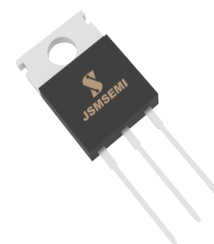


## FEATURES

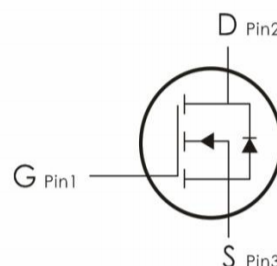
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- High speed switching
- DC-DC Converters
- Motor controls



TO-220-3L



## Device Marking and Package Information

| Device    | Package | Marking   |
|-----------|---------|-----------|
| FQPF85N06 | TO-220  | FQPF85N06 |

## Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                        | Symbol         | Value    | Unit             |
|--------------------------------------------------|----------------|----------|------------------|
|                                                  |                | TO-220   |                  |
| Drain-Source Voltage ( $V_{GS} = 0V$ )           | $V_{DSS}$      | 60       | V                |
| Continuous Drain Current                         | $I_D$          | 70       | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 230      | A                |
| Gate-Source Voltage                              | $V_{GSS}$      | $\pm 20$ | V                |
| Single Pulse Avalanche Energy (note2)            | $E_{AS}$       | 250      | mJ               |
| Avalanche Current (note1)                        | $I_{AR}$       | 50       | A                |
| Repetitive Avalanche Energy (note1)              | $E_{AR}$       | 36       | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )   | $P_D$          | 110      | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55~+150 | $^\circ\text{C}$ |

## Thermal Resistance

| Parameter                               | Symbol     | Value  | Unit |
|-----------------------------------------|------------|--------|------|
|                                         |            | TO-220 |      |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 1.14   | K/W  |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 60     |      |

| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |                                                                             |       |      |      |      |
|--------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------|-------|------|------|------|
| Parameter                                                    | Symbol               | Test Conditions                                                             | Value |      |      | Unit |
|                                                              |                      |                                                                             | Min.  | Typ. | Max. |      |
| Static                                                       |                      |                                                                             |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                | 60    | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C          | --    | --   | 5    | μA   |
|                                                              |                      | V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C         | --    | --   | 100  |      |
| Gate-Source Leakage                                          | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20V                                                      | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                  | 2.0   | --   | 4.0  | V    |
| Drain-Source On-Resistance (Note3)                           | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 25A                                 | --    | 9    | 15   | mΩ   |
| Dynamic                                                      |                      |                                                                             |       |      |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 25V,<br>f = 1.0MHz               | --    | 1489 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                             | --    | 608  | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                             | --    | 275  | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> =48V, I <sub>D</sub> = 50A,<br>V <sub>GS</sub> = 10V        | --    | 60   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                             | --    | 6    | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                             | --    | 31   | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = 30V, I <sub>D</sub> =50A,<br>R <sub>G</sub> = 25 Ω        | --    | 22   | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                             | --    | 82   | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                             | --    | 52   | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                             | --    | 93   | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                             |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25 °C                                                      | --    | --   | 70   | A    |
| Pulsed Diode Forward Current                                 | I <sub>SM</sub>      |                                                                             | --    | --   | 230  |      |
| Body Diode Voltage                                           | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 25A, V <sub>GS</sub> = 0V          | --    | --   | 2    | V    |
| Reverse Recovery Time                                        | t <sub>rr</sub>      | V <sub>GS</sub> = 0V,I <sub>S</sub> = 50A,<br>di <sub>F</sub> /dt =100A /μs | --    | 68   | --   | ns   |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      |                                                                             | --    | 4.2  | --   | μC   |

#### Notes

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

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

Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )

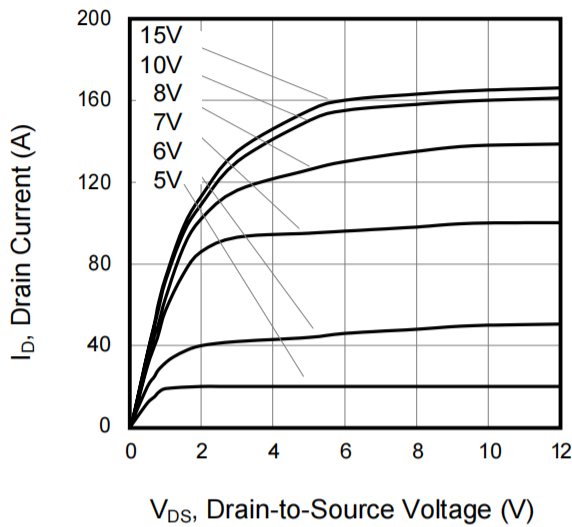


Figure 2. Body Diode Forward Voltage

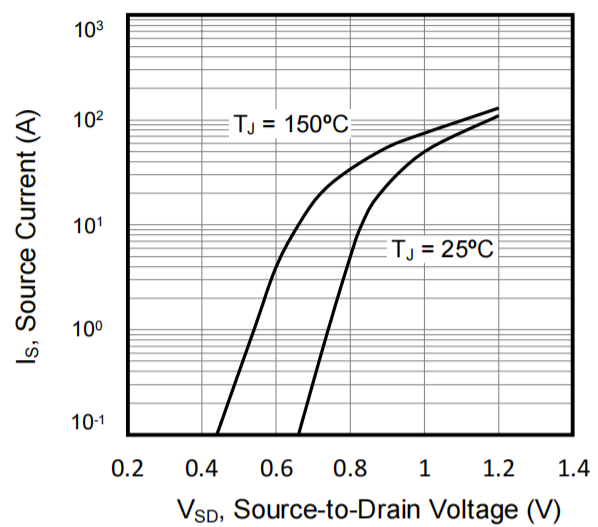


Figure 3. Drain Current vs. Temperature

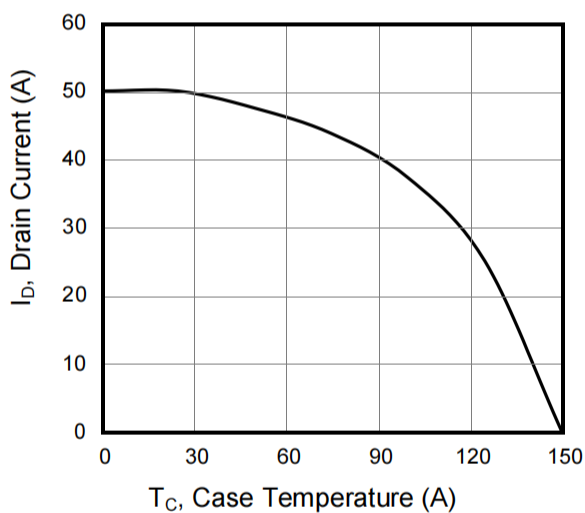


