



STP55NF06L - STP55NF06LFP STB55NF06L - STB55NF06L-1

N-CHANNEL 60V - 0.014Ω - 55A TO-220/FP/D²PAK/I²PAK
STripFET™II POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|--------------|------------------|---------------------|----------------|
| STP55NF06L | 60 V | <0.018 Ω | 55 A |
| STP55NF06LFP | 60 V | <0.018 Ω | 55 A |
| STB55NF06L | 60 V | <0.018 Ω | 55 A |
| STB55NF06L-1 | 60 V | <0.018 Ω | 55 A |

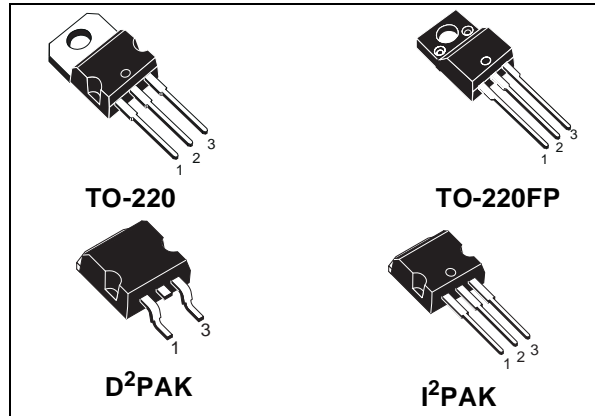
- TYPICAL R_{DS(on)} = 0.014Ω
- EXCEPTIONAL dv/dt CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

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



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | Unit |
|---------------------|--|-----------------------------|--------------|------|
| | | STP55NF06L STB55NF06L/-1 | STP55NF06LFP | |
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 60 | | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 60 | | V |
| V _{GS} | Gate- source Voltage | ± 16 | | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 55 | 30 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 39 | 21 | A |
| I _{DM} (●) | Drain Current (pulsed) | 220 | 120 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 95 | 30 | W |
| | Derating Factor | 0.63 | 0.2 | W/°C |
| dv/dt (2) | Peak Diode Recovery voltage slope | 20 | | V/ns |
| E _{AS} (1) | Single Pulse Avalanche Energy | 300 | | mJ |
| V _{ISO} | Insulation Withstand Voltage (DC) | - | 2500 | V |
| T _{stg} | Storage Temperature | - 55 to 175 | | °C |
| T _j | Max. Operating Junction Temperature | | | |

(●) Pulse width limited by safe operating area
August 2002

(1) Starting T_j=25°C, I_D=27.5A, V_{DD}=30V

(2) I_{SD} ≤ 55 A, di/dt ≤ 200A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}. 1/12

STP55NF06L - STP55NF06LFP - STB55NF06L - STB55NF06L-1

THERMAL DATA

| | | TO-220 D ² PAK I ² PAK | TO-220FP | |
|----------------|--|--|----------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 1.58 | 5.0 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | | °C/W |
| T _I | Maximum Lead Temperature For Soldering Purpose | 300 | | °C |

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 | 60 | | | 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} = ± 16 V | | | ±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 | 1 | 1.7 | | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 5 V, I _D = 27.5 A V _{GS} = 10V, I _D = 27.5 A | | 0.016 0.014 | 0.020 0.018 | Ω Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g _{fs} (1) | Forward Transconductance | V _{DS} = 15V, I _D = 27.5 A | | 30 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 1700 | | pF |
| C _{oss} | Output Capacitance | | | 300 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 105 | | pF |

STP55NF06L - STP55NF06LFP - STB55NF06L - STB55NF06L-1

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 30\text{ V}$, $I_D = 27.5\text{ A}$ | | 20 | | ns |
| t_r | Rise Time | $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (see test circuit, Figure 3) | | 100 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 48\text{ V}$, $I_D = 55\text{ A}$, | | 27 | 37 | nC |
| Q_{gs} | Gate-Source Charge | $V_{GS} = 4.5\text{ V}$ | | 7 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 10 | | nC |

