

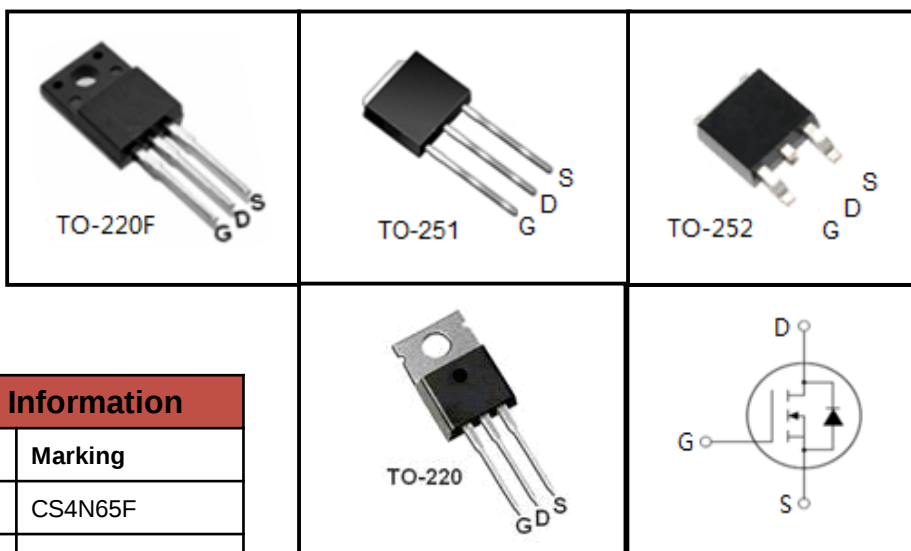
650V N-Channel MOSFET

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
CS4N65F	TO-220F	CS4N65F
CS4N65P	TO-220	CS4N65P
CS4N65U	TO-251	CS4N65U
CS4N65D	TO-252	CS4N65D

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Value				Unit
		TO-220F	TO-220	TO-251	TO-252	
Drain-Source Voltage (V _{GS} = 0V)	V _{DSS}	650				V
Continuous Drain Current	I _D	4				A
Pulsed Drain Current (note1)	I _{DM}	16				A
Gate-Source Voltage	V _{GSS}	± 20				V
Single Pulse Avalanche Energy (note2)	E _{AS}	76				mJ
Avalanche Current (note1)	I _{AS}	4				A
Repetitive Avalanche Energy (note1)	E _{AR}	45				mJ
Power Dissipation (T _C = 25°C)	P _D	20	25			W
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55~+150				°C

Thermal Resistance

Parameter	Symbol	Value				Unit
		TO-220F	TO-251	TO-252	TO-220	
Thermal Resistance, Junction-to-Case	R _{thJC}	6.25	5			K/W
Thermal Resistance, Junction-to-Ambient	R _{thJA}	62.5	60			

Specifications $T_J = 25^{\circ}\text{C}$, 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	650	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
Gate-Source Leakage	I _{GSS}	V _{GS} = ±20V	--	--	±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 = 2A	--	2	2.4	Ω
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 25V, f = 1.0MHz	--	545	--	pF
Output Capacitance	C _{oss}		--	53	--	
Reverse Transfer Capacitance	C _{rss}		--	4.5	--	
Total Gate Charge	Q _g	V _{DD} = 520V, I _D = 4A, V _{GS} = 10V	--	15	--	nC
Gate-Source Charge	Q _{gs}		--	3	--	
Gate-Drain Charge	Q _{gd}		--	7	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 250V, I _D =4A, R _G = 25 Ω	--	36	--	ns
Turn-on Rise Time	t _r		--	13	--	
Turn-off Delay Time	t _{d(off)}		--	80	--	
Turn-off Fall Time	t _f		--	24	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I _S	T _C = 25 °C	--	--	4	A
Pulsed Diode Forward Current	I _{SM}		--	--	16	
Body Diode Voltage	V _{SD}	T _J = 25°C, I _{SD} = 2.0A, V _{GS} = 0V	--	--	1.4	V
Reverse Recovery Time	t _{rr}	V _{GS} = 0V,I _S = 4A, di _F /dt =100A /μs	--	550	--	ns
Reverse Recovery Charge	Q _{rr}		--	1.38	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 10.0mH, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

