



# STS5N15F3

N-channel 150 V, 0.045  $\Omega$ , 5 A, SO-8  
STripFET™ III Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STS5N15F3	150 V	< 0.057 $\Omega$	5 A

- Low on-resistance
- Low input capacitance and gate charge
- Low gate input resistance

## Application

- Switching applications

## Description

This product utilizes the latest advanced design rules of ST's proprietary STripFET™ technology which is suitable for the most demanding DC-DC converter applications where high efficiency is required.

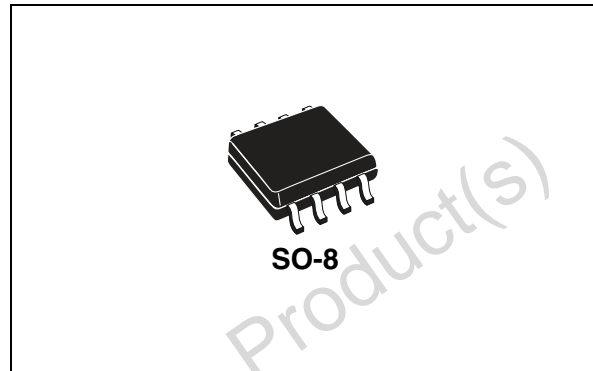


Figure 1. Internal schematic diagram

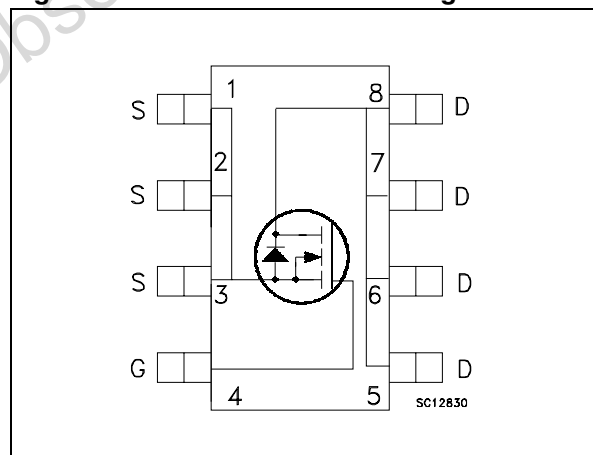


Table 1. Device summary

Order code	Marking	Package	Packaging
STS5N15F3	5F15-	SO-8	Tape and reel

# Contents

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# 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	$\pm 20$	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 inch<sup>2</sup>, 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 $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AS}$ , $V_{DD} = 140\text{ V}$ )	300	mJ

## 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 ( $V_{GS} = 0$ )	$V_{DS} = 150\text{ V}$ , $V_{DS} = 150\text{ V}$ , @ $125\text{ °C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	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	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$		1300		pF
$C_{oss}$	Output capacitance		-	140	-	pF
$C_{rss}$	Reverse transfer capacitance			20.5		pF
$Q_g$	Total gate charge	$V_{DD} = 75\text{ V}$ , $I_D = 5\text{ A}$ $V_{GS} = 10\text{ V}$ <i>Figure 14 on page 8</i>		29		nC
$Q_{gs}$	Gate-source charge		-	3.6	-	nC
$Q_{gd}$	Gate-drain charge			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	-	$\Omega$

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 75\text{ V}$ , $I_D = 2.5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$ <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	$I_{SD} = 5 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_R = 40 \text{ V}, T_J = 150 \text{ }^\circ\text{C}$ <a href="#">Figure 15 on page 8</a>	-	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 $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

