N Channel MOSFET

Lead Free Package and Finish

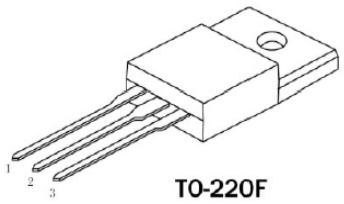
Applications:

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

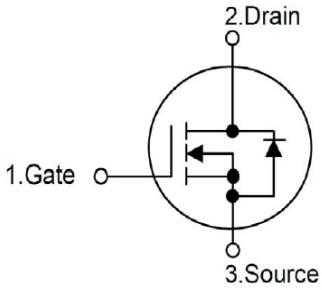
I_D	$R_{DS(ON)}$ (Typ.)	V_{DSS}
20A	0.20Ω	500V

Features:

- Low On Resistance
- Low Gate Charge
- Peak Current vs Pulse Width Curve
- RoHS Compliant



Not to Scale



Ordering Information

Part Number	Package	Marking
RS20N50F	TO-220F	RS20N50F

Absolute Maximun Ratings Tc=25℃ unless otherwise specified

Symbol	Parameter	RS20N50F	Units
V_{DSS}	Drain-to-Source Voltage (Note*1)	500	V
I_D	Continuous Drain Current	20.0	A
I_D@ 100 ℃	Continuous Drain Current	12.60	
I_{DM}	Pulsed Drain Current (Note*2)	80.0	
P_D	Power Dissipation	72	W
	Derating Factor above 25℃	0.58	W/℃
V_{GS}	Gate-to-Source Voltage	±30	V
EAS	Single Pulse Avalanche Engergy L=30mH I_{AS}=9.9A V_{DD}=50V R_G=25Ω T_J=25℃	1596	mJ
TL	Maximum Temperature for Soldering	300	℃
TPKG	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	RS20N50F	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	1.74	℃/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	500	--	--	V	V_{GS}=0V, I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1.0	μA	V_{DS}=500V, V_{GS}=0V
I_{GSS}	Gate-to-Source Forward Leakage	--	--	100	μA	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	--	0.20	0.27	Ω	V_{GS}=10V, I_D=10A
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{GS}=V_{DS}, I_D=250μA

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	27.2	--	nS	V_{DS}=250V I_D=20A R_G=10Ω (Note:3,4)
t_{rise}	Rise Time	--	47.5	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	78.7	--		
t_{fall}	Fall Time	--	41.1	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	2687.7	--	pF	V_{GS}=0V V_{DS}=25V f=1.0MHz
C_{oss}	Output Capacitance	--	355.0	--		
C_{rss}	Reverse Transfer Capacitance	--	10.30	--		
Q_g	Total Gate Charge	--	49.50	--	nC	V_{DS}=400V I_D=20A V_{GS}=10V (Note:3,4)
Q_{gs}	Gate-to-Source Charge	--	14.28	--		
Q_{gd}	Gate-to-Drain("Miller") Charge	--	16.95	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	--	--	20.0	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current	--	--	80.0	A	
V_{SD}	Diode Forward Voltage	--	--	1.4	V	I_S=20A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	570.30	--	nS	V_{GS}=0V
Q_{rr}	Reverse Recovery Charge	--	7.35	--	μC	I_S=20A, di/dt=100A/μs

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. Typical Output Characteristics

