



NX7002BKMB

60 V, N-channel Trench MOSFET

3 December 2014

Product data sheet

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.

2. Features and benefits

- Logic-level compatible
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection > 2kV HBM

3. Applications

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

4. Quick reference data

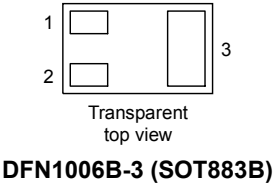
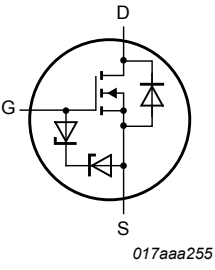
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		-	-	60	V
V_{GS}	gate-source voltage			-20	-	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	350	mA
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 200\text{ mA}; T_j = 25\text{ °C}$		-	2.2	2.8	Ω

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

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

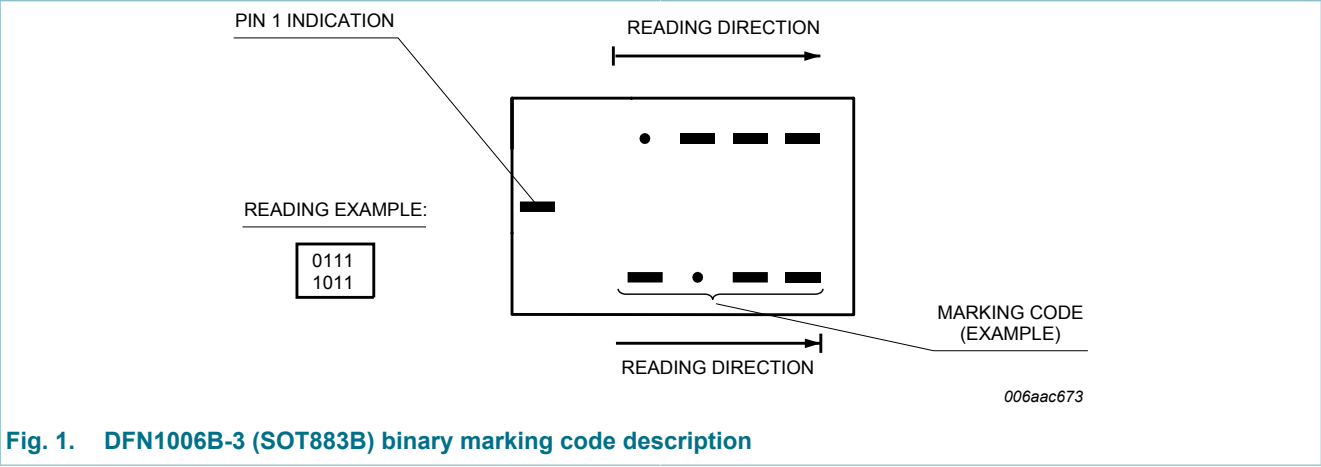
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NX7002BKMB	DFN1006B-3	DFN1006B-3: leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

7. Marking

Table 4. Marking codes

Type number	Marking code
NX7002BKMB	0101 0111



8. 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		-	60	V
V _{GS}	gate-source voltage			-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{amb} = 25 °C	[1]	-	350	mA
		V _{GS} = 10 V; T _{amb} = 100 °C	[1]	-	200	mA
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	0.9	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	350	mW
			[1]	-	680	mW
		T _{sp} = 25 °C		-	3100	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]	-	200	mA

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm².

