



# STS14N3LLH5

N-channel 30 V, 0.005  $\Omega$ , 14 A, SO-8  
STripFET™ V Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS14N3LLH5	30 V	<0.006 $\Omega$	14 A <sup>(1)</sup>

1. The value is rated according R<sub>thj-pcb</sub>

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- Very low switching gate charge
- High avalanche ruggedness
- Low gate drive power losses

## Application

- Switching applications

## Description

This product utilizes the 5<sup>th</sup> generation of design rules of ST's proprietary STripFET™ technology. The lowest available R<sub>DS(on)</sub>\*Q<sub>g</sub>, in SO-8 package, makes this device suitable for the most demanding DC-DC converter applications, where high power density is to be achieved.

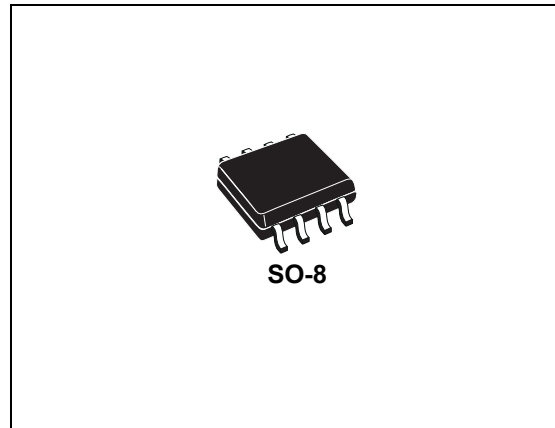


Figure 1. Internal schematic diagram

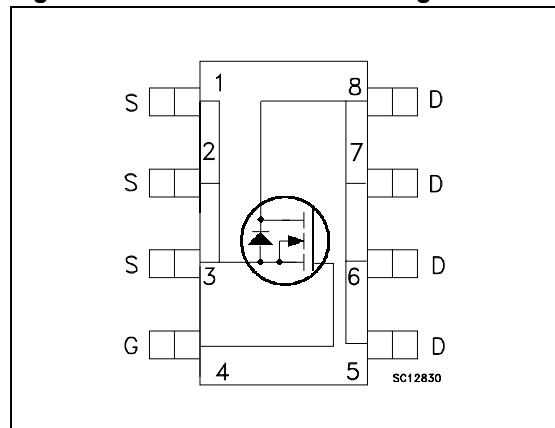


Table 1. Device summary

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

## 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 ( $V_{GS} = 0$ )	30	V
$V_{GS}$	Gate-source voltage	$\pm 22$	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/°C
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 150	°C

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	°C/W

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu, t < 10sec

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current, (pulse width limited by $T_J$ 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

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

**Table 5. On/off states**

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

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GS} = 0$	-	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	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 15 \text{ V}$ , $I_D = 14 \text{ A}$	-	12	14.5	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5 \text{ V}$		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	$V_{DD}=15\text{ V}$ , $I_D=7\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ (see Figure 13)	-	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 $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

