



STS5N15M3

N-channel 150 V, 45 mΩ, 5 A, SO-8
ultra low gate charge MDmesh™ III Power MOSFET

Features

Type	V _{DSS}	R _{DS(on) max}	I _D
STS5N15M3	150 V	< 0.057 Ω	5 A

- Low on-resistance
- Low input capacitance and gate charge
- Low gate input resistance
- High dv/dt avalanche capabilities

Application

- Switching applications

Description

This device is realized with the third generation of MDmesh™ technology. This Power MOSFET associates an improved vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. It is therefore suitable for the most demanding high efficiency converters.

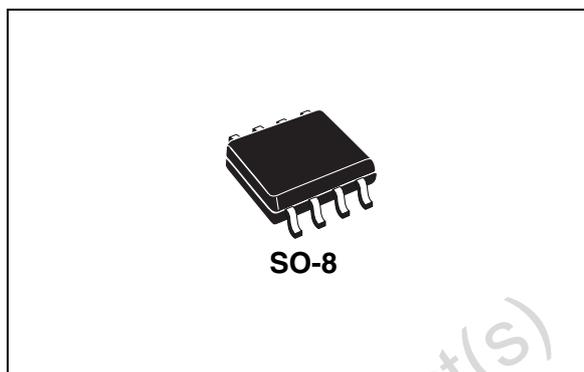


Figure 1. Internal schematic diagram

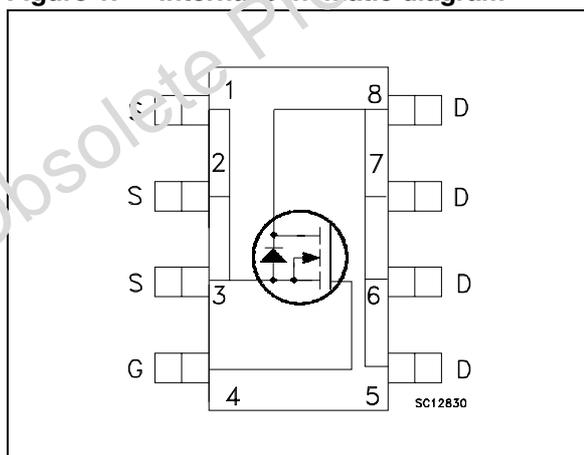


Table 1. Device summary

Order code	Marking	Package	Packaging
STS5N15M3	5R15-	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 ($V_{GS} = 0$)	150	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	5	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	3.2	A
$I_{DM}^{(1)}$	Drain current (pulsed)	20	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	2.5	W
T_{stg}	Storage temperature	-55 to 150	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	50	$^\circ\text{C}/\text{W}$

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

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	2.5	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AS}$, $V_{DD} = 140\text{ V}$)	1.6	J

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	150			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 150\text{ V}$, $V_{DS} = 150\text{ V}$, @ 125 °C			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 2.5\text{ A}$		0.045	0.057	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		1300		pF
C_{oss}	Output capacitance			140		pF
C_{rss}	Reverse transfer capacitance			20.5		pF
Q_g	Total gate charge	$V_{DD} = 75\text{ V}$, $I_D = 5\text{ A}$		29		nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$		3.6		nC
Q_{gd}	Gate-drain charge	Figure 14 on page 8		14.6		nC
R_g	Gate input resistance	$f = 1\text{ MHz}$ Gate DC Bias = 0 Test signal level = 20 mV open drain		3.7		Ω

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=75\text{ V}$, $I_D=2.5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ <i>Figure 13 on page 8</i>		9		ns
t_r	Rise time			13		ns
$t_{d(off)}$	Turn-off delay time			46		ns
t_f	Fall time			20		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				20	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=5\text{ A}$, $V_{GS}=0$			1.3	V
t_{rr}	Reverse recovery time	$I_{SD}=5\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$, $V_R=40\text{ V}$, $T_J=150\text{ }^\circ\text{C}$ <i>Figure 15 on page 8</i>		110		ns
Q_{rr}	Reverse recovery charge			498		nC
I_{RRM}	Reverse recovery current			9.1		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

