迈诺斯科技

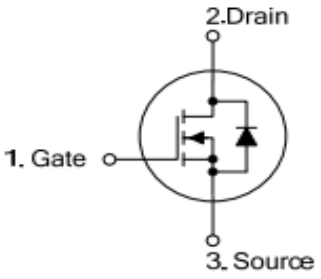
MD20N60

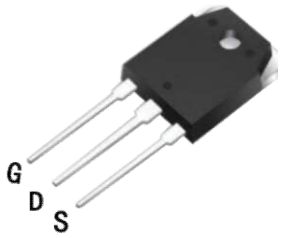
Description

MD20N60,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

Parameter	Value	Unit
$V_{DS@Tj.max}$	600	V
I_D	20	A
$R_{DS(ON).TyP}$	0.39	Ω





TO-3PN

FEATURES

① Fast Switching

② Low Crss (typical 15pF)

③ 100% avalanche tested

④ Improved dv/dt capability

⑤ RoHS product

APPLICATIONS

① High frequency switching mode power supply

Package Marking And Ordering Information：

Ordering Codes	Package	Product Code	Packing
MD20N60	TO-3PN	MD20N60	Tube

ABSOLUTE RATINGS

at Tc = 25°C,unless otherwise specified

Symbol	Parameter	Rating	Units
VDSS	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current Tc = 100C	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	VIns
P_D	Power DissipationTO-247，TO-3PN	300	W
	Derating Factor above 25C	2.38	W/℃
P_D	Power DissipationTO-220	230	W
	Derating Factor above 25°C	1.85	W/℃
P_D	Power DissipationTO-220F	48	W
	Derating Factor above 25°C	0.38	W/℃
T_J，T_{stg}	Operating Junction and Storage Temperature Range	150，-55 to 150	℃
T_L	Maximum Temperature for Soldering	300	℃

Thermal characteristics

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

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

Thermal characteristics (No FulIPAK) TO-220

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

Thermal characteristics (FullPAK) TO-220F

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

Electrical Characteristics
at Tc = 25°C,unless otherwise specified

OFF Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V，I_D=250μA	650	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250μA，Reference25℃	--	0.65	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} =650V，V_{GS}= 0V，T_j=25℃	--	--	10	μA
		V_{DS}=520V，V_{GS}= 0V，T_j= 125℃	--	--	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	VGS=10V，ID=10A(Note4)	--	0.39	0.46	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	VDS = VGS，ID = 250uA(Note4)	2.0	--	4.0	V
g_{fs}	Forward Transconductance	VDS=20V，ID =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	VGS = 0V VDS = 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	ID =20A VDD = 325V VGS = 10V RG =20Ω	--	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	ID =20A VDD =520V VGS = 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**	**TestConditions**	**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	IS=20A, VGS=0V(Note4)	--	--	1.2	V
T_{rr}	Reverse Recovery Time	IS=20A Tj=25°C dIF/dt=100A/us VGS=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,VDs=50V,Start TJ=25℃
Note3:ISD =20A,di/dt ≤100A/us,VDD≤BVDS， Start TJ=25℃
Note4: Pulse width tps ≤00us, <2%

Characteristics Curves

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

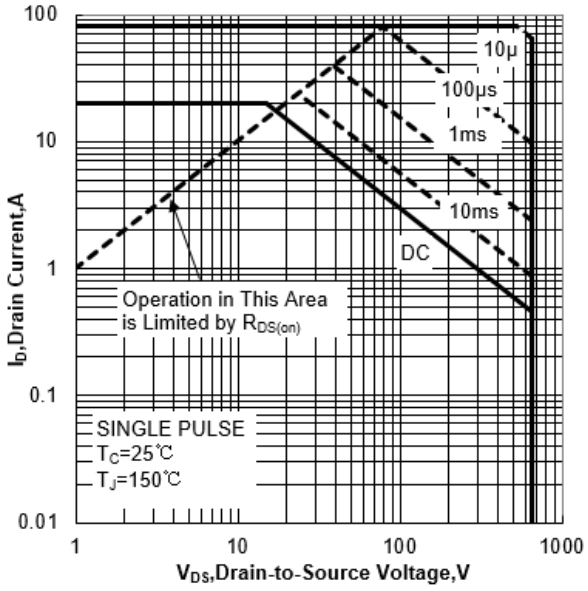


Figure 1b Safe Operating Area (TO-220)

