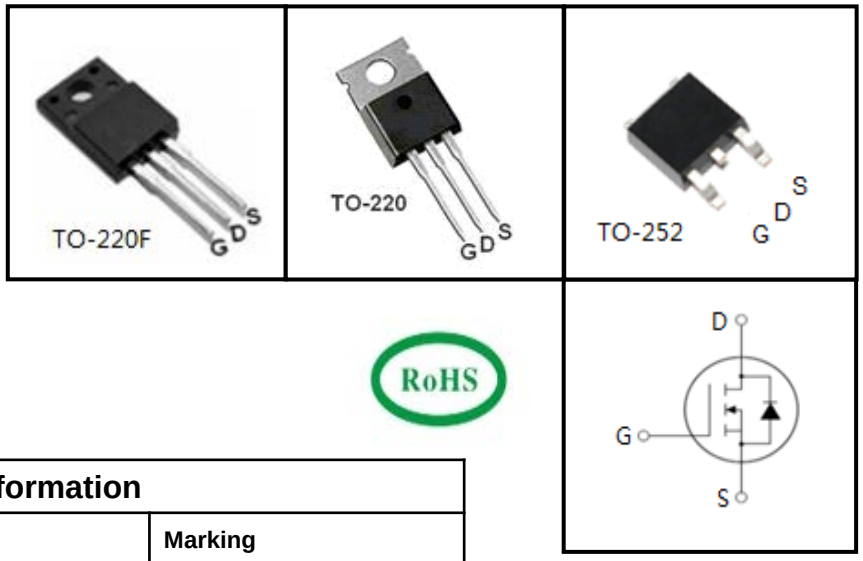
# 200V N-Channel MOSFET

## FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability




## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

RoHS

**Device Marking and Package Information**

| Device | Package | Marking |
|---|---|---|
| TMA18N20H | TO-220F | A18N20H |
| TMP18N20H | TO-220 | P18N20H |
| TMD18N20H | TO-252 | D18N20H |

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

| Parameter | | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | TO-220F | TO-220,TO-252 | |
| Drain-Source Voltage ($V_{GS}$ = 0V) | | $V_{DSS}$ | 200 | | V |
| Continuous Drain Current | | $I_D$ | 18 | | A |
| Pulsed Drain Current | (note1) | $I_{DM}$ | 72 | | A |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | | V |
| Single Pulse Avalanche Energy | (note2) | $E_{AS}$ | 340 | | mJ |
| Avalanche Current | (note1) | $I_{AR}$ | 15 | | A |
| Repetitive Avalanche Energy | (note1) | $E_{AR}$ | 8.3 | | mJ |
| Power Dissipation ($T_C$ = 25ºC) | | $P_D$ | 63.7 | 104 | W |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~+150 | | ºC |

**Thermal Resistance**

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| | | TO-220F | TO-220,TO-252 | |
| Thermal Resistance, Junction-to-Case | $R_{thJC}$ | 1.96 | 1.2 | ºC/W |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62.5 | 60 | |

**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 | 200 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 200V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 5 | μA |
| | | $V_{DS}$ = 160V, $V_{GS}$ = 0V, $T_J$ = 125ºC | -- | -- | 100 | |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±20V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.0 | -- | 4.0 | V |
| Drain-Source On-Resistance (Note3) | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 9A | -- | 0.12 | 0.15 | Ω |
| **Dynamic** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1.0MHz | -- | 1318 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 180 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 75 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 160V, $I_D$ = 18A, $V_{GS}$ = 10V | -- | 41 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 5.5 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 19.5 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 100V, $I_D$ = 18A, $R_G$ = 25 Ω | -- | 24 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 45 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 101 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 95 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25 ºC | -- | -- | 18 | A |
| Pulsed Diode Forward Current | $I_{SM}$ | | -- | -- | 72 | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = 18A, $V_{GS}$ = 0V | -- | -- | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{GS}$ = 0V,$I_S$ = 18A, $di_F/dt$ =100A /μs | -- | 230 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 1.8 | -- | μC |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}$ = 15A, $V_{DD}$ = 50V, $R_G$ = 25 Ω, Starting $T_J$ = 25 ºC
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

