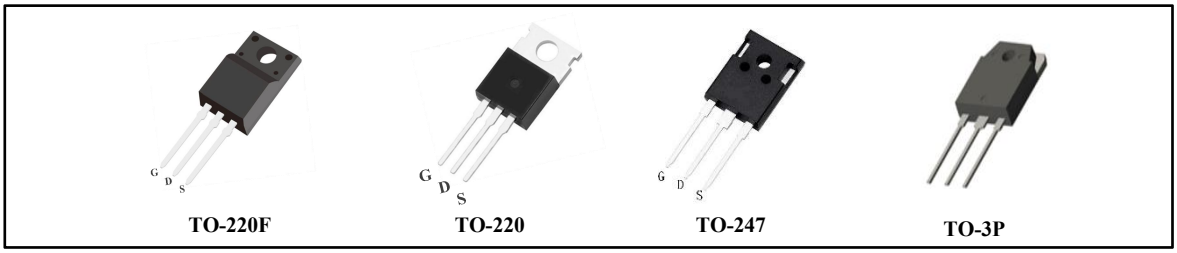
# MPVX20N50B Series
# Power MOSFET

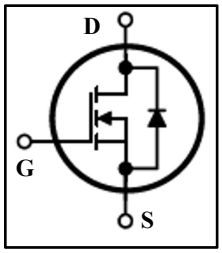
## FEATURES

- $BV_{DSS}$: 500V, $I_D$=20A
- $R_{DS(on)}$ : 0.3Ω(Max) @$V_{GS}$=10V
- Very Low FOM ($R_{DS(on)}$ *$Q_g$)
- Excellent stability and uniformity

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- AC to DC Converters




## Ordering Information

| Type NO. | Marking | Package Code |
|---|---|---|
| MPVA20N50B | MPVA20N50B | TO-220F |
| MPVP20N50B | MPVP20N50B | TO-220 |
| MPVW20N50B | MPVW20N50B | TO-247 |
| MPVT20N50B | MPVT20N50B | TO-3P |

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

| Parameter | | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | 220F | 220-247-3P | |
| Drain-Source Voltage ($V_{GS}$ = 0V) | | $V_{DSS}$ | 500 | | V |
| Continuous Drain Current | | $I_D$ | 20 | | A |
| Pulsed Drain Current | (note1) | $I_{DM}$ | 72 | | A |
| Gate-Source Voltage | | $V_{GSS}$ | ±30 | | V |
| Single Pulse Avalanche Energy | (note2) | $E_{AS}$ | 1000 | | mJ |
| Avalanche Current | (note1) | $I_{AR}$ | 12 | | A |
| Repetitive Avalanche Energy | (note1) | $E_{AR}$ | 64 | | mJ |
| Power Dissipation ($T_C$ = 25ºC) | | $P_D$ | 98 | 210 | W |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~+150 | | ºC |

## Thermal Resistance

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| | | 220F | 220-247-3P | |
| Thermal Resistance, Junction-to-Case | $R_{thJC}$ | 1.27 | 0.6 | ºC/W |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62.5 | 60.0 | |

**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 | 500 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 500V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 1 | μA |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±30V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 3.0 | -- | 4.0 | V |
| Drain-Source On-Resistance (Note4) | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 10.0A | -- | 0.24 | 0.30 | Ω |
| **Dynamic** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1.0MHz | -- | 3000 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 221 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 16 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 400V, $I_D$ = 20.0A, $V_{GS}$ = 10V | -- | 75 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 10 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 31 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ =250V, $I_D$ = 20.0A, $R_G$ = 25Ω | -- | 35 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 40 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 160 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 55 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | 20 | A |
| Pulsed Diode Forward Current | $I_{SM}$ | | -- | -- | 80 | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = 20.0A, $V_{GS}$ = 0V | -- | -- | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{GS}$ = 0V, $I_F$ = 20.0A, $di_F/dt$ = 100A/μs | -- | 430 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 6.5 | -- | μC |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}$ = 12A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%
4. Essentially independent of operating temperature

