



THE DATASHEET OF STS14N3LLH5





STS14N3LLH5

N-channel 30 V, 0.005 Ω , 14 A, SO-8
STripFET™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)}	I _D
STS14N3LLH5	30 V	<0.006 Ω	14 A ⁽¹⁾

1. The value is rated according R_{thj-pcb}

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

Application

- Switching applications

Description

This product utilizes the 5th generation of design rules of ST's proprietary STripFET™ technology. The lowest available R_{DS(on)} * Q_g, in SO-8 package, makes this device suitable for the most demanding DC-DC converter applications, where high power density is to be achieved.

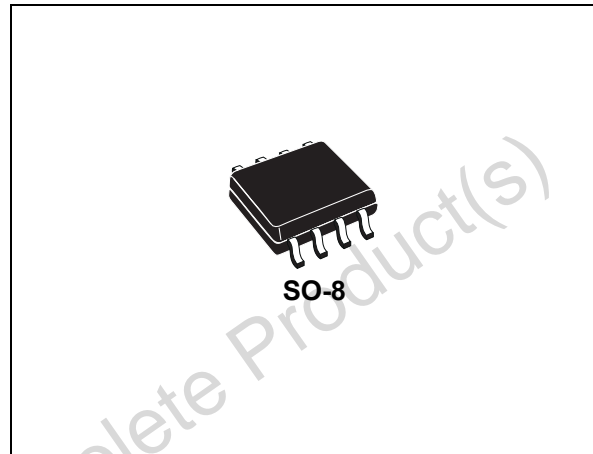


Figure 1. Internal schematic diagram

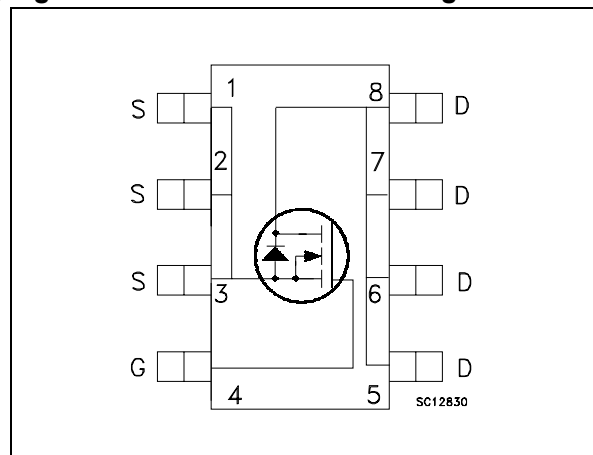


Table 1. Device summary

Order code	Marking	Package	Packaging
STS14N3LLH5	14D3L	SO-8	Tape and reel

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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}	Gate-source voltage	± 22	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	14	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	8.75	A
$I_{DM}^{(2)}$	Drain current (pulsed)	56	A
$P_{TOT}^{(2)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	2.7	W
	Derating factor	0.02	W/ $^\circ\text{C}$
T_J	Operating junction temperature	-55 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature		

1. The value is rated according $R_{thj-pcb}$
2. Pulse width limited by safe operating area

Table 3. Thermal resistance

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

1. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10\text{sec}$

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I_{AV}	Not-repetitive avalanche current, (pulse width limited by $T_J \text{ Max}$)	8.5	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24\text{ V}$)	180	mJ

2 Electrical characteristics

($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{max rating},$ $V_{DS} = \text{max rating @ } 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 22 V$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 7 A$ $V_{GS} = 4.5 V, I_D = 7 A$		0.005 0.0062	0.006 0.0077	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25 V, f = 1 \text{ MHz},$ $V_{GS} = 0$	-	1500		pF
C_{oss}	Output capacitance			295		pF
C_{rss}	Reverse transfer capacitance			39		pF
R_G	Intrinsic gate resistance	$f = 1 \text{ MHz open drain}$		1	1.25	Ω
Q_g	Total gate charge	$V_{DD} = 15 V, I_D = 14 A$	-	12	14.5	nC
Q_{gs}	Gate-source charge	$V_{GS} = 4.5 V$		4		nC
Q_{gd}	Gate-drain charge	(see Figure 14)		4.7		nC

