



# PMXB43UNE

20 V, N-channel Trench MOSFET

19 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
- Very low Drain-Source on-state resistance  $R_{DSon} = 42$  m $\Omega$  in high density
- 1 kV ESD protected

## 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

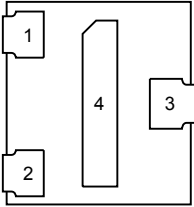
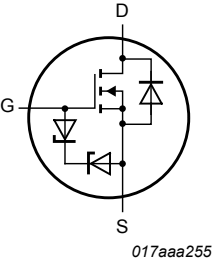
Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions                                     |     | Min | Typ | Max | Unit       |
|-------------------------------|----------------------------------|------------------------------------------------|-----|-----|-----|-----|------------|
| $V_{DS}$                      | drain-source voltage             | $T_j = 25$ °C                                  |     | -   | -   | 20  | 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 |     | -   | 42  | 54  | 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> |  |
| 2   | S      | source      |                                                                                                                                        |                                                                                     |
| 3   | D      | drain       |                                                                                                                                        |                                                                                     |
| 4   | D      | drain       |                                                                                                                                        |                                                                                     |

6. Ordering information

Table 3. Ordering information

| Type number | Package    |                                                                                                            |         |
|-------------|------------|------------------------------------------------------------------------------------------------------------|---------|
|             | Name       | Description                                                                                                | Version |
| PMXB43UNE   | 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 |
|-------------|--------------|
| PMXB43UNE   | 11 00 00     |

