

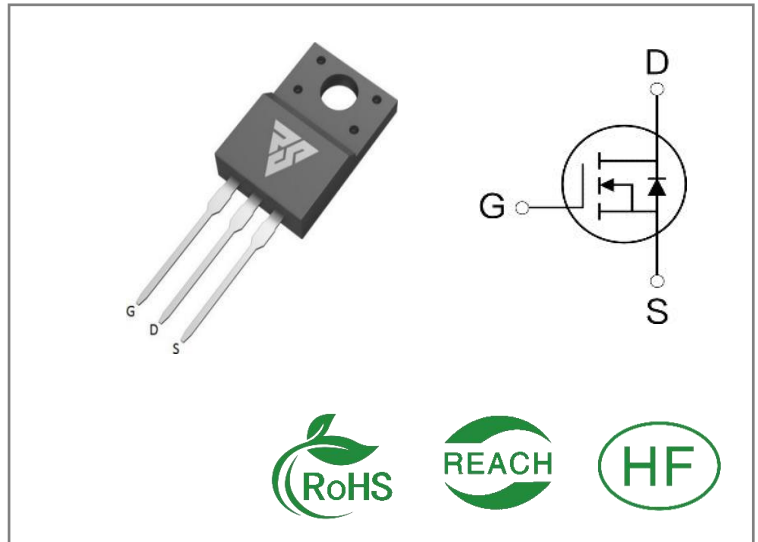
| ID | $R_{DS(ON)}$ (Typ) | VDSS |
|----|--------------------|------|
| 5A | 750m $\Omega$      | 650V |

**Applications:**

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

**Features:**

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


**Ordering Information**

| Part Number | Package | Marking  | Packing | Qty.   |
|-------------|---------|----------|---------|--------|
| RSU5N65F    | T0-220F | RSU5N65F | Tube    | 50 PCS |

**Absolute Maximum Ratings**  $T_c = 25^\circ\text{C}$  unless otherwise specified

| Symbol      | Parameter                                                                                                       | RSU5N65F   | Units            |
|-------------|-----------------------------------------------------------------------------------------------------------------|------------|------------------|
| VDSS        | Drain-to-Source Voltage                                                                                         | 650        | V                |
| ID          | Continuous Drain Current $T_C = 25^\circ\text{C}$                                                               | 5          | A                |
| ID          | Continuous Drain Current $T_C = 100^\circ\text{C}$                                                              | 3          |                  |
| IDM         | Pulsed Drain Current (Note*1)                                                                                   | 20         |                  |
| PD          | Power Dissipation                                                                                               | 29         | W                |
| VGS         | Gate- to- Source Voltage                                                                                        | $\pm 30$   | V                |
| EAS         | Single Pulse Avalanche Energy<br>$L = 10\text{mH}, V_{DS} = 50\text{V}, R_G = 25\Omega, T_C = 25^\circ\text{C}$ | 52         | mJ               |
| dv/dt       | MOSFET dv/ dt ruggedness $V_{DS} = 0 \dots 400\text{V}$                                                         | 50         | V/ns             |
| dv/dt       | Reverse diode dv/dt $V_{DS} = 0 \dots 400\text{V}, T_j = 25^\circ\text{C}, I_{SD} \leq I_D$                     | 15         | V/ns             |
| TL TPKG     | Maximum Temperature for Soldering                                                                               | 300<br>260 | $^\circ\text{C}$ |
|             | Leads at 0.063in(1.6mm)from Case for 10 seconds                                                                 |            |                  |
|             | Package Body for 10 seconds                                                                                     |            |                  |
| TJ and TSTG | Operating Junction and Storage Temperature Range                                                                | -55 to 150 |                  |

\* Drain Current Limited by Maximum Junction Temperature

Caution: Stresses greater than those listed in the " Absolute Maximum Ratings" Table may cause permanent damage to the device.

