



# PMZ1200UPE

30 V, P-channel Trench MOSFET

25 March 2015

Product data sheet

## 1. General description

P-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 package: 1.0 x 0.6 x 0.48 mm

## 3. Applications

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

## 4. Quick reference data

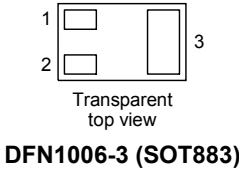
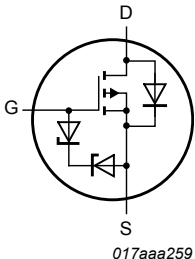
Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions   | Min | Typ | Max  | Unit     |
|-------------------------------|----------------------------------|--|-----|-----|------|----------|
| $V_{DS}$                      | drain-source voltage             | $T_j = 25\text{ °C}$   | -   | -   | -30  | 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] | -   | -410 | mA       |
| <b>Static characteristics</b> |                                  |  |     |     |      |          |
| $R_{DS(on)}$                  | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -410\text{ mA}; T_j = 25\text{ °C}$ | -   | 1.2 | 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>.

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline   | Graphic symbol   |
|-----|--------|-------------|--|--|
| 1   | G      | gate        |  <p>Transparent top view<br/>DFN1006-3 (SOT883)</p> |  <p>017aaa259</p> |
| 2   | S      | source      |  |  |
| 3   | D      | drain       |  |  |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package   |   |         |
|-------------|-----------|---|---------|
|             | Name      | Description   | Version |
| PMZ1200UPE  | DFN1006-3 | DFN1006-3: leadless ultra small plastic package; 3 solder lands | SOT883  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMZ1200UPE  | ZL           |

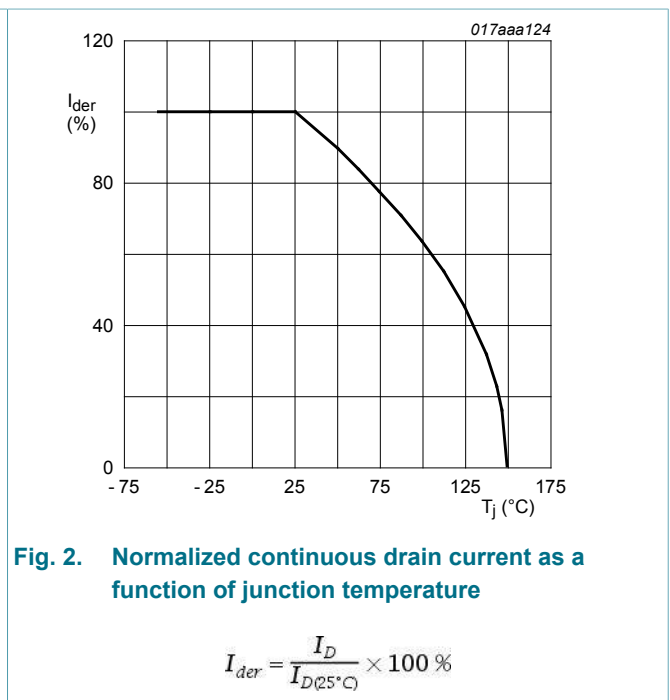
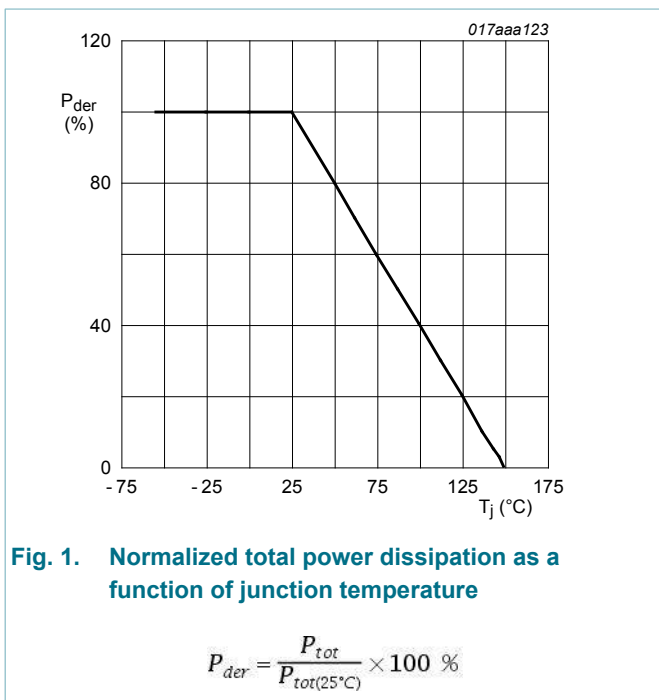
## 8. Limiting values

