

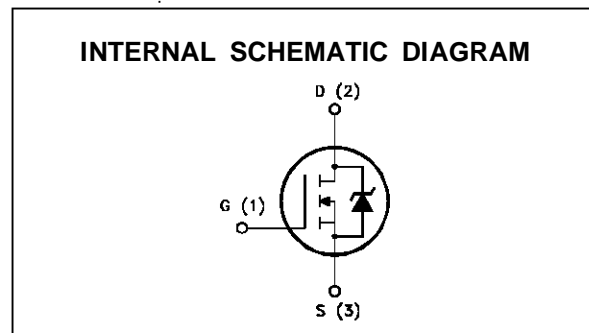
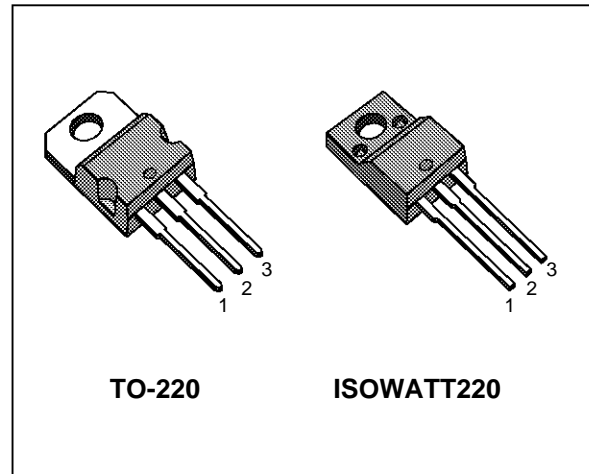
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|----------|------------------|---------------------|----------------|
| IRF520 | 100 V | < 0.27 Ω | 10 A |
| IRF520FI | 100 V | < 0.27 Ω | 7 A |

- TYPICAL R_{DS(on)} = 0.23 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | Unit |
|---------------------|--|------------|----------|------|
| | | IRF520 | IRF520FI | |
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 100 | | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 kΩ) | 100 | | V |
| V _{GS} | Gate-source Voltage | ± 20 | | V |
| I _D | Drain Current (cont.) at T _c = 25 °C | 10 | 7 | A |
| I _D | Drain Current (cont.) at T _c = 100 °C | 7 | 5 | A |
| I _{DM} (●) | Drain Current (pulsed) | 40 | 40 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 70 | 35 | W |
| | Derating Factor | 0.47 | 0.23 | W/°C |
| V _{ISO} | Insulation Withstand Voltage (DC) | — | 2000 | V |
| T _{stg} | Storage Temperature | -65 to 175 | | °C |
| T _j | Max. Operating Junction Temperature | 175 | | °C |

(●) Pulse width limited by safe operating area

THERMAL DATA

| | | TO-220 | ISOWATT220 | | |
|-----------------------|--|--------|------------|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 2.14 | 4.29 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 62.5 | | °C/W |
| R _{thc-s} | 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, δ < 1%) | 10 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 25 V) | 36 | mJ |
| E _{AR} | Repetitive Avalanche Energy (pulse width limited by T _j max, δ < 1%) | 9 | mJ |
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, δ < 1%) | 7 | A |

ELECTRICAL CHARACTERISTICS (T_{case} = 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 | 100 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 125 °C | | | 250 1000 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 20 V | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|--|------|------|------|------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 μA | 2 | 2.9 | 4 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10V I _D = 5 A | | 0.23 | 0.27 | Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} x R _{DS(on)max} V _{GS} = 10 V | 10 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|--|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} > I _{D(on)} x R _{DS(on)max} I _D = 5 A | 2.7 | 4.5 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 330 | 450 | pF |
| C _{oss} | Output Capacitance | | | 90 | 120 | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 25 | 40 | pF |