SWITCHING OFF

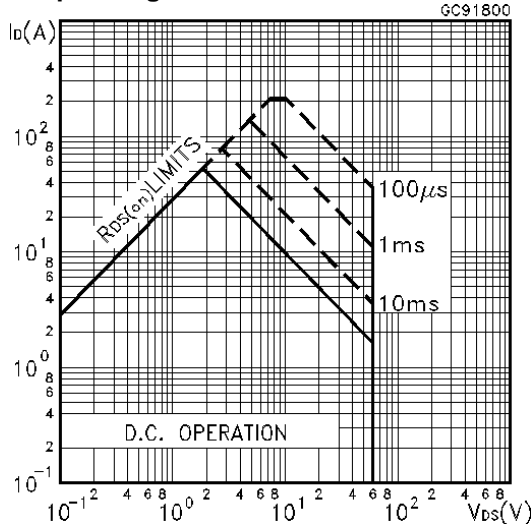
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(off)}$ | Turn-off-Delay Time | $V_{DD} = 30\text{ V}$, $I_D = 27.5\text{ A}$, | | 40 | | ns |
| t_f | Fall Time | $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 5) | | 20 | | ns |

SOURCE DRAIN DIODE

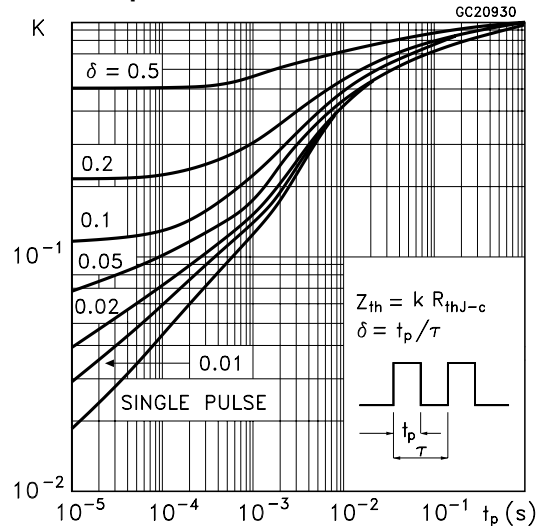
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain Current | | | | 55 | A |
| $I_{SDM(2)}$ | Source-drain Current (pulsed) | | | | 220 | A |
| $V_{SD(1)}$ | Forward On Voltage | $I_{SD} = 55\text{ A}$, $V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 55\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, | | 80 | | ns |
| Q_{rr} | Reverse Recovery Charge | $V_{DD} = 30\text{ V}$, $T_j = 150^\circ\text{C}$ | | 200 | | nC |
| I_{RRM} | Reverse Recovery Current | (see test circuit, Figure 5) | | 5 | | A |

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

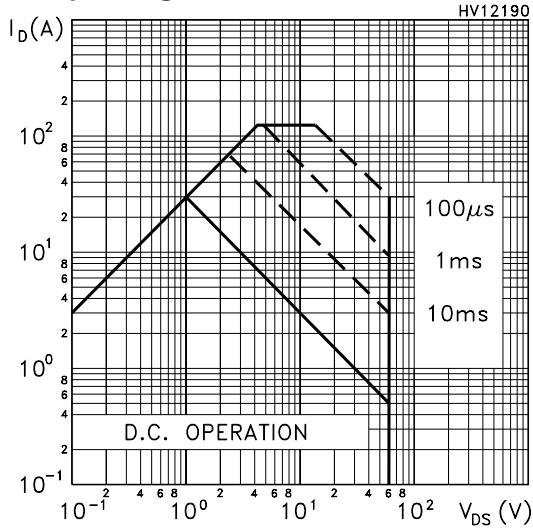
Safe Operating Area For TO-220/D2PAK/I2PAK



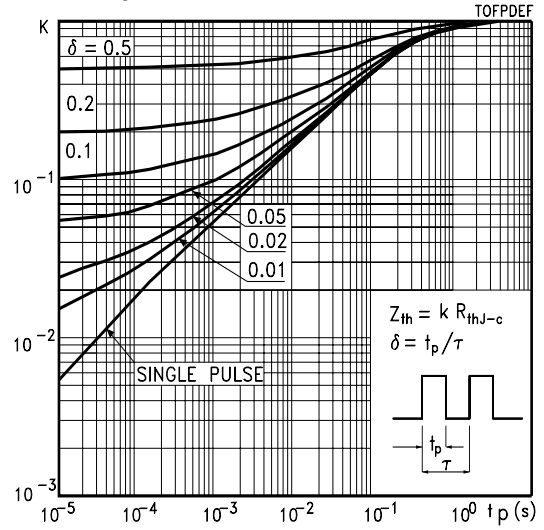
Thermal Impedance for TO-220/D2PAK/I2PAK



