



# NX3008PBKMB

30 V, single P-channel Trench MOSFET

Rev. 1 — 11 May 2012

Product data sheet

## 1. Product profile

### 1.1 General description

P-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
- High-side loadswitch
- Switching circuits

### 1.4 Quick reference data

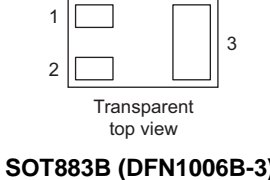
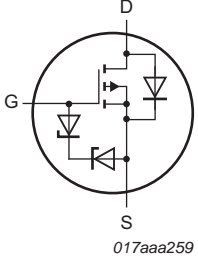
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	-30	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	<a href="#">[1]</a>	-	-300	mA
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -200\text{ mA}; T_j = 25\text{ °C}$	-	2.8	4.1	$\Omega$

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

## 2. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain		

## 3. Ordering information

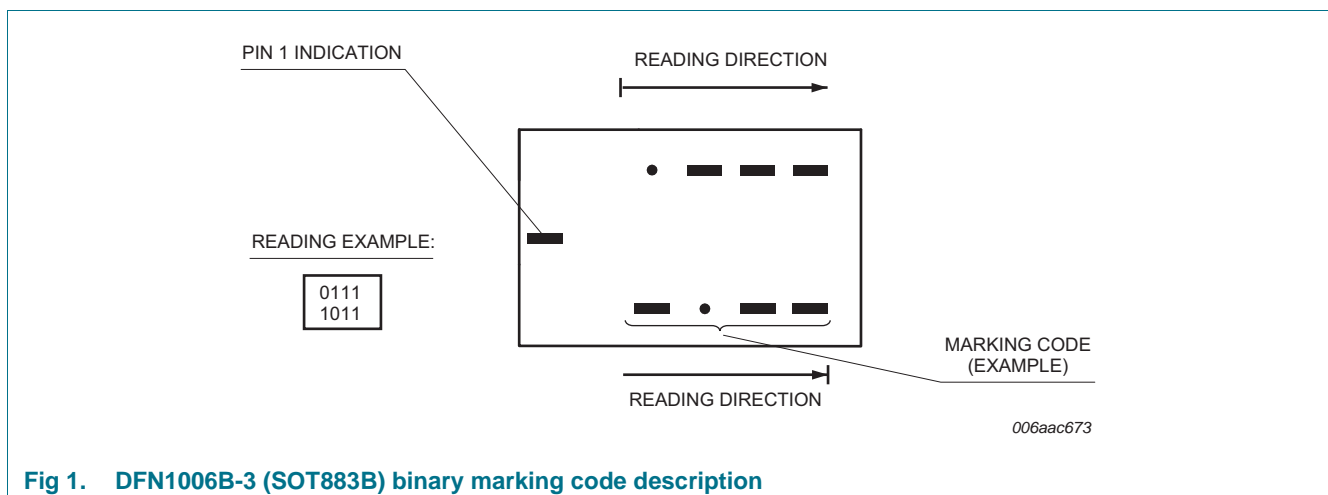
**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
NX3008PBKMB	DFN1006B-3	Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
NX3008PBKMB	0000 0100



## 5. 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	-	-30	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]	-	-300	mA
		V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	-185	mA
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs	-	-1.2	A	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	360	mW
			[1]	-	715	mW
		T <sub>sp</sub> = 25 °C		-	2700	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	

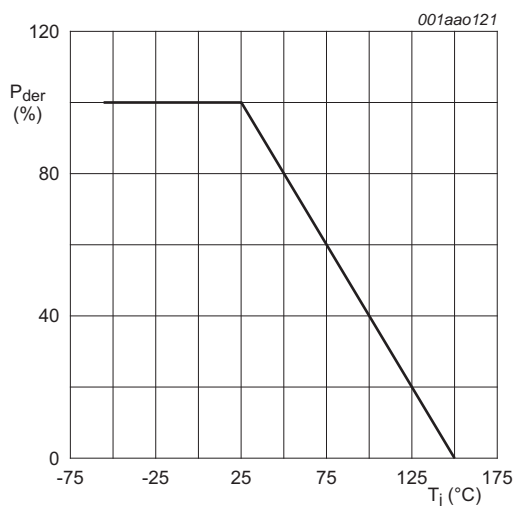
### Source-drain diode

I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	-300	mA
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### ESD maximum rating

