

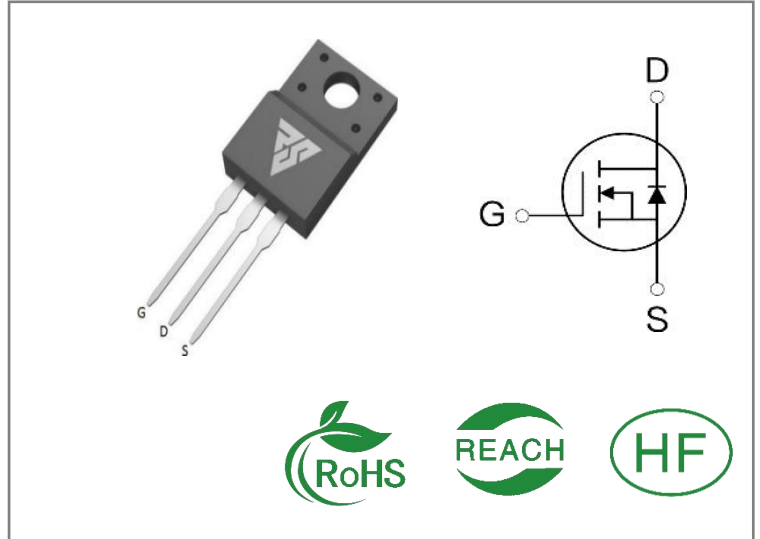
|           |                                |             |
|-----------|--------------------------------|-------------|
| <b>ID</b> | <b>R<sub>Ds(ON)</sub>(Typ)</b> | <b>VDSS</b> |
| 20A       | 0.21Ω                          | 500V        |

**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.   |
|-------------|---------|----------|---------|--------|
| RS20N50F    | T0-220F | RS20N50F | Tube    | 50 PCS |

**Absolute Maximum Ratings** Tc= 25°C unless otherwise specified

| Symbol      | Parameter   | RS20N50F   | Units |
|-------------|---|------------|-------|
| VDSS        | Drain-to-Source Voltage   | 500        | V     |
| ID          | Continuous Drain Current TC=25°C                                | 20         | A     |
| IDM         | Pulsed Drain Current (Note*1)                                   | 80         |       |
| PD          | Power Dissipation   | 130        | W     |
| VGS         | Gate- to- Source Voltage  | ±30        | V     |
| EAS         | Single Pulse Avalanche Energy<br>L = 10mH, VDD = 50V, RG = 25 Ω | 1400       | mJ    |
| TL TPKG     | Maximum Temperature for Soldering                               | 300<br>260 | °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           | RS20N50F | Units  | Test Conditions   |
|---------------|---------------------|----------|--------|---|
| R $\theta$ JC | Junction-to-Case    | 0.95     | °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 | 48.78    |        | 1 cubic foot chamber, free air.   |

**OFF Characteristics** T<sub>J</sub>= 25°C unless otherwise specified

| Symbol | Parameter                           | Min. | Typ. | Max. | Units | Test Conditions  |
|--------|-------------------------------------|------|------|------|-------|------------------|
| BVDSS  | Drain- to- source Breakdown Voltage | 500  | --   | --   | V     | VGS=0V, ID=250μA |
| IDSS   | Drain- to- Source Leakage Current   | --   | --   | 1    | μA    | VDS=500V, VGS=0V |
| IGSS   | Gate- to- Source Forward Leakage    | --   | --   | 100  | nA    | VGS=30V ,VDS=0V  |
|        | Gate- to- Source Reverse Leakage    | --   | --   | -100 |       | VGS=-30V ,VDS=0V |

**ON Characteristics** T<sub>J</sub>=25°C unless otherwise specified

| Symbol  | Parameter                                      | Min. | Typ. | Max. | Units | Test Conditions   |
|---------|--|------|------|------|-------|-------------------|
| RDS(on) | Static Drain- to- Source On-Resistance(Note*2) | --   | 0.21 | 0.27 | Ω     | VGS=10V, ID=10A   |
| VGS(TH) | Gate Threshold Voltage                         | 2    | --   | 4    | 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  | --   | 52   | --   | nS    | VDS=250V<br>ID=20A<br>RG=25Ω |
| trise   | Rise Time            | --   | 69   | --   |       |                              |
| td(OFF) | Turn- OFF Delay Time | --   | 88   | --   |       |                              |
| tfall   | Fall Time            | --   | 17   | --   |       |                              |

