



# STS10N3LH5

N-channel 30 V, 0.019  $\Omega$ , 10 A, SO-8  
STripFET™ V Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STS10N3LH5	30 V	0.021 $\Omega$	10 A

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- Very low switching gate charge
- High avalanche ruggedness
- Low gate drive power losses

## Application

- Switching applications

## Description

This STripFET™V 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 FOM.

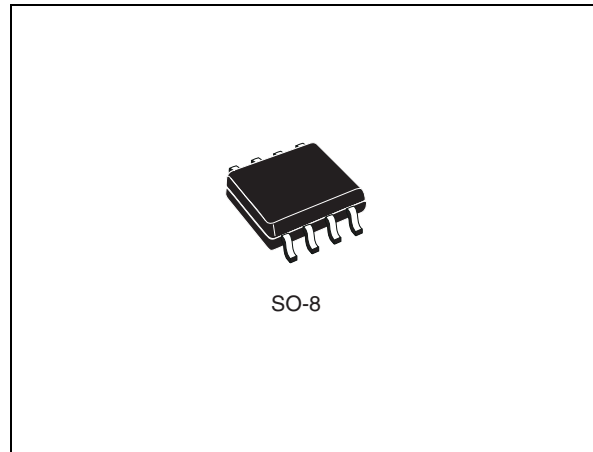


Figure 1. Internal schematic diagram

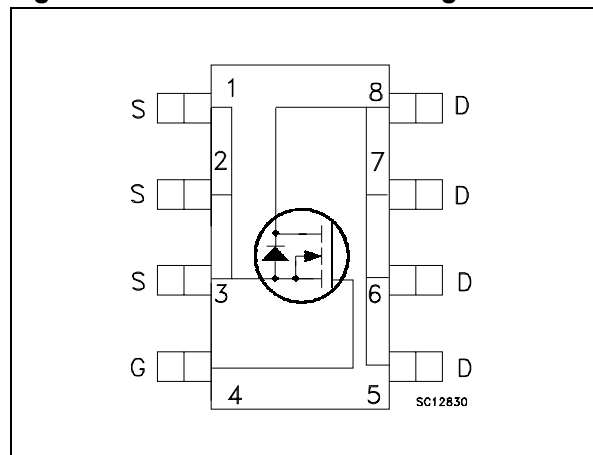


Table 1. Device summary

Order codes	Marking	Package	Packaging
STS10N3LH5	10D3L	SO-8	Tape and reel

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>10</b>
<b>5</b>	<b>Revision history</b> .....	<b>12</b>

# 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	$\pm 22$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	10	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	7	A
$I_{DM}^{(2)}$	Drain current (pulsed)	40	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	2.5	W
	Derating factor	0.02	W/ $^\circ\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	50	mJ
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	- 55 to 150	$^\circ\text{C}$

1. Limited by wire bonding
2. Pulse width limited by safe operating area
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 21\text{ A}$ ,  $L = 0.2\text{ mH}$

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case max	50	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance junction-case max	100	$^\circ\text{C}/\text{W}$
$T_J$	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

## 2 Electrical characteristics

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

**Table 4. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 30\text{ V}$ $V_{DS} = 30\text{ V}$ , $T_c = 125\text{ °C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 22\text{ V}$			$\pm 100$	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	$V_{GS} = 10\text{ V}$ , $I_D = 5\text{ A}$		0.019	0.021	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 5\text{ A}$		0.023	0.028	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	475	-	pF
$C_{oss}$	Output capacitance			97		pF
$C_{rss}$	Reverse transfer capacitance			19		pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 10\text{ A}$	-	4.6	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 5\text{ V}$		1.7		nC
$Q_{gd}$	Gate-drain charge	( <i>Figure 14</i> )		1.9		nC
$Q_{gs1}$	Pre $V_{th}$ gate-to-source charge	$V_{DD} = 15\text{ V}$ , $I_D = 10\text{ A}$	-	0.67	-	nC
$Q_{gs2}$	Post $V_{th}$ gate-to-source charge	$V_{GS} = 5\text{ V}$ ( <i>Figure 19</i> )		0.84		nC
$R_G$	Gate input resistance	$f = 1\text{ MHz}$ gate bias Bias = 0 test signal level = 20 mV open drain	-	2.5	-	$\Omega$