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

**Figure 1. Output Characteristics**

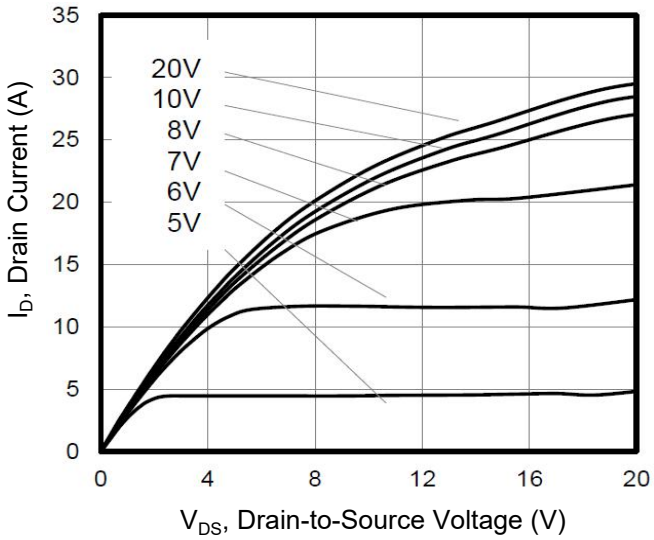



**Figure 2. Transfer Characteristics**

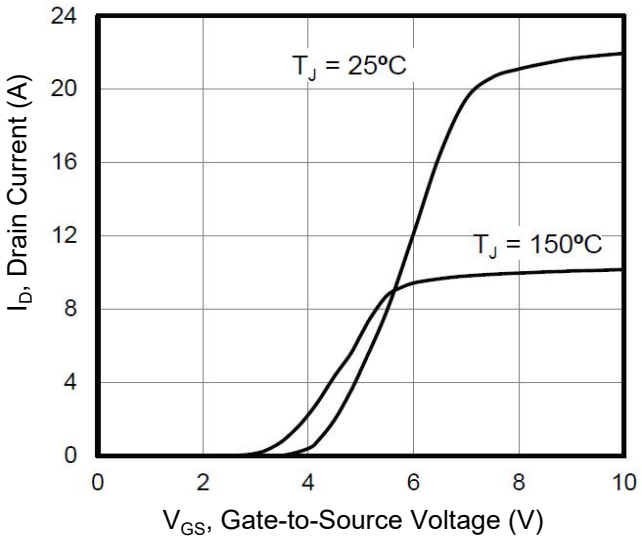