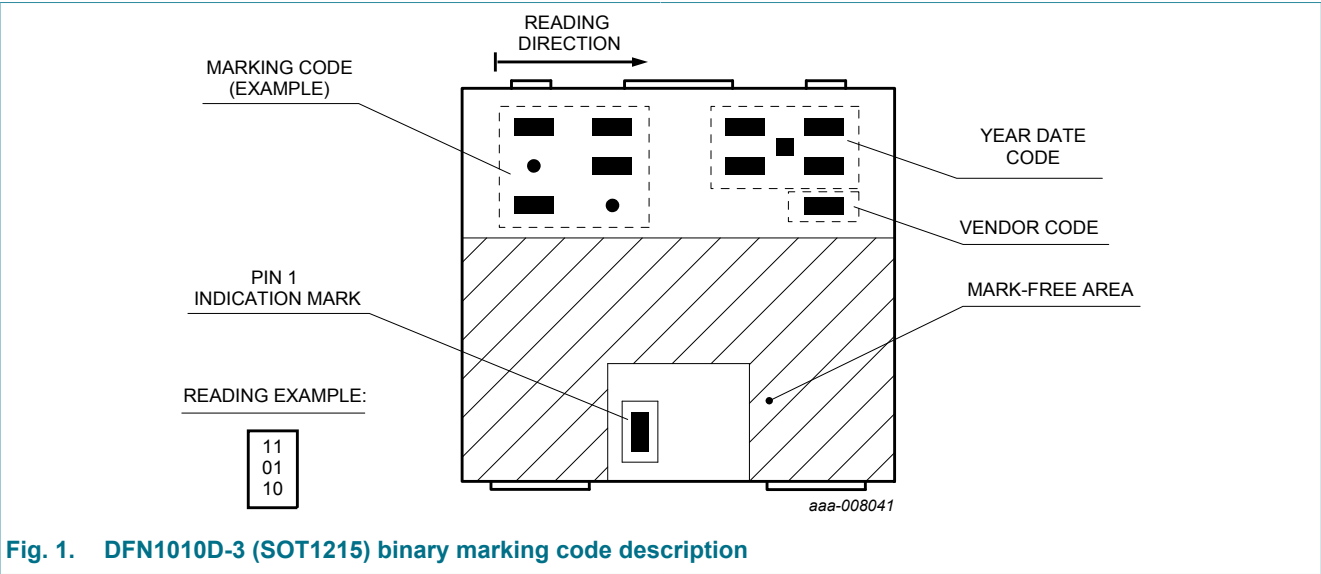


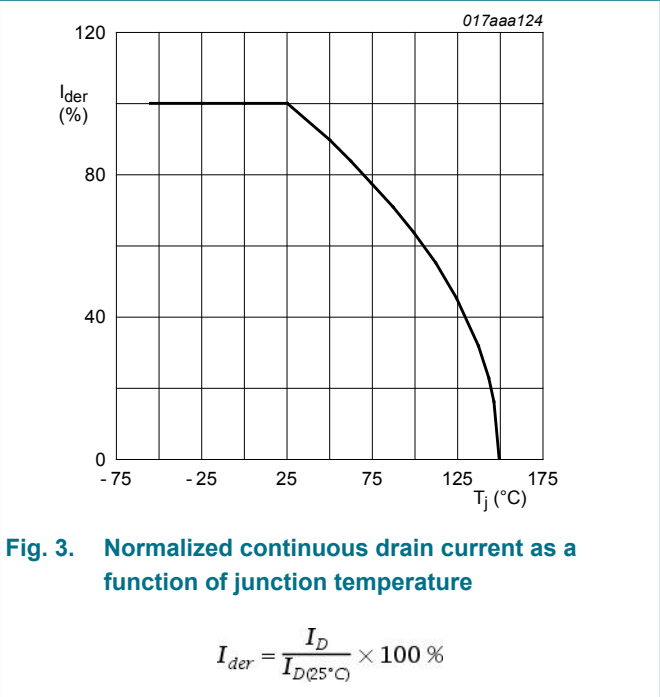
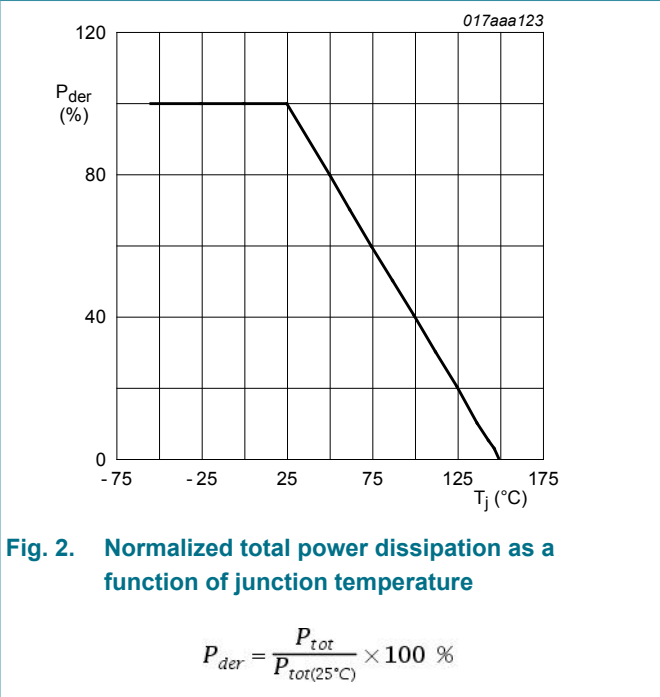
Fig. 1. DFN1010D-3 (SOT1215) binary marking code description

