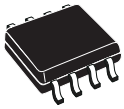
STS4DNFS30

N-channel - 30V - 0.044Ω - 4.5A SO-8
STripFET™ Power MOSFET plus schottky rectifier

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STS4DNFS30	30V	<0.055Ω	4.5A
Schottky	$I_{F(AV)}$	V_{RRM}	$V_{F(MAX)}$
	4.5A	30V	0.53V



SO-8

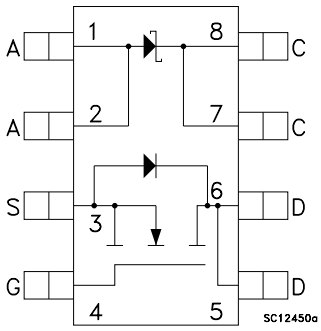
Description

This product associates the latest low voltage STripFET™ in n-channel version to a low drop Schottky diode. Such configuration is extremely versatile in implementing a large variety of DC-DC converters for printers, portable equipment.

Applications

- Switching application

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STS4DNFS30	S4DNFS30	SO-8	Tape & reel

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2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 6

3 Test circuits 8

4 Package mechanical data 9

5 Revision history 11

1 Electrical ratings

Table 1. Mosfet absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{GS}	Gate- source voltage	± 20	V
I_D	Drain current (continuous) at T_C = 25°C	4.5	A
I_D	Drain current (continuous) at T_C = 100°C	3.2	A
I_{DM} (1)	Drain current (pulsed)	13	A
P_{TOT}	Total dissipation at T_C = 25°C	2	W

1. Pulse width limited by safe operating area

Table 2. Schottky absolute maximum ratings

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		30	V
$I_{F(RMS)}$	RMS forward current		10	A
$I_{F(AV)}$	Average forward current	T_L=125°C δ=0.5	4	A
I_{FSM}	Surge non repetitive forward current	tp=10ms Sinusoidal	75	A
I_{RRM}	Repetitive peak reverse current	tp=2µs F=1kHz	1	A
I_{RSM}	Non repetitive peak reverse current	tp=100µs	1	A
dv/dt	Critical rate of rise of reverse voltage		10000	v/µs

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-amb	Thermal resistance junction-amb Mosfet (1)	62.5	°C/W
T_{stg}	Storage temperature range Max	-55 to 150	°C
T_j	Junction temperature	-55 to 150	°C

1. Mounted on FR-4 board (steady state)

2 Electrical characteristics

(Tcase =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 = 250µA, V_{GS} = 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating V_{DS} = Max rating, T_C=125°C			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 2A V_{GS} = 5V, I_D = 2A		0.044	0.055 0.085	Ω Ω

Table 5. Static

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25°C T_j = 100°C	V_R = V_{RRM}		 6	200 15	µA mA
V_F (1)	Zero gate voltage drain current (V_{GS} = 0)	T_j = 25°C T_j = 125°C	I_F = 2A		 0.325	0.45 0.375	V V
		T_j = 25°C T_j = 125°C	I_F = 4A		 0.43	0.53 0.51	V V

1. Pulse test: tp=380µs, δ < 2%. To evaluate the conduction losses use the following equation:

$$P = 0.24 \times I_{F(AV)} + 0.068 I_{F^2}(RMS)$$

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	V_{DS} =10V, I_D =2A		5		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		330 115 28		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 15V, I_D = 4.5A, V_{GS} = 5V (see *Figure 13*)		4.7 1.2 2.1		nC nC nC

Table 7. Switching times

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 15V, I_D = 2A, R_G = 4.7Ω, V_{GS} = 5V (see *Figure 12*)		9 17		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD} = 15V, I_D = 2A, R_G = 4.7Ω, V_{GS} = 5V (see *Figure 12*)		15 6		ns ns

Table 8. Source drain diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				4.5 13	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 4.5A, V_{GS} = 0			1.2	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 4.5A, di/dt = 100A/µs V_{DD} = 15V, T_j = 150°C (see *Figure 17*)		22 14.3 1.3		ns nC 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 1. Safe operating area

