



STP60NF03L

N-CHANNEL 30V - 0.008 Ω - 60A TO-220 STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STP60NF03L | 30 V | < 0.010 Ω | 60 A |

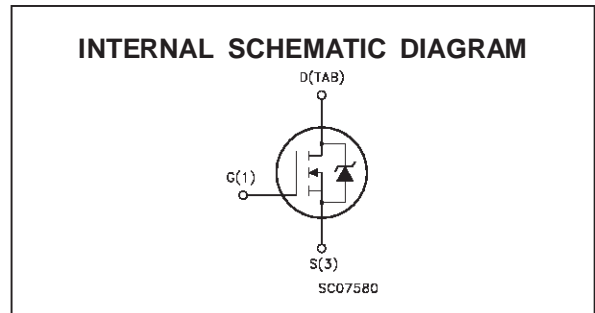
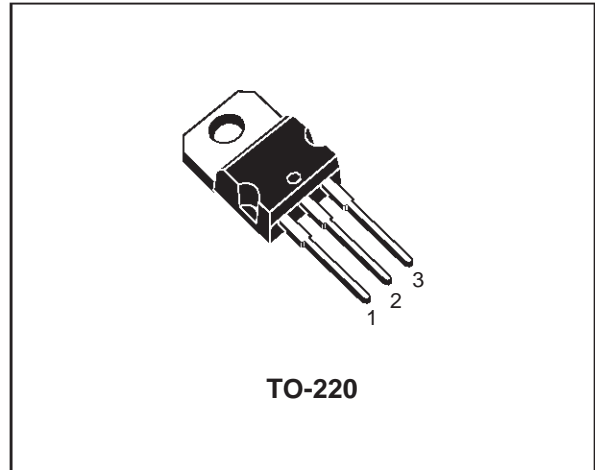
- TYPICAL R_{DS(on)} = 0.008 Ω
- LOW THRESHOLD DRIVE

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

- HIGH CURRENT, HIGH SPEED SWITCHING
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



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) | 30 | V |
| V _{GS} | Gate-source Voltage | ± 20 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 60 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 42 | A |
| I _{DM} (•) | Drain Current (pulsed) | 240 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 100 | W |
| | Derating Factor | 0.67 | W/°C |
| E _{AS} (1) | Single Pulse Avalanche Energy | 650 | mJ |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(•) Pulse width limited by safe operating area

(1) starting T_j = 25 °C, I_D = 30A , V_{DD} = 20V

STP60NF03L

THERMAL DATA

| | | | | |
|----------------|--|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | Max | 1.5 | $^{\circ}C/W$ |
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient | Max | 62.5 | $^{\circ}C/W$ |
| $R_{thc-sink}$ | Thermal Resistance Case-sink | Typ | 0.5 | $^{\circ}C/W$ |
| T_l | Maximum Lead Temperature For Soldering Purpose | | 300 | $^{\circ}C$ |

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}C$ unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 250 \mu A$ $V_{GS} = 0$ | 30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20 V$ | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|--|------|-----------------|----------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$ | 1 | 1.5 | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10V$ $I_D = 30 A$ $V_{GS} = 4.5V$ $I_D = 30 A$ | | 0.008 0.0095 | 0.010 0.015 | Ω Ω |
| $I_{D(on)}$ | On State Drain Current | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$ | 60 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|--|------|------|------|------|
| $g_{fs} (*)$ | Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30 A$ | | 60 | | S |
| C_{iss} | Input Capacitance | $V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$ | | 2550 | | pF |
| C_{oss} | Output Capacitance | | | 630 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 215 | | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 15\text{ V}$ $I_D = 30\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, see fig. 3) | | 40 | | ns |
| t_r | Rise Time | | | 250 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 24\text{ V}$ $I_D = 60\text{ A}$ $V_{GS} = 5\text{ V}$ | | 43 | 58 | nC |
| Q_{gs} | Gate-Source Charge | | | 12 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 21 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(off)}$ | Turn-off Delay Time | $V_{DD} = 15\text{ V}$ $I_D = 30\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, see fig. 3) | | 60 | | ns |
| t_f | Fall Time | | | 70 | | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain Current | | | | 60 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 240 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 60\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 60\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5) | | 75 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 100 | | nC |
| I_{RRM} | Reverse Recovery Current | | | 2.6 | | A |

