

## PRODUCT CHARACTERISTICS

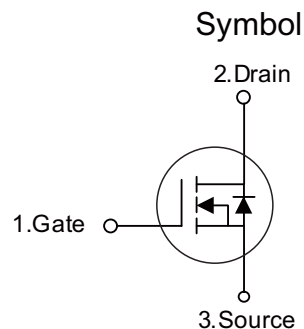
|                                   |               |
|-----------------------------------|---------------|
| VDSS                              | 650V          |
| $R_{DS(on)}$ Typ(@ $V_{GS}=10V$ ) | 0.23 $\Omega$ |
| Qg@type                           | 19nC          |
| ID                                | 15A           |

## FEATURES

- Ultra low  $R_{DS(on)}$
- Ultra low gate charge (typ.  $Q_g = 19nC$ )
- 100% UIS tested
- RoHS compliant

## APPLICATIONS

- Power factor correction
- Switched mode power supplies
- Uninterruptible power supply



## ORDER INFORMATION

| Order codes  |            | Package | Packing        |
|--------------|------------|---------|----------------|
| Halogen-Free | Halogen    |         |                |
| N/A          | MOT65R280F | TO-220F | 50 pieces/Tube |
| N/A          | MOT65R280A | TO-220  | 50 pieces/Tube |

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                        | Symbol         | Value    | Unit       |
|------------------------------------------------------------------|----------------|----------|------------|
| Drain-Source Voltage ( $V_{GS} = 0V$ )                           | $V_{DSS}$      | 650      | V          |
| Continuous Drain Current                                         | $I_D$          | 15       | A          |
| Pulsed Drain Current                                             | $I_{DM}$       | 45       | A          |
| Gate-Source Voltage                                              | $V_{GSS}$      | $\pm 30$ | V          |
| Single Pulse Avalanche Energy                                    | $E_{AS}$       | 290      | mJ         |
| Avalanche Current                                                | $I_{AS}$       | 2.4      | A          |
| 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       |
| Power Dissipation ( $T_C = 25^\circ C$ )                         | TO-220F        | 32       | W          |
|                                                                  | TO-220         | 104      |            |
| Operating Junction and Storage Temperature Range                 | $T_J, T_{stg}$ | -55~+150 | $^\circ C$ |

## THERMAL CHARACTERISTICS

| Parameter                               | Symbol  | Value           | Unit |
|-----------------------------------------|---------|-----------------|------|
| Thermal Resistance, Junction-to-Case    | TO-220  | $R_{\theta JC}$ | 1.2  |
|                                         | TO-220F | $R_{\theta JC}$ | 3.9  |
| Thermal Resistance, Junction-to-Ambient | TO-220  | $R_{\theta JA}$ | 80   |
|                                         | TO-220F | $R_{\theta JA}$ | 62   |

