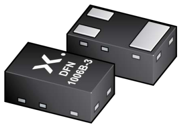

# NX3008NBKMB

**30 V, single N-channel Trench MOSFET**

**Rev. 1 — 11 May 2012** **Product data sheet**

## 1. Product profile

### 1.1 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.

### 1.2 Features and benefits

- Very fast switching
- Low threshold voltage
- Trench MOSFET technology
- ESD protection up to 2 kV
- Ultra thin package profile with 0.37 mm height

### 1.3 Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

### 1.4 Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | $T_j$ = 25 °C | | - | - | 30 | V |
| $V_{GS}$ | gate-source voltage | | | -8 | - | 8 | V |
| $I_D$ | drain current | $V_{GS}$ = 4.5 V; $T_{amb}$ = 25 °C | [1] | - | - | 530 | mA |
| **Static characteristics** | | | | | | | |
| $R_{DSon}$ | drain-source on-state resistance | $V_{GS}$ = 4.5 V; $I_D$ = 350 mA; $T_j$ = 25 °C | | - | 1 | 1.4 | Ω |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 $cm^2$.

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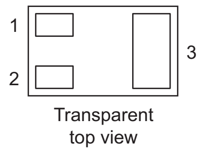
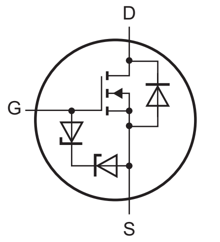
## 2. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | G | gate |   SOT883B (DFN1006B-3) |   |
| 2 | S | source | | |
| 3 | D | drain | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| NX3008NBKMB | DFN1006B-3 | Leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.37 mm | SOT883B |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| NX3008NBKMB | 0000 0011 |

