



# PMZ390UNE

30 V, N-channel Trench MOSFET

12 March 2015

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             | $T_J = 25\text{ °C}$  | -   | -   | 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] | -   | 0.9 | A    |
| <b>Static characteristics</b> |                                  |   |     |     |     |      |
| $R_{DS(on)}$                  | drain-source on-state resistance | $V_{GS} = 4.5\text{ V}; I_D = 0.9\text{ A}; T_J = 25\text{ °C}$ | -   | 390 | 470 | mΩ   |

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

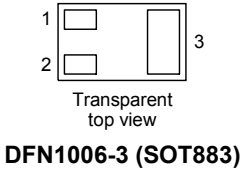
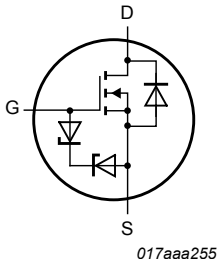


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## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline   | Graphic symbol   |
|-----|--------|-------------|--|--|
| 1   | G      | gate        |  <p>Transparent top view<br/>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 |
| PMZ390UNE   | DFN1006-3 | DFN1006-3: leadless ultra small plastic package; 3 solder lands | SOT883  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMZ390UNE   | ZY           |

## 8. Limiting values

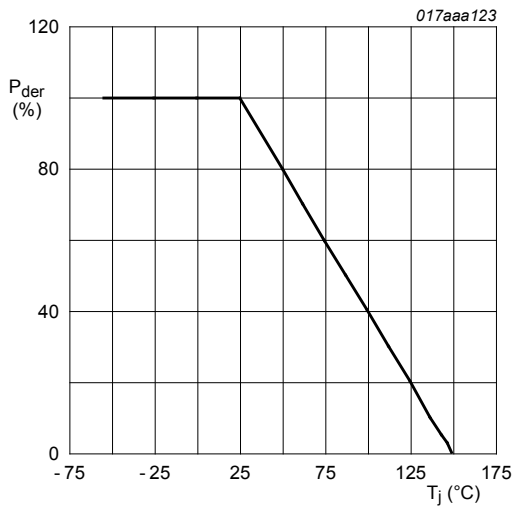
**Table 5. Limiting values**

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] | -   | 0.9  | A    |
|                           |                         | V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C             | [1] | -   | 0.6  | A    |
| I <sub>DM</sub>           | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | 4    | A    |
| P <sub>tot</sub>          | total power dissipation | T <sub>amb</sub> = 25 °C                                       | [2] | -   | 350  | mW   |
|                           |                         |  | [1] | -   | 715  | mW   |
|                           |                         | T <sub>sp</sub> = 25 °C  |     | -   | 5430 | 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] | -   | 0.7  | A    |

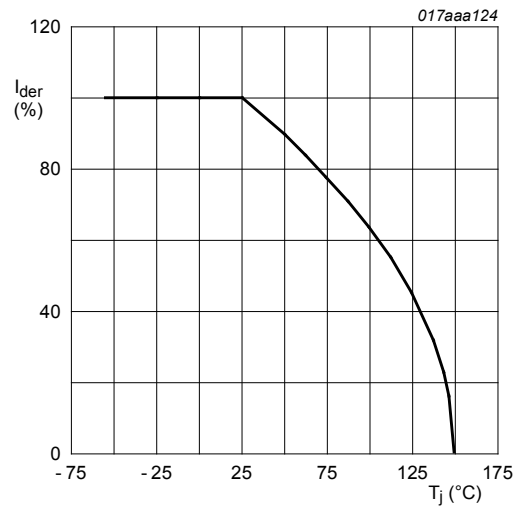
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.