## ■ ELECTRICAL CHARACTERISTICS

| Parameter                               | Symbol               | Test conditions                                                                           | Min. | Typ. | Max. | Unit |
|-----------------------------------------|----------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| Drain-Source Breakdown Voltage          | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                              | 650  | --   | --   | V    |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>     | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C                       | --   | --   | 1    | μA   |
|                                         |                      | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C                      | --   | --   | 100  |      |
| Gate-Source Leakage                     | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30V                                                                    | --   | --   | ±100 | nA   |
| Gate-Source Threshold Voltage           | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                | 2.5  | --   | 4.0  | V    |
| Drain-Source On-Resistance (Note3)      | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 7.5A                                              | --   | 0.23 | 0.28 | Ω    |
| Forward Transconductance (Note3)        | g <sub>fs</sub>      | V <sub>DS</sub> = 10V, I <sub>D</sub> = 7.5A                                              | --   | 10   | --   | S    |
| Dynamic                                 |                      |                                                                                           |      |      |      |      |
| Input Capacitance                       | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 50V,<br>f = 1.0MHz                             | --   | 1250 | --   | pF   |
| Output Capacitance                      | C <sub>oss</sub>     |                                                                                           | --   | 81   | --   |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>     |                                                                                           | --   | 7.1  | --   |      |
| Total Gate Charge                       | Q <sub>g</sub>       | V <sub>DD</sub> = 520V, I <sub>D</sub> = 15A,<br>V <sub>GS</sub> = 10V                    | --   | 30   | --   | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>      |                                                                                           | --   | 9    | --   |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>      |                                                                                           | --   | 10   | --   |      |
| Turn-on Delay Time                      | t <sub>d(on)</sub>   | V <sub>DD</sub> = 400V, I <sub>D</sub> = 15A,<br>R <sub>G</sub> = 25Ω                     | --   | 42   | --   | ns   |
| Turn-on Rise Time                       | t <sub>r</sub>       |                                                                                           | --   | 17   | --   |      |
| Turn-off Delay Time                     | t <sub>d(off)</sub>  |                                                                                           | --   | 135  | --   |      |
| Turn-off Fall Time                      | t <sub>f</sub>       |                                                                                           | --   | 6    | --   |      |
| Drain-Source Body Diode Characteristics |                      |                                                                                           |      |      |      |      |
| Continuous Body Diode Current           | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                                     | --   | --   | 15   | A    |
| Pulsed Diode Forward Current            | I <sub>SM</sub>      |                                                                                           | --   | --   | 45   |      |
| Body Diode Voltage                      | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 15A, V <sub>GS</sub> = 0V                        | --   | 0.9  | 1.2  | V    |
| Reverse Recovery Time                   | t <sub>rr</sub>      | V <sub>R</sub> = 480V, I <sub>F</sub> = I <sub>S</sub> ,<br>di <sub>F</sub> /dt = 100A/μs | --   | 335  | --   | ns   |
| Reverse Recovery Charge                 | Q <sub>rr</sub>      |                                                                                           | --   | 3.4  | --   | μC   |
| Peak Reverse Recovery Current           | I <sub>rrm</sub>     |                                                                                           | --   | 20   | --   | A    |

### Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2.  $I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

