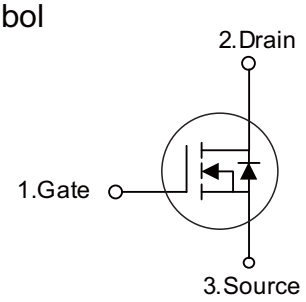
■ PRODUCT CHARACTERISTICS

VDSS	650V
R_{DS}(on)max(@V_{GS} =10 V)	0.28Ω
Qg@type	19nC
ID	15A

Symbol



■ FEATURES

Ultra low $R_{DS(on)}$

Ultra low gate charge (typ. Q_g = 19 nC)

100% UIS tested

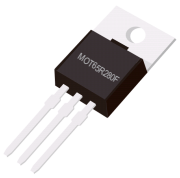
RoHS compliant

■ APPLICATIONS

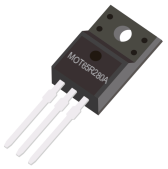
Power faction correction

Switched mode power supplies

Uninterruptible power supply



TO-220



TO-220F

■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT65R280F	TO-220F	50 pieces/Tube
N/A	MOT65R280A	TO-220	50 pieces/Tube

■ ABSOLUTE MAXIMUM RATINGS

Parameter		**Symbol**	**Value**	**Unit**
Drain-Source Voltage (V_{GS} = 0V)		V_{DSS}	650	V
Continuous Drain Current		I_D	15	A
Pulsed Drain Current	(note1)	I_{DM}	45	A
Gate-Source Voltage		V_{GSS}	±30	V
Single Pulse Avalanche Energy	(note2)	E_{AS}	290	mJ
Avalanche Current	(note1)	I_{AS}	2.4	A
MOSFET dv/dt ruggedness, V_{DS} = 0...480V		dv/dt	50	V/ns
Reverse diode dv/dt, V_{DS} = 0…480V, I_{SD} ≤ I_D		dv/dt	15	V/ns
Power Dissipation (T_C = 25ºC)	TO-220F	P_D	32	W
	TO-220		104	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55~+150	ºC

■ THERMAL CHARACTERISTICS

Parameter		**Symbol**	**Value**	**Unit**
Thermal Resistance, Junction-to-Case	TO-220	$R_{\theta JC}$	1.2	°C/W
	TO-220F	$R_{\theta JC}$	3.9	°C/W
Thermal Resistance, Junction-to-Ambient	TO-220	$R_{\theta JA}$	80	°C/W
	TO-220F	$R_{\theta JA}$	62	°C/W

■ ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
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 = 25ºC	--	--	1	μA
		V_{DS} = 650V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4.0	V
Drain-Source On-Resistance (Note3	$R_{DS(on)}$	V_{GS} = 10V, I_D = 7.5A	--	0.23	0.28	Ω
Forward Transconductance (Note3	g_{fs}	V_{DS} = 10V, I_D = 7.5A	--	10	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 50V, f = 1.0MHz	--	1250	--	pF
Output Capacitance	C_{oss}		--	81	--	
Reverse Transfer Capacitance	C_{rss}		--	7.1	--	
Total Gate Charge	Q_g	V_{DD} = 520V, I_D = 15A, V_{GS} = 10V	--	30	--	nC
Gate-Source Charge	Q_{gs}		--	9	--	
Gate-Drain Charge	Q_{gd}		--	10	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 15A, R_G = 25Ω	--	42	--	ns
Turn-on Rise Time	t_r		--	17	--	
Turn-off Delay Time	$t_{d(off)}$		--	135	--	
Turn-off Fall Time	t_f		--	6	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	15	A
Pulsed Diode Forward Current	I_{SM}		--	--	45	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 15A, V_{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 480V, I_F = I_S, di_F/dt = 100A/μs	--	335	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.4	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	20	--	A

