



# PMDXB600UNE

20 V, dual N-channel Trench MOSFET

1 July 2015

Product data sheet

## 1. General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1010B-6 (SOT1216) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Trench MOSFET technology
- Leadless ultra small and ultra thin SMD plastic package: 1.1 × 1.0 × 0.37 mm
- Exposed drain pad for excellent thermal conduction
- ElectroStatic Discharge (ESD) protection > 1 kV HBM
- Drain-source on-state resistance  $R_{DSon} = 470 \text{ m}\Omega$

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

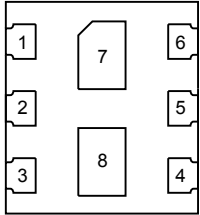
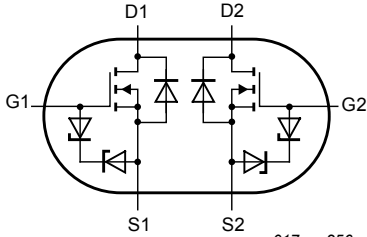
| Symbol   | Parameter                        | Conditions  | Min | Typ | Max | Unit       |
|--|----------------------------------|---|-----|-----|-----|------------|
| <b>Per transistor</b>                          |                                  |   |     |     |     |            |
| $V_{DS}$                                       | 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] | -   | 600 | mA         |
| <b>Static characteristics (per transistor)</b> |                                  |   |     |     |     |            |
| $R_{DSon}$                                     | drain-source on-state resistance | $V_{GS} = 4.5 \text{ V}; I_D = 600 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}$ | -   | 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   | S1     | source TR1  |  <p>Transparent top view<br/><b>DFN1010B-6 (SOT1216)</b></p> |  <p>017aaa256</p> |
| 2   | G1     | gate TR1    |   |  |
| 3   | D2     | drain TR2   |   |  |
| 4   | S2     | source TR2  |   |  |
| 5   | G2     | gate TR2    |   |  |
| 6   | D1     | drain TR1   |   |  |
| 7   | D1     | drain TR1   |   |  |
| 8   | D2     | drain TR2   |   |  |

### 6. Ordering information

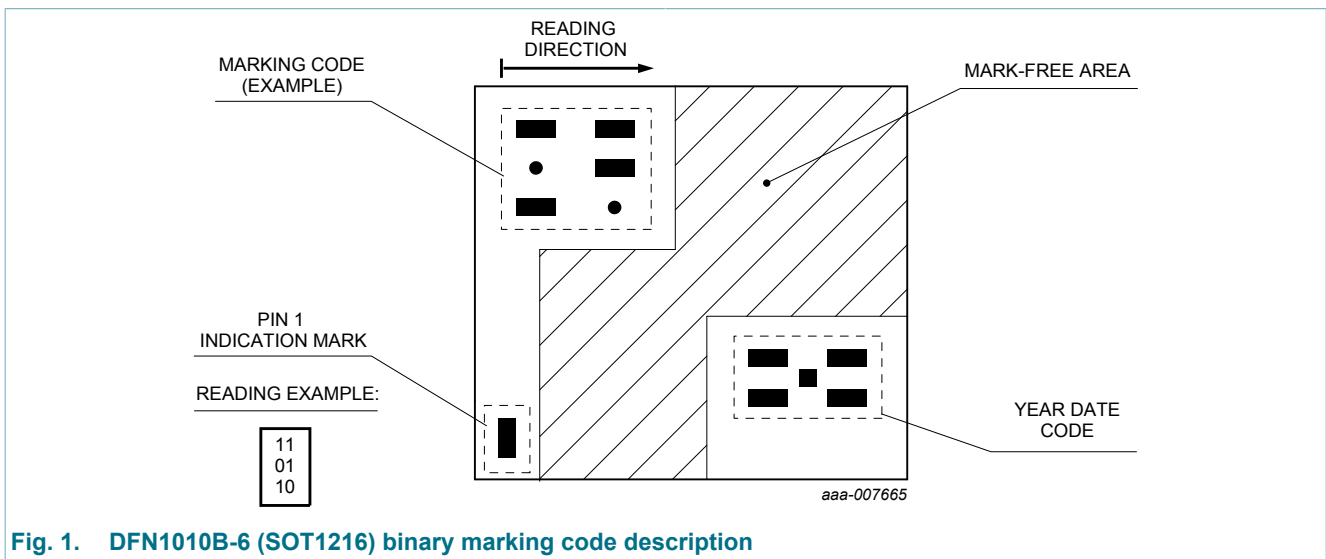
Table 3. Ordering information

| Type number | Package    |  |         |
|-------------|------------|--|---------|
|             | Name       | Description  | Version |
| PMDXB600UNE | DFN1010B-6 | DFN1010B-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals | SOT1216 |