■ ELECTRICAL CHARACTERISTICS

Figure 1. Output Characteristics

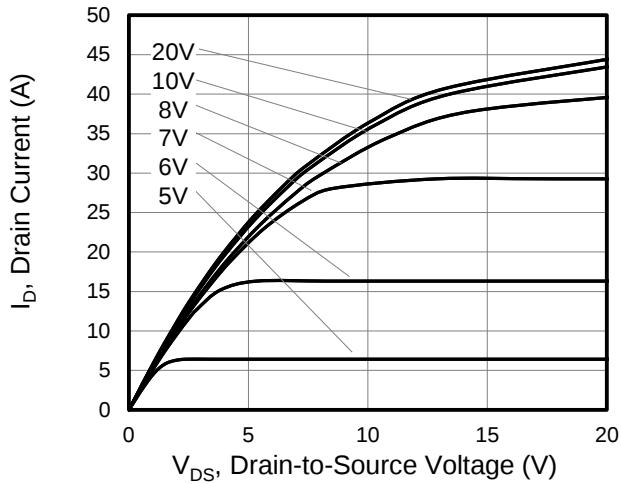


Figure 2. Transfer Characteristics

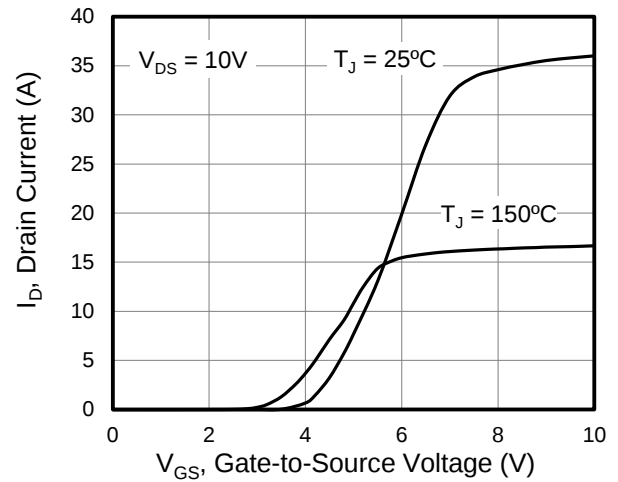


Figure 3. On-Resistance vs. Drain Current

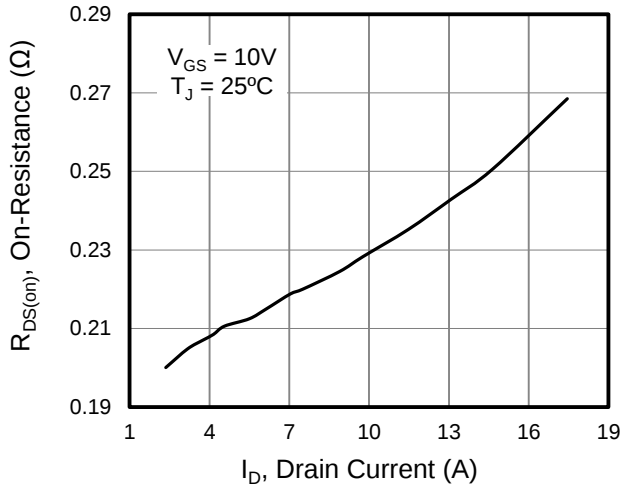


