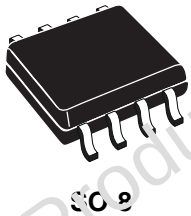
STS20N3LLH6

N-channel 30 V, 0.004 Ω, 20 A, SO-8 STripFET™ VI DeepGATE™ Power MOSFET

Features

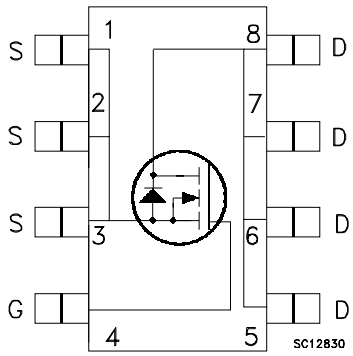
Type	V_{DSS}	$R_{DS(on)}$ max	I_D
STS20N3LLH6	30 V	0.0047 Ω	20 A

- $R_{DS(on)}$ * Q_g industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power losses
- Very low switching gate charge



SO-8

Figure 1. Internal schematic diagram



Application

- Switching applications

Description

This product utilizes the 6th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Obsolete Product(s) - Obsolete Product(s)

Table 1. Device summary

Order code	Marking	Package	Packaging
STS20N3LLH6	20G3L	SO-8	Tape and reel

Contents

1 Electrical ratings 3

2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 6

3 Test circuits 8

4 Package mechanical data 10

5 Revision history 12

Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{GS}(1)	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at T_C = 25 °C	20	A
I_D	Drain current (continuous) at T_C=100 °C	12.5	A
I_{DM}(2)	Drain current (pulsed)	80	A
P_{TOT}	Total dissipation at T_C = 25 °C	2.7	W
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 150	°C

1. Continuous mode
2. Pulse width limited by safe operating area

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj\text{-}amb}$ (1)	Thermal resistance junction-ambient	47	°C/W

1. When mounted on FR-4 board of 1 inch², 2oz Cu, t < 10 sec

Obsolete Product(s) - Obsolete Product(s)

2 Electrical characteristics

(T_{CASE} = 25 °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 µA, V_{GS}= 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating @125 °C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10 V, I_D= 10 A V_{GS}= 4.5 V, I_D= 10 A		0.004 0.0059	0.0047 0.0075	Ω Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25 V, f=1 MHz, V_{GS}=0	-	1690 290 176	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=15 V, I_D = 20 A V_{GS} =4.5 V *Figure 19*	-	17 8 6	-	nC nC nC
R_G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain	-	1.7	-	Ω

Obsolete Product(s) - Obsolete Product(s)

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD}=15 V, I_D= 10 A, R_G=4.7 Ω, V_{GS}=4.5 V *Figure 13*	-	9.5 30 37 12	-	ns ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		20	A
I_{SDM}(1)	Source-drain current (pulsed)		-		80	A
V_{SD}(2)	Forward on Voltage	I_{SD}= 20 A, V_{GS}=0	-		1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}= 20 A, di/dt = 100 A/µs, V_{DD}=20 V, Tj=150 °C *Figure 15*	-	14 16.8 1.4		ns nC A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 µs, duty cycle 1.5%

Obsolete Product(s) - Obsolete Product(s)

