

Silicon N-Channel Power MOSFET

Description

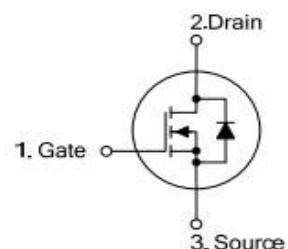
MPF20N65, the silicon N-channel Enhanced MOSFETs, is obtained by advanced MOSFET technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor is suitable device for SMPS, high speed switching and general purpose applications.

KEY CHARACTERISTICS

- ① $V_{DS}=650V$, $R_{ds(on)} < 460m\Omega$ @ $V_{GS}=10V$, $I_D=20A$ (Typ: $390m\Omega$)
- ② Fast Switching
- ③ Low C_{rss} (typical $15pF$)
- ④ 100% avalanche tested
- ⑤ Improved dv/dt capability
- ⑥ RoHS product

APPLICATIONS

- ① High frequency switching mode power supply



Schematic diagram



Package Marking And Ordering Information:

Ordering Codes	Package	Product Code	Packing
MPF20N65	TO-220F	MPF20N65	Tube

ABSOLUTE RATINGS

at $T_c = 25^\circ C$, unless otherwise specified

Symbol	Parameter	Rating	Units
V_{DS}	Drain-to-Source Voltage	650	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current $T_c = 100^\circ C$	12.6	A
I_{DM}	Pulsed Drain Current(Note1)	80	A
V_{GS}	Gate-to-Source Voltage	+30	V
EAS	Single Pulse Avalanche Energy(Note2)	1200	mJ

dv/dt	Peak Diode Recovery dv/dt (Note3)	5.0	V/Ins
P_D	Power Dissipation TO-247, TO-3PN	300	W
	Derating Factor above 25C	2.38	W/°C
P_D	Power Dissipation TO-220	230	W
	Derating Factor above 25°C	1.85	W/°C
P_D	Power Dissipation TO-220F	48	W
	Derating Factor above 25°C	0.38	W/°C
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	°C
T_L	Maximum Temperature for Soldering	300	°C

Thermal characteristics

Thermal characteristics (No FullPAK) TO-247\TO-3PN

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	0.42	°C/W
$R_{\theta JA}$	Junction-to-Ambient	40	°C/W

Thermal characteristics (No FullPAK) TO-220

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	0.54	°C/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	°C/W

Thermal characteristics (FullPAK) TO-220F

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	2.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	°C/W

Electrical Characteristics

at $T_c = 25^\circ\text{C}$, unless otherwise specified

OFF Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{DS}	Drain to Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	650	--	--	V

$\Delta BV_{DSS} / \Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu A$, Reference 25°C	--	0.65	--	V/°C
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=650V$, $V_{GS}=0V$, $T_J=25^\circ C$	--	--	10	μA
		$V_{DS}=520V$, $V_{GS}=0V$, $T_J=125^\circ C$	--	--	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	Values			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V$, $I_D=10A$ (Note4)	--	0.39	0.46	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu A$ (Note4)	2.0	--	4.0	V
g_{fs}	Forward Trans conductance	$V_{DS}=20V$, $I_D=10A$ (Note4)	--	12	--	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	$f=1.0MHz$	--	1.5	--	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V$ $V_{DS}=25V$ $f=1.0MHz$	--	3120	--	PF
C_{oss}	Output Capacitance		--	250	--	
C_{rss}	Reverse Transfer Capacitance		--	15	--	

Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=20A$ $V_{DD}=325V$ $V_{GS}=10V$ $R_G=20\Omega$	--	53	--	ns
t_r	Rise Time		--	85	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	99	--	
T_f	Fall Time		--	93	--	
Q_g	Total Gate Charge	$I_D=20A$ $V_{DD}=520V$ $V_{GS}=10V$	--	62	--	nC
Q_{gs}	Gate to Source Charge		--	15	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	24.5	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
I _S	Continuous Source Current (Body Diode)	TC=25°C	--	--	20	A
I _{SM}	Maximum Pulsed Current(Body Diode)		--	--	80	A
V _{SD}	Diode Forward Voltage	I _S =20A, V _{GS} =0V(Note4)	--	--	1.2	V
T _{rr}	Reverse Recovery Time	I _S =20A T _J =25°C dI _F /dt=100A/us V _{GS} =0V	--	556	--	ns
Q _{rr}	Reverse Recovery Charge		--	6143	--	nC
I _{rrm}	Reverse Recovery Current		--	22.1	--	A

