

N Channel MOSFET


Lead Free Package and Finish

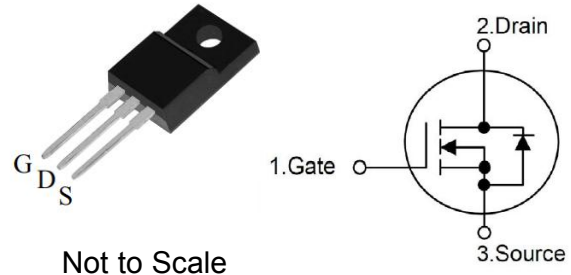
Applications:

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- PFC stages for server & telecom
- Motor Controls

I_D	$R_{DS(ON)}(Max.)$	V_{DSS}
4A	2.7Ω	600V

Features:

- Fast switching
- Integrate fast recovery diode
- Fast switching speed
- 100% avalanche tested
- Improved dv/dt capability


Ordering Information

Part Number	Package	Marking
RSF4N60F	TO-220F	RSF4N60F

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

Symbol	Parameter	RSF4N60F	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current ($T_C = 25^{\circ}\text{C}$)	4	A
	Continuous Drain Current ($T_C = 100^{\circ}\text{C}$)	2.5	
I_{DM}	Pulsed Drain Current (Note*1)	16	
P_D	Power Dissipation($T_c=25^{\circ}\text{C}$)	36	W
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy (Note*2)	80	mJ
I_{AR}	Avalanche Current (Note*1)	4.0	A
E_{AR}	Repetitive Avalanche Energy (Note*1)	20	mJ
T_L T_{PKG}	Maximum Temperature for Soldering	300 260	$^{\circ}\text{C}$
	Leads at 0.063in(1.6mm)from Case for 10 seconds		
	Package Body for 10 seconds		
T_J and T_{STG}	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	RSF4N60F	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	3.47	$^{\circ}\text{C/W}$	Drain lead soldered to water cooled heatsink,PD Adjusted for a peak junction temperature of $+150^{\circ}\text{C}$.
$R_{\theta JA}$	Junction-to-Ambient	62.5		1 cubic foot chamber,free air.

OFF Characteristics $T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BVDSS	Drain-to-source Breakdown Voltage	600	--	--	V	$V_{GS} = 0V, I_D = 250\mu A, T_J = 25^{\circ}\text{C}$
		--	600	--	V	$V_{GS} = 0V, I_D = 250\mu A, T_J = 150^{\circ}\text{C}$
IDSS	Drain-to-Source Leakage Current	--	--	1.0	μA	$V_{DS}=600V, V_{GS}=0V$
IGSS	Gate-to-Source Forward Leakage	--	--	100	nA	$V_{GS}=+30V, V_{DS}=0V$
	Gate-to-Source Reverse Leakage	--	--	-100		$V_{GS}=-30V, V_{DS}=0V$

ON Characteristics $T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
RDS(on)	Static Drain-to-Source On-Resistance	--	2.30	2.70	Ω	$V_{GS}=10V, I_D=2A$
VGS(TH)	Gate Threshold Voltage	3.0	--	4.0	V	$V_{GS}=V_{DS}, I_D=250\mu A$

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
td(ON)	Turn-on Delay Time	--	12	--	ns	$V_{DS}=300V$ $I_D=4A$ $R_G=25\Omega$ $V_{GS}=10V$
trise	Rise Time	--	22	--		
td(OFF)	Turn-OFF Delay Time	--	50	--		
tfall	Fall Time	--	48	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ciss	Input Capacitance	--	580	--	pF	$V_{GS}=0V$ $V_{DS}=100V$ $f=1.0\text{MHz}$
Coss	Output Capacitance	--	69.6	--		
Crss	Reverse Transfer Capacitance	--	10.5	--		
Qg	Total Gate Charge	--	15.0	--	nC	$V_{DS}=480V$ $I_D=4A$ $V_{GS}=10V$
Qgs	Gate-to-Source Charge	--	2.5	--		
Qgd	Gate-to-Drain("Miller") Charge	--	7.5	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
IS	Continuous Source Current	--	--	4	A	Integral pn-diode in MOSFET
ISM	Maximum Pulsed Current	--	--	16	A	
VSD	Diode Forward Voltage	--	0.9	1.4	V	IS=4A, VGS=0V Tj=25°C
trr	Reverse Recovery Time	--	83	--	nS	VGS=0V IS=4A, di/dt=100A/μs
Qrr	Reverse Recovery Charge	--	0.38	--	μC	