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING RESISTIVE LOAD

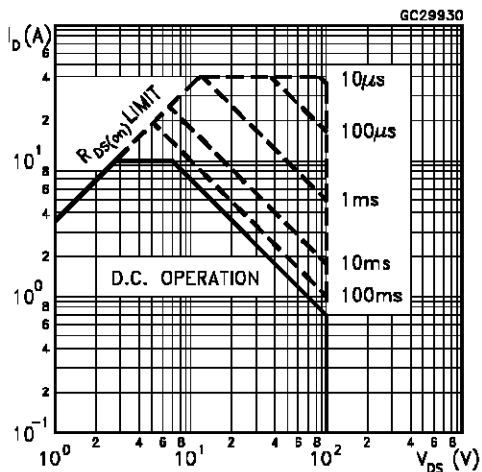
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time | $V_{DD} = 50\text{ V}$ $I_D = 5\text{ A}$ | | 10 | 15 | ns |
| t_r | Rise Time | $R_{GS} = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 50 | 75 | ns |
| $t_{d(off)}$ | Turn-off Delay Time | (see test circuit) | | 25 | 40 | ns |
| t_f | Fall Time | | | 20 | 30 | ns |
| Q_g | Total Gate Charge | $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$ | | 15 | 25 | nC |
| Q_{gs} | Gate-Source Charge | $V_{DD} = \text{Max Rating} \times 0.8$ | | 7 | | nC |
| Q_{gd} | Gate-Drain Charge | (see test circuit) | | 4 | | nC |

SOURCE DRAIN DIODE

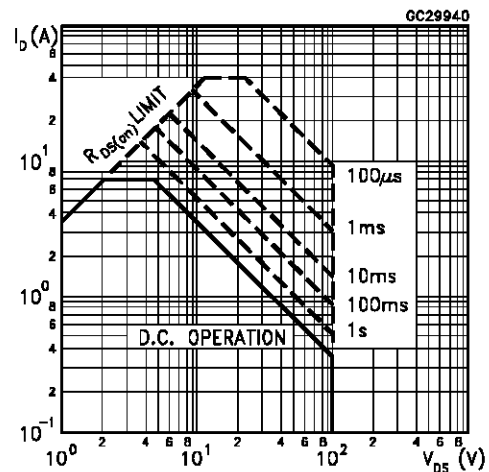
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 10 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 40 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 10\text{ A}$ $V_{GS} = 0$ | | | 1.6 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ | | 80 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 0.22 | | μC |

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %
 (•) Pulse width limited by safe operating area