**Figure 3. Drain Current vs. Temperature**

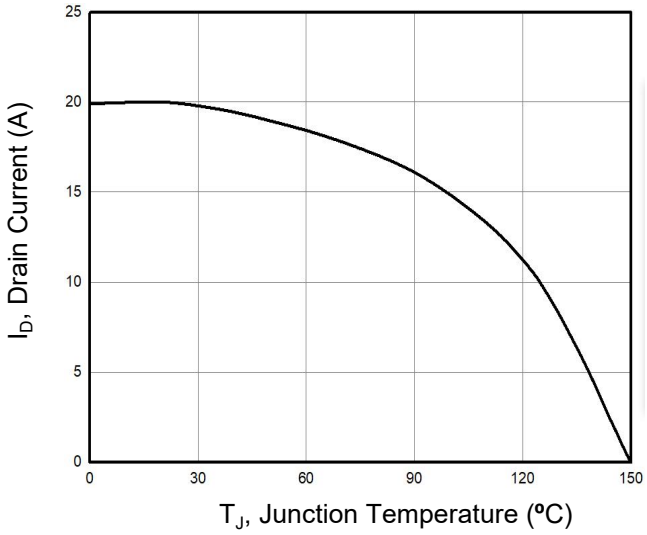



**Figure 4. Capacitance**

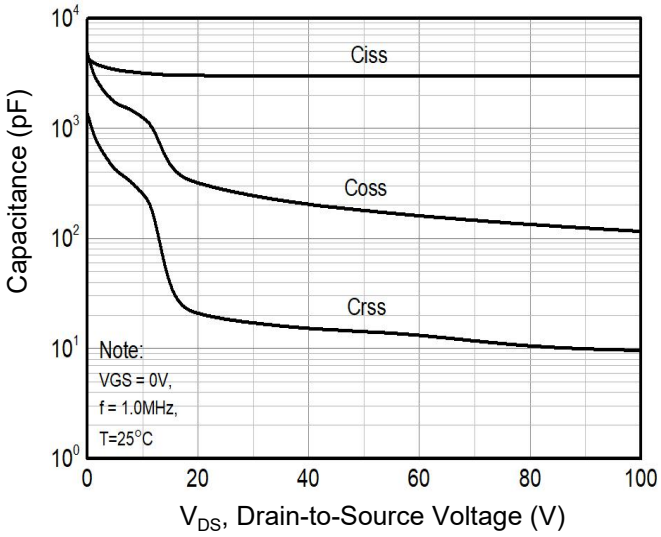



**Figure 5. Gate Charge**

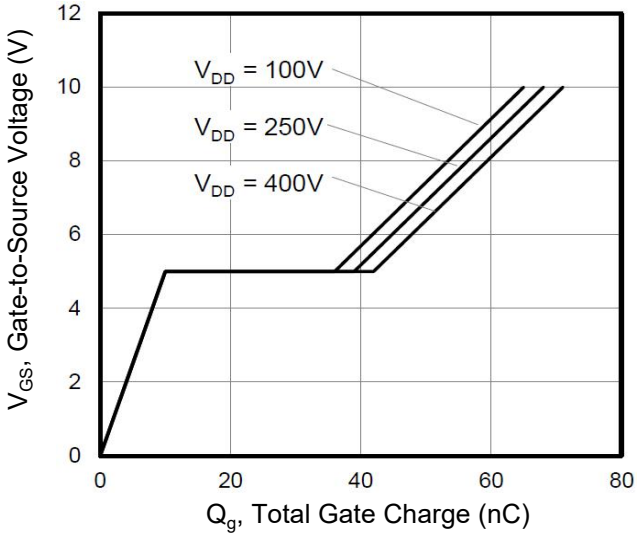
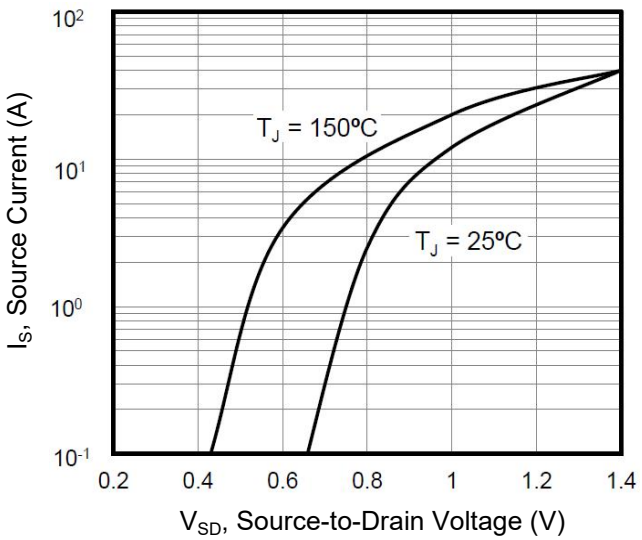



