



STY60NM60

N-CHANNEL 600V - 0.050Ω - 60A Max247 Zener-Protected MDmesh™ Power MOSFET

TARGET DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STY60NM60 | 600V | < 0.06Ω | 60 A |

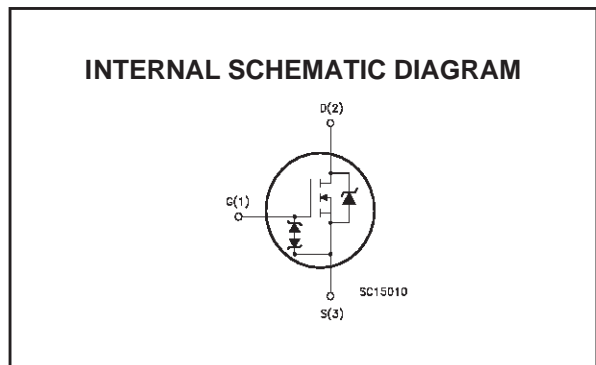
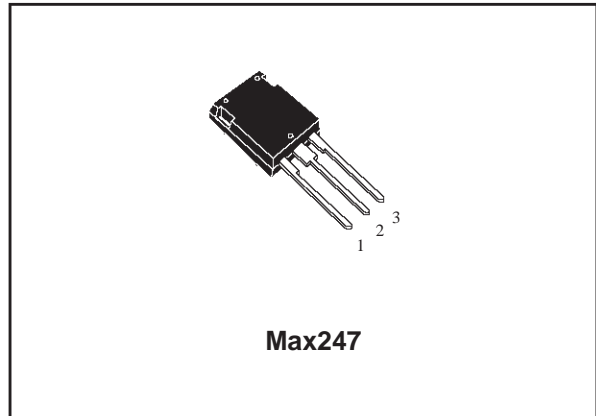
- TYPICAL R_{DS(on)} = 0.050Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL
- INDUSTRY'S LOWEST ON-RESISTANCE

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 competition's products.

APPLICATIONS

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



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 | 60 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 37.8 | A |
| I _{DM} (●) | Drain Current (pulsed) | 240 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 450 | W |
| V _{ESD(G-S)} | Gate source ESD(HBM-C=100pF, R=15KΩ) | 4 | KV |
| | Derating Factor | 3.6 | W/°C |
| dv/dt | 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

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THERMAL DATA

| | | | | |
|----------------|--|-----|-------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 0.277 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 30 | °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) | 30 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 35 V) | 1350 | 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 | | | 10 100 | 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 = 30A | | 0.050 | 0.06 | Ω |

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 = 30A | | 20 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 4430 | | pF |
| C _{oss} | Output Capacitance | | | 733 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 54 | | pF |
| R _G | Gate Input Resistance | f = 1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain | | 1.5 | | 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 | $V_{DD} = 250V, I_D = 30A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | TBD | | ns |
| t_r | Rise Time | | | TBD | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 400V, I_D = 60A,$ $V_{GS} = 10V$ | | 104 | 145 | nC |
| Q_{gs} | Gate-Source Charge | | | TBD | | nC |
| Q_{gd} | Gate-Drain Charge | | | TBD | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|--|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 400V, I_D = 60A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 5) | | TBD | | ns |
| t_f | Fall Time | | | TBD | | ns |
| t_c | Cross-over Time | | | TBD | | ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|--|------|------|------|---------|
| I_{SD} | Source-drain Current | | | | 60 | A |
| $I_{SDM(2)}$ | Source-drain Current (pulsed) | | | | 240 | A |
| $V_{SD(1)}$ | Forward On Voltage | $I_{SD} = 60A, V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 60A, di/dt = 100A/\mu s,$ $V_{DD} = 60V, T_j = 150^\circ C$ (see test circuit, Figure 5) | | TBD | | ns |
| Q_{rr} | Reverse Recovery Charge | | | TBD | | μC |
| I_{RRM} | Reverse Recovery Current | | | TBD | | 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