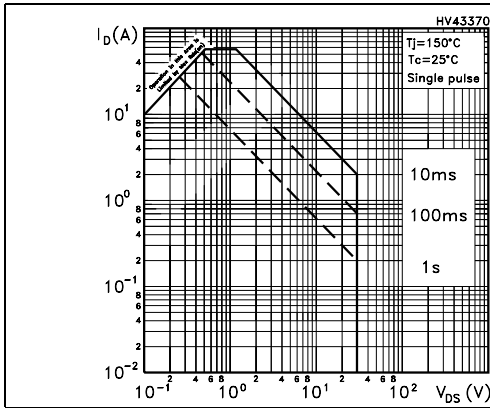


Figure 3. Thermal impedance

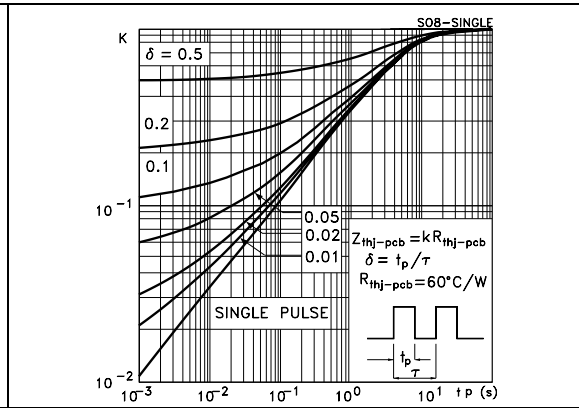


Figure 4. Output characteristics

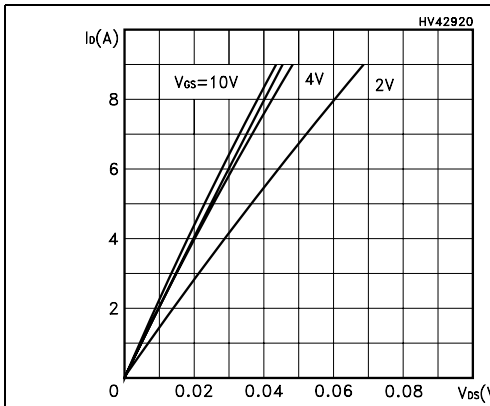


Figure 5. Transfer characteristics

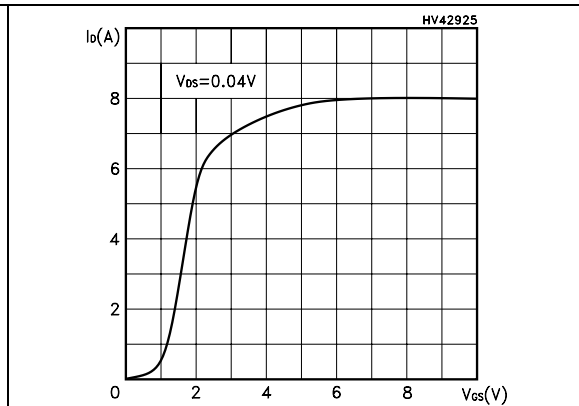


Figure 6. Normalized B\_V\_DSS vs temperature

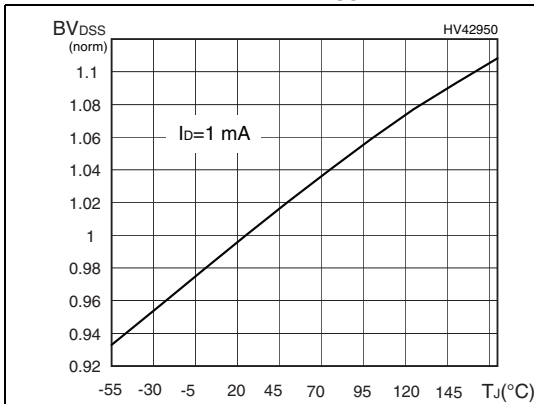


