



# THE DATASHEET OF STL8NH3LL





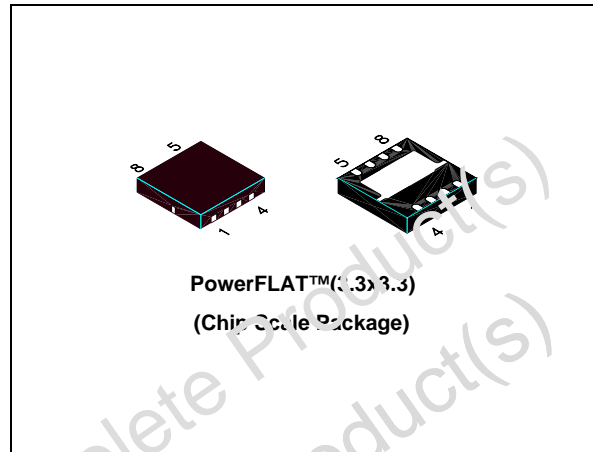
# STL8NH3LL

N-channel 30 V, 0.012  $\Omega$ , 8 A - PowerFLAT™ (3.3x3.3)  
ultra low gate charge STripFET™ Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STL8NH3LL	30V	<0.015 $\Omega$	8A <sup>(1)</sup>

- Improved die-to-footprint ratio
- Very low profile package (1mm max)
- Very low thermal resistance
- Very low gate charge
- Low threshold device
- In compliance with the 2002/95/EC European directive



## Description

This application specific Power MOSFET is the latest generation of STMicroelectronics unique STripFET™ technology. The resulting transistor is optimized for low on-resistance and minimal gate charge. The chip-scaled PowerFLAT™ package allows a significant board space saving, still boosting the performance.

## Applications

- Switching application

Figure 1. Internal schematic diagram

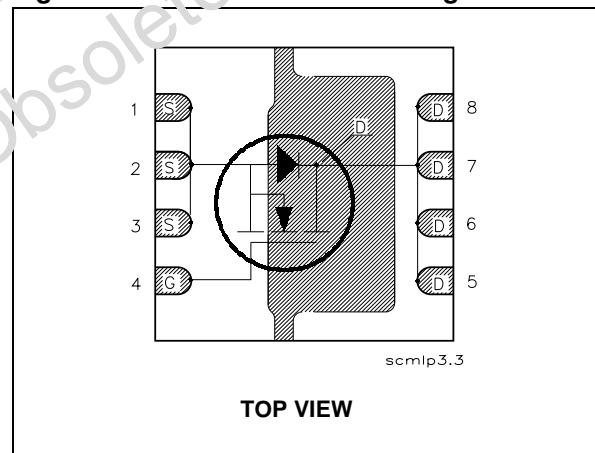


Table 1. Device summary

Order code	Marking	Package	Packaging
STL8NH3LL	8NH3L	PowerFLAT™ (3.3x3.3)	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>9</b>
<b>5</b>	<b>Revision history</b> .....	<b>11</b>

Obsolete Product(s) - Obsolete Product(s)  
Obsolete Product(s) - Obsolete Product(s)

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	30	V
$V_{GS}$	Gate-source voltage	$\pm 18$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	8	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	5	A
$I_{DM}^{(2)}$	Drain current (pulsed)	32	A
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25^\circ\text{C}$	50	W
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25^\circ\text{C}$	?	W
	Derating factor	0.4	W/ $^\circ\text{C}$
$T_J$	Operating junction temperature	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

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

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case (drain)	2.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	42.8	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(2)}$	Thermal resistance junction-pcb	63.5	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu,  $t < 10$  sec
2. Steady state

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{max rating}$ , $V_{DS} = \text{max rating @ } 125\text{°C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 18\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$ , $I_D = 4\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 4\text{ A}$		0.012 0.0135	0.015 0.017	$\Omega$ $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$ , $I_D = 4\text{ A}$		30		S
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$		965		pF
$C_{oss}$	Output capacitance			285		pF
$C_{rss}$	Reverse transfer capacitance			38		pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 8\text{ A}$		9	12	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5\text{ V}$		3.7		nC
$Q_{gd}$	Gate-drain charge	(see Figure 8)		3		nC
$R_G$	Gate input resistance	$f = 1\text{ MHz}$ gate DC bias = 0 test signal level = 20mV open drain	0.5	1.5	2.5	$\Omega$

