



**THE DATASHEET OF  
STS15N4LLF5**





# STS15N4LLF5

N-channel 40 V, 0.00625  $\Omega$ , 15 A, SO-8  
STripFET™ Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STS15N4LLF5	40 V	< 0.0076 $\Omega$	15 A

- Optimal R<sub>DS(on)</sub> × Q<sub>g</sub> trade-off @ 4.5 V
- Conduction losses reduced
- Switching losses reduced

## Applications

- Switching application

## Description

This STripFET™ Power MOSFET technology is among the latest improvements, which have been especially tailored to achieve very low on-state resistance providing also one of the best-in-class figure of merit (FOM).

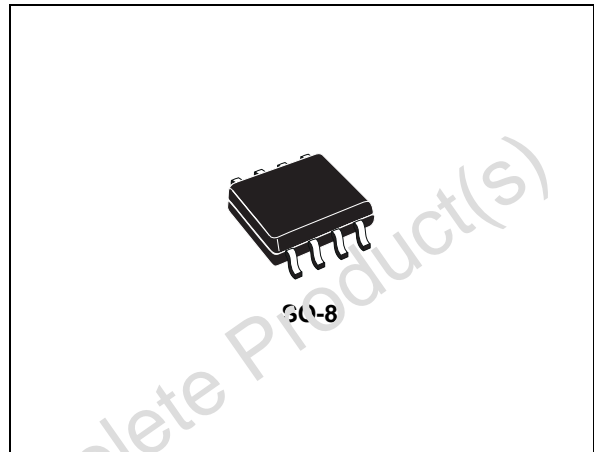


Figure 1. Internal schematic diagram

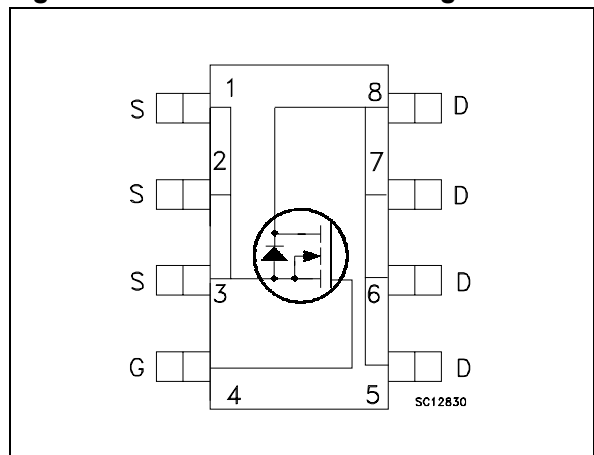


Table 1. Device summary

Order code	Marking	Package	Packaging
STS15N4LLF5	15C4L	SO-8	Tape and reel

# Contents

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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 ( $V_{GS} = 0$ )	40	V
$V_{GS}$	Gate-source voltage	$\pm 16$	V
$V_{GS}^{(1)}$	Gate- source voltage	$\pm 18$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	15	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	10	A
$I_{DM}^{(2)}$	Drain current (pulsed)	63.6	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	3	W
$E_{AS}^{(3)}$	Single pulse avalanche energy	1090	mJ

1. Guaranteed for test time  $\leq 15\text{ms}$
2. Pulse width limited by  $T_{jmax}$
3. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 7.5\text{ A}$ ,  $V_{DD} = 25\text{ V}$

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	47	$^\circ\text{C/W}$
$T_l$	Maximum lead temperature for soldering	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$

