



STB45NF06

N-CHANNEL 60V - 0.022Ω - 38A D2PAK STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STB45NF06 | 60V | <0.028Ω | 38A |

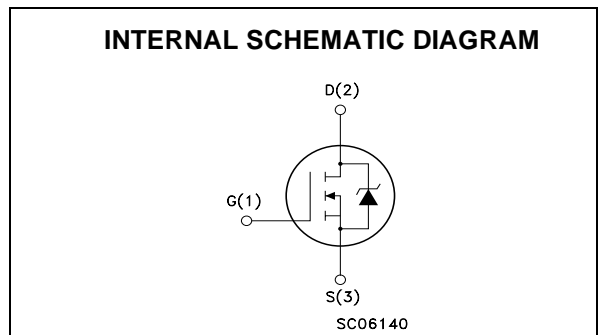
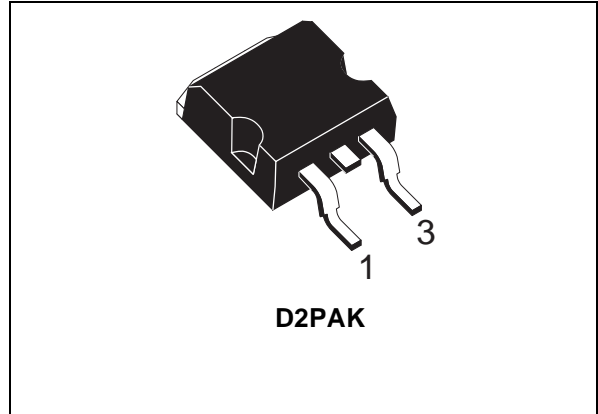
- TYPICAL R_{DS(on)} = 0.022Ω
- EXCEPTIONAL dv/dt CAPABILITY

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-EFFICIENCY DC-DC CONVERTERS
- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 60 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 60 | V |
| V _{GS} | Gate- source Voltage | ±20 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 38 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 26 | A |
| I _{DM} (●) | Drain Current (pulsed) | 152 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 80 | W |
| | Derating Factor | 0.53 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 7 | V/ns |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤ 38A, di/dt ≤ 300A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

STB45NF06

THERMAL DATA

| | | | |
|----------------|--|------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 1.87 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | °C/W |
| T _l | 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) | 38 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 135 | mJ |

ELECTRICAL CHARACTERISTICS (TCASE = 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 | 60 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C | | | 1 10 | μA 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 = 250μA | 2 | 3 | 4 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V, I _D = 19 A | | 0.022 | 0.028 | Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} , V _{GS} = 10V | 45 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|--|------|------|------|------|
| g _{fs} (1) | Forward Transconductance | V _{DS} > I _{D(on)} × R _{DS(on)max} , I _D = 19 A | | 24 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 1730 | | pF |
| C _{oss} | Output Capacitance | | | 215 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 63 | | pF |

ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING ON**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 30V, I_D = 19A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | 20 | | ns |
| t_r | Rise Time | | | 100 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 48V, I_D = 38A,$ $V_{GS} = 10V$ | | 43 | 58 | nC |
| Q_{gs} | Gate-Source Charge | | | 9 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 15 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------|---|------|------|------|------|
| $t_{d(off)}$ | Turn-off-Delay Time | $V_{DD} = 30V, I_D = 19A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | 50 | | ns |
| t_f | Fall Time | | | 20 | | ns |
| $t_{d(off)}$ | Off-voltage Rise Time | $V_{clamp} = 48V, I_D = 38A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 5) | | 45 | | ns |
| t_f | Fall Time | | | 42 | | ns |
| t_c | Cross-over Time | | | 60 | | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain Current | | | | 38 | A |
| $I_{SDM(1)}$ | Source-drain Current (pulsed) | | | | 152 | A |
| $V_{SD(2)}$ | Forward On Voltage | $I_{SD} = 38A, V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 38A, di/dt = 100A/\mu s,$ $V_{DD} = 100V, T_j = 150^\circ C$ (see test circuit, Figure 5) | | 95 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 260 | | nC |
| I_{RRM} | Reverse Recovery Current | | | 5.5 | | A |

