



## STS2DNE60

### N - CHANNEL 60V - 0.180Ω - 2A SO-8 STripFET™ POWER MOSFET

#### PRELIMINARY DATA

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STS2DNE60 | 60 V             | < 0.23 Ω            | 2 A            |

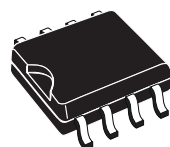
- TYPICAL R<sub>DS(on)</sub> = 0.18 Ω
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY
- LOW THRESHOLD DRIVE

#### 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.

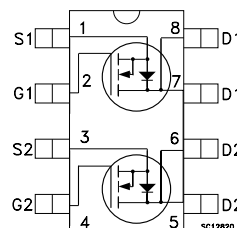
#### APPLICATIONS

- DC MOTOR DRIVE
- DC-DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN PORTABLE/DESKTOP PC<sub>s</sub>



SO-8

#### 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 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  | 2     | A    |
|                     | Drain Current (continuous) at T <sub>c</sub> = 100 °C Single Operation | 1.3   | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                                 | 8     | 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

## STS2DNE60

### THERMAL DATA

|               |                                        |                  |            |                      |
|---------------|----------------------------------------|------------------|------------|----------------------|
| $R_{thj-amb}$ | *Thermal Resistance Junction-ambient   | Single Operation | 78         | $^{\circ}\text{C/W}$ |
| $T_j$         | Maximum Operating Junction Temperature | Dual Operation   | 62.5       | $^{\circ}\text{C/W}$ |
| $T_{stg}$     | Storage Temperature                    |                  | 150        | $^{\circ}\text{C}$   |
|               |                                        |                  | -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            | $V_{DS} = V_{GS}$ $I_D = 250\ \mu\text{A}$                           | 2    | 3.3   | 4    | V        |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\ \text{V}$ $I_D = 1\ \text{A}$                          |      | 0.180 | 0.23 | $\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\ \text{V}$ | 8    |       |      | A        |

### DYNAMIC

| Symbol       | Parameter                    | Test Conditions                                                    | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|--------------------------------------------------------------------|------|------|------|------|
| $g_{fs}$ (*) | Forward Transconductance     | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1\ \text{A}$      |      | 1.8  |      | S    |
| $C_{iss}$    | Input Capacitance            | $V_{DS} = 25\ \text{V}$ $f = 1\ \text{MHz}$ $V_{GS} = 0\ \text{V}$ |      | 310  |      | pF   |
| $C_{oss}$    | Output Capacitance           |                                                                    |      | 45   |      | pF   |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                    |      | 12   |      | pF   |

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

| Symbol      | Parameter          | Test Conditions                                                            | Min. | Typ. | Max. | Unit |
|-------------|--------------------|----------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 30\text{ V}$ $I_D = 1\text{ A}$                                  |      | 9    |      | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 10   |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 24\text{ V}$ $I_D = 2\text{ A}$ $V_{GS} = 4.5\text{ V}$          |      | 12   | 16   | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                            |      | 5.1  |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                            |      | 2.7  |      | nC   |

**SWITCHING OFF**

| Symbol        | Parameter             | Test Conditions                                                            | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|----------------------------------------------------------------------------|------|------|------|------|
| $t_{d(off)}$  | Turn-off Delay Time   | $V_{DD} = 30\text{ V}$ $I_D = 1\text{ A}$                                  |      | 25   |      | ns   |
| $t_f$         | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 5    |      | ns   |
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{clamp} = 48\text{ V}$ $I_D = 2\text{ A}$                               |      | 4.5  |      | ns   |
| $t_f$         | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$                                 |      | 5    |      | ns   |
| $t_c$         | Cross-over Time       | (Inductive Load, see fig. 5)                                               |      | 12   |      | ns   |

