



# STP30NE06L STP30NE06LFP

## N - CHANNEL 60V - 0.040 Ω - 30A - TO-220/TO-220FP STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE         | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|--------------|------------------|---------------------|----------------|
| STP30NE06L   | 60 V             | < 0.05 Ω            | 30 A           |
| STP30NE06LFP | 60 V             | < 0.05 Ω            | 17 A           |

- TYPICAL R<sub>DS(on)</sub> = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- 175°C OPERATING TEMPERATURE
- HIGH dv/dt CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

### DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size" process where by a single body is implanted on a strip layout structure. 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

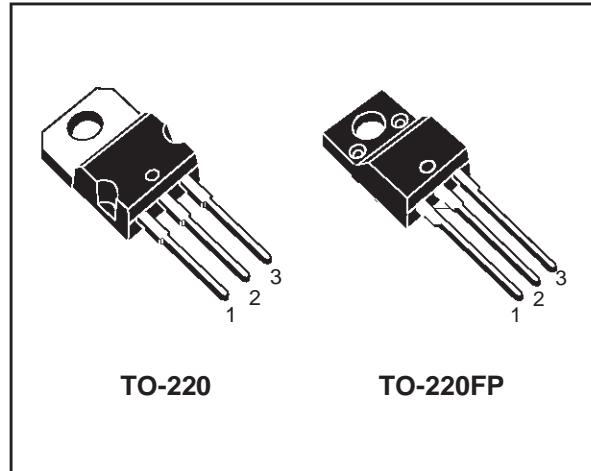
- DC MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION

### ABSOLUTE MAXIMUM RATINGS

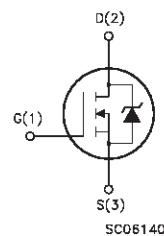
| Symbol             | Parameter   | Value      |              | Unit |
|--------------------|---|------------|--------------|------|
|                    |   | STP30NE06L | STP30NE06LFP |      |
| V <sub>DS</sub>    | Drain-source Voltage (V <sub>GS</sub> = 0)            | 60         |              | V    |
| V <sub>DGR</sub>   | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)          | 60         |              | V    |
| V <sub>GS</sub>    | Gate-source Voltage                                   | ± 20       |              | V    |
| I <sub>D</sub>     | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 30         | 17           | A    |
| I <sub>D</sub>     | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 21         | 12           | A    |
| I <sub>DM(•)</sub> | Drain Current (pulsed)                                | 120        | 68           | A    |
| P <sub>tot</sub>   | Total Dissipation at T <sub>c</sub> = 25 °C           | 80         | 30           | W    |
|                    | Derating Factor                                       | 0.53       | 0.2          | W/°C |
| V <sub>ISO</sub>   | Insulation Withstand Voltage (DC)                     | —          | 2000         | V    |
| dV/dt              | Peak Diode Recovery voltage slope                     | 7          |              | V/ns |
| T <sub>stg</sub>   | Storage Temperature                                   | -65 to 175 |              | °C   |
| T <sub>j</sub>     | Max. Operating Junction Temperature                   | 175        |              | °C   |

(•) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 30 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>



### INTERNAL SCHEMATIC DIAGRAM



# STP30NE06LFP

## THERMAL DATA

|   |   |            | TO-220      | TO-220FP |                    |
|---|---|------------|-------------|----------|--------------------|
| R <sub>thj-case</sub>                         | Thermal Resistance Junction-case                                    | Max        | 1.87        | 5        | °C/W               |
| R <sub>thj-amb</sub><br>R <sub>thc-sink</sub> | Thermal Resistance Junction-ambient<br>Thermal Resistance Case-sink | Max<br>Typ | 62.5<br>0.5 | 300      | °C/W<br>°C/W<br>°C |
| T <sub>I</sub>                                | Maximum Lead Temperature For Soldering Purpose                      |            |             |          |                    |

## AVALANCHE CHARACTERISTICS

| Symbol          | Parameter  | Max Value | Unit |
|-----------------|--|-----------|------|
| I <sub>AR</sub> | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)                                | 30        | A    |
| E <sub>AS</sub> | Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 30 V) | 100       | mJ   |

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

| Symbol               | Parameter   | Test Conditions  | Min. | Typ. | Max.    | Unit     |
|----------------------|---|--|------|------|---------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0  | 60   |      |         | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating T <sub>c</sub> = 125 °C |      |      | 1<br>10 | μA<br>μA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ± 20 V   |      |      | ± 100   | nA       |