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

■ ELECTRCAL CHARACTERISTICS

Figure 1. Output Characteristics

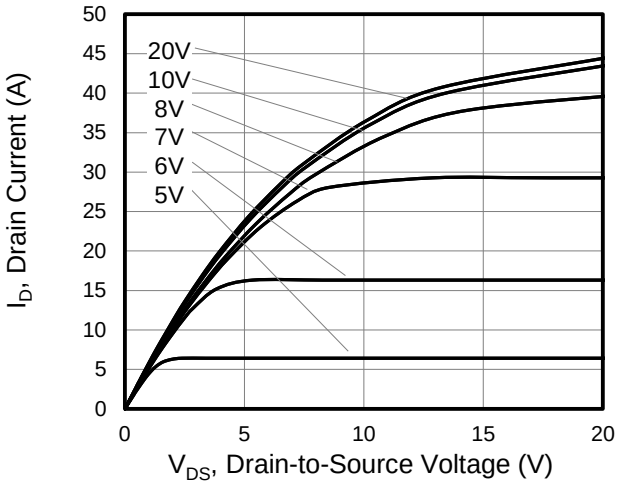


Figure 2. Transfer Characteristics

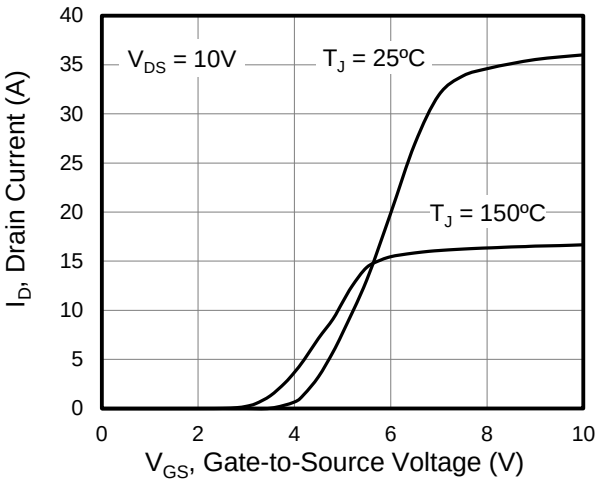


Figure 3. On-Resistance vs. Drain Current

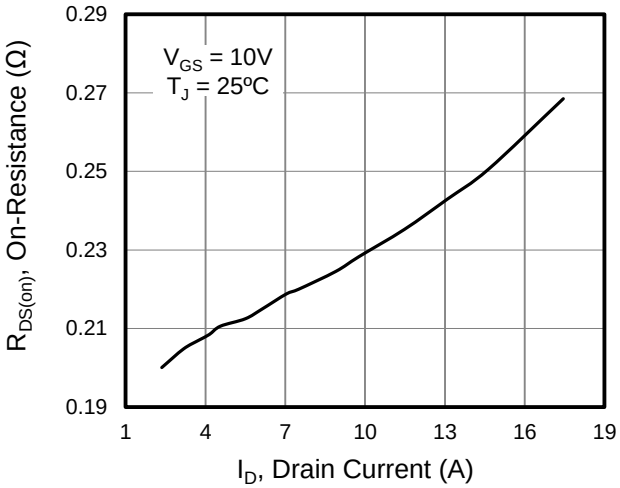


Figure 4. Capacitance

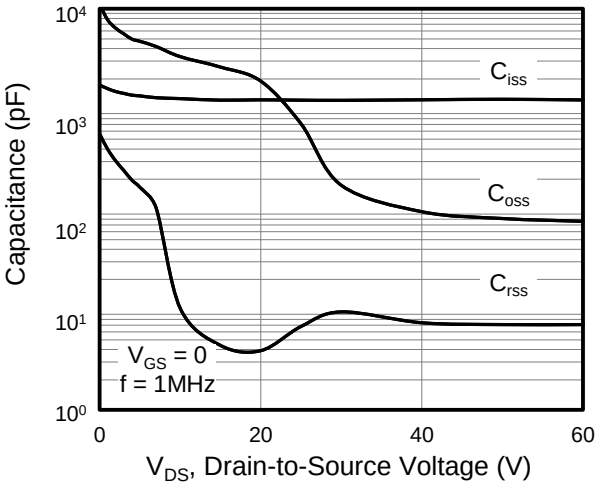


Figure 5. Gate Charge

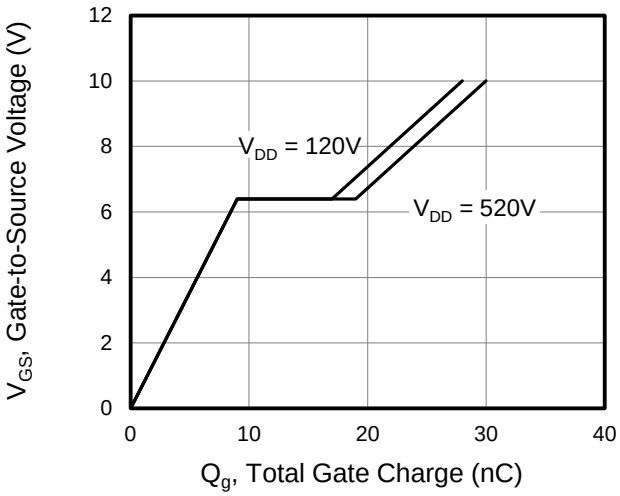
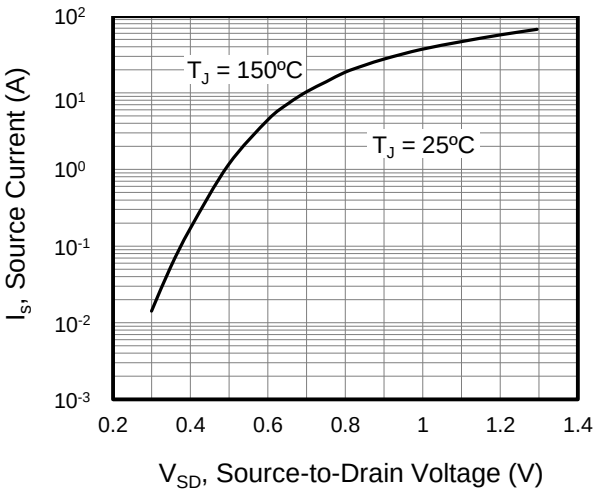


Figure 6. Body Diode Forward Voltage



■ ELECTRCAL CHARACTERISTICS(Cont.)