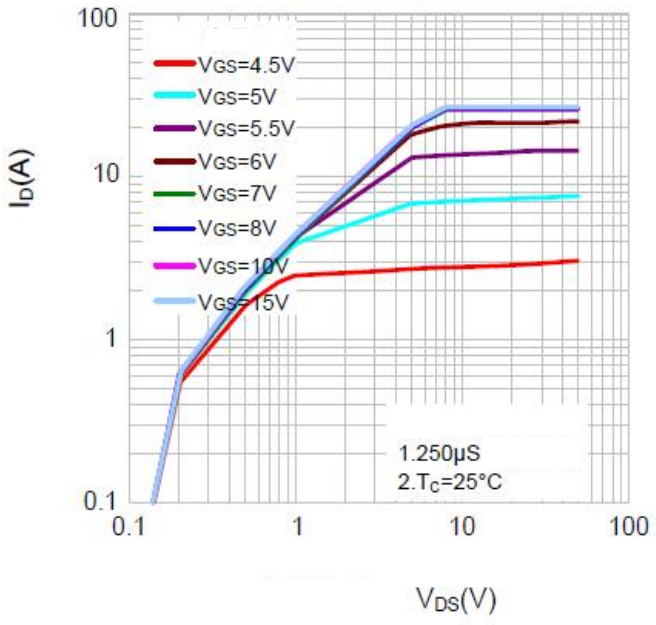
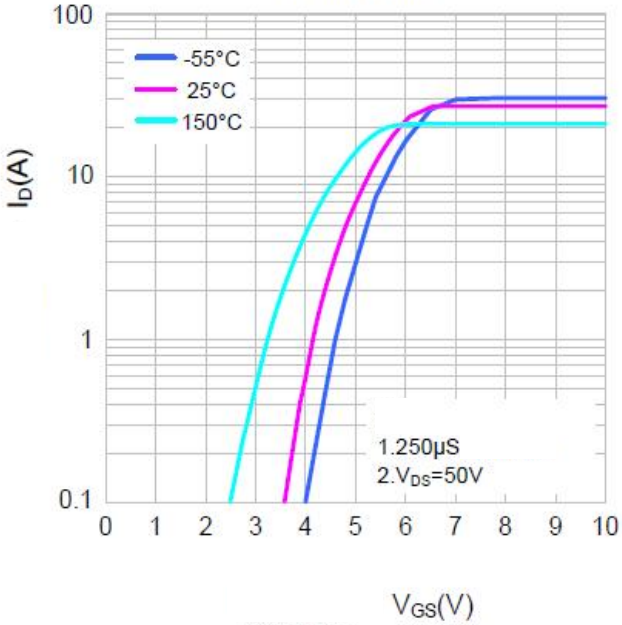
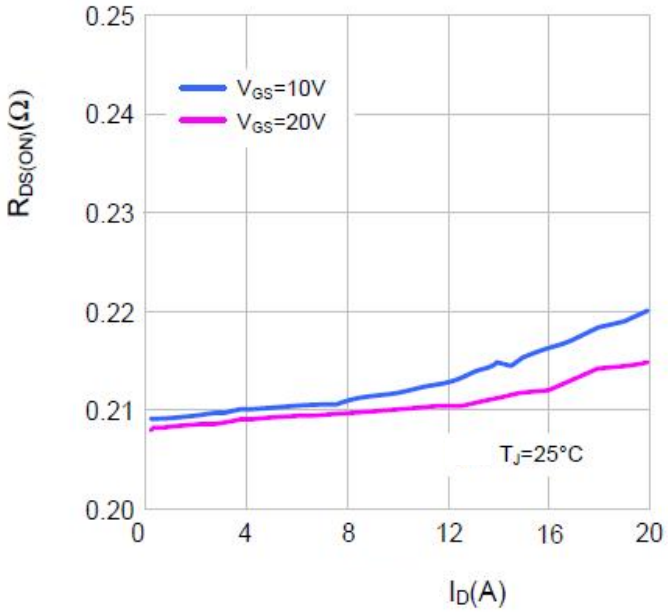