**Dynamic Characteristics** Essentially independent of operating temperature

| Symbol | Parameter                       | Min. | Typ. | Max. | Units | Test Conditions               |
|--------|---------------------------------|------|------|------|-------|-------------------------------|
| Ciss   | Input Capacitance               | --   | 2050 | --   | pF    | VGS=0V<br>VDS=25V<br>f=1.0MHz |
| Coss   | Output Capacitance              | --   | 274  | --   |       |                               |
| Crss   | Reverse Transfer Capacitance    | --   | 16.5 | --   |       |                               |
| Qg     | Total Gate Charge               | --   | 70   | --   | nC    | VDS=400V<br>ID=20A<br>VGS=10V |
| Qgs    | Gate- to- Source Charge         | --   | 15.5 | --   |       |                               |
| Qgd    | Gate-to-Drain(" Miller") Charge | --   | 27.5 | --   |       |                               |

**Source- Drain Diode Characteristics**

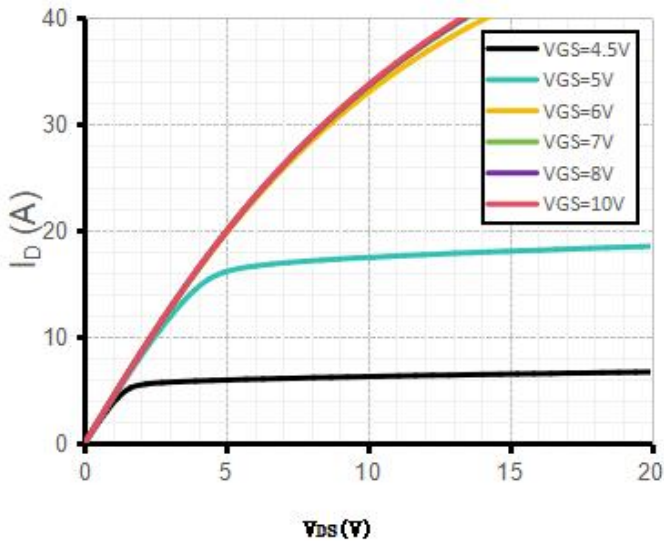
| Symbol | Parameter                 | Min. | Typ. | Max. | Units | Test Conditions                    |
|--------|---------------------------|------|------|------|-------|------------------------------------|
| IS     | Continuous Source Current | --   | --   | 20   | A     | Integral pn- diode<br>in MOSFET    |
| ISM    | Maximum Pulsed Current    | --   | --   | 80   | A     |                                    |
| VSD    | Diode Forward Voltage     | --   | --   | 1.2  | V     | IS=10A,VGS=0V                      |
| trr    | Reverse Recovery Time     | --   | 550  | --   | nS    | VGS=0V<br>IS=20A,di/dt=100<br>A/μs |
| Qrr    | Reverse Recovery Charge   | --   | 6.08 | --   | μC    |                                    |

**Notes:**

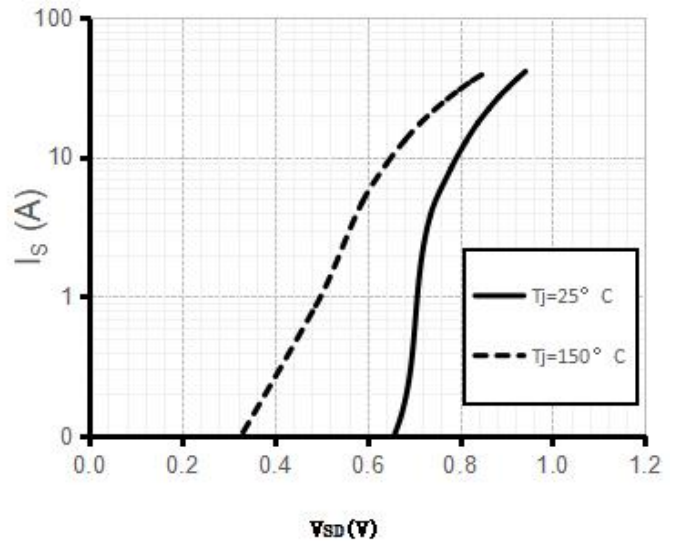
- \* 1. Repetitive rating, pulse width limited by maximum junction temperature.
- \* 2. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 1\%$