### 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMDXB600UNE | 00 10 00     |



## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol                    | Parameter               | Conditions  |     | Min | Max  | Unit |
|---------------------------|-------------------------|---|-----|-----|------|------|
| <b>Per transistor</b>     |                         |   |     |     |      |      |
| $V_{DS}$                  | drain-source voltage    | $T_j = 25\text{ °C}$  |     | -   | 20   | V    |
| $V_{GS}$                  | gate-source voltage     |   |     | -8  | 8    | V    |
| $I_D$                     | drain current           | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$                               | [1] | -   | 600  | mA   |
|                           |                         | $V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$                              | [1] | -   | 400  | mA   |
| $I_{DM}$                  | peak drain current      | $T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$ |     | -   | 2.5  | A    |
| $P_{tot}$                 | total power dissipation | $T_{amb} = 25\text{ °C}$  | [2] | -   | 265  | mW   |
|                           |                         |   | [1] | -   | 380  | mW   |
|                           |                         | $T_{sp} = 25\text{ °C}$   |     | -   | 4025 | mW   |
| <b>Source-drain diode</b> |                         |   |     |     |      |      |
| $I_S$                     | source current          | $T_{amb} = 25\text{ °C}$  | [1] | -   | 0.4  | A    |
| <b>Per device</b>         |                         |   |     |     |      |      |
| $T_j$                     | junction temperature    |   |     | -55 | 150  | °C   |
| $T_{amb}$                 | ambient temperature     |   |     | -55 | 150  | °C   |
| $T_{stg}$                 | storage temperature     |   |     | -65 | 150  | °C   |

[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.