Notes:

- *1.Repetitive rating;pulse width limited by maximum junction temperature.
*2. IAS = 4A, VDD = 50V, RG = 25Ω, Starting TJ = 25°C Pulse width tp limited by Tj,max

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

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

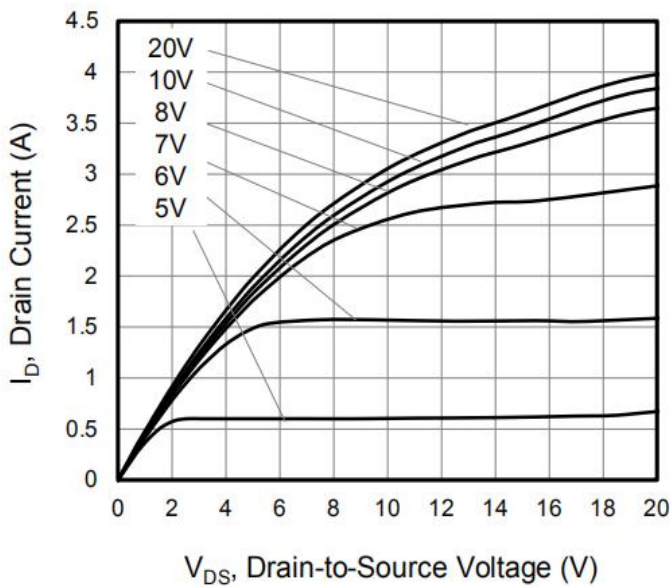


Figure2. Body Diode Forward Voltage

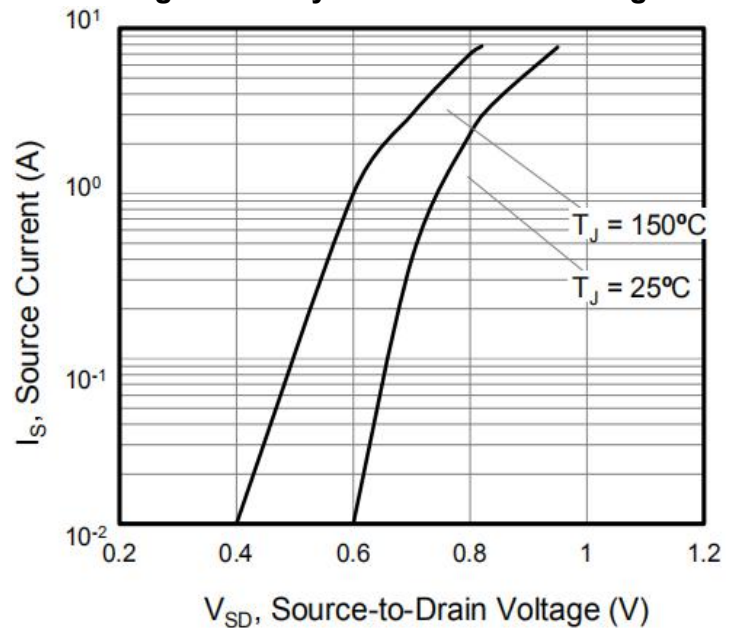


Figure 3. Drain Current vs. Temperature

