

•General Description

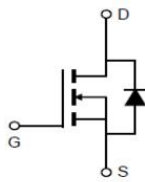


The SJ MOSFET LH70R170 has the low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and power supplies.

•Features

- Much lower $R_{on} \cdot A$ performance for On-state efficiency
- Much lower FOM for fast switching efficiency

•Application

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Power Supplies

| | |
|--|---|
|  | $V_{DS} = 700V$ $R_{DS(ON)} = 170m\Omega$ $I_D = 20A$ |
|  TO-220F |  TO-220 |

■ **RoHS COMPLIANT**

•Ordering Information:

| | | |
|---------------------------------------|------------------------|-----------------------|
| Part number | LH70R170 | LH70R170 |
| Package | TO-220F | TO-220 |
| Basic ordering unit (pcs) | 1000 | 1000 |
| Normal Package Material Ordering Code | LH70R170F-TO220F-TU | LH70R170T-TO220-TU |
| Halogen Free Ordering Code | LH70R170F-TO220F-TU-HF | LH70R170T-TO220-TU-HF |

•Absolute Maximum Ratings (TC = 25°C)

| PARAMETER | SYMBOL | Value | UNIT |
|---|---------------|--------------------------|------|
| Drain-Source Breakdown Voltage | V_{DSS} | 700 | V |
| Gate-Source Voltage | V_{GS} | ± 30 | V |
| Continuous Drain Current | I_D | 20 | A |
| | TC = 100°C | 12 | |
| Pulsed drain current (TC = 25°C, tp limited by Tjmax) ¹ | I_D pulse | 60 | A |
| Single Pulse Avalanche Energy ¹ | E_{AR} | 3.5 | A |
| Single Pulse Avalanche Energy ² | E_{AS} | 484 | mJ |
| Repetitive Avalanche Energy ¹ | E_{AR} | 0.7 | mJ |
| Power Dissipation(TC=25°C) | P_D | TO-220:151 TO-220F:34 | W |
| Operating Temperature and Storage Temperature Range | T_J/T_{STG} | -55~+150 | °C |
| MOSFET dv/dt ruggedness, $V_{DS}=0 \dots 480V$ | dv/dt | 50 | V/ns |
| Reverse diode dv/dt, $V_{DS}=0 \dots 480V, I_{SD} \leq I_D$ | dv/dt | 15 | V/ns |

●Electronic Characteristics

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---|--------------|---|-----|------|-----------|----------|
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS} = 0V, I_D = 250\mu A$ | 700 | -- | -- | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.5 | -- | 4.5 | V |
| Drain-source On Resistance ³ | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 7.5A$ | -- | 0.15 | 0.17 | Ω |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS} = 700V, V_{GS} = 0V, T_J = 25^\circ C$ | -- | -- | 1 | μA |
| | | $V_{DS} = 700V, V_{GS} = 0V, T_J = 125^\circ C$ | -- | -- | 100 | |
| Gate-Source Leakage Current | I_{GSS} | $V_{GS} = \pm 30$ | -- | -- | ± 100 | nA |
| Forward Transconductance ³ | R_G | f=1.0MHz open drain | -- | -- | 12 | S |
| Input Capacitance | C_{iss} | $V_{GS} = 0V,$ $V_{DS} = 100V$ $f = 1.0MHz$ | -- | 1724 | -- | pF |
| Output Capacitance | C_{oss} | | -- | 61 | -- | |
| Reverse transfer Capacitance | C_{rss} | | -- | 6 | -- | |
| Turn-on delay time | $T_d(on)$ | $I_D = 20A,$ $V_{DD} = 400V$ $R_G = 25\Omega$ | -- | 15 | -- | nS |
| Rise time | T_r | | -- | 59 | -- | |
| Turn -Off Delay Time | $T_d(off)$ | | -- | 121 | -- | |
| Fall time | T_f | | -- | 44 | -- | |
| Total Gate Charge | Q_g | $I_D = 20A,$ $V_{DS} = 520V$ $V_{GS} = 10V$ | -- | 38.5 | --- | nC |
| Gate-to-Source Charge | Q_{gs} | | -- | 8 | -- | |
| Gate-to-Drain Charge | Q_{gd} | | -- | 15 | --- | |
| Continuous Diode Forward Current | I_S | | -- | -- | 20 | A |
| Pulsed Diode Forward Current | I_{SM} | | -- | -- | 60 | A |
| Diode Forward Voltage | V_{SD} | $T_J = 25^\circ C, I_S = 20A$ $V_{GS} = 0V$ | -- | 0.9 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $V_{RR} = 400V,$ $I_f = I_S$ $di_f/dt = 100A/\mu s$ | -- | 423 | -- | ns |
| Reverse Recovery Charge | Q_{rr} | | -- | 5.3 | -- | μC |
| Peak Reverse Recovery Current | I_{RRM} | | -- | 25 | -- | A |