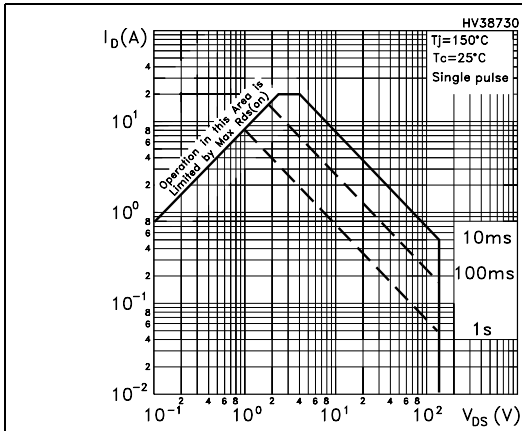


Figure 3. Thermal impedance

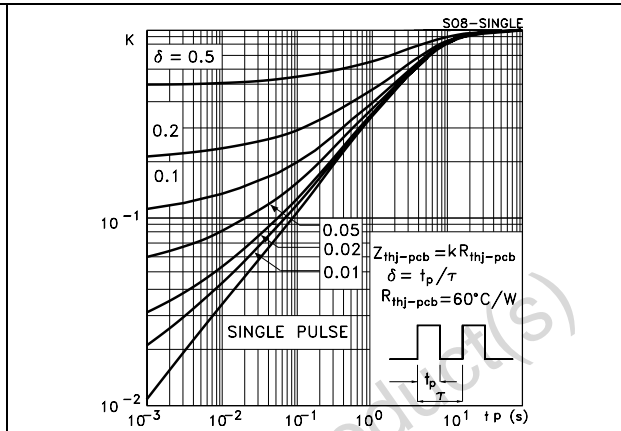


Figure 4. Output characteristics

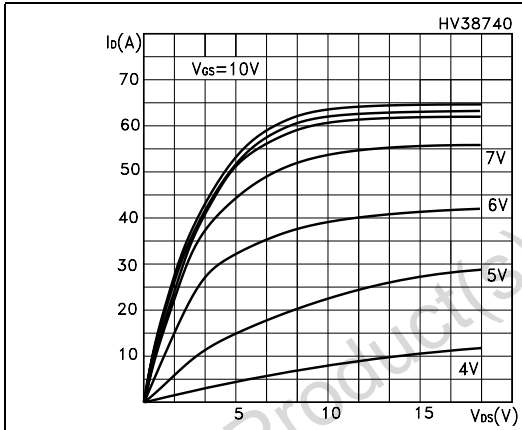


Figure 5. Transfer characteristics

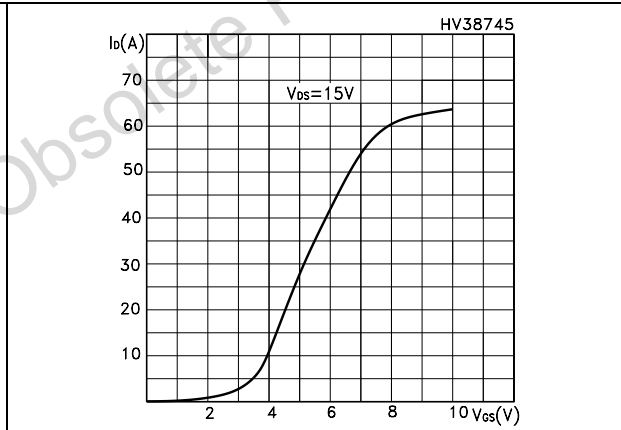


Figure 6. Normalized  $BV_{DSS}$  vs temperature

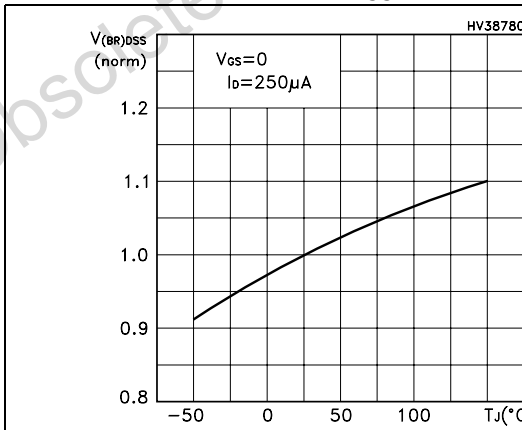


Figure 7. Static drain-source on resistance

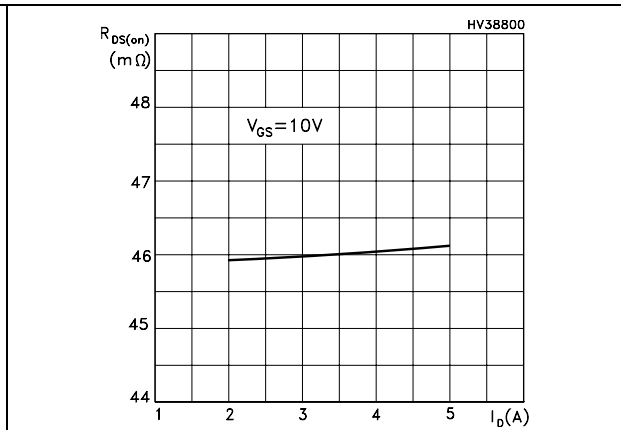