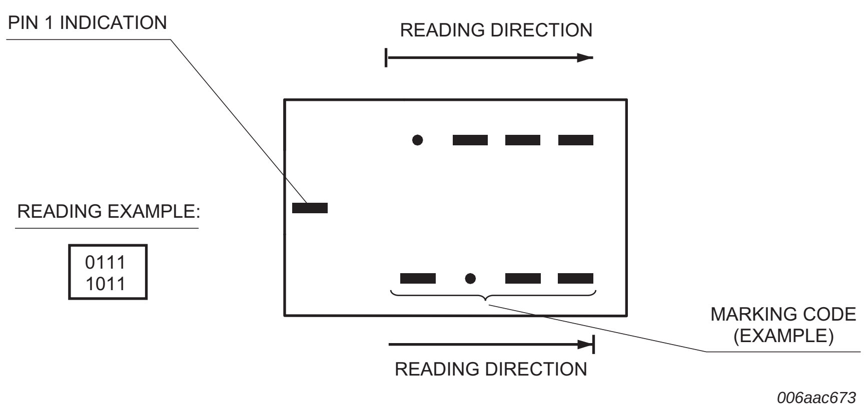



**Fig 1. DFN1006B-3 (SOT883B) binary marking code description**

## 5. Limiting values

**Table 5. Limiting values**

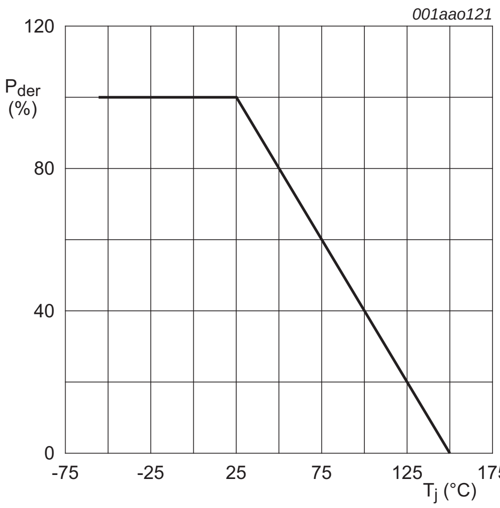
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | $T_j$ = 25 °C | | - | 30 | V |
| $V_{GS}$ | gate-source voltage | | | -8 | 8 | V |
| $I_D$ | drain current | $V_{GS}$ = 4.5 V; $T_{amb}$ = 25 °C | [1] | - | 530 | mA |
| | | $V_{GS}$ = 4.5 V; $T_{amb}$ = 100 °C | [1] | - | 330 | mA |
| $I_{DM}$ | peak drain current | $T_{amb}$ = 25 °C; single pulse; $t_p \leq$ 10 µs | | - | 2.1 | A |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = 25 °C | [2] | - | 360 | mW |
| | | | [1] | - | 715 | mW |
| | | $T_{sp}$ = 25 °C | | - | 2700 | mW |
| $T_j$ | junction temperature | | | -55 | 150 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 150 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 150 | °C |
| **Source-drain diode** | | | | | | |
| $I_S$ | source current | $T_{amb}$ = 25 °C | [1] | - | 530 | mA |
| **ESD maximum rating** | | | | | | |
| $V_{ESD}$ | electrostatic discharge voltage | HBM | [3] | - | 2000 | V |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 $cm^2$.

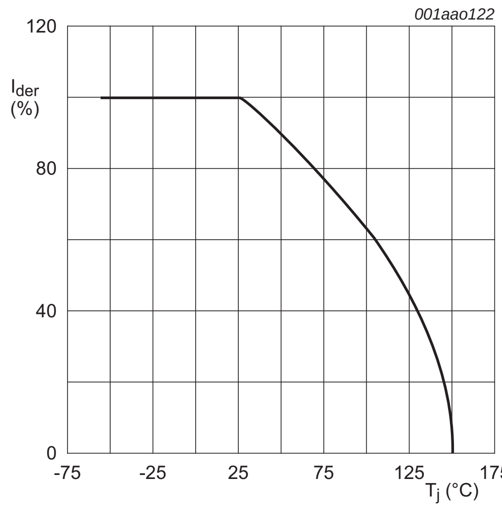
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[3] Measured between all pins.