●Thermal Characteristics

| PARAMETER | SYMBOL | MAX | | UNIT |
|-------------------------------------|------------|---------|--------|--------------|
| | | TO-220F | TO-220 | |
| Thermal Resistance Junction-case | R_{thJC} | 3.7 | 0.83 | $^\circ C/W$ |
| Thermal Resistance Junction-ambient | R_{thJA} | 80 | 62 | $^\circ C/W$ |

Notes:

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $I_{AS} = 1.8A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ C$
3. Pulse Test : Pulse width $\leq 300\mu s, \text{Duty cycle } \leq 2\%$

● **Typical Characteristics** $T_J=25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

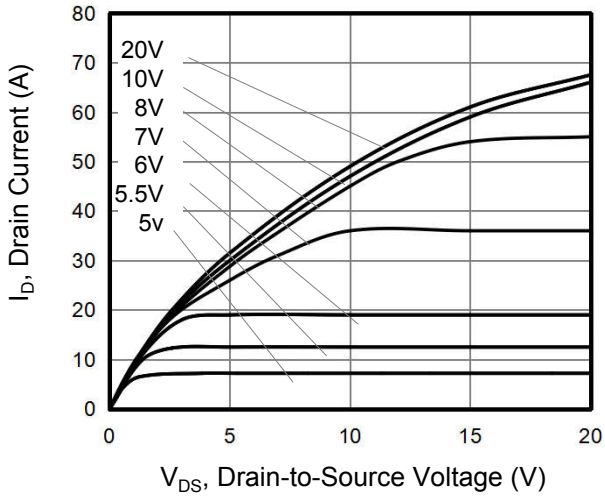


Figure 2. Transfer Characteristics

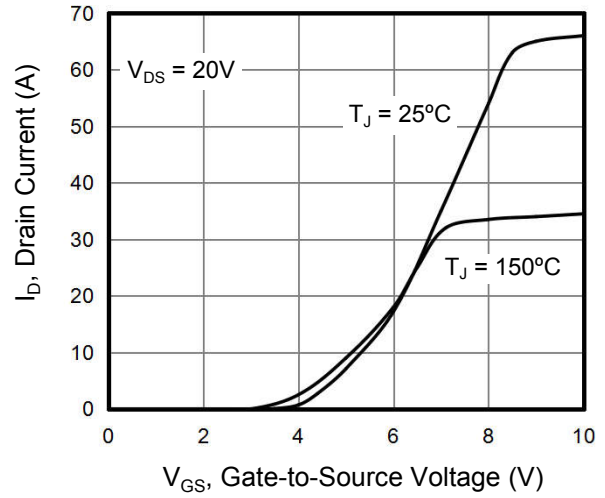


Figure 3. On-Resistance vs. Drain Current

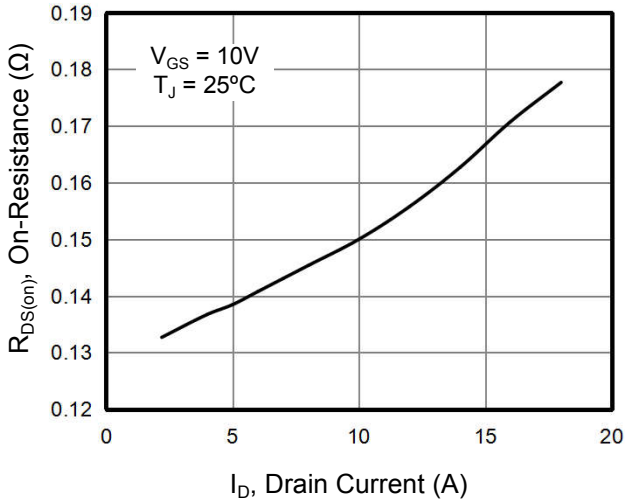


Figure 4. Capacitance

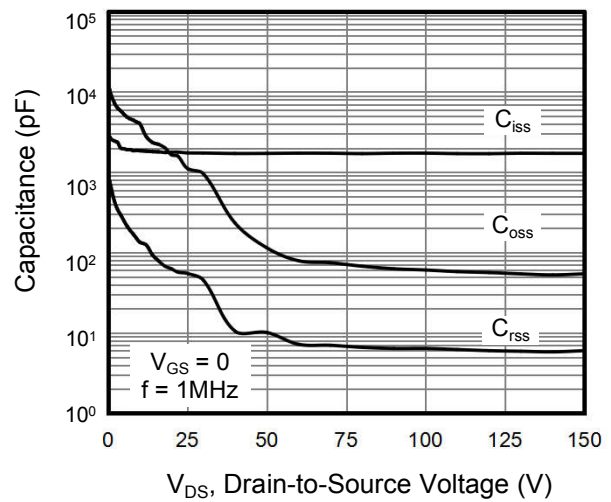


Figure 5. Gate Charge

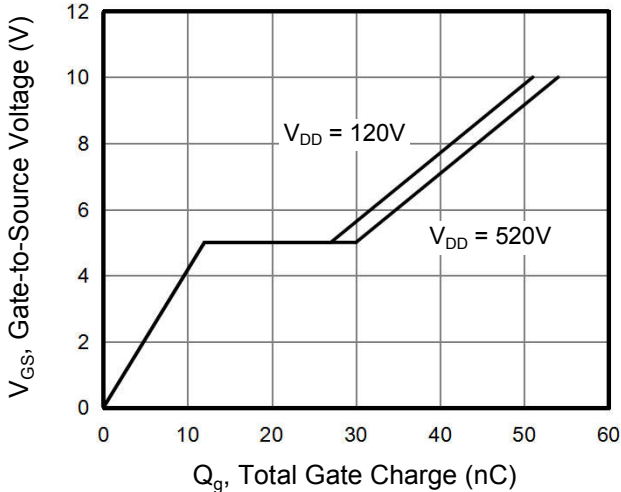
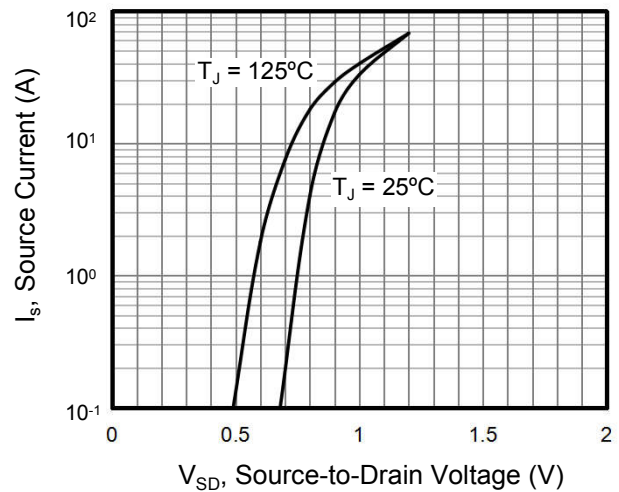


Figure 6. Body Diode Forward Voltage



• Typical Characteristics (Cont.)