Figure 8. Capacitance variations

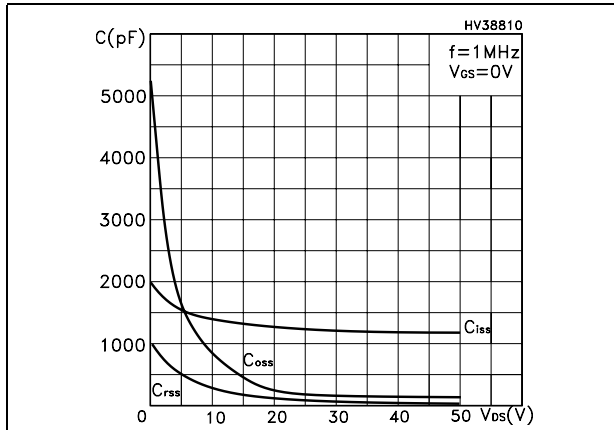


Figure 9. Gate charge vs gate-source voltage

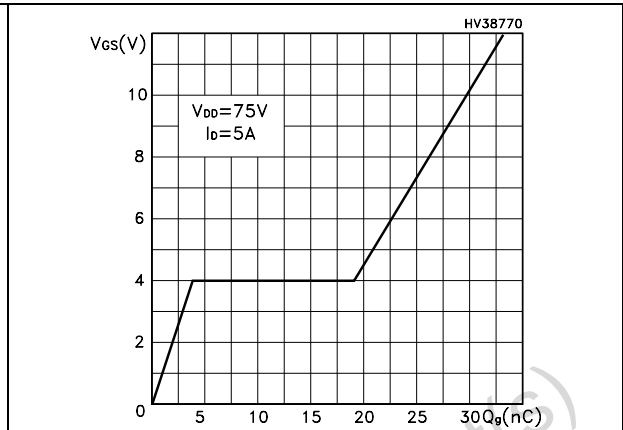


Figure 10. Normalized gate threshold voltage vs temperature

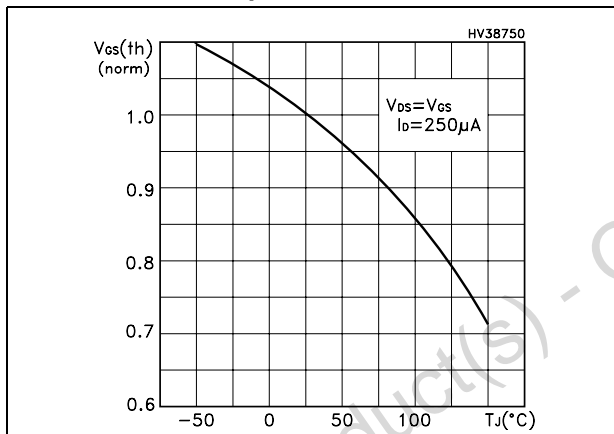


Figure 11. Normalized on resistance vs temperature

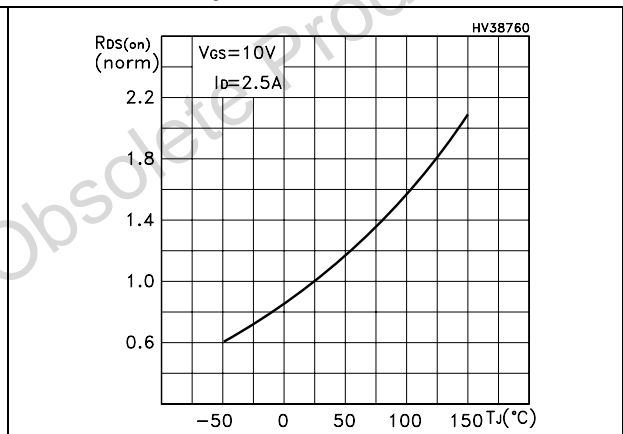
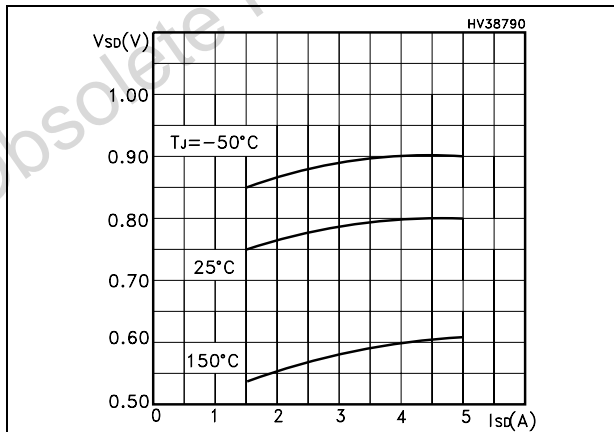
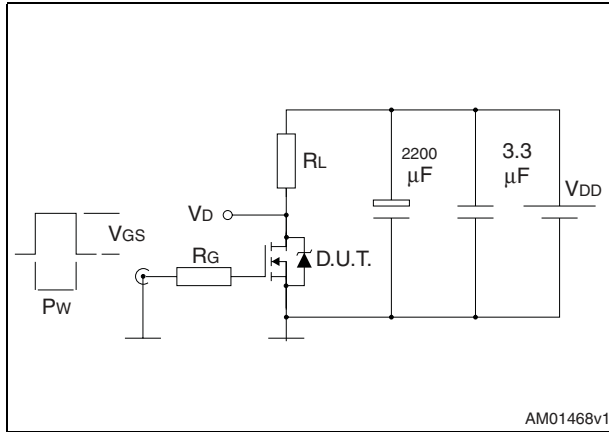