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

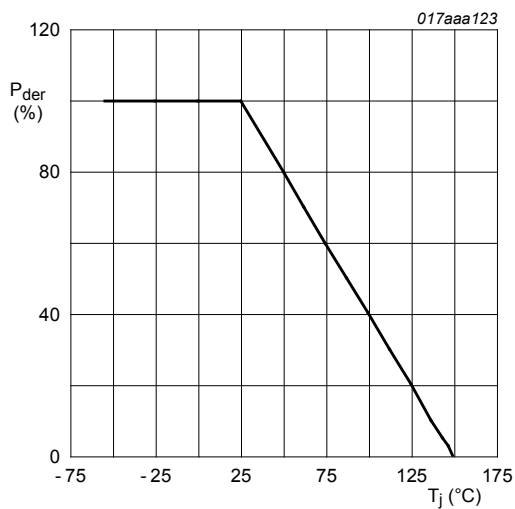


Fig. 2. Normalized total power dissipation as a function of junction temperature

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

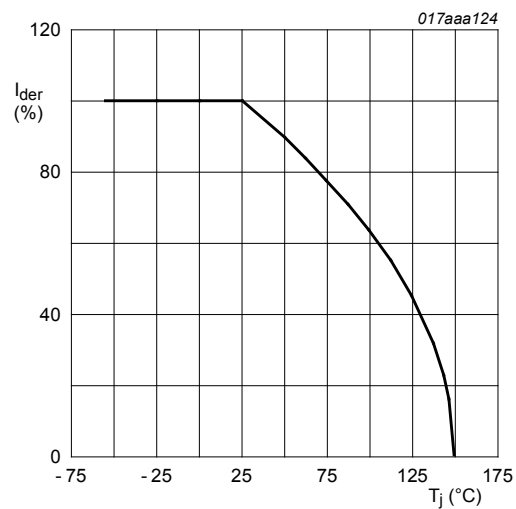


Fig. 3. Normalized continuous drain current as a function of junction temperature

