

N Channel MOSFET


Lead Free Package and Finish

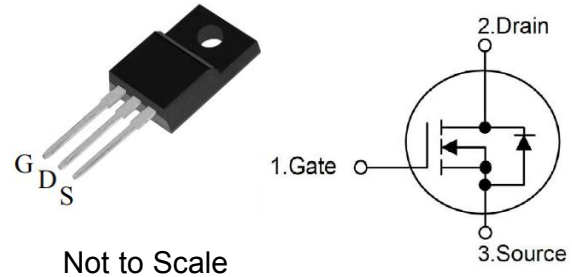
Applications:

- 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



Not to Scale

Ordering Information

Part Number	Package	Marking
RSF4N60F	TO-220F	RSF4N60F

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

Symbol	Parameter	RSF4N60F	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current ($T_C = 25^{\circ}C$)	4	A
	Continuous Drain Current ($T_C = 100^{\circ}C$)	2.5	
I_{DM}	Pulsed Drain Current (Note*1)	16	
P_D	Power Dissipation($T_c=25^{\circ}C$)	36	W
V_{GS}	Gate-to-Source Voltage	± 30	V
EAS	Single Pulse Avalanche Energy (Note*2)	80	mJ
IAR	Avalanche Current (Note*1)	4.0	A
EAR	Repetitive Avalanche Energy (Note*1)	20	mJ
TL TPKG	Maximum Temperature for Soldering	300 260	$^{\circ}C$
	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	$^{\circ}C/W$	Drain lead soldered to water cooled heatsink,PD Adjusted for a peak junction temperature of $+150^{\circ}C$.
$R_{\theta JA}$	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
BV _{DSS}	Drain-to-source Breakdown Voltage	600	--	--	V	V _{GS} = 0V, I _D = 250 μ A, T _J = 25 $^{\circ}$ C
		--	600	--	V	V _{GS} = 0V, I _D = 250 μ A, T _J = 150 $^{\circ}$ C
ID _{SS}	Drain-to-Source Leakage Current	--	--	1.0	μ A	V _D S=600V, V _G S=0V
IG _{SS}	Gate-to-Source Forward Leakage	--	--	100	nA	V _G S=+30V V _D S=0V
	Gate-to-Source Reverse Leakage	--	--	-100		V _G S=-30V V _D S=0V

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R _{DS(on)}	Static Drain-to-Source On-Resistance	--	2.30	2.70	Ω	V _G S=10V, I _D =2A
V _{GS(TH)}	Gate Threshold Voltage	3.0	--	4.0	V	V _G S=V _D S, I _D =250 μ A

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t _{d(ON)}	Turn-on Delay Time	--	12	--	ns	V _D S=300V I _D =4A R _G =25 Ω V _G S=10V
t _{rise}	Rise Time	--	22	--		
t _{d(OFF)}	Turn-OFF Delay Time	--	50	--		
t _{fall}	Fall Time	--	48	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C _{iss}	Input Capacitance	--	580	--	pF	V _G S=0V V _D S=100V f=1.0MHz
C _{oss}	Output Capacitance	--	69.6	--		
C _{rss}	Reverse Transfer Capacitance	--	10.5	--		
Q _g	Total Gate Charge	--	15.0	--	nC	V _D S=480V I _D =4A V _G S=10V
Q _{gs}	Gate-to-Source Charge	--	2.5	--		
Q _{gd}	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°C, unless otherwise noted

