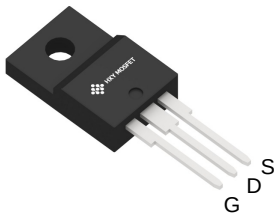
Description

The SMIRF4N65T2TL can be used in various power swithching circuit for system miniaturization and higher efficiency.The package form is TO-220F, which accords with the RoHS standard.



TO-220F

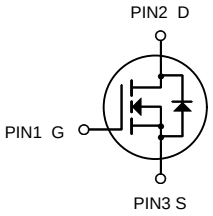
General Features

V_{DS} = 650V, I_D = 4A

$R_{DS(ON)}$ <2.8Ω @ V_{GS}=10V

Application

- Power switch circuit of adaptor and charger.



N-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Marking	Units Tube
SMIRF4N65T2TL	TO-220F	4N65 XXX YYYY	50

Absolute Maximum Ratings @T_j=25°C(unless otherwise specified)

Symbol	Parameter	Rating	Units
VDS	Drain-Source Voltage	650	V
VGS	Gate-Source Voltage	±30	V
I_D@T_C=25℃	Drain Current, V_{GS} @ 4.5V	4	A
I_D@T_C=100℃	Drain Current, V_{GS} @ 4.5V	2.5	A
IDM	Pulsed Drain Current[1]	16	A
P_D@T_C=25℃	Total Power Dissipation	30	W
E_{AS}	Single Pulse Avalanche Energy[4]	200	mJ
TSTG	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

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	650	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA,Reference25°C	--	0.67	--	V/°C
I_{DSS}	Drain to Source Leakage Current	V_{DS} =650V, V_{GS}= 0V, T_a = 25°C	--	--	1	μA
		V_{DS} =520V, V_{GS}= 0V, T_a = 125°C	--	--	100	μA
$I_{GSS(F)}$	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=2A	--	2.4	2.8	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V
Pulse width tp≤300μs,δ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	V_{DS}=15V, I_D =2A	--	3.5	--	S
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	610	--	pF
C_{oss}	Output Capacitance		--	53	--	
C_{rss}	Reverse Transfer Capacitance		--	3.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =4A V_{DD} = 325V R_G =10Ω	--	14	--	ns
tr	Rise Time		--	16	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	32	--	
t_f	Fall Time		--	11	--	
Q_g	Total Gate Charge	I_D =4A V_{DD} =520V V_{GS} = 10V	--	14.5	--	nC
Q_{gs}	Gate to Source Charge		--	3	--	
Q_{gd}	Gate to Drain (“Miller”)Charge		--	6.5	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	4	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	16	A
V_{SD}	Diode Forward Voltage	I_S=4.0A,V_{GS}=0V	--	--	1.5	V
trr	Reverse Recovery Time	I_S=4.0A,T_j = 25°C dI_F/dt=100A/us, V_{GS}=0V	--	256	--	ns
Qrr	Reverse Recovery Charge		--	1200	--	nC
I_{RRM}	Reverse Recovery Current		--	9.4	--	A
Pulse width tp≤300μs,δ≤2%						

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case	4.17	°C/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	°C/W

[a1]: Repetitive rating; pulse width limited by maximum junction temperature
[a2]: L=10mH, I_D=6.3A, Start T_J=25°C
[a3]: I_{SD} =4A,di/dt ≤100A/us,V_{DD}≤$BV_{DS,}$ Start T_J=25°C