1. When mounted on FH-4 board with 1 inch<sup>2</sup> pad, 2oz of Cu and  $t < 10\text{ sec}$

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	40			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{max rating}$ , $V_{DS} = \text{max rating @ } 125\text{°C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16\text{ V}$			±200	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	$V_{GS} = 10\text{ V}$ , $I_D = 7.5\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 7.5\text{ A}$		0.00625 0.0076	0.0067 0.0083	$\Omega$ $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	1570 257 32	-	pF pF pF
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 15\text{ V}$ , $I_D = 18\text{ A}$ $V_{GS} = 4.5\text{ V}$ (see Figure 14)	-	12.9 3.9 5.3	-	nC nC nC
$R_{IG}$	Gate input resistance	$f = 1\text{ MHz}$ Gate DC Bias = 0 Test signal level = 20 mV open drain	-	1.5	-	$\Omega$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$ , $I_D = 9\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 16)	-	14 42	-	ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time		-	37 5.2	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		18	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		72	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 18 \text{ A}, V_{GS} = 0$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 18 \text{ A}, V_{DD} = 25 \text{ V},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $T_j = 150 \text{ }^\circ\text{C}$ <i>(see Figure 15)</i>	-	27.2		ns
$Q_{rr}$	Reverse recovery charge			24.5		nC
$I_{RRM}$	Reverse recovery current			1.8		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