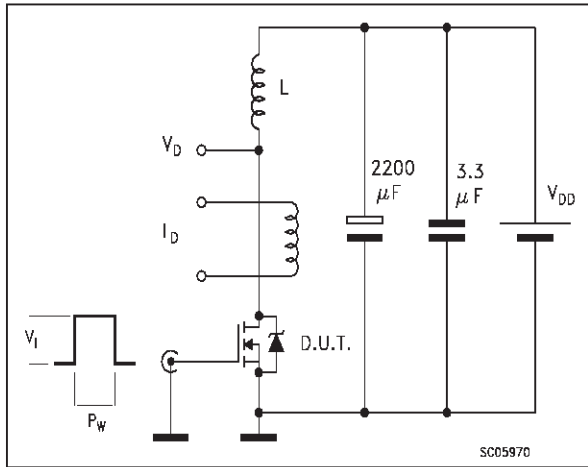


Fig. 2: Unclamped Inductive Waveform

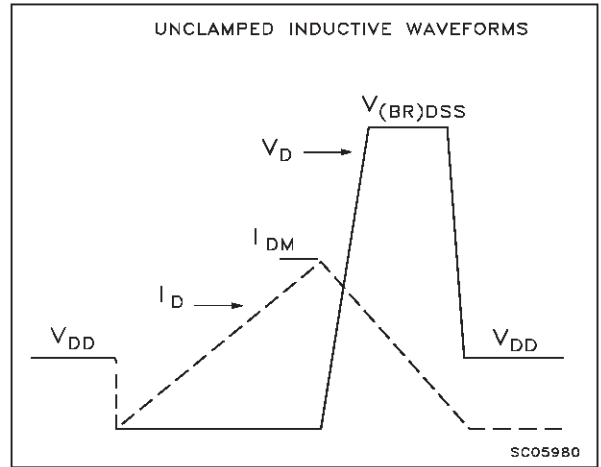


Fig. 3: Switching Times Test Circuit For Resistive Load

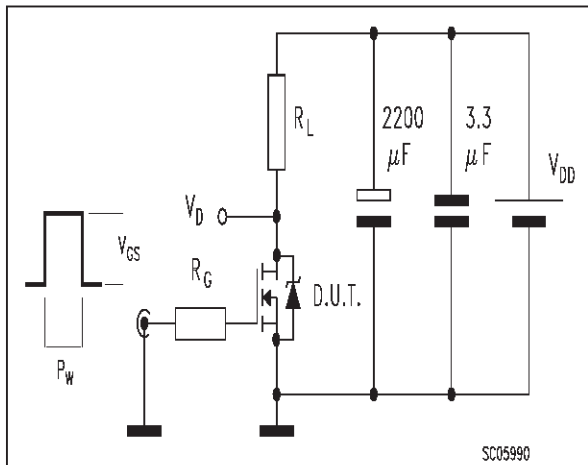


Fig. 4: Gate Charge test Circuit

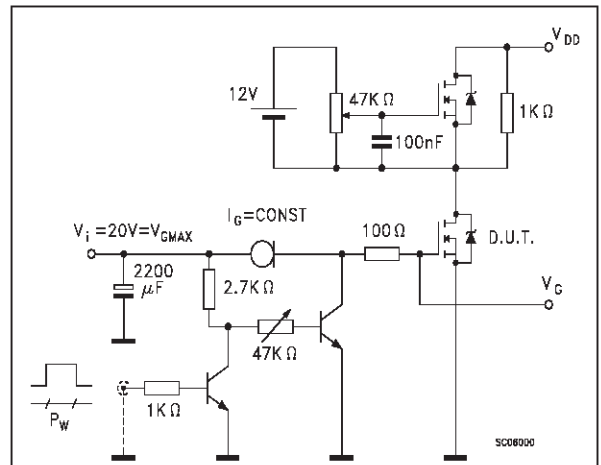
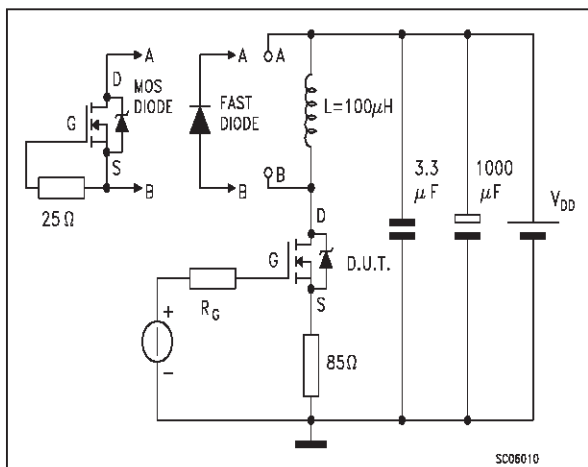
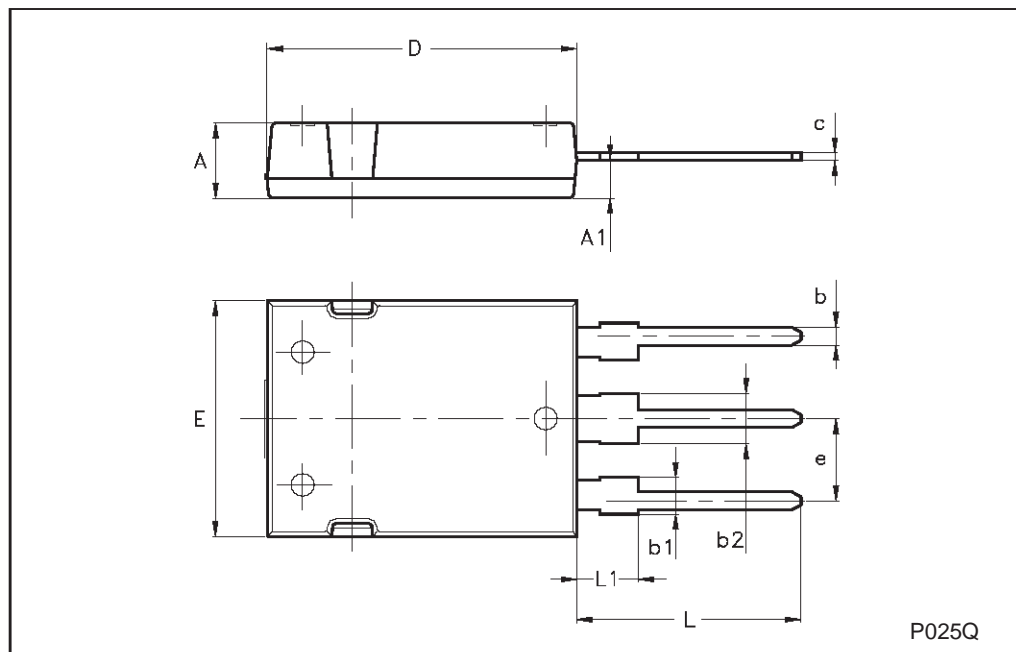


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



Max247 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|------|------|------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.70 | | 5.30 | | | |
| A1 | 2.20 | | 2.60 | | | |
| b | 1.00 | | 1.40 | | | |
| b1 | 2.00 | | 2.40 | | | |
| b2 | 3.00 | | 3.40 | | | |
| c | 0.40 | | 0.80 | | | |
| D | 19.70 | | 20.30 | | | |
| e | 5.35 | | 5.55 | | | |
| E | 15.30 | | 15.90 | | | |
| L | 14.20 | | 15.20 | | | |
| L1 | 3.70 | | 4.30 | | | |



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