Characteristies Curve

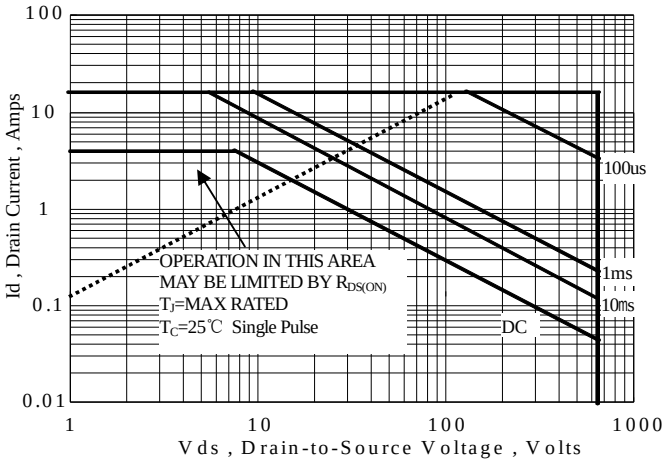


Figure 1 Maximum Forward Bias Safe Operating Area

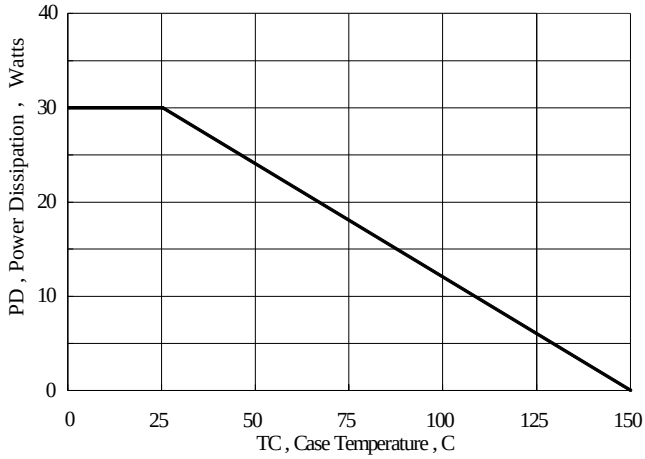


Figure 2 Maximum Power Dissipation vs Case Temperature

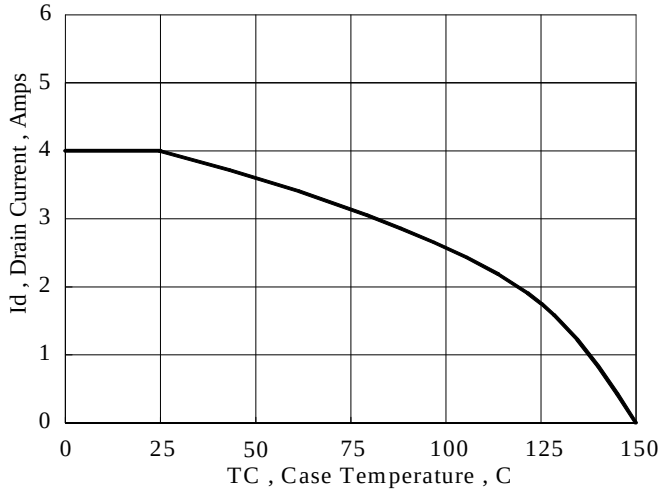


Figure 3 Maximum Continuous Drain Current vs Case Temperature

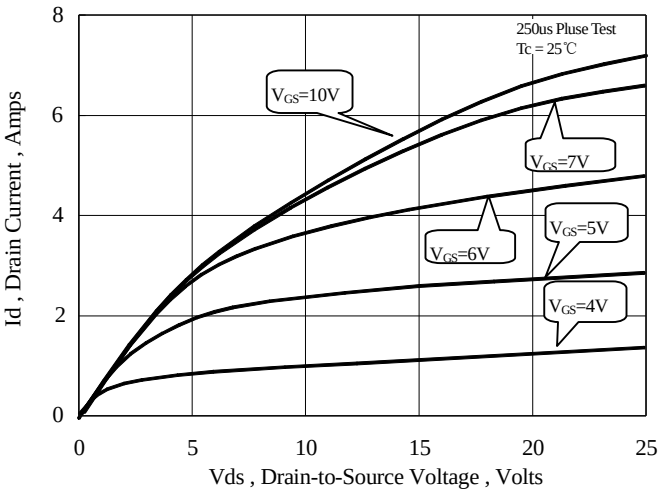


Figure 4 Typical Output Characteristics