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



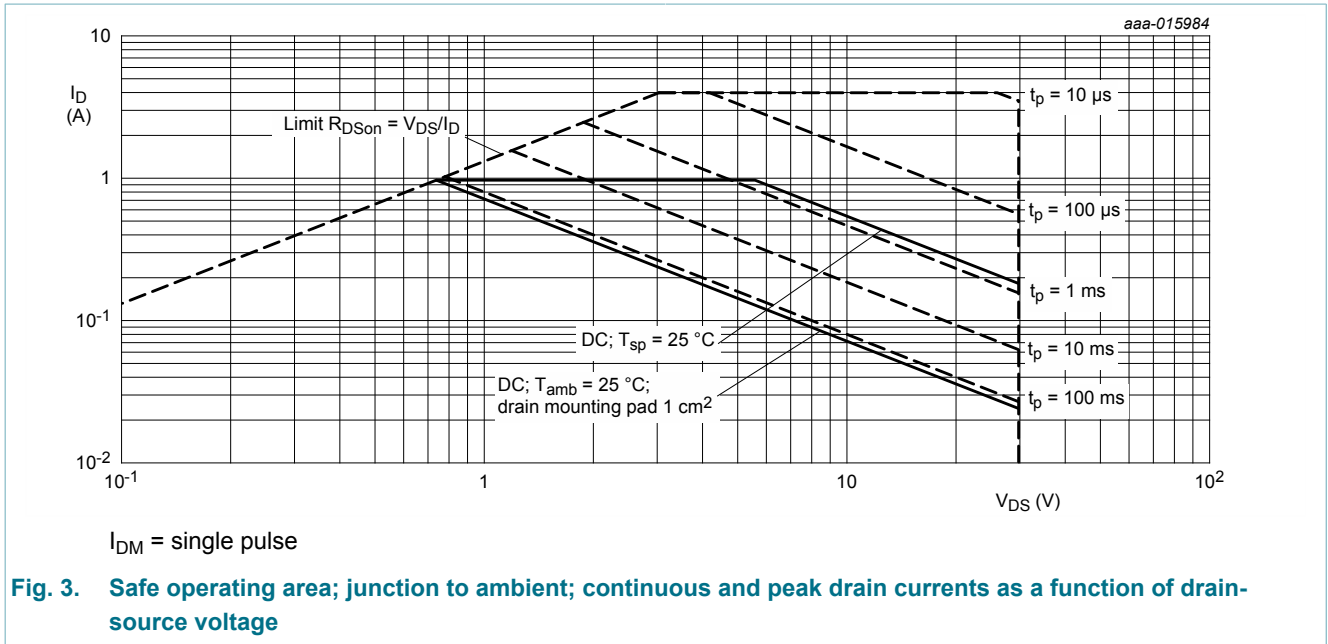
**Fig. 1. Normalized total power dissipation as a function of junction temperature**

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



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

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



## 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] | -   | 315 | 360 | K/W  |
|                |  |             | [2] | -   | 150 | 175 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             |     | -   | 20  | 23  | 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  $1\text{ cm}^2$ .

