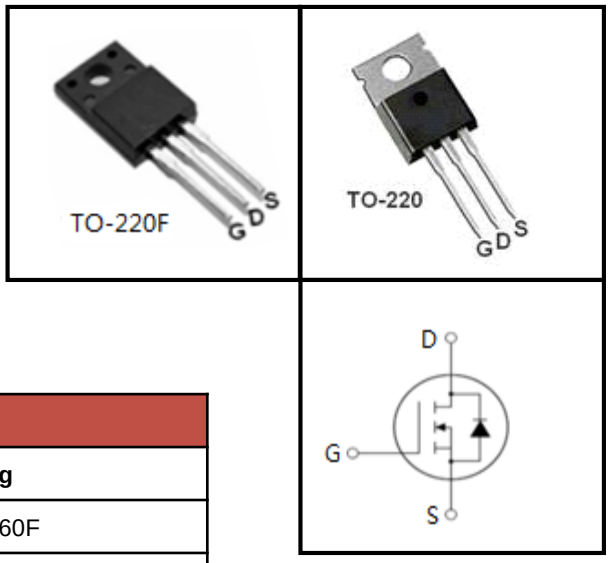
600V N-Channel MOSFET

FEATURES

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



APPLICATIONS

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

Device Marking and Package Information

Device	Package	Marking
CS20N60F	TO-220F	CS20N60F
CS20N60P	TO-220	CS20N60P

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220F	TO-220	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	600		V
Continuous Drain Current	I_D	20		A
Pulsed Drain Current (note1)	I_{DM}	80		A
Gate-Source Voltage	V_{GSS}	±30		V
Single Pulse Avalanche Energy (note2)	E_{AS}	566		mJ
Avalanche Current (note1)	I_{AS}	11		A
Repetitive Avalanche Energy (note1)	E_{AR}	339		mJ
Power Dissipation (T_C = 25ºC)	P_D	120	140	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220F	TO-220	
Thermal Resistance, Junction-to-Case	R_{thJC}	1.9	1.2	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	60	

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	600	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 10A	--	0.32	0.40	Ω
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz	--	2521	--	pF
Output Capacitance	C_{oss}		--	264	--	
Reverse Transfer Capacitance	C_{rss}		--	35	--	
Total Gate Charge	Q_g	V_{DD} = 480V, I_D = 20A, V_{GS} = 10V	--	76	--	nC
Gate-Source Charge	Q_{gs}		--	13	--	
Gate-Drain Charge	Q_{gd}		--	32	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 300V, I_D = 20A, R_G = 25 Ω	--	53	--	ns
Turn-on Rise Time	t_r		--	44	--	
Turn-off Delay Time	$t_{d(off)}$		--	321	--	
Turn-off Fall Time	t_f		--	80	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25 ºC	--	--	20	A
Pulsed Diode Forward Current	I_{SM}		--	--	80	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 10A, V_{GS} = 0V	--	--	1.4	V
Reverse Recovery Time	t_{rr}	V_{GS} = 0V,I_S = 20A, di_F/dt =100A /μs	--	733	--	ns
Reverse Recovery Charge	Q_{rr}		--	6.5	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=10mH, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25 ºC
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics (T_J = 25ºC)