Figure2. Typical Transfer Characteristics



Figuer3. Typical ON Resistance vs Drain Current



Figuer4. Typical Body Diode Transfer Characteristics

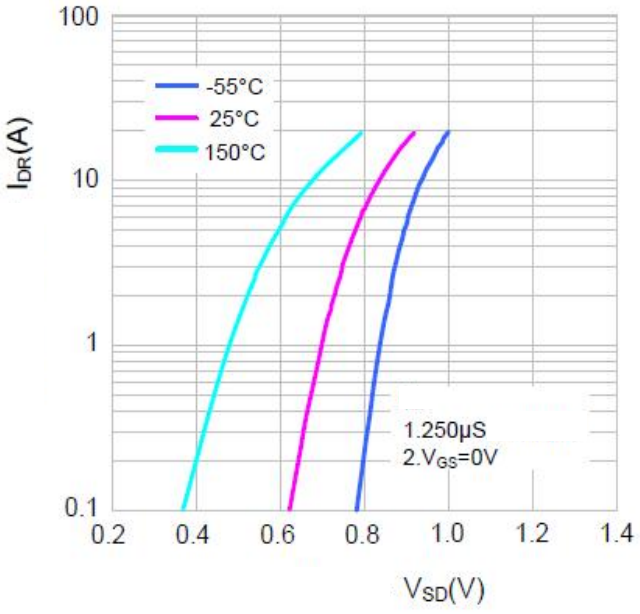


Figure5. Typical Capacitance vs Drain-to-Source Voltage

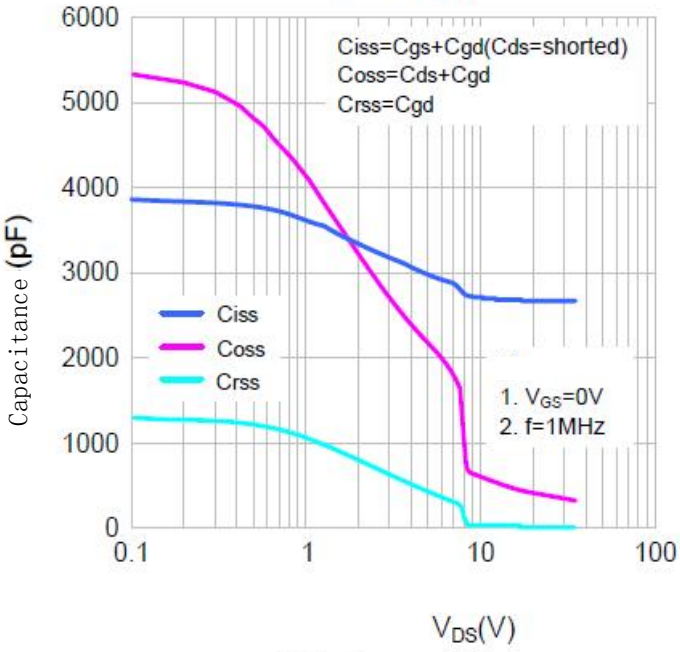


Figure6. Typical Gate Charge vs Gate-to-Source Voltage

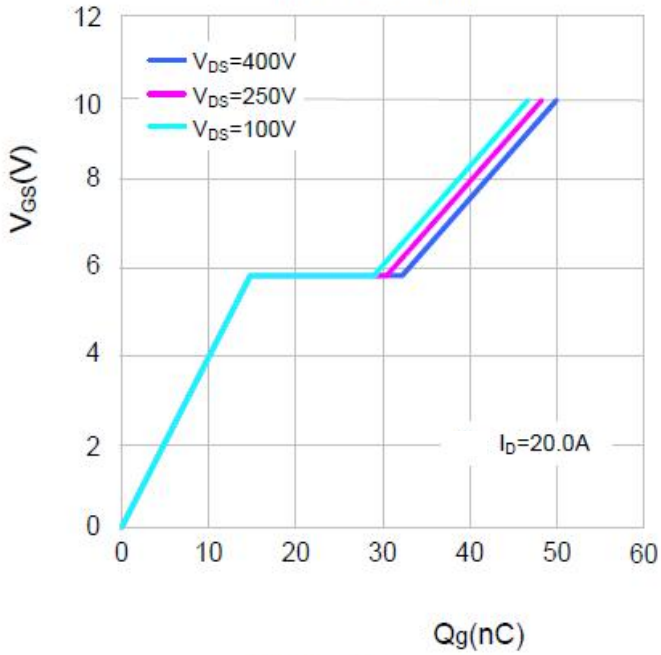


