



# PMZ600UNE

20 V, N-channel Trench MOSFET

26 June 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
- Leadless ultra small SMD plastic package:  $1.0 \times 0.6 \times 0.48$  mm
- ElectroStatic Discharge (ESD) protection  $> 1$  kV HBM
- Drain-source on-state resistance  $R_{DSon} = 470$  m $\Omega$

## 3. Applications

- Relay driver
- High-speed line driver
- Low-side load switch
- Switching circuits

## 4. Quick reference data

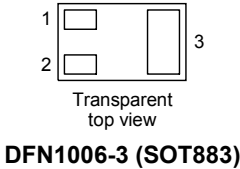
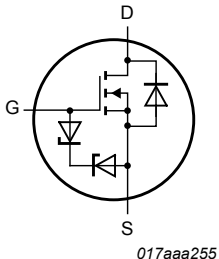
Table 1. Quick reference data

| 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] | -   | -   | 0.6 | A          |
| <b>Static characteristics</b> |                                  |                                                |     |     |     |     |            |
| $R_{DSon}$                    | drain-source on-state resistance | $V_{GS} = 4.5$ V; $I_D = 0.6$ A; $T_J = 25$ °C |     | -   | 470 | 620 | m $\Omega$ |

[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        | <br>Transparent<br>top view<br><b>DFN1006-3 (SOT883)</b> | <br>017aaa255 |
| 2   | S      | source      |                                                                                                                                           |                                                                                                  |
| 3   | D      | drain       |                                                                                                                                           |                                                                                                  |

6. Ordering information

Table 3. Ordering information

| Type number | Package   |                                                                 |         |
|-------------|-----------|-----------------------------------------------------------------|---------|
|             | Name      | Description                                                     | Version |
| PMZ600UNE   | DFN1006-3 | DFN1006-3: leadless ultra small plastic package; 3 solder lands | SOT883  |

7. Marking

Table 4. Marking codes

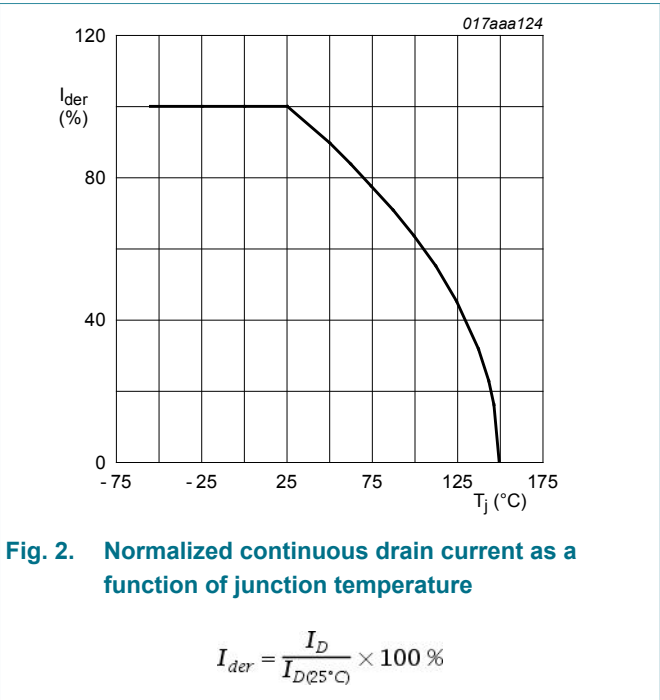
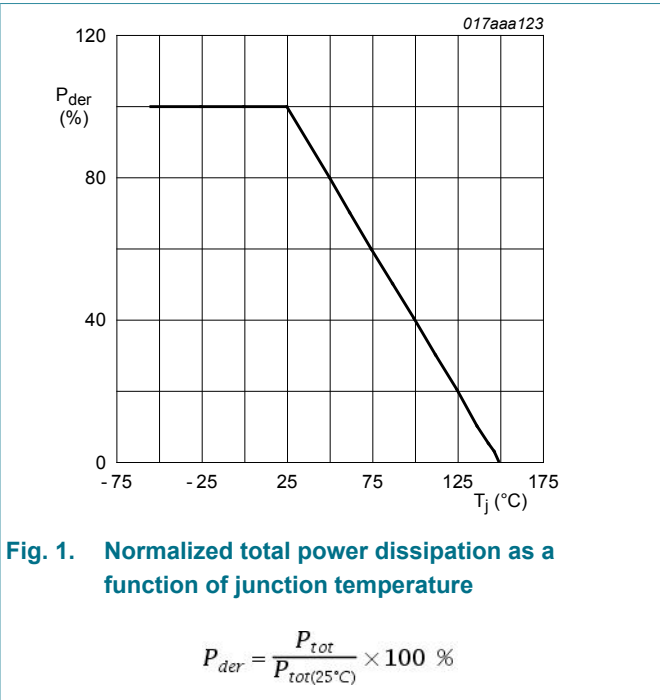
| Type number | Marking code |
|-------------|--------------|
| PMZ600UNE   | SA           |

