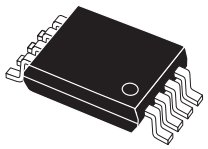
# STC5NF30V

## N-CHANNEL 30V - 0.027 Ω - 5A TSSOP8
## 2.7V-DRIVE STripFET™ II POWER MOSFET

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STC5NF30V | 30 V | < 0.031 Ω ( @ 4.5 V )<br>< 0.035 Ω ( @ 2.7 V ) | 5 A |

- TYPICAL $R_{DS}$(on) = 0.027 Ω @ 4.5 V
- TYPICAL $R_{DS}$(on) = 0.031 Ω @ 2.7 V
- ULTRA LOW THRESHOLD GATE DRIVE (2.7 V)
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY



**TSSOP8**

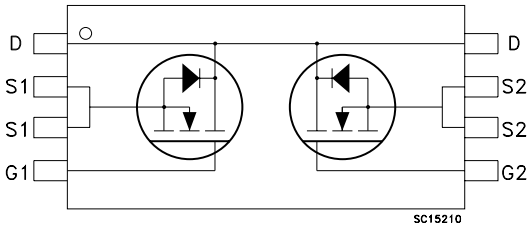
### DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronis 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 PCs

### INTERNAL SCHEMATIC DIAGRAM




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 30 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 20 | V |
| $V_{GS}$ | Gate- source Voltage | ± 12 | V |
| $I_D$ | Drain Current (continuous) at $T_C$ = 25°C | 5 | A |
| $I_D$ | Drain Current (continuous) at $T_C$ = 100°C | 3 | A |
| $I_{DM}$(•) | Drain Current (pulsed) | 20 | A |
| $P_{tot}$ | Total Dissipation at $T_C$ = 25°C | 1.5 | W |

(•) Pulse width limited by safe operating area.

## THERMAL DATA

| | | | | |
|---|---|---|---|---|
| Rthj-pcb | Thermal Resistance Junction-PCB (**) | Max | 100 | °C/W |
| Rthj-pcb | Thermal Resistance Junction-PCB (*) | Max | 83.5 | °C/W |
| $T_j$ | Operating Junction Temperature | | -55 to 150 | °C |
| $T_{stg}$ | Storage temperature | | -55 to 150 | °C |

(*) When Mounted on FR-4 board with 1 inch² pad, 2 oz of Cu and t ≤ 10 sec
(**) When Mounted on minimum recommended footprint

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 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 | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_C$ = 125°C | | | 1<br>10 | µA<br>µA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ± 12V | | | ±100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ $I_D$ = 250 µA | 0.6 | | | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 4.5 V $I_D$ = 2.5 A<br>$V_{GS}$ = 2.7 V $I_D$ = 2.5 A | | 0.027<br>0.031 | 0.031<br>0.035 | Ω<br>Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (*) | Forward Transconductance | $V_{DS}$=15 V $I_D$ = 2.5 A | | 9.5 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 15V f = 1 MHz, $V_{GS}$ = 0 | | 460<br>200<br>50 | | pF<br>pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD}$ = 10 V $I_D$ = 2.5 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V<br>(Resistive Load, Figure 1) | | 7<br>33 | | ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$= 16V $I_D$= 5A $V_{GS}$=4.5V<br>(see test circuit, Figure 2) | | 8.5<br>1.8<br>2.4 | 11.5 | nC<br>nC<br>nC |

SWITCHING OFF

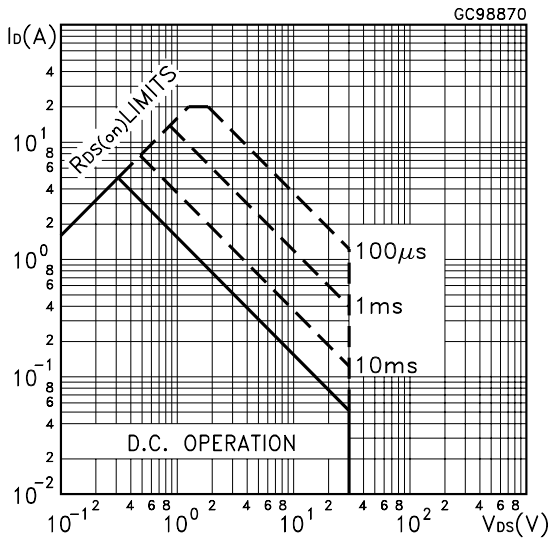
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD}$ = 10 V $I_D$ = 2.5 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 4.5 V<br>(Resistive Load, Figure 1) | | 27<br>10 | | ns<br>ns |
| $t_{d(Voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{clamp}$ = 16 V $I_D$ = 5 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 4.5 V<br>(Inductive Load, Figure 3) | | 26<br>11<br>21 | | ns<br>ns<br>ns |

