



STW8NB90 STH8NB90FI

N-CHANNEL 900V - 1.1 Ω - 8 A TO-247/ISOWATT218

PowerMesh™ MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STW8NB90 | 900 V | < 1.45 Ω | 8 A |
| STH8NB90FI | 900 V | < 1.45 Ω | 5 A |

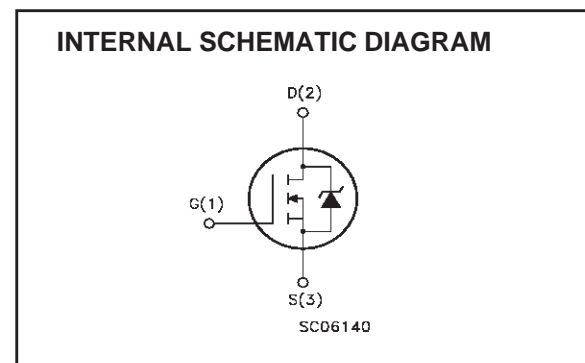
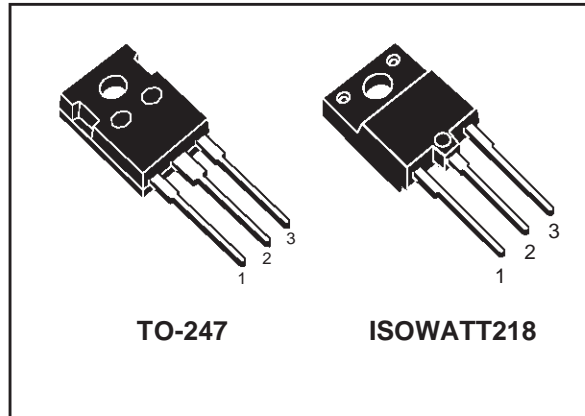
- TYPICAL R_{DS(on)} = 1.1 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | Unit |
|---------------------|---|------------|------------|------|
| | | STW8NB90 | STH8NB90FI | |
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 900 | | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 k Ω) | 900 | | V |
| V _{GS} | Gate- source Voltage | ±30 | | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 8 | 5 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 5 | 3 | A |
| I _{DM} (●) | Drain Current (pulsed) | 32 | 20 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 200 | 80 | W |
| | Derating Factor | 1.6 | 0.64 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 4 | | V/ns |
| V _{ISO} | Insulation Withstand Voltage (DC) | - | 2500 | V |
| 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} ≤ 8 A, di/dt ≤ 200A/ μ s, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

STW8NB90 - STH8NB90FI

THERMAL DATA

| | | TO-247 | ISOWATT218 | |
|----------------|--|--------|------------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 0.625 | 1.56 | °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) | 8 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 700 | 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 | 900 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C | | | 1 50 | 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 = 250 μA | 3 | 4 | 5 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V, I _D = 4 A | | 1.1 | 1.45 | 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 = 4 A | | 8 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 2120 | | pF |
| C _{oss} | Output Capacitance | | | 225 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 23 | | pF |

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 450\text{ V}, I_D = 3.5\text{ A}$ $R_G = 4.7\Omega, V_{GS} = 10\text{ V}$ (see test circuit, Figure 3) | | 25 | | ns |
| t_r | Rise Time | | | 12 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 400\text{ V}, I_D = 9\text{ A},$ $V_{GS} = 10\text{ V}$ | | 46 | 72 | nC |
| Q_{gs} | Gate-Source Charge | | | 12.5 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 18 | | nC |

SWITCHING OFF

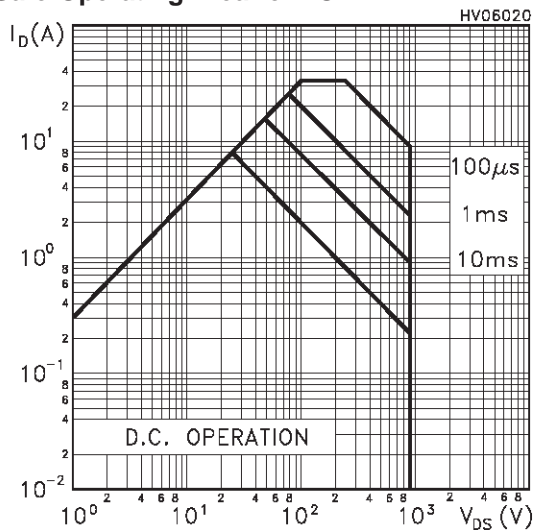
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 720\text{ V}, I_D = 7.4\text{ A},$ $R_G = 4.7\Omega, V_{GS} = 10\text{ V}$ (see test circuit, Figure 5) | | 22 | | ns |
| t_f | Fall Time | | | 15 | | ns |
| t_c | Cross-over Time | | | 31 | | ns |

