

N Channel MOSFET



Lead Free Package and Finish

Applications:

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

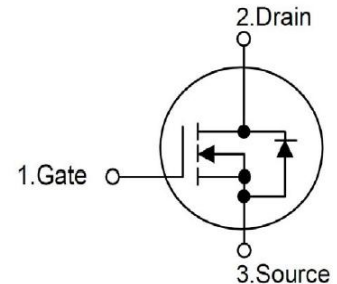
Features:

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

Id	R _{DS(ON)} (Typ.)	V _{DSS}
20A	0.3Ω	600V



Not to Scale



Ordering Information

Part Number	Package	Marking
RS20N60F	TO-220F	RS20N60F

Absolute Maximum Ratings Tc=25°C unless otherwise specified

Symbol	Parameter	RS20N60F	Units
V _{DSS}	Drain-to-Source Voltage (Note*1)	600	V
I _D	Continuous Drain Current	20.0	A
I _{D@ 100 °C}	Continuous Drain Current	12.5	
I _{DM}	Pulsed Drain Current (Note*2)	80.0	
P _D	Power Dissipation	72	W
	Derating Factor above 25°C	0.57	W/°C
V _{GS}	Gate-to-Source Voltage	±30	V
EAS	Single Pulse Avalanche Energy L=10mH V _{DD} =50V R _G =25Ω T _J =25°C	1600	mJ
T _L TPKG	Maximum Temperature for Soldering	300 260	°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	RS20N60F	Units	Test Conditions
R _{θJC}	Junction-to-Case	1.62	°C/W	Drain lead soldered to water cooled heatsink,P _D adjusted for a peak junction temperature of +150°C.
R _{θJA}	Junction-to-Ambient	115		1 cubic foot chamber,free air.

OFF Characteristics TJ=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BVDSS	Drain-to-source Breakdown Voltage	600	--	--	V	V _{GS} =0V, I _D =250μA
IDSS	Drain-to-Source Leakage Current	--	--	1.0	μA	V _{DS} =600V, V _{GS} =0V
IGSS	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°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
RDS(on)	Static Drain-to-Source On-Resistance	--	0.3	0.42	Ω	V _{GS} =10V, I _D =10A
VGS(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
td(ON)	Turn-on Delay Time	--	61	--	nS	V _{DS} =300V I _D =10A R _G =10Ω V _{GS} =10V (Note:3,4)
trise	Rise Time	--	132	--		
td(OFF)	Turn-OFF Delay Time	--	218	--		
tfall	Fall Time	--	73	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ciss	Input Capacitance	--	2315	--	pF	V _{GS} =0V
Coss	Output Capacitance	--	1280	--		V _{DS} =25V
Crss	Reverse Transfer Capacitance	--	86	--		f=1.0MHz
Qg	Total Gate Charge	--	51	--	nC	V _{DS} =480V
Qgs	Gate-to-Source Charge	--	15.0	--		I _D =20A
Qgd	Gate-to-Drain("Miller") Charge	--	22	--		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	--	--	1.4	V	$I_S=20A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	--	468	--	nS	$V_{GS}=0V$ $I_S=20A, di/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge	--	5.3	--	μC	

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 $\leq 2\%$.
- *4. Basically not affected by temperature.