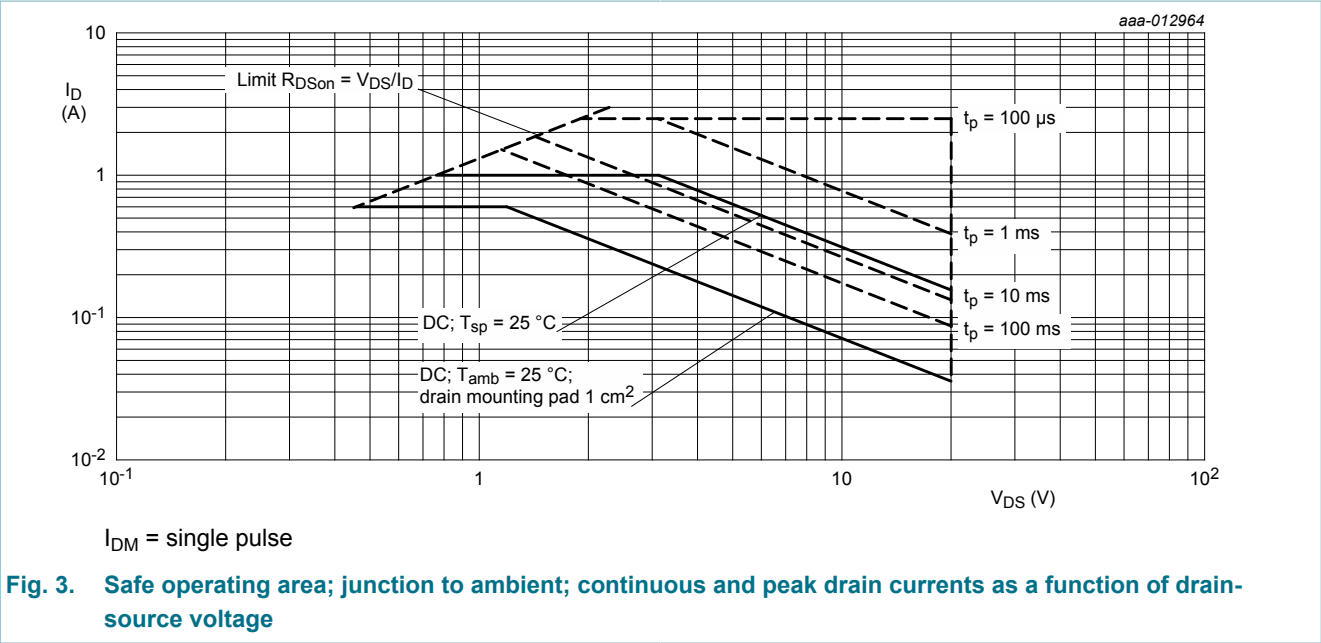
8. Limiting values

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                                         |     | -   | 20   | 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] | -   | 0.6  | A    |
|                    |                         | V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C             | [1] | -   | 0.4  | A    |
| I <sub>DM</sub>    | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | 2.5  | A    |
| P <sub>tot</sub>   | total power dissipation | T <sub>amb</sub> = 25 °C                                       | [2] | -   | 360  | mW   |
|                    |                         |                                                                | [1] | -   | 715  | mW   |
|                    |                         | T <sub>sp</sub> = 25 °C                                        |     | -   | 2700 | 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   |
| Source-drain diode |                         |                                                                |     |     |      |      |
| I <sub>S</sub>     | source current          | T <sub>amb</sub> = 25 °C                                       | [1] | -   | 0.4  | A    |

- [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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