Figure 4. Capacitance

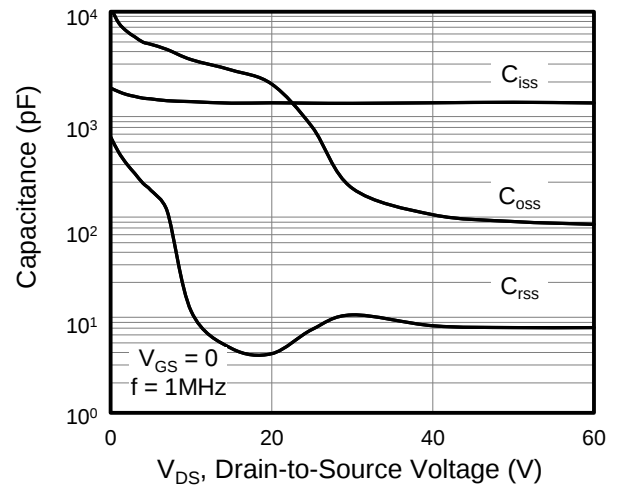


Figure 5. Gate Charge

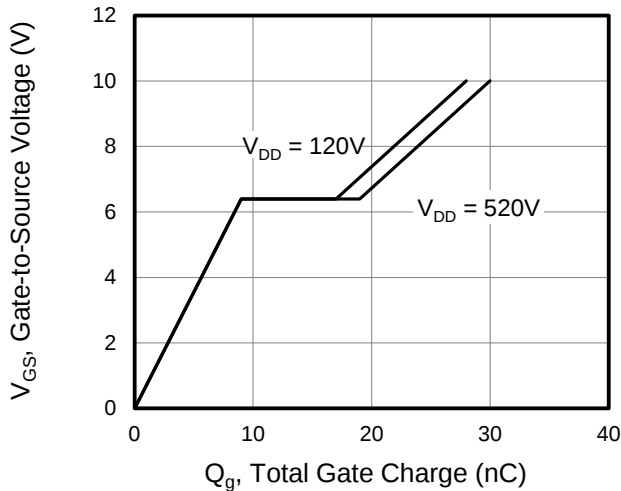
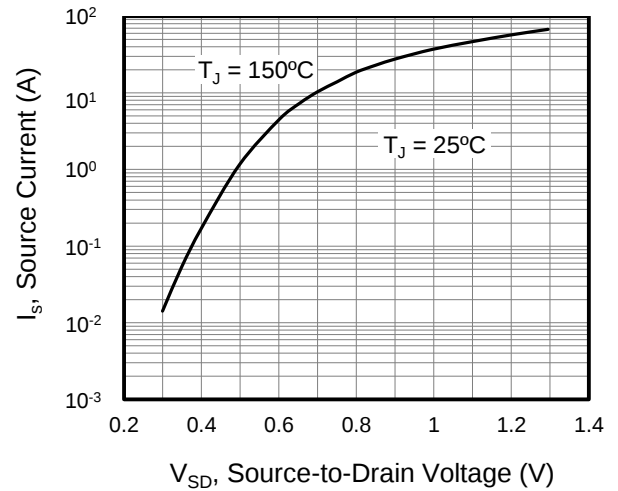


Figure 6. Body Diode Forward Voltage



■ ELECTRICAL CHARACTERISTICS(Cont.)