Figure7. Typical Breakdown Voltage vs Junation Temperature

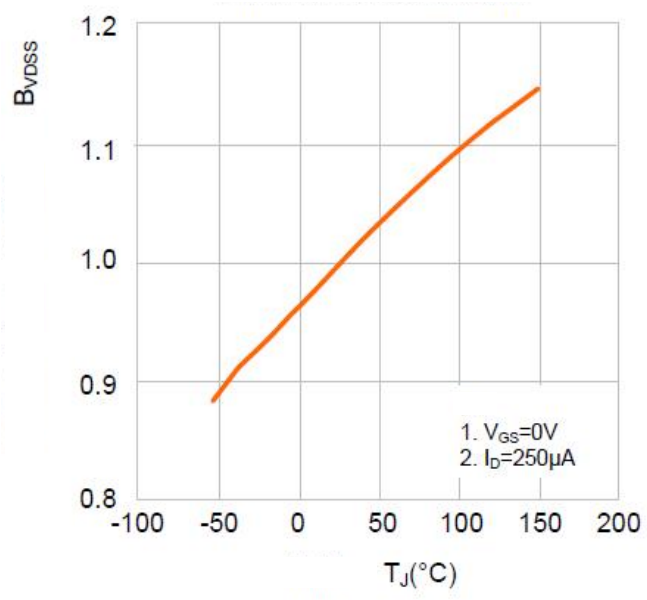


Figure8. Figure10.Typical Drain-to-Source ON Resistance vs Junction Temperature

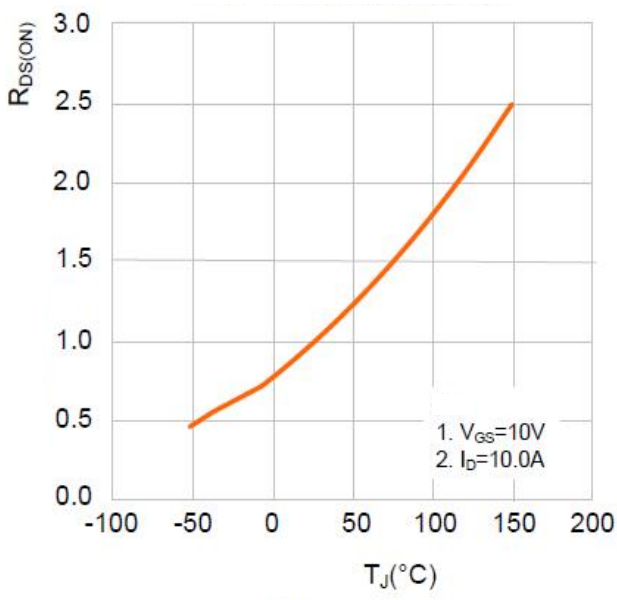


Figure9.Maximum Continuous Drain Current vs Case Temperature

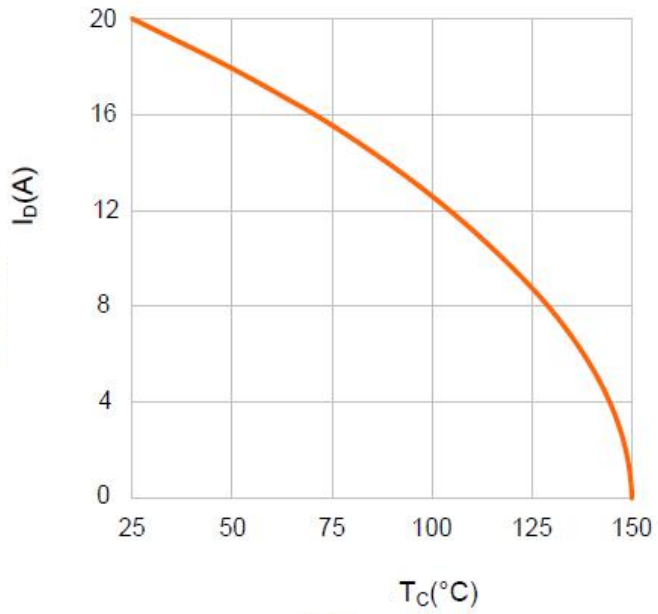
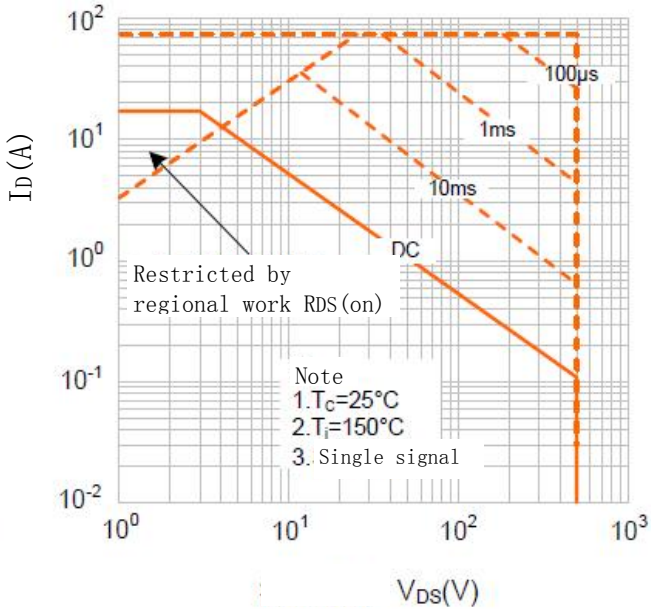


