



# STS25N3LLH6

N-channel 30 V, 0.0025  $\Omega$ , 22 A, SO-8  
STripFET™ VI DeepGATE™ Power MOSFET

Preliminary Data

## Features

| Type        | V <sub>DSS</sub> | R <sub>DS(on) max</sub> | I <sub>D</sub> |
|-------------|------------------|-------------------------|----------------|
| STS25N3LLH6 | 30 V             | 0.0032 $\Omega$         | 22 A           |

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

## Application

- Switching applications

## Description

This product utilizes the 6<sup>th</sup> generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in a standard package, that makes it suitable for the most demanding DC-DC converter applications, where high power density has to be achieved.

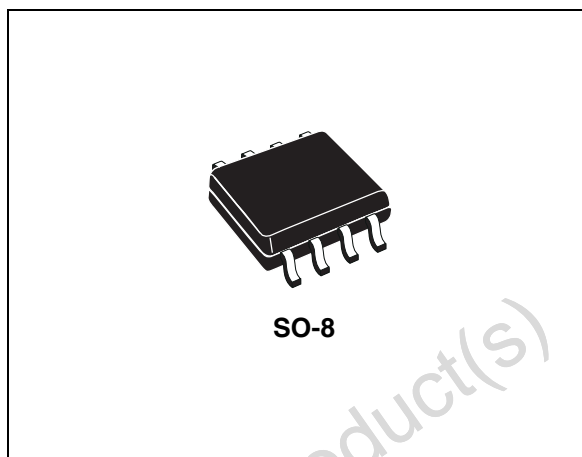


Figure 1. Internal schematic diagram

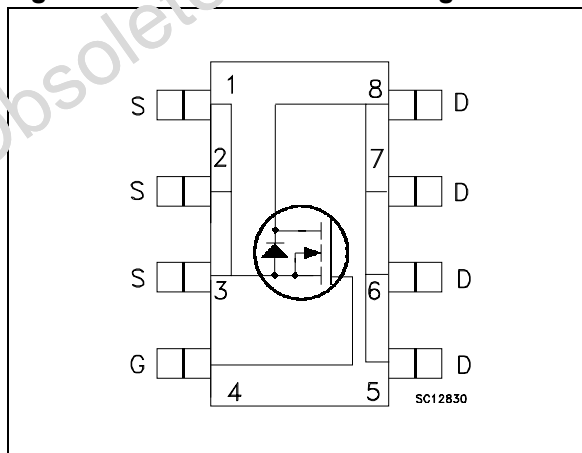


Table 1. Device summary

| Order code  | Marking | Packag | Packaging     |
|-------------|---------|--------|---------------|
| STS25N3LLH6 | 25G3L   | SO-8   | Tape and reel |

# Contents

|   |                                  |    |
|---|----------------------------------|----|
| 1 | Electrical ratings .....         | 3  |
| 2 | Electrical characteristics ..... | 4  |
| 3 | Test circuit .....               | 6  |
| 4 | Package mechanical data .....    | 8  |
| 5 | Revision history .....           | 10 |

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                |
| $V_{GS}^{(1)}$     | Gate-source voltage   | $\pm 20$   | V                |
| $I_D$              | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$  | 22         | A                |
| $I_D$              | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 13.7       | A                |
| $I_{DM}^{(2)}$     | Drain current (pulsed)  | 88         | A                |
| $P_{TOT}$          | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$           | 2.7        | W                |
| $T_J$<br>$T_{stg}$ | Operating junction temperature<br>Storage temperature           | -55 to 150 | $^\circ\text{C}$ |

1. Continuous mode
2. Pulse width limited by safe operating area

**Table 3. Thermal resistance**

| Symbol              | Parameter                           | Value | Unit               |
|---------------------|-------------------------------------|-------|--------------------|
| $R_{thj-amb}^{(1)}$ | Thermal resistance junction-ambient | 47    | $^\circ\text{C/W}$ |

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

**Table 4. Avalanche data**

| Symbol   | Parameter  | Value | Unit |
|----------|--|-------|------|
| $I_{AV}$ | Not-repetitive avalanche current   | TBD   | A    |
| $E_{AS}$ | Single pulse avalanche energy<br>(starting $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AV}$ ) | TBD   | mJ   |