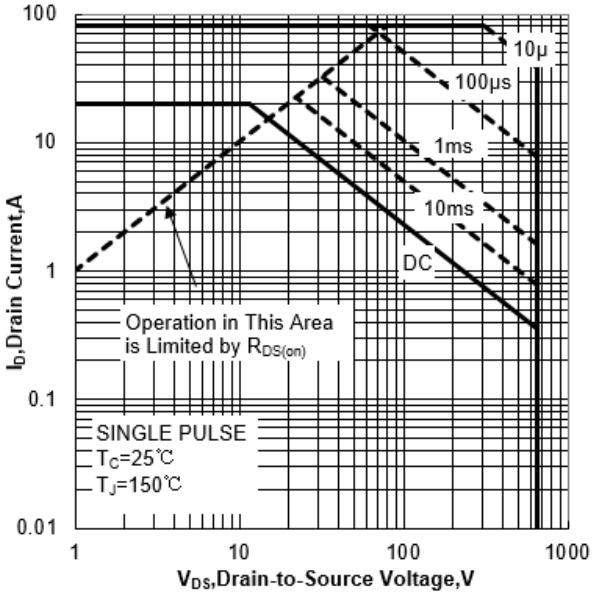


Figure 1c Safe Operating Area (TO-220F)

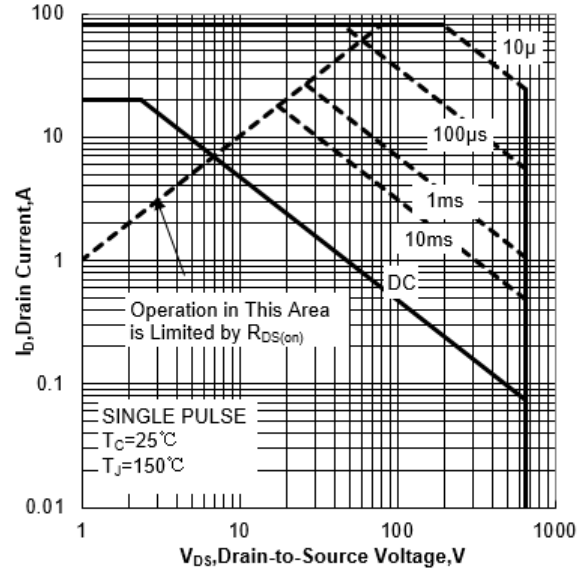


Figure 2a Power Dissipation (TO-247&TO-3PN)

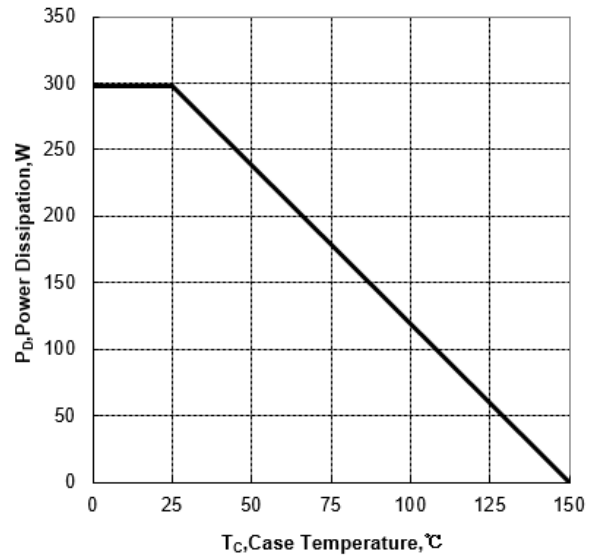


Figure 2b Power Dissipation (TO-220)

