

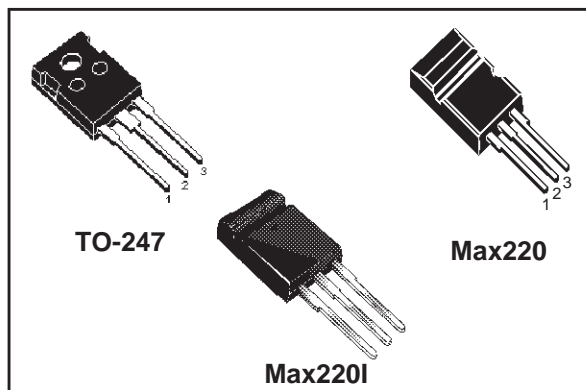


STW26NM50 STU26NM50, STU26NM50I

N-CHANNEL 500V - 0.10Ω - 26A TO-247, Max220, Max220I
Zener-Protected MDmesh™ Power MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STW26NM50 | 500 V | < 0.120 Ω | 30 A |
| STU26NM50 | 500 V | < 0.120 Ω | 26 A |
| STU26NM50I | 500 V | < 0.120 Ω | 26 A |

- TYPICAL R_{DS(on)} = 0.10Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- IMPROVED ESD CAPABILITY
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE

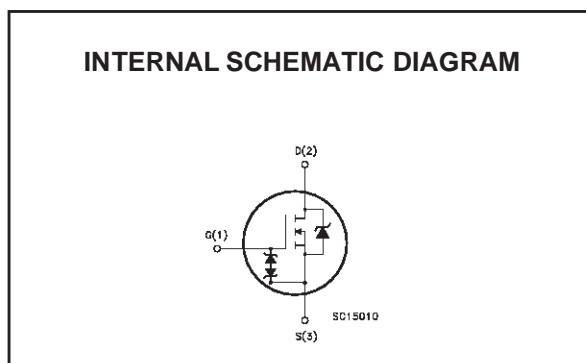


DESCRIPTION

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.



ORDERING INFORMATION

| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|------------|----------|---------|-----------|
| STW26NM50 | W26NM50 | TO-247 | TUBE |
| STU26NM50 | U26NM50 | Max220 | TUBE |
| STU26NM50I | U26NM50I | Max220I | TUBE |

STW26NM50, STU26NM50, STU26NM50I

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | | Unit |
|-----------------------|--|------------|-----------|------------|------|
| | | STW26NM50 | STU26NM50 | STU26NM50I | |
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 500 | | | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 500 | | | V |
| V _{GS} | Gate- source Voltage | ± 30 | | | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 30 | 26 | 26 (*) | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 18.9 | 16.38 | 16.38 (*) | A |
| I _{DM} (†) | Drain Current (pulsed) | 120 | 104 | 104 (*) | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 313 | 192 | 73 | W |
| | Derating Factor | 2.5 | 1.54 | 0.58 | W/°C |
| V _{ESD(G-S)} | Gate source ESD(HBM-C=100pF, R=1.5KΩ) | 6000 | | | V |
| dv/dt (1) | Peak Diode Recovery voltage slope | 15 | | | V/ns |
| T _j | Operating Junction Temperature | -55 to 150 | | | °C |
| T _{stg} | Storage Temperature | -55 to 150 | | | °C |

(†) Pulse width limited by safe operating area

(1) I_{SD} ≤ 26A, di/dt ≤ 200A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

(*) Limited only by maximum temperature allowed

THERMAL DATA

| | | TO-247 | Max220 | Max220I | |
|-----------------------|--|--------|--------|---------|------|
| R _{thj-case} | Thermal Resistance Junction-case Max | 0.4 | 0.65 | 1.7 | °C/W |
| R _{thj-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) | 13 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 740 | mJ |

GATE-SOURCE ZENER DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------|-------------------------------|---------------------------------------|------|------|------|------|
| BV _{GSO} | Gate-Source Breakdown Voltage | I _{gss} = ± 1mA (Open Drain) | 30 | | | V |

PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

ELECTRICAL CHARACTERISTICS (TCASE =25°C UNLESS OTHERWISE SPECIFIED)
ON/OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|--|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 250 \mu A, V_{GS} = 0$ | 500 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$ | | | 10 100 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20V$ | | | ± 10 | μA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 3 | 4 | 5 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10V, I_D = 13 A$ | | 0.1 | 0.12 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|---|------|-------------------|------|----------------|
| $g_{fs} (1)$ | Forward Transconductance | $V_{DS} = 15 V, I_D = 13 A$ | | 20 | | S |
| C_{iss} C_{oss} C_{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | $V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$ | | 3000 700 50 | | pF pF pF |