**Table 6. Switching on/off (resistive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Figure 13 and Figure 18)	-	4 22	-	ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 15\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Figure 13 and Figure 18)	-	13 2.8	-	ns ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		10 40	A A
$V_{SD}$	Forward on voltage	$I_{SD} = 5\text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 10\text{ A}$ , $V_{DD} = 25\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ , (Figure 15)	-	16.2 7.8 1		ns nC A

1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

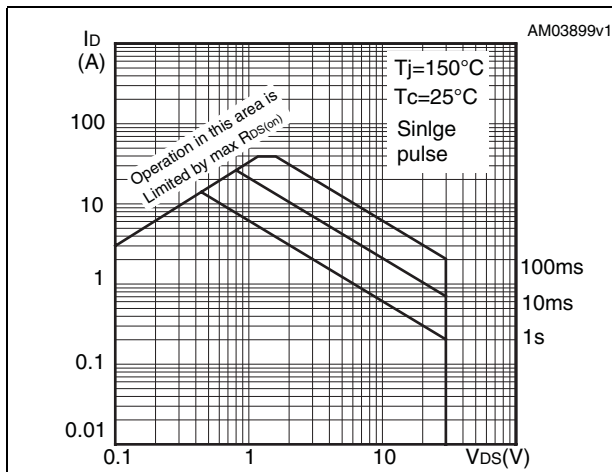


Figure 3. Thermal impedance

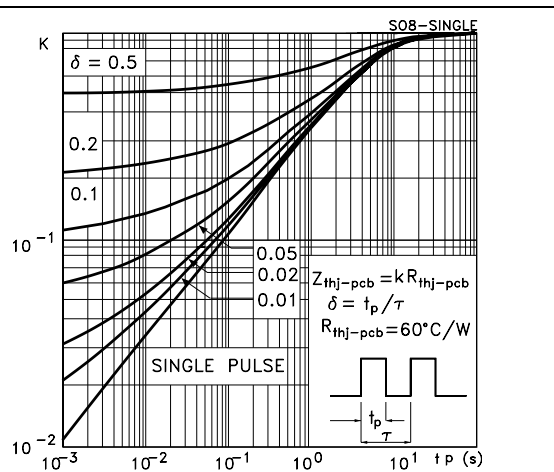


Figure 4. Output characteristics

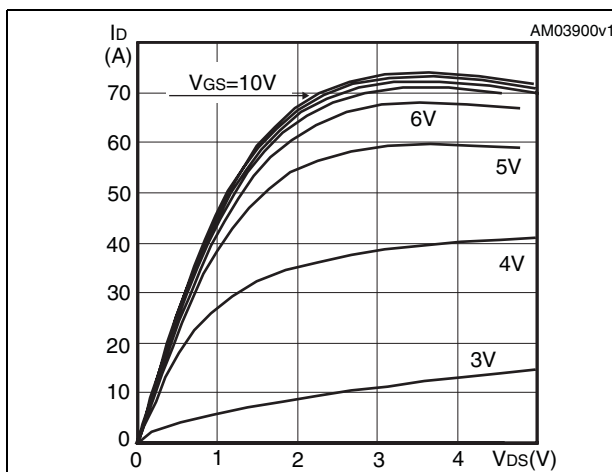


Figure 5. Transfer characteristics

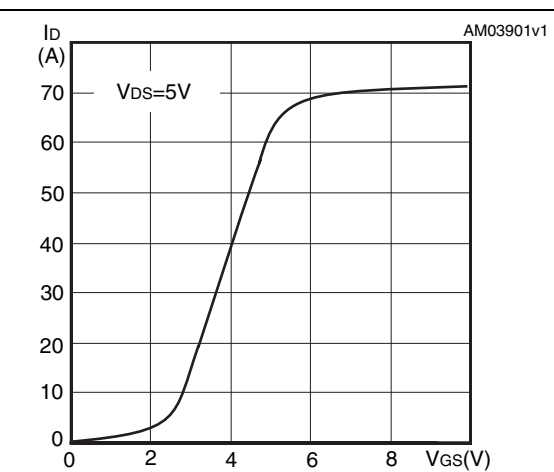


