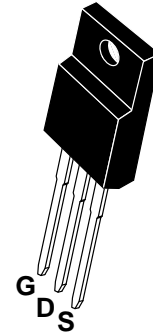




PIN Connection TO-220F

V _{DSS}	500	V
I _D	16	A
P _D (T _C =25°C)	70	W
R _{DS(ON)}	0.4	Ω



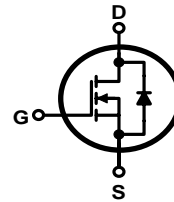
Features

- I Fast Switching
- I Low ON Resistance(Rdson≤0.40Ω)
- I Low Gate Charge (Typical Data:50nC)
- I Low Reverse transfer capacitances(Typical:25.5pF)
- I 100% Single Pulse avalanche energy Test

Applications

Automotive、 DC Motor Control and Class D Amplifier.

Schematic diagram



Marking Diagram



Y = Year
 A = Assembly Location
 WW = Work Week
 FIR16N50F = Specific Device Code

Absolute (T_c= 25°C unless otherwise specified)

Symbol	Parameter	Rating	Units
V _{DSS}	Drain-to-Source Voltage	500	V
I _D	Continuous Drain Current	16	A
	Continuous Drain Current T _C = 100 °C	9.5	A
I _{DM} ^{a1}	Pulsed Drain Current	60	A
V _{GS}	Gate-to-Source Voltage	±30	V
E _{AS} ^{a2}	Single Pulse Avalanche Energy	1000	mJ
E _{AR} ^{a1}	Avalanche Energy ,Repetitive	200	mJ
I _{AR} ^{a1}	Avalanche Current	6.3	A
dv/dt ^{a3}	Peak Diode Recovery dv/dt	5.0	V/ns
P _D	Power Dissipation	70	W
	Derating Factor above 25°C	0.56	W/°C
T _J , T _{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	°C
T _L	MaximumTemperature for Soldering	300	°C



Electrical Characteristics (Tc= 25°C unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V _{DSS}	Drain to Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	500	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Bvdss Temperature Coefficient	I _D =250uA, Reference 25°C	--	0.6	--	V/°C
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 500V, V _{GS} = 0V, T _a = 25°C	--	--	1	μA
		V _{DS} = 400V, V _{GS} = 0V, T _a = 125°C	--	--	10	
I _{GSS(F)}	Gate to Source Forward Leakage	V _{GS} = +30V	--	--	100	nA
I _{GSS(R)}	Gate to Source Reverse Leakage	V _{GS} = -30V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R _{DS(ON)}	Drain-to-Source On-Resistance	V _{GS} =10V, I _D =8.0A	--	0.3	0.4	Ω
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2.0		4.0	V
Pulse width tp ≤ 380μs, δ ≤ 2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g _{fs}	Forward Transconductance	V _{DS} =15V, I _D =8.0A	--	18	--	S
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1.0MHz	--	2400	--	pF
C _{oss}	Output Capacitance		--	235	--	
C _{rss}	Reverse Transfer Capacitance		--	25.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t _{d(ON)}	Turn-on Delay Time	I _D = 16A V _{DD} = 250V V _{GS} = 10V R _G = 6.1Ω	--	15	--	ns
t _r	Rise Time		--	30	--	
t _{d(OFF)}	Turn-Off Delay Time		--	50	--	
t _f	Fall Time		--	40	--	
Q _g	Total Gate Charge	I _D = 16A V _{DD} = 250V V _{GS} = 10V	--	50		nC
Q _{gs}	Gate to Source Charge		--	12	--	
Q _{gd}	Gate to Drain ("Miller") Charge		--	20	--	



Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	16	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	60	A
V_{SD}	Diode Forward Voltage	$I_S=16A, V_{GS}=0V$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=16A, T_j = 25^\circ C$	--	582		ns
Q_{rr}	Reverse Recovery Charge	$dI_F/dt=100A/us, V_{GS}=0V$	--	4.7		μC
Pulse width $t_p \leq 380\mu s, \delta \leq 2\%$						