SOURCE DRAIN DIODE

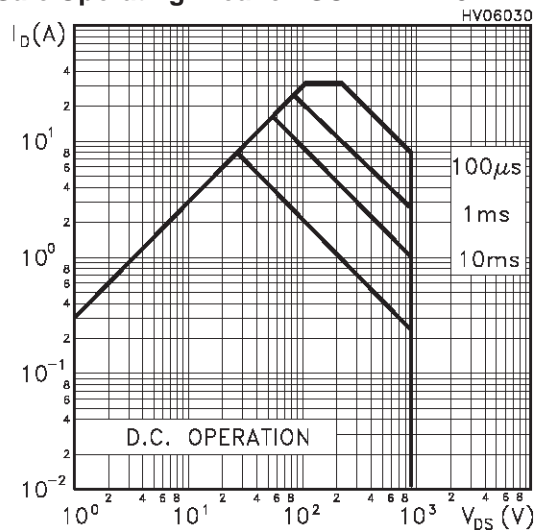
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|--|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 8 | A |
| $I_{SDM(2)}$ | Source-drain Current (pulsed) | | | | 32 | A |
| $V_{SD(1)}$ | Forward On Voltage | $I_{SD} = 8\text{ A}, V_{GS} = 0$ | | | 1.6 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 7.4\text{ A}, di/dt = 100\text{ A}/\mu\text{s},$ $V_{DD} = 100\text{ V}, T_J = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 700 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 6.3 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 18 | | A |