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

**Figure 1. Output Characteristics ($T_J$ = 25ºC)**

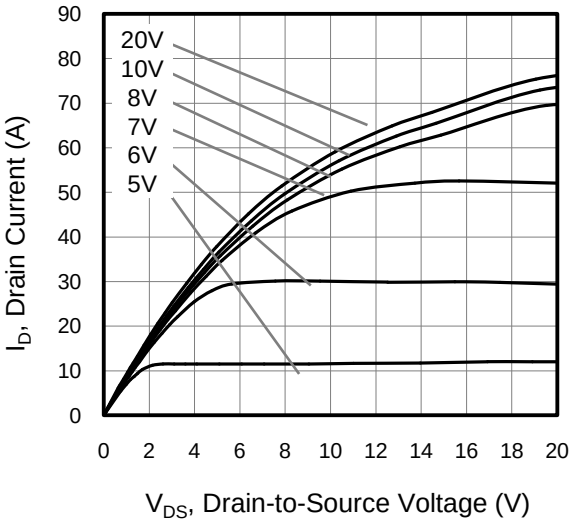



**Figure 2. Body Diode Forward Voltage**

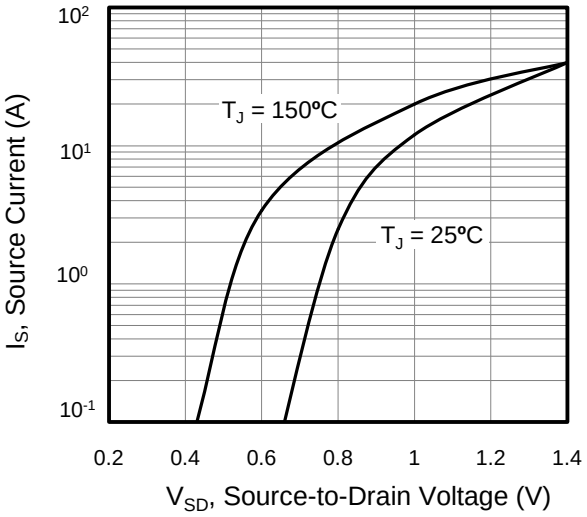



