



# BSS84AKMB

50 V, single P-channel Trench MOSFET

Rev. 1 — 6 June 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

- Logic-level compatible
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection up to 1 kV
- Ultra thin package profile with 0.37 mm height

### 1.3 Applications

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

### 1.4 Quick reference data

Table 1. Quick reference data

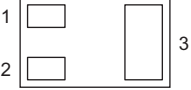
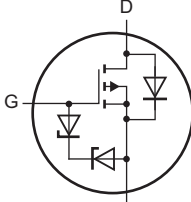
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	-50	V
$V_{GS}$	gate-source voltage		-20	-	20	V
$I_D$	drain current	$V_{GS} = -10\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-230	mA
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -10\text{ V}; I_D = -100\text{ mA}; T_j = 25\text{ °C}$	-	4.5	7.5	$\Omega$

[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	 <p>Transparent top view</p> <p><b>SOT883B (DFN1006B-3)</b></p>	 <p>017aaa259</p>
2	S	source		
3	D	drain		

## 3. Ordering information

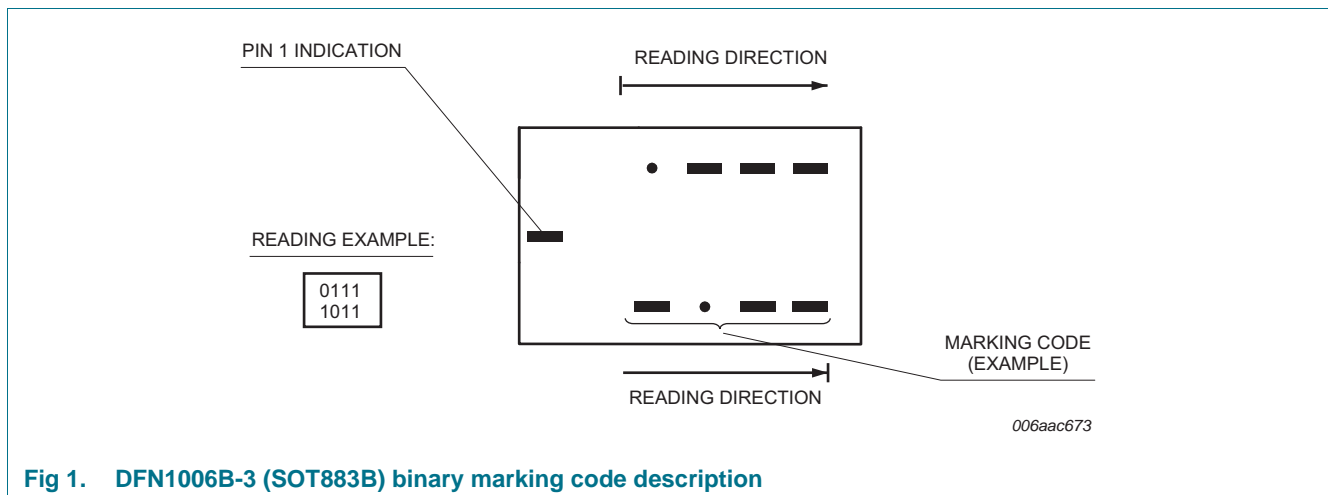
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSS84AKMB	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
BSS84AKMB	0000 0010



