



STD5NM60

N-CHANNEL 600V - 0.8Ω - 5A DPAK

MDmesh™ Power MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|----------|------------------|---------------------|----------------|
| STD5NM60 | 600V | <0.9Ω | 5 A |

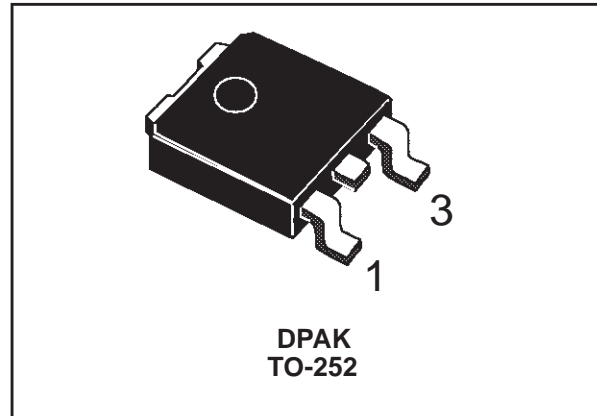
- TYPICAL R_{DS(on)} = 0.8Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTURING YIELDS

DESCRIPTION

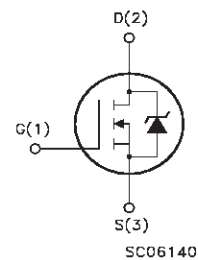
The MDmesh™ is a new revolutionary MOSFET technology that associates the Multiple Drain process with the Company's PowerMESH™ horizontal layout. The resulting product has an outstanding low on-resistance, impressively high dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary strip technique yields overall dynamic performance that is significantly better than that of similar completion's products.

APPLICATIONS

The MDmesh™ family is very suitable for increase the power density of high voltage converters allowing system miniaturization and higher efficiencies.



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 600 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 600 | V |
| V _{GS} | Gate- source Voltage | ±30 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 5 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 3.1 | A |
| I _{DM} (●) | Drain Current (pulsed) | 20 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 50 | W |
| | Derating Factor | 0.4 | W/°C |
| dv/dt(1) | Peak Diode Recovery voltage slope | 6 | V/ns |
| T _{stg} | Storage Temperature | -65 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(●)Pulse width limited by safe operating area

(1)|I_{SD}<5A, di/dt<200A/μs, V_{DD}<V_{(BR)DSS}, T_J<T_{JMAX}

May 2000

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THERMAL DATA

| | | | |
|----------------|--|------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 2.5 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | °C/W |
| Rthc-sink | Thermal Resistance Case-sink Typ | 0.5 | °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) | 5 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 400 | 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 | 600 | | | 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} = ±30V | | | ±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 | 3 | 4 | 5 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10V, I _D = 2.5A | | 0.8 | 0.9 | Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} , V _{GS} = 10V | 5 | | | 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 = 2.5A | | 2.4 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 412 | | pF |
| C _{OSS} | Output Capacitance | | | 94 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 10 | | pF |
| R _G | Gate Input Resistance | f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain | | 3 | | Ω |

Note: 1. Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %.

ELECTRICAL CHARACTERISTICS (CONTINUED)
SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 300V, I_D = 2.5A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | 16 | | ns |
| t_r | Rise Time | | | 9 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 400V, I_D = 5A,$ $V_{GS} = 10V$ | | 13 | | nC |
| Q_{gs} | Gate-Source Charge | | | 3 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 11 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 480V, I_D = 5A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 5) | | 20 | | ns |
| t_f | Fall Time | | | 29 | | ns |
| t_c | Cross-over Time | | | 30 | | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|---|------|------|------|---------|
| I_{SD} | Source-drain Current | | | | 5 | A |
| $I_{SDM(2)}$ | Source-drain Current (pulsed) | | | | 20 | A |
| $V_{SD(1)}$ | Forward On Voltage | $I_{SD} = 5A, V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 5A, di/dt = 100A/\mu s, V_{DD} = 100V, T_j = 150^\circ C$ (see test circuit, Figure 5) | | 300 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 1.8 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 12 | | 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