SOURCE DRAIN DIODE

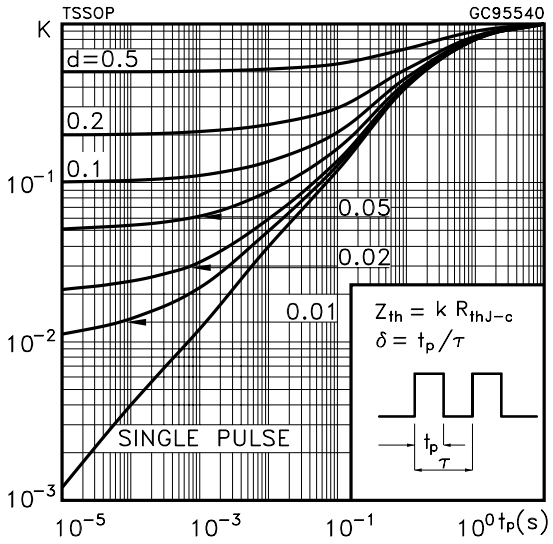
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ (•) | Source-drain Current<br>Source-drain Current (pulsed) | | | | 5<br>20 | A<br>A |
| $V_{SD}$ (*) | Forward On Voltage | $I_{SD}$ = 5 A $V_{GS}$ = 0 | | | 1.2 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD}$ = 5 A di/dt = 100A/µs<br>$V_{DD}$ = 10 V $T_j$ = 150°C<br>(see test circuit, Figure 3) | | 26<br>13<br>1 | | ns<br>nC<br>A |

(*)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
(•)Pulse width limited by safe operating area.