**Figure 6. Body Diode Forward Voltage**



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

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

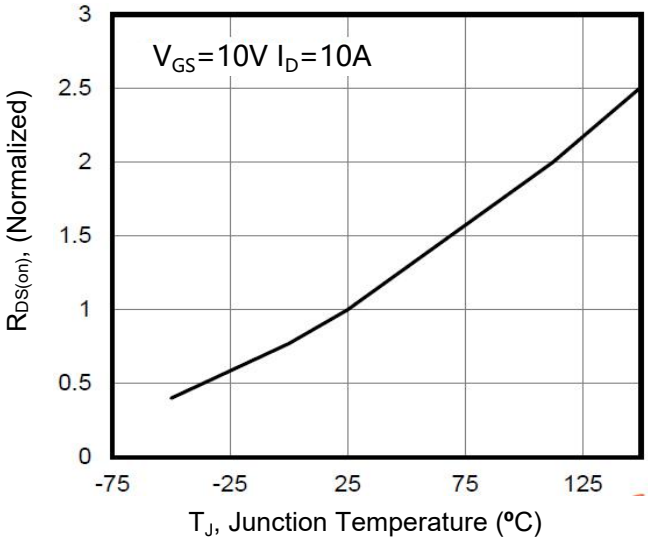



**Figure 8. $BV_{DSS}$ vs. Temperature**