**Figure 3. Drain Current vs. Temperature**

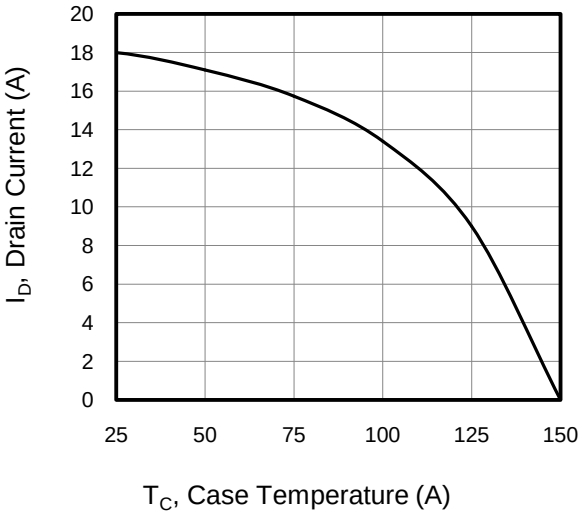



**Figure 4. $BV_{DSS}$ Variation vs. Temperature**

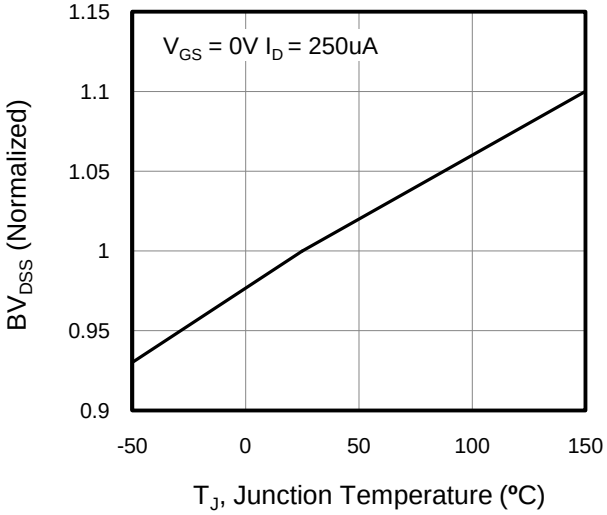



**Figure 5. Transfer Characteristics**

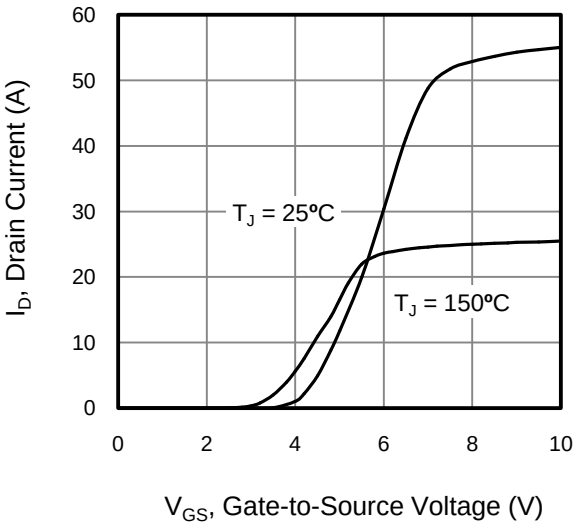
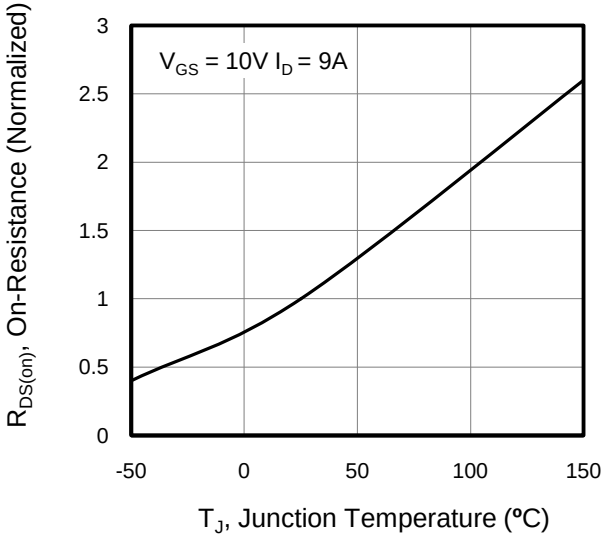