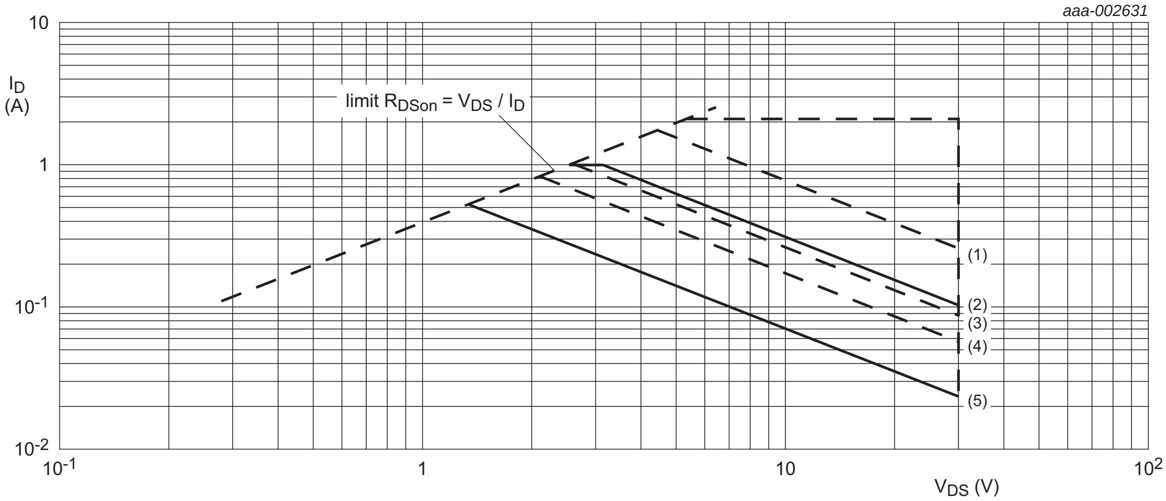

$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100\,\%$$

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




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

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




$I_{DM}$ is single pulse

(1) $t_p$ = 1 ms

(2) DC; $T_{sp}$ = 25 °C

(3) $t_p$ = 10 ms

(4) $t_p$ = 100 ms

(5) DC; $T_{amb}$ = 25 °C; drain mounting pad 1 $cm^2$

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

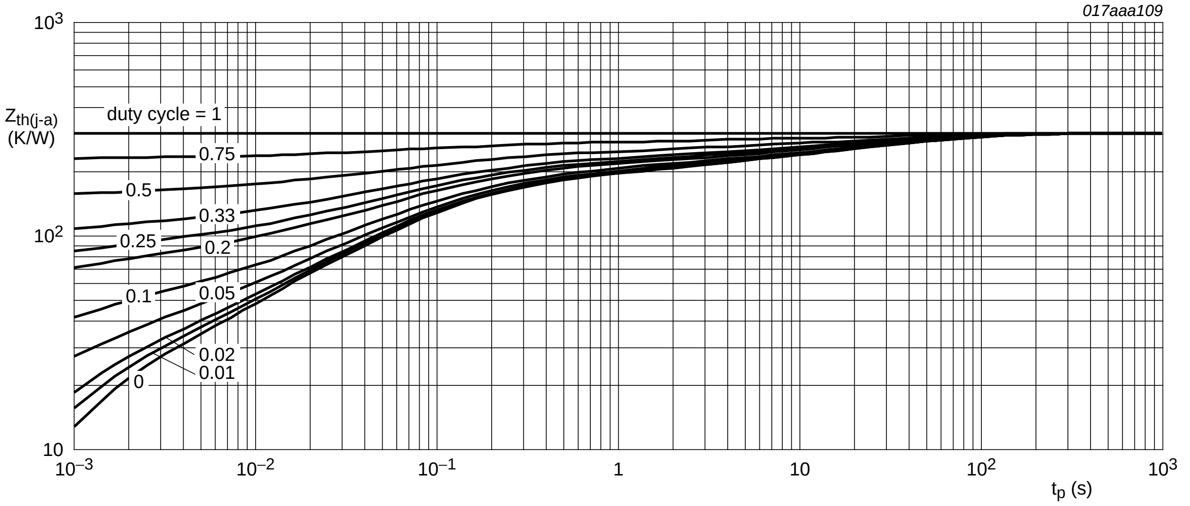
## 6. Thermal characteristics

**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] | - | 305 | 360 | K/W |
| | | | [2] | - | 150 | 175 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | - | 40 | K/W |

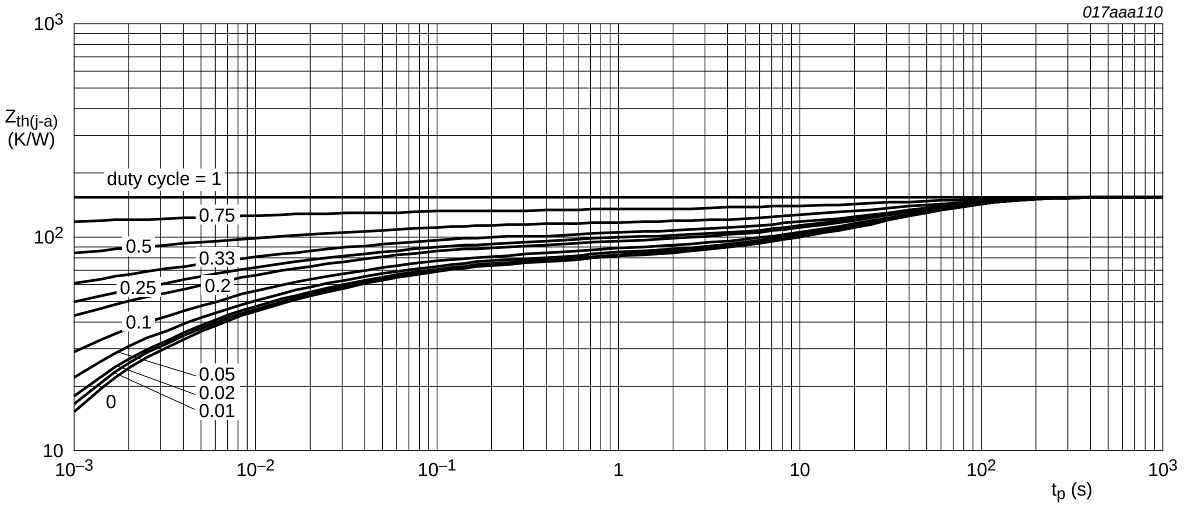
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 $cm^2$.