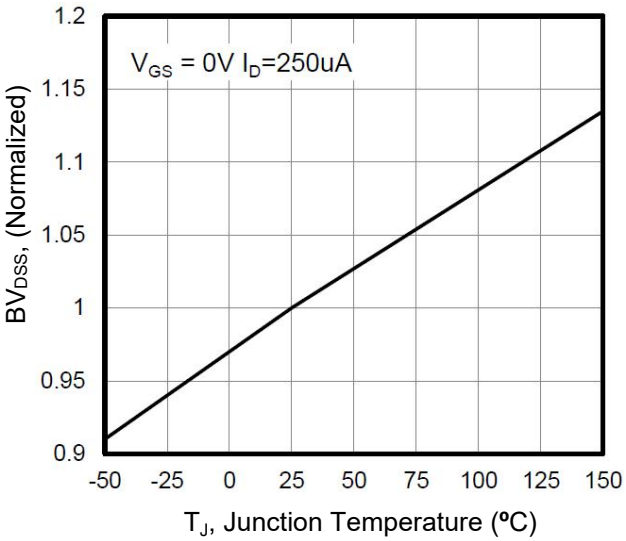



**Figure 9. Transient Thermal Impedance (TO-220F)**

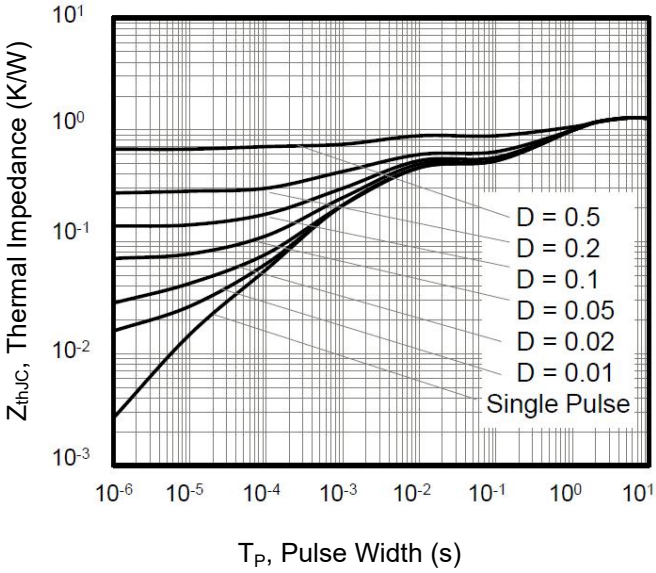



**Figure 10. Transient Thermal Impedance (TO-220 TO-247 TO-3P)**

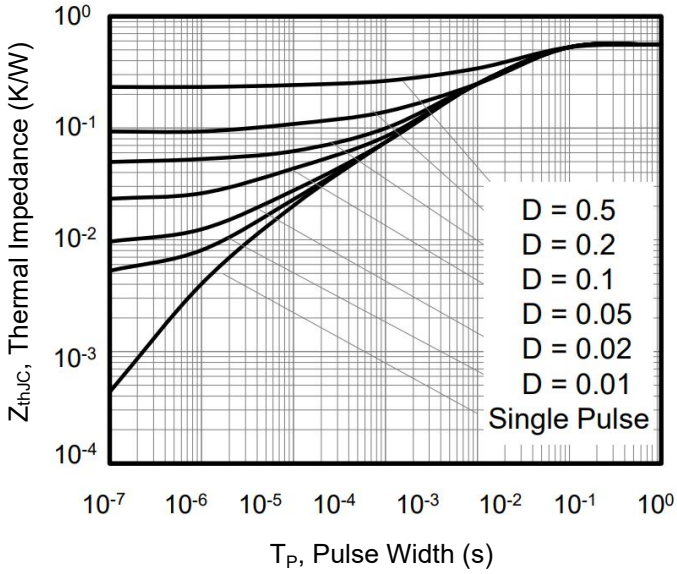