Figure 7. On-Resistance vs. Junction Temperature

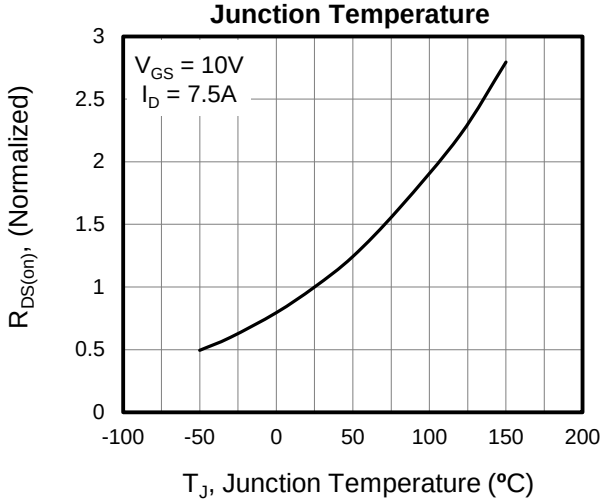


Figure 8. Threshold Voltage vs. Junction Temperature

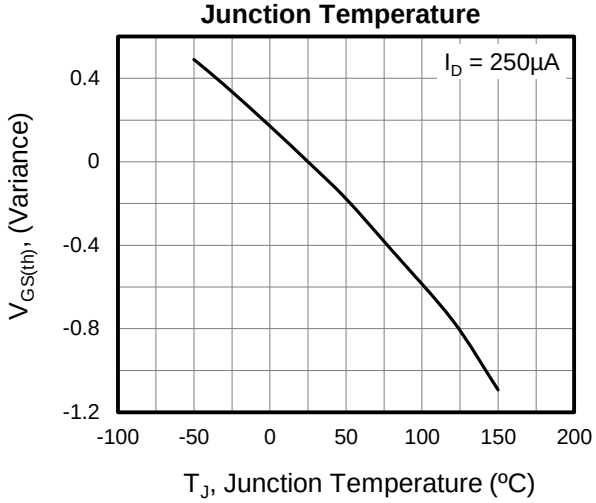


Figure 9. Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