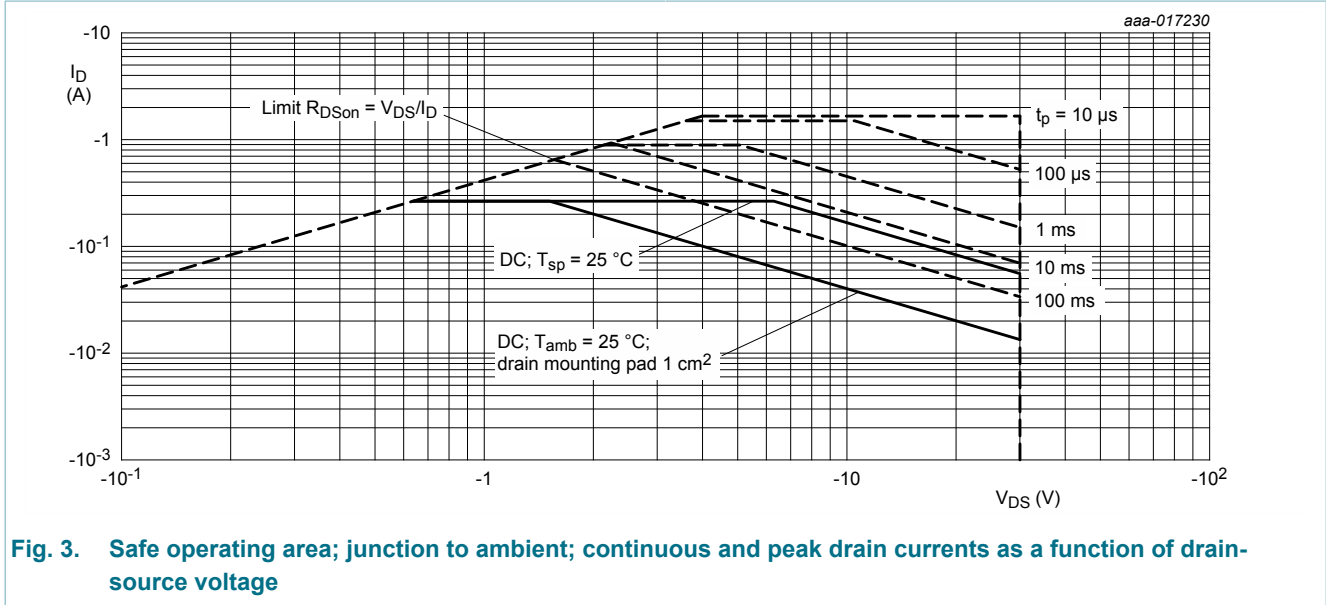
**Table 5. Limiting values**

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   |     | -   | -30  | 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] | -   | -410 | mA   |
|                           |                         | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C            | [1] | -   | -260 | mA   |
| I <sub>DM</sub>           | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | -1.7 | A    |
| P <sub>tot</sub>          | total power dissipation | T <sub>amb</sub> = 25 °C                                       | [2] | -   | 310  | mW   |
|                           |                         |  | [1] | -   | 400  | mW   |
|                           |                         | T <sub>sp</sub> = 25 °C  |     | -   | 1670 | 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] | -   | -410 | 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.





