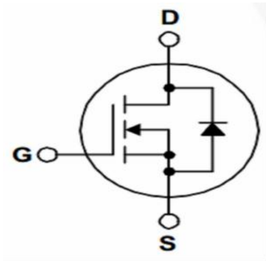
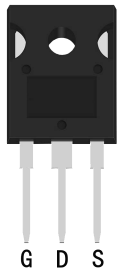
Silicon N-Channel Power MOSFET

Description

MD20N50 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.





TO247

General Features

①V_{DS}=500V, R_{dson}<280mΩ @V_{GS}=10V, I_D=20A (Typ:230mΩ)
②Fast Switching
③Low Crss (typical 18pF)
④100% avalanche tested
⑤Improved dv/dt capability
⑥RoHS product

Application

① High frequency switching mode power supply

Package Marking And Ordering Information：

Ordering Codes	Package	Product Code	Packing
MD20N50	TO-247	MD20N50	Tube

ABSOLUTE RATINGS @ Ta=25℃ (unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	500	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current T_C = 100 °C	12.6	A
I_{DM}	Pulsed Drain Current(Note1)	80	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy(Note2)	1200	mJ
dv/dt	Peak Diode Recovery dv/dt(Note3)	5.0	V/ns
P_D	Power Dissipation TO-220, TO-3PN	230	W
	Derating Factor above 25°C	1.85	W/℃
P_D	Power Dissipation TO-220F, TO-3PF	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 FullPAK) TO-3PN

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-3PF

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 T_C = 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	500	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA, Reference25℃	--	0.6	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS}=500V, V_{GS}= 0V, Tj = 25℃	--	--	10	μA
		V_{DS}=400V, V_{GS}= 0V, Tj = 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	V_{GS}=10V, I_D=10A(Note4)	--	0.23	0.28	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA(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	--	1920	--	PF
C_{oss}	Output Capacitance		--	290	--	
C_{rss}	Reverse Transfer Capacitance		--	18	--	

Switching Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =20A V_{DD} = 250V V_{GS} = 10V R_G =20Ω	--	33	--	ns
tr	Rise Time		--	75	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	91	--	
t_f	Fall Time		--	83	--	
Q_g	Total Gate Charge	I_D =20A V_{DD}=400V V_{GS} = 10V	--	56	--	nC
Q_{gs}	Gate to Source Charge		--	13	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	20	--	

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, Tj = 25°C dIF/dt=100A/us, VGS=0V	--	536	--	ns
Q_{rr}	Reverse Recovery Charge		--	5668	--	nC
I_{rrm}	Reverse Recovery Current		--	21.1	--	A

Note1: Pulse width limited by maximum junction temperature
Note2: L=10mH, V_{DS}=50V, Start TJ=25℃
Note3: ISD =20A,di/dt ≤100A/us,VDD≤BVDS, Start TJ=25℃
Note4: Pulse width tp≤300μs, δ≤2%

Characteristics Curves

Figure 1a Safe Operating Area (No FullPAK)

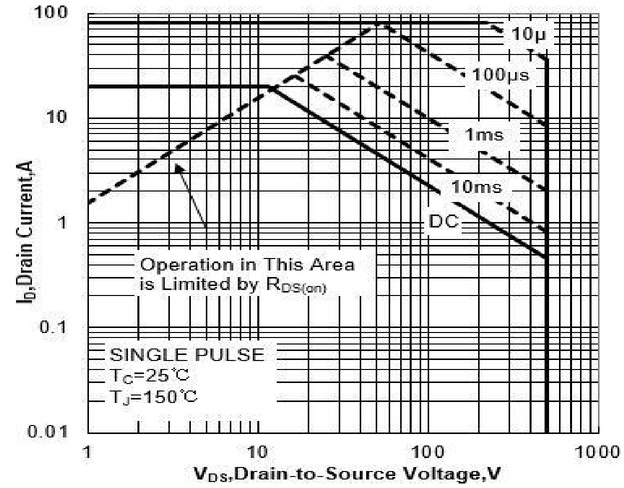


Figure 1b Safe Operating Area (FullPAK)