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case	1.79	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	100	$^\circ C/W$

^{a1}: Repetitive rating; pulse width limited by maximum junction temperature

^{a2}: $L=10.0mH, I_D=14.1A, \text{Start } T_j=25^\circ C$

^{a3}: $I_{SD}=16A, di/dt \leq 100A/us, V_{DD} \leq BV_{DS}, \text{Start } T_j=25^\circ C$



Characteristic Curves

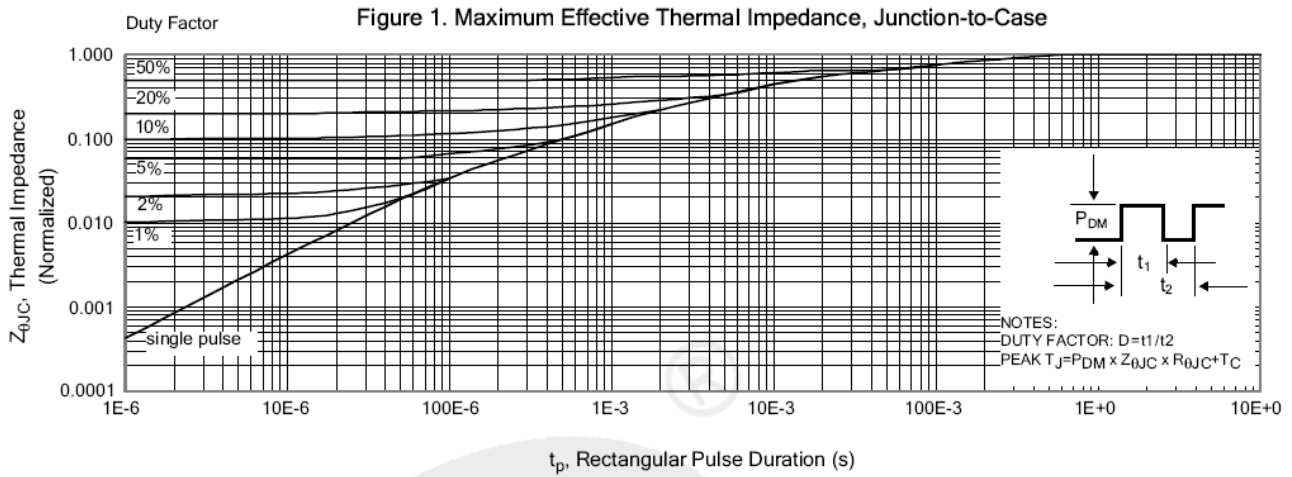