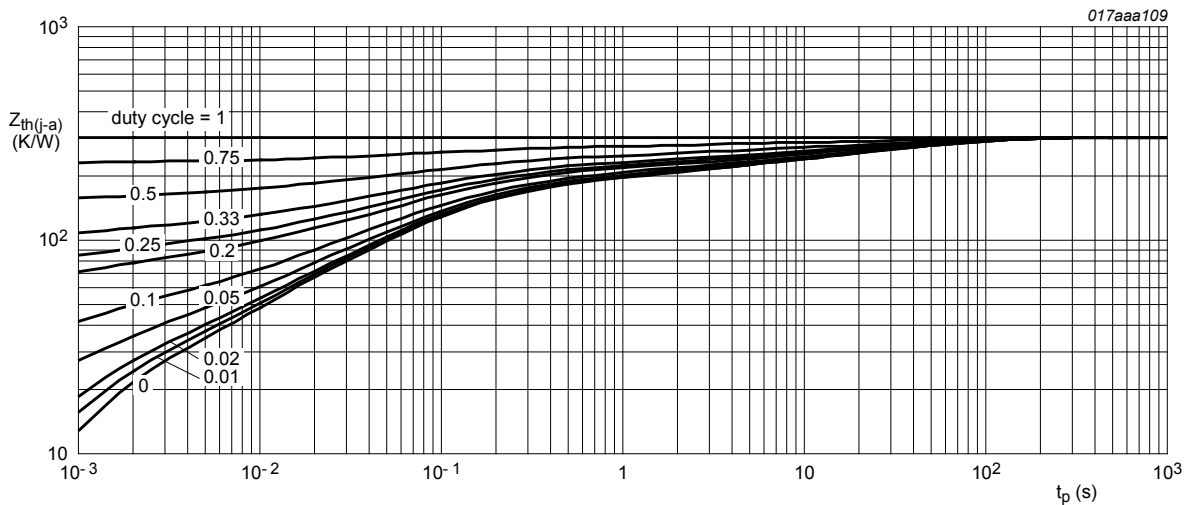


9. Thermal characteristics

Table 6. Thermal characteristics

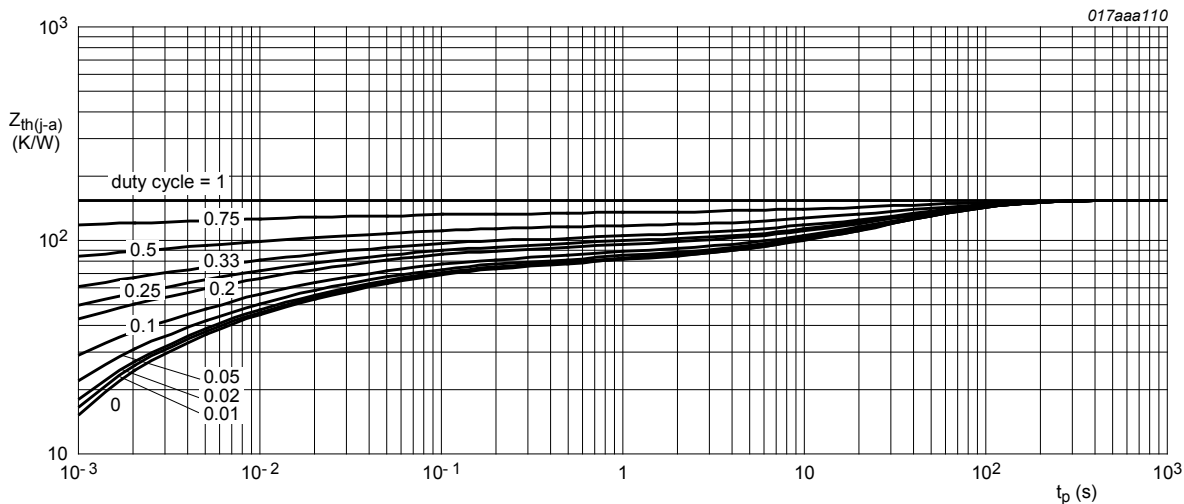
| Symbol         | Parameter                                        | Conditions  |     | Min | Typ | Max | Unit |
|----------------|--------------------------------------------------|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in 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  $1\text{ cm}^2$ .