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

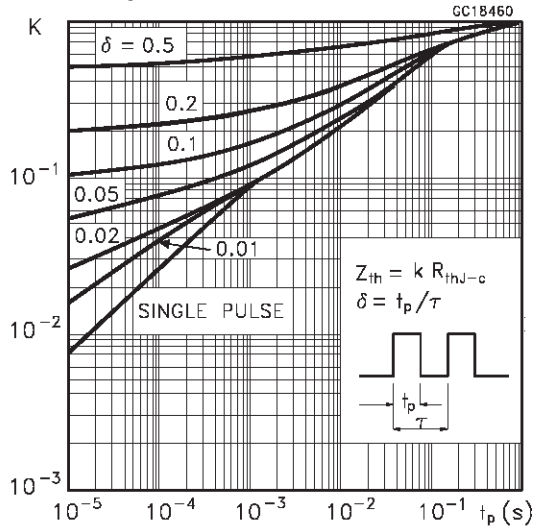
Safe Operating Area for TO-247



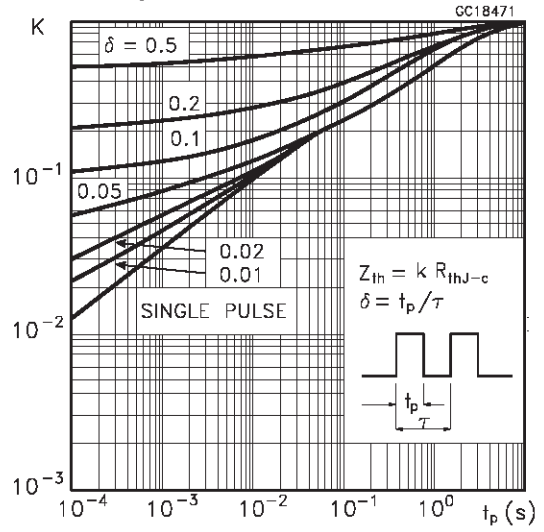
Safe Operating Area for ISOWATT218



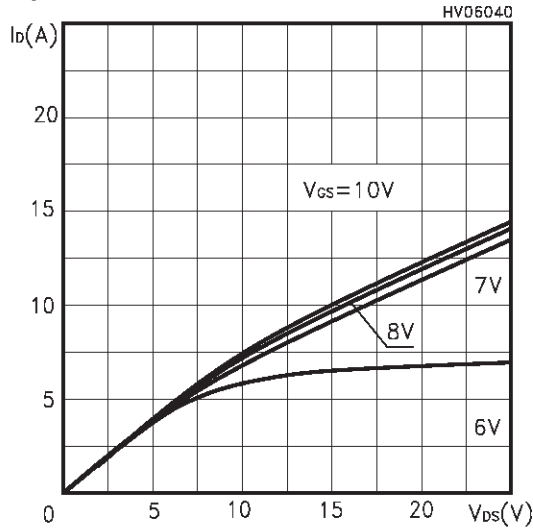
Thermal Impedance for TO-247



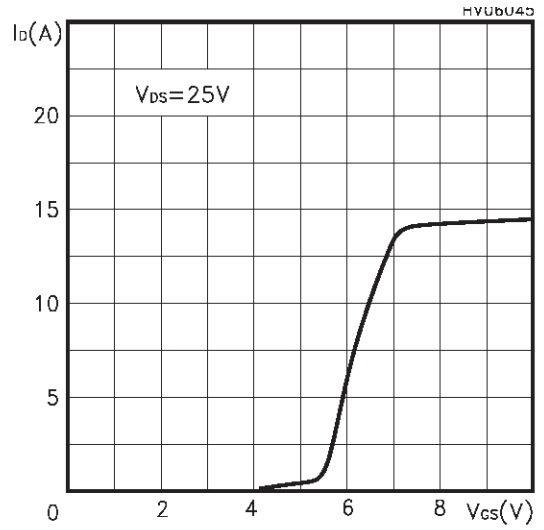
Thermal Impedance for ISOWATT218



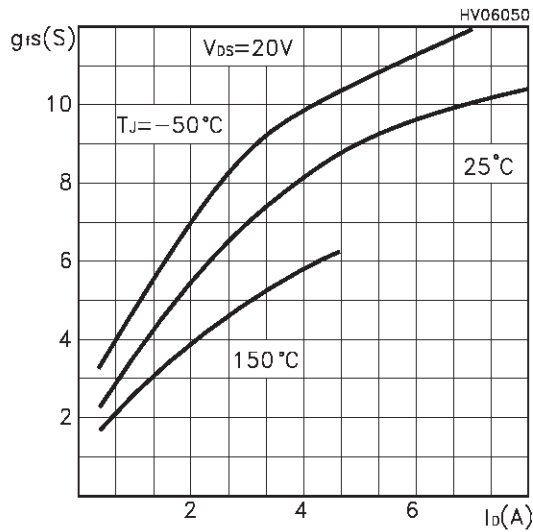