Figure 4.  $BV_{DSS}$  Variation vs. Temperature

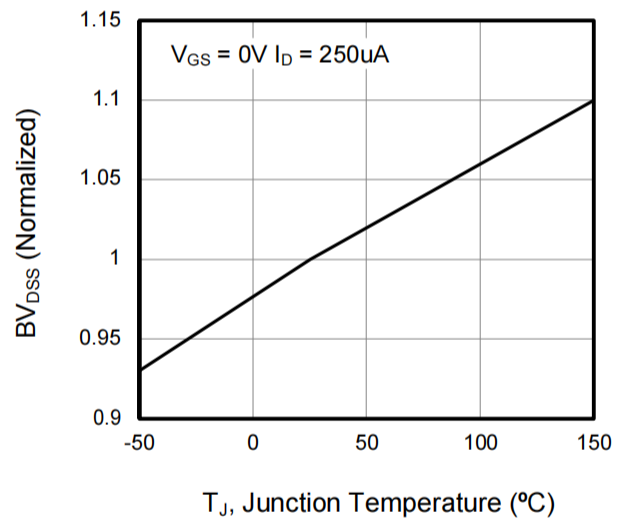


Figure 5. Transfer Characteristics

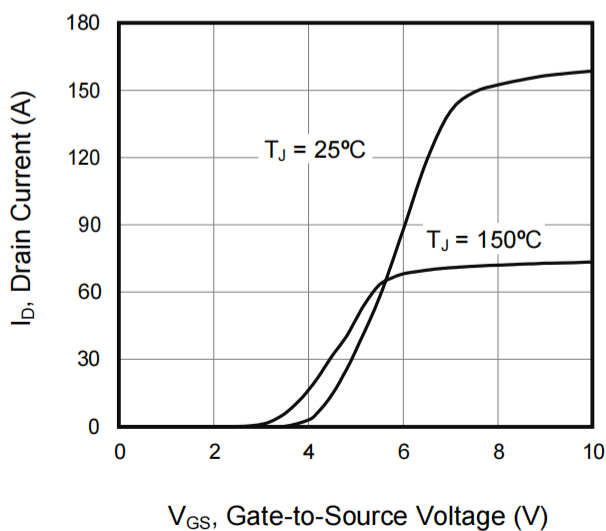
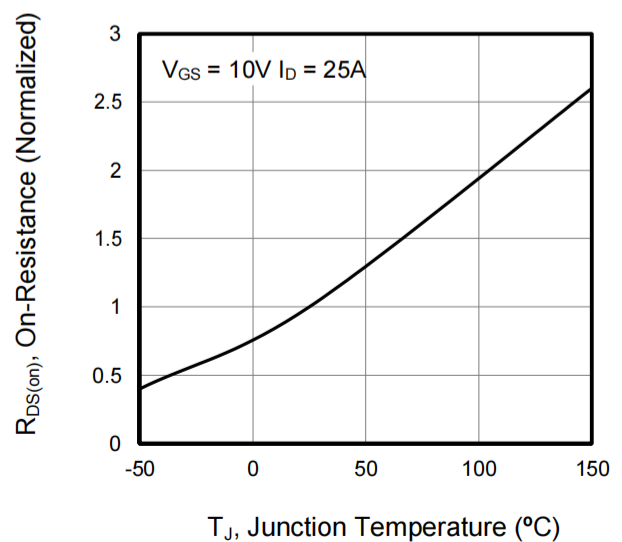