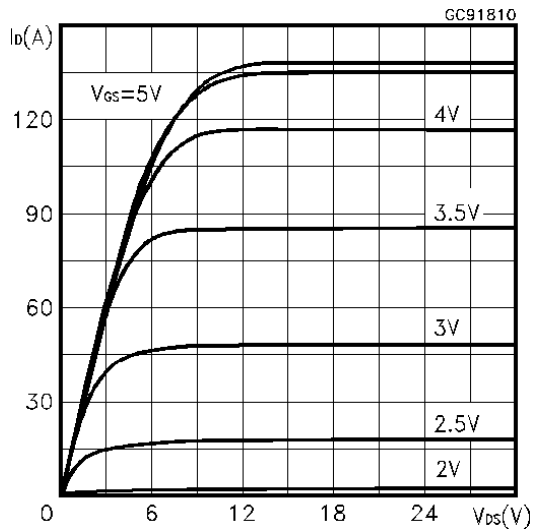
Safe Operating Area For TO-220FP



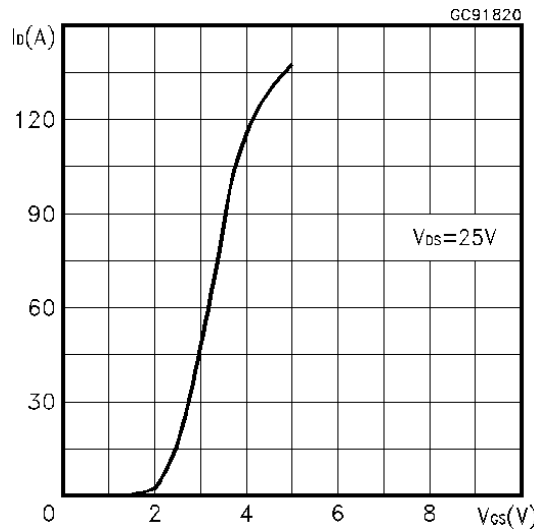
Thermal Impedance For TO-220FP



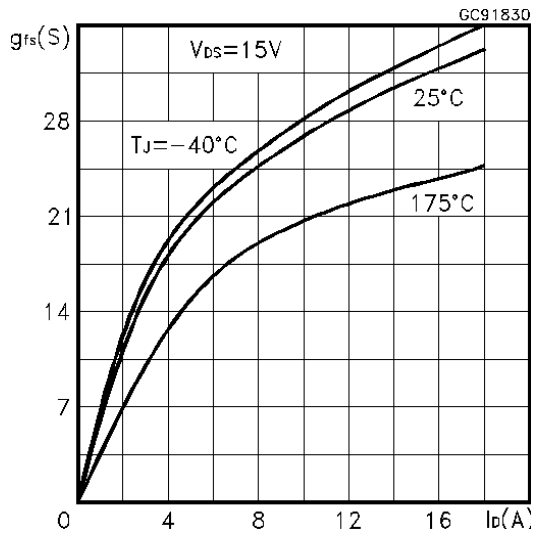
Output Characteristics



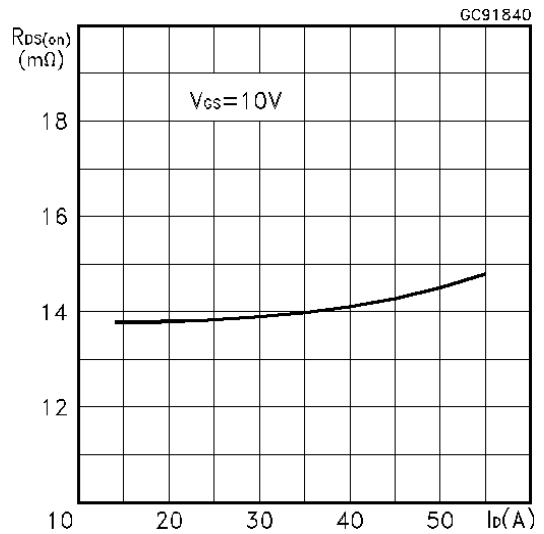
Transfer Characteristics