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

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$ , $I_D = 4\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (see Figure 14)		15		ns	
$t_r$	Rise time			32		ns	
$t_{d(off)}$	Turn-off delay time		-		18	-	ns
$t_f$	Fall Time				8.5		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		8	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		32	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=8\text{ A}$ , $V_{GS}=0$	-		1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD}=8\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD}=20\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$ (see Figure 16)	-	24		ns
$Q_{rr}$	Reverse recovery charge			17.4		nC
$I_{RRM}$	Reverse recovery current			1.45		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

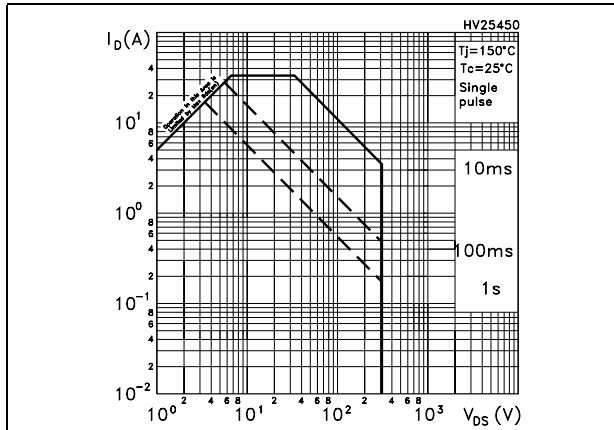


Figure 3. Thermal impedance

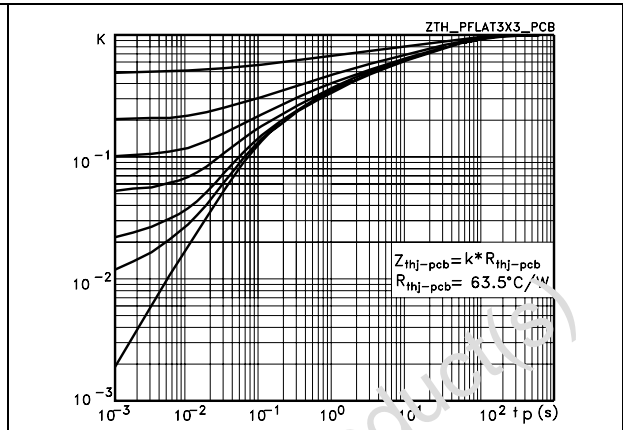


Figure 4. Output characteristics

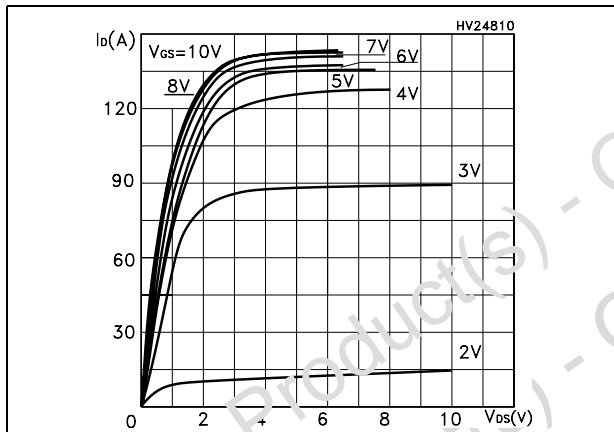


Figure 5. Transfer characteristics

