



STP80NF03L

N-CHANNEL 30V - 0.004 Ω - 80A TO-220

STripFET™ II MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STP80NF03L | 30 V | < 0.0045 Ω | 80 A |

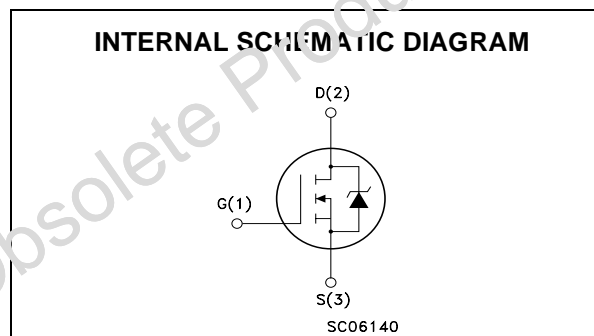
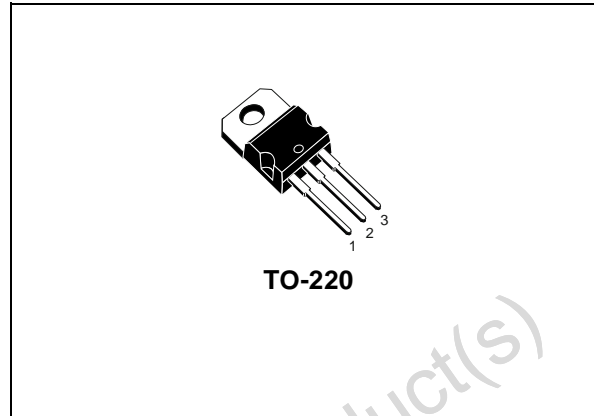
- TYPICAL R_{DS(on)} = 0.004 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW THRESHOLD DRIVE

DESCRIPTION

This Power MOSFET is the latest development of ST-Microelectronics 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, LAMP DRIVERS
Etc.)



ORDERING INFORMATION

| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|------------|----------|---------|-----------|
| STP80NF03L | P80NF03L | TO-220 | TUBE |

STP80NF03L

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|--------------|---|------------|---------------------|
| V_{DS} | Drain-source Voltage ($V_{GS} = 0$) | 30 | V |
| V_{DGR} | Drain-gate Voltage ($R_{GS} = 20 \text{ k}\Omega$) | 30 | V |
| V_{GS} | Gate-source Voltage | ± 20 | V |
| I_D (#) | Drain Current (continuous) at $T_C = 25^\circ\text{C}$ | 80 | A |
| I_D (#) | Drain Current (continuous) at $T_C = 100^\circ\text{C}$ | 80 | A |
| I_{DM} (●) | Drain Current (pulsed) | 320 | A |
| P_{TOT} | Total Dissipation at $T_C = 25^\circ\text{C}$ | 300 | W |
| | Derating Factor | 2.0 | W/ $^\circ\text{C}$ |
| dv/dt (1) | Peak Diode Recovery Voltage Slope | 2.0 | V/ns |
| T_{stg} | Storage Temperature | -65 to 175 | $^\circ\text{C}$ |
| T_j | Max. Operating Junction Temperature | 175 | $^\circ\text{C}$ |

(#) Current Limited by Package.

(●) Pulse width limited by safe operating area.

(1) $I_{SD} \leq 80\text{A}$, $di/dt \leq 240 \text{ A}/\mu\text{s}$, $V_{DD} = 24\text{V}$; $T_j \leq T_{JMAX}$.

THERMAL DATA

| | | | |
|-----------|--|------|---------------------------|
| Rthj-case | Thermal Resistance Junction-case Max | 0.5 | $^\circ\text{C}/\text{W}$ |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | $^\circ\text{C}/\text{W}$ |
| T_l | Maximum Lead Temperature For Soldering Purpose Typ | 300 | $^\circ\text{C}$ |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|----------|---|-----------|------|
| I_{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max) | 40 | A |
| E_{AS} | Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 20 \text{ V}$) | 2.3 | J |

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF/ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|-----------------|------------------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 250 \mu\text{A}$, $V_{GS} = 0$ | 30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$ | 1 | 1.5 | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10 \text{ V}$, $I_D = 40 \text{ A}$ $V_{GS} = 4.5 \text{ V}$, $I_D = 40 \text{ A}$ | | 0.004 0.0045 | 0.0045 0.0065 | Ω Ω |