Note1: Pulse width limited by maximum junction temperature

Note2: L=10mH,V_{DS}=50V,Start T_J=25°C

Note3:I_{SD} =20A,di/dt ≤100A/us,V_{DD}≤BV_{DS}, Start T_J=25°C

Note4: Pulse width t_{ps} ≤00us, <2%

Characteristics Curves

Figure 1a Safe Operating Area (TO-247&TO-3PN)

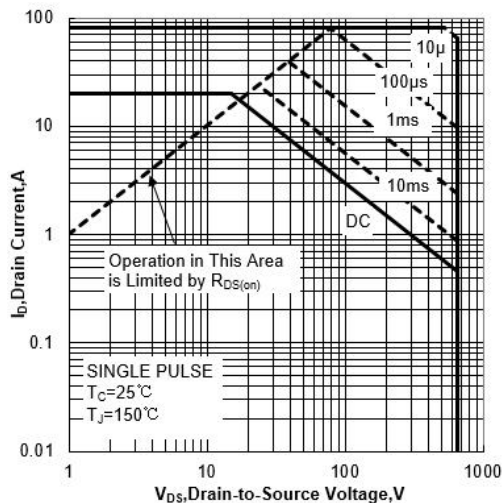


Figure 1b Safe Operating Area (TO-220)

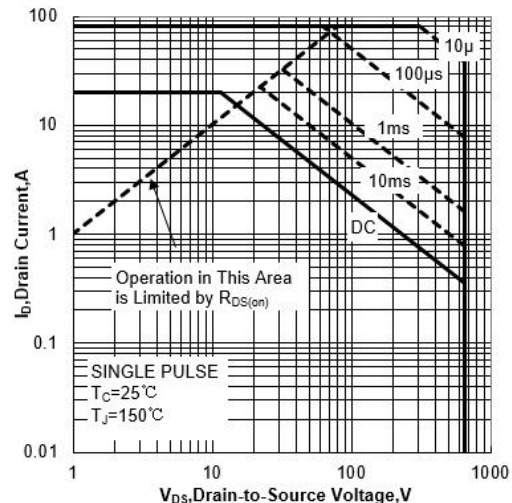


Figure 1c Safe Operating Area (TO-220F)

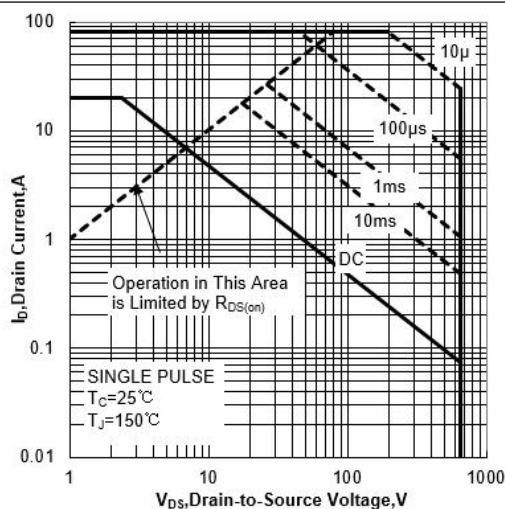


Figure 2a Power Dissipation (TO-247&TO-3PN)

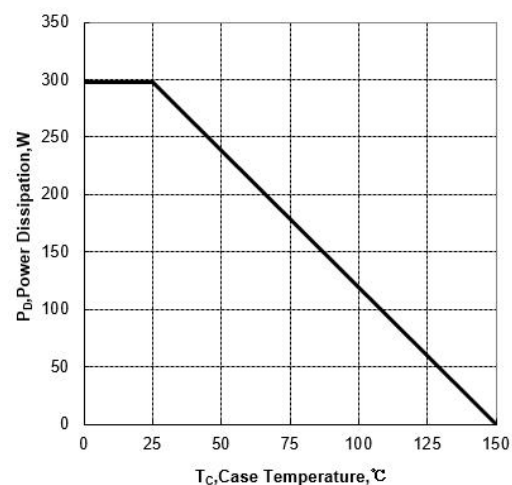


Figure 2b Power Dissipation (TO-220)