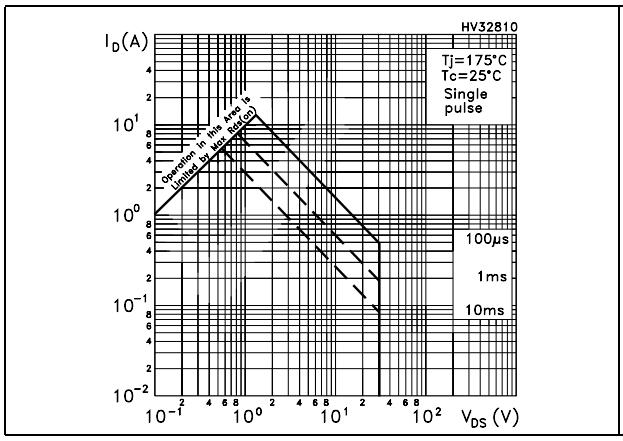


Figure 2. Thermal impedance

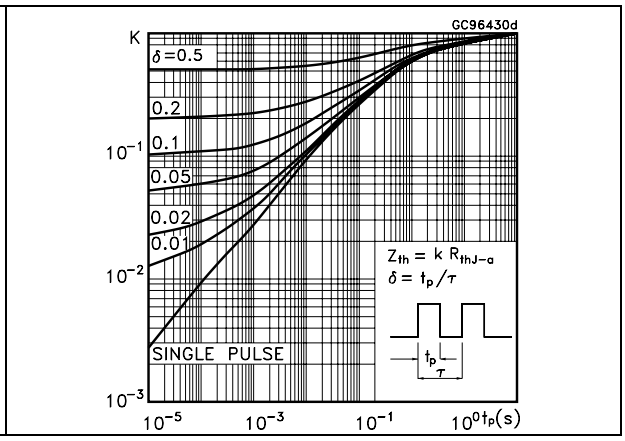


Figure 3. Output characterisics

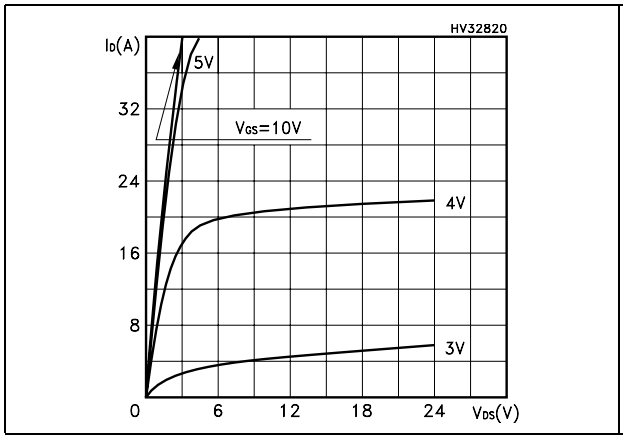


Figure 4. Transfer characteristics

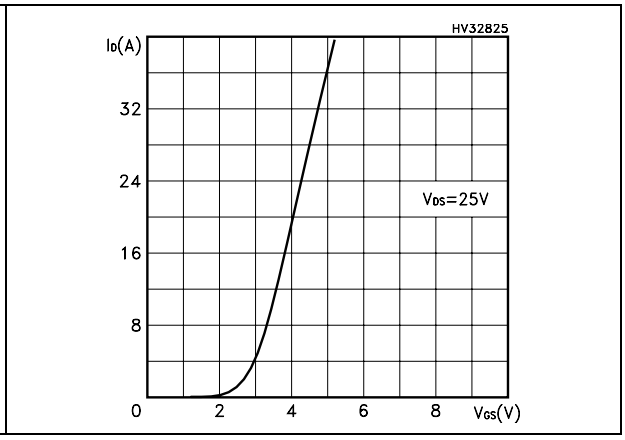


Figure 5. Source-drain diode forward characteristics

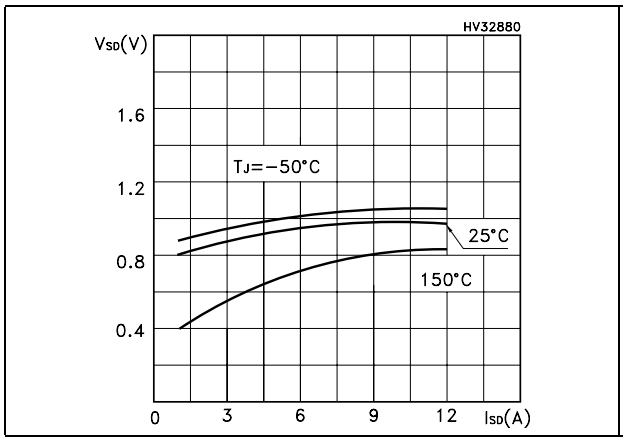


Figure 6. Static drain-source on resistance