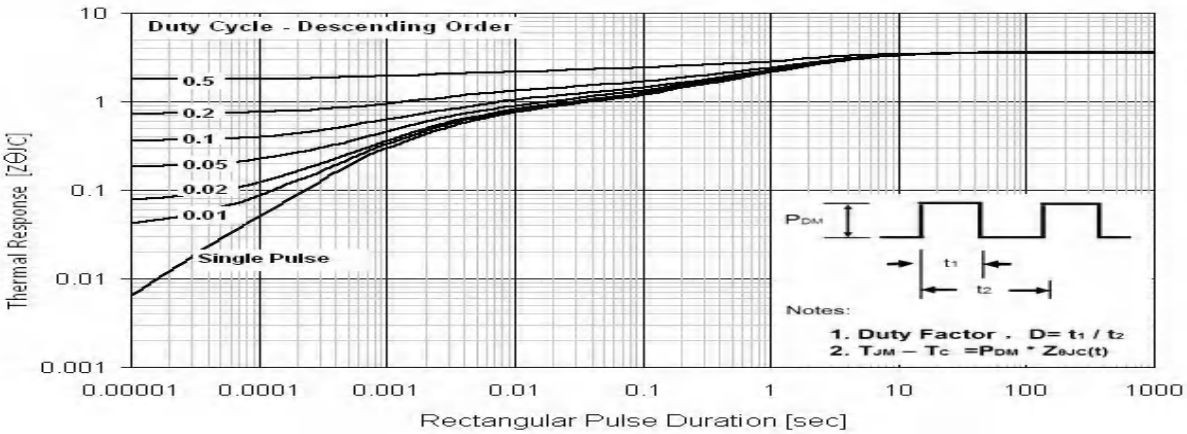


Figure 5 Maximum Effective Thermal Impendance , Junction to Case

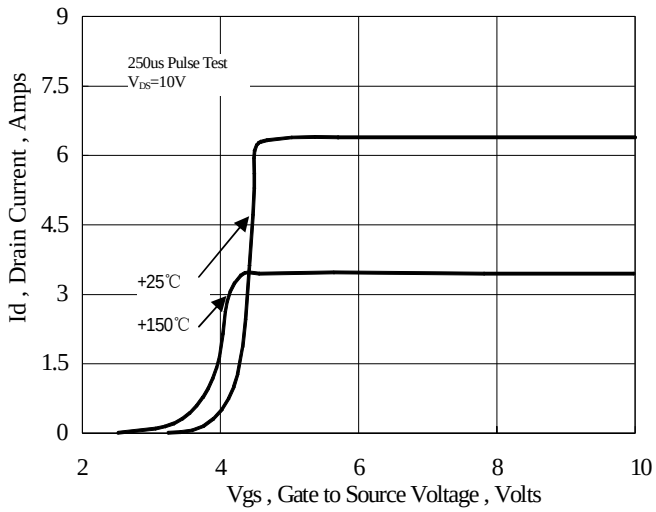


Figure 6 Typical Transfer Characteristics

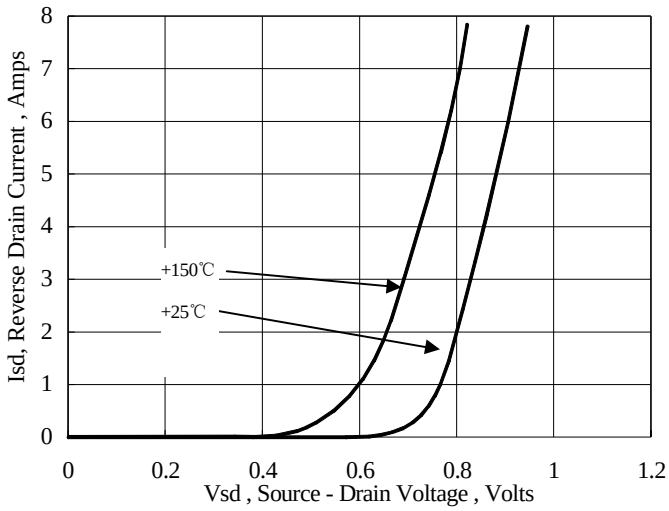


Figure 7 Typical Body Diode Transfer Characteristics

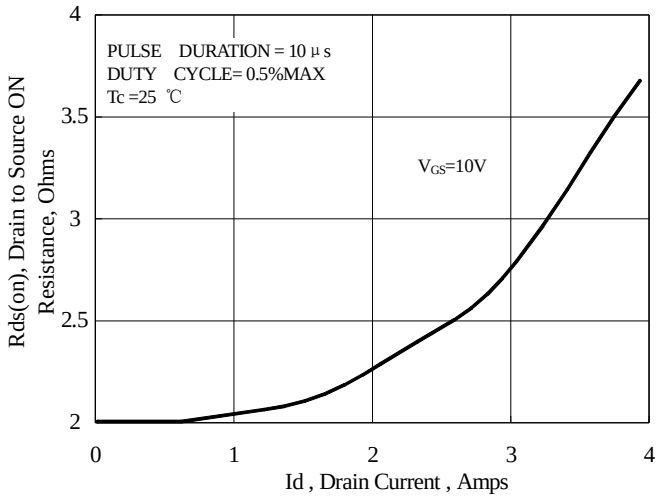


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

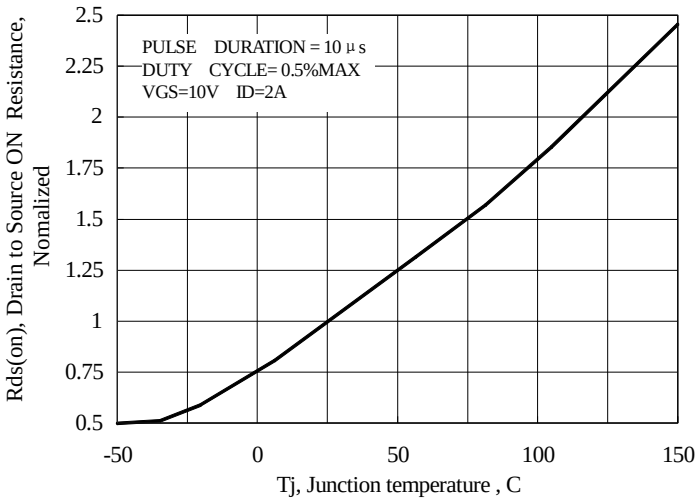