Output Characteristics



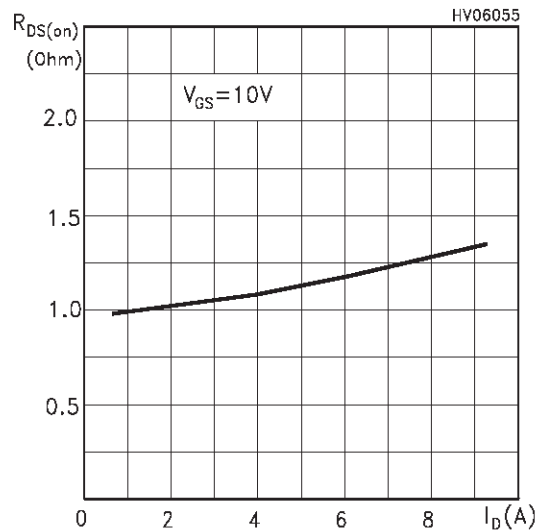
Transfer Characteristics



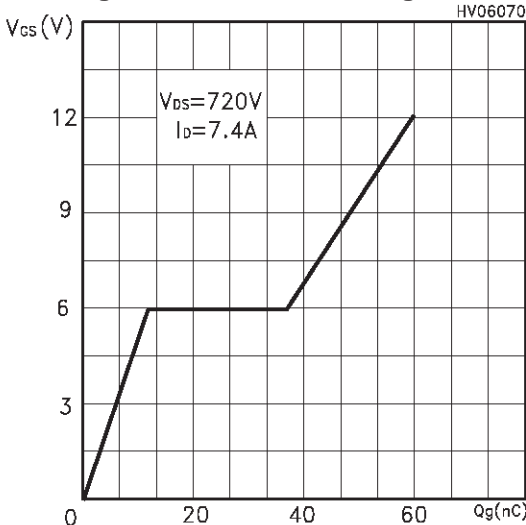
Transconductance



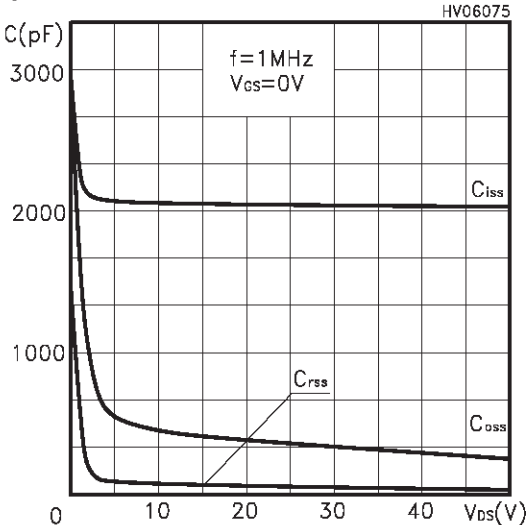
Static Drain-source On Resistance



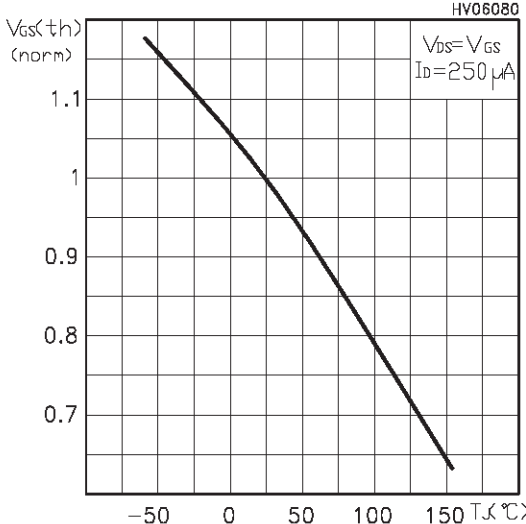
Gate Charge vs Gate-source Voltage



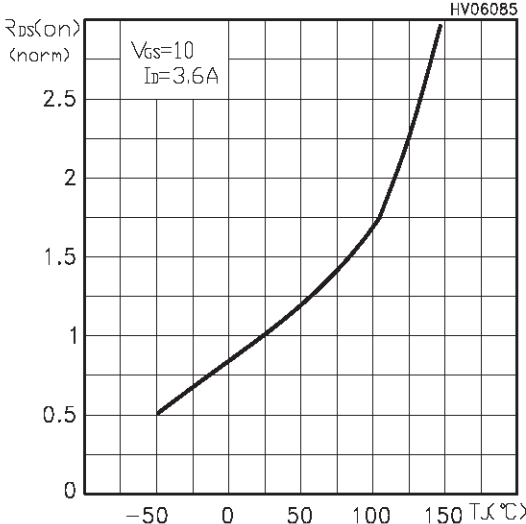
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

