

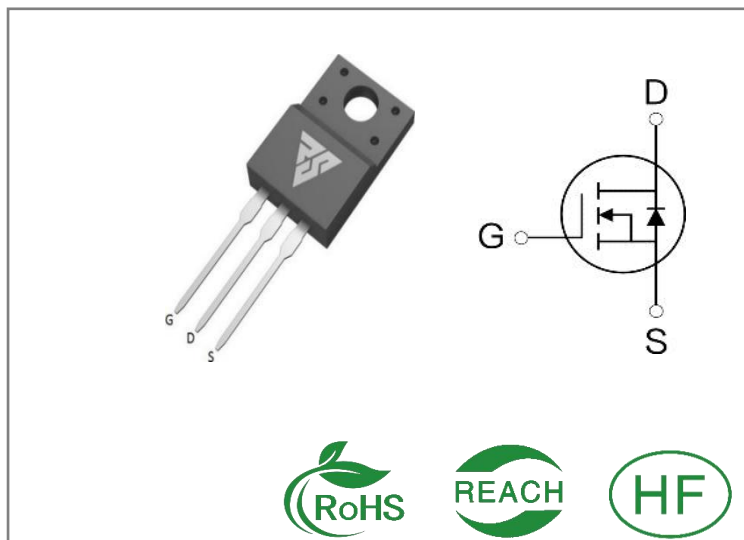
| ID  | $R_{DS(ON)}$ (Typ) | VDSS |
|-----|--------------------|------|
| 38A | 0.09Ω              | 300V |

#### Applications:

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

#### Features:

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



#### Ordering Information

| Part Number | Package | Marking   | Packing | Qty.   |
|-------------|---------|-----------|---------|--------|
| RSF38N30F   | T0-220F | RSF38N30F | Tube    | 50 PCS |

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

| Symbol      | Parameter   | RSF38N30F  | Units            |
|-------------|---|------------|------------------|
| VDSS        | Drain-to-Source Voltage   | 300        | V                |
| ID          | Continuous Drain Current $T_C=25^\circ\text{C}$   | 38         | A                |
| IDM         | Pulsed Drain Current (Note*1)   | 152        |                  |
| PD          | Power Dissipation   | 36         | W                |
| VGS         | Gate- to- Source Voltage  | $\pm 30$   | V                |
| EAS         | Single Pulse Avalanche Energy<br>$L = 10\text{mH}$ , $V_{DD} = 50\text{V}$ , $R_G = 25\ \Omega$ | 353        | mJ               |
| TL TPKG     | Maximum Temperature for Soldering   | 300        | $^\circ\text{C}$ |
|             | Leads at 0.063in(1.6mm)from Case for 10 seconds<br>Package Body for 10 seconds                  | 260        |                  |
| 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            | RSF38N30F | Units  | Test Conditions   |
|---------------|----------------------|-----------|--------|---|
| R $\theta$ JC | Junction-to-Case     | 3.5       | °C / W | Drain lead soldered to water cooled heatsink, PD adjusted for a peak junction temperature of + 1 5 0 °C |
| R $\theta$ JA | Junction-to- Ambient | 62.5      |        | 1 cubic foot chamber,free air.  |

### OFF Characteristics TJ= 25°C unless otherwise specified

| Symbol | Parameter                           | Min. | Typ. | Max. | Units | Test Conditions   |
|--------|-------------------------------------|------|------|------|-------|-------------------|
| BVDSS  | Drain- to- source Breakdown Voltage | 300  | --   | --   | V     | VGS=0V,ID=250μA   |
| IDSS   | Drain- to- Source Leakage Current   | --   | --   | 1    | μA    | VDS=300V,VGS=0 V  |
| IGSS   | Gate- to- Source Forward Leakage    | --   | --   | 100  | nA    | VGS=30V ,VDS=0V   |
|        | Gate- to- Source Reverse Leakage    | --   | --   | -100 |       | VGS=-30V ,VDS=0 V |

### ON Characteristics TJ=25°C unless otherwise specified

| Symbol  | Parameter                                      | Min. | Typ. | Max. | Units | Test Conditions  |
|---------|--|------|------|------|-------|------------------|
| RDS(on) | Static Drain- to- Source On-Resistance(Note*2) | --   | 0.09 | 0.11 | Ω     | VGS=10V,ID=19A   |
| VGS(TH) | Gate Threshold Voltage                         | 3    | --   | 5    | V     | VGS=VDS,ID=250μA |