**Figure 6. On-Resistance vs. Temperature**



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

**Figure 7. Capacitance**

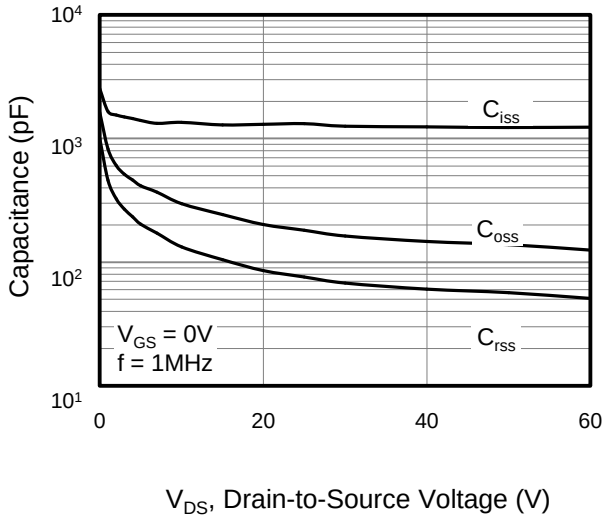



**Figure 8. Gate Charge**

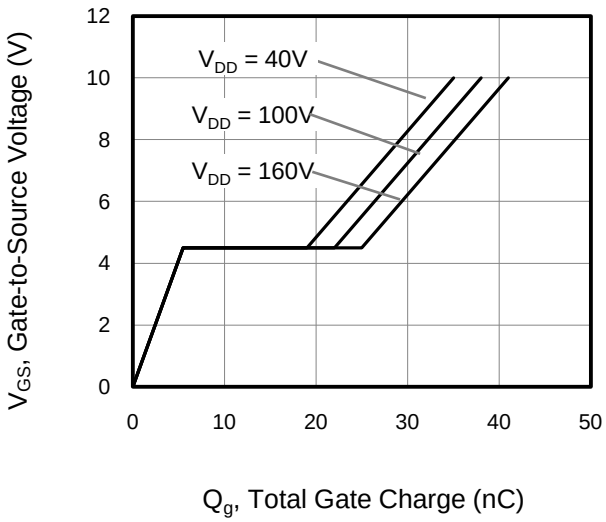