Figure10.Maximum Continuous Drain Current vs Case Temperature



Test Circuits and Waveforms

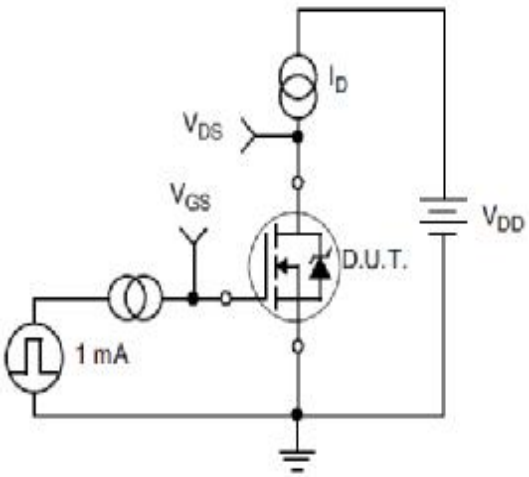


Figure11.
Gate Charge Test Circuit

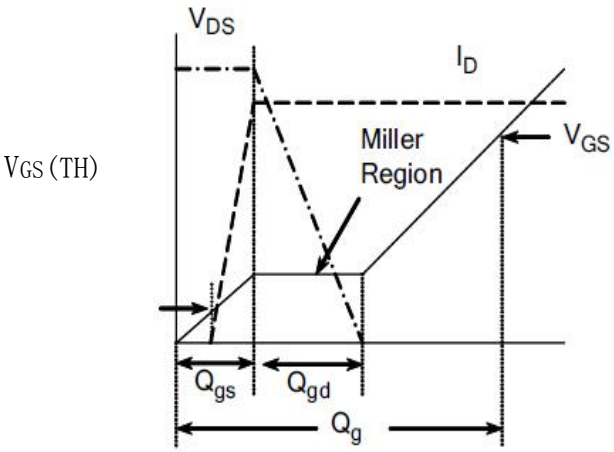


Figure12.
Gate Charge Waveform

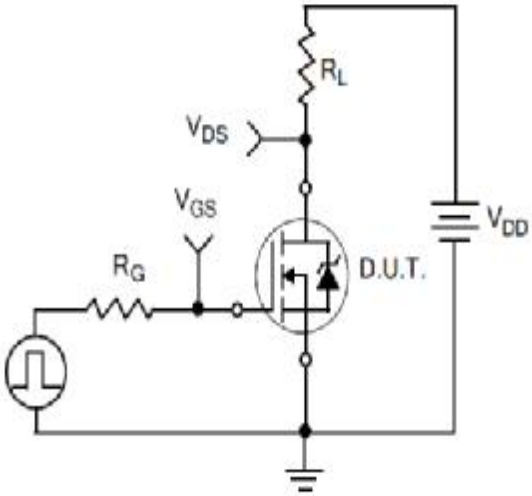


Figure13.
Resistive Switching Test Circuit