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

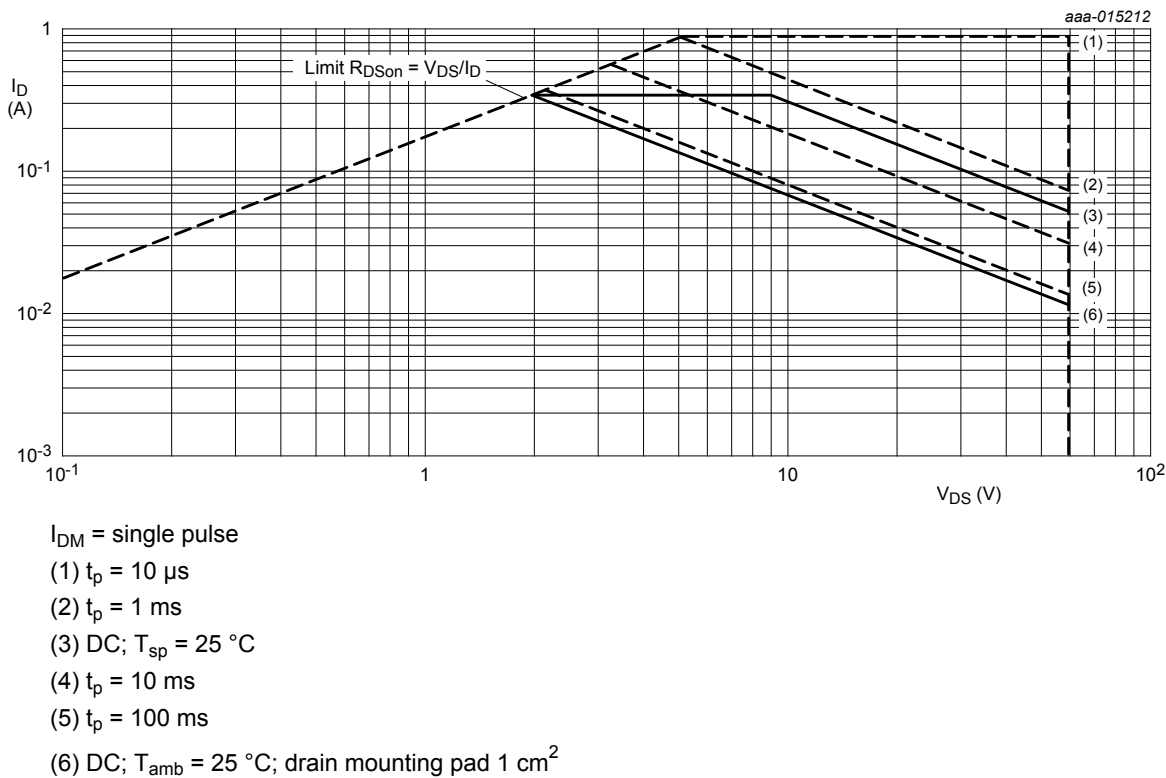


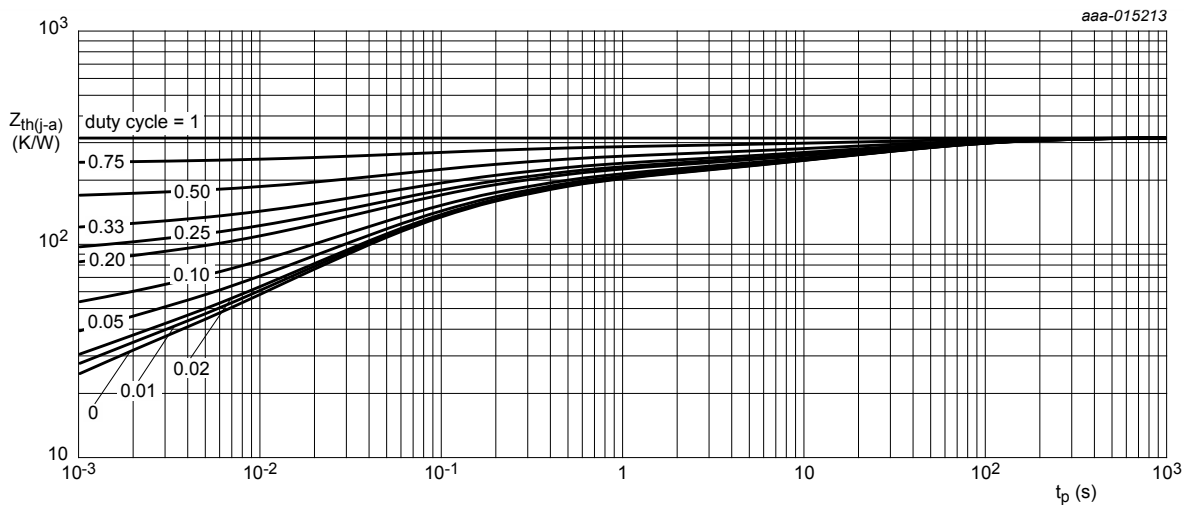
Fig. 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

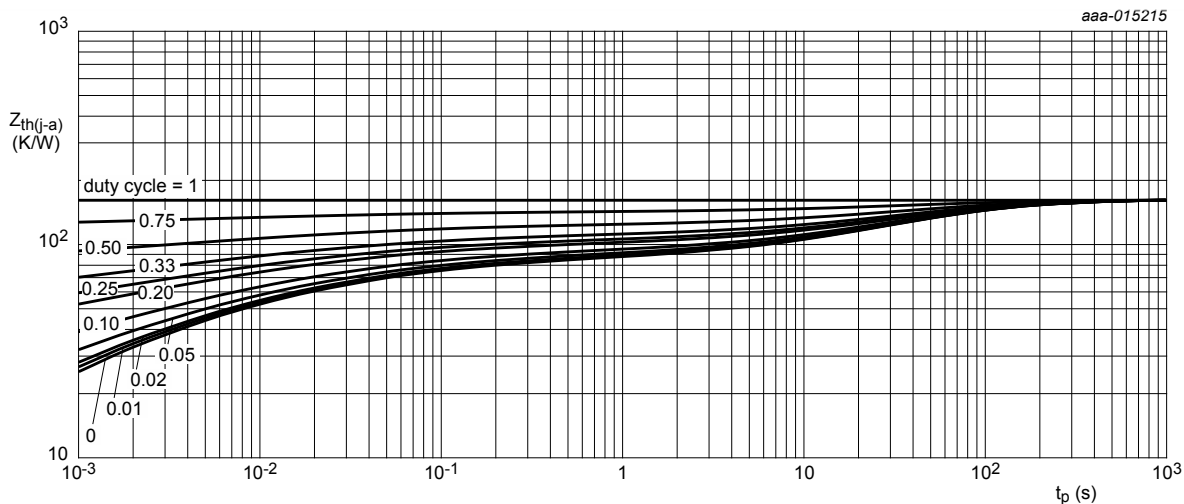
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	314	360	K/W
			[2]	-	159	180	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	35	40	K/W