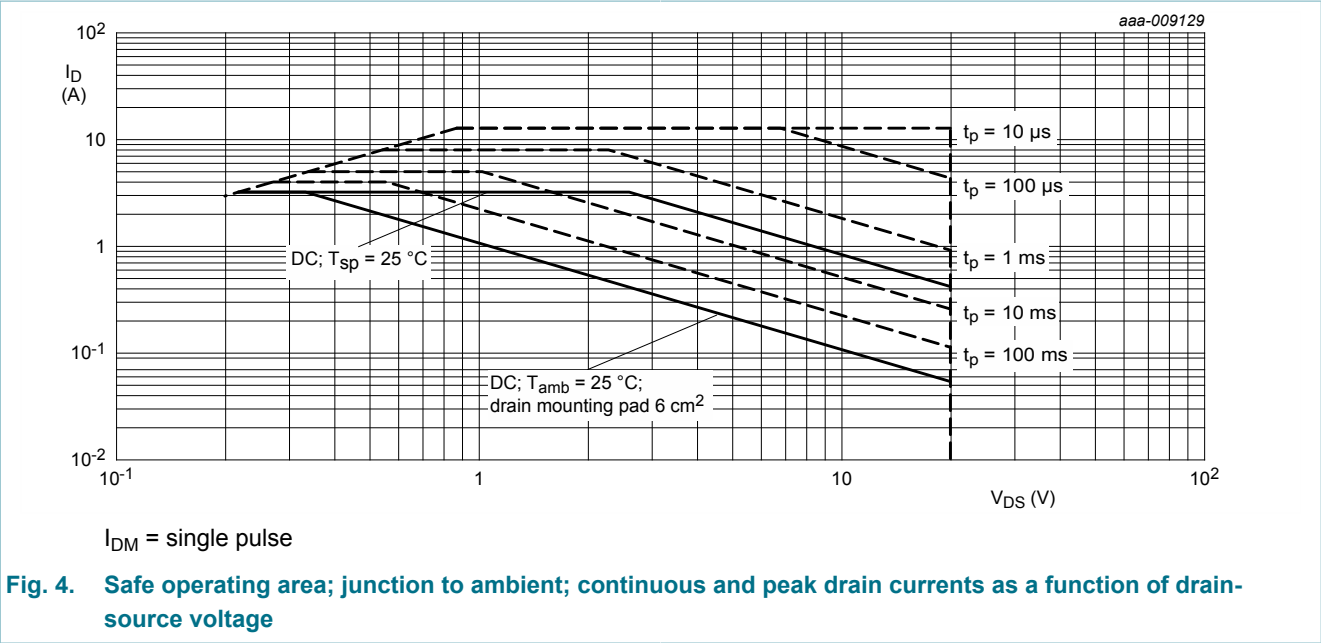
8. Limiting values

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] | -   | 3.2  | A    |
|                    |                         | V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C             | [1] | -   | 2.3  | A    |
| I <sub>DM</sub>    | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | 12.8 | 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   |
| Source-drain diode |                         |                                                                |     |     |      |      |
| I <sub>S</sub>     | source current          | T <sub>amb</sub> = 25 °C                                       | [1] | -   | 0.9  | 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 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] | -   | 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  $6\text{ cm}^2$ .