### Resistive Switching Characteristics Essentially independent of operating temperature

| Symbol  | Parameter            | Min. | Typ. | Max. | Units | Test Conditions              |
|---------|----------------------|------|------|------|-------|------------------------------|
| td(ON)  | Turn- on Delay Time  | --   | 63   | --   | nS    | VDS=150V<br>ID=38A<br>RG=25Ω |
| trise   | Rise Time            | --   | 69   | --   |       |                              |
| td(OFF) | Turn- OFF Delay Time | --   | 244  | --   |       |                              |
| tfall   | Fall Time            | --   | 67   | --   |       |                              |

**Dynamic Characteristics** Essentially independent of operating temperature

| Symbol | Parameter                       | Min. | Typ. | Max. | Units | Test Conditions               |
|--------|---------------------------------|------|------|------|-------|-------------------------------|
| Ciss   | Input Capacitance               | --   | 2794 | --   | pF    | VGS=0V<br>VDS=25V<br>f=1.0MHz |
| Coss   | Output Capacitance              | --   | 360  | --   |       |                               |
| Crss   | Reverse Transfer Capacitance    | --   | 38   | --   |       |                               |
| Qg     | Total Gate Charge               | --   | 72   | --   | nC    | VDS=240V<br>ID=38A<br>VGS=10V |
| Qgs    | Gate- to- Source Charge         | --   | 13   | --   |       |                               |
| Qgd    | Gate-to-Drain(" Miller") Charge | --   | 37   | --   |       |                               |

**Source- Drain Diode Characteristics**

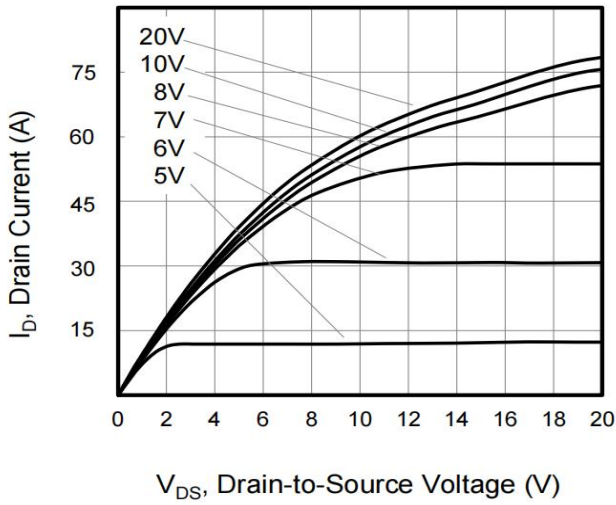
| Symbol | Parameter                 | Min. | Typ. | Max. | Units | Test Conditions                    |
|--------|---------------------------|------|------|------|-------|------------------------------------|
| IS     | Continuous Source Current | --   | --   | 38   | A     | Integral pn- diode<br>in MOSFET    |
| ISM    | Maximum Pulsed Current    | --   | --   | 152  | A     |                                    |
| VSD    | Diode Forward Voltage     | --   | --   | 1.4  | V     | IS=19A,VGS=0V                      |
| trr    | Reverse Recovery Time     | --   | 80   | --   | nS    | VGS=0V<br>IS=19A,di/dt=100A<br>/μs |
| Qrr    | Reverse Recovery Charge   | --   | 0.29 | --   | μC    |                                    |

**Notes:**

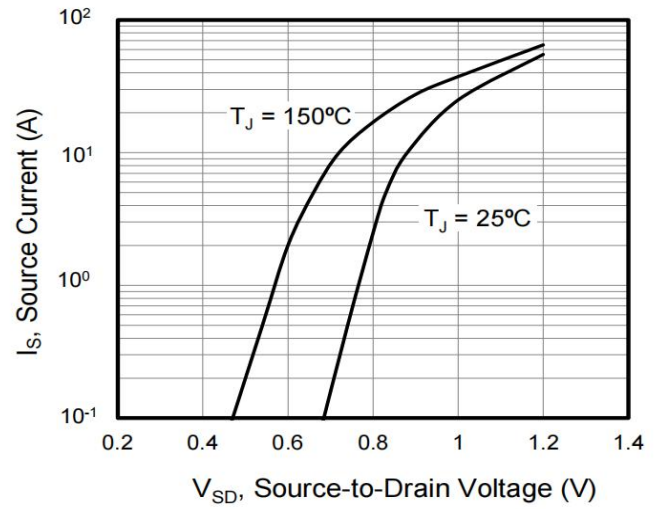
- \* 1. Repetitive rating, pulse width limited by maximum junction temperature.
- \* 2. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