Figure 2. Maximum Power Dissipation vs Case Temperature

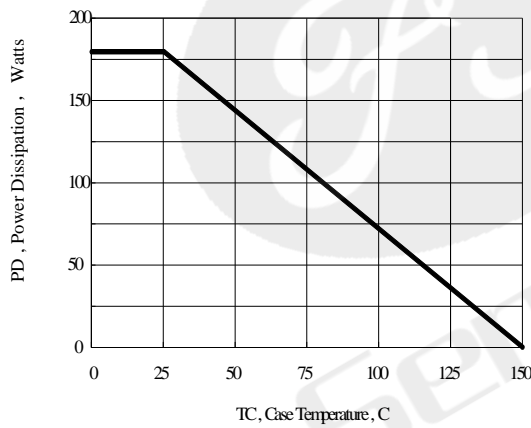


Figure 3. Maximum Continuous Drain Current vs Case Temperature

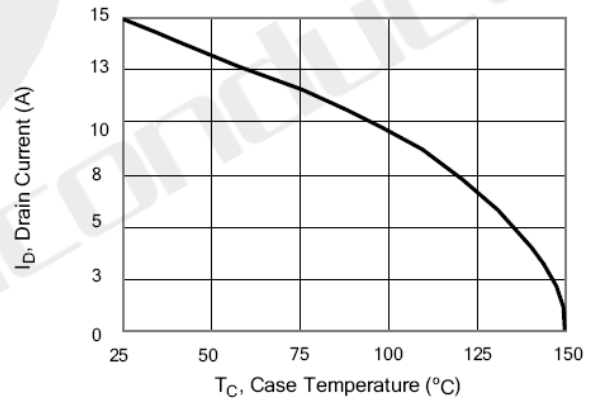


Figure 4. Typical Output Characteristics

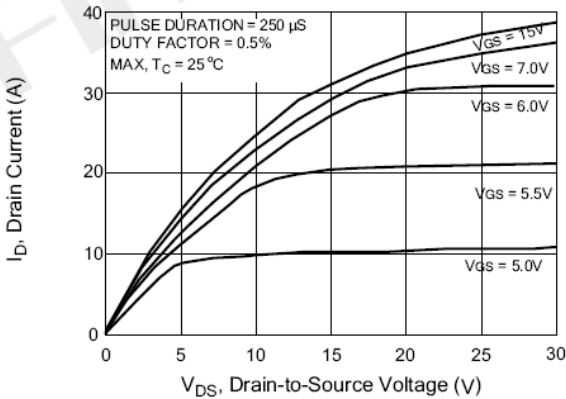


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current

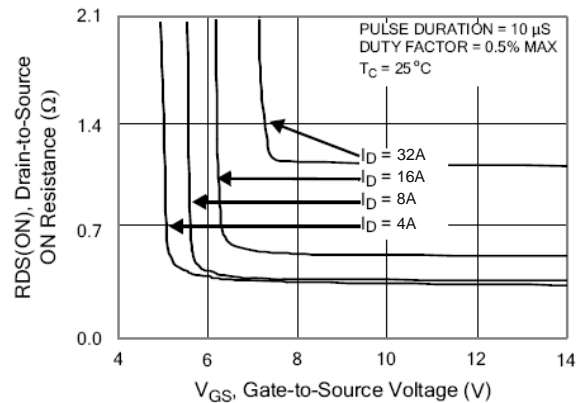




Figure 6. Maximum Peak Current Capability

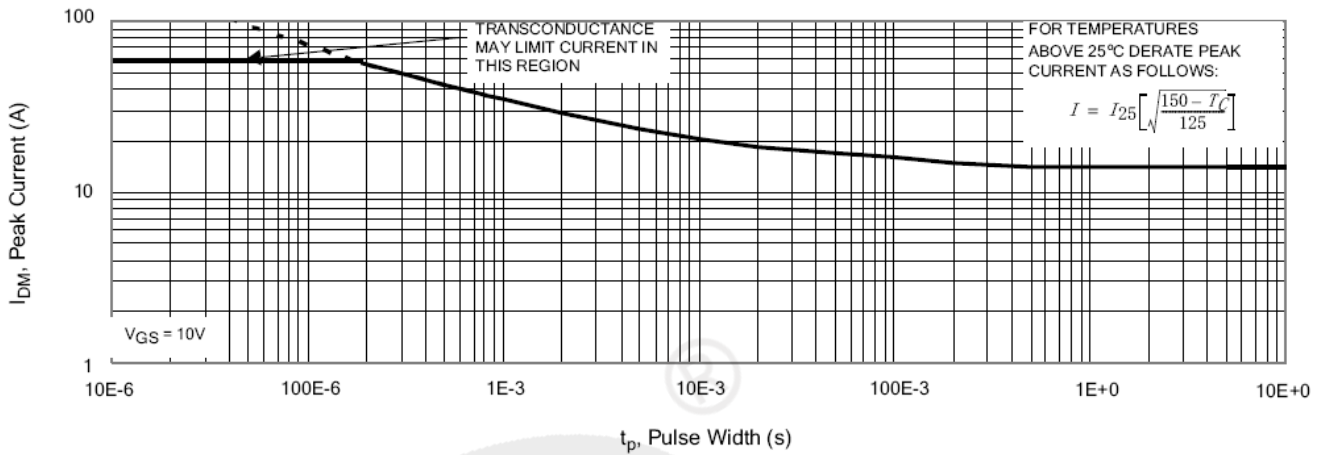