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

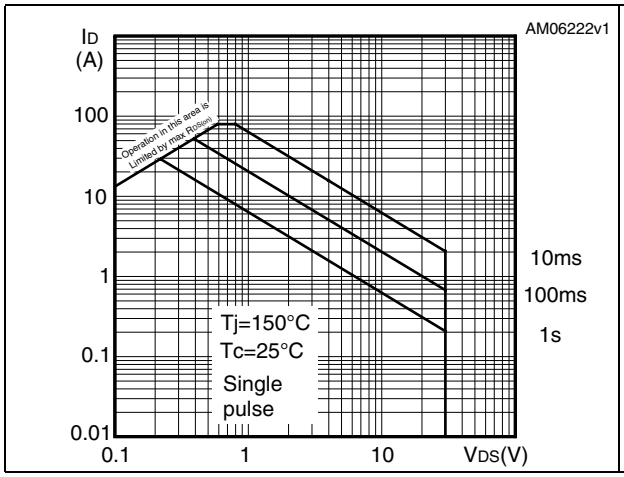


Figure 3. Thermal impedance

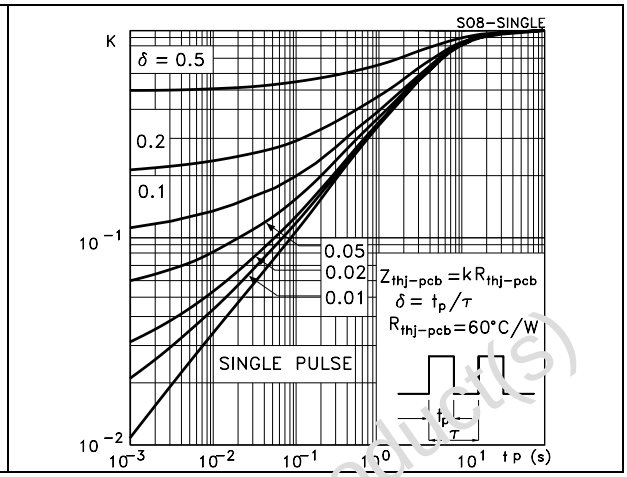


Figure 4. Output characteristics

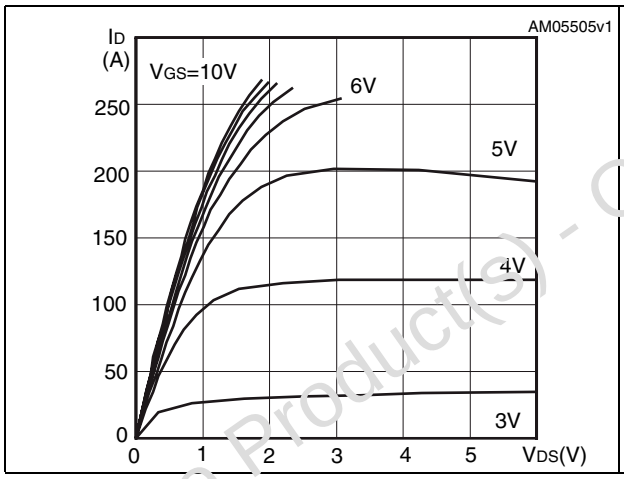


Figure 5. Transfer characteristics

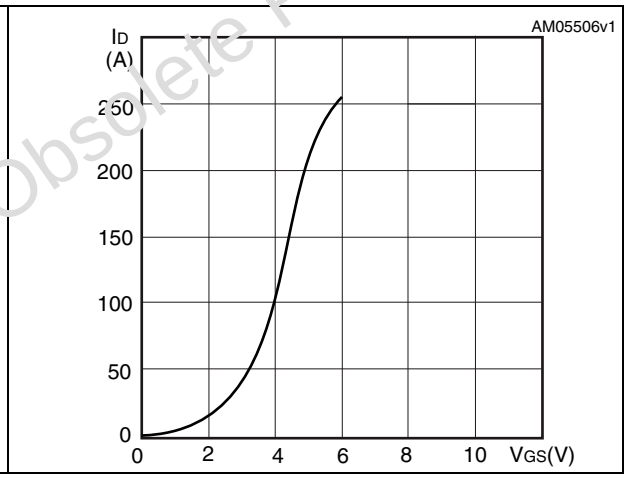


Figure 6. Normalized B_{VDSS} vs temperature

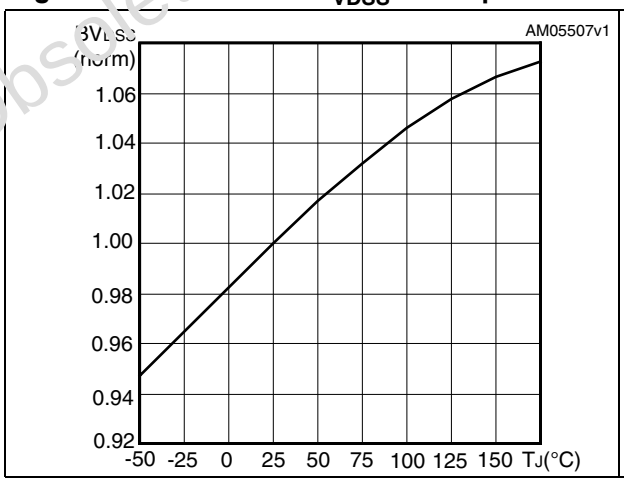
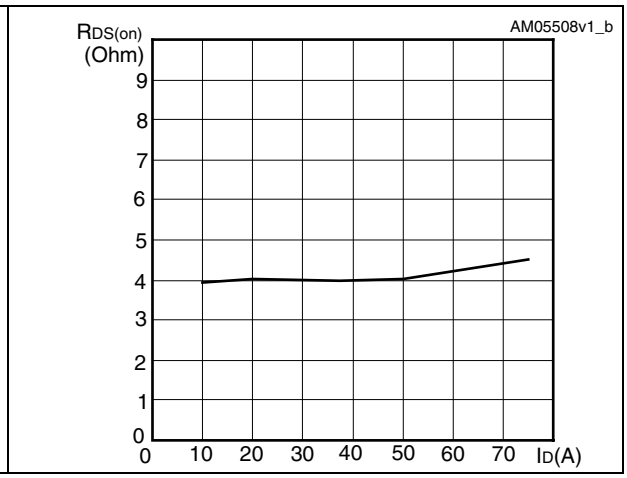


Figure 7. Static drain-source on resistance



Obsolete Product(s) - Obsolete Product(s)

