



STS25NH3LL

N-channel 30 V - 0.0032 Ω - 25 A - SO-8
STripFET™ III Power MOSFET for DC/DC conversion

Features

Type	V _{DSS}	R _{DS(on)}	I _D
STS25NH3LL	30 V	<0.0035 Ω	25 A ⁽¹⁾

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

- Optimal R_{DS(on)} x Q_g trade off @ 4.5 V
- Conduction losses reduced
- Switching losses reduced

Applications

- Switching applications

Description

This device utilizes the advanced design rules of ST's proprietary STripFET™ technology. The innovative process coupled with unique metallization techniques makes it possible to produce the most advanced low voltage Power MOSFET in an SO-8 package. The device is therefore suitable for demanding DC-DC converter applications where high efficiency at high output current is needed.

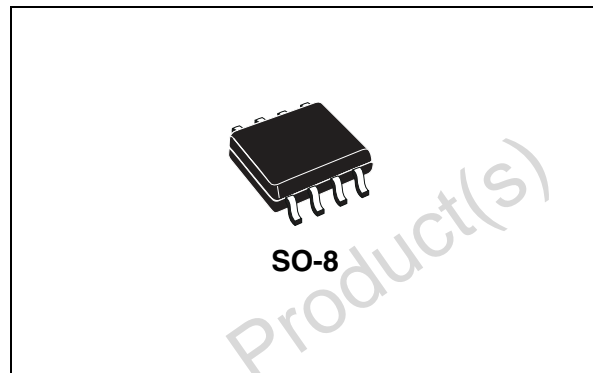


Figure 1. Internal schematic diagram

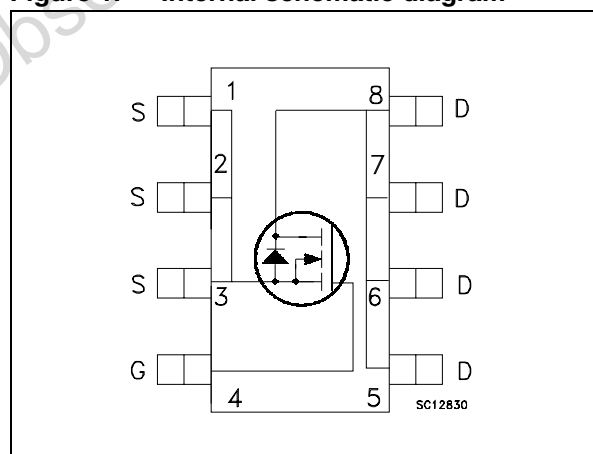


Table 1. Device summary

Order code	Marking	Package	Packaging
STS25NH3LL	25H3LL	SO-8	Tape & reel

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	± 18	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	25	A
I_D	Drain current (continuous) at $T_C=100\text{ }^\circ\text{C}$	18	A
$I_{DM}^{(2)}$	Drain current (pulsed)	100	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	3.2	W

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-amb max	47	$^\circ\text{C}/\text{W}$
T_j T_{stg}	Operation junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

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

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AV}	Not-repetitive avalanche current (pulse width limited by T_j max.)	12.5	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24\text{ V}$)	1.3	J

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 ($V_{DS} = 0$)	$V_{GS} = \pm 18 V$			± 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	$V_{GS} = 10 V, I_D = 12.5 A$ $V_{GS} = 4.5 V, I_D = 12.5 A$		0.0032 0.004	0.0035 0.005	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 10 V, I_D = 12.5 A$		30		S
C_{iss}	Input capacitance	$V_{DS} = 25 V, f = 1 \text{ MHz},$ $V_{GS} = 0$		4450		pF
C_{oss}	Output capacitance			655		pF
C_{rss}	Reverse transfer capacitance			50		pF
Q_g	Total gate charge	$V_{DD} = 15 V, I_D = 25 A$ $V_{GS} = 4.5 V$ <i>Figure 14</i>		30	40	nC
Q_{gs}	Gate-source charge			12.5		nC
Q_{gd}	Gate-drain charge			10		nC
$Q_{OSS}^{(2)}$	Output charge	$V_{DD} = 24 V, V_{GS} = 0$		23		nC
R_G	Gate input resistance	$f = 1 \text{ MHz}, \text{ gate DC bias} = 0$ test signal level = 20 mV open drain	1	2	3	Ω