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=15\text{ V}$, $I_D=7\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ <i>(see Figure 13)</i>		9.3		ns	
t_r	Rise time			14.5		ns	
$t_{d(off)}$	Turn-off delay time				22.7		ns
t_f	Fall time				4.5		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit	
I_{SD}	Source-drain current		-		14	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		56	A	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 14\text{ A}$, $V_{GS}=0$	-		1.1	V	
t_{rr}	Reverse recovery time	$I_{SD} = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_j=150\text{ }^\circ\text{C}$		25		ns	
Q_{rr}	Reverse recovery charge			-	17.5		nC
I_{RRM}	Reverse recovery current				1.4		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

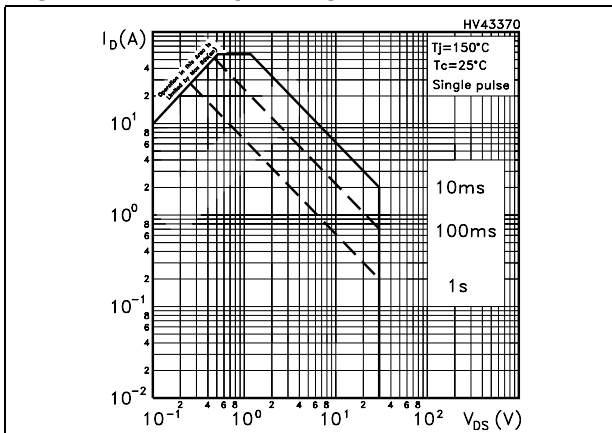


Figure 3. Thermal impedance

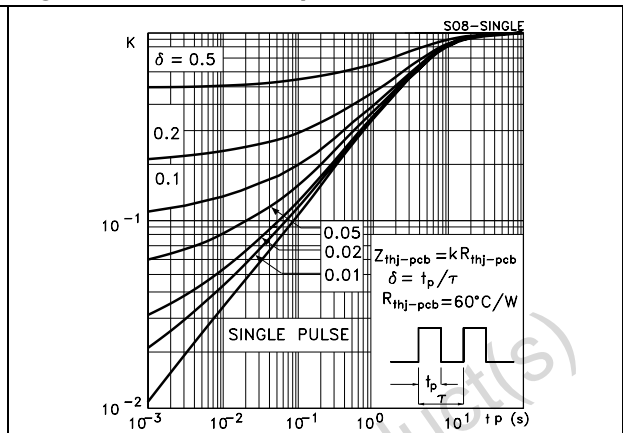


Figure 4. Output characteristics

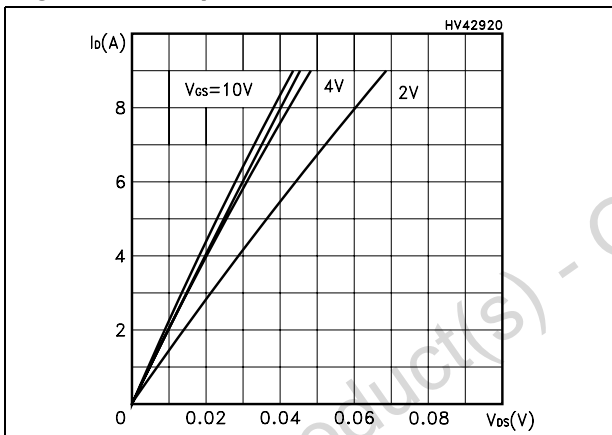


Figure 5. Transfer characteristics