Figure 9 Typical Drian to Source on Resistance vs Junction Temperature

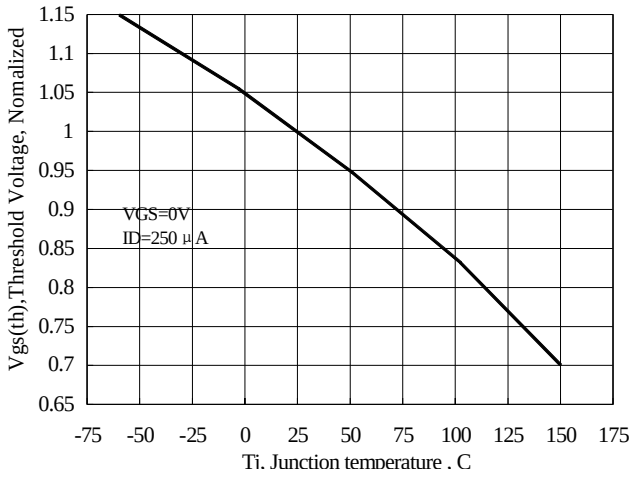


Figure 10 Typical Theshold Voltage vs Junction Temperature

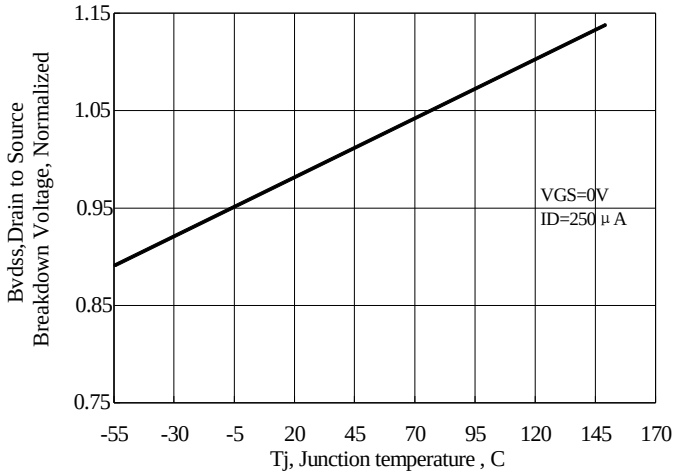


Figure 11 Typical Breakdown Voltage vs Junction Temperature

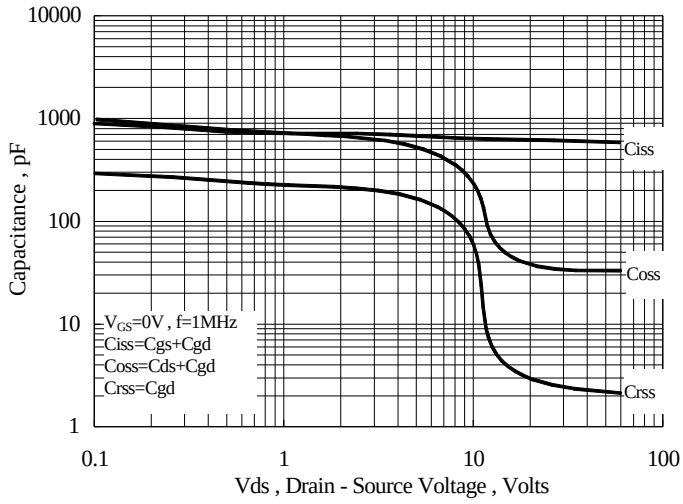


Figure 12 Typical Capacitance vs Drain to Source Voltage

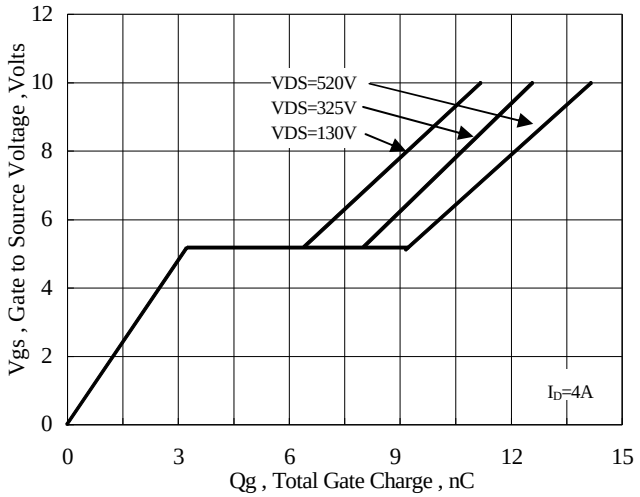