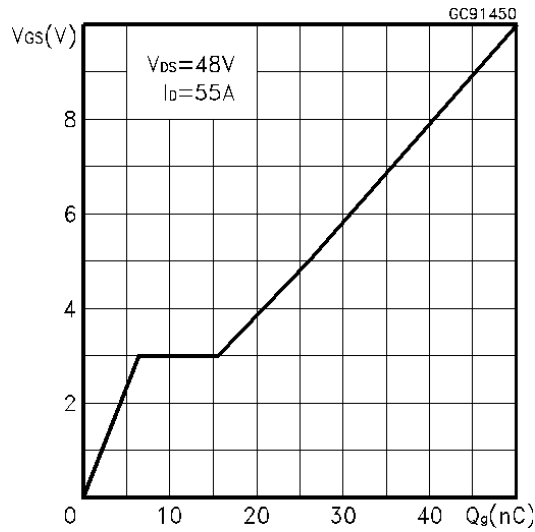
Transconductance



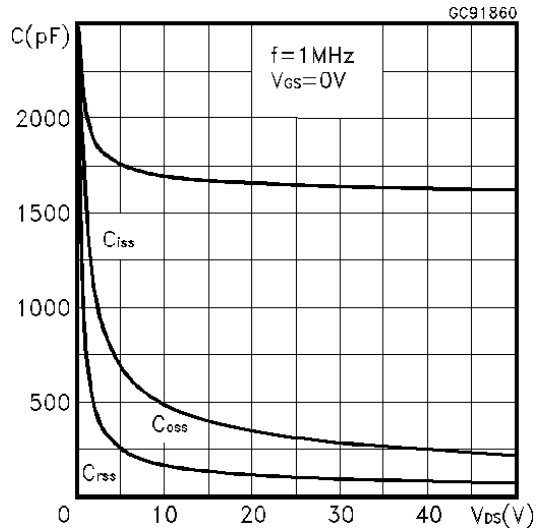
Static Drain-source On Resistance



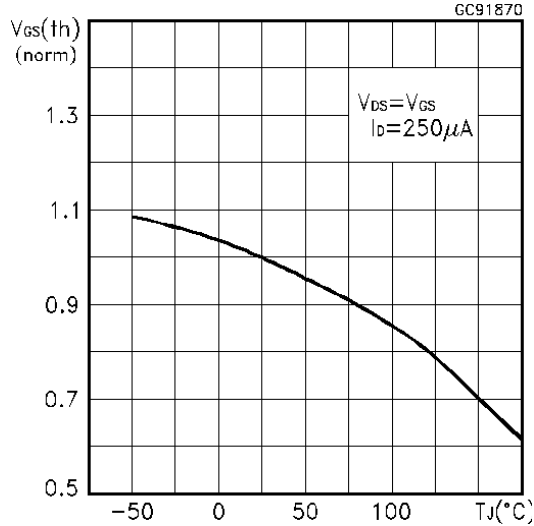
Gate Charge vs Gate-source Voltage



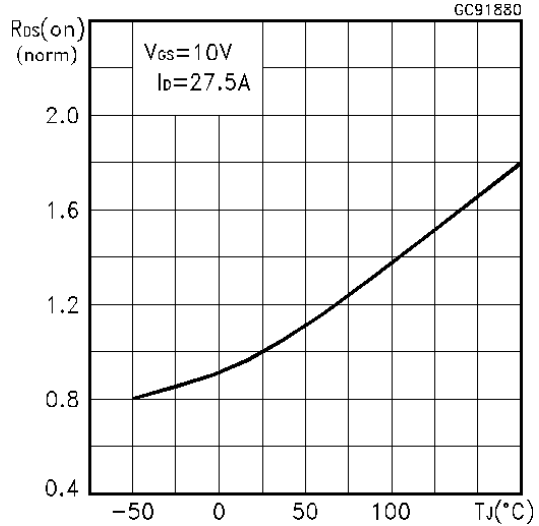
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