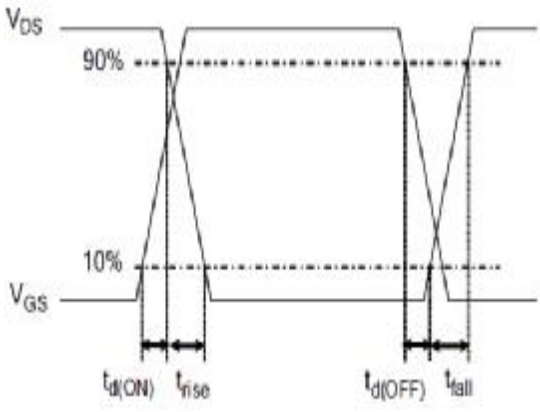


Figure14.
Resistive Switching Waveforms

Test Circuits and Waveforms

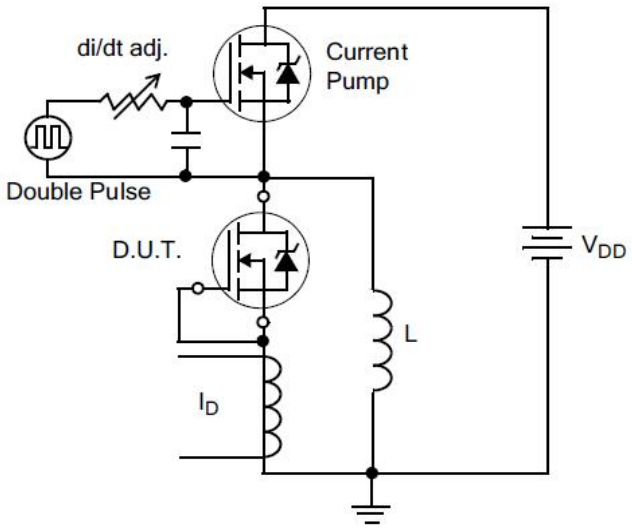


Figure15. Diode Reverse Recovery Test Circuit

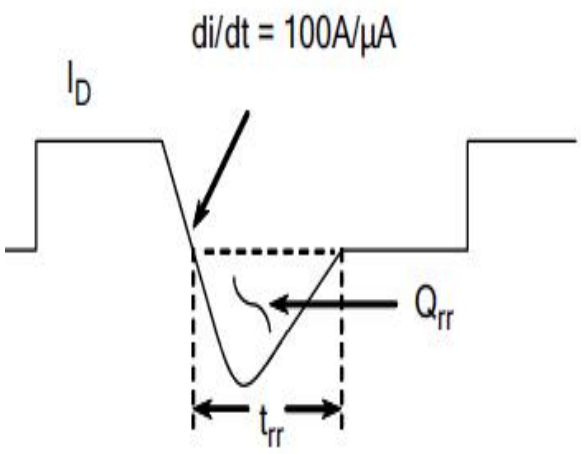


Figure16. Diode Reverse Recovery Waveform

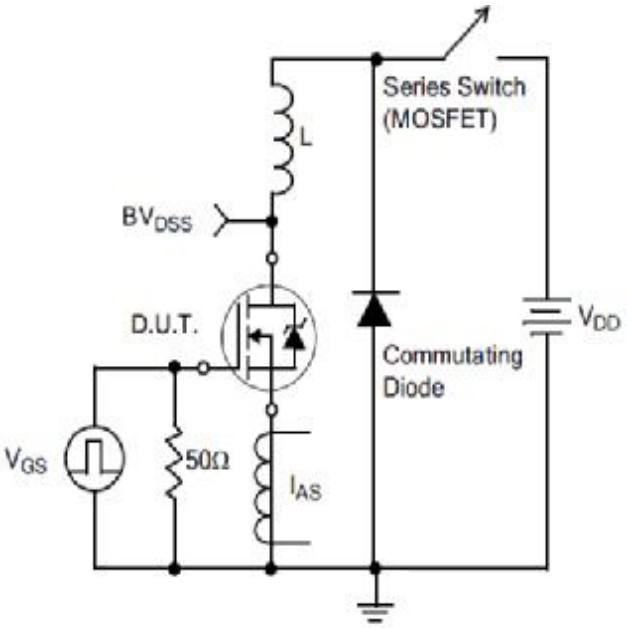
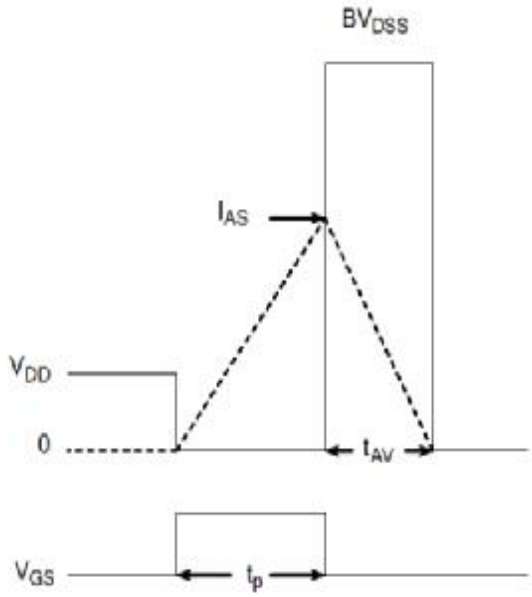


