



# PMXB40UNE

12 V, N-channel Trench MOSFET

27 September 2013

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1010D-3 (SOT1215) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Trench MOSFET technology
- Leadless ultra small and thin SMD plastic package:  $1.1 \times 1.0 \times 0.37$  mm
- Exposed drain pad for excellent thermal conduction
- ElectroStatic Discharge (ESD) protection 1 kV
- Very low Drain-Source on-state resistance  $R_{DSon} = 34$  m $\Omega$
- Very low threshold voltage of 0.65 V for portable applications

## 3. Applications

- Low-side load switch and charging switch for portable devices
- Power management in battery-driven portables
- LED driver
- DC-to-DC converters

## 4. Quick reference data

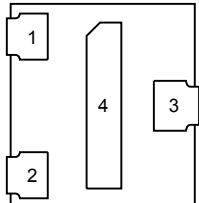
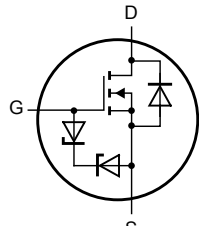
Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions                                     | Min | Typ | Max | Unit       |
|-------------------------------|----------------------------------|--|-----|-----|-----|------------|
| $V_{DS}$                      | drain-source voltage             | $T_j = 25$ °C                                  | -   | -   | 12  | V          |
| $V_{GS}$                      | gate-source voltage              |  | -8  | -   | 8   | V          |
| $I_D$                         | drain current                    | $V_{GS} = 4.5$ V; $T_{amb} = 25$ °C            | [1] | -   | 3.2 | A          |
| <b>Static characteristics</b> |                                  |  |     |     |     |            |
| $R_{DSon}$                    | drain-source on-state resistance | $V_{GS} = 4.5$ V; $I_D = 3.2$ A; $T_j = 25$ °C | -   | 34  | 45  | m $\Omega$ |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 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/>DFN1010D-3 (SOT1215)</p> |  <p>017aaa255</p> |
| 2   | S      | source      |  |  |
| 3   | D      | drain       |  |  |
| 4   | D      | drain       |  |  |

### 6. Ordering information

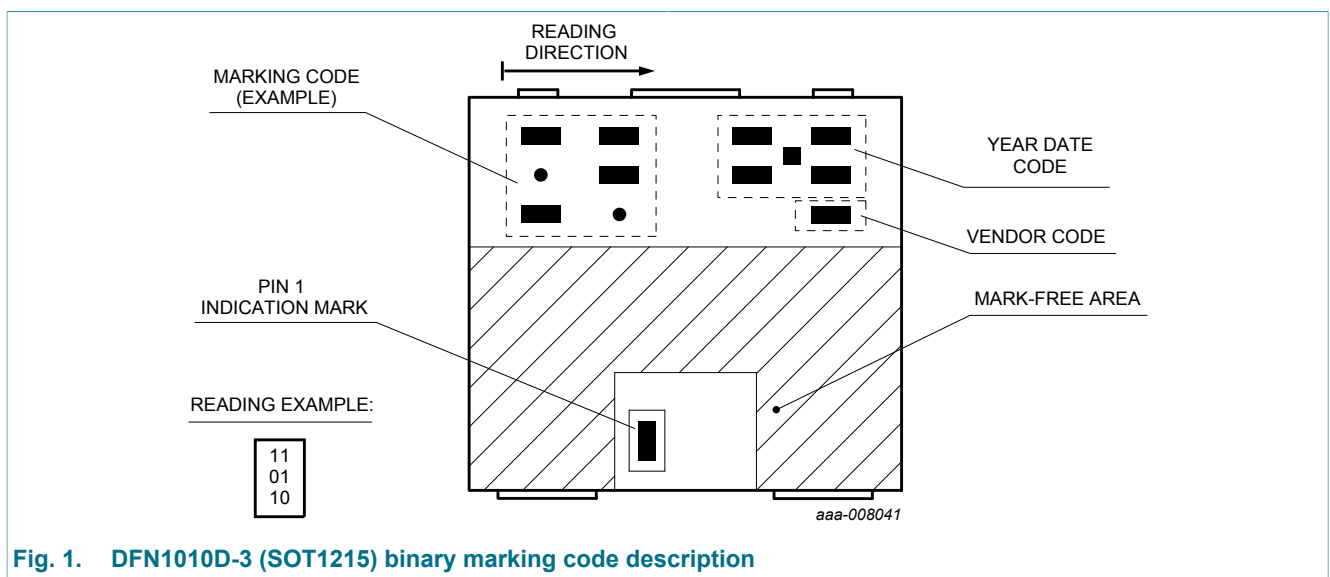
Table 3. Ordering information

| Type number | Package    |  | Version |
|-------------|------------|--|---------|
|             | Name       | Description  |         |
| PMXB40UNE   | DFN1010D-3 | DFN1010D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 1.1 x 1.0 x 0.37 mm | SOT1215 |