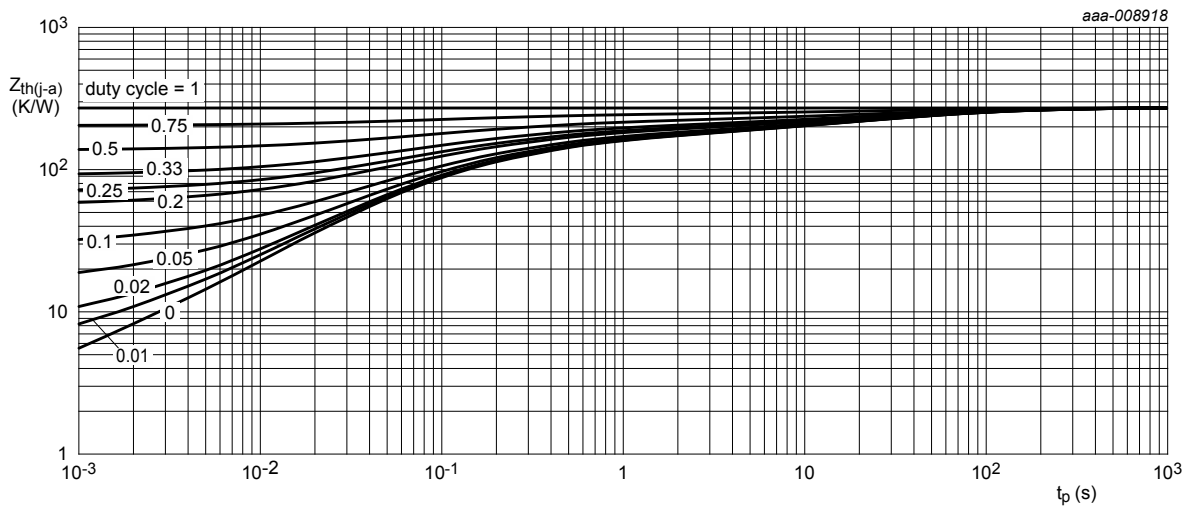


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

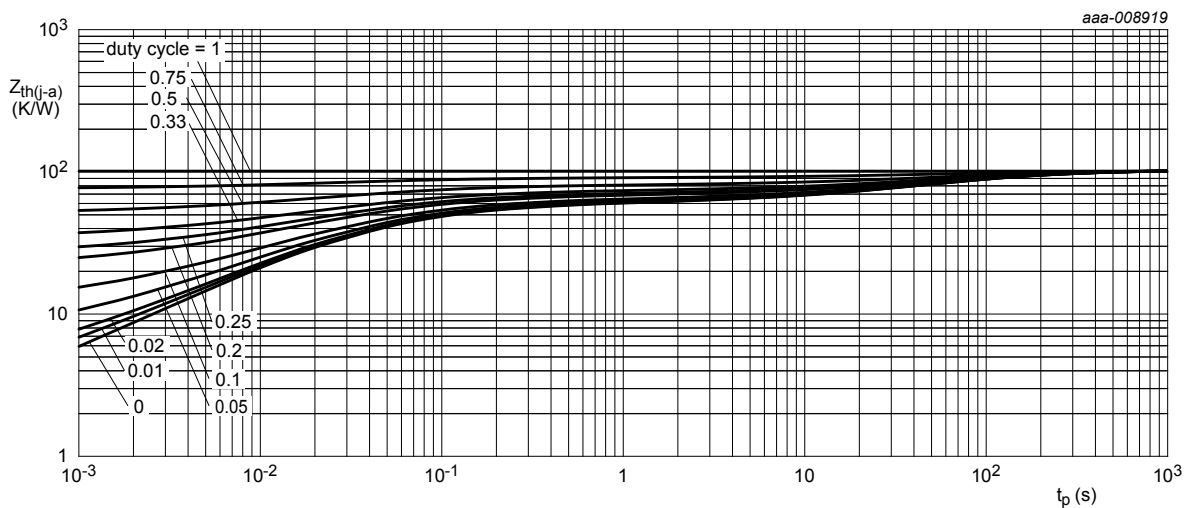


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

| Symbol                  | Parameter                        | Conditions                                                                                                                 |  | Min | Typ  | Max | Unit |
|-------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------|--|-----|------|-----|------|
| Static characteristics  |                                  |                                                                                                                            |  |     |      |     |      |
| V <sub>(BR)DSS</sub>    | drain-source breakdown voltage   | I <sub>D</sub> = 250 μA; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                     |  | 20  | -    | -   | V    |
| V <sub>GSth</sub>       | gate-source threshold voltage    | I <sub>D</sub> = 250 μA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = 25 °C                                        |  | 0.4 | 0.65 | 0.9 | V    |
| I <sub>DSS</sub>        | drain leakage current            | V <sub>DS</sub> = 20 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                      |  | -   | -    | 1   | μA   |
| I <sub>GSS</sub>        | gate leakage current             | V <sub>GS</sub> = 8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                       |  | -   | -    | 10  | μA   |
|                         |                                  | V <sub>GS</sub> = -8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                      |  | -   | -    | -10 | μA   |
|                         |                                  | V <sub>GS</sub> = 4.5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                     |  | -   | -    | 1   | μA   |
|                         |                                  | V <sub>GS</sub> = -4.5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                    |  | -   | -    | -1  | μA   |
| R <sub>DSon</sub>       | drain-source on-state resistance | V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 3.2 A; T <sub>j</sub> = 25 °C                                                    |  | -   | 42   | 54  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 3.2 A; T <sub>j</sub> = 150 °C                                                   |  | -   | 64   | 83  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 2.5 V; I <sub>D</sub> = 3.1 A; T <sub>j</sub> = 25 °C                                                    |  | -   | 48   | 68  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 1.8 V; I <sub>D</sub> = 1 A; T <sub>j</sub> = 25 °C                                                      |  | -   | 56   | 90  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 1.5 V; I <sub>D</sub> = 0.1 A; T <sub>j</sub> = 25 °C                                                    |  | -   | 64   | 120 | mΩ   |
| g <sub>fs</sub>         | forward transconductance         | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 3.2 A; T <sub>j</sub> = 25 °C                                                     |  | -   | 28   | -   | S    |
| R <sub>G</sub>          | gate resistance                  | f = 1 MHz; T <sub>j</sub> = 25 °C                                                                                          |  | -   | 0.84 | -   | Ω    |
| Dynamic characteristics |                                  |                                                                                                                            |  |     |      |     |      |
| Q <sub>G(tot)</sub>     | total gate charge                | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 3.2 A; V <sub>GS</sub> = 4.5 V; T <sub>j</sub> = 25 °C                            |  | -   | 5.7  | 10  | nC   |
| Q <sub>GS</sub>         | gate-source charge               |                                                                                                                            |  | -   | 0.6  | -   | nC   |
| Q <sub>GD</sub>         | gate-drain charge                |                                                                                                                            |  | -   | 0.9  | -   | nC   |
| C <sub>iss</sub>        | input capacitance                | V <sub>DS</sub> = 10 V; f = 1 MHz; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                           |  | -   | 551  | -   | pF   |
| C <sub>oss</sub>        | output capacitance               |                                                                                                                            |  | -   | 57   | -   | pF   |
| C <sub>rss</sub>        | reverse transfer capacitance     |                                                                                                                            |  | -   | 46   | -   | pF   |
| t <sub>d(on)</sub>      | turn-on delay time               | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 3.2 A; V <sub>GS</sub> = 4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C |  | -   | 6    | -   | ns   |
| t <sub>r</sub>          | rise time                        |                                                                                                                            |  | -   | 20   | -   | ns   |
| t <sub>d(off)</sub>     | turn-off delay time              |                                                                                                                            |  | -   | 17   | -   | ns   |
| t <sub>f</sub>          | fall time                        |                                                                                                                            |  | -   | 4    | -   | ns   |
| Source-drain diode      |                                  |                                                                                                                            |  |     |      |     |      |
| V <sub>SD</sub>         | source-drain voltage             | I <sub>S</sub> = 0.9 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                      |  | -   | 0.7  | 1.2 | V    |