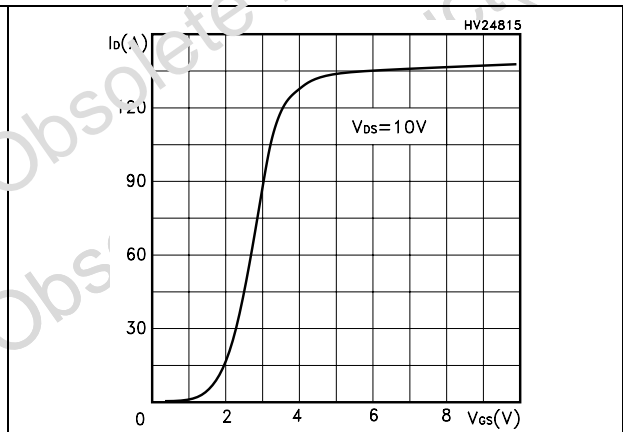


Figure 6. Transconductance

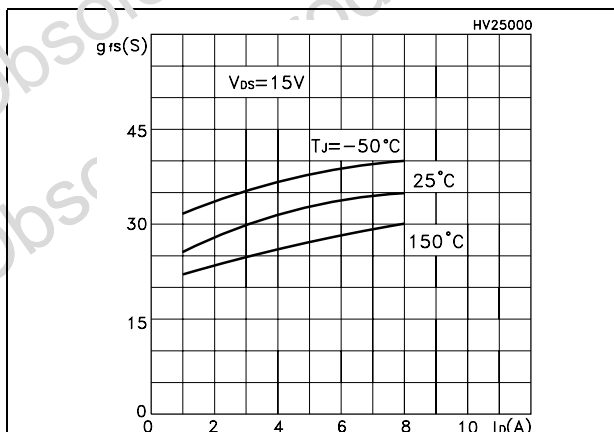


Figure 7. Static drain-source on resistance

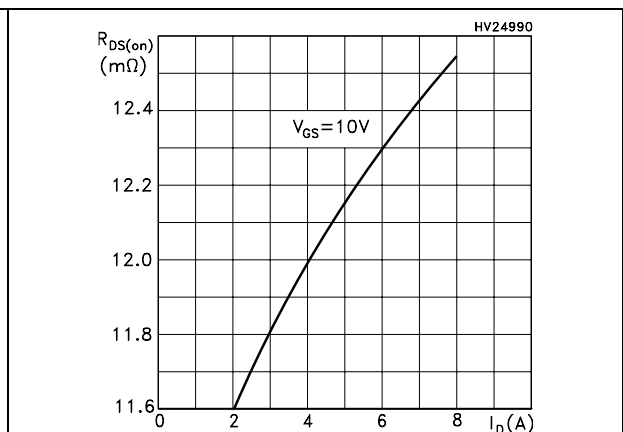


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

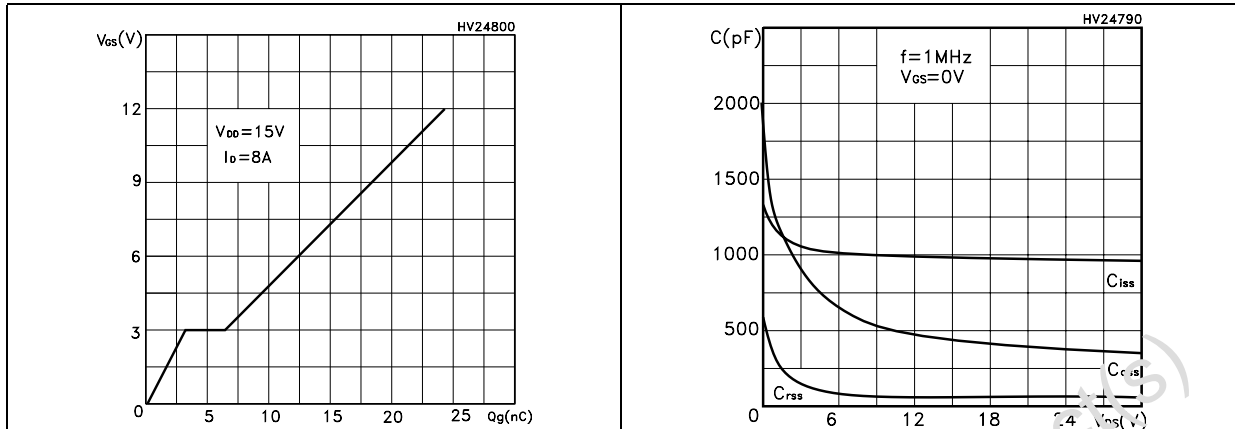


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

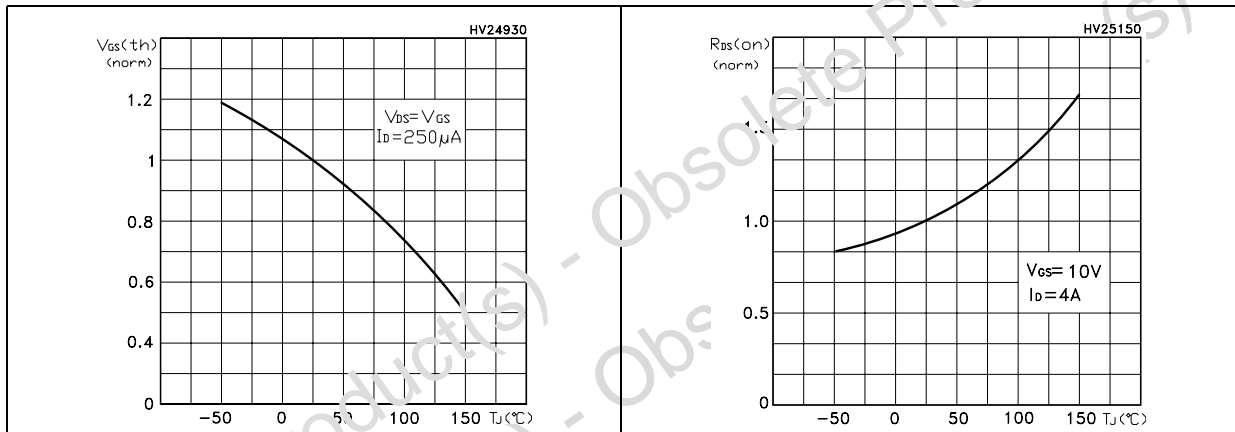
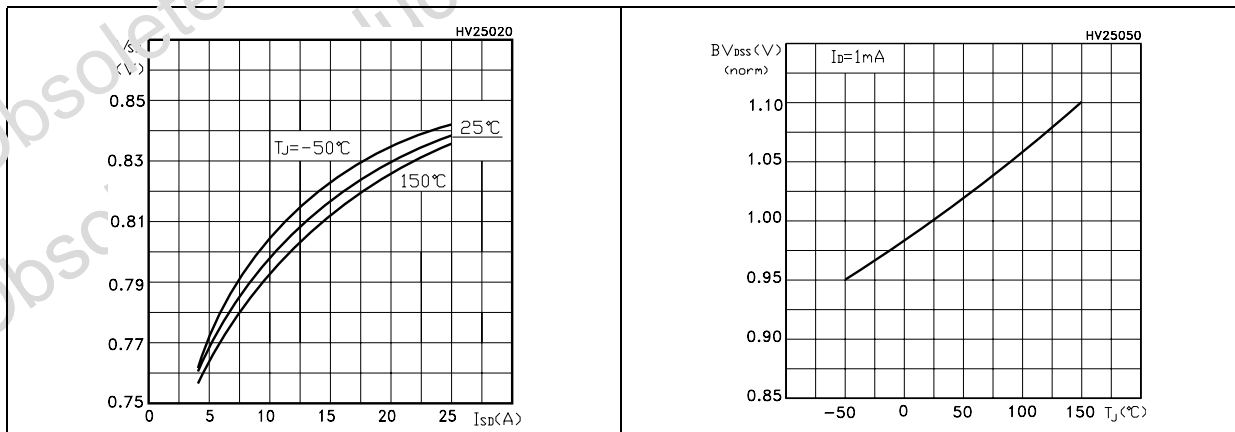


Figure 12. Source-drain diode forward characteristics Figure 13. Normalized  $B_{VDSS}$  vs temperature