**Figure 9. Transient Thermal Impedance TO-220F**

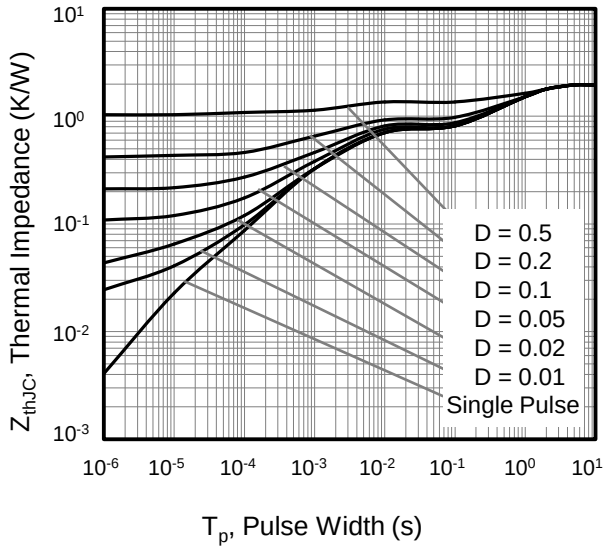



**Figure 10. Transient Thermal Impedance TO-220, TO-252**

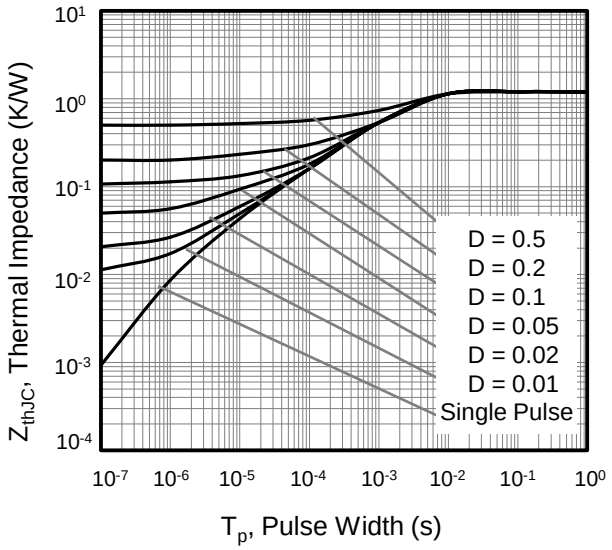


**Figure A：Gate Charge Test Circuit and