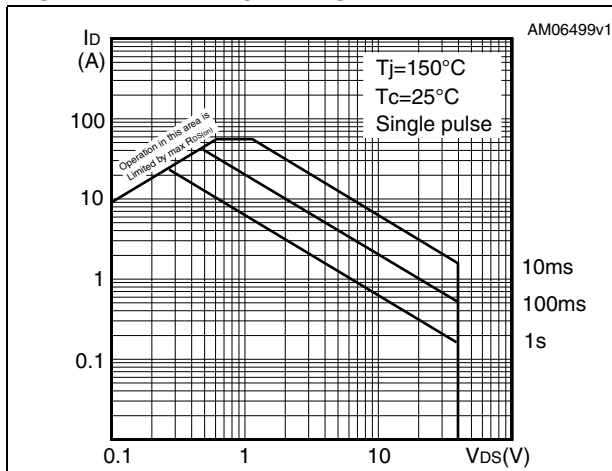


Figure 3. Thermal impedance

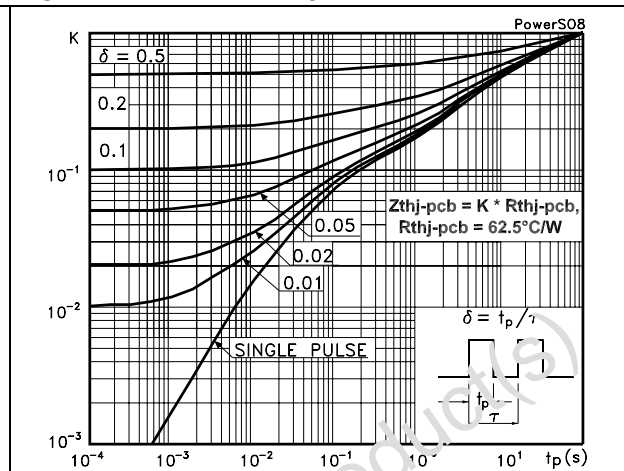


Figure 4. Output characteristics

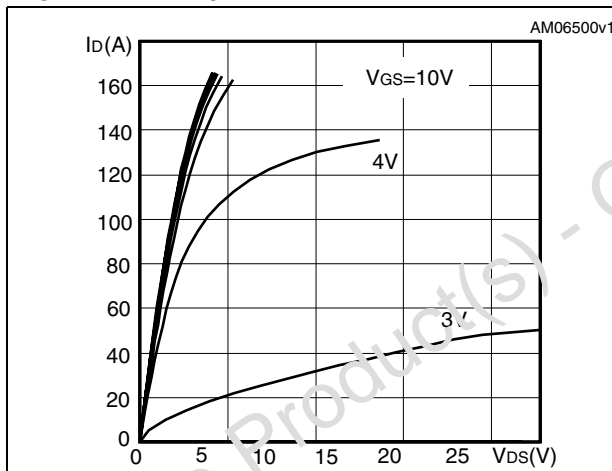


Figure 5. Transfer characteristics

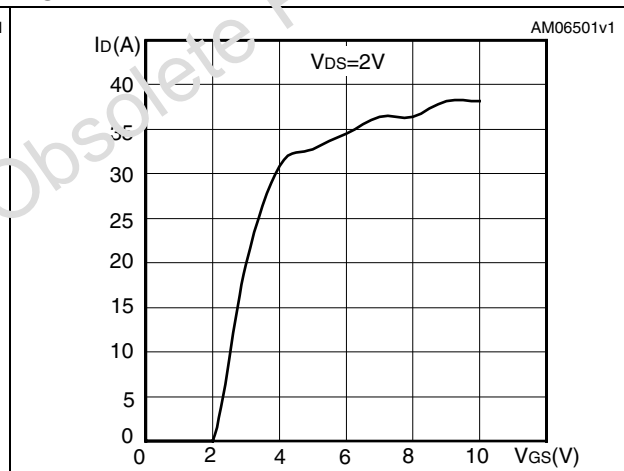


Figure 6. Normalized  $B_{V_{DS}}$  vs temperature

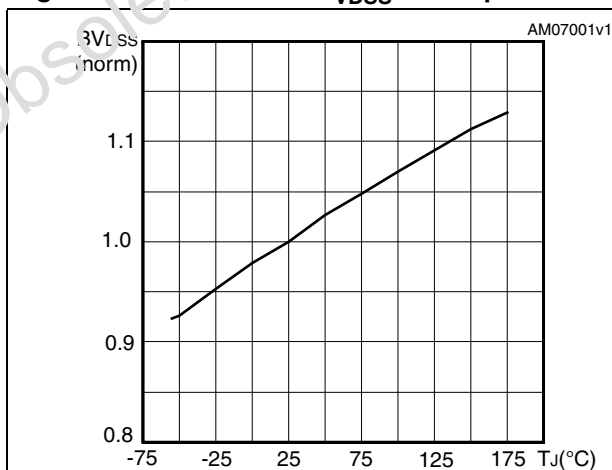