FR4 PCB, standard footprint

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



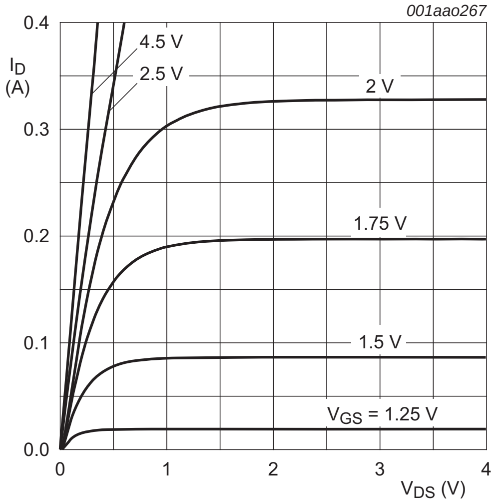

FR4 PCB, mounting pad for drain 1 $cm^2$

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

## 7. Characteristics

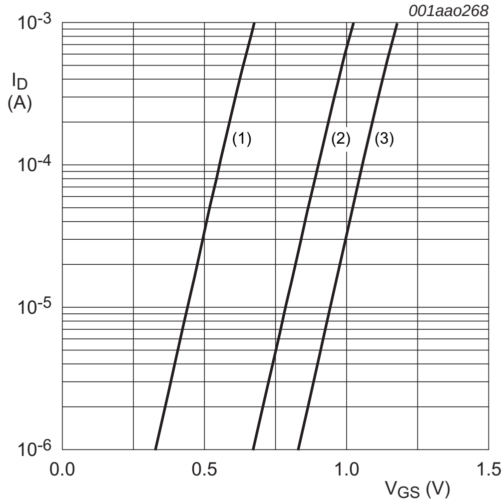
**Table 7. Characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D$ = 250 µA; $V_{GS}$ = 0 V; $T_j$ = 25 °C | 30 | - | - | V |
| $V_{GSth}$ | gate-source threshold voltage | $I_D$ = 250 µA; $V_{DS}$ = $V_{GS}$; $T_j$ = 25 °C | 0.6 | 0.9 | 1.1 | V |
| $I_{DSS}$ | drain leakage current | $V_{DS}$ = 30 V; $V_{GS}$ = 0 V; $T_j$ = 25 °C | - | - | 1 | µA |
| | | $V_{DS}$ = 30 V; $V_{GS}$ = 0 V; $T_j$ = 150 °C | - | - | 10 | µA |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 8 V; $V_{DS}$ = 0 V; $T_j$ = 25 °C | - | 0.2 | 1 | µA |
| | | $V_{GS}$ = -8 V; $V_{DS}$ = 0 V; $T_j$ = 25 °C | - | 0.2 | 1 | µA |
| $R_{DSon}$ | drain-source on-state resistance | $V_{GS}$ = 4.5 V; $I_D$ = 350 mA; $T_j$ = 25 °C | - | 1 | 1.4 | Ω |
| | | $V_{GS}$ = 4.5 V; $I_D$ = 350 mA; $T_j$ = 150 °C | - | 1.8 | 2.5 | Ω |
| | | $V_{GS}$ = 2.5 V; $I_D$ = 200 mA; $T_j$ = 25 °C | - | 1.4 | 2.1 | Ω |
| | | $V_{GS}$ = 1.8 V; $I_D$ = 10 mA; $T_j$ = 25 °C | - | 2 | 2.8 | Ω |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 350 mA; $T_j$ = 25 °C | - | 310 | - | mS |
| **Dynamic characteristics** | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS}$ = 15 V; $I_D$ = 400 mA; $V_{GS}$ = 4.5 V; $T_j$ = 25 °C | - | 0.52 | 0.68 | nC |
| $Q_{GS}$ | gate-source charge | | - | 0.17 | - | nC |
| $Q_{GD}$ | gate-drain charge | | - | 0.08 | - | nC |
| $C_{iss}$ | input capacitance | $V_{DS}$ = 15 V; f = 1 MHz; $V_{GS}$ = 0 V; $T_j$ = 25 °C | - | 34 | 50 | pF |
| $C_{oss}$ | output capacitance | | - | 6.5 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | | - | 2.2 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS}$ = 20 V; $R_L$ = 250 Ω; $V_{GS}$ = 4.5 V; $R_{G(ext)}$ = 6 Ω; $T_j$ = 25 °C | - | 15 | 30 | ns |
| $t_r$ | rise time | | - | 11 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 69 | 138 | ns |
| $t_f$ | fall time | | - | 19 | - | ns |
| **Source-drain diode** | | | | | | |
| $V_{SD}$ | source-drain voltage | $I_S$ = 350 mA; $V_{GS}$ = 0 V; $T_j$ = 25 °C | 0.47 | 0.85 | 1.2 | V |