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

Fig. 1: Unclamped Inductive Load Test Circuit

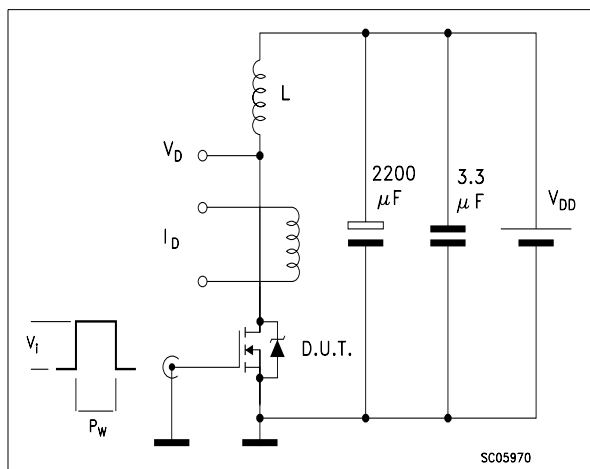


Fig. 2: Unclamped Inductive Waveform

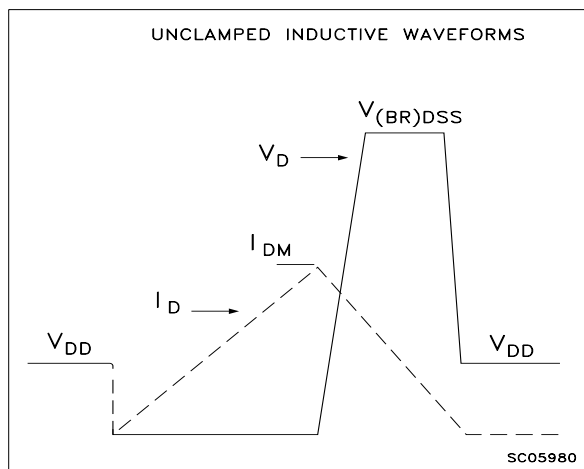


Fig. 3: Switching Times Test Circuit For Resistive Load

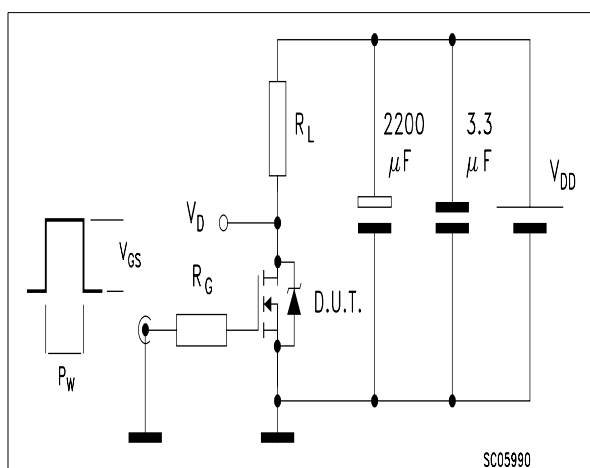


Fig. 4: Gate Charge test Circuit

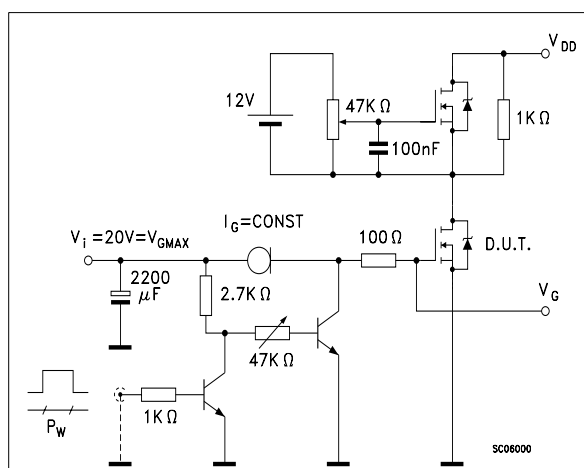
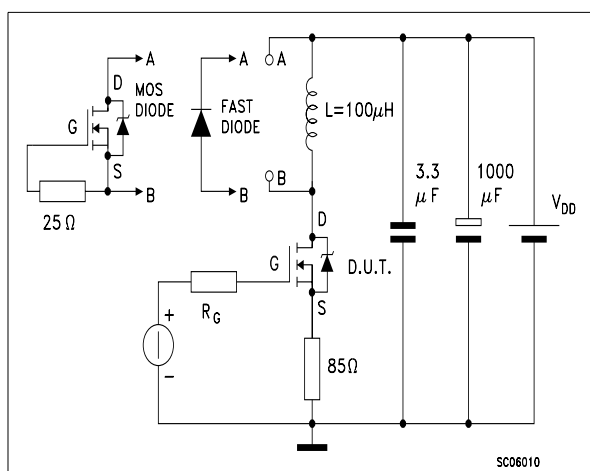
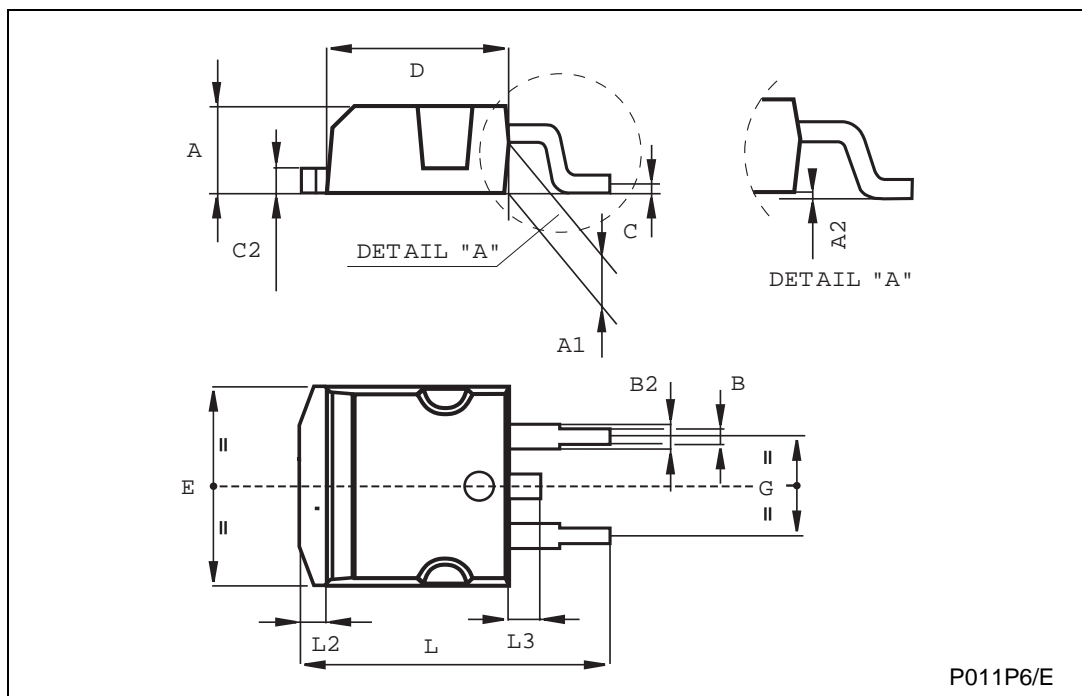


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|-------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.21 | | 1.36 | 0.047 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.624 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.068 |



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