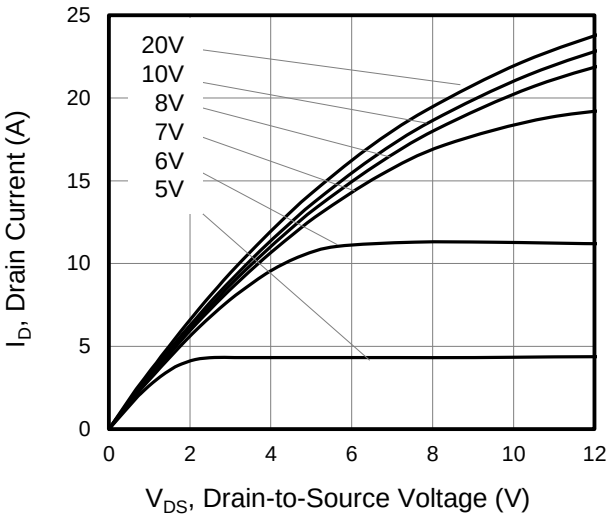


Figure 2. Body Diode Forward Voltage

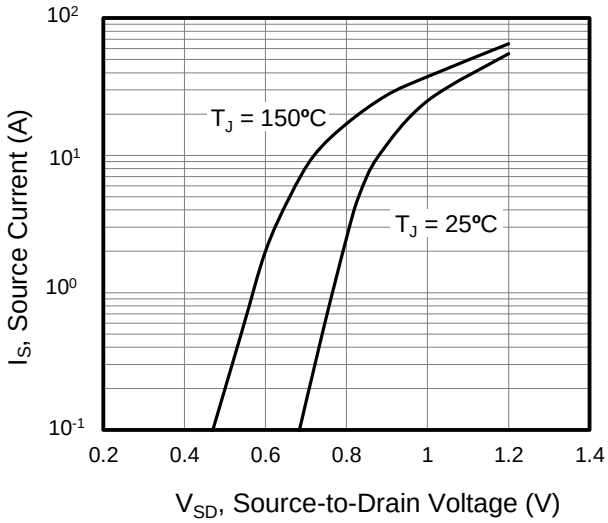


Figure 3. Drain Current vs. Temperature

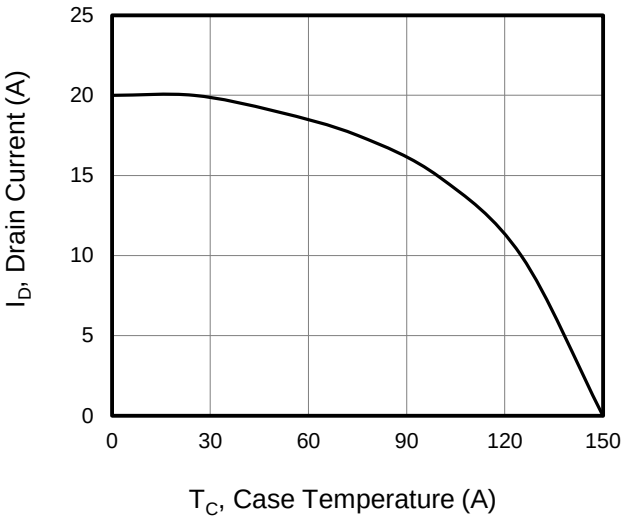


