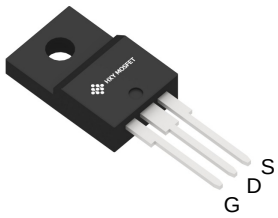
Description

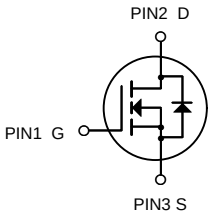
The SMIRF16N65T2TL can be used in various power swithching circuit for system miniaturization and higher efficiency.The package form is TO-220F, which accords with the RoHS standard.



TO-220F

General Features

V_{DS} = 650V,I_D =16A
$R_{DS(ON)}$ <0.50Ω@ V_{GS}=10V



N-Channel MOSFET

Application

- Power switch circuit of adaptor and charger.

Package Marking and Ordering Information

Product ID	Pack	Brand	Units Tube
SMIRF16N65T2TL	TO-220F	HXY MOSFET	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	16	A
I_D@T_C=100℃	Drain Current, V_{GS} @ 4.5V	10	A
IDM	Pulsed Drain Current[1]	64	A
P_D@T_C=25℃	Total Power Dissipation	43	W
E_{AS}	Single Pulse Avalanche Energy[4]	950	mJ
TSTG	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Electrical Characteristics（Tj= 25℃ 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℃	--	0.7	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} =650V, V_{GS}= 0V, Tj = 25℃	--	--	1	μA
		V_{DS} =520V, V_{GS}= 0V, Tj = 125℃	--	--	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=8A	--	0.45	0.50	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 =8A	--	15.3	--	S
R_g	Gate resistance	f = 1.0MHz	--	2.8	--	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	2437	--	PF
C_{oss}	Output Capacitance		--	200	--	
C_{rss}	Reverse Transfer Capacitance		--	10.4	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =16.0A V_{DD} = 325V V_{GS} = 10V R_G =10Ω	--	26	--	ns
tr	Rise Time		--	41.4	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	65.6	--	
t_f	Fall Time		--	42.3	--	
Q_g	Total Gate Charge	I_D =16.0A V_{DD} =520V V_{GS} = 10V	--	50.5	--	nC
Q_{gs}	Gate to Source Charge		--	11.2	--	
Q_{gd}	Gate to Drain (“Miller”)Charge		--	20.7	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	T_C = 25 °C	--	--	16	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	64	A
V_{SD}	Diode Forward Voltage	I_S=16.0A,V_{GS}=0V	--	--	1.5	V
T_{rr}	Reverse Recovery Time	I_S=16.0A,T_j = 25°C dI_F/dt=100A/us, V_{GS}=0V	--	552	--	ns
Q_{rr}	Reverse Recovery Charge		--	5960	--	nC
I_{rrm}	Reverse Recovery Current		--	21.6	--	A
Pulse width tp≤300μs,δ≤2%						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	2.92	℃/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	℃/W

[a1]: Repetitive rating; pulse width limited by maximum junction temperature
[a2]: L=10mH, I_D=13.7A, Start T_J=25°C
[a3]: I_{SD} =16A,di/dt ≤100A/us,V_{DD}≤$BV_{DS,}$ Start T_J=25°C

Characteristics Curve:

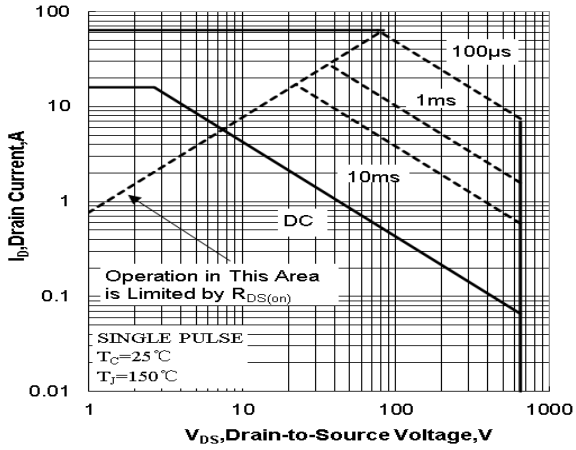


Figure 1 Maximum Forward Bias Safe Operating Area

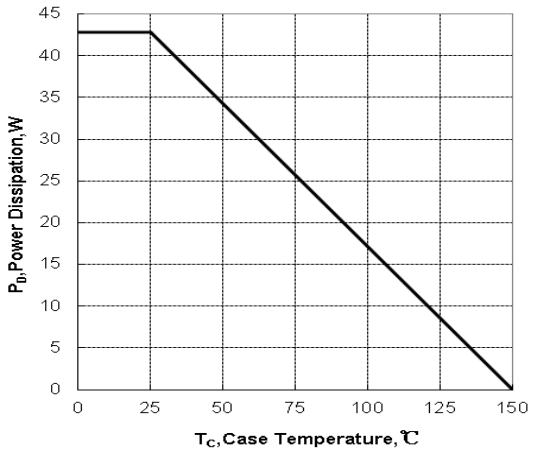


Figure 2 Maximum Power dissipation vs Case Temperature

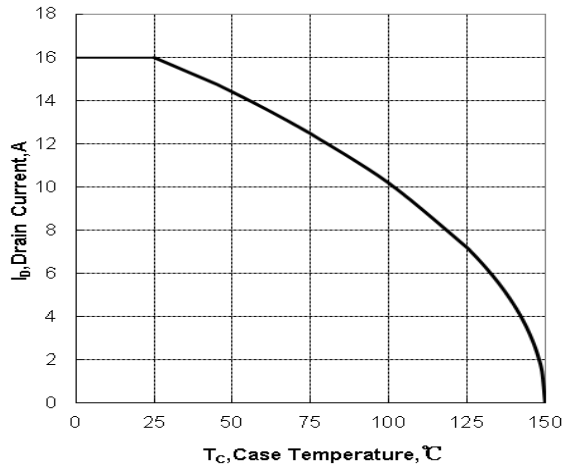


Figure 3 Maximum Continuous Drain Current vs Case Temperature

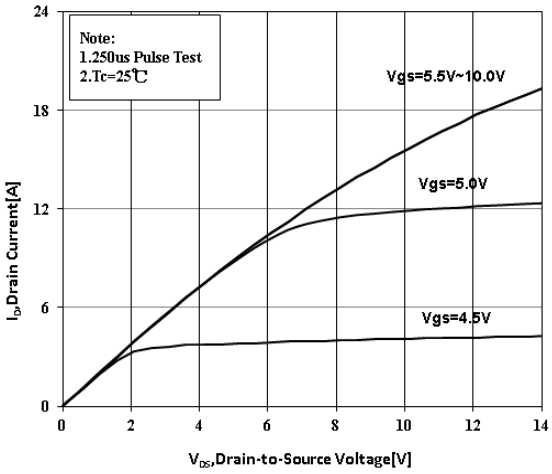


Figure 4 Typical Output Characteristics

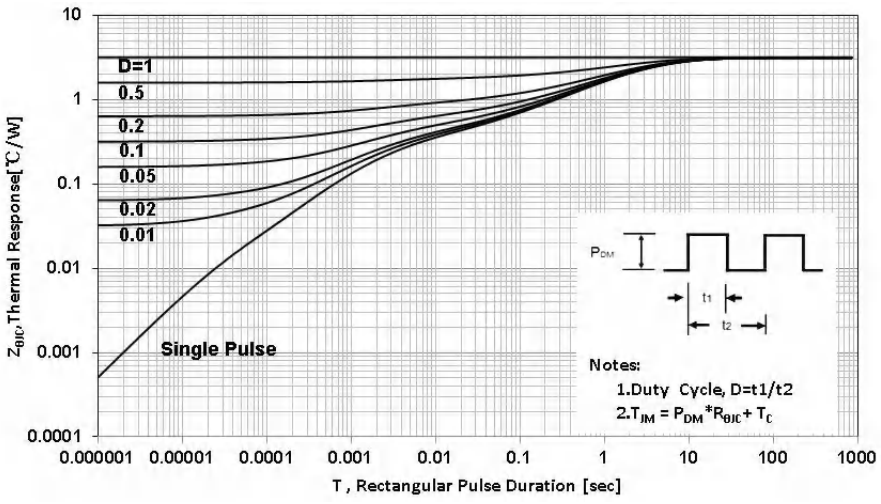


