

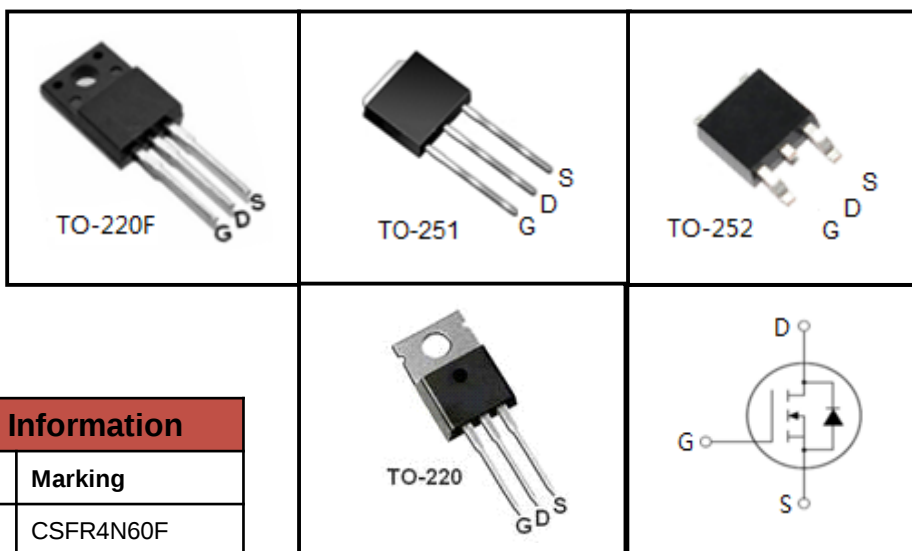
600V N-Channel MOSFET

FEATURES

- Fast switching
- Integrate fast recovery diode
- Fast switching speed
- 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
CSFR4N60F	TO-220F	CSFR4N60F
CSFR4N60P	TO-220	CSFR4N60P
CSFR4N60U	TO-251	CSFR4N60U
CSFR4N60D	TO-252	CSFR4N60D

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}	600				V
Continuous Drain Current	I _D	4				A
Pulsed Drain Current (note1)	I _{DM}	16				A
Gate-Source Voltage	V _{GSS}	±30				V
Single Pulse Avalanche Energy (note2)	E _{AS}	80				mJ
Avalanche Current (note1)	I _{AS}	4				A
Repetitive Avalanche Energy (note1)	E _{AR}	48				mJ
Power Dissipation (T _C = 25°C)	P _D	36	75			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}	3.47	1.67			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	600	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 600V, V _{GS} = 0V, T _J = 25°C	--	--	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 = 2.0A	--	2	2.4	Ω
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 25V, f = 1.0MHz	--	515	--	pF
Output Capacitance	C _{oss}		--	60	--	
Reverse Transfer Capacitance	C _{rss}		--	9	--	
Total Gate Charge	Q _g	V _{DD} = 480V, I _D = 4.0A, V _{GS} = 10V	--	18	--	nC
Gate-Source Charge	Q _{gs}		--	2.8	--	
Gate-Drain Charge	Q _{gd}		--	9.2	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} 300V, I _D =4.0A, R _G = 25 Ω	--	38	--	ns
Turn-on Rise Time	t _r		--	23	--	
Turn-off Delay Time	t _{d(off)}		--	100	--	
Turn-off Fall Time	t _f		--	41	--	
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 = 4.0A, di _F /dt =100A /μs	--	60	--	ns
Reverse Recovery Charge	Q _{rr}		--	0.07	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=10mH, V_{DD} = 50V, R_G = 25\Omega$, 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 ($T_J = 25^\circ\text{C}$)

