

N Channel MOSFET



Lead Free Package and Finish

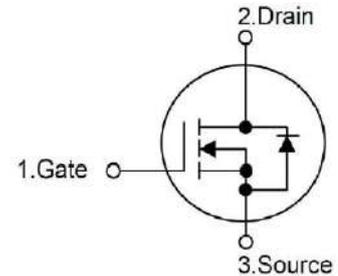
Applications:

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

I_D	$R_{DS(ON)}(Typ.)$	V_{DSS}
20A	0.39Ω	650V

Features:

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



Not to Scale

Ordering Information

Part Number	Package	Marking
RS20N65F	TO-220F	RS20N65F

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	RS20N65F	Units
V_{DSS}	Drain-to-Source Voltage (Note*1)	650	V
I_D	Continuous Drain Current	20	A
$I_{D@100^\circ\text{C}}$	Continuous Drain Current	12	
I_{DM}	Pulsed Drain Current (Note*2)	80	
PD	Power Dissipation	90	W
	Derating Factor above 25°C	0.74	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 30	V
EAS	Single Pulse Avalanche Energy L=10mH VDD=50V $R_G=25\Omega$ $T_J=25^\circ\text{C}$	640	mJ
TL TPKG	Maximum Temperature for Soldering	300 260	$^\circ\text{C}$
	Leads at 0.063in(1.6mm)from Case for 10 seconds		
	Package Body for 10 seconds		
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	RS20N65F	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	1.42	$^\circ\text{C}/\text{W}$	Drain lead soldered to water cooled heatsink,PD adjusted for a peak junction temperature of $+150^\circ\text{C}$.
$R_{\theta JA}$	Junction-to-Ambient	62.5		1 cubic foot chamber,free air.

OFF Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{DSS}	Drain-to-source Breakdown Voltage	650	--	--	v	$V_{GS}=0V, I_D=250\mu A$
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 $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	--	0.39	0.47	Ω	$V_{GS}=10V, I_D=10A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{GS}=V_{DS}, I_D=250\mu A$
gfs	Forward Trans conductance		--	9.7	S	$V_{DS}=15V, I_D=8A$

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	31	--	nS	$V_{DS}=325V$ $I_D=20A$ $R_G=25\Omega$ (Note:3,4)
t_{rise}	Rise Time	--	25	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	93	--		
t_{fall}	Fall Time	--	25	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	2810	--	pF	$V_{GS}=0V$
C_{oss}	Output Capacitance	--	235	--		$V_{DS}=25V$
C_{rss}	Reverse Transfer Capacitance	--	8.9	--		$f=1.0MHz$
Q_g	Total Gate Charge	--	50.2	--	nC	$V_{DS}=520V$
Q_{gs}	Gate-to-Source Charge	--	1634	--		$I_D=20A$
Q_{gd}	Gate-to-Drain("Miller") Charge	--	17.5	--		$V_{GS}=10V$ (Note:3,4)

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	--	--	20	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current	--	--	80	A	
V_{SD}	Diode Forward Voltage	--	--	1	V	$I_S=20A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	--	486	--	nS	$V_{GS}=0V$
Q_{rr}	Reverse Recovery Charge	--	5.5	--	μC	$I_S=20A, di/dt=100A/\mu s$

Notes:

- *1. $T_J = \pm 25^\circ C$ to $+150^\circ C$.
- *2. Repetitive rating; pulse width limited by maximum junction temperature.
- *3. Pulse width $\leq 300\mu s$; duty cycle $\leq 1\%$.
- *4. Basically not affected by temperature.