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

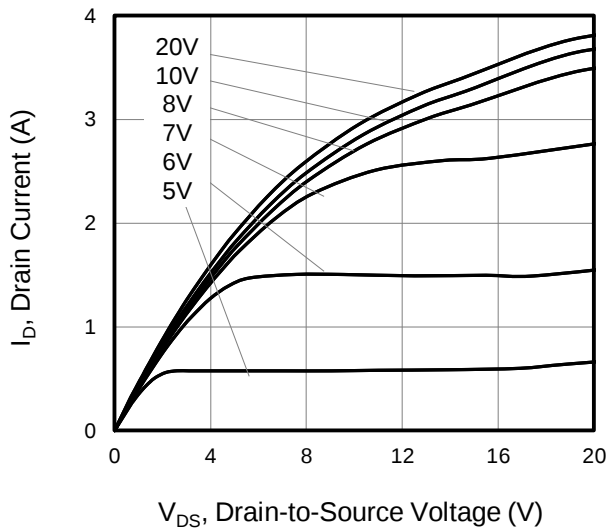


Figure 2. Body Diode Forward Voltage

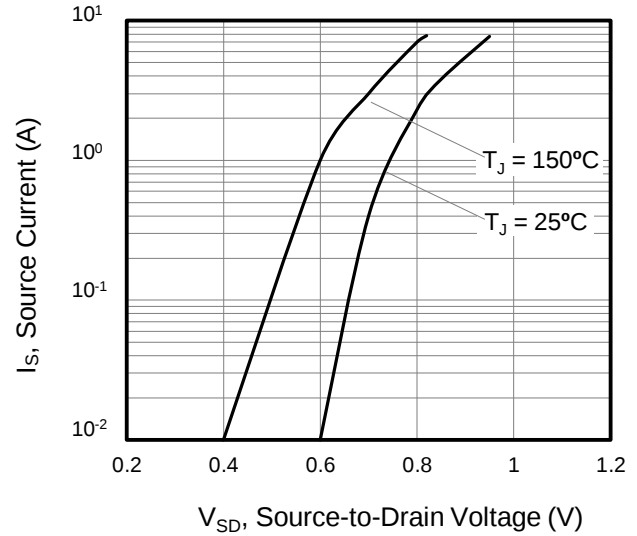


Figure 3. Drain Current vs. Temperature

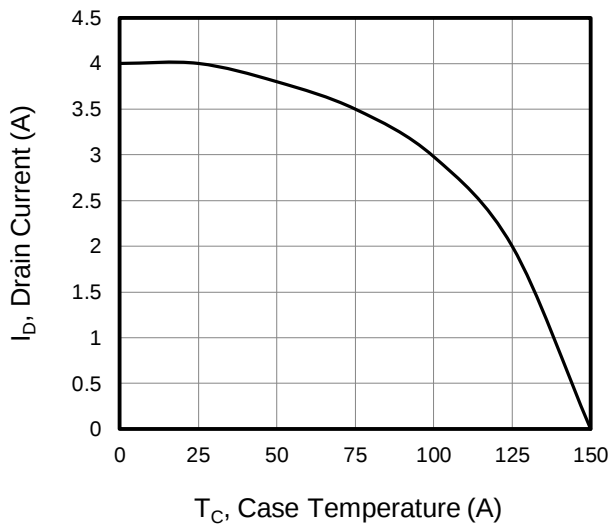


Figure 4. Power Dissipation vs. Temperature

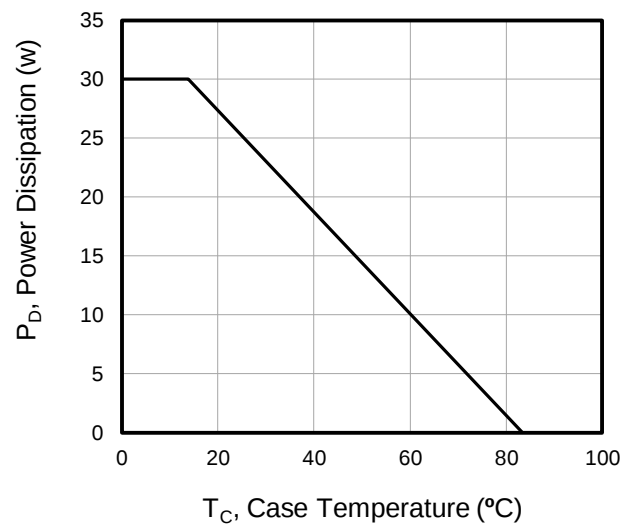