Figure 8. Gate charge vs gate-source voltage

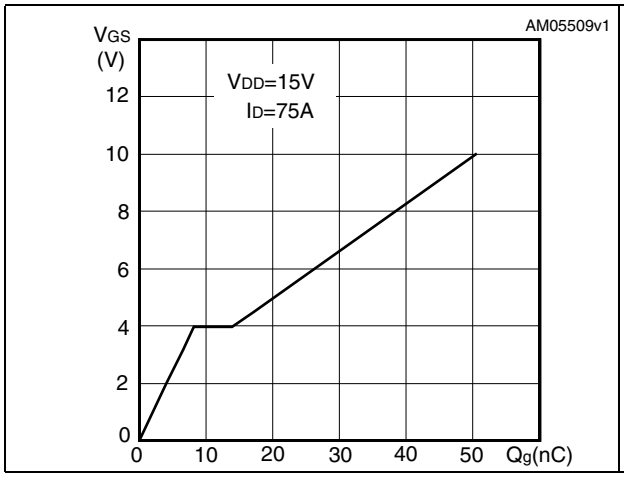


Figure 9. Capacitance variations

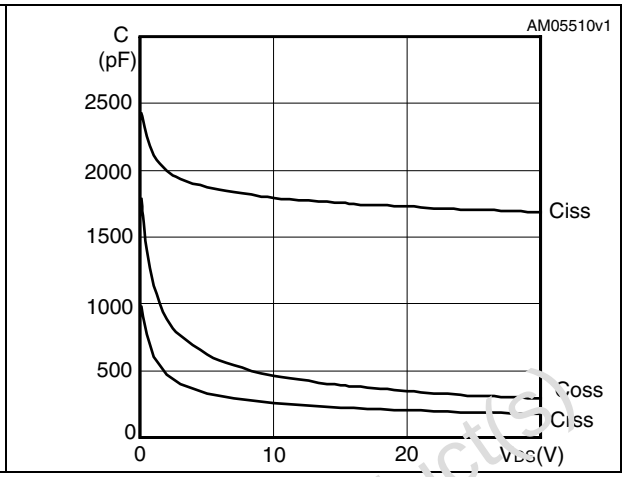


Figure 10. Normalized gate threshold voltage vs temperature

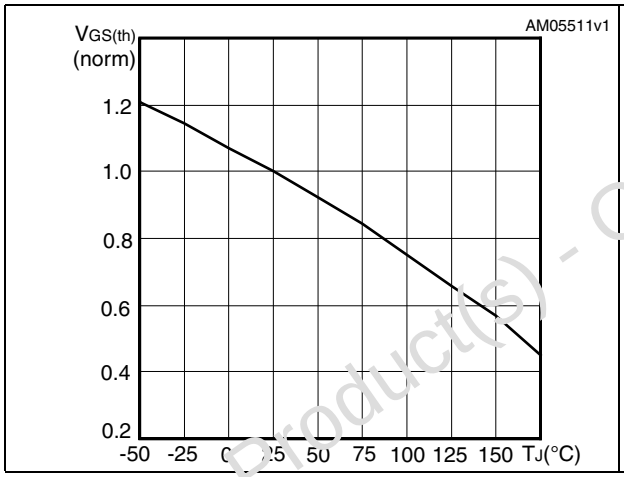


Figure 11. Normalized on resistance vs temperature

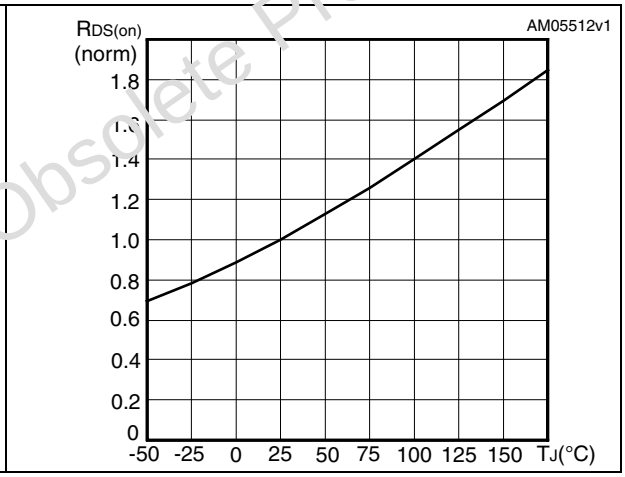
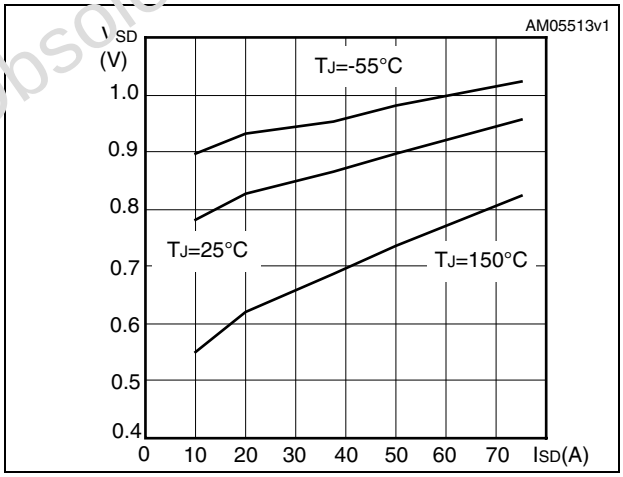


Figure 12. Source-drain diode forward characteristics



Obsolete Product(s) - Obsolete Product(s)

