



# STS4DNF60L

## N - CHANNEL 60V - 0.045Ω - 4A SO-8 STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|------------|------------------|---------------------|----------------|
| STS4DNF60L | 60 V             | < 0.055 Ω           | 4 A            |

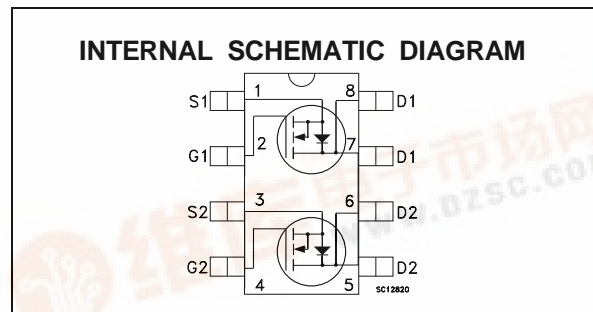
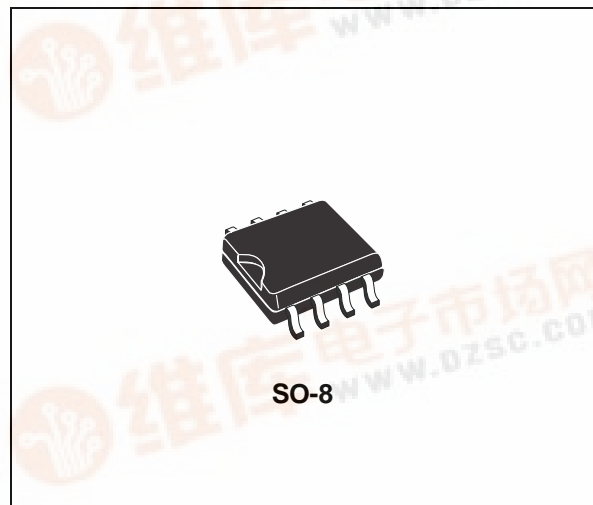
- TYPICAL R<sub>DS(on)</sub> = 0.045 Ω
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY
- LOW THRESHOLD DRIVE

### DESCRIPTION

This Power MOSFET is the second generation 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 DRIVE
- DC-DC CONVERTERS
- BATTERY MANAGMENT IN NOMADIC EQUIPMENT
- POWER MANAGMENT IN PORTABLE/DESKTOP PC<sub>s</sub>



### 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 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 Single Operation  | 4     | A    |
|                     | Drain Current (continuous) at T <sub>c</sub> = 100 °C Single Operation | 2.5   | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)   | 16    | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C Dual Operation             | 2     | W    |
|                     | Total Dissipation at T <sub>c</sub> = 25 °C Single Operation           | 1.6   | W    |

(●) Pulse width limited by safe operating area



## STS4DNF60L

### THERMAL DATA

|               |  |                  |            |                             |
|---------------|--|------------------|------------|-----------------------------|
| $R_{thj-amb}$ | *Thermal Resistance Junction-ambient   | Single Operation | 78         | $^{\circ}\text{C}/\text{W}$ |
|               |  | Dual Operation   | 62.5       | $^{\circ}\text{C}/\text{W}$ |
| $T_j$         | Maximum Operating Junction Temperature |                  | 150        | $^{\circ}\text{C}$          |
| $T_{stg}$     | Storage Temperature                    |                  | -55 to 150 | $^{\circ}\text{C}$          |

(\*) Mounted on FR-4 board ( $t \leq 10\text{sec}$ )

### 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                   | $I_D = 250 \mu\text{A}$ $V_{GS} = 0$   | 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            | $V_{DS} = V_{GS}$ $I_D = 250 \mu\text{A}$   | 1    | 1.7           | 2.5            | V                    |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10 \text{V}$ $I_D = 2 \text{A}$<br>$V_{GS} = 4.5 \text{V}$ $I_D = 2 \text{A}$ |      | 0.045<br>0.05 | 0.055<br>0.065 | $\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10 \text{V}$                     | 20   |               |                | A                    |

### DYNAMIC

| Symbol       | Parameter                    | Test Conditions   | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|---|------|------|------|------|
| $g_{fs}$ (*) | Forward Transconductance     | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2 \text{A}$    |      | 7    |      | S    |
| $C_{iss}$    | Input Capacitance            | $V_{DS} = 25 \text{V}$ $f = 1 \text{MHz}$ $V_{GS} = 0 \text{V}$ |      | 1250 |      | pF   |
| $C_{oss}$    | Output Capacitance           |   |      | 130  |      | pF   |
| $C_{rss}$    | Reverse Transfer Capacitance |   |      | 26   |      | 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                                    | $V_{DD} = 15\text{ V}$ $I_D = 2\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ |      | TBD          | TBD  | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 48\text{ V}$ $I_D = 4\text{ A}$ $V_{GS} = 4.5\text{ V}$                        |      | 15<br>4<br>4 | 25   | nC<br>nC<br>nC |