Figure 5. Transfer Characteristics

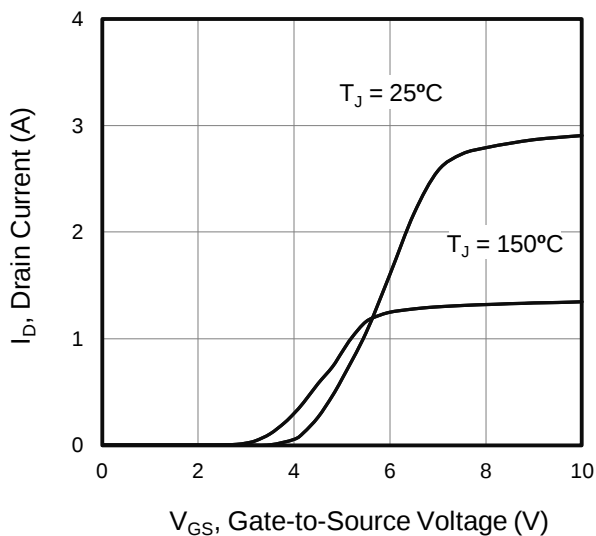
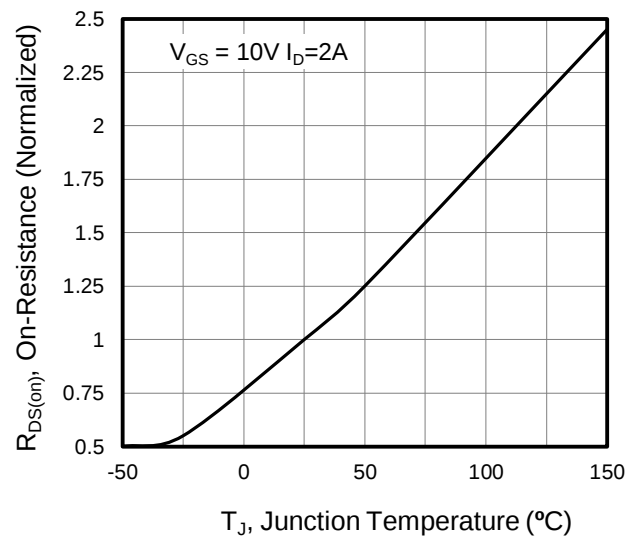


Figure 6. On-Resistance vs. Temperature



Typical Characteristics $T_j = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

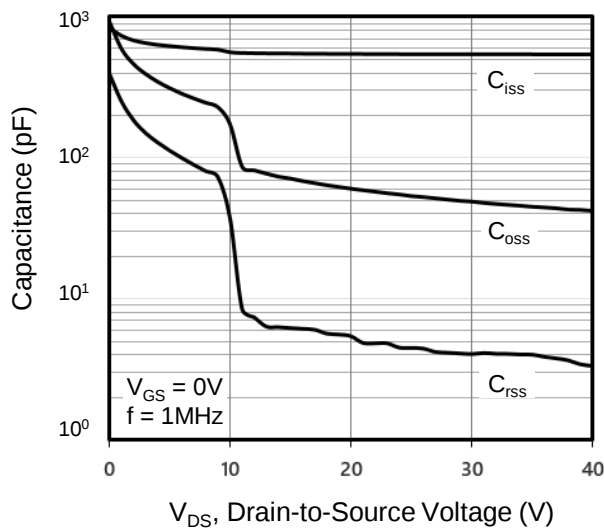
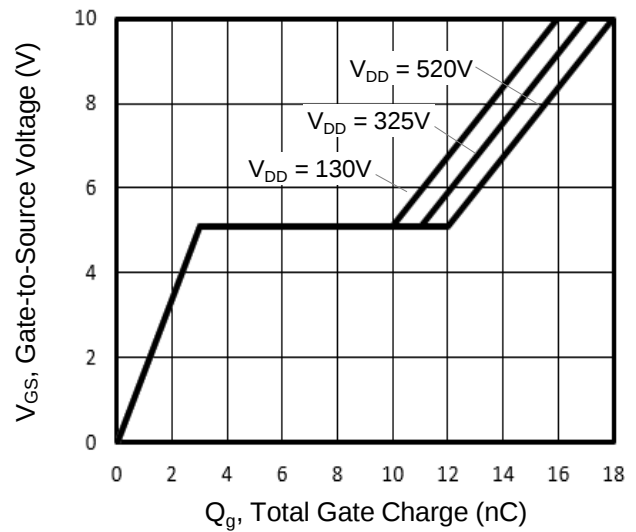
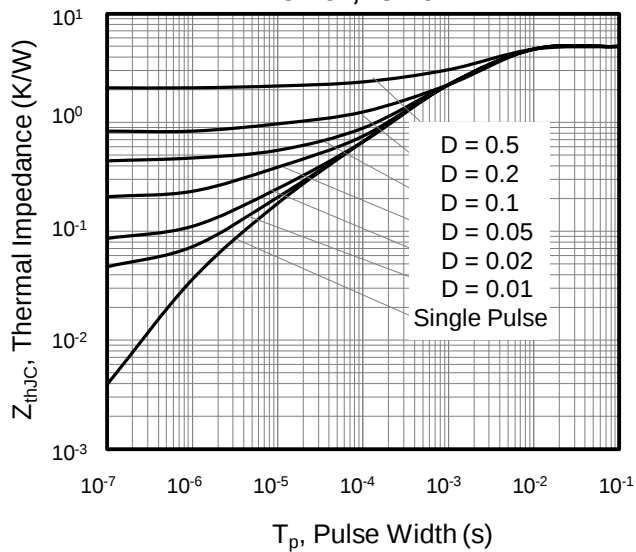