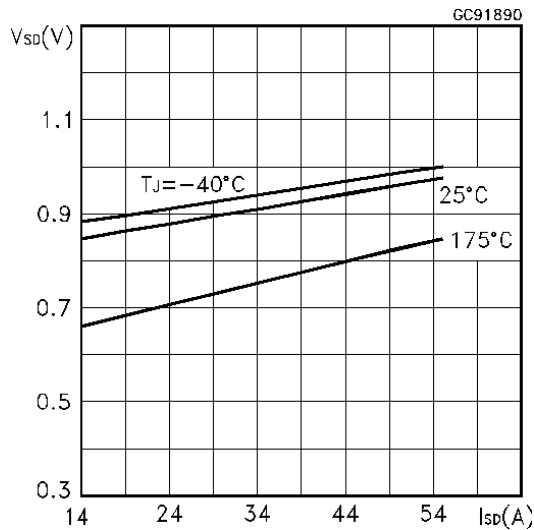


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuit For Resistive Load

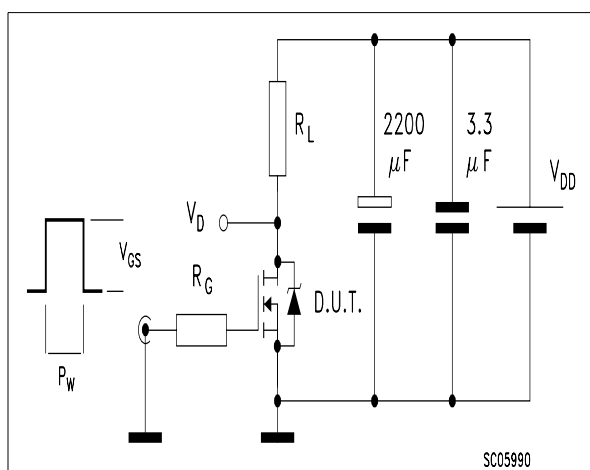


Fig. 4: Gate Charge test Circuit

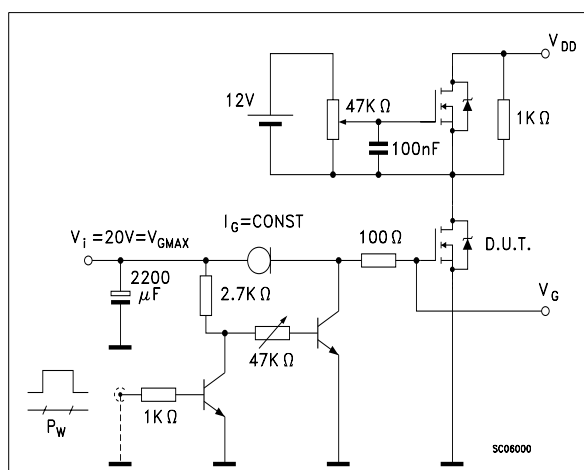
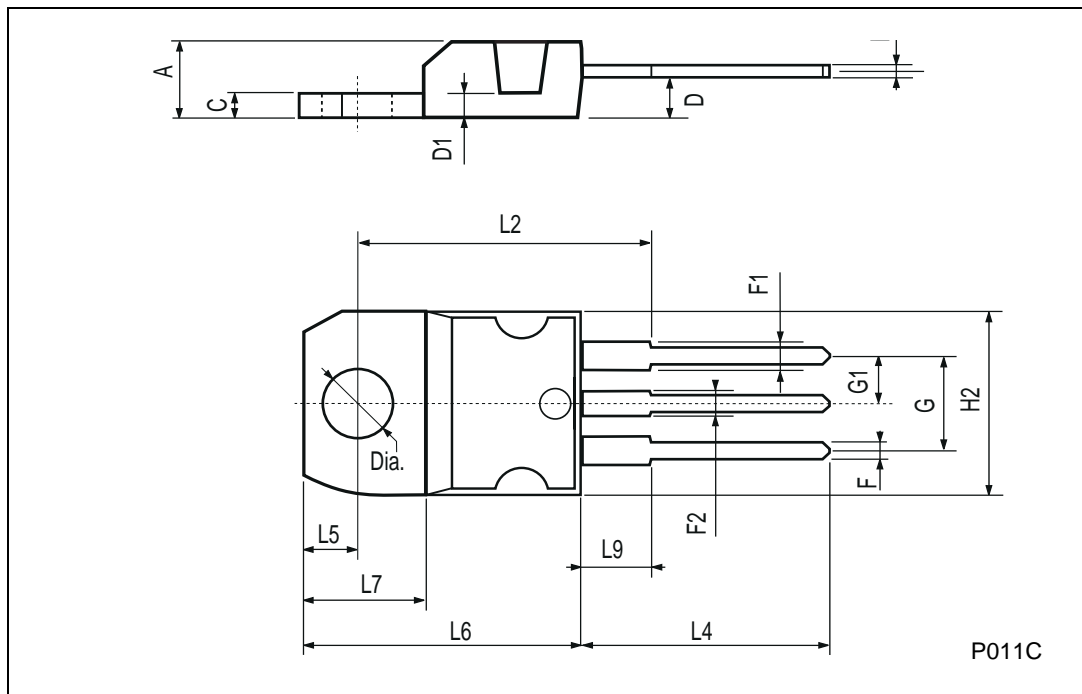