**Typical Feature Curve**

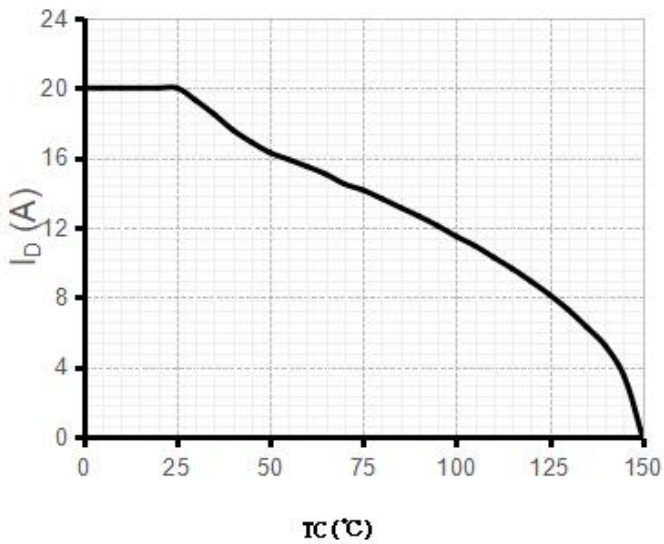
**Figure 1. Output Characteristics ( $T_j=25^\circ\text{C}$ )**



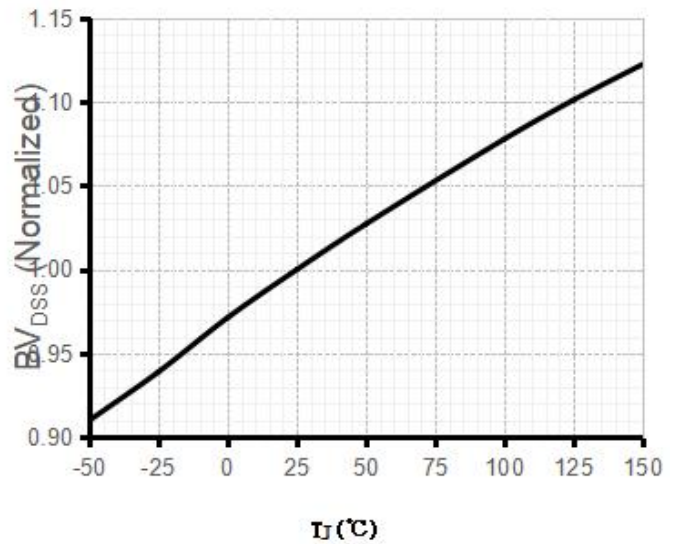
**Figure 2. Body Diode Forward Voltage**



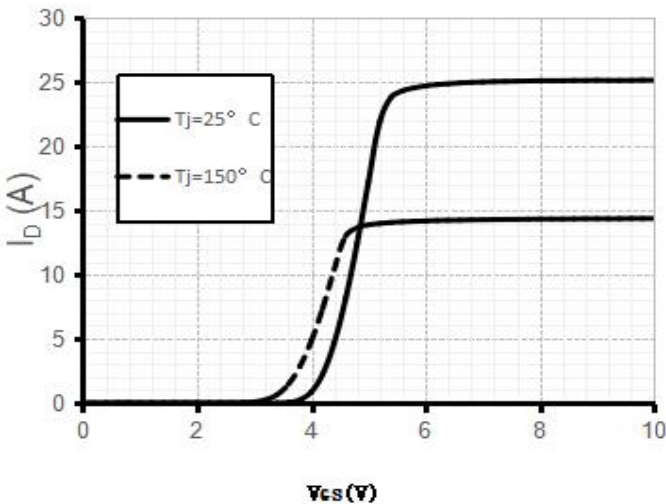
**Figure 3. Drain Current vs. Temperature**