### Thermal Resistance

| Symbol        | Parameter           | RSU5N65F | Units                         | Test Conditions                                                                                                         |
|---------------|---------------------|----------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| R $\theta$ JC | Junction-to-Case    | 4.3      | $^{\circ}\text{C} / \text{W}$ | Drain lead soldered to water cooled heatsink, PD adjusted for a peak junction temperature of + 1 5 0 $^{\circ}\text{C}$ |
| R $\theta$ JA | Junction-to-Ambient | 80       |                               | 1 cubic foot chamber, free air.                                                                                         |

### OFF Characteristics $T_J = 25^{\circ}\text{C}$ unless otherwise specified

| Symbol | Parameter                           | Min. | Typ. | Max. | Units         | Test Conditions                        |
|--------|-------------------------------------|------|------|------|---------------|----------------------------------------|
| BVDSS  | Drain- to- source Breakdown Voltage | 650  | --   | --   | V             | $V_{GS}=0\text{V}, I_D=250\mu\text{A}$ |
| IDSS   | Drain- to- Source Leakage Current   | --   | --   | 1    | $\mu\text{A}$ | $V_{DS}=650\text{V}, V_{GS}=0\text{V}$ |
| IGSS   | Gate- to- Source Forward Leakage    | --   | --   | 100  | nA            | $V_{GS}=30\text{V}, V_{DS}=0\text{V}$  |
|        | Gate- to- Source Reverse Leakage    | --   | --   | -100 |               | $V_{GS}=-30\text{V}, V_{DS}=0\text{V}$ |

### ON Characteristics $T_J = 25^{\circ}\text{C}$ unless otherwise specified

| Symbol  | Parameter                                      | Min. | Typ. | Max. | Units      | Test Conditions                      |
|---------|------------------------------------------------|------|------|------|------------|--------------------------------------|
| RDS(on) | Static Drain- to- Source On-Resistance(Note*2) | --   | 750  | 900  | m $\Omega$ | $V_{GS}=10\text{V}, I_D=2.5\text{A}$ |
| VGS(TH) | Gate Threshold Voltage                         | 2.5  | --   | 4    | V          | $V_{GS}=V_{DS}, I_D=250\mu\text{A}$  |

### Resistive Switching Characteristics Essentially independent of operating temperature

| Symbol  | Parameter            | Min. | Typ. | Max. | Units | Test Conditions                                            |
|---------|----------------------|------|------|------|-------|------------------------------------------------------------|
| td(ON)  | Turn- on Delay Time  | --   | 7    | --   | nS    | $V_{DS}=400\text{V}$<br>$I_D=2.5\text{A}$<br>$R_G=5\Omega$ |
| trise   | Rise Time            | --   | 3    | --   |       |                                                            |
| td(OFF) | Turn- OFF Delay Time | --   | 52   | --   |       |                                                            |
| tfall   | Fall Time            | --   | 10   | --   |       |                                                            |

**Dynamic Characteristics** Essentially independent of operating temperature

| Symbol | Parameter                       | Min. | Typ. | Max. | Units | Test Conditions              |
|--------|---------------------------------|------|------|------|-------|------------------------------|
| Ciss   | Input Capacitance               | --   | 370  | --   | pF    | VGS=0V<br>VDS=50V<br>f=1MHz  |
| Coss   | Output Capacitance              | --   | 25   | --   |       |                              |
| Crss   | Reverse Transfer Capacitance    | --   | 0.5  | --   |       |                              |
| Qg     | Total Gate Charge               | --   | 10.5 | --   | nC    | VDS=480V<br>ID=5A<br>VGS=10V |
| Qgs    | Gate- to- Source Charge         | --   | 2.6  | --   |       |                              |
| Qgd    | Gate-to-Drain(" Miller") Charge | --   | 5.3  | --   |       |                              |