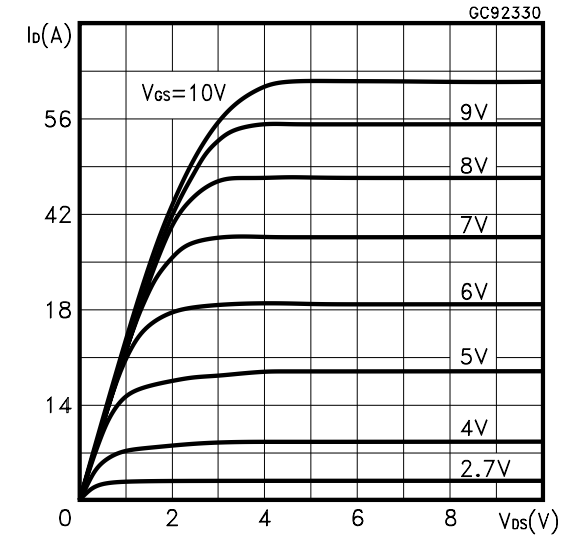
Safe Operating Area



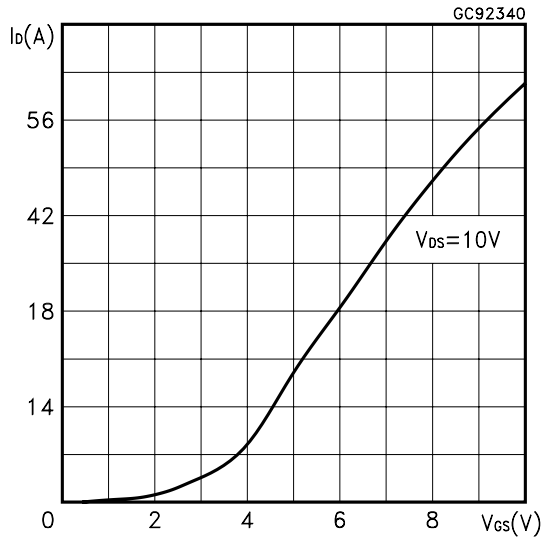

Thermal Impedance



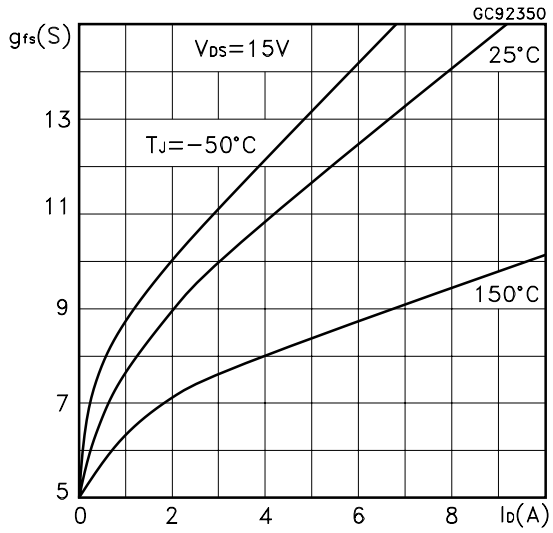
Output Characteristics



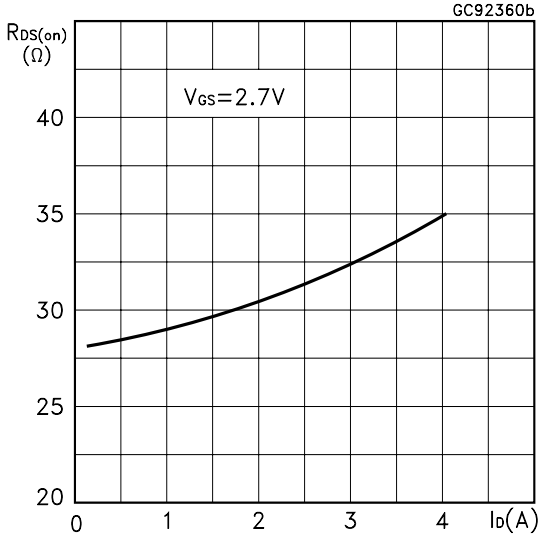

Transfer Characteristics



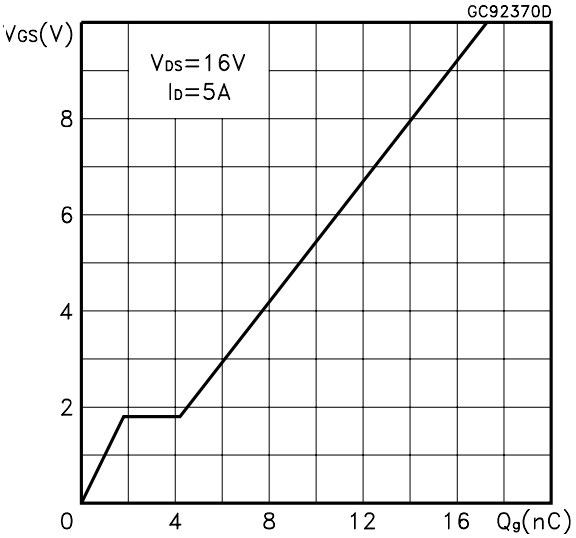

Transconductance