Figure 6. Normalized  $BV_{DSS}$  vs temperature

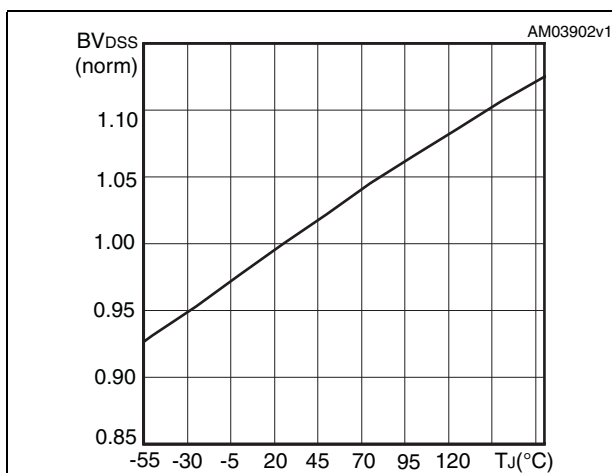


Figure 7. Static drain-source on resistance

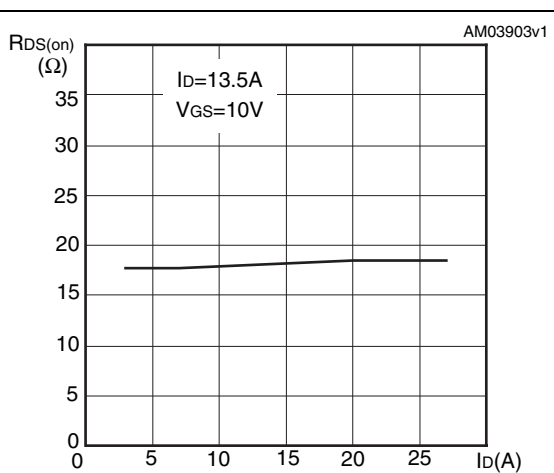


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

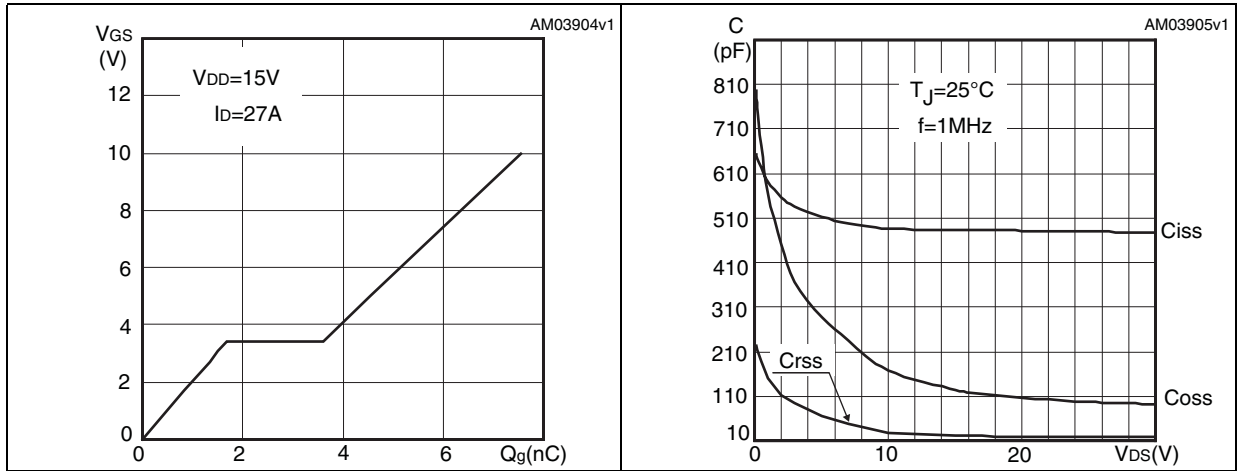


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

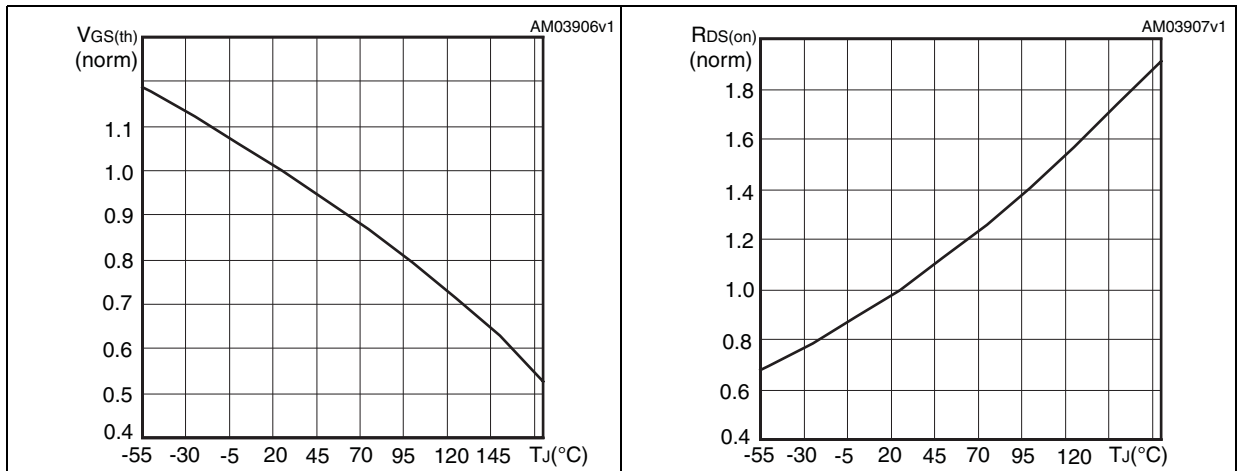
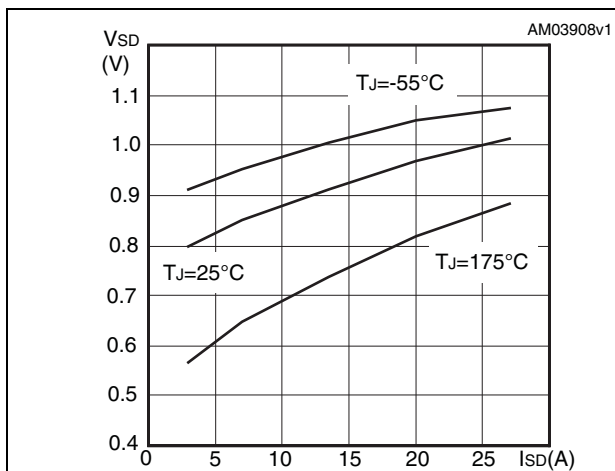
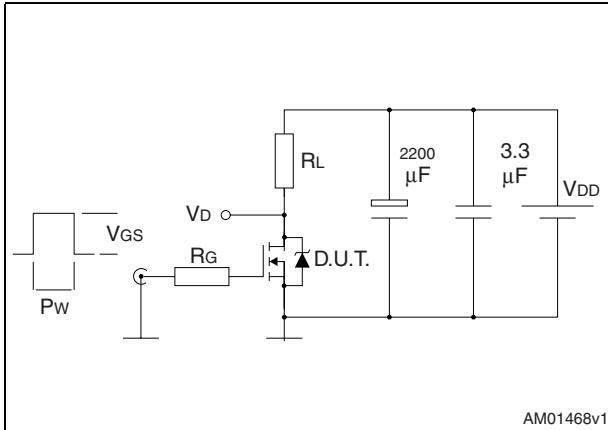