**Source- Drain Diode Characteristics**

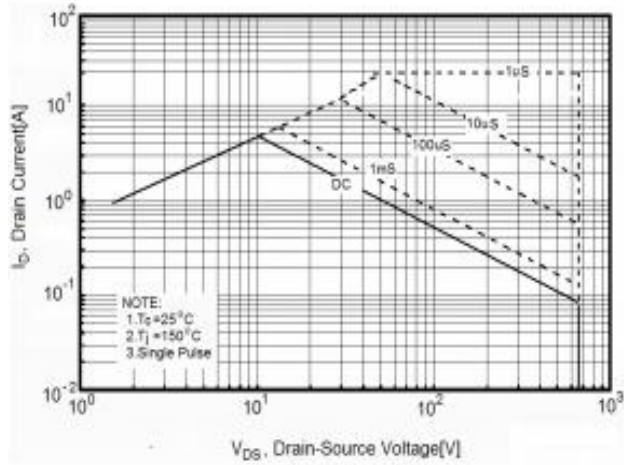
| Symbol | Parameter                 | Min. | Typ. | Max. | Units | Test Conditions                     |
|--------|---------------------------|------|------|------|-------|-------------------------------------|
| IS     | Continuous Source Current | --   | --   | 5    | A     | Integral pn- diode<br>in MOSFET     |
| ISM    | Maximum Pulsed Current    | --   | --   | 20   | A     |                                     |
| VSD    | Diode Forward Voltage     | --   | 0.9  | 1.2  | V     | IS=2A,VGS=0V                        |
| trr    | Reverse Recovery Time     | --   | 210  | --   | nS    | VR=50V<br>IS=2.5A,di/dt=10<br>0A/μs |
| Qrr    | Reverse Recovery Charge   | --   | 0.66 | --   | μC    |                                     |

**Notes:**

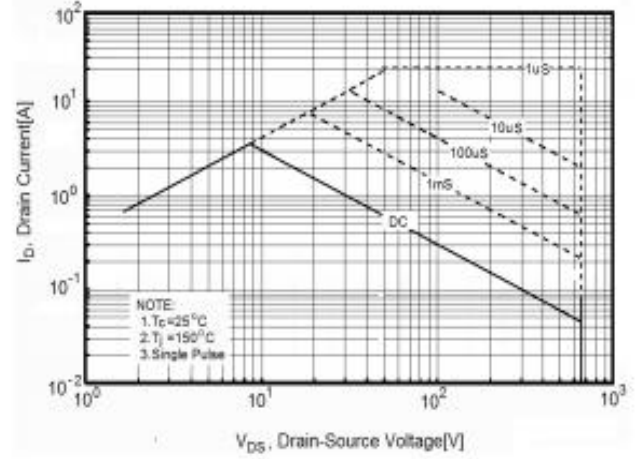
- \* 1. Repetitive rating, pulse width limited by maximum junction temperature.
- \* 2. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

## Typical Feature Curve

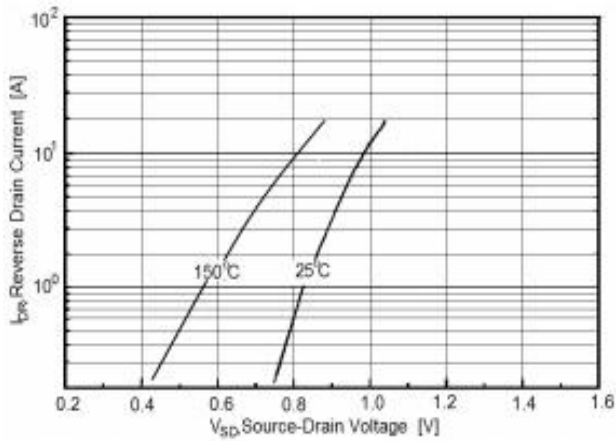
**Figure1. Safe operating area for TO-220, TO-263**



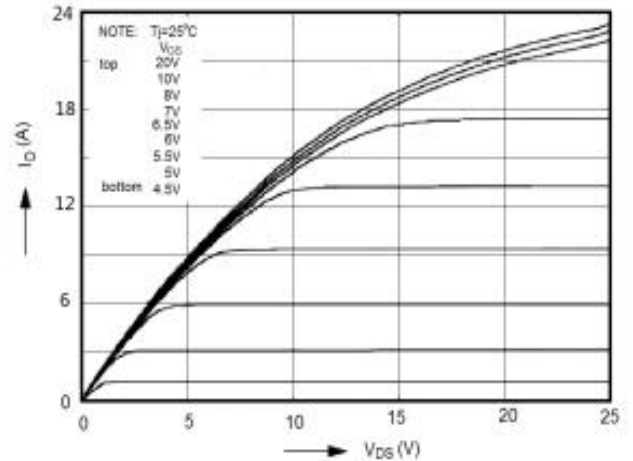
**Figure2. Safe operating area for TO-220F**