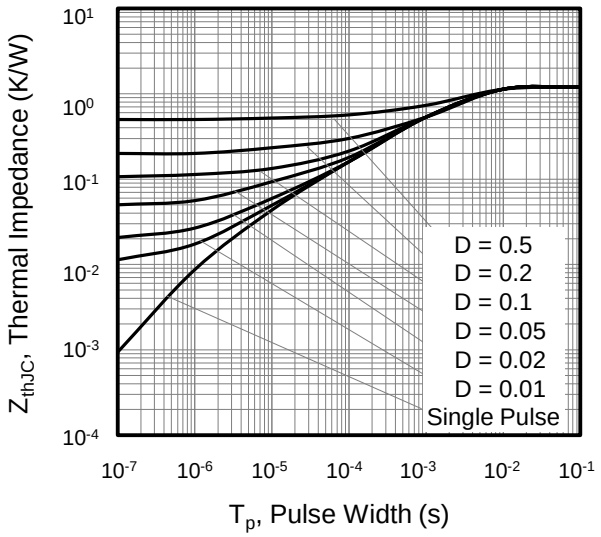


Figure 10. Transient Thermal Impedance TO-220F

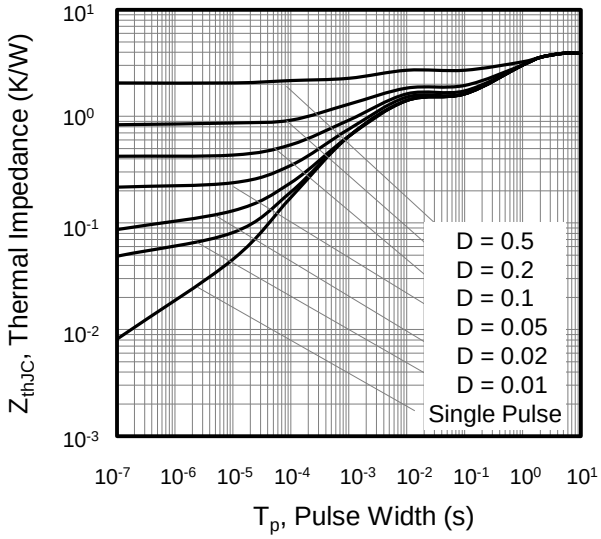


Figure 11. Safe operation area for TO-220,TO-251,TO-252,TO-262,TO-263

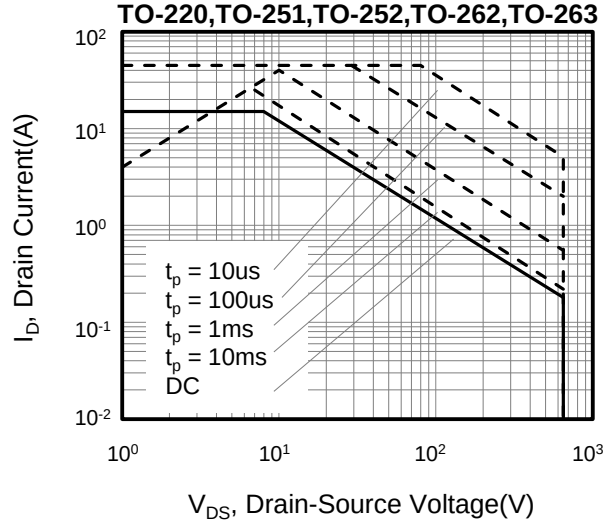
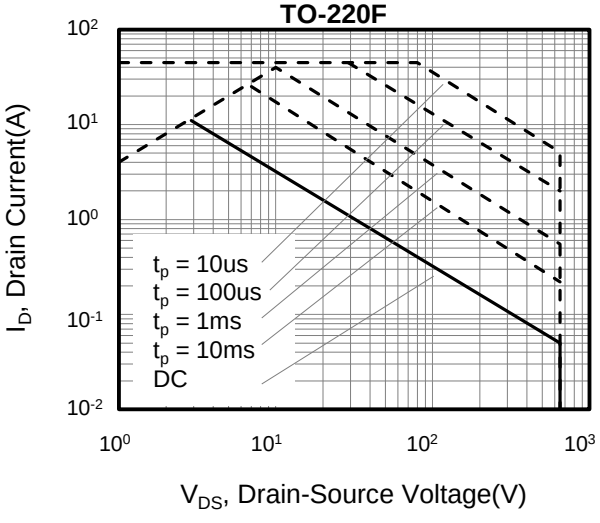


