



# PMZB290UNE2

20 V, N-channel Trench MOSFET

24 March 2015

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006B-3 (SOT883B) 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
- Ultra thin package profile of 0.37 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             | $T_J = 25\text{ }^\circ\text{C}$  | -   | -   | 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] | -   | 1.2 | A          |
| <b>Static characteristics</b> |                                  |   |     |     |     |            |
| $R_{DS(on)}$                  | drain-source on-state resistance | $V_{GS} = 4.5\text{ V}; I_D = 1.2\text{ A}; T_J = 25\text{ }^\circ\text{C}$ | -   | 270 | 320 | m $\Omega$ |

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

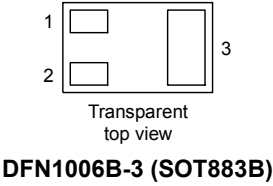
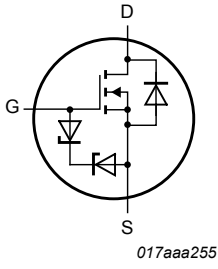


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### 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline   | Graphic symbol   |
|-----|--------|-------------|--|--|
| 1   | G      | gate        |  <p>Transparent top view<br/>DFN1006B-3 (SOT883B)</p> |  <p>017aaa255</p> |
| 2   | S      | source      |  |  |
| 3   | D      | drain       |  |  |

### 6. Ordering information

Table 3. Ordering information

| Type number | Package    |  |         |
|-------------|------------|--|---------|
|             | Name       | Description  | Version |
| PMZB290UNE2 | DFN1006B-3 | DFN1006B-3: leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm | SOT883B |