### 3 Test circuits

Figure 14. Switching times test circuit for resistive load

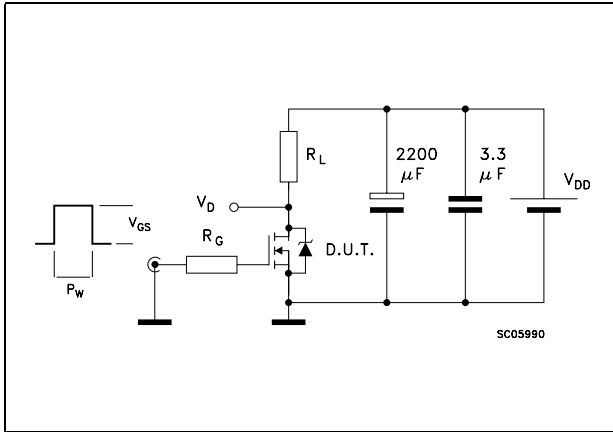


Figure 15. Gate charge test circuit

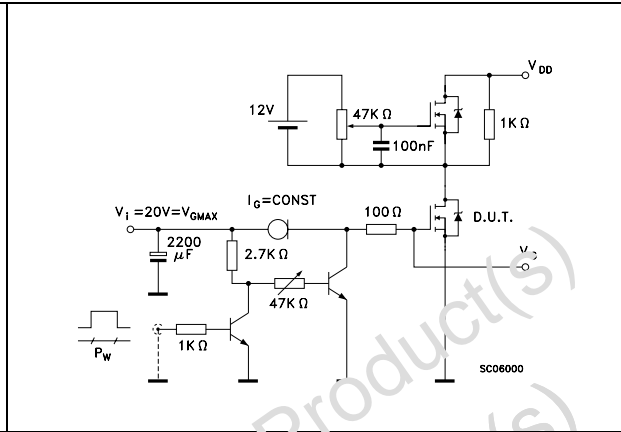


Figure 16. Inductive load switching and diode recovery times

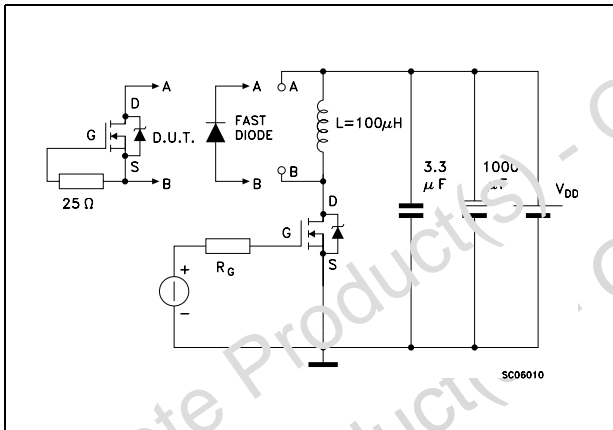


Figure 17. Uncamped inductive load test circuit

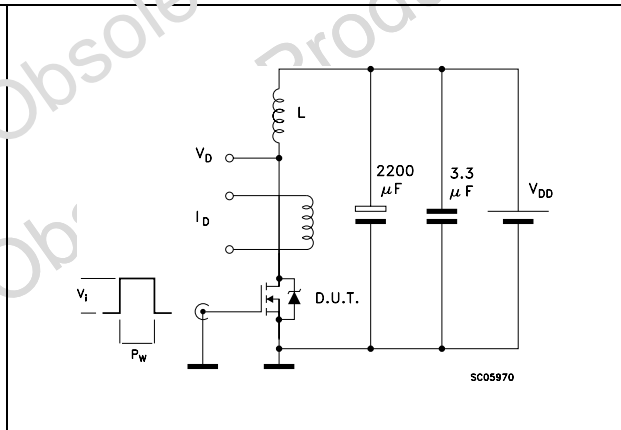


Figure 18. Unclamped inductive waveform

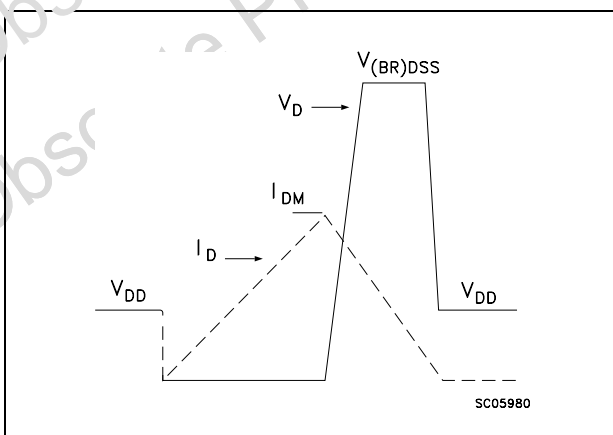
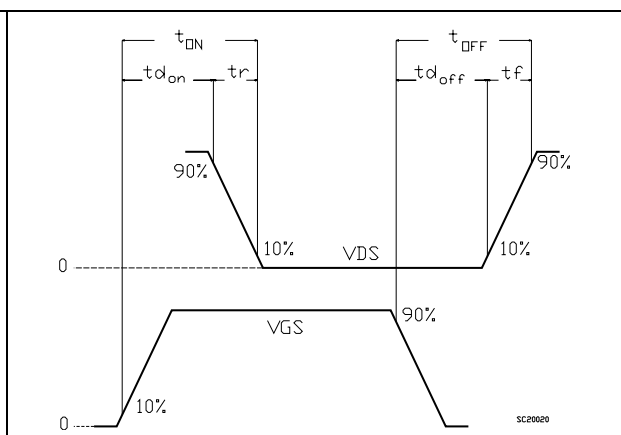


Figure 19. Switching time waveform



## 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.

**Table 8. Package dimensions**

Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	0.80	0.90	1.00	0.031	0.035	0.039
A1		0.02	0.05		0.0007	0.0019
A3		0.20			0.007	
b	0.23	0.30	0.38	0.009	0.011	0.015
C		0.328			0.012	
C1		0.12			0.004	
D		3.30			0.13	
D2	2.50	2.65	2.75	0.098	0.104	0.108
E		3.30			0.13	
E2	1.25	1.40	1.50	0.049	0.055	0.059
F		1.325			0.052	
F1		0.975			0.038	
e		0.65			0.025	
L	0.30		0.50	0.011		0.019