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|--|------|----------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 250 V, I_D = 13 A$ $R_G = 4.7\Omega, V_{GS} = 10 V$ (Resistive Load see, Figure 3) | | 28 25 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 400V, I_D = 26 A,$ $V_{GS} = 10V$ | | 76 20 36 | 106 | nC nC nC |

SWITCHING OFF

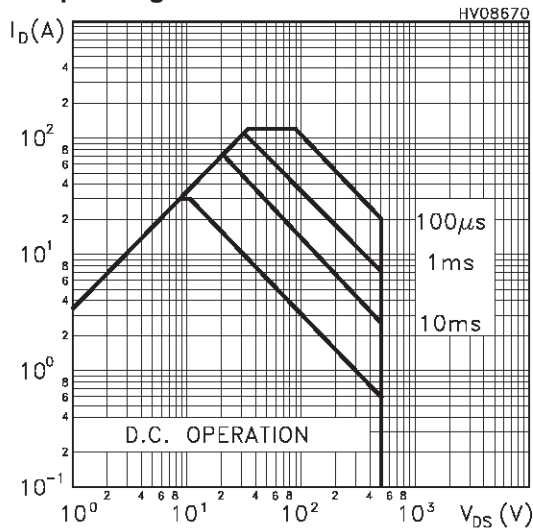
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|---|---|------|----------------|------|----------------|
| $t_{r(Voff)}$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{DD} = 400V, I_D = 26 A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (Inductive Load see, Figure 5) | | 13 19 36 | | ns ns ns |

SOURCE DRAIN DIODE

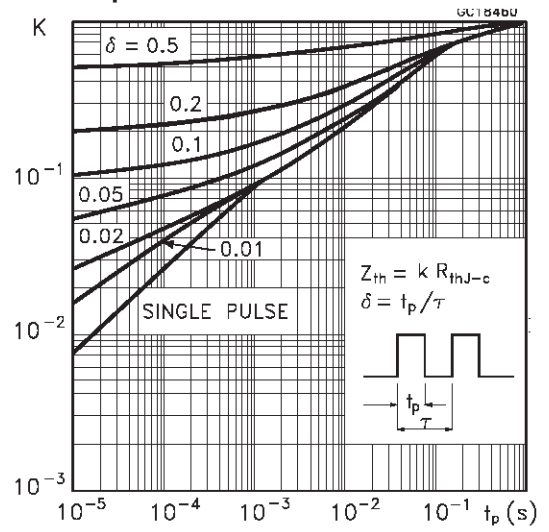
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|------------------|-----------|--------------------|
| I_{SD} $I_{SDM} (2)$ | Source-drain Current Source-drain Current (pulsed) | | | | 26 104 | A A |
| $V_{SD} (1)$ | Forward On Voltage | $I_{SD} = 26 A, V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 26 A, di/dt = 100A/\mu s$ $V_{DD} = 60V, T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 400 5.5 27 | | ns μC A |

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by safe operating area.
3. $C_{oss eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