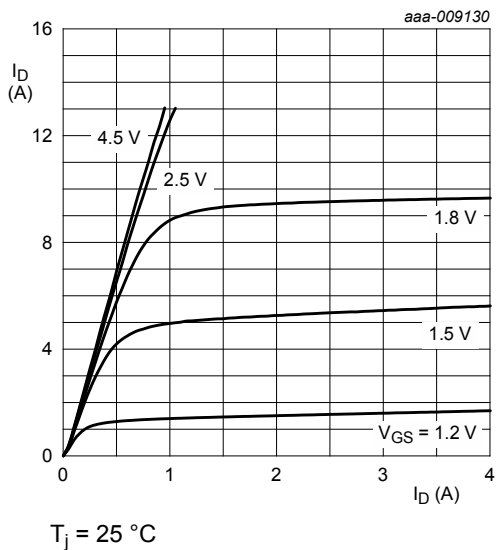


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

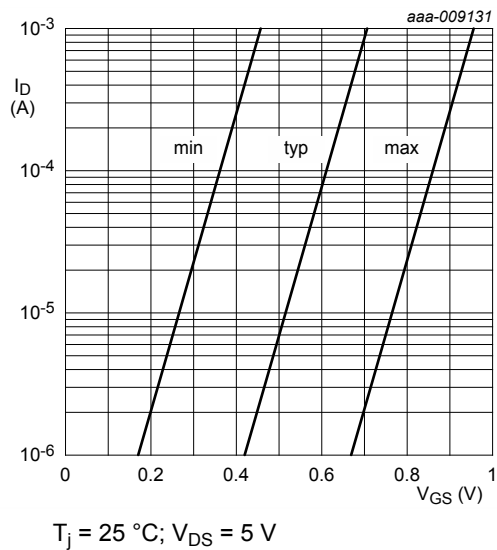


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

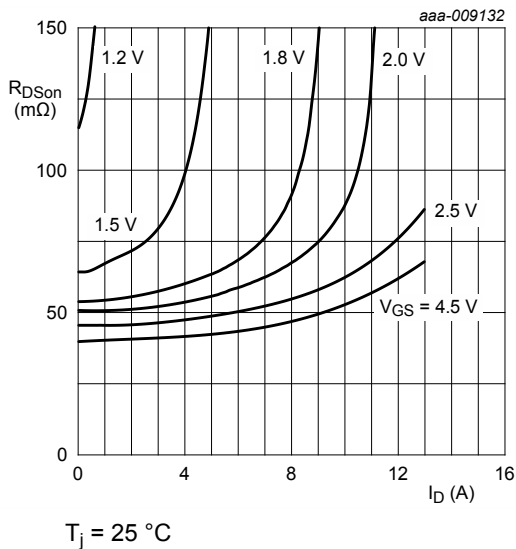


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

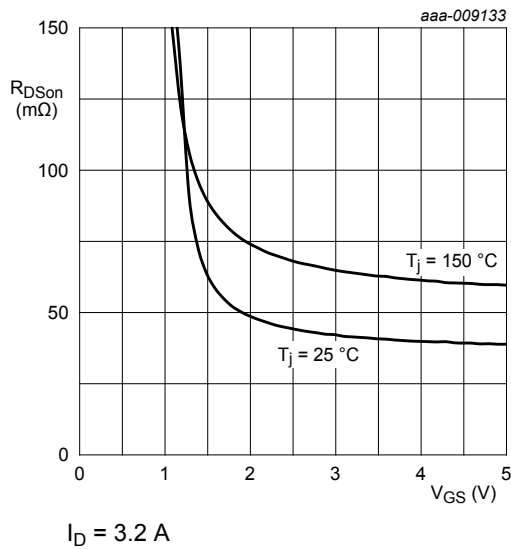


Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values

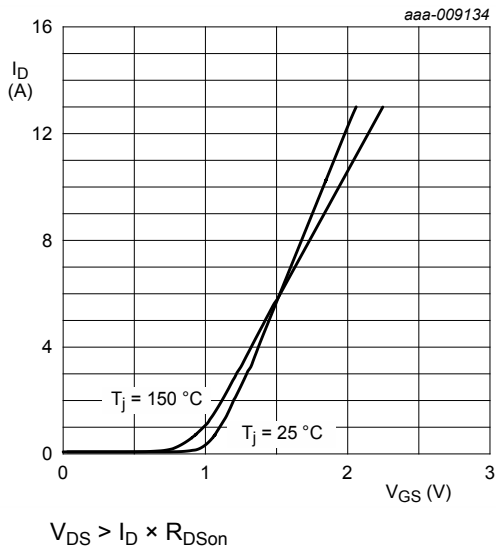


Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

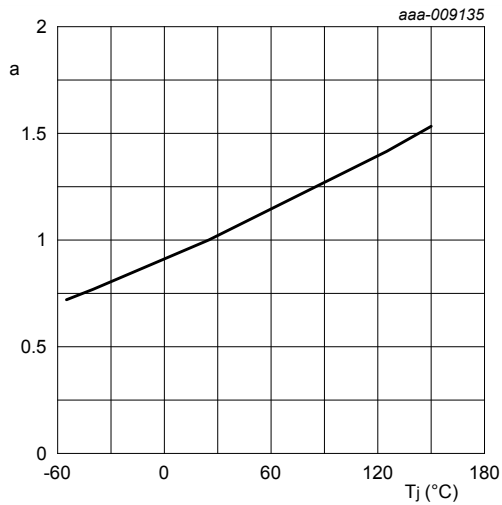


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{ °C})}}$$

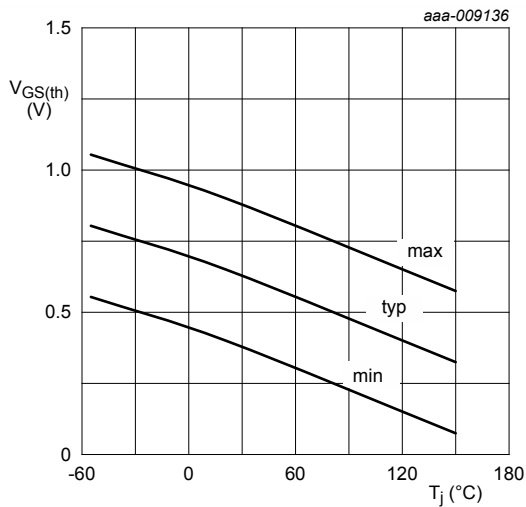


Fig. 13. Gate-source threshold voltage as a function of junction temperature

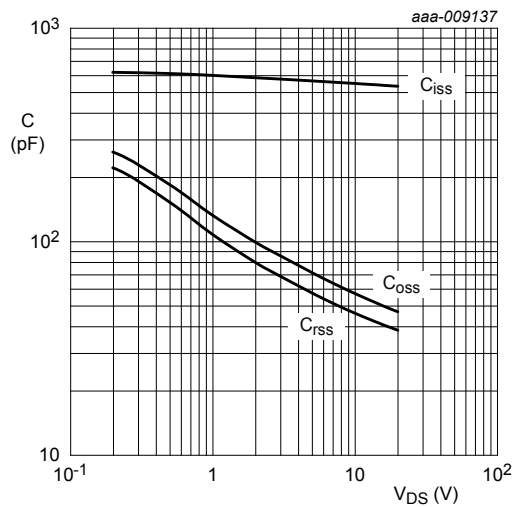


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

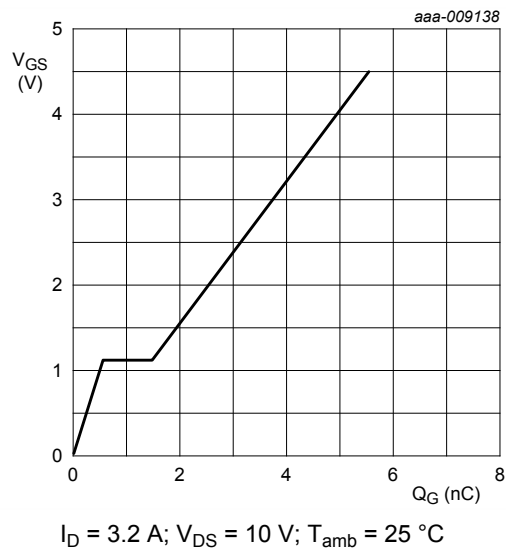


Fig. 15. Gate-source voltage as a function of gate charge; typical values