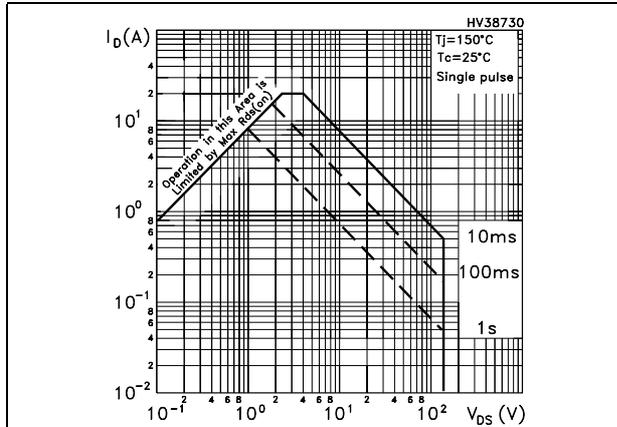


Figure 3. Thermal impedance

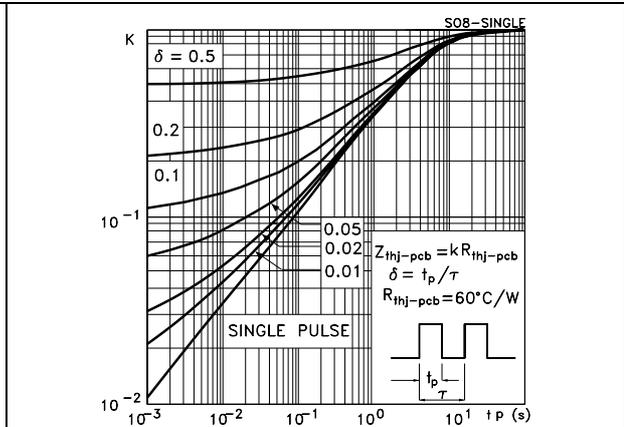


Figure 4. Output characteristics

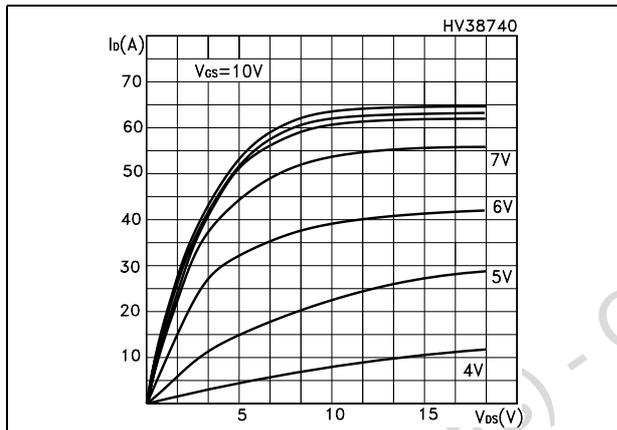


Figure 5. Transfer characteristics

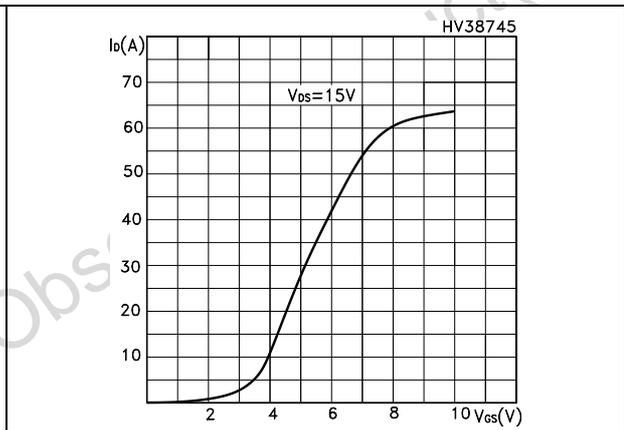


Figure 6. Normalized BV_{DSS} vs temperature

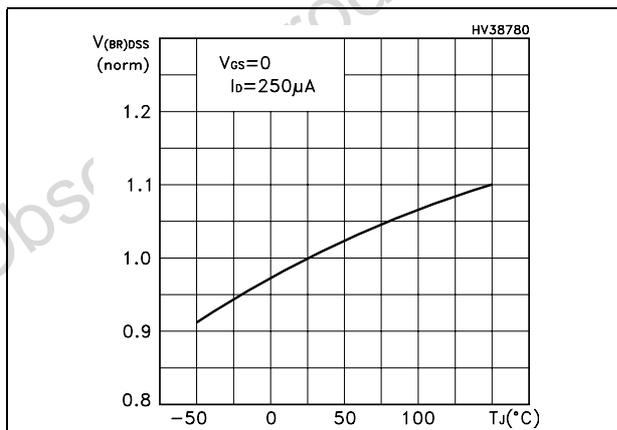


Figure 7. Static drain-source on resistance

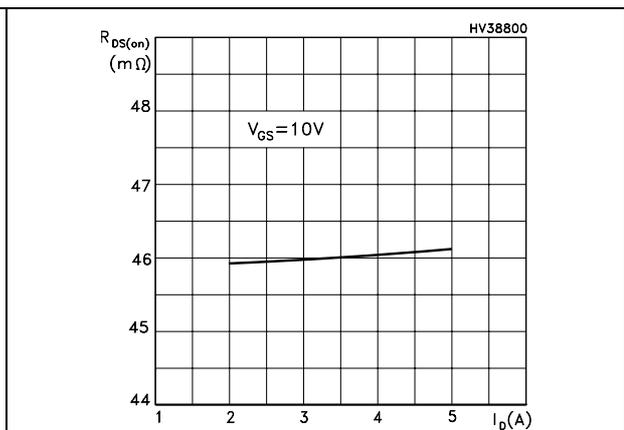