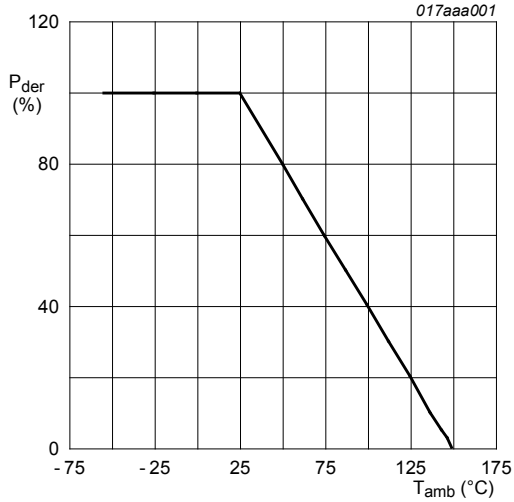


Fig. 2. Normalized total power dissipation as a function of ambient temperature

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

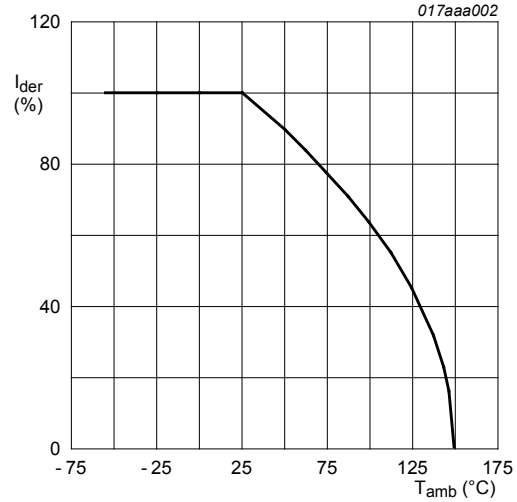


Fig. 3. Normalized continuous drain current as a function of ambient temperature

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

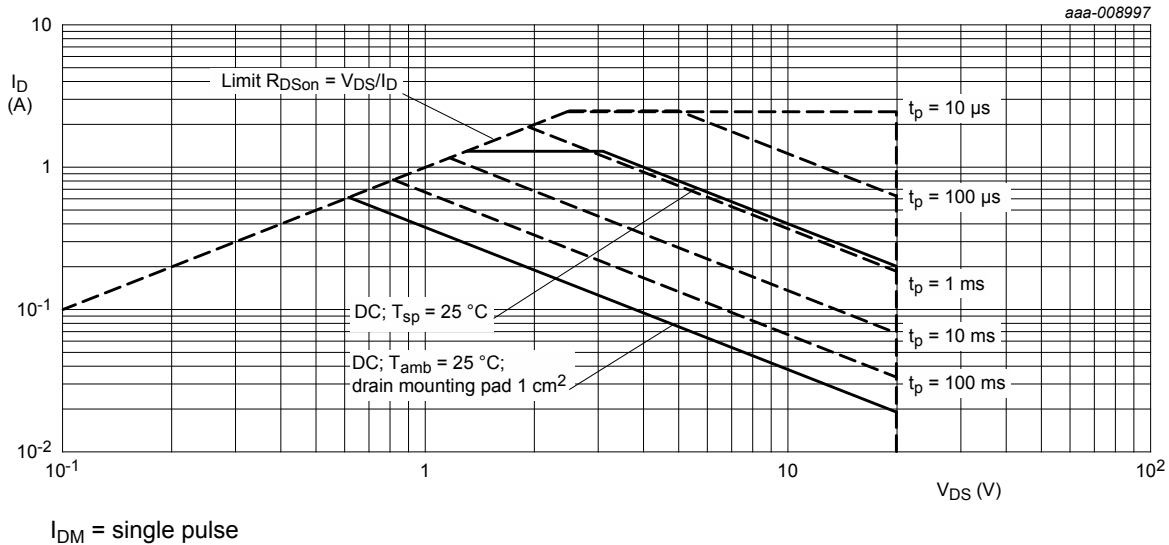


Fig. 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

## 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol                | Parameter                                   | Conditions  | Min | Typ | Max | Unit |     |
|-----------------------|---|-------------|-----|-----|-----|------|-----|
| <b>Per transistor</b> |   |             |     |     |     |      |     |
| $R_{th(j-a)}$         | thermal resistance from junction to ambient | in free air | [1] | -   | 410 | 475  | K/W |
|                       |   |             | [2] | -   | 285 | 330  | K/W |

| Symbol         | Parameter  | Conditions | Min | Typ | Max | Unit |
|----------------|--|------------|-----|-----|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |            | -   | 27  | 31  | 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 cm<sup>2</sup>.