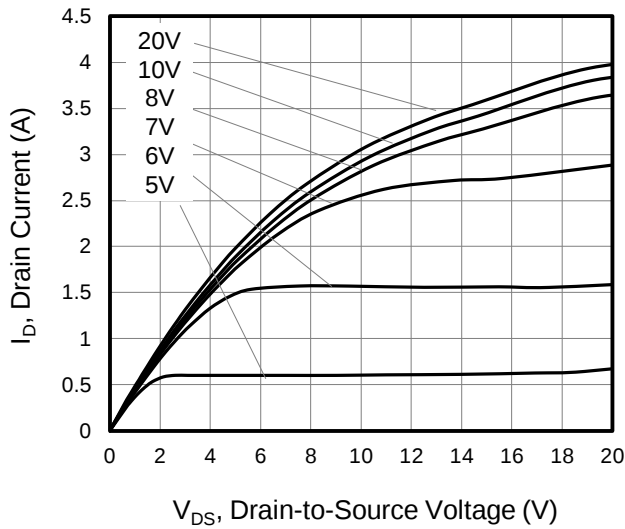


Figure 2. Body Diode Forward Voltage

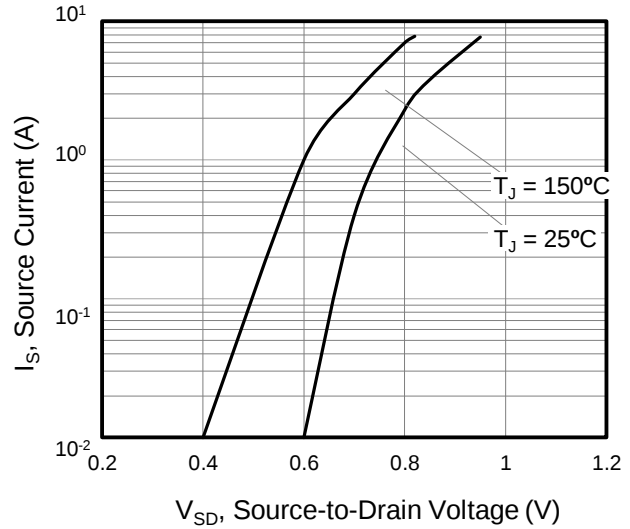


Figure 3. Drain Current vs. Temperature

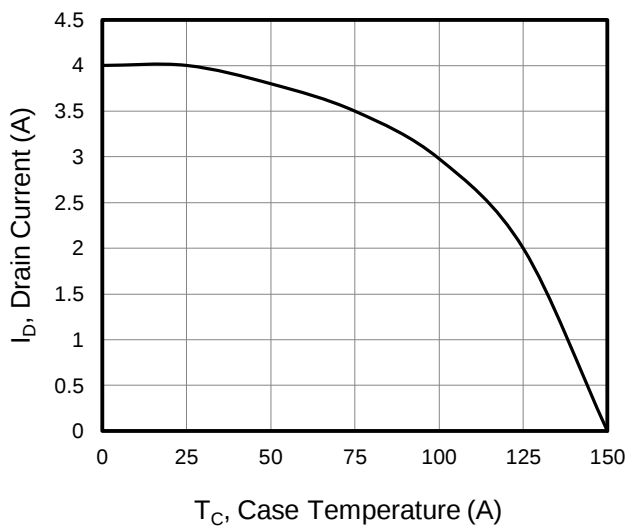


