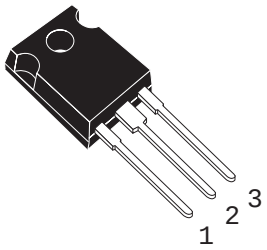
# STW220NF75

## N-CHANNEL 75V - 0.004 Ω - 120A TO-247
## STripFET™ II POWER MOSFET

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STW220NF75 | 75V | <0.0044Ω | 120A(**) |

- TYPICAL $R_{DS}$(on) = 0.004Ω
- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED

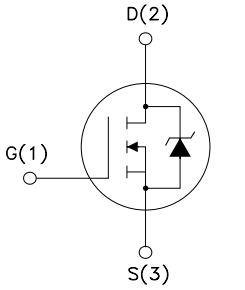



**TO-247**

### 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
- HIGH CURRENT, HIGH SWITCHING SPEED
- AUTOMOTIVE 42V BATTERY SYSTEM
- OR-ING FUNCTION

### INTERNAL SCHEMATIC DIAGRAM




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 75 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 75 | V |
| $V_{GS}$ | Gate- source Voltage | ± 20 | V |
| $I_D$(**) | Drain Current (continuous) at $T_C$ = 25°C | 120 | A |
| $I_D$(**) | Drain Current (continuous) at $T_C$ = 100°C | 120 | A |
| $I_{DM}$(•) | Drain Current (pulsed) | 480 | A |
| $P_{tot}$ | Total Dissipation at $T_C$ = 25°C | 500 | W |
| | Derating Factor | 3.33 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 10 | V/ns |
| $E_{AS}$(2) | Single Pulse Avalanche Energy | 2500 | mJ |
| $T_{stg}$ | Storage Temperature | -55 to 175 | °C |
| $T_j$ | Operating Junction Temperature | | |

•) Pulse width limited by safe operating area.
(**) Current Limited by Package

(1) $I_{SD}$ ≤120A, di/dt ≤100A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_j$ ≤ $T_{JMAX}$
(2) Starting $T_j$ = 25 °C, $I_D$ = 60 A, $V_{DD}$ = 30V

## THERMAL DATA

| | | | | |
|---|---|---|---|---|
| Rthj-case<br>Rthj-amb<br>$T_j$ | Thermal Resistance Junction-case<br>Thermal Resistance Junction-ambient<br>Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec) | Max<br>Max<br>Typ | 0.30<br>50<br>300 | °C/W<br>°C/W<br>°C |

## 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 | 75 | | | 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) | $V_{GS}$ = ± 20V | | | ±100 | nA |

ON (1)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ $I_D$ = 250 µA | 2 | | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 10 V $I_D$ = 60 A | | 0.004 | 0.0044 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (*) | Forward Transconductance | $V_{DS}$ = 25 V $I_D$ = 60 A | | 200 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 25V, f = 1 MHz, $V_{GS}$ = 0 | | 12500<br>2150<br>600 | | 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 | $V_{DD}$ = 38 V $I_D$ = 60 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 10 V<br>(Resistive Load, Figure 3) | | 50<br>215 | | ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$=38V $I_D$=120A $V_{GS}$=10V | | 350<br>60<br>135 | 430 | nC<br>nC<br>nC |

SWITCHING OFF

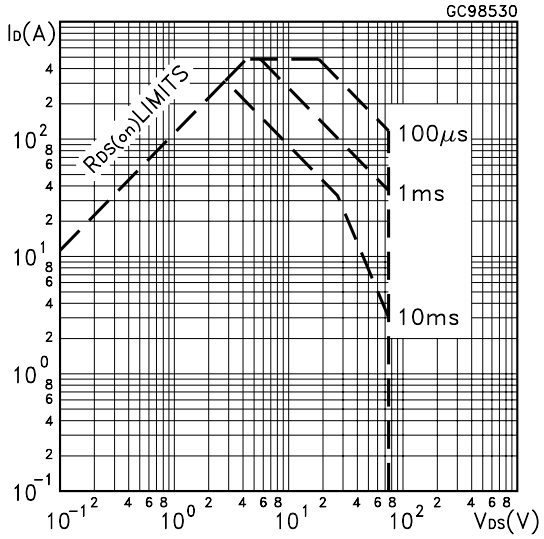
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD}$ = 38 V $I_D$ = 60 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 10 V<br>(Resistive Load, Figure 3) | | 250<br>130 | | ns<br>ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ (•) | Source-drain Current<br>Source-drain Current (pulsed) | | | | 120<br>480 | A<br>A |
| $V_{SD}$ (*) | Forward On Voltage | $I_{SD}$ = 120 A $V_{GS}$ = 0 | | | 1.5 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD}$ = 120 A di/dt = 100A/µs<br>$V_{DD}$ = 32 V $T_j$ = 150°C<br>(see test circuit, Figure 5) | | 140<br>770<br>11 | | 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