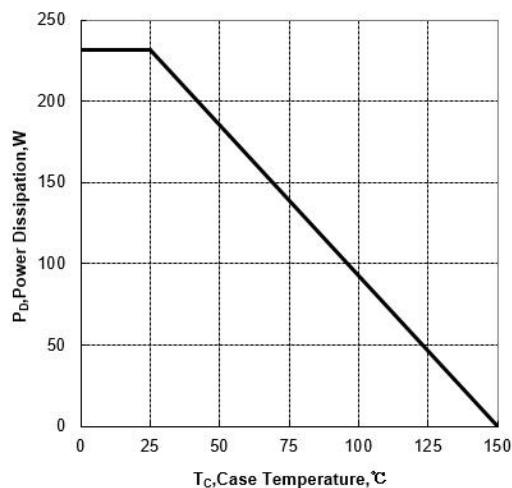


Figure 2c Power Dissipation (TO-220F)

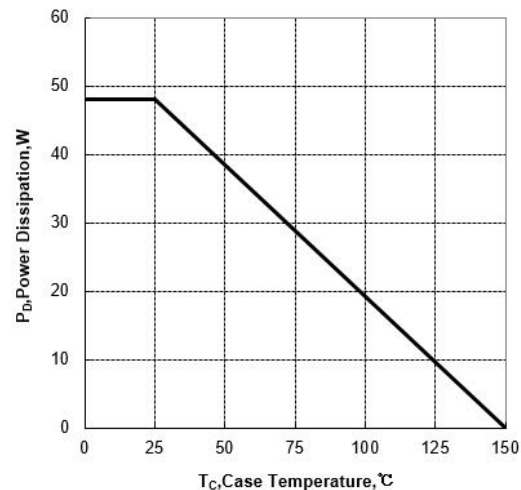


Figure 3a Max Thermal Impedance (TO-247&TO-3PN)

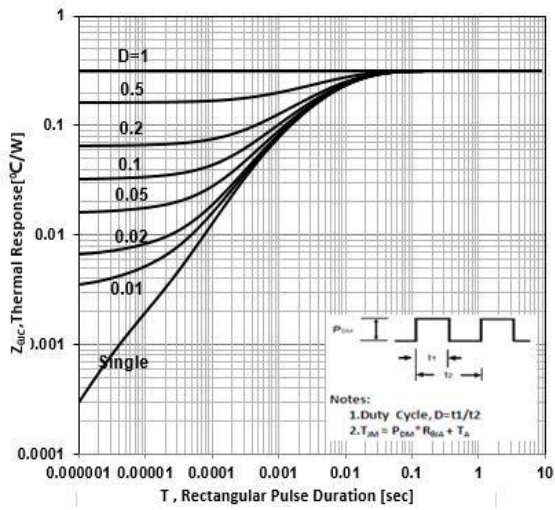


Figure 3b Max Thermal Impedance (TO-220)

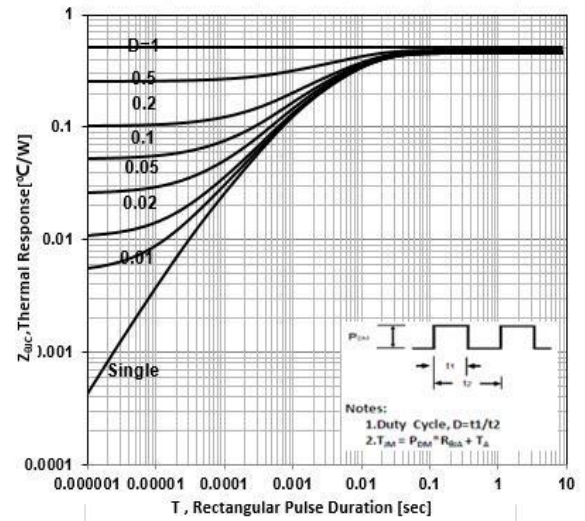


Figure 3c Max Thermal Impedance (TO-220F)