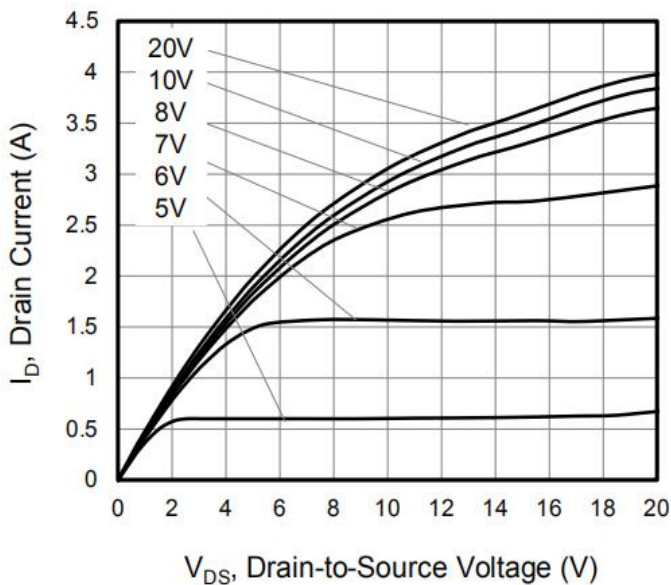
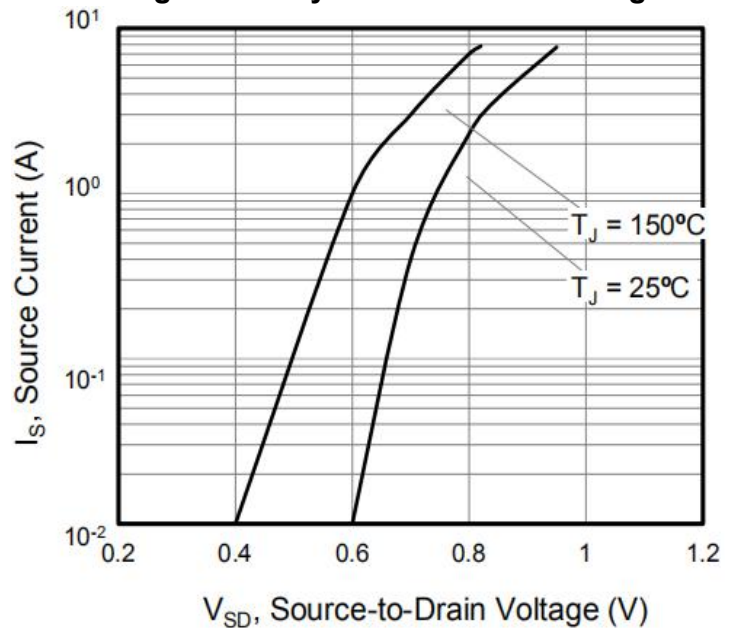
Figure 1. Output Characteristics (T_J = 25°C)