Typical Feature curve

$T_J = 25^\circ C$, unless otherwise noted

Figure 1. Output Characteristics

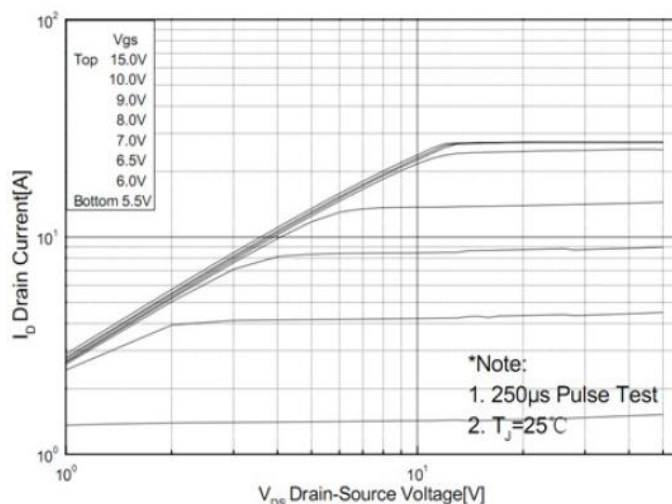


Figure 2. On-Resistance vs. Drain Current

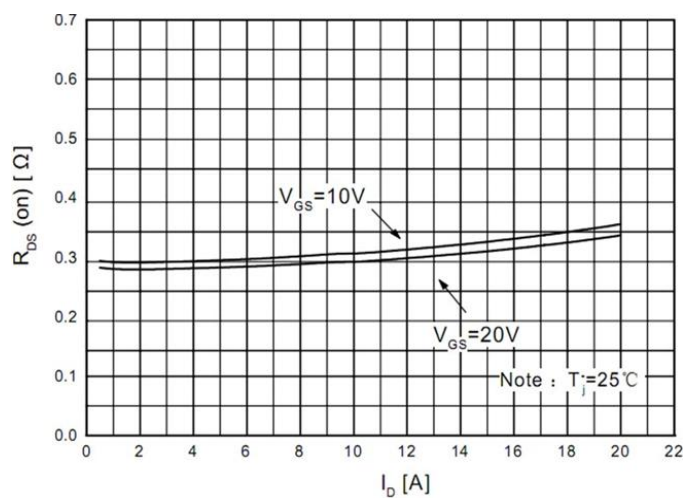


Figure 3. BVDSS vs. Temperature

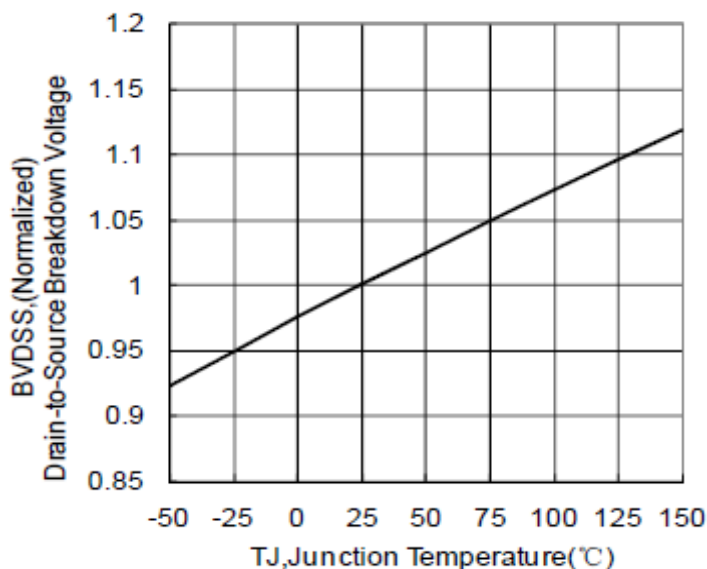