Figure 8. Gate Charge



**Figure 9. Transient Thermal Impedance
TO-251,TO-252**



**Figure 10. Transient Thermal Impedance
TO-220F**

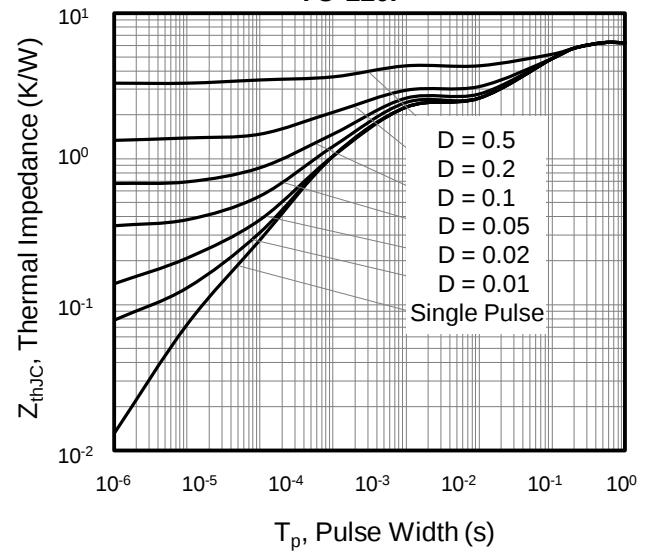
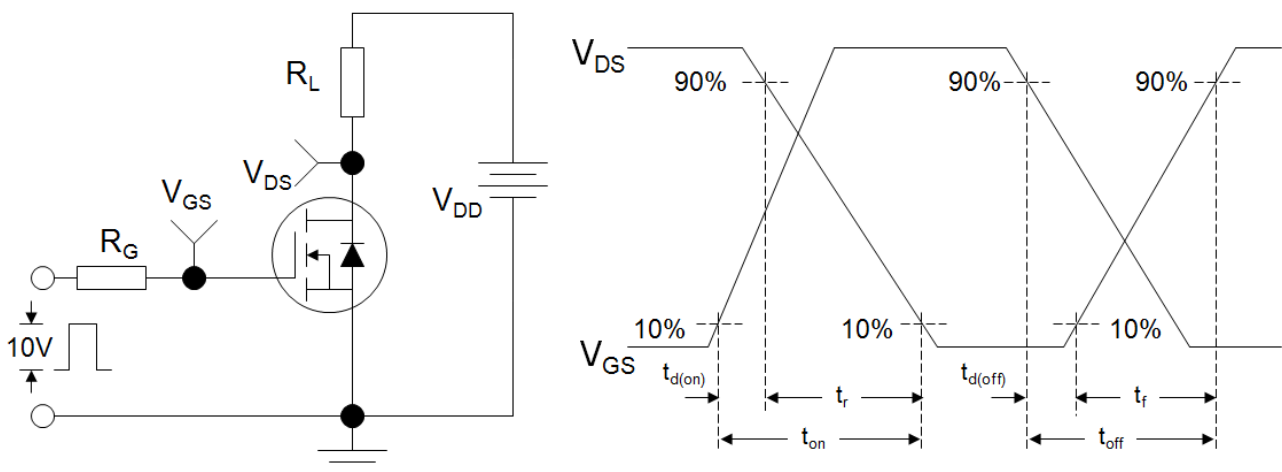
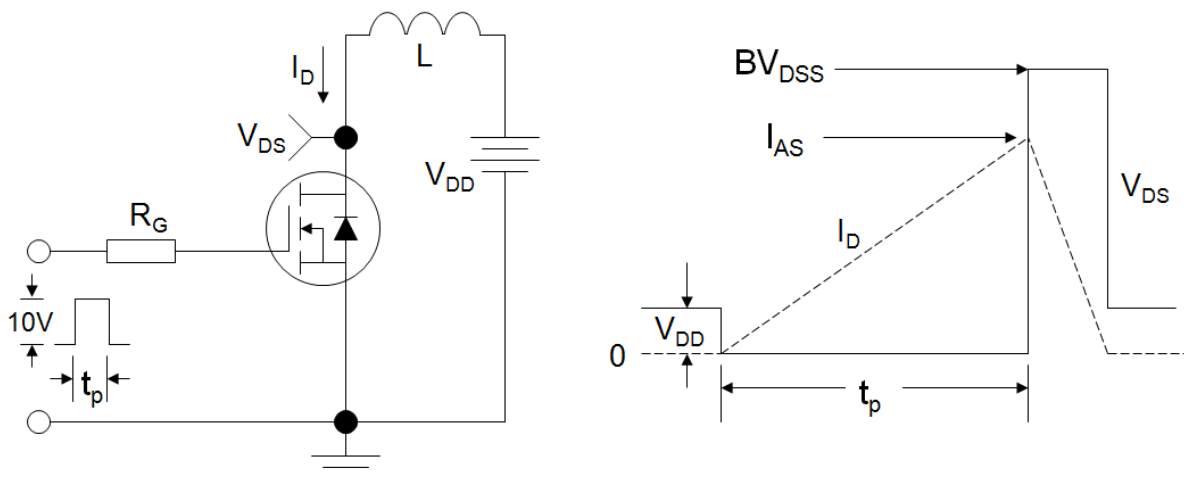
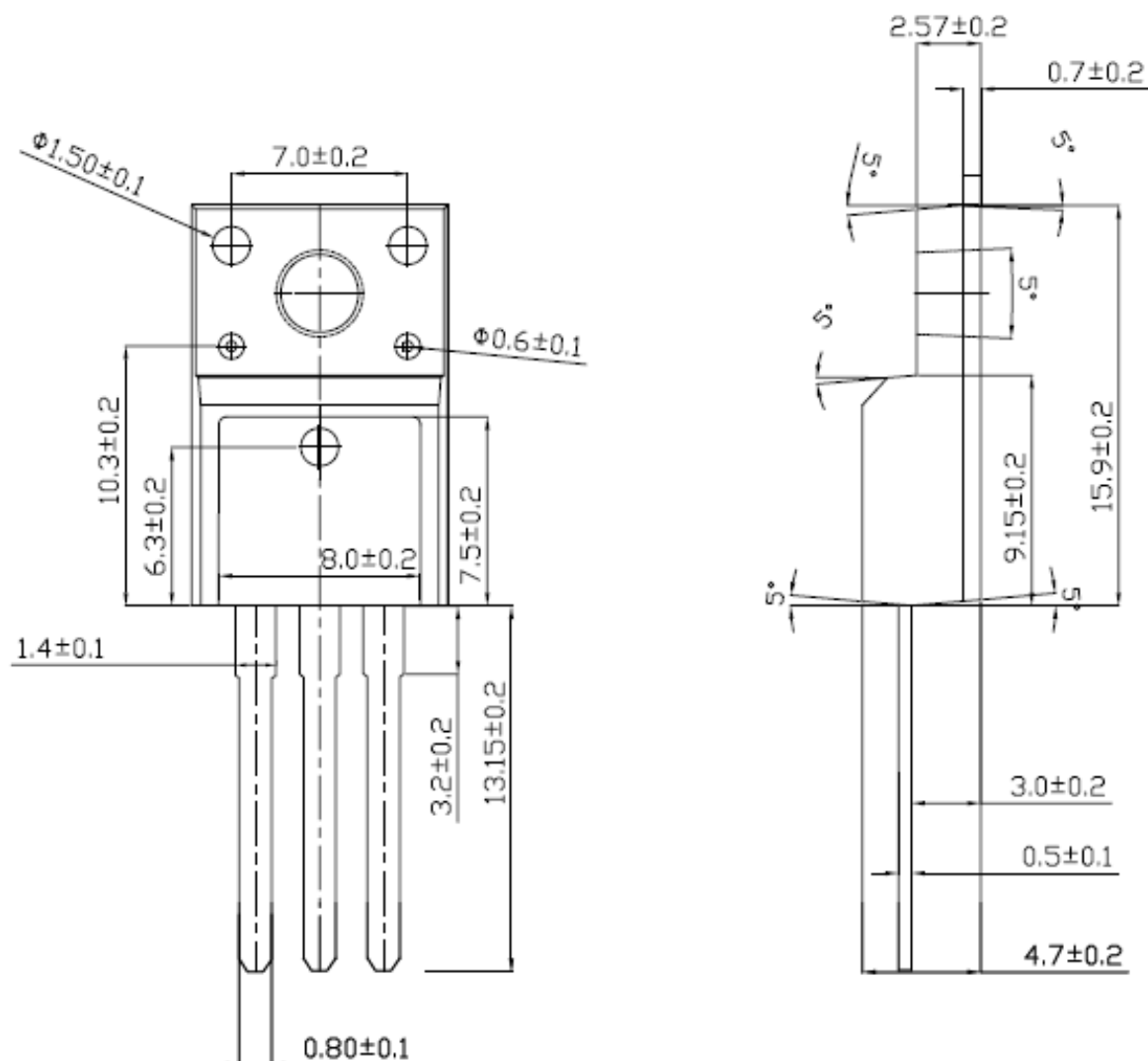