Figure2. Body Diode Forward Voltage


Figure 3. Drain Current vs. Temperature

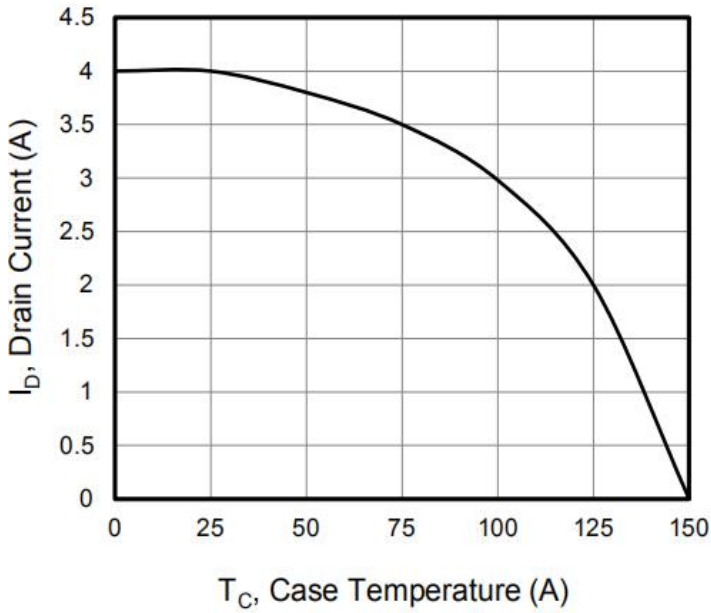


Figure 4. Power Dissipation vs. Temperature

