Wuxi Unigroup Microelectronics CO.,LTD.

# 30V N-Channel Trench MOSFET(Preliminary)

## Features

- Trench Power Technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for Fast-switching Applications

## Applications

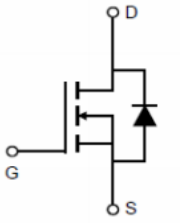
- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

## Product Summary

| | |
|---|---|
| VDS | 30V |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | < 5mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$=4.5V) | < 7mΩ |
| $I_D$ (at $V_{GS}$=10V) | 90A |
| 100% UIS Tested | |

RoHS

**TO-220**


| Device | Package | Marking |
|---|---|---|
| TTP90N03AT | TO-220 | 90N03AT |

## Absolute Maximum Ratings $T_C$ = 25ºC, unless otherwise noted

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage ($V_{GS}$ = 0V) | | $V_{DSS}$ | 30 | V |
| Continuous Drain Current [B] | $T_C$ = 25ºC | $I_D$ | 90 | A |
| | $T_C$ = 100ºC | | 63 | |
| Pulsed Drain Current [A] | | $I_{DM}$ | 270 | A |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Single Pulse Avalanche Energy L =0.3mH [A] | | $E_{AS}$ | 72 | mJ |
| Avalanche Current [A] | | $I_{As}$ | 22 | A |
| Power Dissipation [C] | $T_C$ = 25ºC | $P_D$ | 108 | W |
| | $T_C$ = 100ºC | $P_D$ | 82 | W |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{SGT}$ | -55~+175 | ºC |

## Thermal Resistance

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{thJC}$ | 1.45 | ºC/W |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 100 | |

**Specifications** $T_J$ = 25ºC, unless otherwise noted

| Parameter | Symbol | Test Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 30 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 1 | μA |
| | | $V_{DS}$ = 30V, $V_{GS}$ = 0V, $T_J$ = 100ºC | -- | -- | 25 | |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±20V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.0 | 1.7 | 2.4 | V |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 30A | -- | 3.6 | 5.0 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 30A | -- | 5 | 7.0 | mΩ |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ =20A | 17.3 | -- | -- | S |
| **Dynamic** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1.0MHz | -- | 1608 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 513 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 297 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 15V, $I_D$ = 50A, $V_{GS}$ = 10V | -- | 62 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 7 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 13 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 15V, $I_D$ = 50A, $R_G$ = 3Ω | -- | 13 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 17 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 42 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 13 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current [B] | $I_S$ | $T_C$ = 25ºC | -- | -- | 46 | A |
| Pulsed Diode Forward Current [A] | $I_{SM}$ | | -- | -- | 270 | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = 30A, $V_{GS}$ = 0V | -- | -- | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 30A, $di_F/dt$ = 100A/μs | -- | 40 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 88 | -- | nC |

**Notes**

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. $V_{DD}$ = 30V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