Figure 7. On-Resistance vs. Junction Temperature

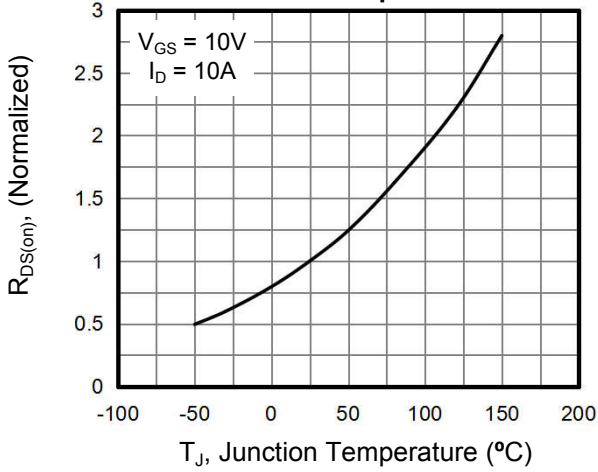


Figure 8. Threshold Voltage vs. Junction Temperature

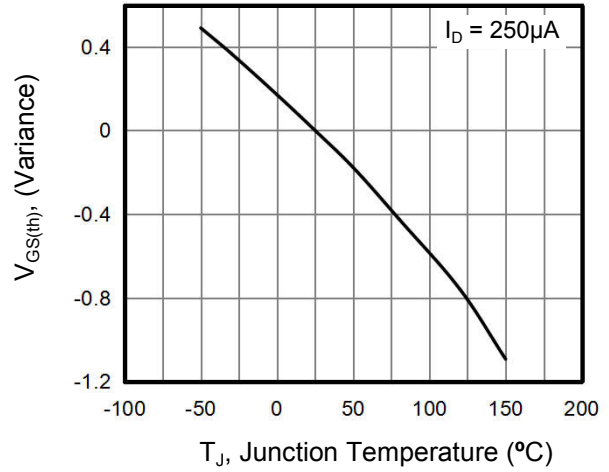


Figure 9. Transient Thermal Impedance