Figure 7. Static drain-source on resistance

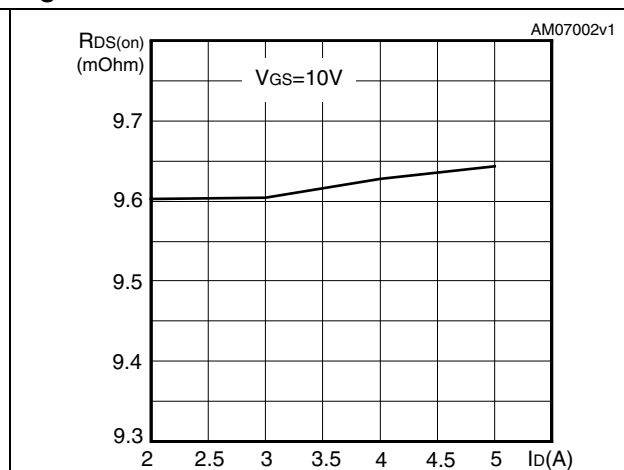


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

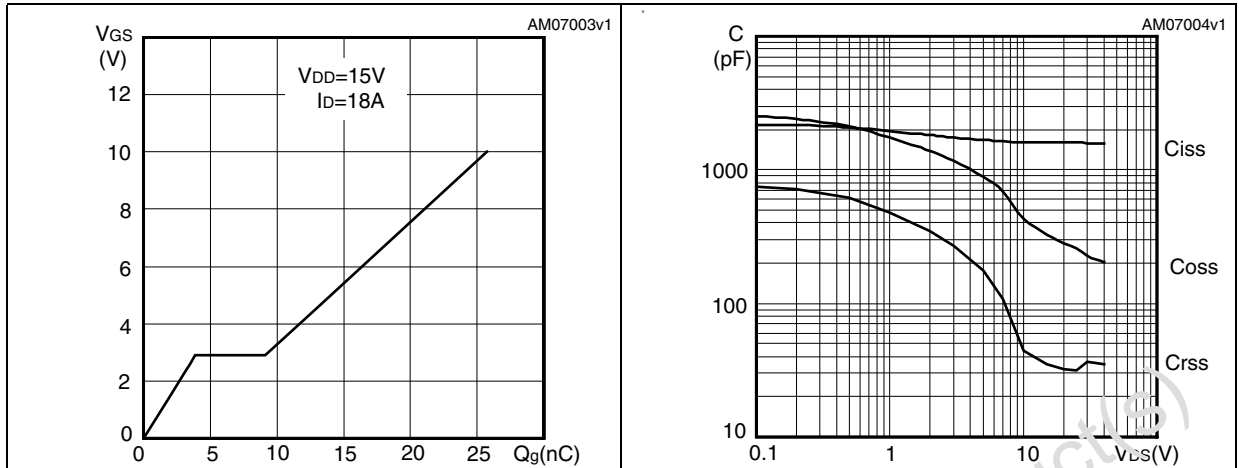


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

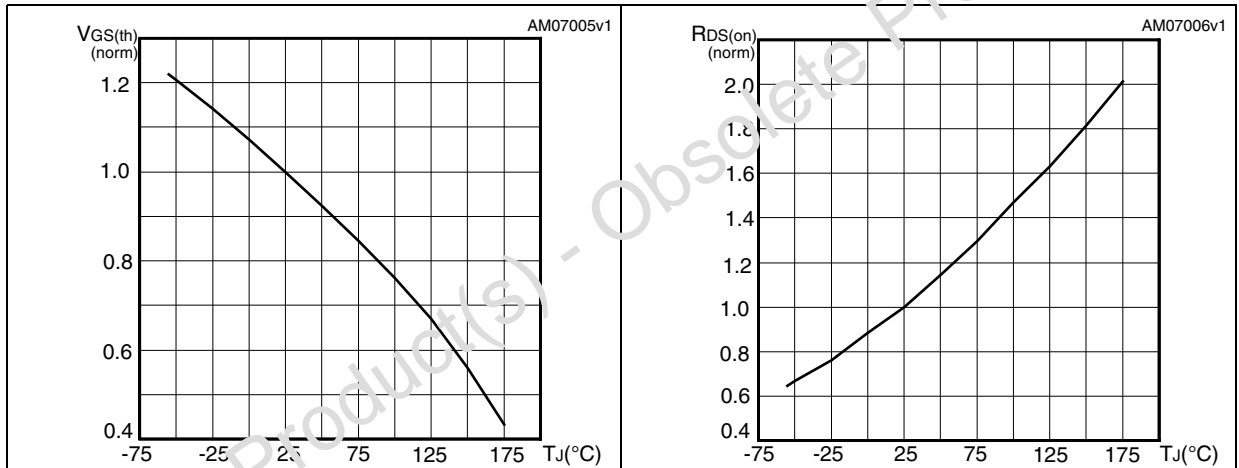
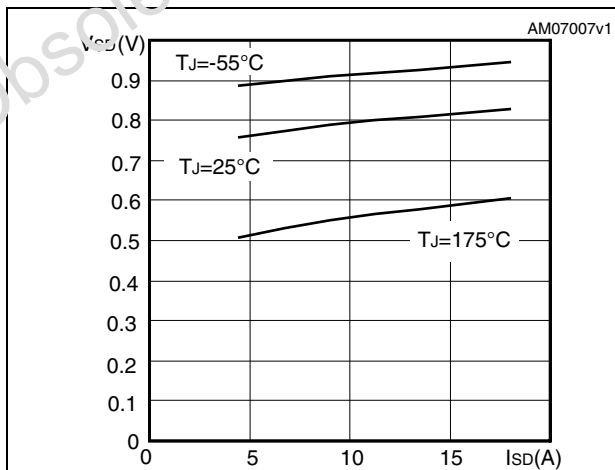
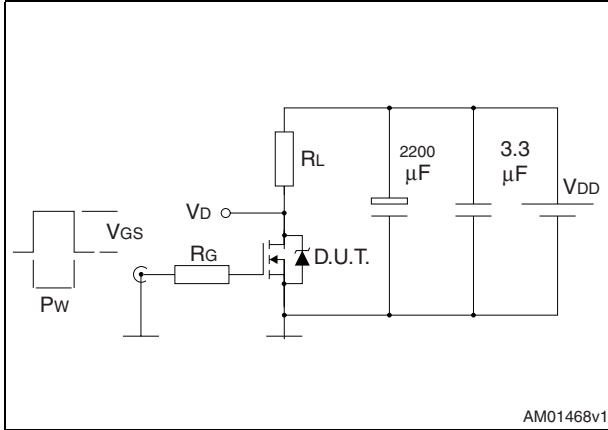