**Typical Feature Curve**

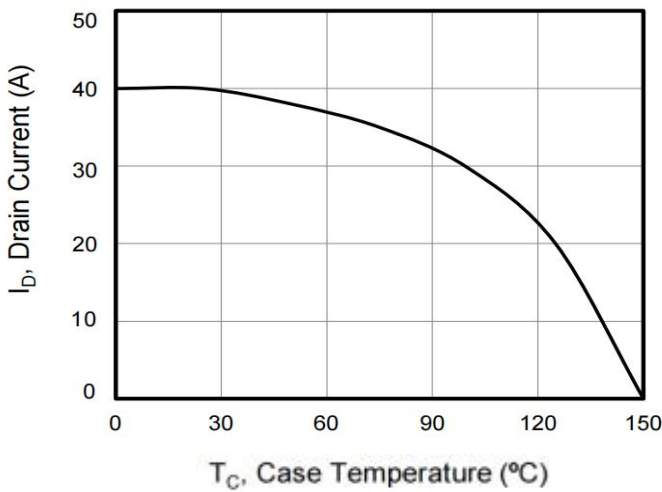
**Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



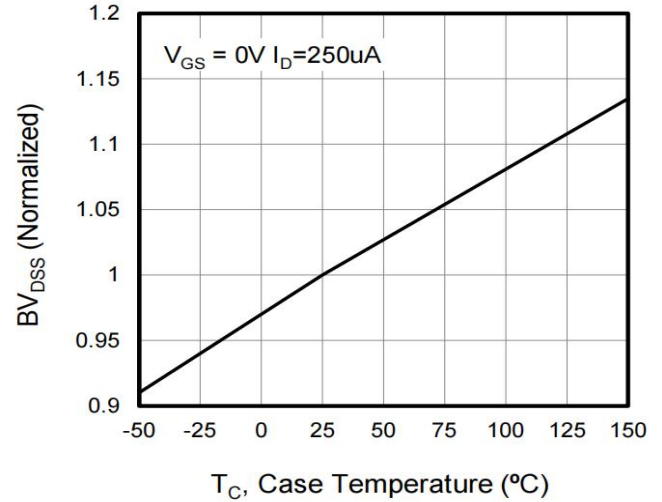
**Figure 2. Body Diode Forward Voltage**



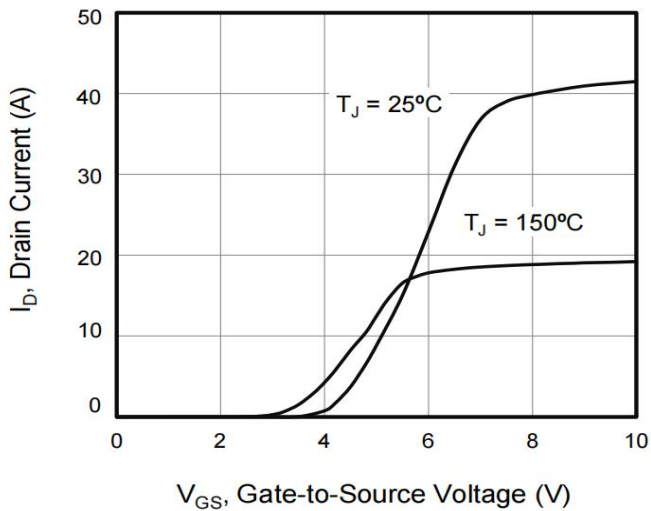
**Figure 3. Drain Current vs. Temperature**



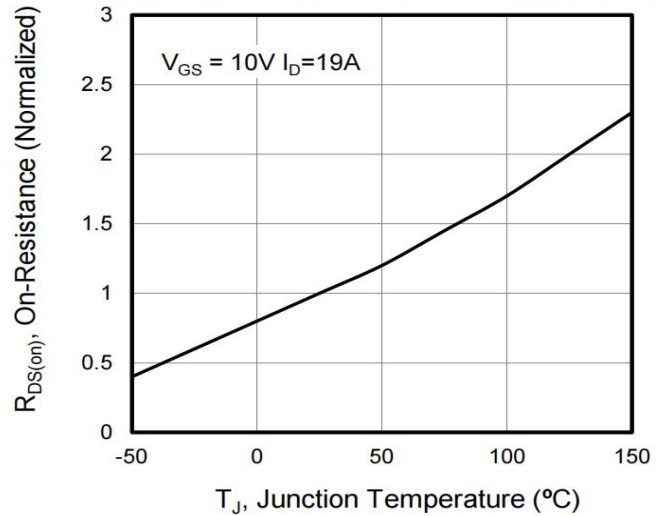
**Figure 4.  $BV_{DSS}$  Variation vs. Temperature**