Figure 7. Typical Transfer Characteristics

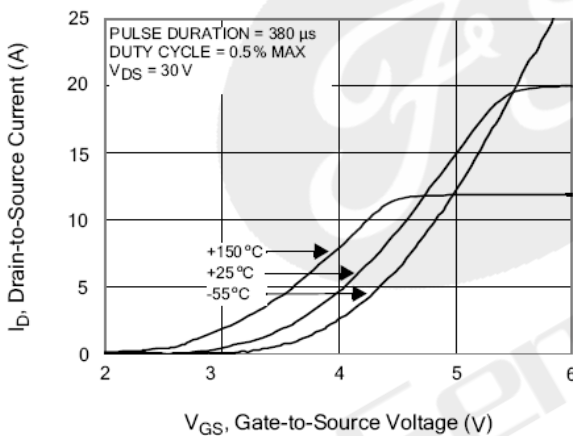


Figure 8. Unclamped Inductive Switching Capability

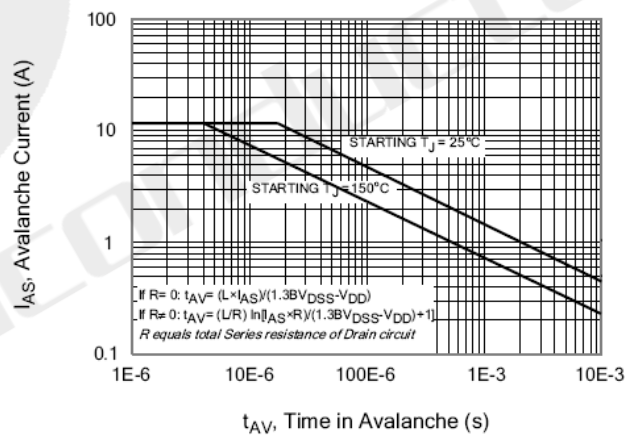


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

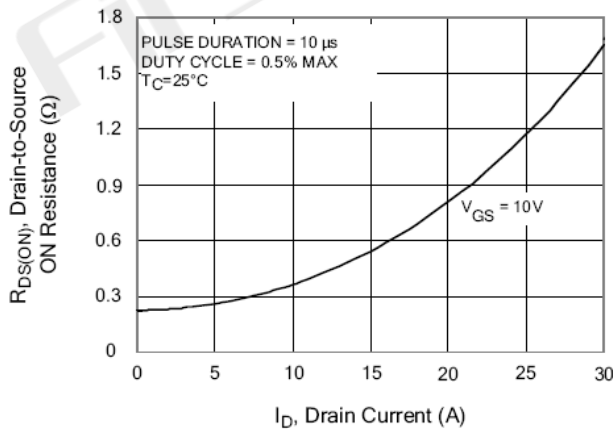


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature

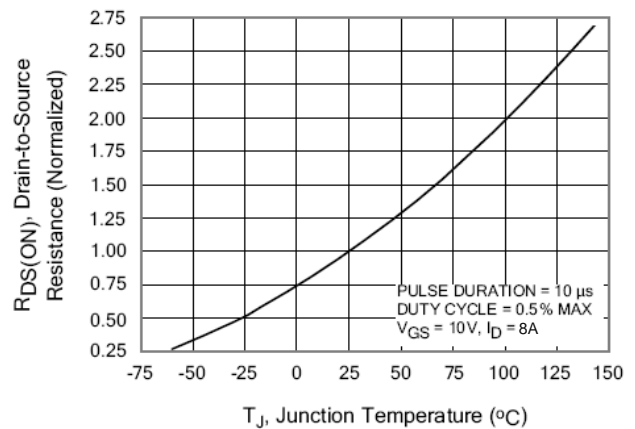




Figure 11. Typical Breakdown Voltage vs Junction Temperature