ELECTRICAL CHARACTERISTICS (CONTINUED)
DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|--|------|------|------|------|
| g_{fs} (1) | Forward Transconductance | $V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$ | | 50 | | S |
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$ | | 5500 | | pF |
| C_{oss} | Output Capacitance | | | 1670 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 290 | | pF |

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3) | | 30 | | ns |
| t_r | Rise Time | | | 270 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 24\text{ V}$, $I_D = 80\text{ A}$, $V_{GS} = 4.5\text{ V}$ | | 85 | 110 | nC |
| Q_{gs} | Gate-Source Charge | | | 23 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 40 | | nC |

SWITCHING OFF

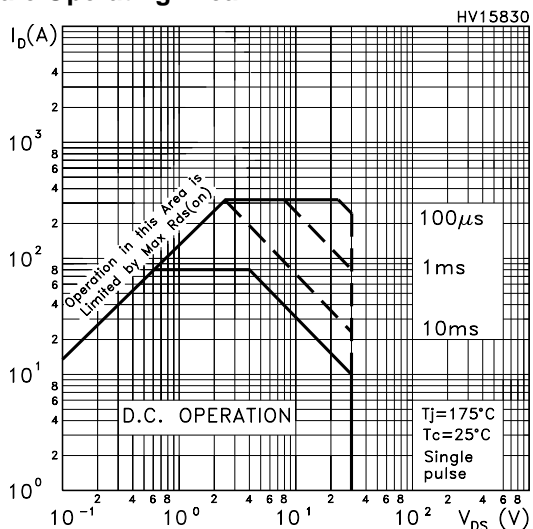
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|-----------------------|--|------|------|------|------|
| $t_{d(off)}$ | Turn-off-Delay Time | $V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3) | | 110 | | ns |
| t_f | Fall Time | | | 95 | | ns |
| $t_r(V_{off})$ | Off-Voltage Rise Time | $V_{clamp} = 24\text{ V}$, $I_D = 80\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (Inductive Load, Figure 5) | | 125 | | ns |
| t_f | Fall Time | | | 75 | | ns |
| t_c | Cross-over Time | | | 125 | | ns |

SOURCE DRAIN DIODE

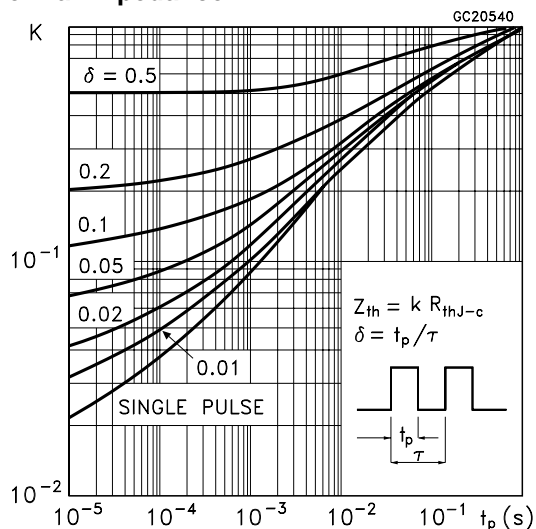
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 80 | A |
| I_{SDM} (1) | Source-drain Current (pulsed) | | | | 320 | A |
| V_{SD} (2) | Forward On Voltage | $I_{SD} = 80\text{ A}$, $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 75 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 0.15 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 4 | | A |