SWITCHING OFF

| Symbol                          | Parameter   | Test Conditions  | Min. | Typ. | Max. | Unit           |
|---------------------------------|---|--|------|------|------|----------------|
| $t_{r(voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{DD} = 48\text{ V}$ $I_D = 4\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ |      | TBD  |      | ns<br>ns<br>ns |

SOURCE DRAIN DIODE

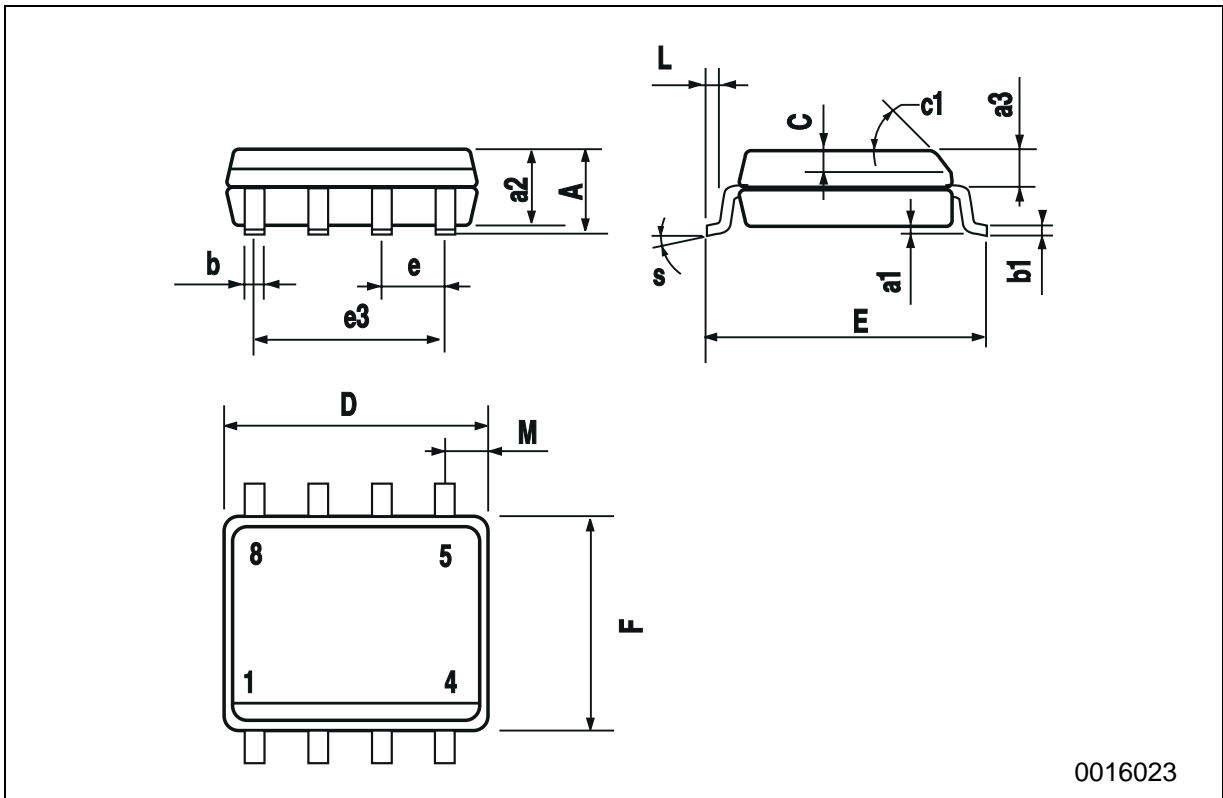
| Symbol                            | Parameter  | Test Conditions   | Min. | Typ. | Max.    | Unit          |
|-----------------------------------|--|---|------|------|---------|---------------|
| $I_{SD}$<br>$I_{SDM}(\bullet)$    | Source-drain Current<br>Source-drain Current (pulsed)                        |   |      |      | 4<br>16 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage   | $I_{SD} = 4\text{ A}$ $V_{GS} = 0$  |      |      | 1.2     | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_r = 20\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ |      | TBD  | TBD     | ns<br>nC<br>A |

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

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

**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.)  |      |      |       |       |       |



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