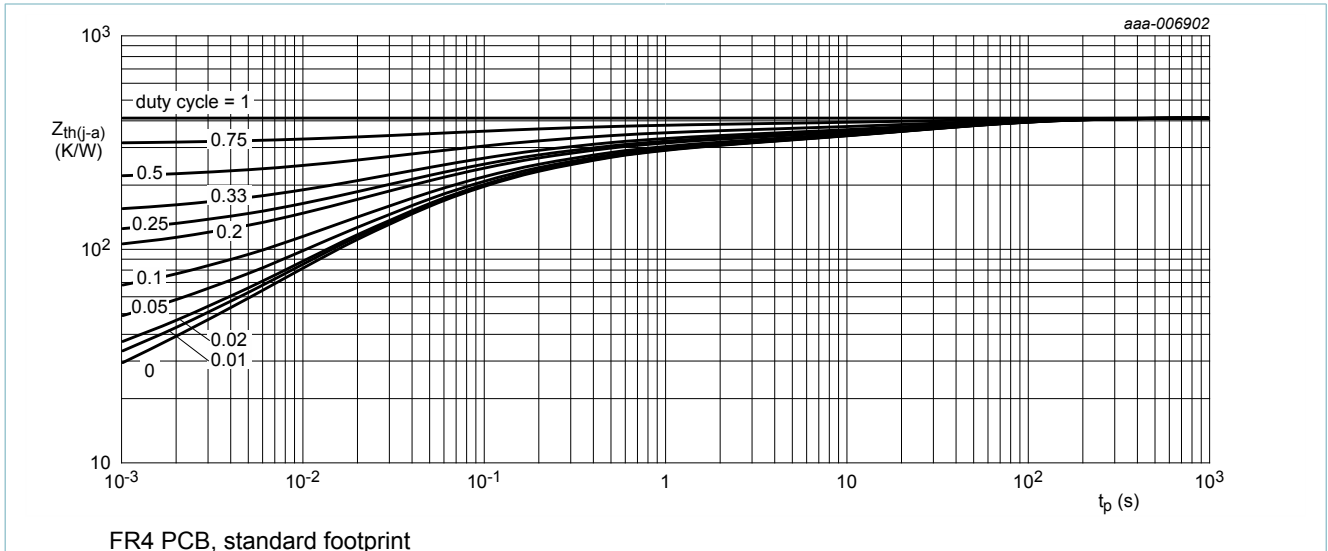


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

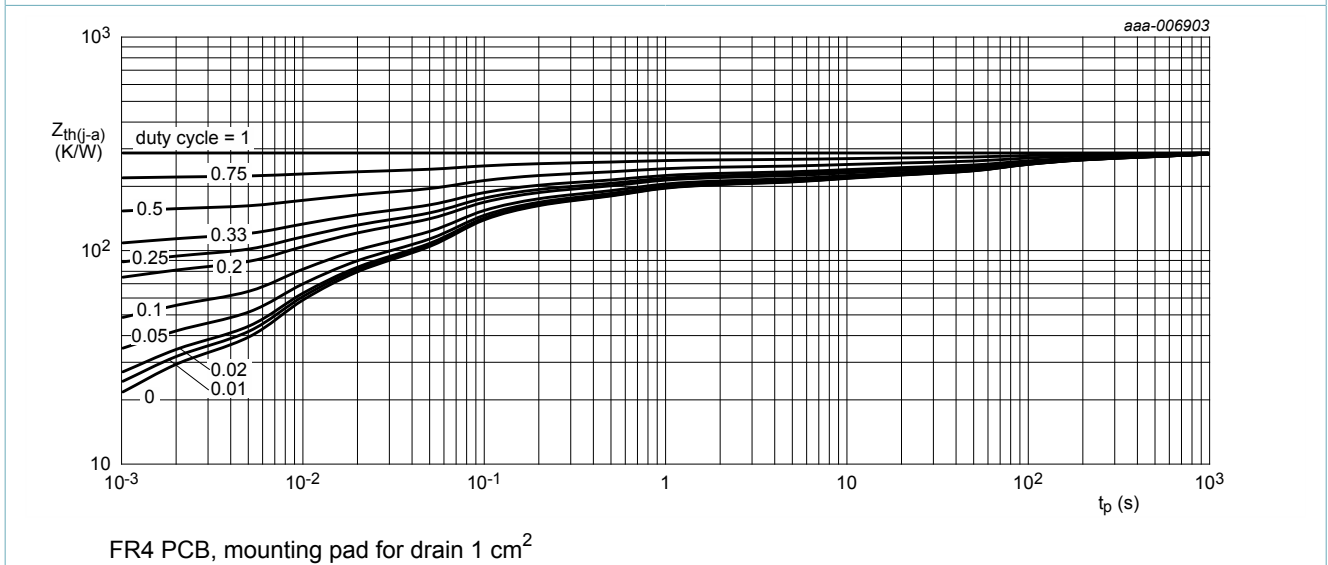
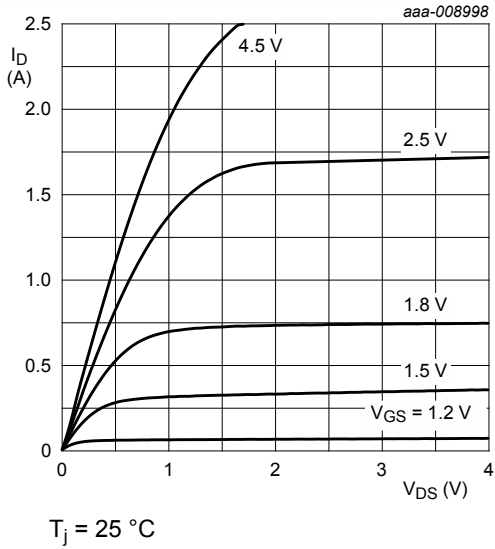