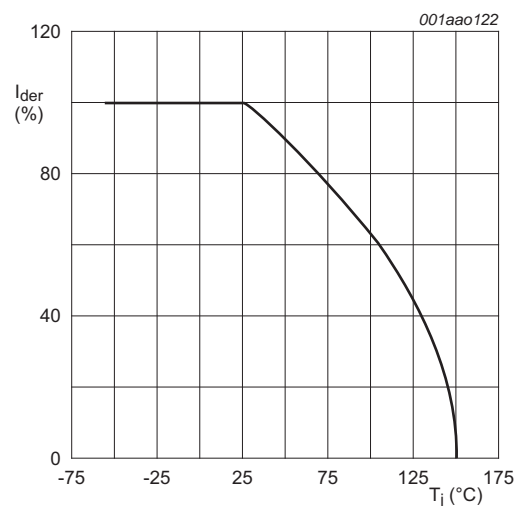
V <sub>ESD</sub>	electrostatic discharge voltage	HBM	[3]	-	2000	V
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- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Measured between all pins.



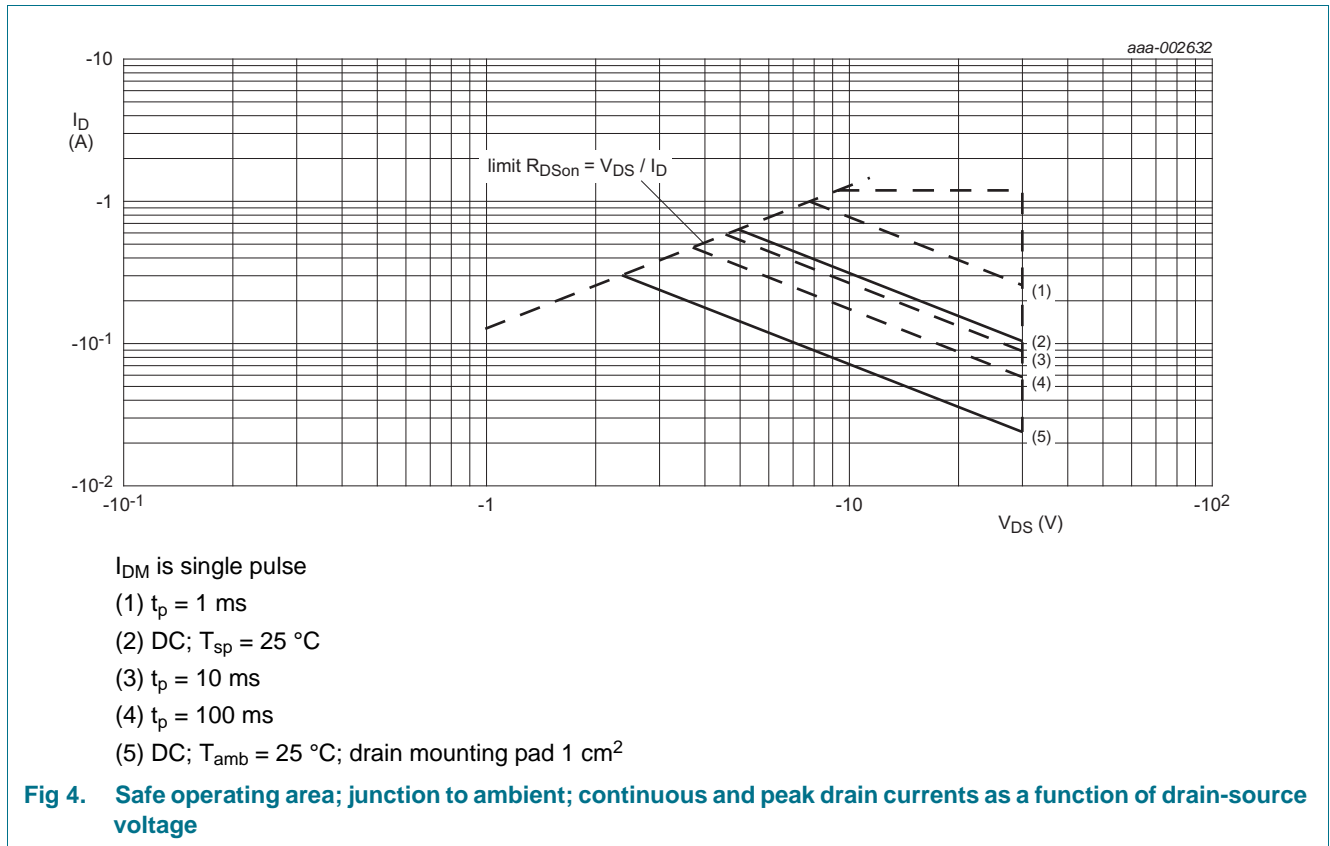
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