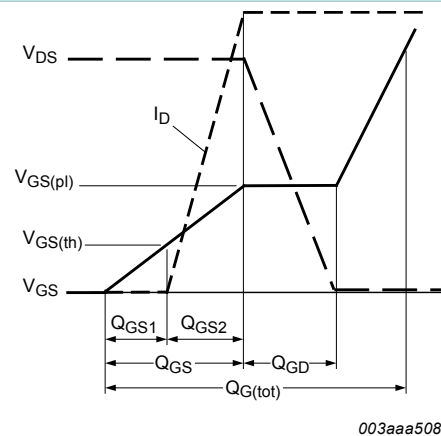


Fig. 16. MOSFET transistor: Gate charge waveform definitions

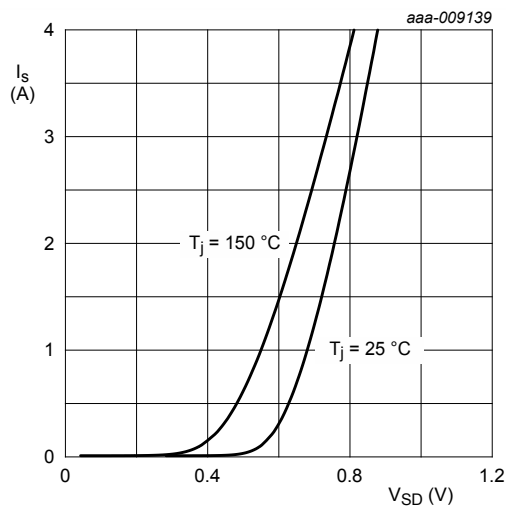


Fig. 17. Source current as a function of source-drain voltage; typical values

## 11. Test information

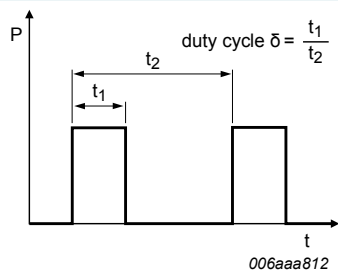


Fig. 18. Duty cycle definition

12. Package outline

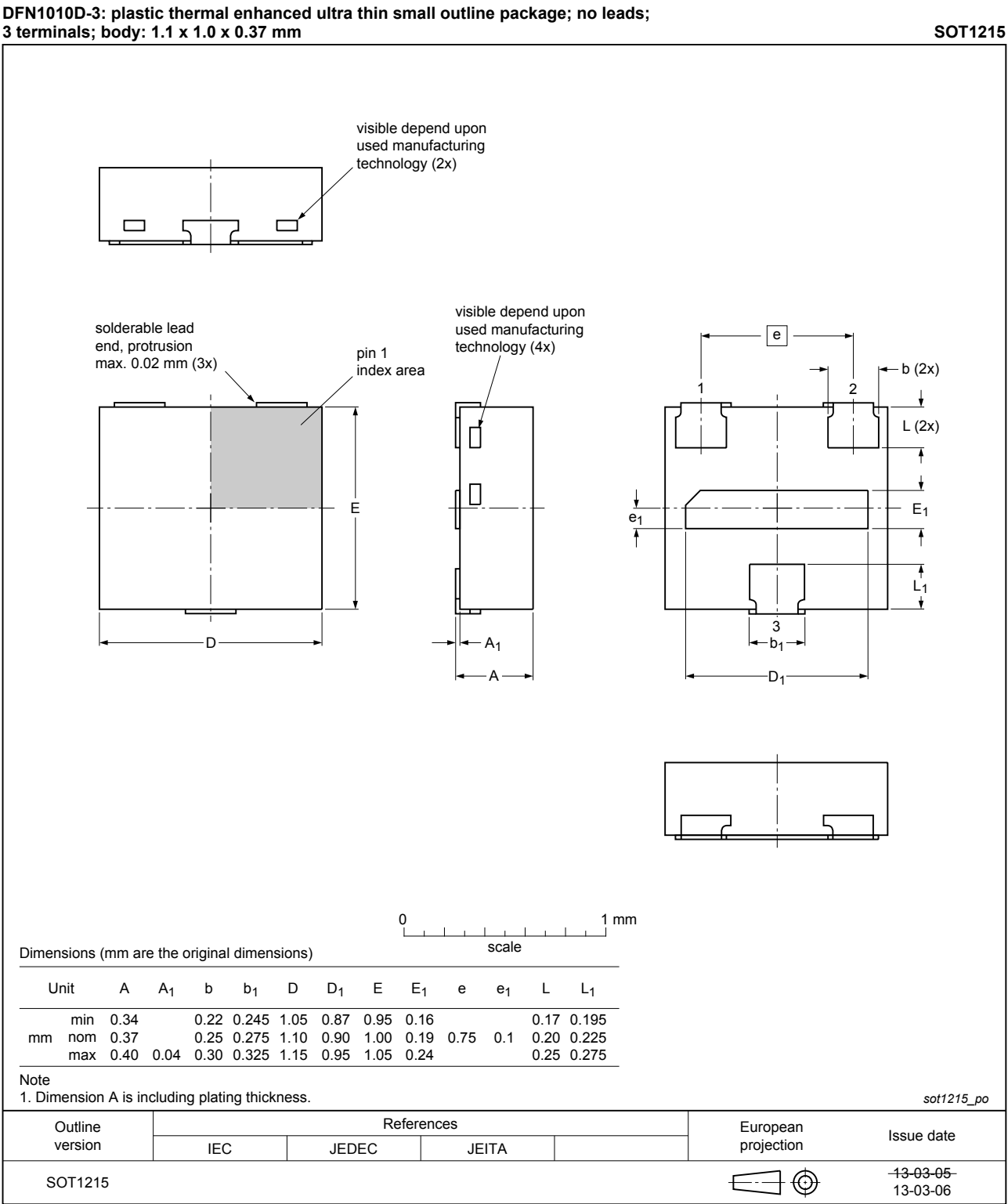


Fig. 19. Package outline DFN1010D-3 (SOT1215)