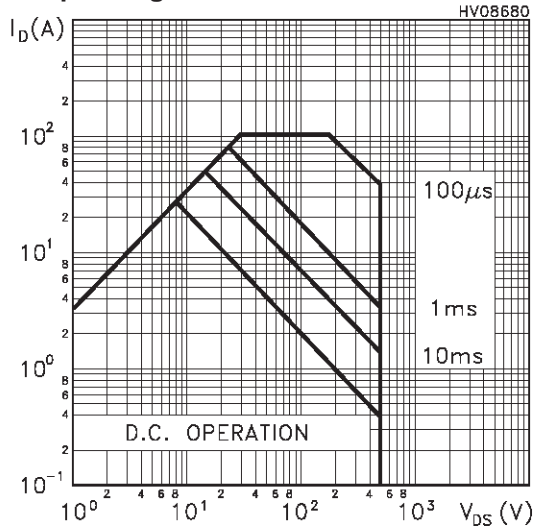
Safe Operating Area For TO-247



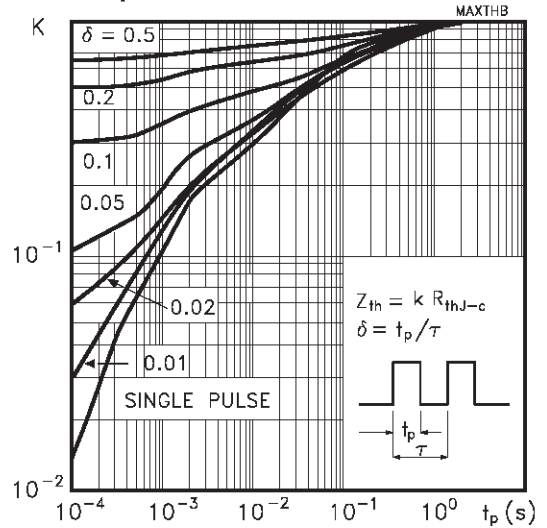
Thermal Impedance For TO-247



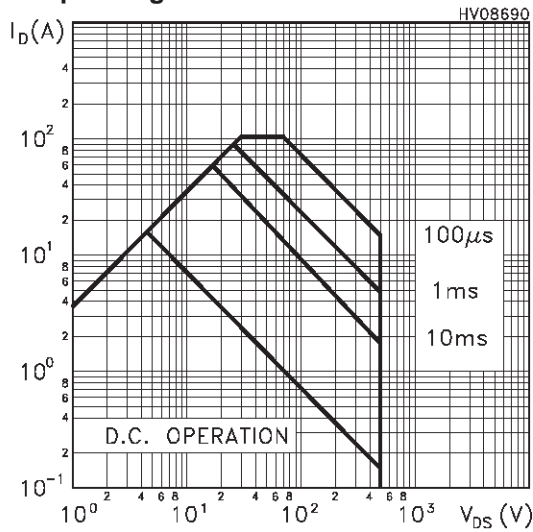
Safe Operating Area For Max220



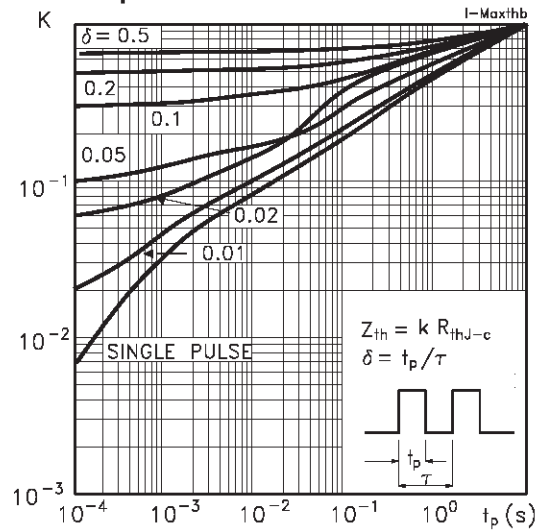
Thermal Impedance For Max220



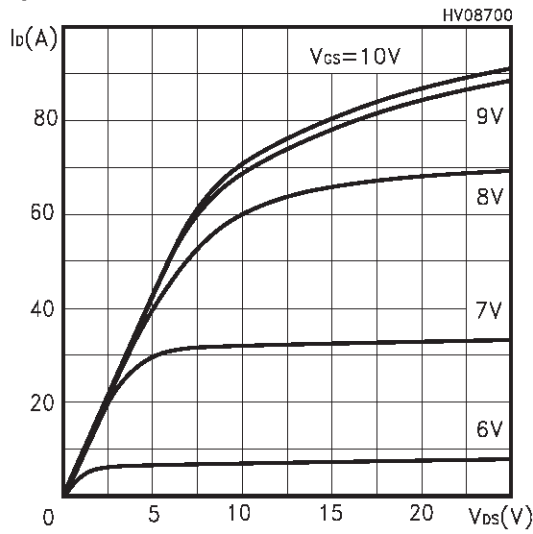
Safe Operating Area For Max220I



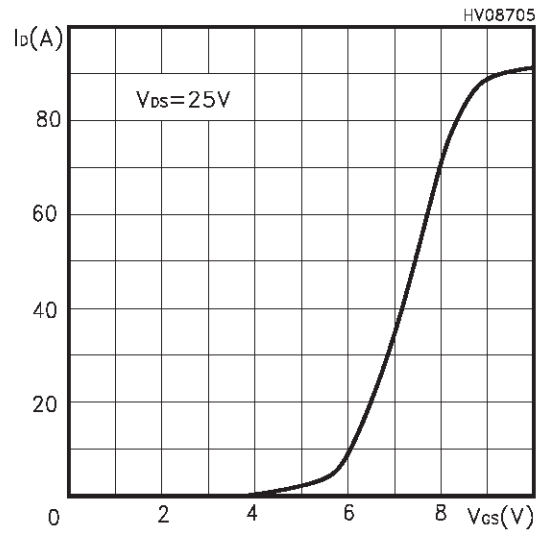
Thermal Impedance For Max220I