## ON (\*)

| Symbol              | Parameter                         | Test Conditions   | Min. | Typ.           | Max.          | Unit   |
|---------------------|-----------------------------------|---|------|----------------|---------------|--------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA                                 | 1    | 1.8            | 2.5           | V      |
| R <sub>D(on)</sub>  | Static Drain-source On Resistance | V <sub>GS</sub> = 10V I <sub>D</sub> = 15 A<br>V <sub>GS</sub> = 5V I <sub>D</sub> = 15 A |      | 0.045<br>0.040 | 0.055<br>0.05 | Ω<br>Ω |
| I <sub>D(on)</sub>  | On State Drain Current            | V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>D(on)max</sub><br>V <sub>GS</sub> = 10 V    | 30   |                |               | A      |

## DYNAMIC

| Symbol   | Parameter   | Test Conditions  | Min. | Typ.              | Max. | Unit           |
|--|---|--|------|-------------------|------|----------------|
| g <sub>fs</sub> (*)                                      | Forward Transconductance  | V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>D(on)max</sub> I <sub>D</sub> = 10 A | 7    | 13                |      | S              |
| C <sub>iss</sub><br>C <sub>oss</sub><br>C <sub>rss</sub> | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0                               |      | 1300<br>200<br>60 |      | pF<br>pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)

## SWITCHING ON

| Symbol                        | Parameter  | Test Conditions   | Min. | Typ.          | Max. | Unit           |
|-------------------------------|--|---|------|---------------|------|----------------|
| $t_{d(on)}$<br>$t_r$          | Turn-on Time<br>Rise Time                                    | $V_{DD} = 30 \text{ V}$ $I_D = 15 \text{ A}$<br>$R_G = 4.7 \Omega$ $V_{GS} = 5 \text{ V}$ |      | 17<br>100     |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 48 \text{ V}$ $I_D = 30 \text{ A}$ $V_{GS} = 10 \text{ V}$                      |      | 20<br>8<br>11 |      | nC<br>nC<br>nC |

## SWITCHING OFF

| Symbol                             | Parameter   | Test Conditions   | Min. | Typ.           | Max. | Unit           |
|------------------------------------|---|---|------|----------------|------|----------------|
| $t_{r(V_{off})}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{DD} = 48 \text{ V}$ $I_D = 30 \text{ A}$<br>$R_G = 4.7 \Omega$ $V_{GS} = 5 \text{ V}$ |      | 11<br>40<br>60 |      | ns<br>ns<br>ns |

## SOURCE DRAIN DIODE

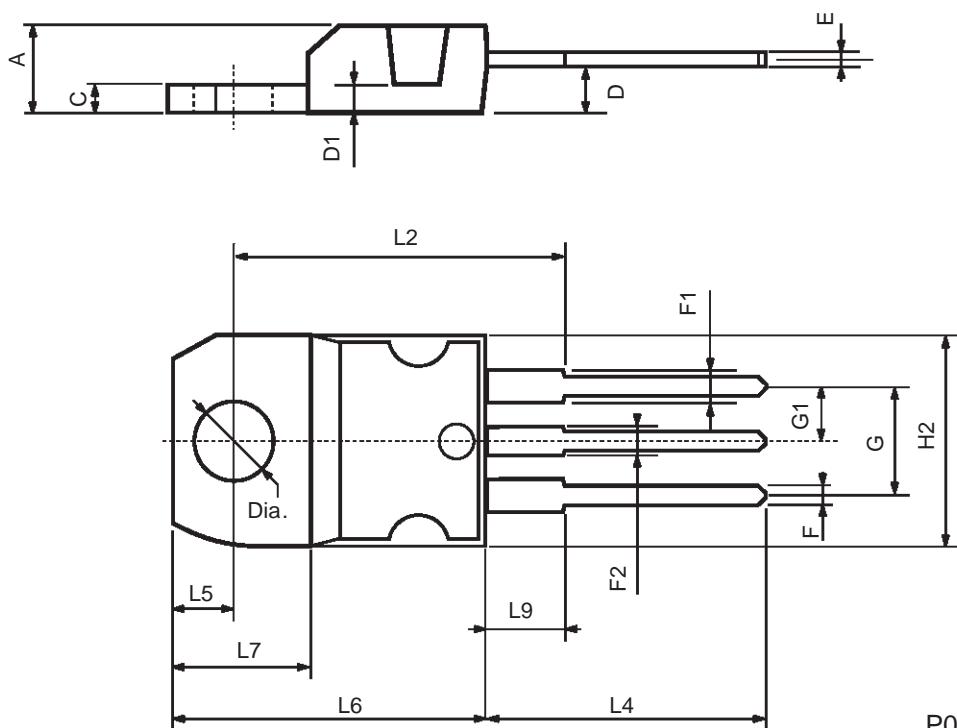
| Symbol                            | Parameter  | Test Conditions  | Min. | Typ.           | Max.      | Unit                     |
|-----------------------------------|--|--|------|----------------|-----------|--------------------------|
| $I_{SD}$<br>$I_{SDM}(\bullet)$    | Source-drain Current<br>Source-drain Current (pulsed)                        |  |      |                | 30<br>120 | A<br>A                   |
| $V_{SD} (\ast)$                   | 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>$V_{DD} = 30 \text{ V}$ $T_j = 150^\circ\text{C}$ |      | 70<br>140<br>4 |           | ns<br>$\mu\text{C}$<br>A |