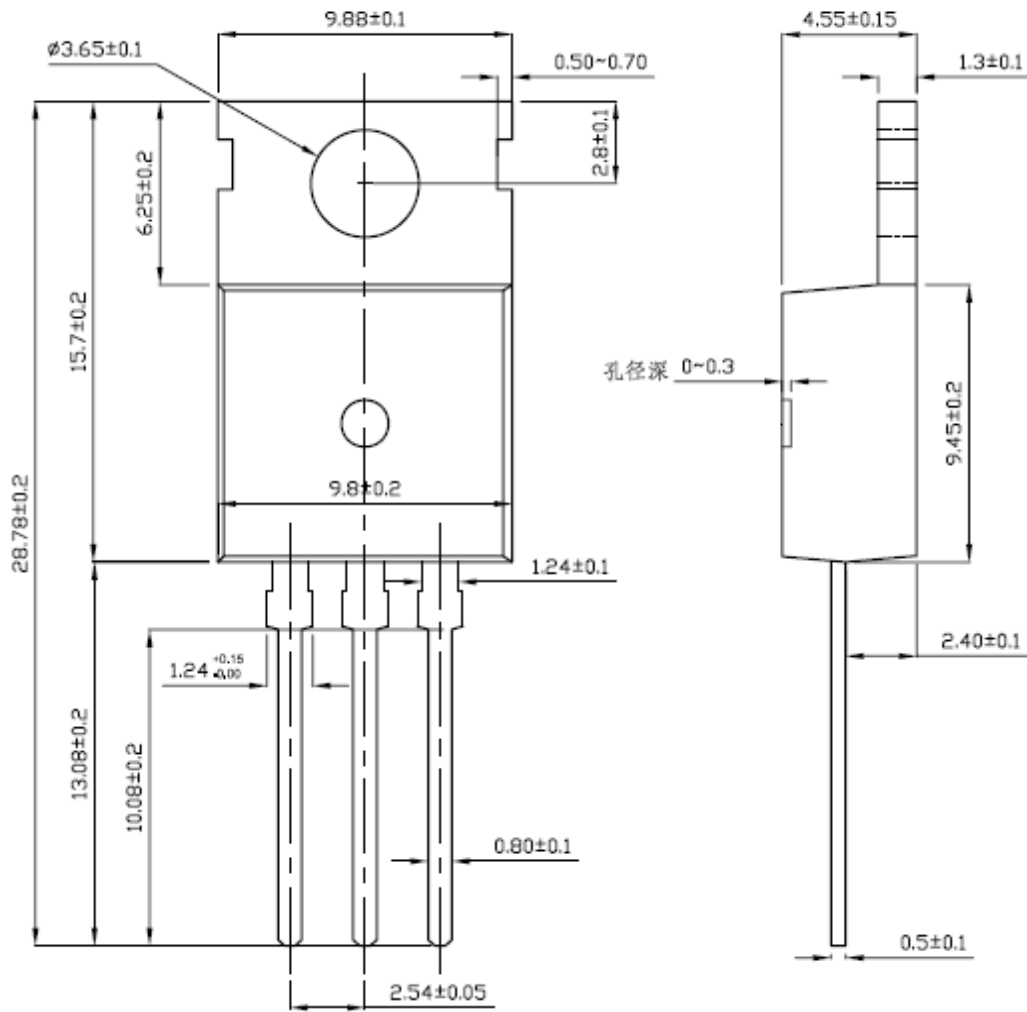
Figure A: Gate Charge Test Circuit and Waveform