**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**



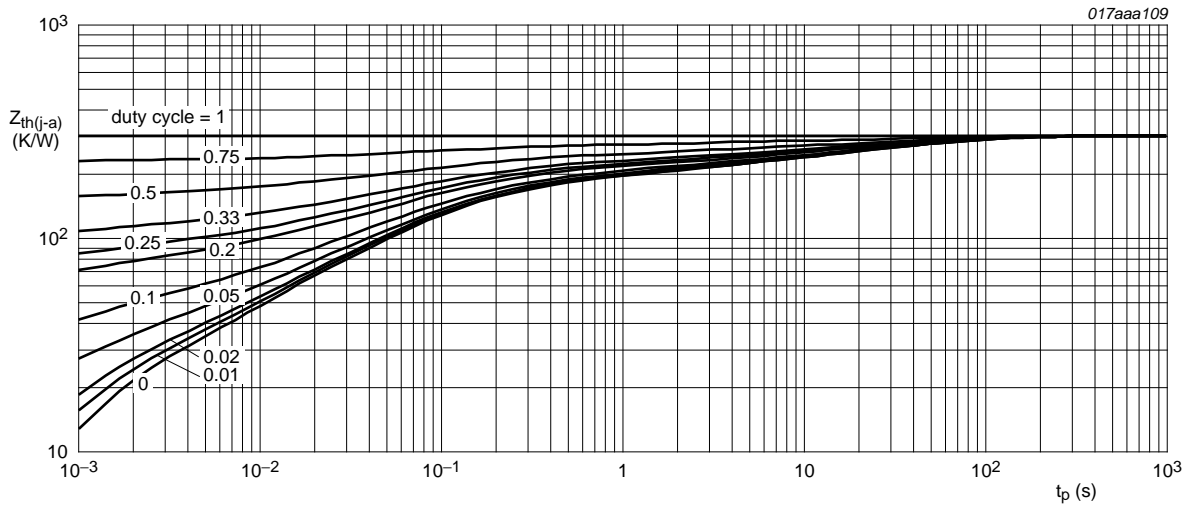
## 6. Thermal characteristics

**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	

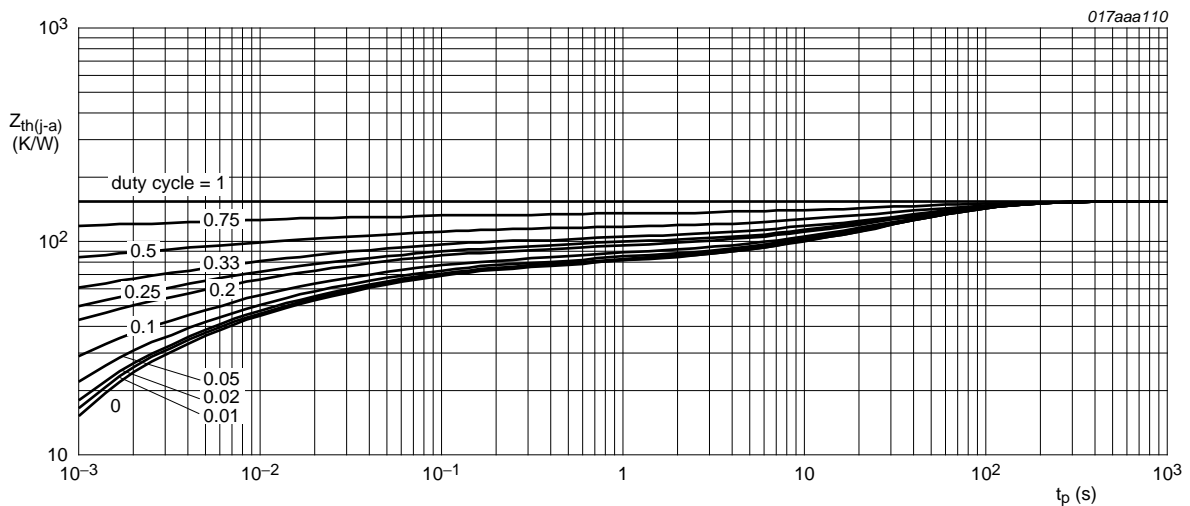
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



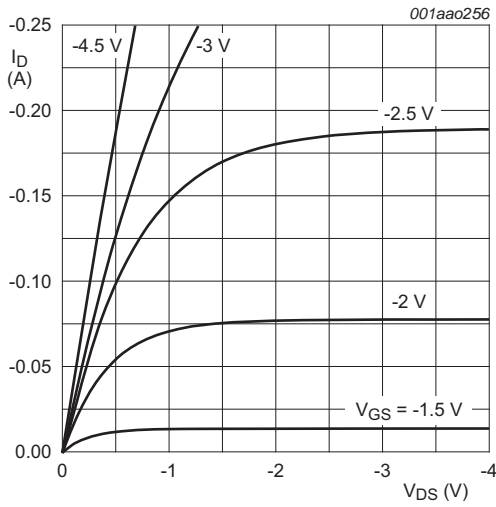
FR4 PCB, mounting pad for drain 1 cm<sup>2</sup>

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

## 7. Characteristics

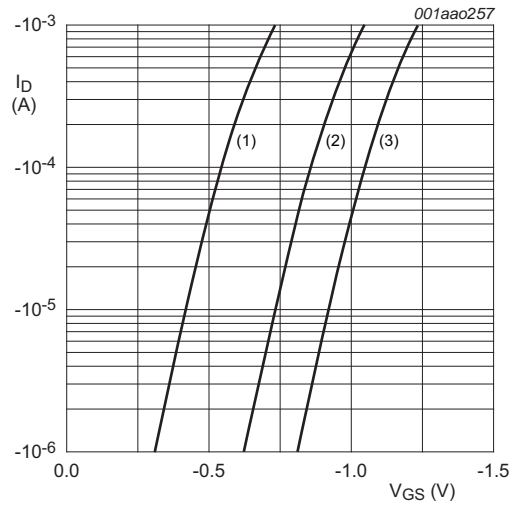
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-30	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.6	-0.9	-1.1	V
$I_{DSS}$	drain leakage current	$V_{DS} = -30 V$ ; $V_{GS} = 0 V$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	$\mu A$
		$V_{DS} = -30 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.2	-1	$\mu A$
		$V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.2	-1	$\mu A$
		$V_{GS} = 4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-10	-	nA
		$V_{GS} = -4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-10	-	nA
		$V_{GS} = 2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-1	-	nA
		$V_{GS} = -2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-1	-	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 V$ ; $I_D = -200 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.8	4.1	$\Omega$
		$V_{GS} = -4.5 V$ ; $I_D = -200 \text{ mA}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	5.3	7.8	$\Omega$
		$V_{GS} = -2.5 V$ ; $I_D = -10 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	5.3	6.5	$\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -10 V$ ; $I_D = -200 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	160	-	mS
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -15 V$ ; $I_D = -200 \text{ mA}$ ; $V_{GS} = -4.5 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	0.55	0.72	nC
$Q_{GS}$	gate-source charge		-	0.23	-	nC
$Q_{GD}$	gate-drain charge		-	0.09	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -15 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	31	46	pF
$C_{oss}$	output capacitance		-	6.5	-	pF
$C_{rss}$	reverse transfer capacitance		-	2.3	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -20 V$ ; $R_L = 250 \Omega$ ; $V_{GS} = -4.5 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	19	38	ns
$t_r$	rise time		-	30	-	ns
$t_{d(off)}$	turn-off delay time		-	65	130	ns
$t_f$	fall time		-	38	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -200 \text{ mA}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.47	-0.88	-1.2	V