Figure 4. Power Dissipation vs. Temperature

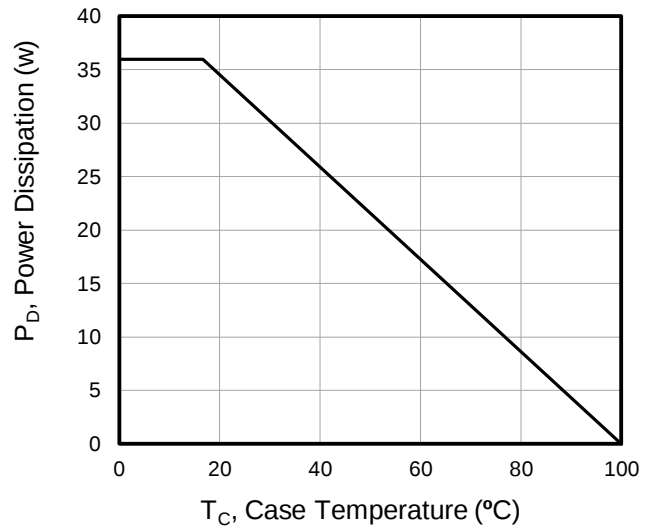


Figure 5. Transfer Characteristics

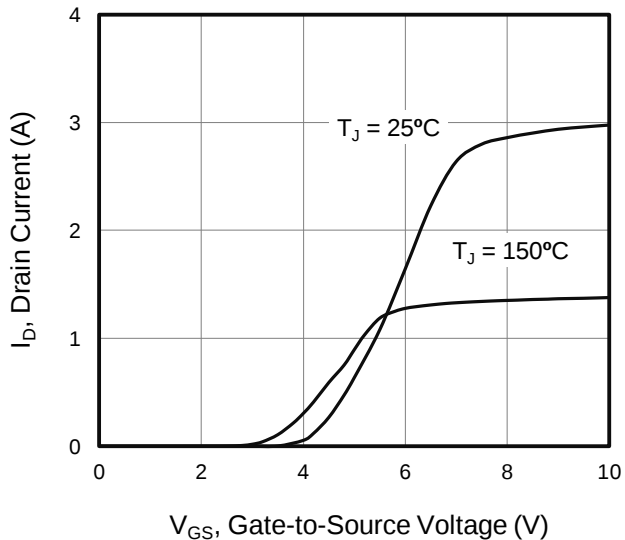
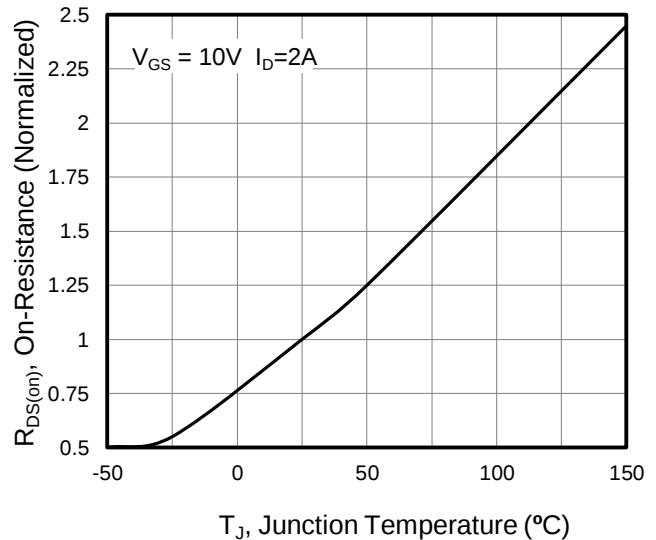