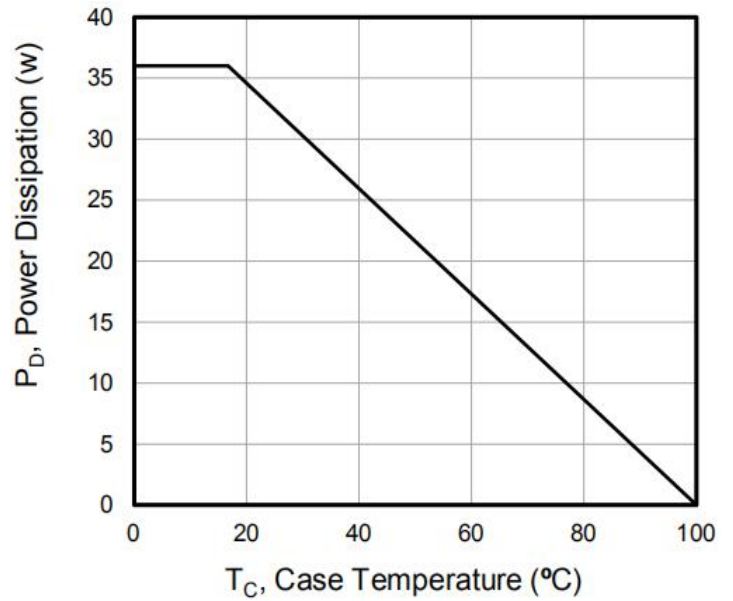


Figure 5. Transfer Characteristics

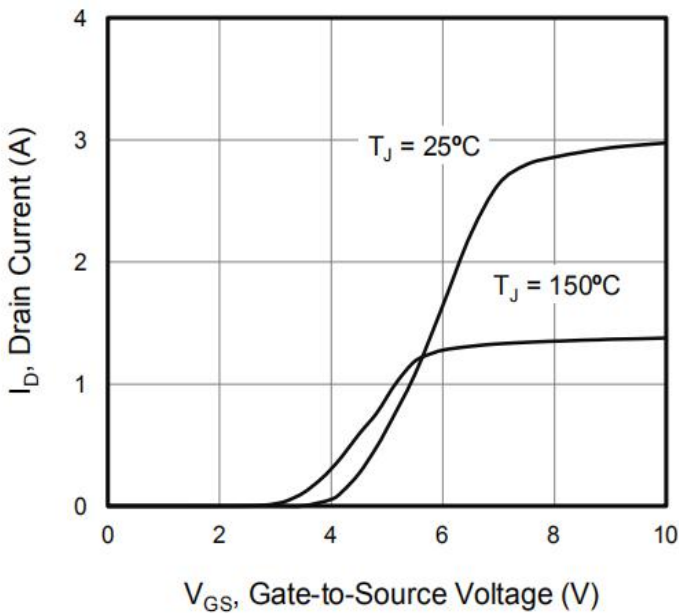


Figure 6. On-Resistance vs. Temperature