**Figure A：Gate Charge Test Circuit and Waveform**

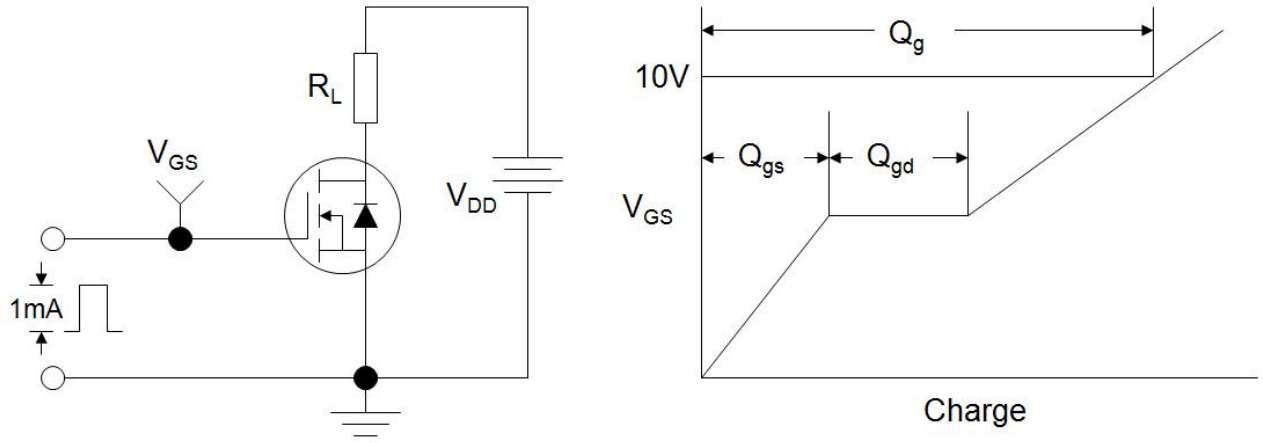



**Figure B：Resistive Switching Test Circuit and Waveform**

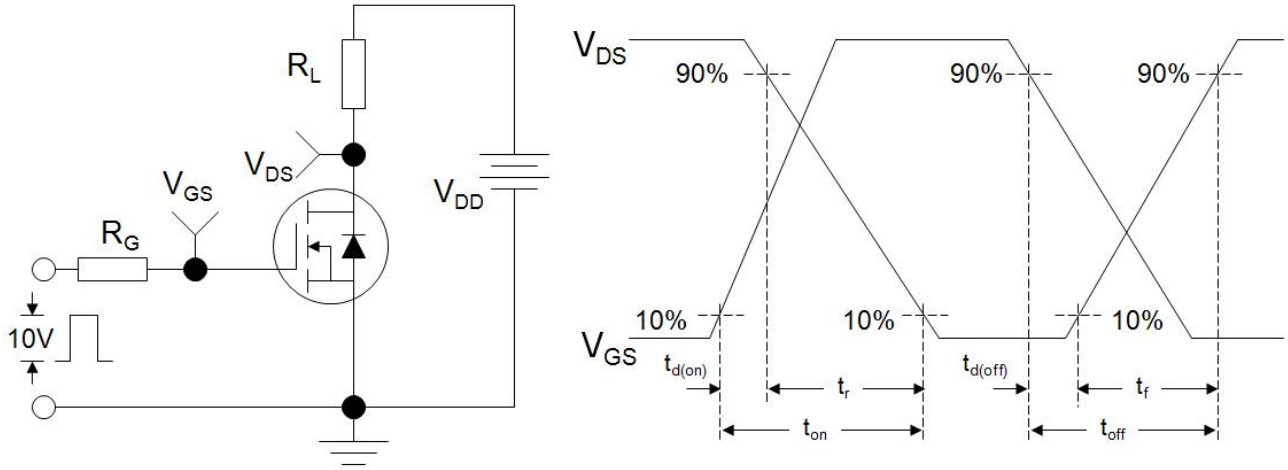
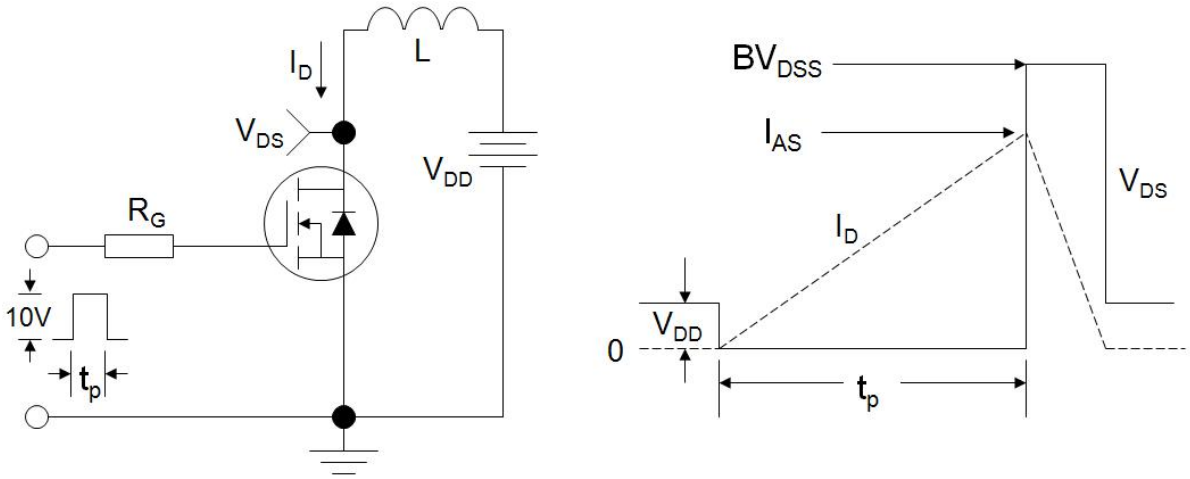