Figure 7. On-Resistance vs. Junction Temperature

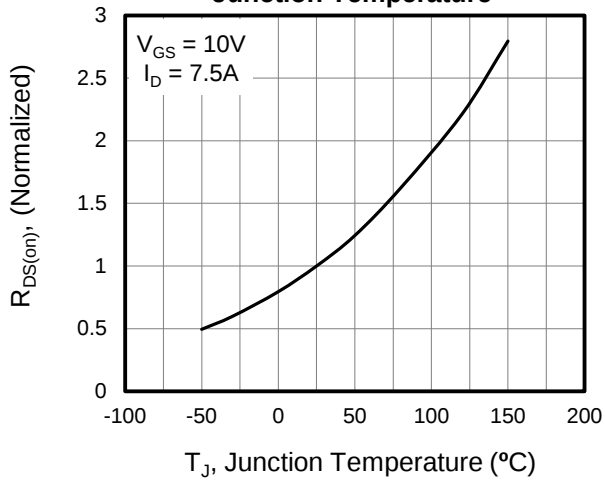


Figure 8. Threshold Voltage vs. Junction Temperature

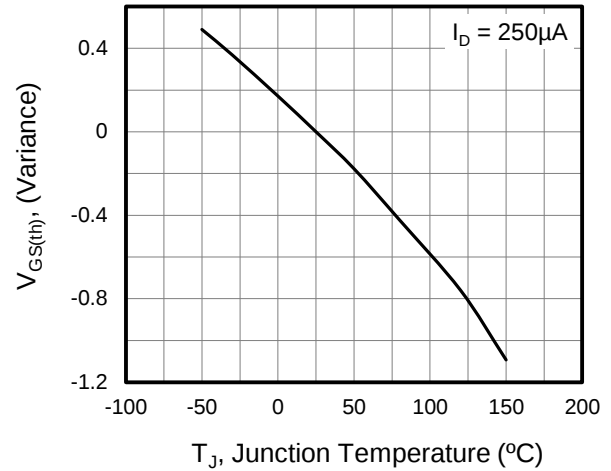


Figure 9. Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

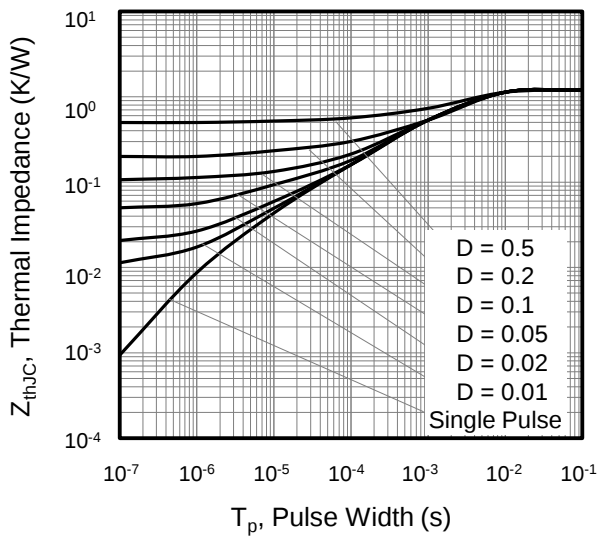


Figure 10. Transient Thermal Impedance TO-220F

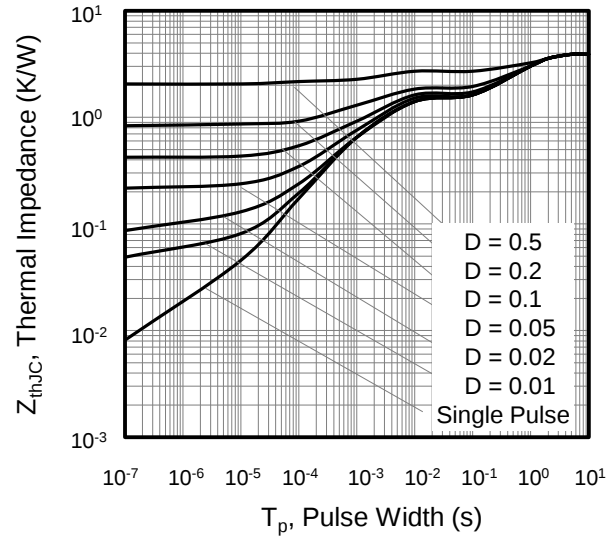


Figure 11. Safe operation area for TO-220,TO-251,TO-252,TO-262,TO-263

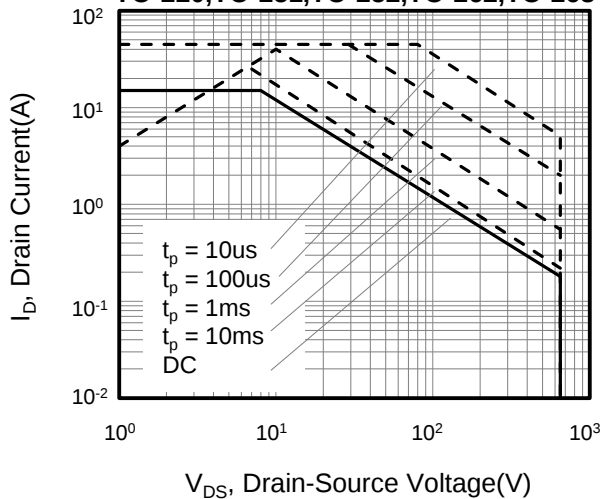
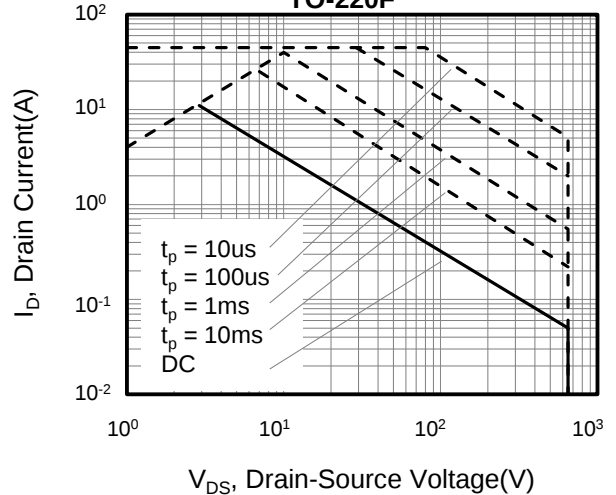


