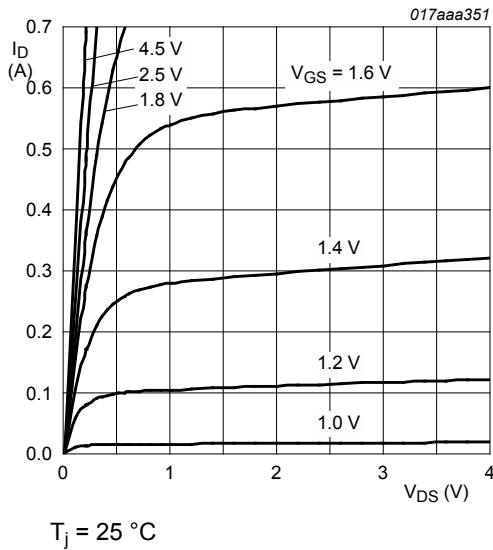


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

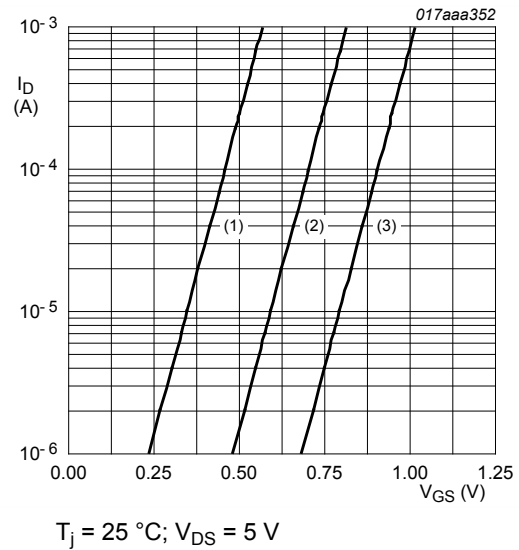
## 10. Characteristics

Table 7. Characteristics

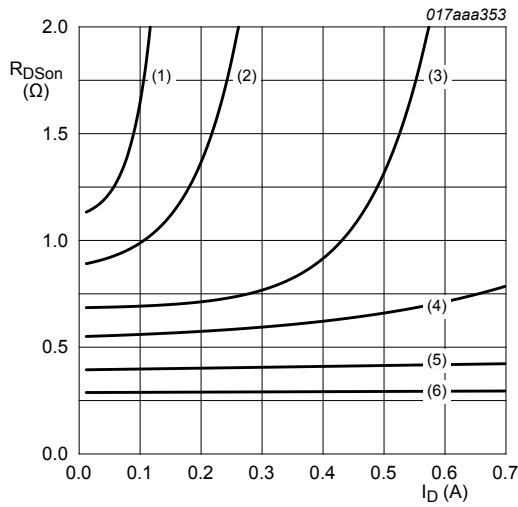
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.5	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	$\mu A$
		$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	2	$\mu A$
		$V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	2	$\mu A$
		$V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	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 $\Omega$
		$V_{GS} = 4.5 V; I_D = 500 \text{ mA}; T_j = 150 \text{ }^\circ C$	-	460	610	m $\Omega$
		$V_{GS} = 2.5 V; I_D = 400 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	420	620	m $\Omega$
		$V_{GS} = 1.8 V; I_D = 100 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	600	1100	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	1.6	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	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
$C_{riss}$	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
<b>Source-drain diode</b>						
$V_{SD}$	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



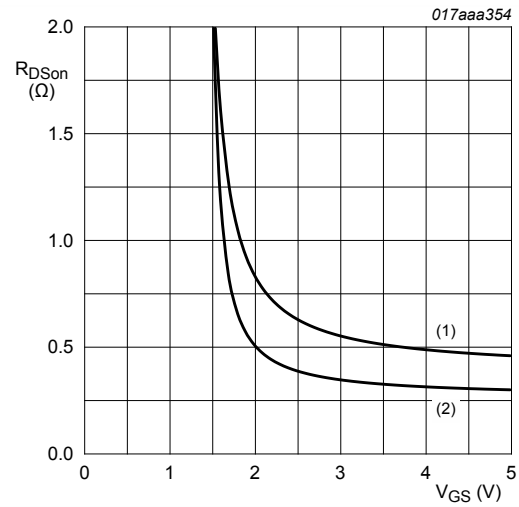
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