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

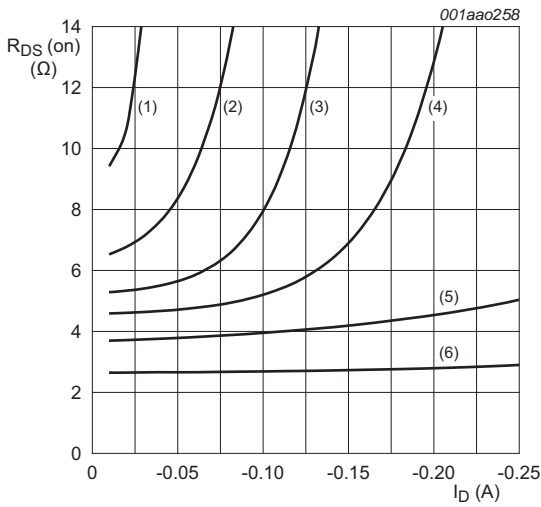
**Fig 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



$T_j = 25\text{ }^\circ\text{C}; V_{DS} = -5\text{ V}$

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

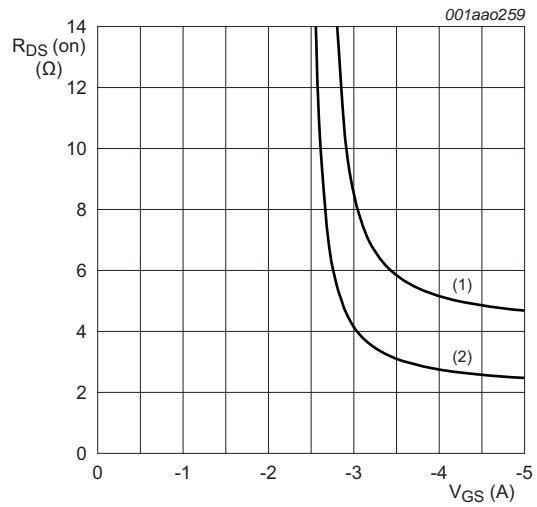
**Fig 8. Subthreshold drain current as a function of gate-source voltage**



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

- (1)  $V_{GS} = -1.75\text{ V}$
- (2)  $V_{GS} = -2.0\text{ V}$
- (3)  $V_{GS} = -2.25\text{ V}$
- (4)  $V_{GS} = -2.5\text{ V}$
- (5)  $V_{GS} = -3.0\text{ V}$
- (6)  $V_{GS} = -4.5\text{ V}$