Typical Feature curve

Figure1. Typical Output Characteristics

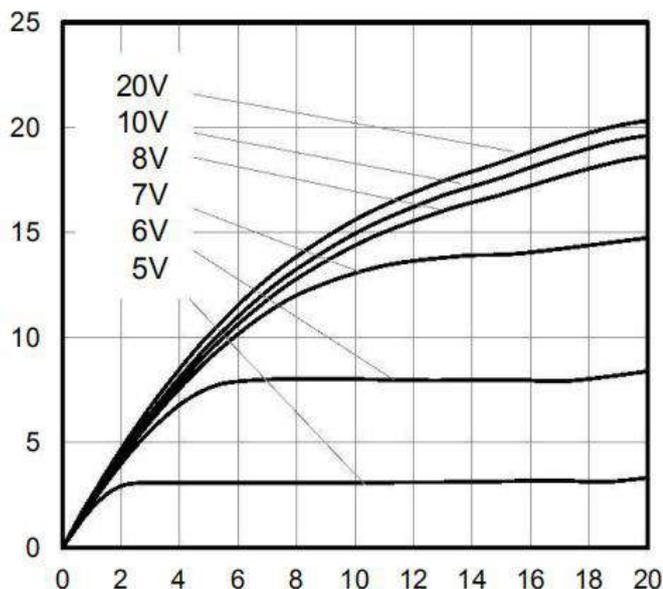
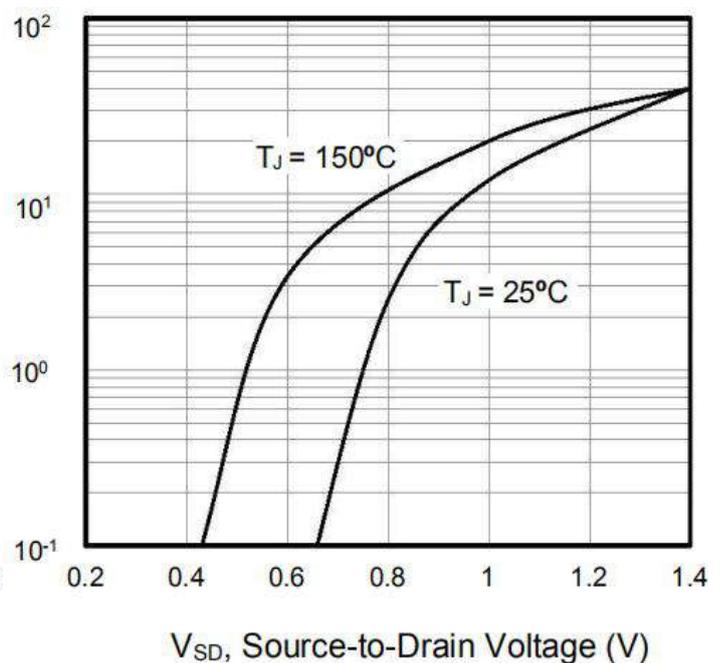
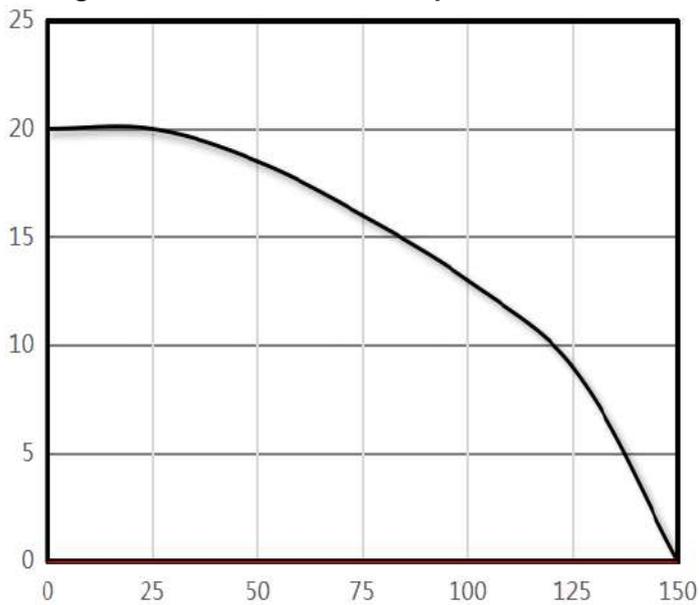