Figure B: Resistive Switching Test Circuit and Waveform

Figure C: Unclamped Inductive Switching Test Circuit and Waveform


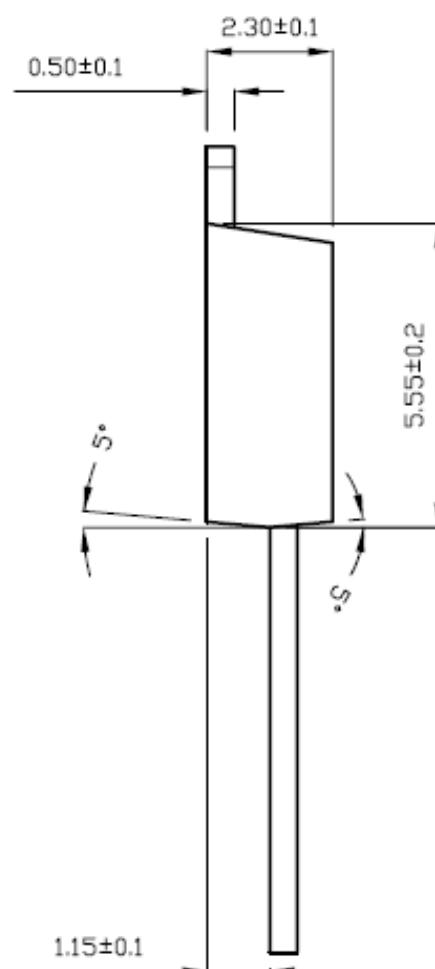
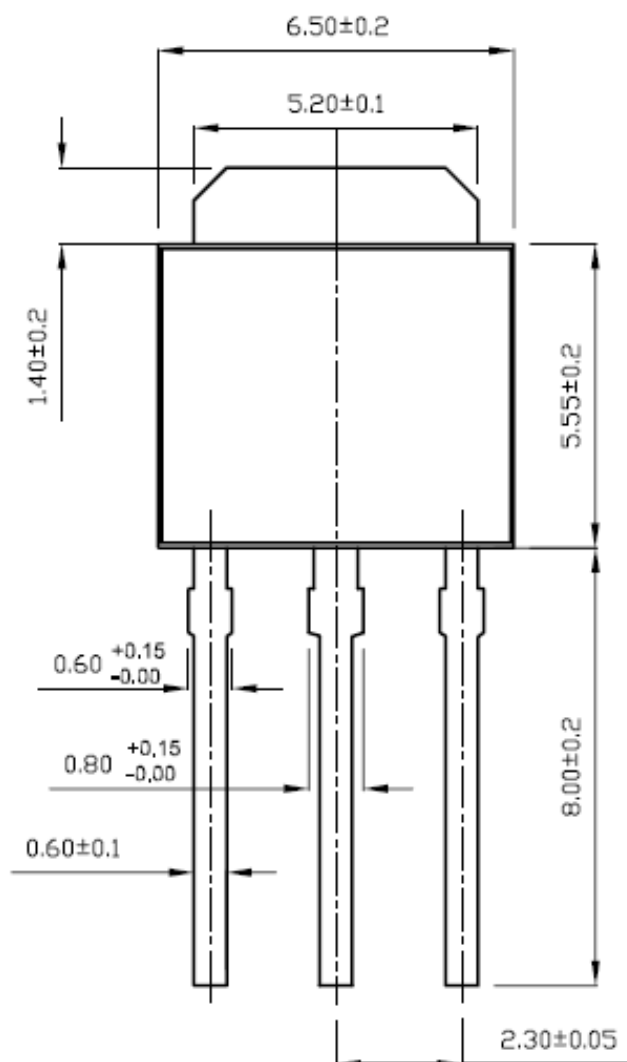
TO-220F