Figure 4. BV_{DSS} Variation vs. Temperature

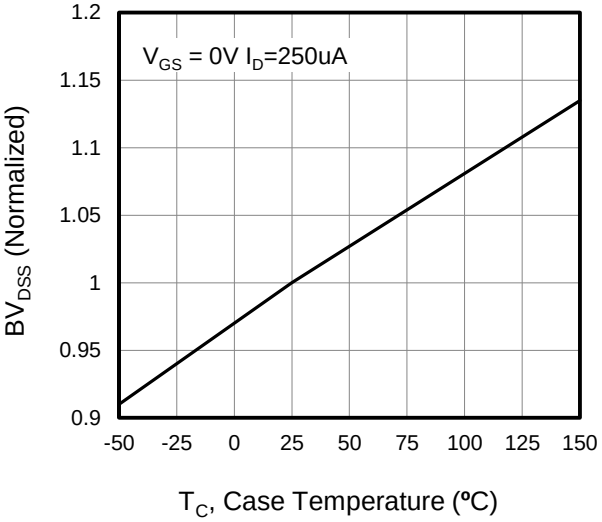


Figure 5. Transfer Characteristics

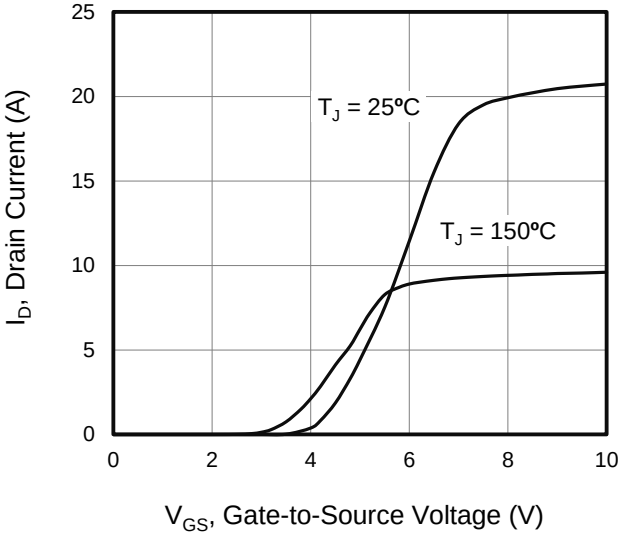
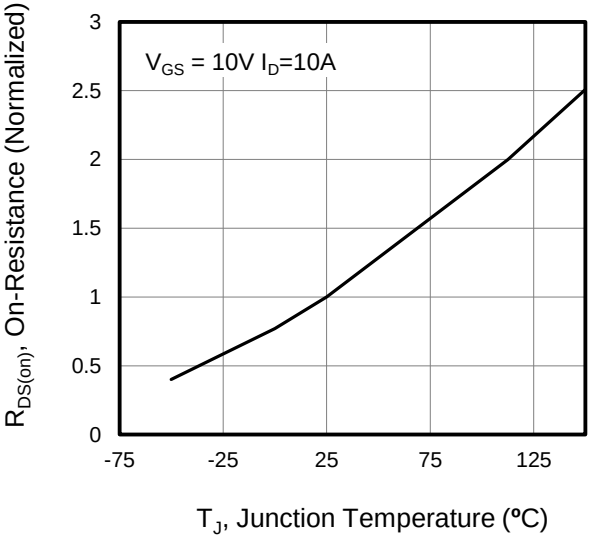