1. Pulsed: pulse duration=300 μs , duty cycle 1.5%

2. $Q_{OSS} = C_{OSS} * \Delta V_{in}$, $C_{OSS} = C_{gd} + C_{ds}$

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$, $I_D = 12.5\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ <i>Figure 13</i>		18		ns	
t_r	Rise time			50		ns	
$t_{d(off)}$	Turn-off delay time				75		ns
t_f	Fall time				8		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit	
I_{SD}	Source-drain current				25	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				100	A	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 25\text{ A}$, $V_{GS} = 0$			1.3	V	
t_{rr}	Reverse recovery time	$I_{SD} = 25\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ <i>Figure 18</i>		32		ns	
Q_{rr}	Reverse recovery charge				34		nC
I_{RRM}	Reverse recovery current				2.1		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

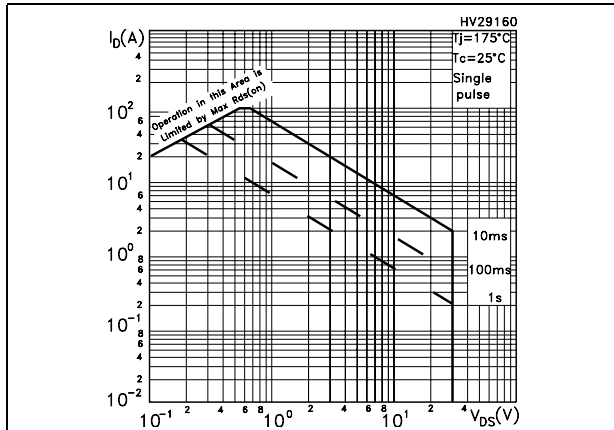


Figure 3. Thermal impedance

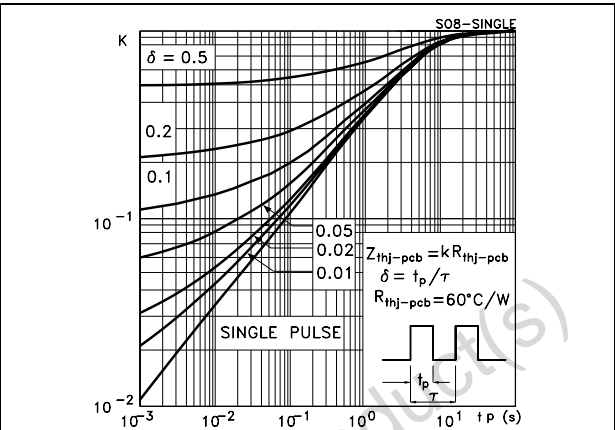


Figure 4. Output characteristics

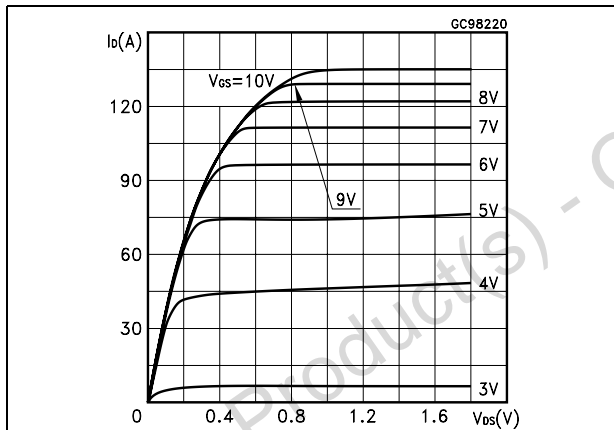