$T_j$ = 25 °C

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



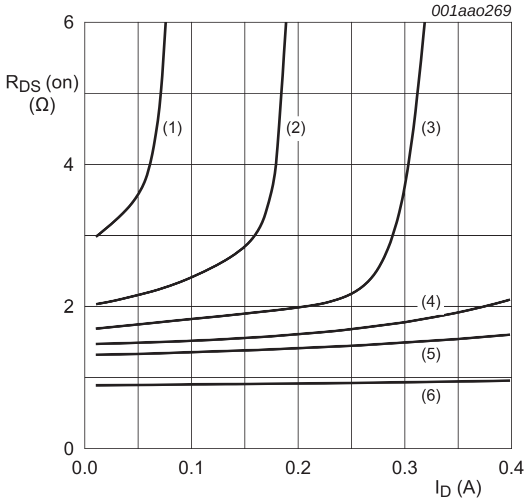

$T_j$ = 25 °C; $V_{DS}$ = 5 V

(1) minimum values

(2) typical values

(3) maximum values

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




$T_j$ = 25 °C

(1) $V_{GS}$ = 1.5 V

(2) $V_{GS}$ = 1.75 V

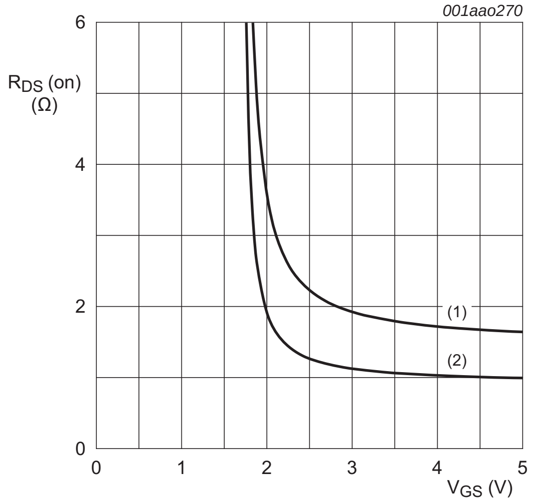
(3) $V_{GS}$ = 2.0 V

(4) $V_{GS}$ = 2.25 V

(5) $V_{GS}$ = 2.5 V

(6) $V_{GS}$ = 4.5 V

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

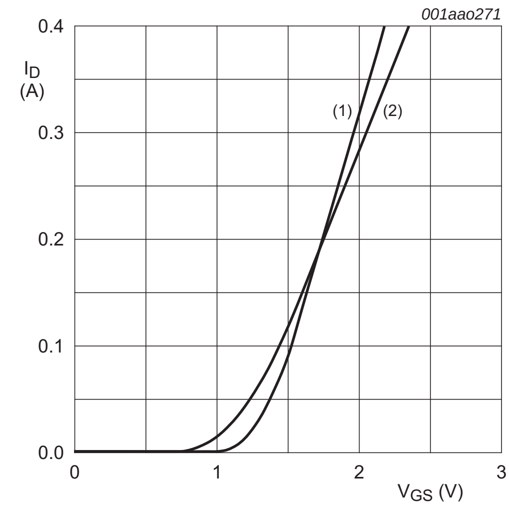



$I_D$ = 400 mA

(1) $T_j$ = 150 °C

(2) $T_j$ = 25 °C