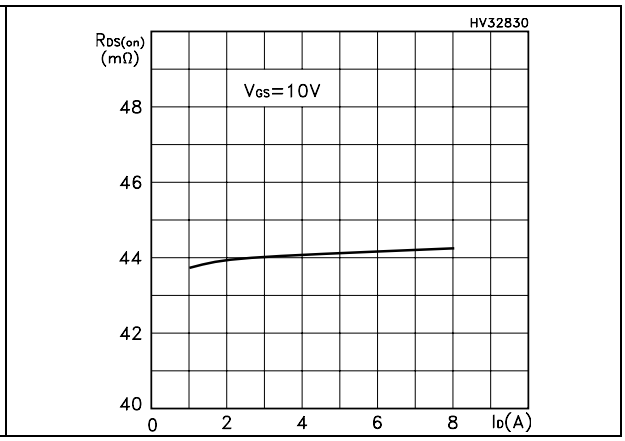


Figure 7. Gate charge vs gate-source voltage

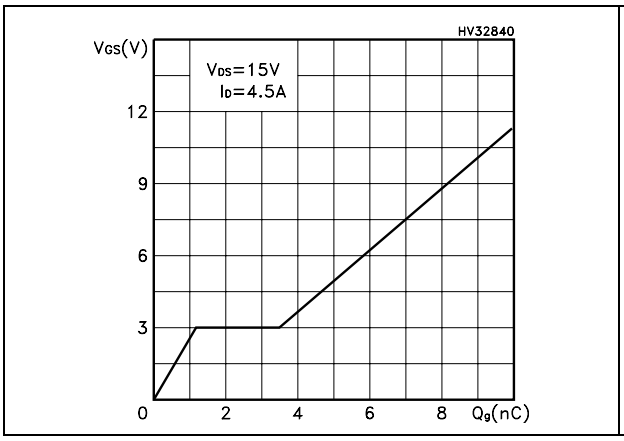


Figure 8. Capacitance variations

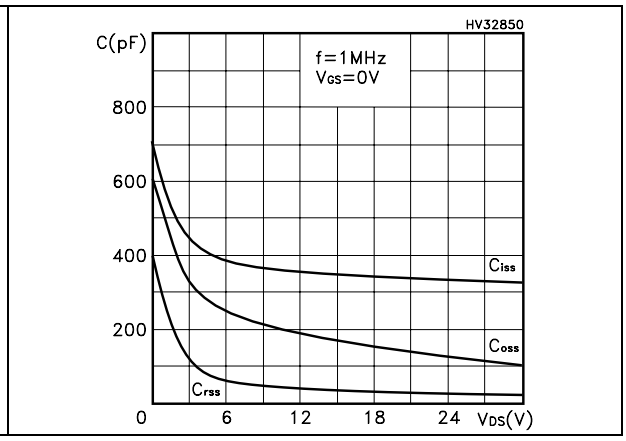


Figure 9. Normalized gate threshold voltage vs temperature

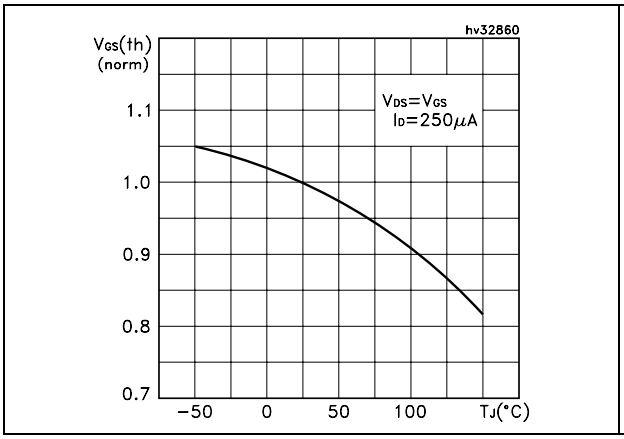


Figure 10. Normalized on resistance vs temperature

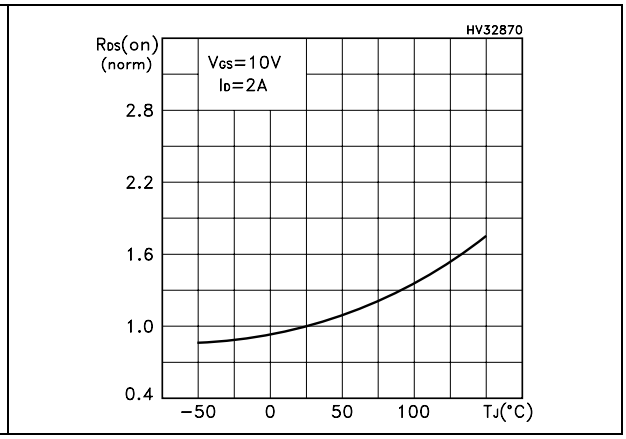
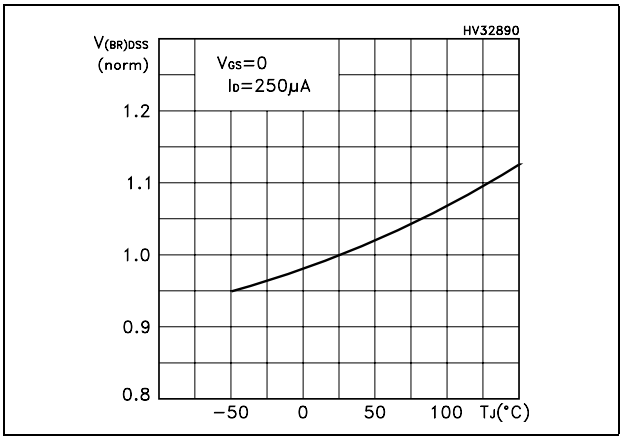