Figure 6. On-Resistance vs. Temperature



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

Figure 7. Capacitance

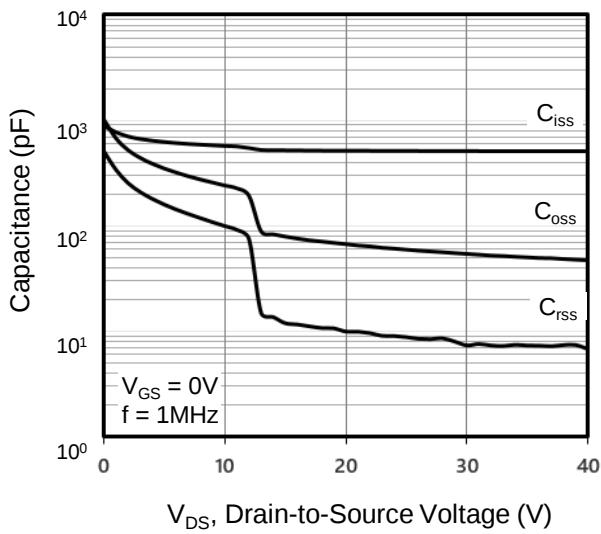


Figure 8. Gate Charge

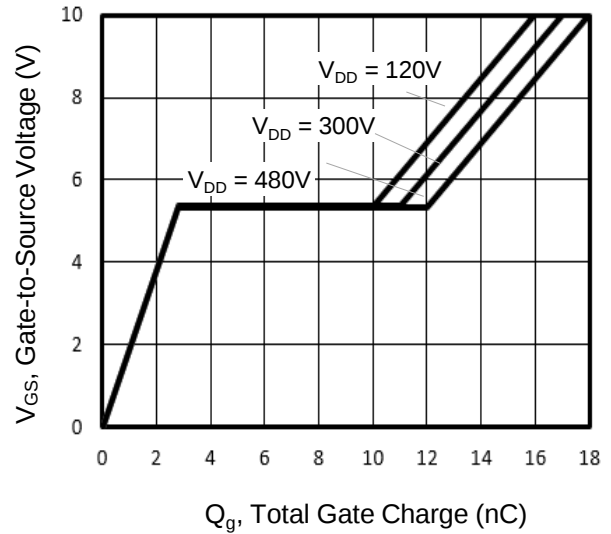


Figure 9. Transient Thermal Impedance