13. Soldering

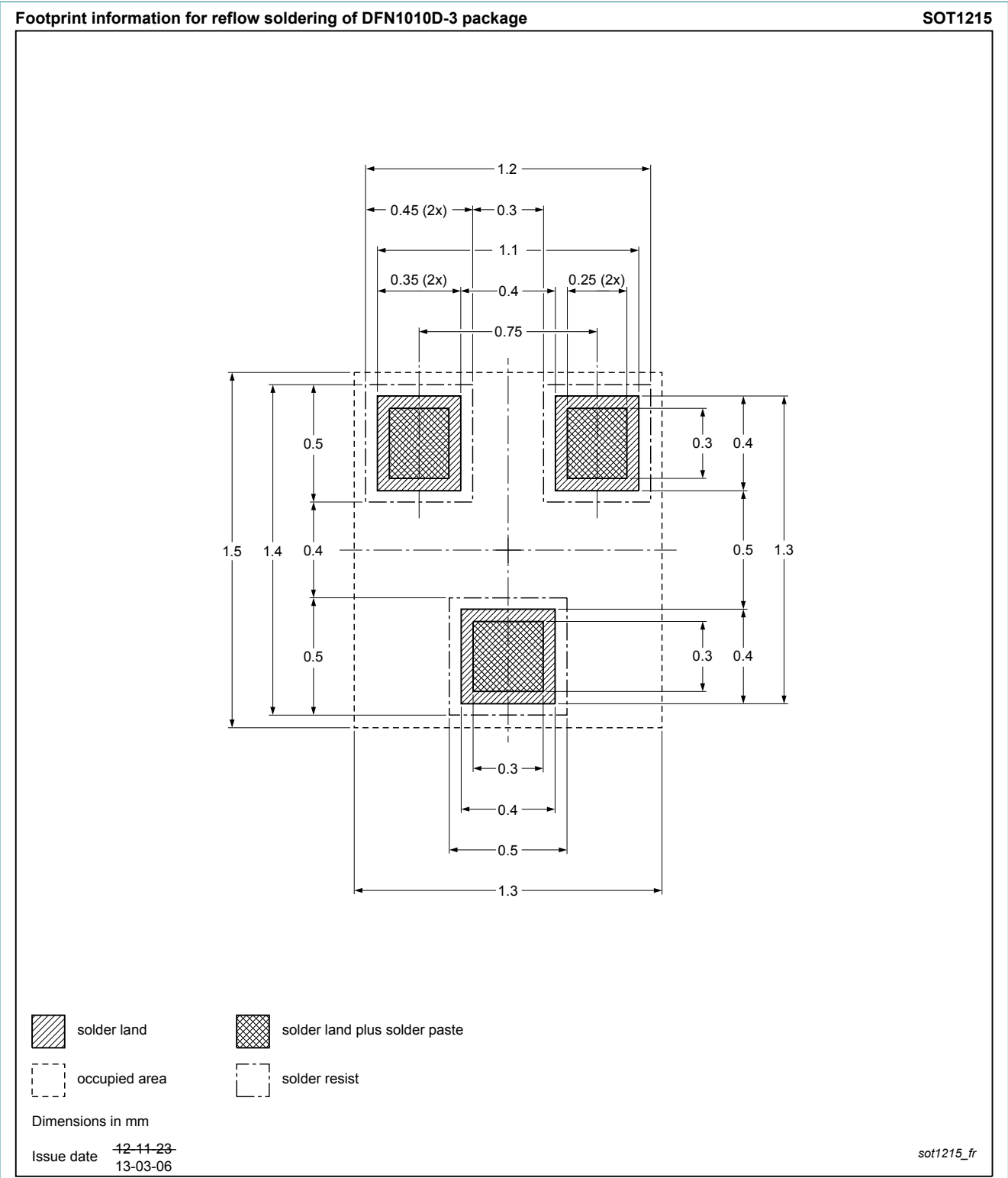


Fig. 20. Reflow soldering footprint for DFN1010D-3 (SOT1215)

## 14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMXB43UNE v.1 | 20130919     | 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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