**Typical Characteristics** $T_J$ = 25ºC, unless otherwise noted

**Figure 1. Output Characteristics**

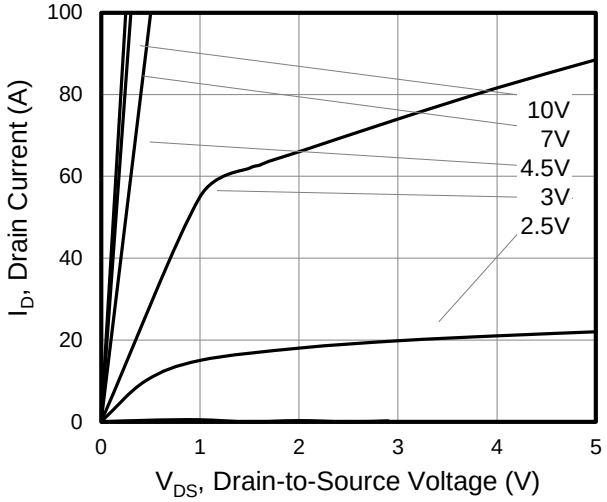



**Figure 2. Transfer Characteristics**

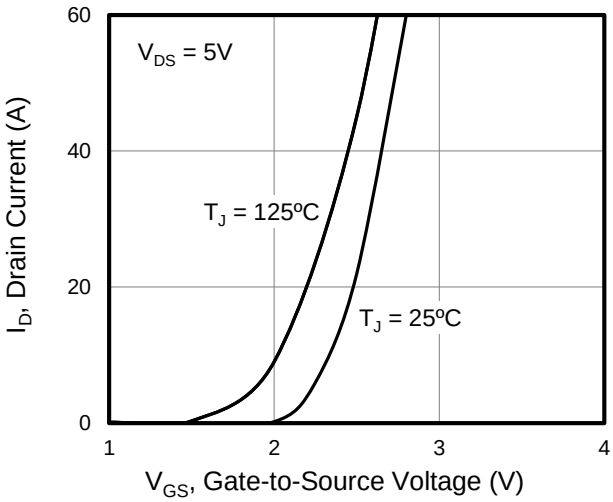



**Figure 3. On-Resistance vs. Drain Current**

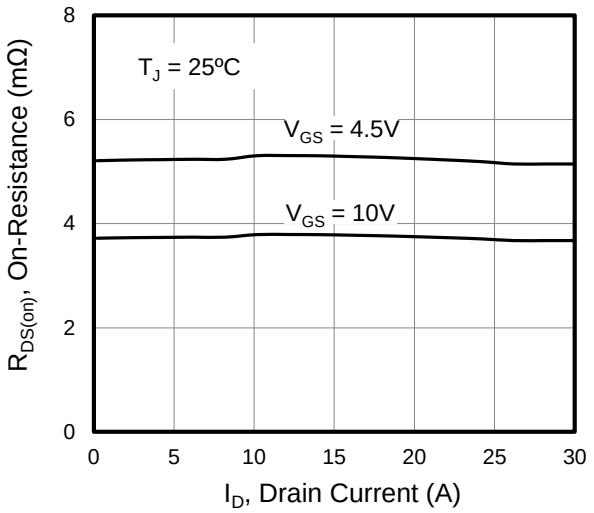



**Figure 4. Capacitance**

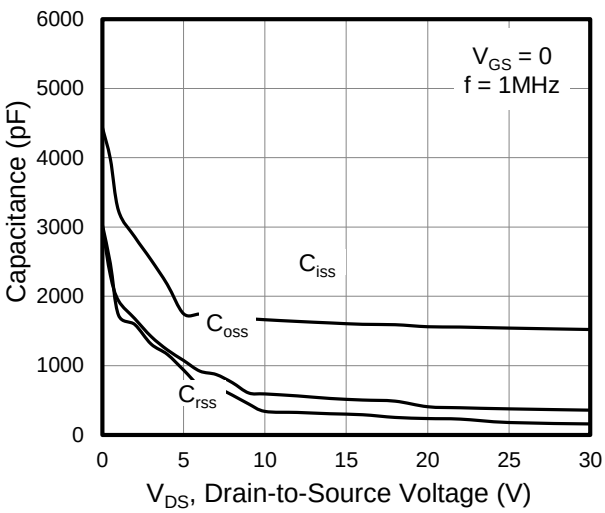



**Figure 5. Gate Charge**

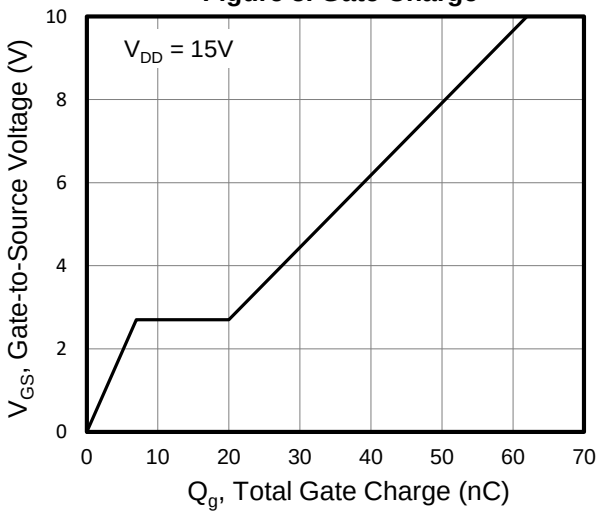
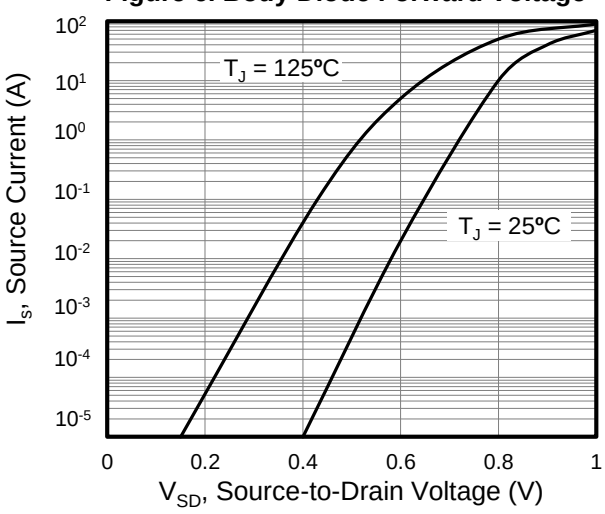



