



# STN3NE06L

## N - CHANNEL 60V - 0.10 $\Omega$ - 3A - SOT-223 STripFET™ POWER MOSFET

### PRELIMINARY DATA

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STN3NE06L | 60 V             | < 0.120 $\Omega$    | 3 A            |

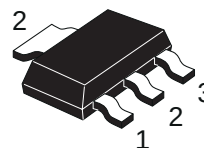
- TYPICAL R<sub>DS(on)</sub> = 0.10  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- AVALANCHE RUGGED TECHNOLOGY
- 100 % AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

### DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size™" stip-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.

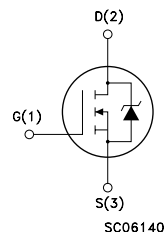
### APPLICATIONS

- DC MOTOR CONTROL (DISK DRIVES, etc.)
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION



SOT-223

### 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                                    | $\pm 20$   | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C   | 3          | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C  | 1.8        | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                 | 12         | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C            | 2.5        | W    |
|                     | Derating Factor                                        | 0.02       | W/°C |
| dv/dt(1)            | Peak Diode Recovery voltage slope                      | 6          | V/ns |
| T <sub>stg</sub>    | Storage Temperature                                    | -65 to 150 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                    | 150        | °C   |

(•) Pulse width limited by safe operating area  
New RDS (on) spec. starting from JULY 98

(1) I<sub>SD</sub>  $\leq$  12 A, di/dt  $\leq$  200 A/ $\mu$ S, V<sub>DD</sub>  $\leq$  V<sub>(BR)DSS</sub>, T<sub>j</sub>  $\leq$  T<sub>JMAX</sub>

## THERMAL DATA

|               |                                                          |     |     |                      |
|---------------|----------------------------------------------------------|-----|-----|----------------------|
| $R_{thj-pcb}$ | Thermal Resistance Junction-PC Board                     | Max | 50  | $^{\circ}\text{C/W}$ |
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient<br>(Surface Mounted) | Max | 60  | $^{\circ}\text{C/W}$ |
| $T_l$         | Maximum Lead Temperature For Soldering Purpose           |     | 260 | $^{\circ}\text{C}$   |

## AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                                         | Max Value | Unit |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive<br>(pulse width limited by $T_j$ max)                             | 3         | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy<br>(starting $T_j = 25^{\circ}\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 25\text{ V}$ ) | 20        | mJ   |

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

OFF

| Symbol        | Parameter                                        | Test Conditions                                                                          | Min. | Typ. | Max.      | Unit                           |
|---------------|--------------------------------------------------|------------------------------------------------------------------------------------------|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$                                              | 60   |      |           | V                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}\text{C}$ |      |      | 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 (\*)

| 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    | 1.7          | 2.5           | V                    |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 6\text{ A}$<br>$V_{GS} = 5\text{ V}$ $I_D = 6\text{ A}$ |      | 0.080<br>0.1 | 0.100<br>0.12 | $\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\text{ V}$                   | 3    |              |               | A                    |

## DYNAMIC

| Symbol       | Parameter                    | Test Conditions                                                 | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|-----------------------------------------------------------------|------|------|------|------|
| $g_{fs} (*)$ | Forward Transconductance     | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.5\text{ A}$  | 1    | 3    |      | S    |
| $C_{iss}$    | Input Capacitance            | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0\text{ V}$ |      | 700  | 960  | pF   |
| $C_{oss}$    | Output Capacitance           |                                                                 |      | 100  | 140  | pF   |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                 |      | 30   | 45   | pF   |

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

| Symbol         | Parameter             | Test Conditions                                                                         | Min. | Typ. | Max. | Unit       |
|----------------|-----------------------|-----------------------------------------------------------------------------------------|------|------|------|------------|
| $t_{d(on)}$    | Turn-on Time          | $V_{DD} = 30\text{ V}$ $I_D = 6\text{ A}$                                               |      | 17   | 23   | ns         |
| $t_r$          | Rise Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$                                               |      | 35   | 50   | ns         |
| $(di/dt)_{on}$ | Turn-on Current Slope | $V_{DD} = 25\text{ V}$ $I_D = 6\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ |      | 200  |      | A/ $\mu$ s |
| $Q_g$          | Total Gate Charge     | $V_{DD} = 40\text{ V}$ $I_D = 12\text{ A}$ $V_{GS} = 5\text{ V}$                        |      | 13   | 18   | nC         |
| $Q_{gs}$       | Gate-Source Charge    |                                                                                         |      | 6    |      | nC         |
| $Q_{gd}$       | Gate-Drain Charge     |                                                                                         |      | 5    |      | nC         |

**SWITCHING OFF**

| Symbol        | Parameter             | Test Conditions                            | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|--------------------------------------------|------|------|------|------|
| $t_{r(voff)}$ | Off-voltage Rise Time | $V_{DD} = 48\text{ V}$ $I_D = 12\text{ A}$ |      | 9    | 12   | ns   |
| $t_f$         | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$  |      | 18   | 25   | ns   |
| $t_c$         | Cross-over Time       |                                            |      | 30   | 45   | ns   |