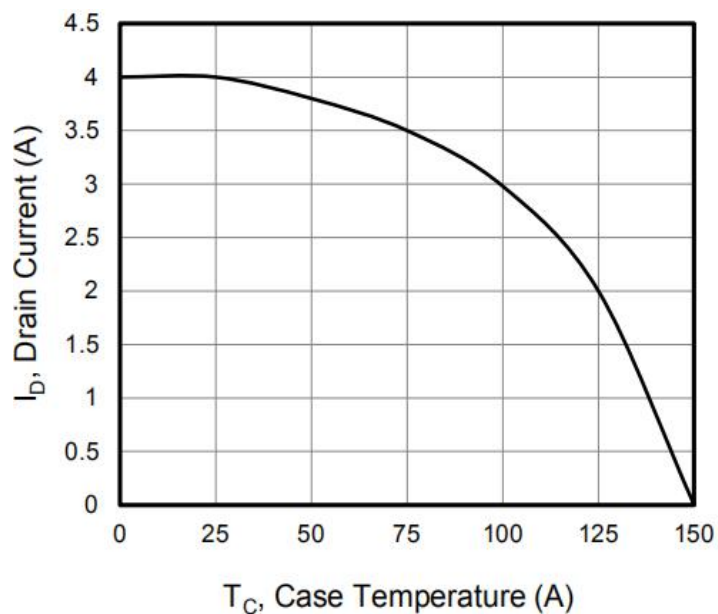


Figure 4. Power Dissipation vs. Temperature

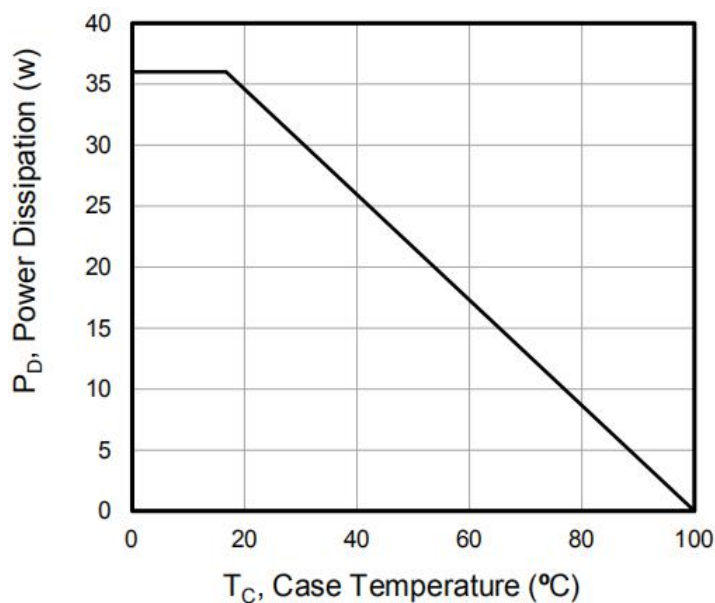


Figure 5. Transfer Characteristics

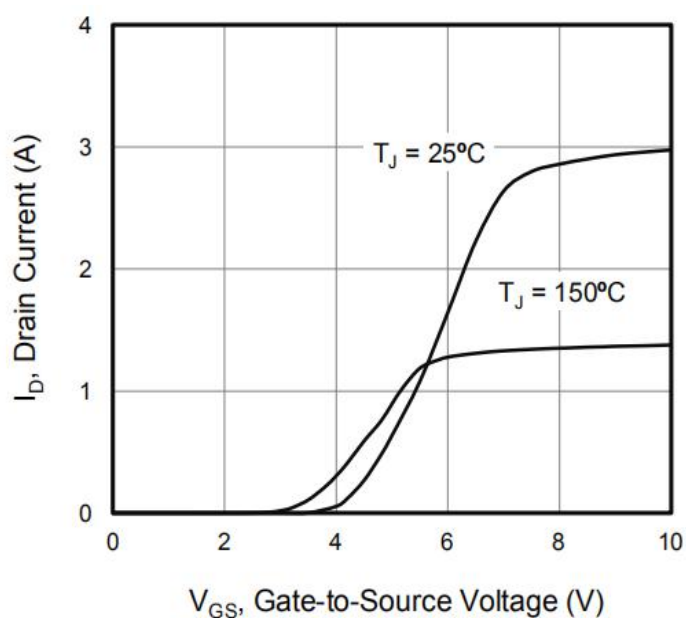