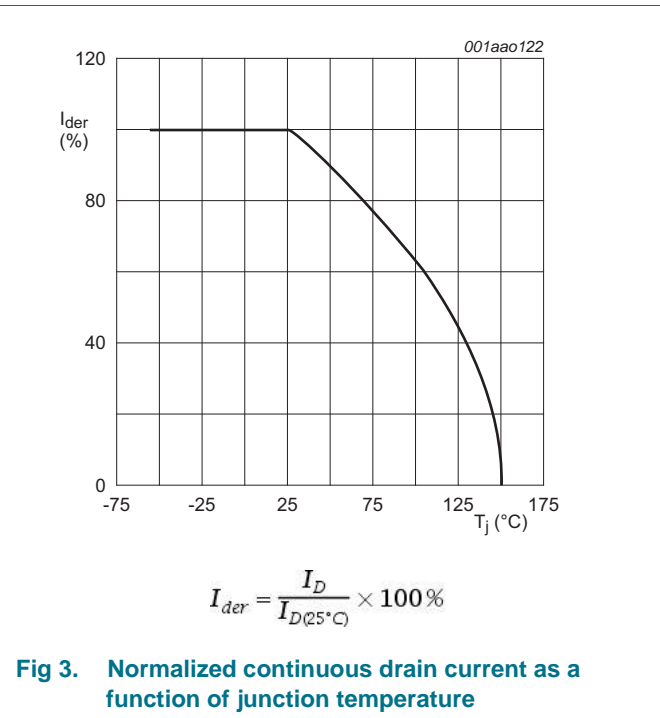
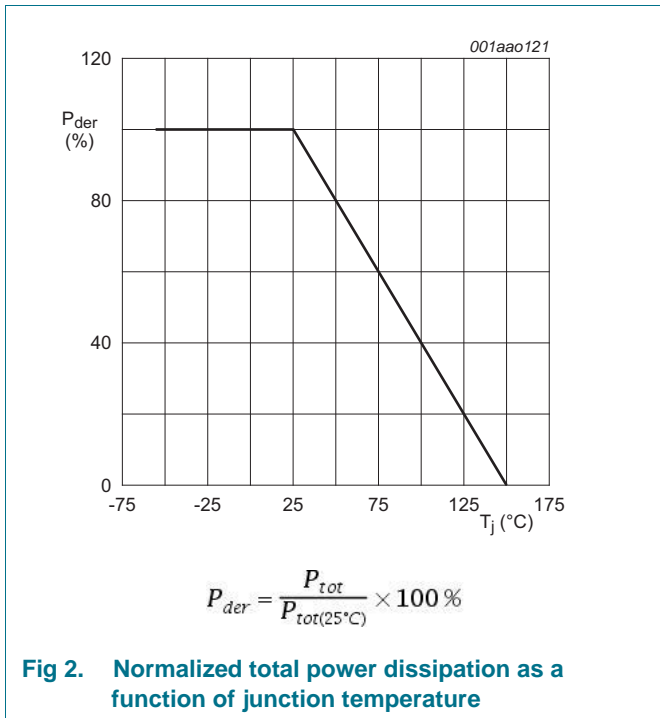
## 5. Limiting values