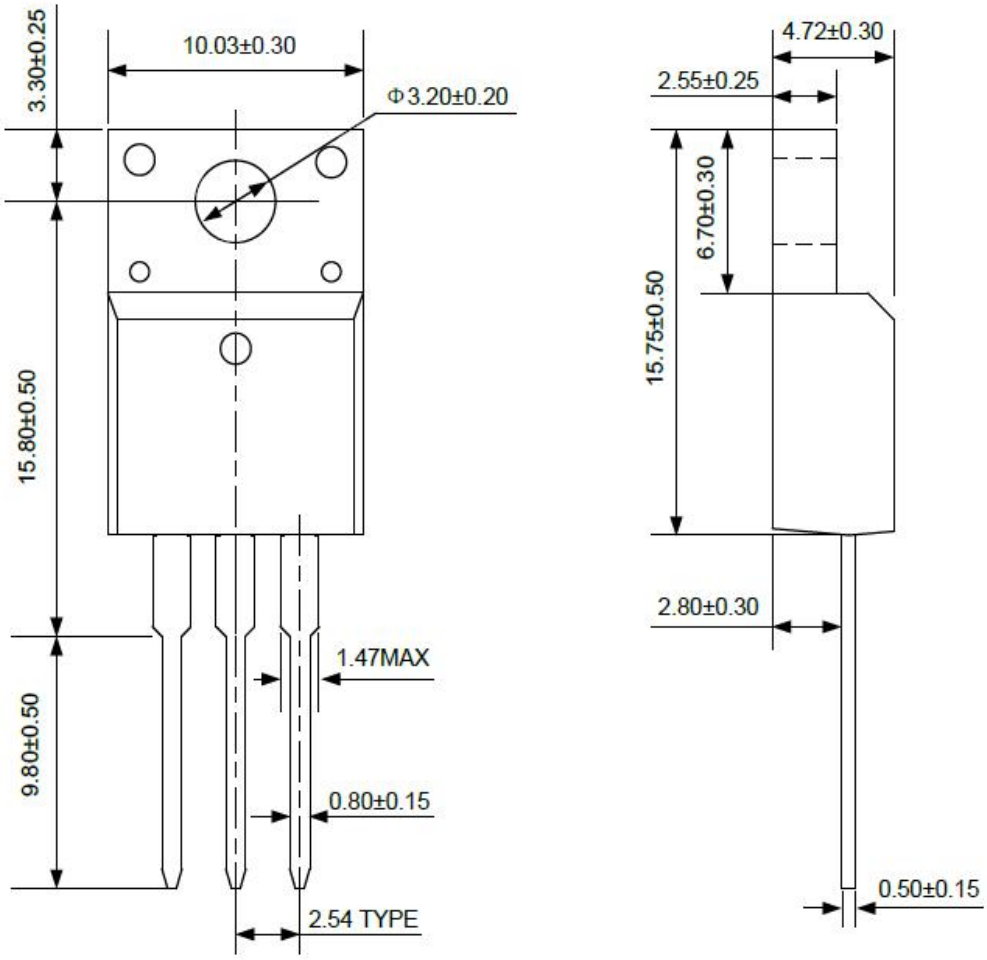
Figure17. Unclamped Inductive Switching Test Circuit



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

Figure18. Unclamped Inductive Switching Waveforms

Package outline drawing



TO-220F

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