TO-220F

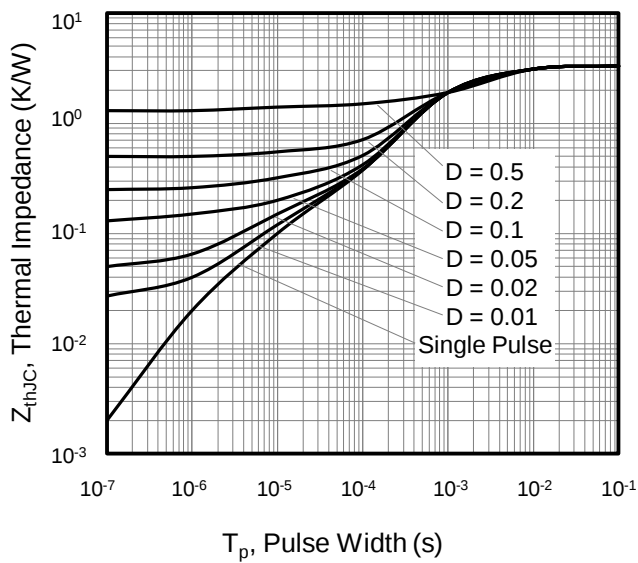


Figure 10. Transient Thermal Impedance
TO-220, TO-251, TO-252

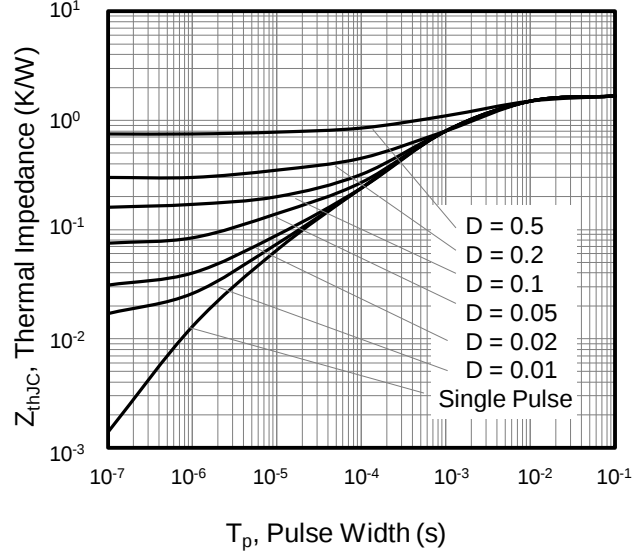
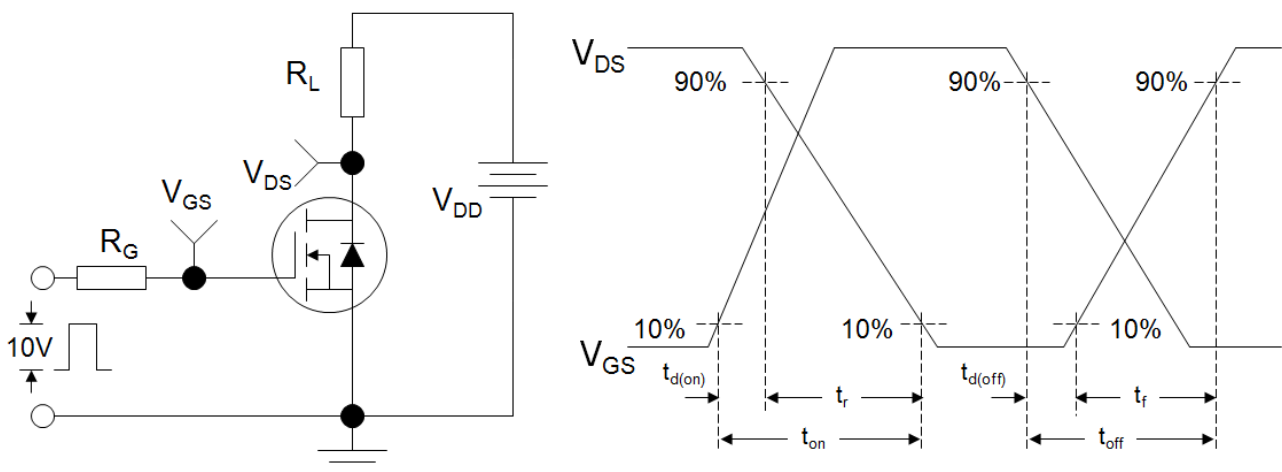
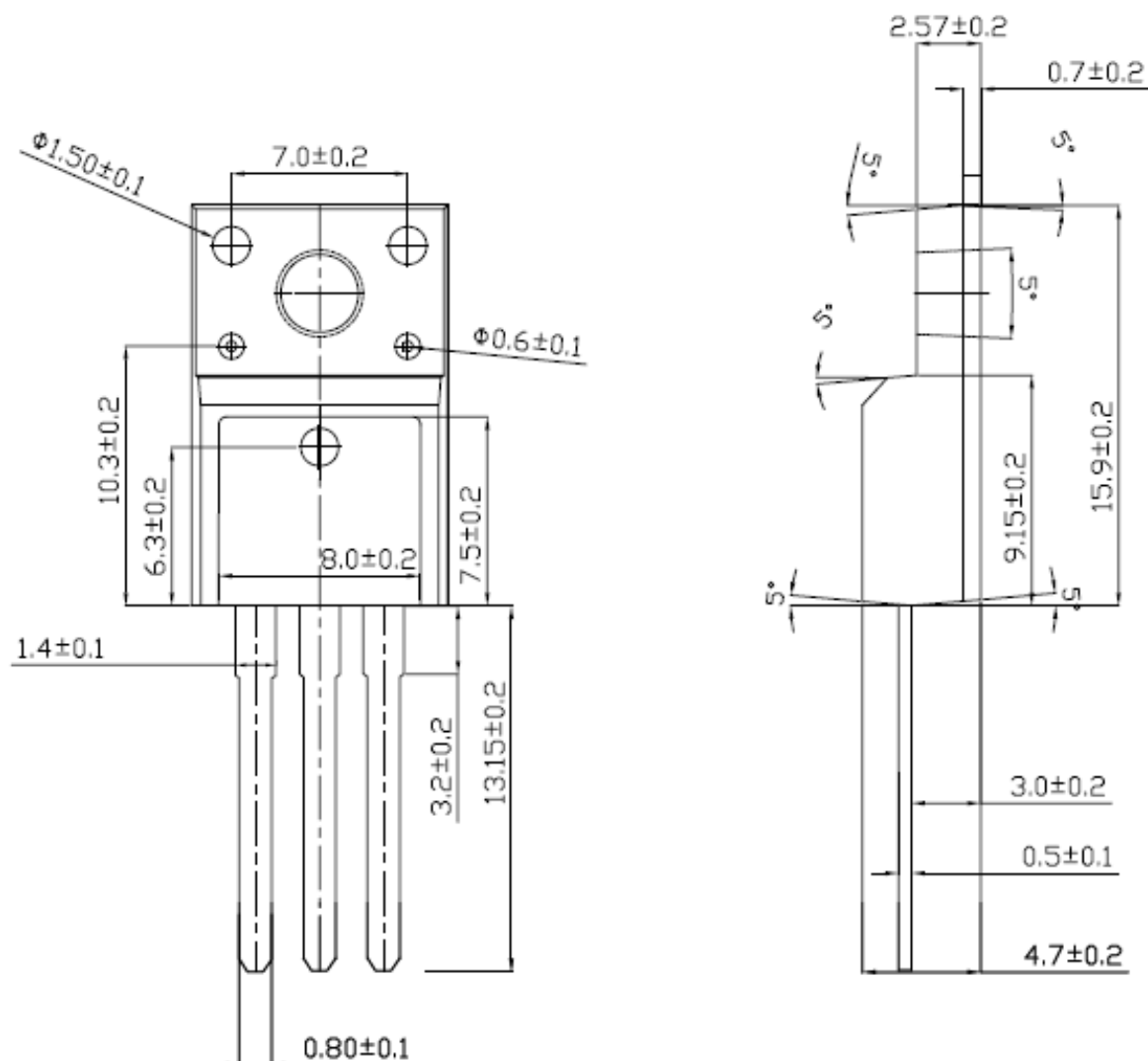