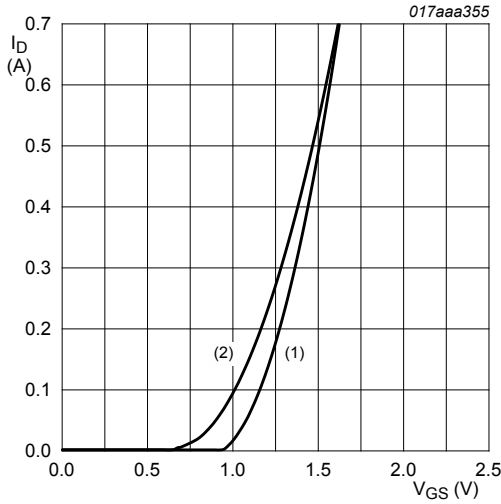
**Fig. 7. Sub-threshold drain current as a function of gate-source voltage**  
 $T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$   
 (1) minimum values  
 (2) typical values  
 (3) maximum values



**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)  $T_j = 25\text{ }^\circ\text{C}$

(2)  $T_j = 150\text{ }^\circ\text{C}$

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

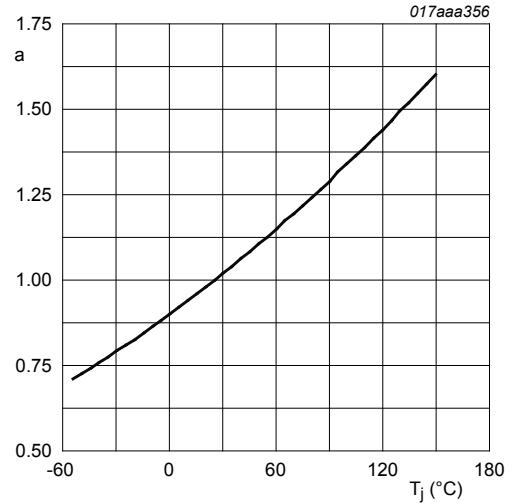
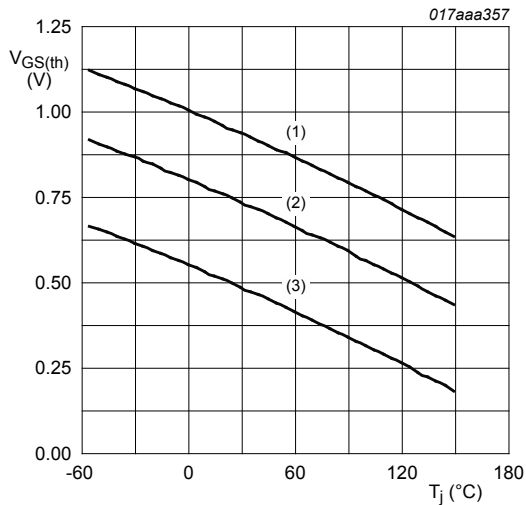


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



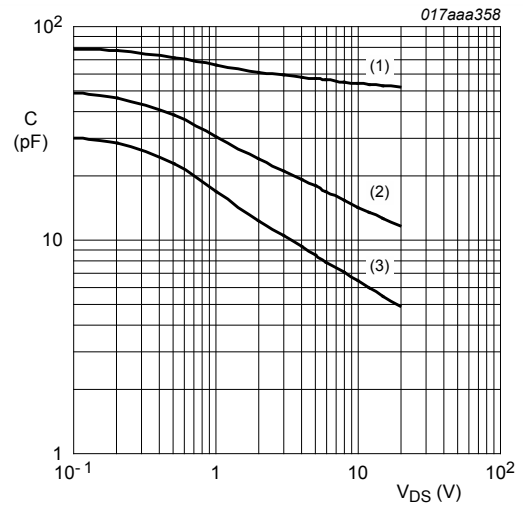
$$I_D = 0.25\text{ mA}; V_{DS} = V_{GS}$$

(1) maximum values

(2) typical values

(3) minimum values

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



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

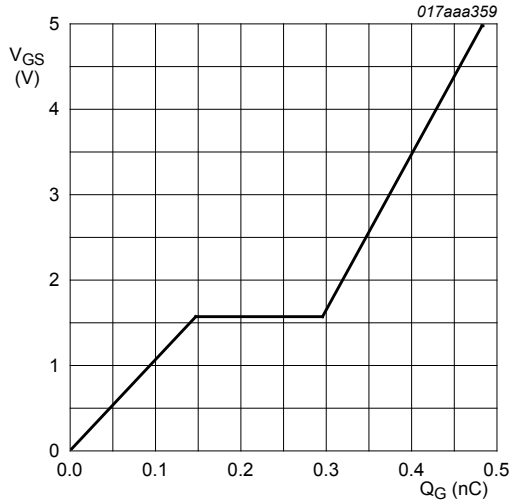
(1)  $C_{iss}$

(2)  $C_{oss}$

(3)  $C_{rss}$

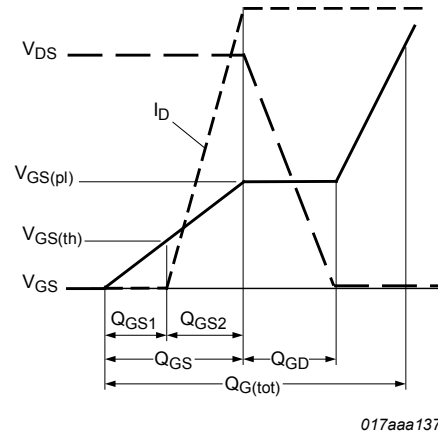
Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