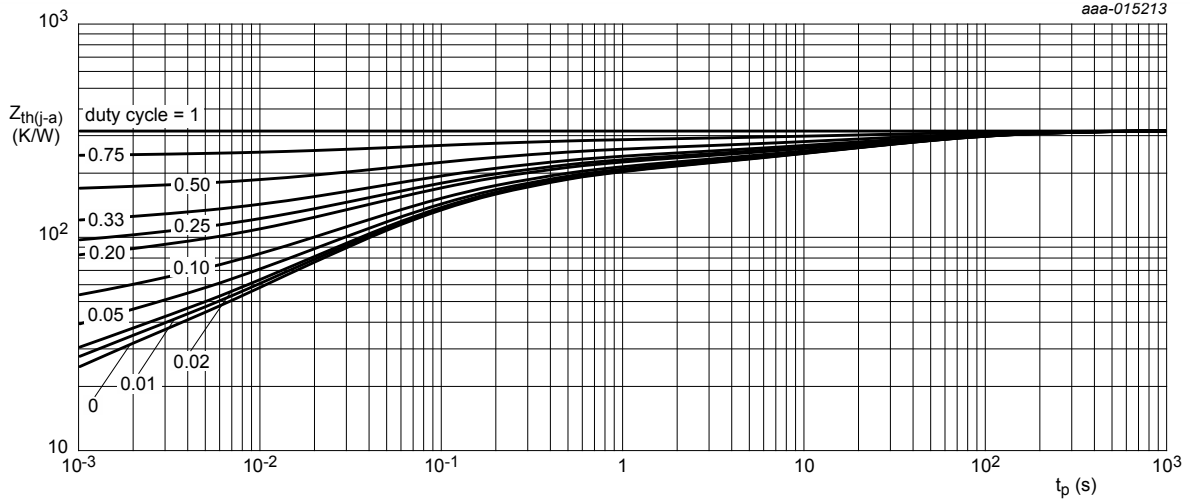
## 9. Thermal characteristics

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] | -   | 350 | 405 | K/W  |
|                       |  |             | [2] | -   | 270 | 310 | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             |     | -   | 65  | 75  | K/W  |

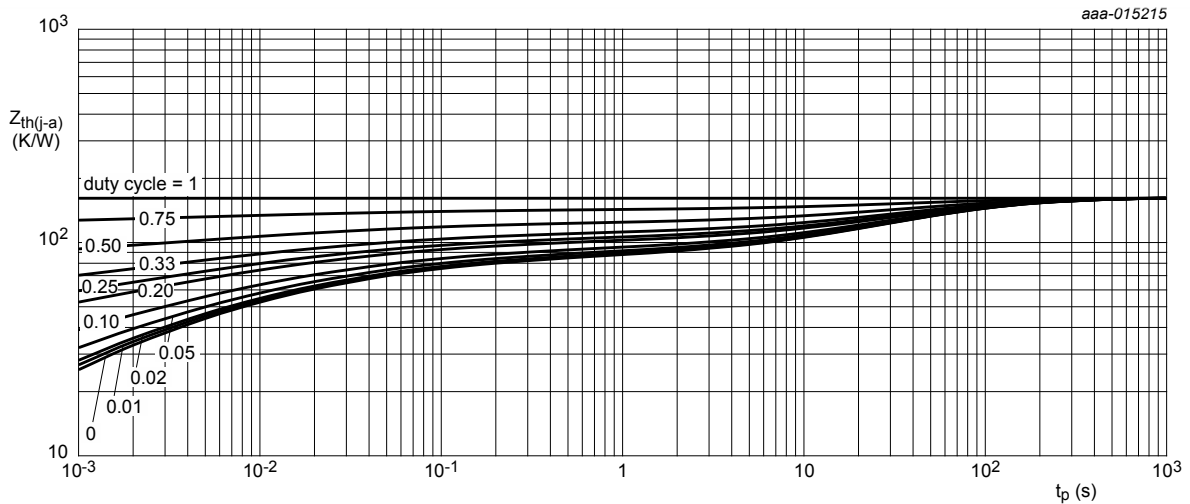
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



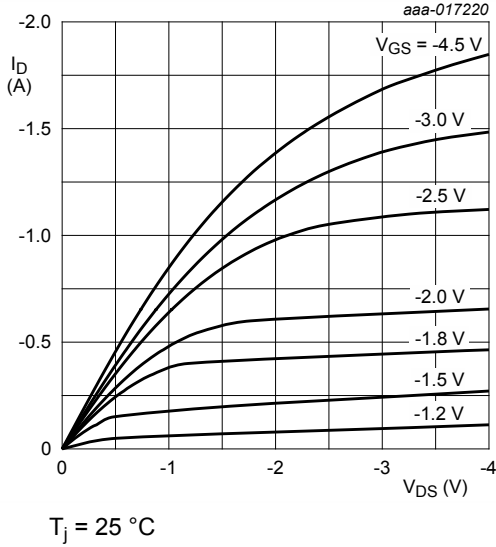
FR4 PCB, mounting pad for drain  $1\text{ cm}^2$