Figure 4. On-Resistance vs. Temperature

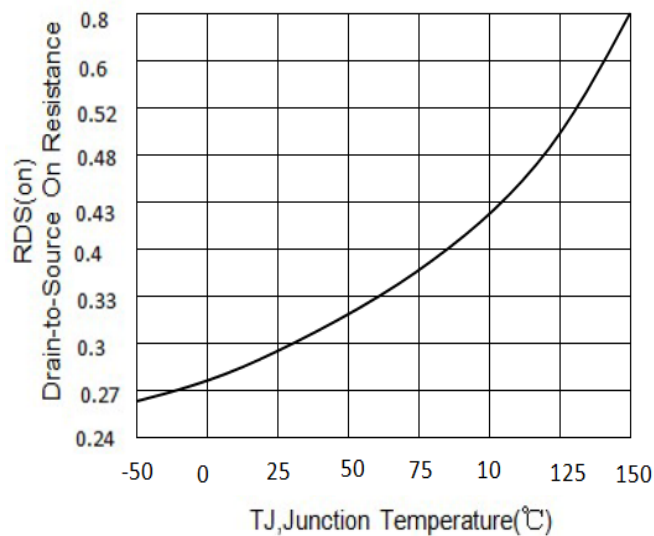


Figure 5. Gate Charge vs. V_{gs}

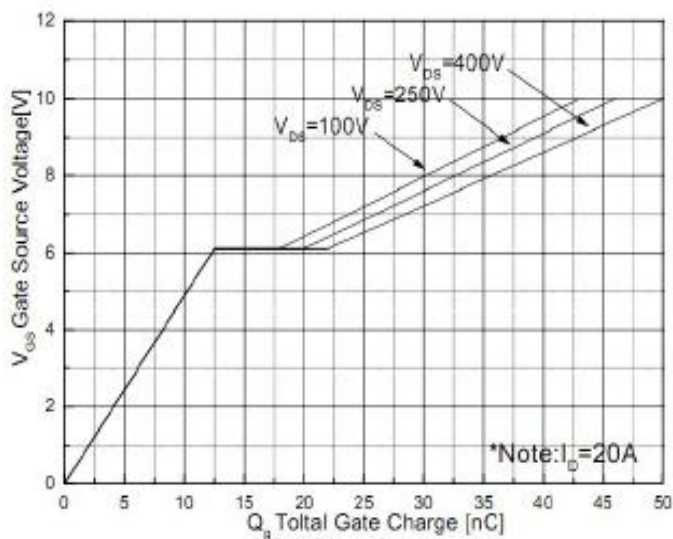


Figure 6. Diode Forward Voltage vs. Current

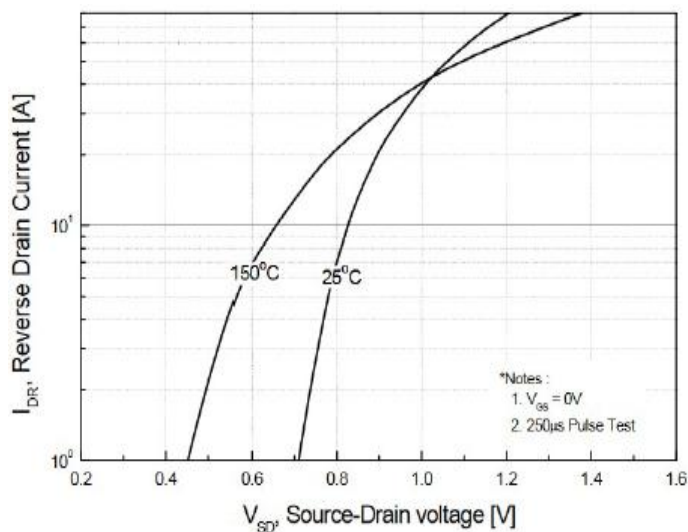


Figure 7. Maximum Continuous Drain Current vs Case Temperature