3 Test circuits

Figure 13. Switching times test circuit for resistive load

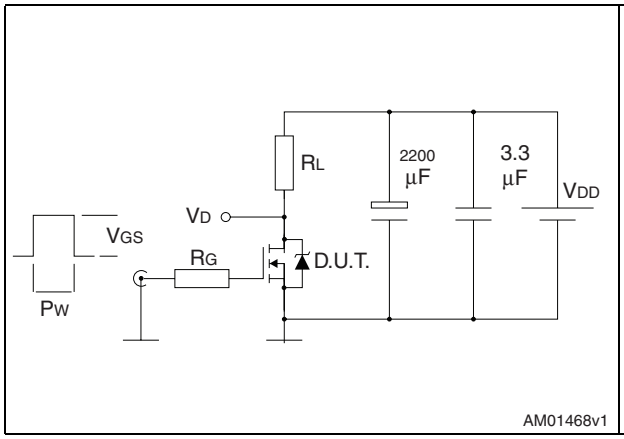


Figure 14. Gate charge test circuit

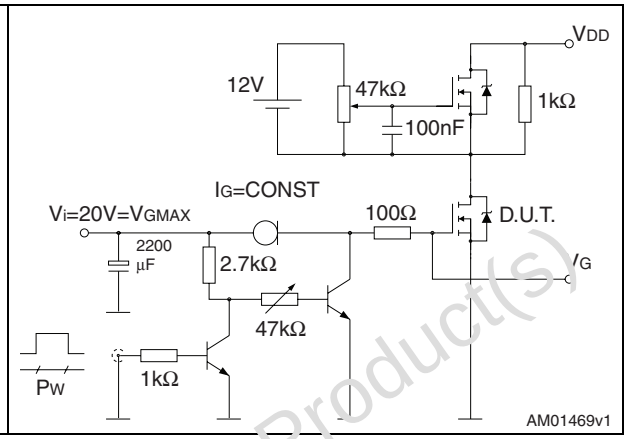


Figure 15. Test circuit for inductive load switching and diode recovery times