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



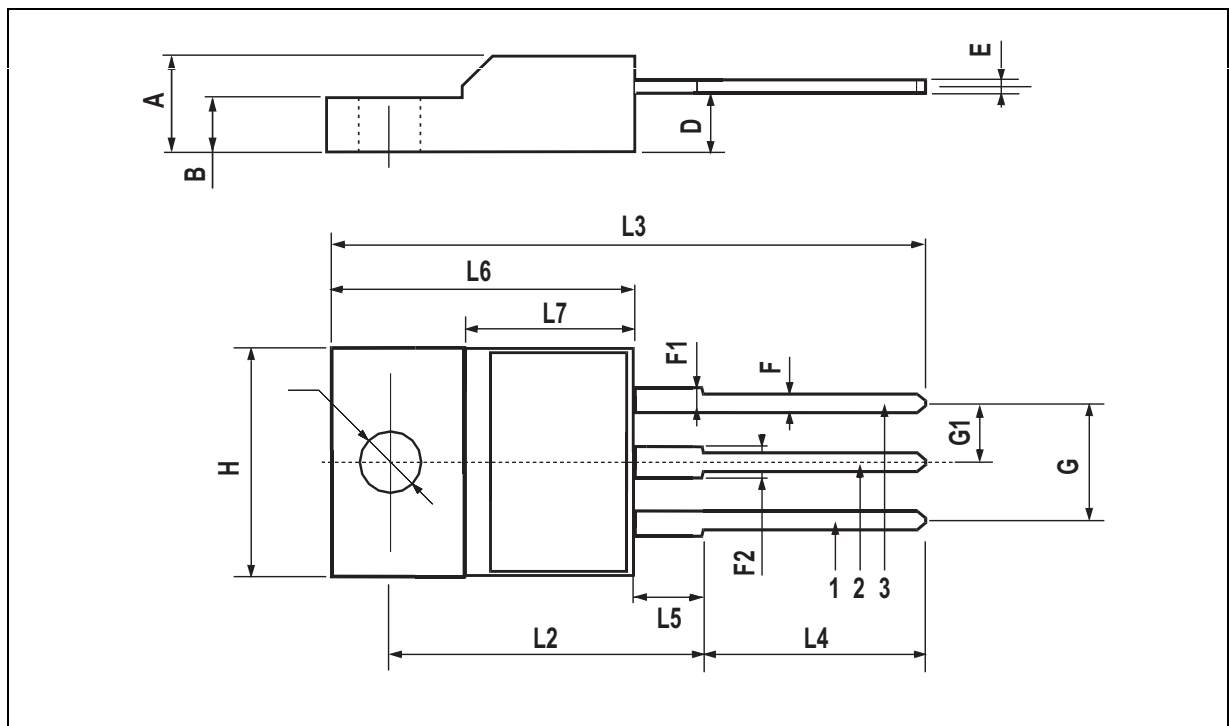
TO-220 MECHANICAL DATA

| 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 |



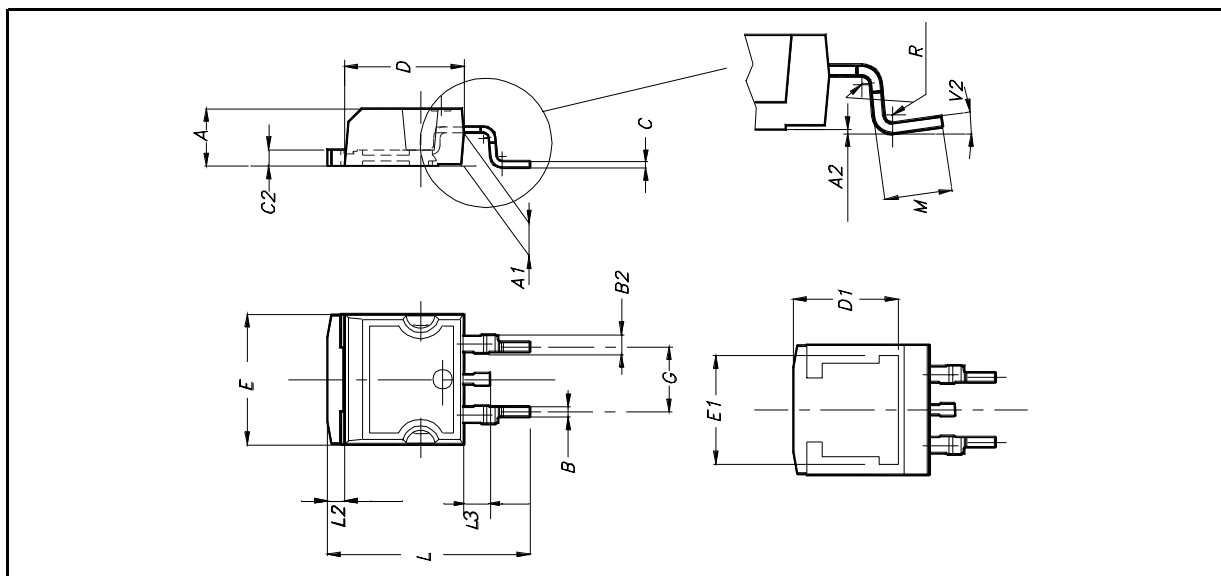
TO-220FP MECHANICAL DATA

| 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 | 0.45 | | 0.7 | 0.017 | | 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 | .0385 | | 0.417 |
| L5 | 2.9 | | 3.6 | 0.114 | | 0.141 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| ∅ | 3 | | 3.2 | 0.118 | | 0.126 |