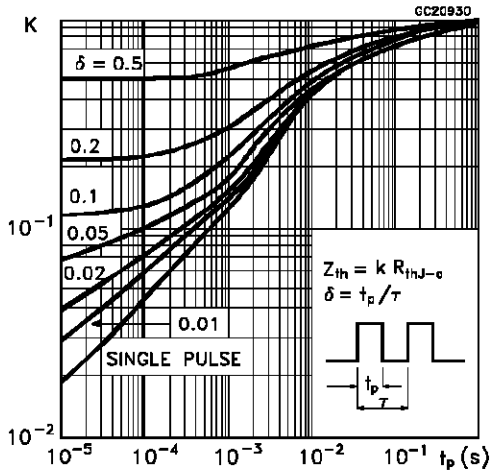
Safe Operating Area for TO-220



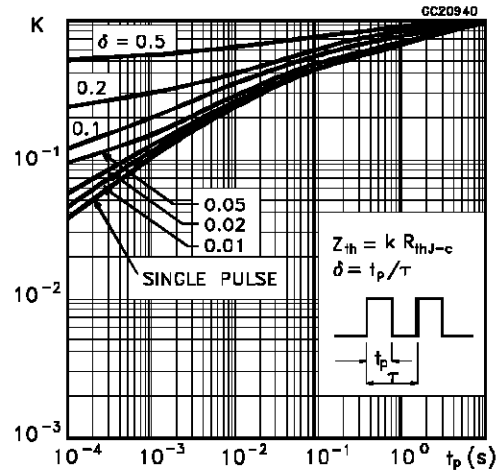
Safe Operating Area for ISOWATT220



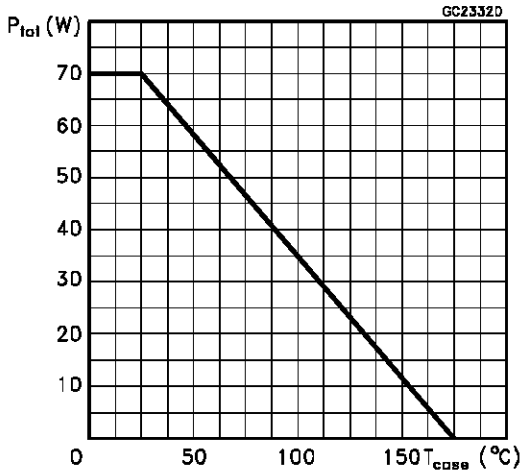
Thermal Impedance for TO-220



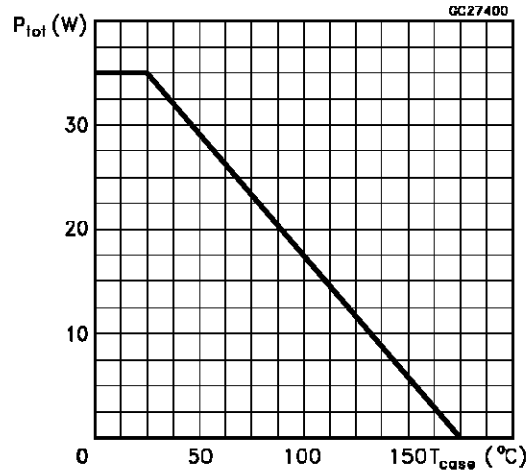
Thermal Impedance for ISOWATT220



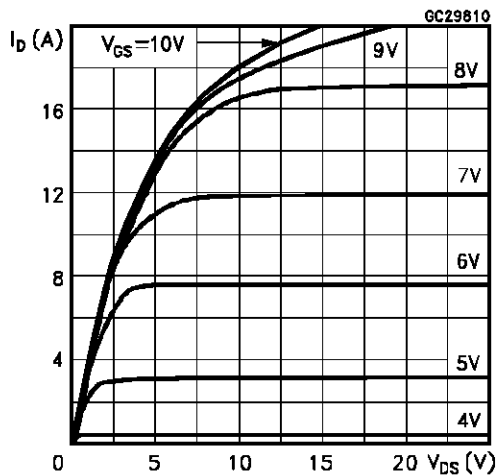
Derating Curve for TO-220



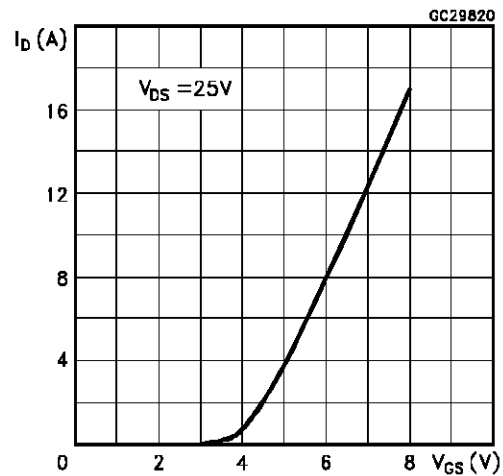