### 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMXB40UNE   | 10 00 00     |



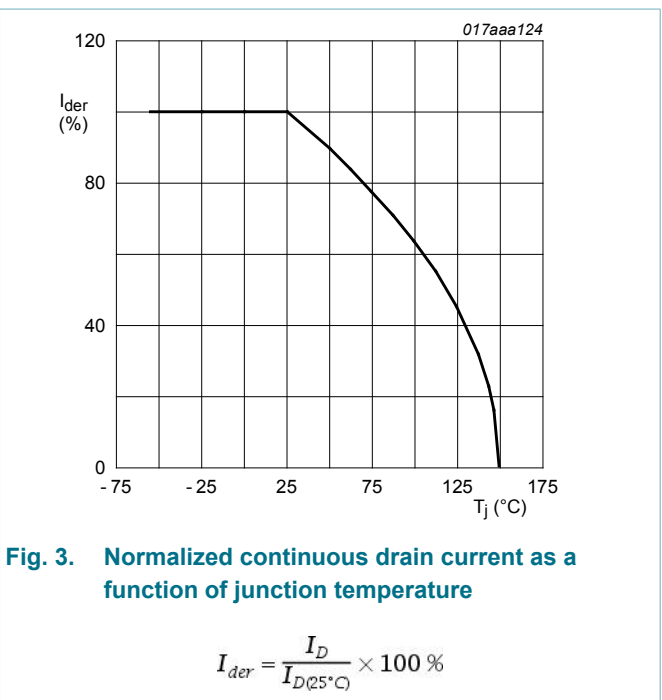
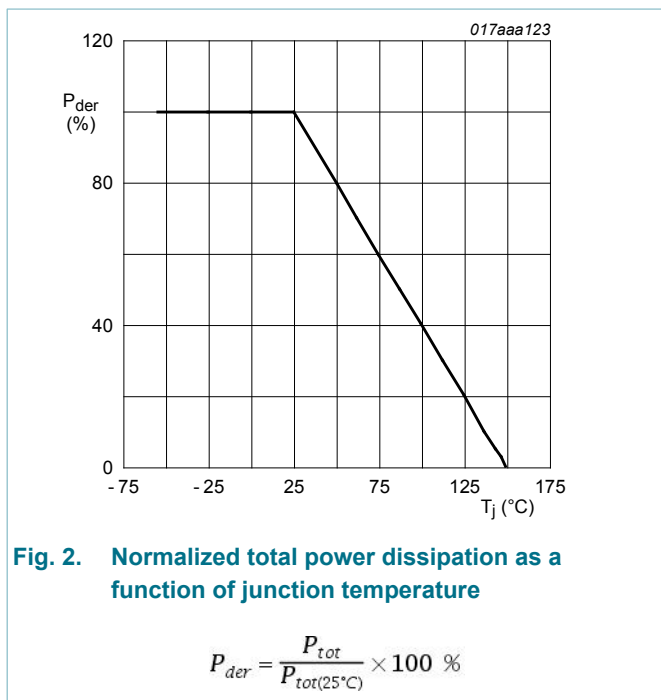
## 8. Limiting values