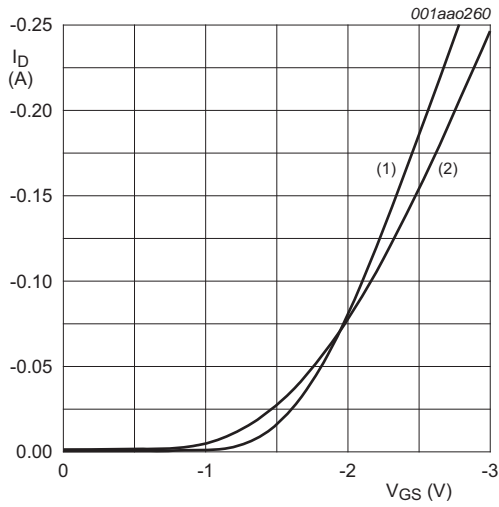
**Fig 9. Drain-source on-state resistance as a function of drain current; typical values**



$I_D = -200\text{ mA}$

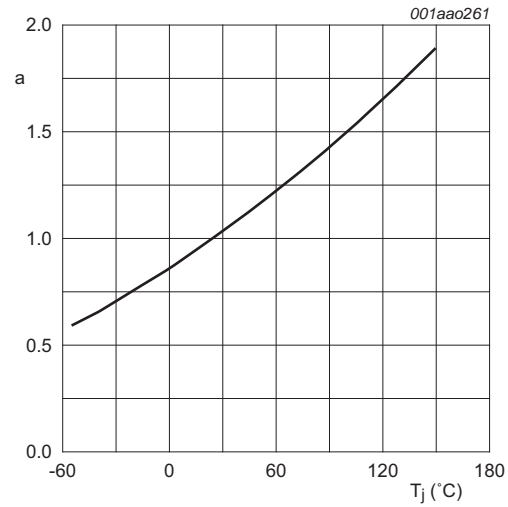
- (1)  $T_j = 150\text{ }^\circ\text{C}$
- (2)  $T_j = 25\text{ }^\circ\text{C}$

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



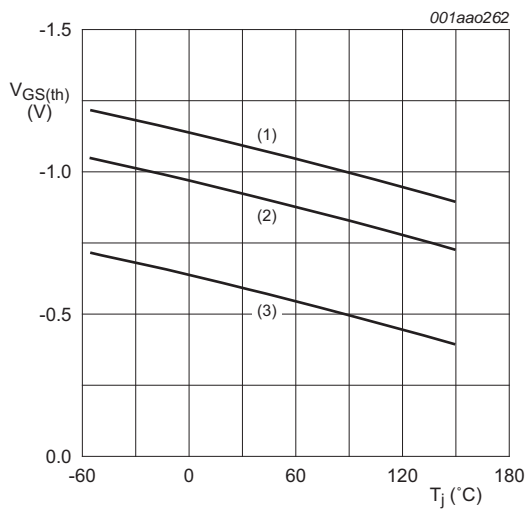
$V_{DS} > I_D \times R_{DS(on)}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

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



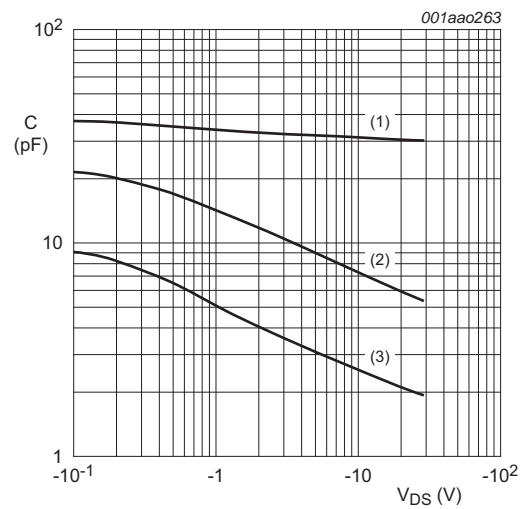
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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



$I_D = -0.25\text{ mA}$ ;  $V_{DS} = V_{GS}$   
 (1) maximum values  
 (2) typical values  
 (3) minimum values