Figure 12. Source-drain diode forward characteristics

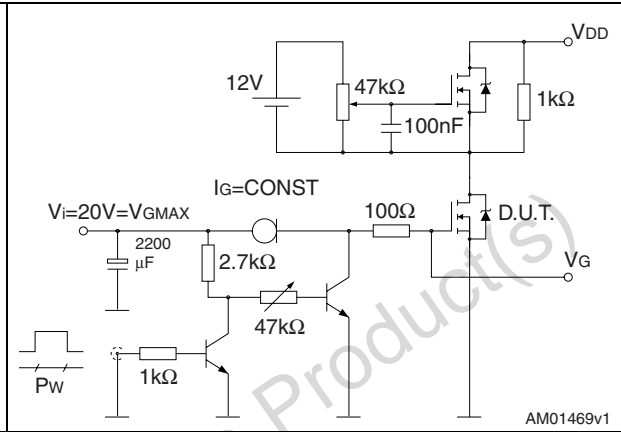


### 3 Test circuit

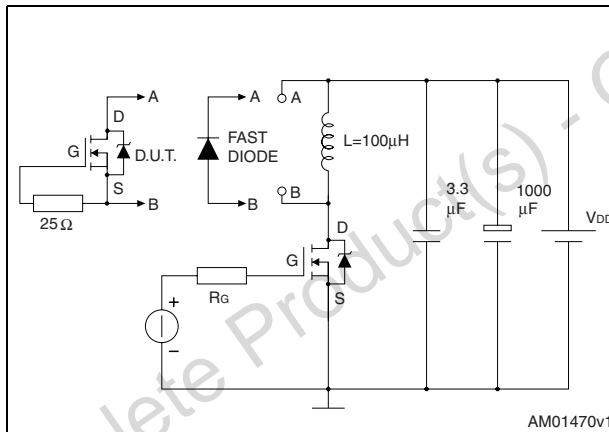
**Figure 13. Switching times test circuit for resistive load**