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

(\*) Pulse width limited by safe operating area

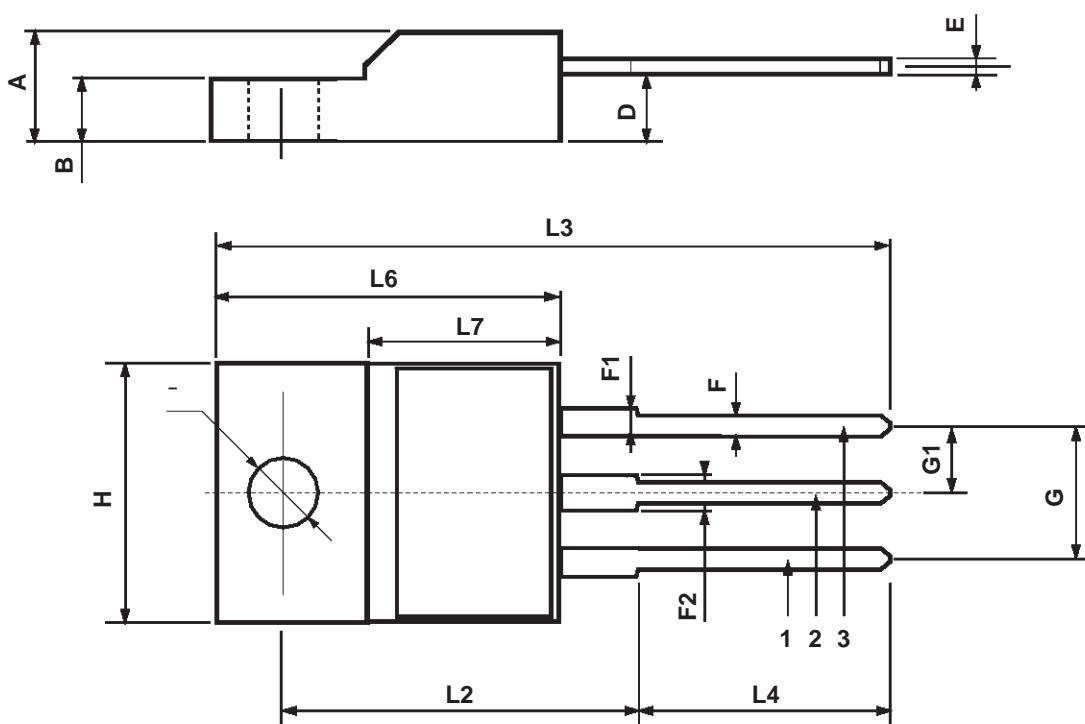
## TO-220 MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



## TO-220FP MECHANICAL DATA

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| B    | 2.5  |      | 2.7  | 0.098 |       | 0.106 |
| D    | 2.5  |      | 2.75 | 0.098 |       | 0.108 |
| E    | 0.45 |      | 0.7  | 0.017 |       | 0.027 |
| F    | 0.75 |      | 1    | 0.030 |       | 0.039 |
| F1   | 1.15 |      | 1.7  | 0.045 |       | 0.067 |
| F2   | 1.15 |      | 1.7  | 0.045 |       | 0.067 |
| G    | 4.95 |      | 5.2  | 0.195 |       | 0.204 |
| G1   | 2.4  |      | 2.7  | 0.094 |       | 0.106 |
| H    | 10   |      | 10.4 | 0.393 |       | 0.409 |
| L2   |      | 16   |      |       | 0.630 |       |
| L3   | 28.6 |      | 30.6 | 1.126 |       | 1.204 |
| L4   | 9.8  |      | 10.6 | 0.385 |       | 0.417 |
| L6   | 15.9 |      | 16.4 | 0.626 |       | 0.645 |
| L7   | 9    |      | 9.3  | 0.354 |       | 0.366 |
| Ø    | 3    |      | 3.2  | 0.118 |       | 0.126 |



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