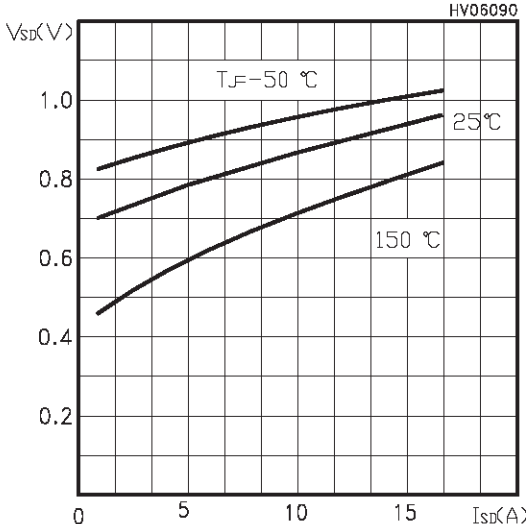


Fig. 1: Unclamped Inductive Load Test Circuit

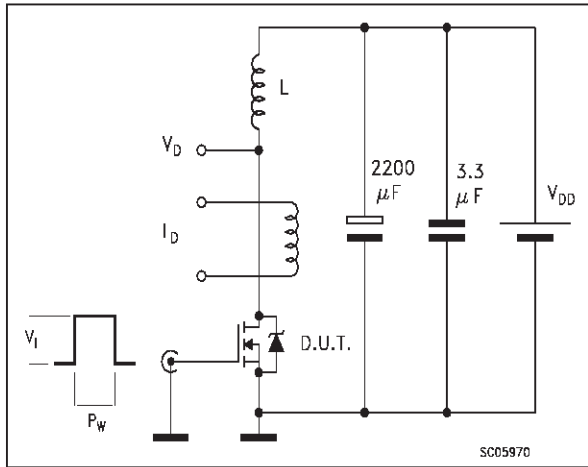


Fig. 2: Unclamped Inductive Waveform

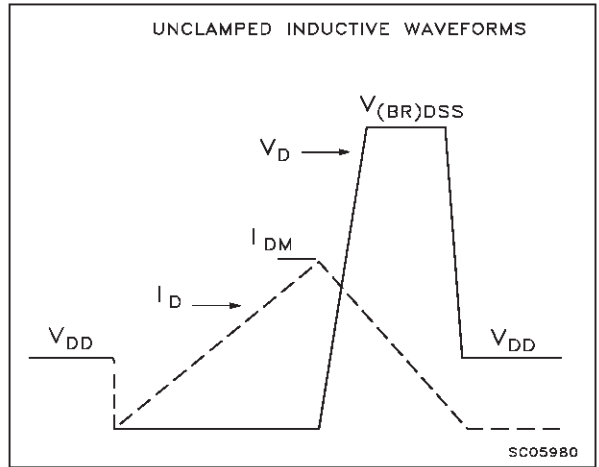