Figure 5 Maximum Effective Thermal Impedance , Junction to Case

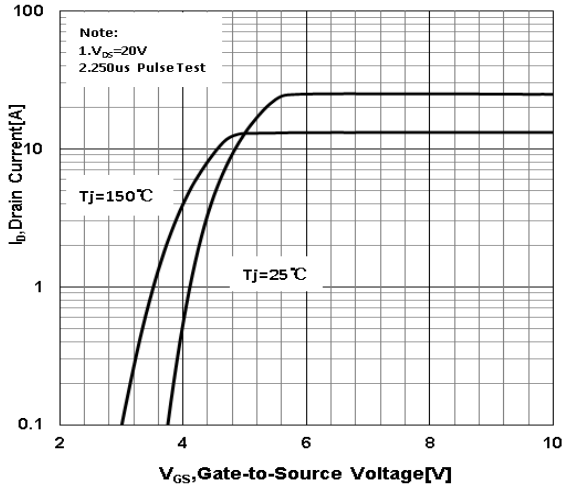


Figure 6 Typical Transfer Characteristics

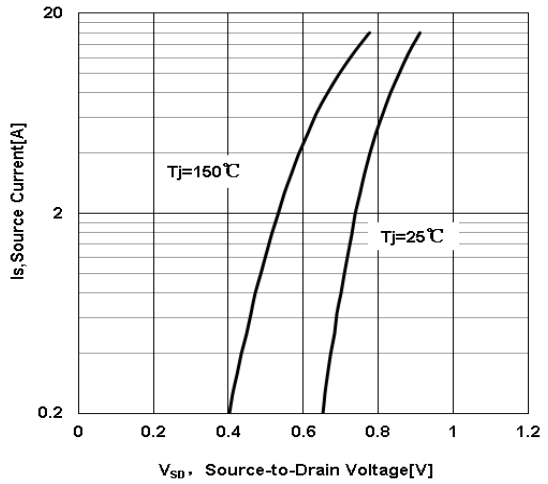


Figure 7 Typical Body Diode Transfer Characteristics

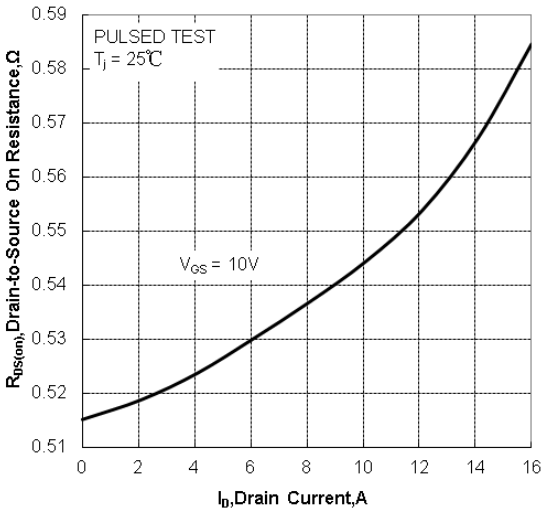


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

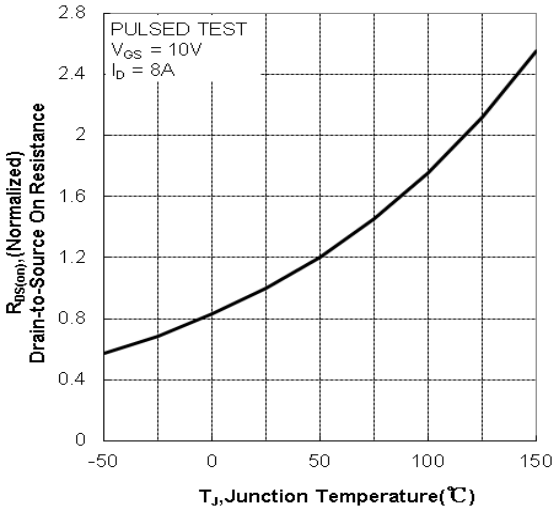


Figure 9 Typical Drian to Source on Resistance vs Junction Temperature