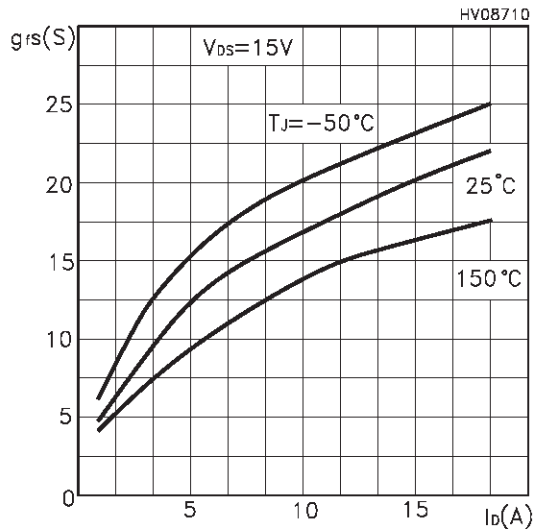
Output Characteristics



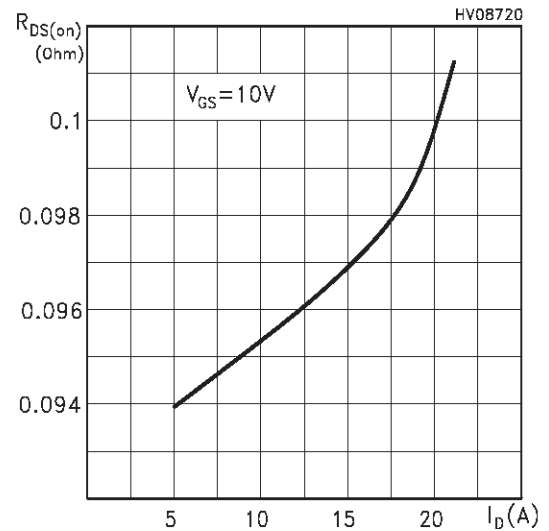
Transfer Characteristics



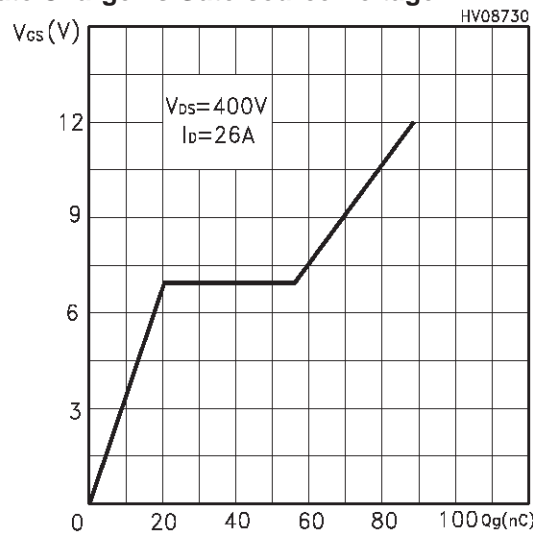
Transconductance



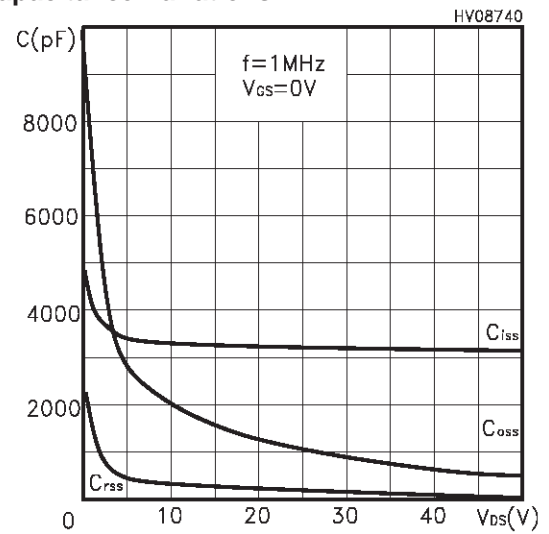
Static Drain-source On Resistance



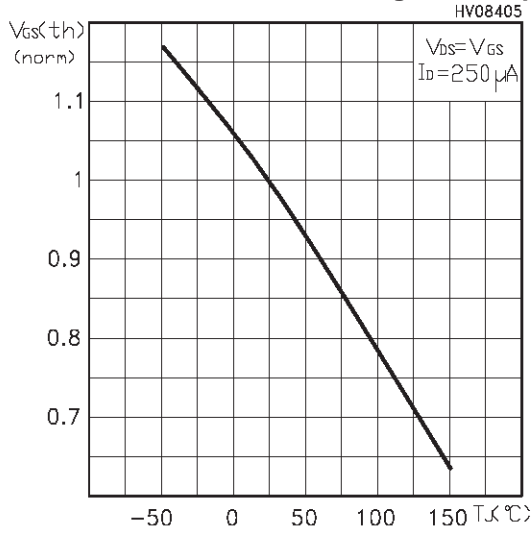
Gate Charge vs Gate-source Voltage



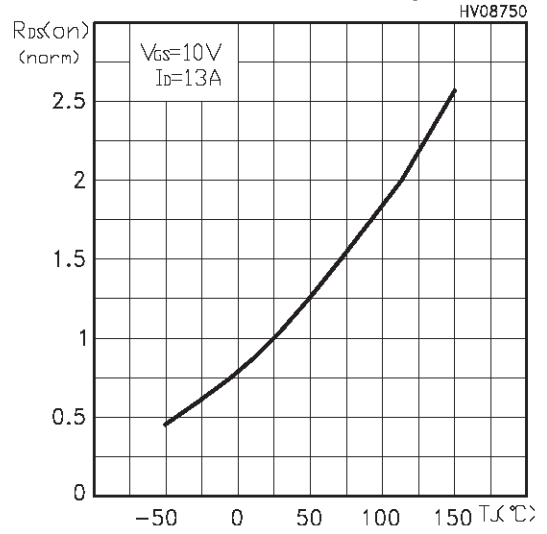
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