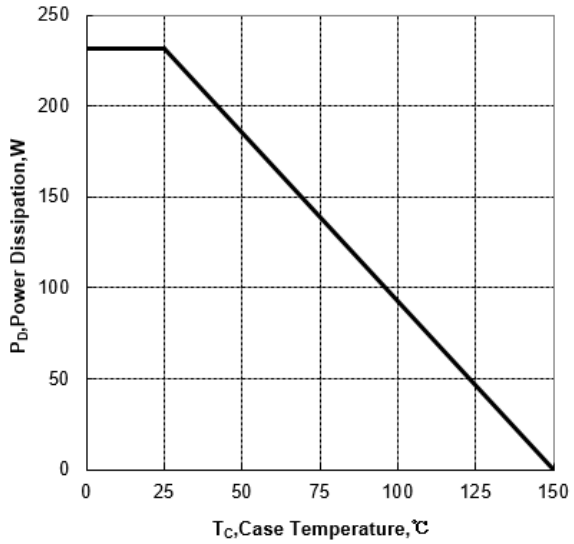


Figure 2c Power Dissipation (TO-220F)

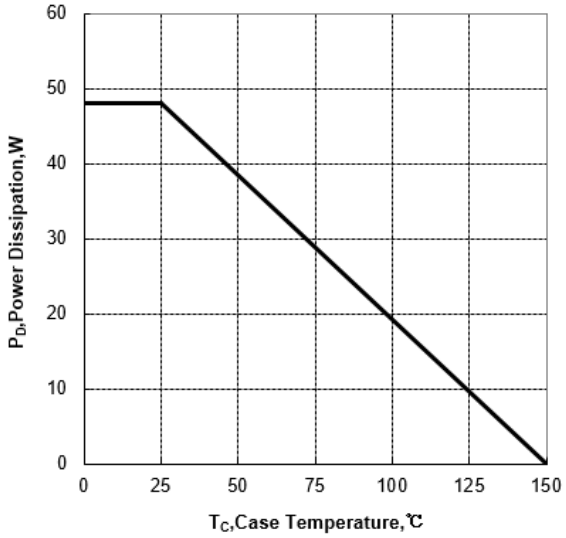


Figure 3a Max Thermal Impendance (TO-247&TO-3PN)

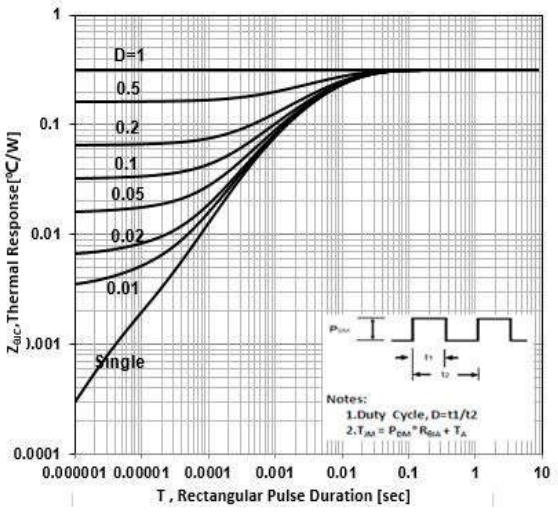


Figure 3b Max Thermal Impendance (TO-220)

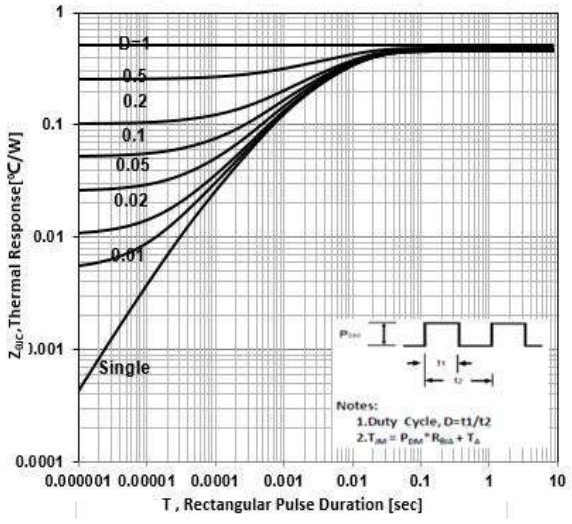


Figure 3c Max Thermal Impendance (TO-220F)

