N Channel MOSFET

Lead Free Package and Finish

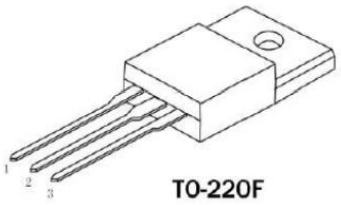
Applications:

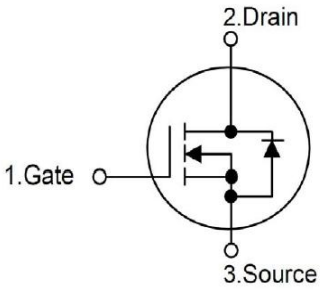
- •Adapter & Charger
- •AC-DC Switching Power Supply
- •LED driving power
- •PC Power Supply

I_D	$R_{DS(ON)}$(Typ.)	V_{DSS}
4A	2.1Ω	650V

Features:

- •100% avalanche tested
- •Ultra low gate Charge(typical 14nC)
- •Low Cress(typical 5.4pF)
- •Fast switching capability
- •RoHS Compliant





Not to Scale

Ordering Information

Part Number	Package	Marking
RS4N65F	TO-220F	RS4N65F

Absolute Maximun Ratings Tc=25℃ unless otherwise specified

Symbol	Parameter	RS4N65F	Units
V_{DSS}	Drain-to-Source Voltage (Note*1)	650	V
I_D	Continuous Drain Current	4	A
I_D@ 100 ℃	Continuous Drain Current	2.7	
I_{DM}	Pulsed Drain Current (Note*2)	16	
P_D	Power Dissipation	38	W
	Derating Factor above 25℃	0.3	W/℃
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Engergy L=29mH IAS=4A VDD=50V RG=25Ω TJ=25℃	232	mJ
E_{AR}	Repetitve Pulse Avalanche Engergy (pulse width limied by maximum junction temperature)	15	mJ
T_L	Maximum Temperature for Soldering	300	℃
T_{PKG}	Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	260	
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	RS4N65F	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	3.29	℃/W	Drain lead soldered to water cooled heatsink,P_D adjusted for a peak junction temperature of +150℃.
$R_{\theta JA}$	Junction-to-Ambient	120		1 cubic foot chamber,free air.

OFF Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-source Breakdown Voltage	650	--	--	V	V_{GS}=0V,I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1.0	μA	V_{DS}=650V,V_{GS}=0V
I_{GSS}	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 TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	--	2.1	2.6	Ω	V_{GS}=10V,I_D=2A
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{GS}=V_{DS},I_D=250μA
Gfs	Forward Transconductance		2.5		S	V_{DS}=50V,I_D=2A

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	15	--	nS	V_{DS}=325V I_D=4A R_G=10Ω (Note:3,4)
t_{rise}	Rise Time	--	30	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	20	--		
t_{fall}	Fall Time	--	14	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	570	--	pF	V_{GS}=0V V_{DS}=25V f=1.0MHz
C_{oss}	Output Capacitance	--	56	--		
C_{rss}	Reverse Transfer Capacitance	--	5.4	--		
Q_g	Total Gate Charge	--	14	--	nC	V_{DS}=520V I_D=4A V_{GS}=10V (Note:3,4)
Q_{gs}	Gate-to-Source Charge	--	3.8	--		
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	--	--	1.4	V	IS=4A,VGS=0V
trr	Reverse Recovery Time	--	513	--	nS	VGS=0V IS=4A,di/dt=100A/μs
Qrr	Reverse Recovery Charge	--	2.6	--	μC	

Notes:

*1.TJ=±25℃ to +150℃.
*2.Repetitive rating;pulse width limited by maximum junction temperature.
*3.Pulse width≤300μs;duty cycle ≤2%.
*4.Basically not affected by temperature.