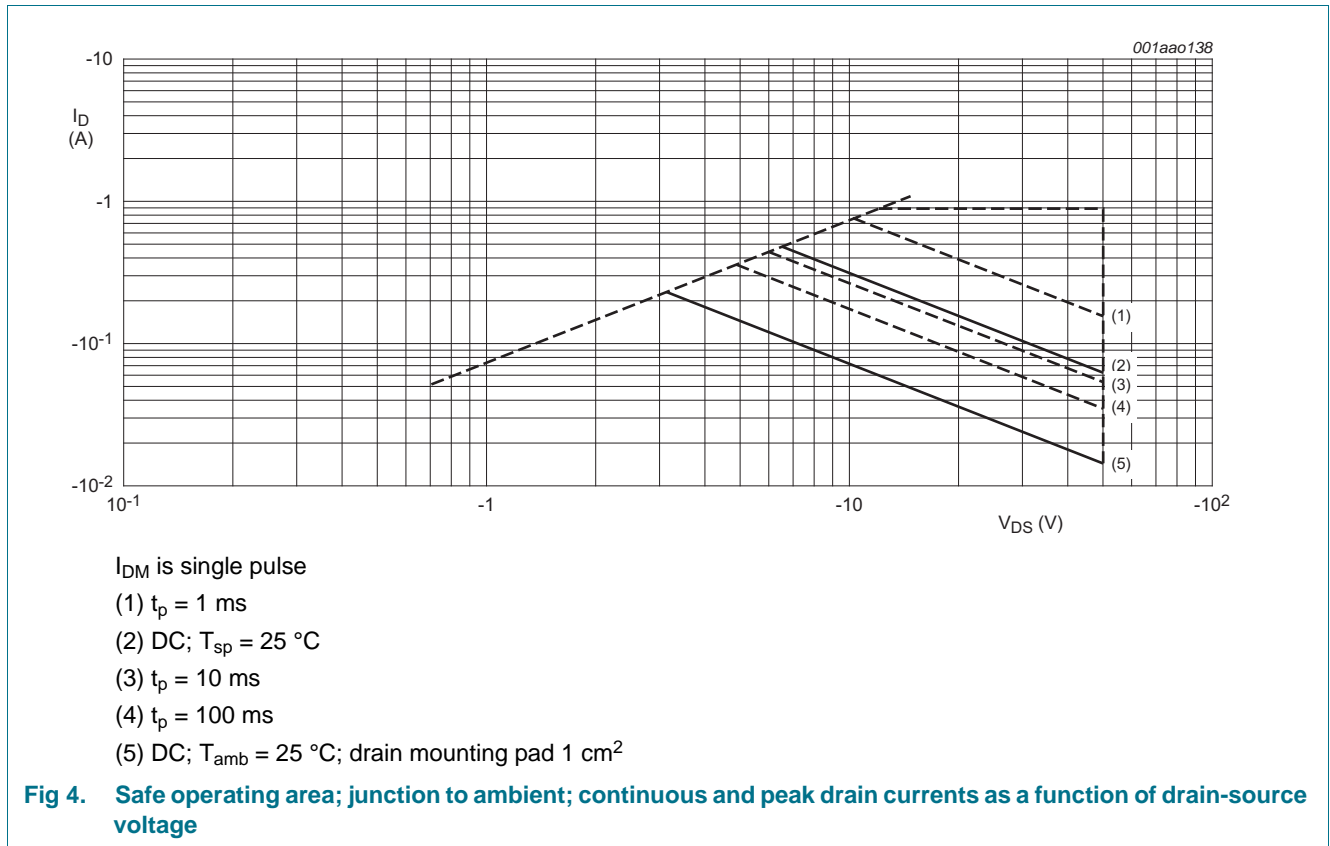
**Table 5. Limiting values**

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	-	-50	V
V <sub>GS</sub>	gate-source voltage		-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = -10 V; T <sub>amb</sub> = 25 °C	[1]	-230	mA
		V <sub>GS</sub> = -10 V; T <sub>amb</sub> = 100 °C	[1]	-150	mA
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs	-	-0.9	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
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-230	mA
<b>ESD maximum rating</b>					
V <sub>ESD</sub>	electrostatic discharge voltage	HBM	[3]	1000	V

- [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.