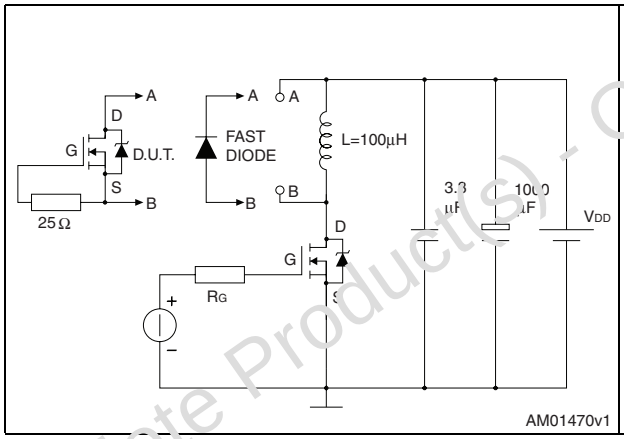


Figure 16. Unclamped inductive load test circuit

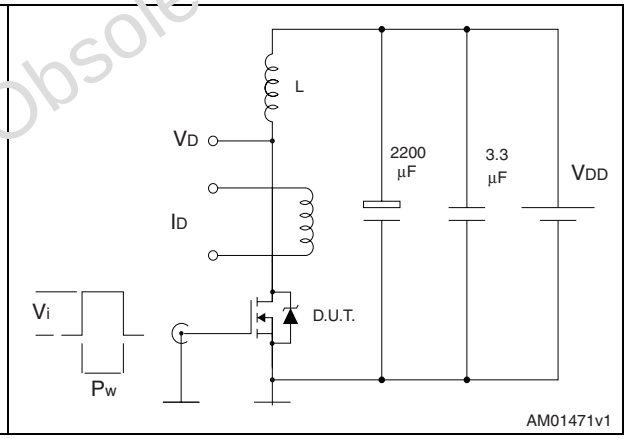


Figure 17. Unclamped inductive waveform

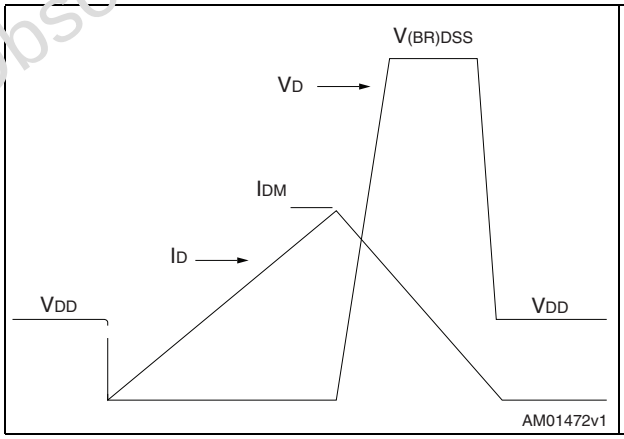
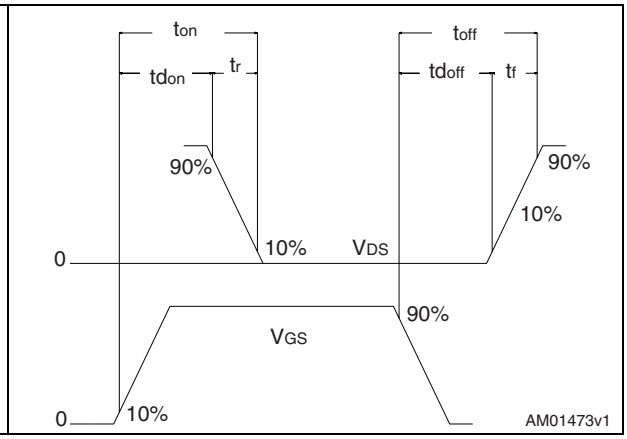
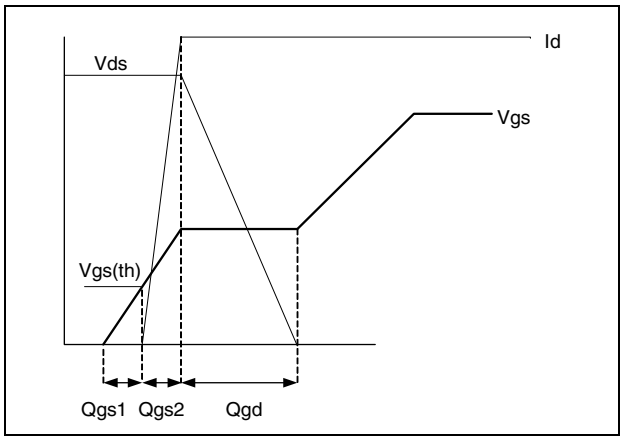