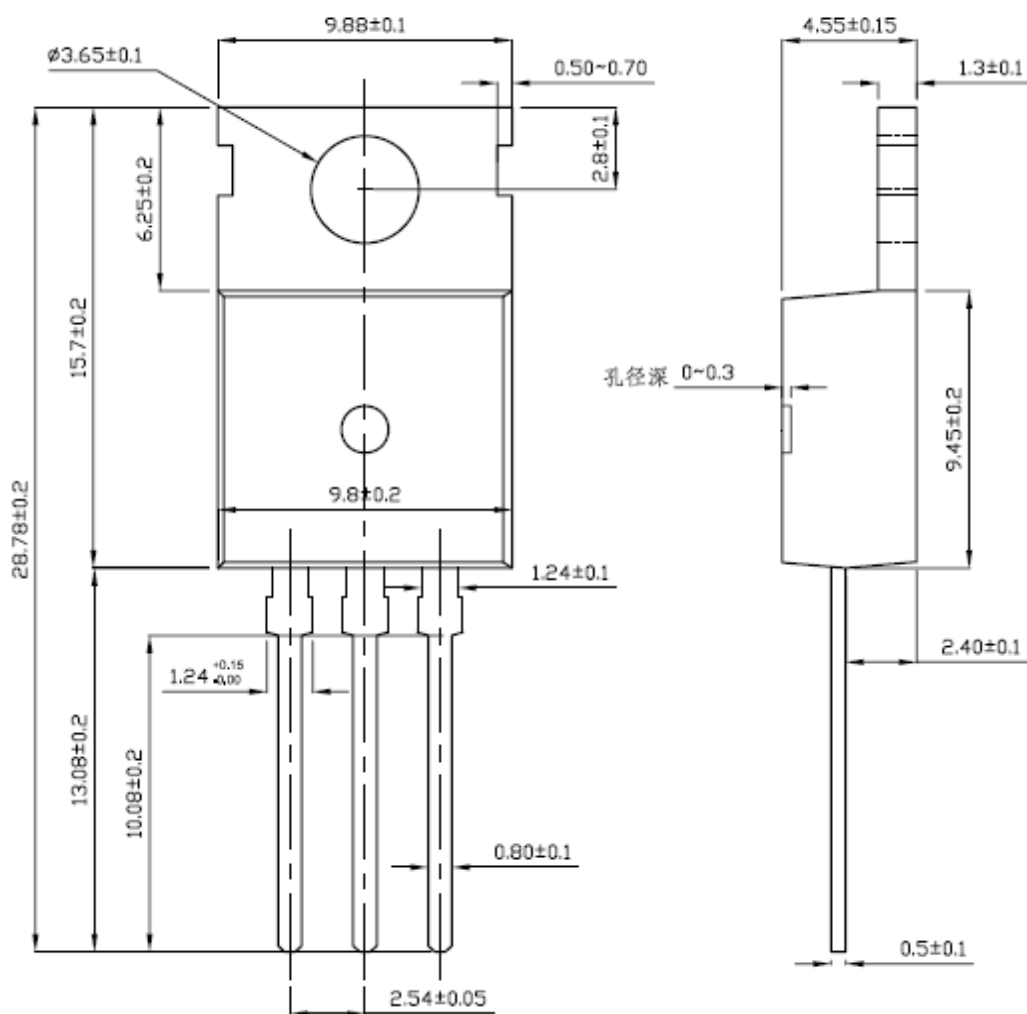
Figure A: Gate Charge Test Circuit and Waveform