Figure 7. Static drain-source on resistance

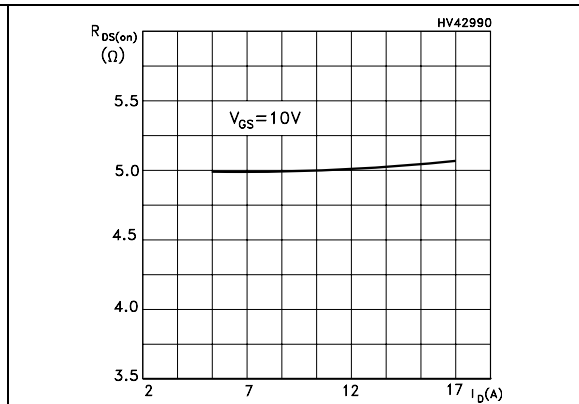


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

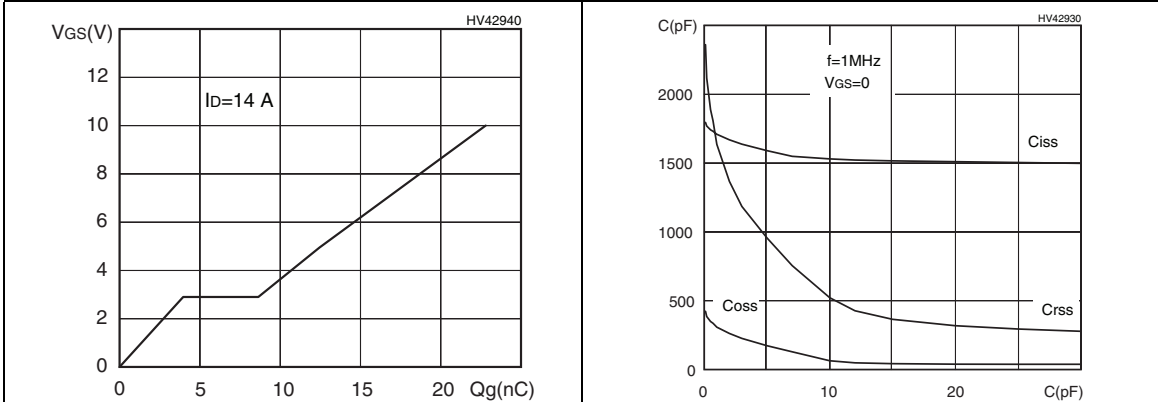


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

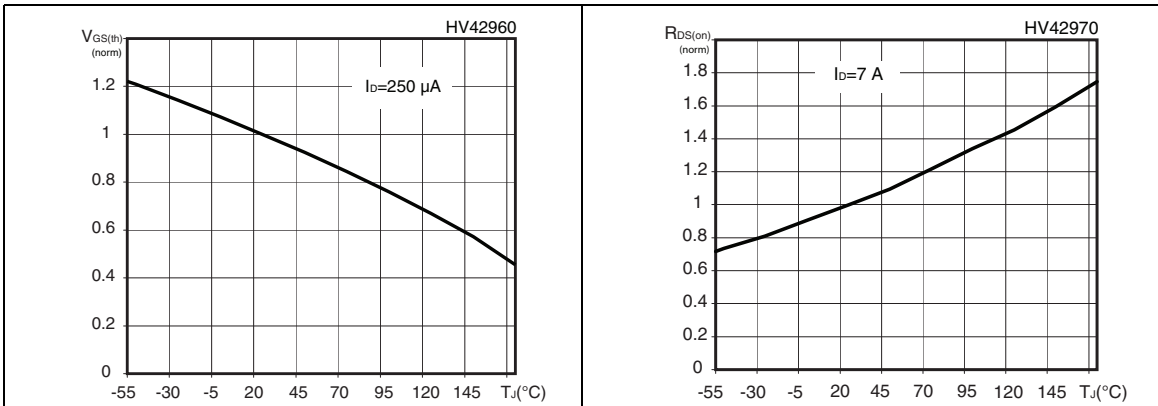
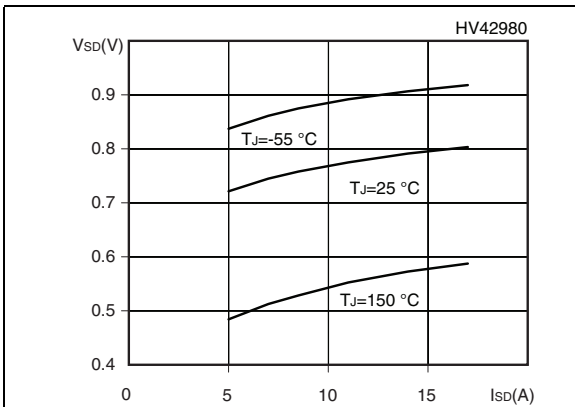