Figure2. Typical Transfer Characteristics

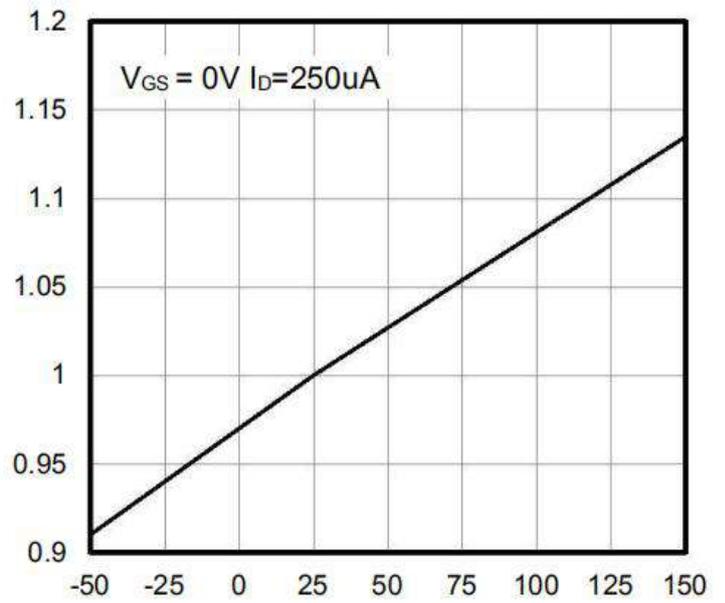


Figuer3.Drain Current vs. Temperature



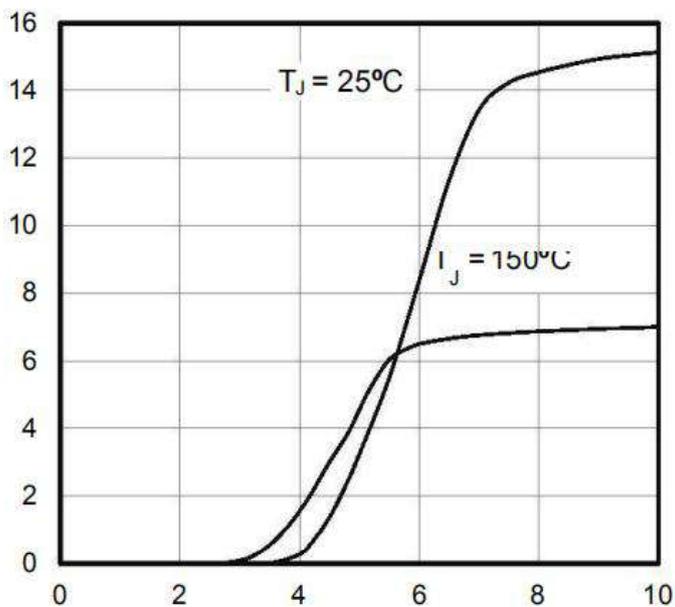
T_C , Case Temperature (A)

Figuer4. Figure 4. BVDSS Variation vs. Temperature



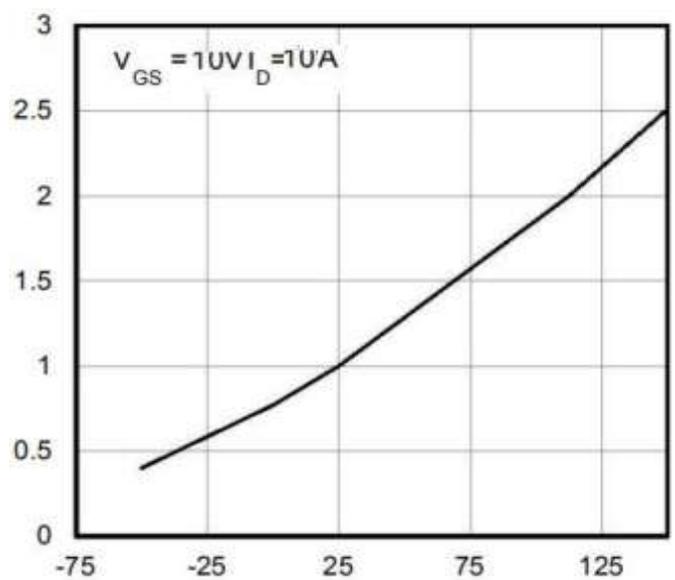
T_C , Case Temperature (°C)

Figure5.Transfer Characteristics



V_{GS} , Gate-to-Source Voltage (V)

Figure 6. On-Resistance vs. Temperature



T_J , Junction Temperature (°C)