Figure 6. On-Resistance vs. Temperature



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

Figure 7. Capacitance

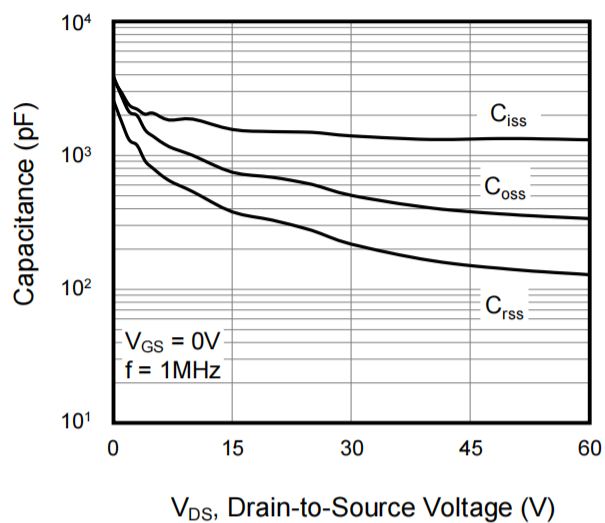


Figure 8. Gate Charge

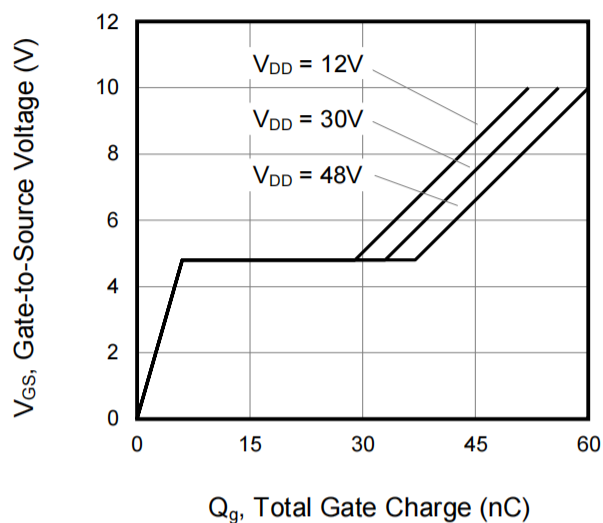
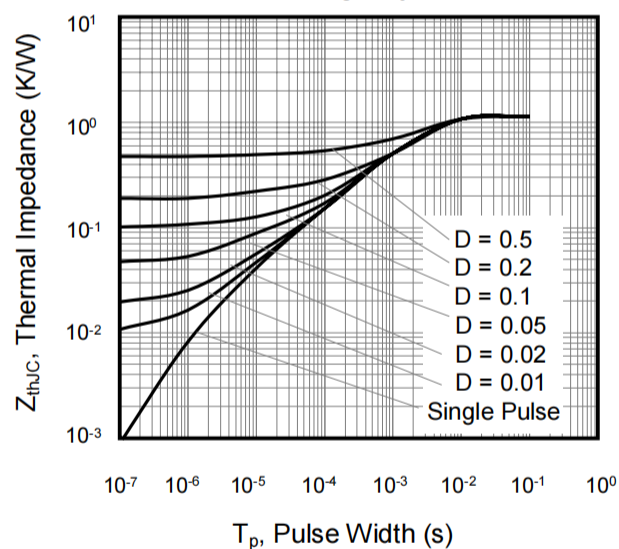
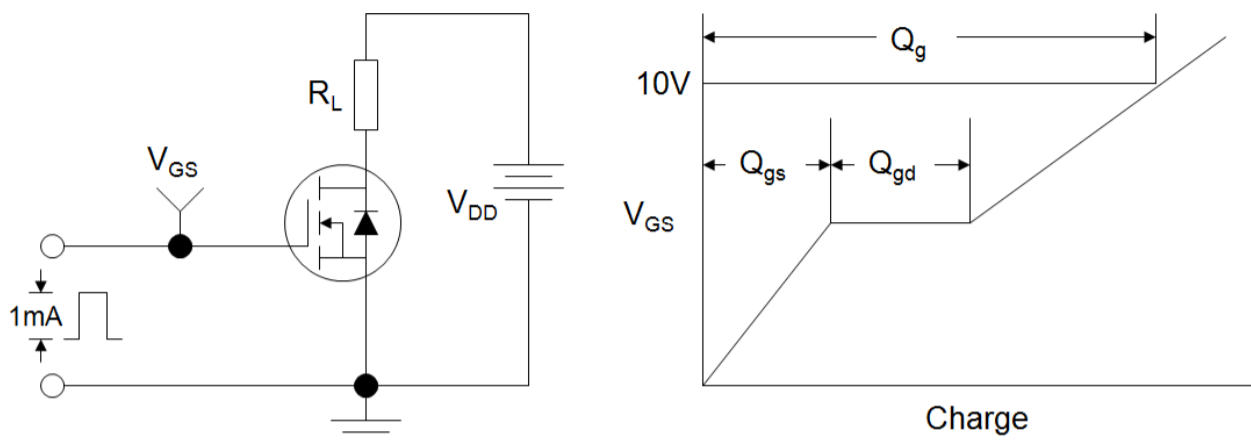