[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 cm²

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 _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C		60	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS} ; T _j = 25 °C		1.1	1.6	2.1	V
I _{DSS}	drain leakage current	V _{DS} = 60 V; V _{GS} = 0 V; T _j = 25 °C		-	-	1	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	10	μA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-10	μA
		V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C		-	-	1	μA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-1	μA
		V _{GS} = 5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	0.3	μA
		V _{GS} = -5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-0.3	μA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 200 mA; T _j = 25 °C		-	2.2	2.8	Ω
		V _{GS} = 10 V; I _D = 100 mA; T _j = 150 °C		-	4.5	5.7	Ω
		V _{GS} = 5 V; I _D = 200 mA; T _j = 25 °C		-	2.5	3.2	Ω
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 200 mA; T _j = 25 °C		-	600	-	mS
R _G	internal gate resistance (AC)	f = 2.5 MHz		-	2.5	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = 30 V; I _D = 200 mA; V _{GS} = 10 V; T _j = 25 °C		-	1	-	nC
Q _{GS}	gate-source charge			-	0.12	-	nC
Q _{GD}	gate-drain charge			-	0.18	-	nC
C _{iss}	input capacitance	V _{DS} = 10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	23.6	-	pF
C _{oss}	output capacitance			-	4.6	-	pF
C _{rss}	reverse transfer capacitance			-	3	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; I _D = 200 mA; V _{GS} = 10 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	4.7	-	ns
t _r	rise time			-	4.3	-	ns
t _{d(off)}	turn-off delay time			-	6.9	-	ns
t _f	fall time			-	2.9	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 200 mA; V _{GS} = 0 V; T _j = 25 °C		-	0.87	1.2	V