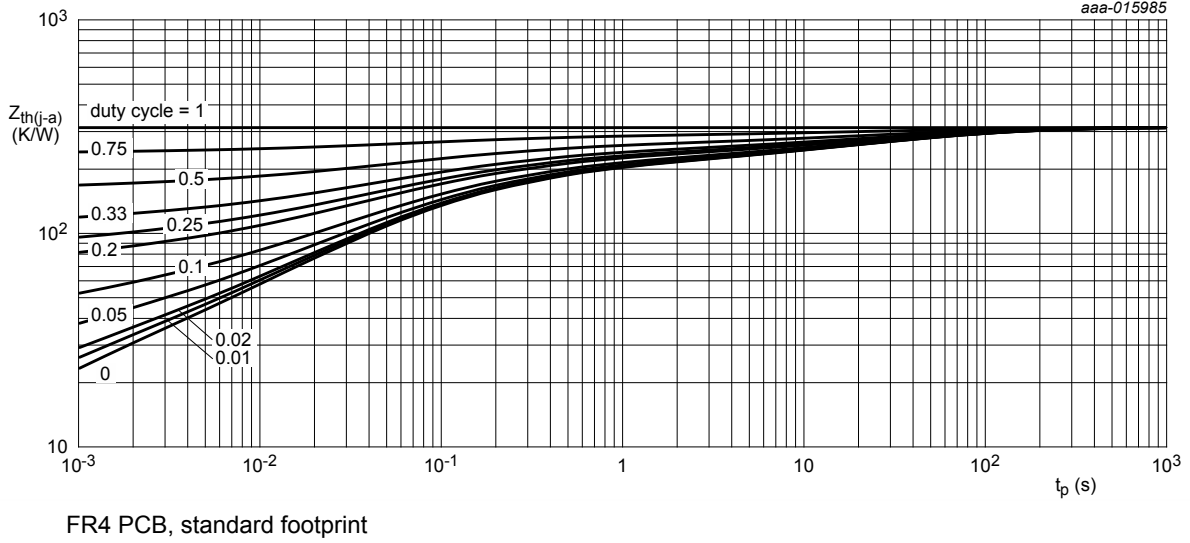


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

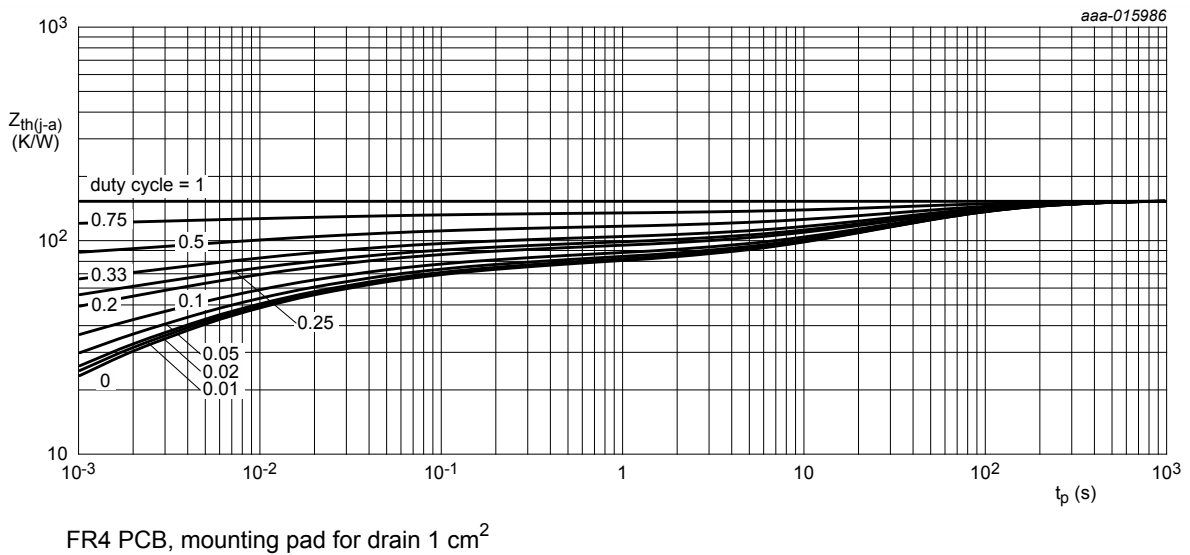


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                        | Conditions   | Min  | Typ  | Max  | Unit       |
|--------------------------------|----------------------------------|--|------|------|------|------------|
| <b>Static characteristics</b>  |                                  |  |      |      |      |            |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$                                     | 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 | $V_{GS} = 4.5 V; I_D = 0.9 A; T_j = 25 \text{ }^\circ C$                                       | -    | 390  | 470  | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5 V; I_D = 0.9 A; T_j = 150 \text{ }^\circ C$                                      | -    | 660  | 790  | m $\Omega$ |
|                                |                                  | $V_{GS} = 2.5 V; I_D = 0.8 A; T_j = 25 \text{ }^\circ C$                                       | -    | 460  | 620  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.8 V; I_D = 0.12 A; T_j = 25 \text{ }^\circ C$                                      | -    | 530  | 770  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.5 V; I_D = 0.01 A; T_j = 25 \text{ }^\circ C$                                      | -    | 610  | 1020 | m $\Omega$ |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = 10 V; I_D = 1 A; T_j = 25 \text{ }^\circ C$  | -    | 2    | -    | S          |
| <b>Dynamic characteristics</b> |                                  |  |      |      |      |            |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = 15 V; I_D = 0.8 A; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$                        | -    | 0.8  | 1.3  | nC         |
| $Q_{GS}$                       | gate-source charge               |  | -    | 0.1  | -    | nC         |
| $Q_{GD}$                       | gate-drain charge                |  | -    | 0.2  | -    | nC         |
| $C_{iss}$                      | input capacitance                | $V_{DS} = 15 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$                    | -    | 41   | -    | pF         |
| $C_{oss}$                      | output capacitance               |  | -    | 6    | -    | pF         |
| $C_{rss}$                      | reverse transfer capacitance     |  | -    | 5    | -    | pF         |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = 15 V; I_D = 0.8 A; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$ | -    | 4    | -    | ns         |
| $t_r$                          | rise time                        |  | -    | 8    | -    | ns         |
| $t_{d(off)}$                   | turn-off delay time              |  | -    | 12   | -    | ns         |
| $t_f$                          | fall time                        |  | -    | 3    | -    | ns         |
| <b>Source-drain diode</b>      |                                  |  |      |      |      |            |
| $V_{SD}$                       | source-drain voltage             | $I_S = 0.7 A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$   | -    | 0.86 | 1.2  | V          |