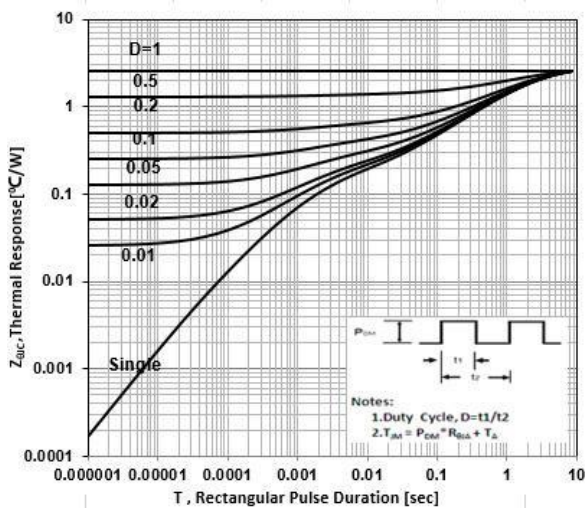


Figure 4 Typical Output Characteristics

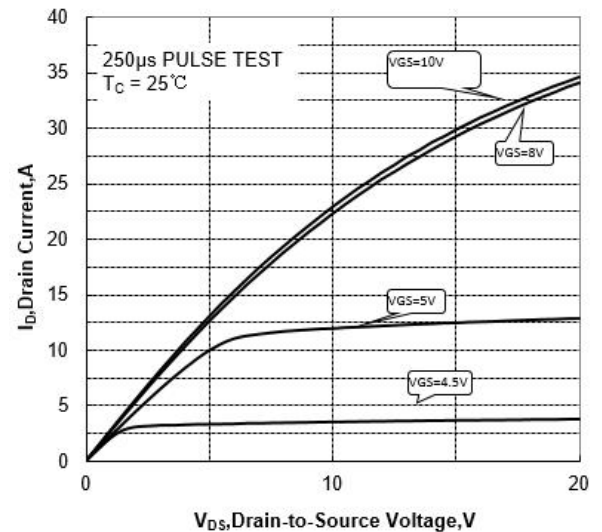


Figure 5 Typical Transfer Characteristics

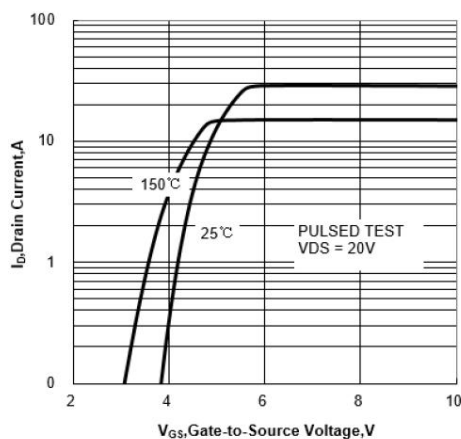


Figure 6 Typical Drain to Source ON Resistance vs Drain Current

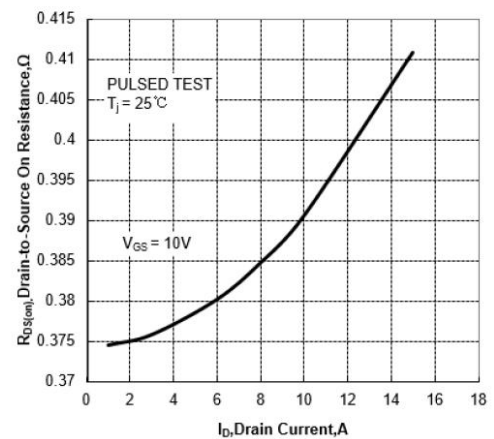


Figure 7 Typical Drain to Source on Resistance vs Junction Temperature