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

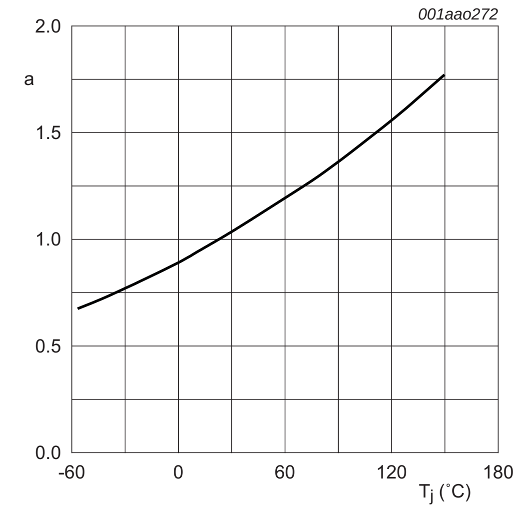



$V_{DS} > I_D \times R_{DSon}$

(1) $T_j$ = 25 °C

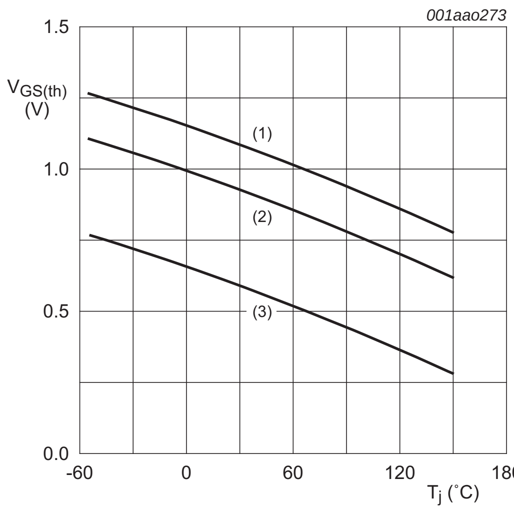
(2) $T_j$ = 150 °C

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




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

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



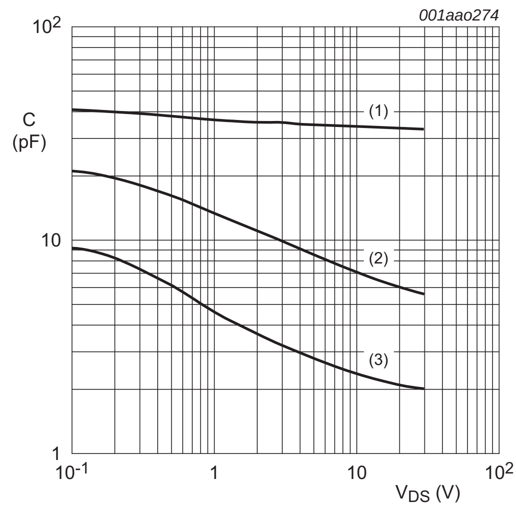

$I_D$ = 0.25 mA; $V_{DS} = V_{GS}$

(1) maximum values

(2) typical values

(3) minimum values

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



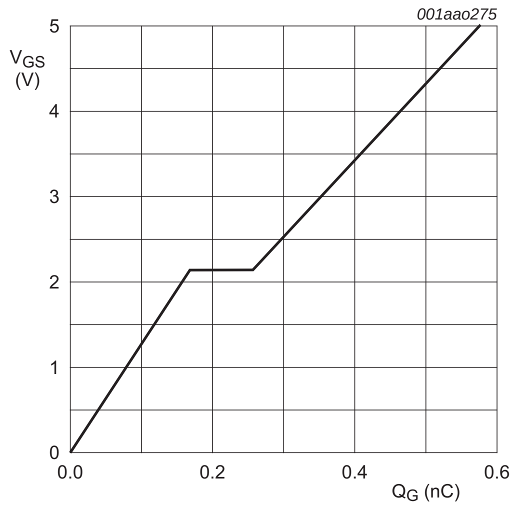

f = 1 MHz; $V_{GS}$ = 0 V