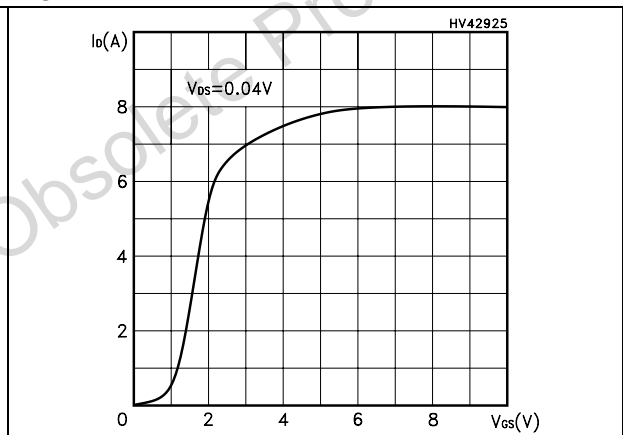


Figure 6. Normalized $B_{V_{DS}}$ vs temperature

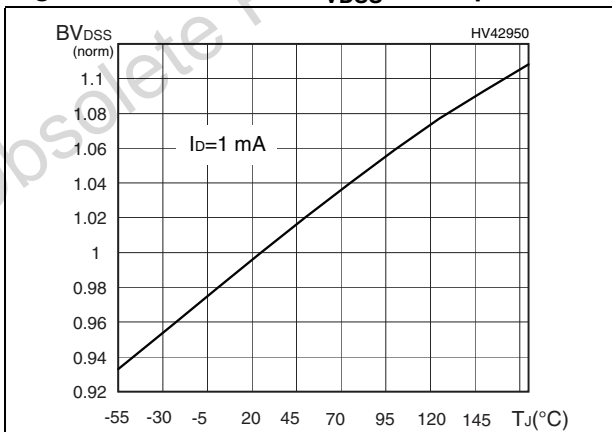


Figure 7. Static drain-source on resistance

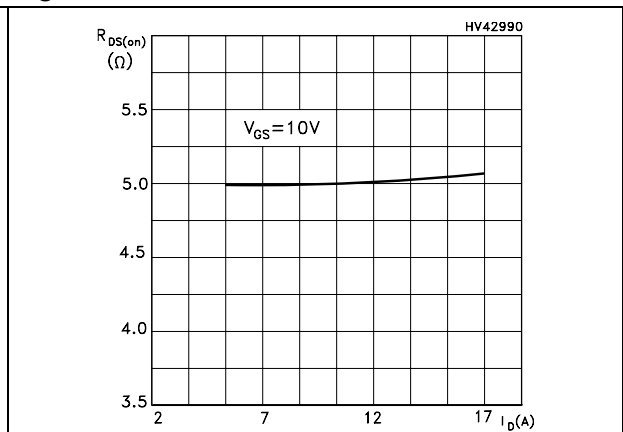


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

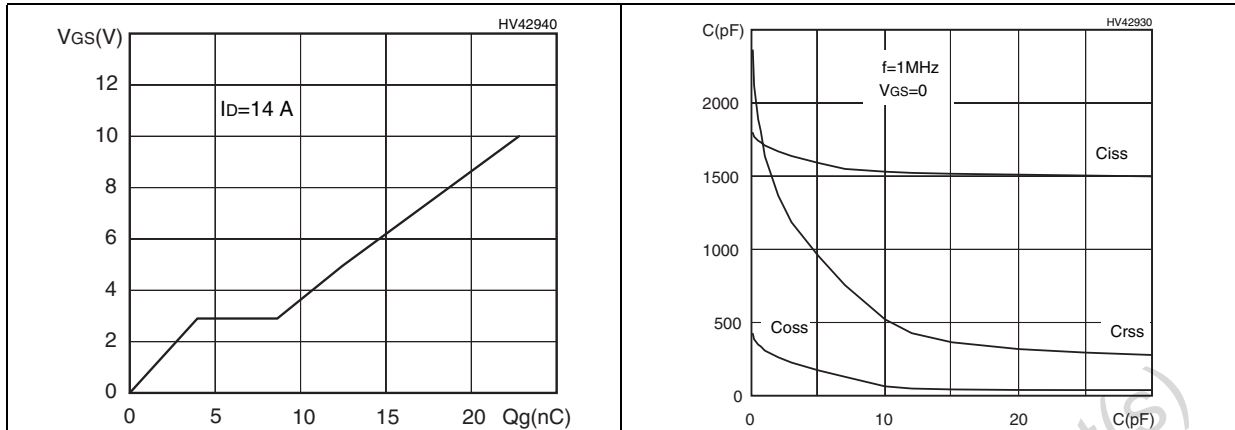


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

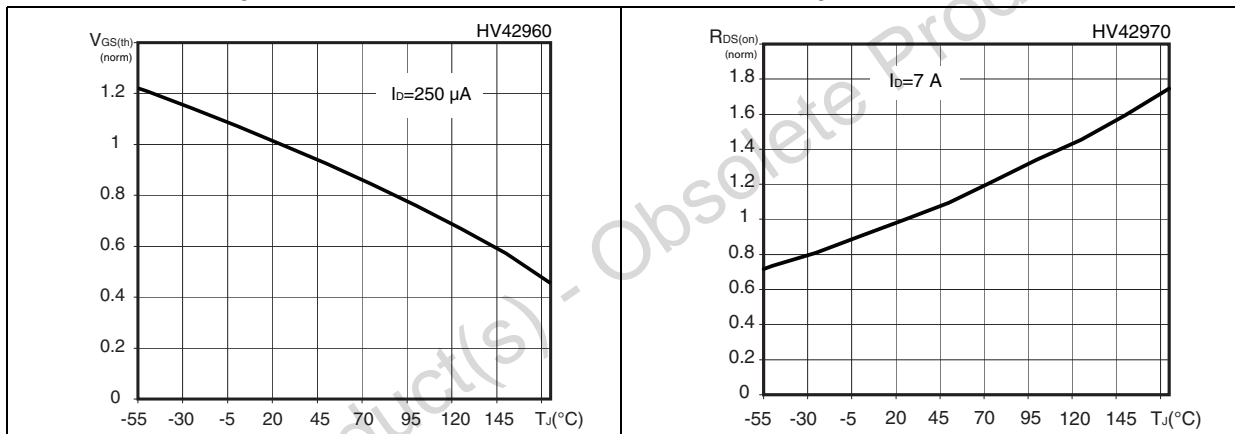
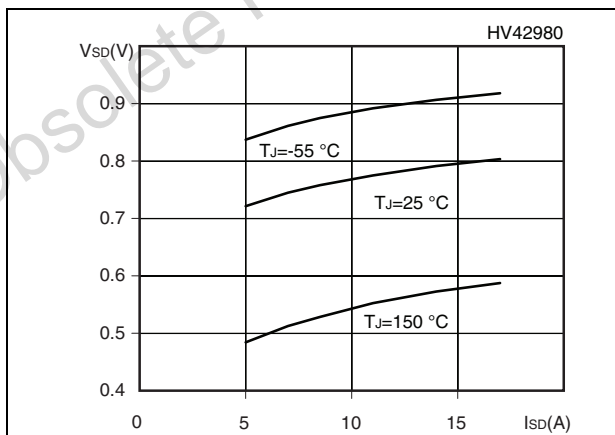
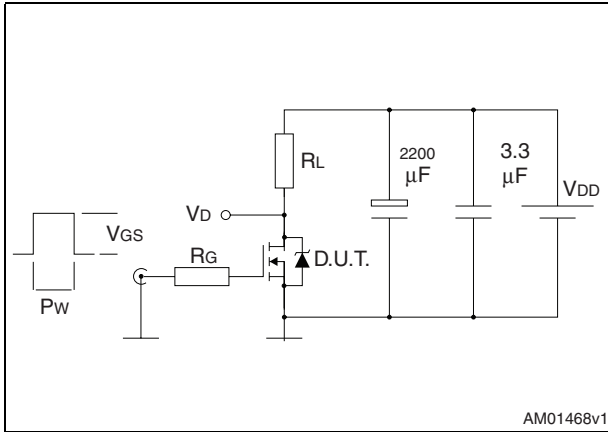