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 cm<sup>2</sup>

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   | $I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                             | 20   | -    | -    | V          |
| $V_{GSth}$                     | gate-source threshold voltage    | $I_D = 250\ \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25\ ^\circ C$                                           | 0.45 | 0.7  | 0.95 | V          |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = 20\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                               | -    | -    | 1    | $\mu A$    |
|                                |                                  | $V_{DS} = 20\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 150\ ^\circ C$                                              | -    | -    | 10   | $\mu A$    |
| $I_{GSS}$                      | gate leakage current             | $V_{GS} = 8\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                                | -    | -    | 10   | $\mu A$    |
|                                |                                  | $V_{GS} = -8\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                               | -    | -    | -10  | $\mu A$    |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                              | -    | -    | 1    | $\mu A$    |
|                                |                                  | $V_{GS} = -4.5\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                             | -    | -    | -1   | $\mu A$    |
| $R_{DSon}$                     | drain-source on-state resistance | $V_{GS} = 4.5\ V$ ; $I_D = 0.6\ A$ ; $T_j = 25\ ^\circ C$                                               | -    | 470  | 620  | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $I_D = 0.6\ A$ ; $T_j = 150\ ^\circ C$                                              | -    | 760  | 1000 | m $\Omega$ |
|                                |                                  | $V_{GS} = 2.5\ V$ ; $I_D = 0.5\ A$ ; $T_j = 25\ ^\circ C$                                               | -    | 620  | 850  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.8\ V$ ; $I_D = 0.1\ A$ ; $T_j = 25\ ^\circ C$                                               | -    | 845  | 1300 | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.5\ V$ ; $I_D = 10\ mA$ ; $T_j = 25\ ^\circ C$                                               | -    | 1125 | 3000 | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.2\ V$ ; $I_D = 1\ mA$ ; $T_j = 25\ ^\circ C$                                                | -    | 2210 | -    | m $\Omega$ |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = 5\ V$ ; $I_D = 0.6\ A$ ; $T_j = 25\ ^\circ C$                                                 | -    | 1    | -    | S          |
| $R_G$                          | gate resistance                  | $f = 1\ MHz$                                                                                            | -    | 34   | -    | $\Omega$   |
| <b>Dynamic characteristics</b> |                                  |                                                                                                         |      |      |      |            |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = 10\ V$ ; $I_D = 0.6\ A$ ; $V_{GS} = 4.5\ V$ ; $T_j = 25\ ^\circ C$                            | -    | 0.4  | 0.7  | nC         |
| $Q_{GS}$                       | gate-source charge               |                                                                                                         | -    | 0.1  | -    | nC         |
| $Q_{GD}$                       | gate-drain charge                |                                                                                                         | -    | 0.1  | -    | nC         |
| $C_{iss}$                      | input capacitance                | $V_{DS} = 10\ V$ ; $f = 1\ MHz$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                | -    | 21.3 | -    | pF         |
| $C_{oss}$                      | output capacitance               |                                                                                                         | -    | 5.4  | -    | pF         |
| $C_{rss}$                      | reverse transfer capacitance     |                                                                                                         | -    | 4.2  | -    | pF         |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = 10\ V$ ; $I_D = 0.6\ A$ ; $V_{GS} = 4.5\ V$ ; $R_{G(ext)} = 6\ \Omega$ ; $T_j = 25\ ^\circ C$ | -    | 5.6  | -    | ns         |
| $t_r$                          | rise time                        |                                                                                                         | -    | 9.2  | -    | ns         |
| $t_{d(off)}$                   | turn-off delay time              |                                                                                                         | -    | 19   | -    | ns         |
| $t_f$                          | fall time                        |                                                                                                         | -    | 51   | -    | ns         |

| Symbol             | Parameter            | Conditions                                                                         | Min | Typ | Max | Unit |
|--------------------|----------------------|------------------------------------------------------------------------------------|-----|-----|-----|------|
| Source-drain diode |                      |                                                                                    |     |     |     |      |
| $V_{SD}$           | source-drain voltage | $I_S = 0.36\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ | -   | 0.8 | 1.2 | V    |