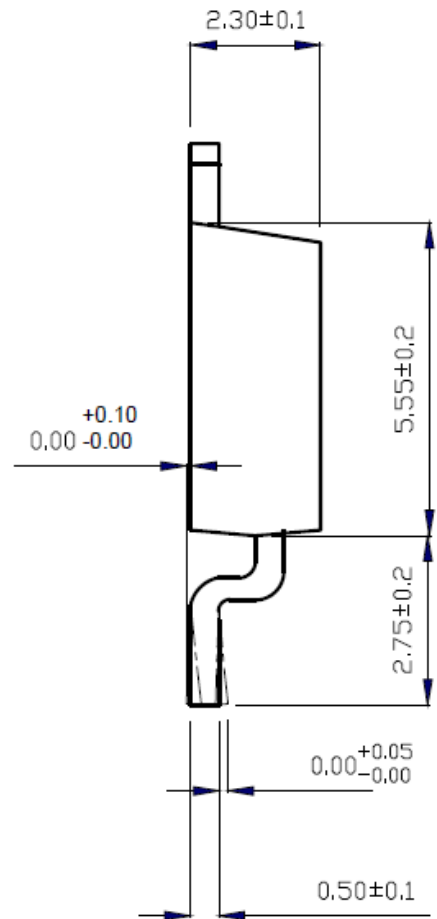
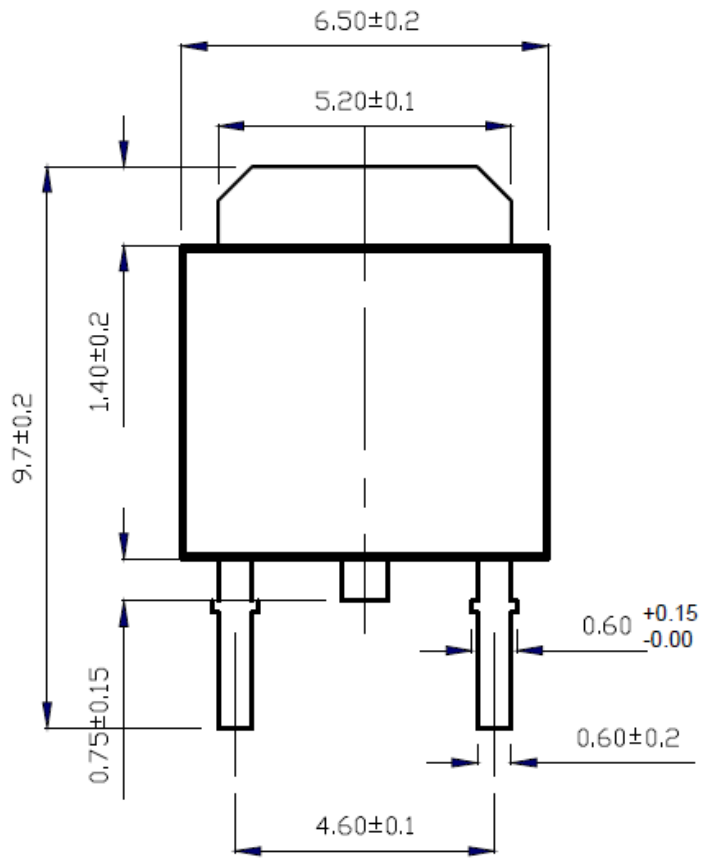
TO-220



TO-251



TO-252



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