Typical Feature curve

Figure1.TypicalOutput Characteistics

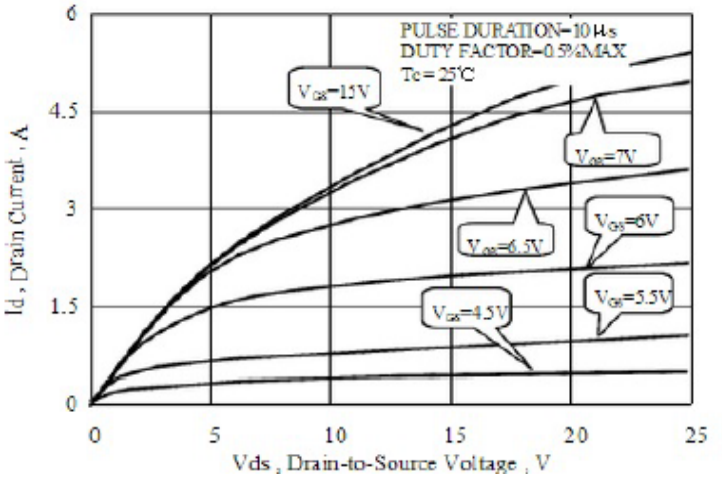
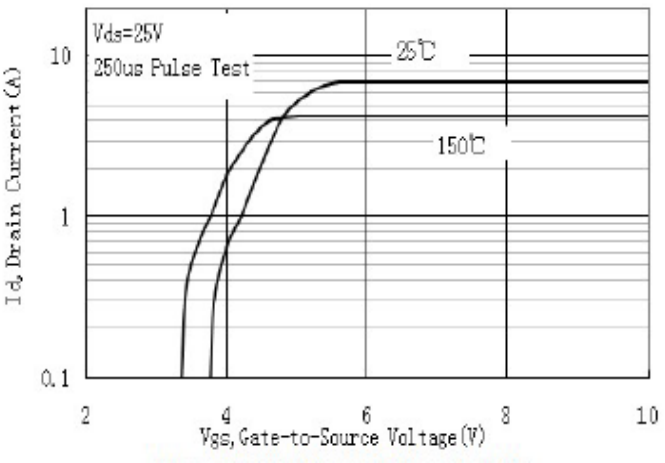
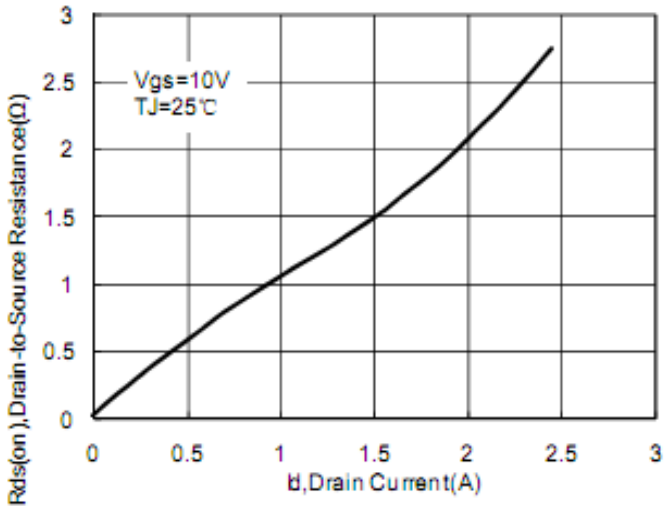