(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**




$I_D$ = 0.4 A; $V_{DS}$ = 15 V; $T_{amb}$ = 25 °C

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

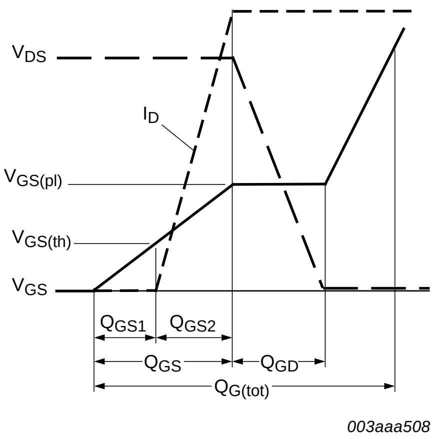
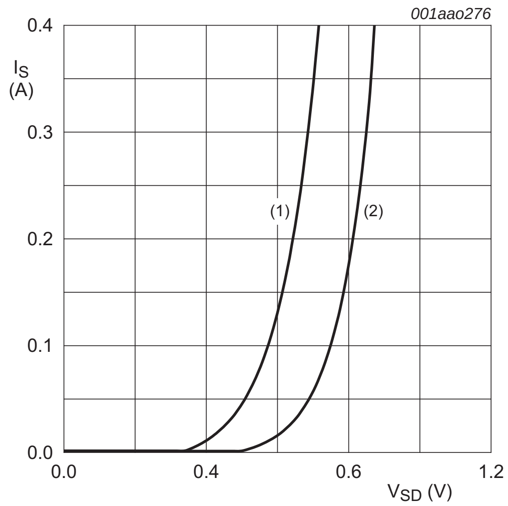



**Fig 16. Gate charge waveform definitions**




$V_{GS}$ = 0 V

(1) $T_j$ = 150 °C

(2) $T_j$ = 25 °C

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

## 8. Test information

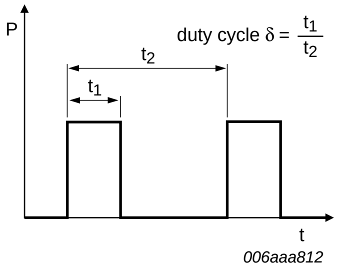



Fig 18. Duty cycle definition

## 9. Package outline

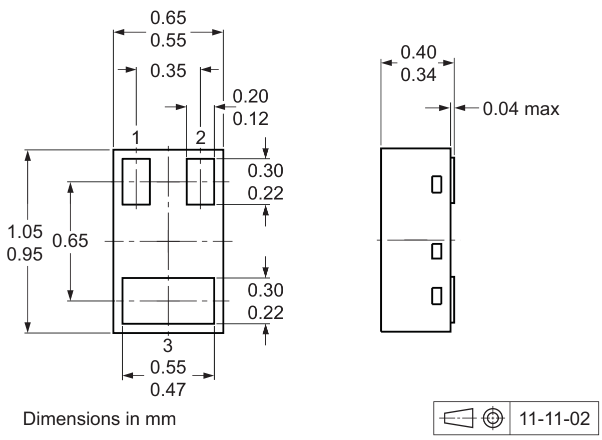



Fig 19. Package outline SOT883B (DFN1006B-3)