Figure 20. Package drawing

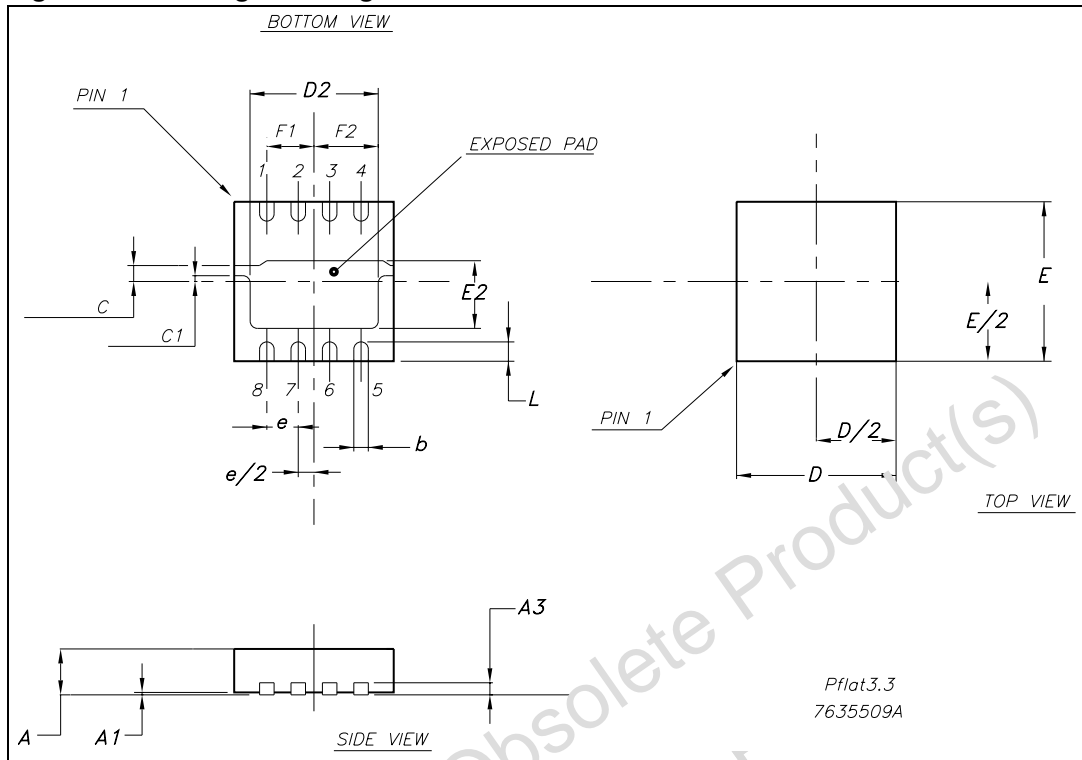
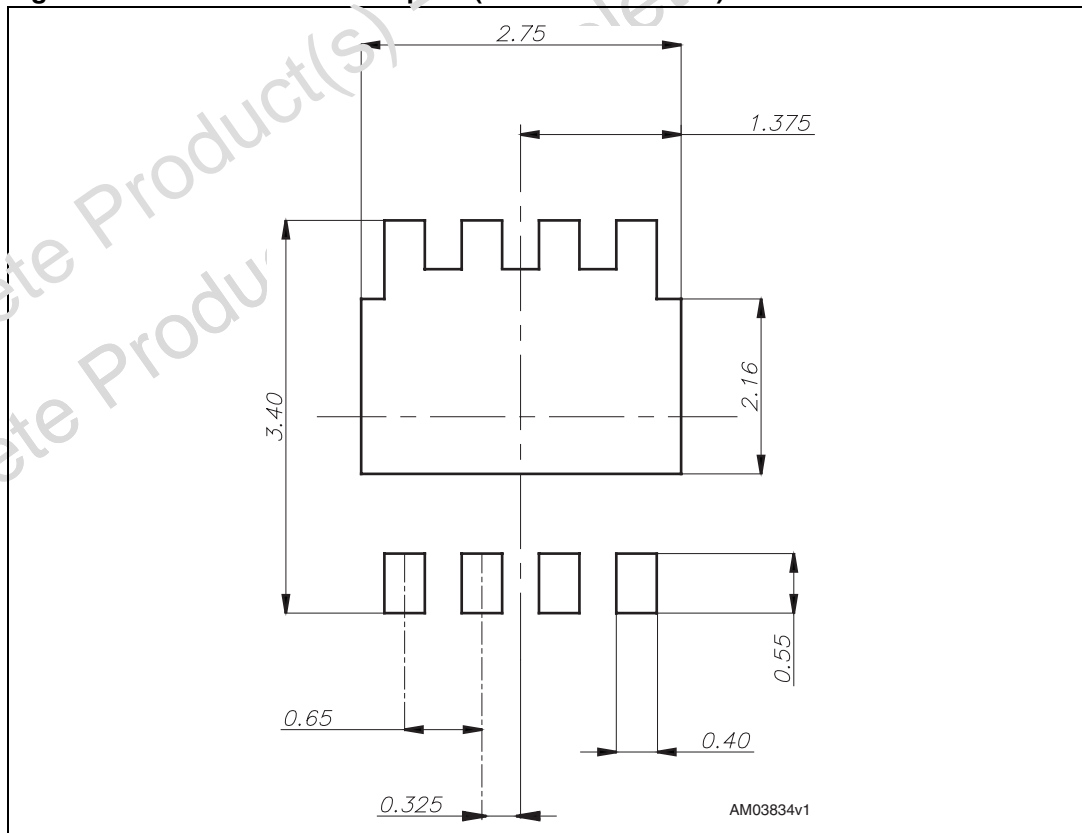


Figure 21. Recommended footprint (dimensions in mm)



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
21-Jul-2004	1	First release
05-Oct-2004	2	Values changed
19-Oct-2004	3	New value inserted
22-Nov-2004	4	Document updated
21-Feb-2005	5	Final version
18-Apr-2005	6	Modified <a href="#">Figure 4</a> , <a href="#">Figure 6.</a> , <a href="#">Figure 9.</a> , <a href="#">Figure 10.</a>
14-Mar-2006	7	New template
10-Sep-2009	8	Inserted <a href="#">Figure 21</a>

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