Figure 12. Source-drain diode forward characteristics

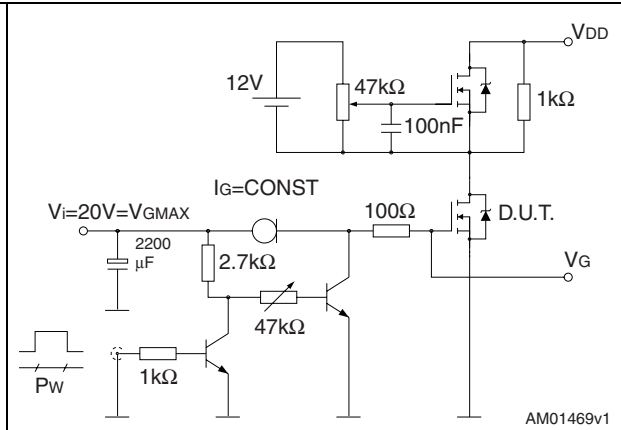


### 3 Test circuits

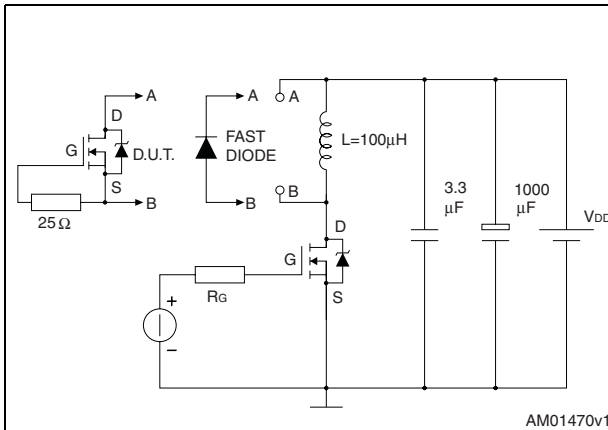
**Figure 13. Switching times test circuit for resistive load**



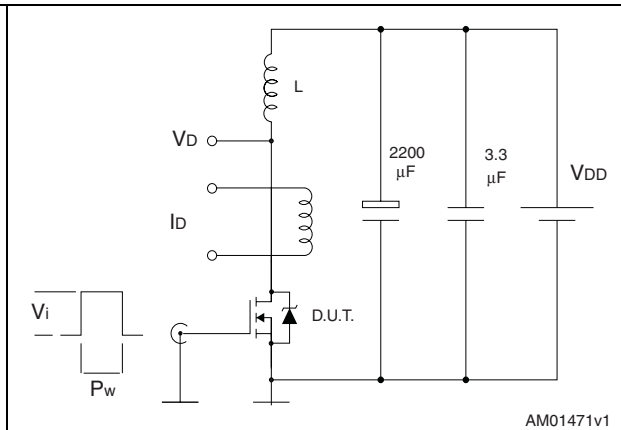
**Figure 14. Gate charge test circuit**



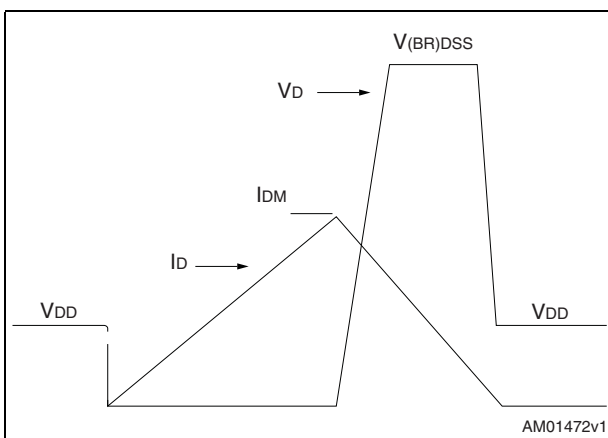
**Figure 15. Test circuit for inductive load switching and diode recovery times**