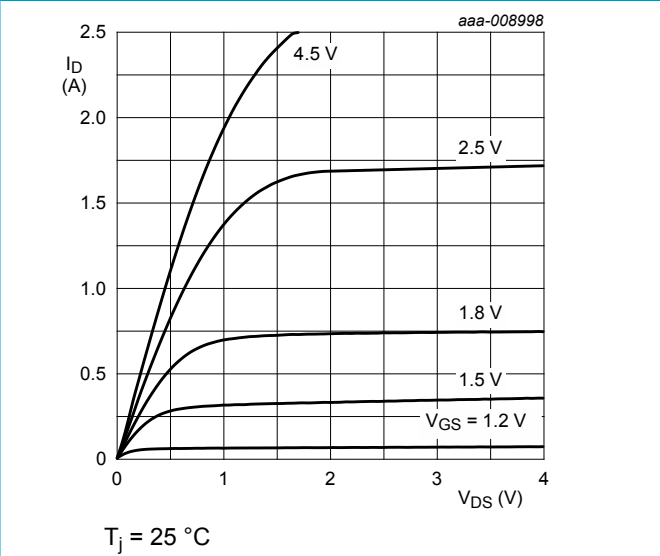


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

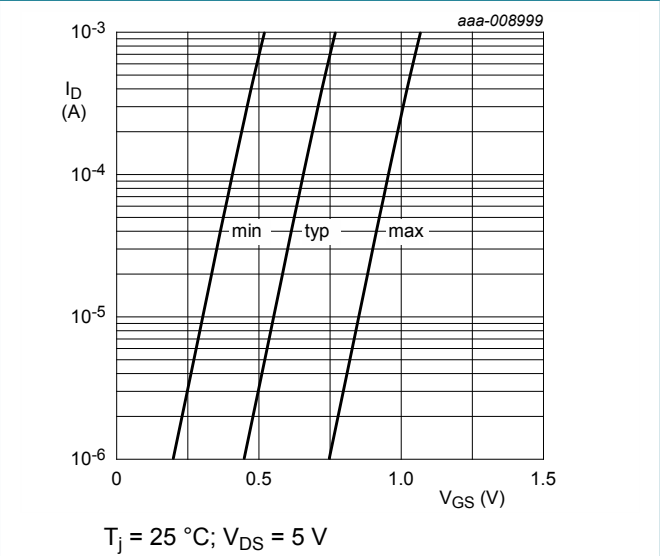


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

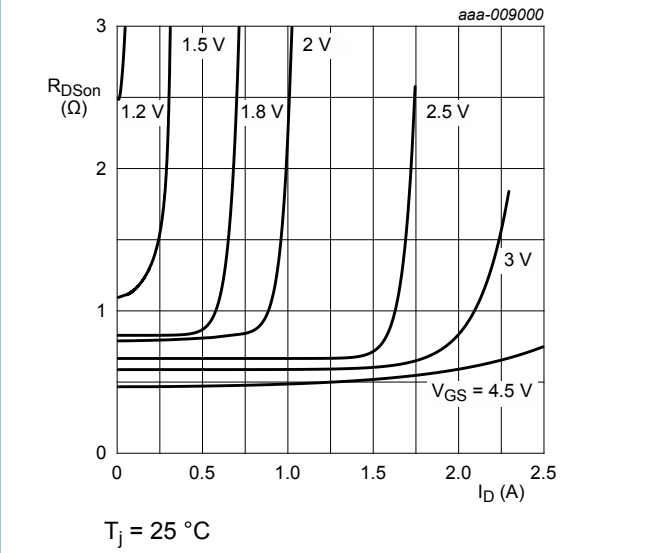


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

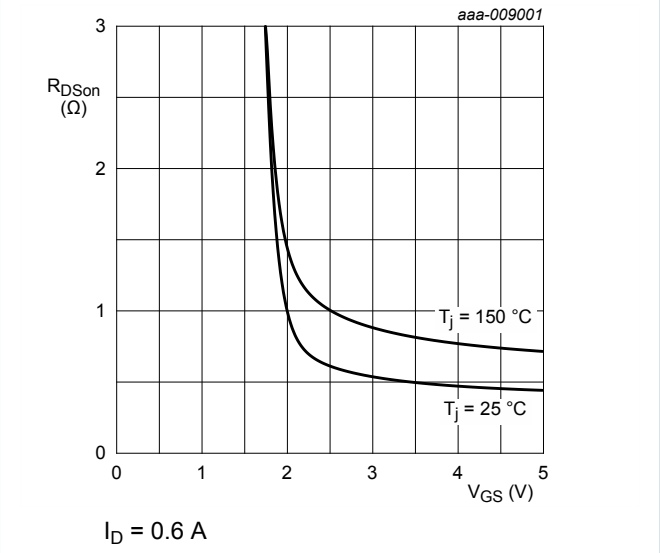
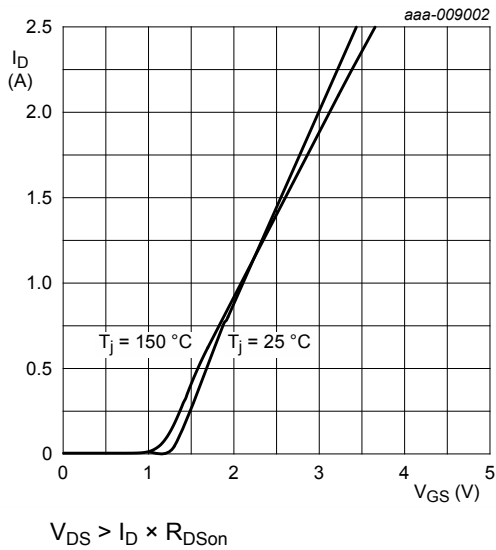