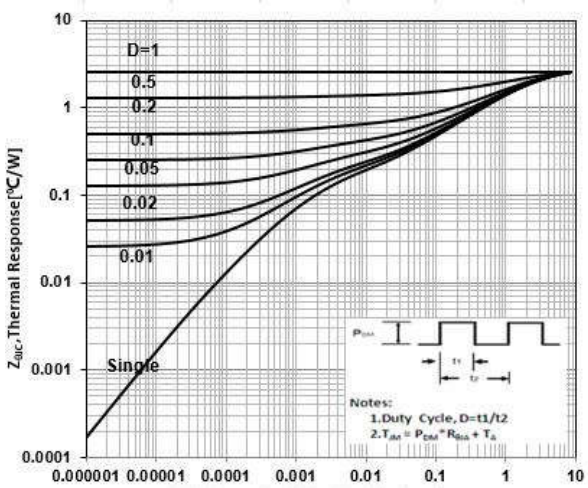


Figure 4 Typical Output Characteristics

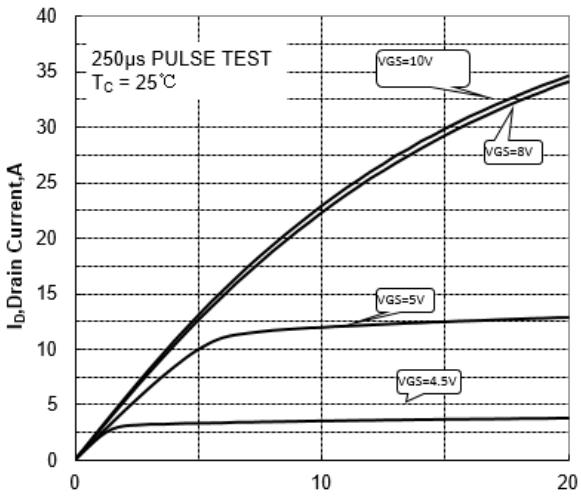


Figure 5 Typical Transfer Characteristics

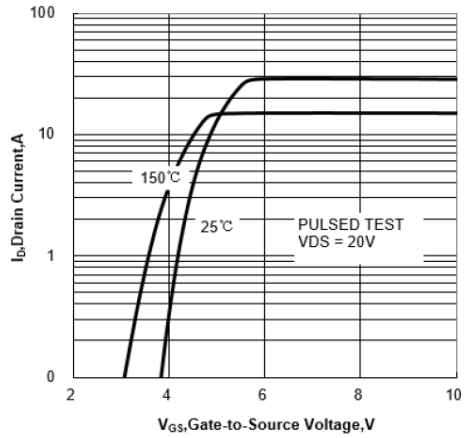


Figure 6 Typical Drain to Source ON Resistancevs Drain Current

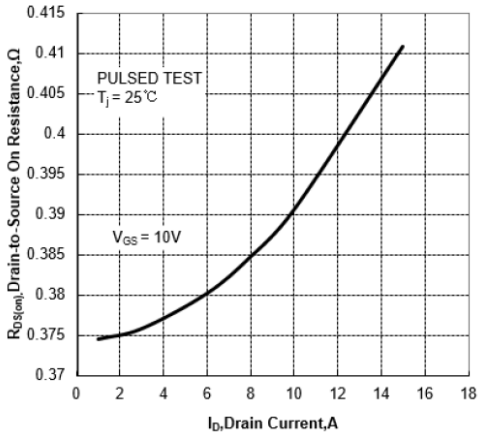


Figure 7 Typical Drian to Source on Resistancevs Junction Temperature