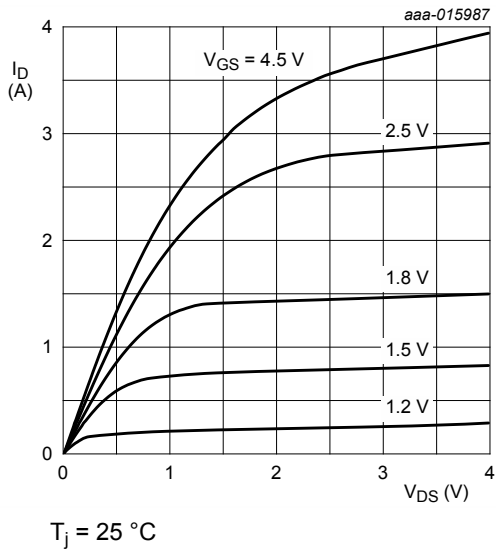


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

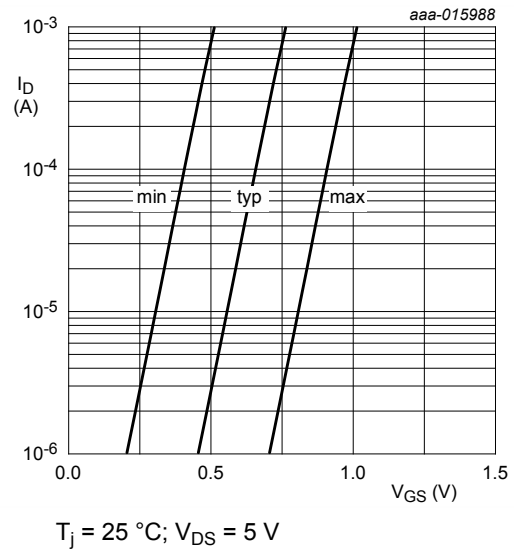


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

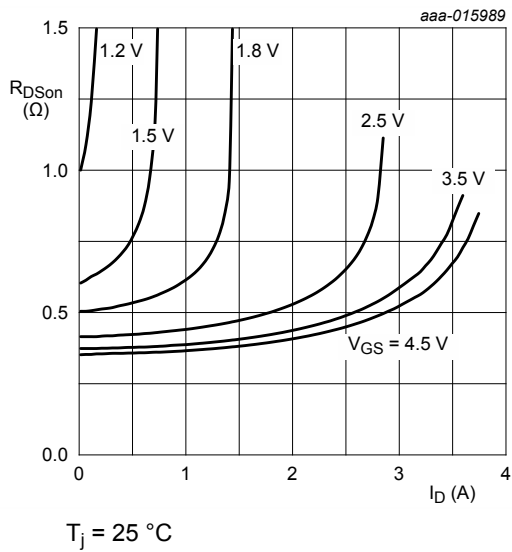


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

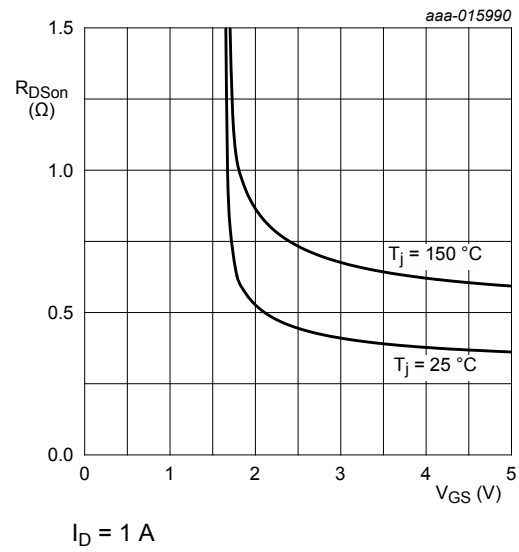
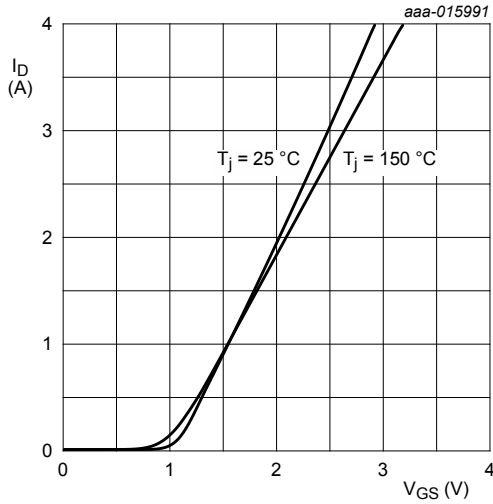
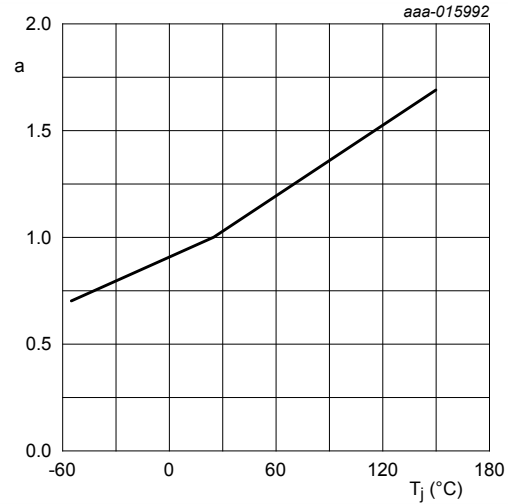


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

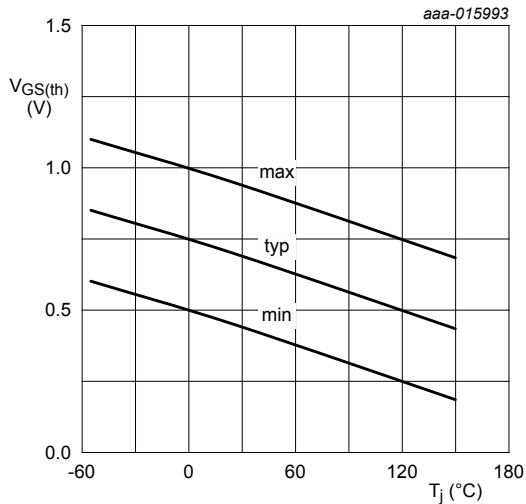


**Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



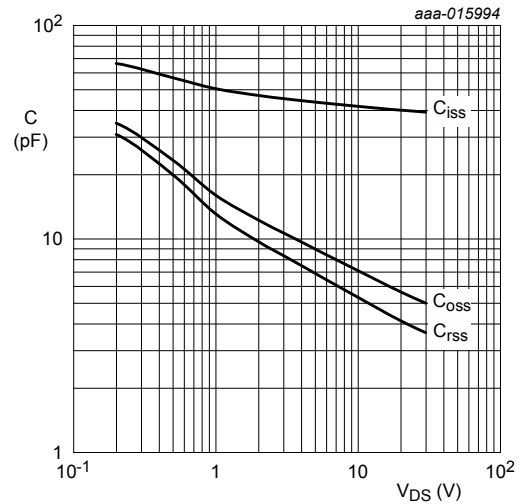
**Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

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



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

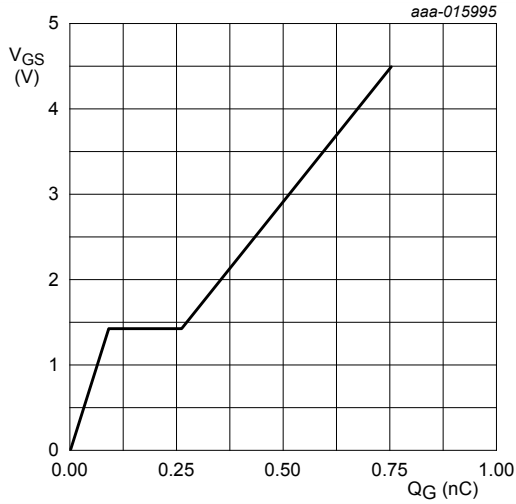
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$



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

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



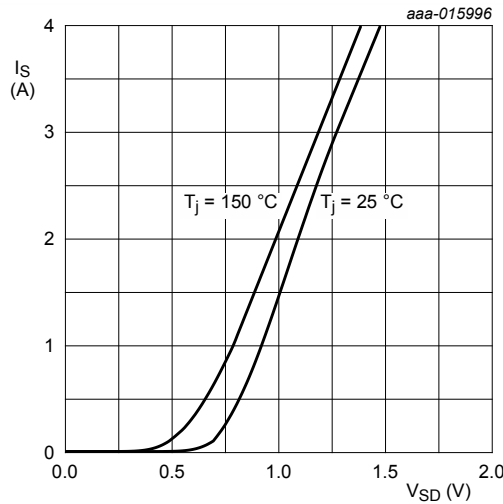


$I_D = 0.8 \text{ A}$ ;  $V_{DS} = 15 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$

