



## Description

The STL56N3LLH5 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = 30V$   $I_D = 50A$

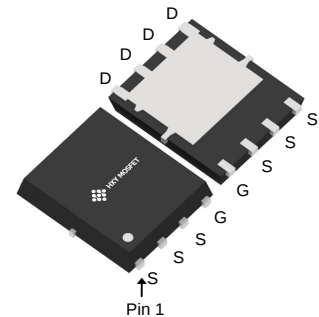
$R_{DS(ON)} < 8.5m\Omega$   $V_{GS}=10V$

## Application

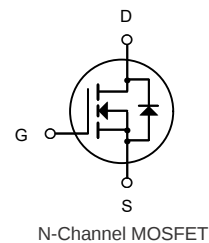
Battery protection

Load switch

Uninterruptible power supply



DFN5X6-8L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID  | Pack      | Brand      | Qty(PCS) |
|-------------|-----------|------------|----------|
| STL56N3LLH5 | DFN5X6-8L | HXY MOSFET | 5000     |

## Absolute Maximum Ratings ( $T_c=25^\circ C$ unless otherwise noted)

| Symbol                | Parameter                                     | Rating     | Units        |
|-----------------------|-----------------------------------------------|------------|--------------|
| $V_{DS}$              | Drain-Source Voltage                          | 30         | V            |
| $V_{GS}$              | Gate-Source Voltage                           | $\pm 20$   | V            |
| $I_D@T_c=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$      | 60         | A            |
| $I_D@T_c=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$      | 38         | A            |
| $I_{DM}$              | Pulsed Drain Current <sup>1</sup>             | 200        | A            |
| EAS                   | Single Pulse Avalanche Energy <sup>2</sup>    | 36         | mJ           |
| $I_{AS}$              | Avalanche Current                             | 50         | A            |
| $P_D@T_c=25^\circ C$  | Total Power Dissipation <sup>4</sup>          | 31         | W            |
| $T_{STG}$             | Storage Temperature Range                     | -55 to 150 | $^\circ C$   |
| $T_J$                 | Operating Junction Temperature Range          | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$       | Thermal Resistance Junction-Ambient           | 62         | $^\circ C/W$ |
| $R_{\theta JC}$       | Thermal Resistance Junction-Case <sup>3</sup> | 27         | $^\circ C/W$ |



**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol              | Parameter                               | Conditions                                                                               | Min | Typ  | Max  | Units |
|---------------------|-----------------------------------------|------------------------------------------------------------------------------------------|-----|------|------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                               | 30  | ---  | ---  | V     |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current         | V <sub>GS</sub> =0V, V <sub>DS</sub> =24V                                                | --- | ---  | 1    | μA    |
| I <sub>GSS</sub>    | Gate-Source Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0A                                               | --- | ---  | ±100 | nA    |
| V <sub>GS(th)</sub> | GATE-Source Threshold Voltage           | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA                                 | 1.2 | 1.5  | 2.5  | V     |
| R <sub>DS(ON)</sub> | Drain-Source On Resistance <sup>4</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =30A                                                | --- | 6.5  | 8.5  | mΩ    |
|                     |                                         | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A                                               | --- | 11   | 14   |       |
| G <sub>FS</sub>     | Forward Transconductance                | V <sub>DS</sub> =5V, I <sub>D</sub> =30A                                                 | --- | 38   | ---  | S     |
| C <sub>iss</sub>    | Input Capacitance                       | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V,<br>f=1MHz                                     | --- | 1317 | 1844 | pF    |
| C <sub>oss</sub>    | Output Capacitance                      |                                                                                          | --- | 163  | 228  |       |
| C <sub>rss</sub>    | Reverse Transfer Capacitance            |                                                                                          | --- | 131  | 183  |       |
| t <sub>d(on)</sub>  | Turn-On Delay Time                      | V <sub>DD</sub> =15V, I <sub>D</sub> =15A,<br>V <sub>GS</sub> =15V, R <sub>G</sub> =3.3Ω | --- | 4.6  | 9.2  | ns    |
| t <sub>r</sub>      | Rise Time                               |                                                                                          | --- | 12.2 | 22   | ns    |
| t <sub>d(off)</sub> | Turn-Off Delay Time                     |                                                                                          | --- | 26.6 | 53   | ns    |
| t <sub>f</sub>      | Fall Time                               |                                                                                          | --- | 8    | 16   | ns    |
| Q <sub>g</sub>      | Total Gate Charge                       | V <sub>GS</sub> =4.5V,<br>V <sub>DS</sub> =15V, I <sub>D</sub> =15A                      | --- | 17.6 | 21   | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge                      |                                                                                          | --- | 2.35 | 5.9  | nC    |
| Q <sub>gd</sub>     | Gate-Drain "Miller" Charge              |                                                                                          | --- | 5.9  | 7.1  | nC    |
| V <sub>SD</sub>     | Source-Drain Diode Forward Voltage      | V <sub>GS</sub> =0V, I <sub>S</sub> =1A                                                  | --- | ---  | 1    | V     |
| I <sub>S</sub>      | Continuous Source Current               | V <sub>G</sub> =V <sub>D</sub> =0V ,<br>Force Current                                    | --- | ---  | 58   | A     |
| I <sub>SM</sub>     | Pulsed Source Current                   |                                                                                          | --- | ---  | 115  | A     |
| t <sub>rr</sub>     | Reverse Recovery Time                   | I <sub>F</sub> =30A ,<br>dI/dt=100A/μs T <sub>J</sub> =25°C                              | --- | 9.2  | ---  | ns    |
| Q <sub>rr</sub>     | Reverse Recovery Charge                 |                                                                                          | --- | 2    | ---  | nC    |