Figure2.Typical Transfer Characteristics



Figuer3.Typical ON Resistance vs Drain Current



Figuer4.Typical Body Diode Transfer Characteristics

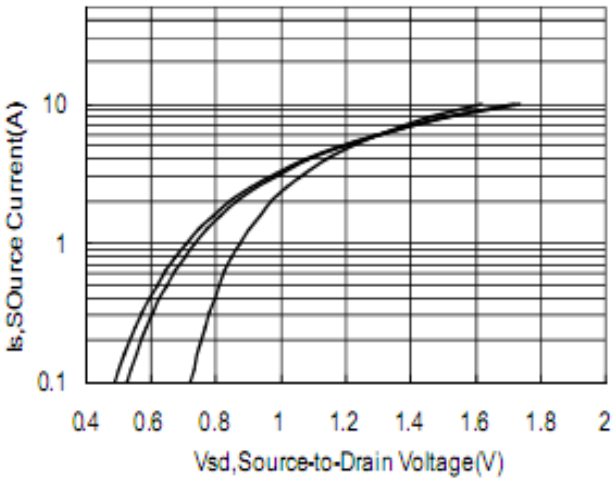


Figure5.Typical Capacitance vs Drain-to-Source Voltage

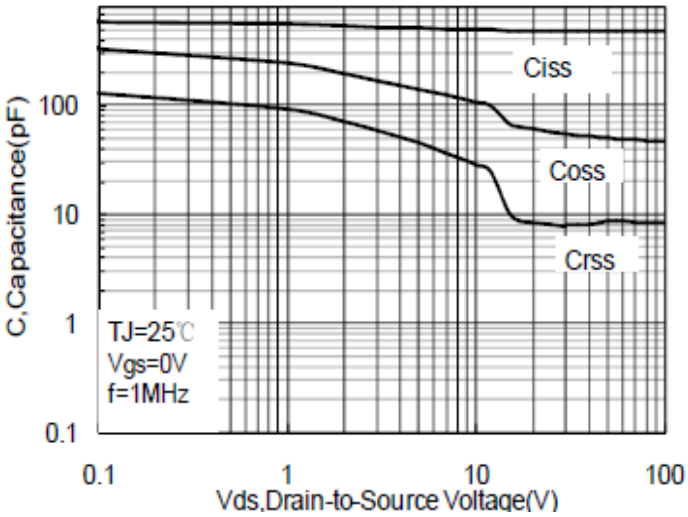


Figure6.Typical Gate Charge vs Gate-to-Source Voltage

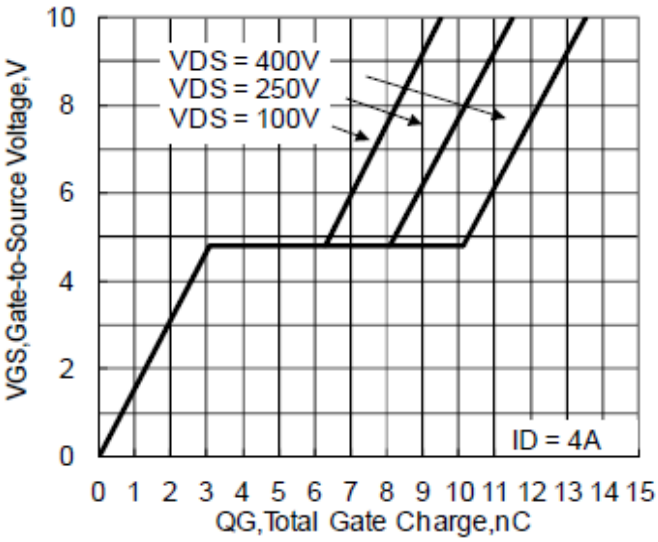