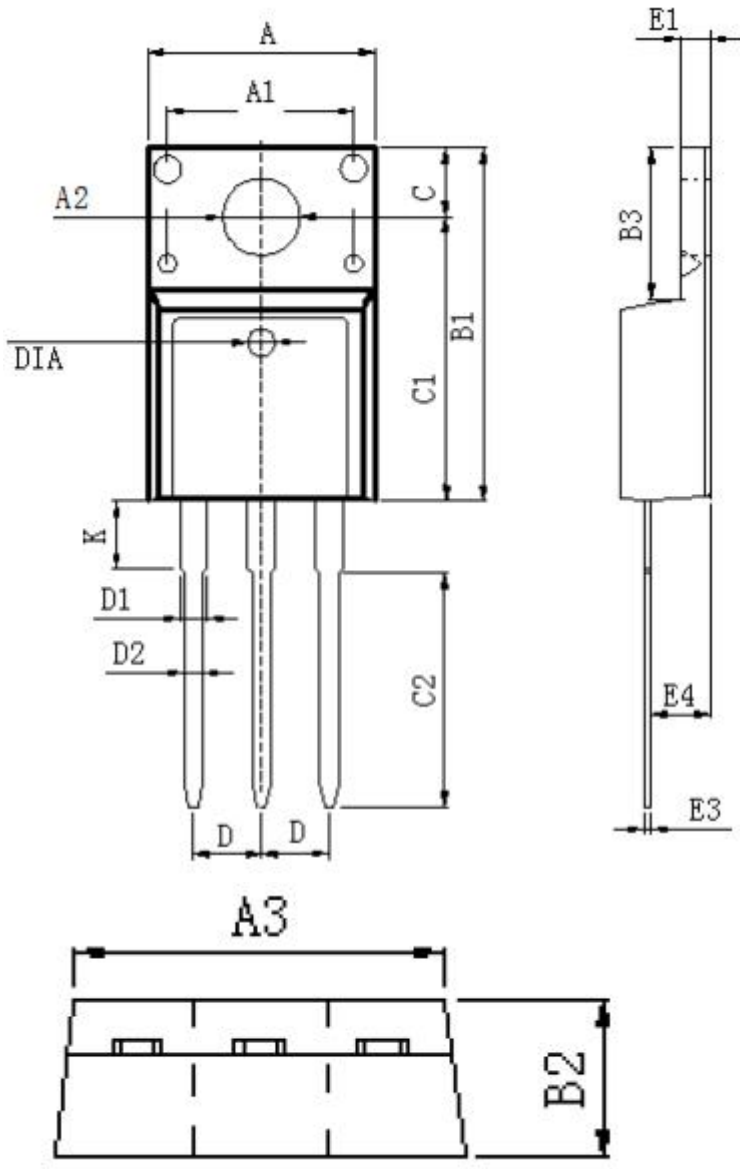

**Figure C：Unclamped Inductive Switching Test Circuit and Waveform**



## Outline Dimension

**Unit: mm**

# TO-220F



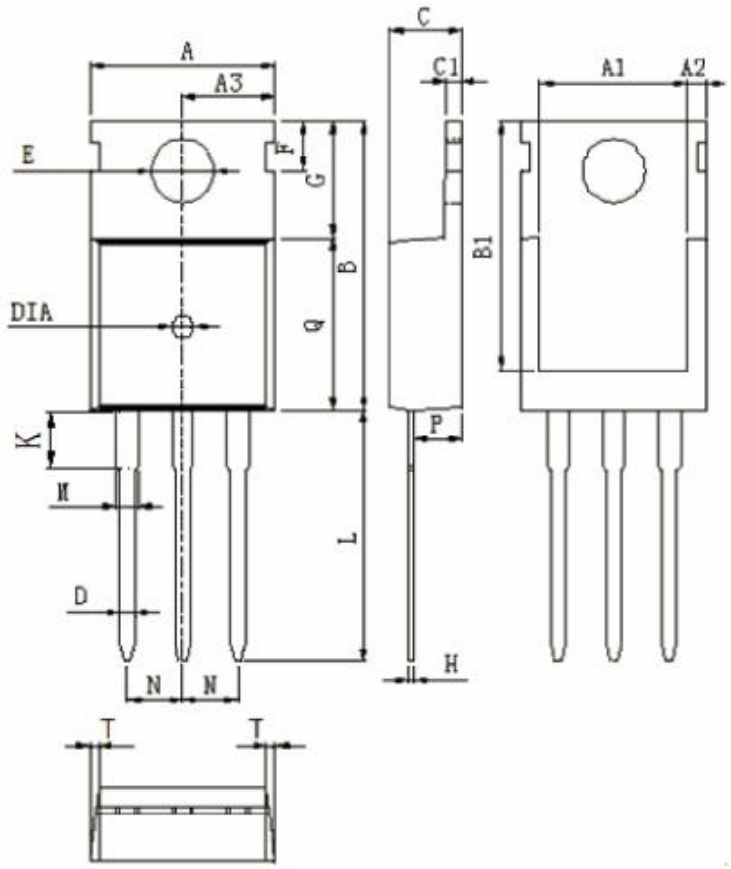

| DIM | MILLIMETERS |
|---|---|
| A | 10.16±0.3 |
| A1 | 7.00±0.1 |
| A2 | 3.3±0.2 |
| A3 | 9.5±0.2 |
| B1 | 15.87±0.3 |
| B2 | 4.7±0.2 |
| B3 | 6.68±0.4 |
| C | 3.3±0.2 |
| C1 | 12.57±0.3 |
| C2 | 10.02±0.5 |
| D | 2.54±0.05 |
| D1 | 1.28±0.2 |
| D2 | 0.8±0.1 |
| K | 3.1±0.3 |
| E1 | 2.54±0.1 |
| E3 | 0.5±0.1 |
| E4 | 2.76±0.2 |
| DIA | ⊙1.5(deep 0.2) |