Figure 6. On-Resistance vs. Temperature



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. Capacitance

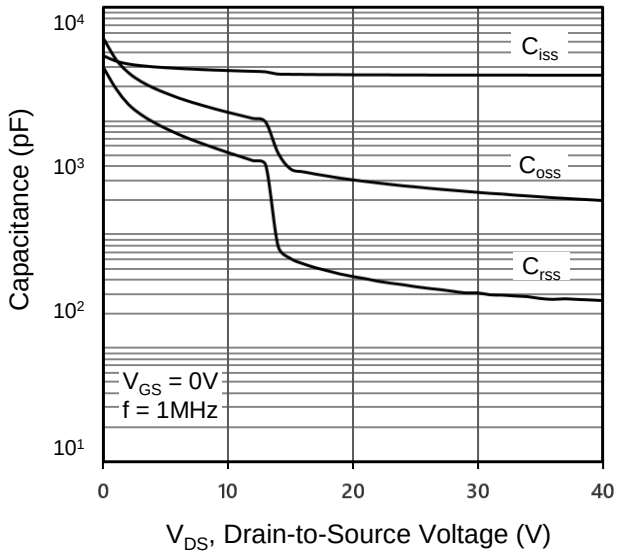


Figure 8. Gate Charge

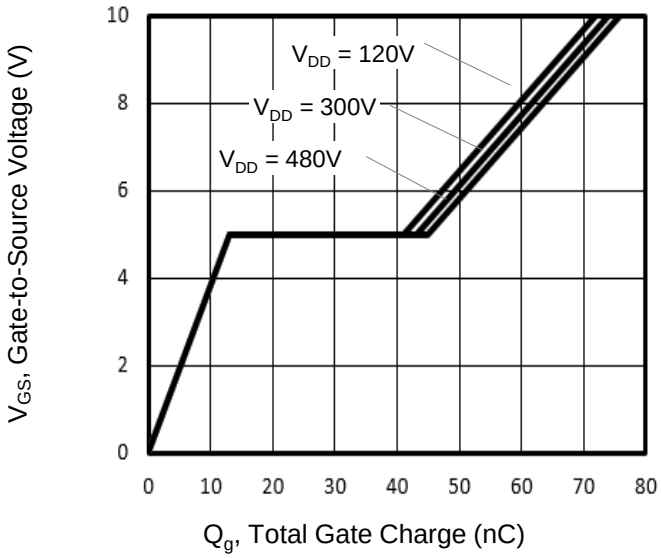


