



## STB30NE06L

N-CHANNEL 60V - 0.35  $\Omega$  - 30A D<sup>2</sup>PAK

STripFET™ POWER MOSFET

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|------------|------------------|---------------------|----------------|
| STB30NE06L | 60 V             | <0.05 $\Omega$      | 30 A           |

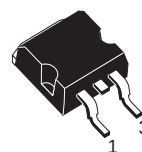
- TYPICAL R<sub>DS(on)</sub> = 0.035 $\Omega$
- 100% AVALANCHE TESTED
- LOW GATE CHARGE 100 °C
- APPLICATION ORIENTED CHARACTERIZATION
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

### DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

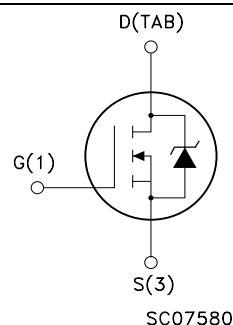
### APPLICATIONS

- DC MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS



**D<sup>2</sup>PAK**  
**TO-263**  
(suffix "T4")

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 60         | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ ) | 60         | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                  | ±20        | V    |
| I <sub>D</sub>      | Drain Current (continuos) at T <sub>C</sub> = 25°C    | 30         | A    |
| I <sub>D</sub>      | Drain Current (continuos) at T <sub>C</sub> = 100°C   | 21         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 120        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C            | 80         | W    |
|                     | Derating Factor                                       | 0.53       | W/°C |
| T <sub>stg</sub>    | Storage Temperature                                   | -60 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 175        | °C   |

(•)Pulse width limited by safe operating area.

## STB30NE06L

### THERMAL DATA

|                |                                                |     |       |      |
|----------------|------------------------------------------------|-----|-------|------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 1.875 | °C/W |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62.5  | °C/W |
| $R_{thc-sink}$ | Thermal Resistance Case-sink                   | Typ | 0.5   | °C/W |
| $T_j$          | Maximum Lead Temperature For Soldering Purpose |     | 300   | °C   |

### AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                                | Max Value | Unit |
|----------|----------------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)                       | 20        | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ ) | 100       | mJ   |

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25\text{ °C}$ unless otherwise specified)

#### OFF

| Symbol        | Parameter                                        | Test Conditions                                                                      | Min. | Typ. | Max.      | Unit                           |
|---------------|--------------------------------------------------|--------------------------------------------------------------------------------------|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 25\text{ }\mu\text{A}$ , $V_{GS} = 0$                                         | 60   |      |           | V                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ , $T_C = 125\text{ °C}$ |      |      | 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                             |

#### ON <sup>(1)</sup>

| Symbol       | Parameter                         | Test Conditions                                                                         | Min. | Typ.           | Max.         | Unit                 |
|--------------|-----------------------------------|-----------------------------------------------------------------------------------------|------|----------------|--------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$                                        | 1    | 1.75           | 2.5          | V                    |
| $I_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 5\text{ V}$ $I_D = 15\text{ A}$<br>$V_{GS} = 10\text{ V}$ $I_D = 15\text{ A}$ |      | 0.045<br>0.035 | 0.06<br>0.05 | $\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\text{ V}$                     | 30   |                |              | A                    |

### DYNAMIC

| Symbol         | Parameter                     | Test Conditions                                                 | Min. | Typ. | Max. | Unit |
|----------------|-------------------------------|-----------------------------------------------------------------|------|------|------|------|
| $g_{fs}^{(1)}$ | Forward Transconductance      | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ , $I_D = 15\text{ A}$ | 10   | 18   |      | S    |
| $C_{iss}$      | Input Capacitance             | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$          |      | 1350 |      | pF   |
| $C_{oss}$      | Output Capacitance            |                                                                 |      | 195  |      | pF   |
| $C_{rss}$      | Reverse Transfer Capacitances |                                                                 |      | 58   |      | pF   |