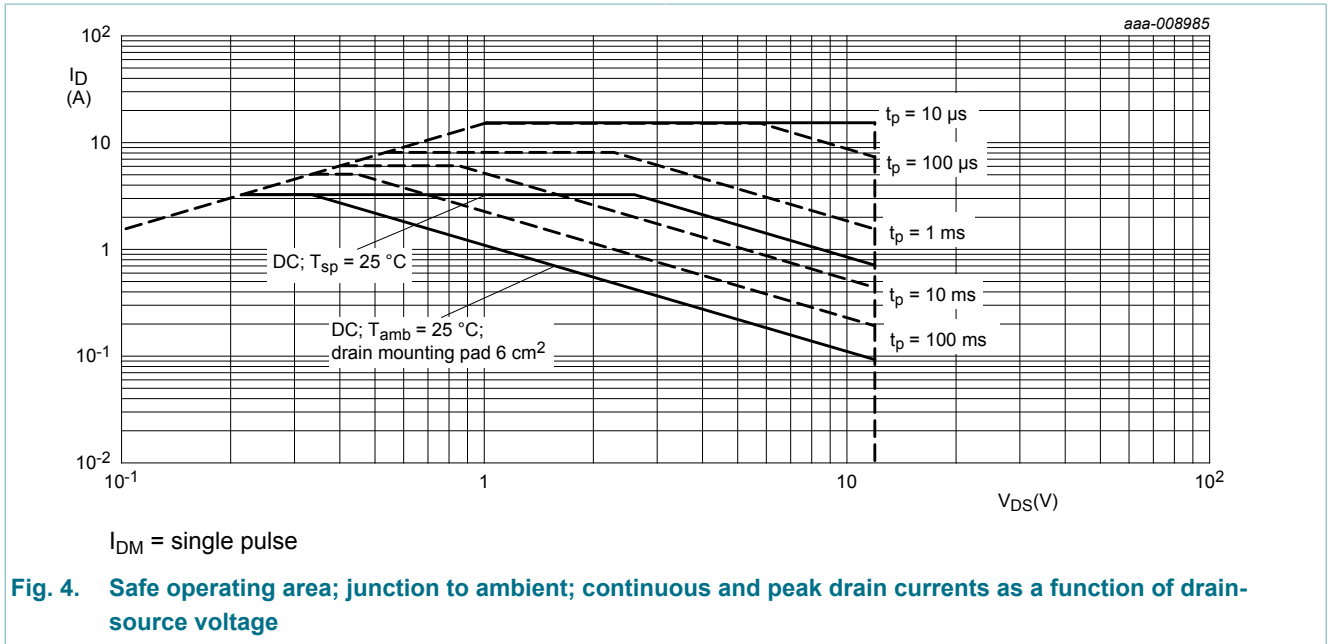
**Table 5. Limiting values**

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   |     | -   | 12   | 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] | -   | 3.2  | A    |
|                           |                         | V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C             | [1] | -   | 2.5  | A    |
| I <sub>DM</sub>           | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | 15   | A    |
| P <sub>tot</sub>          | total power dissipation | T <sub>amb</sub> = 25 °C                                       | [2] | -   | 0.4  | W    |
|                           |                         |  | [1] | -   | 1.07 | W    |
|                           |                         | T <sub>sp</sub> = 25 °C  |     | -   | 8.33 | W    |
| 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] | -   | 1    | A    |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.





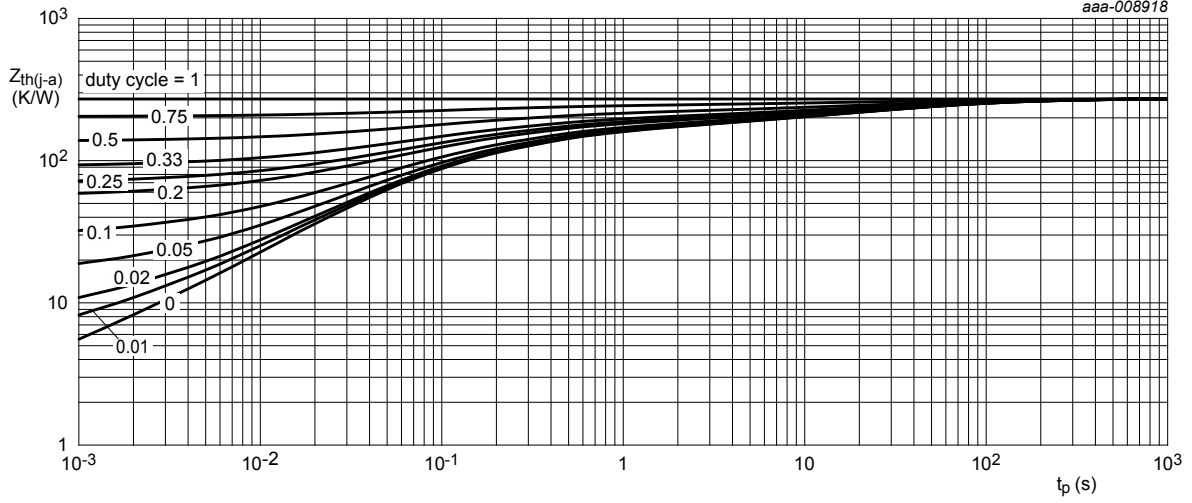
## 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter  | Conditions  |     | Min | Typ | Max | Unit |
|----------------|--|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1] | -   | 271 | 311 | K/W  |
|                |  |             | [2] | -   | 102 | 117 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             |     | -   | 10  | 15  | K/W  |

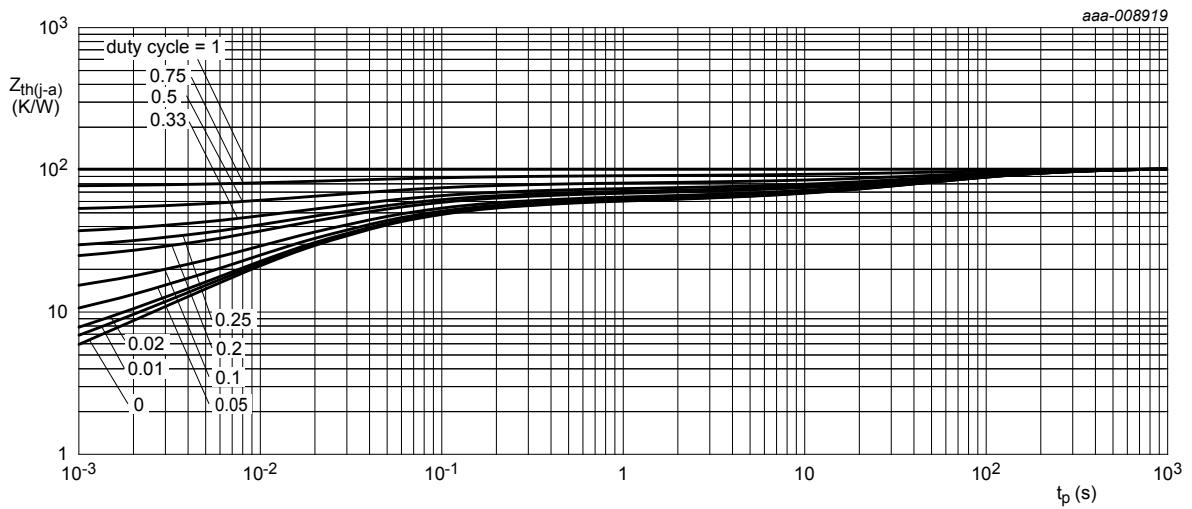
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $6\text{ cm}^2$ .



FR4 PCB, standard footprint

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



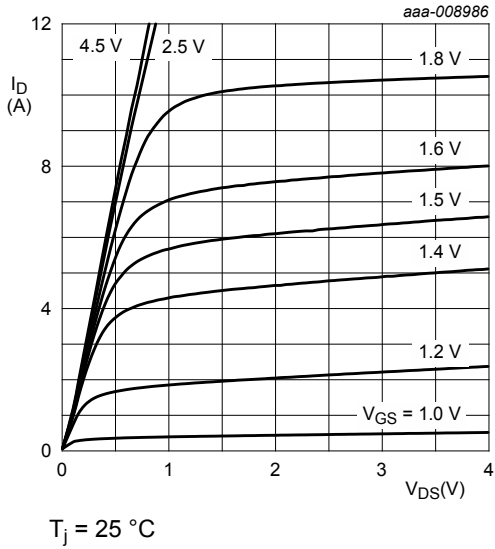
FR4 PCB, mounting pad for drain 6 cm<sup>2</sup>

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

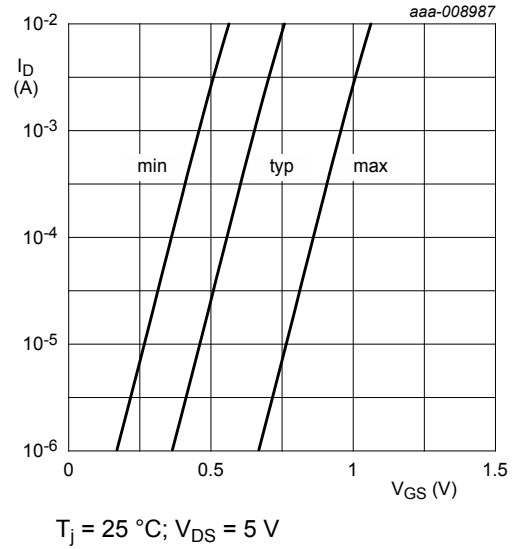
## 10. Characteristics

Table 7. Characteristics

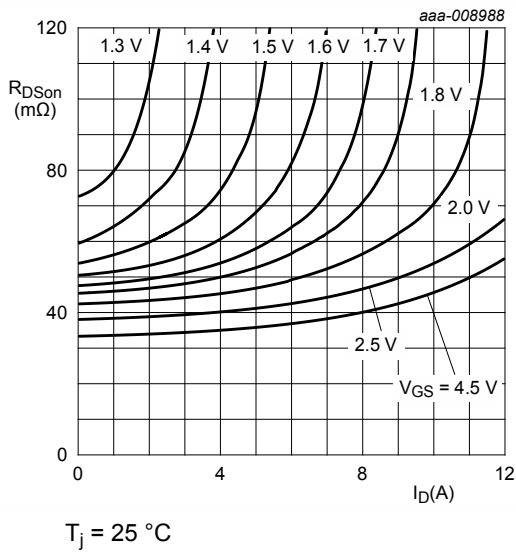
| Symbol                         | Parameter                        | Conditions  | Min | Typ  | Max  | Unit       |
|--------------------------------|----------------------------------|---|-----|------|------|------------|
| <b>Static characteristics</b>  |                                  |   |     |      |      |            |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | 12  | -    | -    | V          |
| $V_{GSth}$                     | gate-source threshold voltage    | $I_D = 250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ C$   | 0.4 | 0.65 | 0.9  | V          |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = 12 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -   | -    | 1    | $\mu A$    |
| $I_{GSS}$                      | gate leakage current             | $V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$   | -   | -    | 10   | $\mu A$    |
|                                |                                  | $V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -   | -    | -10  | $\mu A$    |
| $R_{DSon}$                     | drain-source on-state resistance | $V_{GS} = 4.5 V$ ; $I_D = 3.2 A$ ; $T_j = 25 \text{ }^\circ C$  | -   | 34   | 45   | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5 V$ ; $I_D = 3.2 A$ ; $T_j = 150 \text{ }^\circ C$   | -   | 49   | 67   | m $\Omega$ |
|                                |                                  | $V_{GS} = 2.5 V$ ; $I_D = 3.2 A$ ; $T_j = 25 \text{ }^\circ C$  | -   | 39   | 64   | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.8 V$ ; $I_D = 1 A$ ; $T_j = 25 \text{ }^\circ C$  | -   | 46   | 85   | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.5 V$ ; $I_D = 0.1 A$ ; $T_j = 25 \text{ }^\circ C$  | -   | 50   | 100  | m $\Omega$ |
|                                |                                  | $V_{GS} = 1.2 V$ ; $I_D = 1 mA$ ; $T_j = 25 \text{ }^\circ C$   | -   | 121  | -    | m $\Omega$ |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = 10 V$ ; $I_D = 2 A$ ; $T_j = 25 \text{ }^\circ C$   | -   | 1.2  | -    | S          |
| $R_G$                          | gate resistance                  | $f = 1 \text{ MHz}$   | -   | 1    | -    | $\Omega$   |
| <b>Dynamic characteristics</b> |                                  |   |     |      |      |            |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = 10 V$ ; $I_D = 3.2 A$ ; $V_{GS} = 4.5 V$ ;<br>$T_j = 25 \text{ }^\circ C$                           | -   | 6.6  | 11.6 | nC         |
| $Q_{GS}$                       | gate-source charge               |   | -   | 0.6  | -    | nC         |
| $Q_{GD}$                       | gate-drain charge                |   | -   | 1.7  | -    | nC         |
| $C_{iss}$                      | input capacitance                | $V_{DS} = 10 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ;<br>$T_j = 25 \text{ }^\circ C$                       | -   | 556  | -    | pF         |
| $C_{oss}$                      | output capacitance               |   | -   | 107  | -    | pF         |
| $C_{riss}$                     | reverse transfer capacitance     |   | -   | 94   | -    | pF         |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = 10 V$ ; $I_D = 3.2 A$ ; $V_{GS} = 4.5 V$ ;<br>$R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$ | -   | 6    | -    | ns         |
| $t_r$                          | rise time                        |   | -   | 21   | -    | ns         |
| $t_{d(off)}$                   | turn-off delay time              |   | -   | 18   | -    | ns         |
| $t_f$                          | fall time                        |   | -   | 9    | -    | ns         |
| <b>Source-drain diode</b>      |                                  |   |     |      |      |            |
| $V_{SD}$                       | source-drain voltage             | $I_S = 1 A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$  | -   | 0.8  | 1.2  | V          |



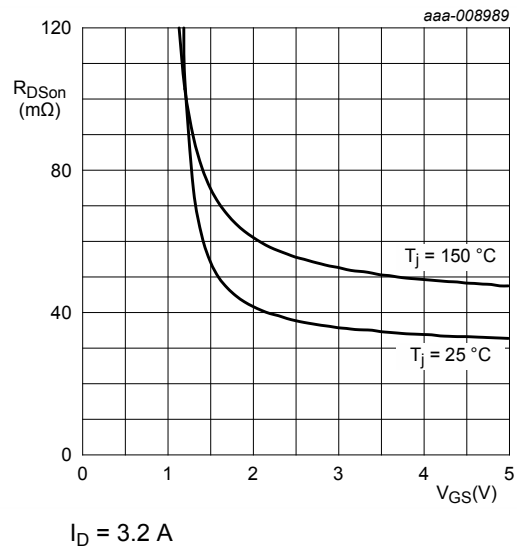
**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



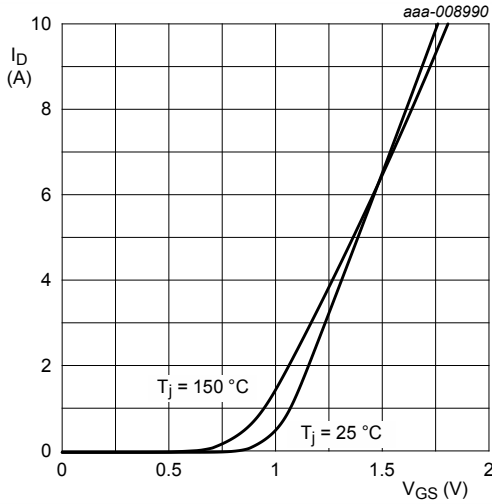
**Fig. 8. Sub-threshold drain current as a function of gate-source voltage**