Figure7. Typical Breakdown Voltage vs Junation Temperature

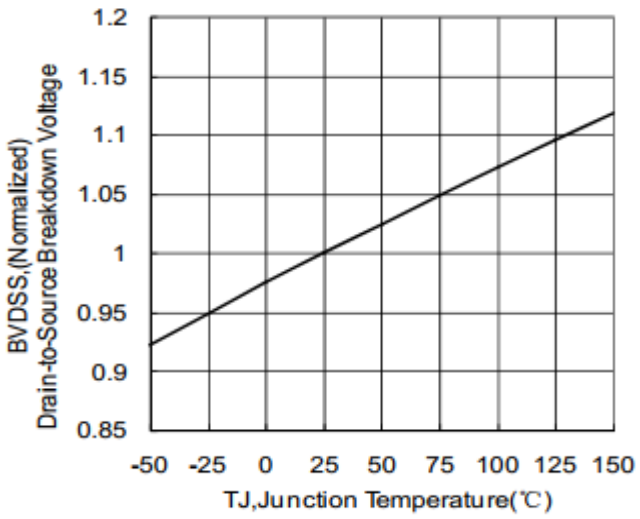


Figure8. Typical Drain-to-Source ON Resistance vs Junction Temperature

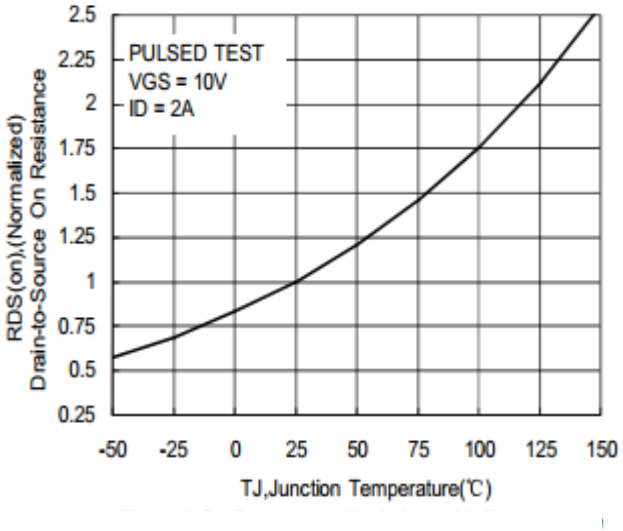


Figure9.Maximum Continuous Drain Current vs Case Temperature

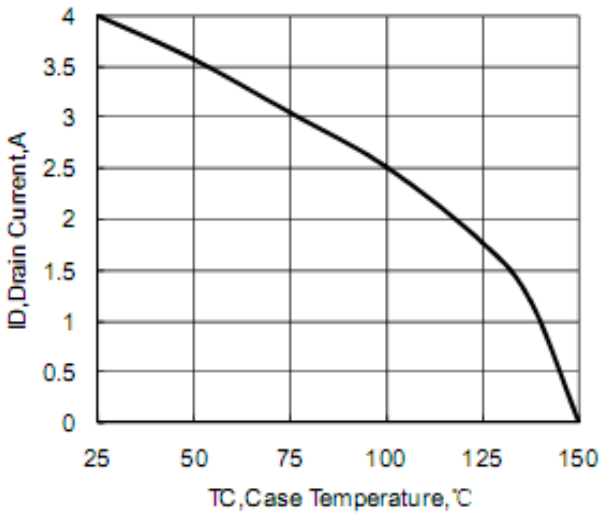
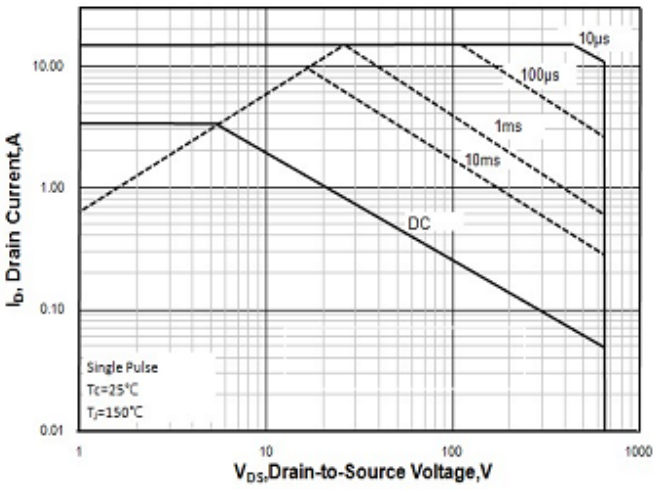