Figure 7. Capacitance

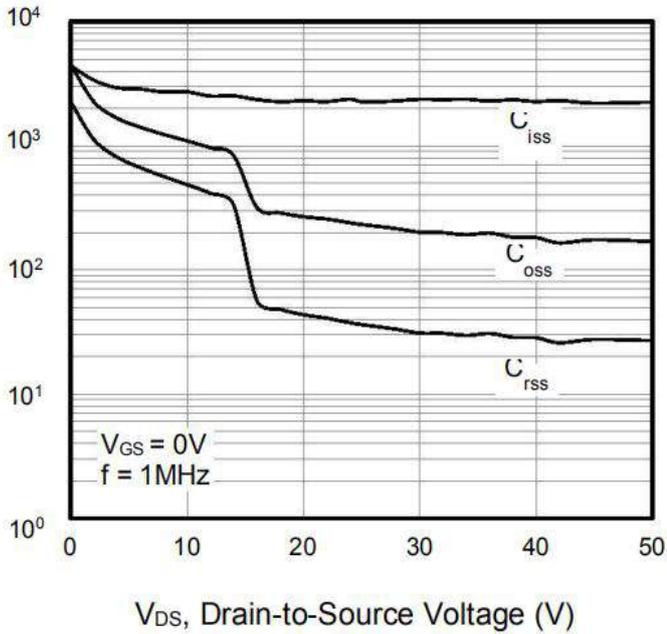


Figure 8. Gate Charge

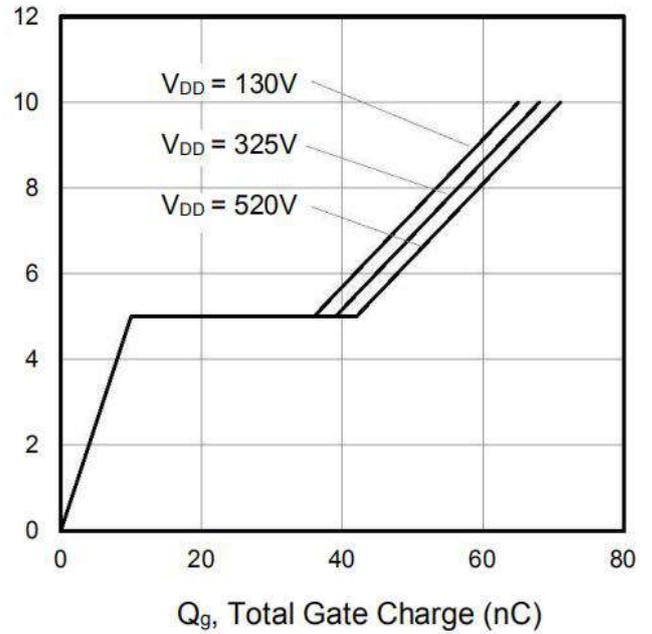
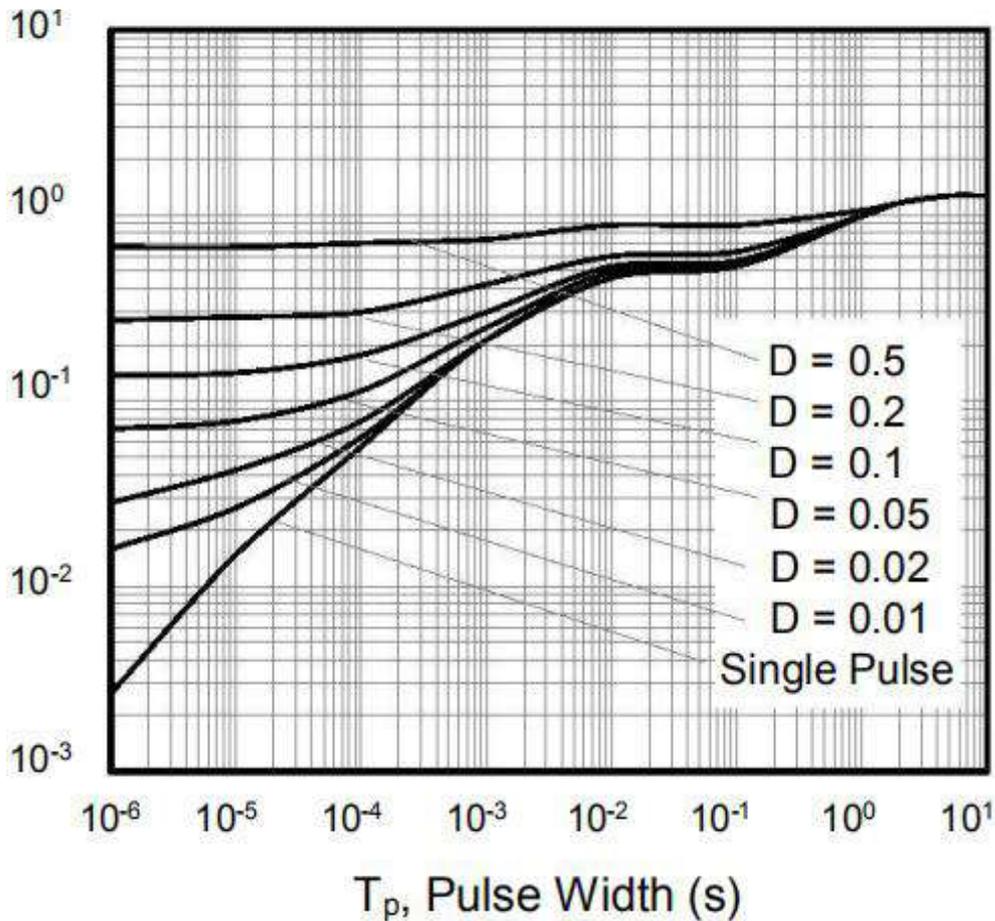