**Figure 6. Body Diode Forward Voltage**



**Typical Characteristics** $T_J$ = 25ºC, unless otherwise noted

**Figure 7. On-Resistance vs. Junction Temperature**

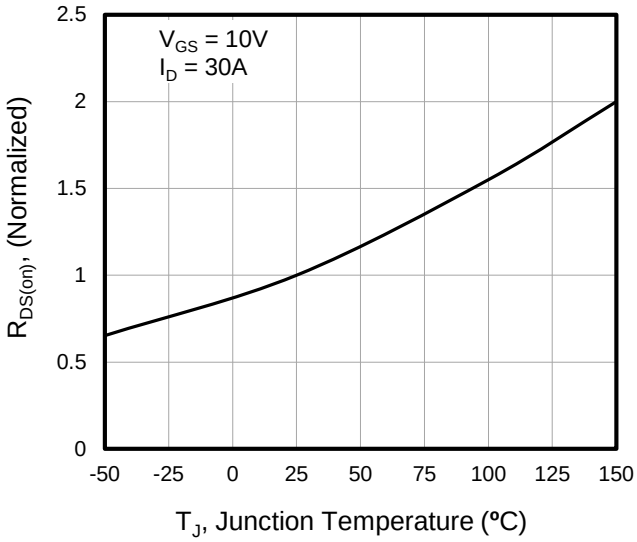



**Figure 8. Threshold Voltage vs. Junction Temperature**

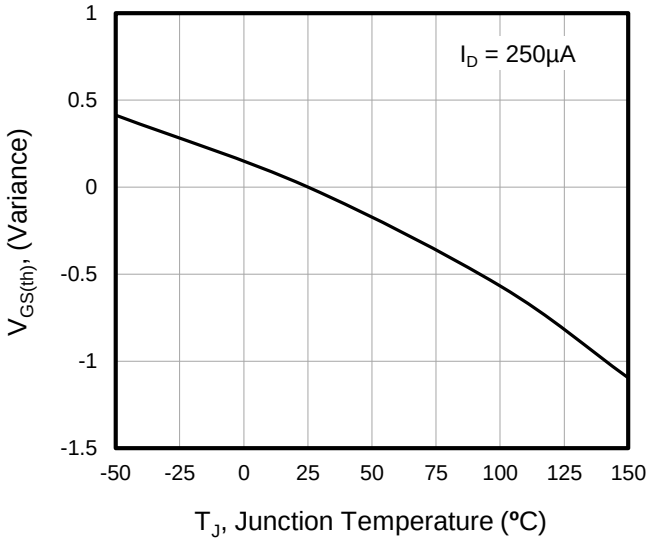