**SOURCE DRAIN DIODE**

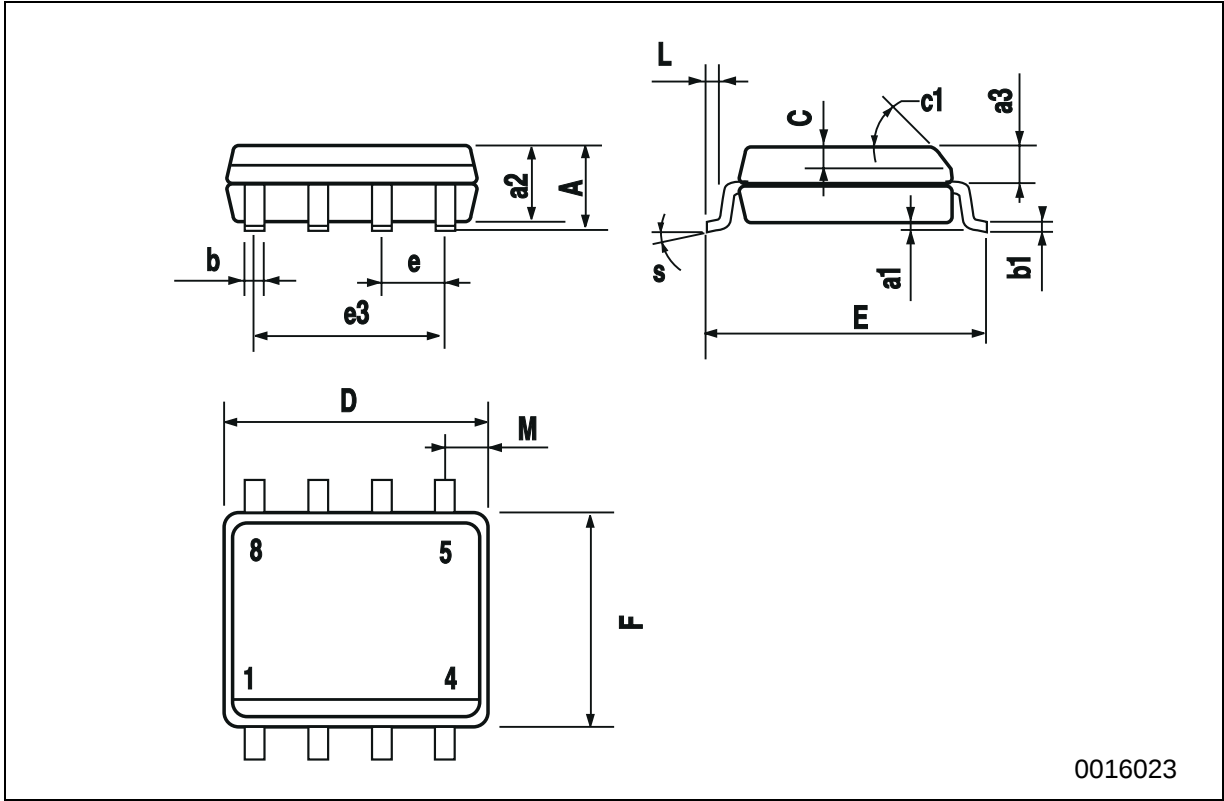
| Symbol             | Parameter                     | Test Conditions                                                                                                                                    | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{SD}$           | Source-drain Current          |                                                                                                                                                    |      |      | 2    | A    |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) |                                                                                                                                                    |      |      | 8    | A    |
| $V_{SD} (*)$       | Forward On Voltage            | $I_{SD} = 2\text{ A}$ $V_{GS} = 0$                                                                                                                 |      |      | 1.2  | V    |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 2\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 25\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$<br>(see test circuit, fig. 5) |      | 40   |      | ns   |
| $Q_{rr}$           | Reverse Recovery Charge       |                                                                                                                                                    |      | 50   |      | nC   |
| $I_{RRM}$          | Reverse Recovery Current      |                                                                                                                                                    |      | 2.5  |      | 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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