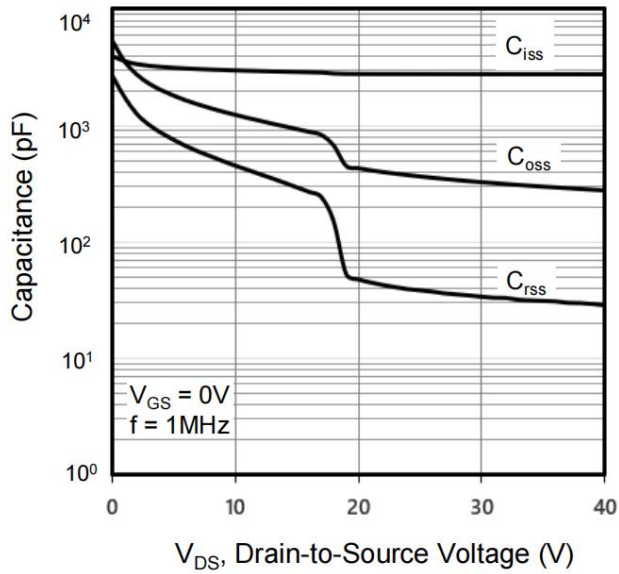
**Figure 5. Transfer Characteristics**



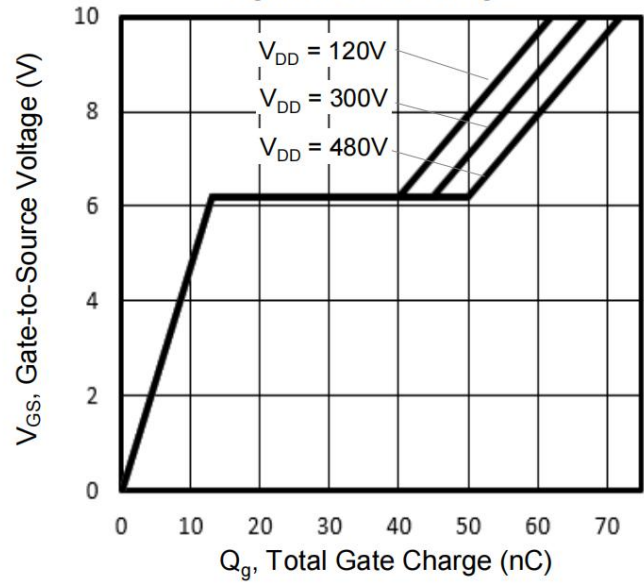
**Figure 6. On-Resistance vs. Temperature**