Figure 5. Transfer characteristics

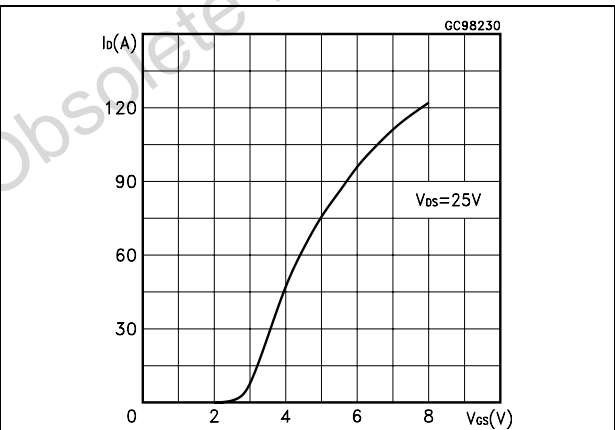


Figure 6. Normalized $B_{V_{DS}}$ vs temperature

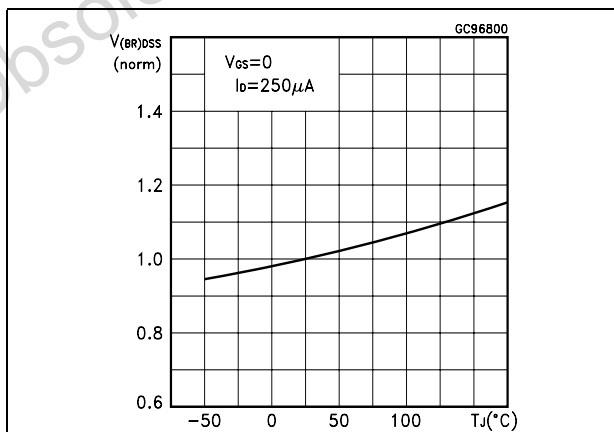


Figure 7. Static drain-source on resistance

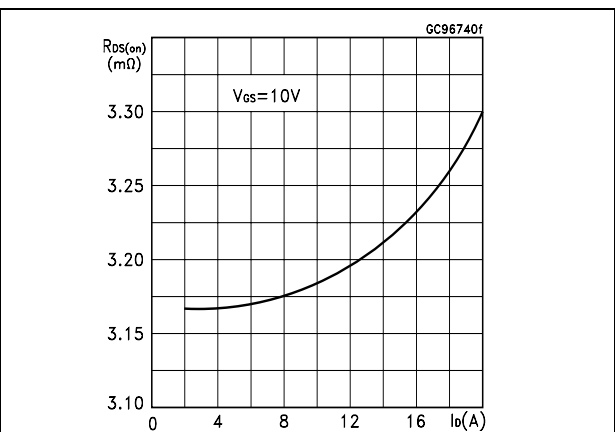


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

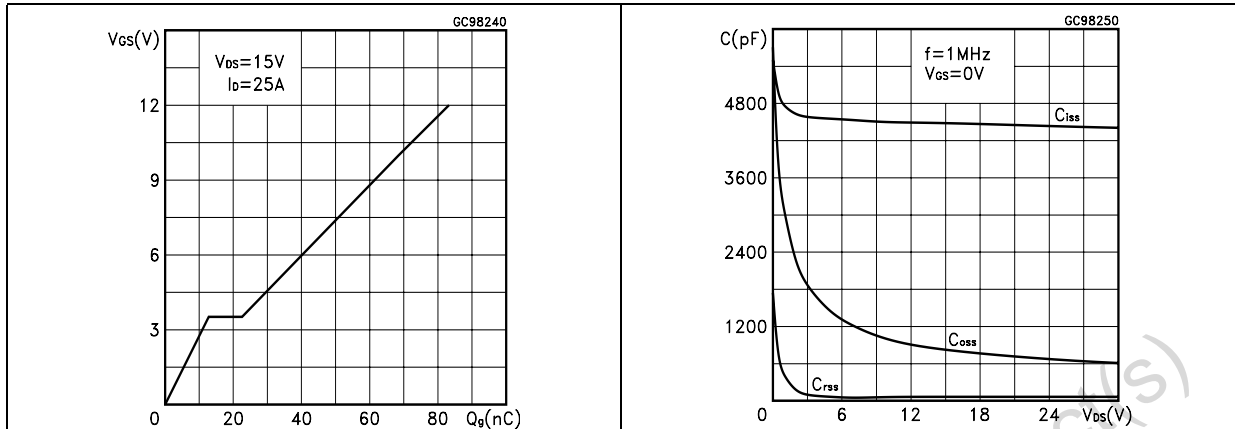


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

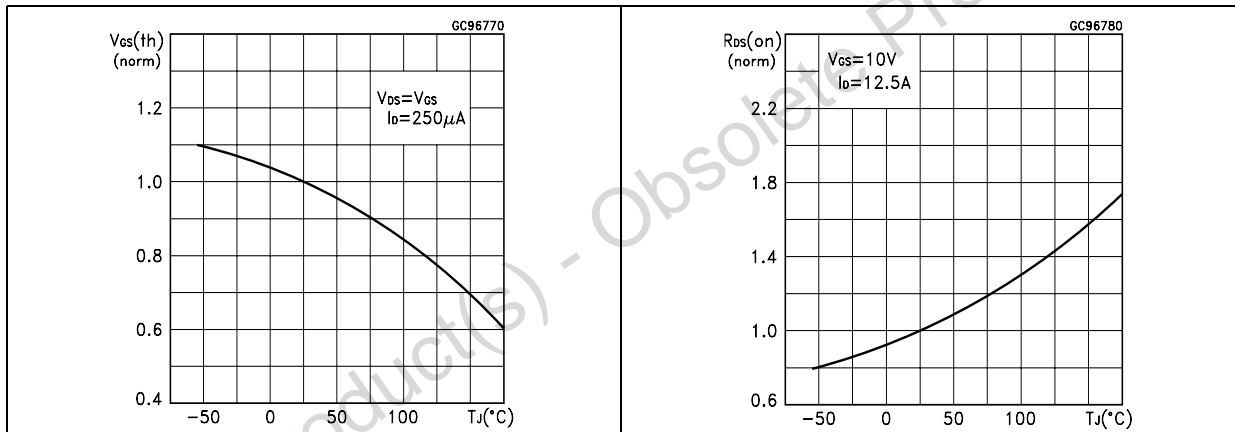
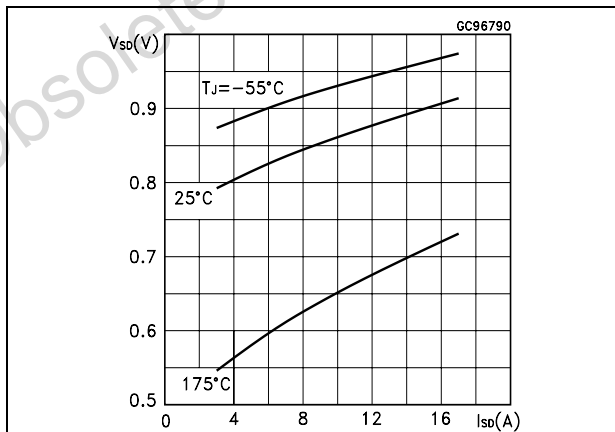