**Notes:**

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E<sub>AS</sub> condition: Starting T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, R<sub>G</sub>=25ohm, L=0.5mH, I<sub>AS</sub>=14A
3. R<sub>θJA</sub> is measured with the device mounted on a 1inch<sup>2</sup> pad of 2oz copper FR4 PCB
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.



### Typical Characteristics

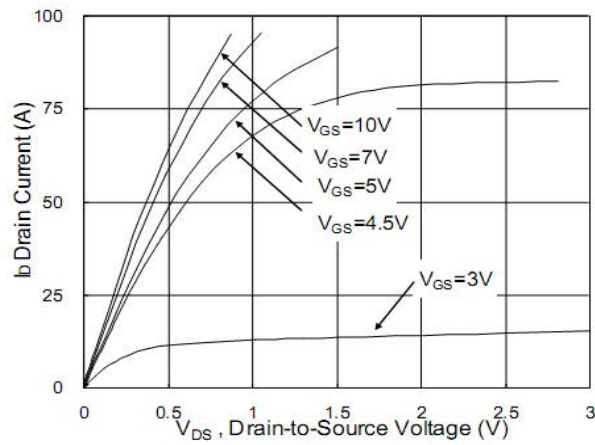


Fig.1 Typical Output Characteristics

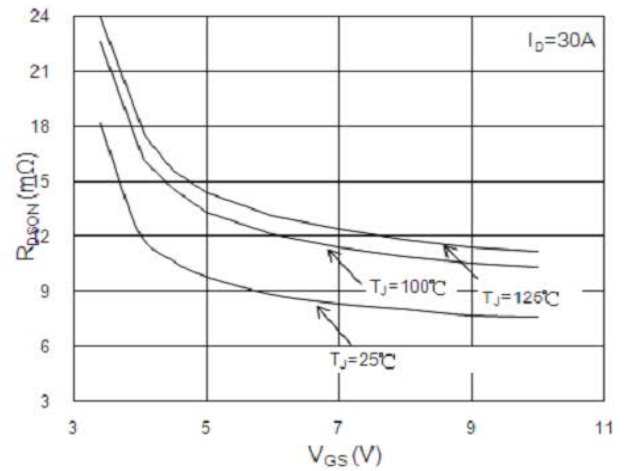


Fig.2 On-Resistance vs. Gate-Source

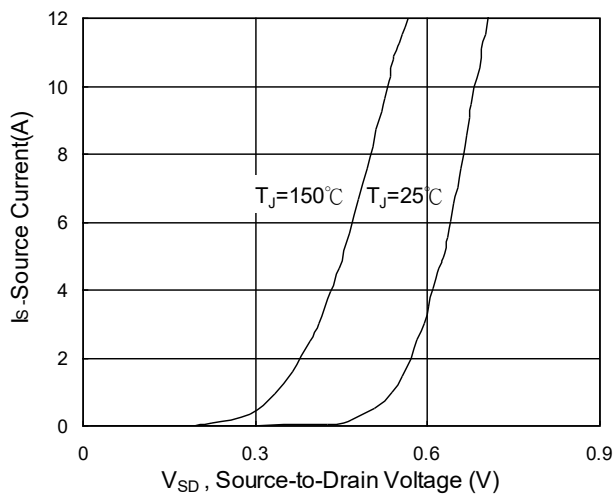


Fig.3 Forward Characteristics of reverse

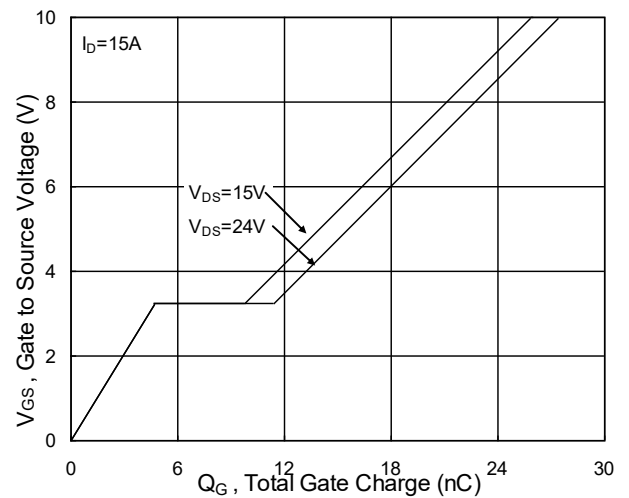


Fig.4 Gate-Charge Characteristics

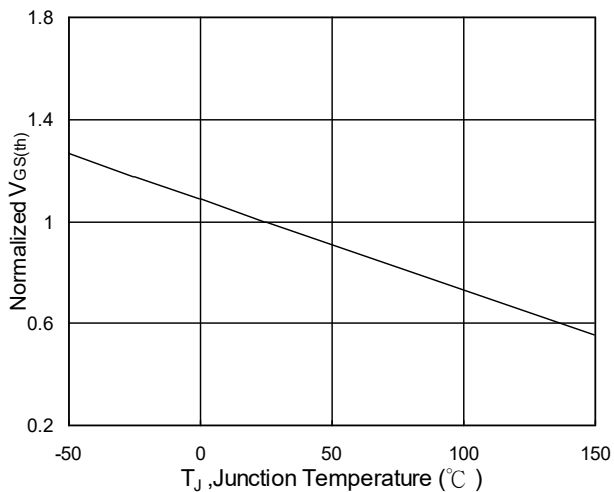