Figure 11. Normalized BV_{DSS} voltage vs temperature



3 Test circuits

Figure 12. Switching times test circuit for resistive load

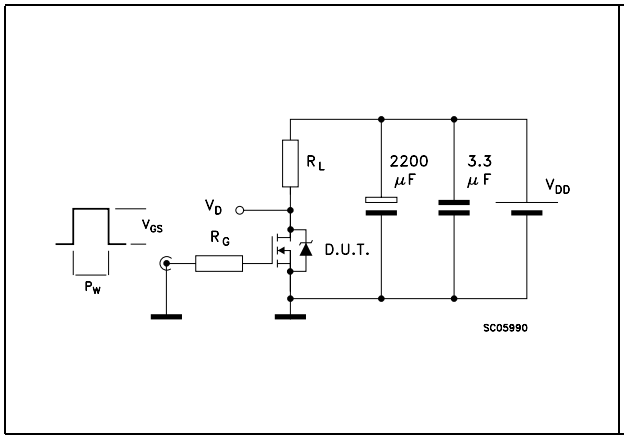


Figure 13. Gate charge test circuit

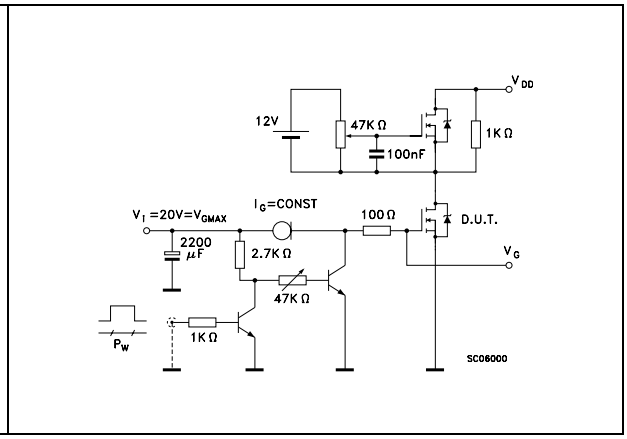


Figure 14. Test circuit for inductive load switching and diode recovery times

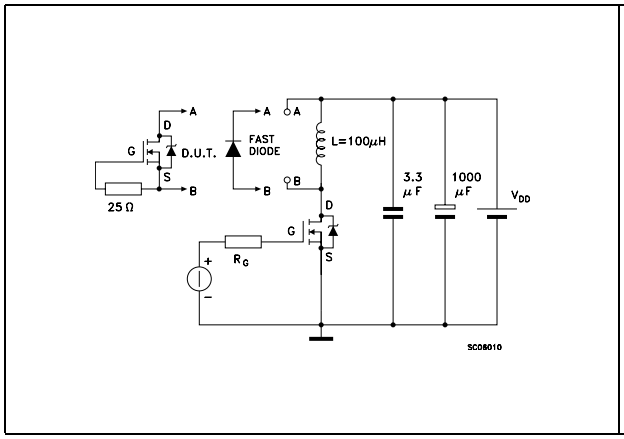


Figure 15. Unclamped inductive load test circuit

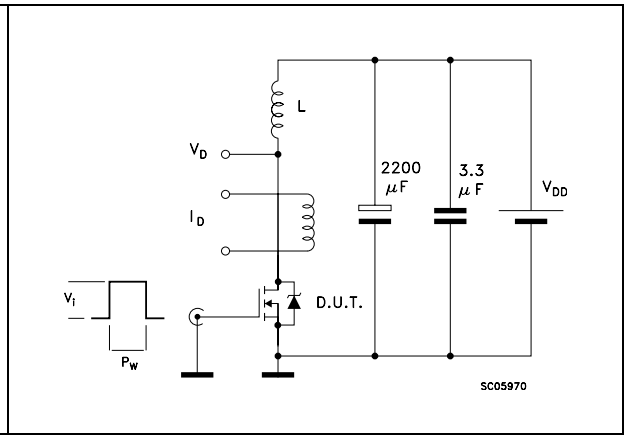