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

| Symbol               | Parameter                       | Test Conditions                                                                                                           | Min. | Typ.      | Max. | Unit     |
|----------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|------|-----------|------|----------|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD} = 30\text{ V}$ $I_D = 15\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$<br>(see test circuit, Figure 3) |      | 25<br>105 |      | ns<br>ns |
| $Q_g$                | Total Gate Charge               | $V_{DD}=48\text{ V}$ $I_D=30\text{ A}$ $V_{GS}=5\text{ V}$                                                                |      | 20        | 28   | nC       |
| $Q_{gs}$             | Gate-Source Charge              |                                                                                                                           |      | 8         |      | nC       |
| $Q_{gd}$             | Gate-Drain Charge               |                                                                                                                           |      | 10        |      | nC       |

**SWITCHING OFF**

| Symbol                         | Parameter                                             | Test Conditions                                                                                                             | Min. | Typ.           | Max. | Unit           |
|--------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------|----------------|------|----------------|
| $t_{d(off)}$<br>$t_f$          | Turn-off Delay Time<br>Fall Time                      | $V_{DD} = 30\text{ V}$ $I_D = 15\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$<br>(Resistive Load, see fig.3)    |      | 50<br>20       |      | ns<br>ns       |
| $t_{d(off)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{clamp} = 48\text{ V}$ $I_D = 30\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$<br>(Inductive Load, see fig.5) |      | 15<br>40<br>60 |      | ns<br>ns<br>ns |

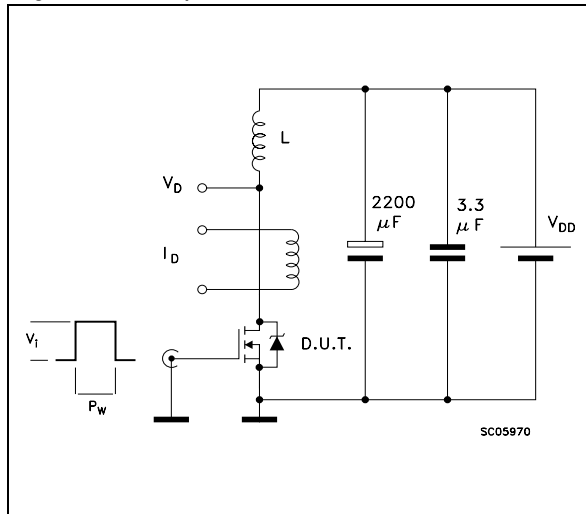
**SOURCE DRAIN DIODE**

| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                                       | Min. | Typ.              | Max. | Unit                     |
|-----------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------|------|--------------------------|
| $I_{SD}$                          | Source-drain Current                                                         |                                                                                                                                                       |      |                   | 30   | A                        |
| $I_{SDM} (\bullet)$               | Source-drain Current (pulsed)                                                |                                                                                                                                                       |      |                   | 120  | A                        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 30\text{ A}$ $V_{GS} = 0$                                                                                                                   |      |                   | 1.5  | V                        |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 30\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$<br>(see test circuit, Figure 3) |      | 80<br>0.18<br>4.5 |      | ns<br>$\mu\text{C}$<br>A |

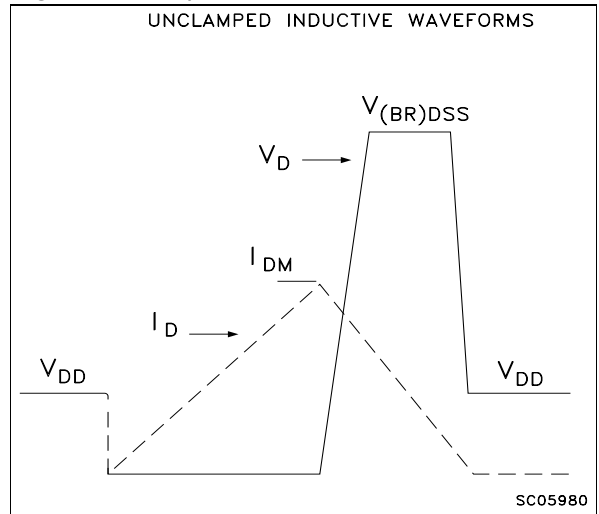
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

(\bullet) Pulse width limited by safe operating area.