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

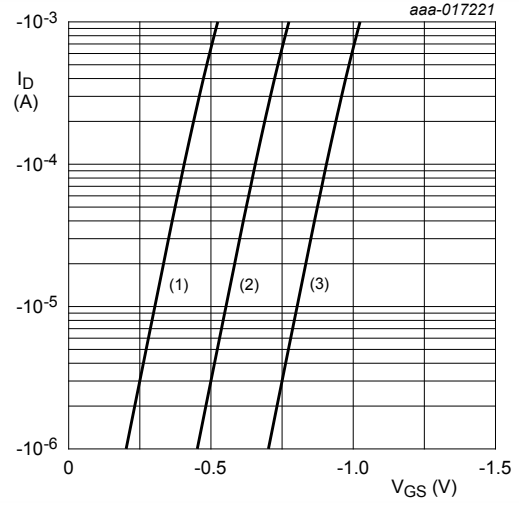
## 10. Characteristics

Table 7. Characteristics

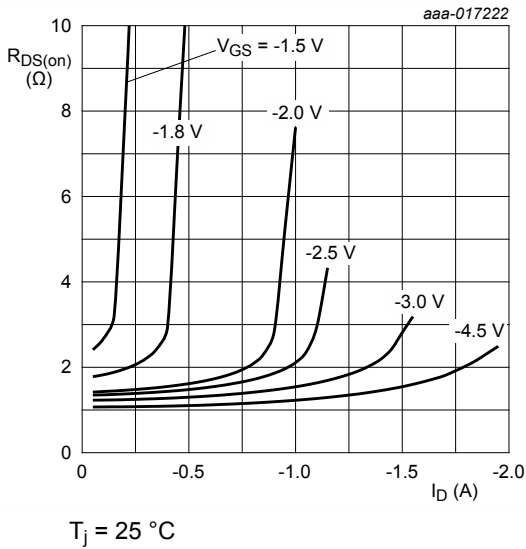
| Symbol                         | Parameter                        | Conditions  | Min   | Typ   | Max   | Unit     |
|--------------------------------|----------------------------------|---|-------|-------|-------|----------|
| <b>Static characteristics</b>  |                                  |   |       |       |       |          |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = -250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -30   | -     | -     | 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            | $V_{DS} = -30 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -     | -     | -1    | $\mu A$  |
| $I_{GSS}$                      | gate leakage current             | $V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -     | -     | 5     | $\mu A$  |
|                                |                                  | $V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -     | -     | -5    | $\mu A$  |
|                                |                                  | $V_{GS} = 4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -     | -     | 1     | $\mu A$  |
|                                |                                  | $V_{GS} = -4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -     | -     | -1    | $\mu A$  |
|                                |                                  | $V_{GS} = 2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -     | -     | 100   | nA       |
|                                |                                  | $V_{GS} = -2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -     | -     | -100  | nA       |
| $R_{DSon}$                     | drain-source on-state resistance | $V_{GS} = -4.5 V$ ; $I_D = -410 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$   | -     | 1.2   | 1.4   | $\Omega$ |
|                                |                                  | $V_{GS} = -4.5 V$ ; $I_D = -410 \text{ mA}$ ; $T_j = 150 \text{ }^\circ C$  | -     | 2     | 2.4   | $\Omega$ |
|                                |                                  | $V_{GS} = -2.5 V$ ; $I_D = -320 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$   | -     | 1.7   | 2.3   | $\Omega$ |
|                                |                                  | $V_{GS} = -1.8 V$ ; $I_D = -80 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$  | -     | 2.1   | 3.1   | $\Omega$ |
|                                |                                  | $V_{GS} = -1.5 V$ ; $I_D = -10 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$  | -     | 3     | 5.1   | $\Omega$ |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = -10 V$ ; $I_D = -410 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$  | -     | 820   | -     | mS       |
| <b>Dynamic characteristics</b> |                                  |   |       |       |       |          |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = -15 V$ ; $I_D = -410 \text{ mA}$ ;<br>$V_{GS} = -4.5 V$ ; $T_j = 25 \text{ }^\circ C$                           | -     | 0.7   | 1.2   | nC       |
| $Q_{GS}$                       | gate-source charge               |   | -     | 0.2   | -     | nC       |
| $Q_{GD}$                       | gate-drain charge                |   | -     | 0.2   | -     | nC       |
| $C_{iss}$                      | input capacitance                | $V_{DS} = -15 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ;<br>$T_j = 25 \text{ }^\circ C$                                  | -     | 43.2  | -     | pF       |
| $C_{oss}$                      | output capacitance               |   | -     | 5.9   | -     | pF       |
| $C_{rss}$                      | reverse transfer capacitance     |   | -     | 4.2   | -     | pF       |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = -15 V$ ; $I_D = -410 \text{ mA}$ ;<br>$V_{GS} = -4.5 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$ | -     | 3     | -     | ns       |
| $t_r$                          | rise time                        |   | -     | 4     | -     | ns       |
| $t_{d(off)}$                   | turn-off delay time              |   | -     | 14    | -     | ns       |
| $t_f$                          | fall time                        |   | -     | 5     | -     | ns       |
| <b>Source-drain diode</b>      |                                  |   |       |       |       |          |
| $V_{SD}$                       | source-drain voltage             | $I_S = -410 \text{ mA}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -     | -0.95 | -1.2  | V        |