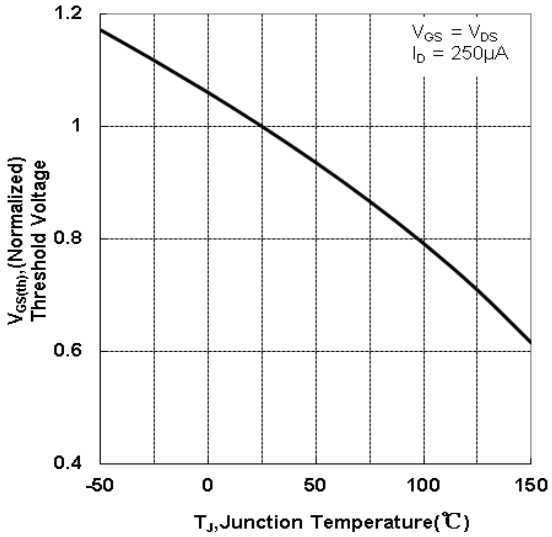


Figure 10 Typical Theshold Voltage vs Junction Temperature

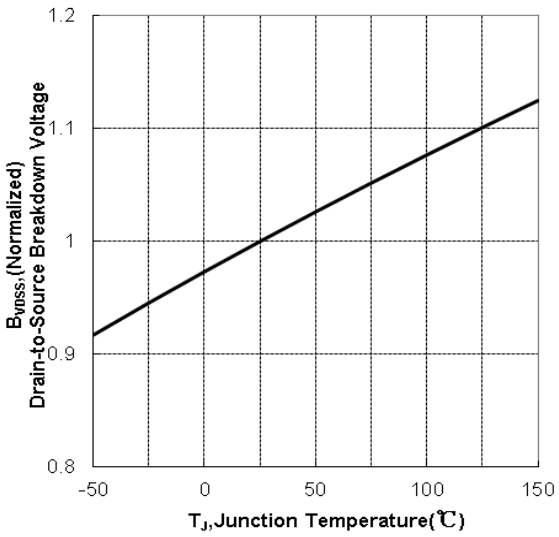


Figure 11 Typical Breakdown Voltage vs Junction Temperature

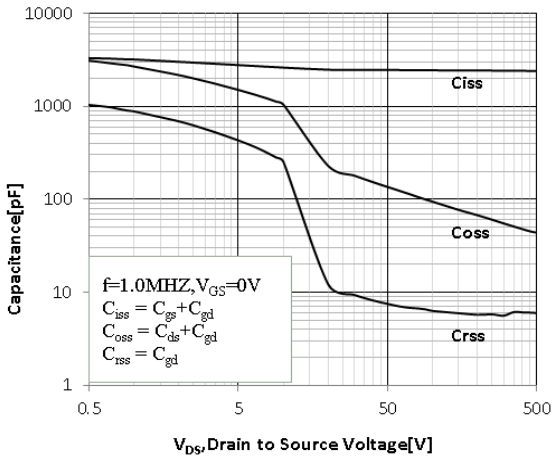


Figure 12 Typical Capacitance vs Drain to Source Voltage

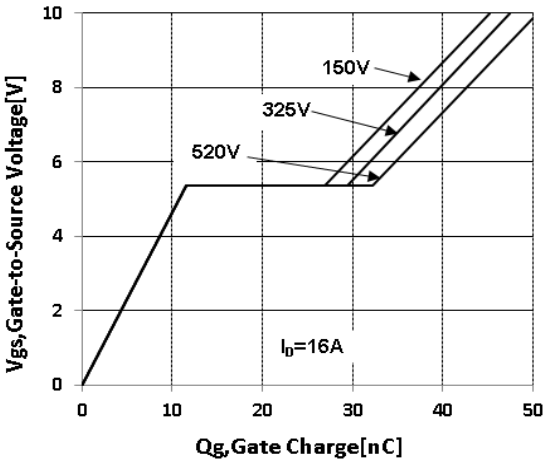


Figure 13 Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform

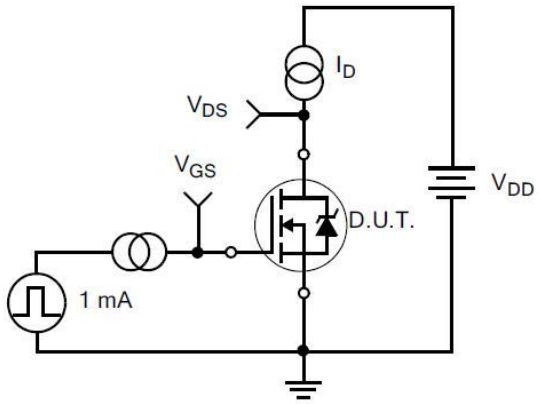


Figure 14. Gate Charge Test Circuit

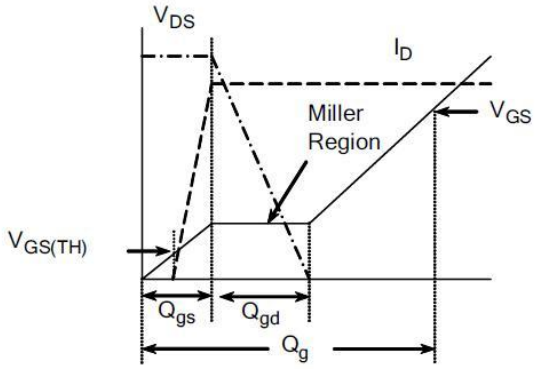


Figure 15. Gate Charge Waveforms

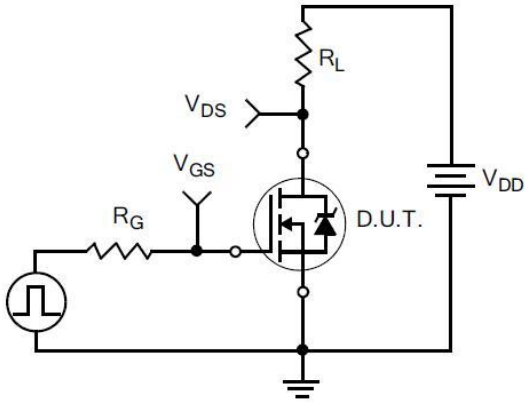


Figure 16. Resistive Switching Test Circuit

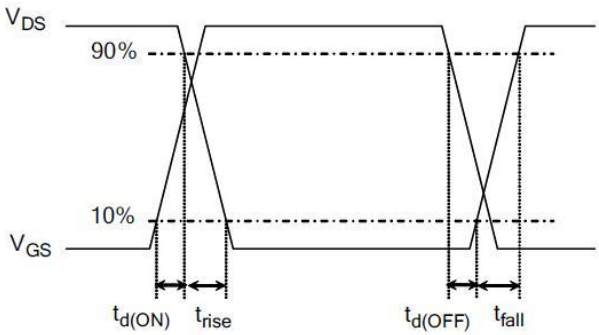


Figure 17. Resistive Switching Waveforms

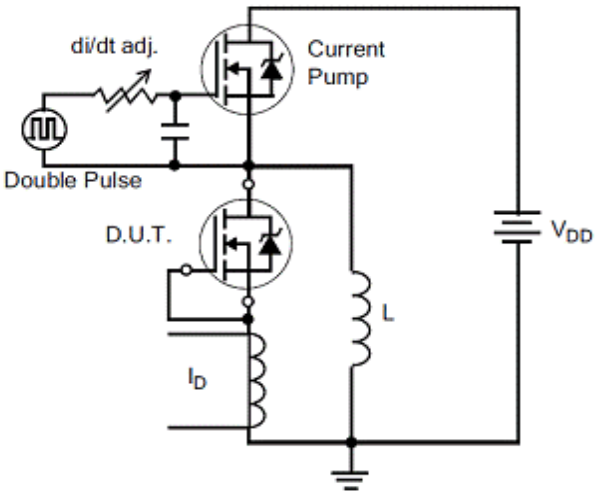


Figure 18. Diode Reverse Recovery Test Circuit