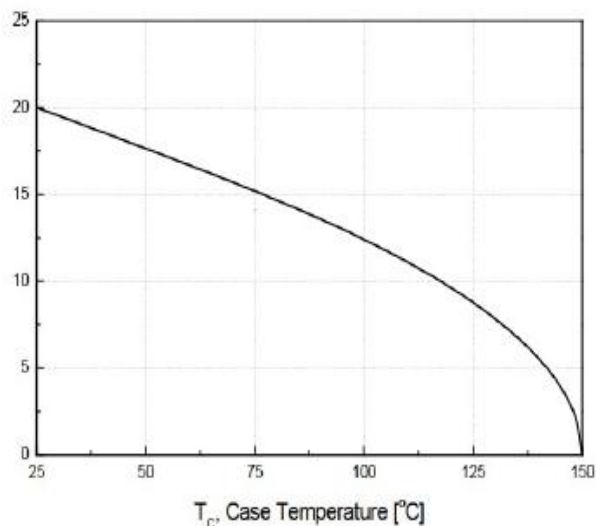


Figure 8. Typical Transfer Characteristics

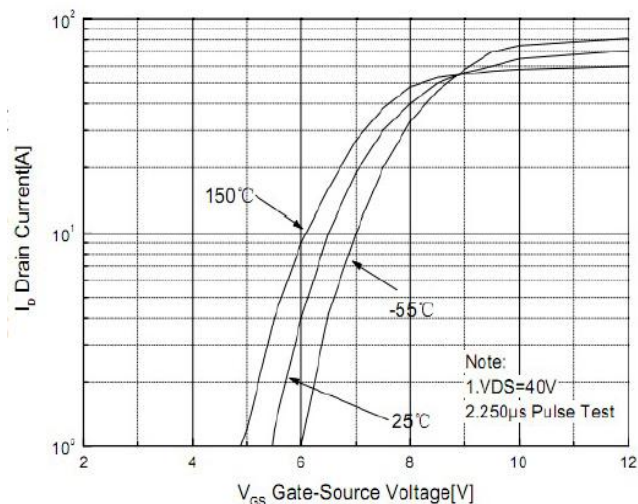


Figure 9. Capacitance vs. Drain-to-source voltage

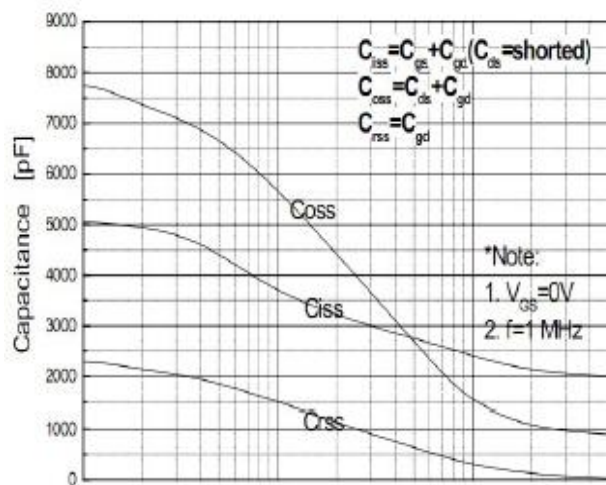
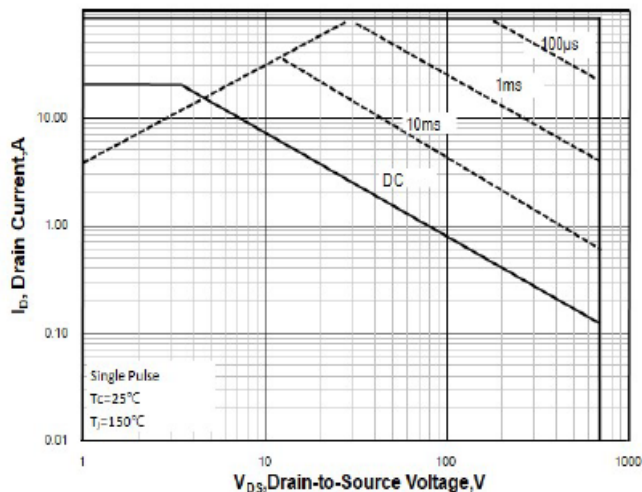