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

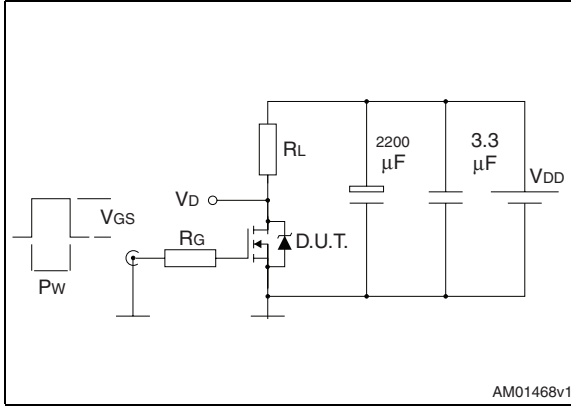


Figure 14. Gate charge test circuit

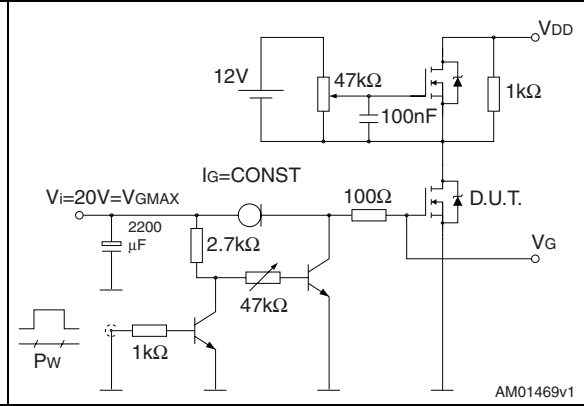


Figure 15. Test circuit for inductive load switching and diode recovery times

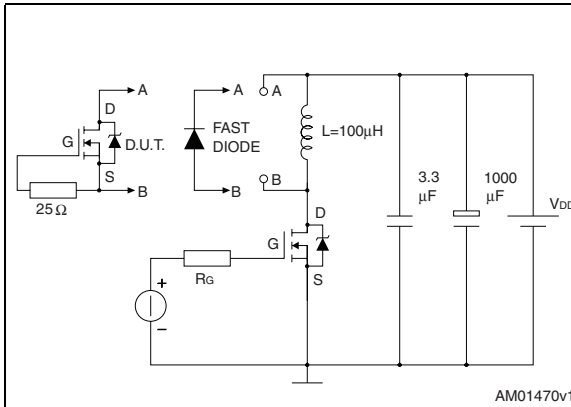


Figure 16. Unclamped inductive load test circuit

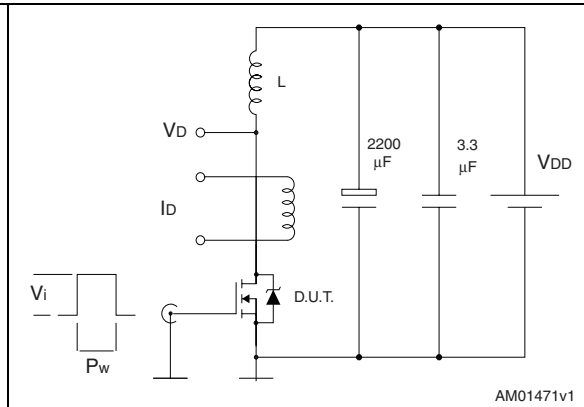


Figure 17. Unclamped inductive waveform

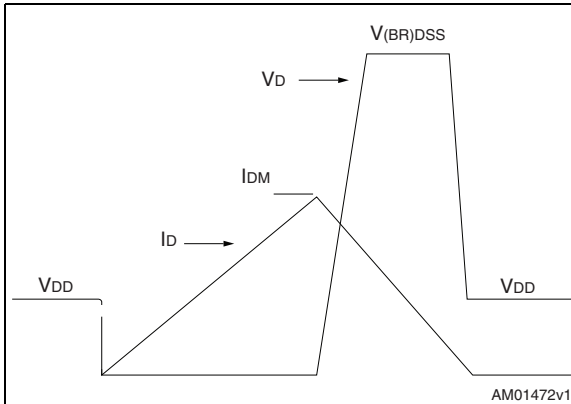
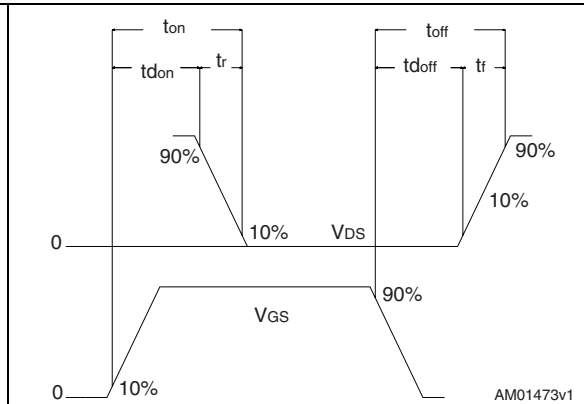


Figure 18. Switching time waveform