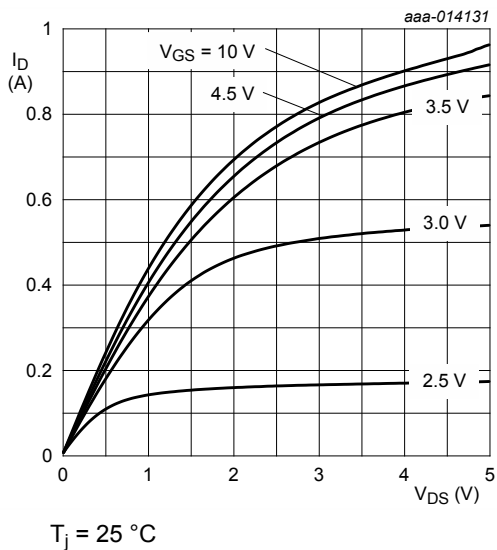


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

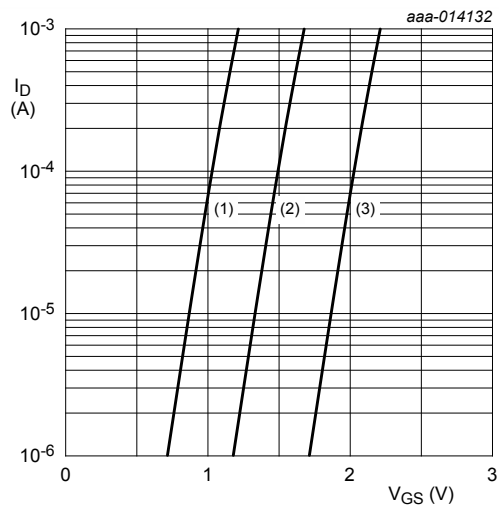


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

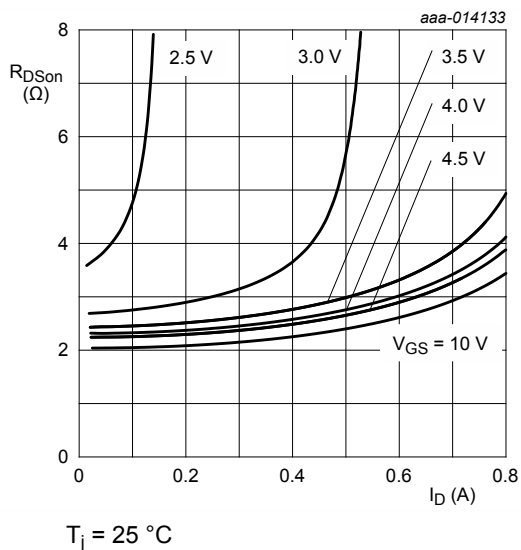


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

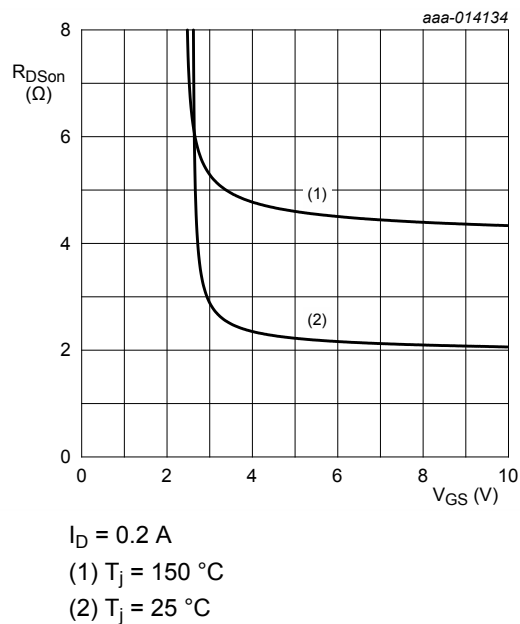
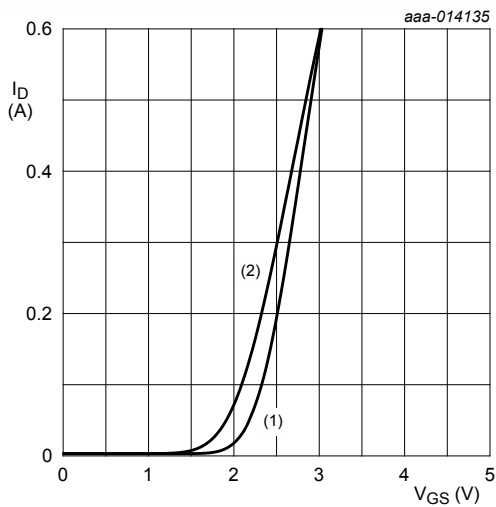


Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

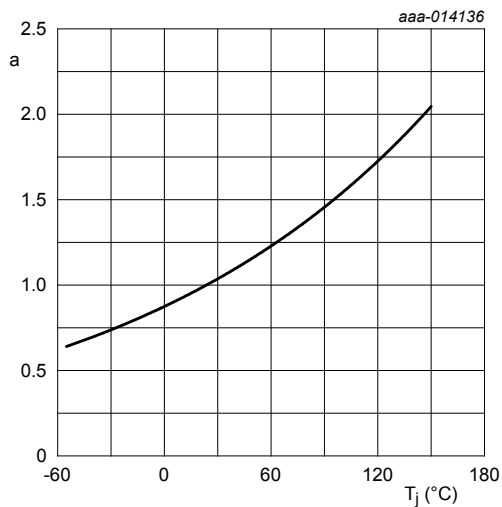
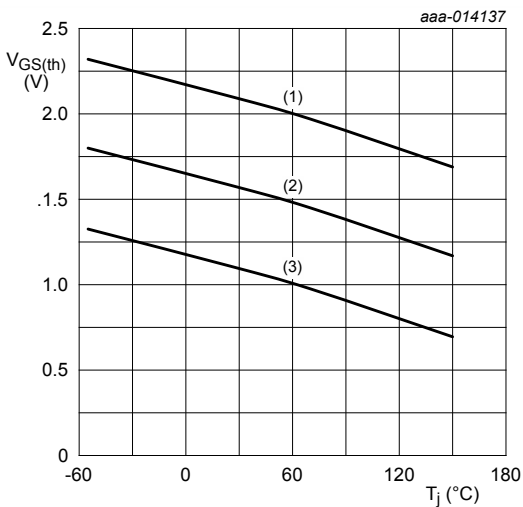


