



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





# STS6NF20V

N-channel 20 V, 0.030  $\Omega$  typ., 6 A 2.7 V drive STripFET™ II  
Power MOSFET in a SO-8 package

Datasheet — production data

## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS6NF20V	20 V	< 0.040 $\Omega$ (@4.5 V)	6 A
		< 0.045 $\Omega$ (@2.7 V)	

- Ultra low threshold gate drive (2.5 V)
- Standard outline for easy automated surface mount assembly

## Applications

- Switching application

## Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

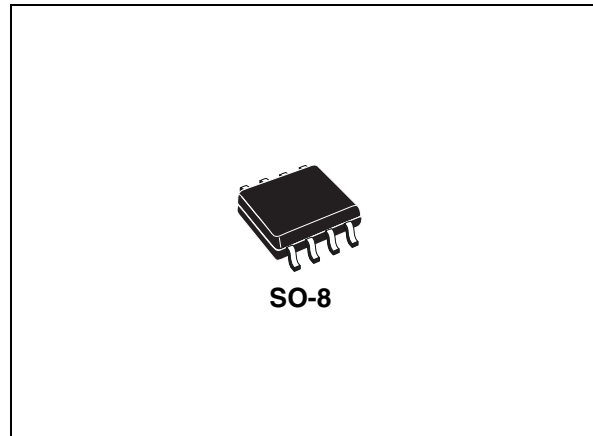


Figure 1. Schematic diagram

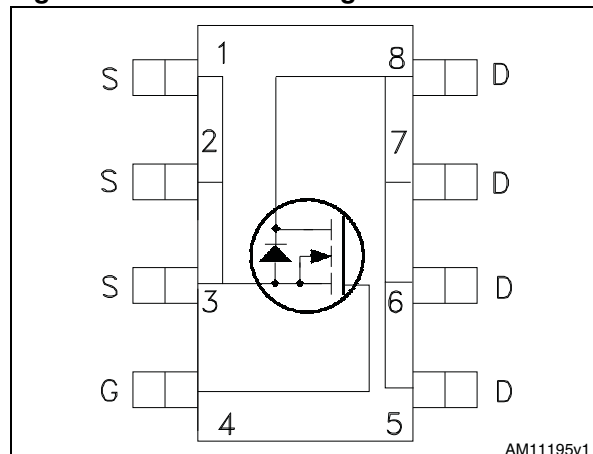


Table 1. Device summary

Order code	Marking	Package	Packaging
STS6NF20V	S6NF20V	SO-8	Tape and reel

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Revision history</b> .....	<b>11</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	20	V
$V_{GS}$	Gate- source voltage	$\pm 12$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	6	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	3.8	A
$I_{DM}^{(1)}$	Drain current (pulsed)	24	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	2.5	W
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-amb}$	Thermal resistance junction-ambient max	50	$^\circ\text{C/W}$

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified)

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	20			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 20\ \text{V}$ $V_{DS} = 20\ \text{V}$ , $T_C = 125\text{ °C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 12\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	0.6			V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 4.5\ \text{V}$ , $I_D = 3\ \text{A}$		0.030	0.040	$\Omega$
		$V_{GS} = 2.7\ \text{V}$ , $I_D = 3\ \text{A}$		0.037	0.045	$\Omega$
		$V_{GS} = 1.95\ \text{V}$ , $I_D = 0.9\ \text{A}$			0.09	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward transconductance		6.5	10	15	S
$C_{iss}$	Input capacitance	$V_{DS} = 15\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{GS} = 0$	320	460	640	pF
$C_{oss}$	Output capacitance					
$C_{rss}$	Reverse transfer capacitance					
$Q_g$	Total gate charge	$V_{DD} = 16\ \text{V}$ , $I_D = 6\ \text{A}$ ,	5.5	8.5	11.5	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5\ \text{V}$	1.2	1.8	2.5	nC
$Q_{gd}$	Gate-drain charge	(see <a href="#">Figure 13</a> )	1.6	2.4	3.4	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (see <a href="#">Figure 12</a> )		7	20	ns	
$t_r$	Rise time		-	33	45	ns	
$t_{d(off)}$	Turn-off-delay time				27	40	ns
$t_f$	Fall time				10	20	ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		6	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				24	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 6\text{ A}$ , $V_{GS} = 0$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 6\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 10\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ (see <a href="#">Figure 17</a> )	-	26		ns
$Q_{rr}$	Reverse recovery charge			13		nC
$I_{RRM}$	Reverse recovery current			1		A