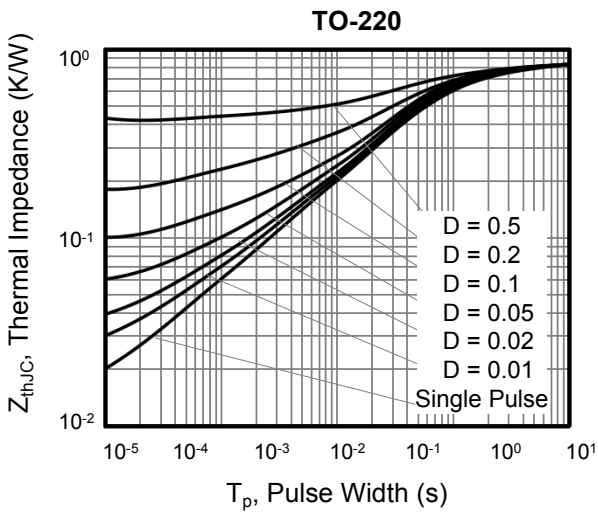


Figure 10. Transient Thermal Impedance

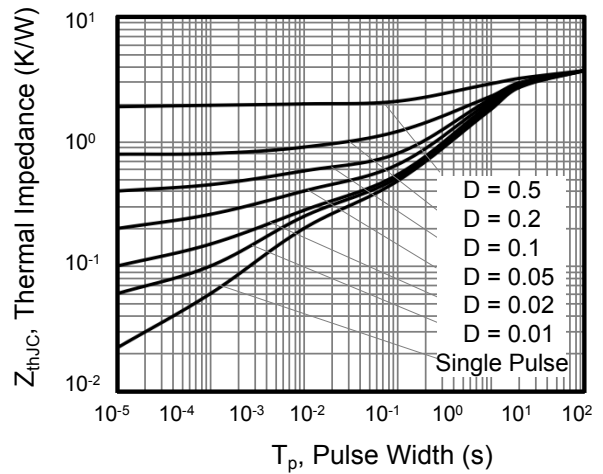


Figure 12. Safe operation area for TO-220

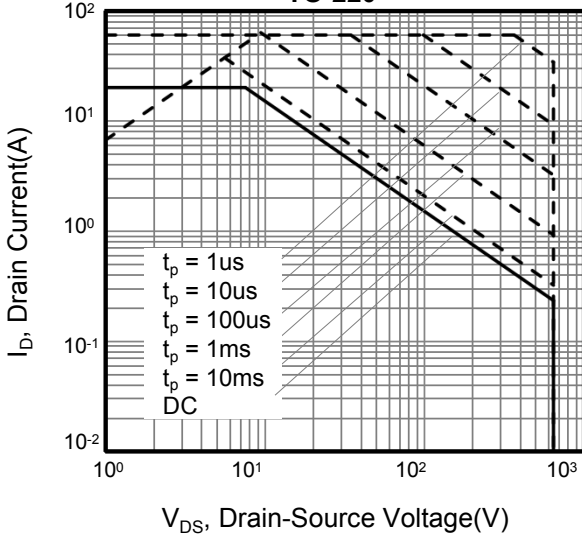
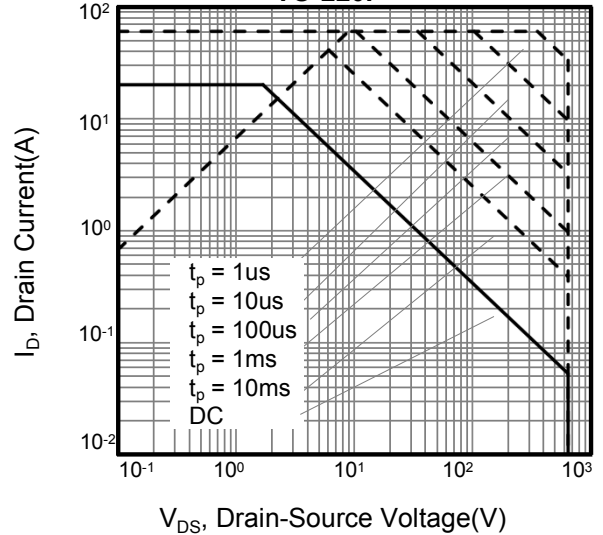