Figure 6. On-Resistance vs. Temperature

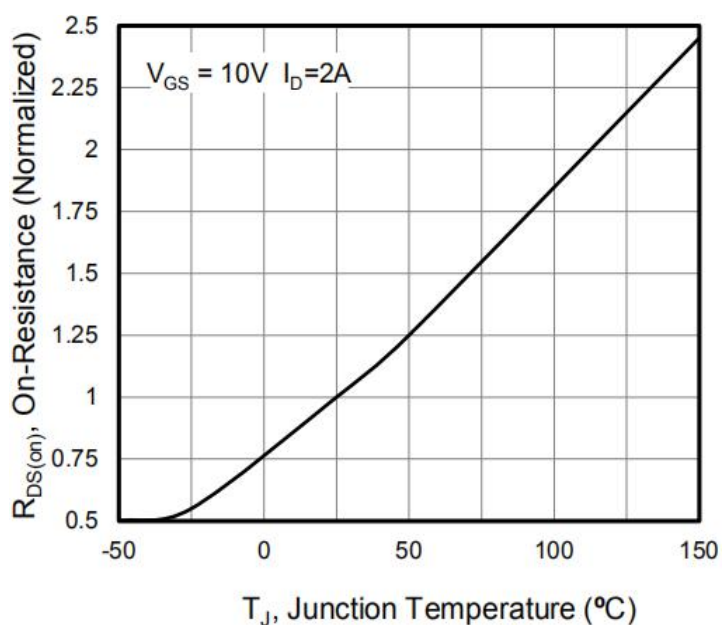


Figure 7. Capacitance

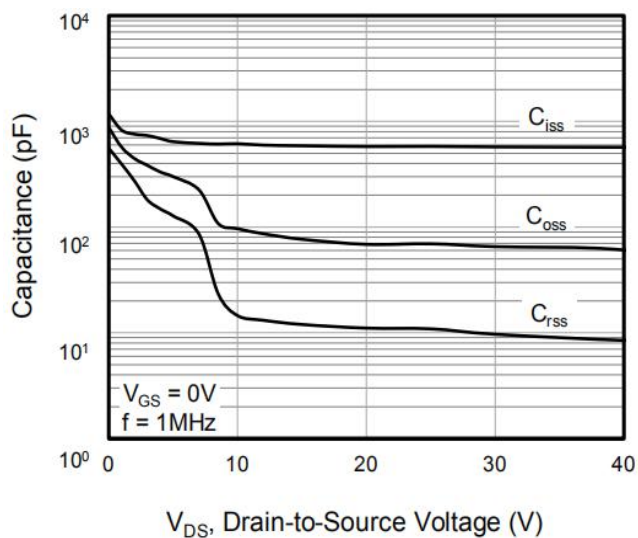
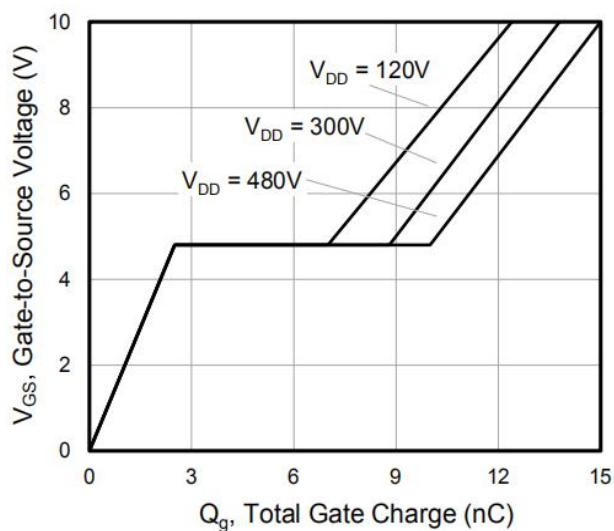
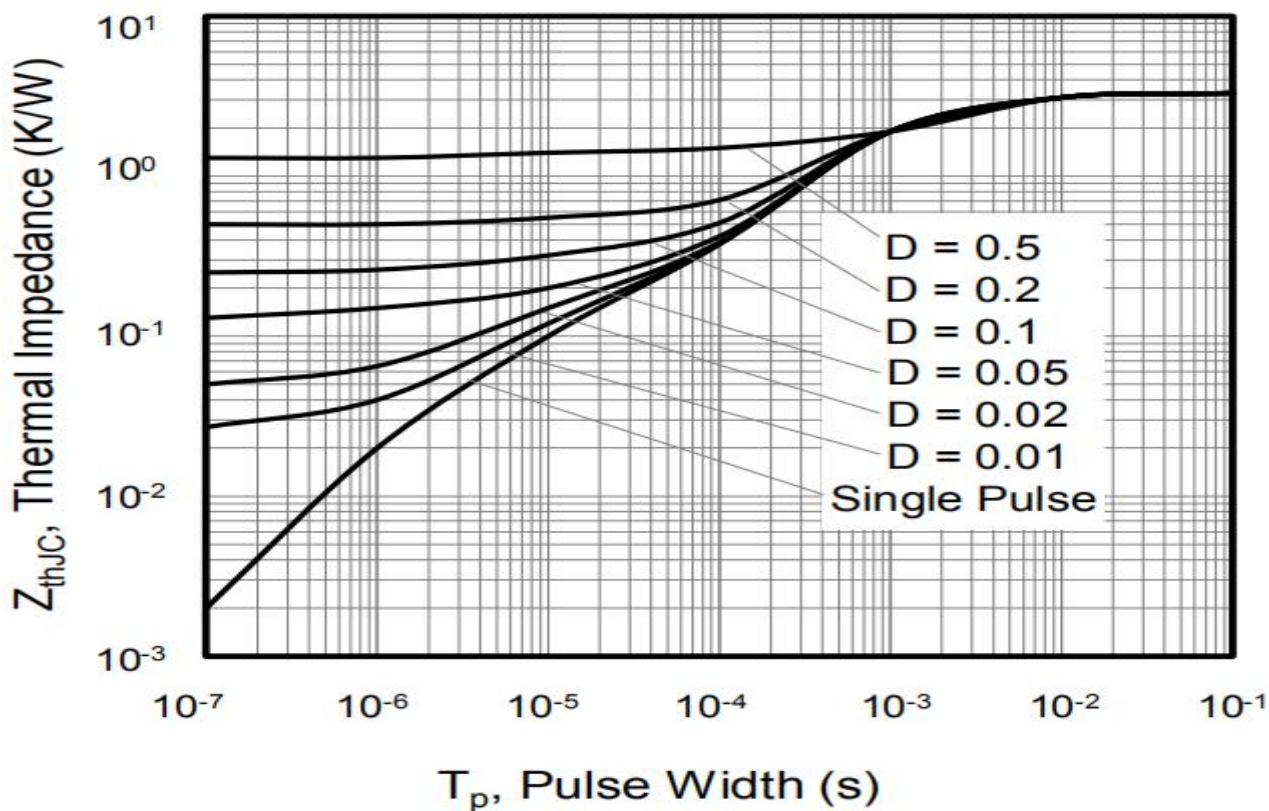