Figure9. Transient Thermal Impedance



Test Circuits and Waveforms

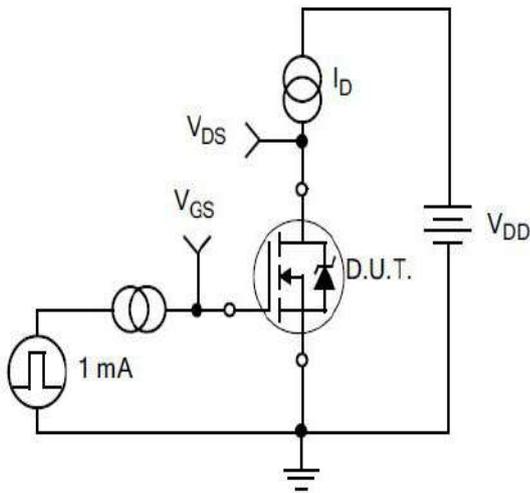


Figure 11.
Gate Charge Test Circuit

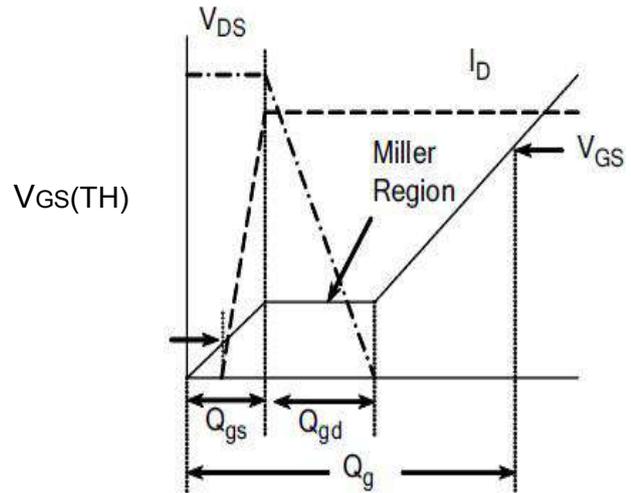


Figure 12.
Gate Charge Waveform

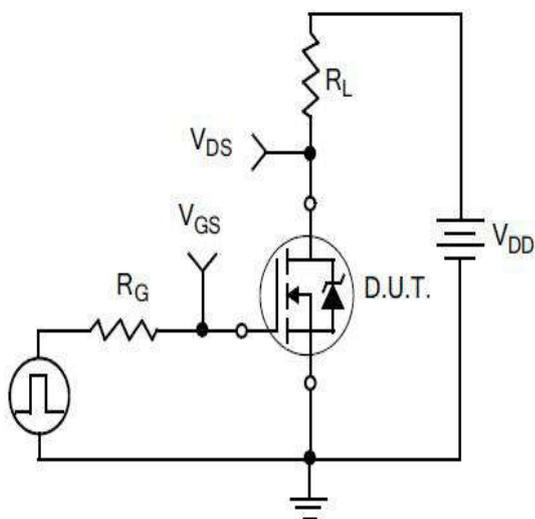


Figure 13.
Resistive Switching Test Circuit

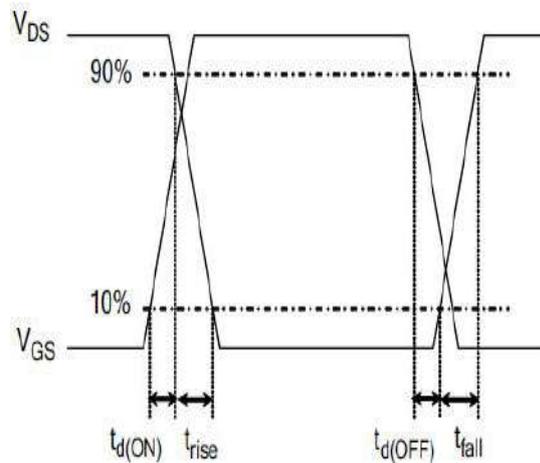