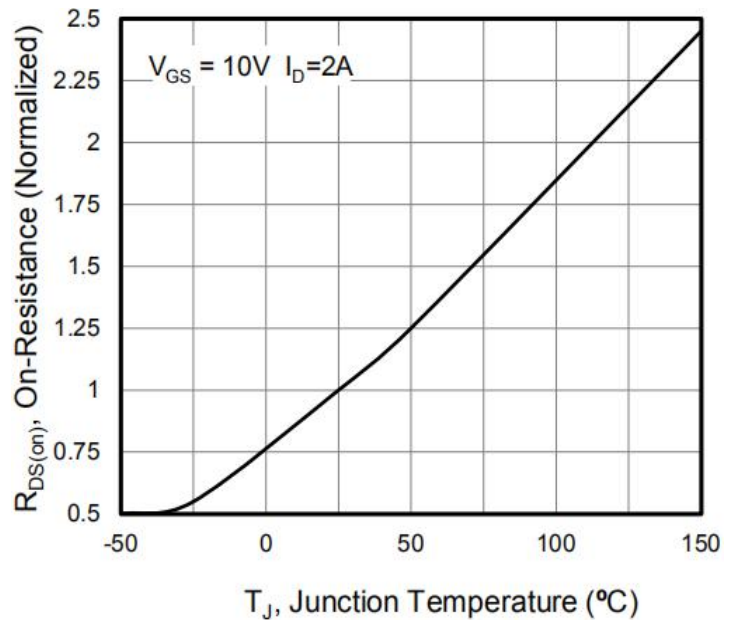


Figure 7. Capacitance

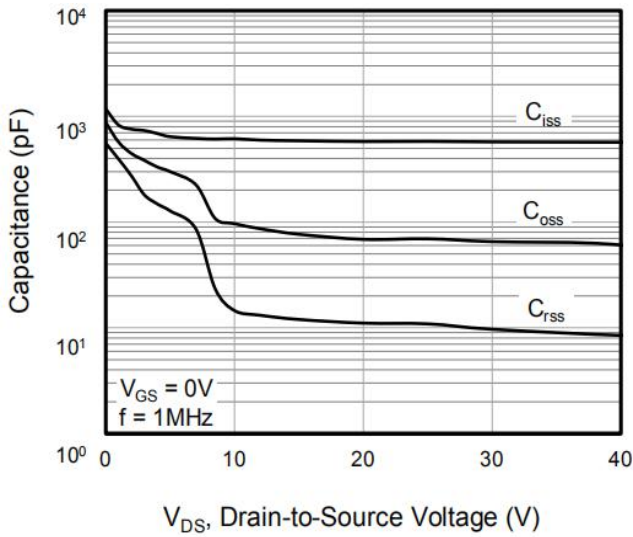
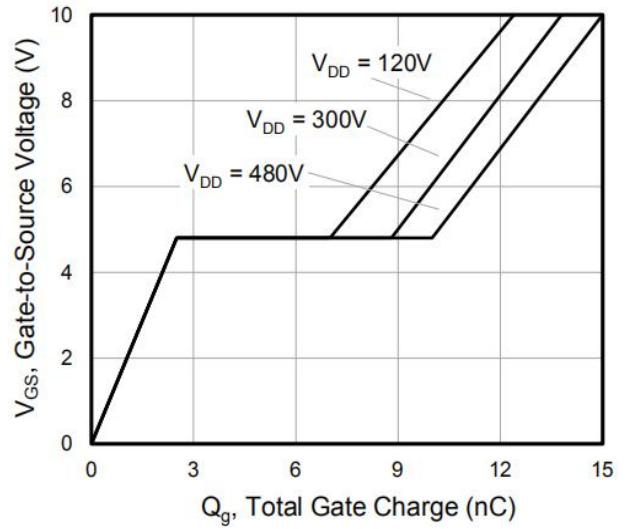
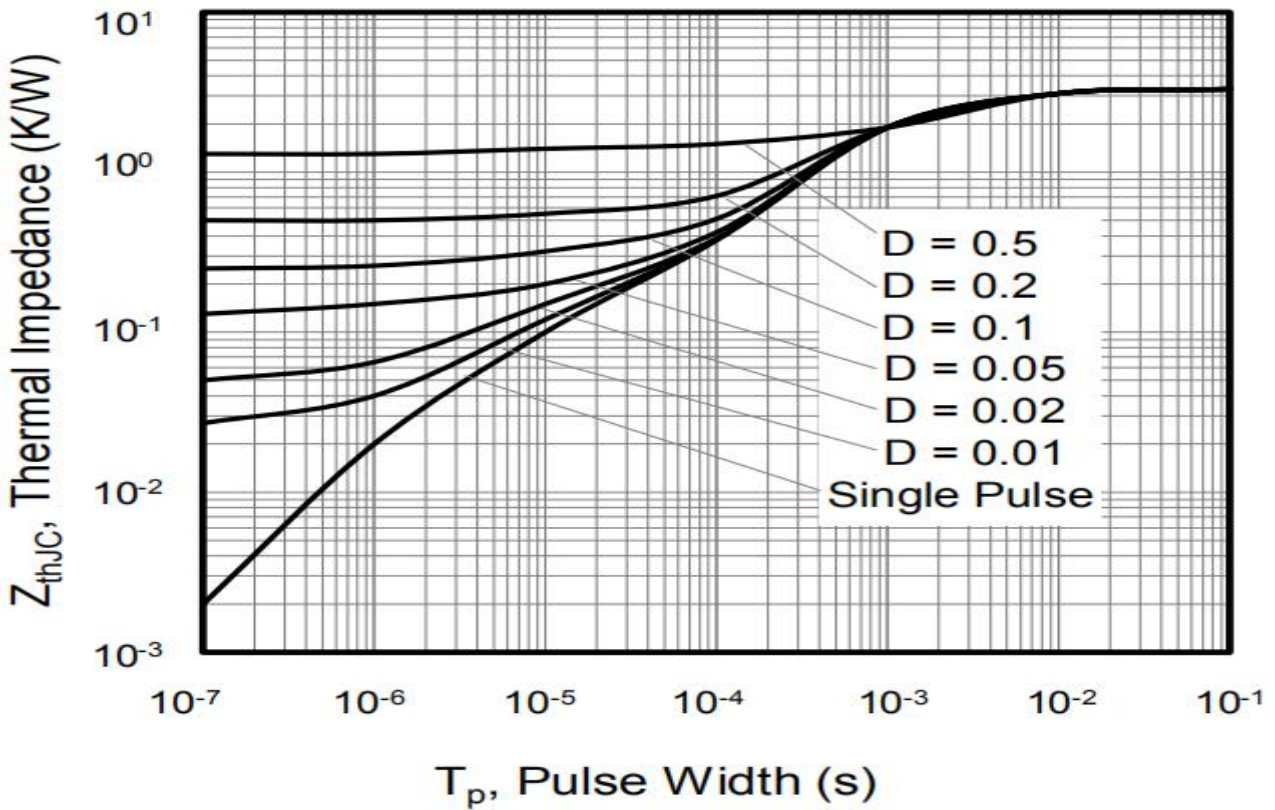