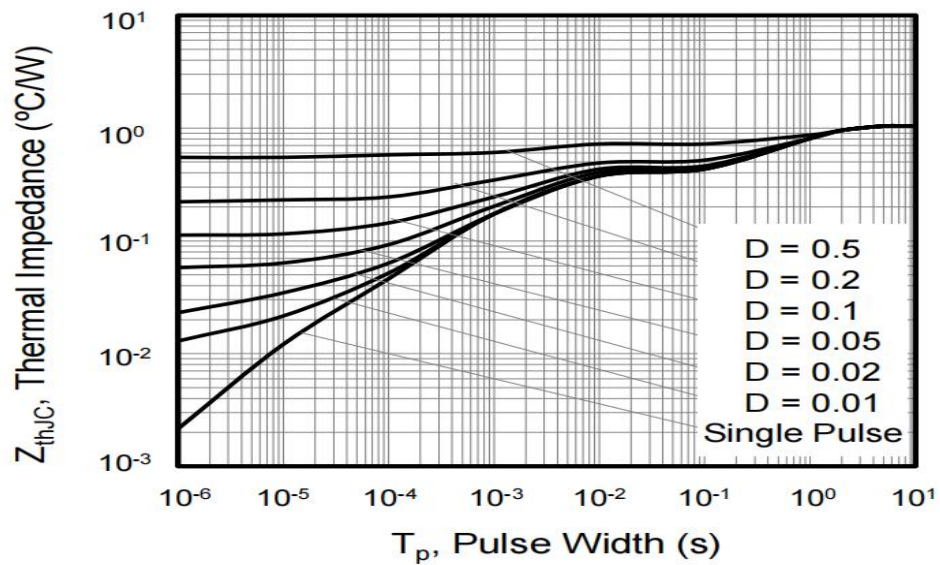
**Figure 7. Capacitance**



**Figure 8. Gate Charge**



**Figure 9. Transient Thermal Impedance**



**Test Circuits and Waveforms**

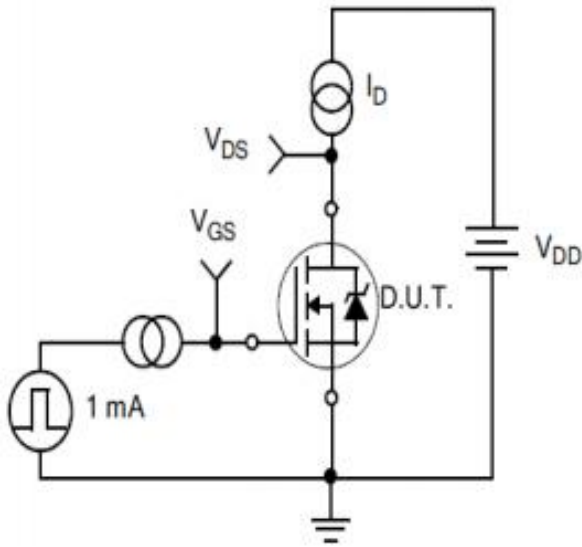


Figure10.  
Gate Charge Test Circuit