## 2 Electrical characteristics

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

**Table 5. On/off states**

| Symbol        | Parameter  | Test conditions   | Min. | Typ.             | Max.          | Unit                           |
|---------------|--|---|------|------------------|---------------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage                   | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$   | 30   |                  |               | V                              |
| $I_{DSS}$     | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max rating}$ ,<br>$V_{DS} = \text{Max rating @ } 125\text{ °C}$               |      |                  | 1<br>10       | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$  |      |                  | $\pm 100$     | nA                             |
| $V_{GS(th)}$  | Gate threshold voltage                           | $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$  | 1    |                  |               | V                              |
| $R_{DS(on)}$  | Static drain-source on resistance                | $V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$<br>$V_{GS} = 4.5\text{ V}$ , $I_D = 15\text{ A}$ |      | 0.0025<br>0.0042 | 0.0032<br>TBD | $\Omega$<br>$\Omega$           |

**Table 6. Dynamic**

| Symbol    | Parameter                    | Test conditions  | Min. | Typ. | Max. | Unit     |
|-----------|------------------------------|--|------|------|------|----------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,<br>$V_{GS} = 0$                              |      | 2100 |      | pF       |
| $C_{oss}$ | Output capacitance           |  |      | 400  |      | pF       |
| $C_{rss}$ | Reverse transfer capacitance |  |      | 170  |      | pF       |
| $Q_g$     | Total gate charge            | $V_{DD} = 15\text{ V}$ , $I_D = 22\text{ A}$<br>$V_{GS} = 4.5\text{ V}$<br><i>Figure 8</i> |      | 16   | TBD  | nC       |
| $Q_{gs}$  | Gate-source charge           |  |      | TBD  |      | nC       |
| $Q_{gd}$  | Gate-drain charge            |  |      | TBD  |      | nC       |
| $R_G$     | Gate Input Resistance        | $f = 1\text{ MHz}$ Gate DC Bias = 0<br>Test signal level = 20 mV<br>open drain             |      | TBD  |      | $\Omega$ |

**Table 7. Switching times**

| Symbol       | Parameter           | Test conditions  | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD}=15\text{ V}$ , $I_D=11\text{ A}$ ,<br>$R_G=4.7\ \Omega$ , $V_{GS}=4.5\text{ V}$<br><i>Figure 2</i> |      | TBD  |      | ns   |
| $t_r$        | Rise time           |  |      | TBD  |      | ns   |
| $t_{d(off)}$ | Turn-off delay time |  |      | TBD  |      | ns   |
| $t_f$        | Fall time           |  |      | TBD  |      | ns   |

**Table 8. Source drain diode**

| Symbol          | Parameter                     | Test conditions   | Min | Typ. | Max | Unit |
|-----------------|-------------------------------|---|-----|------|-----|------|
| $I_{SD}$        | Source-drain current          |   |     |      | 22  | A    |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |   |     |      | 88  | A    |
| $V_{SD}^{(2)}$  | Forward on Voltage            | $I_{SD}=22\text{ A}$ , $V_{GS}=0$   |     |      | 1.1 | V    |
| $t_{rr}$        | Reverse recovery time         | $I_{SD}=22\text{ A}$ ,<br>$di/dt=100\text{ A}/\mu\text{s}$ ,<br>$V_{DD}=20\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$<br><i>Figure 4</i> |     | TBD  |     | ns   |
| $Q_{rr}$        | Reverse recovery charge       |   |     | TBD  |     | nC   |
| $I_{RRM}$       | Reverse recovery current      |   |     | TBD  |     | A    |

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300  $\mu\text{s}$ , duty cycle 1.5%