**SOURCE DRAIN DIODE**

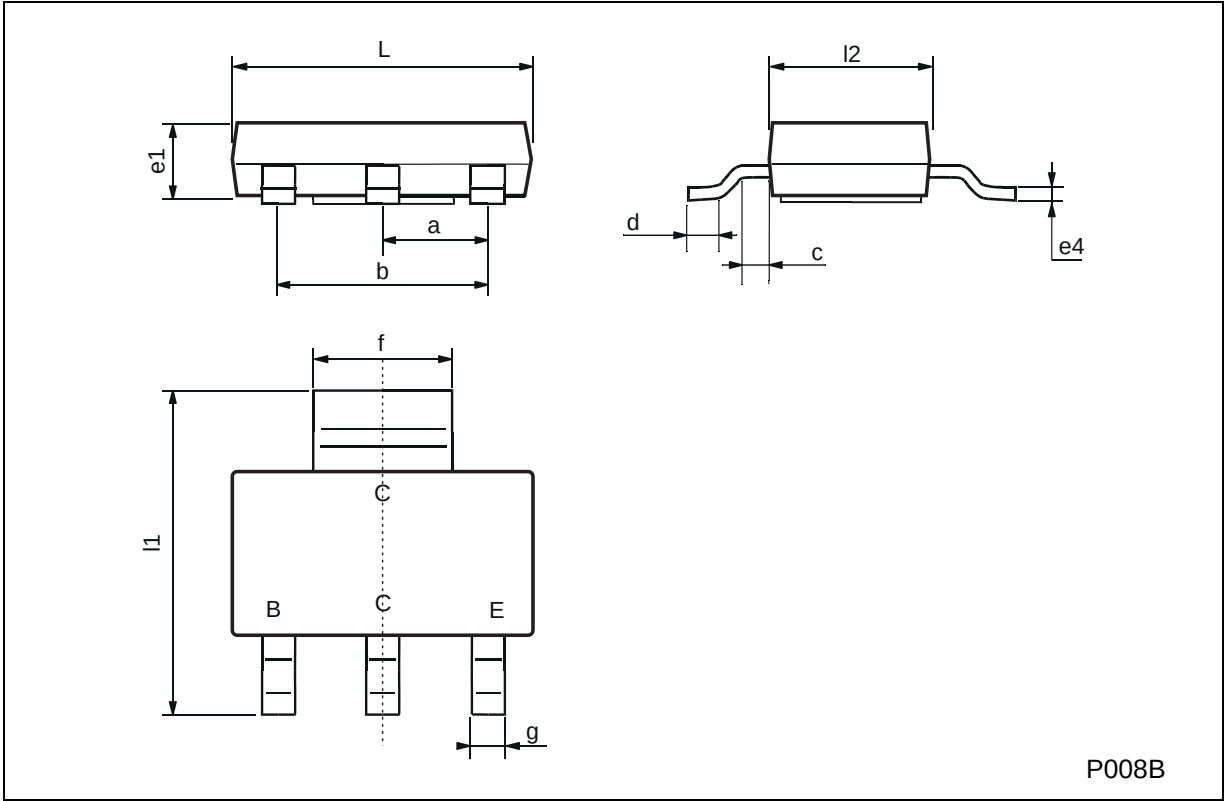
| Symbol             | Parameter                     | Test Conditions                                                                                                       | Min. | Typ. | Max. | Unit          |
|--------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$           | Source-drain Current          |                                                                                                                       |      |      | 3    | A             |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) |                                                                                                                       |      |      | 12   | A             |
| $V_{SD} (*)$       | Forward On Voltage            | $I_{SD} = 3\text{ A}$ $V_{GS} = 0$                                                                                    |      |      | 1.5  | V             |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 12\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 25\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ |      | 65   |      | ns            |
| $Q_{rr}$           | Reverse Recovery Charge       |                                                                                                                       |      | 0.13 |      | $\mu\text{C}$ |
| $I_{RRM}$          | Reverse Recovery Current      |                                                                                                                       |      | 4    |      | A             |

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

(\bullet) Pulse width limited by safe operating area

SOT-223 MECHANICAL DATA

| DIM. | mm   |      |      | mils  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| a    | 2.27 | 2.3  | 2.33 | 89.4  | 90.6  | 91.7  |
| b    | 4.57 | 4.6  | 4.63 | 179.9 | 181.1 | 182.3 |
| c    | 0.2  | 0.4  | 0.6  | 7.9   | 15.7  | 23.6  |
| d    | 0.63 | 0.65 | 0.67 | 24.8  | 25.6  | 26.4  |
| e1   | 1.5  | 1.6  | 1.7  | 59.1  | 63    | 66.9  |
| e4   |      |      | 0.32 |       |       | 12.6  |
| f    | 2.9  | 3    | 3.1  | 114.2 | 118.1 | 122.1 |
| g    | 0.67 | 0.7  | 0.73 | 26.4  | 27.6  | 28.7  |
| l1   | 6.7  | 7    | 7.3  | 263.8 | 275.6 | 287.4 |
| l2   | 3.5  | 3.5  | 3.7  | 137.8 | 137.8 | 145.7 |
| L    | 6.3  | 6.5  | 6.7  | 248   | 255.9 | 263.8 |



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