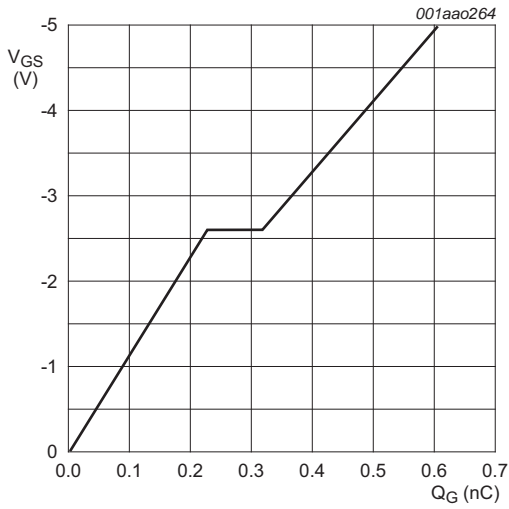
**Fig 13. Gate-source threshold voltage as a function of junction temperature**



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

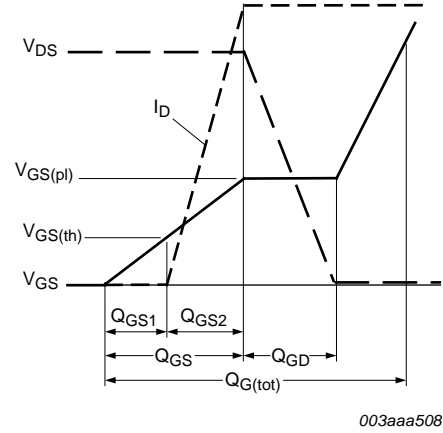
**Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**



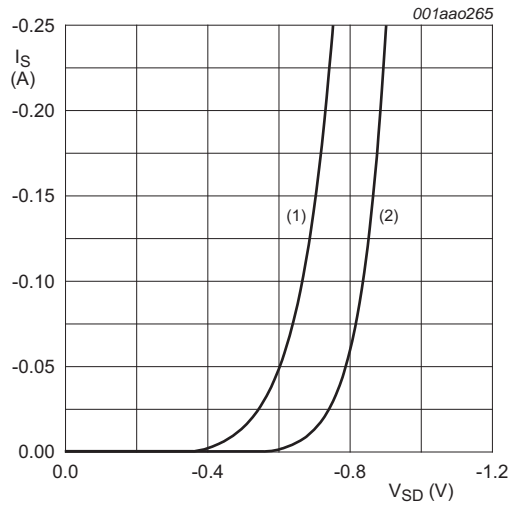


$I_D = -200 \text{ mA}$ ;  $V_{DS} = -15 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$

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



**Fig 16. Gate charge waveform definitions**



$V_{GS} = 0 \text{ V}$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$   
 (2)  $T_j = 25 \text{ }^\circ\text{C}$