Unit :mm

## Outline Dimension

**Unit: mm**

# TO-220



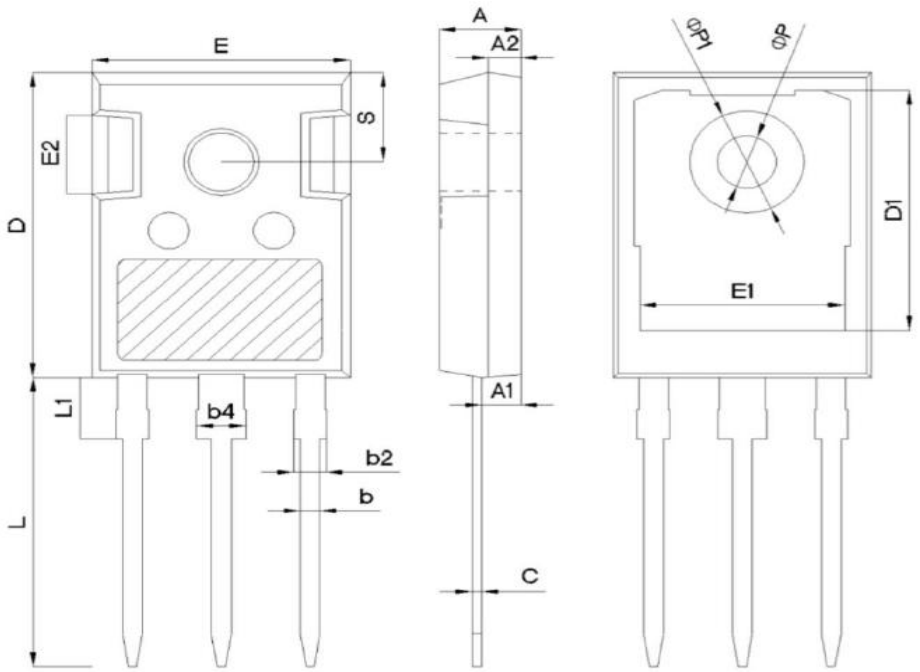

| DIM | MILLIMETERS |
|---|---|
| A | 10.0±0.3 |
| A1 | 8.64±0.2 |
| A2 | 1.15±0.1 |
| A3 | 5.0±0.2 |
| B | 15.8±0.4 |
| B1 | 13.2±0.3 |
| C | 4.56±0.1 |
| C1 | 1.3±0.2 |
| D | 0.8±0.2 |
| E | 3.6±0.2 |
| F | 2.95±0.3 |
| G | 6.5±0.3 |
| H | 0.5±0.1 |
| K | 3.1±0.2 |
| L | 13.2±0.4 |
| M | 1.25±0.1 |
| N | 2.54±0.1 |
| P | 2.4±0.3 |
| Q | 9.0±0.3 |
| T | W:0.35 |
| DIA | ⊙1.5(deep 0.2) |

Unit :mm

## Outline Dimension

**Unit: mm**

# TO-247




| SYMBOL | mm | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.80 | 5.00 | 5.20 |
| A1 | 2.21 | 2.41 | 2.61 |
| A2 | 1.85 | 2.00 | 2.15 |
| b | 1.11 | 1.21 | 1.36 |
| b2 | 1.91 | 2.01 | 2.21 |
| b4 | 2.91 | 3.01 | 3.21 |
| c | 0.51 | 0.61 | 0.75 |
| D | 20.70 | 21.00 | 21.30 |
| D1 | 16.25 | 16.55 | 16.85 |
| E | 15.50 | 15.80 | 16.10 |
| E1 | 13.00 | 13.30 | 13.60 |
| E2 | 4.80 | 5.00 | 5.20 |
| E3 | 2.30 | 2.50 | 2.70 |
| e | 5.44BSC | | |
| L | 19.62 | 19.92 | 20.22 |
| L1 | - | - | 4.30 |
| ΦP | 3.40 | 3.60 | 3.80 |
| ΦP1 | - | - | 7.30 |
| S | 6.15BSC | | |

## Outline Dimension

**Unit: mm**

### TO-3P