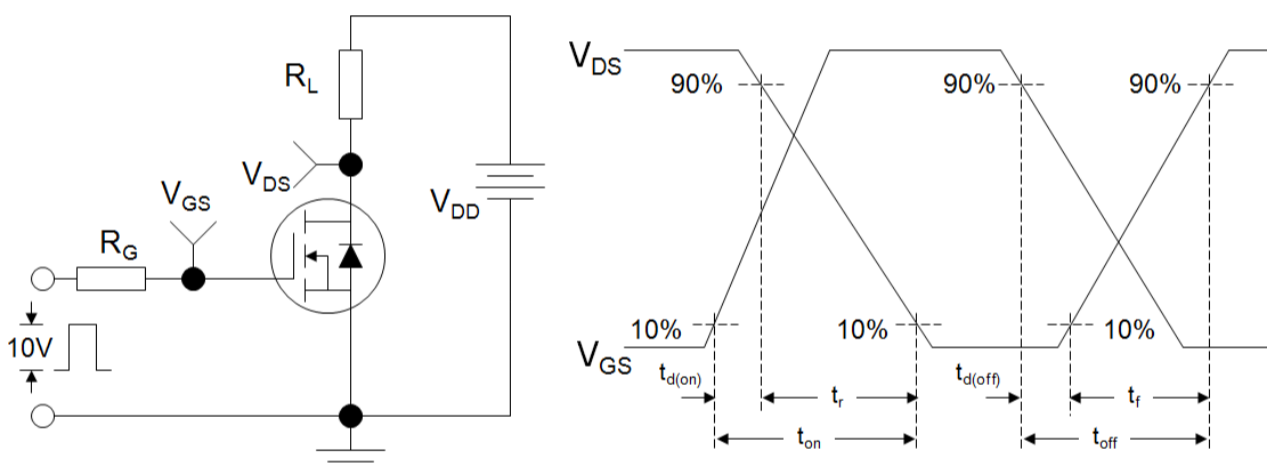
Figure 9. Transient Thermal Impedance  
TO-220



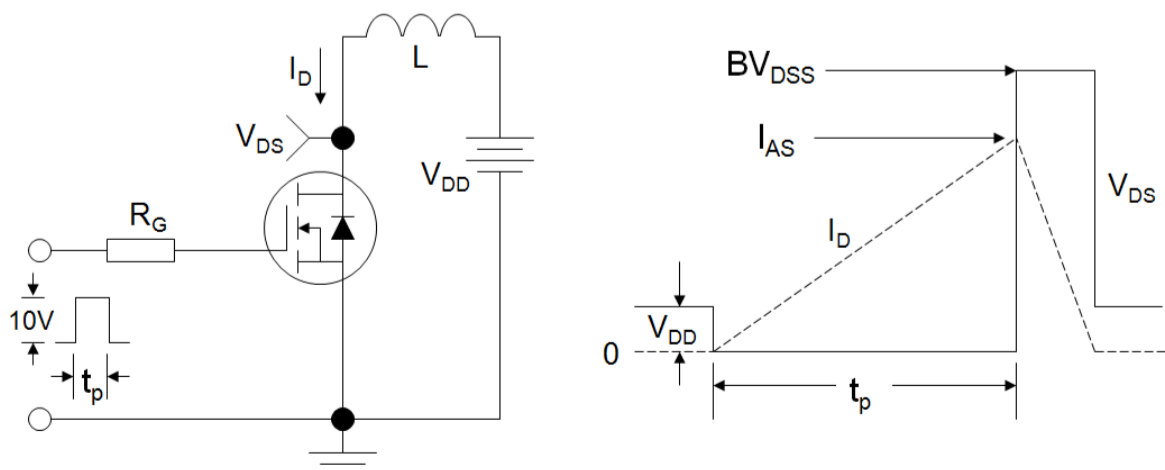
**Figure A: Gate Charge Test Circuit and Waveform**