Figure10.Maximum Safe Operating Area



Test Circuits and Waveforms

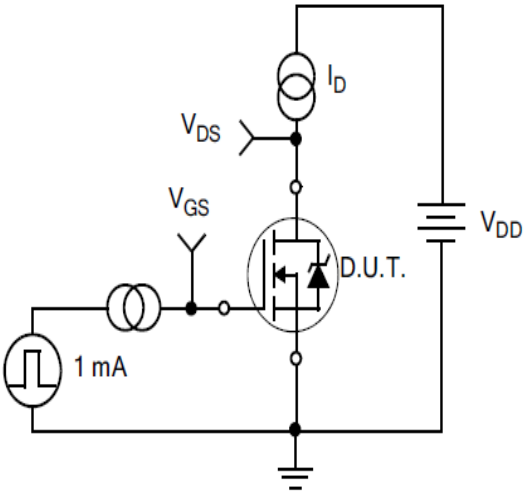


Figure11.
Gate Charge Test Circuit

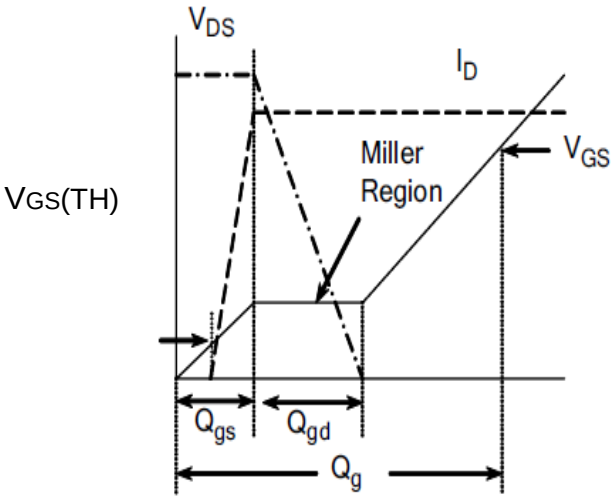


Figure12.
Gate Charge Waveform

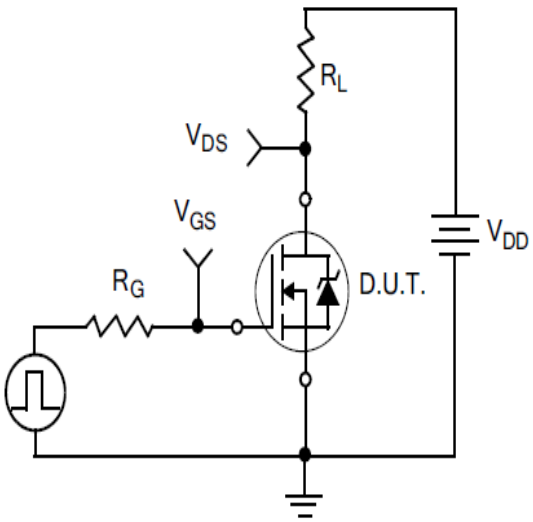


Figure13.
Resistive Switching Test Circuit

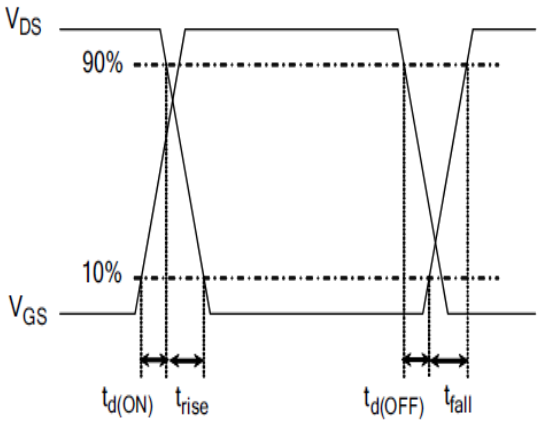