Figure 13. Safe operation area for TO-220F



● Test Circuit and Waveform

Figure A: Gate Charge Test Circuit and Waveform

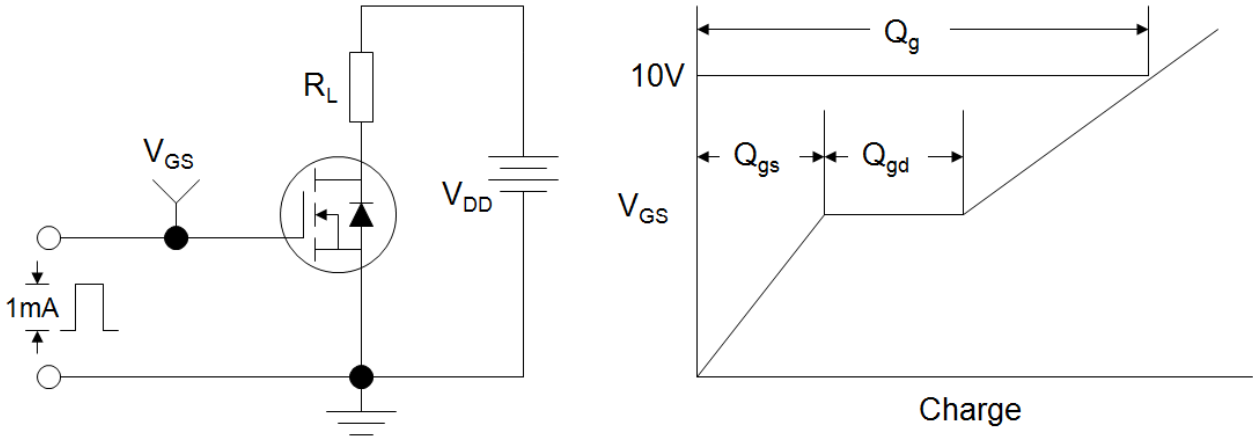


Figure B: Resistive Switching Test Circuit and Waveform

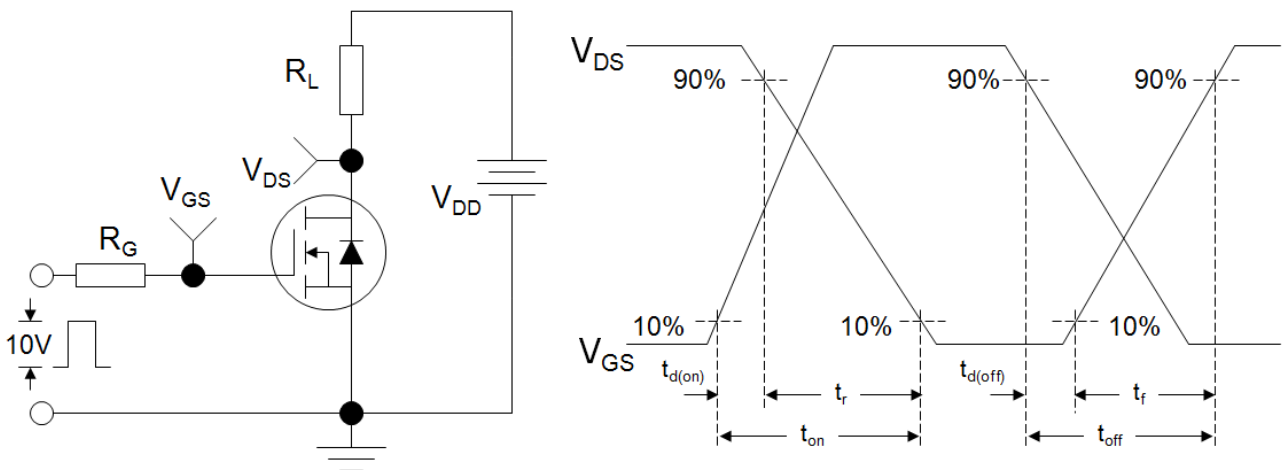
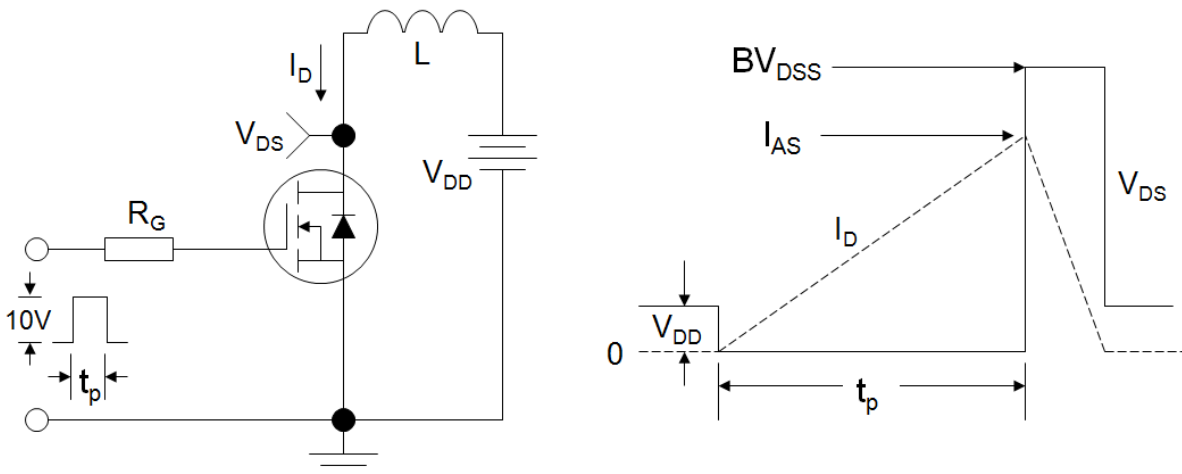