Waveform**

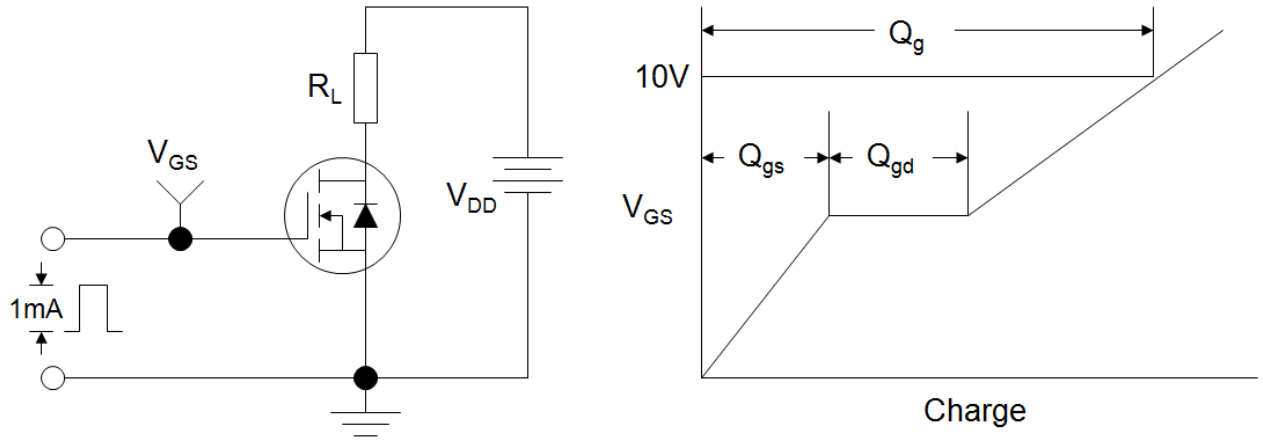



**Figure B：Resistive Switching Test Circuit and Waveform**

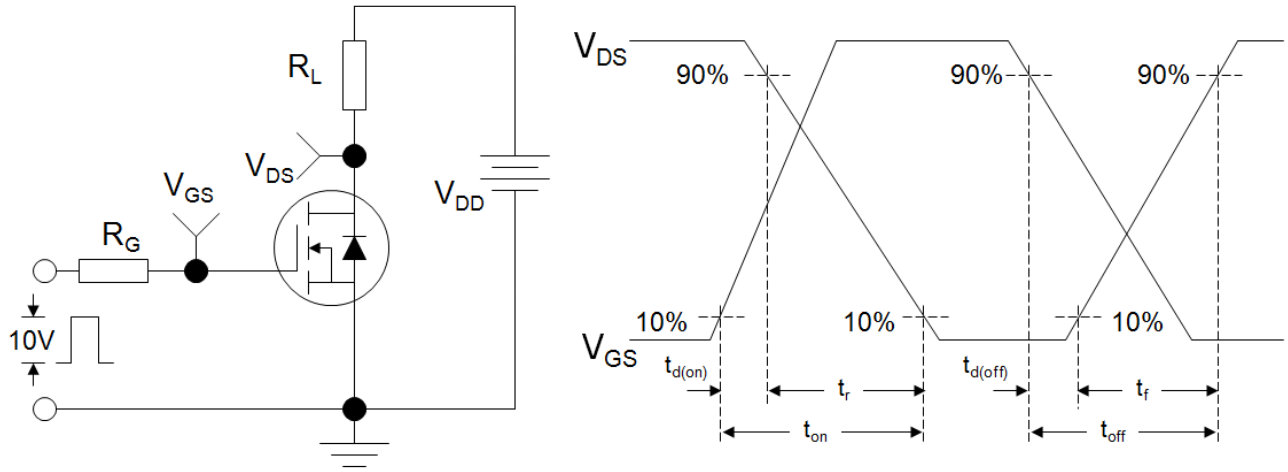
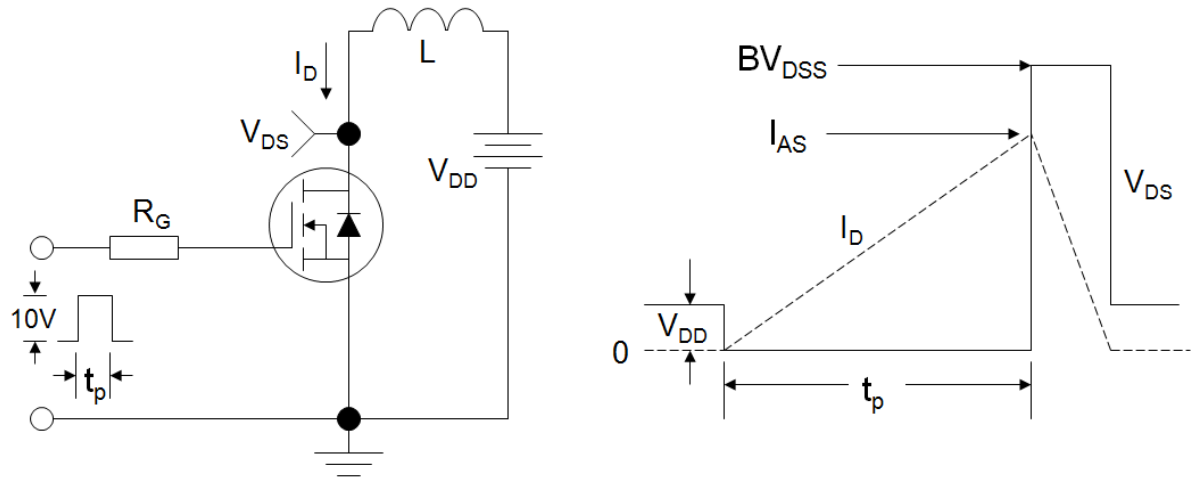
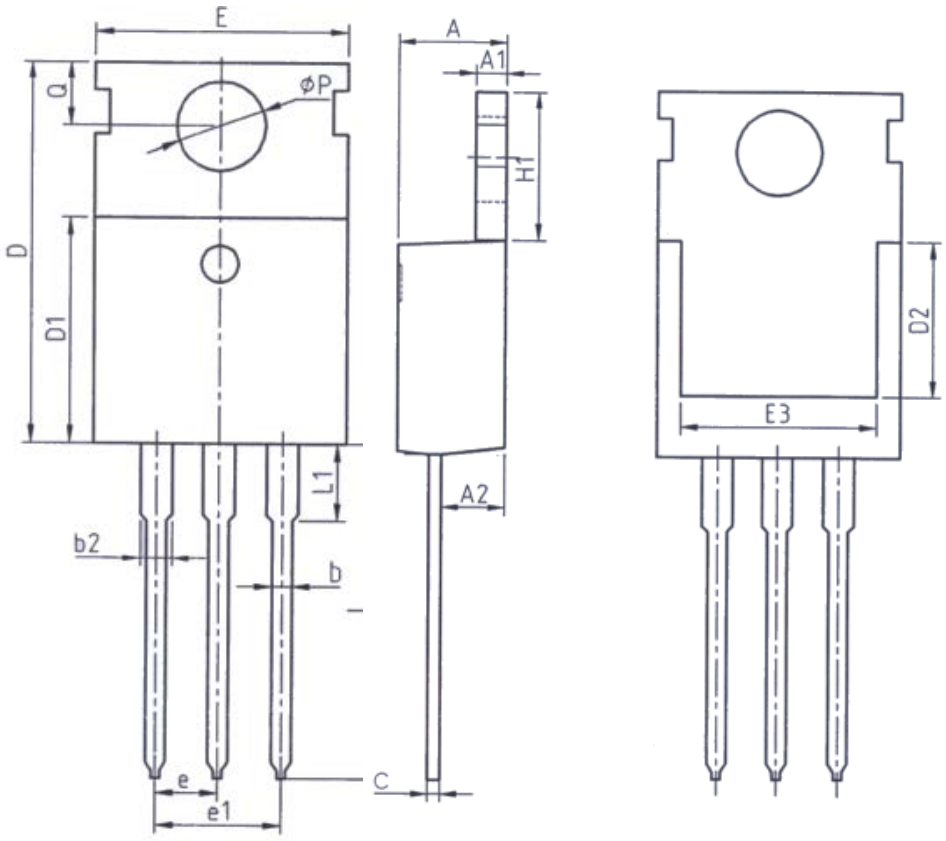