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

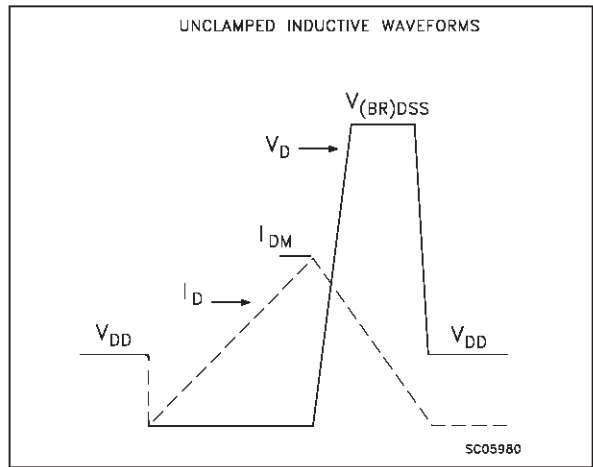


Fig. 3: Switching Times Test Circuits For Resistive Load

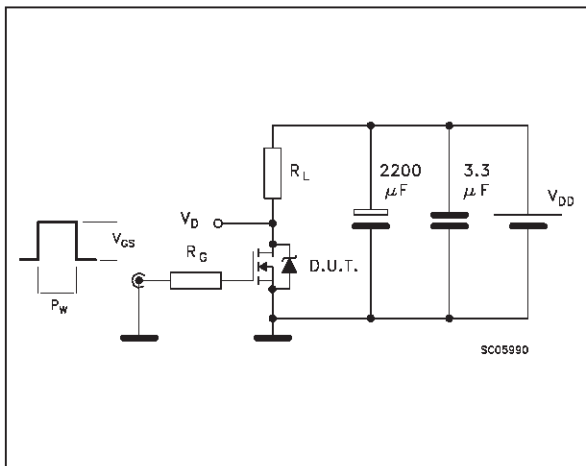


Fig. 4: Gate Charge test Circuit

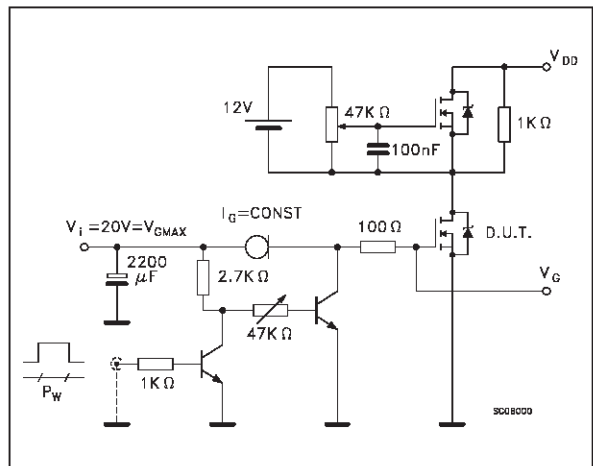
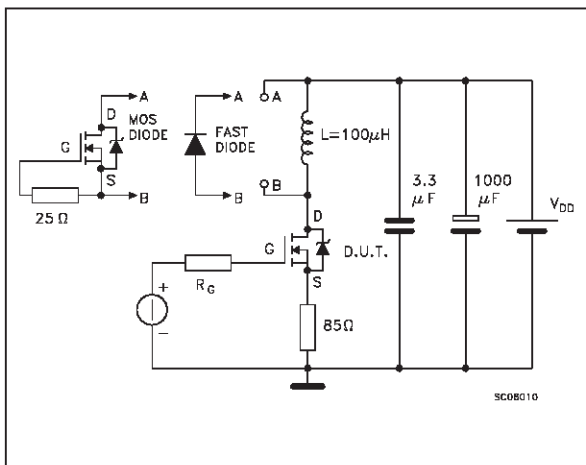
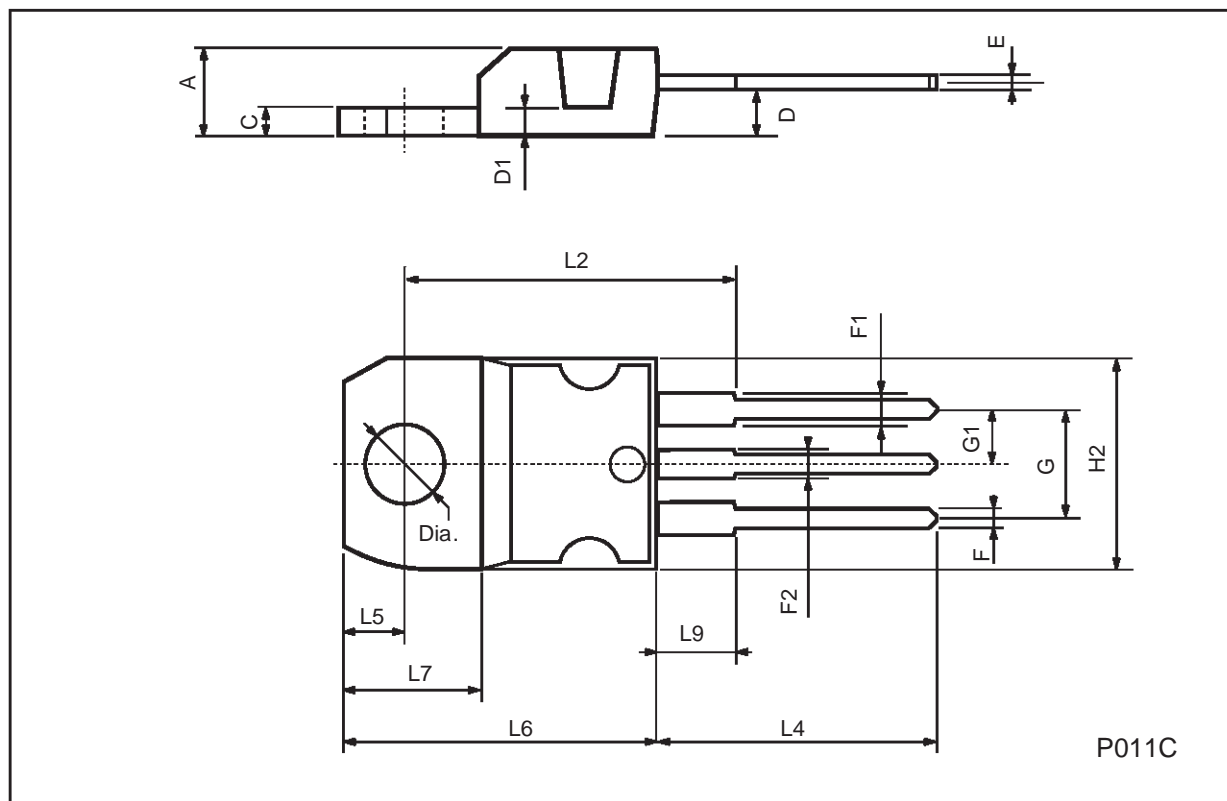


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



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