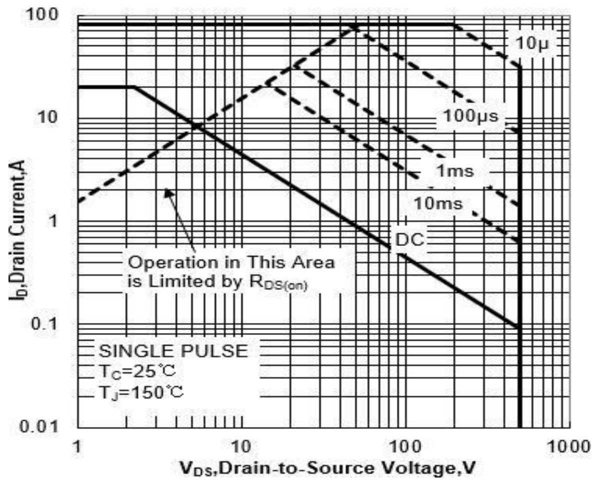


Figure 2a Power Dissipation (No FullPAK)

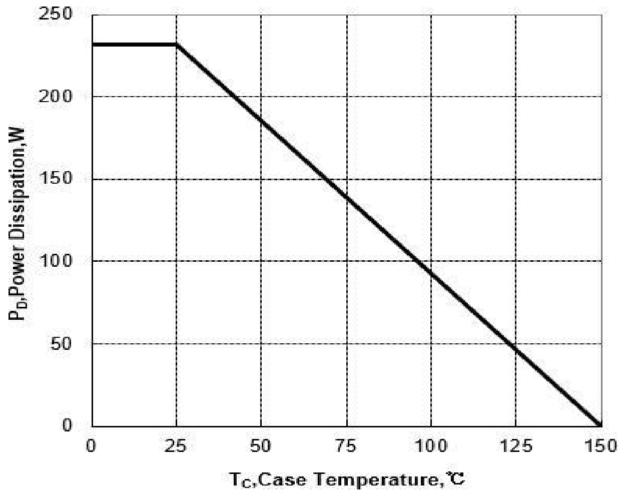


Figure 2b Power Dissipation (FullPAK)

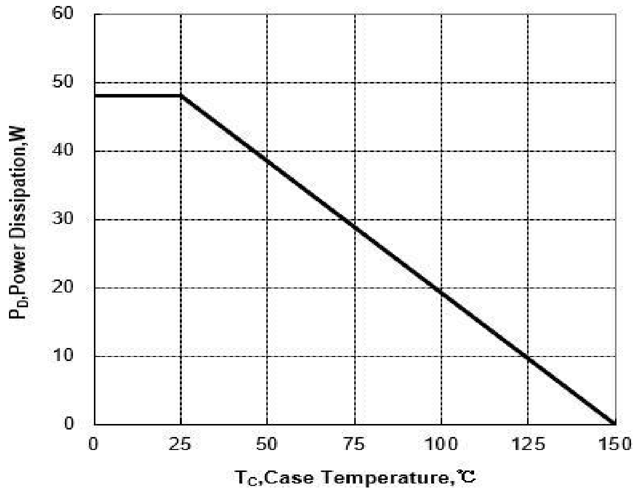


Figure 3a Max Thermal Impendance (No FullPAK)

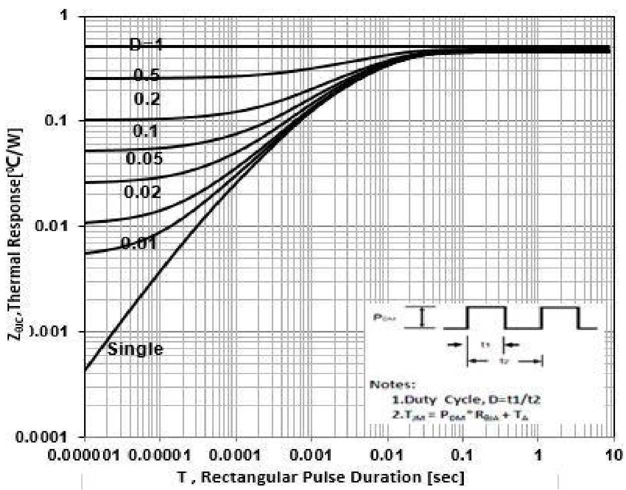


Figure 3b Max Thermal Impendance (FullPAK)