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

## 8. Test information



Fig 18. Duty cycle definition

## 9. Package outline

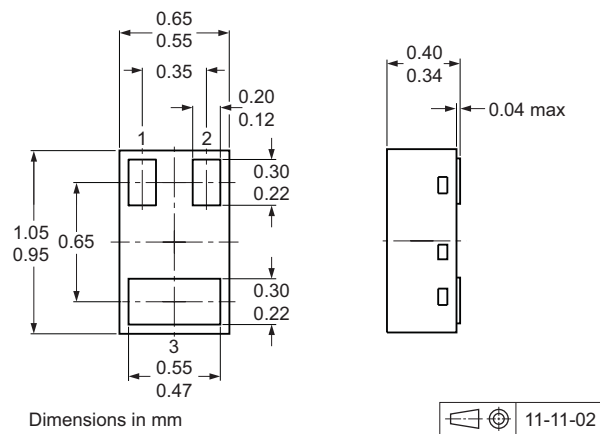
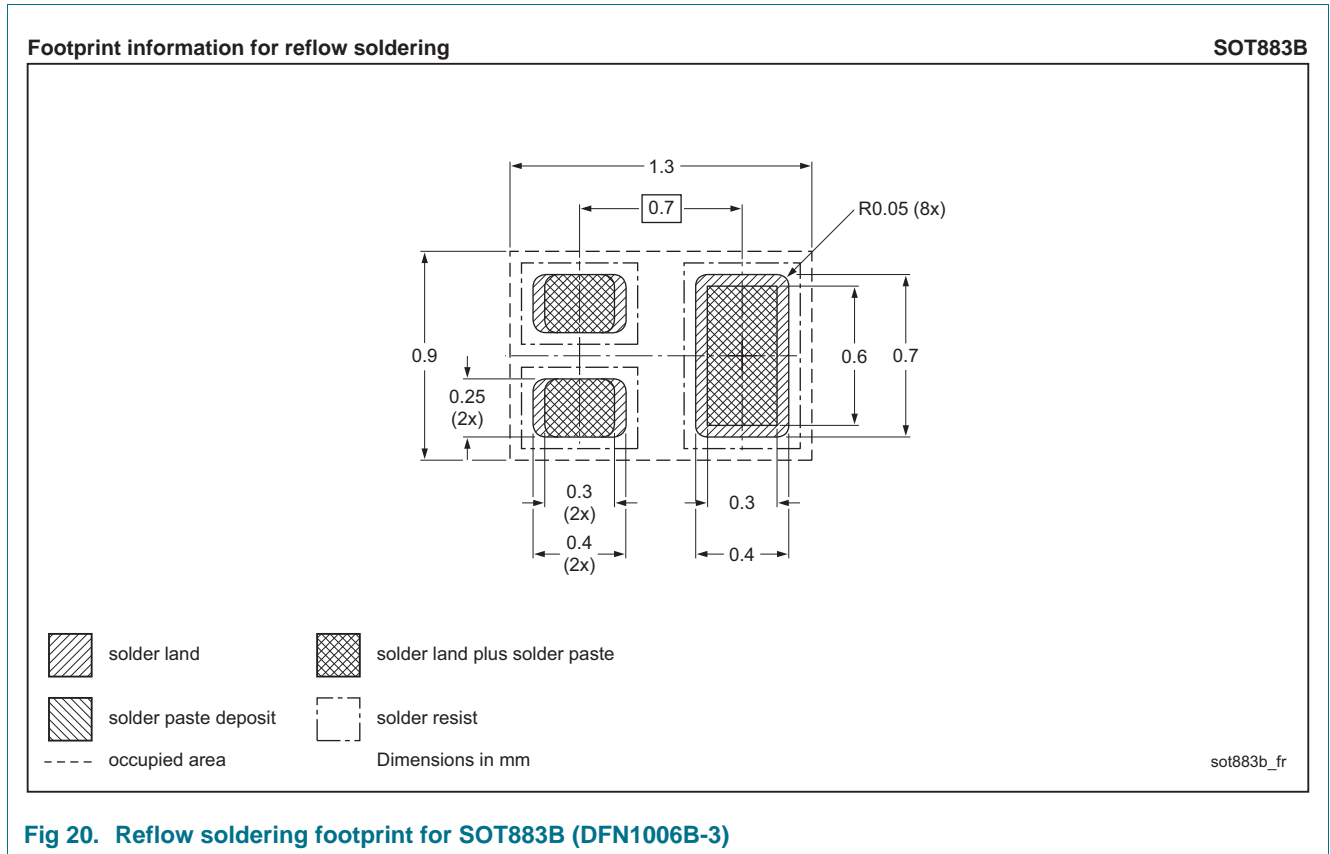


Fig 19. Package outline SOT883B (DFN1006B-3)

**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
NX3008PBKMB v.1	20120511	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1]</sup> [2]	Product status <sup>[3]</sup>	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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