Figure14.
Resistive Switching Waveforms

Test Circuits and Waveforms

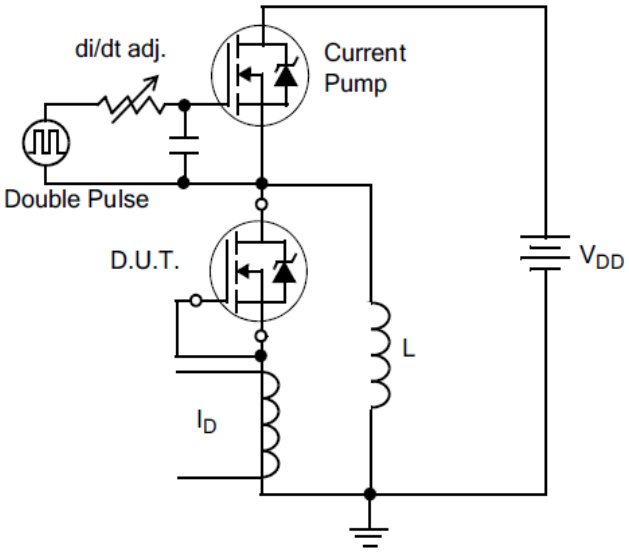


Figure15.Diode Reverse Recovery Test Circuit

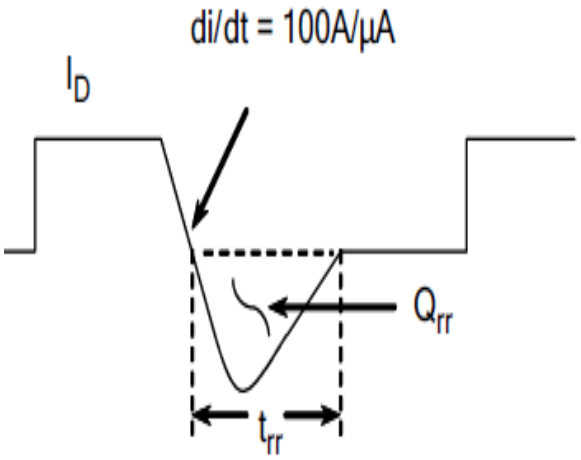


Figure16.Diode Reverse Recovery Waveform

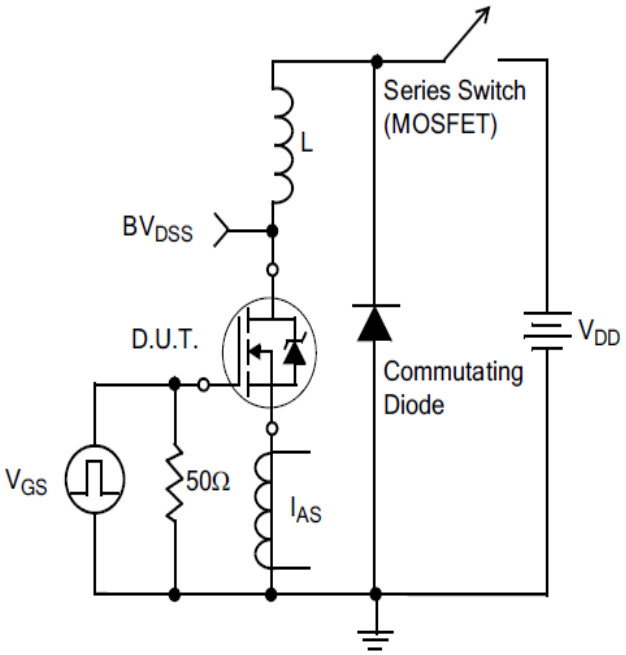
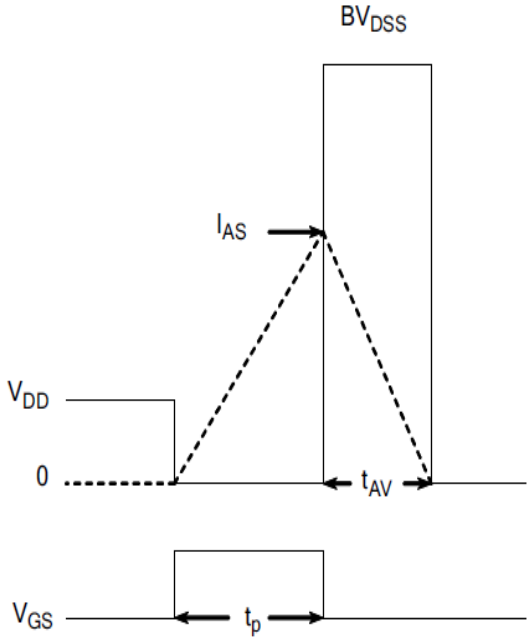