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

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

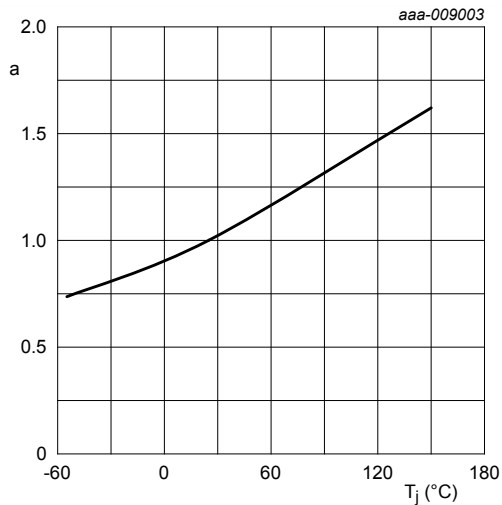
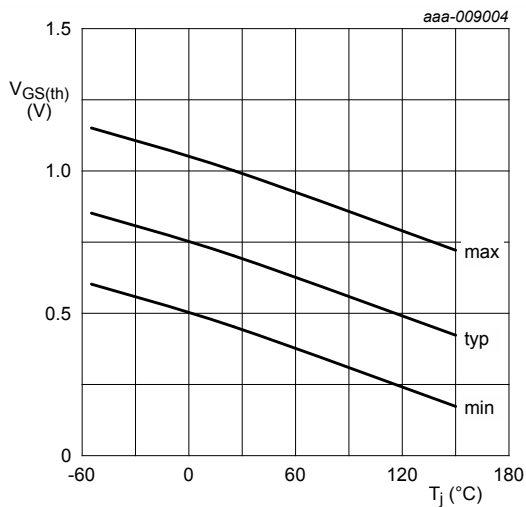


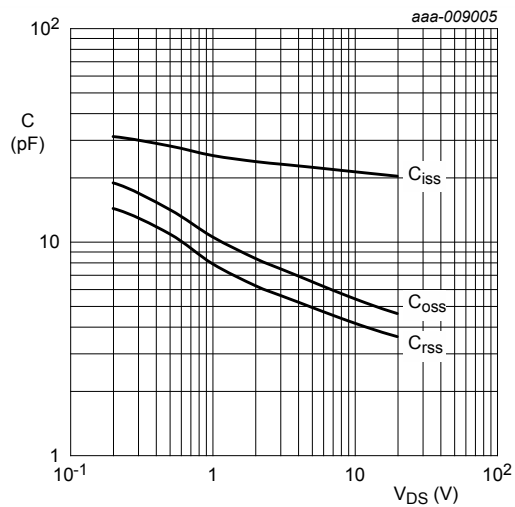
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