### 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMZB290UNE2 | 0101 0011    |

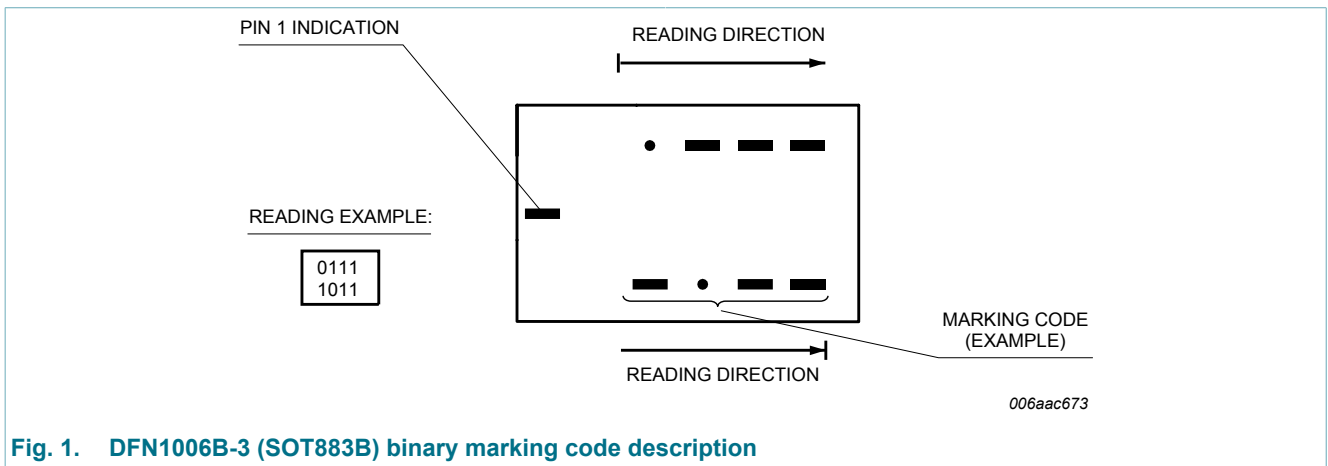


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

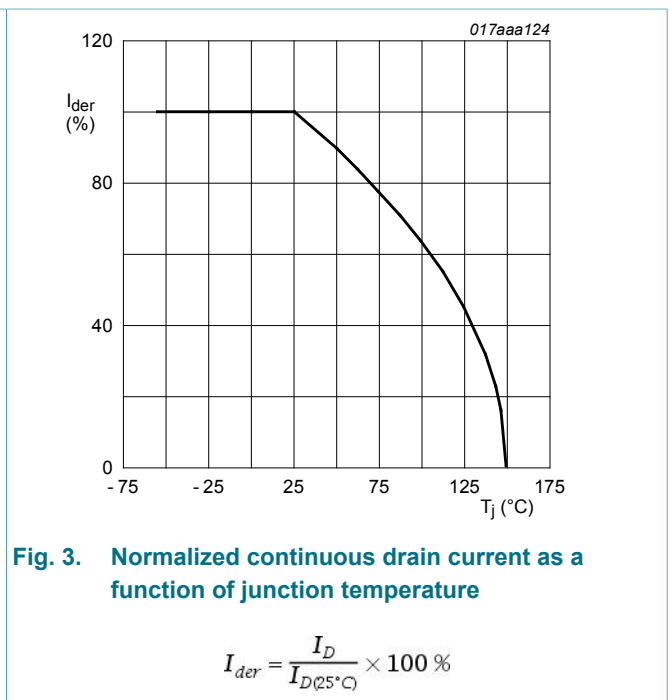
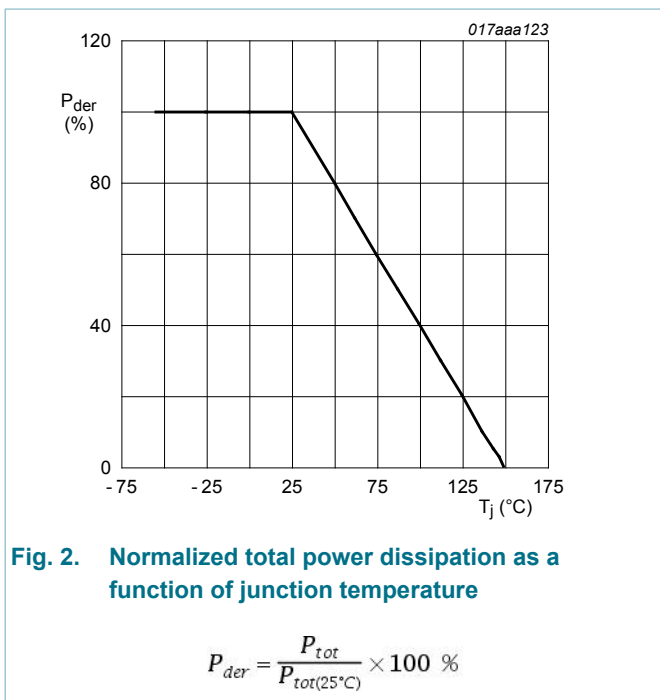
## 8. Limiting values

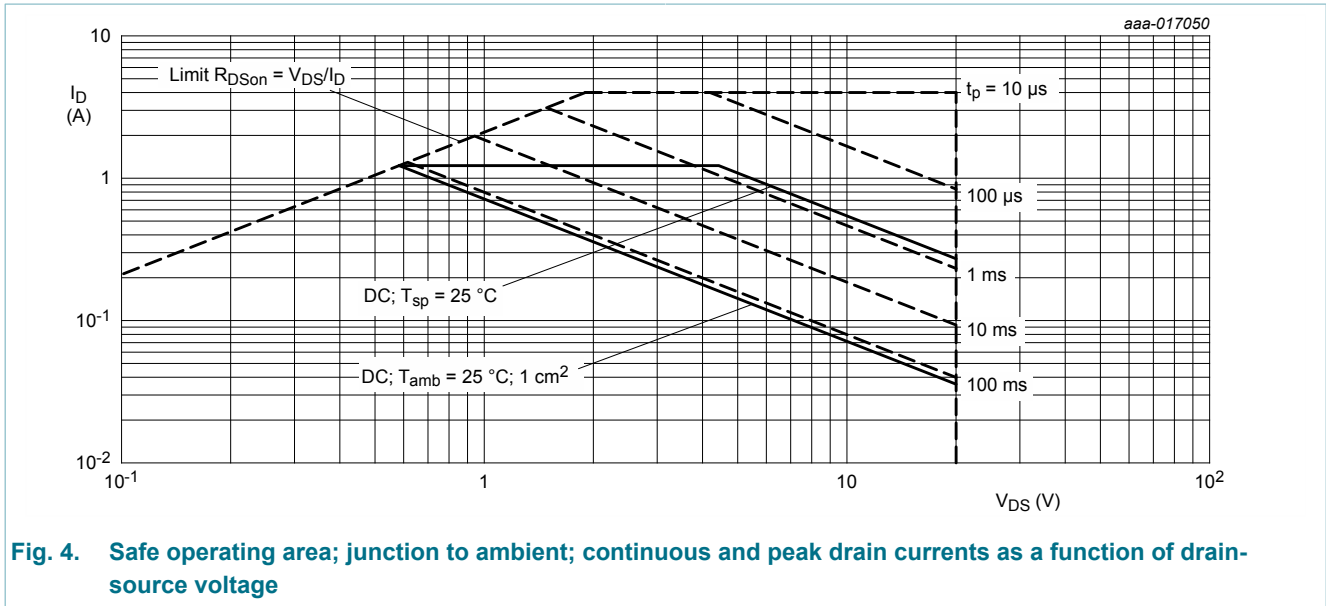
**Table 5. Limiting values**

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] | -   | 1.2  | A    |
|                           |                         | V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C             | [1] | -   | 0.8  | 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 and 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.