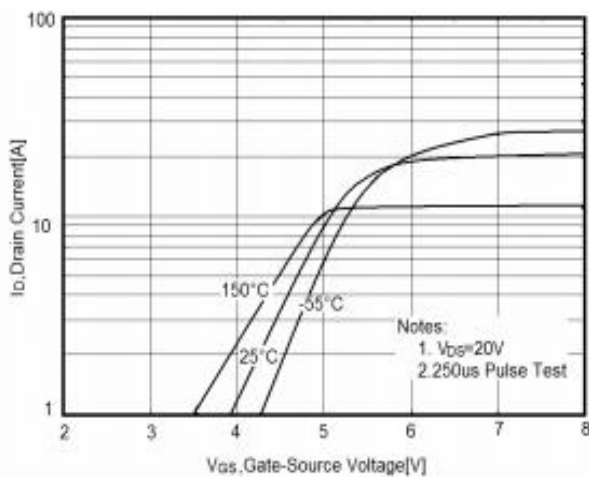
**Figure3. Source-Drain Diode Forward Voltage**



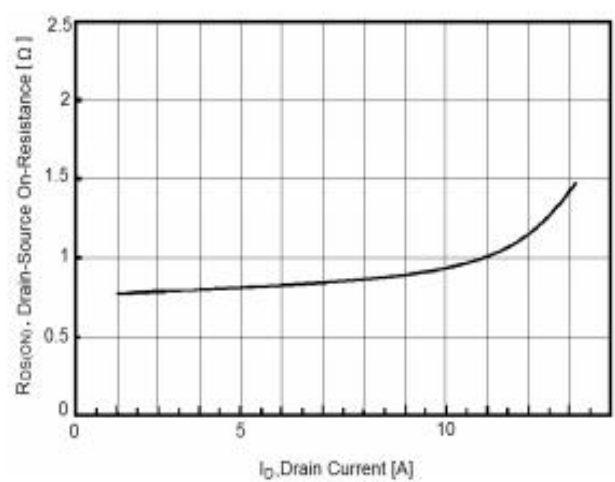
**Figure4. Output characteristics**



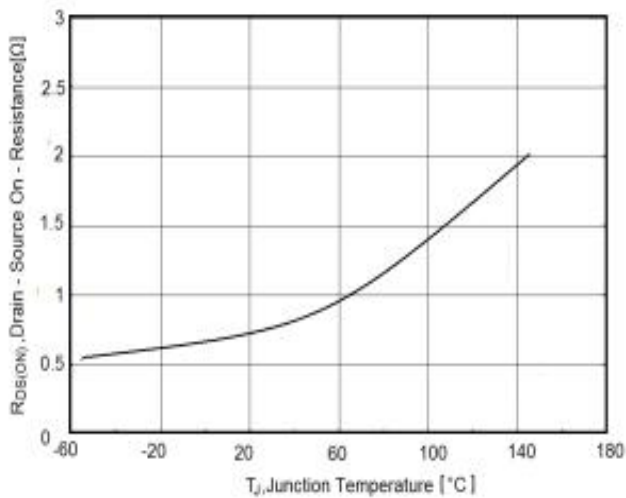
**Figure5. Transfer characteristics**



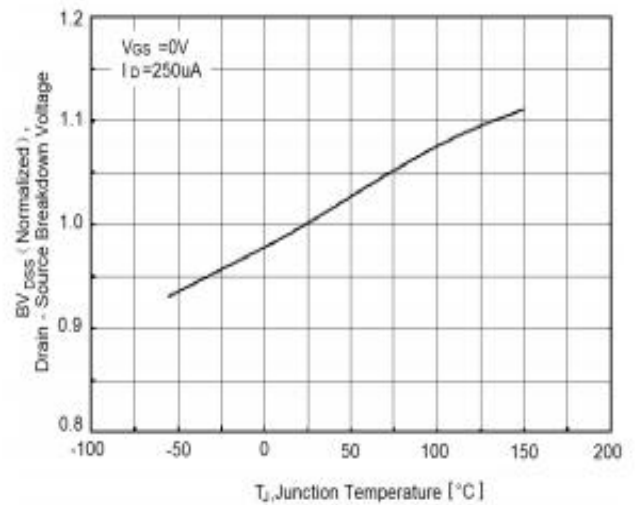