Figure 9. Transient Thermal Impedance

TO-220

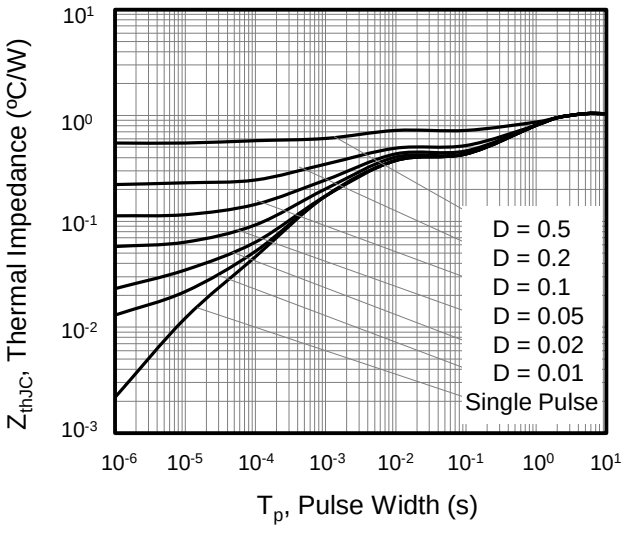


Figure 9. Transient Thermal Impedance

TO-220F

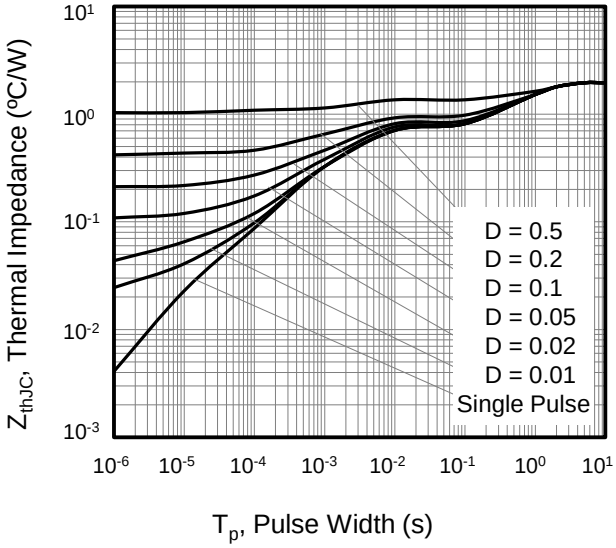


Figure A：Gate Charge Test Circuit and Waveform