Figure 10. Maximum Safe Operating Area



Test Circuits and Waveforms

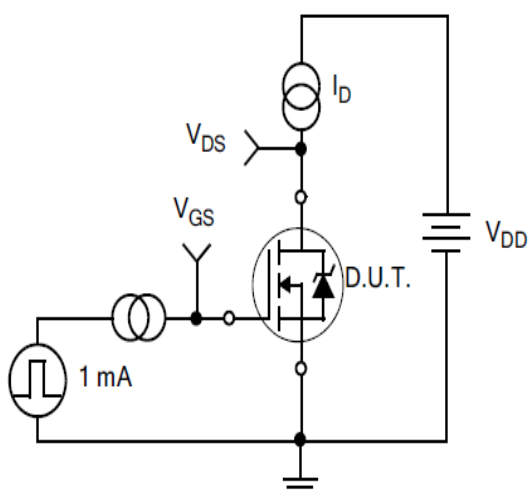


Figure11.
Gate Charge Test Circuit

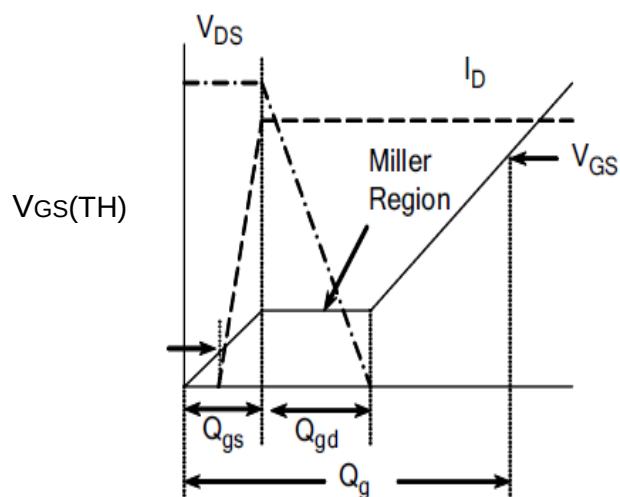


Figure12.
Gate Charge Waveform

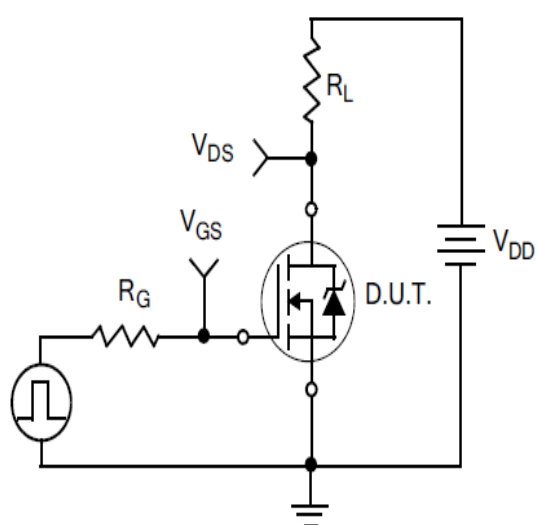


Figure13.
Resistive Switching Test Circuit

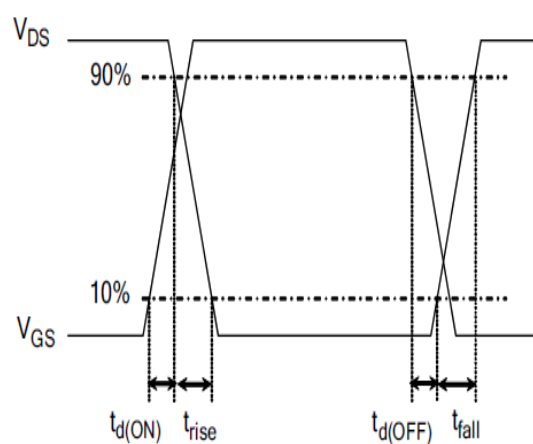


Figure14.
Resistive Switching Waveforms

Test Circuits and Waveforms

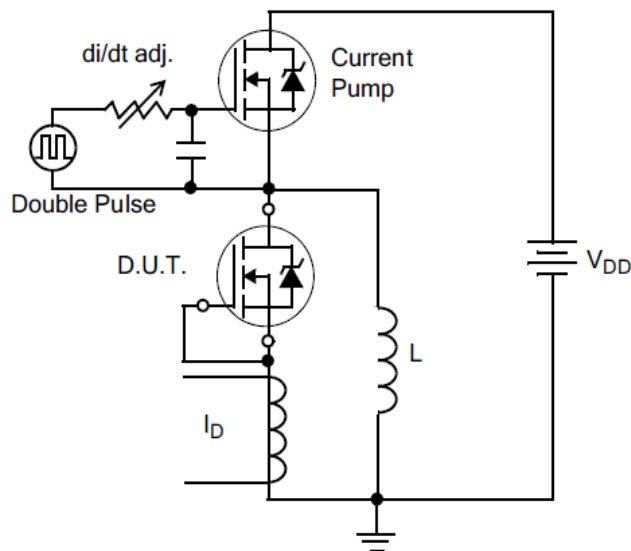


Figure15.Diode Reverse Recovery Test Circuit