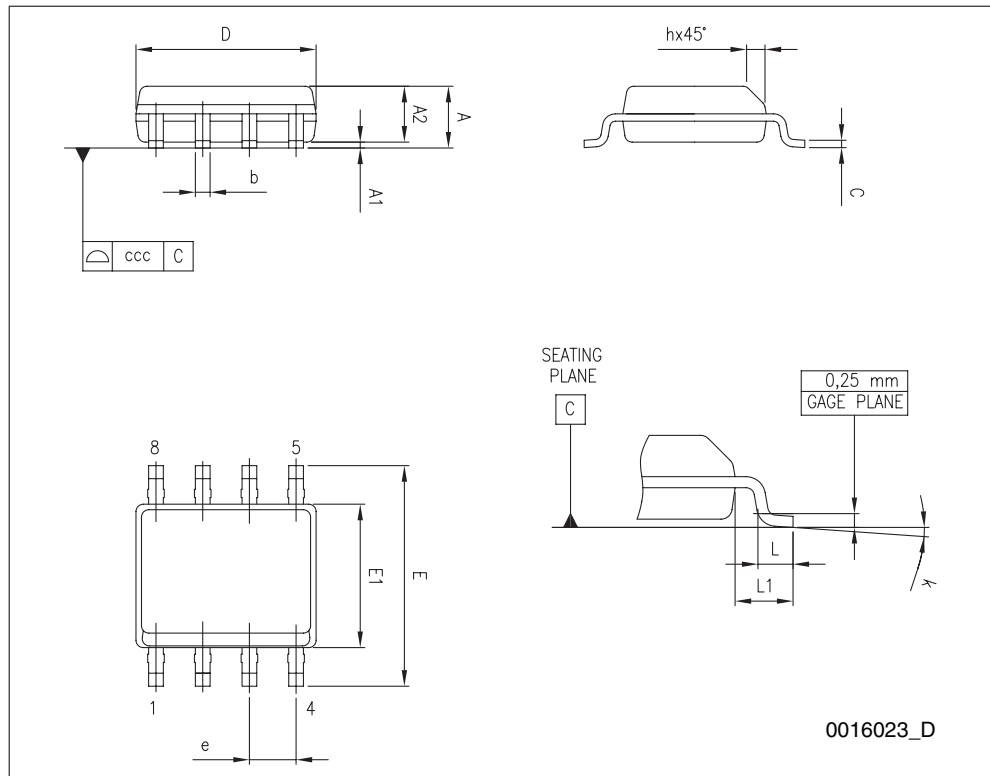


## 4 Package mechanical data

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

**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 <a href="#">Figure 1: Internal schematic diagram</a> – Document status promoted from preliminary data to datasheet.
23-Sep-2008	3	$V_{GS}$ value has been changed on <a href="#">Table 2</a> and <a href="#">Table 5</a>
19-Nov-2009	4	– Added $Q_g$ max. value in <a href="#">Table 6</a> – Added new row in <a href="#">Table 6</a>

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