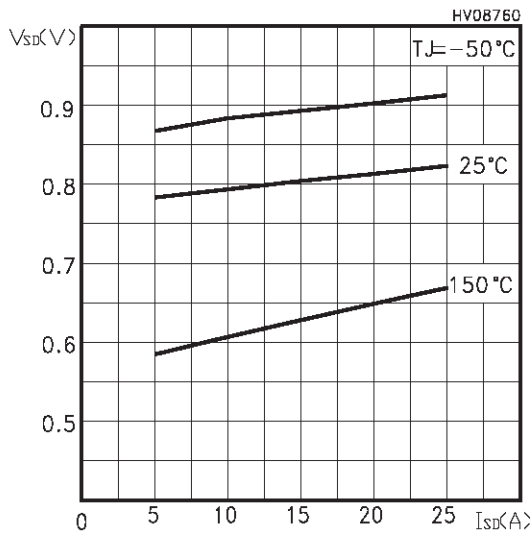


Fig. 1: Unclamped Inductive Load Test Circuit

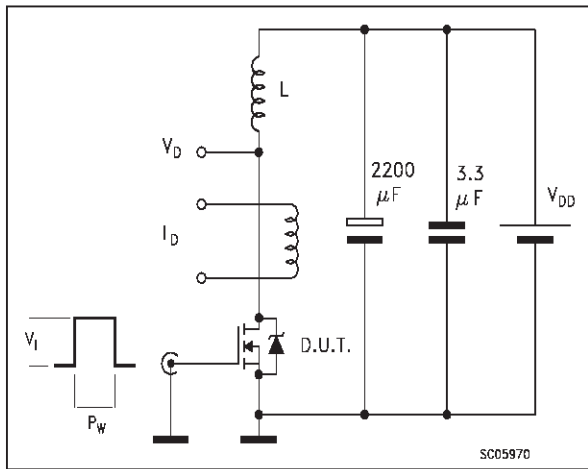


Fig. 2: Unclamped Inductive Waveform

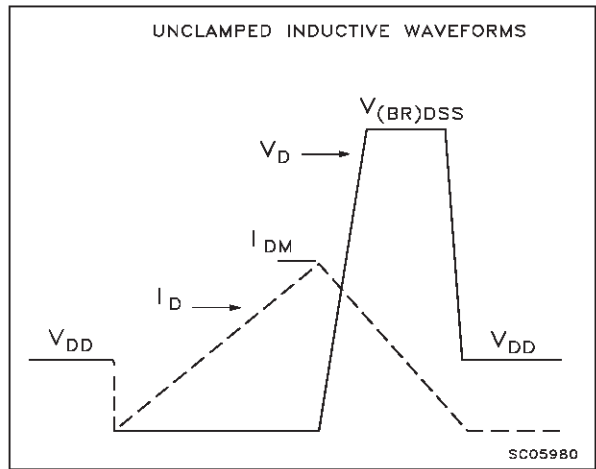