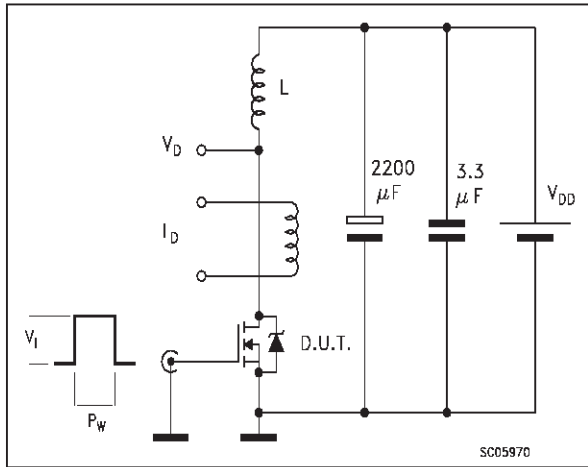


Fig. 2: Unclamped Inductive Waveform

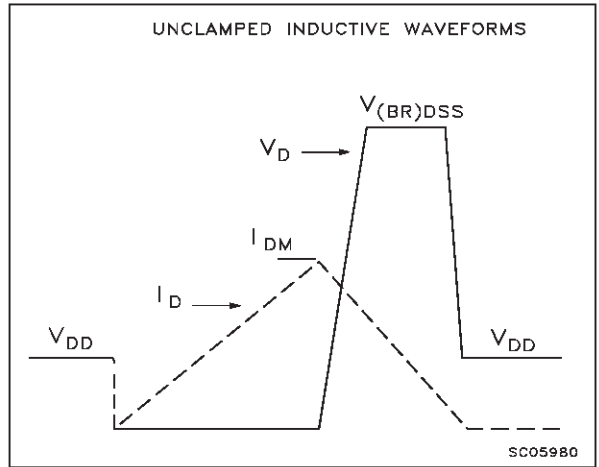


Fig. 3: Switching Times Test Circuit For Resistive Load

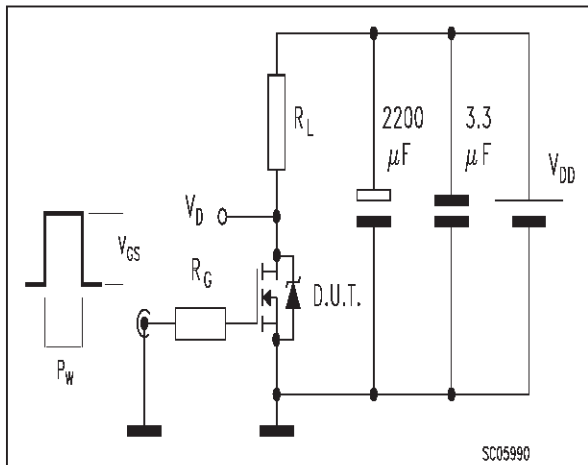


Fig. 4: Gate Charge test Circuit

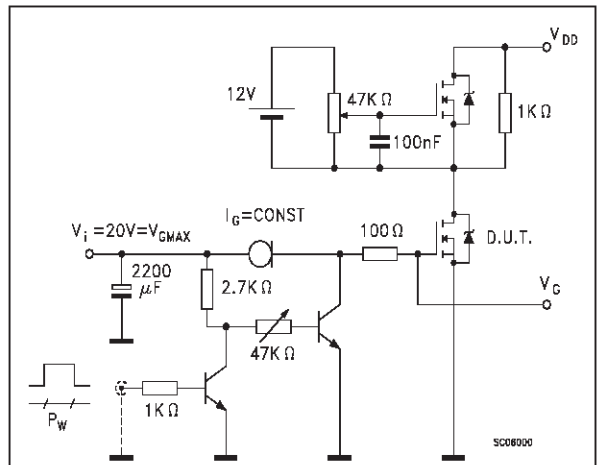
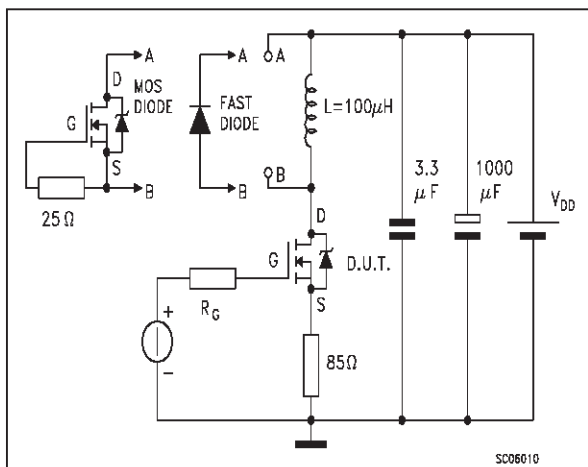
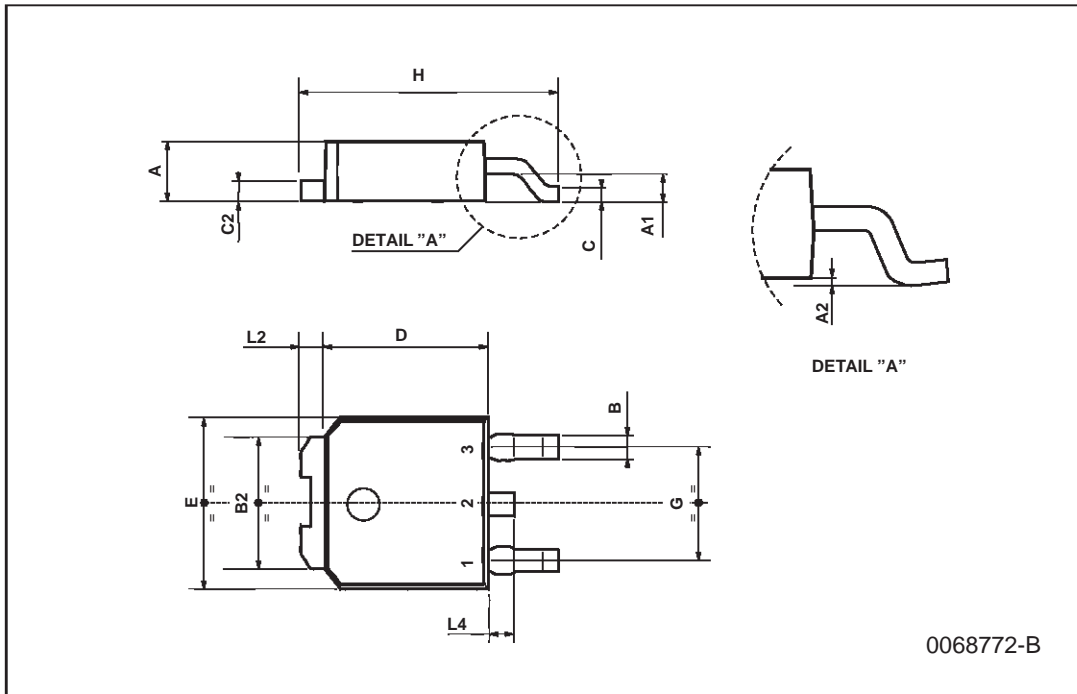


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-252 (DPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.2 | | 2.4 | 0.086 | | 0.094 |
| A1 | 0.9 | | 1.1 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.64 | | 0.9 | 0.025 | | 0.035 |
| B2 | 5.2 | | 5.4 | 0.204 | | 0.212 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 0.48 | | 0.6 | 0.019 | | 0.023 |
| D | 6 | | 6.2 | 0.236 | | 0.244 |
| E | 6.4 | | 6.6 | 0.252 | | 0.260 |
| G | 4.4 | | 4.6 | 0.173 | | 0.181 |
| H | 9.35 | | 10.1 | 0.368 | | 0.397 |
| L2 | | 0.8 | | | 0.031 | |
| L4 | 0.6 | | 1 | 0.023 | | 0.039 |



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