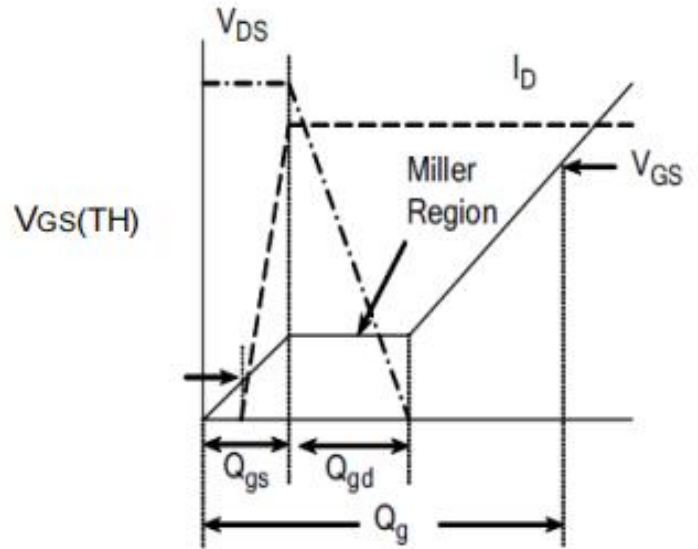


Figure11.  
Gate Charge Waveform

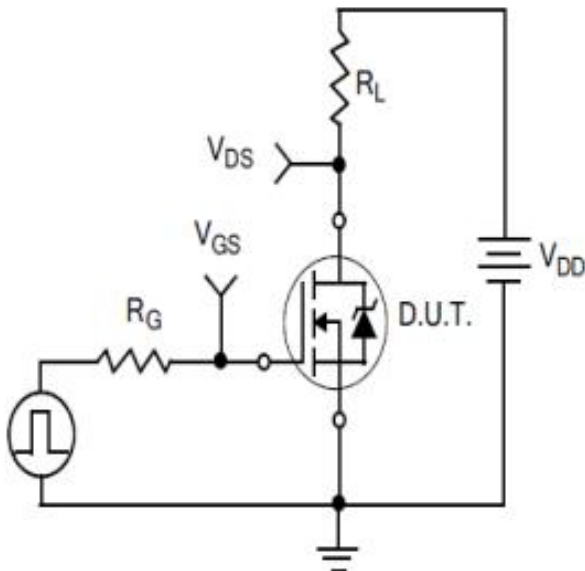


Figure12.  
Resistive Switching Test Circuit

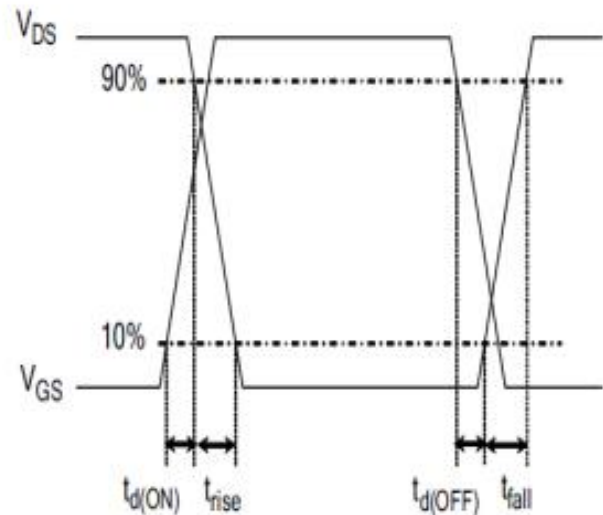


Figure13.  
Resistive Switching Waveforms



