



# STP80PF55

P-CHANNEL 55V - 0.016  $\Omega$  - 80A TO-220

STripFET™ II POWER MOSFET

PRELIMINARY DATA

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STB80PF55 | 55 V             | < 0.018 $\Omega$    | 80 A           |

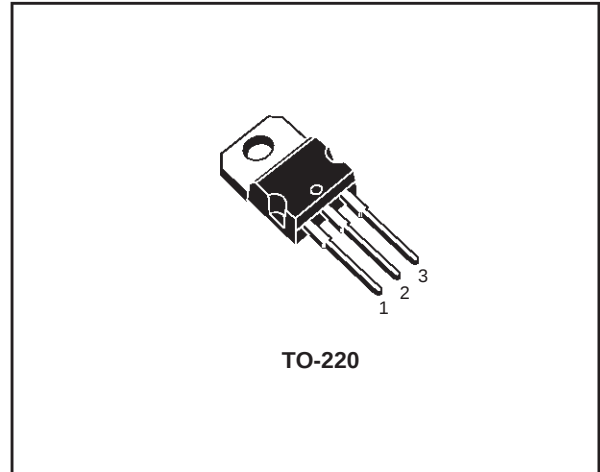
- TYPICAL R<sub>DS(on)</sub> = 0.016  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

## DESCRIPTION

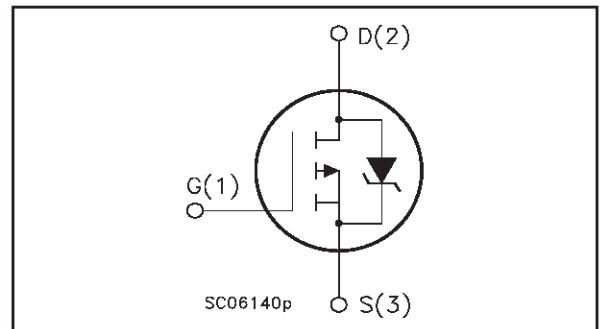
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

## APPLICATIONS

- MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS



## INTERNAL SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 55         | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ ) | 55         | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                  | ± 16       | V    |
| I <sub>D</sub> (*)  | Drain Current (continuous) at T <sub>C</sub> = 25°C   | 80         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 100°C  | 57         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 320        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C            | 300        | W    |
|                     | Derating Factor                                       | 2          | W/°C |
| dv/dt (1)           | Peak Diode Recovery voltage slope                     | 7          | V/ns |
| E <sub>AS</sub> (2) | Single Pulse Avalanche Energy                         | 1.4        | mJ   |
| T <sub>stg</sub>    | Storage Temperature                                   | -55 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   |            |      |

(•) Pulse width limited by safe operating area

(\*) Current Limited by Package

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

(1) I<sub>SD</sub> ≤ 40A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 80A, V<sub>DD</sub> = 40V

## STP80PF55

### THERMAL DATA

|                       |                                                |     |      |      |
|-----------------------|------------------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case               | Max | 0.5  | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient            | Max | 62.5 | °C/W |
| T <sub>I</sub>        | Maximum Lead Temperature For Soldering Purpose | Typ | 300  | °C   |

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

#### OFF

| Symbol               | Parameter                                             | Test Conditions                                                                     | Min. | Typ. | Max.    | Unit     |
|----------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|---------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0                                        | 55   |      |         | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C |      |      | 1<br>10 | μA<br>μA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ± 16 V                                                            |      |      | ±100    | nA       |

#### ON (\*)

| Symbol              | Parameter                         | Test Conditions                                           | Min. | Typ.  | Max.  | Unit |
|---------------------|-----------------------------------|-----------------------------------------------------------|------|-------|-------|------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA | 2    | 3     | 4     | V    |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 40 A              |      | 0.016 | 0.018 | Ω    |

#### DYNAMIC

| Symbol                                                   | Parameter                                                               | Test Conditions                                                                          | Min. | Typ.                | Max. | Unit           |
|----------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------|---------------------|------|----------------|
| g <sub>fs</sub>                                          | Forward Transconductance                                                | V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> ,<br>I <sub>D</sub> = 40 A |      | 32                  |      | S              |
| C <sub>iss</sub><br>C <sub>oss</sub><br>C <sub>rss</sub> | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0                                    |      | 5500<br>1130<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                              | $V_{DD} = 25\text{ V}$ $I_D = 40\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3) |      | 35<br>190       |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 25\text{ V}$ $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$                                                      |      | 190<br>27<br>65 | 258  | nC<br>nC<br>nC |

**SWITCHING OFF (\*)**

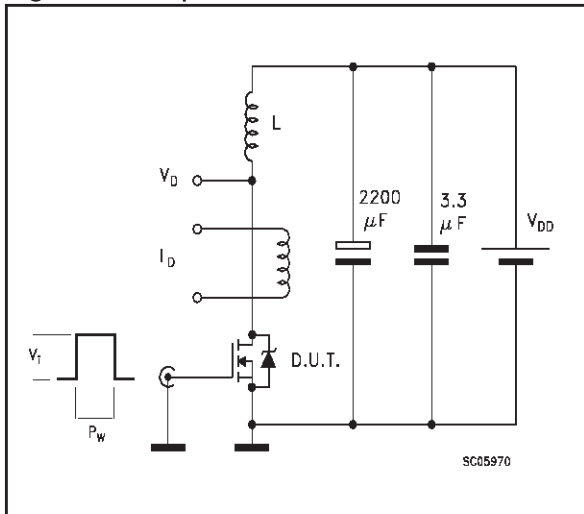
| Symbol                          | Parameter                                             | Test Conditions                                                                                                           | Min. | Typ.           | Max. | Unit           |
|---------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------|----------------|------|----------------|
| $t_{d(off)}$<br>$t_f$           | Turn-off Delay Time<br>Fall Time                      | $V_{DD} = 25\text{ V}$ $I_D = 40\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3)    |      | 165<br>80      |      | ns<br>ns       |
| $t_{r(voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{clamp} = 40\text{ V}$ $I_D = 80\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Inductive Load, Figure 5) |      | 60<br>40<br>85 |      | ns<br>ns<br>ns |

**SOURCE DRAIN DIODE (\*)**

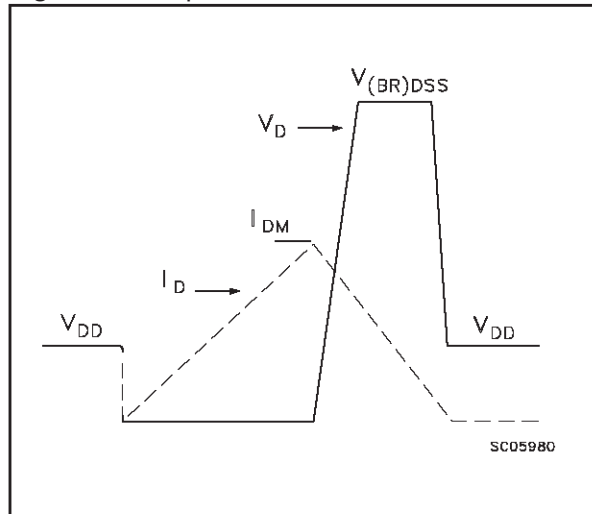
| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                               | Min. | Typ.            | Max.      | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|-----------|---------------|
| $I_{SD}$<br>$I_{SDM} (*)$         | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                               |      |                 | 80<br>320 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 80\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                 | 1.3       | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 80\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 25\text{ V}$ $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 5) |      | 110<br>495<br>9 |           | ns<br>nC<br>A |

(\*) Pulse width  $\leq 300\ \mu\text{s}$ , duty cycle 1.5 %.(\*) Pulse width limited by  $T_{JMAX}$

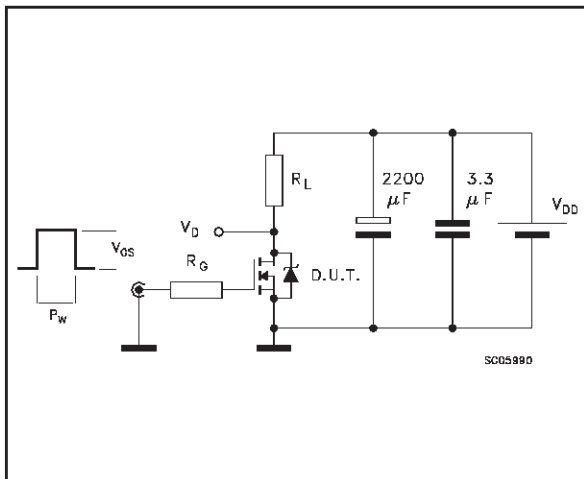
**Fig. 1: Unclamped Inductive Load Test Circuit**



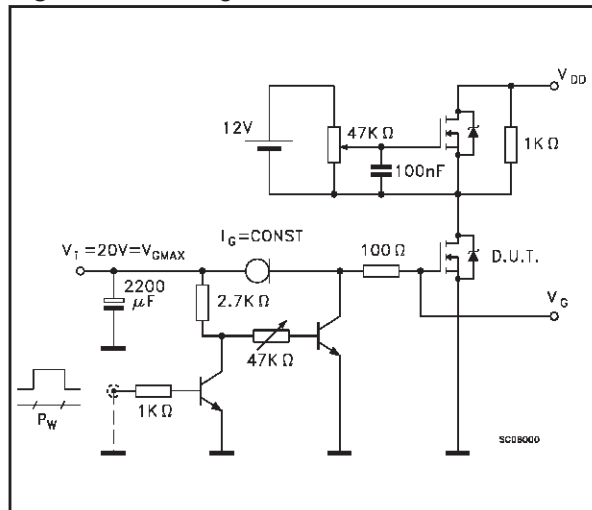
**Fig. 2: Unclamped Inductive Waveform**



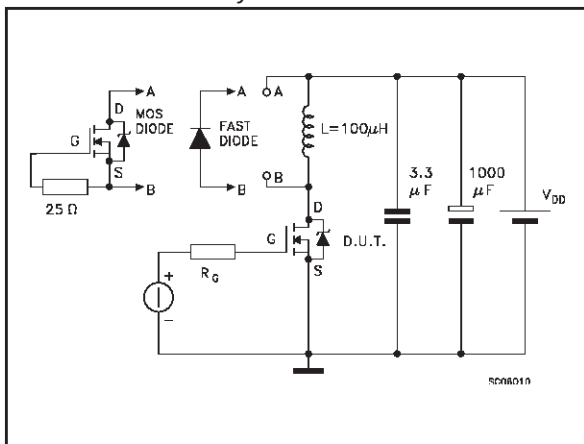
**Fig. 3: Switching Times Test Circuits For Resistive Load**



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

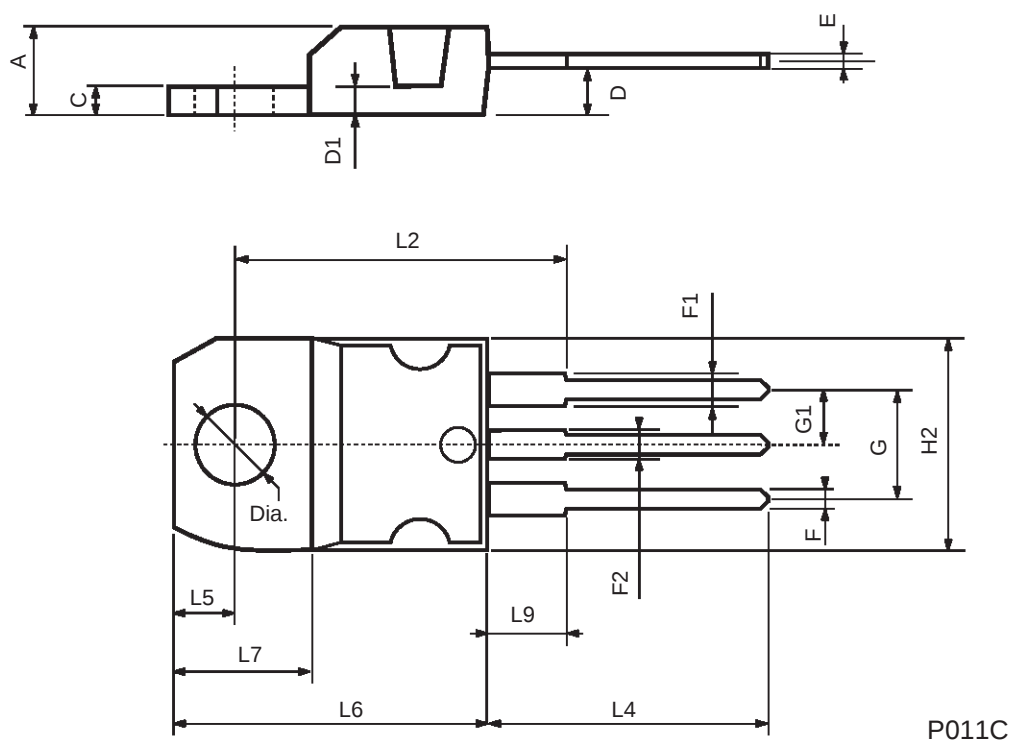


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



## 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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