Figure 13 Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform

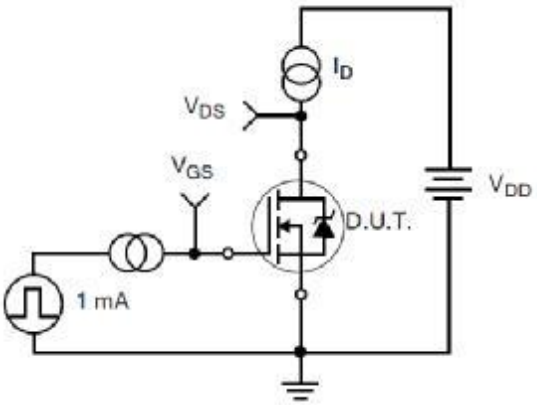


Figure 17. Gate Charge Test Circuit

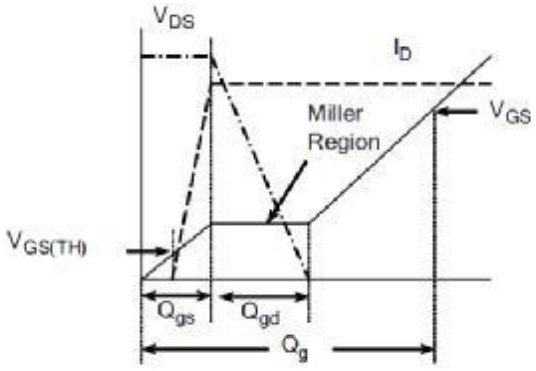


Figure 18. Gate Charge Waveform

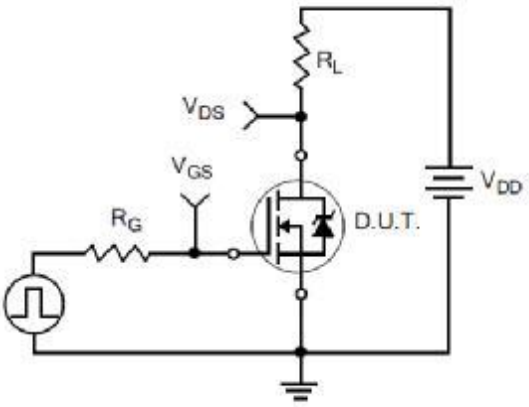


Figure 19. Resistive Switching Test Circuit

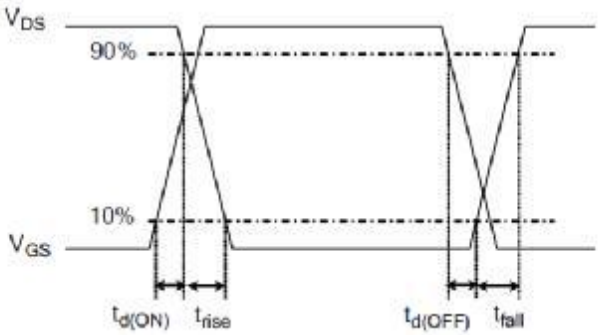


Figure 20. Resistive Switching Waveforms