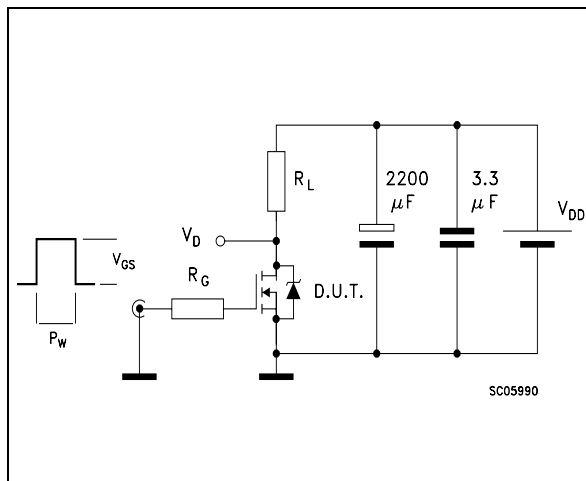
**Fig. 1: Unclamped Inductive Load Test Circuit**



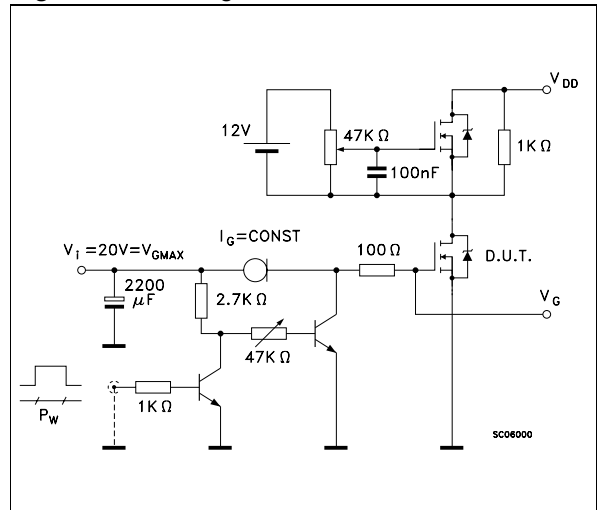
**Fig. 2: Unclamped Inductive Waveform**



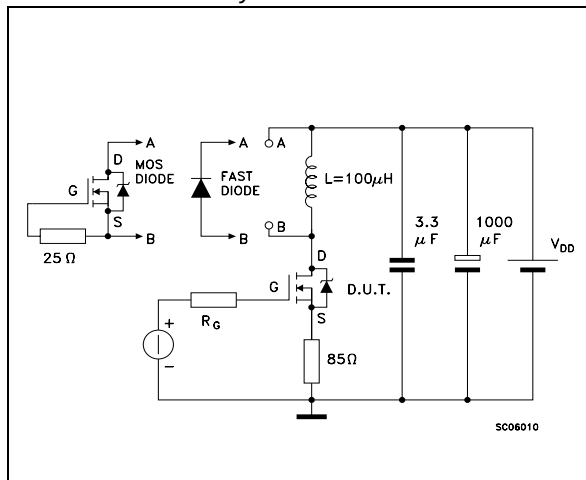
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