Figure 8. Gate Charge



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



Test Circuits and Waveforms

Figure A: Gate Charge Test Circuit and Waveform

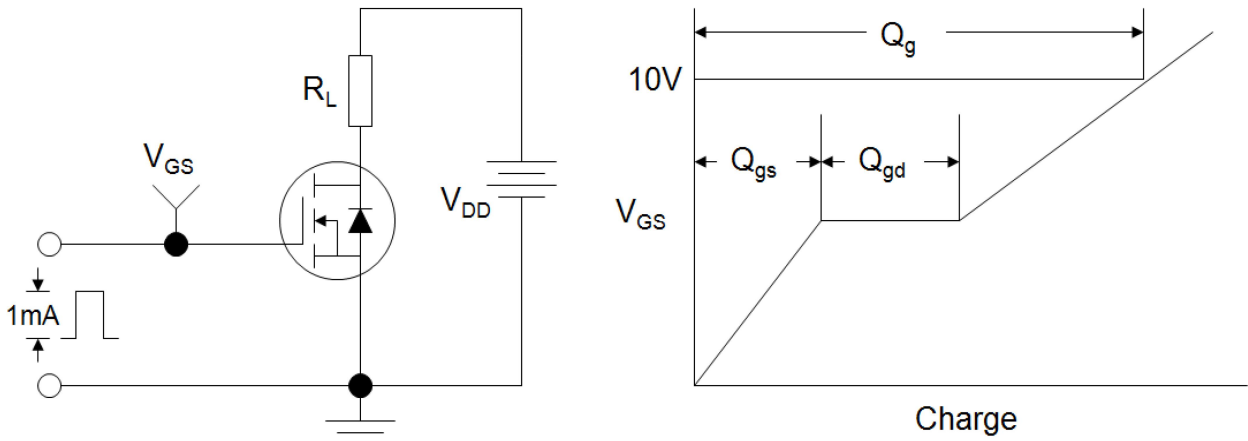


Figure B: Resistive Switching Test Circuit and Waveform

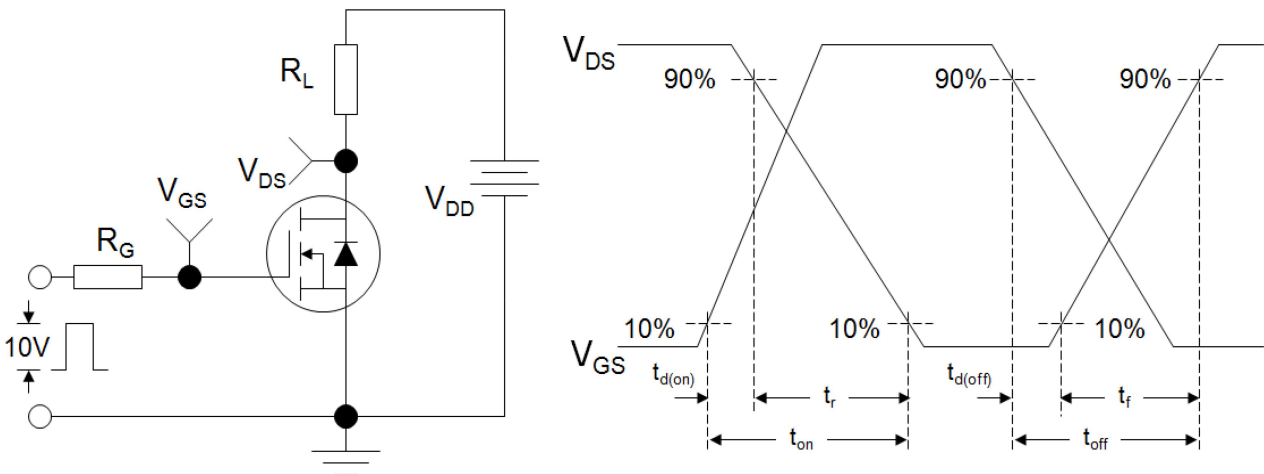
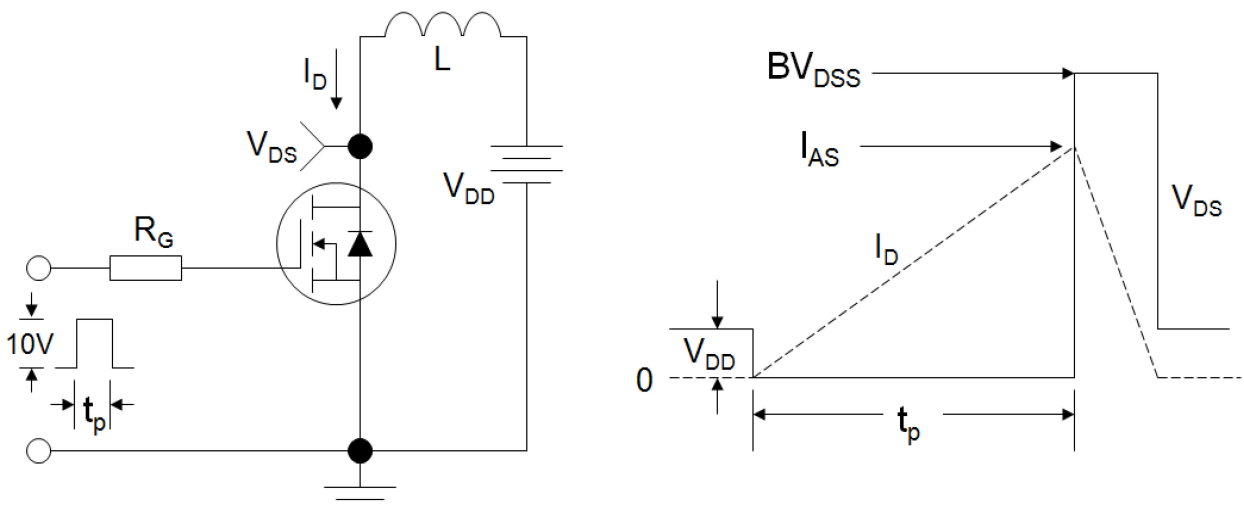