Figure 12. Safe operation area for TO-220F



■ GATE CHARGE TEST CIRCUIT WAVEFORM

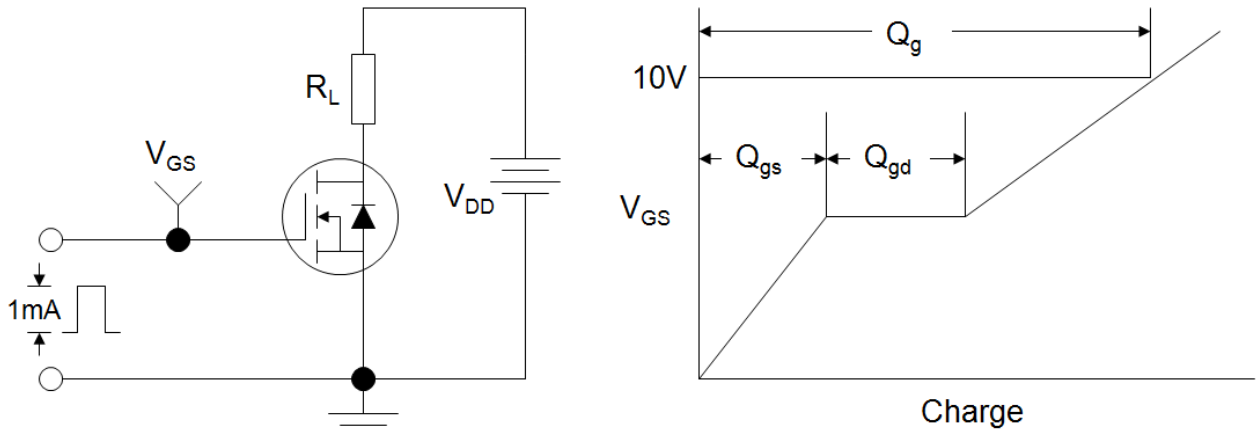


Figure B: Resistive Switching Test Circuit and Waveform