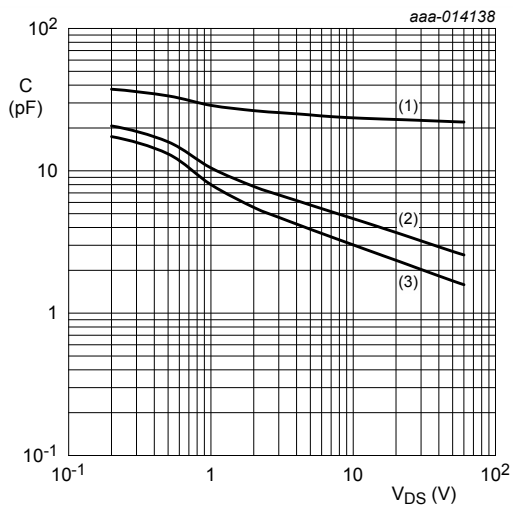
Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



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

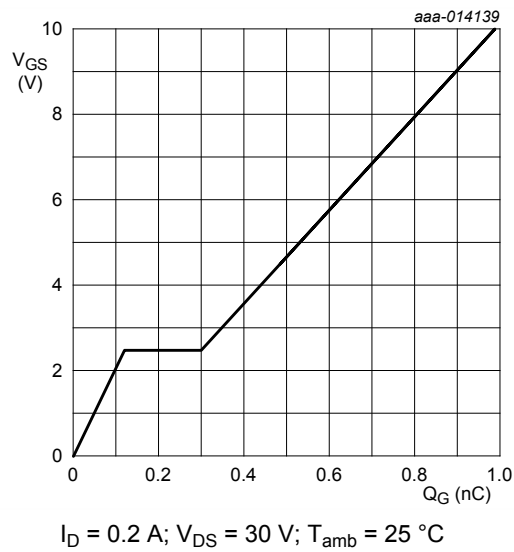


Fig. 15. Gate-source voltage as a function of gate charge; typical values

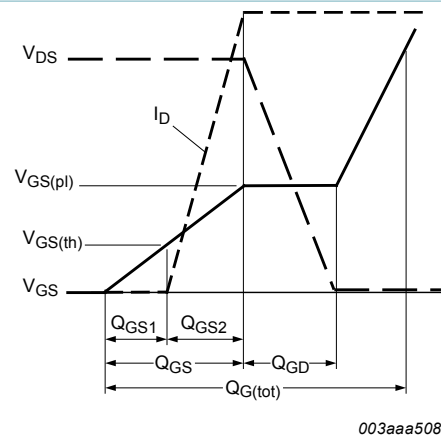
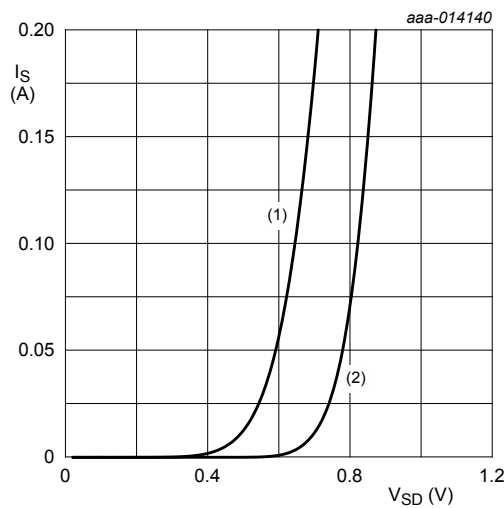