Figure 12. Source-drain diode forward characteristics



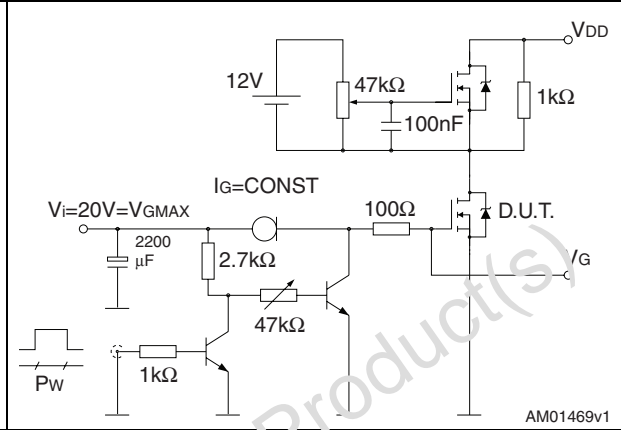
### 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**



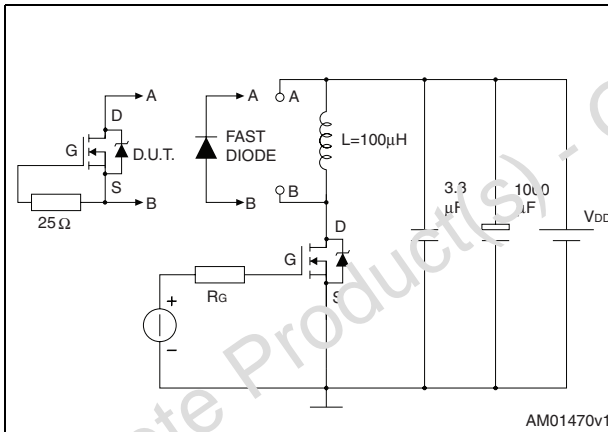
AM01468v1

**Figure 14. Gate charge test circuit**



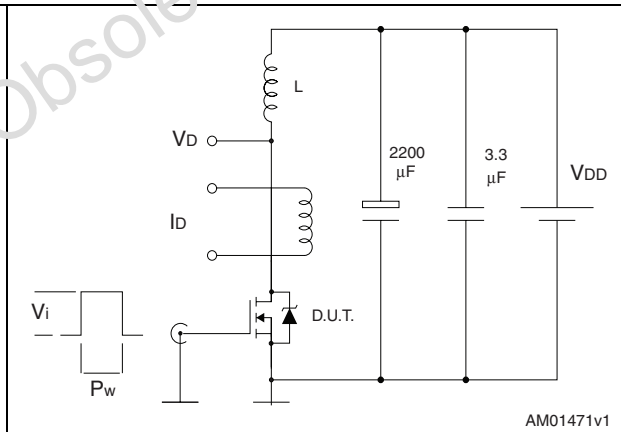
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**Figure 15. Test circuit for inductive load switching and diode recovery times**