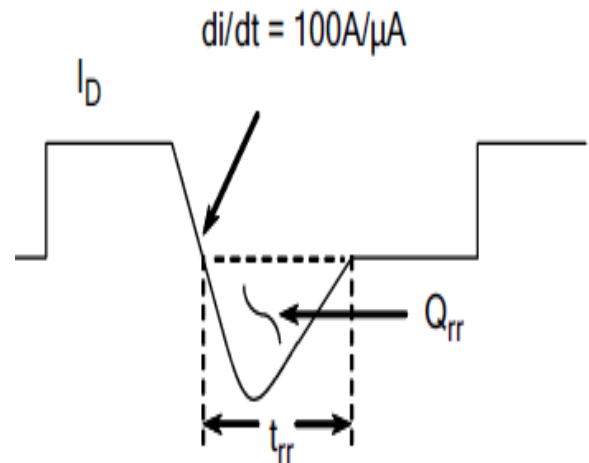


Figure16.Diode Reverse Recovery Waveform

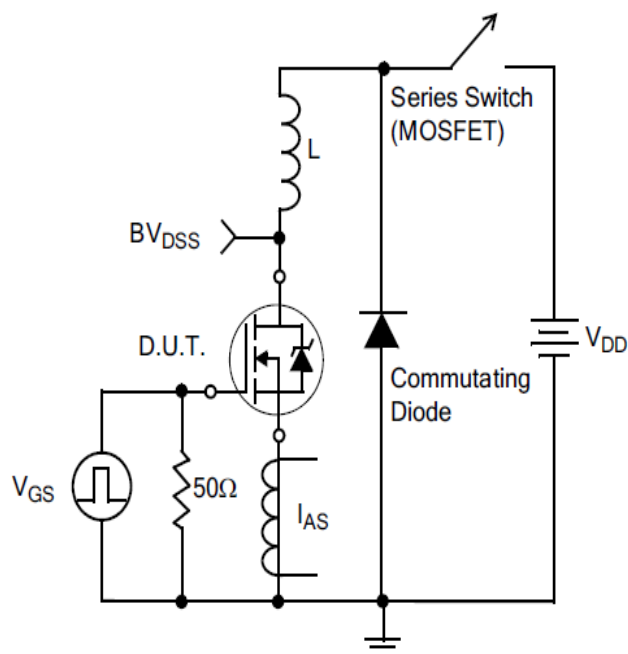
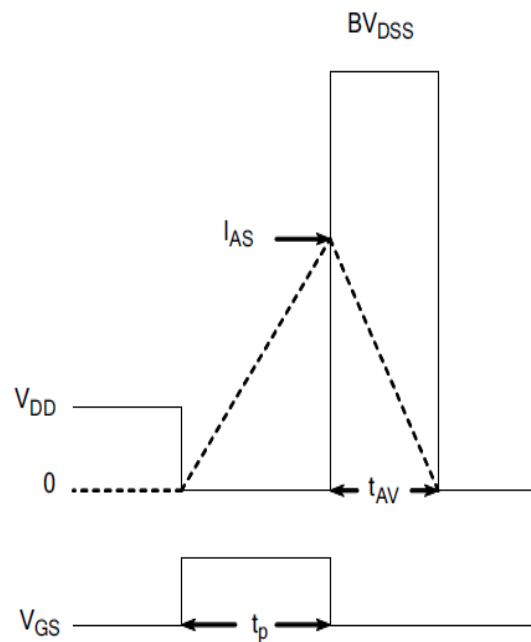


Figure17.Unclamped Inductive Switching Test Circuit



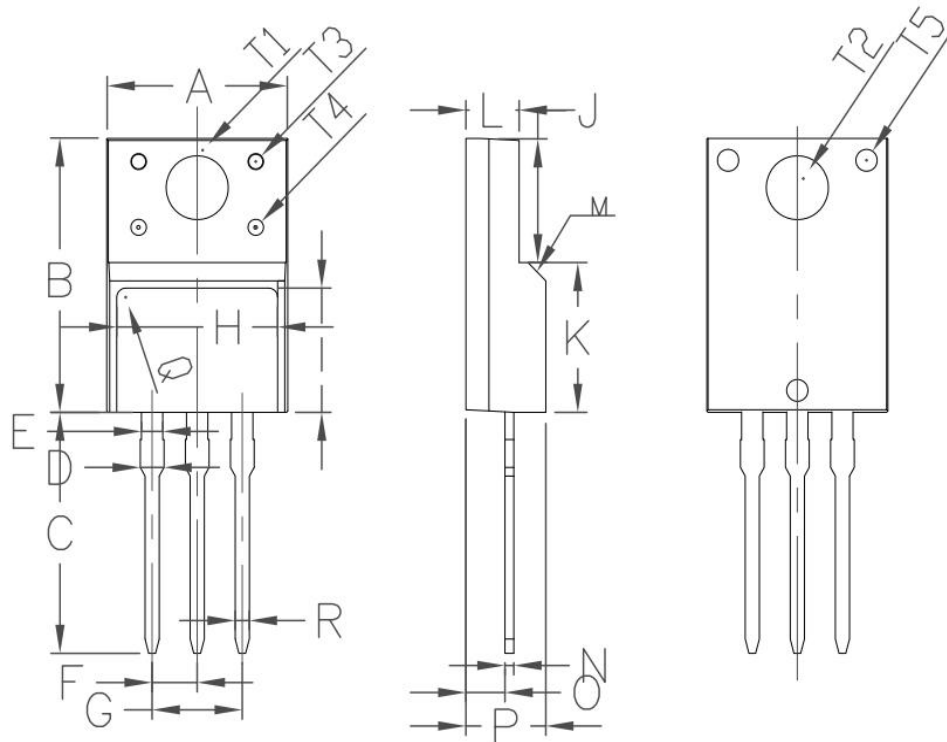
$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure18.Unclamped Inductive Switching Waveforms

Package outline drawing

TO-220F

Unit: mm



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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