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

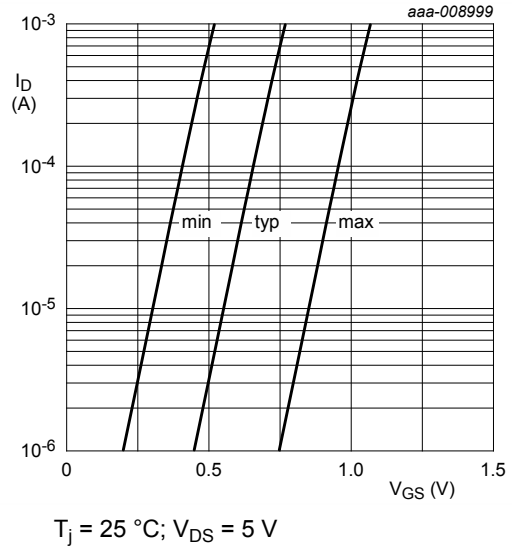
## 10. Characteristics

Table 7. Characteristics

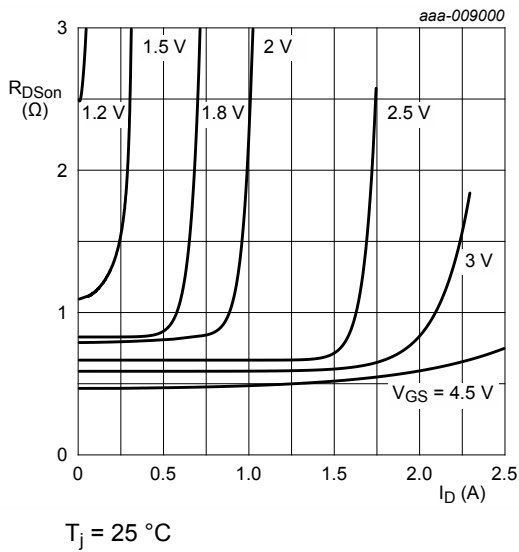
| Symbol  | Parameter                        | Conditions   | Min   | Typ  | Max  | Unit       |
|---|----------------------------------|--|---|------|------|------------|
| <b>Static characteristics (per transistor)</b>  |                                  |  |   |      |      |            |
| $V_{(BR)DSS}$                                   | 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             | $V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$                          | -   | -    | 10   | $\mu A$    |
|   |                                  | $V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$                         | -   | -    | -10  | $\mu A$    |
|   |                                  | $V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$                        | -   | -    | 1    | $\mu A$    |
|   |                                  | $V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$                       | -   | -    | -1   | $\mu A$    |
| $R_{DSon}$                                      | drain-source on-state resistance | $V_{GS} = 4.5 V; I_D = 600 \text{ mA}; T_j = 25 \text{ }^\circ C$                | -   | 470  | 620  | m $\Omega$ |
|   |                                  | $V_{GS} = 4.5 V; I_D = 600 \text{ mA}; T_j = 150 \text{ }^\circ C$               | -   | 760  | 1000 | m $\Omega$ |
|   |                                  | $V_{GS} = 2.5 V; I_D = 500 \text{ mA}; T_j = 25 \text{ }^\circ C$                | -   | 620  | 850  | m $\Omega$ |
|   |                                  | $V_{GS} = 1.8 V; I_D = 100 \text{ mA}; T_j = 25 \text{ }^\circ C$                | -   | 845  | 1300 | m $\Omega$ |
|   |                                  | $V_{GS} = 1.5 V; I_D = 10 \text{ mA}; T_j = 25 \text{ }^\circ C$                 | -   | 1125 | 3000 | m $\Omega$ |
|   |                                  | $V_{GS} = 1.2 V; I_D = 1 \text{ mA}; T_j = 25 \text{ }^\circ C$                  | -   | 2210 | -    | m $\Omega$ |
| $g_{fs}$  | forward transconductance         | $V_{DS} = 5 V; I_D = 0.6 \text{ A}; T_j = 25 \text{ }^\circ C$                   | -   | 1    | -    | S          |
| <b>Dynamic characteristics (per transistor)</b> |                                  |  |   |      |      |            |
| $Q_{G(tot)}$                                    | total gate charge                | $V_{DS} = 10 V; I_D = 600 \text{ mA}; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$ | -   | 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                | $V_{DS} = 10 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$      | -   | 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               |  | $V_{DS} = 10 V; I_D = 600 \text{ mA}; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$ | -    | 5.6  | -          |
| $t_r$   | rise time                        | -  |   | 9.2  | -    | ns         |
| $t_{d(off)}$                                    | turn-off delay time              | -  |   | 19   | -    | ns         |
| $t_f$   | fall time                        | -  |   | 51   | -    | ns         |
| <b>Source-drain diode (per transistor)</b>      |                                  |  |   |      |      |            |
| $V_{SD}$  | source-drain voltage             | $I_S = 0.36 \text{ A}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$                  | -   | 0.8  | 1.2  | V          |



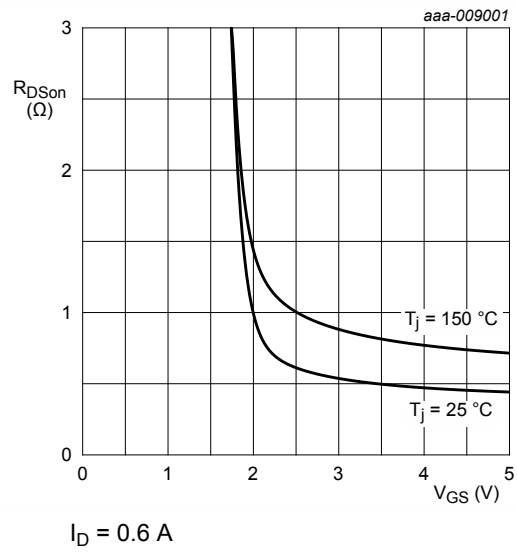
**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