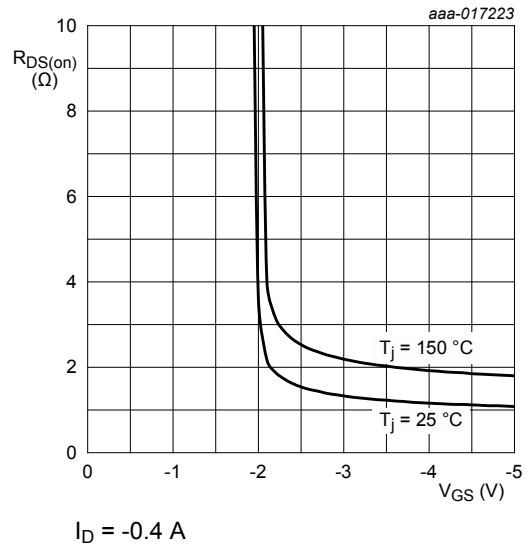
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



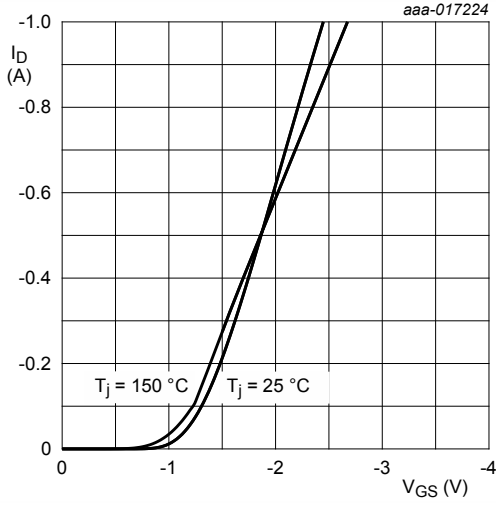
**Fig. 7. Sub-threshold drain current as a function of gate-source voltage**  
 $V_{DS} = -5 \text{ V}$   
 $T_j = 25 \text{ }^\circ\text{C}$   
 (1) minimum values  
 (2) typical values  
 (3) maximum values