**Figure 9. Transient Thermal Impedance**

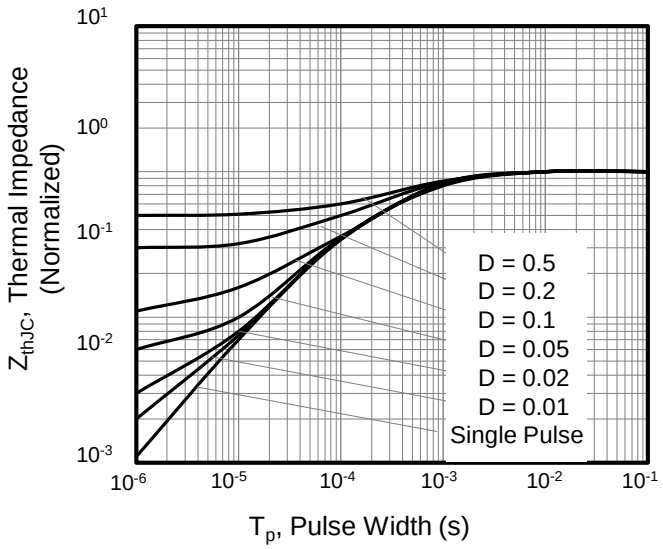



**Figure 10. Safe operation area**

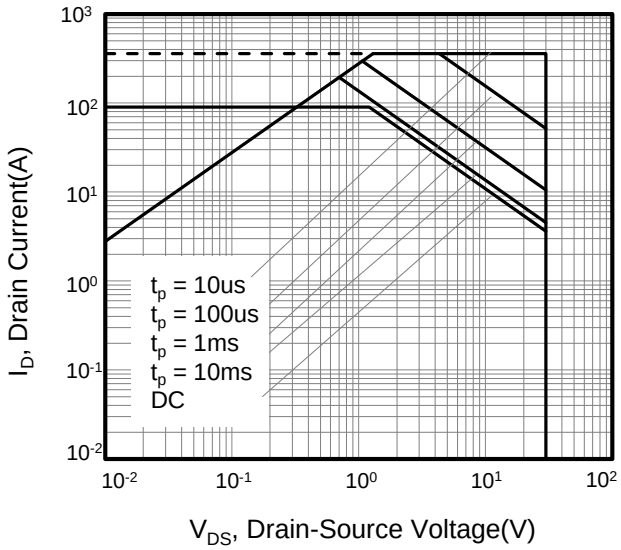


**Figure A：Gate Charge Test Circuit and Waveform**

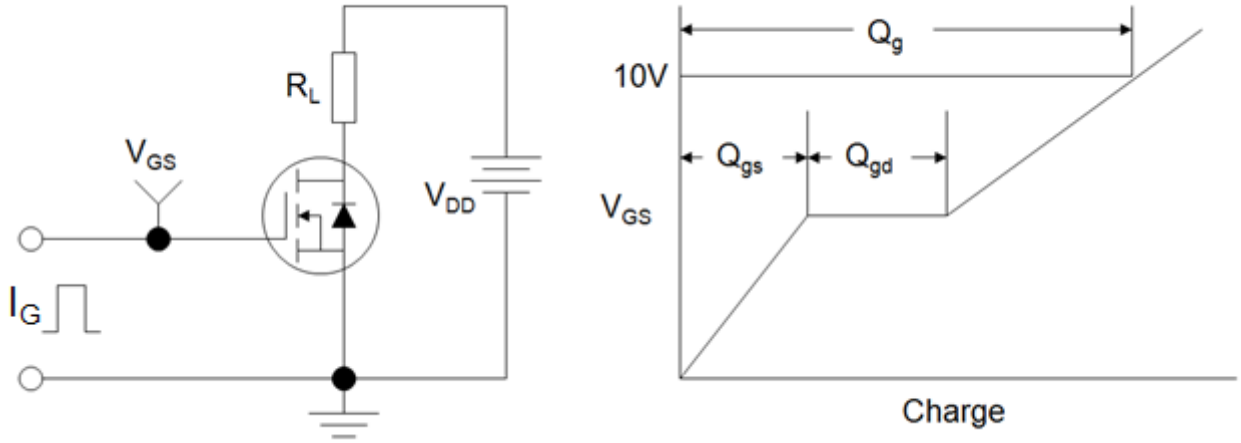



**Figure B：Resistive Switching Test Circuit and Waveform**

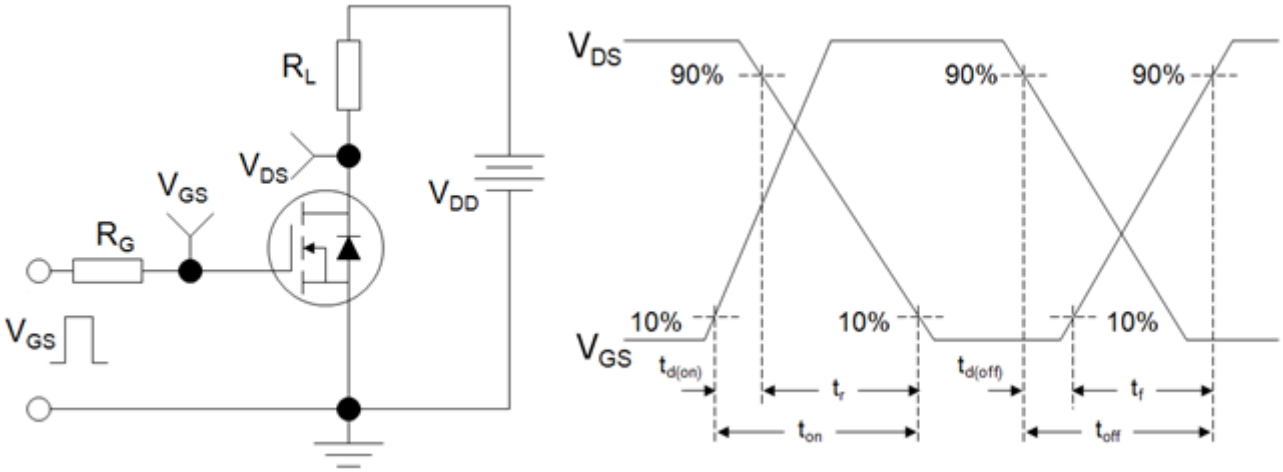