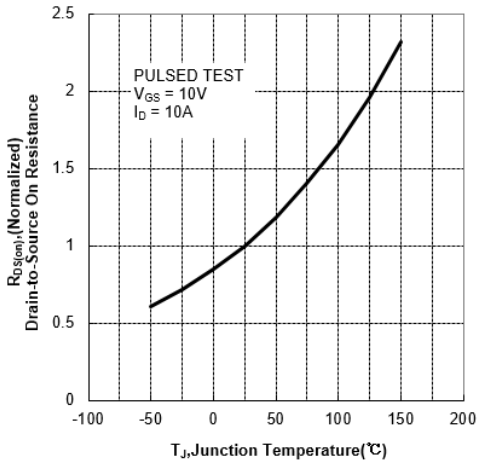


Figure 8 Typical Theshold Voltage vs Junction Temperature

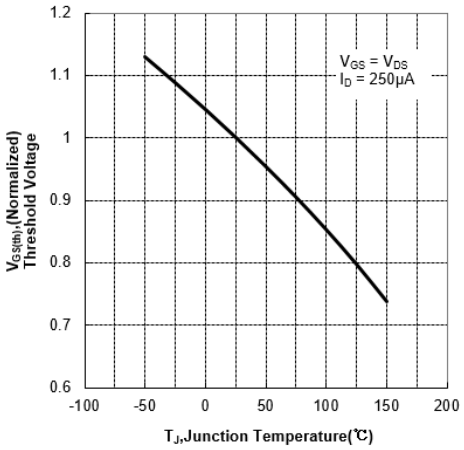


Figure 9 Typical Breakdown Voltage vs Junction Temperature

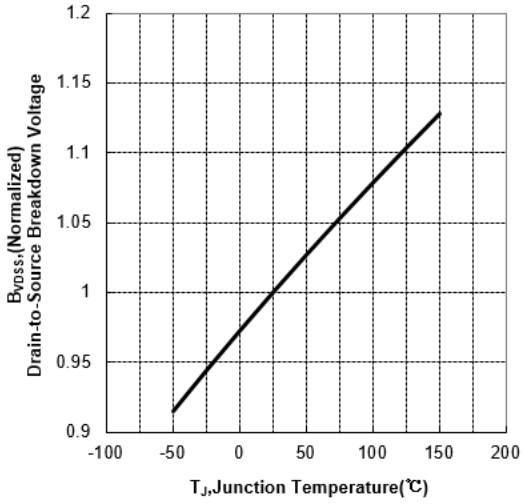


Figure 10 T Typical Capacitance vs Drain to Source Voltage

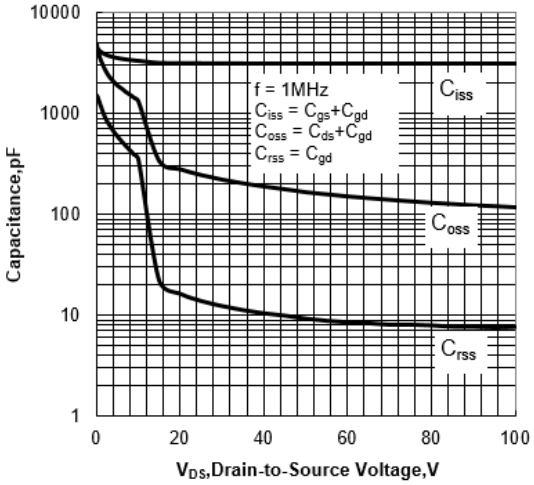
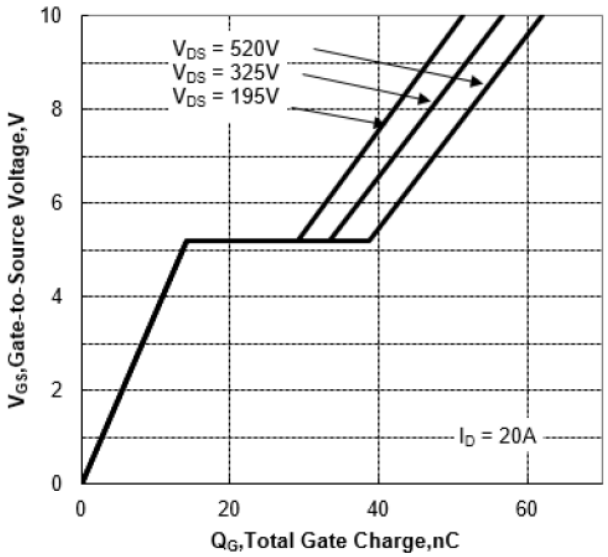