**Fig. 8. Drain-source on-state resistance as a function of drain current; typical values**

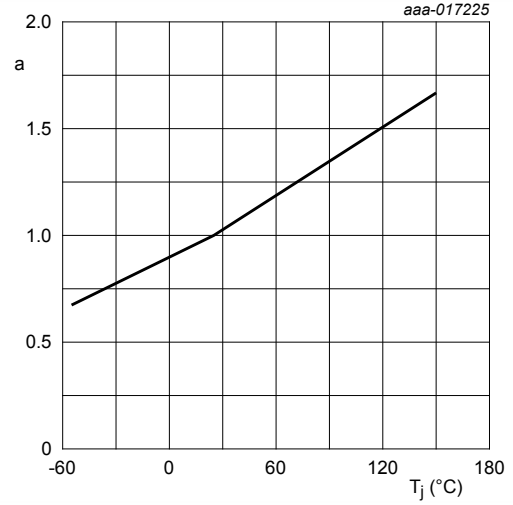


**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**  
 $I_D = -0.4 \text{ A}$



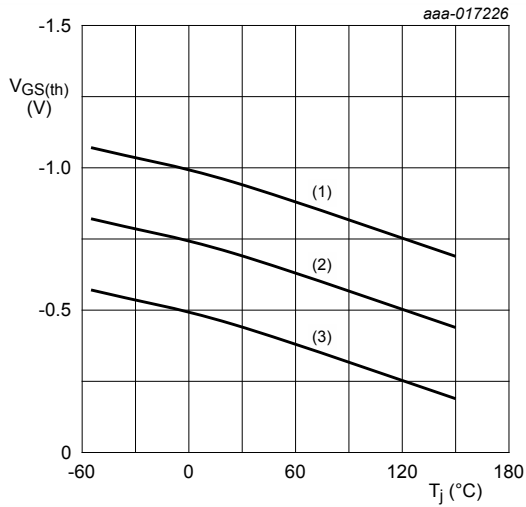
$$V_{DS} > I_D \times R_{DS(on)}$$

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



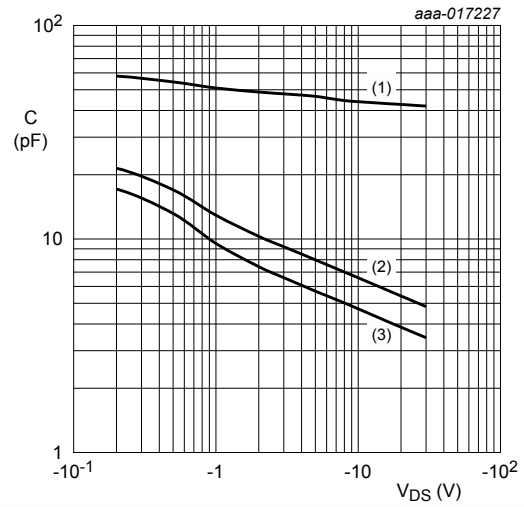
**Fig. 11. Normalized drain-source on-state resistance as a function of ambient temperature; typical values**

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



$I_D = -250 \mu A; V_{DS} = V_{GS}$   
 (1) maximum values  
 (2) typical values  
 (3) minimum values

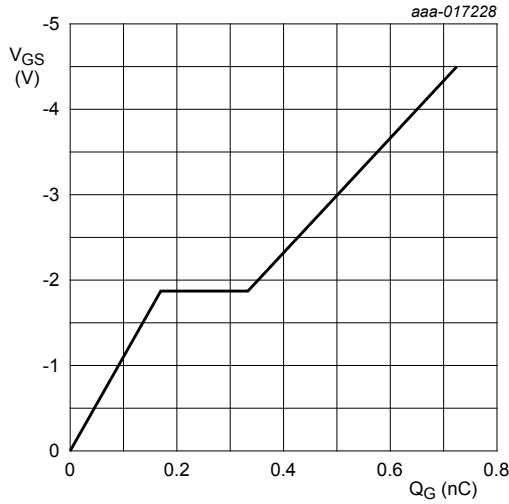
**Fig. 12. Gate-source threshold voltage as a function of junction temperature**



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





$V_{DS} = -15\text{ V}; I_D = -410\text{ mA } T_{amb} = 25\text{ }^\circ\text{C}$

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

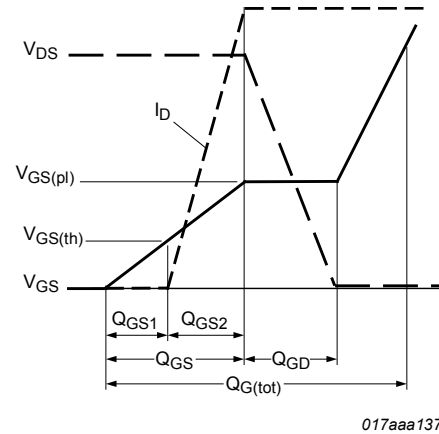
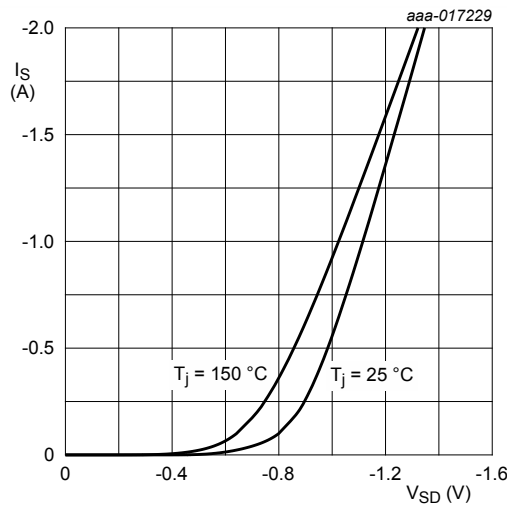