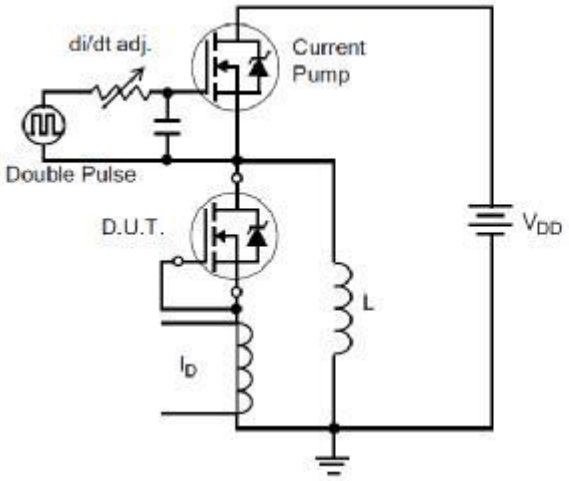


Figure 21. Diode Reverse Recovery Test Circuit

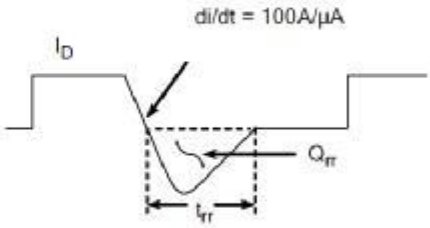


Figure 22. Diode Reverse Recovery Waveform

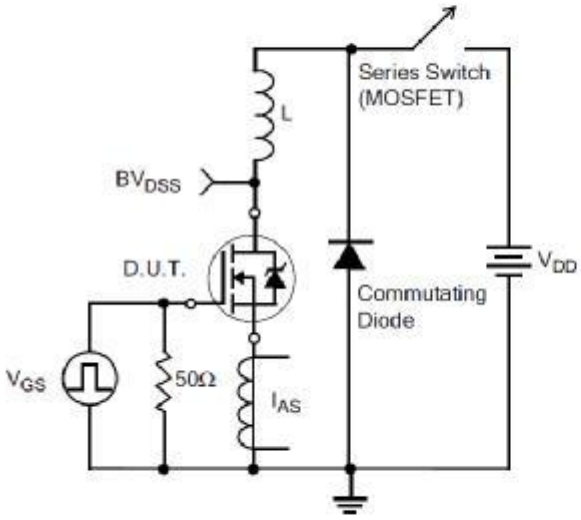


Figure 23. Unclamped Inductive Switching Test Circuit

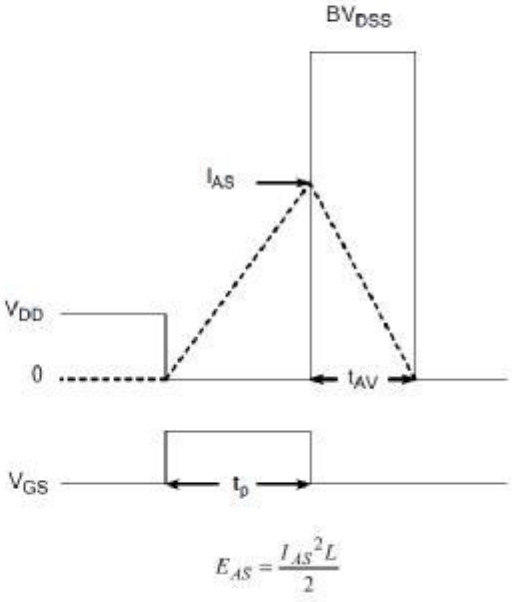
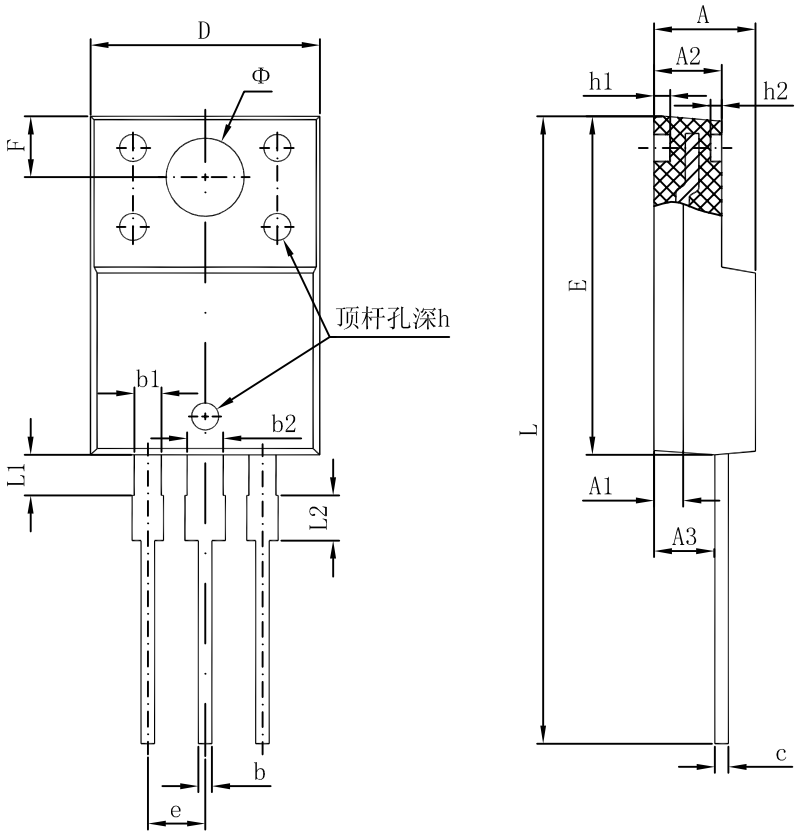


Figure 24. Unclamped Inductive Switching Waveforms

Package Information

TO-220F



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	1.300 REF.		0.051 REF.	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540 TYP.		0.100 TYP.	
F	2.700 REF.		0.106 REF.	
Φ	3.500 REF.		0.138 REF.	
h	0.000	0.300	0.000	0.012
h1	0.800 REF.		0.031 REF.	
h2	0.500 REF.		0.020 REF.	
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	1.900	2.100	0.075	0.083

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