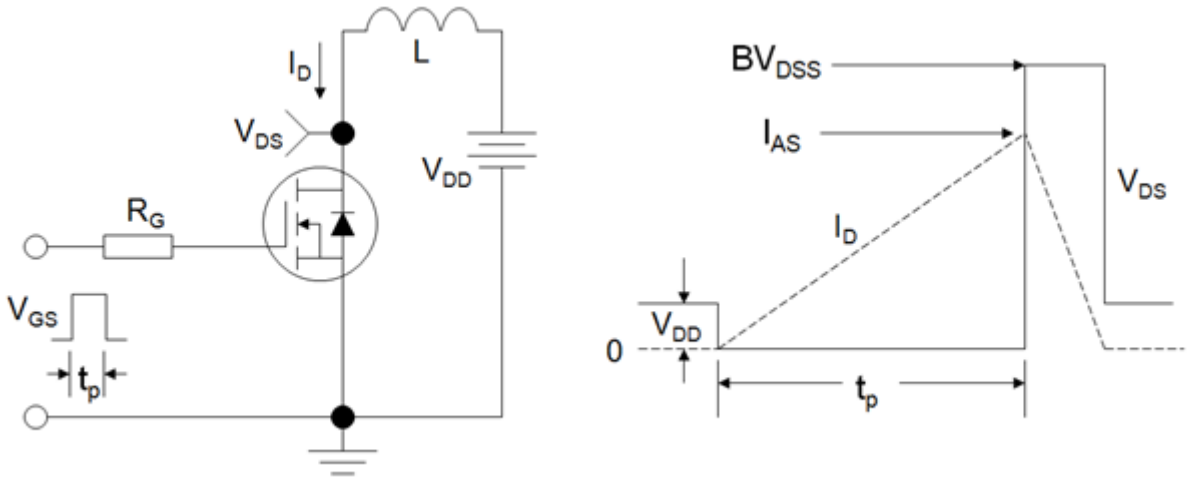
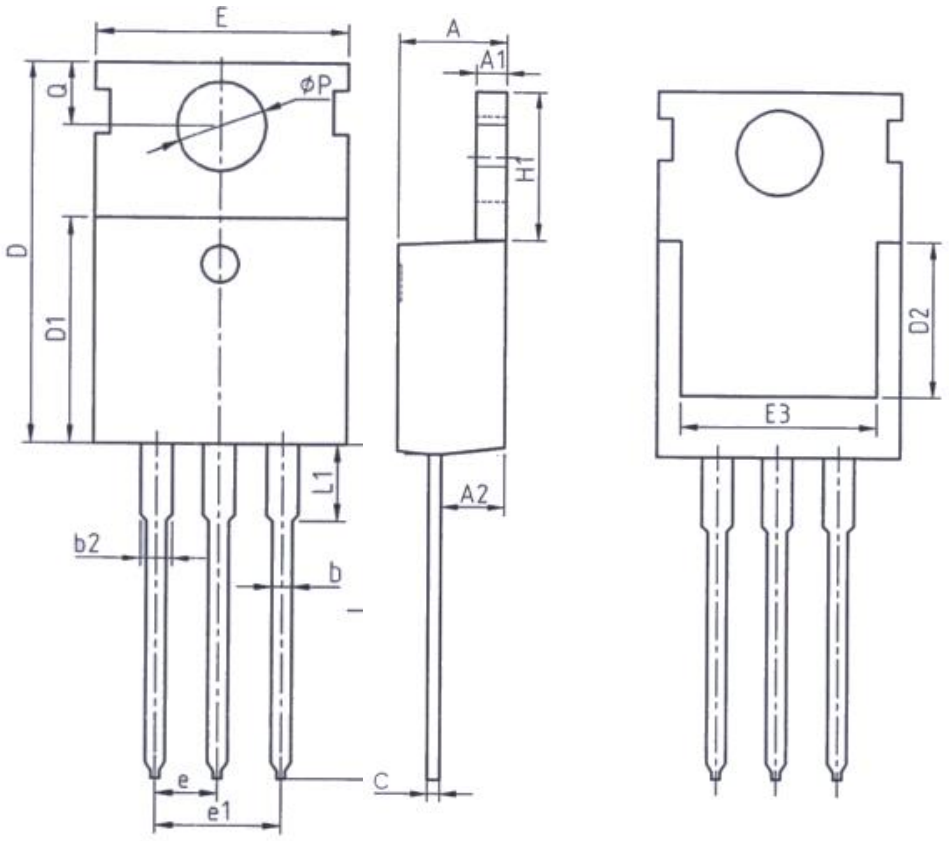



**Figure C：Unclamped Inductive Switching Test Circuit and Waveform**



# TO-220(H)




| Unit: mm | | |
|---|---|---|
| Symbol | Min. | Max. |
| A | 4.37 | 4.77 |
| A1 | 1.25 | 1.45 |
| A2 | 2.20 | 2.60 |
| b | 0.70 | 0.95 |
| b2 | 1.17 | 1.47 |
| c | 0.40 | 0.65 |
| D | 15.10 | 16.10 |
| D1 | 8.80 | 9.40 |
| D2 | 5.50 | – |

| Unit: mm | | |
|---|---|---|
| Symbol | Min. | Max. |
| E | 9.70 | 10.30 |
| E3 | 7.00 | – |
| e | 2.54BSC | |
| e1 | 5.08BSC | |
| H1 | 6.25 | 6.85 |
| L | 12.75 | 13.80 |
| L1 | – | 3.40 |
| P | 3.40 | 3.80 |
| Q | 2.60 | 3.00 |

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