**Figure6. Static drain-source on resistance**



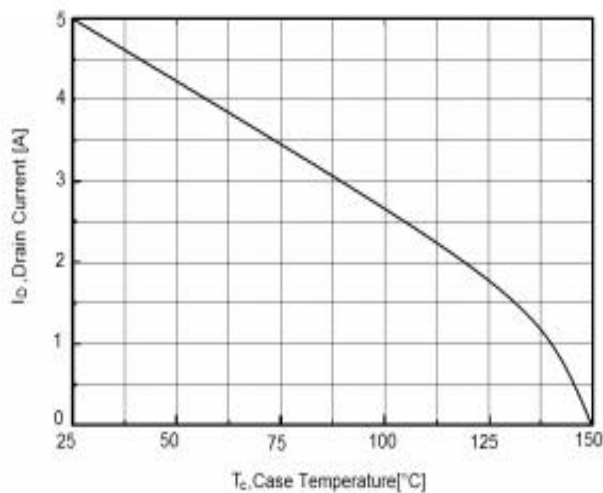
**Figure7.  $R_{DS(ON)}$  vs Junction Temperature**



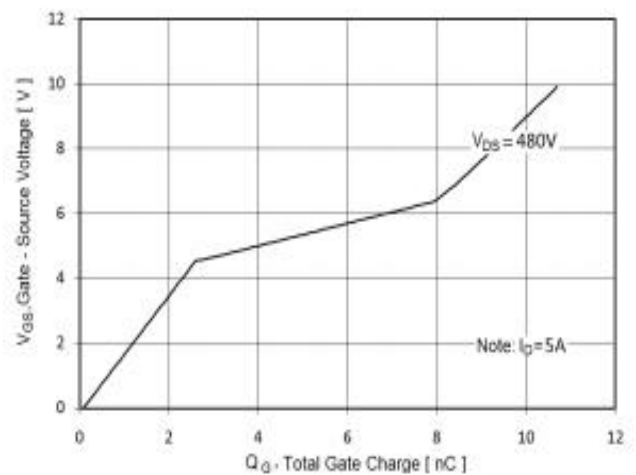
**Figure8.  $BV_{DSS}$  vs Junction Temperature**



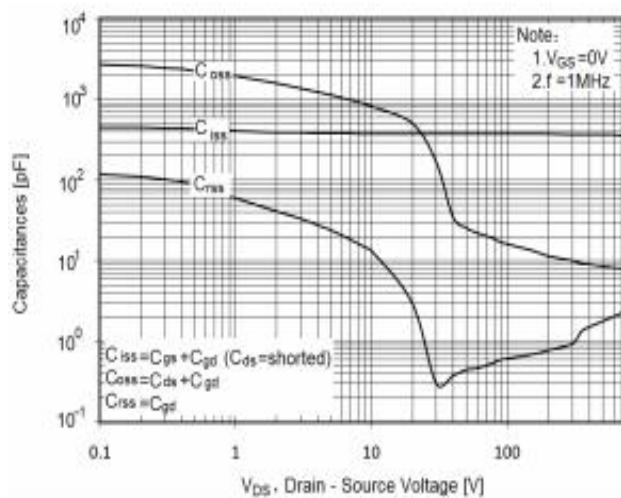
**Figure9. Maximum  $I_D$  vs Junction Temperature**