Figure B: Resistive Switching Test Circuit and Waveform

Figure C: Unclamped Inductive Switching Test Circuit and Waveform

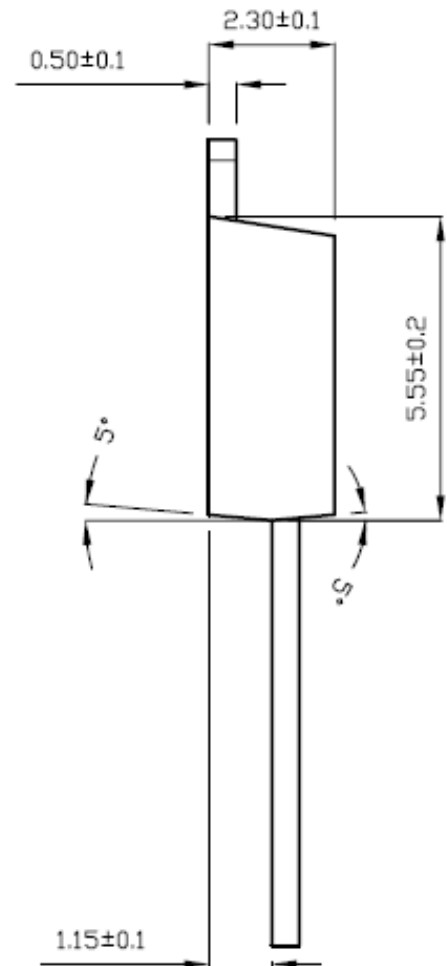
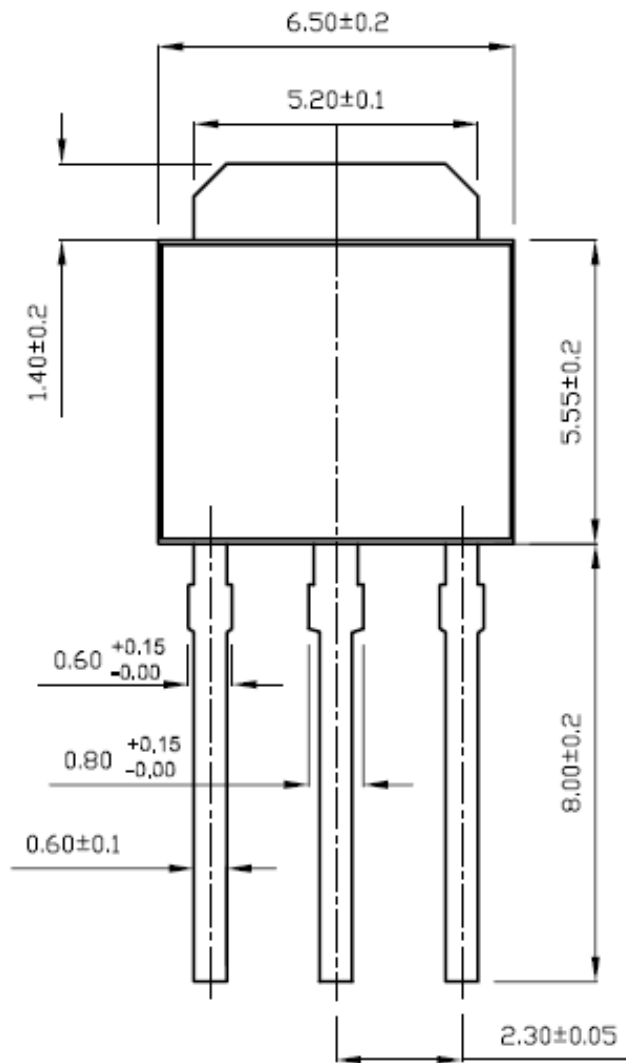