Fig. 3: Switching Times Test Circuit For Resistive Load

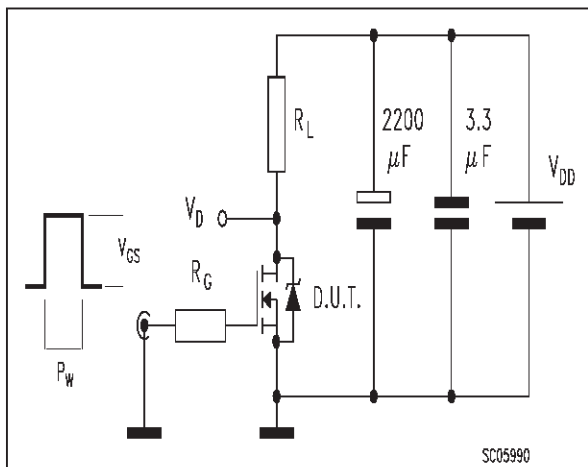


Fig. 4: Gate Charge test Circuit

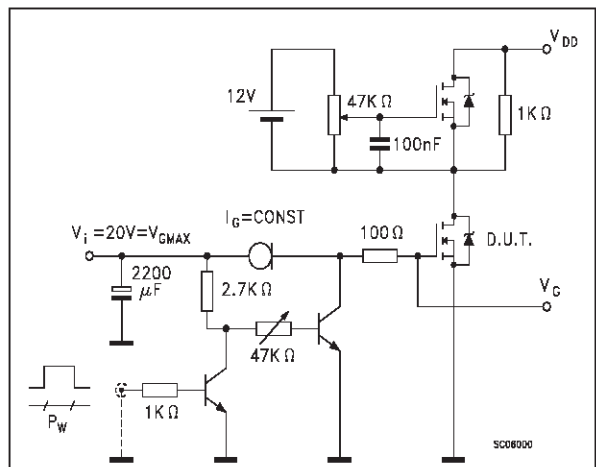
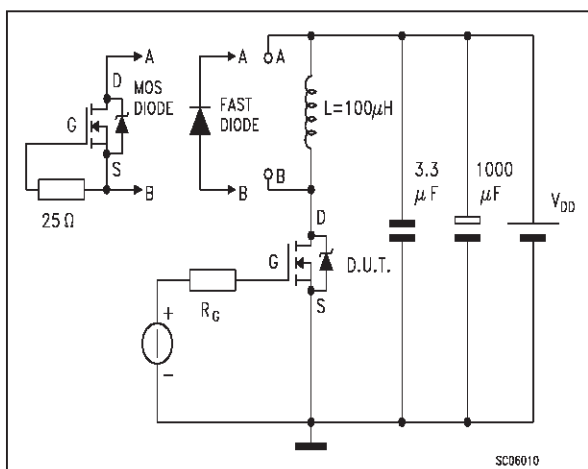
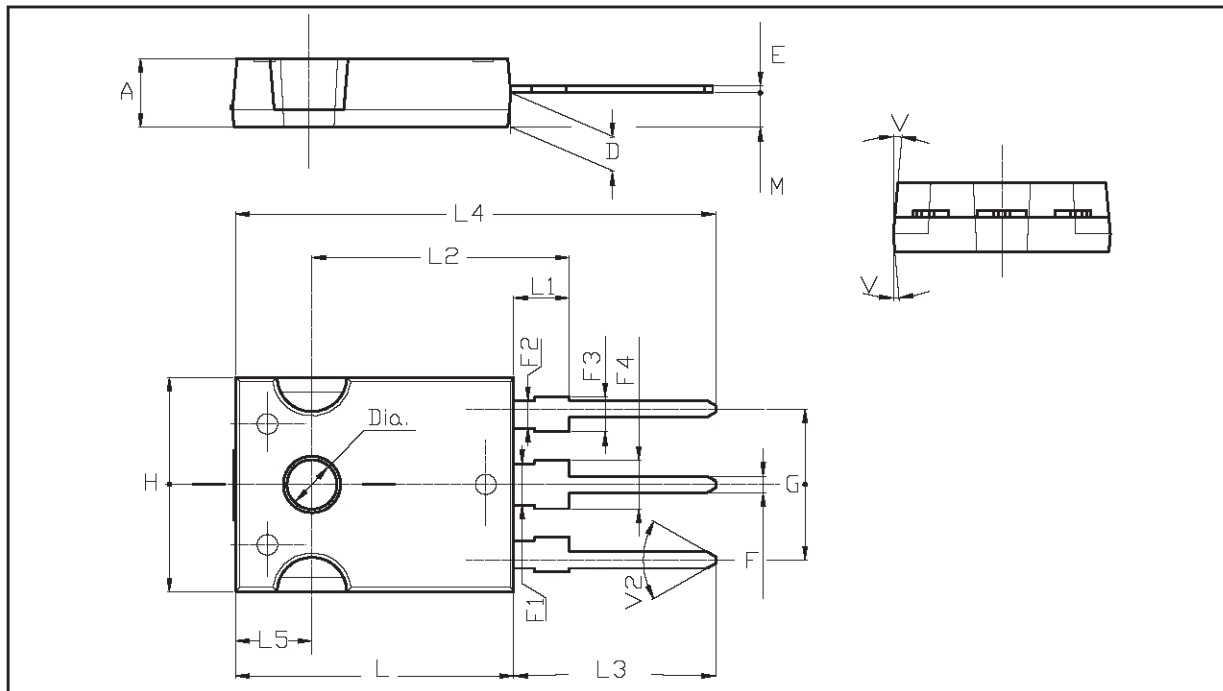