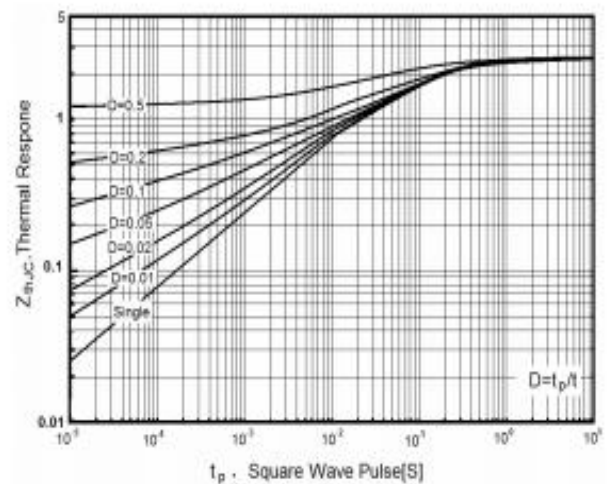
**Figure10. Gate charge waveforms**



**Figure11. Capacitance**

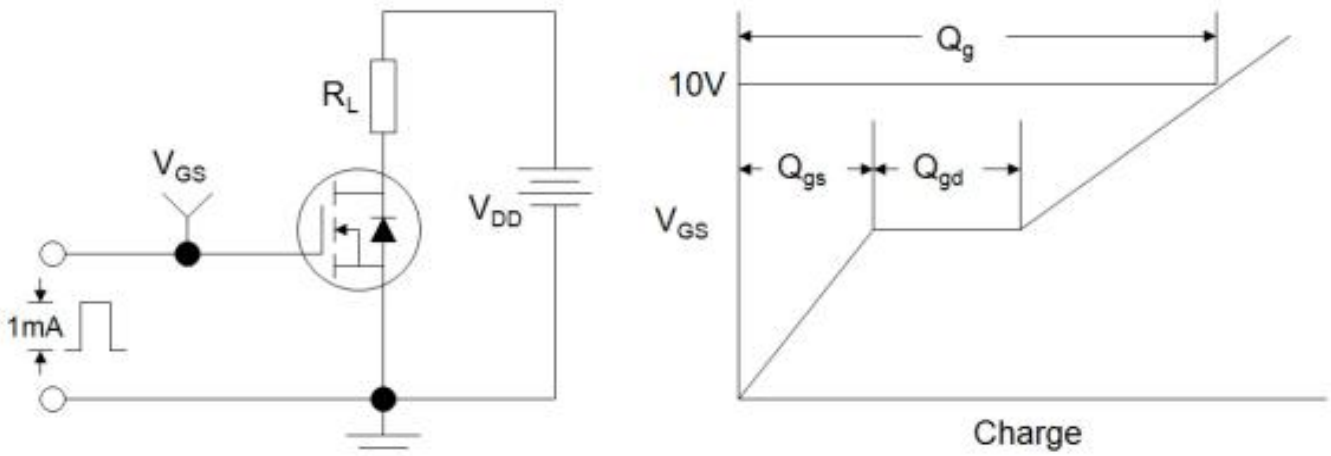


**Figure12. Transient Thermal