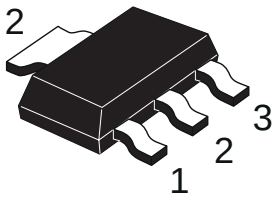
# STN3PF06

## P-CHANNEL 60V - 0.18Ω - 3A SOT-223
## STripFET™ II POWER MOSFET

**PRELIMINARY DATA**

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STN3PF06 | 60V | <0.20Ω | 2.5A |

- TYPICAL $R_{DS}(on)$ = 0.18Ω
- EXCEPTIONAL dv/dt CAPABILITY
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- LOW THRESHOLD DRIVE

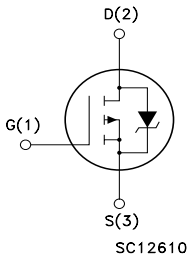



**SOT-223**

### 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 avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### INTERNAL SCHEMATIC DIAGRAM




### APPLICATIONS

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

### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 60 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 60 | V |
| $V_{GS}$ | Gate- source Voltage | ±20 | V |
| $I_D$ | Drain Current (continuos) at $T_C$ = 25°C | 2.5 | A |
| $I_D$ | Drain Current (continuos) at $T_C$ = 100°C | 1.5 | A |
| $I_{DM}$ (●) | Drain Current (pulsed) | 10 | A |
| $P_{TOT}$ | Total Dissipation at $T_C$ = 25°C | 2.5 | W |
| | Derating Factor | 0.02 | W/°C |
| dv/dt(1) | Peak Diode Recovery voltage slope | 6 | V/ns |
| $T_{stg}$ | Storage Temperature | –65 to 175 | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | °C |

(●) Pulse width limited by safe operating area

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

(1)$I_{SD}$ ≤3A, di/dt ≤200A/µs, $V_{DD} \le V_{(BR)DSS}$, $T_j \le T_{JMAX.}$

## THERMAL DATA

| | | | |
|---|---|---|---|
| Rthj-pcb | Thermal Resistance Junction-PC Board Max | 50 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max (Surface Mounted) | 60 | °C/W |
| $T_l$ | Maximum Lead Temperature For Soldering Purpose | 260 | °C |

## ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D$ = 250 µA, $V_{GS}$ = 0 | 60 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating | | | 1 | µA |
| | | $V_{DS}$ = Max Rating, $T_C$ = 125 °C | | | 10 | µA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ±20V | | | ±100 | nA |

ON (1)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA | 2 | | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 10V, $I_D$ = 1.25 A | | 0.18 | 0.20 | Ω |
| $I_{D(on)}$ | On State Drain Current | $V_{DS}$ > $I_{D(on)}$ x $R_{DS(on)max}$, $V_{GS}$ = 10V | 2.5 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (1) | Forward Transconductance | $V_{DS}$ > $I_{D(on)}$ x $R_{DS(on)max}$, $I_D$ =1.25 A | | 1.5 | | S |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, f = 1 MHz, $V_{GS}$ = 0 | | 850 | | pF |
| $C_{oss}$ | Output Capacitance | | | 230 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 75 | | pF |

**ELECTRICAL CHARACTERISTICS** (CONTINUED)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$ = 30V, $I_D$ = 6A | | 20 | | ns |
| $t_r$ | Rise Time | $R_G$ = 4.7Ω $V_{GS}$ = 10V (see test circuit, Figure 3) | | 40 | | ns |
| $Q_g$ | Total Gate Charge | $V_{DD}$ = 48V, $I_D$ = 12A, $V_{GS}$ = 10 V | | 16 | 21 | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 4 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 6 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(off)}$ | Turn-off-Delay Time | $V_{DD}$ = 30V, $I_D$ = 6A, | | 40 | | ns |
| $t_f$ | Fall Time | $R_G$ = 4.7Ω, $V_{GS}$ = 10V (see test circuit, Figure 3) | | 10 | | ns |
| $t_{r(off)}$ | Off-voltage Rise Time | Vclamp =48V, $I_D$ =12 A $R_G$ = 4.7Ω, $V_{GS}$ = 10V | | 10 | | ns |
| $t_f$ | Fall Time | (see test circuit, Figure 5) | | 17 | | ns |
| $t_c$ | Cross-over Time | | | 30 | | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$ | Source-drain Current | | | | 2.5 | A |
| $I_{SDM}$ (1) | Source-drain Current (pulsed) | | | | 10 | A |
| $V_{SD}$ (2) | Forward On Voltage | $I_{SD}$ = 2.5A, $V_{GS}$ = 0 | | | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$ = 12A, di/dt = 100A/µs, | | 100 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | $V_{DD}$ = 30V, $T_j$ = 150°C | | 260 | | nC |
| $I_{RRM}$ | Reverse Recovery Current | (see test circuit, Figure 5) | | 5.2 | | A |