### 3 Test circuit

Figure 2. Switching times test circuit for resistive load

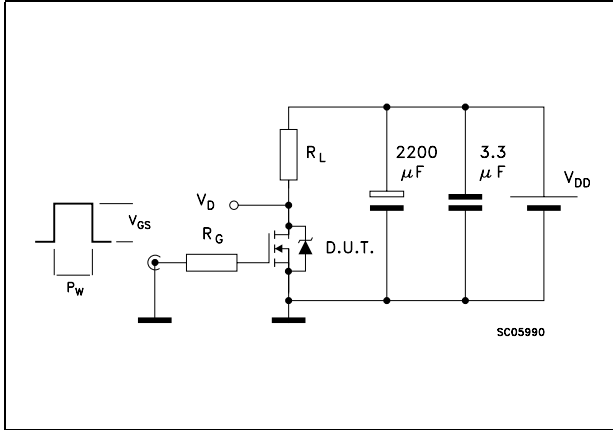


Figure 3. Gate charge test circuit

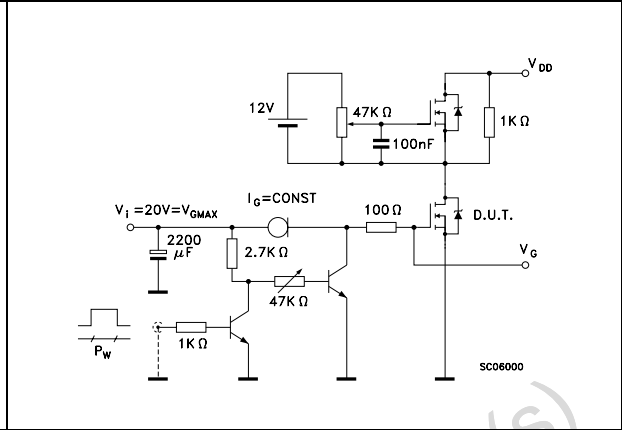


Figure 4. Test circuit for inductive load switching and diode recovery times

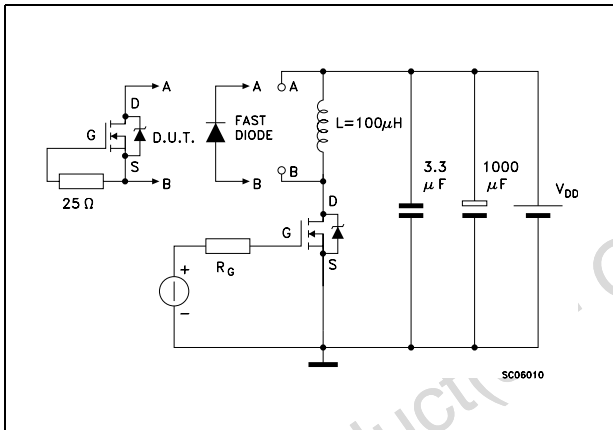


Figure 5. Unclamped inductive load test circuit

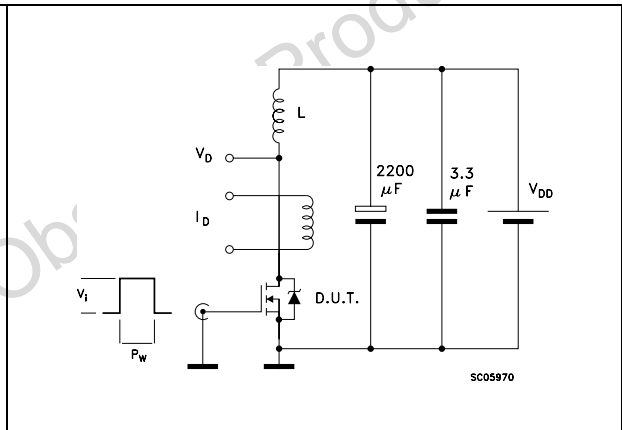


Figure 6. Unclamped inductive waveform

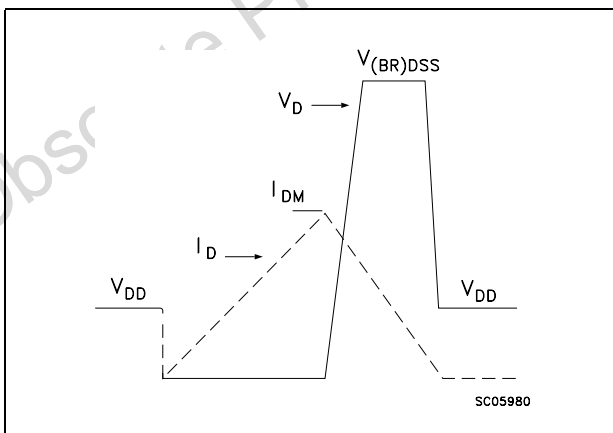


Figure 7. Switching time waveform

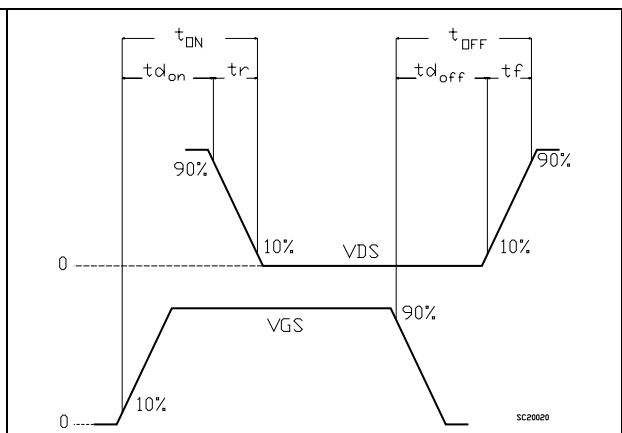
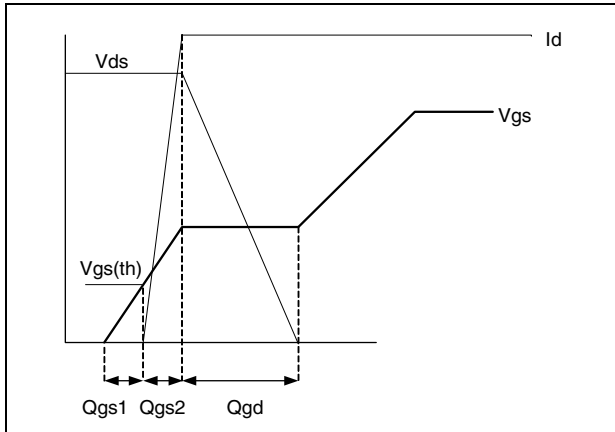