Figure 11 Typical Gate Charge vs Gate to Source Voltage



Test Circuit and Waveform

Figure 12 Gate Charge Test Circuit	Figure 13 Gate Charge Waveforms

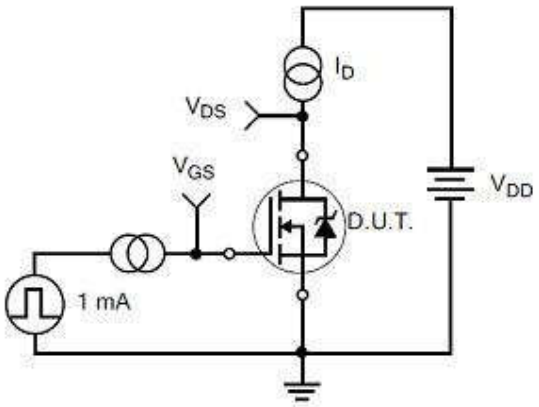
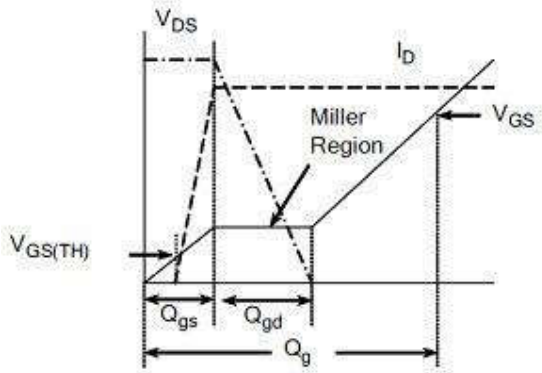

	

Figure 14 Resistive Switching Test Circuit	**Figure 15 Resistive Switching Waveforms**

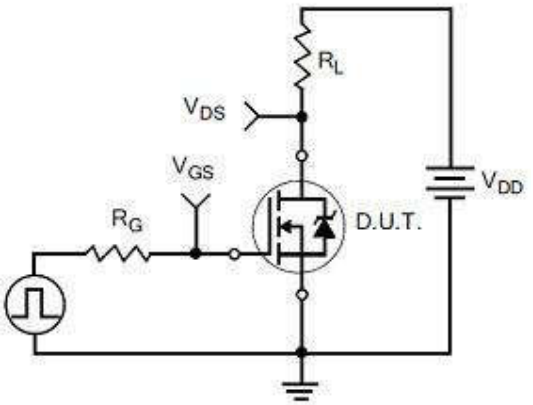
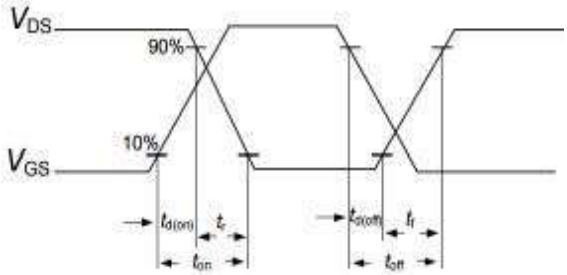

	