Figure 16. Unclamped inductive waveform

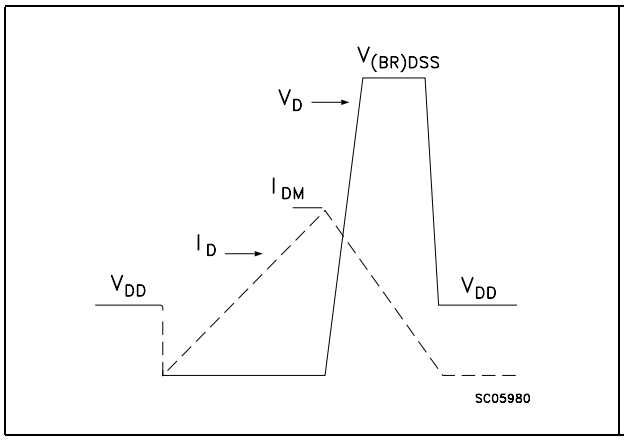
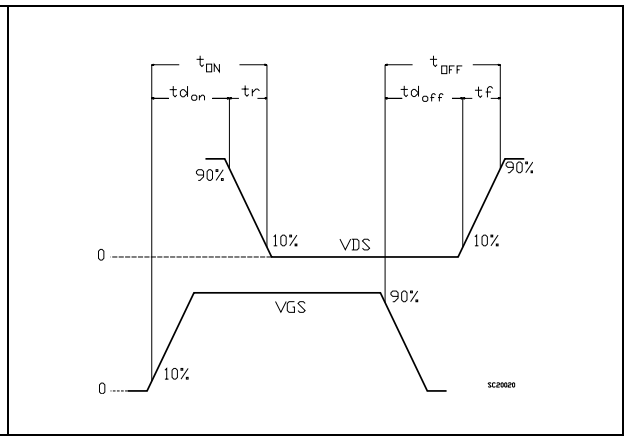


Figure 17. Switching time waveform

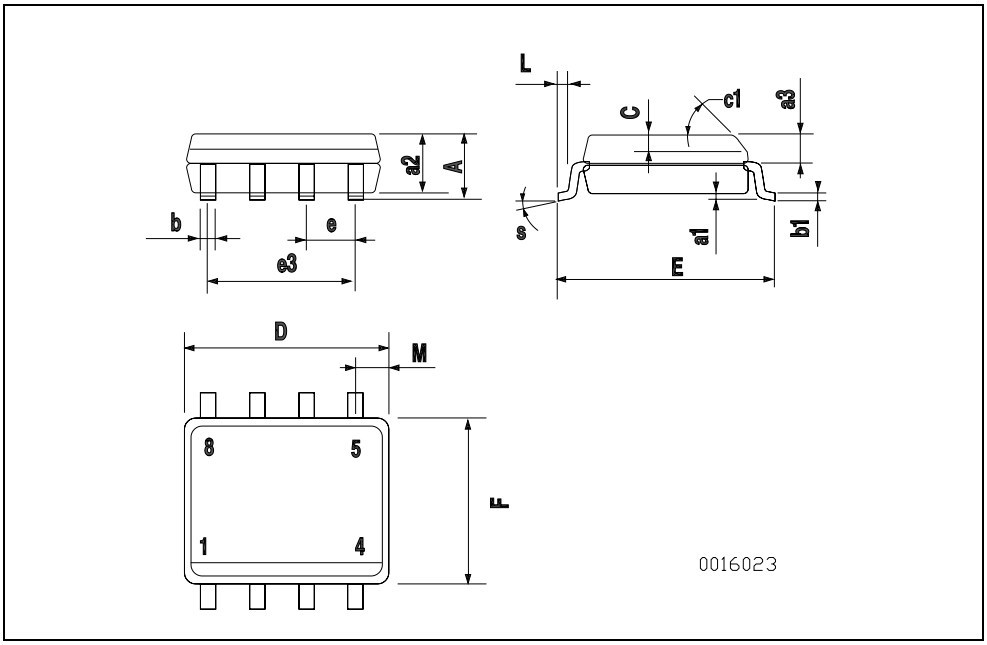


4 Package mechanical data

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*

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. Revision history

Date	Revision	Changes
19-Jul-2005	1	First release

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