Impedance**

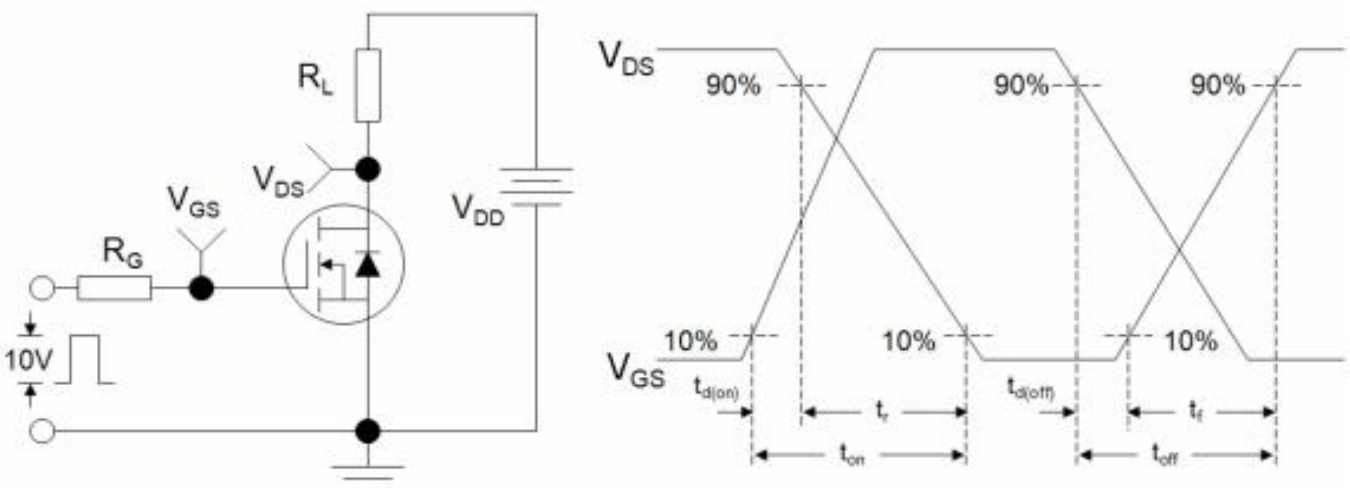


## Test Circuits and Waveforms

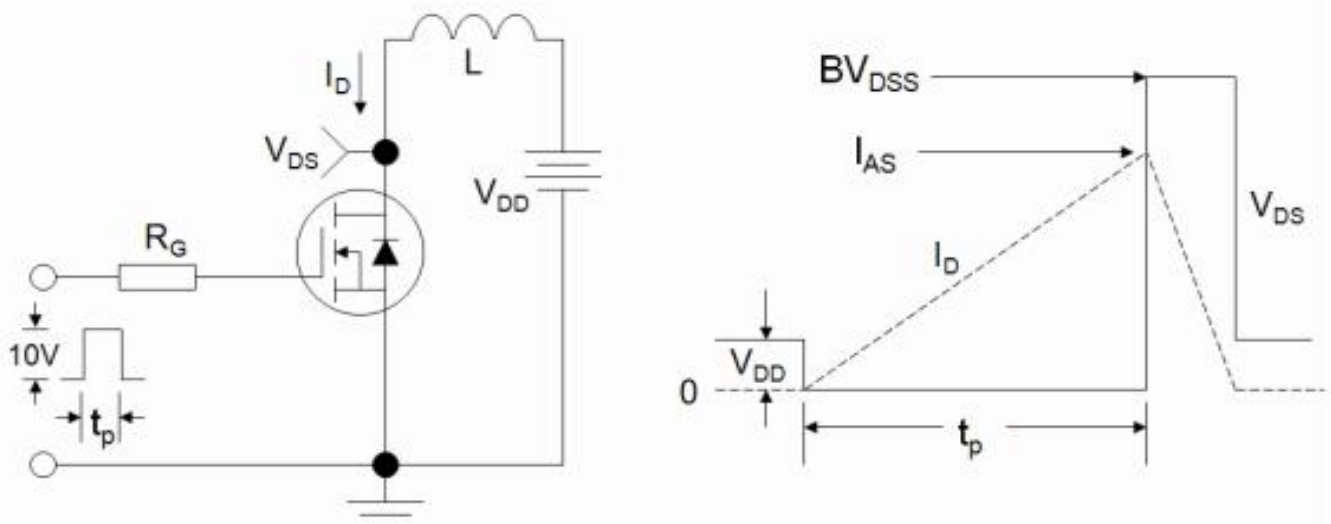
**Figure A: Gate Charge Test Circuit and Waveform**



