



# STS2DPF20V

## DUAL P-CHANNEL 20V - 0.14Ω - 2A SO-8 2.7V-DRIVE STripFET™ II POWER MOSFET

PRELIMINARY DATA

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub>              | I <sub>D</sub> |
|------------|------------------|----------------------------------|----------------|
| STS2DPF20V | 20 V             | <0.20Ω (@4.5V)<br><0.25Ω (@2.7V) | 2 A            |

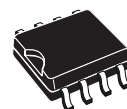
- TYPICAL R<sub>DS(on)</sub> = 0.14Ω (@4.5V)
- TYPICAL R<sub>DS(on)</sub> = 0.2Ω (@2.7V)
- ULTRA LOW THRESHOLD GATE DRIVE (2.7V)
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY

### 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.

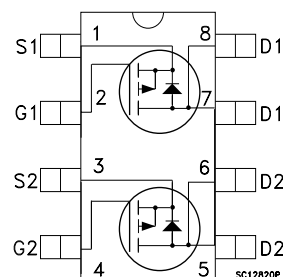
### APPLICATIONS

- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN CELLULAR PHONES



SO-8

### INTERNAL SCHEMATIC DIAGRAM



### MOSFET ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                                                                                                                     | Value     | Unit   |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)                                                                                                    | 20        | V      |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)                                                                                                  | 20        | V      |
| V <sub>GS</sub>     | Gate- source Voltage                                                                                                                          | ± 12      | V      |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 25°C Single Operation<br>Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operation | 2<br>1.26 | A<br>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<br>Total Dissipation at T <sub>C</sub> = 25°C Single Operation                      | 1.6<br>2  | W<br>W |

(●) Pulse width limited by safe operating area.

Note: For the P-CHANNEL MOSFET actual polarity of Voltages and current has to be reversed

## STS2DPF20V

### THERMAL DATA

|                  |                                                                                         |            |              |
|------------------|-----------------------------------------------------------------------------------------|------------|--------------|
| Rthj-amb         | (*)Thermal Resistance Junction-ambient Single Operation<br>Dual Operation               | 62.5<br>78 | °C/W<br>°C/W |
| T <sub>stg</sub> | Storage Temperature                                                                     | -55 to 150 | °C           |
| T <sub>j</sub>   | Junction-ambient Temperature<br>(*) When Mounted on 0.5 in <sup>2</sup> of 2 oz. Copper | -55 to 150 | °C           |

### MOSFET ELECTRICAL CHARACTERISTICS (TCASE = 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                                          | 20   |      |         | 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> = ± 12 V                                                              |      |      | ±100    | nA       |

### ON (1)

| 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> = 250µA                                     | 0.6  |              |              | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1 A<br>V <sub>GS</sub> = 2.7 V, I <sub>D</sub> = 1 A |      | 0.14<br>0.20 | 0.20<br>0.25 | Ω<br>Ω |

### DYNAMIC

| Symbol              | Parameter                    | Test Conditions                                       | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|-------------------------------------------------------|------|------|------|------|
| g <sub>fs</sub> (1) | Forward Transconductance     | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 1.5 A        |      | 4.5  |      | S    |
| C <sub>iss</sub>    | Input Capacitance            | V <sub>DS</sub> = 15V, f = 1 MHz, V <sub>GS</sub> = 0 |      | 315  |      | pF   |
| C <sub>oss</sub>    | Output Capacitance           |                                                       |      | 87   |      | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance |                                                       |      | 17   |      | pF   |

**ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING ON**

| Symbol      | Parameter          | Test Conditions                                                                                          | Min. | Typ. | Max. | Unit |
|-------------|--------------------|----------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 10\text{ V}$ , $I_D = 1.5\text{ A}$                                                            |      | 38   |      | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\Omega$ , $V_{GS} = 4.5\text{ V}$<br>(see test circuit, Figure 1)                              |      | 30   |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 10\text{ V}$ , $I_D = 2\text{ A}$ ,<br>$V_{GS} = 4.5\text{ V}$<br>(see test circuit, Figure 2) |      | 3.8  | 4.8  | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                                                          |      | 0.34 |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                                                          |      | 0.8  |      | nC   |

**SWITCHING OFF**

| Symbol       | Parameter           | Test Conditions                                                                                                              | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(off)}$ | Turn-off Delay Time | $V_{DD} = 10\text{ V}$ , $I_D = 1\text{ A}$ ,<br>$R_G = 4.7\Omega$ , $V_{GS} = 4.5\text{ V}$<br>(see test circuit, Figure 1) |      | 45   |      | ns   |
| $t_f$        | Fall Time           |                                                                                                                              |      | 11   |      | ns   |