Note: 1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

**Fig. 1:** Unclamped Inductive Load Test Circuit

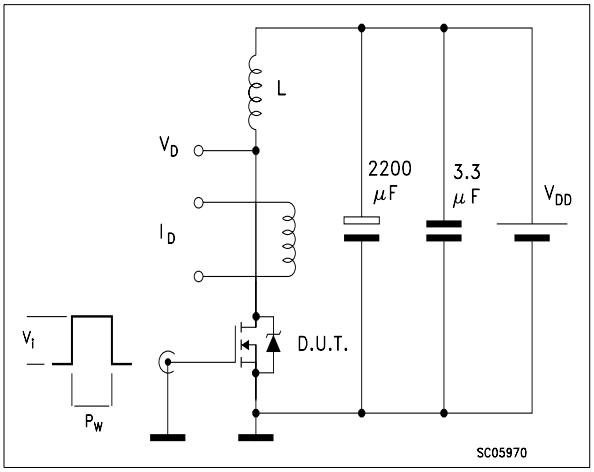



**Fig. 2:** Unclamped Inductive Waveform

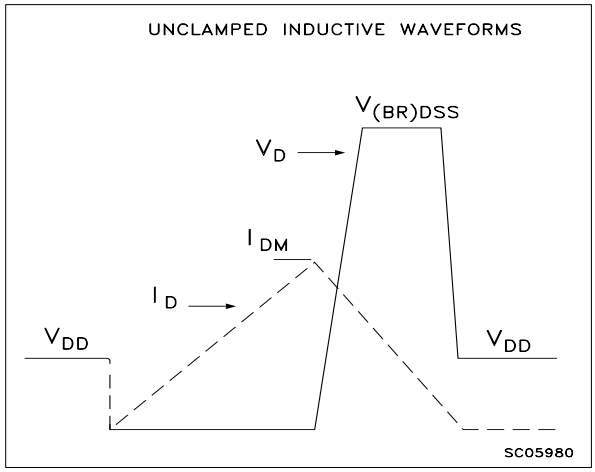



**Fig. 3:** Switching Times Test Circuit For Resistive Load

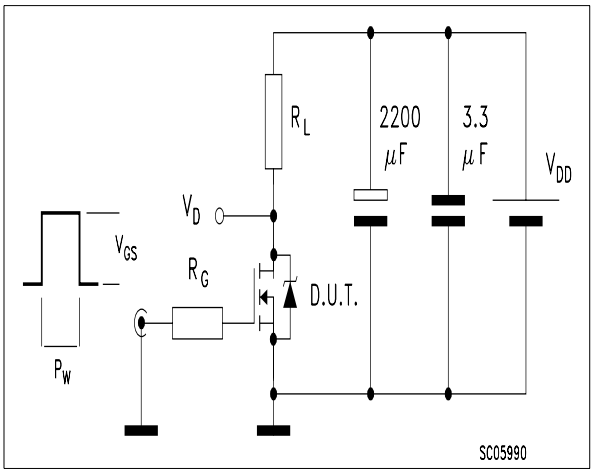



**Fig. 4:** Gate Charge test Circuit

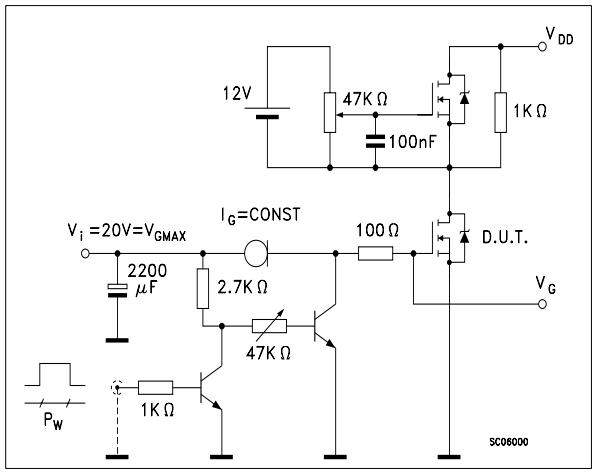
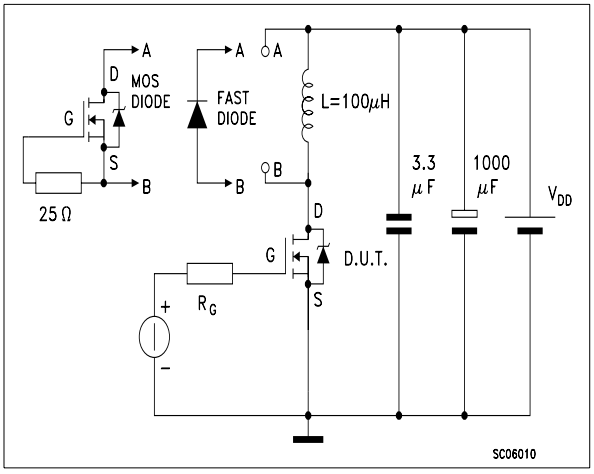
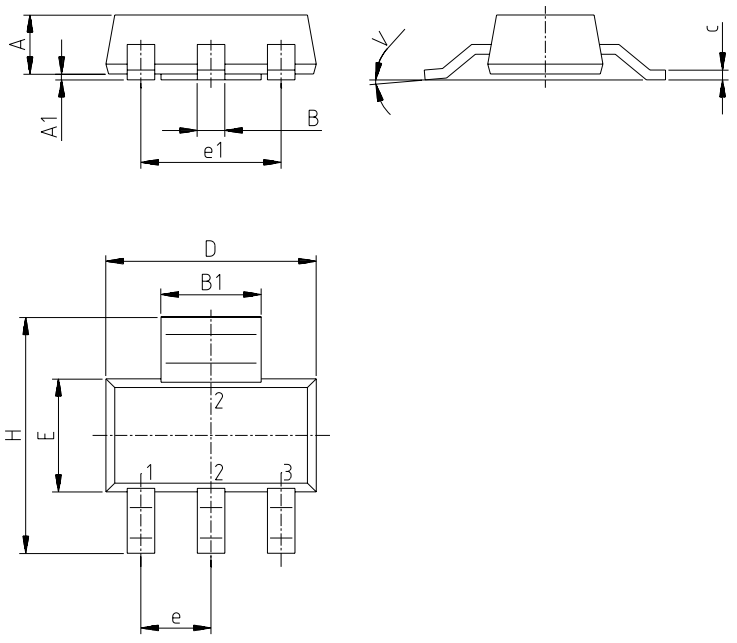



**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Recovery Times



## SOT-223 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.80 | | | 0.071 |
| B | 0.60 | 0.70 | 0.80 | 0.024 | 0.027 | 0.031 |
| B1 | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| c | 0.24 | 0.26 | 0.32 | 0.009 | 0.010 | 0.013 |
| D | 6.30 | 6.50 | 6.70 | 0.248 | 0.256 | 0.264 |
| e | | 2.30 | | | 0.090 | |
| e1 | | 4.60 | | | 0.181 | |
| E | 3.30 | 3.50 | 3.70 | 0.130 | 0.138 | 0.146 |
| H | 6.70 | 7.00 | 7.30 | 0.264 | 0.276 | 0.287 |
| V | | | $10^o$ | | | $10^o$ |
| A1 | | 0.02 | | | | |

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