## Test Circuits and Waveforms

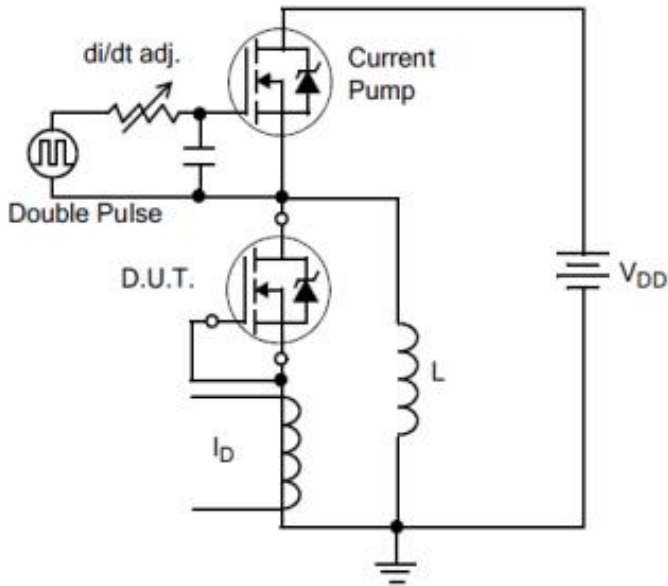


Figure14.Diode Reverse Recovery Test Circuit

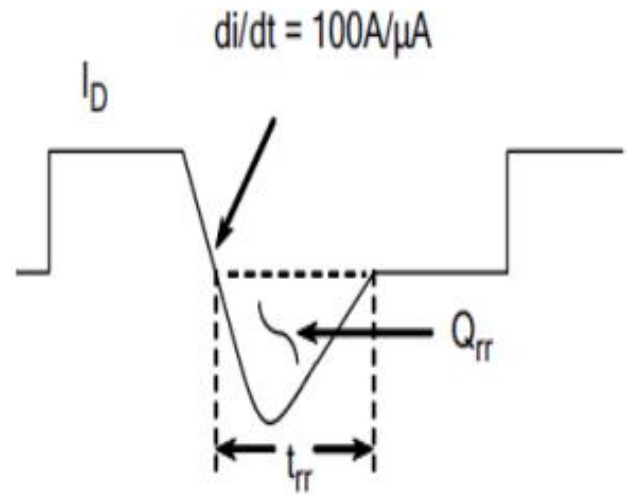


Figure15.Diode Reverse Recovery Waveform

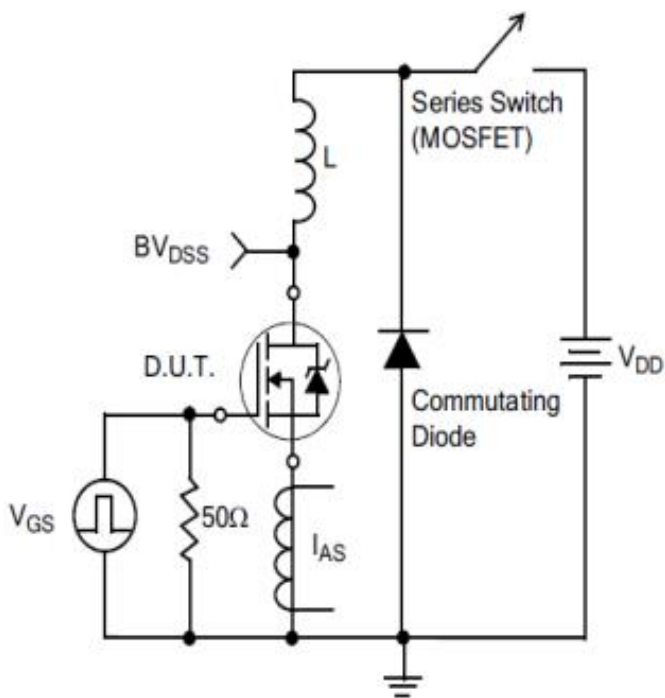
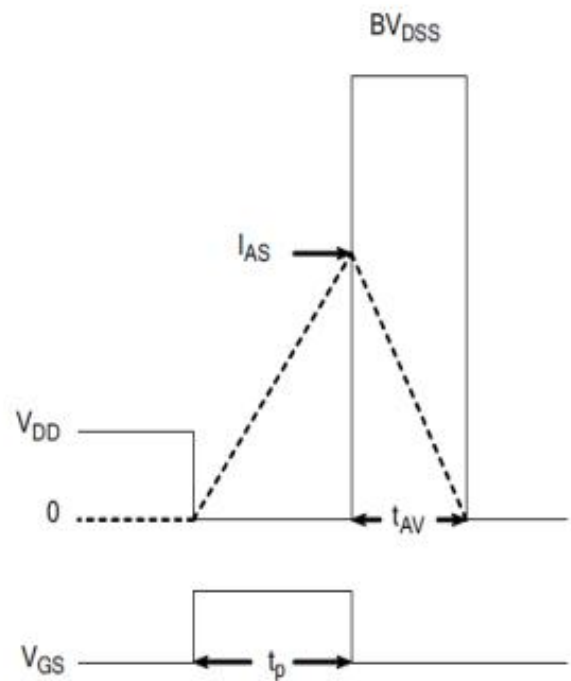