Fig. 16. MOSFET transistor: Gate charge waveform definitions



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

11. Test information

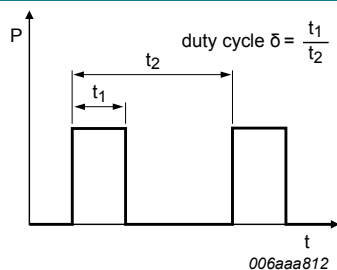


Fig. 18. Duty cycle definition

12. Package outline

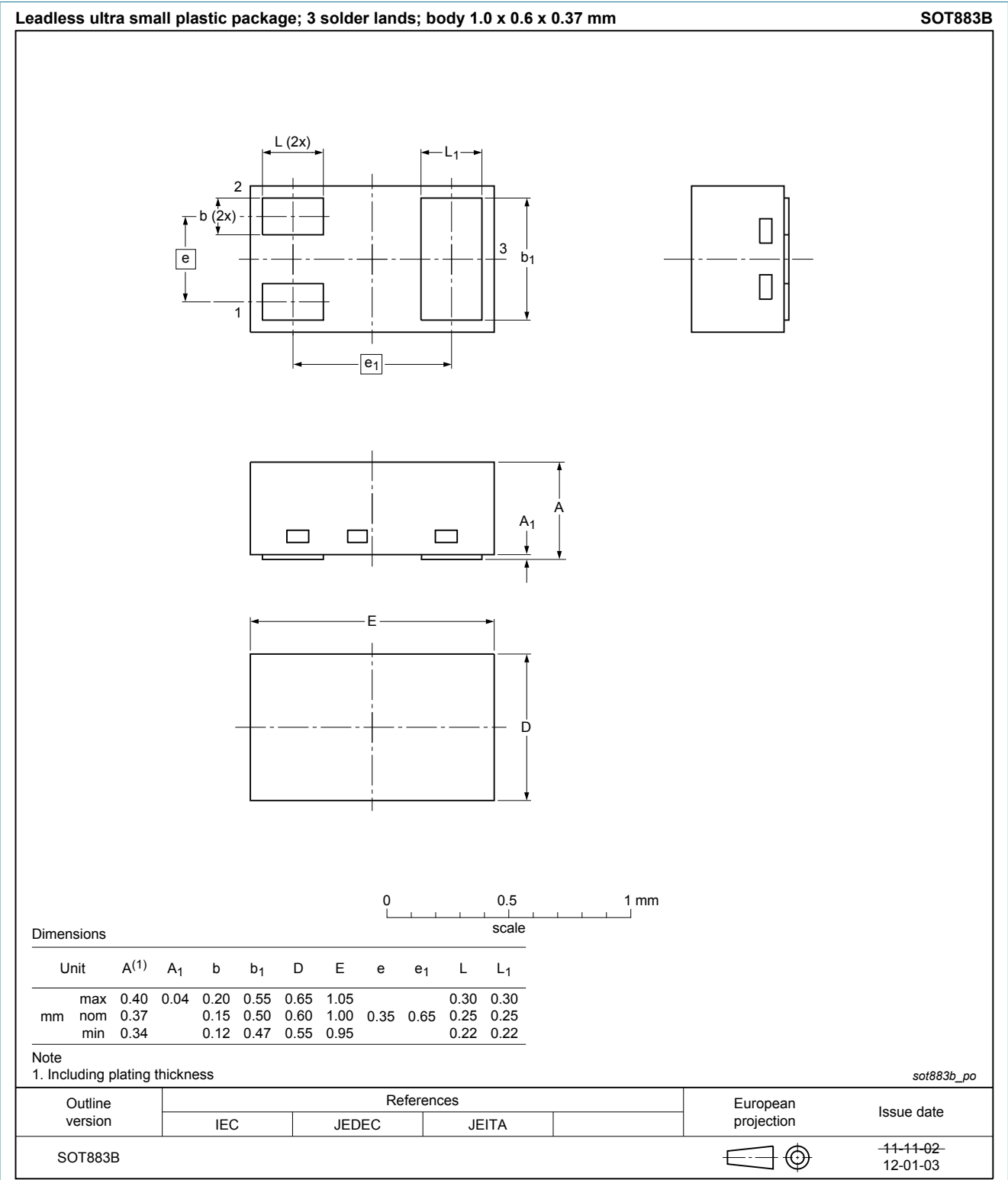


Fig. 19. Package outline DFN1006B-3 (SOT883B)

13. Soldering

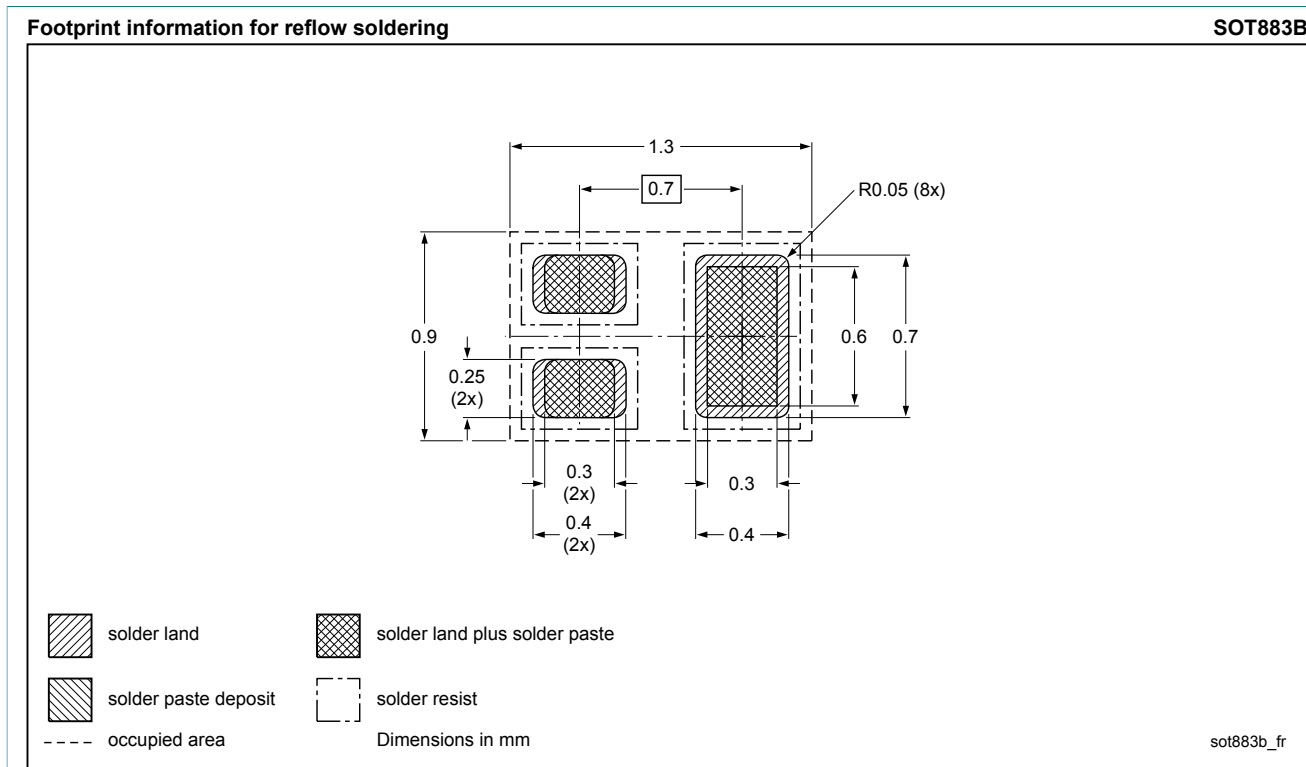


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
NX7002BKMB v.2	20141203	Product data sheet	-	NX7002BKMB v.1
Modification:	Figure 3 updated			
NX7002BKMB v.1	20141001	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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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 10

12 Package outline 11

13 Soldering 12

14 Revision history 13

15 Legal information 14

15.1 Data sheet status 14

15.2 Definitions 14

15.3 Disclaimers 14

15.4 Trademarks 15

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