Figure 8. Gate Charge



**Figure 9. Transient Thermal Impedance
TO-220F**



Test Circuits and Waveforms

Figure A: Gate Charge Test Circuit and Waveform

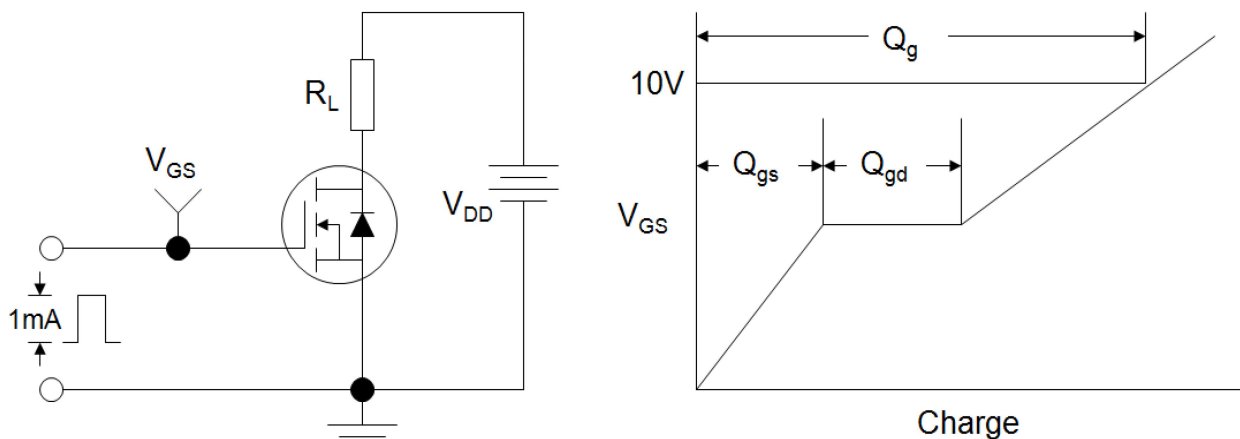


Figure B: Resistive Switching Test Circuit and Waveform

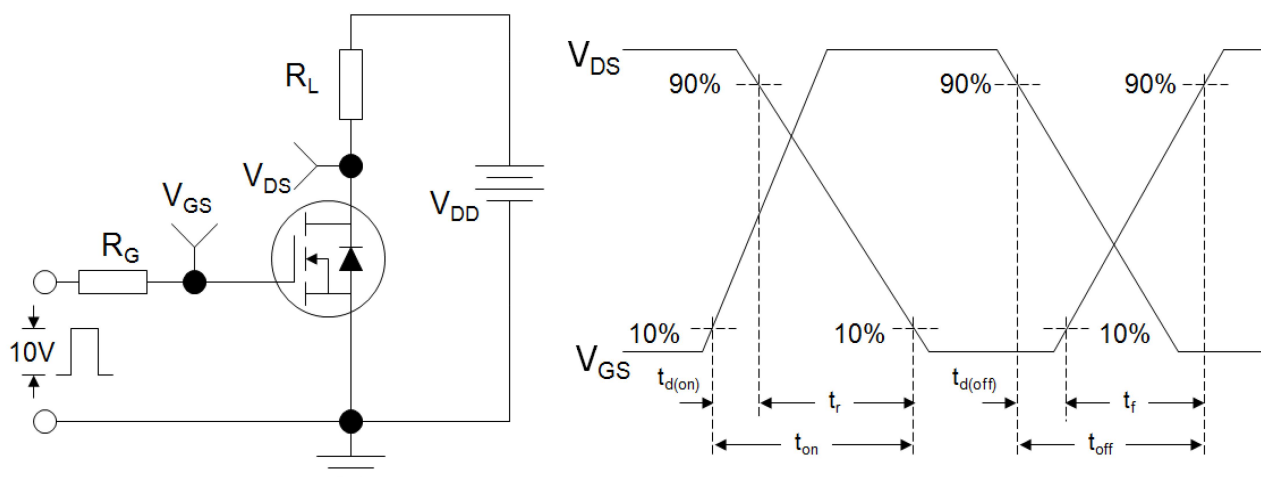
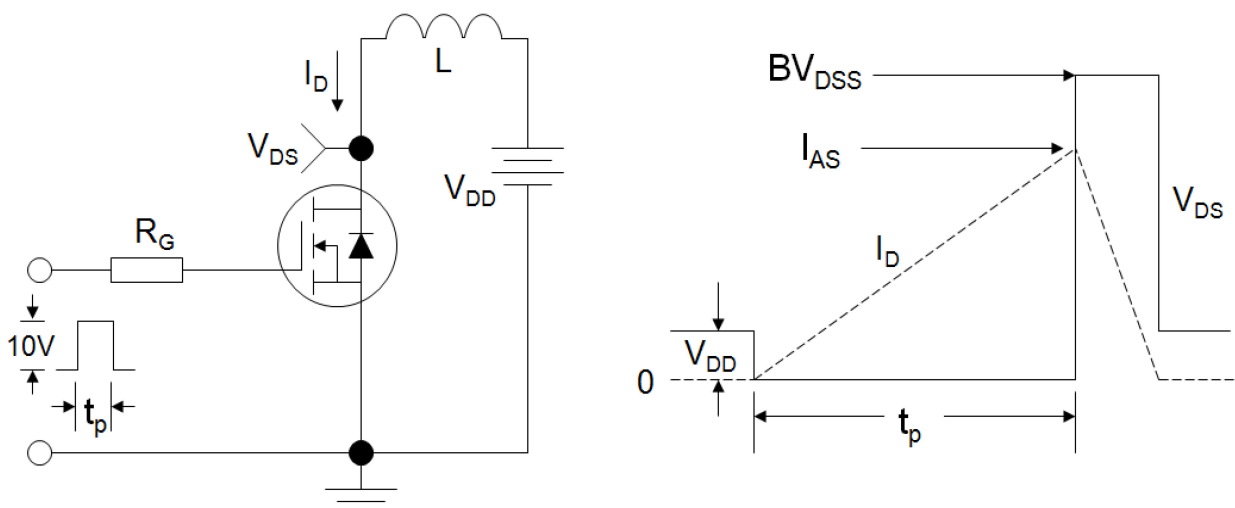