1. Pulse width limited by safe operating area
2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

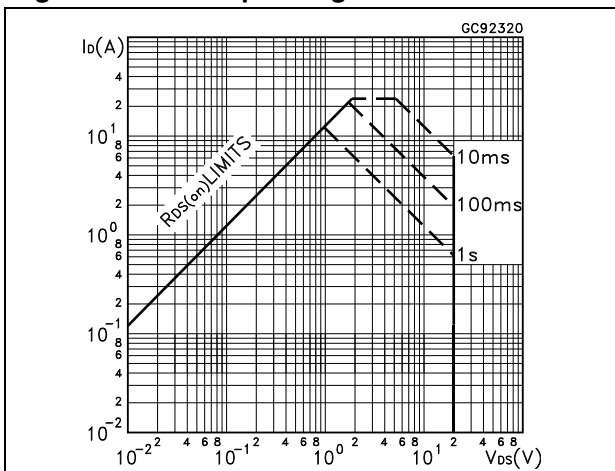


Figure 3. Thermal impedance

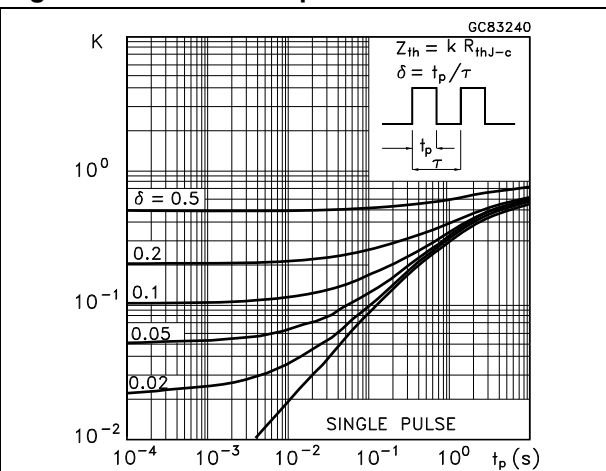


Figure 4. Output characteristics

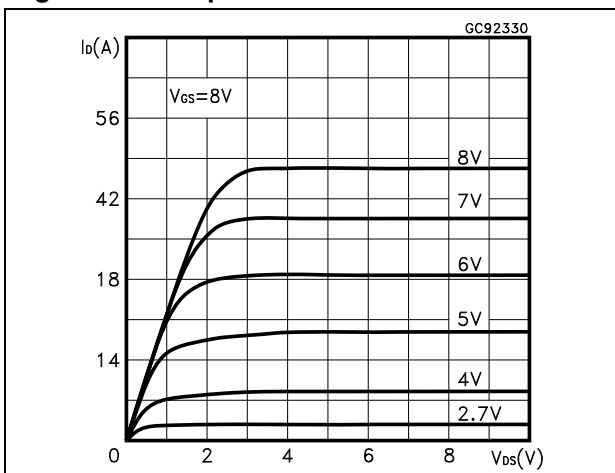