Derating Curve for ISOWATT220



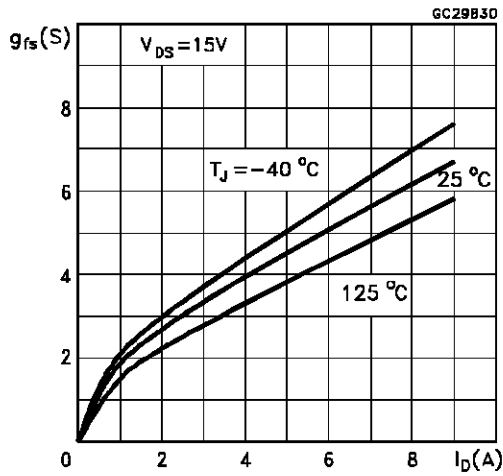
Output Characteristics



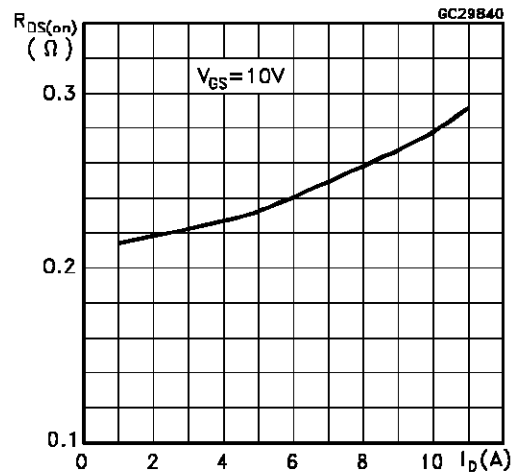
Transfer Characteristics



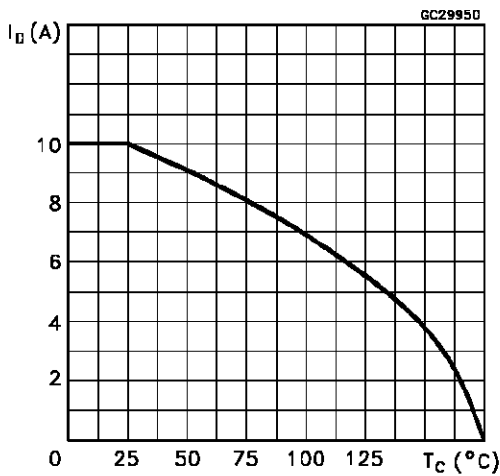
Transconductance



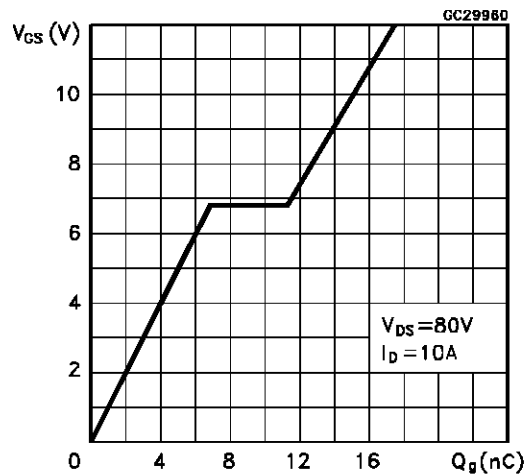
Static Drain-source On Resistance



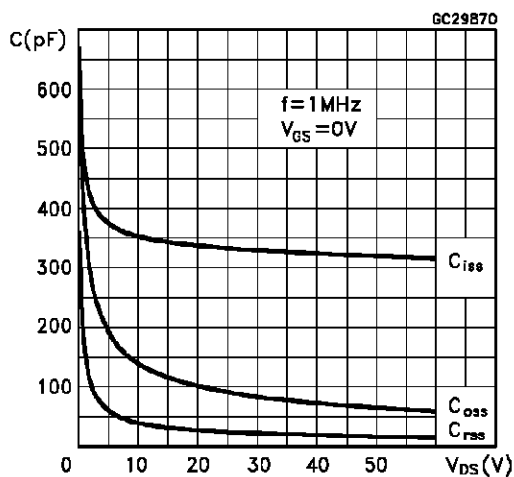
Maximum Drain Current vs Temperature