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

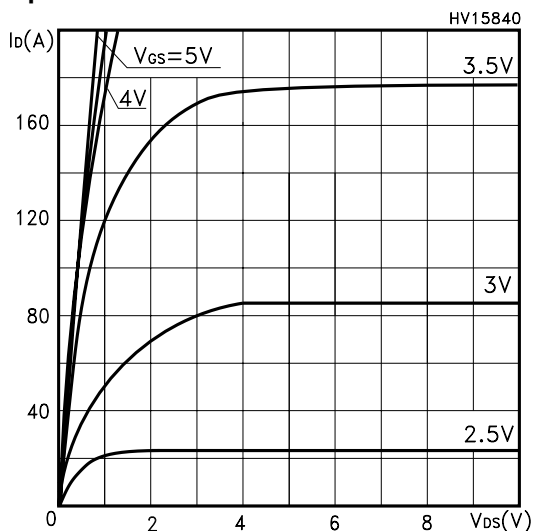
Safe Operating Area



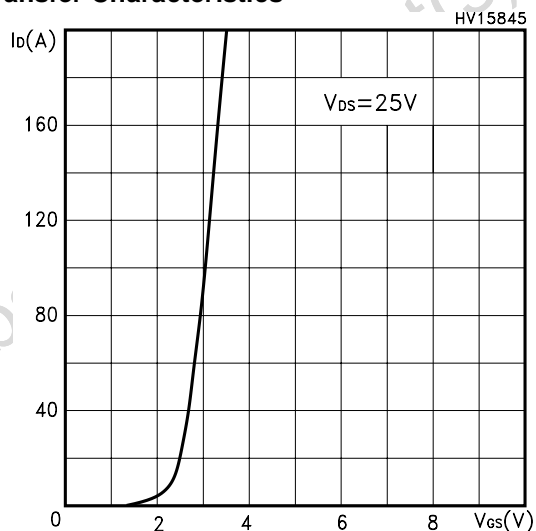
Thermal Impedance



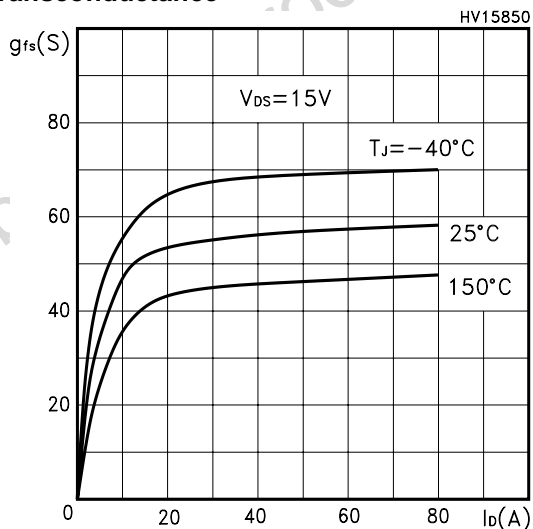
Output Characteristics



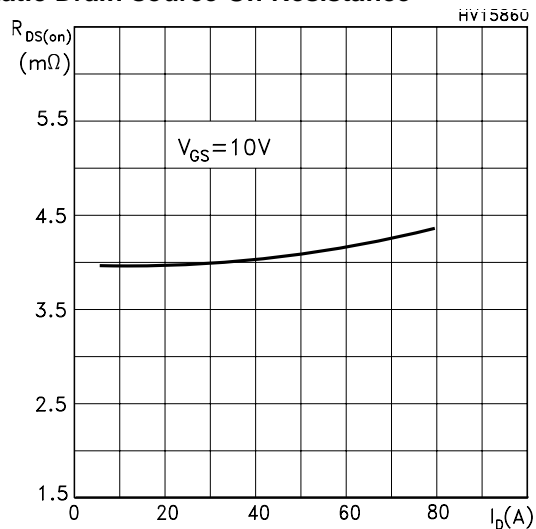
Transfer Characteristics



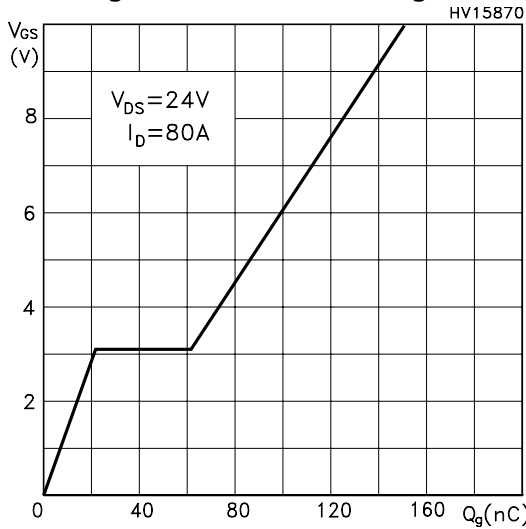