Figure 5. Transfer characteristics

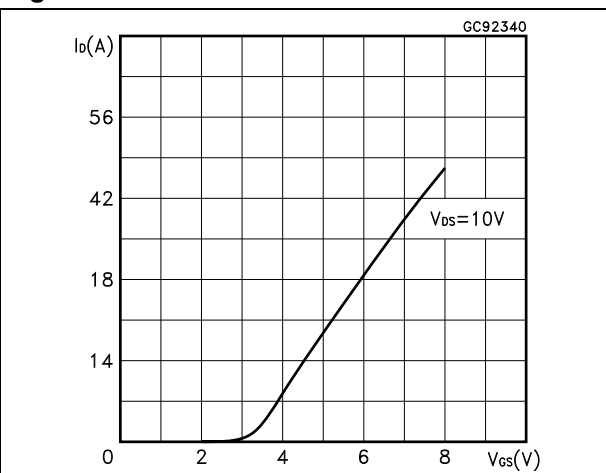


Figure 6. Source-drain diode forward characteristics

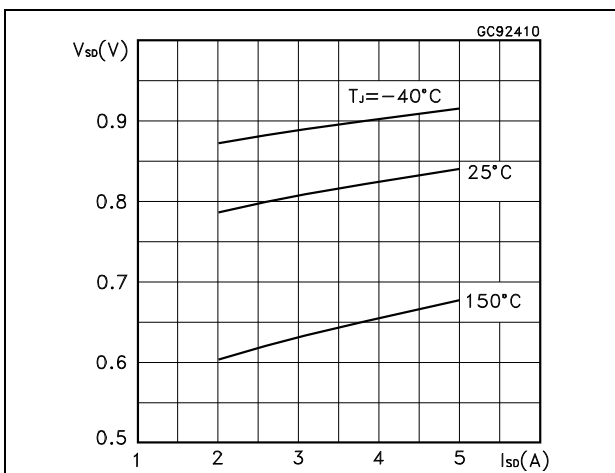


Figure 7. Static drain-source on-resistance

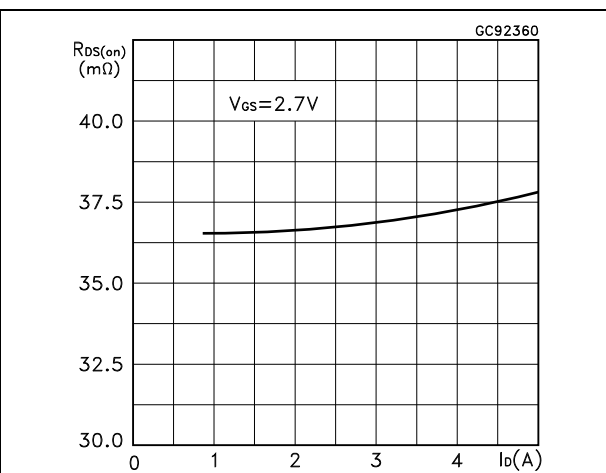