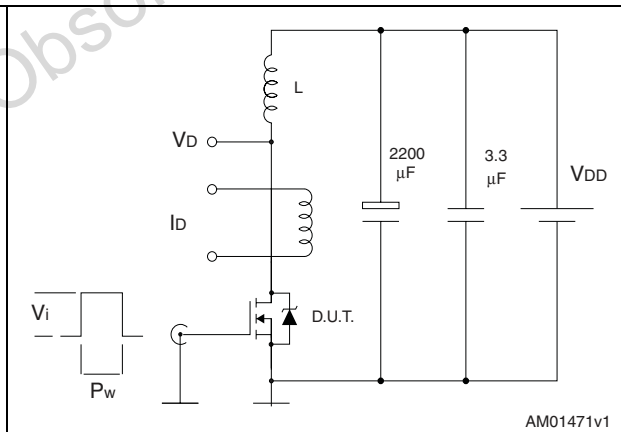
**Figure 14. Gate charge test circuit**



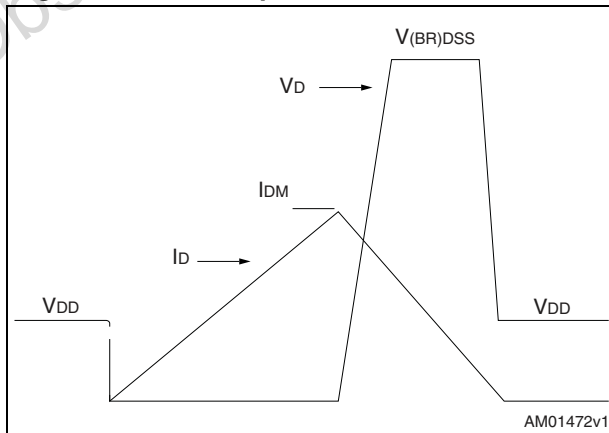
**Figure 15. Test circuit for inductive load switching and diode recovery times**



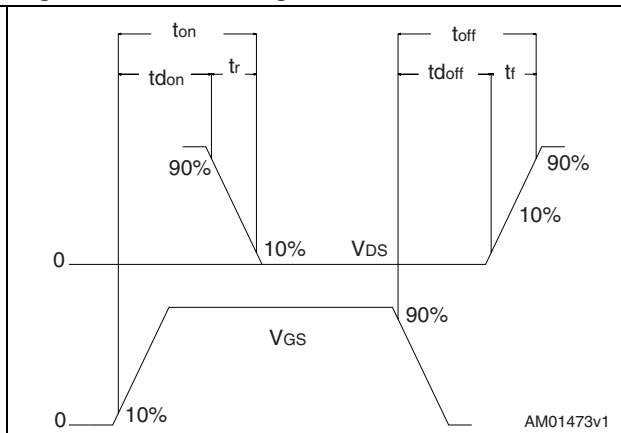
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**





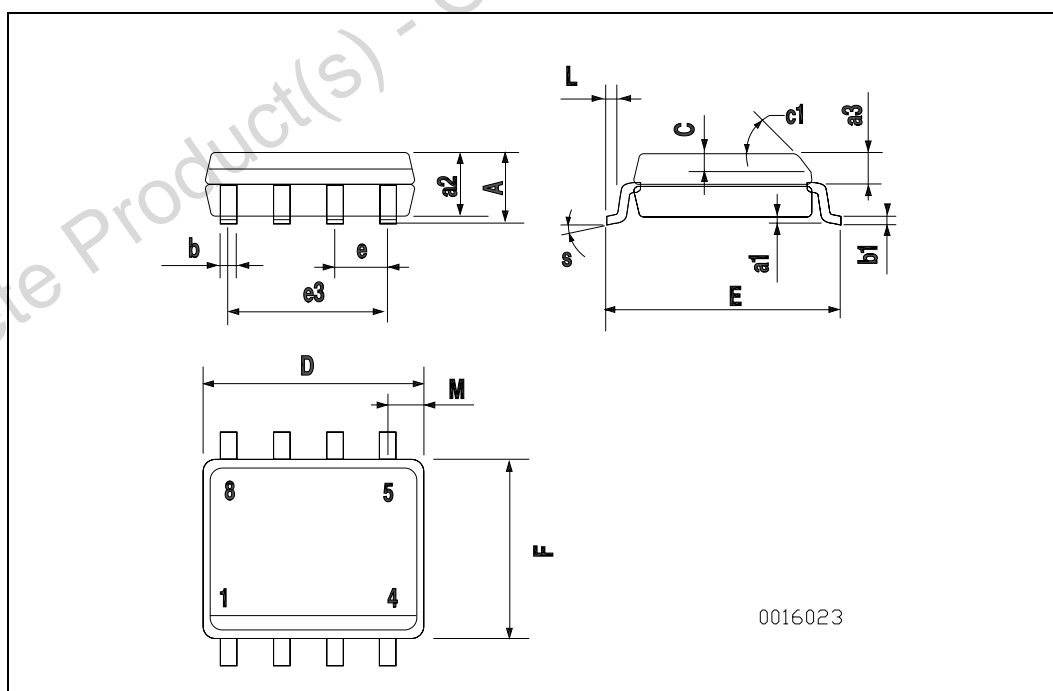
## 4 Package mechanical data

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**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
03-Mar-2009	1	First release
23-Aug-2010	2	Updated <a href="#">Table 1: Device summary</a> .

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