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



**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

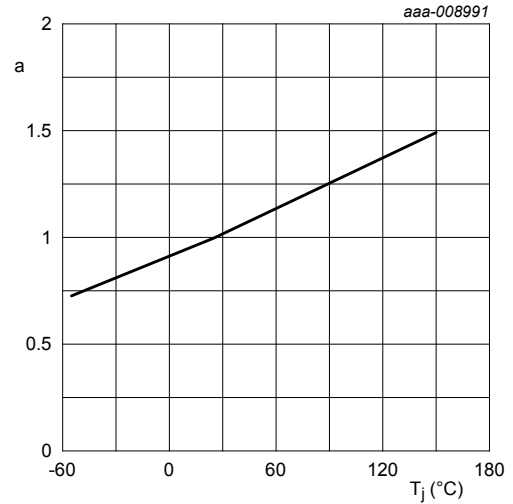
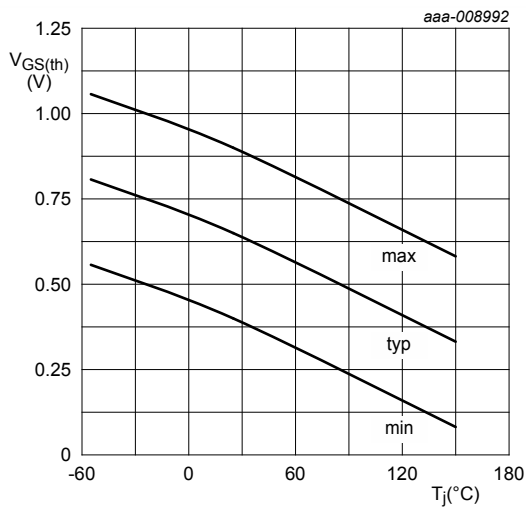


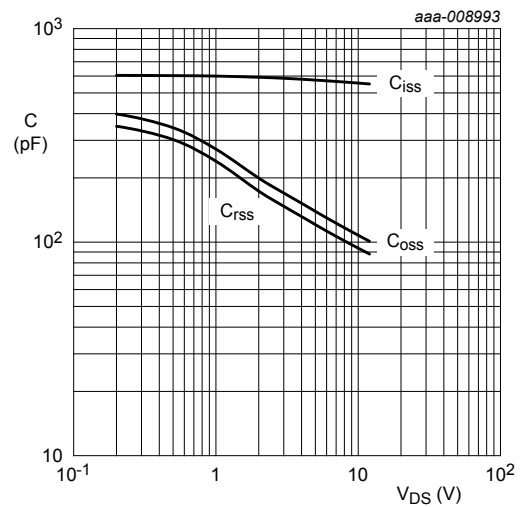
Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

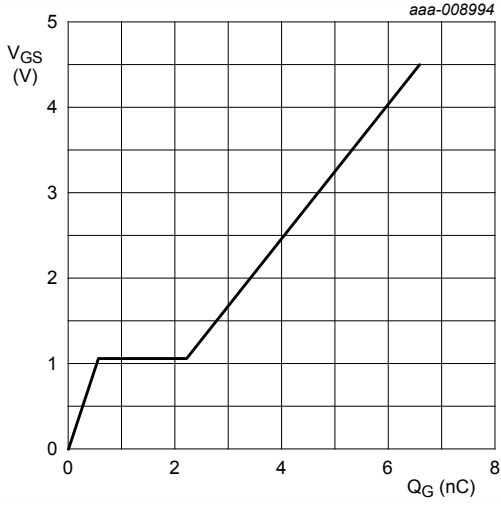
Fig. 13. Gate-source threshold voltage as a function of junction temperature



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

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





$I_D = 3.2 \text{ A}$ ;  $V_{DS} = 10 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$

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

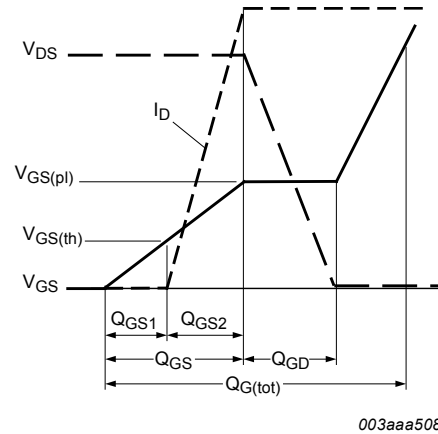
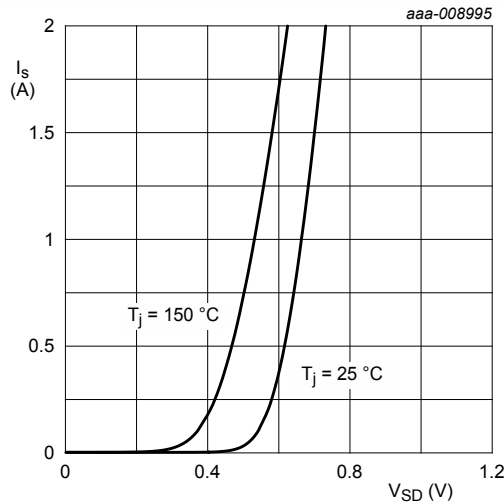