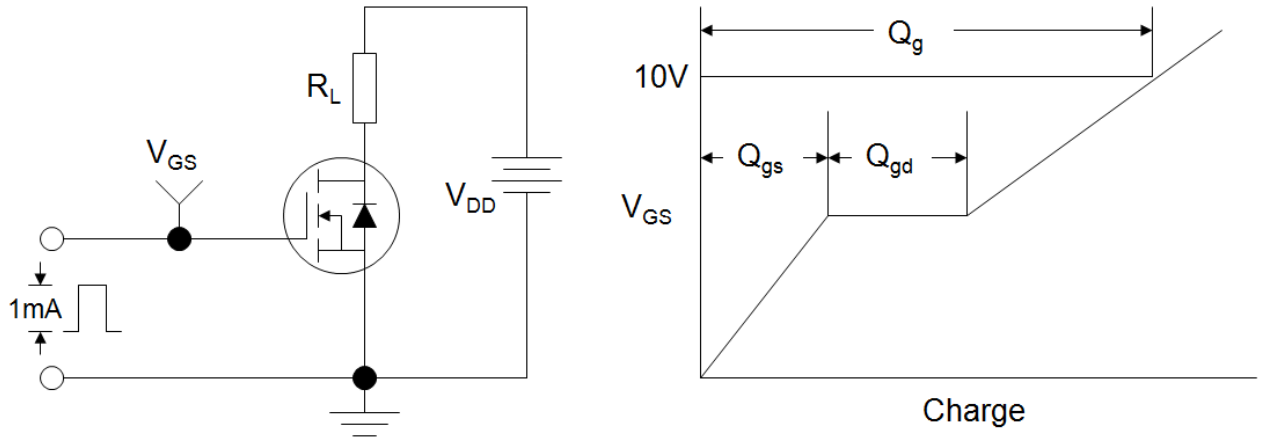


Figure B：Resistive Switching Test Circuit and Waveform

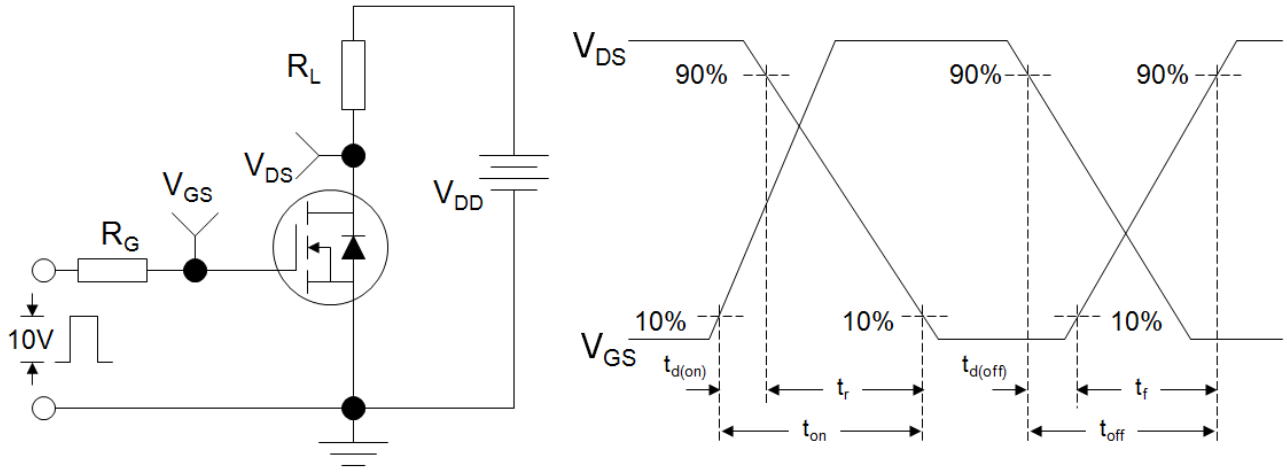
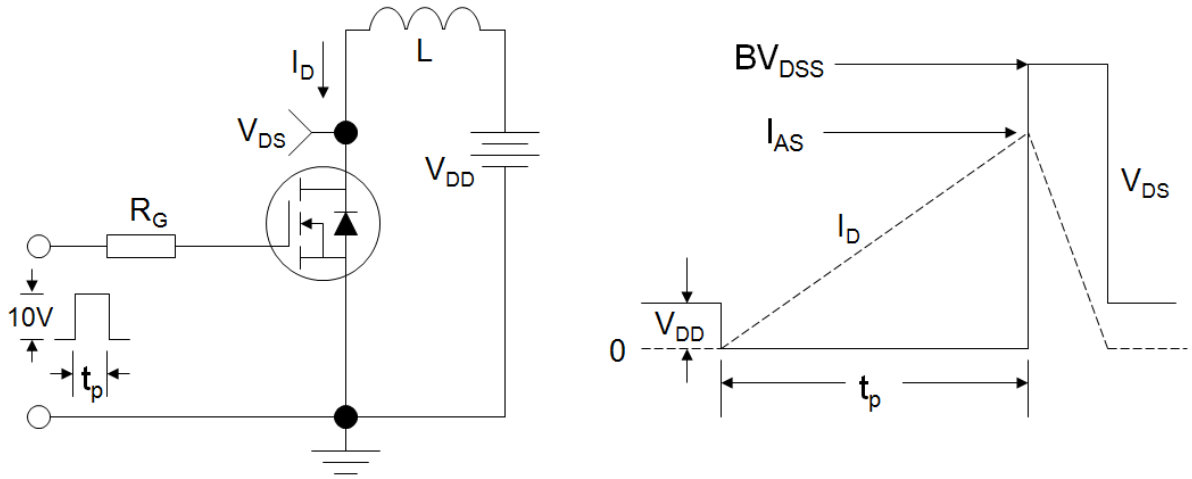
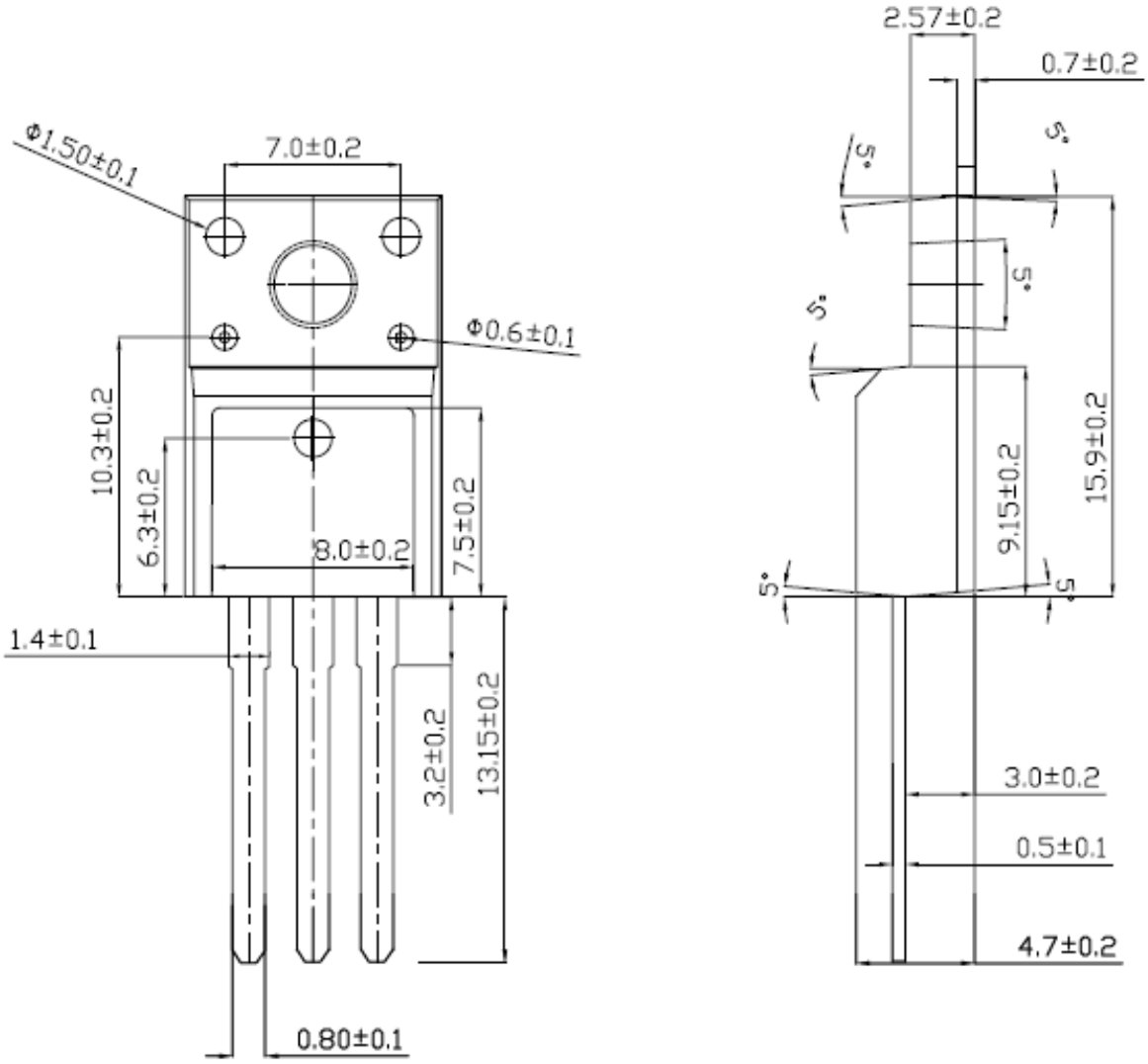