Figure 12. Source-drain diode forward characteristics



3 Test circuit

Figure 13. Switching times test circuit for resistive load

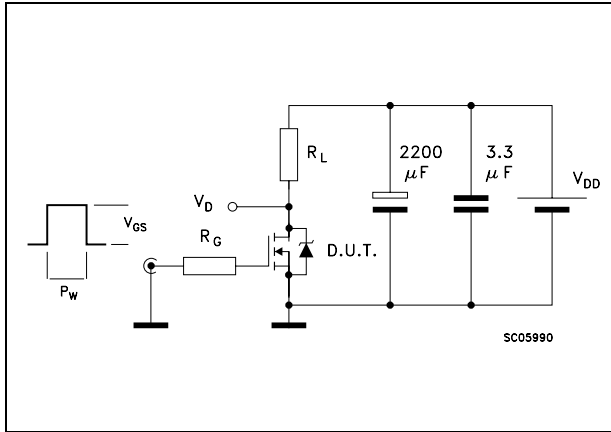


Figure 14. Gate charge test circuit

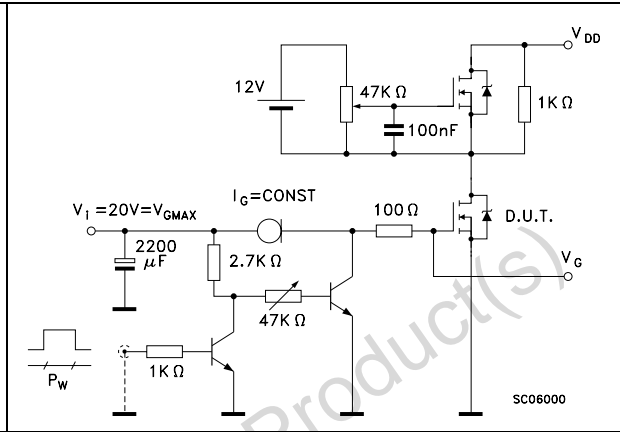


Figure 15. Test circuit for inductive load switching and diode recovery times

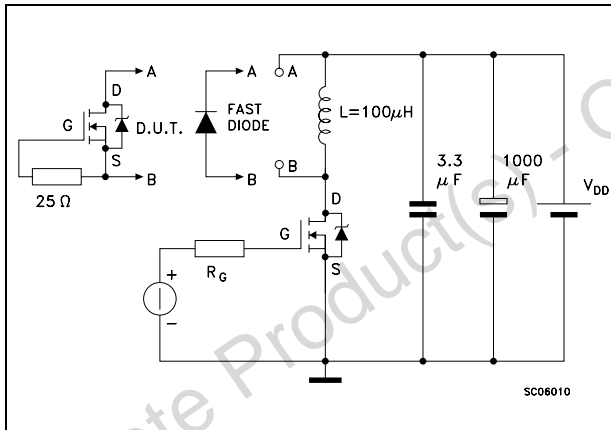


Figure 16. Unclamped inductive load test circuit

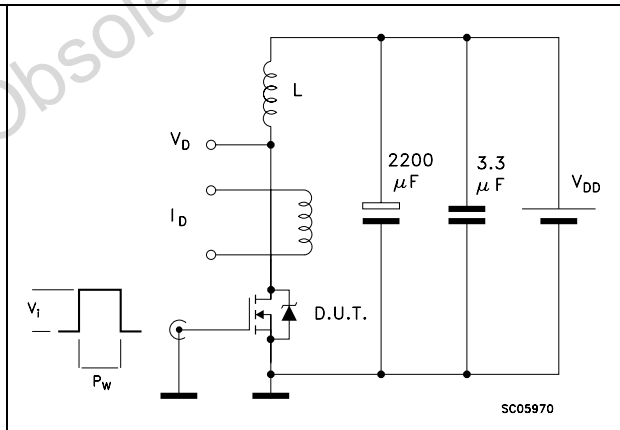


Figure 17. Unclamped inductive waveform

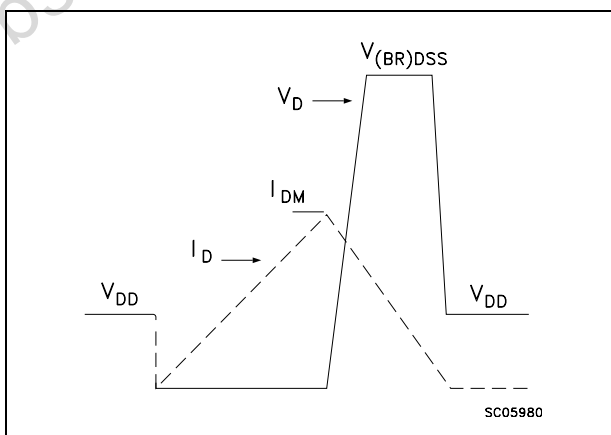
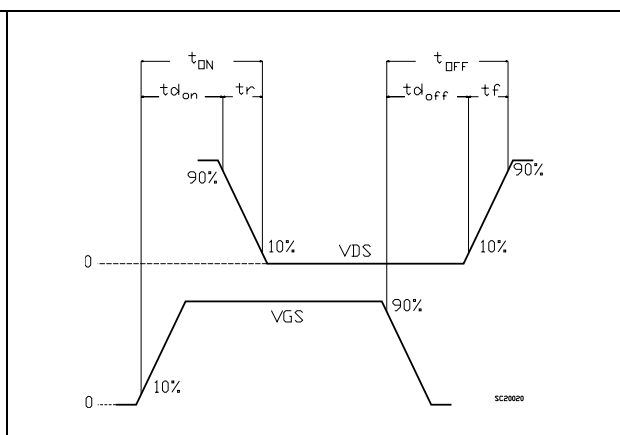


Figure 18. Switching time waveform



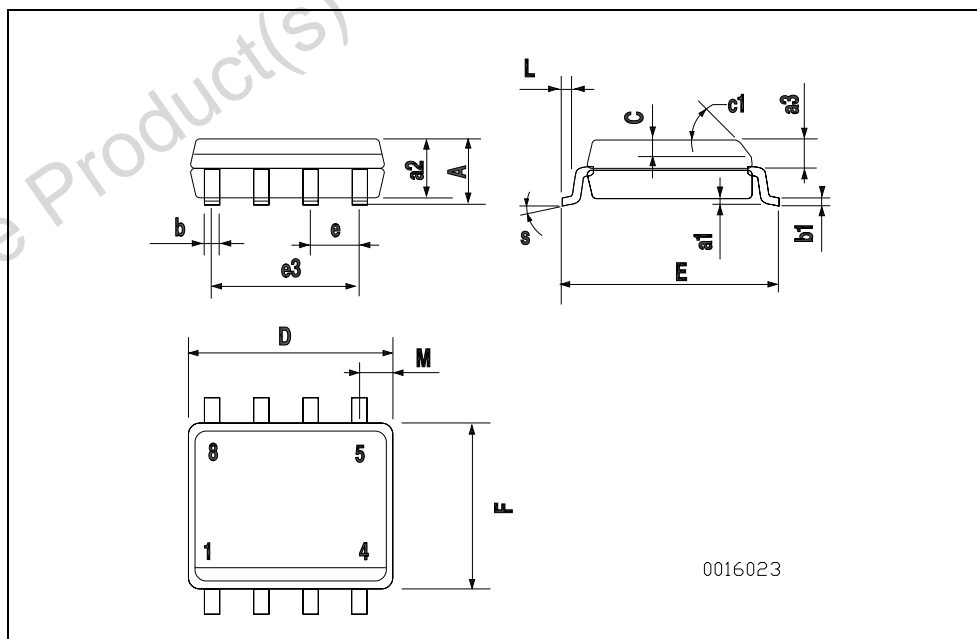
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

Obsolete Product(s) - Obsolete Product(s)

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Nov-2007	10	Document status promoted from preliminary data to datasheet

Obsolete Product(s) - Obsolete Product(s)

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