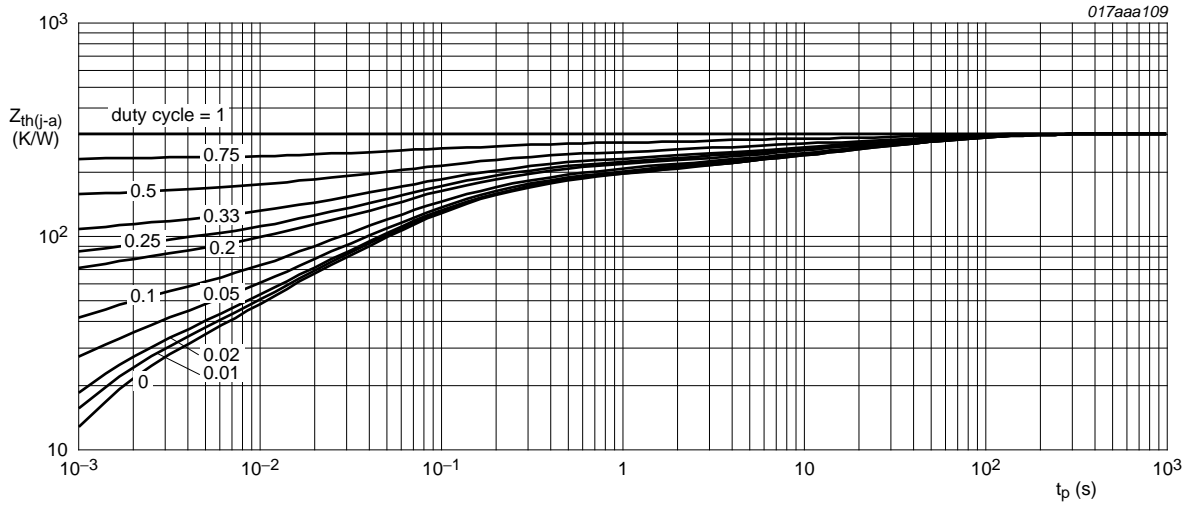
## 6. Thermal characteristics

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

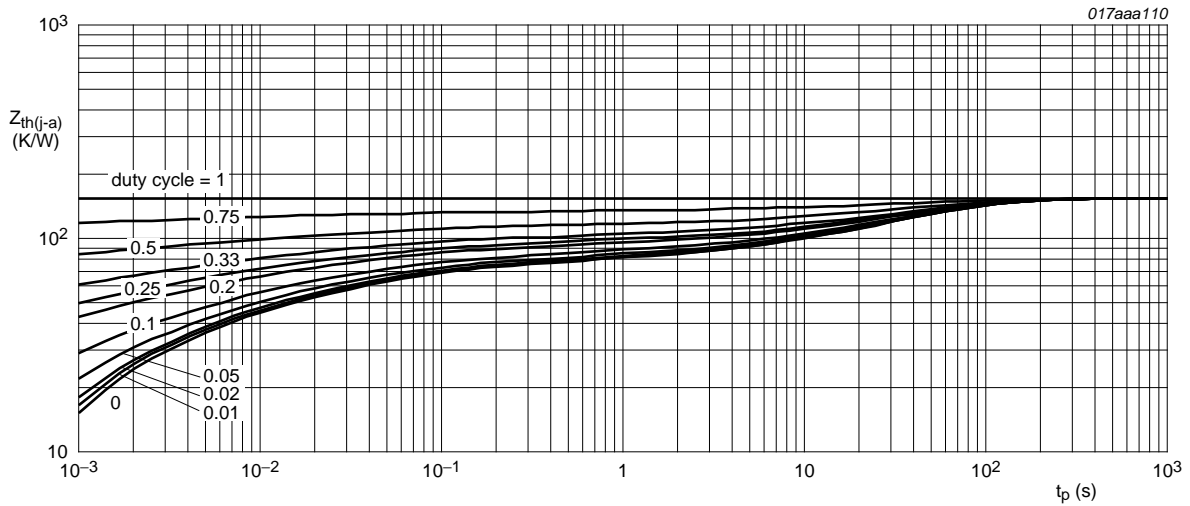
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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**



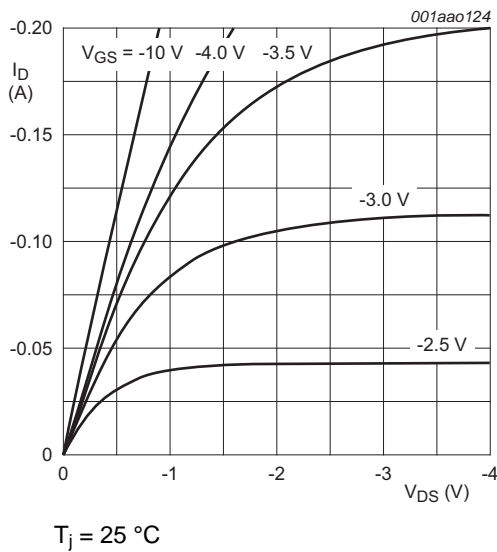
FR4 PCB, mounting pad for drain 1 cm<sup>2</sup>