Figure 18. Switching time waveform



Obsolete Product(s) - Obsolete Product(s)

Figure 19. Gate charge waveform



Obsolete Product(s) - Obsolete Product(s)

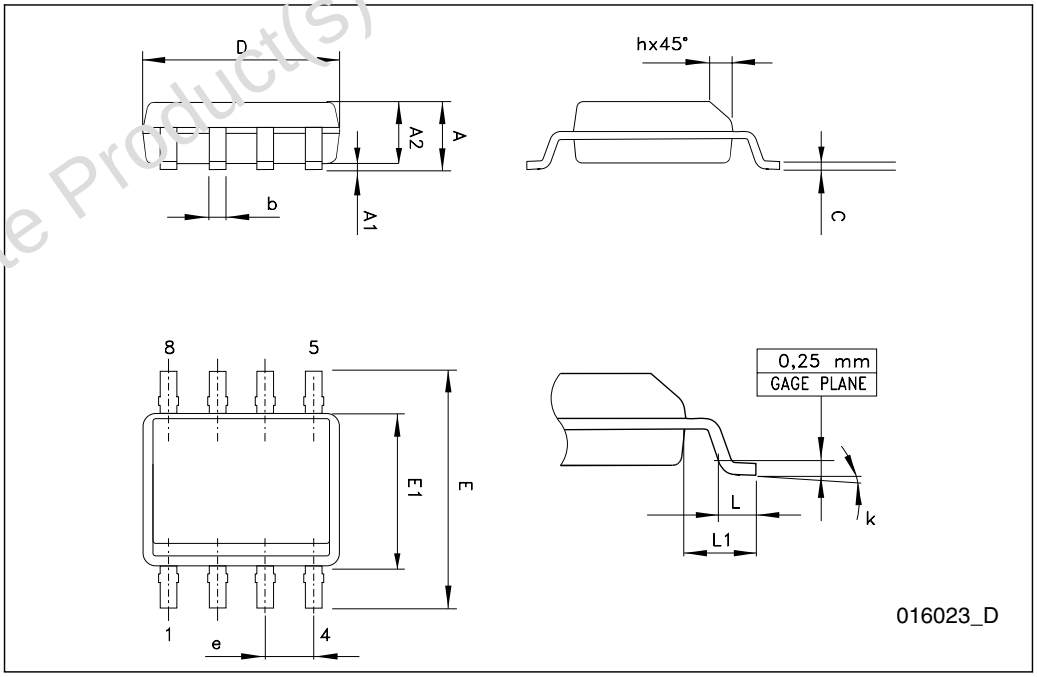
4 Package mechanical data

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. ECOPACK is an ST trademark.

Obsolete Product(s) - Obsolete Product(s)

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°



Obsolete Product(s) - Obsolete Product(s)

5 Revision history

Table 8. Document revision history

Date	Revision	Changes
23-Mar-2009	1	First release
17-Mar-2010	2	Document status promoted from preliminary data to datasheet.

Obsolete Product(s) - Obsolete Product(s)

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 AN AUTHORIZED ST REPRESENTATIVE, 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.

Obsolete Product(s) - Obsolete Product(s)

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.

© 2010 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