Figure 8. Gate charge waveform



Obsolete Product(s) - Obsolete Product(s)

## 4 Package mechanical data

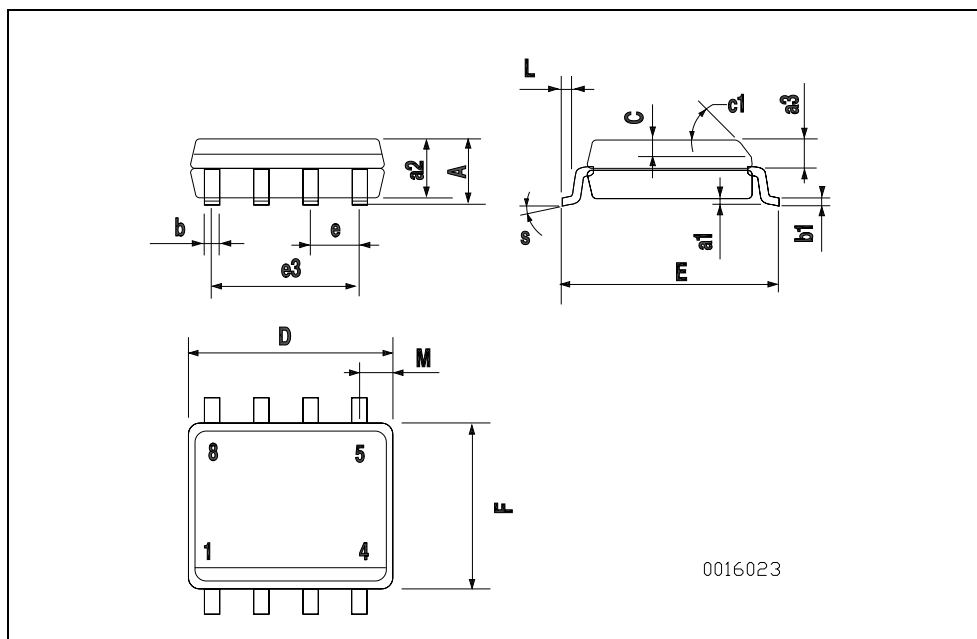
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

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.)  |      |      |       |       |       |



## 5 Revision history

Table 9. Document revision history

| Date        | Revision | Changes       |
|-------------|----------|---------------|
| 27-Jan-2009 | 1        | First release |

Obsolete Product(s) - Obsolete Product(s)

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)