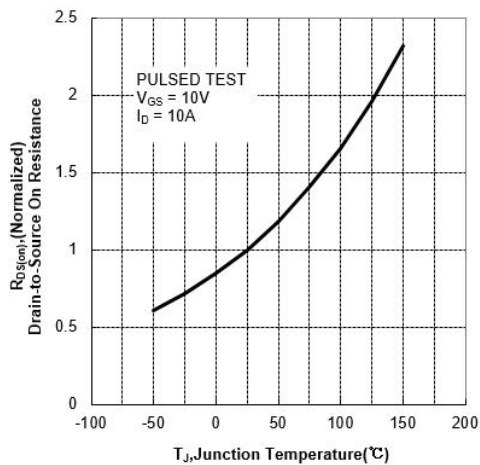


Figure 8 Typical Threshold Voltage vs Junction Temperature

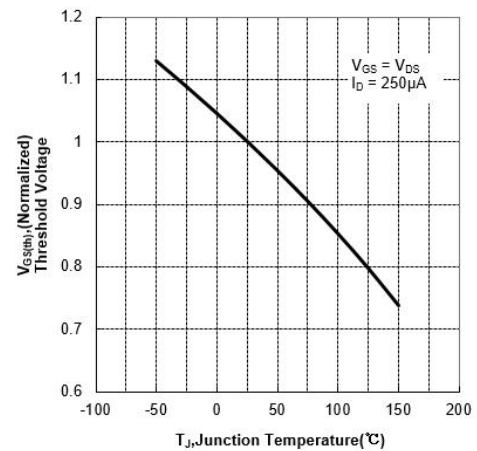


Figure 9 Typical Breakdown Voltage vs Junction Temperature

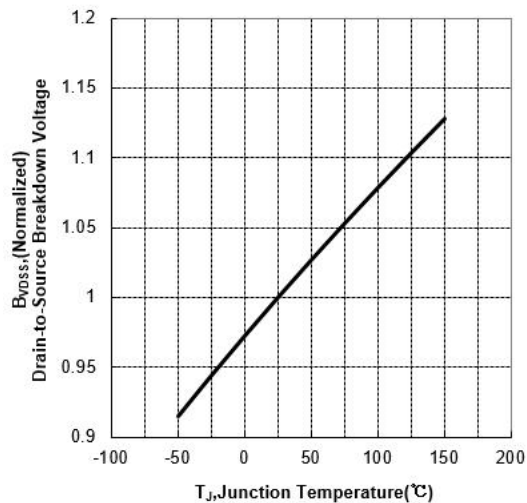


Figure 10 Typical Capacitance vs Drain to Source Voltage

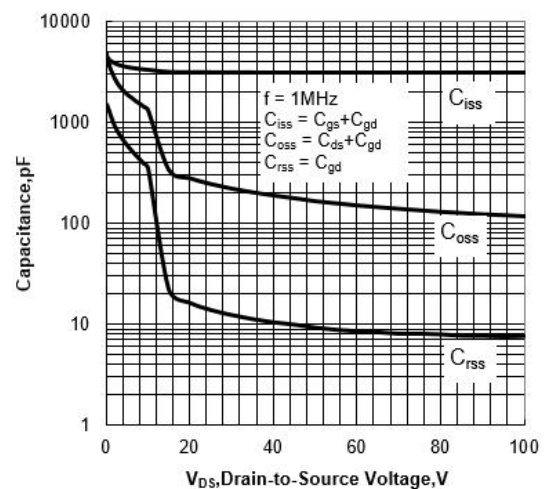
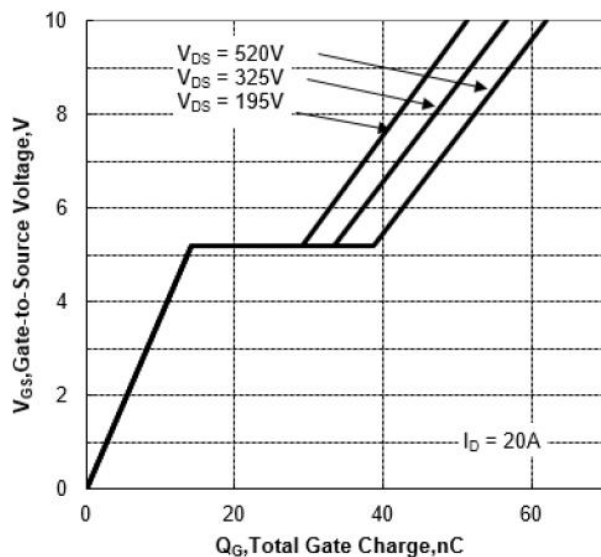