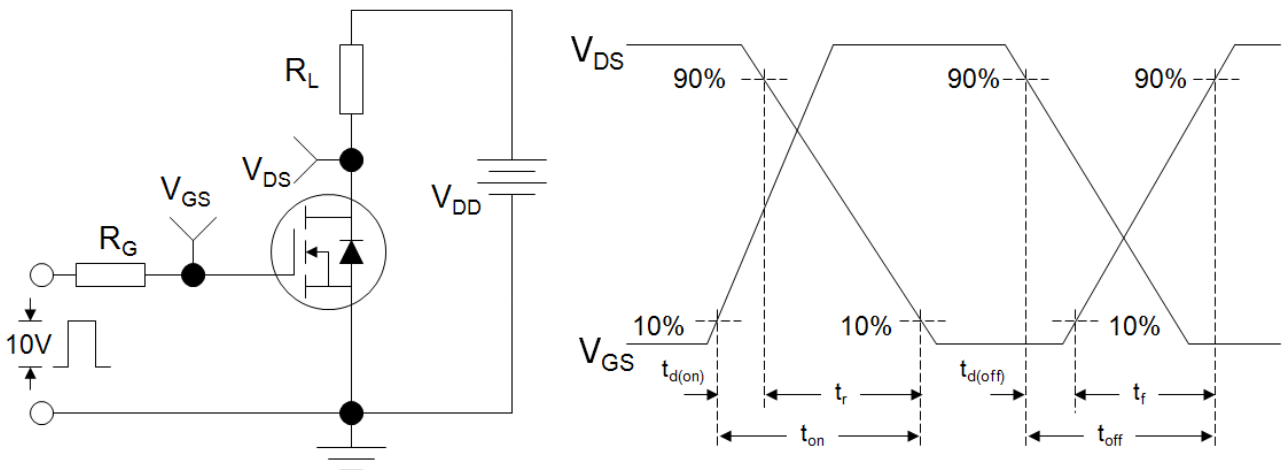
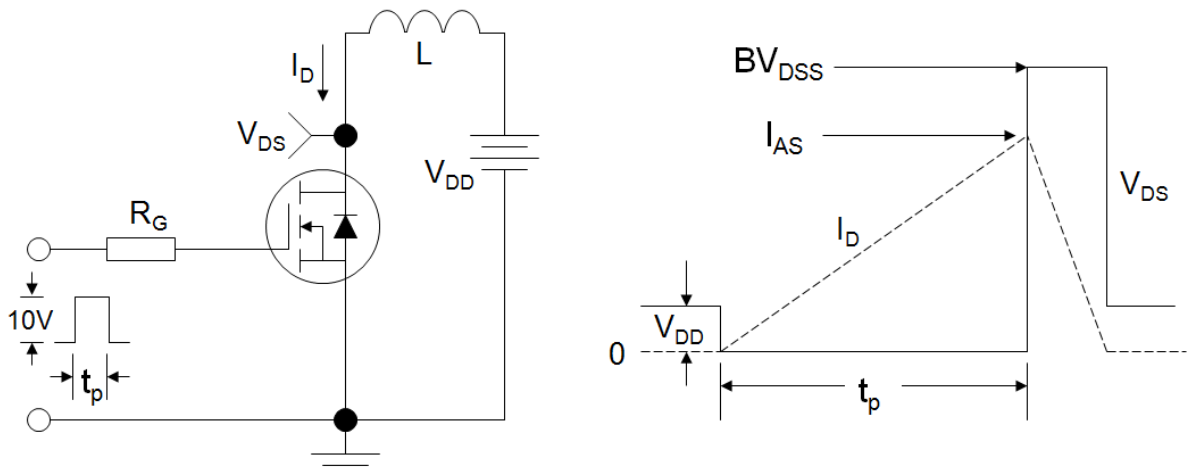
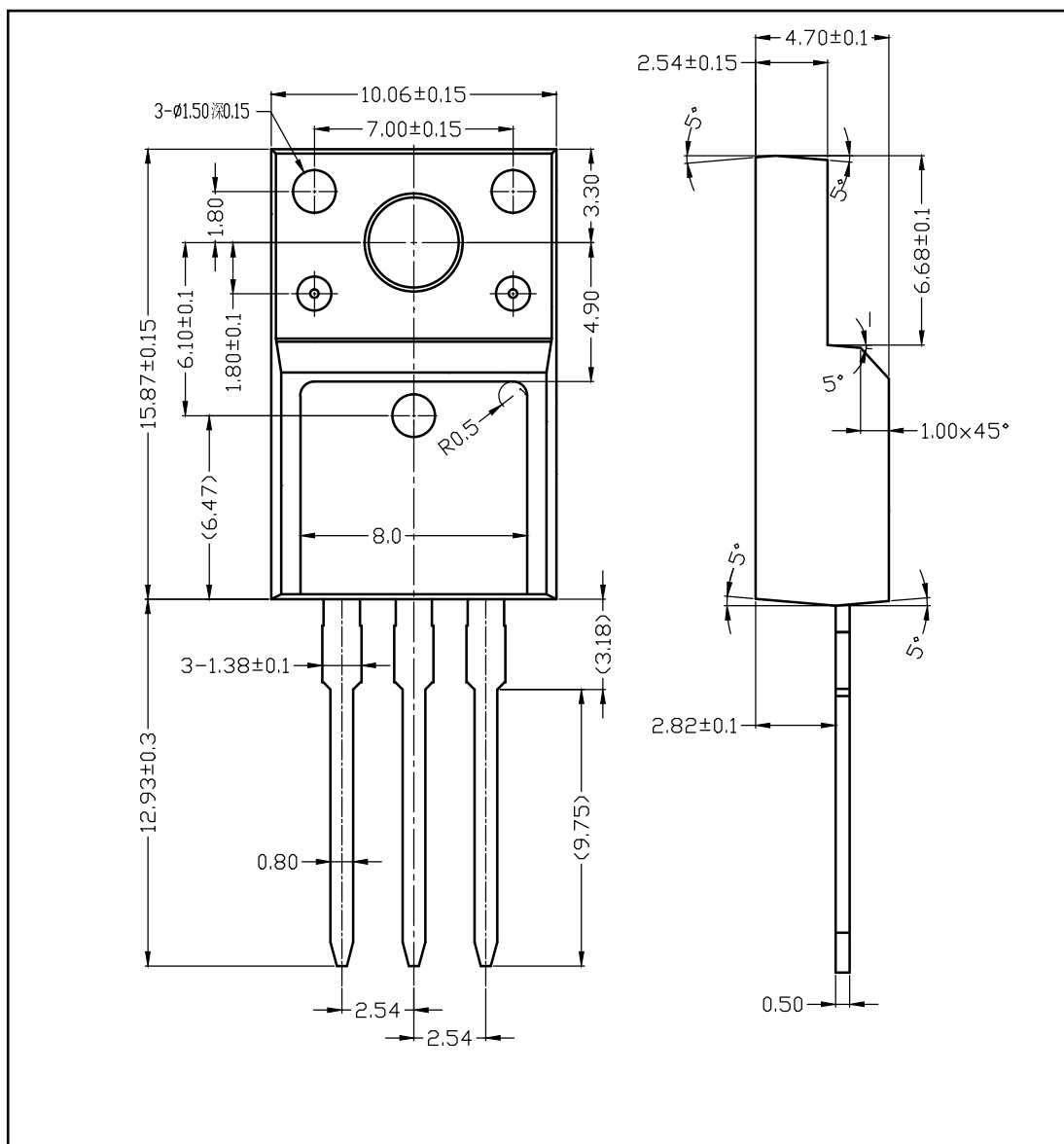


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