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

## 7. Characteristics

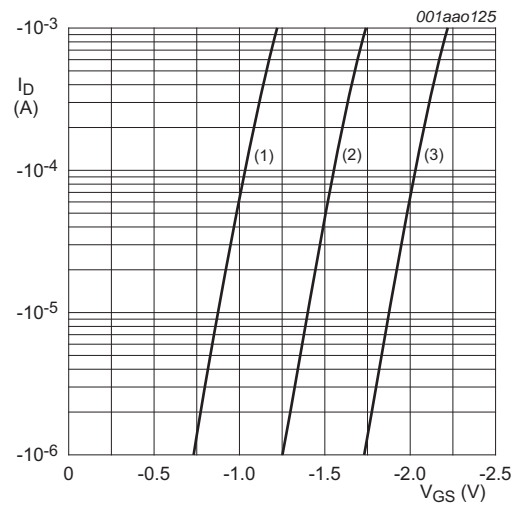
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-50	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ C$	-1.1	-1.6	-2.1	V
$I_{DSS}$	drain leakage current	$V_{DS} = -50 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-1	$\mu A$
		$V_{DS} = -50 V$ ; $V_{GS} = 0 V$ ; $T_j = 150 \text{ }^\circ C$	-	-	-2	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = -20 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-10	$\mu A$
		$V_{GS} = 20 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-10	$\mu A$
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -10 V$ ; $I_D = -100 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	4.5	7.5	$\Omega$
		$V_{GS} = -10 V$ ; $I_D = -100 \text{ mA}$ ; $T_j = 150 \text{ }^\circ C$	-	8	13.5	$\Omega$
		$V_{GS} = -5 V$ ; $I_D = -100 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	5.7	8.5	$\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -10 V$ ; $I_D = -100 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	150	-	mS
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -25 V$ ; $I_D = -200 \text{ mA}$ ; $V_{GS} = -5 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.26	0.35	nC
$Q_{GS}$	gate-source charge		-	0.12	-	nC
$Q_{GD}$	gate-drain charge	$V_{DS} = -10 V$ ; $I_D = -200 \text{ mA}$ ; $V_{GS} = -5 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.09	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -25 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	24	36	pF
$C_{oss}$	output capacitance		-	4.5	-	pF
$C_{rss}$	reverse transfer capacitance		-	1.3	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -30 V$ ; $R_L = 250 \Omega$ ; $V_{GS} = -10 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$	-	13	26	ns
$t_r$	rise time		-	11	-	ns
$t_{d(off)}$	turn-off delay time		-	48	96	ns
$t_f$	fall time		-	25	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -115 \text{ mA}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-0.48	-0.85	-1.2	V



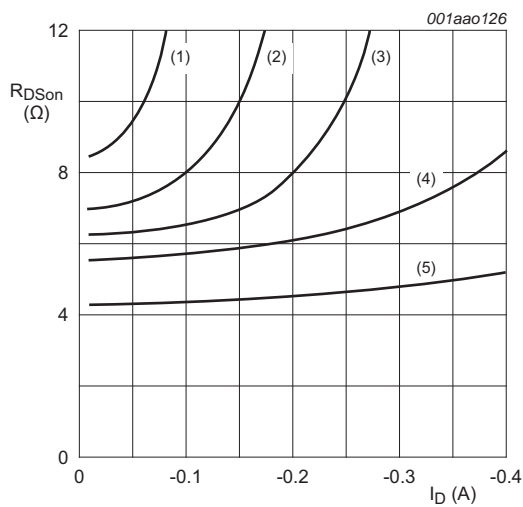
$T_j = 25\text{ }^\circ\text{C}$

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



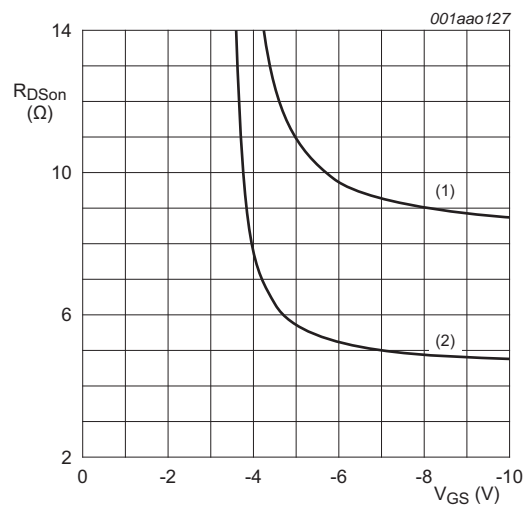
$T_j = 25\text{ }^\circ\text{C}; V_{DS} = -5\text{ V}$   
 (1) minimum values  
 (2) typical values  
 (3) maximum values