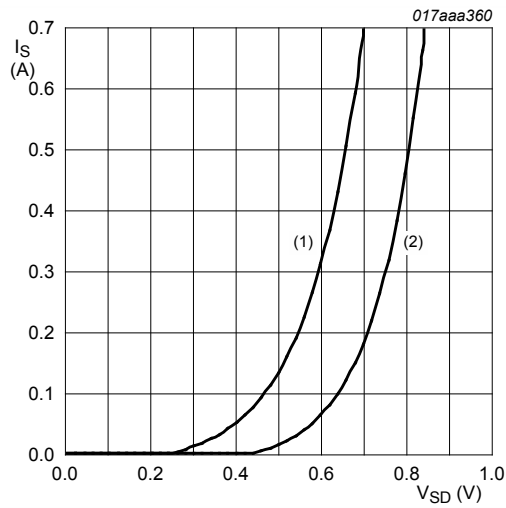


$I_D = 0.5$  A;  $V_{DS} = 10$  V;  $T_{amb} = 25$  °C

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



**Fig. 15. Gate charge waveform definitions**



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

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

### 11. Test information

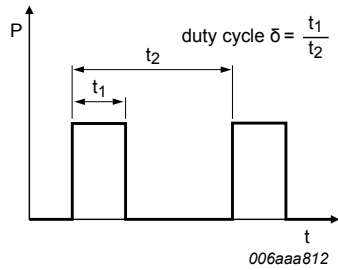


Fig. 17. Duty cycle definition

### 12. Package outline

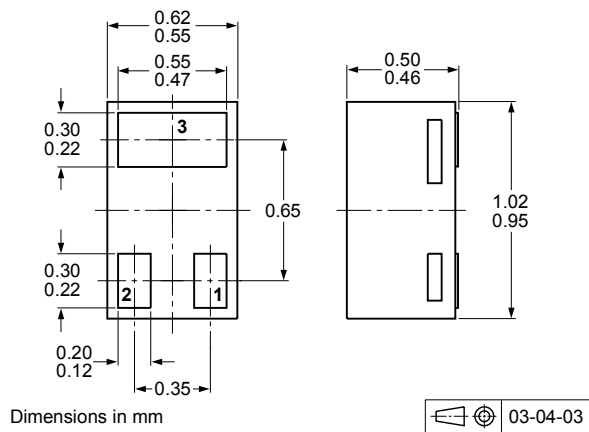


Fig. 18. Package outline DFN1006-3 (SOT883)

### 13. Soldering

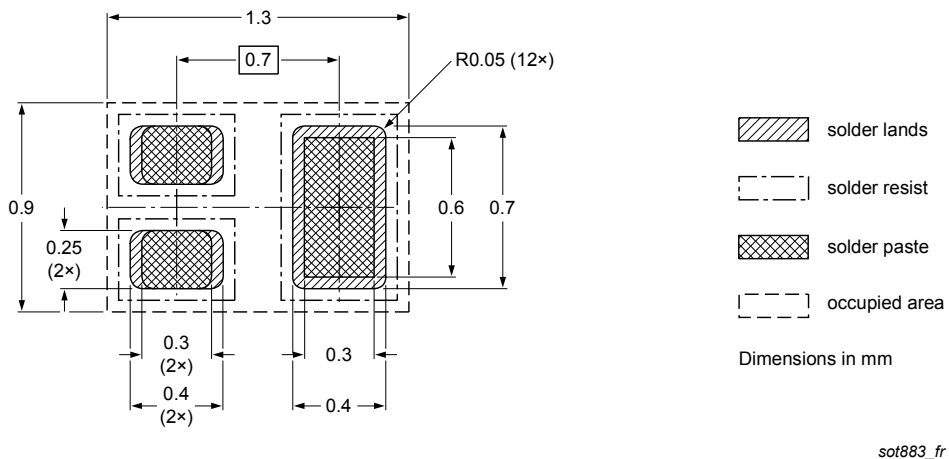


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

## 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

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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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