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



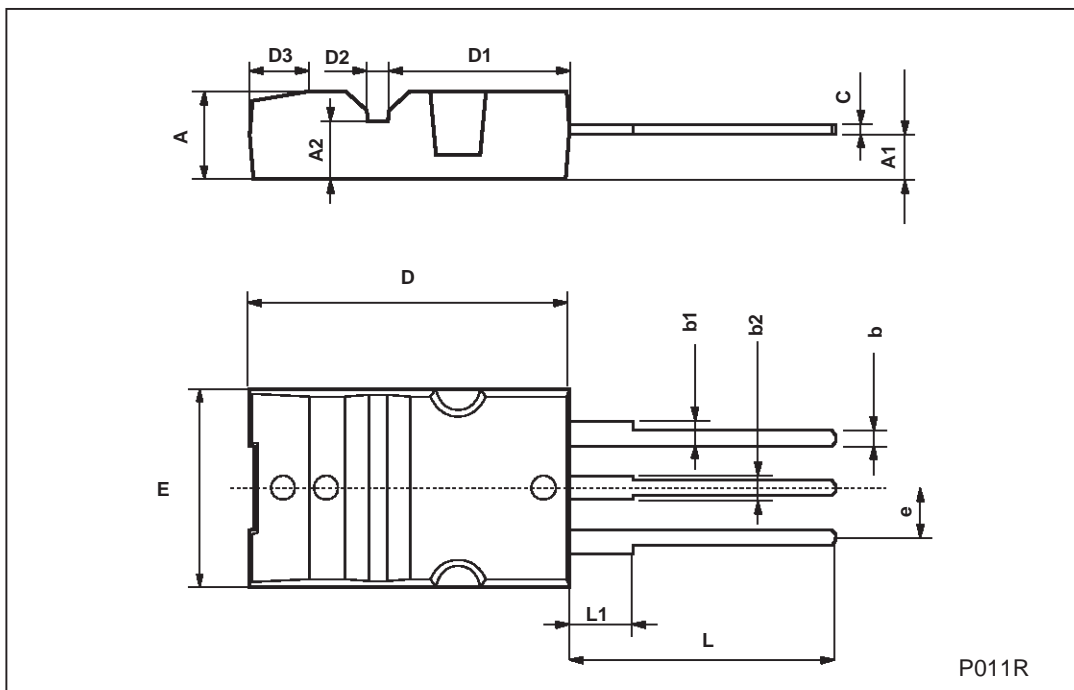
TO-247 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|-------|-------|------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.85 | | 5.15 | 0.19 | | 0.20 |
| D | 2.20 | | 2.60 | 0.08 | | 0.10 |
| E | 0.40 | | 0.80 | 0.015 | | 0.03 |
| F | 1 | | 1.40 | 0.04 | | 0.05 |
| F1 | | 3 | | | 0.11 | |
| F2 | | 2 | | | 0.07 | |
| F3 | 2 | | 2.40 | 0.07 | | 0.09 |
| F4 | 3 | | 3.40 | 0.11 | | 0.13 |
| G | | 10.90 | | | 0.43 | |
| H | 15.45 | | 15.75 | 0.60 | | 0.62 |
| L | 19.85 | | 20.15 | 0.78 | | 0.79 |
| L1 | 3.70 | | 4.30 | 0.14 | | 0.17 |
| L2 | | 18.50 | | | 0.72 | |
| L3 | 14.20 | | 14.80 | 0.56 | | 0.58 |
| L4 | | 34.60 | | | 1.36 | |
| L5 | | 5.50 | | | 0.21 | |
| M | 2 | | 3 | 0.07 | | 0.11 |
| V | | 5° | | | 5° | |
| V2 | | 60° | | | 60° | |
| Dia | 3.55 | | 3.65 | 0.14 | | 0.143 |