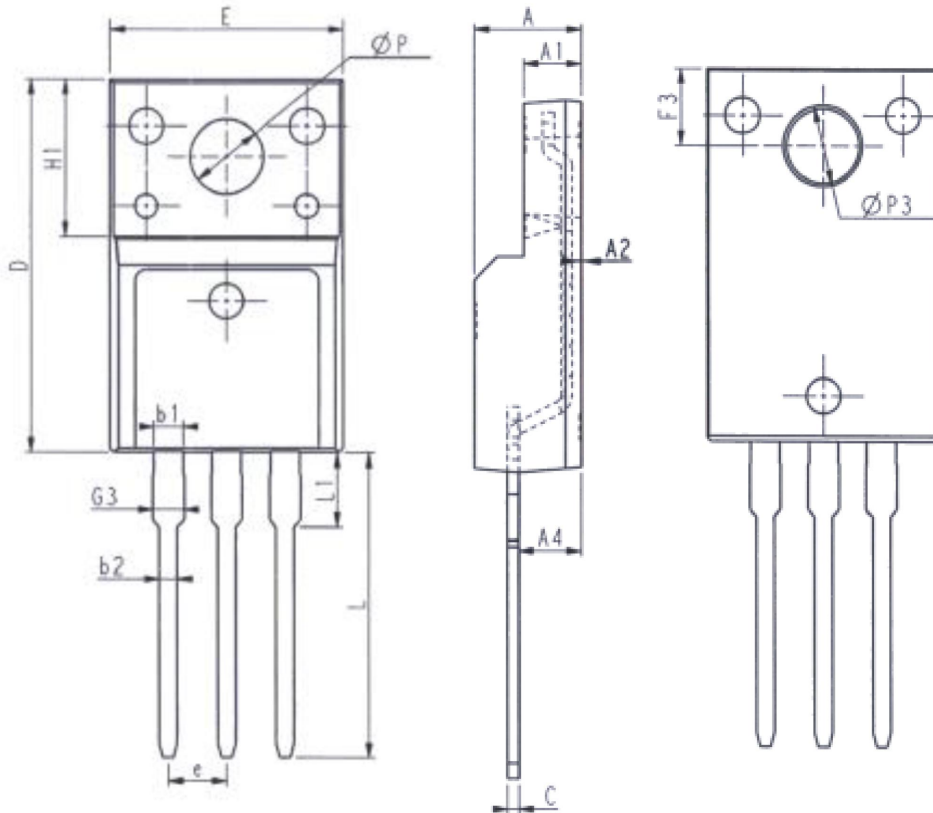
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



Package outline drawing

Unit:mm

TO-220F



Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

Unit: mm		
Symbol	Min.	Max.
L	12.68	13.28
L1	2.93	3.13
P	3.03	3.38
P3	3.15	3.65
F3	3.15	3.45
G3	1.25	1.55
b1	1.18	1.43
b2	0.70	0.95

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