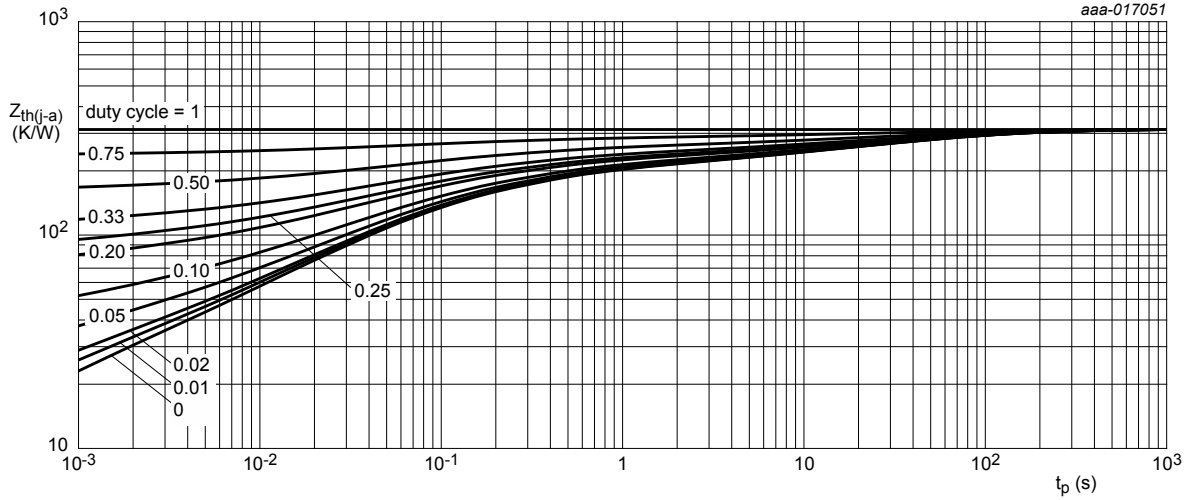
## 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol                | Parameter  | Conditions  |     | Min | Typ | Max | Unit |
|-----------------------|--|-------------|-----|-----|-----|-----|------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | [1] | -   | 315 | 360 | K/W  |
|                       |  |             | [2] | -   | 150 | 175 | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             |     | -   | 20  | 23  | K/W  |

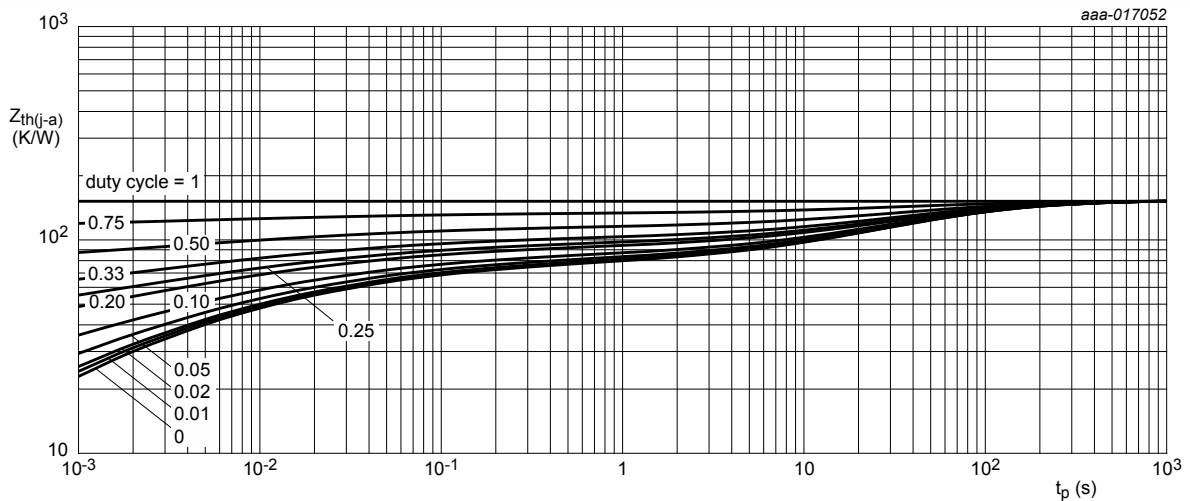
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



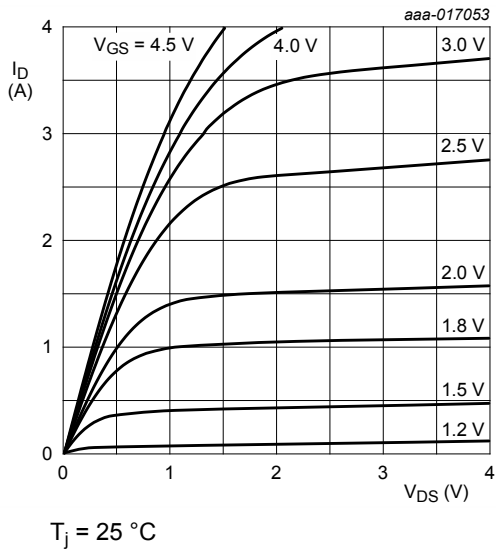
FR4 PCB, mounting pad for drain =  $1 \text{ cm}^2$

Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

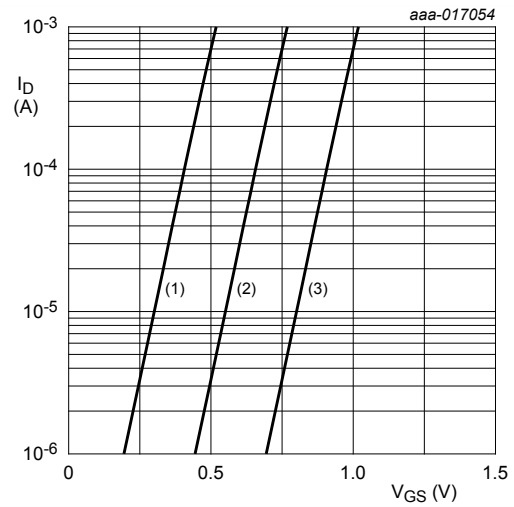
Table 7. Characteristics

| 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    | $I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$                                  | 0.45 | 0.7 | 0.95 | V          |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$                                       | -    | -   | 1    | $\mu A$    |
| $I_{GSS}$                      | 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         |
| $R_{DSon}$                     | drain-source on-state resistance | $V_{GS} = 4.5 V; I_D = 1.2 A; T_j = 25 \text{ }^\circ C$                                       | -    | 270 | 320  | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5 V; I_D = 1.2 A; T_j = 150 \text{ }^\circ C$                                      | -    | 400 | 475  | m $\Omega$ |
|                                |                                  | $V_{GS} = 2.5 V; I_D = 1.0 A; T_j = 25 \text{ }^\circ C$                                       | -    | 360 | 480  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.8 V; I_D = 0.12 A; T_j = 25 \text{ }^\circ C$                                      | -    | 470 | 680  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.5 V; I_D = 0.01 A; T_j = 25 \text{ }^\circ C$                                      | -    | 600 | 1190 | m $\Omega$ |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = 10 V; I_D = 1.23 A; T_j = 25 \text{ }^\circ C$                                       | -    | 1.9 | -    | S          |
| <b>Dynamic characteristics</b> |                                  |  |      |     |      |            |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = 10 V; I_D = 1.0 A; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$                        | -    | 0.8 | 1.4  | nC         |
| $Q_{GS}$                       | gate-source charge               |  | -    | 0.1 | -    | nC         |
| $Q_{GD}$                       | gate-drain charge                |  | -    | 0.2 | -    | nC         |
| $C_{iss}$                      | input capacitance                | $V_{DS} = 10 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$                    | -    | 46  | -    | pF         |
| $C_{oss}$                      | output capacitance               |  | -    | 9.6 | -    | pF         |
| $C_{rss}$                      | reverse transfer capacitance     |  | -    | 7.7 | -    | pF         |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = 10 V; I_D = 1.0 A; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$ | -    | 6   | -    | ns         |
| $t_r$                          | rise time                        |  | -    | 10  | -    | ns         |
| $t_{d(off)}$                   | turn-off delay time              |  | -    | 11  | -    | ns         |
| $t_f$                          | fall time                        |  | -    | 4   | -    | ns         |
| <b>Source-drain diode</b>      |                                  |  |      |     |      |            |
| $V_{SD}$                       | source-drain voltage             | $I_S = 0.7 A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$   | -    | 0.9 | 1.2  | V          |



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

**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**

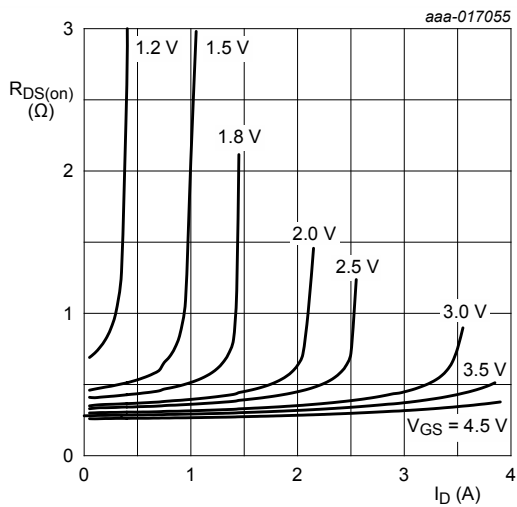


$V_{DS} = 5\text{ V}$

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

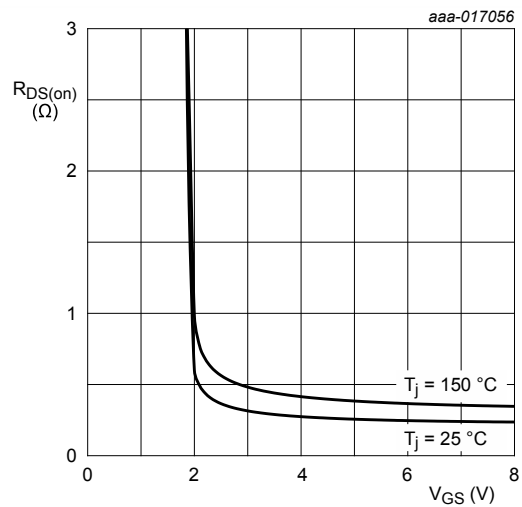
- (1) minimum values
- (2) typical values
- (3) maximum values

**Fig. 8. Sub-threshold drain current as a function of gate-source voltage**



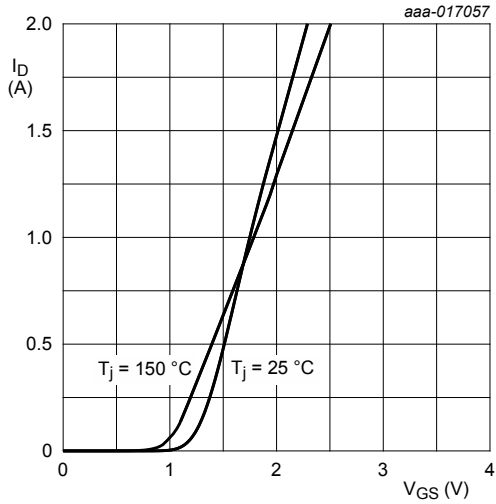
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 9. Drain-source on-state resistance as a function of drain current; typical values**



$I_D = 1\text{ A}$

**Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values**



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

Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

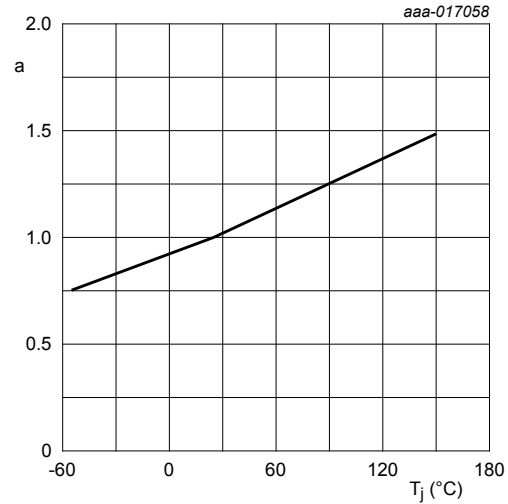
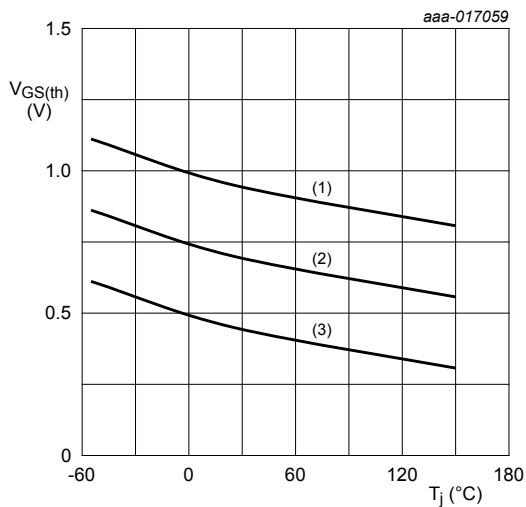


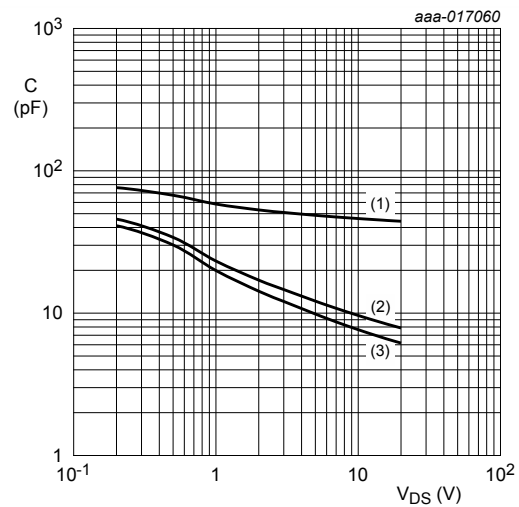
Fig. 12. Normalized drain-source on-state resistance as a function of ambient temperature; typical values

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



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

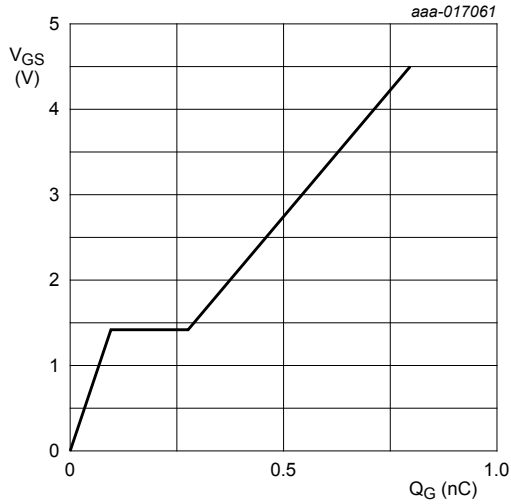
Fig. 13. Gate-source threshold voltage as a function of ambient temperature



$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$   
 (1)  $C_{iss}$   
 (2)  $C_{oss}$   
 (3)  $C_{rss}$

Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values





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

Fig. 15. Gate-source voltage as a function of gate charge; typical values

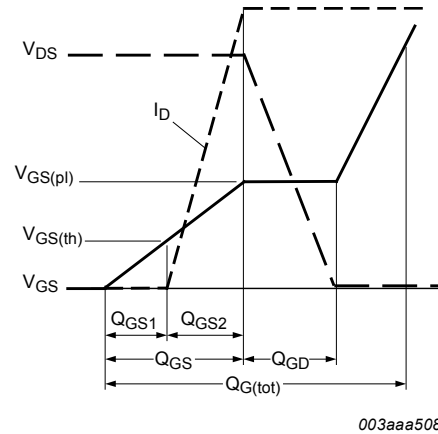
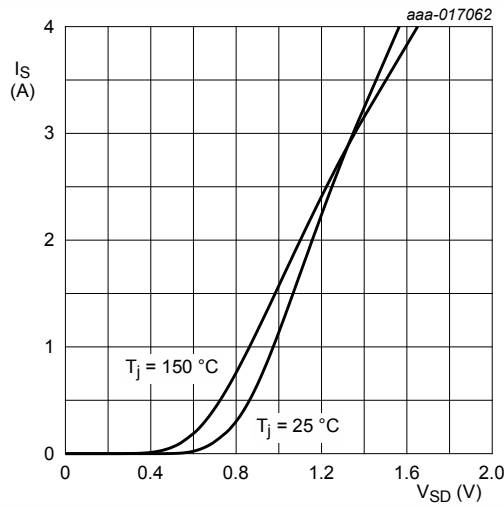


Fig. 16. Gate charge waveform definitions



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

Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

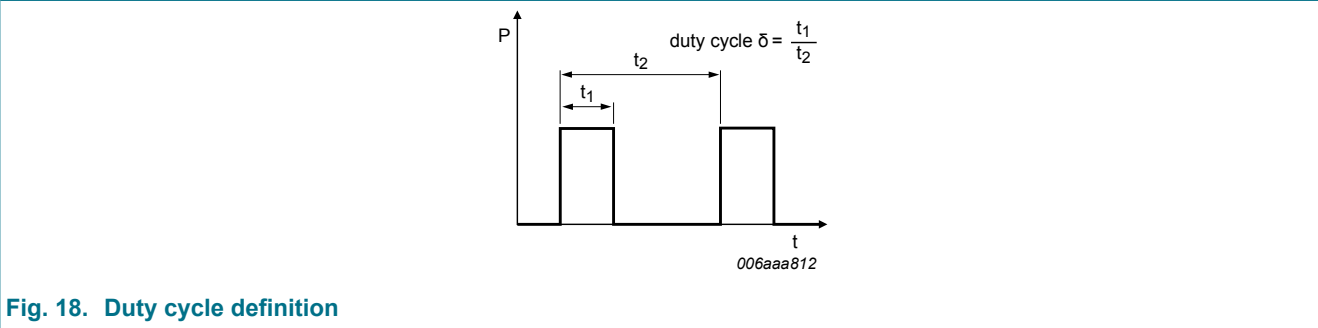


Fig. 18. Duty cycle definition

## 12. Package outline

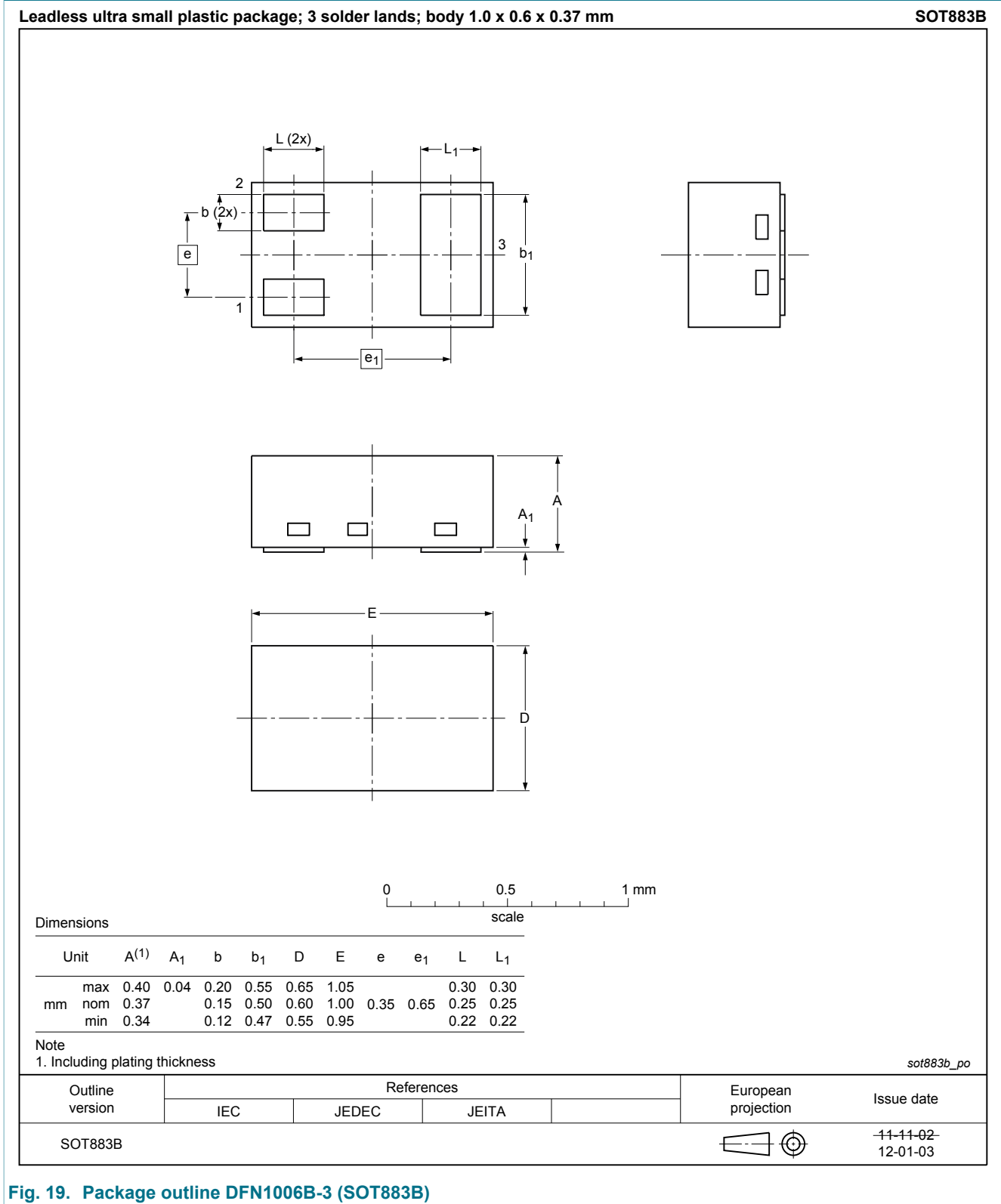


Fig. 19. Package outline DFN1006B-3 (SOT883B)