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

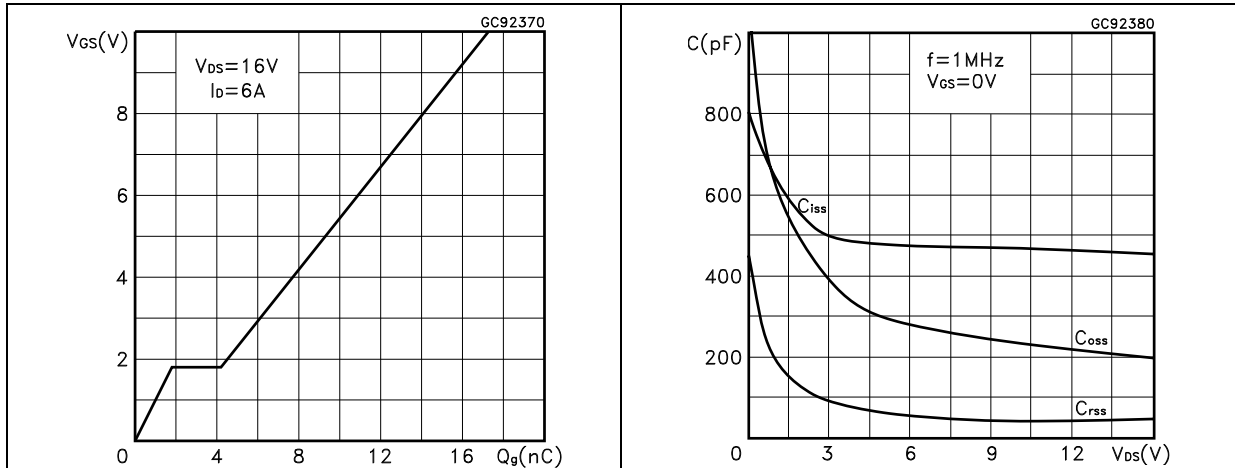
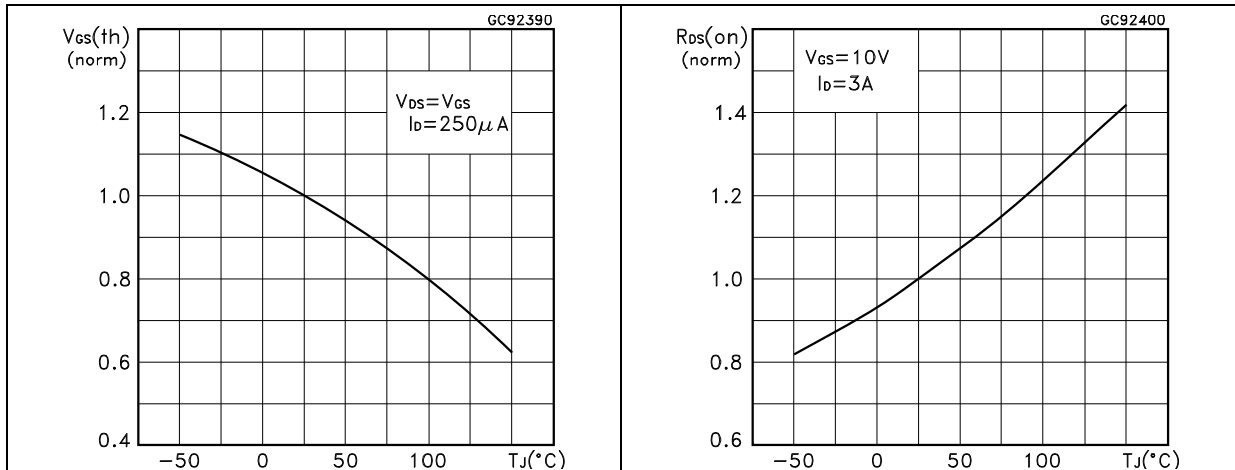


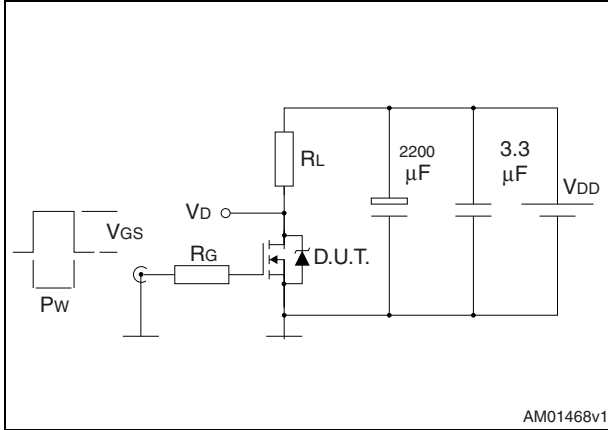
Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on-resistance vs temperature