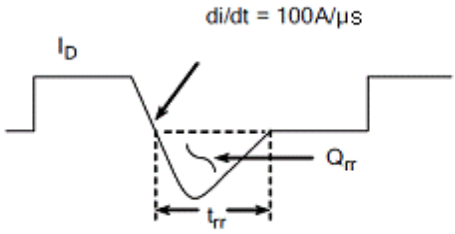


Figure 19. Diode Reverse Recovery Waveform

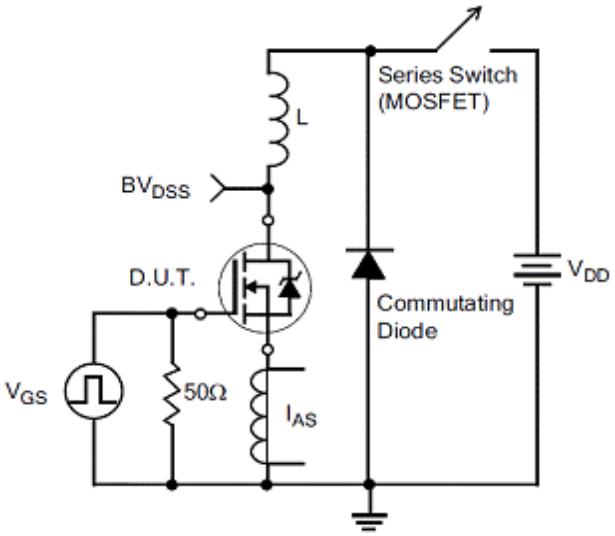


Figure20.Unclamped Inductive Switching Test Circuit

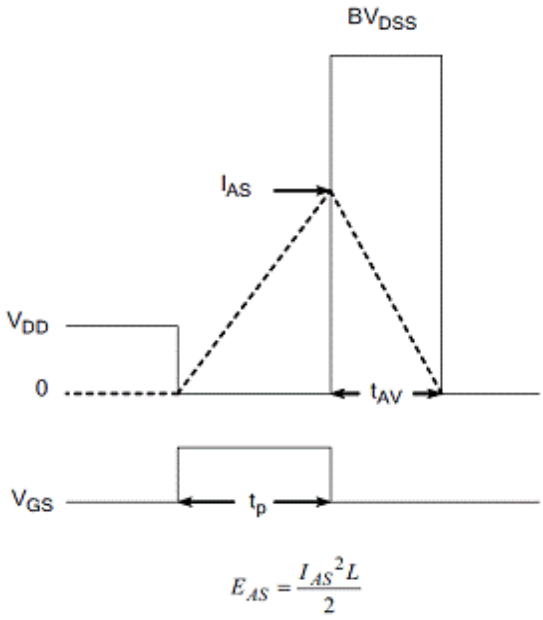
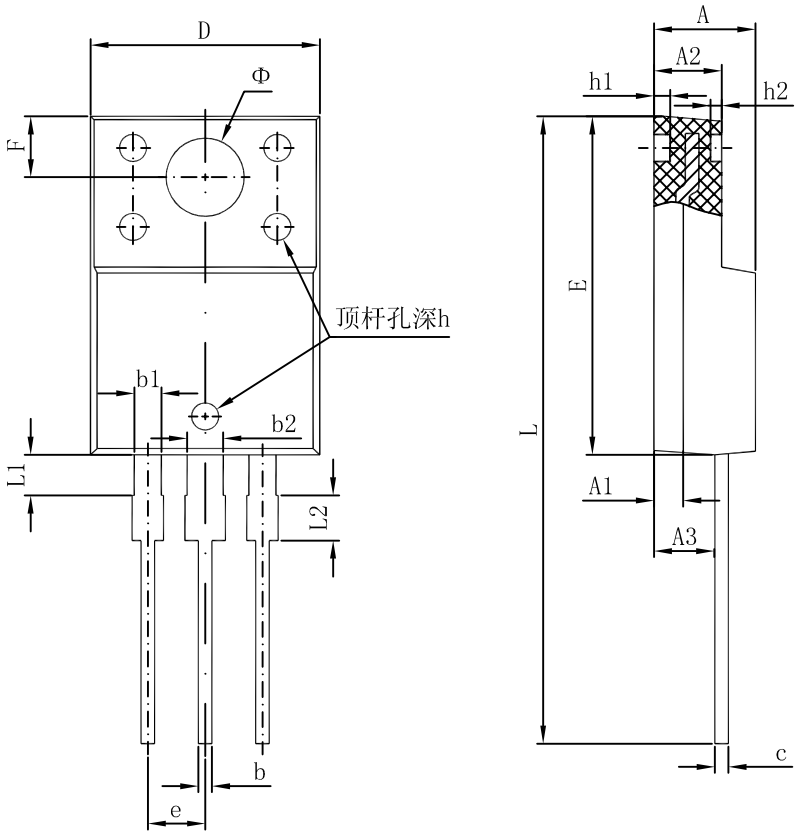


Figure21.Unclamped Inductive Switching Waveform

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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