Figure 14.
Resistive Switching Waveforms

Test Circuits and Waveforms

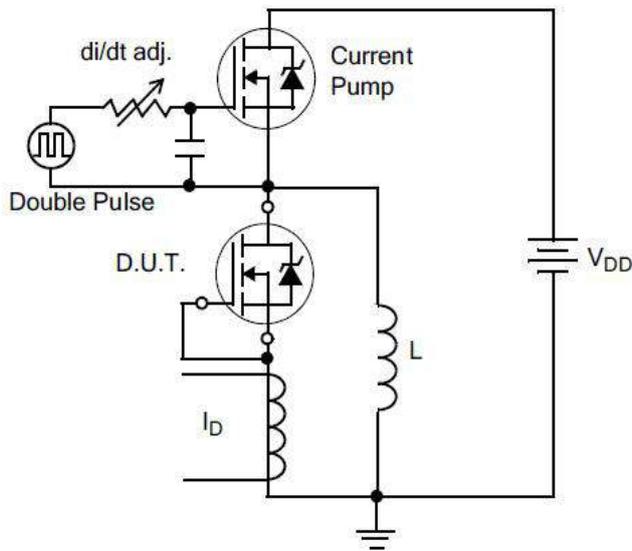


Figure15.Diode Reverse Recovery Test Circuit

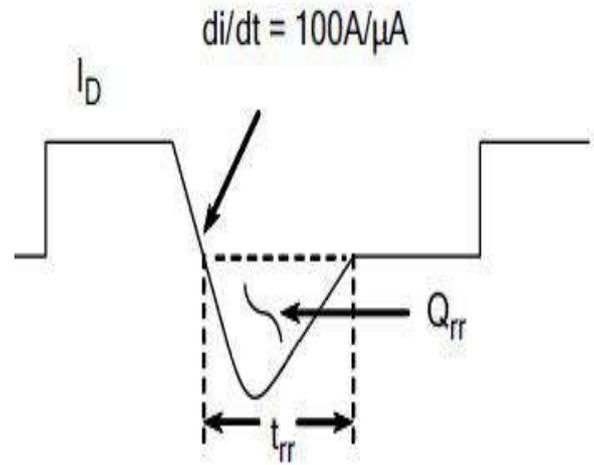


Figure16.Diode Reverse Recovery Waveform

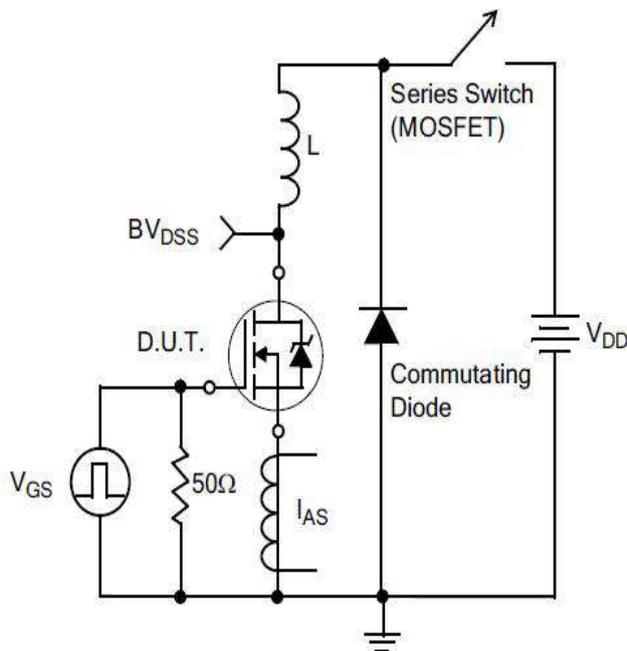
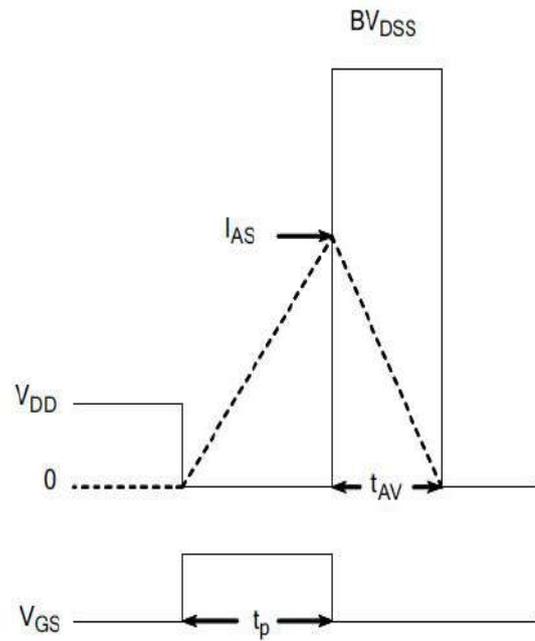