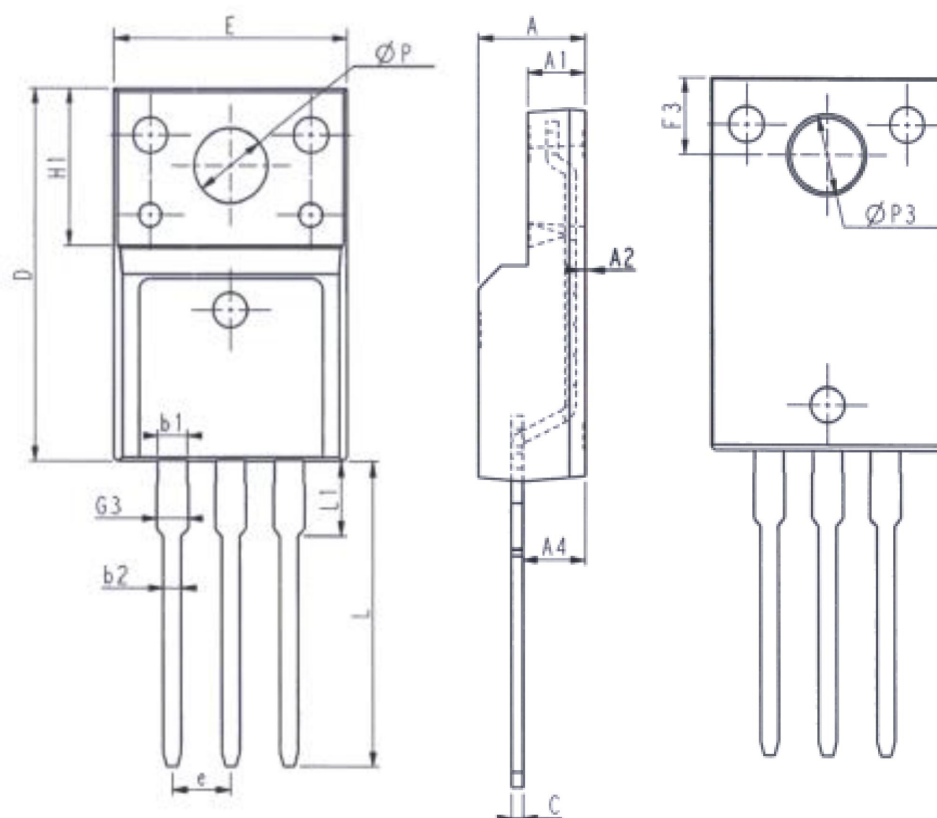
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



Package outline drawing

Unit:mm

TO-220F



Unit: mm			Unit: mm		
Symbol	Min.	Max.	Symbol	Min.	Max.
E	9.96	10.36	L	12.68	13.28
A	4.50	4.90	L1	2.93	3.13
A1	2.34	2.74	P	3.03	3.38
A2	0.30	0.60	P3	3.15	3.65
A4	2.56	2.96	F3	3.15	3.45
c	0.40	0.65	G3	1.25	1.55
D	15.57	16.17	b1	1.18	1.43
H1	6.70REF		b2	0.70	0.95
e	2.54BSC				

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