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



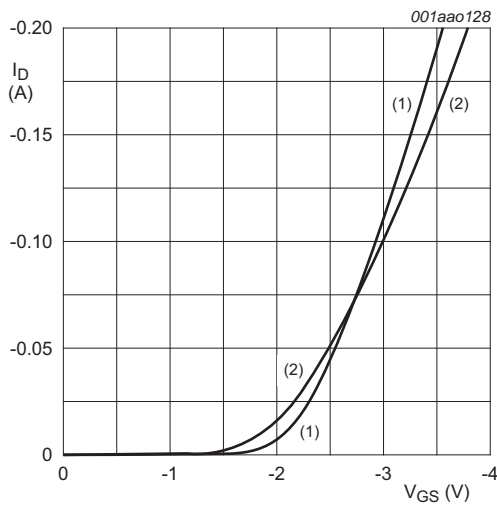
$T_j = 25\text{ }^\circ\text{C}$   
 (1)  $V_{GS} = -3.0\text{ V}$   
 (2)  $V_{GS} = -3.5\text{ V}$   
 (3)  $V_{GS} = -4.0\text{ V}$   
 (4)  $V_{GS} = -5.0\text{ V}$   
 (5)  $V_{GS} = -10.0\text{ V}$

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



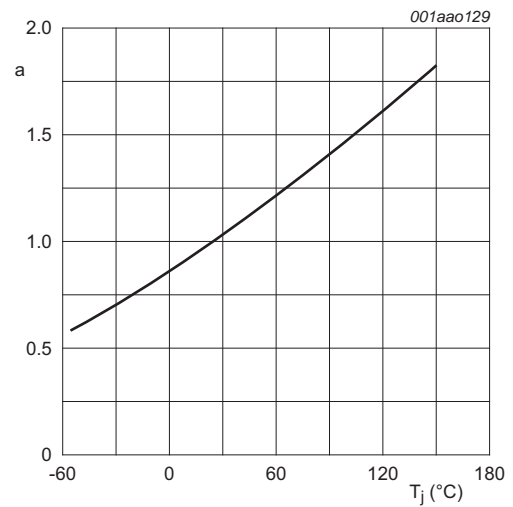
$I_D = -200\text{ mA}$   
 (1)  $T_j = 150\text{ }^\circ\text{C}$   
 (2)  $T_j = 25\text{ }^\circ\text{C}$

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



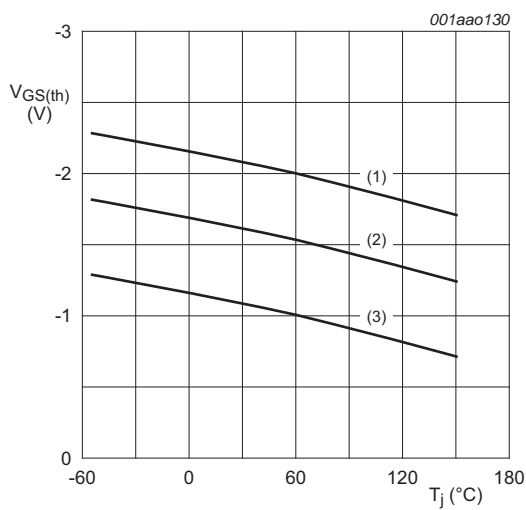
$V_{DS} > I_D \times R_{DSon}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