Transconductance



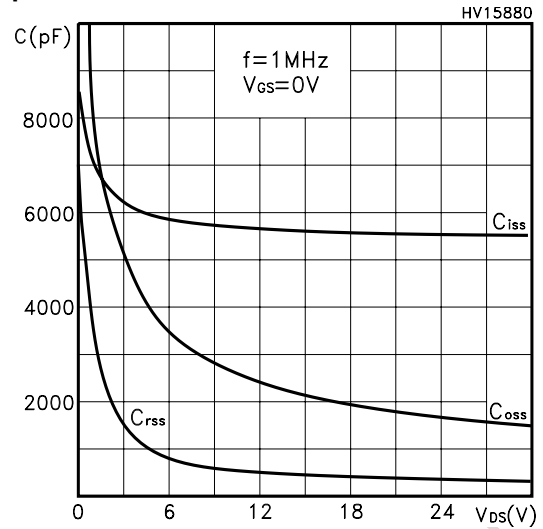
Static Drain-source On Resistance



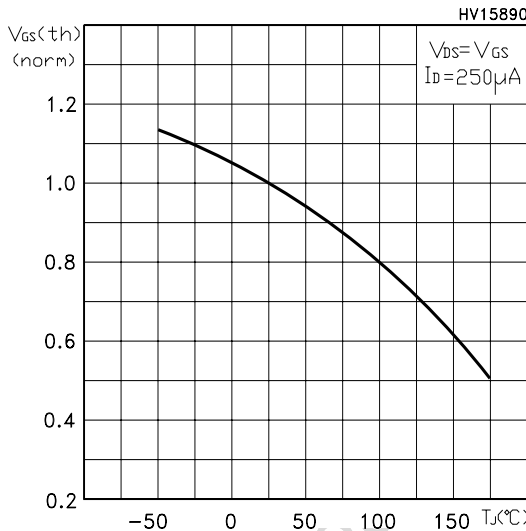
Gate Charge vs Gate-source Voltage



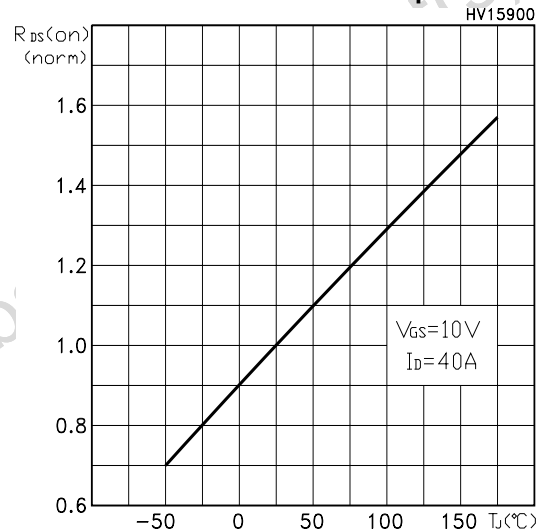
Capacitance Variations



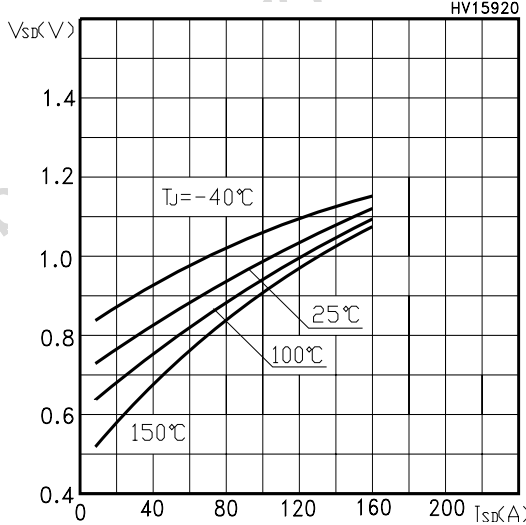
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature

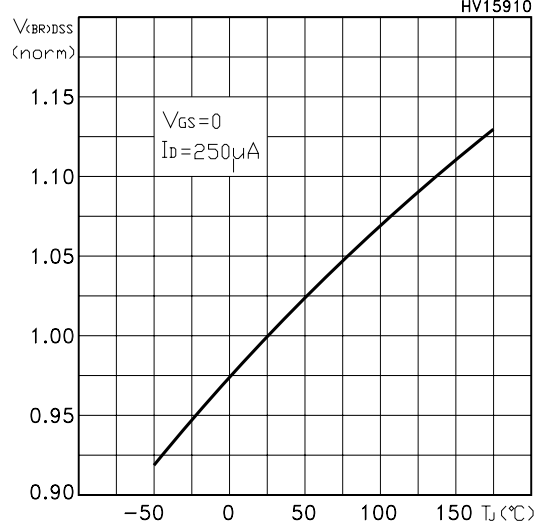


Fig. 1: Unclamped Inductive Load Test Circuit

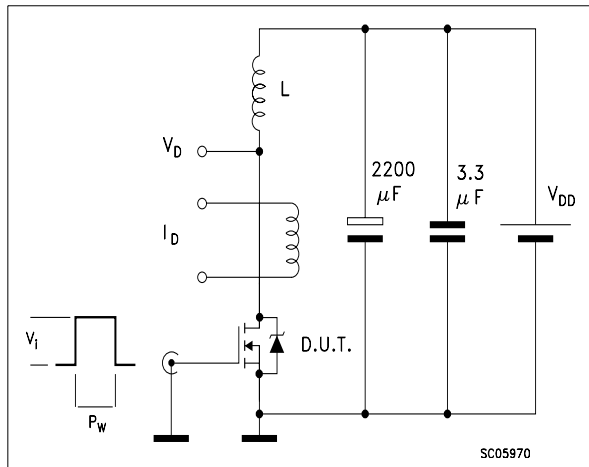


Fig. 2: Unclamped Inductive Waveform

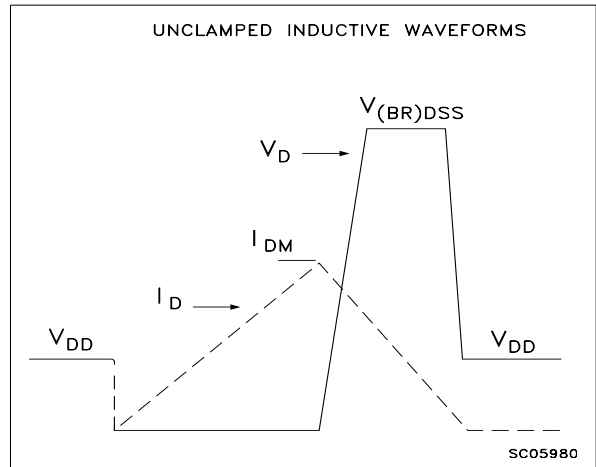


Fig. 3: Switching Times Test Circuit For Resistive Load

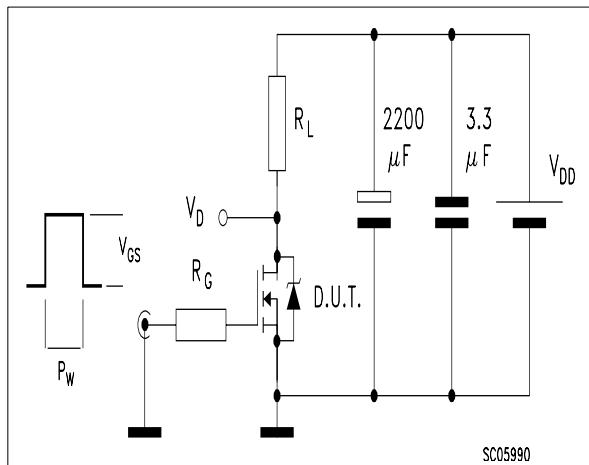


Fig. 4: Gate Charge test Circuit

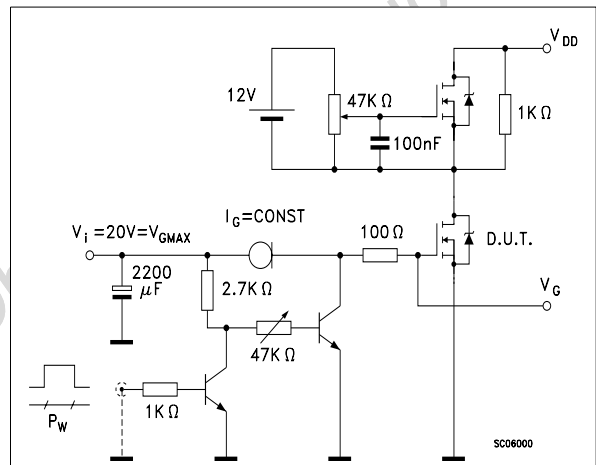
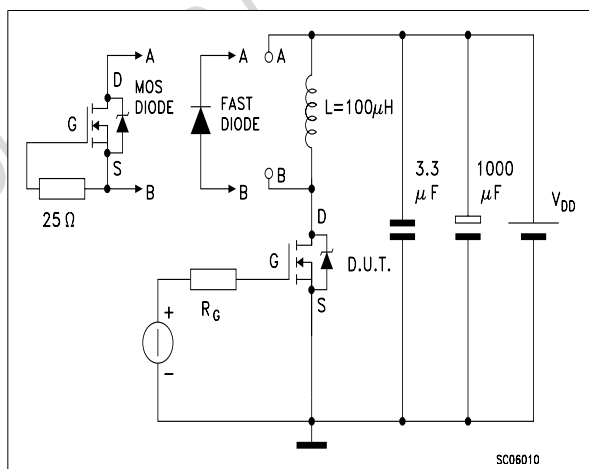
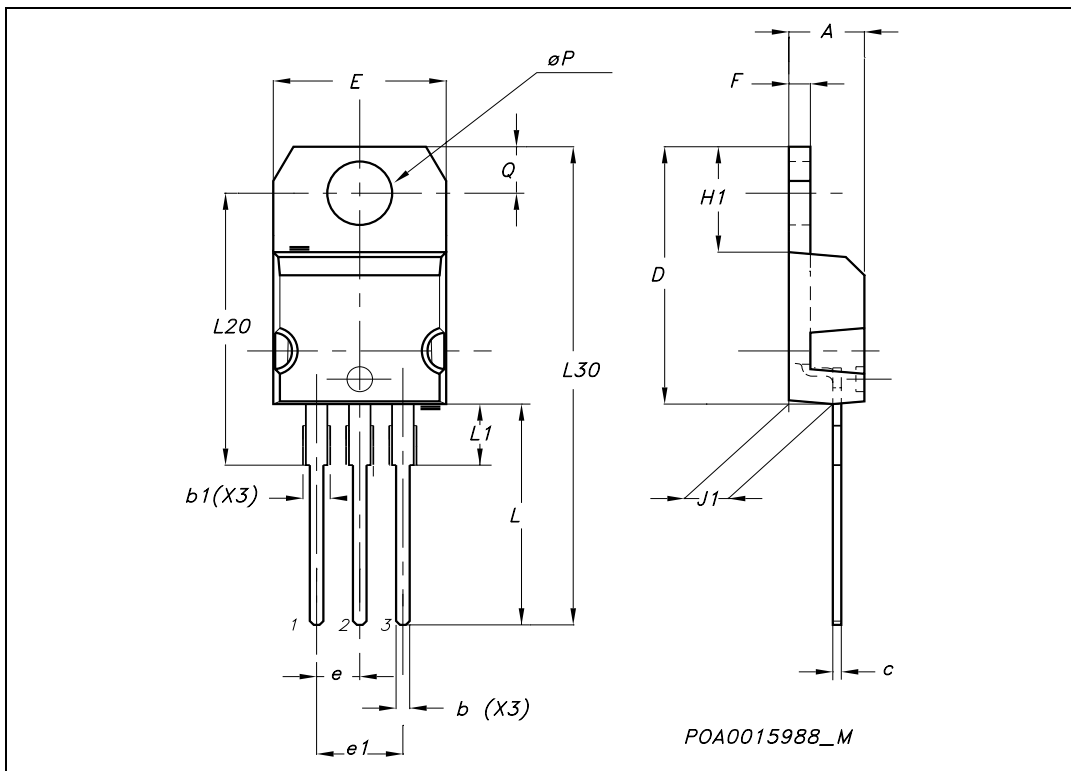


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.15 | | 1.70 | 0.045 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.60 | | 0.620 |
| E | 10 | | 10.40 | 0.393 | | 0.409 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| F | 1.23 | | 1.32 | 0.048 | | 0.052 |
| H1 | 6.20 | | 6.60 | 0.244 | | 0.256 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.40 | | | 0.645 | |
| L30 | | 28.90 | | | 1.137 | |
| øP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |



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