**Figure C：Unclamped Inductive Switching Test Circuit and Waveform**



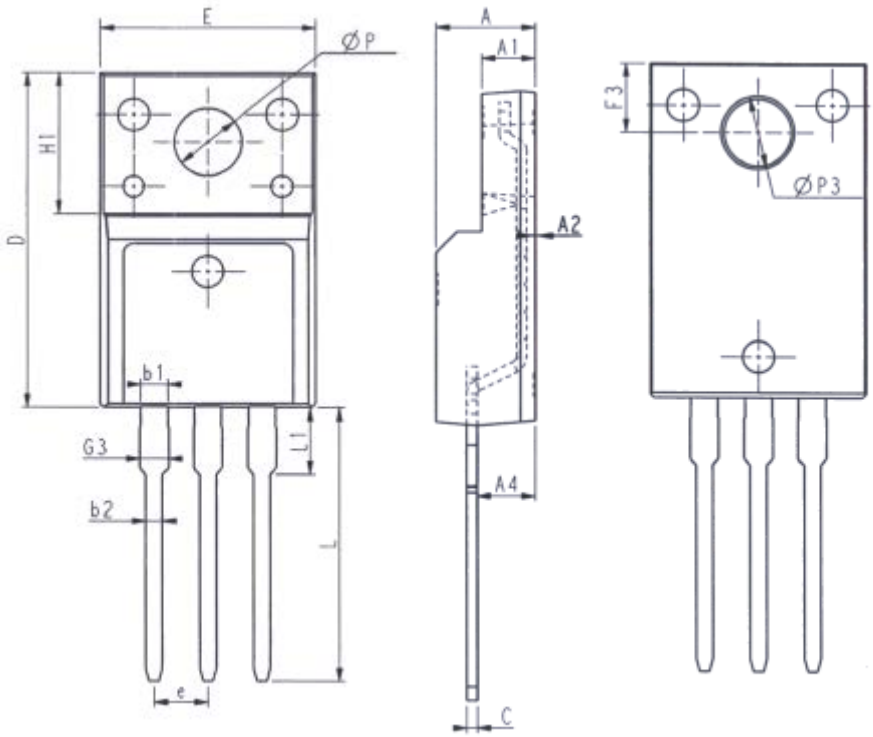
# TO-220




| 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 |

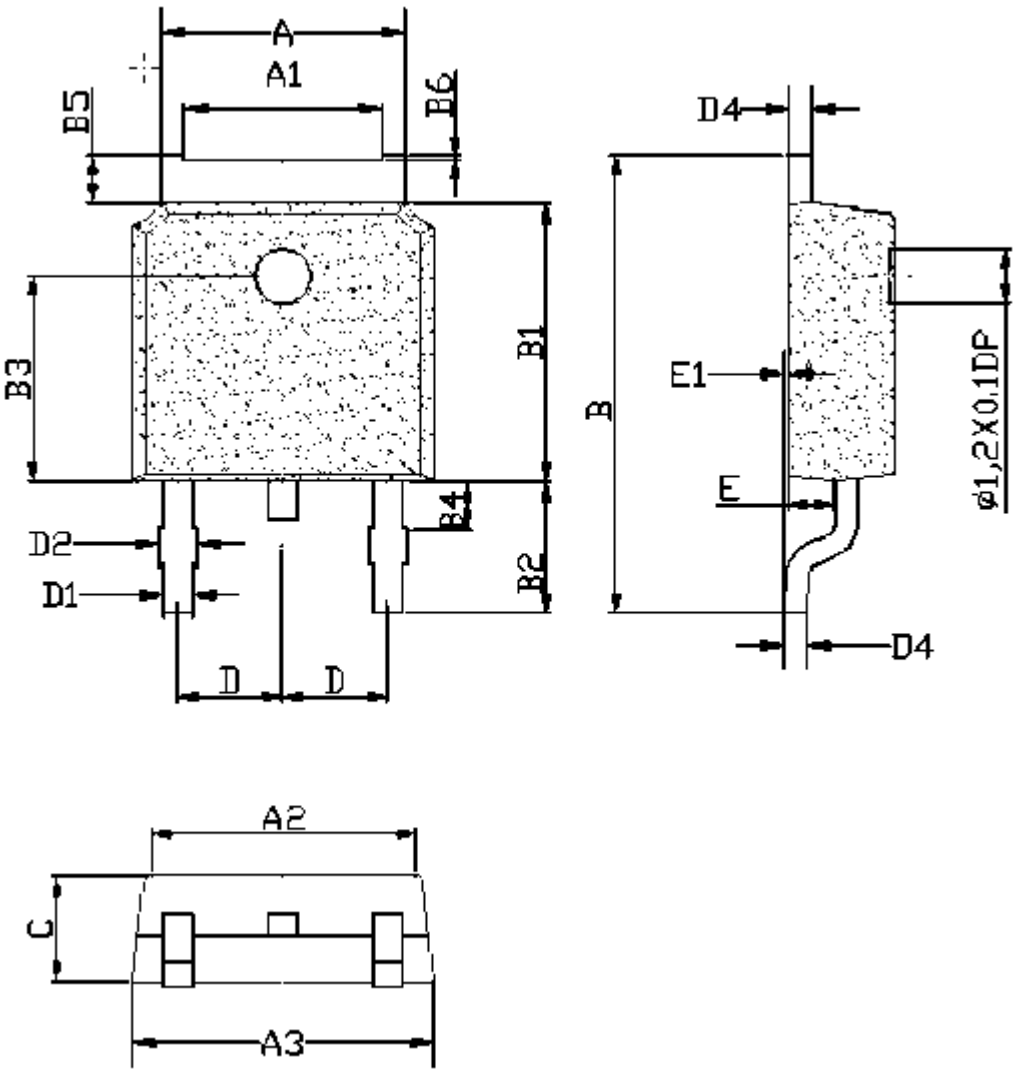
# TO-220F




| Unit: mm | | |
|---|---|---|
| Symbol | Min. | Max. |
| E | 9.96 | 10.36 |
| A | 4.50 | 4.90 |
| A1 | 2.34 | 2.74 |
| A2 | 0.30 | 0.60 |
| A4 | 2.56 | 2.96 |
| c | 0.40 | 0.65 |
| D | 15.57 | 16.17 |
| H1 | 6.70REF | |
| e | 2.54BSC | |

| Unit: mm | | |
|---|---|---|
| Symbol | Min. | Max. |
| L | 12.68 | 13.28 |
| L1 | 2.93 | 3.13 |
| P | 3.03 | 3.38 |
| P3 | 3.15 | 3.65 |
| F3 | 3.15 | 3.45 |
| G3 | 1.25 | 1.55 |
| b1 | 1.18 | 1.43 |
| b2 | 0.70 | 0.95 |

# TO-252




| DIM | MILLIMETERS |
|---|---|
| A | 5.33±0.2 |
| A1 | 4.33±0.2 |
| A2 | 5.78±0.1 |
| A3 | 6.6±0.2 |
| B | 10±0.5 |
| B1 | 6.1±0.3 |
| B2 | 2.85±0.5 |
| B3 | 4.5±0.25 |
| B4 | 1.0±0.1 |
| B5 | 1.05±0.1 |
| B6 | 0.1±0.05 |
| C | 2.3±0.2 |
| D | 2.286±0.05 |
| D1 | 0.62±0.15 |
| D2 | 0.75±0.15 |
| D3 | 0.5±0.15 |
| D4 | 0.5±0.15 |
| E | 1.01±0.2 |
| E1 | 0.1±0.05 |
| DIA | ⊙1.2(deep 0.1) |

Unit :mm

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