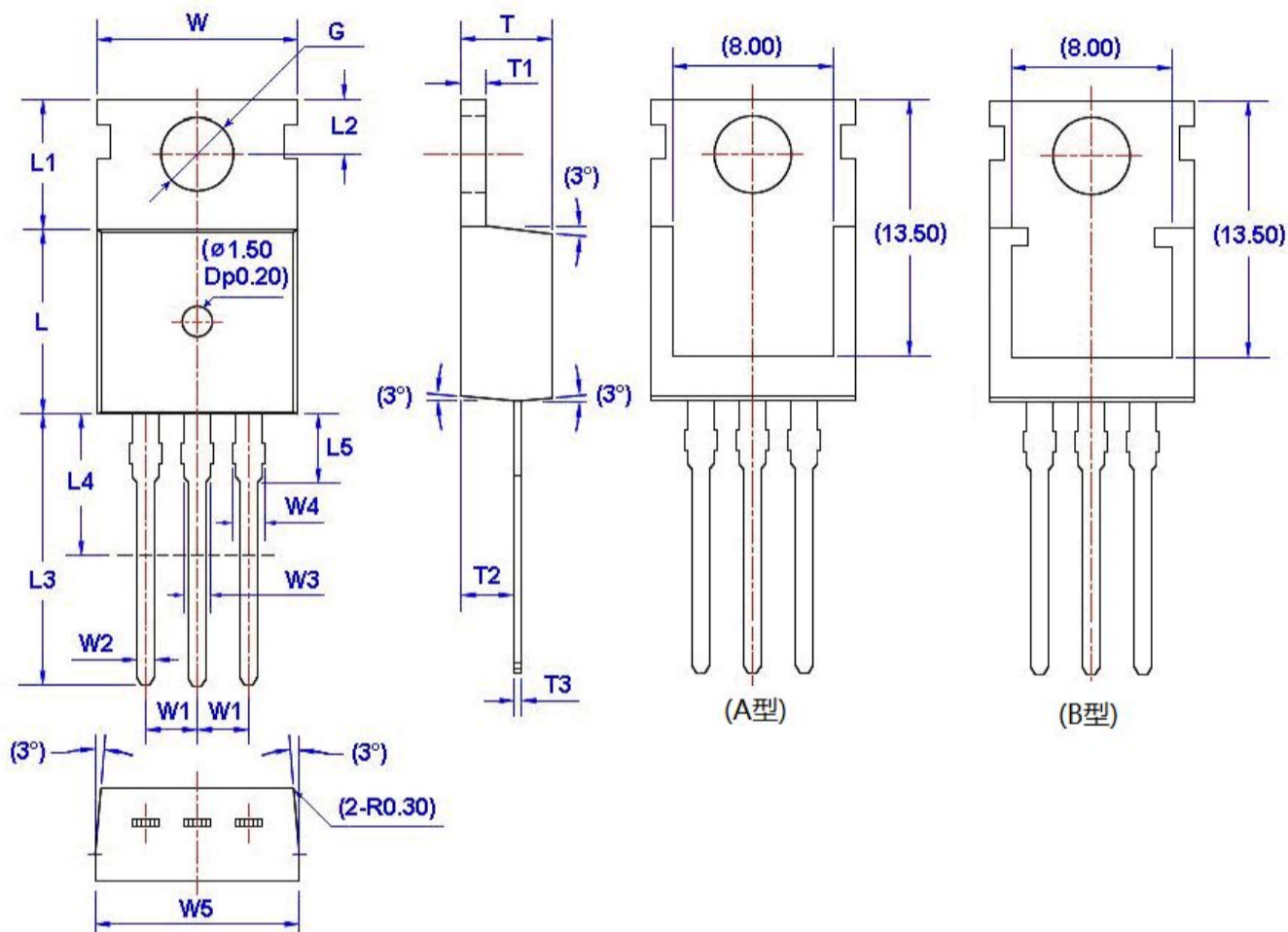
**Figure B: Resistive Switching Test Circuit and Waveform**



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



Package Outline: TO-220



Unit: mm

| Symbol | Size       |       | Symbol | Size  |       | Symbol | Size |      | Symbol | Size |      |
|--------|------------|-------|--------|-------|-------|--------|------|------|--------|------|------|
|        | Min        | Max   |        | Min   | Max   |        | Min  | Max  |        | Min  | Max  |
| W      | 9.66       | 10.28 | W5     | 9.80  | 10.20 | L4**   | 6.20 | 6.60 | T3     | 0.45 | 0.60 |
| W1     | 2.54 (TYP) |       | L      | 9.00  | 9.40  | L5     | 2.79 | 3.30 | G(Φ)   | 3.50 | 3.70 |
| W2     | 0.70       | 0.95  | L1     | 6.40  | 6.80  | T      | 4.30 | 4.70 |        |      |      |
| W3     | 1.17       | 1.37  | L2     | 2.70  | 2.90  | T1     | 1.15 | 1.40 |        |      |      |
| W4*    | 1.32       | 1.72  | L3     | 12.70 | 14.27 | T2     | 2.20 | 2.60 |        |      |      |