Figure 11 Typical Gate Charge vs Gate to Source Voltage



Test Circuit and Waveform

Figure 12 Gate Charge Test Circuit

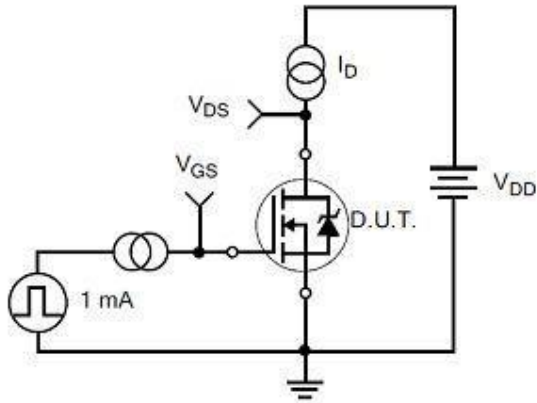


Figure 13 Gate Charge Waveforms

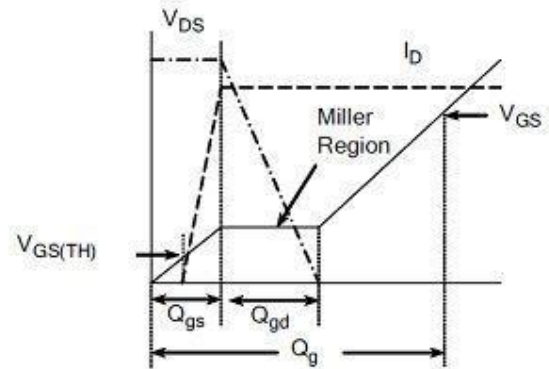


Figure 14 Resistive Switching Test Circuit

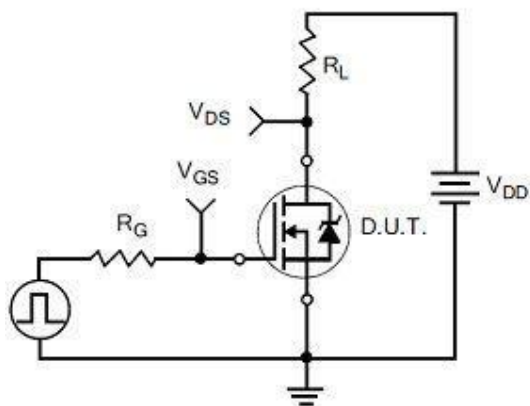


Figure 15 Resistive Switching Waveforms

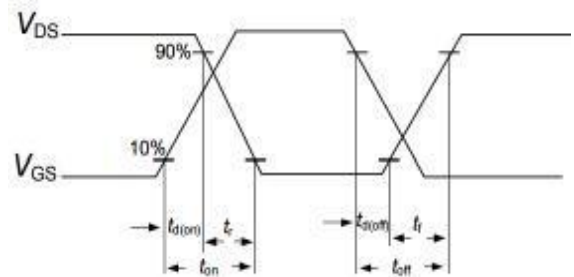


Figure 16 Diode Reverse Recovery Test Circuit

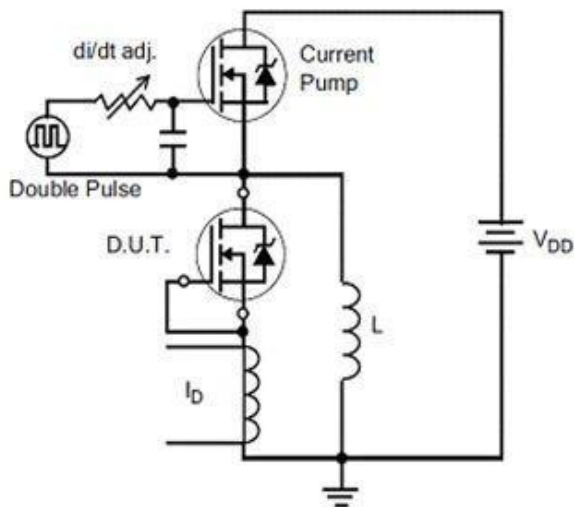


Figure 17 Diode Reverse Recovery Waveform

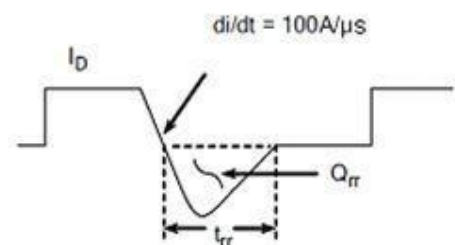


Figure 18 Unclamped Inductive Switching Test Circuit