Figure 12. Source-drain diode forward characteristics



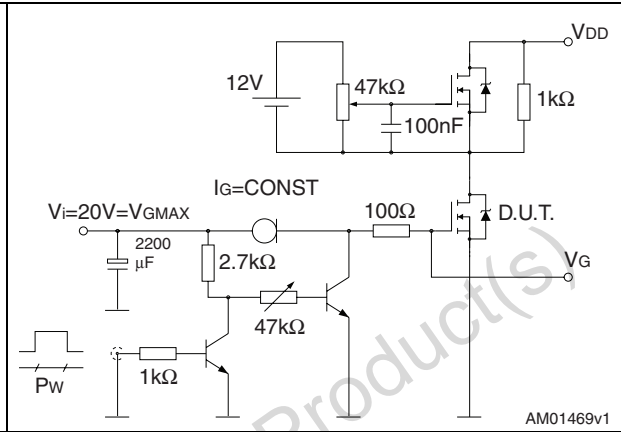
3 Test circuits

Figure 13. Switching times test circuit for resistive load



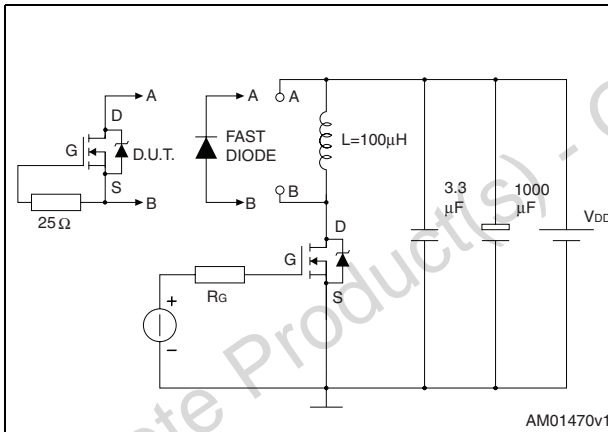
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Figure 14. Gate charge test circuit



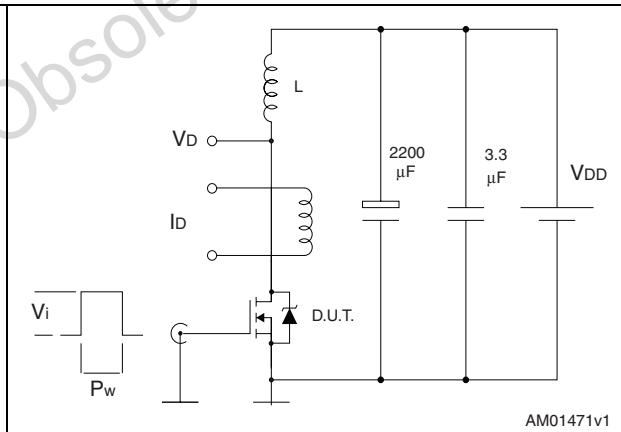
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Figure 15. Test circuit for inductive load switching and diode recovery times



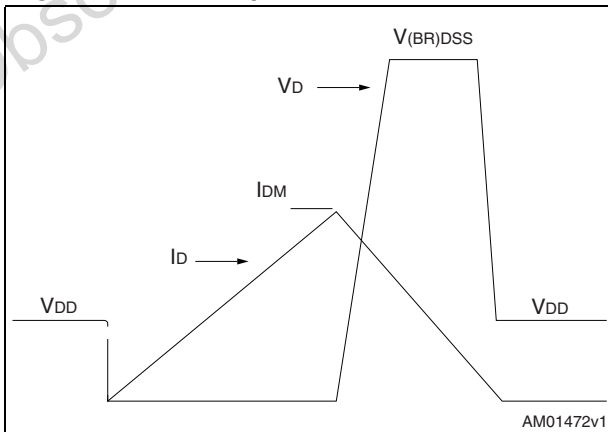
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Figure 16. Unclamped inductive load test circuit