Figure 12. Safe operation area for TO-220F



■ GATE CHARGE TESR CIRCUIT WAVEFORM

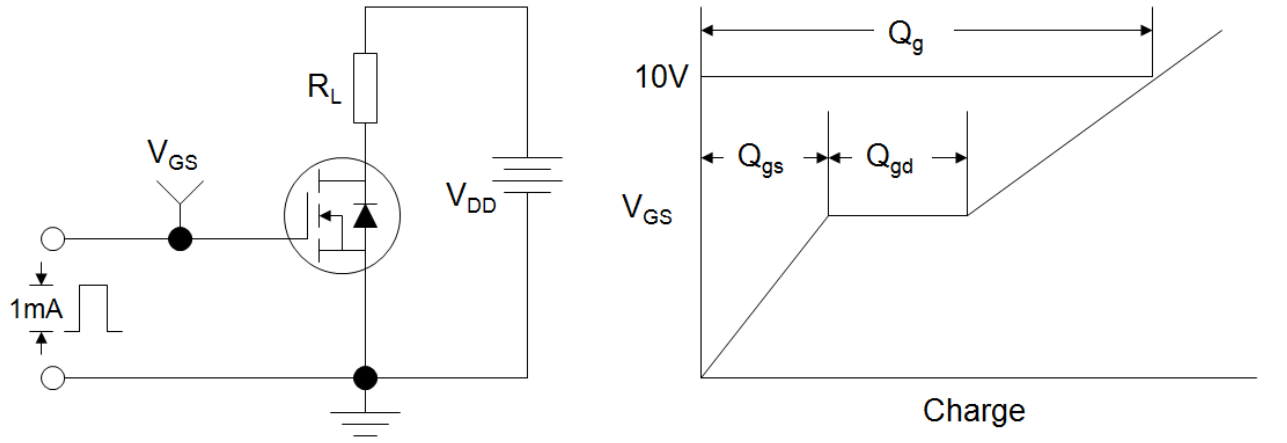


Figure B：Resistive Switching Test Circuit and Waveform