Figure17.Unclamped Inductive Switching Test Circuit

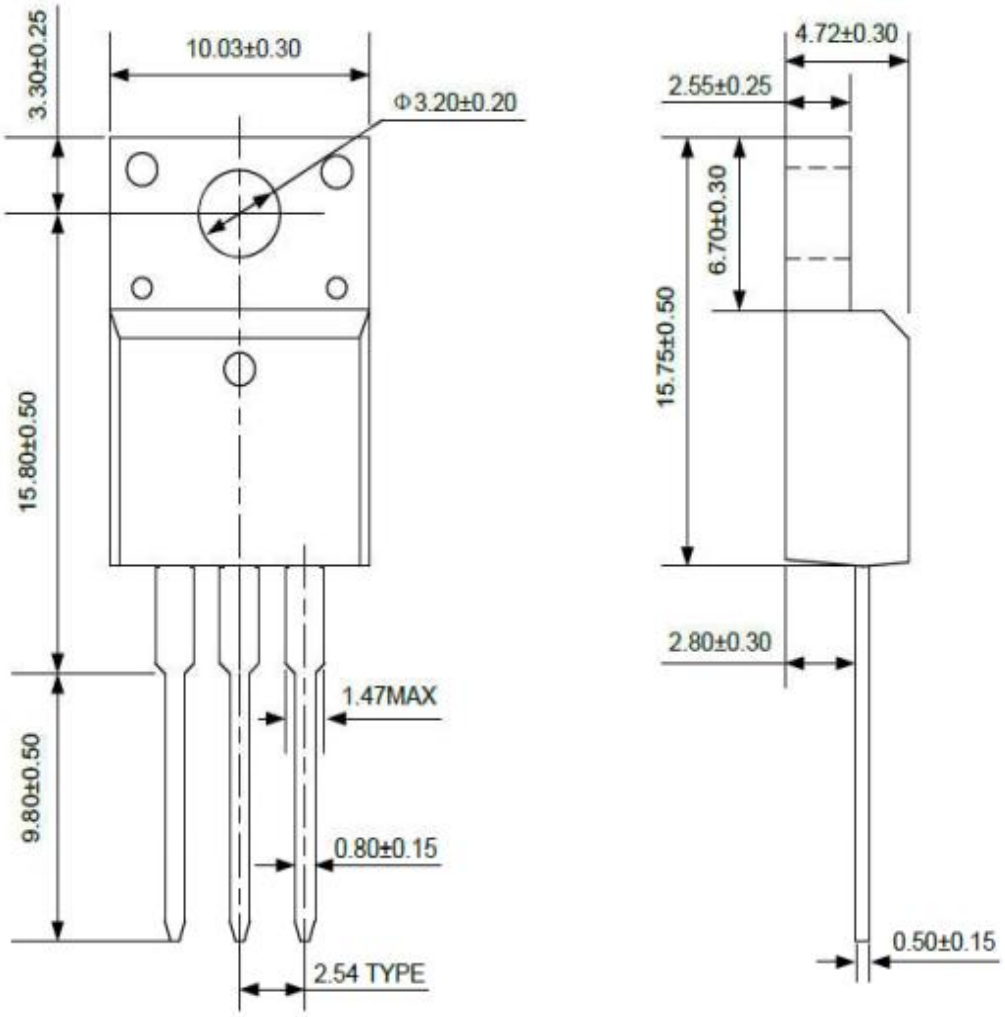


$$E_{AS}=\frac{I_{AS}^2 L}{2}$$

Figure18.Unclamped Inductive Switching Waveforms

Package outline drawing

Unit:mm



TO-220F

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