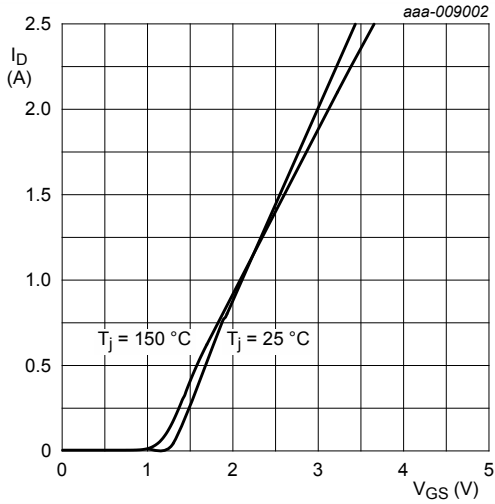
**Fig. 8. Sub-threshold drain current as a function of gate-source voltage**



**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

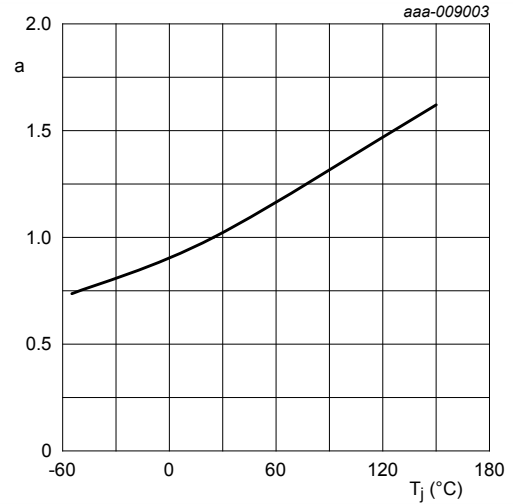
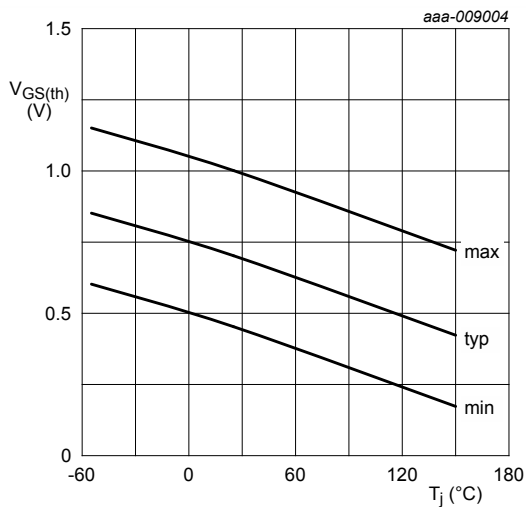


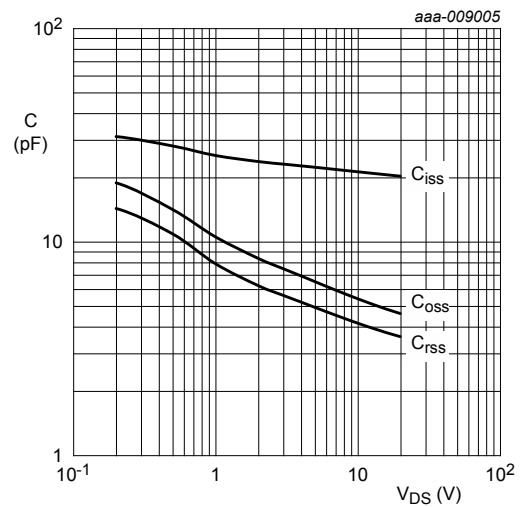
Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

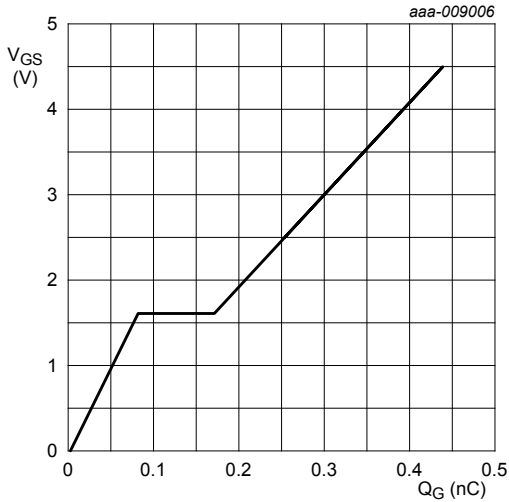
Fig. 13. Gate-source threshold voltage as a function of junction temperature



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

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





$I_D = 0.6 \text{ A}; V_{DS} = 10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