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



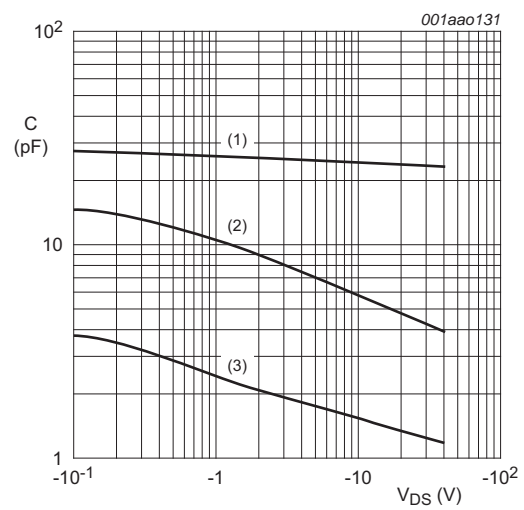
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ C)}}$$

**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

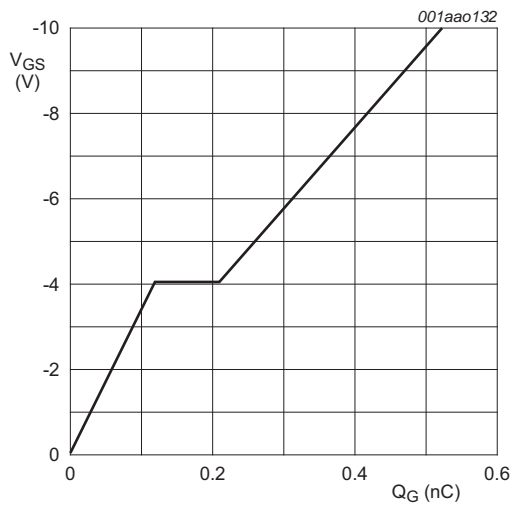
**Fig 13. Gate-source threshold voltage as a function of junction temperature**



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

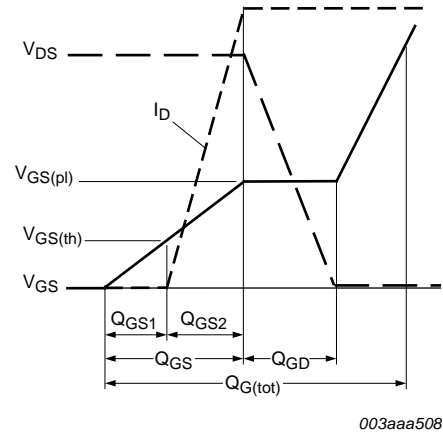
**Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**



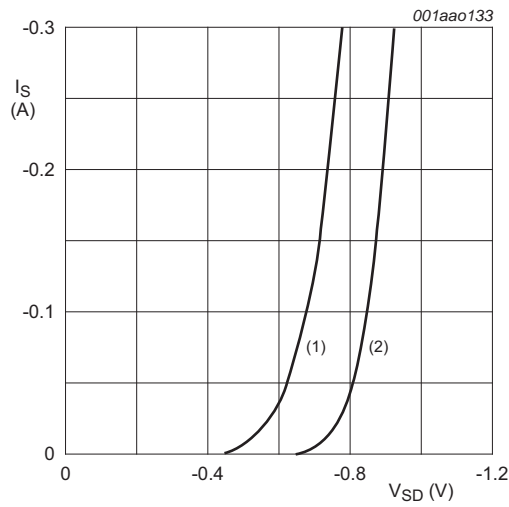


$I_D = -0.2 \text{ A}; V_{DS} = -25 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