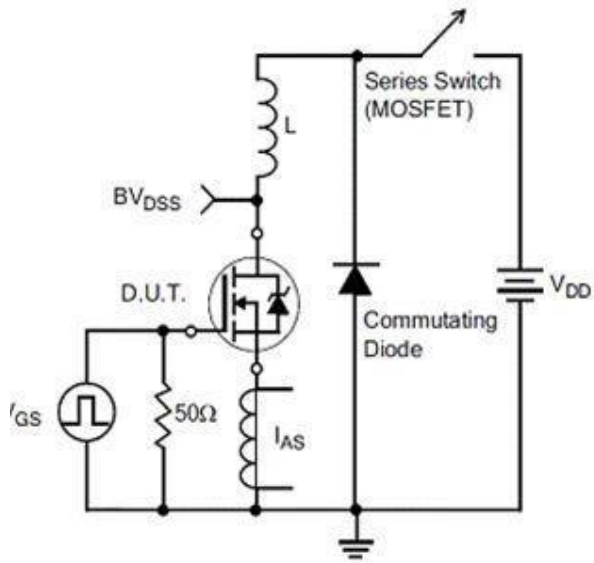
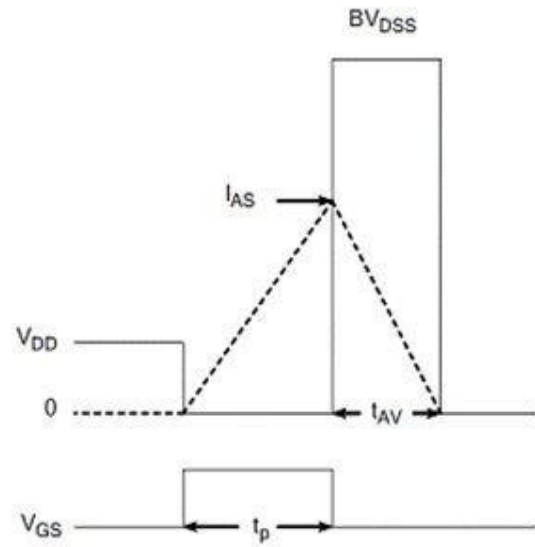
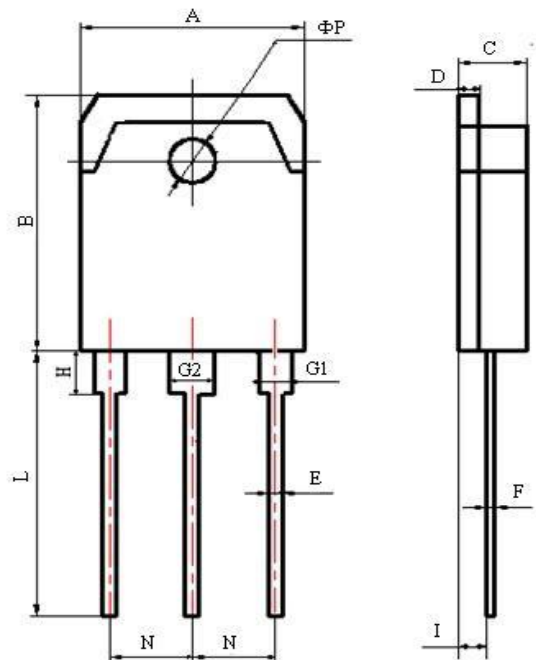


Figure 19 Unclamped Inductive Switching Waveform



Package Description



Items	Values(mm)	
	MIN	MAX
A	15.00	16.00
B	19.20	20.60
C	4.60	5.00
D	1.40	1.60
E	0.90	1.10
F	0.50	0.70
G1	2.00	2.20
G2	3.00	3.20
H	3.00	3.70
I	1.20	1.70
	2.70	2.90
L	19.00	21.00
N	5.25	5.65
ΦP	3.10	3.30



迈诺斯科技

MPF20N65

NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shenzhen Minos reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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