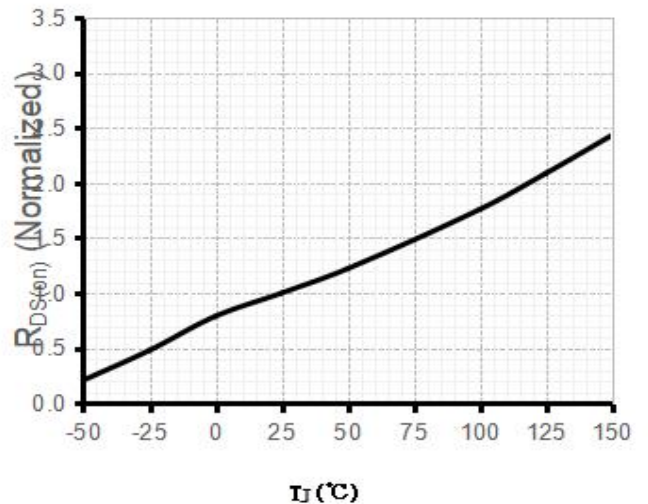
**Figure 4. BV\_DS\_S Variation vs. Temperature**



**Figure 5. Transfer Characteristics**



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



Typical Feature Curve

Figure 7. Capacitance

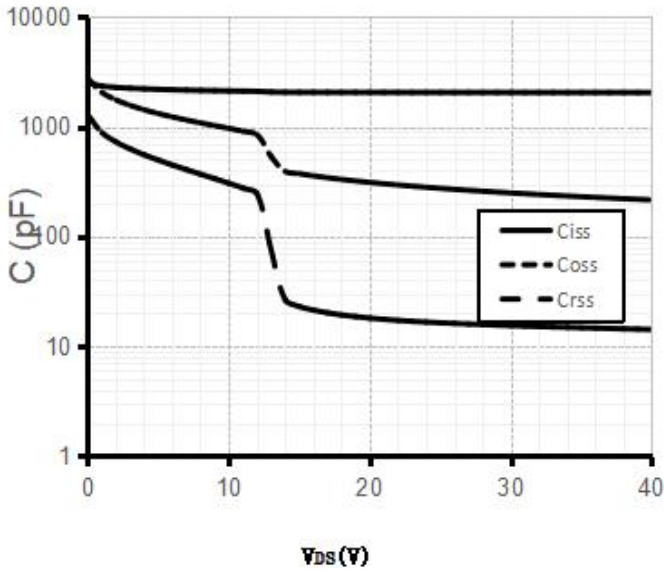


Figure 8. Gate Charge

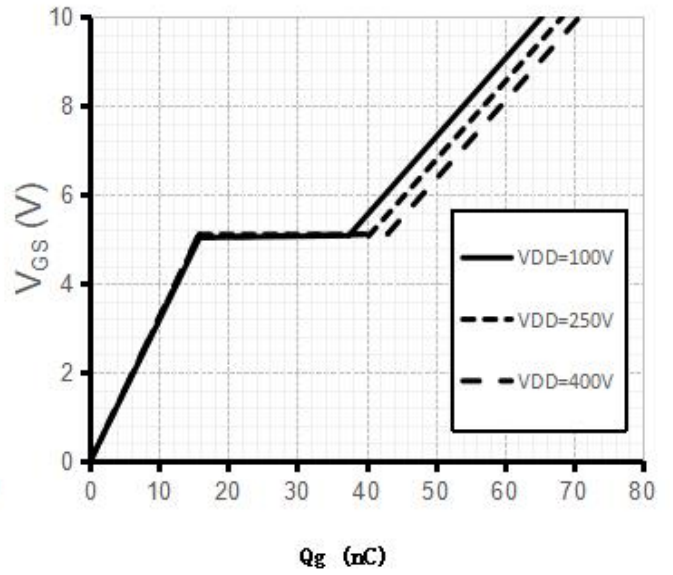


Figure 9. Transient Thermal Impedance

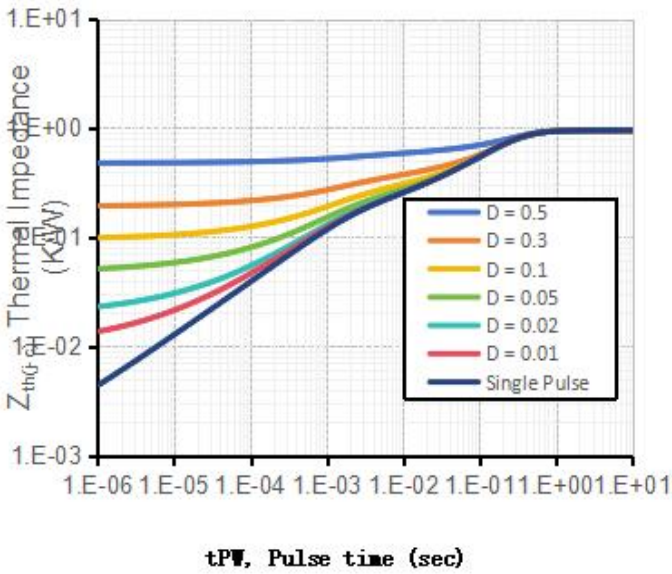
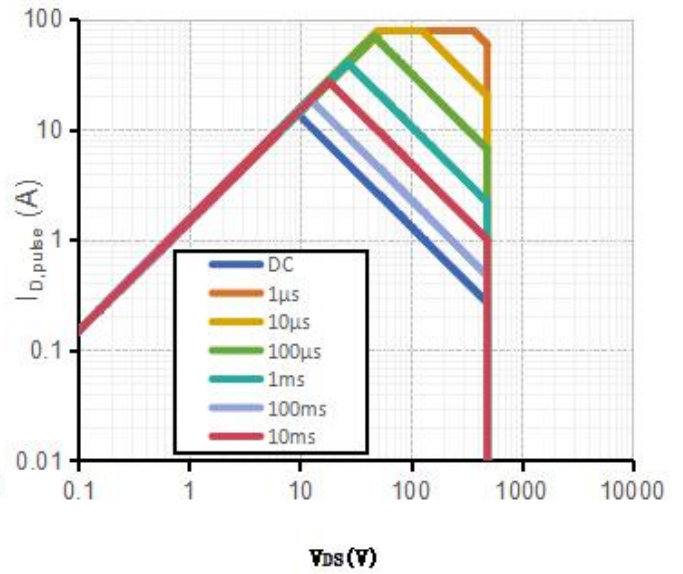
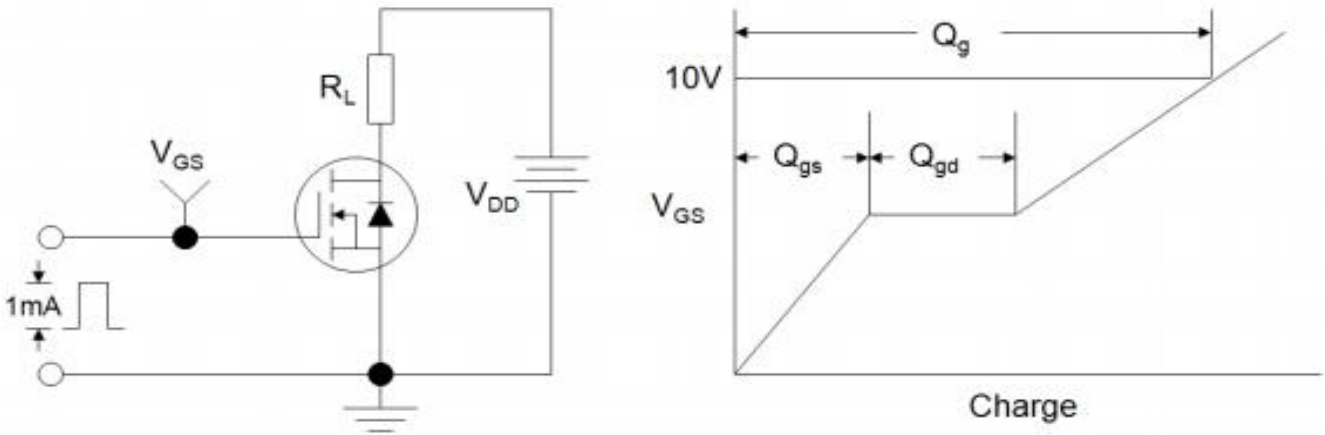