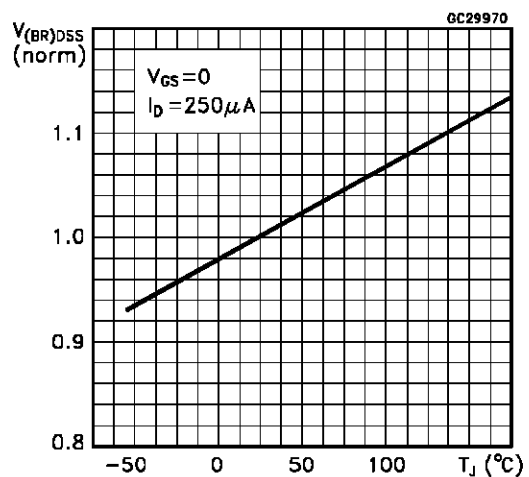
Gate Charge vs Gate-source Voltage



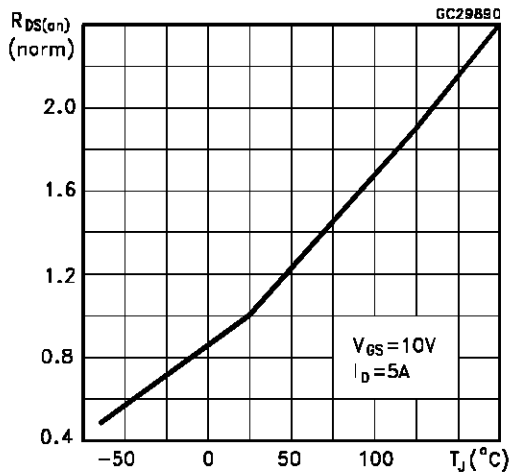
Capacitance Variations



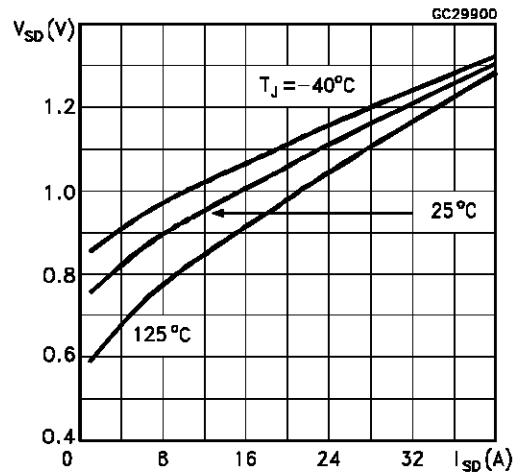
Normalized Breakdown Voltage vs Temperature



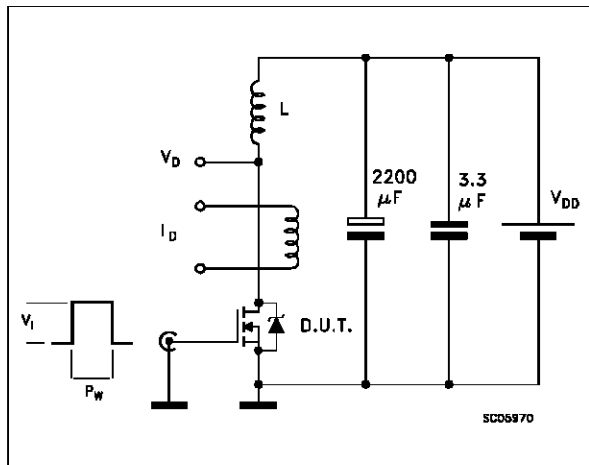
Normalized On Resistance vs Temperature



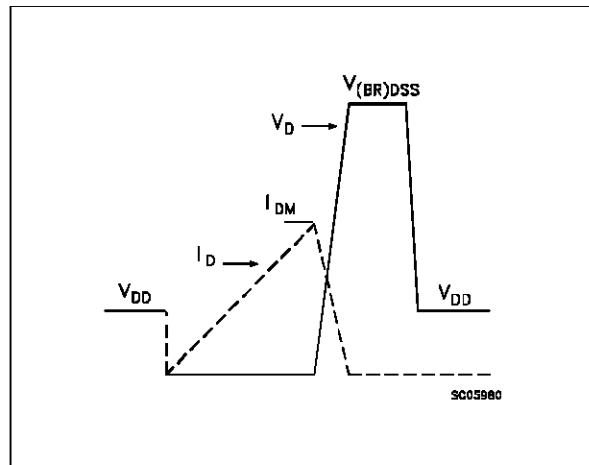
Source-drain Diode Forward Characteristics