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

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

## 11. Test information

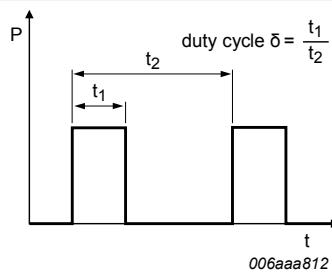


Fig. 17. Duty cycle definition

## 12. Package outline

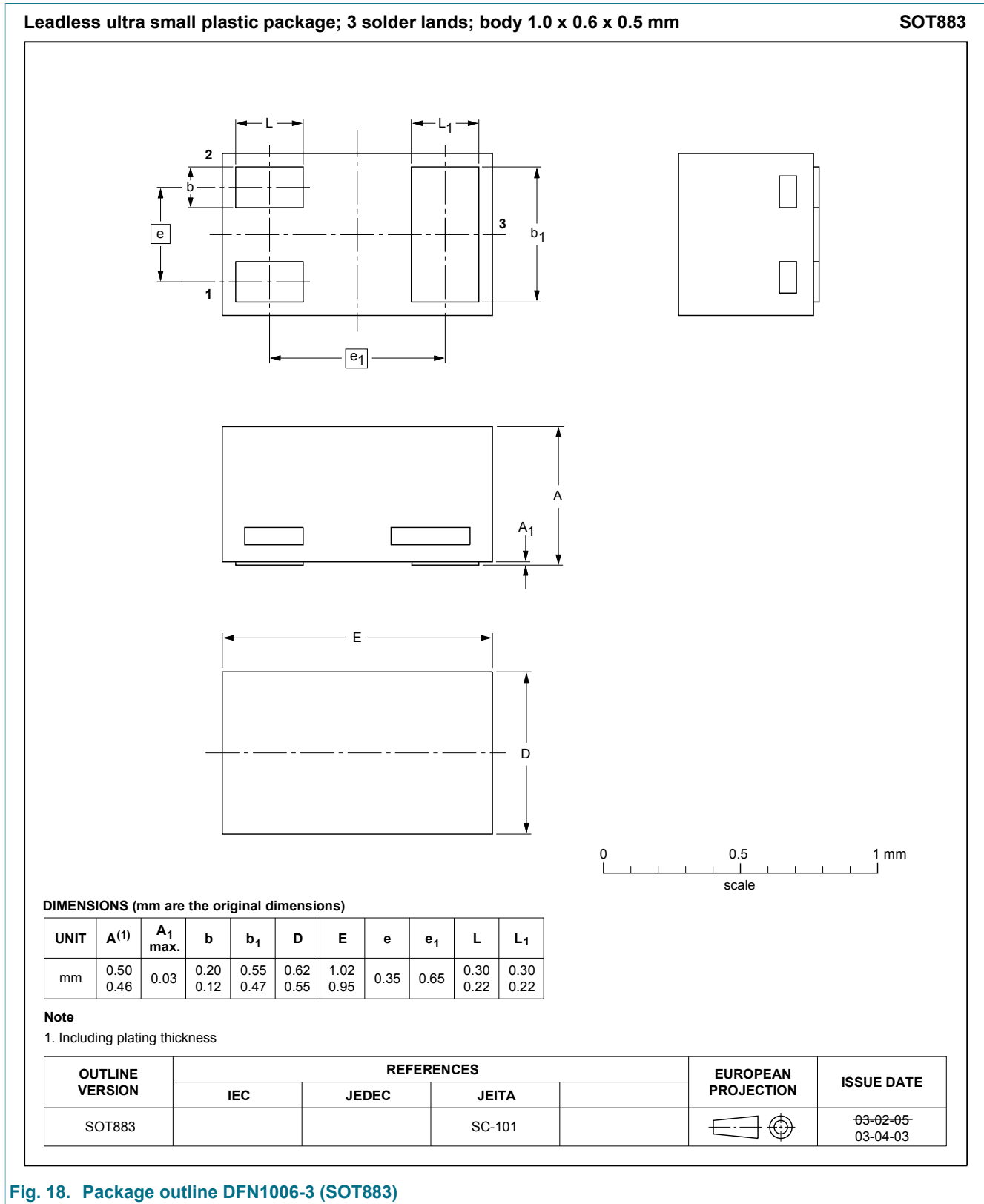


Fig. 18. Package outline DFN1006-3 (SOT883)

### 13. Soldering

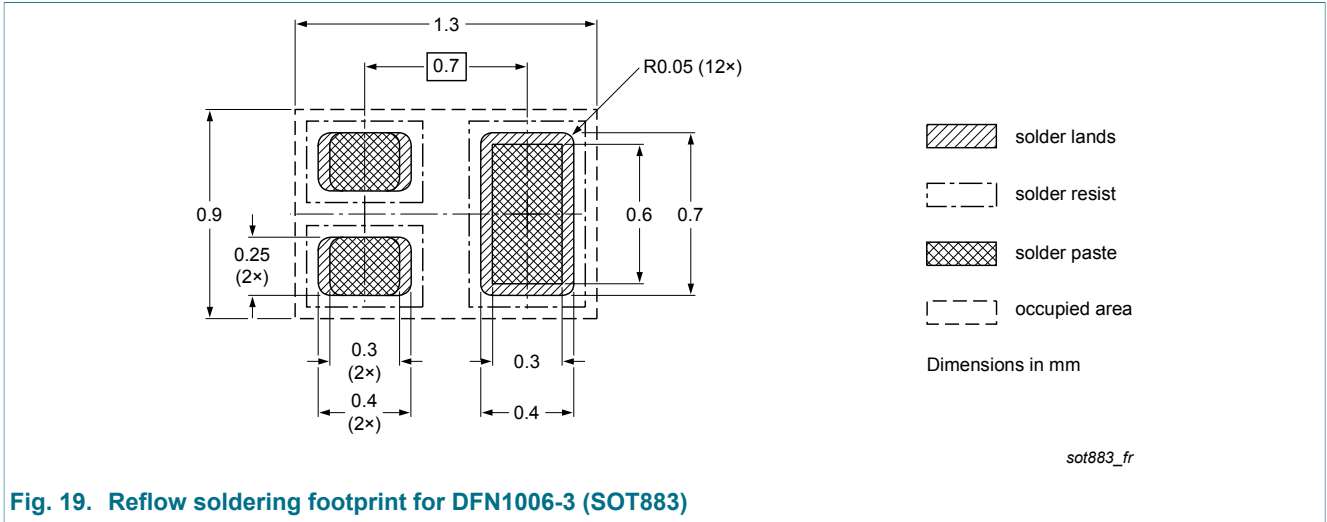


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

## 14. Revision history

Table 8. Revision history

| Data sheet ID  | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| PMZ1200UPE v.1 | 20150325     | 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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## 16. Contents

|      |                               |    |
|------|-------------------------------|----|
| 1    | General description .....     | 1  |
| 2    | Features and benefits .....   | 1  |
| 3    | Applications .....            | 1  |
| 4    | Quick reference data .....    | 1  |
| 5    | Pinning information .....     | 2  |
| 6    | Ordering information .....    | 2  |
| 7    | Marking .....                 | 2  |
| 8    | Limiting values .....         | 3  |
| 9    | Thermal characteristics ..... | 4  |
| 10   | Characteristics .....         | 6  |
| 11   | Test information .....        | 9  |
| 12   | Package outline .....         | 10 |
| 13   | Soldering .....               | 11 |
| 14   | Revision history .....        | 12 |
| 15   | Legal information .....       | 13 |
| 15.1 | Data sheet status .....       | 13 |
| 15.2 | Definitions .....             | 13 |
| 15.3 | Disclaimers .....             | 13 |
| 15.4 | Trademarks .....              | 14 |

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