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



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

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



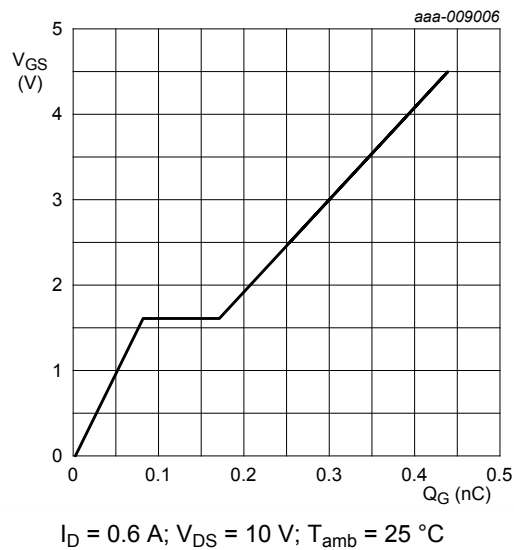


Fig. 14. Gate-source voltage as a function of gate charge; typical values

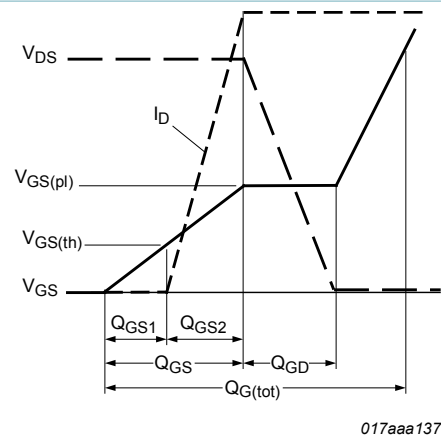
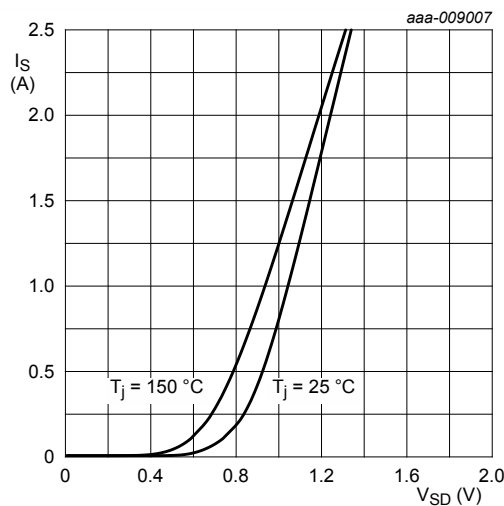