Figure 10. Safe Operating Area

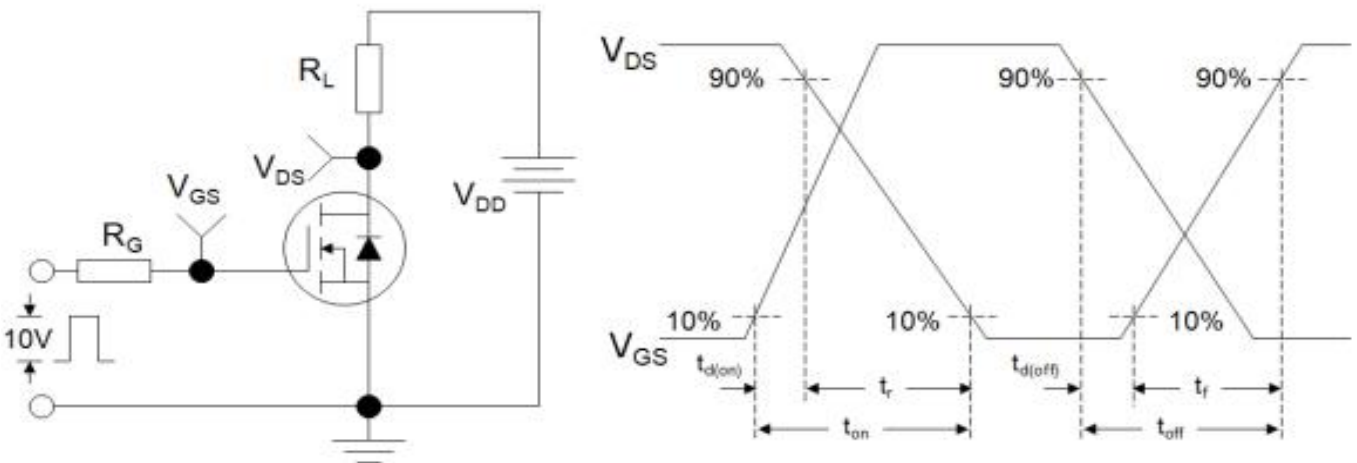


**Test Circuits and Waveforms**

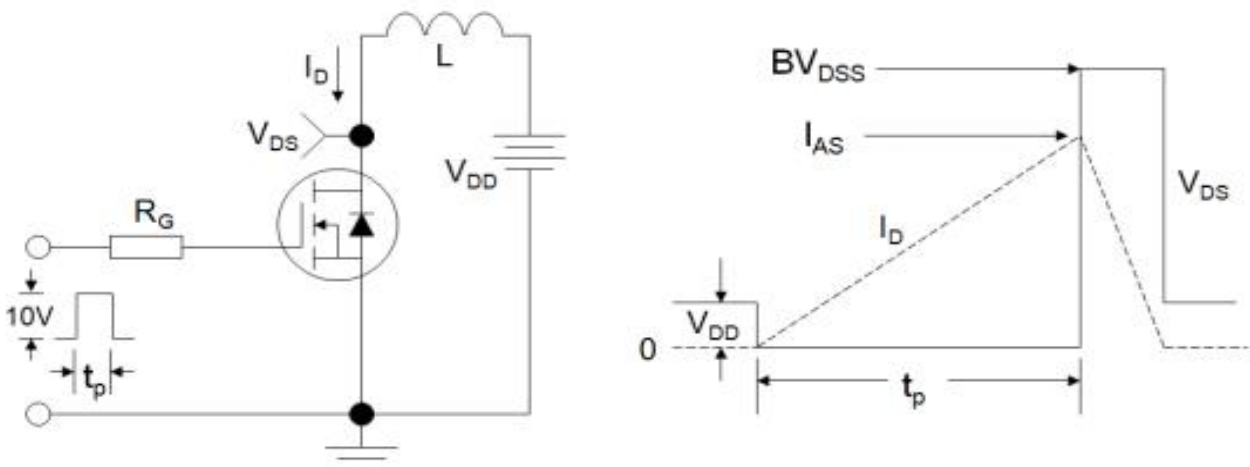
**Figure A: Gate Charge Test Circuit and Waveform**