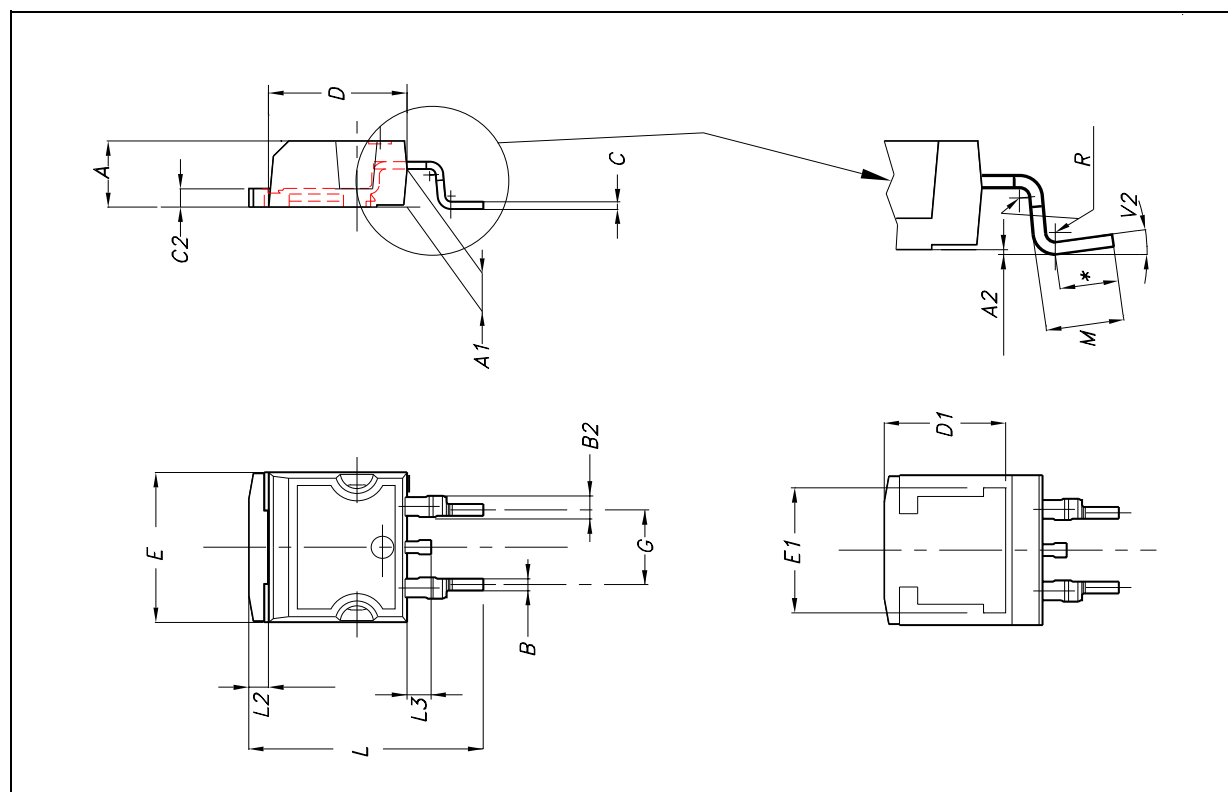


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



D<sup>2</sup>PAK MECHANICAL DATA

| DIM. | mm.  |     |       | inch  |       |       |
|------|------|-----|-------|-------|-------|-------|
|      | MIN. | TYP | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |     | 4.6   | 0.173 |       | 0.181 |
| A1   | 2.49 |     | 2.69  | 0.098 |       | 0.106 |
| A2   | 0.03 |     | 0.23  | 0.001 |       | 0.009 |
| B    | 0.7  |     | 0.93  | 0.027 |       | 0.036 |
| B2   | 1.14 |     | 1.7   | 0.044 |       | 0.067 |
| C    | 0.45 |     | 0.6   | 0.017 |       | 0.023 |
| C2   | 1.23 |     | 1.36  | 0.048 |       | 0.053 |
| D    | 8.95 |     | 9.35  | 0.352 |       | 0.368 |
| D1   |      | 8   |       |       | 0.315 |       |
| E    | 10   |     | 10.4  | 0.393 |       |       |
| E1   |      | 8.5 |       |       | 0.334 |       |
| G    | 4.88 |     | 5.28  | 0.192 |       | 0.208 |
| L    | 15   |     | 15.85 | 0.590 |       | 0.625 |
| L2   | 1.27 |     | 1.4   | 0.050 |       | 0.055 |
| L3   | 1.4  |     | 1.75  | 0.055 |       | 0.068 |
| M    | 2.4  |     | 3.2   | 0.094 |       | 0.126 |
| R    |      | 0.4 |       |       | 0.015 |       |
| V2   | 0°   |     | 8°    |       |       |       |



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