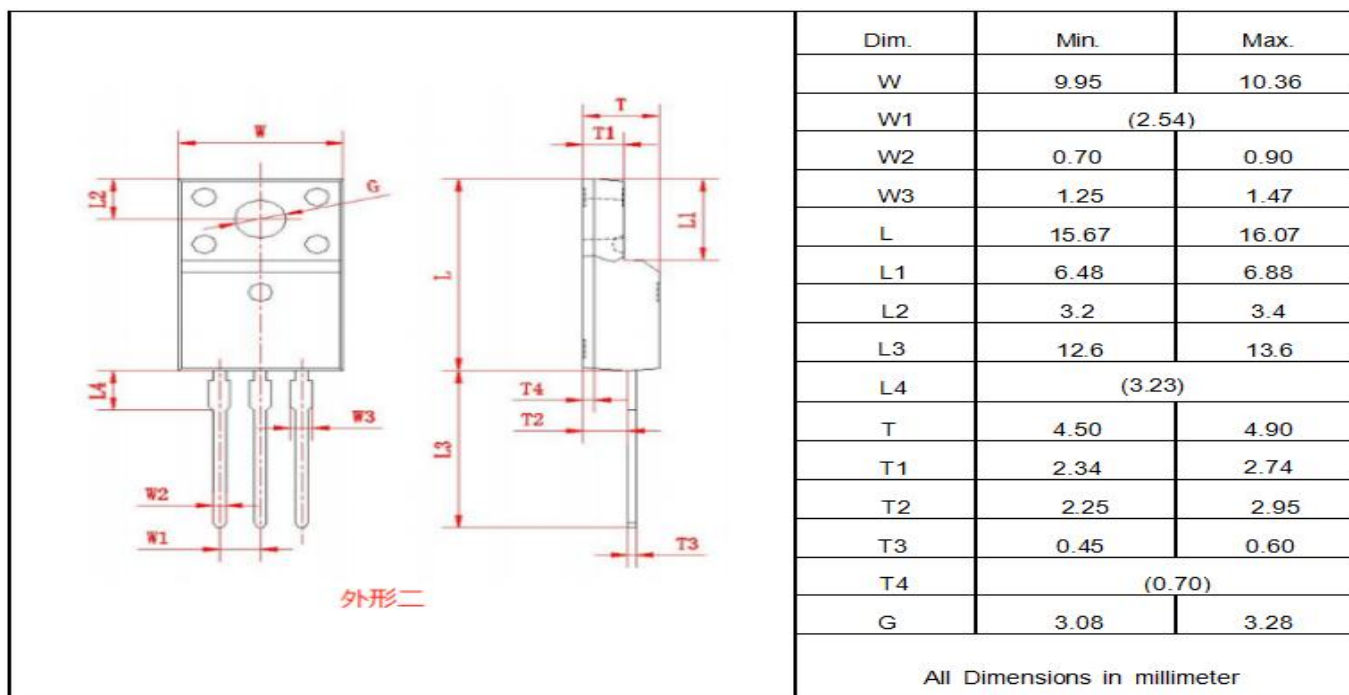
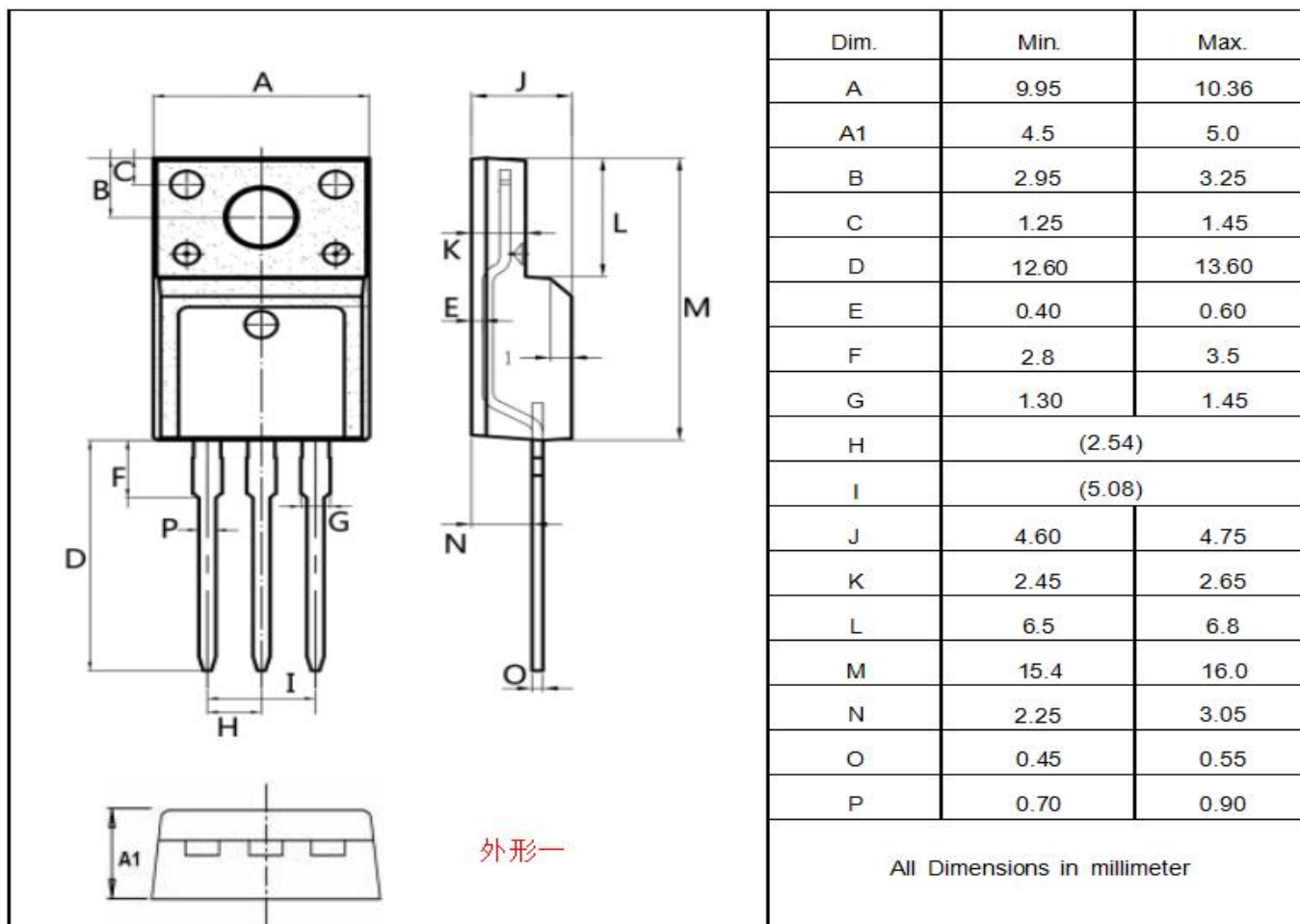
Figure16.Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure17.Unclamped Inductive Switching Waveforms

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





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