### 13. Soldering

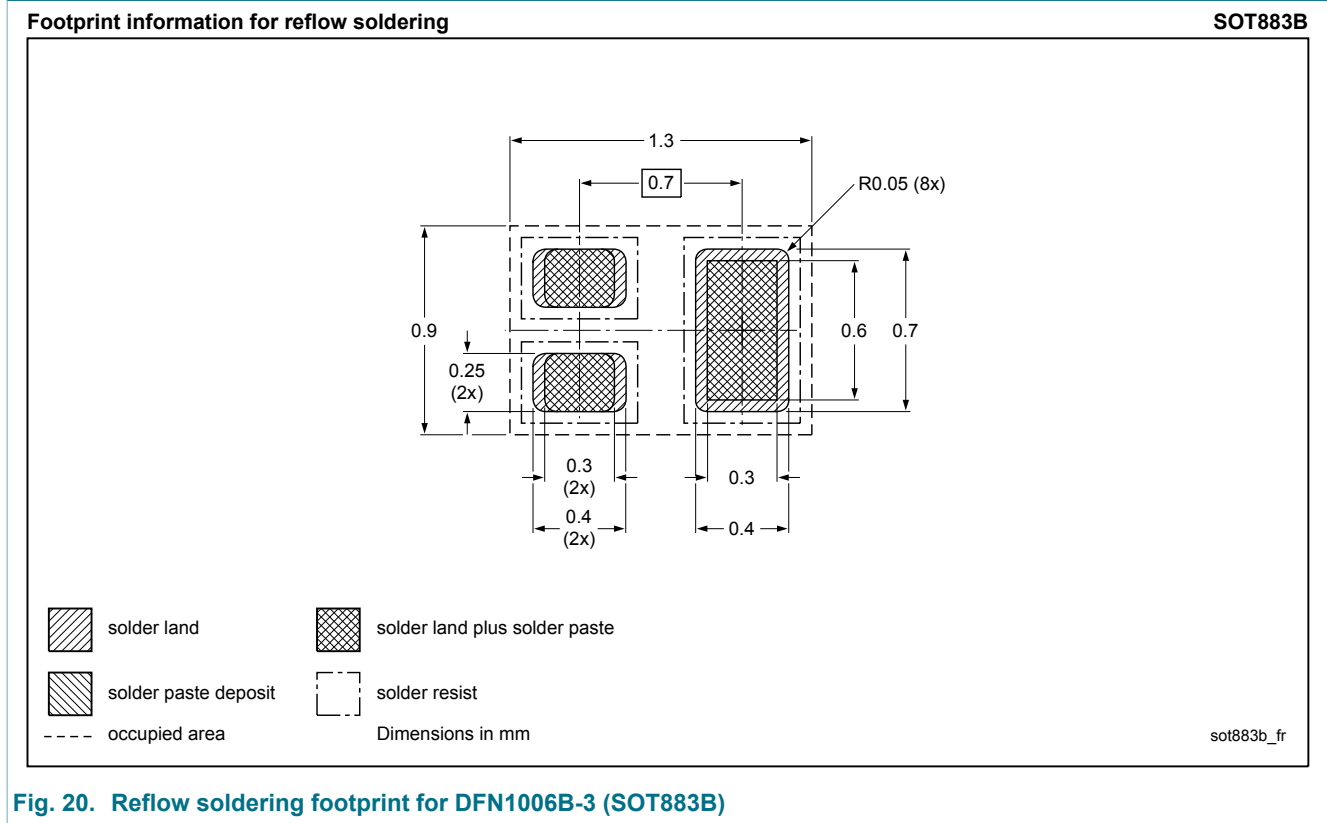


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

## 14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PMZB290UNE2 v.1 | 20150324     | Product data sheet | -             | -          |

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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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## 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 .....        | 10 |
| 12   | Package outline .....         | 11 |
| 13   | Soldering .....               | 12 |
| 14   | Revision history .....        | 13 |
| 15   | Legal information .....       | 14 |
| 15.1 | Data sheet status .....       | 14 |
| 15.2 | Definitions .....             | 14 |
| 15.3 | Disclaimers .....             | 14 |
| 15.4 | Trademarks .....              | 15 |

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