



STP80NS04ZB

N-CHANNEL CLAMPED 7.5mΩ - 80A TO-220 FULLY PROTECTED MESH OVERLAY™ MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-------------|------------------|---------------------|----------------|
| STP80NS04ZB | CLAMPED | <0.008 Ω | 80 A |

- TYPICAL R_{DS(on)} = 0.0075 Ω
- 100% AVALANCHE TESTED
- LOW CAPACITANCE AND GATE CHARGE
- 175 °C MAXIMUM JUNCTION TEMPERATURE

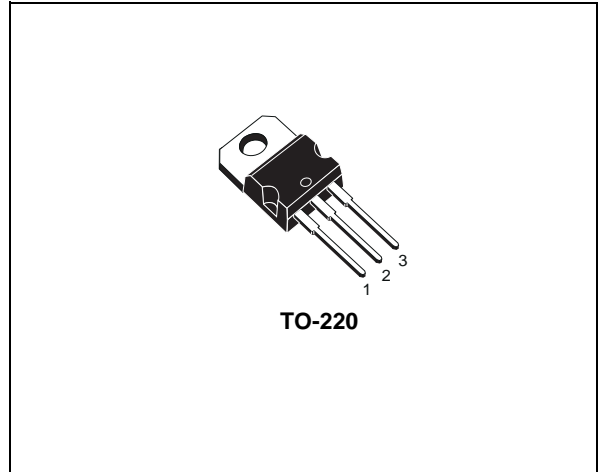
DESCRIPTION

This fully clamped Mosfet is produced by using the latest advanced Company's Mesh Overlay process which is based on a novel strip layout.

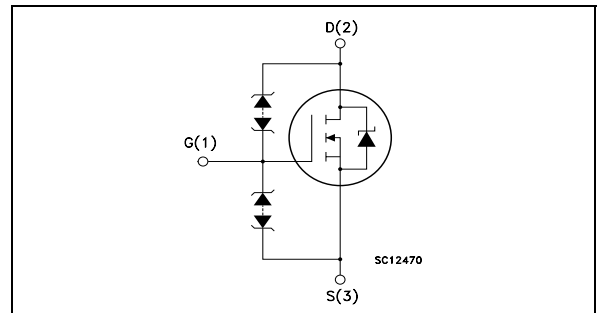
The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitable for the harshest operation conditions such as those encountered in the automotive environment. Any other application requiring extra ruggedness is also recommended.

APPLICATIONS

- ABS, SOLENOID DRIVERS
- MOTOR CONTROL
- DC-DC CONVERTERS



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | CLAMPED | V |
| V _{DG} | Drain-gate Voltage | CLAMPED | V |
| V _{GS} | Gate- source Voltage | CLAMPED | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 80 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 60 | A |
| I _{DG} | Drain Gate Current (continuous) | ± 50 | mA |
| I _{GS} | Gate SourceCurrent (continuous) | ± 50 | mA |
| I _{DM} (•) | Drain Current (pulsed) | 320 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 200 | W |
| | Derating Factor | 1.33 | W/°C |
| V _{ESD} (G-S) | Gate-Source ESD (HBM - C = 100pF, R=1.5 kΩ) | 4 | kV |
| V _{ESD} (G-D) | Gate-Drain ESD (HBM - C = 100pF, R=1.5 kΩ) | 4 | kV |
| V _{ESD} (D-S) | Drain-source ESD (HBM - C = 100pF, R=1.5 kΩ) | 4 | kV |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | -40 to 175 | °C |

(•) Pulse width limited by safe operating area.

STP80NS04ZB

THERMAL DATA

| | | | | |
|----------------|--|-----|------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 0.75 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| T _I | Maximum Lead Temperature For Soldering Purpose | | 300 | °C |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|-----------------|--|-----------|------|
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _J max) | 80 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _J = 25 °C, I _D = I _{AR} , V _{DD} = 30 V) | 500 | mJ |

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|--|------|------|-----------------|----------------|
| V _{(BR)DSS} | Clamped Voltage | I _D = 1 mA, V _{GS} = 0 -40 < T _J < 175 °C | 33 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = 16 V T _C =25 °C V _{DS} = 16 V T _J =150 °C V _{DS} = 16 V T _J =175 °C | | | 10 50 100 | μA μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 10 V T _J =175 °C V _{GS} = ± 16 V T _J =175 °C | | | 50 150 | μA μA |
| V _{GSS} | Gate-Source Breakdown Voltage | I _{GS} = 100 μA | 18 | | | V |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|--|------|----------|--------|----------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 1 mA -40 < T _J < 150 °C | 1.7 | 3 | 4.2 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 40 A V _{GS} = 16 V I _D = 40 A | | 8 7.5 | 9 8 | mΩ mΩ |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)} max, V _{GS} = 10V | 80 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|---|--|------|---------------------|---------------------|----------------|
| g _{fs} (*) | Forward Transconductance | V _{DS} >I _{D(on)} ×R _{DS(on)} max I _D =40A | 30 | 50 | | S |
| C _{iss} C _{oss} C _{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 2700 1275 285 | 3300 1600 350 | pF pF pF |