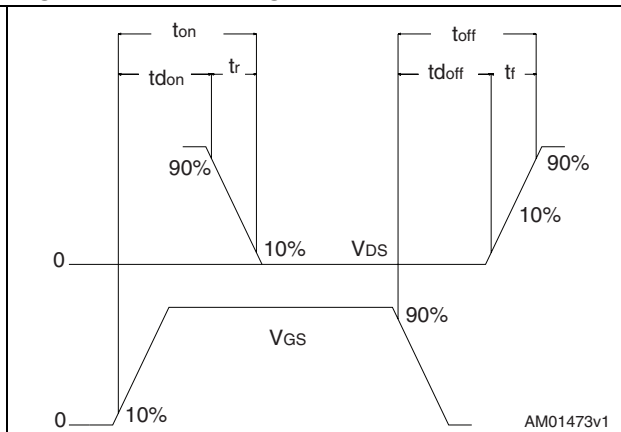
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Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

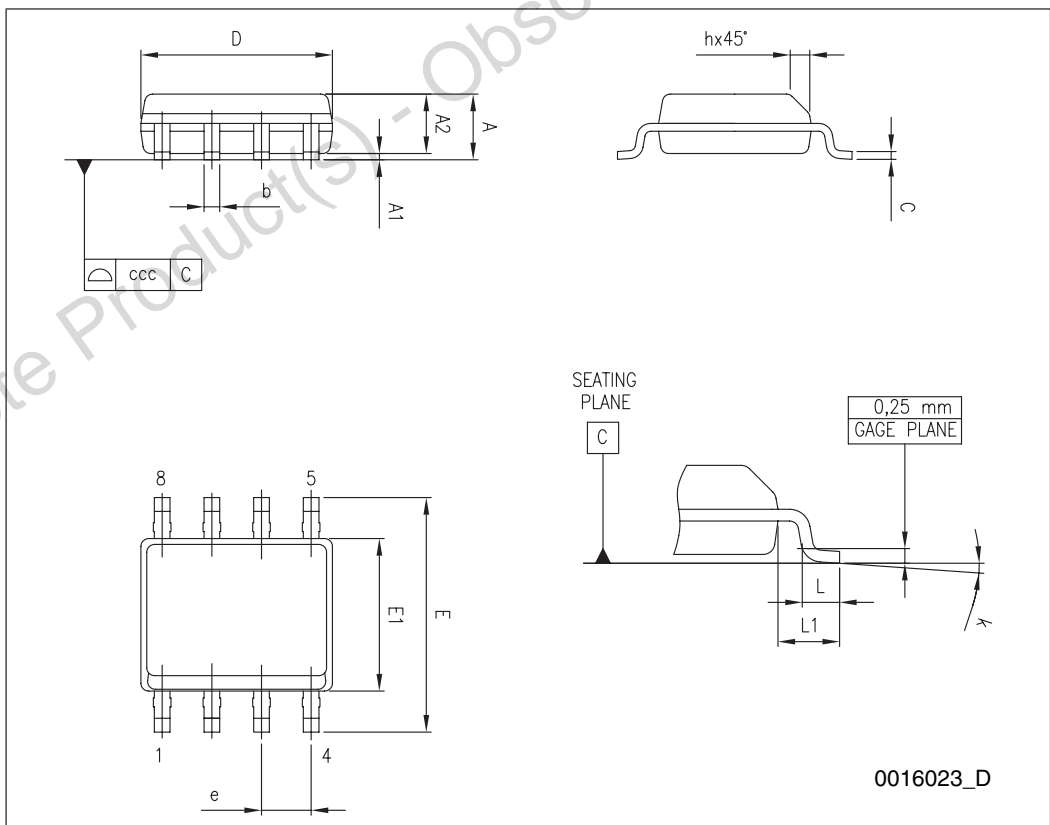
4 Package mechanical data

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. ECOPACK is an ST trademark.

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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



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
12-Nov-2007	1	First release
15-Apr-2008	2	– Updated Figure 1: Internal schematic diagram – Document status promoted from preliminary data to datasheet.
23-Sep-2008	3	V_{GS} value has been changed on Table 2 and Table 5
19-Nov-2009	4	– Added Q_g max. value in Table 6 – Added new row in Table 6

Obsolete Product(s) - Obsolete Product(s)

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