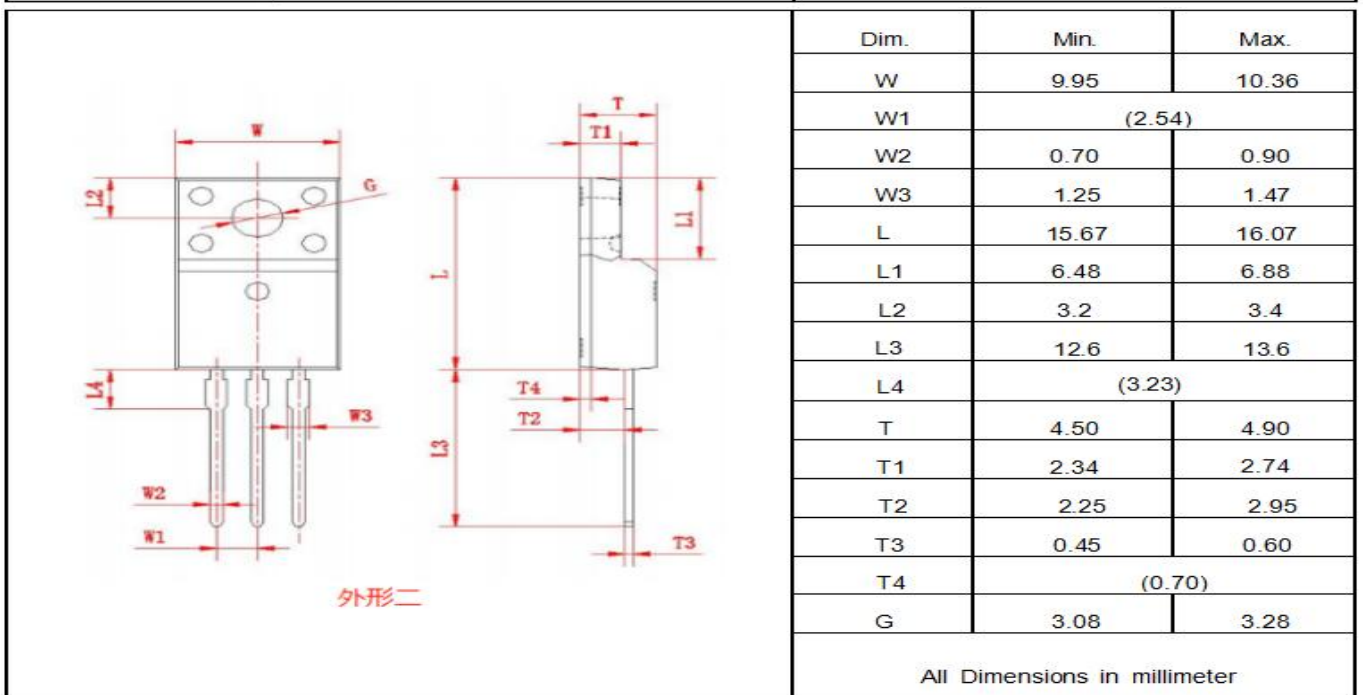
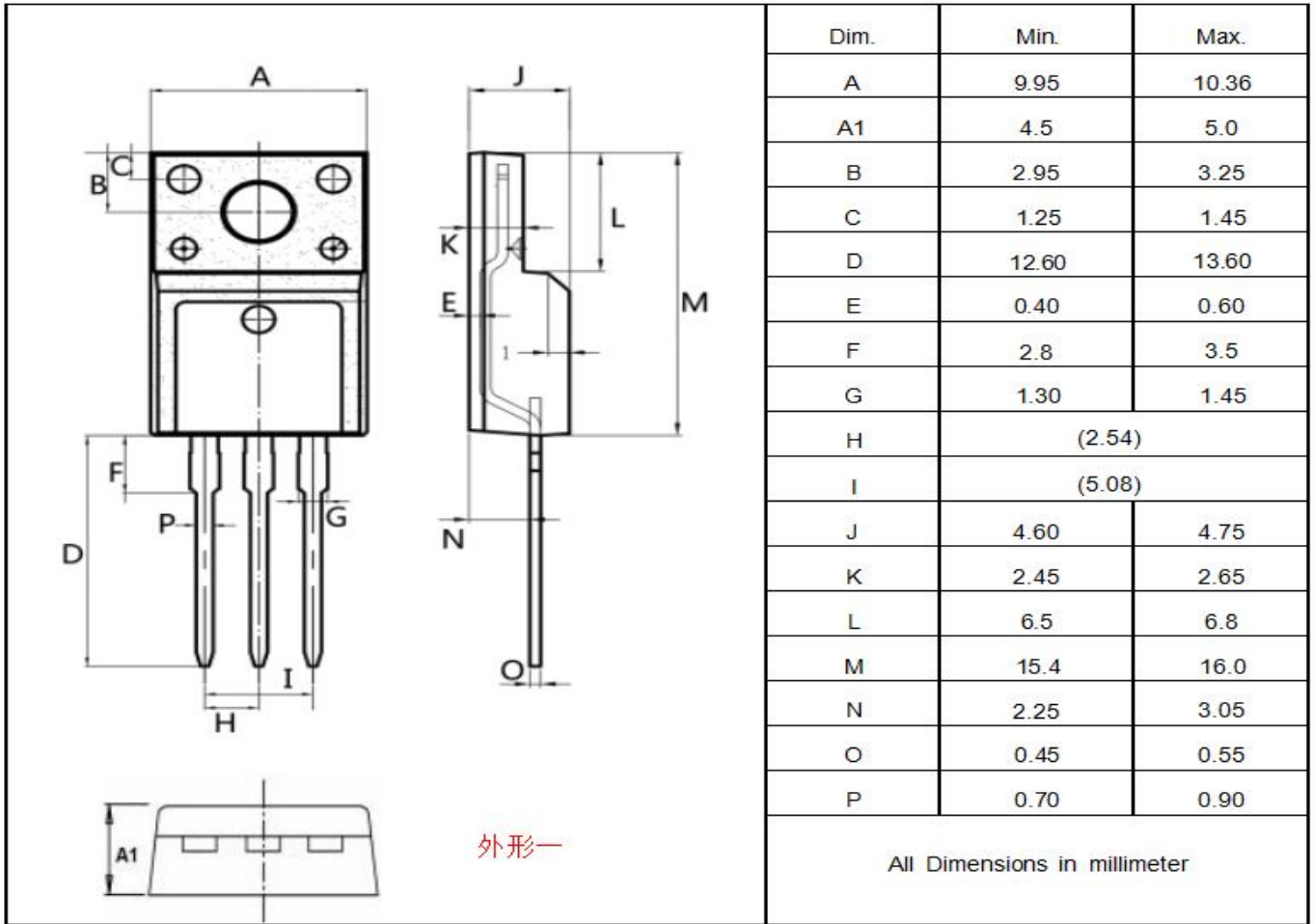
**Figure B: Resistive Switching Test Circuit and Waveform**



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



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



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