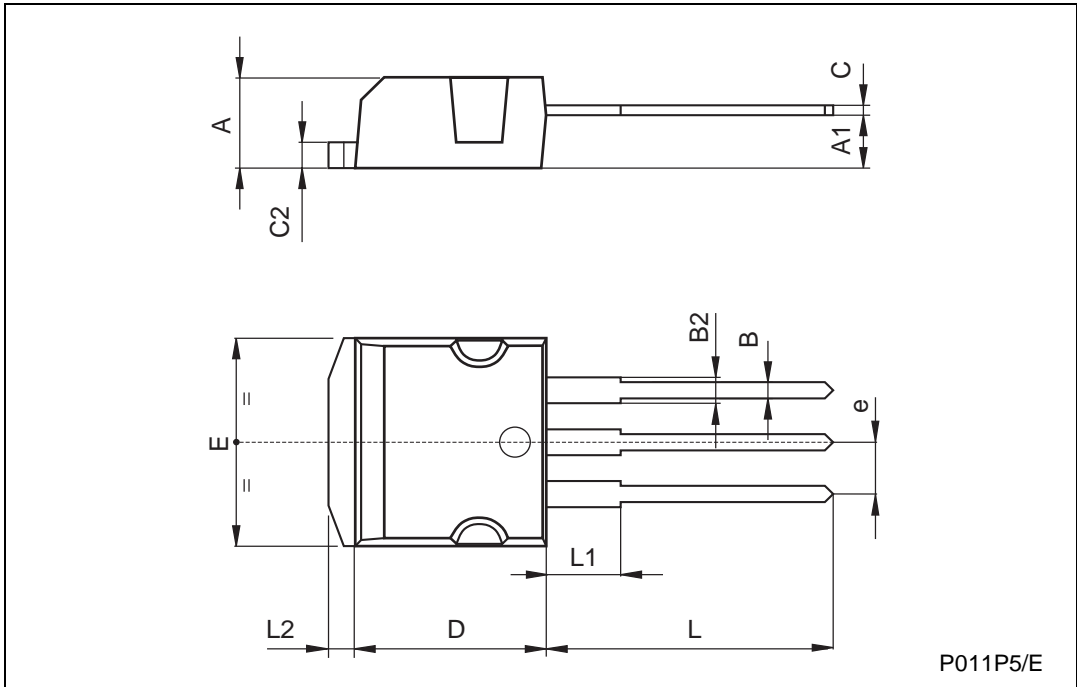
D²PAK MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-----|-------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8 | | | 0.315 | |
| E | 10 | | 10.4 | 0.393 | | |
| E1 | | 8.5 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.625 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.068 |
| M | 2.4 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.4 | | | 0.015 | |
| V2 | 0° | | 4° | | | |