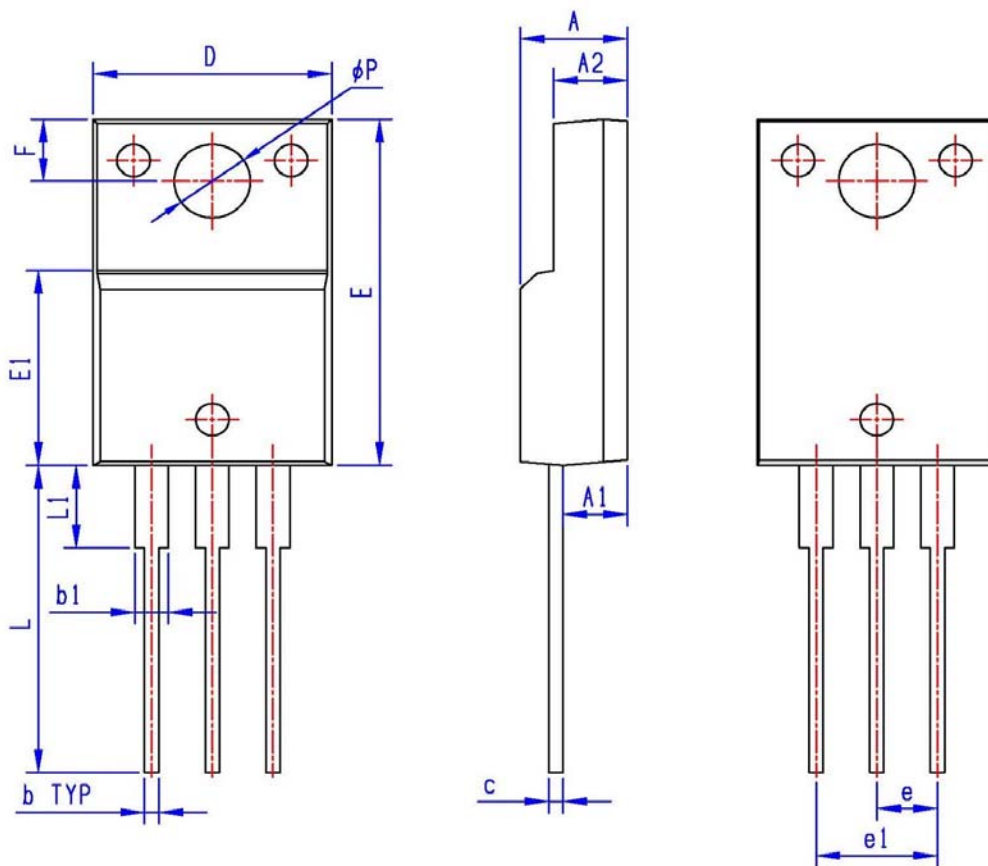
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



•Dimensions (TO-220F)

UNIT:mm

| SYMBOL | min | max | SYMBOL | min | max |
|--------|-------|-------|--------|-------|-------|
| A | 4.20 | 4.80 | E1 | 8.30 | 8.70 |
| A1 | 2.50 | 2.90 | e | 2.40 | 2.70 |
| A2 | 2.90 | 3.30 | e1 | 4.95 | 5.25 |
| b | 0.40 | 0.80 | F | 2.50 | 2.90 |
| b1 | 1.10 | 1.50 | L | 13.00 | 14.00 |
| c | 0.50 | 0.70 | L1 | 3.00 | 4.00 |
| D | 9.80 | 10.60 | ∅P | 2.90 | 3.50 |
| E | 14.60 | 15.60 | | | |



●Dimensions (TO-220)

UNIT:mm

| SYMBOL | min | max | SYMBOL | min | max |
|--------|-------|-------|--------|-------|-------|
| A | 4.25 | 4.85 | B1 | 2.60 | 3.00 |
| A1 | 2.30 | 3.00 | e | 2.40 | 2.70 |
| A2 | 1.20 | 1.40 | e1 | 4.95 | 5.25 |
| b | 0.60 | 0.90 | L | 12.60 | 14.40 |
| b1 | 1.10 | 1.70 | L1 | 2.40 | 4.00 |
| c | 0.40 | 0.70 | ∅P | 3.50 | 3.90 |
| D | 9.80 | 10.60 | | | |
| B | 15.20 | 16.20 | | | |