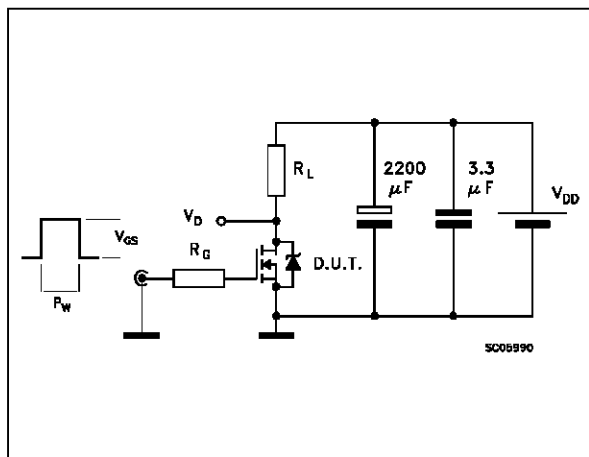
Unclamped Inductive Load Test Circuit



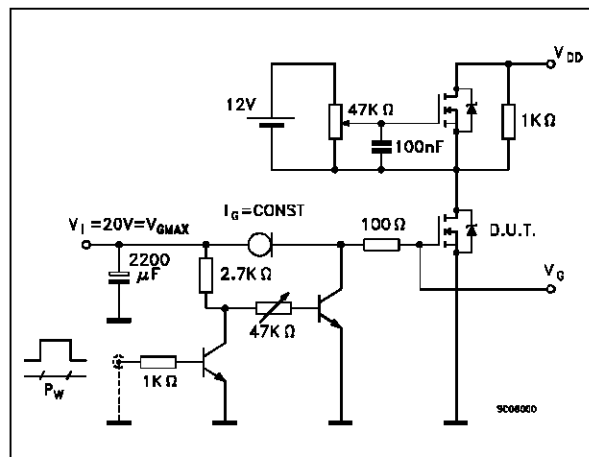
Unclamped Inductive Waveforms



Switching Time Test Circuit

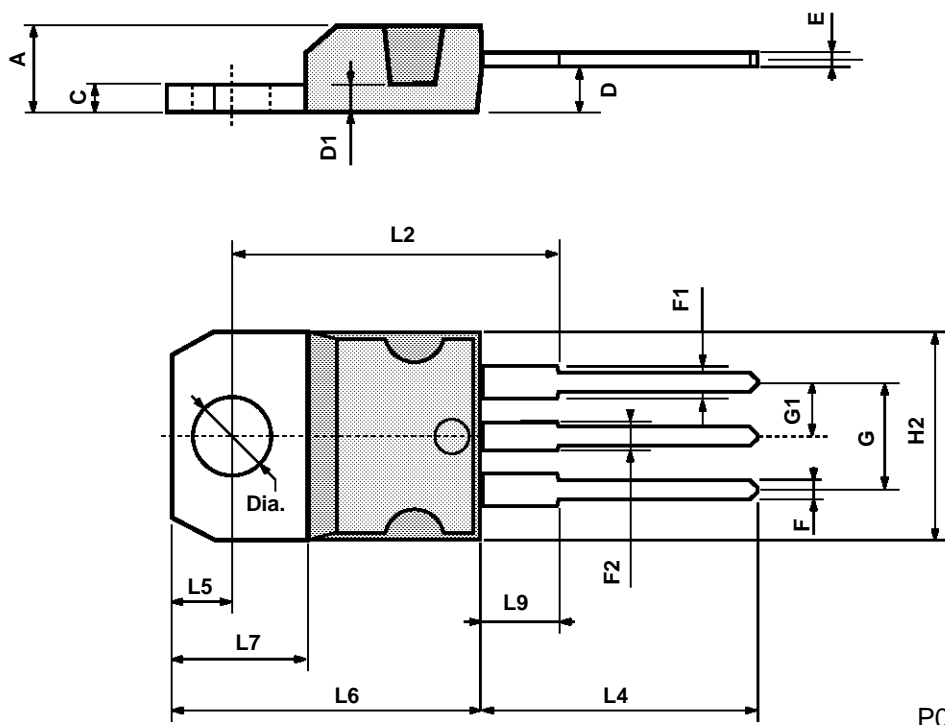


Gate Charge Test Circuit



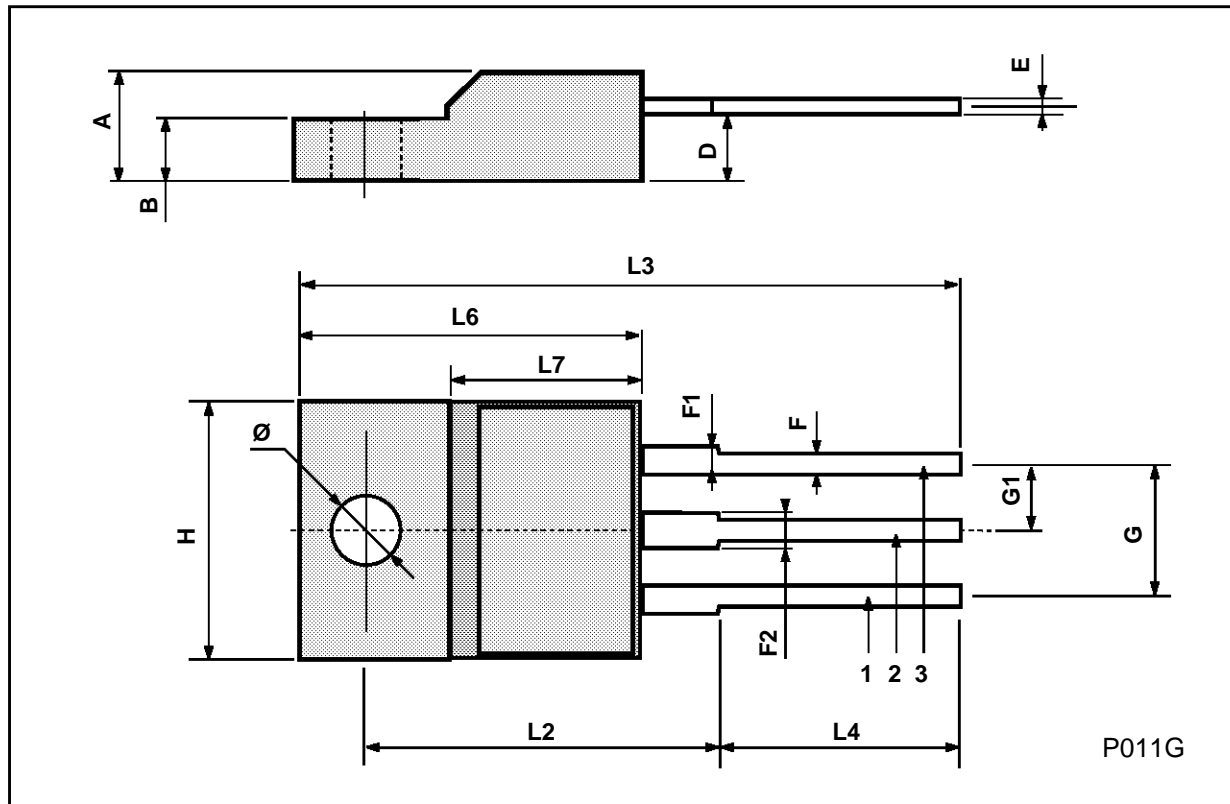
TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



ISOWATT220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| B | 2.5 | | 2.7 | 0.098 | | 0.106 |
| D | 2.5 | | 2.75 | 0.098 | | 0.108 |
| E | 0.4 | | 0.7 | 0.015 | | 0.027 |
| F | 0.75 | | 1 | 0.030 | | 0.039 |
| F1 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| F2 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| G | 4.95 | | 5.2 | 0.195 | | 0.204 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H | 10 | | 10.4 | 0.393 | | 0.409 |
| L2 | | 16 | | | 0.630 | |
| L3 | 28.6 | | 30.6 | 1.126 | | 1.204 |
| L4 | 9.8 | | 10.6 | 0.385 | | 0.417 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| ∅ | 3 | | 3.2 | 0.118 | | 0.126 |



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