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

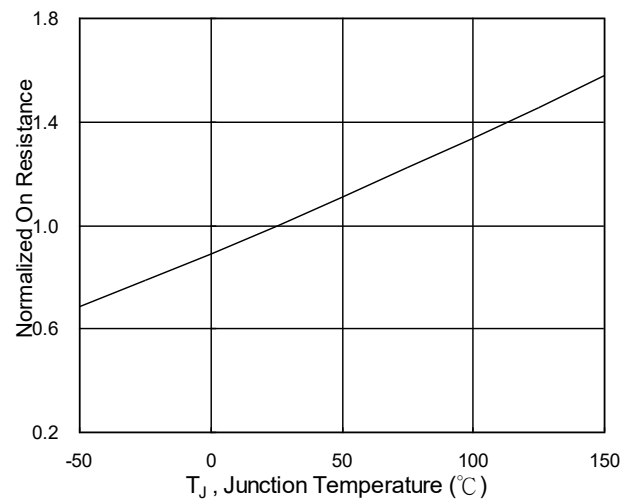


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

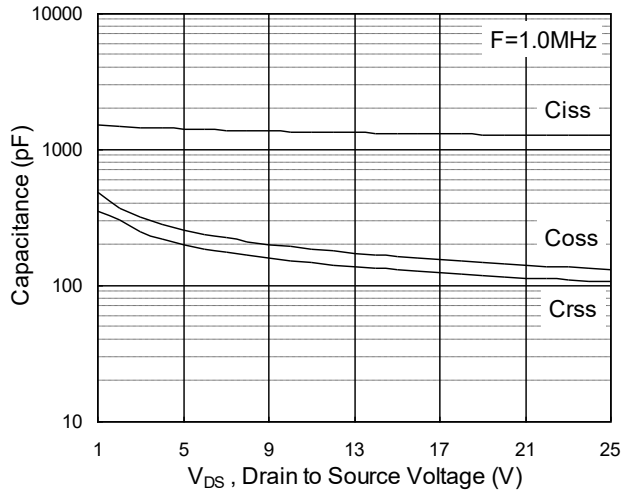


Fig.7 Capacitance

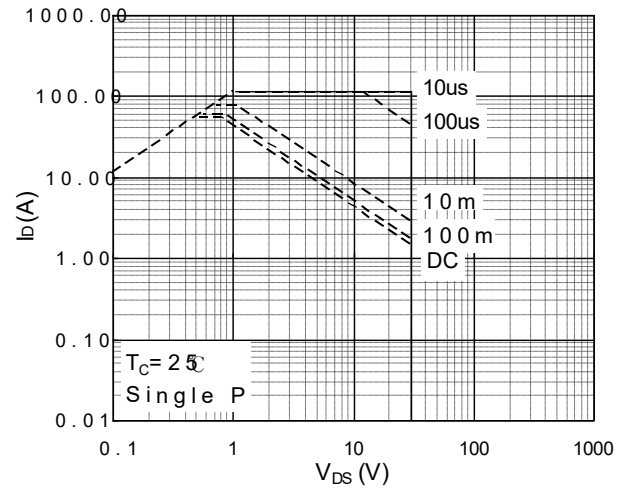


Fig.8 Safe Operating Area

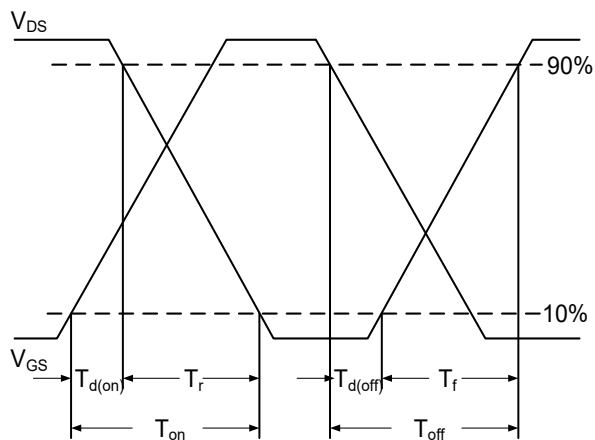
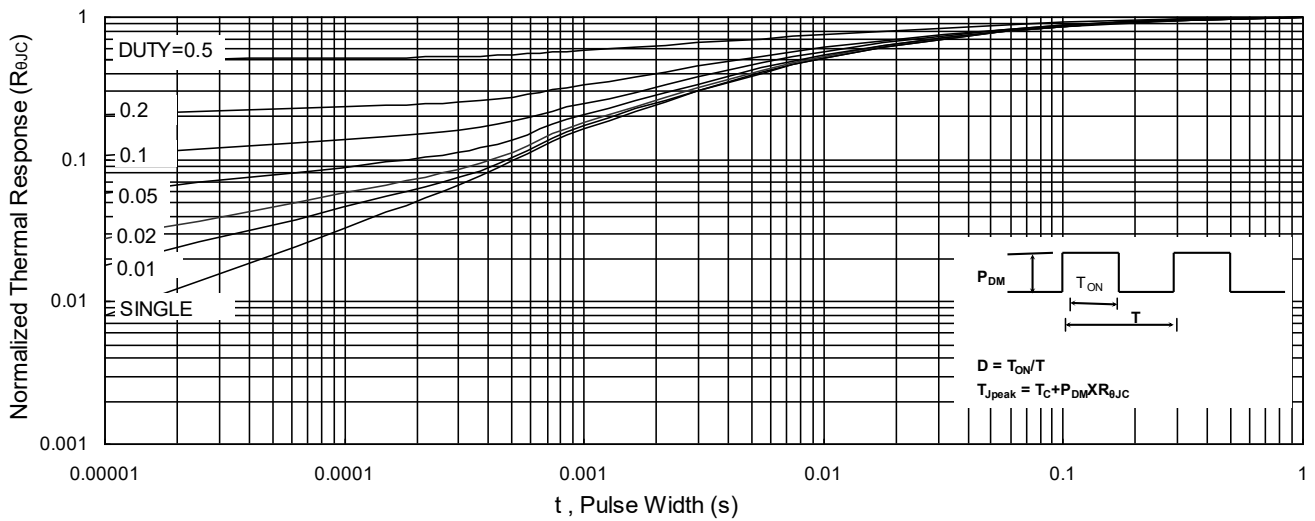
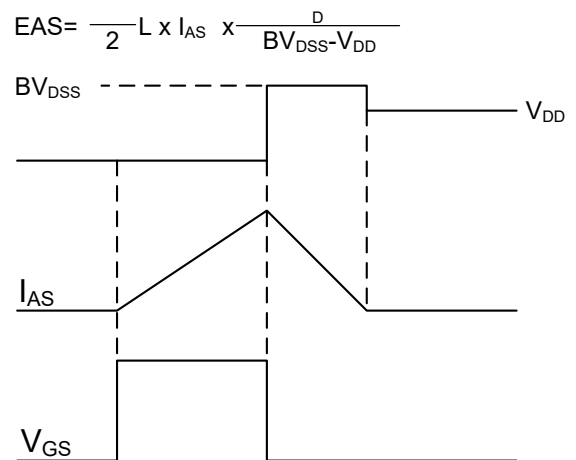