**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

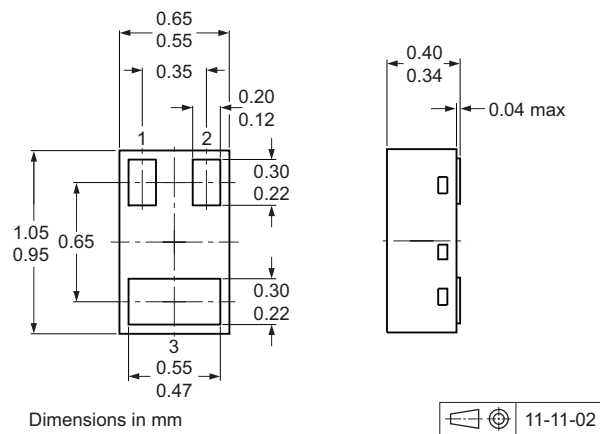
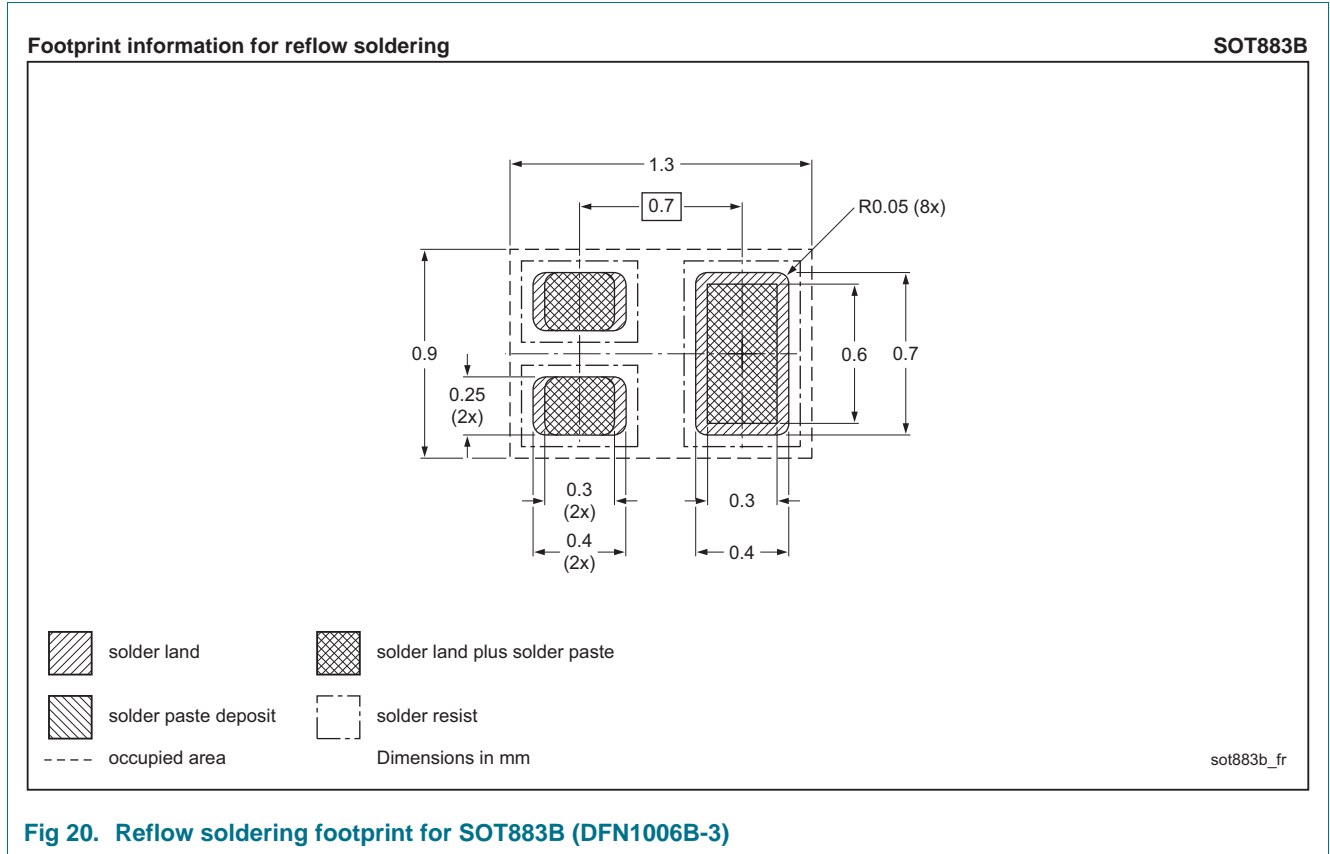


Fig 19. Package outline SOT883B (DFN1006B-3)

## 10. Soldering



## 11. Revision history

**Table 8.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BSS84AKMB v.1	20120606	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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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