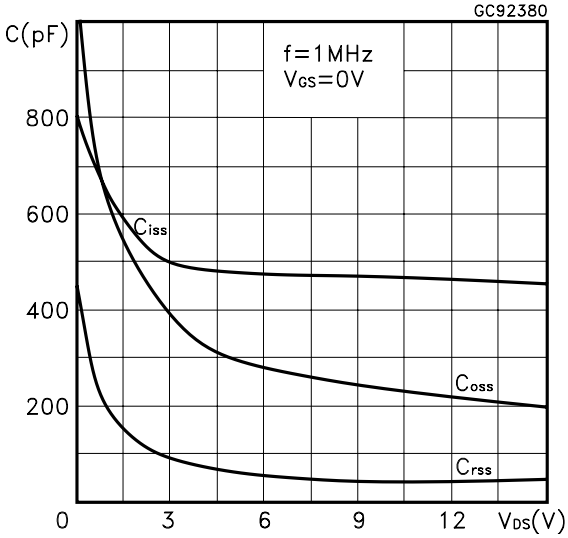

Static Drain-source On Resistance



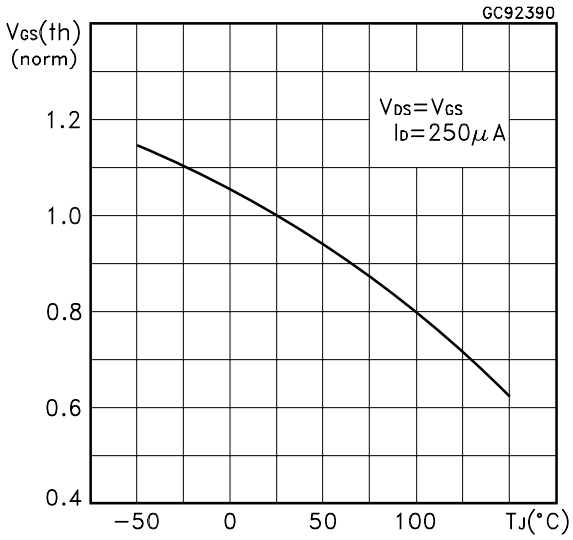

Gate Charge vs Gate-source Voltage



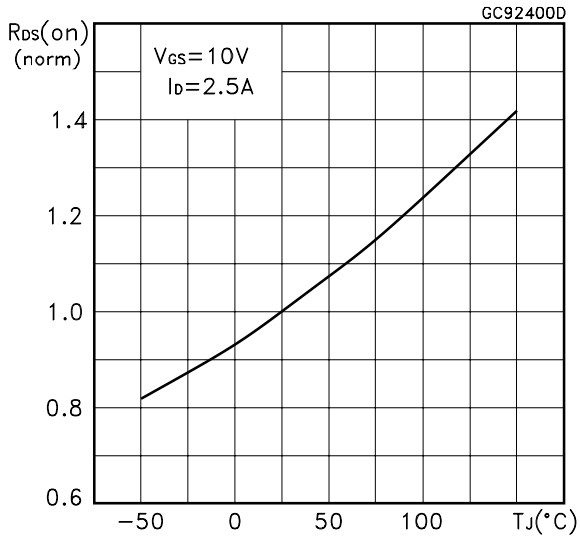

Capacitance Variations



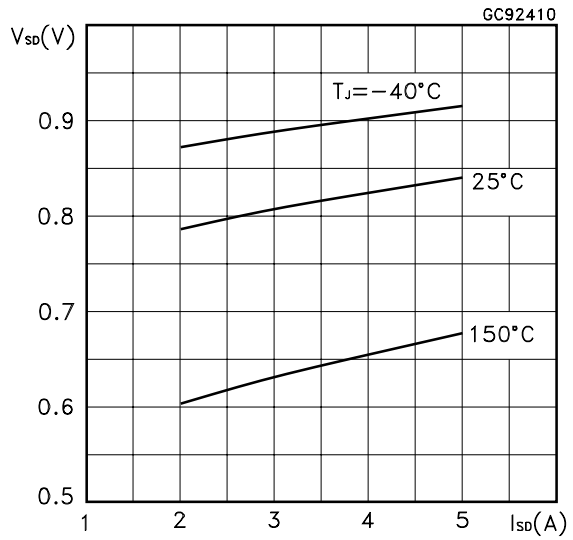
Normalized Gate Threshold Voltage vs Temperature