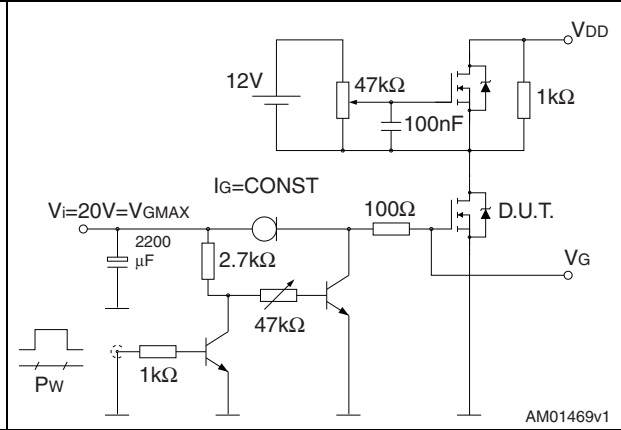
### 3 Test circuits

**Figure 12. Switching times test circuit for resistive load**



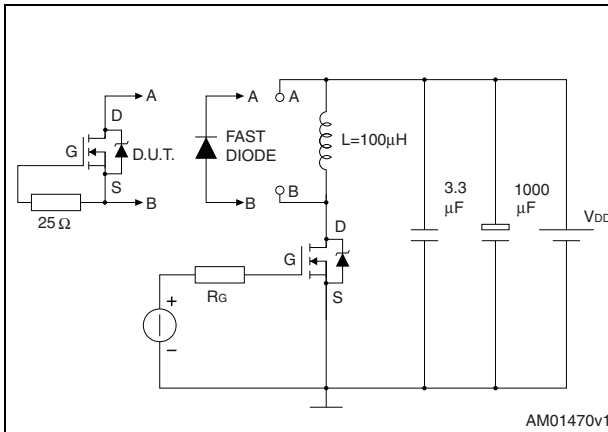
AM01468v1

**Figure 13. Gate charge test circuit**



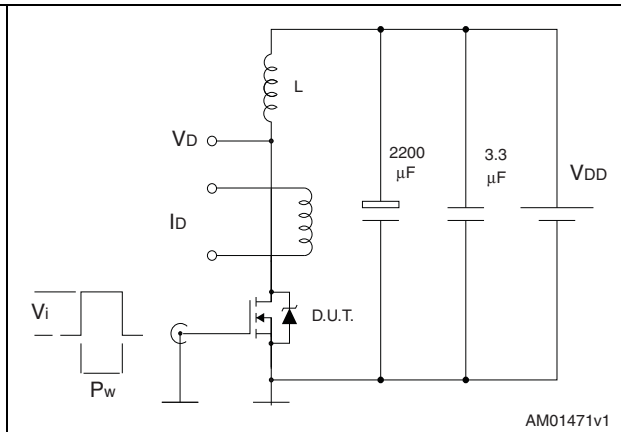
AM01469v1

**Figure 14. Test circuit for inductive load switching and diode recovery times**



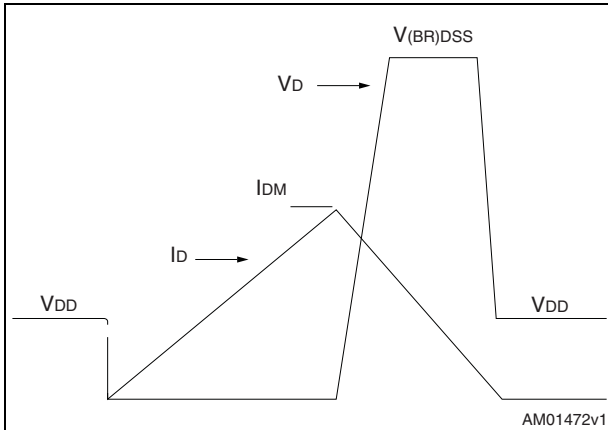
AM01470v1

**Figure 15. Unclamped inductive load test circuit**



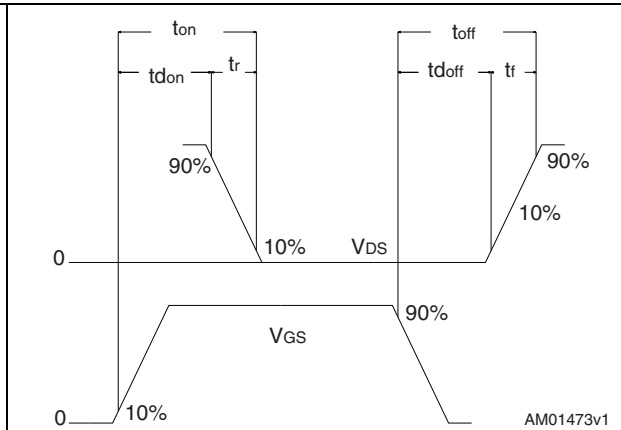
AM01471v1

**Figure 16. Unclamped inductive waveform**



AM01472v1

**Figure 17. Switching time waveform**



AM01473v1

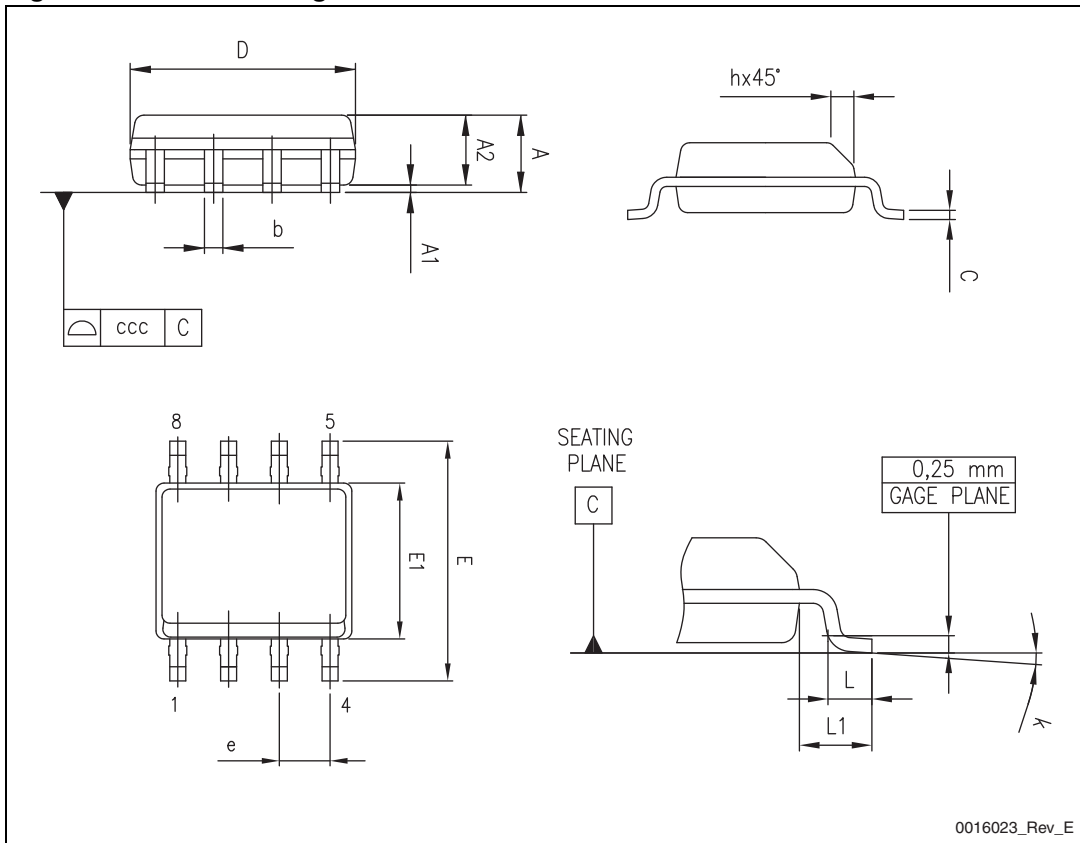
## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

**Table 8. SO-8 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.28		0.48
c	0.17		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
k	0°		8°
ccc			0.10

Figure 18. SO-8 drawing



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
07-Feb-2008	1	First release
18-Nov-2009	2	Added new $R_{DS(on)}$ value on <a href="#">Table 4: On /off states</a>
29-Nov-2012	3	Max values have been added in <a href="#">Table 5: Dynamic</a> and <a href="#">Table 6: Switching times</a> . <a href="#">Section 4: Package mechanical data</a> has been updated. Minor text changes.

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)