Fig. 3: Switching Times Test Circuit For Resistive Load

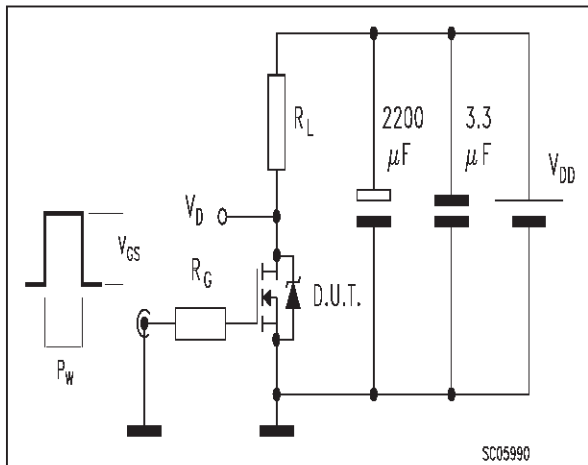


Fig. 4: Gate Charge test Circuit

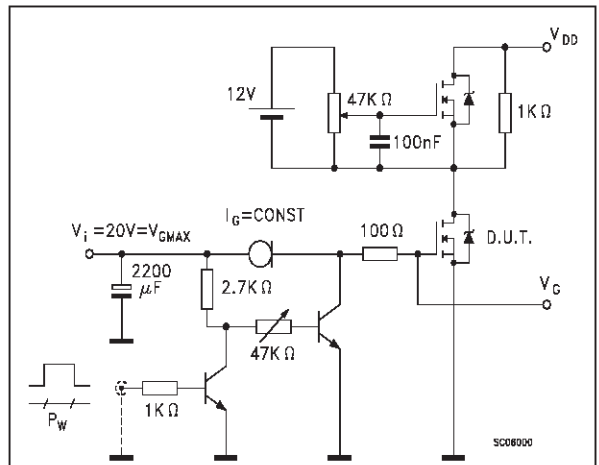
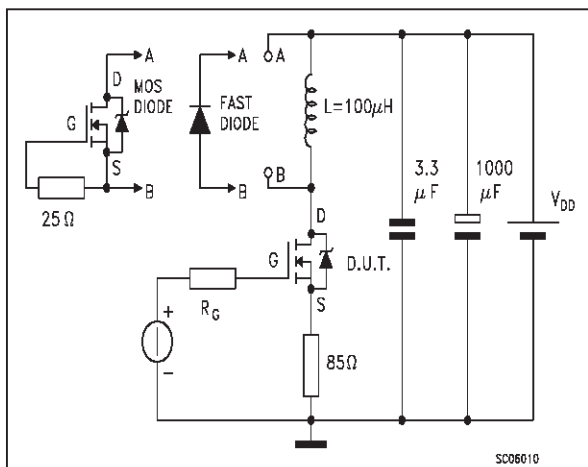
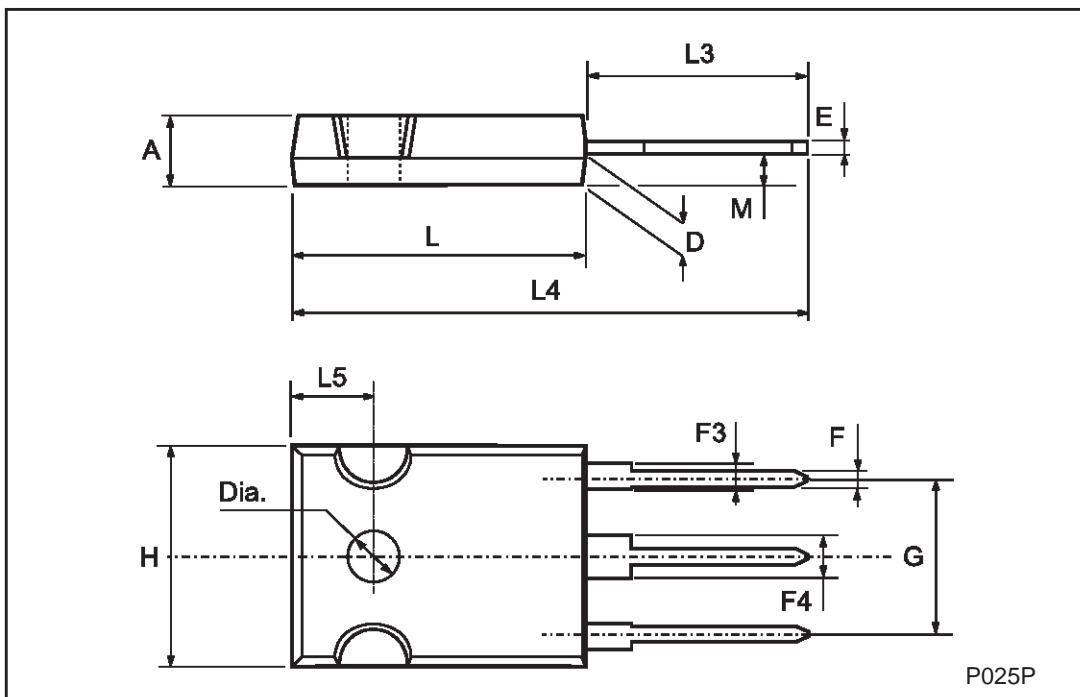