Fig. 15. MOSFET transistor: Gate charge waveform definitions



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

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

## 11. Test information

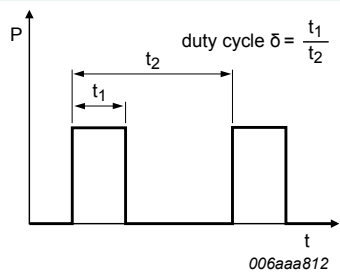


Fig. 17. Duty cycle definition

12. Package outline

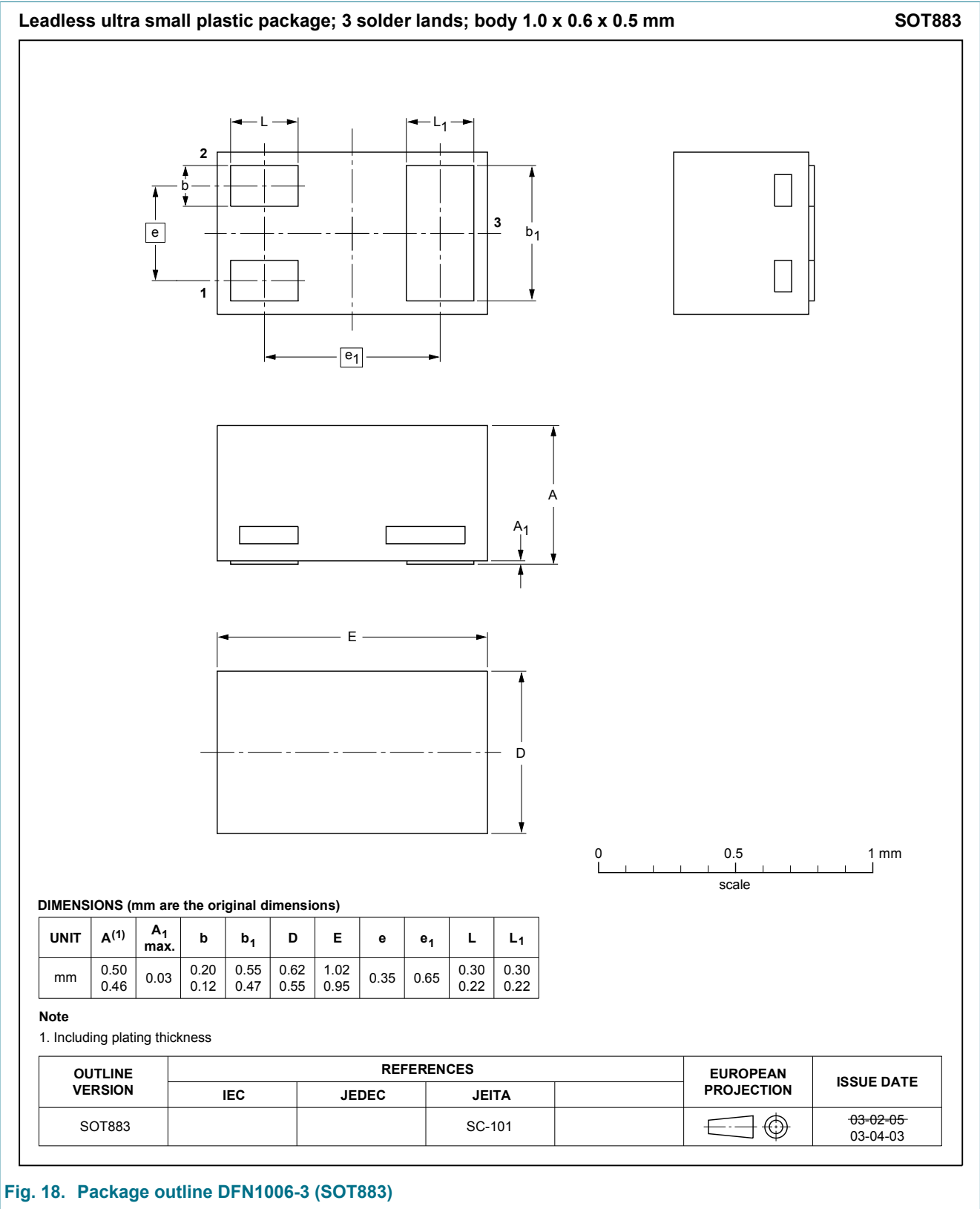


Fig. 18. Package outline DFN1006-3 (SOT883)

13. Soldering

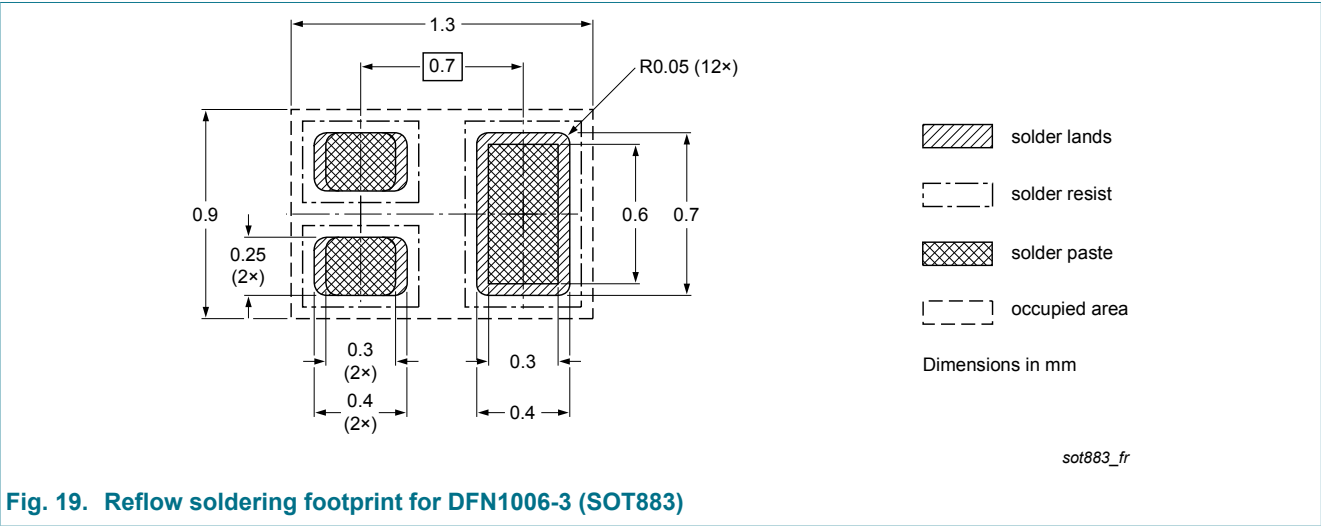


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

## 14. Revision history

Table 8. Revision history

| Data sheet ID  | Release date                                                                                        | Data sheet status  | Change notice      | Supersedes    |
|----------------|-----------------------------------------------------------------------------------------------------|--------------------|--------------------|---------------|
| PMZ600UNE v.2  | 20140626                                                                                            | Product data sheet | Product data sheet | PMZ600UNE v.1 |
| Modifications: | <ul style="list-style-type: none"><li>Limiting values parameter source current corrected.</li></ul> |                    |                    |               |
| PMZ600UNE v.1  | 20140509                                                                                            | 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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