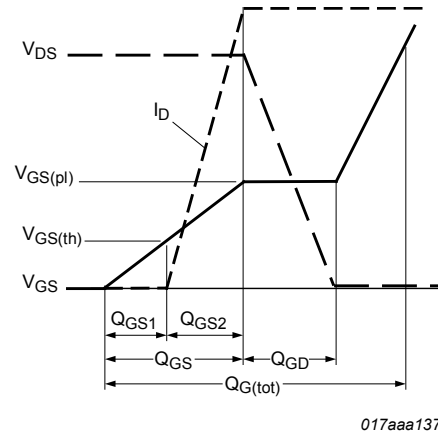
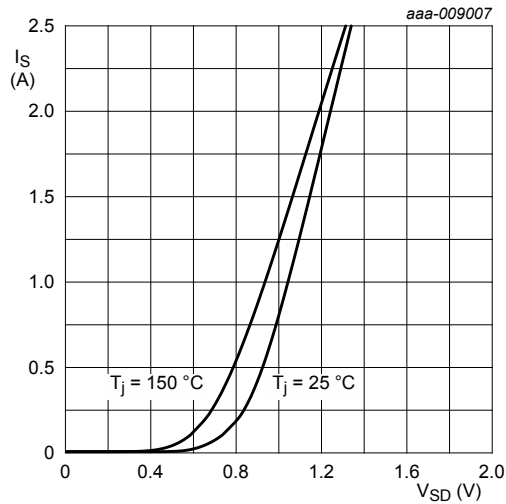


Fig. 16. MOSFET transistor: Gate charge waveform definitions



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

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

## 11. Test information

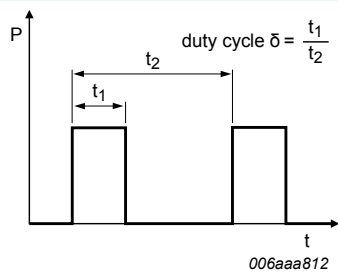


Fig. 18. Duty cycle definition

## 12. Package outline

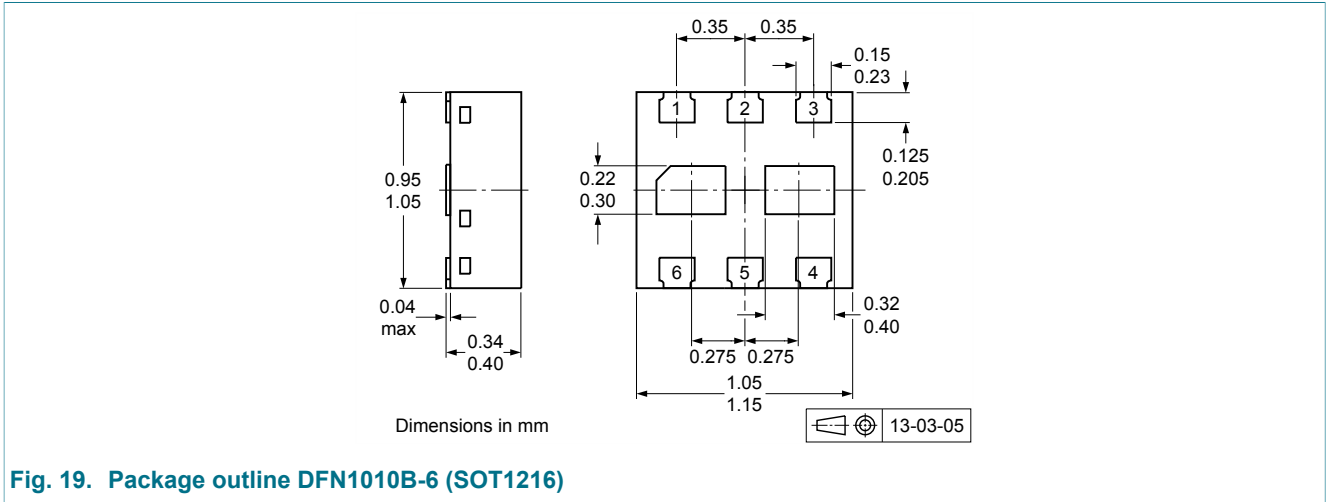


Fig. 19. Package outline DFN1010B-6 (SOT1216)