Normalized on Resistance vs Temperature




Source-drain Diode Forward Characteristics




Thermal resistance and max power

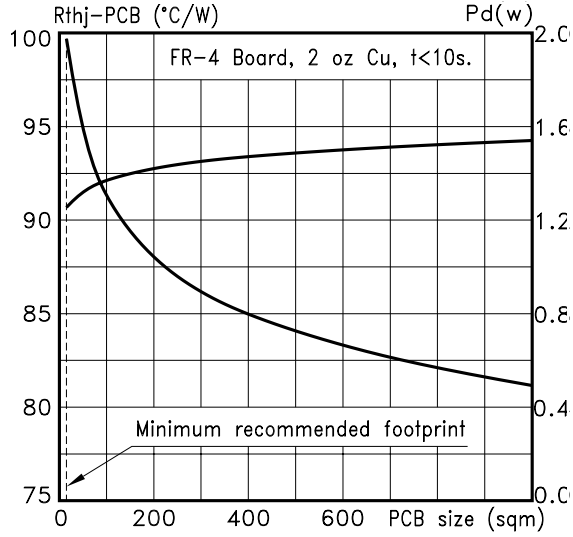


**Fig. 1:** Switching Times Test Circuits For Resistive Load

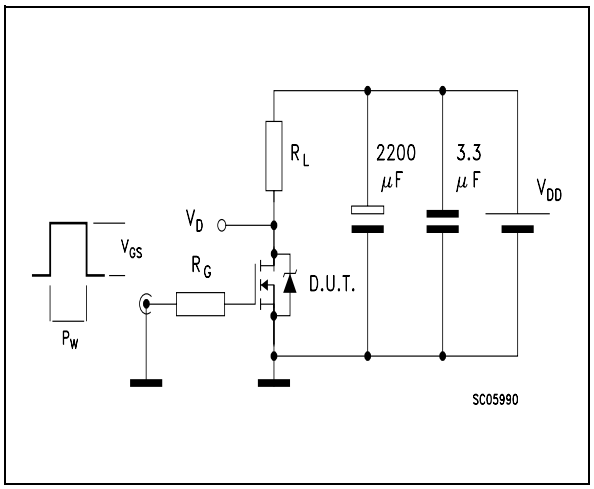



**Fig. 2:** Gate Charge test Circuit

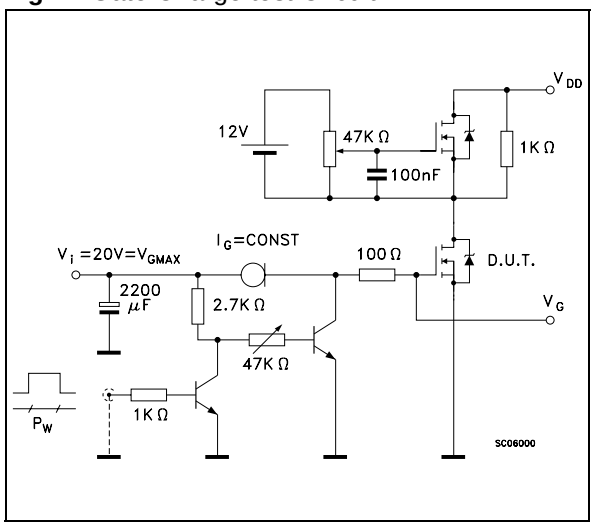
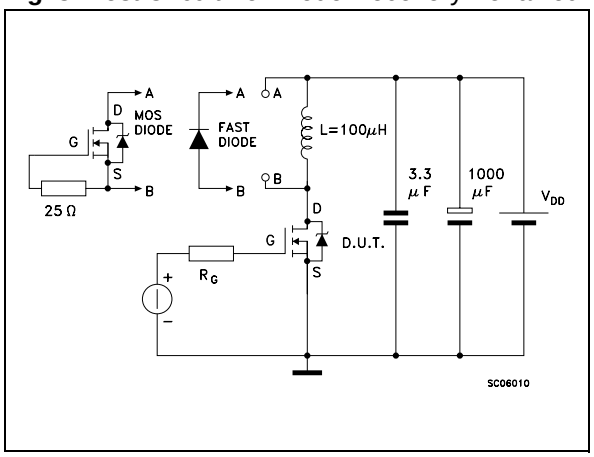



**Fig. 3:** Test Circuit For Diode Recovery Behaviour



## TSSOP8 MECHANICAL DATA

| DIM. | mm. | | | inch. | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 1.05 | | 1.20 | 0.041 | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.006 |
| A2 | 0.80 | | 1.05 | 0.032 | | 0.041 |
| b | 0.19 | | 0.30 | 0.008 | | 0.012 |
| c | 0.090 | | 0.20 | 0.003 | | 0.007 |
| D | 2.90 | | 3.10 | 0.114 | | 0.122 |
| E | 6.20 | | 6.60 | 0.240 | | 0.260 |
| E1 | 4.30 | | 4.50 | 0.170 | | 0.177 |
| e | | 0.65 | | | 0.025 | |
| L | 0.45 | | 0.75 | 0.018 | | 0.030 |
| L1 | | 1.00 | | | 0.039 | |
| k | 0° | | 8° | 0.192 | | 0.208 |