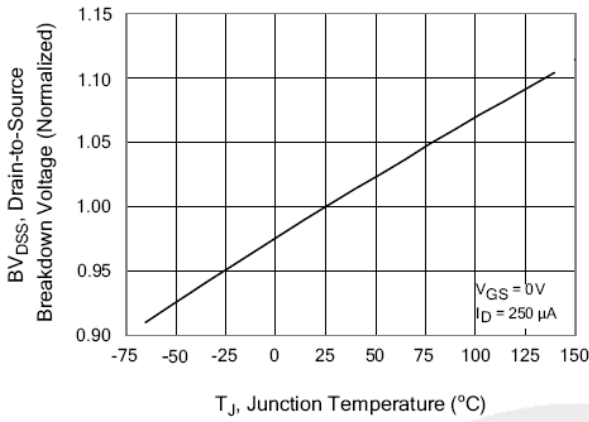


Figure 12. Typical Threshold Voltage vs Junction Temperature

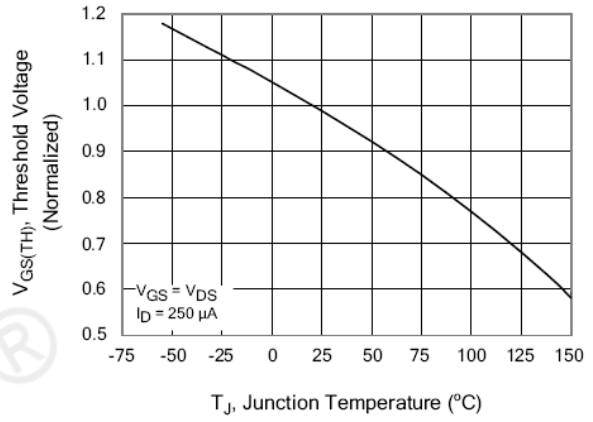


Figure 13. Maximum Forward Bias Safe Operating Area

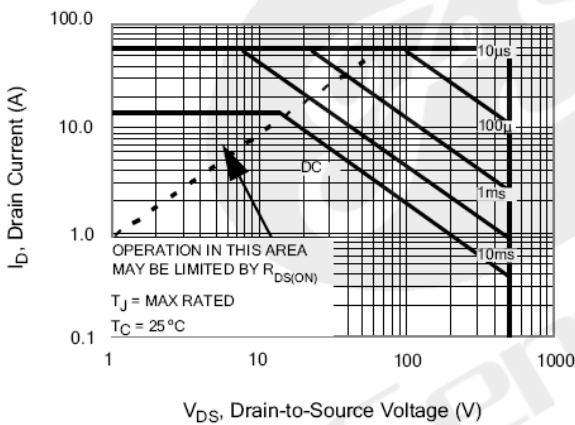


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

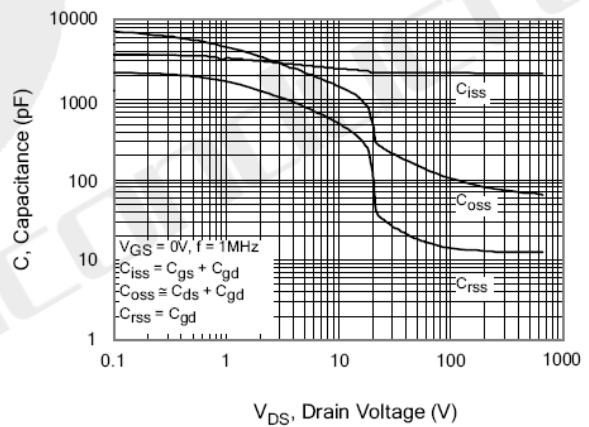


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

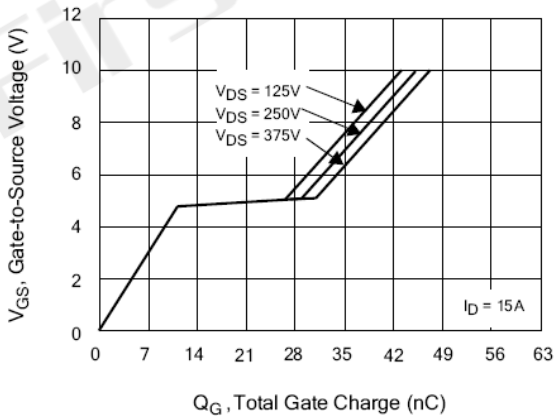
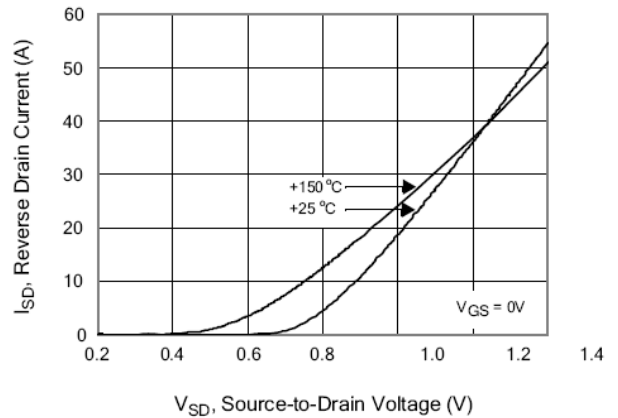