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



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**

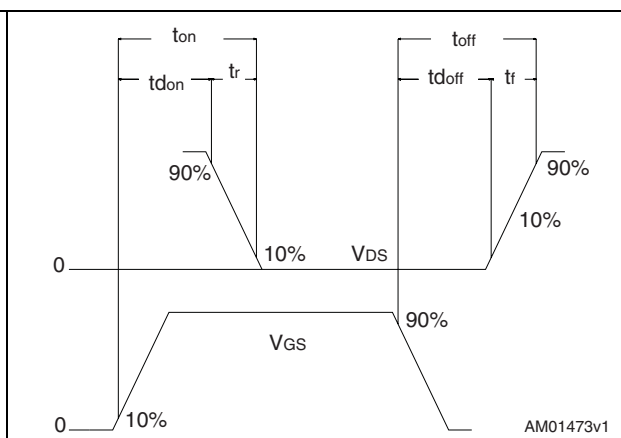
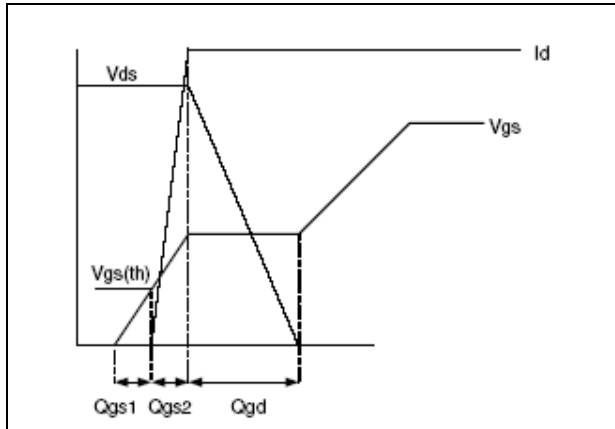




Figure 19. Gate charge waveform

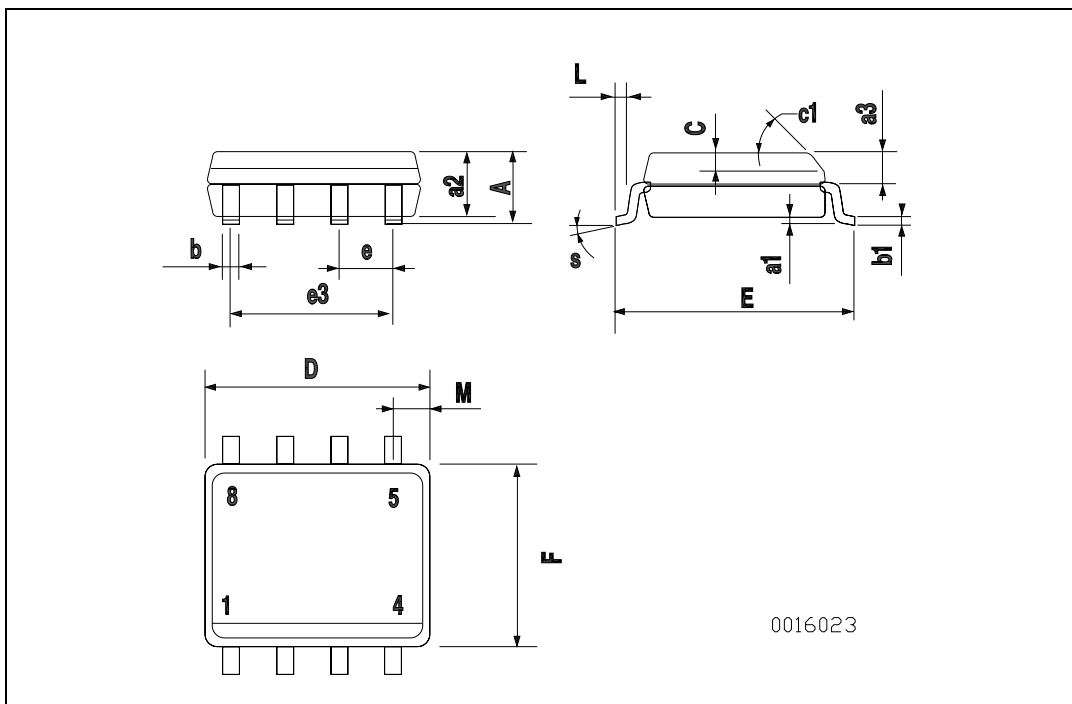


## 4 Package mechanical data

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.

**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 8. Document revision history**

Date	Revision	Changes
06-May-2009	1	First release

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