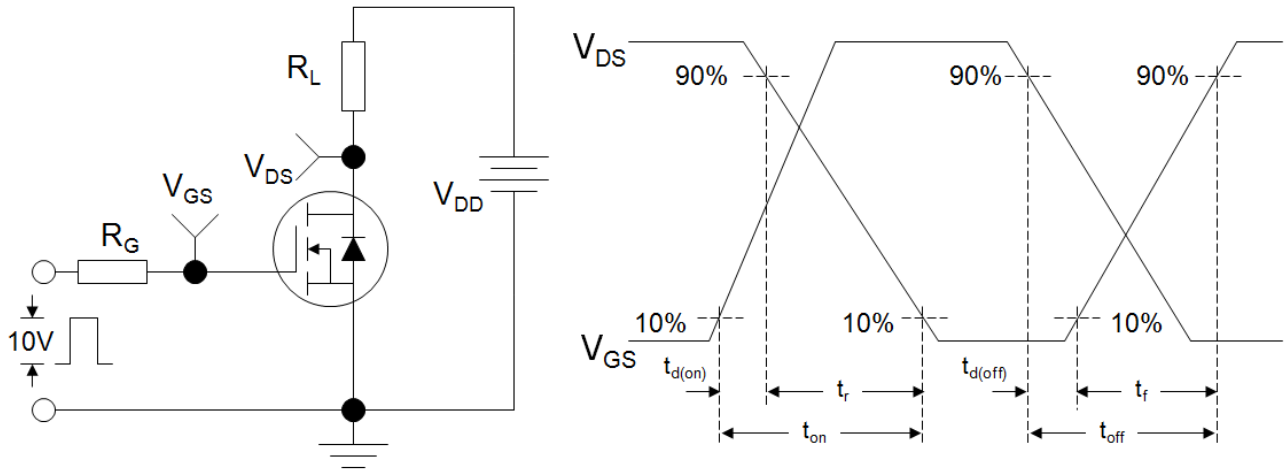
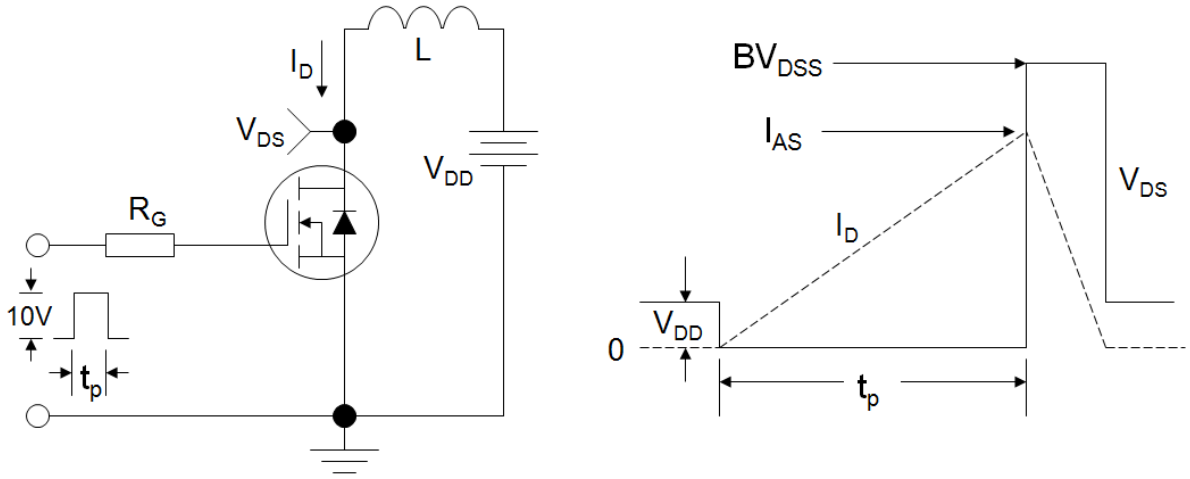
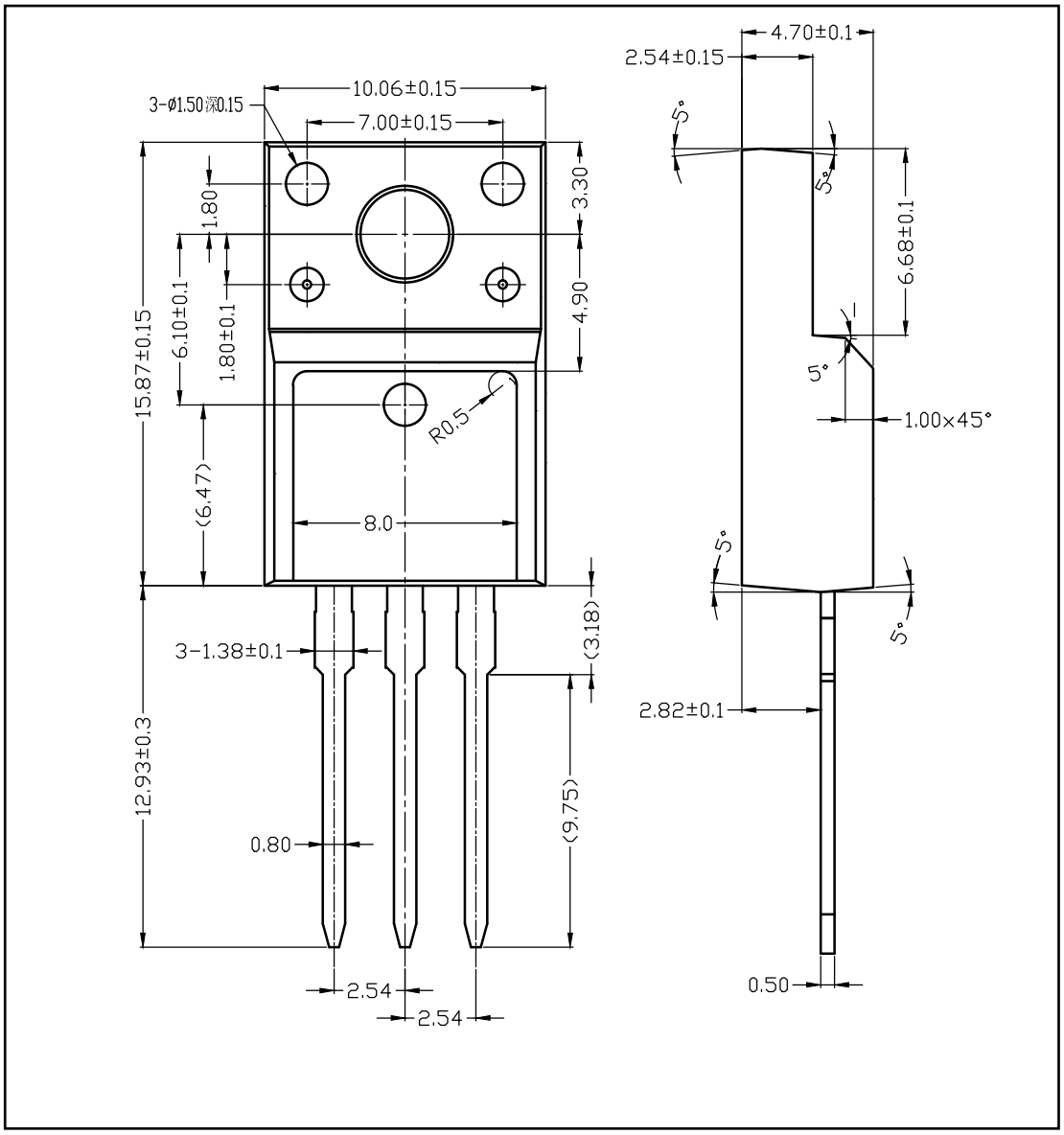


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS