

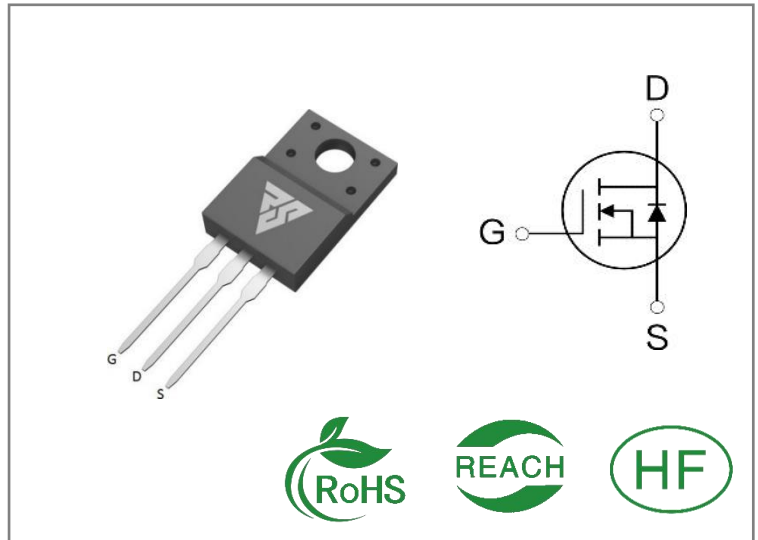
ID	$R_{DS(ON)}$ (Typ)	VDSS
13A	0.36Ω	500V

#### 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.
RS13N50F	T0-220F	RS13N50F	Tube	50 PCS

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

Symbol	Parameter	RS13N50F	Units
VDSS	Drain-to-Source Voltage	500	V
ID	Continuous Drain Current $T_C=25^\circ\text{C}$	13	A
	Continuous Drain Current $T_C=100^\circ\text{C}$	7.5	
IDM	Pulsed Drain Current (Note*1)	50	
PD	Power Dissipation	105	W
VGS	Gate- to- Source Voltage	±30	V
EAS	Single Pulse Avalanche Energy L = 10mH, VDD = 50V, RG = 25 Ω	700	mJ
TL TPKG	Maximum Temperature for Soldering	300	°C
	Leads at 0.063in(1.6mm)from Case for 10 seconds	260	
	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	RS13N50F	Units	Test Conditions
R $\theta$ JC	Junction-to-Case	1.14	°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	50		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	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 TJ=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
RDS(on)	Static Drain- to- Source On-Resistance(Note*2)	--	0.36	0.46	Ω	VGS=10V, ID=6.5A
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	--	29	--	nS	VDS=250V ID=13A RG=25Ω
trise	Rise Time	--	58	--		
td(OFF)	Turn- OFF Delay Time	--	58	--		
tfall	Fall Time	--	13	--		

**Dynamic Characteristics** Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ciss	Input Capacitance	--	2050	--	pF	VGS=0V VDS=25V f=1.0MHz
Coss	Output Capacitance	--	182	--		
Crss	Reverse Transfer Capacitance	--	10	--		
Qg	Total Gate Charge	--	43	--	nC	VDS=400V ID=13A VGS=10V
Qgs	Gate- to- Source Charge	--	9	--		
Qgd	Gate-to-Drain(" Miller") Charge	--	16	--		

**Source- Drain Diode Characteristics**

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
IS	Continuous Source Current	--	--	13	A	Integral pn- diode in MOSFET
ISM	Maximum Pulsed Current	--	--	50	A	
VSD	Diode Forward Voltage	--	0.8	1.2	V	IS=6.5A,VGS=0V
trr	Reverse Recovery Time	--	420	--	nS	VGS=0V IS=13A, di/dt=100A/μs
Qrr	Reverse Recovery Charge	--	4.4	--	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

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

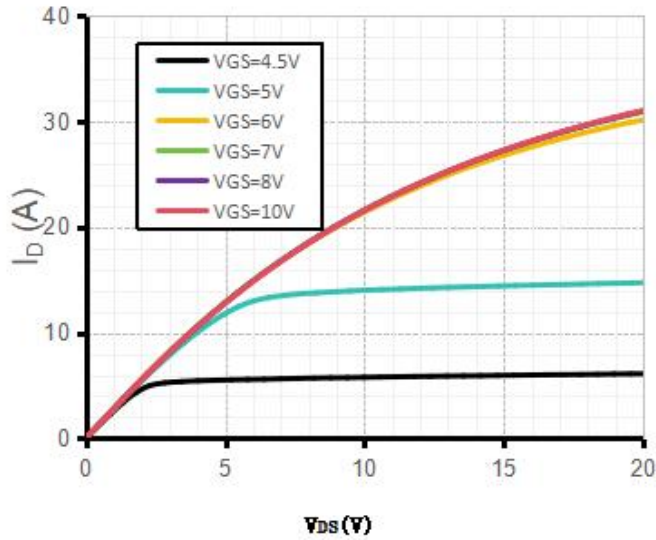


Figure 2. Body Diode Forward Voltage

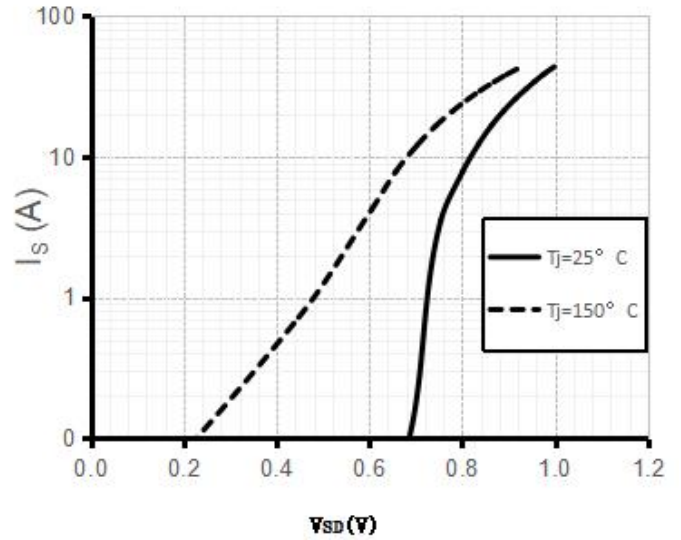


Figure 3. Drain Current vs. Temperature

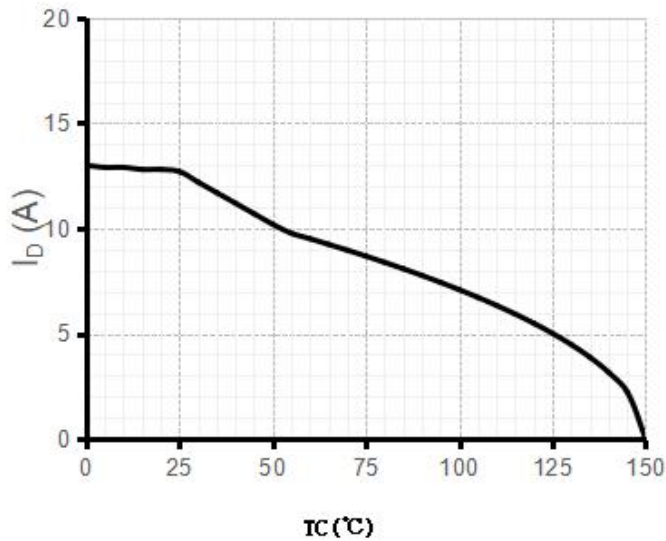


Figure 4. BVDS Variation vs. Temperature

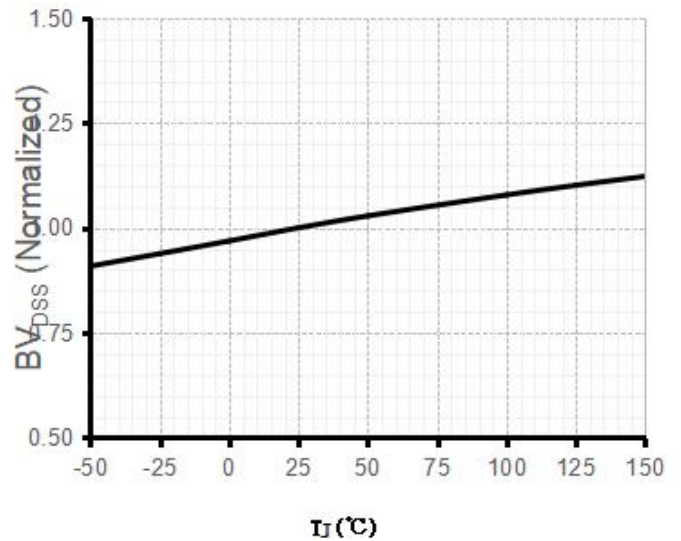


Figure 5. Transfer Characteristics

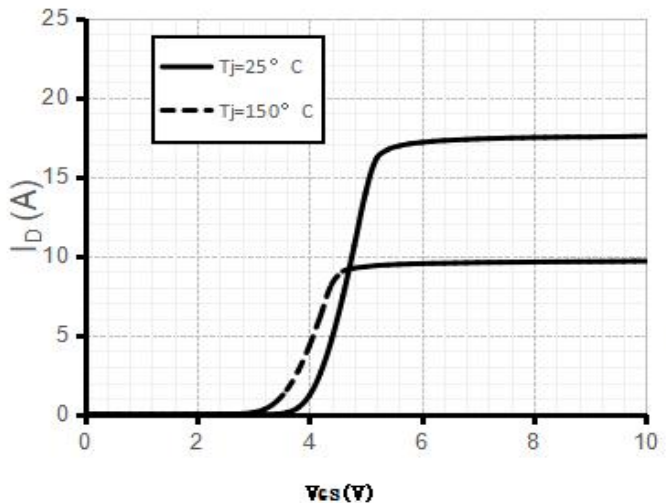
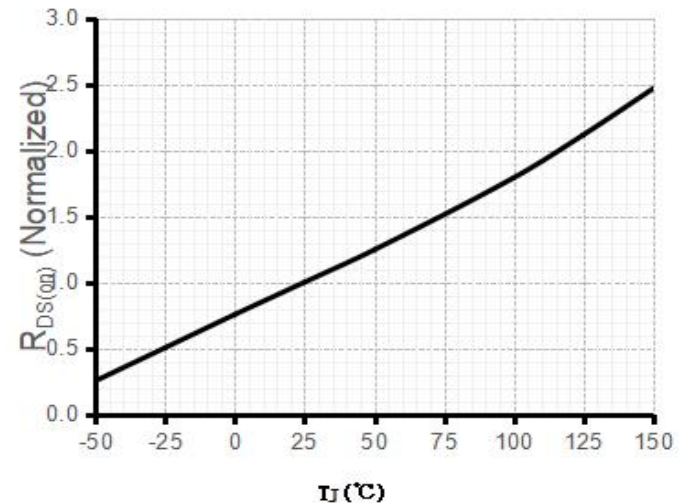


Figure 6. On-Resistance vs. Temperature



## Typical Feature Curve

Figure 7. Capacitance

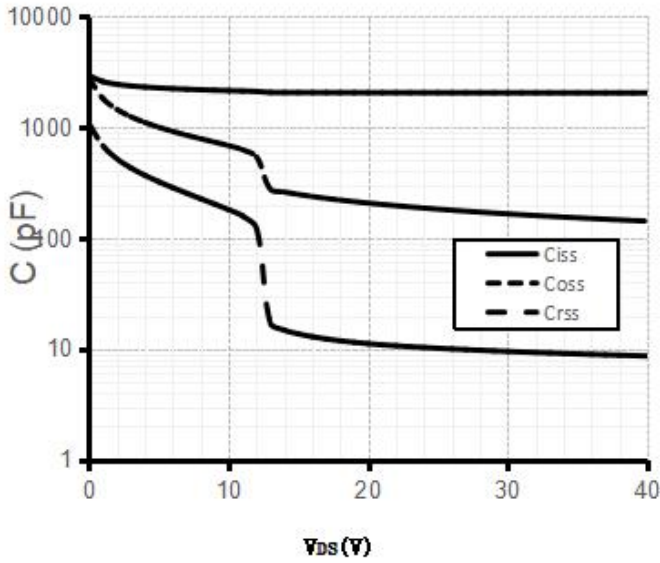


Figure 8. Gate Charge

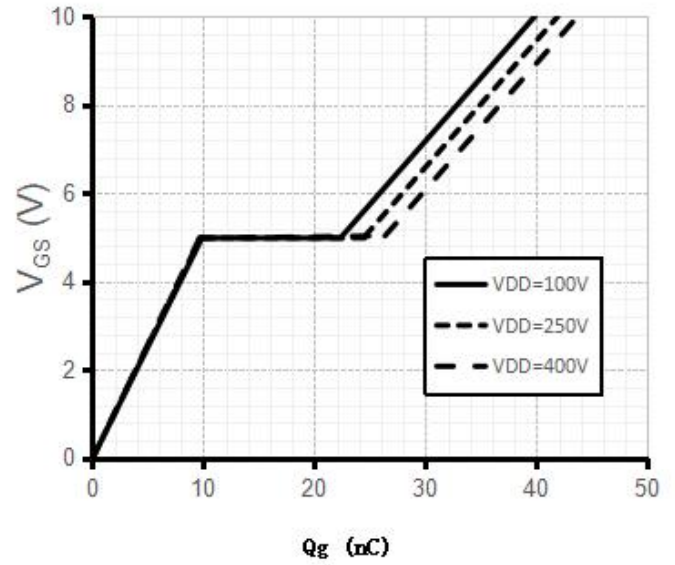


Figure 9. Transient Thermal Impedance

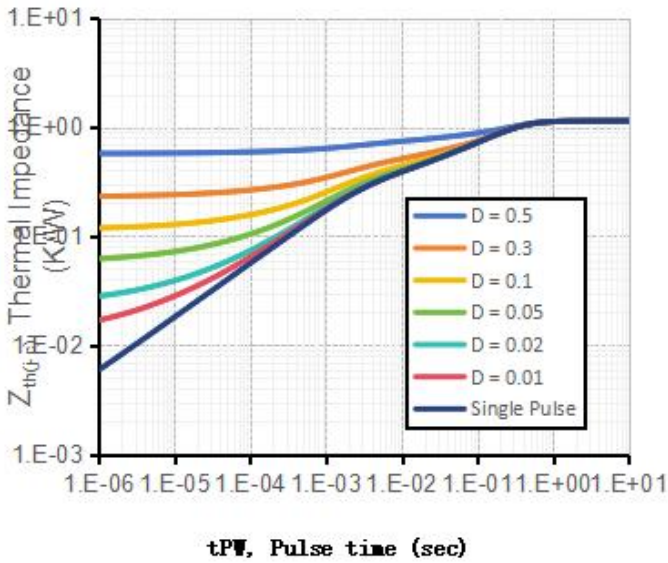
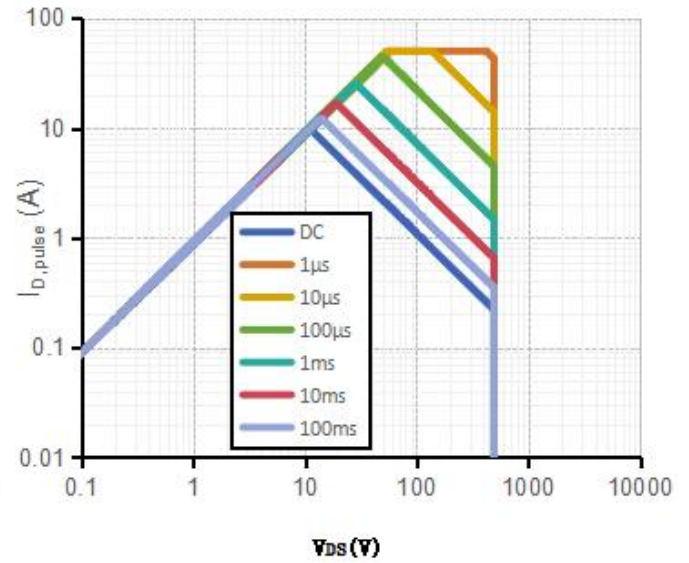


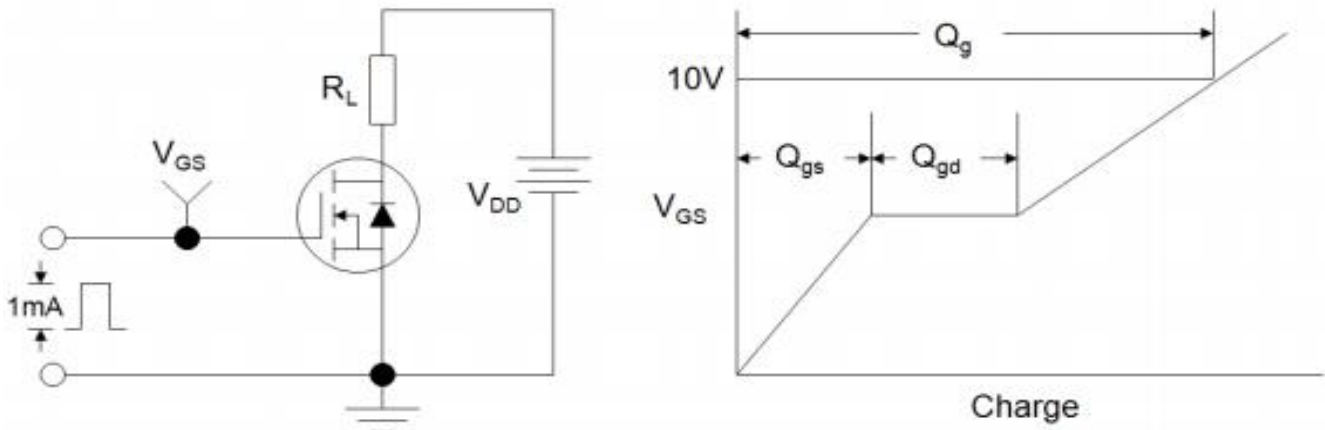
Figure 10. Safe Operating Area



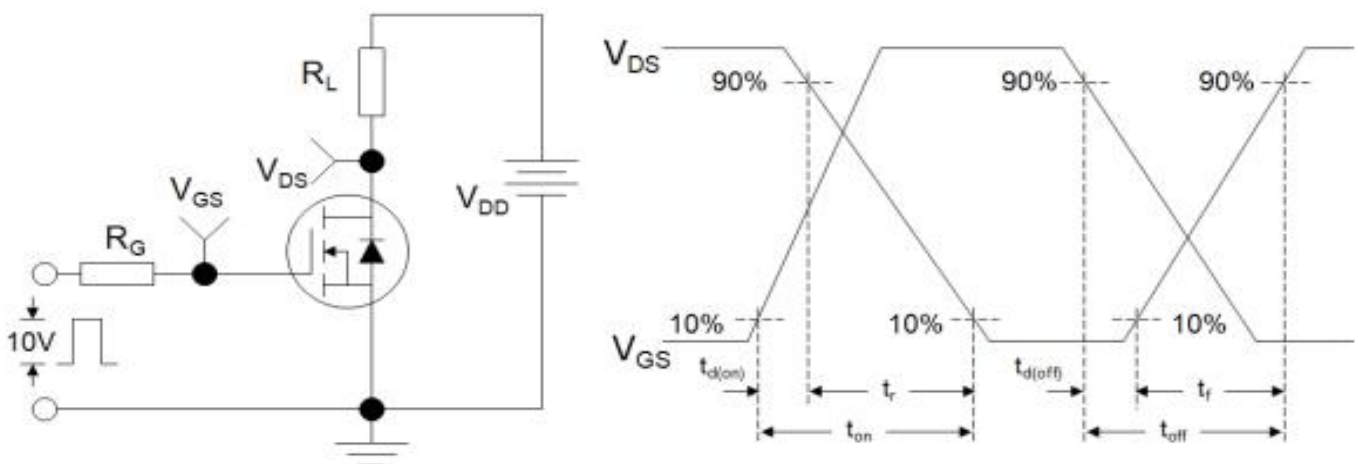


## Test Circuits and Waveforms

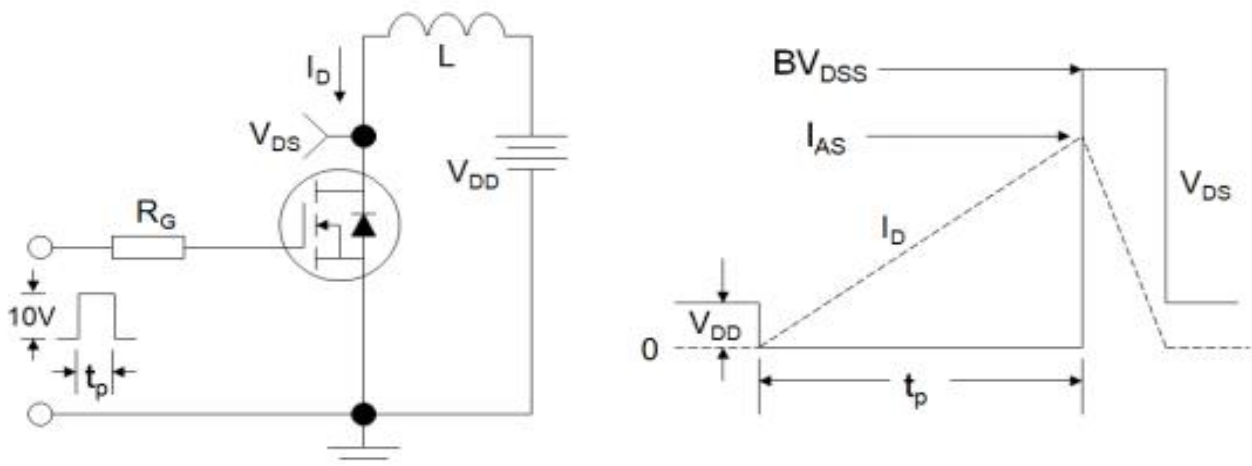
**Figure A: Gate Charge Test Circuit and Waveform**

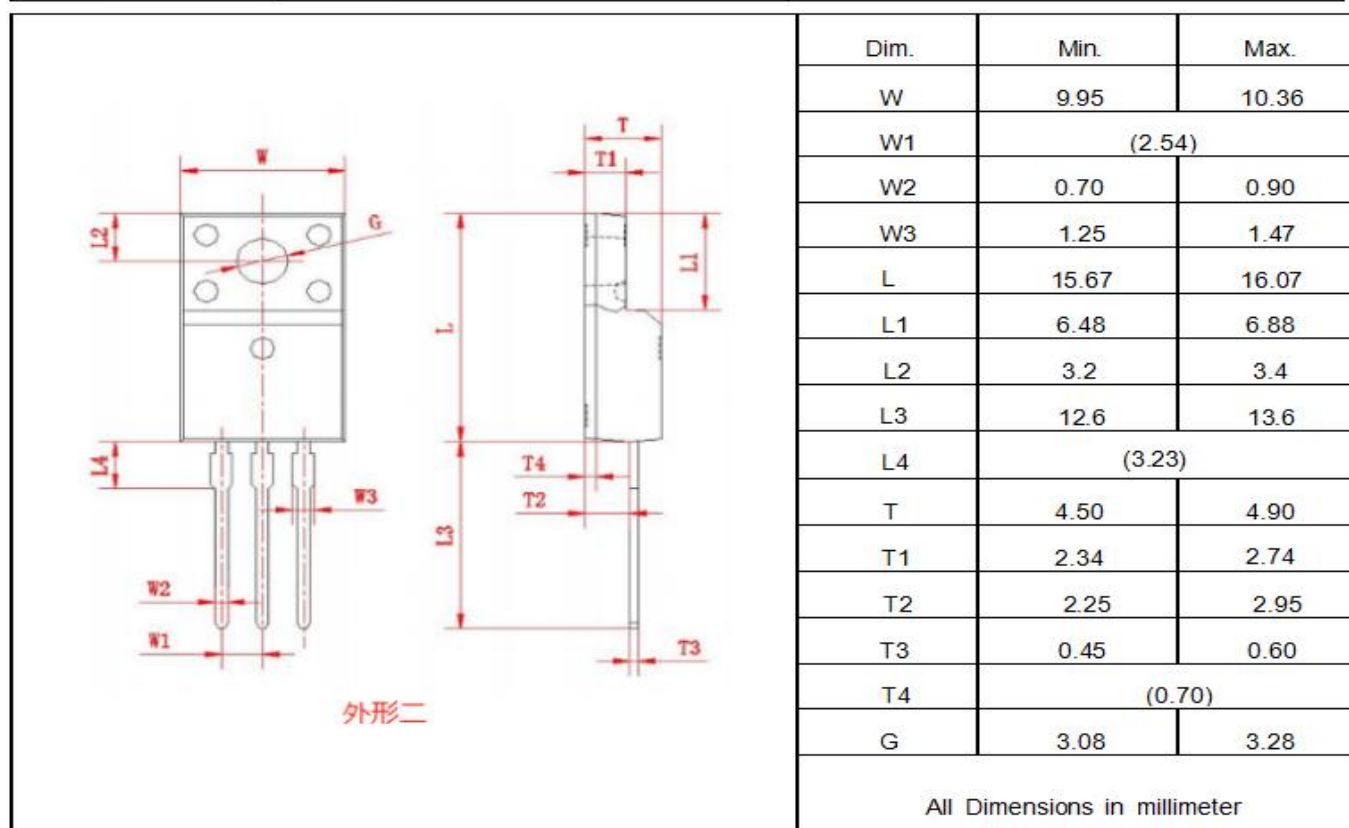
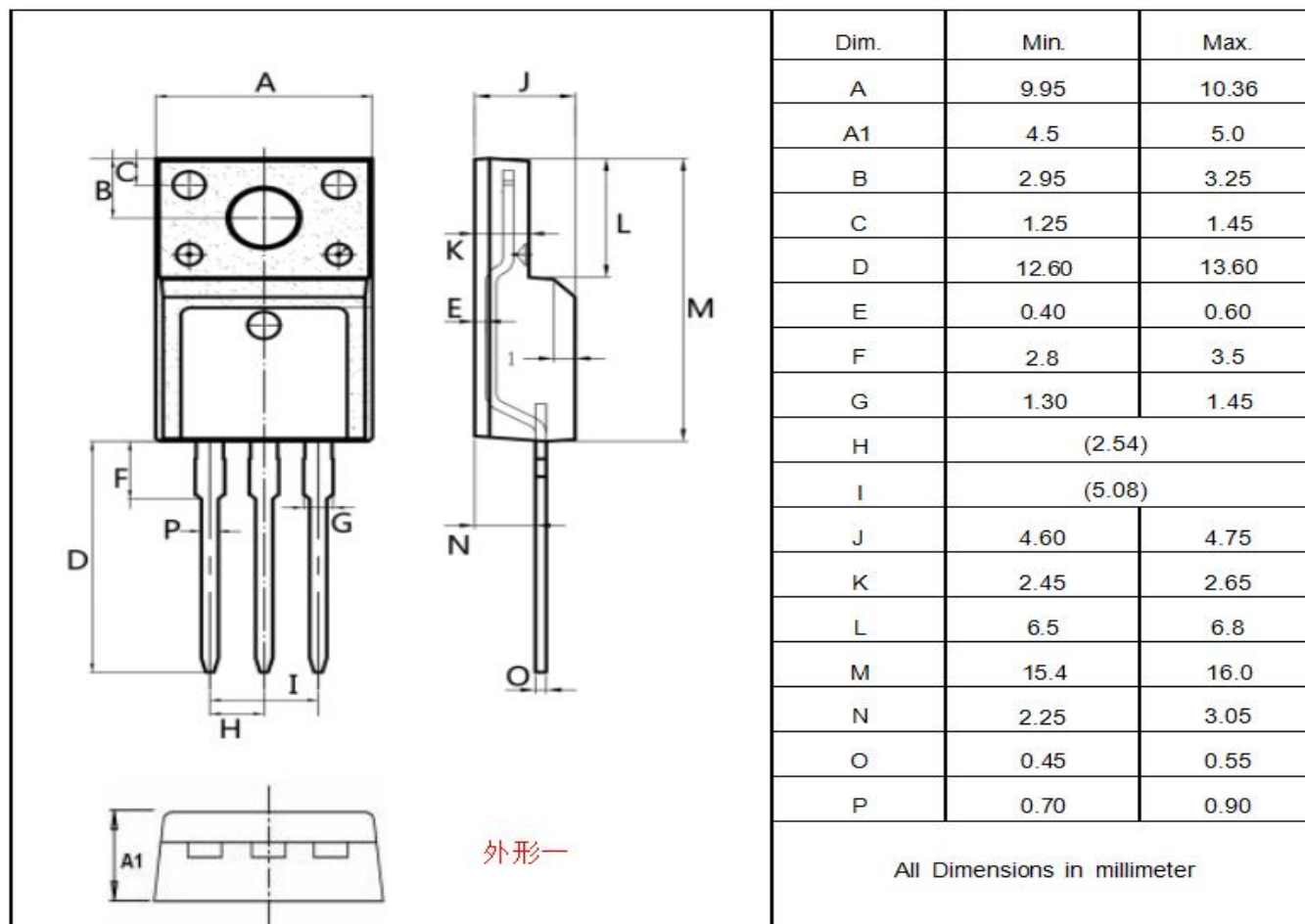


**Figure B: Resistive Switching Test Circuit and Waveform**



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



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


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