Fig. 16. MOSFET transistor: Gate charge waveform definitions



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

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

## 11. Test information

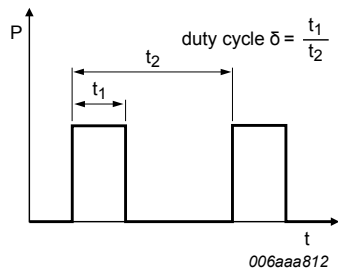


Fig. 18. Duty cycle definition

## 12. Package outline

DFN1010D-3: plastic thermal enhanced ultra thin small outline package; no leads;  
3 terminals; body: 1.1 x 1.0 x 0.37 mm

SOT1215

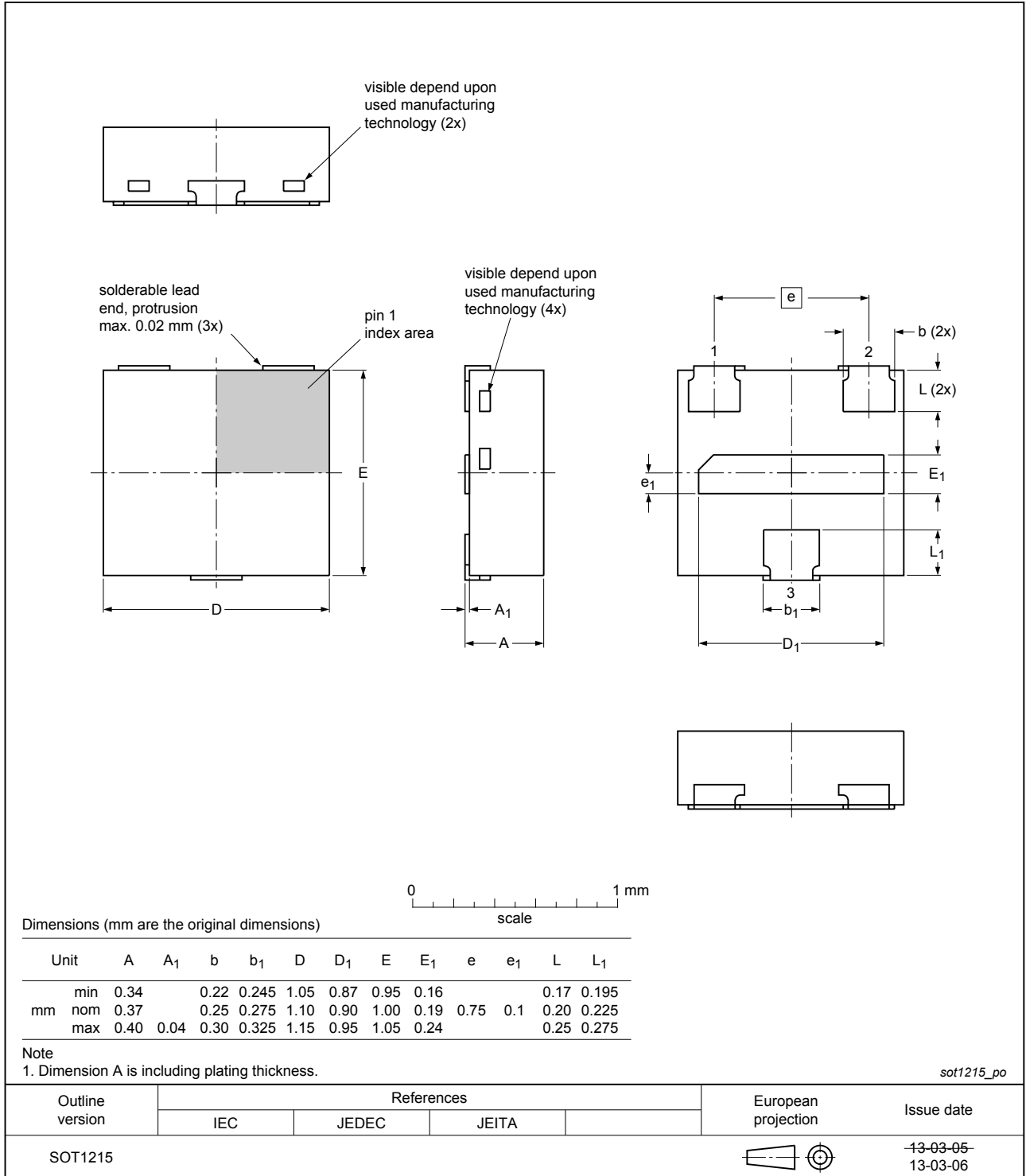


Fig. 19. Package outline DFN1010D-3 (SOT1215)