Figure 16. Typical Body Diode Transfer Characteristics



Test Circuit and Waveform

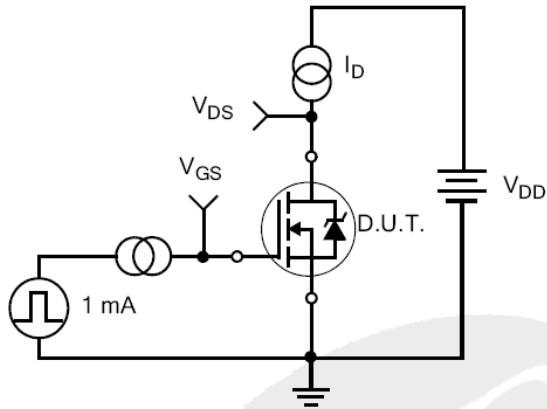


Figure 17. Gate Charge Test Circuit

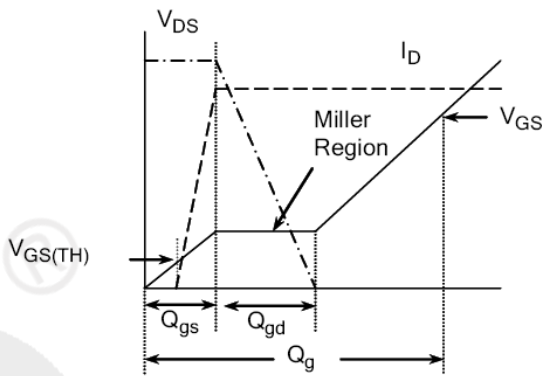


Figure 18. Gate Charge Waveform

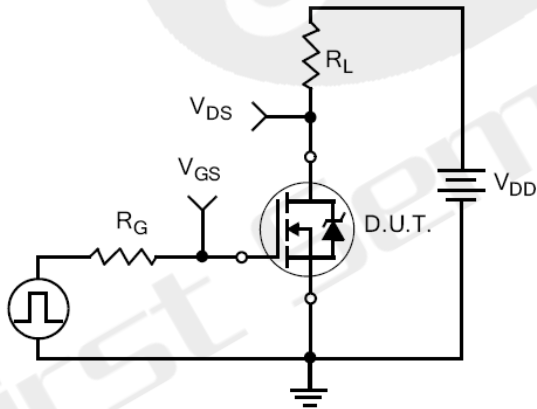


Figure 19. Resistive Switching Test Circuit

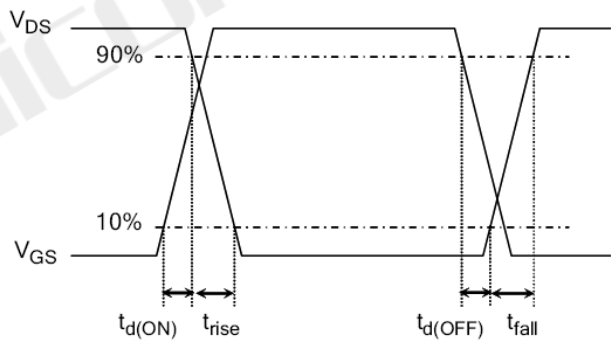


Figure 20. Resistive Switching Waveforms

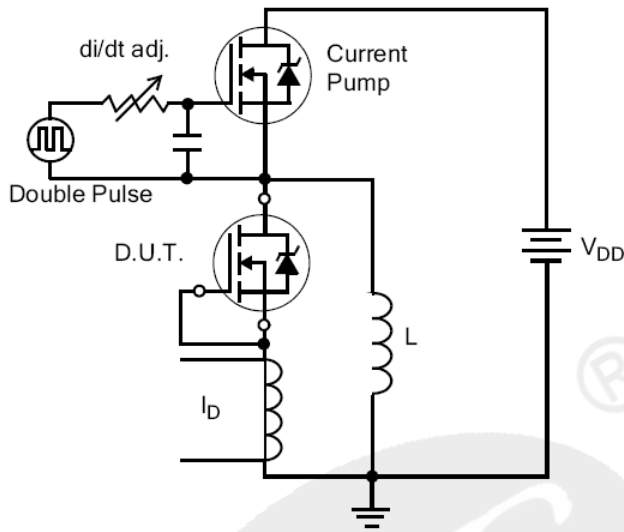


Figure 21. Diode Reverse Recovery Test Circuit