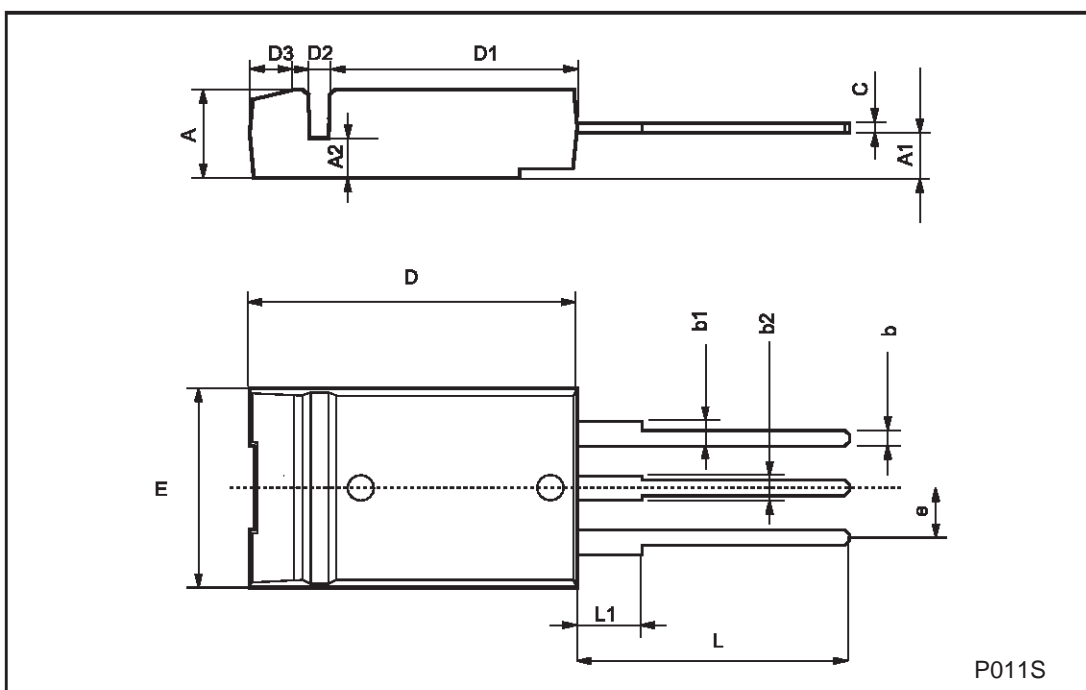
Max220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.3 | | 4.6 | 0.169 | | 0.181 |
| A1 | 2.2 | | 2.4 | 0.087 | | 0.094 |
| A2 | 2.9 | | 3.1 | 0.114 | | 0.122 |
| b | 0.7 | | 0.93 | 0.027 | | 0.036 |
| b1 | 1.25 | | 1.4 | 0.049 | | 0.055 |
| b2 | 1.2 | | 1.38 | 0.047 | | 0.054 |
| c | 0.45 | | 0.6 | | 0.18 | 0.023 |
| D | 15.9 | | 16.3 | | 0.626 | 0.641 |
| D1 | 9 | | 9.35 | 0.354 | | 0.368 |
| D2 | 0.8 | | 1.2 | 0.031 | | 0.047 |
| D3 | 2.8 | | 3.2 | 0.110 | | 0.126 |
| e | 2.44 | | 2.64 | 0.096 | | 0.104 |
| E | 10.05 | | 10.35 | 0.396 | | 0.407 |
| L | 13.2 | | 13.6 | 0.520 | | 0.535 |
| L1 | 3 | | 3.4 | 0.118 | | 0.133 |



I-Max220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.3 | | 4.6 | 0.169 | | 0.181 |
| A1 | 2.6 | | 2.75 | 0.102 | | 0.108 |
| A2 | 1.95 | | 2.15 | 0.077 | | 0.084 |
| b | 0.7 | | 0.93 | 0.027 | | 0.036 |
| b1 | 1.25 | | 1.4 | 0.049 | | 0.055 |
| b2 | 1.2 | | 1.38 | 0.047 | | 0.054 |
| c | 0.45 | | 0.6 | 0.017 | | 0.023 |
| D | 15.9 | | 16.3 | 0.626 | | 0.641 |
| D1 | 12.5 | | 12.9 | 0.492 | | 0.508 |
| D2 | 0.6 | | 1 | 0.023 | | 0.039 |
| D3 | 1.75 | | 2.15 | 0.069 | | 0.084 |
| e | 2.44 | | 2.64 | 0.096 | | 0.104 |
| E | 10.05 | | 10.35 | 0.396 | | 0.407 |
| L | 13.2 | | 13.6 | 0.520 | | 0.535 |
| L1 | 3 | | 3.4 | 0.118 | | 0.133 |



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