## 10. Soldering

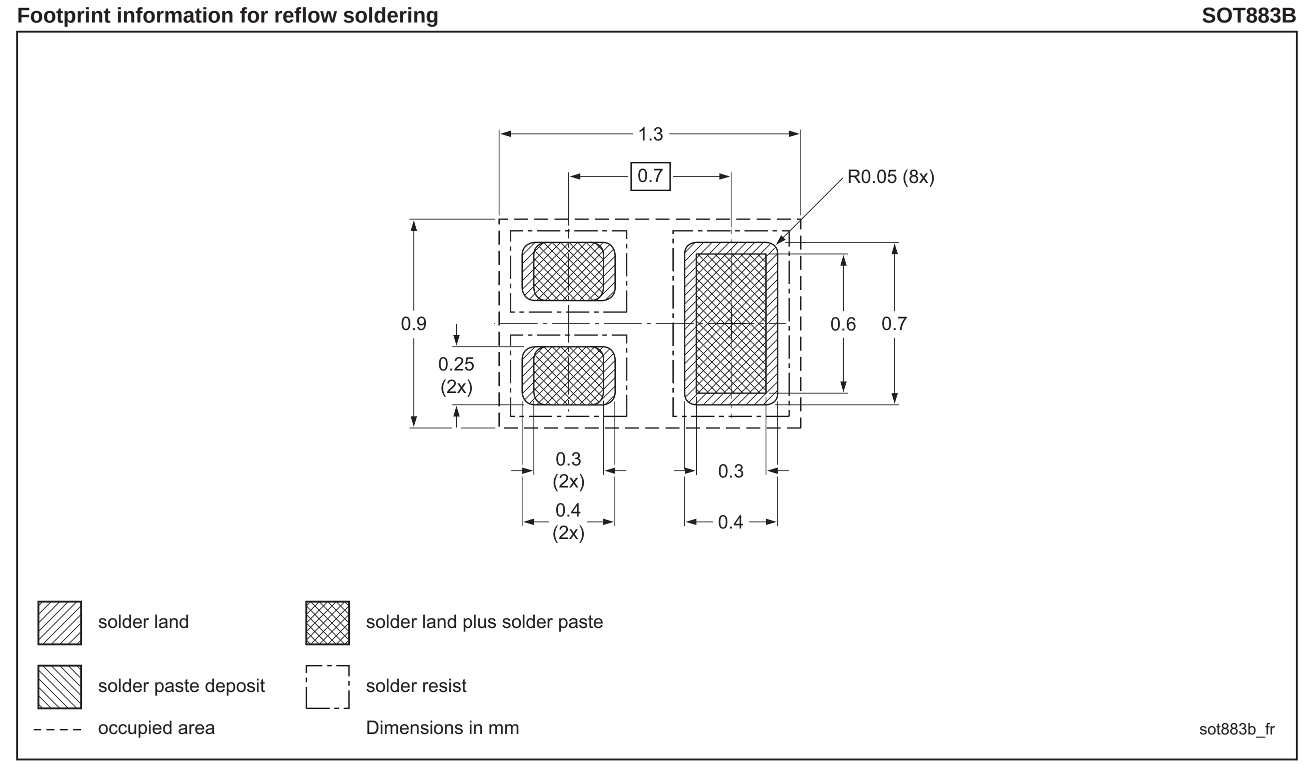



Fig 20. Reflow soldering footprint for SOT883B (DFN1006B-3)

## 11. Revision history

**Table 8. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| NX3008NBKMB v.1 | 20120511 | Product data sheet | - | - |

# 12. Legal information

## 12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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## 14. Contents





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**Date of release: 11 May 2012**