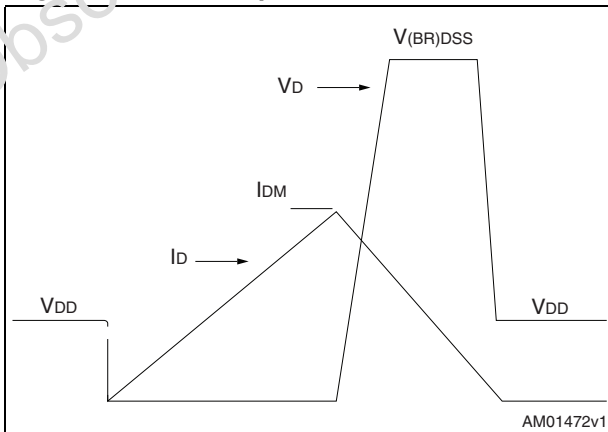
AM01470v1

**Figure 16. Unclamped inductive load test circuit**



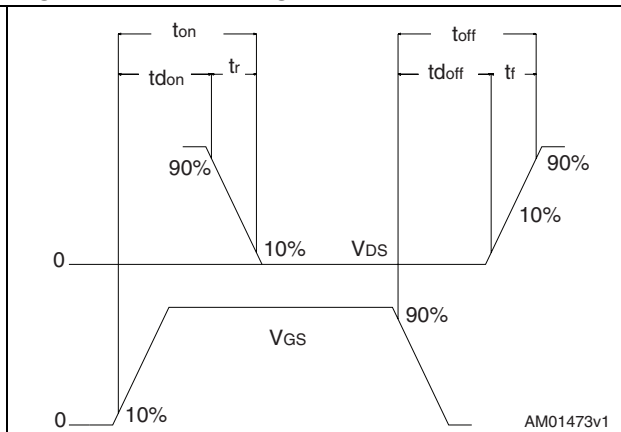
AM01471v1

**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](http://www.st.com). ECOPACK is an ST trademark.

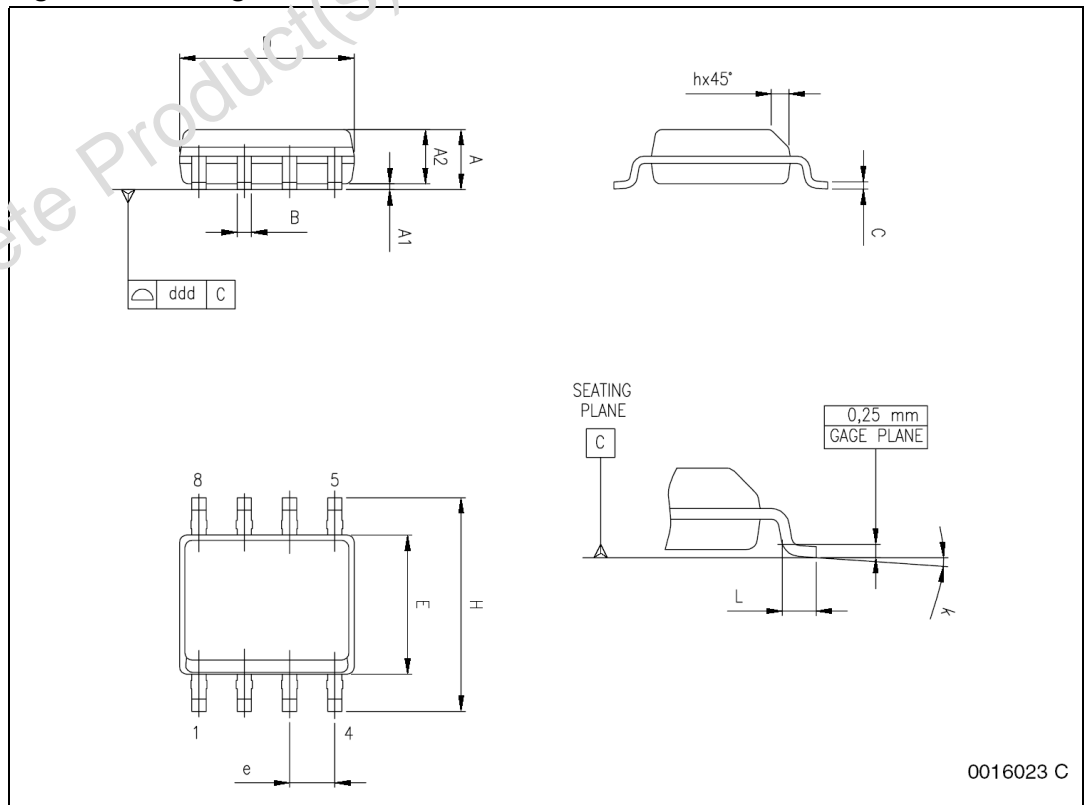
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Table 1. SO-8 mechanical data

Dim.	mm.			inch		
	Min	Typ	Max	Min	Typ	Max
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.004		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D <sup>(1)</sup>	4.80		5.00	0.189		0.197
E	3.80		4.00	0.15		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	0° (min.), 9° (max.)					
ddd			0.10			0.004

1. Dimensions D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15mm (.006inch) in total (both side).

Figure 19. Package dimensions



0016023 C

## 5 Revision history

Table 8. Revision history

Date	Revision	Changes
07-Apr-2010	1	First release

Obsolete Product(s) - Obsolete Product(s)

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