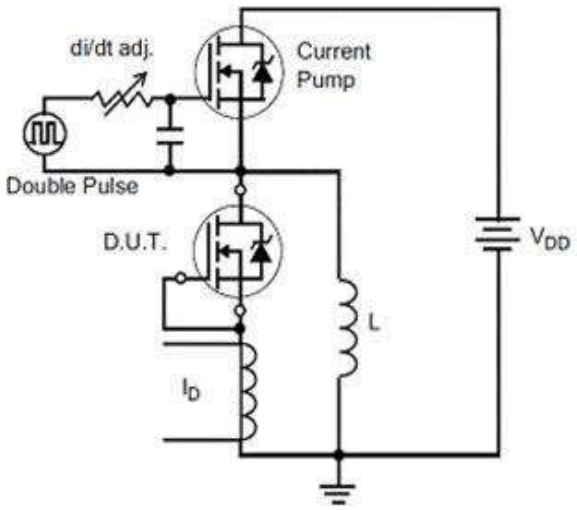
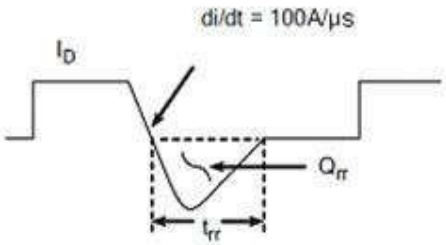
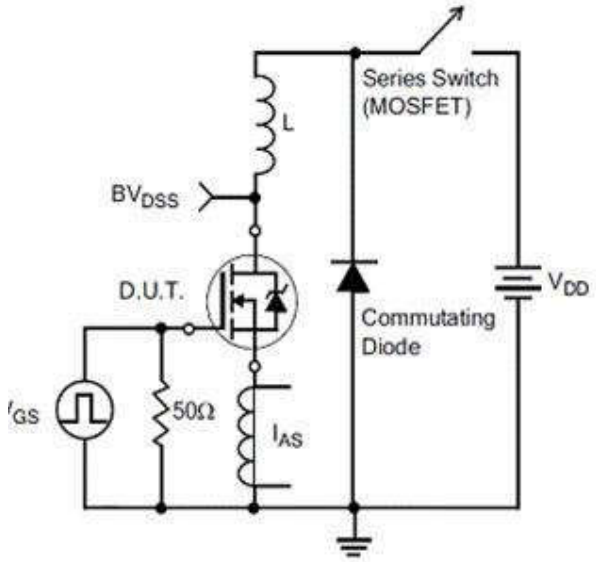
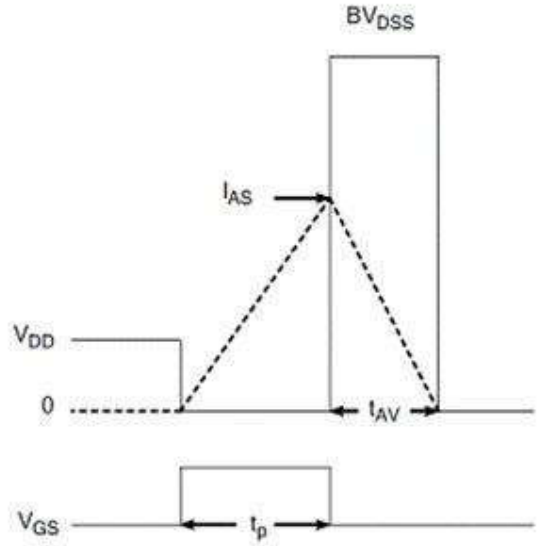
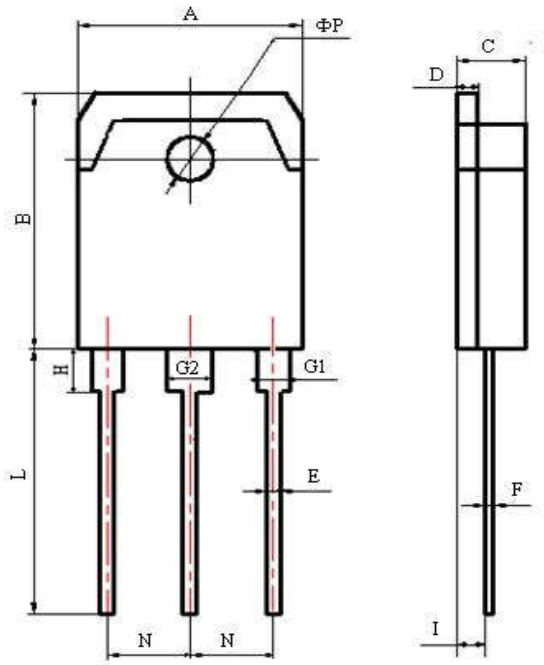
Figure 16 Diode Reverse Recovery Test Circuit	**Figure 17 Diode Reverse Recovery Waveform**
	

Figure 18 Unclamped Inductive Switching Test Circuit	Fiqure 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

TO-3PN Package

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 withoutprior notice.

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