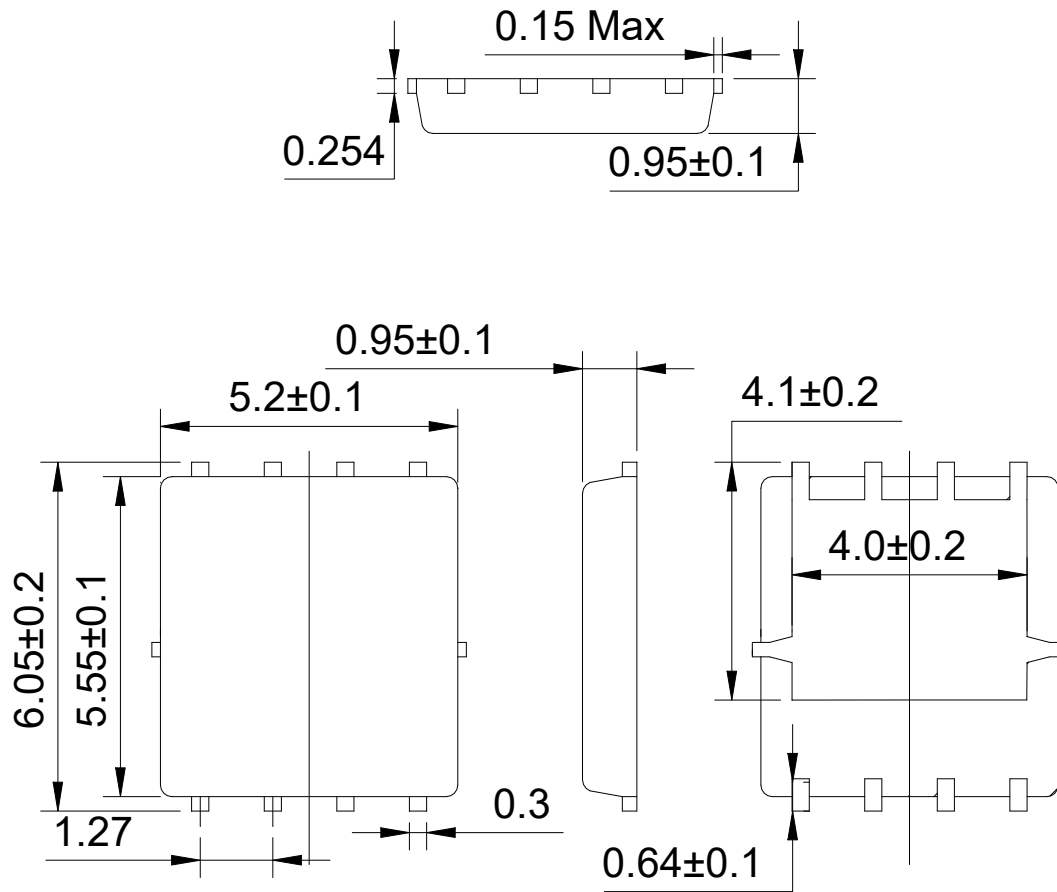
Fig.10 Switching Time Waveform





## DFN5X6-8L Package Information

Unit:mm





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