### 13. Soldering

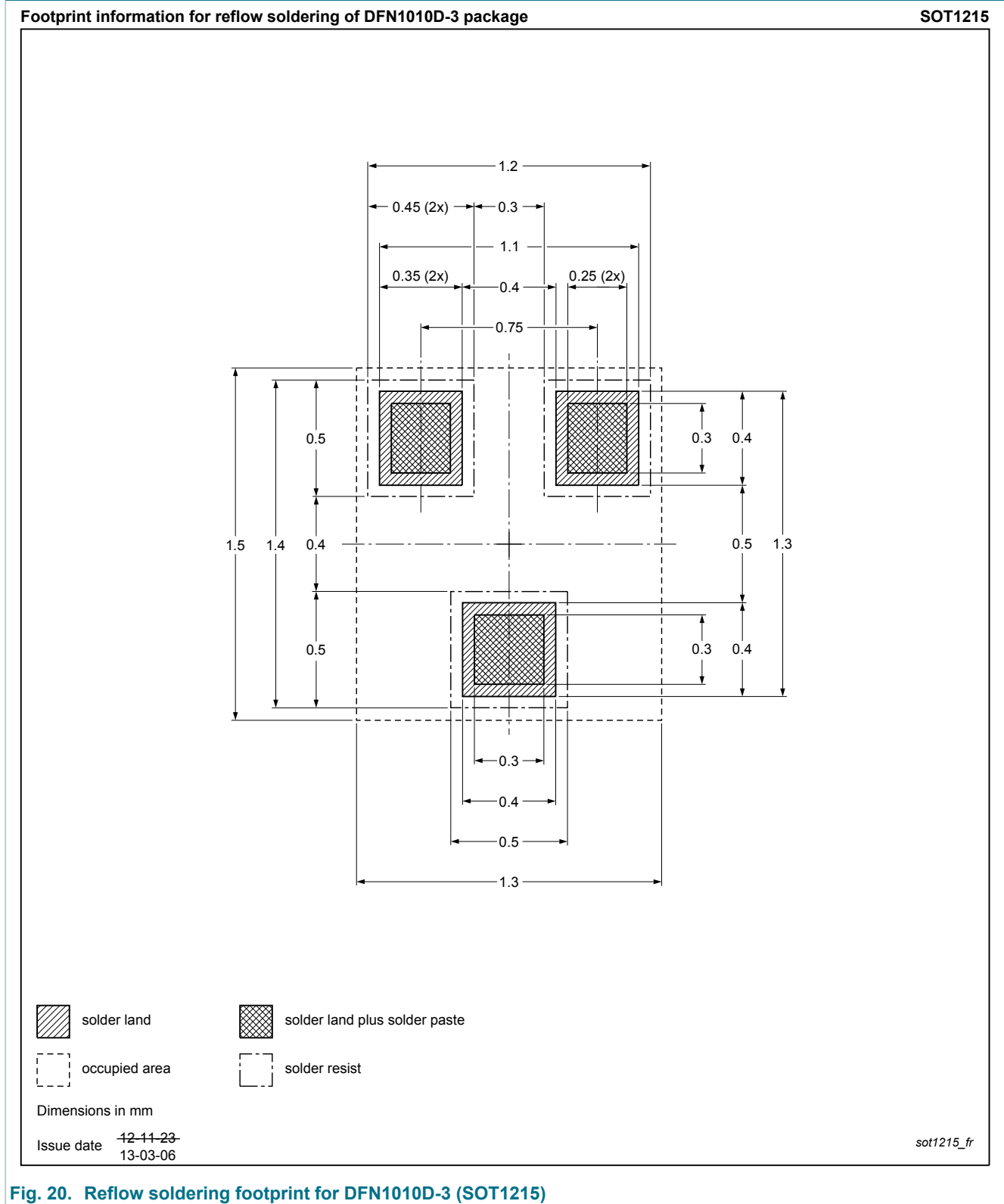


Fig. 20. Reflow soldering footprint for DFN1010D-3 (SOT1215)

## 14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMXB40UNE v.1 | 20130927     | Product data sheet | -             | -          |

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### 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. |
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| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

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[DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [ECH8691-TL-W](#) [FCAB21350L1](#) [P85W28HP2F-7071](#) [DMN1053UCP4-7](#) [NTE221](#) [NTE2384](#)  
[NTE2903](#) [NTE2941](#) [NTE2945](#) [NTE2946](#) [NTE2960](#) [NTE2967](#) [NTE2969](#) [NTE2976](#) [NTE455](#) [NTE6400A](#) [NTE2910](#) [NTE2916](#) [NTE2956](#)  
[NTE2911](#) [US6M2GTR](#) [TK10A80W,S4X\(S](#) [SSM6P69NU,LF](#)