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



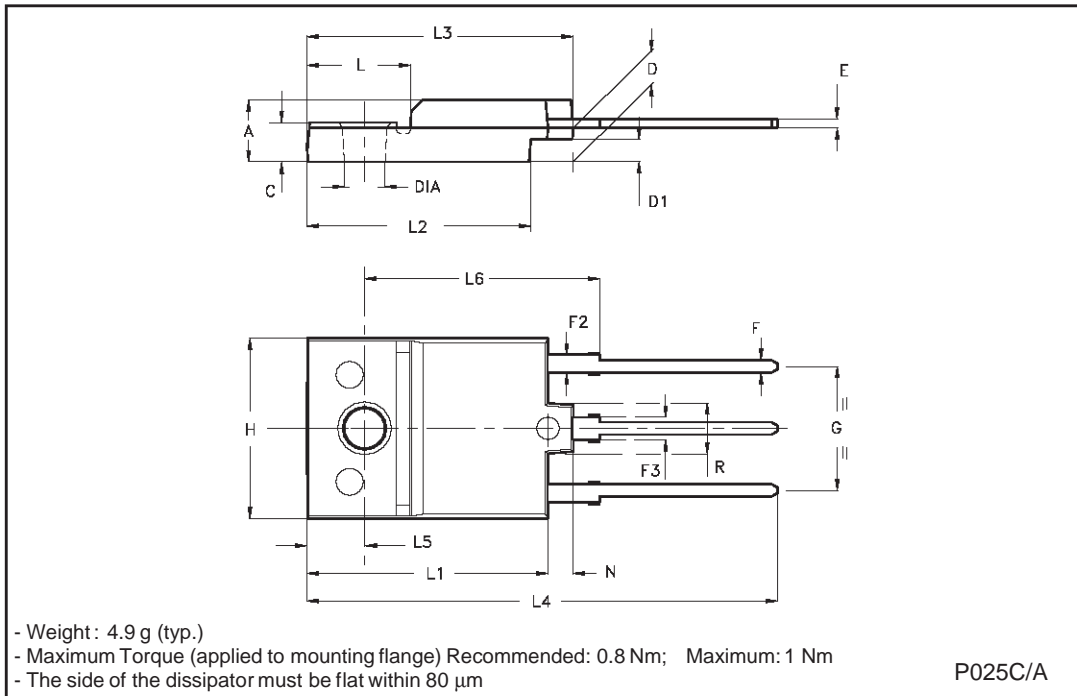
TO-247 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.7 | | 5.3 | 0.185 | | 0.209 |
| D | 2.2 | | 2.6 | 0.087 | | 0.102 |
| E | 0.4 | | 0.8 | 0.016 | | 0.031 |
| F | 1 | | 1.4 | 0.039 | | 0.055 |
| F3 | 2 | | 2.4 | 0.079 | | 0.094 |
| F4 | 3 | | 3.4 | 0.118 | | 0.134 |
| G | | 10.9 | | | 0.429 | |
| H | 15.3 | | 15.9 | 0.602 | | 0.626 |
| L | 19.7 | | 20.3 | 0.776 | | 0.779 |
| L3 | 14.2 | | 14.8 | 0.559 | | 0.582 |
| L4 | | 34.6 | | | 1.362 | |
| L5 | | 5.5 | | | 0.217 | |
| M | 2 | | 3 | 0.079 | | 0.118 |



ISOWATT218 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 5.35 | | 5.65 | 0.211 | | 0.222 |
| C | 3.30 | | 3.80 | 0.130 | | 0.150 |
| D | 2.90 | | 3.10 | 0.114 | | 0.122 |
| D1 | 1.88 | | 2.08 | 0.074 | | 0.082 |
| E | 0.75 | | 0.95 | 0.030 | | 0.037 |
| F | 1.05 | | 1.25 | 0.041 | | 0.049 |
| F2 | 1.50 | | 1.70 | 0.059 | | 0.067 |
| F3 | 1.90 | | 2.10 | 0.075 | | 0.083 |
| G | 10.80 | | 11.20 | 0.425 | | 0.441 |
| H | 15.80 | | 16.20 | 0.622 | | 0.638 |
| L | | 9 | | | 0.354 | |
| L1 | 20.80 | | 21.20 | 0.819 | | 0.835 |
| L2 | 19.10 | | 19.90 | 0.752 | | 0.783 |
| L3 | 22.80 | | 23.60 | 0.898 | | 0.929 |
| L4 | 40.50 | | 42.50 | 1.594 | | 1.673 |
| L5 | 4.85 | | 5.25 | 0.191 | | 0.207 |
| L6 | 20.25 | | 20.75 | 0.797 | | 0.817 |
| N | 2.1 | | 2.3 | 0.083 | | 0.091 |
| R | | 4.6 | | | 0.181 | |
| DIA | 3.5 | | 3.7 | 0.138 | | 0.146 |



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