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

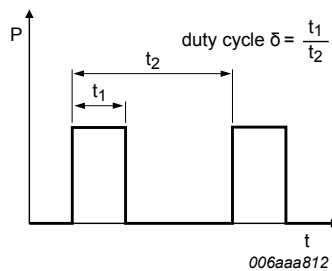


Fig. 17. Duty cycle definition

## 12. Package outline

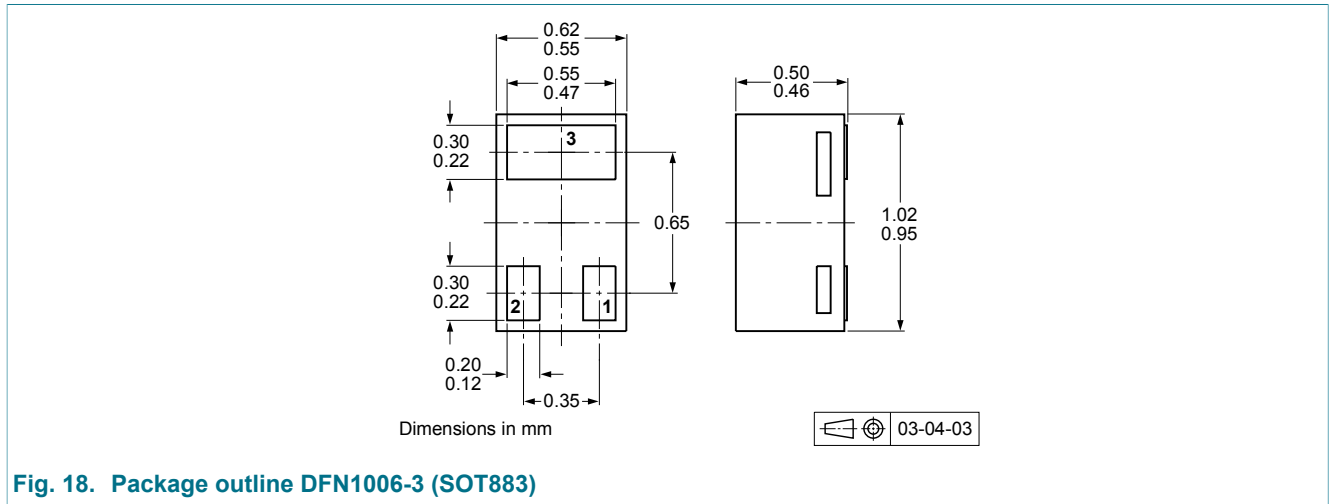


Fig. 18. Package outline DFN1006-3 (SOT883)

## 13. Soldering

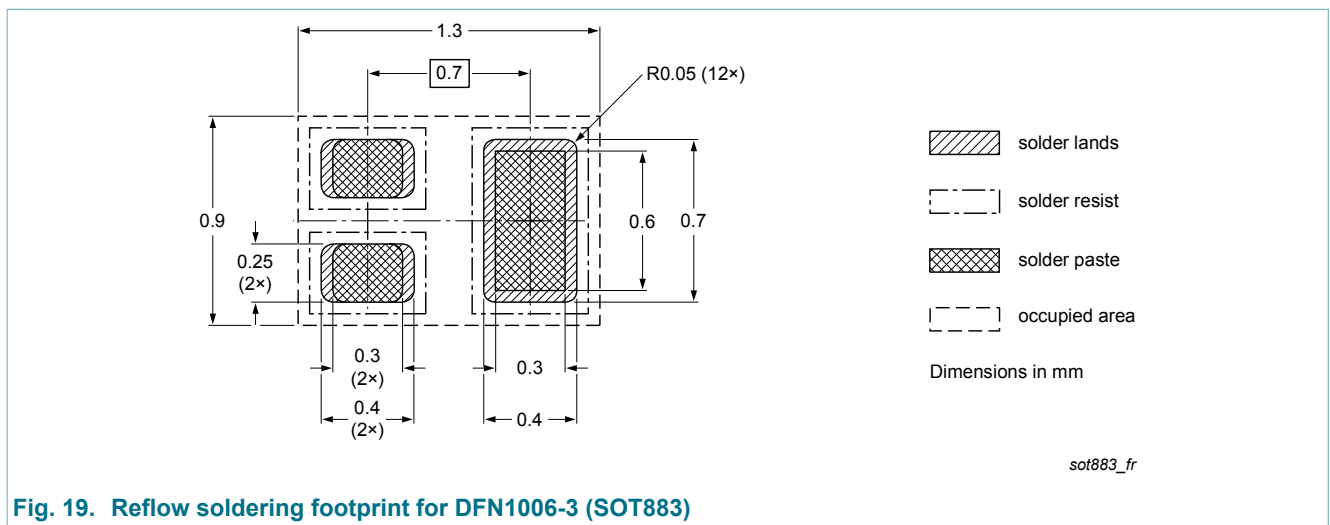


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

## 14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMZ390UNE v.1 | 20150312     | Product data sheet | -             | -          |

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|--------------------------------|--------------------|---|
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