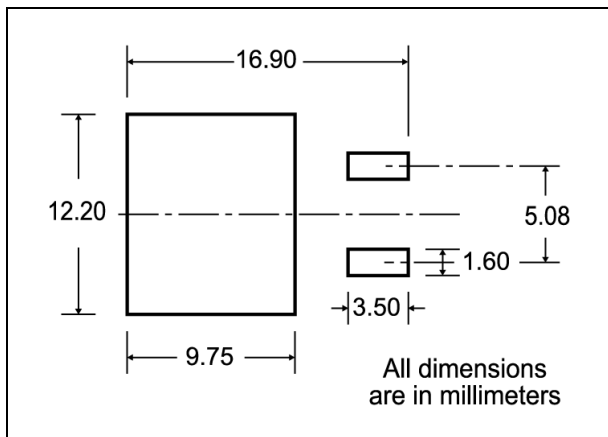


TO-262 (I²PAK) MECHANICAL DATA

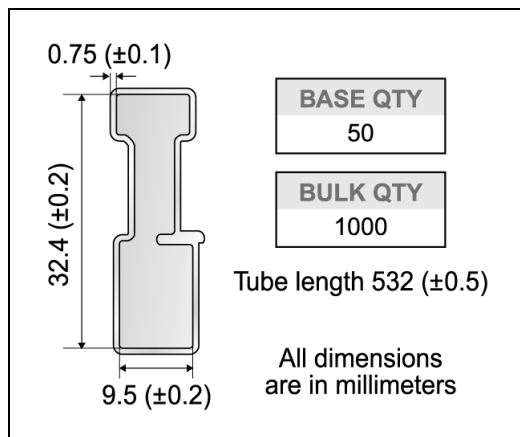
| DIM. | mm | | | inch | | |
|------|------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| e | 2.4 | | 2.7 | 0.094 | | 0.106 |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| L | 13.1 | | 13.6 | 0.515 | | 0.531 |
| L1 | 3.48 | | 3.78 | 0.137 | | 0.149 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape mechanical data. It includes a circular view of the tape with dimensions A, B, C, D, and a full radius. A note indicates a 40 mm min. access hole at the slot location. Another note indicates a tape slot in the core for tape start with a 2.5 mm min. width. A side view shows dimensions T, C, N, and G measured at the hub.

TAPE MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|--------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A0 | 10.5 | 10.7 | 0.413 | 0.421 |
| B0 | 15.7 | 15.9 | 0.618 | 0.626 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.59 | 1.61 | 0.062 | 0.063 |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 11.4 | 11.6 | 0.449 | 0.456 |
| K0 | 4.8 | 5.0 | 0.189 | 0.197 |
| P0 | 3.9 | 4.1 | 0.153 | 0.161 |
| P1 | 11.9 | 12.1 | 0.468 | 0.476 |
| P2 | 1.9 | 2.1 | 0.075 | 0.082 |
| R | 50 | | 1.574 | |
| T | 0.25 | 0.35 | 0.0098 | 0.0137 |
| W | 23.7 | 24.3 | 0.933 | 0.956 |

REEL MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|-------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A | | 330 | | 12.992 |
| B | 1.5 | | 0.059 | |
| C | 12.8 | 13.2 | 0.504 | 0.520 |
| D | 20.2 | | 0.795 | |
| G | 24.4 | 26.4 | 0.960 | 1.039 |
| N | 100 | | 3.937 | |
| T | | 30.4 | | 1.197 |

| BASE QTY | BULK QTY |
|----------|----------|
| 1000 | 1000 |

Diagram showing the reel mechanical data. It includes a side view of the reel with dimensions K₀, T, D, P₂, P₀, E, F, W, B₀, D₁, A₀, P₁, and a note for 10 pitches cumulative tolerance on tape +/- 0.2 mm. A top view shows the center line of the cavity and the user direction of feed. A bottom view shows the feed direction. A bending radius diagram shows R min.

* on sales type



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