Figure17.Unclamped Inductive Switching Test Circuit



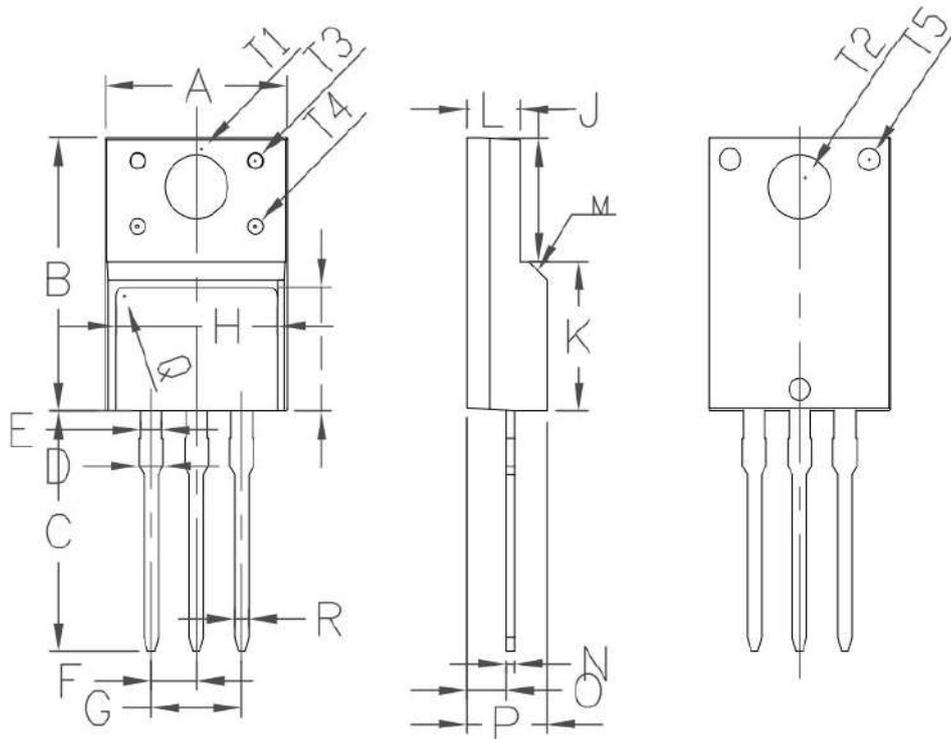
$$EAS = \frac{I_{AS}^2 L}{2}$$

Figure18.Unclamped Inductive Switching Waveforms

Package outline drawing

Unit: mm

TO-220F



Symbol	Min	Non	Max
A	9.96	10.16	10.36
B	15.67	15.87	16.07
C	13.14	13.34	13.54
D	1.20	1.30	1.40
E		1.20	
F		2.54	
G		5.08	
H	7.60	7.80	8.00
I	7.10	7.30	7.50
J	6.48	6.68	6.88
K	8.99	9.19	9.39
L	2.34	2.54	2.74
M		45°	
N	0.49	0.50	0.52
O	2.15	2.35	2.55
P	4.50	4.70	4.90
Q		0.50	
S	4°	4.5°	5°
T1		3.45	
T2		3.18	
T3		1.50	
T4		1.20	
T5		1.50	
R	0.77	0.8	0.83

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