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

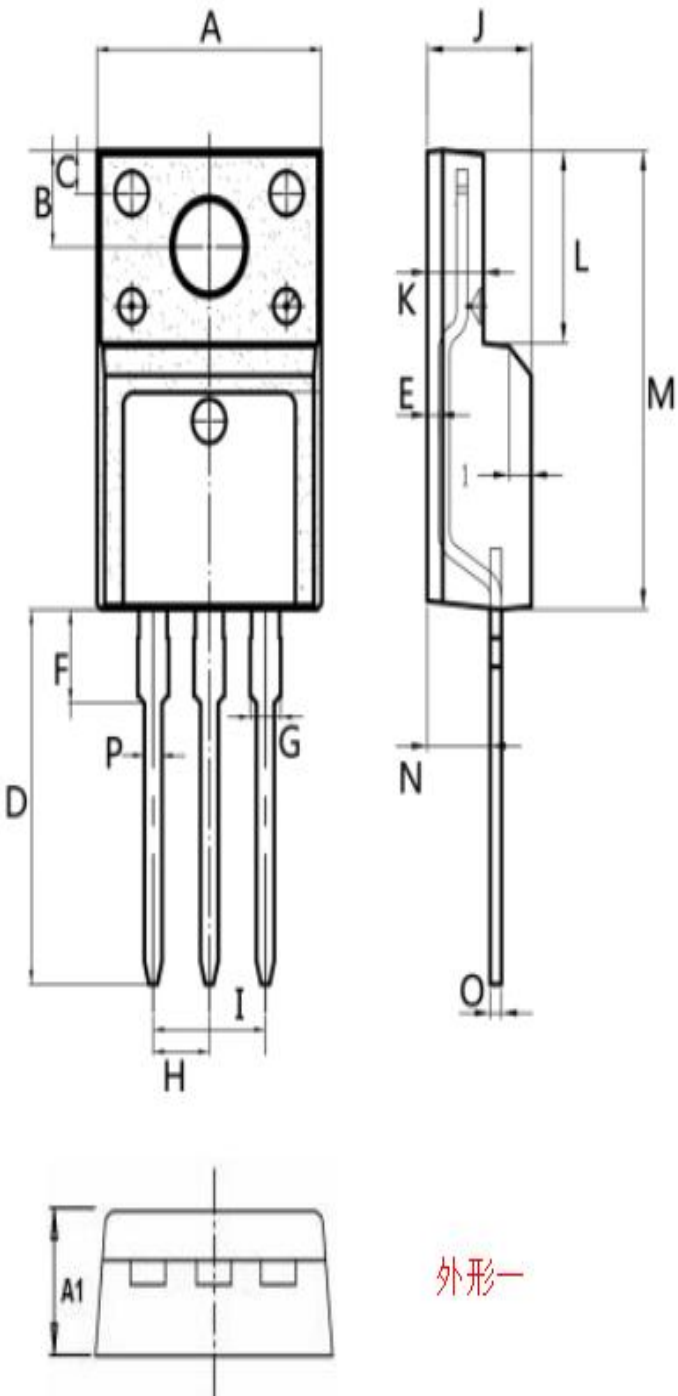


**Figure C: Unclamped Inductive Switching Test Circuit and Waveform**





**Package outline drawing(TO-220F Unit: mm )**

|                                                                                    |                              |        |       |
|------------------------------------------------------------------------------------|------------------------------|--------|-------|
|  | Dim.                         | Min.   | Max.  |
|                                                                                    | A                            | 9.95   | 10.36 |
|                                                                                    | A1                           | 4.5    | 5.0   |
|                                                                                    | B                            | 2.95   | 3.25  |
|                                                                                    | C                            | 1.25   | 1.45  |
|                                                                                    | D                            | 12.60  | 13.60 |
|                                                                                    | E                            | 0.40   | 0.60  |
|                                                                                    | F                            | 2.8    | 3.5   |
|                                                                                    | G                            | 1.30   | 1.45  |
|                                                                                    | H                            | (2.54) |       |
|                                                                                    | I                            | (5.08) |       |
|                                                                                    | J                            | 4.60   | 4.75  |
|                                                                                    | K                            | 2.45   | 2.65  |
|                                                                                    | L                            | 6.5    | 6.8   |
|                                                                                    | M                            | 15.4   | 16.0  |
|                                                                                    | N                            | 2.25   | 3.05  |
|                                                                                    | O                            | 0.45   | 0.55  |
|                                                                                    | P                            | 0.70   | 0.90  |
|                                                                                    | All Dimensions in millimeter |        |       |

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