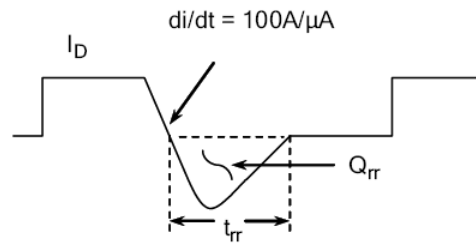


Figure 22. Diode Reverse Recovery Waveform

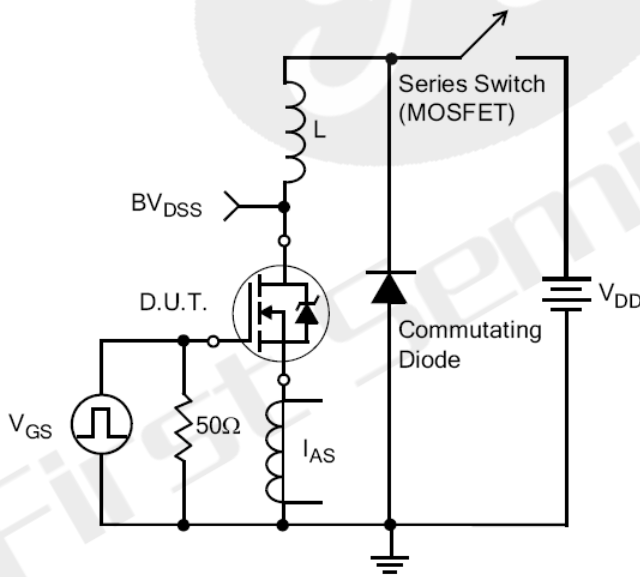


Figure 23. Unclamped Inductive Switching Test Circuit

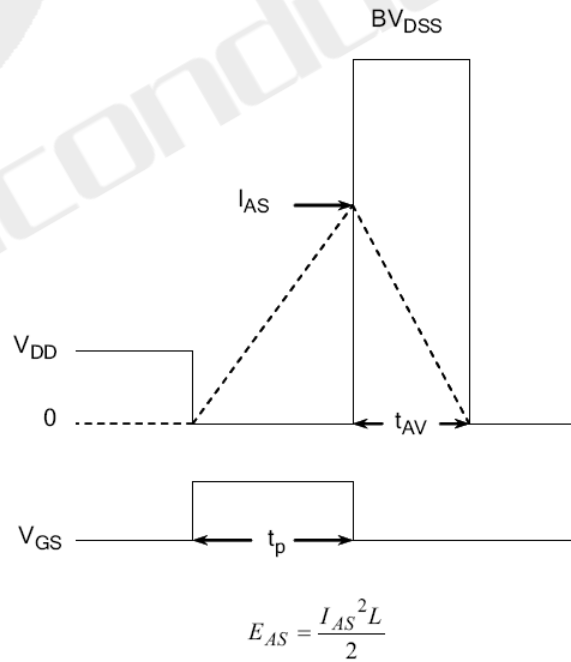
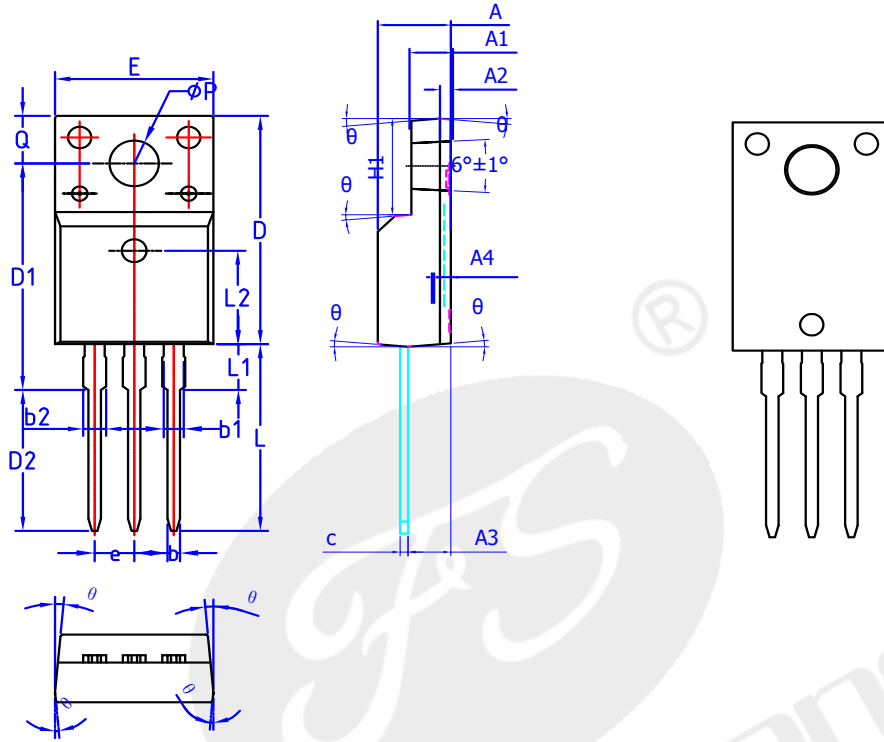


Figure 24. Unclamped Inductive Switching Waveforms



Package Dimensions

TO-220F



Units: mm

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.96
b	0.70	0.80	0.90
b1	1.17	1.2	1.25
b2	1.17	1.2	1.25
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	10.0	10.2	10.4
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50REF		
phi P	3.08	3.18	3.28
Q	3.20	3.30	3.40
theta 1	1°	3°	5°
A4	0.53	0.56	0.59



Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure, The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing, To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

ATTACHMENT

Revision History

Date	REV	Description	Page
2018.01.01	1.0	Initial release	