Figure 8. Capacitance variations

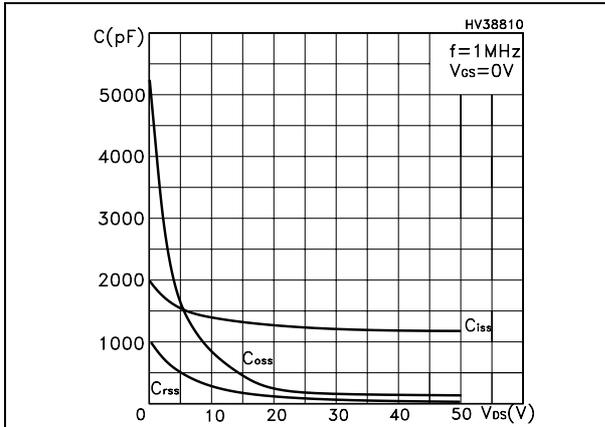


Figure 9. Gate charge vs gate-source voltage

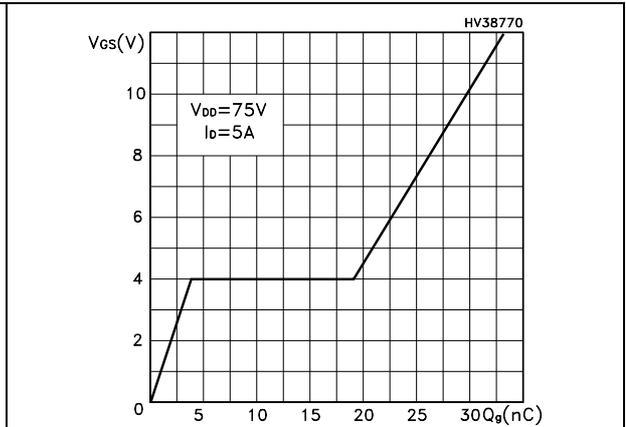


Figure 10. Normalized gate threshold voltage vs temperature

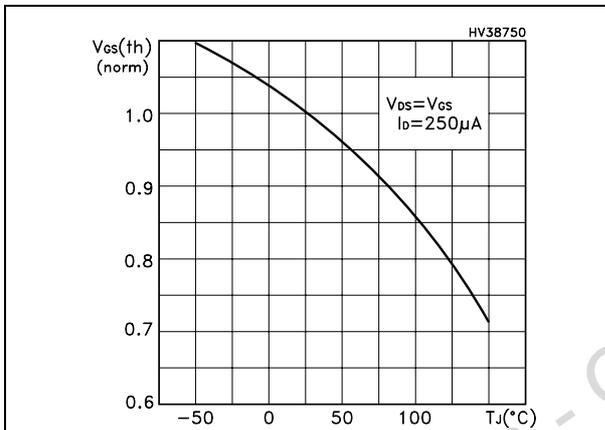


Figure 11. Normalized on resistance vs temperature

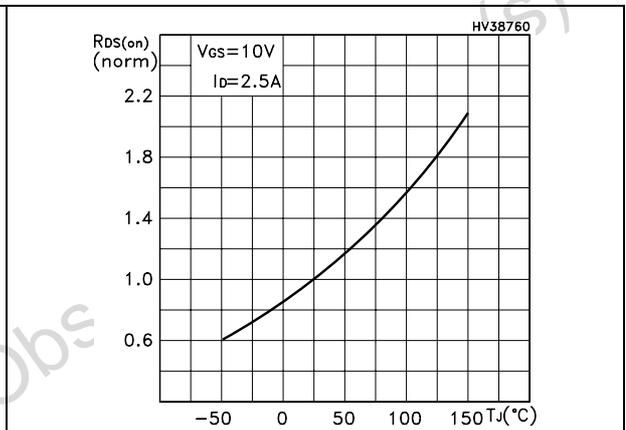
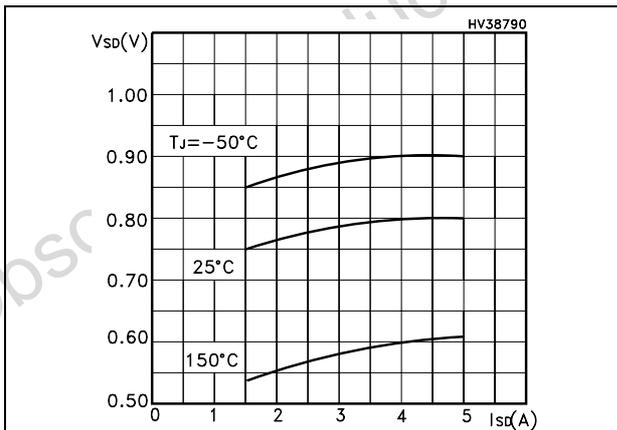


Figure 12. Source-drain diode forward characteristics



3 Test circuit

Figure 13. Switching times test circuit for resistive load

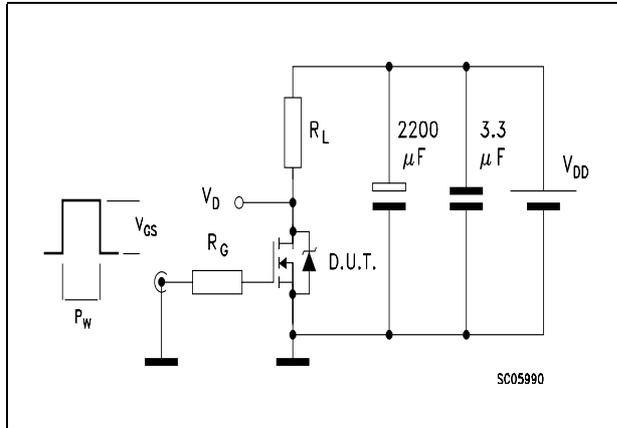


Figure 14. Gate charge test circuit

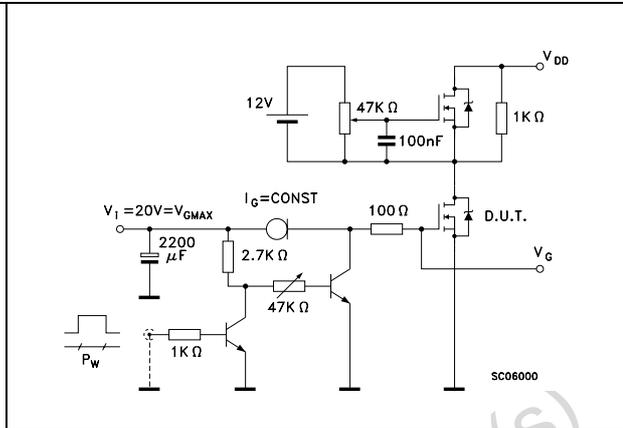


Figure 15. Test circuit for inductive load switching and diode recovery times

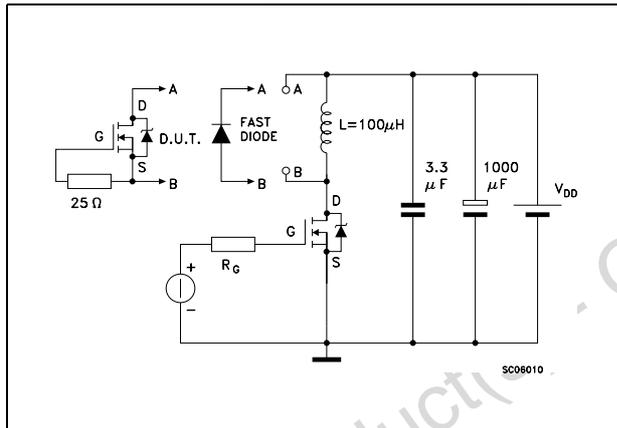


Figure 16. Unclamped inductive load test circuit

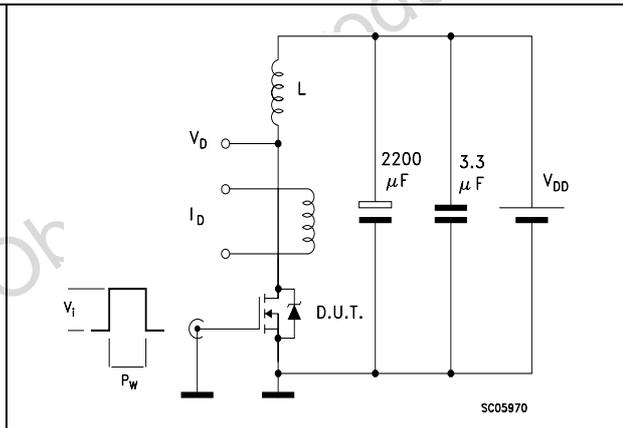


Figure 17. Unclamped inductive waveform

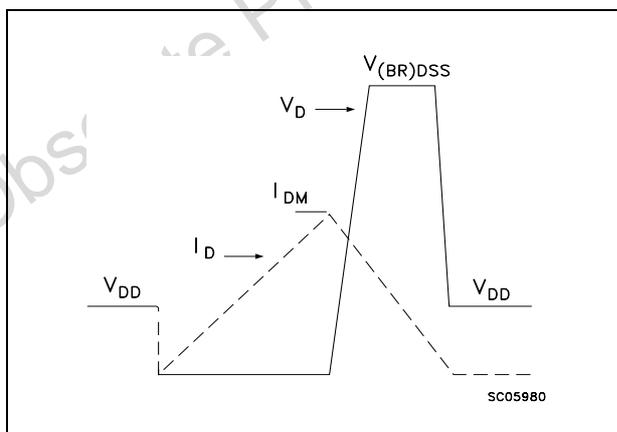
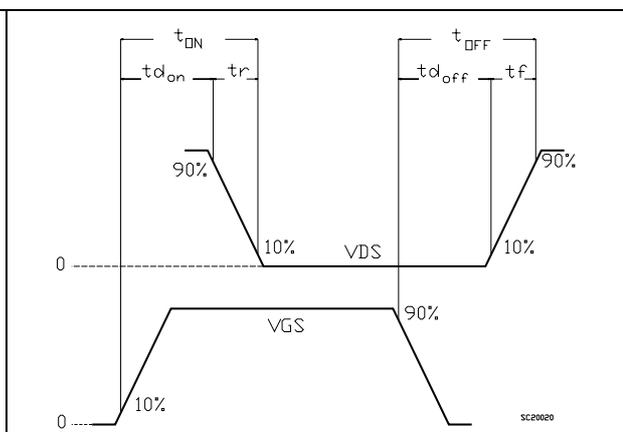


Figure 18. Switching time waveform



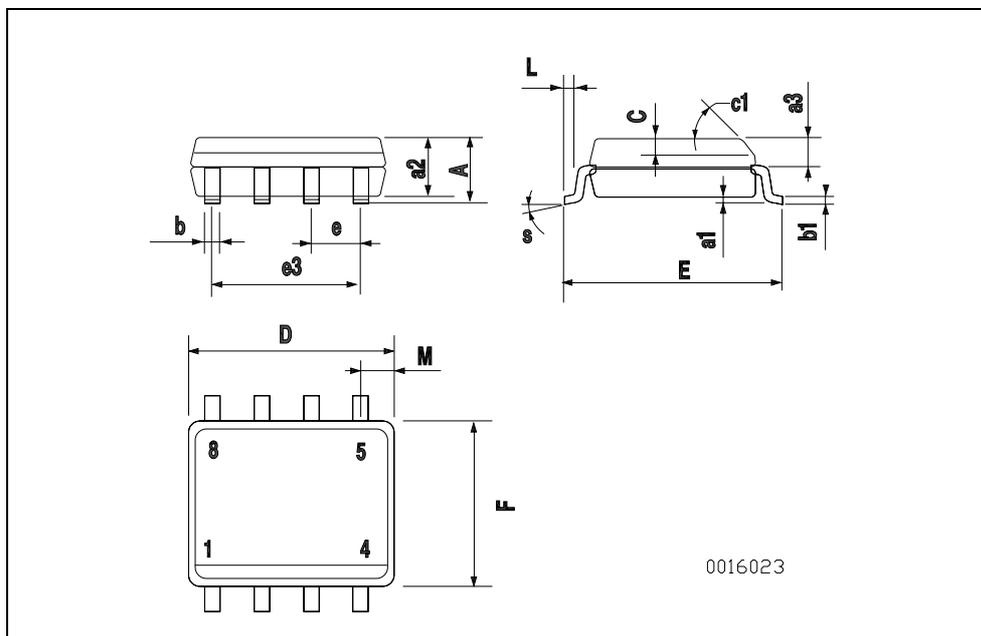
4 Package mechanical data

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.)					



0016023

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
02-Apr-2007	1	First release
25-Jun-2008	2	Modified values in Table 6: Dynamic

Obsolete Product(s) - Obsolete Product(s)

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