TO-220F



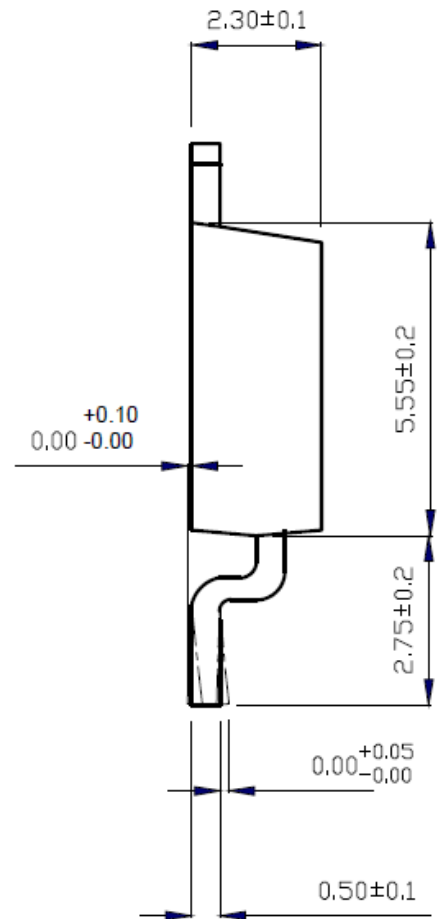
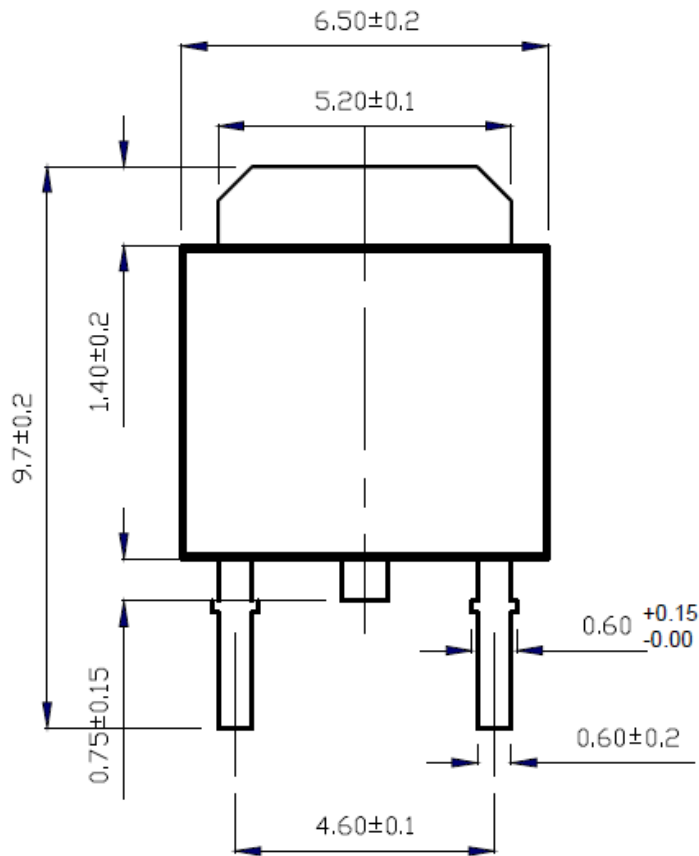
TO-220



TO-251



TO-252



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