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------|--------------------|---|------|------|------|------|
| Q_g | Total Gate Charge | $V_{DD} = 20\text{ V}$ $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$ | | 80 | 105 | nC |
| Q_{gs} | Gate-Source Charge | | | 20 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 27 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{clamp} = 30\text{ V}$ $I_D = 80\text{ A}$ | | 115 | 150 | ns |
| t_f | Fall Time | $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ | | 80 | 105 | ns |
| t_c | Cross-over Time | (Inductive Load, Figure 5) | | 210 | 280 | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 80 | A |
| $I_{SDM} (*)$ | Source-drain Current (pulsed) | | | | 320 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 80\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 80\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ | | 90 | | ns |
| Q_{rr} | Reverse Recovery Charge | $V_{DD} = 25\text{ V}$ $T_j = 150^\circ\text{C}$ | | 0.18 | | μC |
| I_{RRM} | Reverse Recovery Current | (see test circuit, Figure 5) | | 4 | | A |

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

(●) Pulse width limited by safe operating area.

Fig. 1: Unclamped Inductive Load Test Circuit

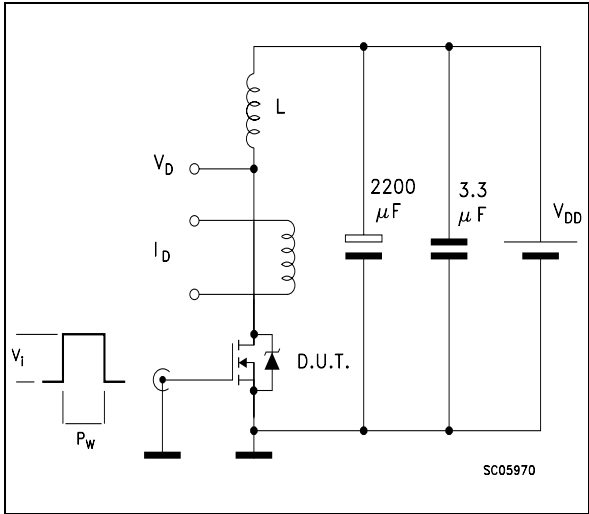


Fig. 2: Unclamped Inductive Waveform

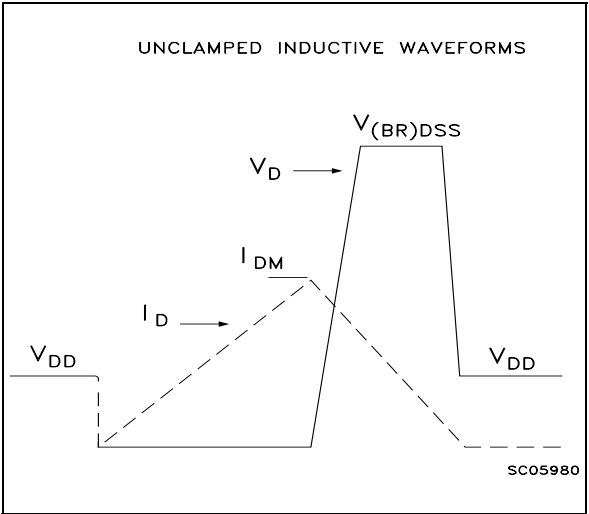


Fig. 3: Switching Times Test Circuits For Resistive Load

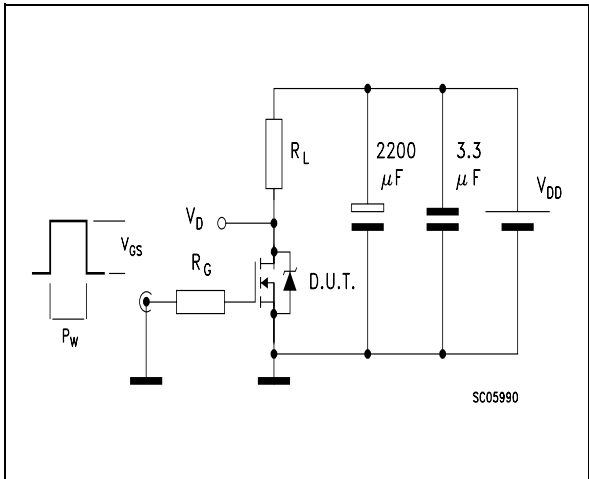


Fig. 4: Gate Charge test Circuit

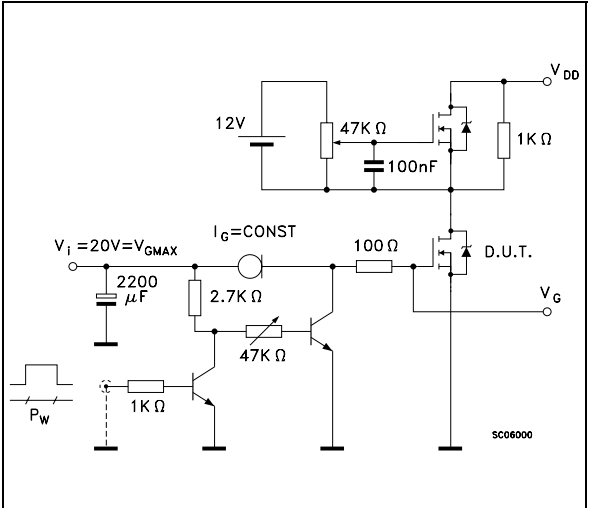
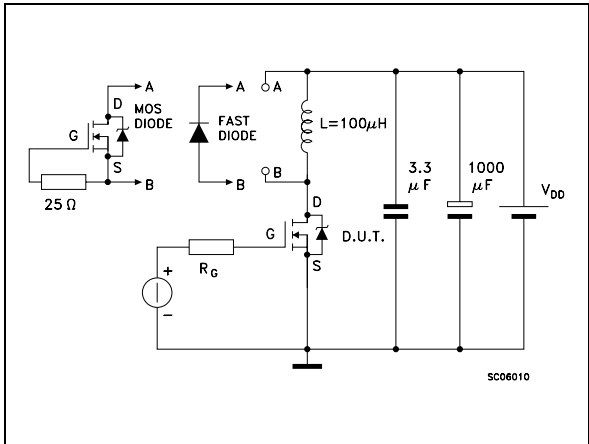
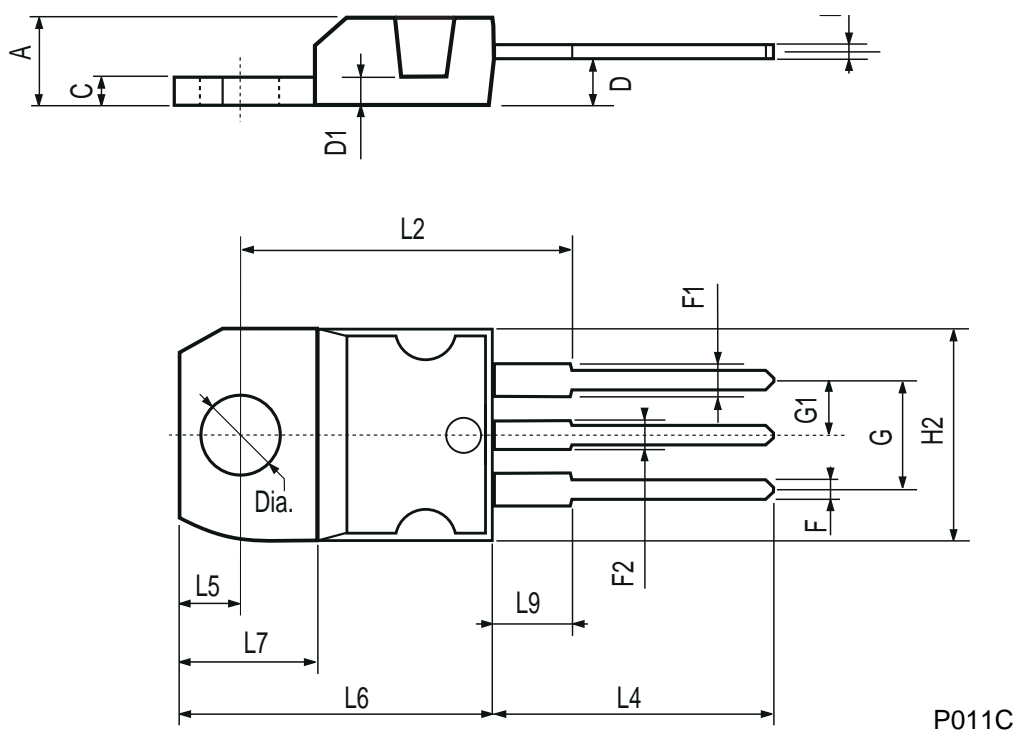


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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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