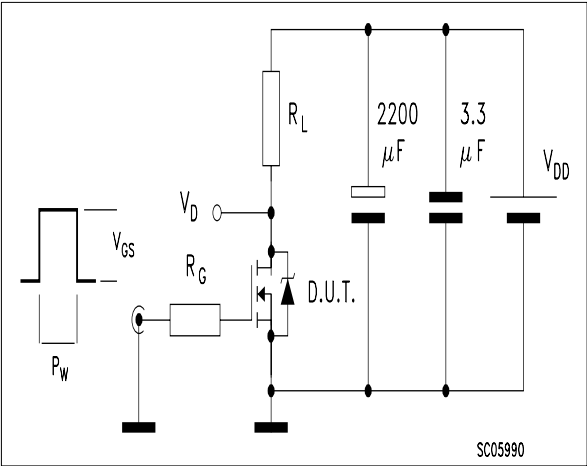
**SOURCE DRAIN DIODE**

| Symbol        | Parameter                     | Test Conditions                                                                                                                                    | Min. | Typ. | Max. | Unit |
|---------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{SD}$      | Source-drain Current          |                                                                                                                                                    |      |      | 2    | A    |
| $I_{SDM} (2)$ | Source-drain Current (pulsed) |                                                                                                                                                    |      |      | 8    | A    |
| $V_{SD} (1)$  | 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>$V_{DD} = 10\text{ V}$ , $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 3) |      | 15   |      | ns   |
| $Q_{rr}$      | Reverse Recovery Charge       |                                                                                                                                                    |      | 7.5  |      | nC   |
| $I_{RRM}$     | Reverse Recovery Current      |                                                                                                                                                    |      | 1    |      | A    |

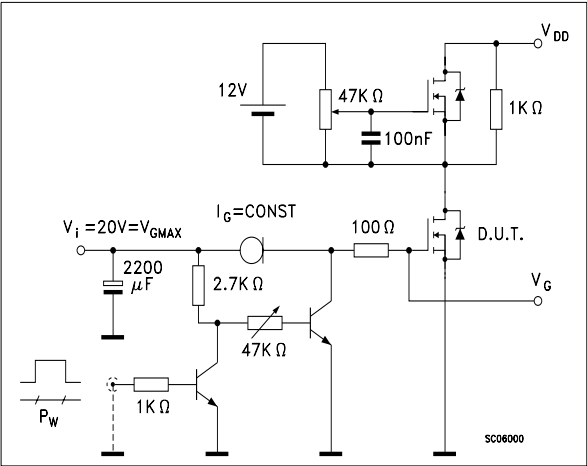
Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

2. Pulse width limited by safe operating area.

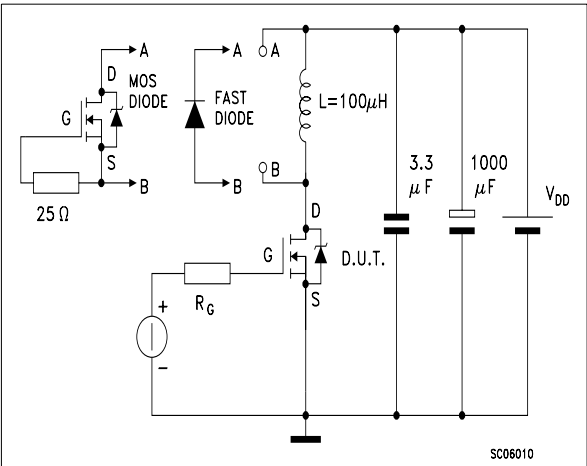
**Fig. 1:** Switching Times Test Circuit For Resistive Load



**Fig. 2:** Gate Charge test Circuit

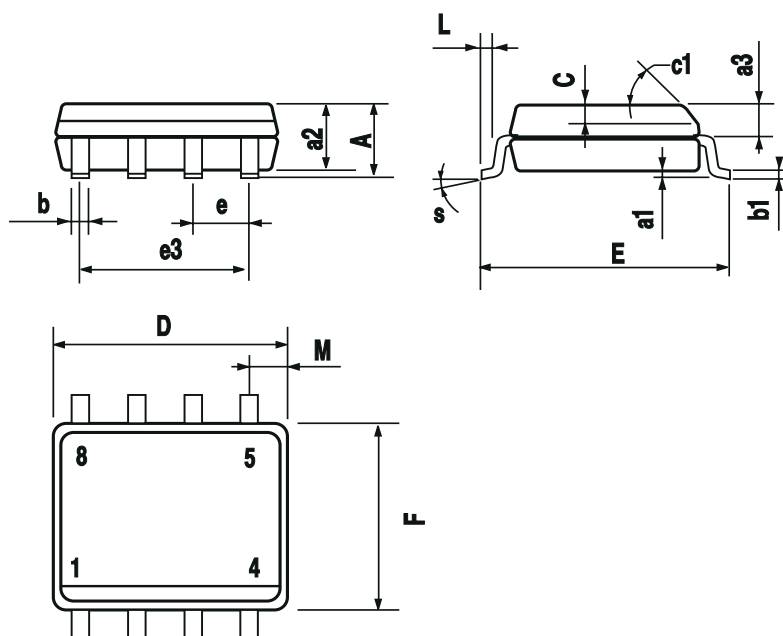


**Fig. 3:** Test Circuit For Diode Recovery Behaviour



## 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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