### 13. Soldering

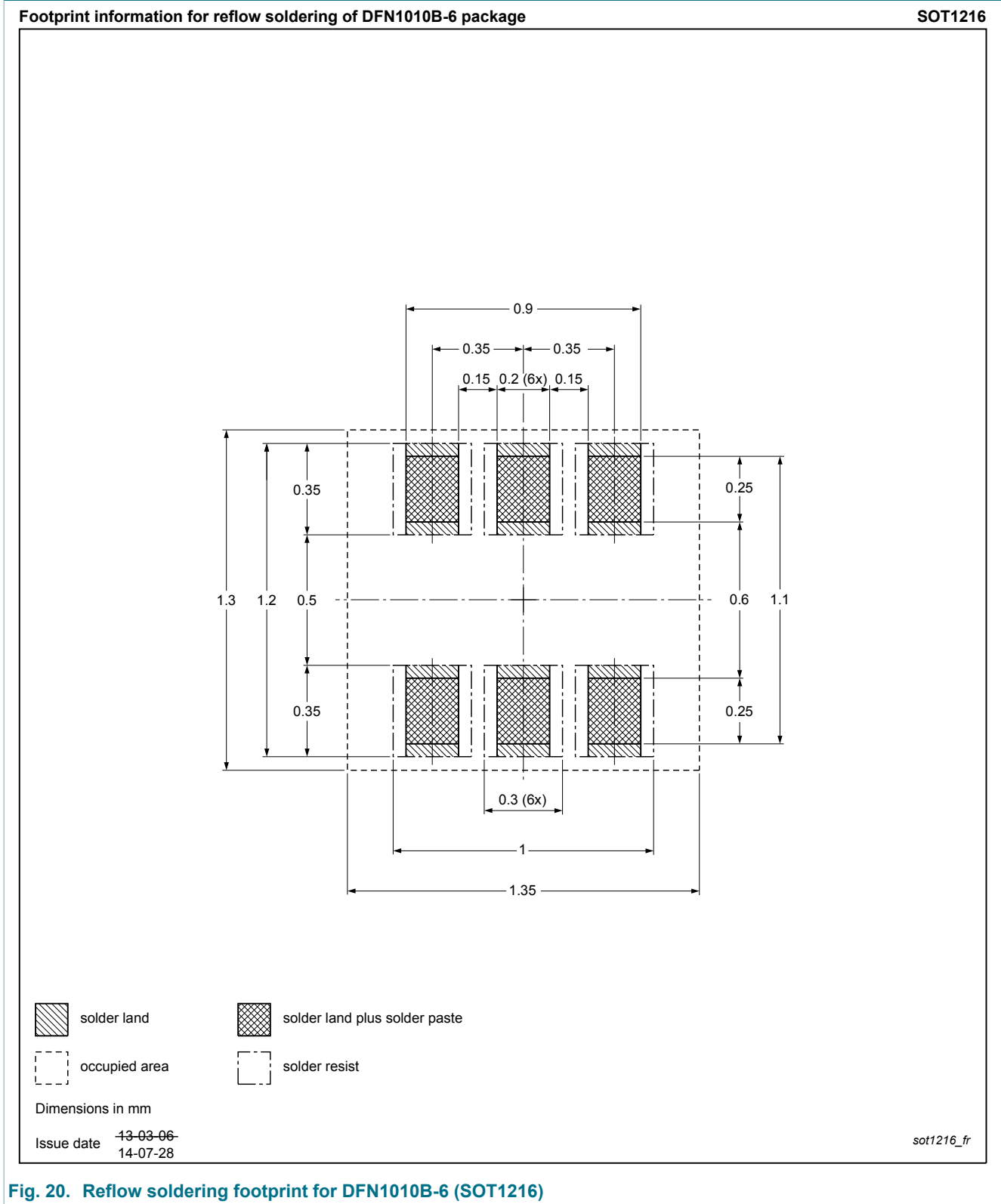


Fig. 20. Reflow soldering footprint for DFN1010B-6 (SOT1216)

## 14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date  | Data sheet status  | Change notice | Supersedes      |
|-----------------|---|--------------------|---------------|-----------------|
| PMDXB600UNE v.2 | 20150701  | Product data sheet | -             | PMDXB600UNE v.1 |
| Modifications:  | <ul style="list-style-type: none"><li>Change of binary marking code position.</li></ul> |                    |               |                 |
| PMDXB600UNE v.1 | 20130916  | 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. |
| 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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## 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 .....        | 9  |
| 12   | Package outline .....         | 10 |
| 13   | Soldering .....               | 11 |
| 14   | Revision history .....        | 12 |
| 15   | Legal information .....       | 13 |
| 15.1 | Data sheet status .....       | 13 |
| 15.2 | Definitions .....             | 13 |
| 15.3 | Disclaimers .....             | 13 |
| 15.4 | Trademarks .....              | 14 |

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