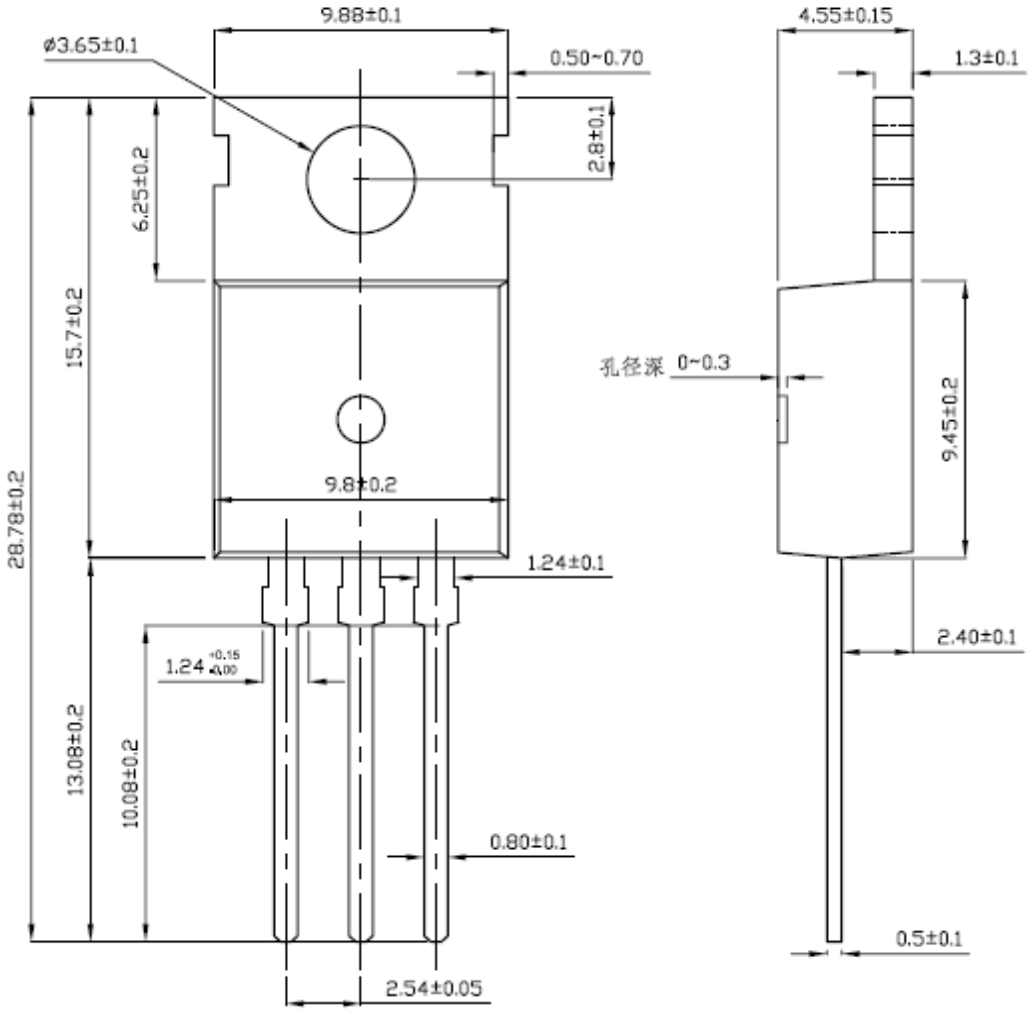
Figure C：Unclamped Inductive Switching Test Circuit and Waveform



TO-220F


2.57±0.2
0.7±0.2
5°
5°
5°
5°
5°
5°
Φ1.50±0.1
7.0±0.2
Φ0.6±0.1
10.3±0.2
6.3±0.2
8.0±0.2
7.5±0.2
15.9±0.2
9.15±0.2
1.4±0.1
3.2±0.2
13.15±0.2
3.0±0.2
0.5±0.1
4.7±0.2
0.80±0.1

TO-220


9.88±0.1
ø3.65±0.1
0.50~0.70
2.8±0.1
6.25±0.2
15.7±0.2
28.78±0.2
9.8±0.2
1.24±0.1
1.24 +0.15 -0.00
13.08±0.2
10.08±0.2
0.80±0.1
2.54±0.05
4.55±0.15
1.3±0.1
孔径深 0~0.3
9.45±0.2
2.40±0.1
0.5±0.1

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