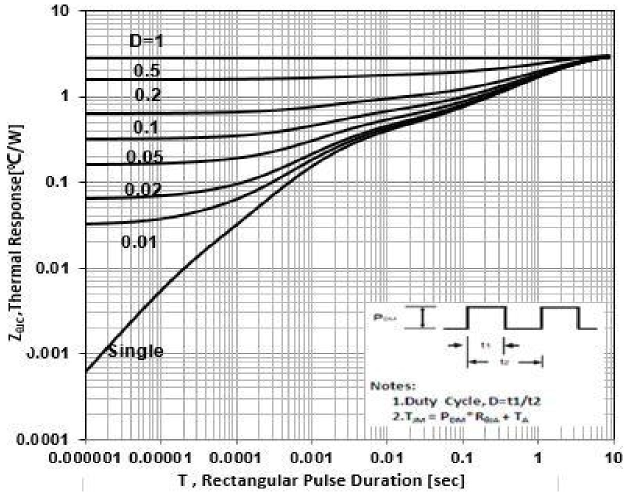


Figure 4 Typical Output Characteristics	Figure 5 Typical Transfer Characteristics

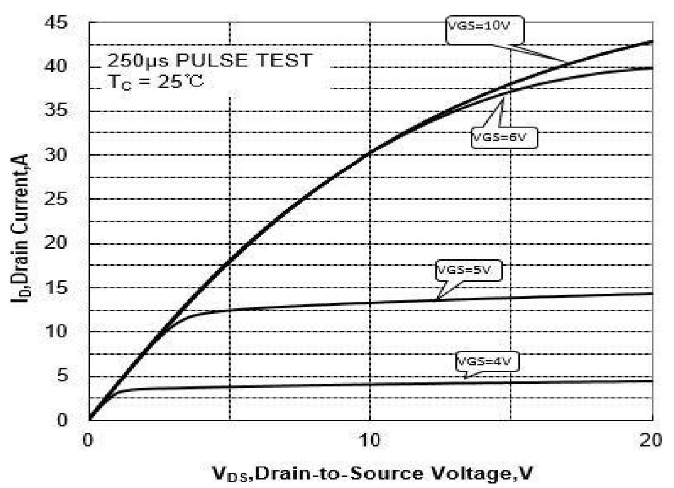
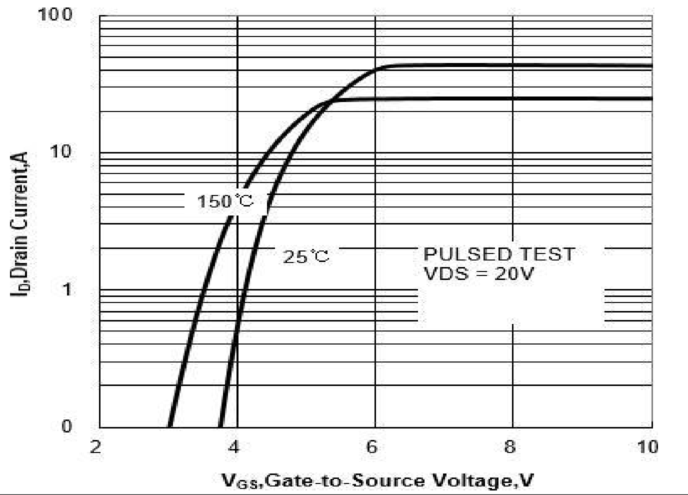

	

Figure 6 Typical Drain to Source ON Resistance vs Drain Current	Figure 7 Typical Drian to Source on Resistance vs Junction Temperature

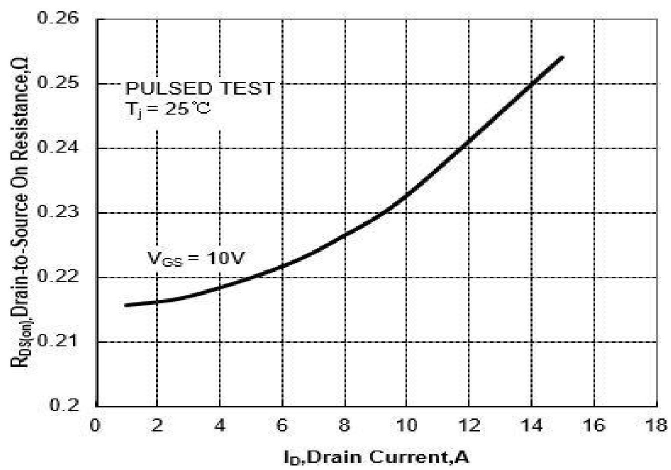
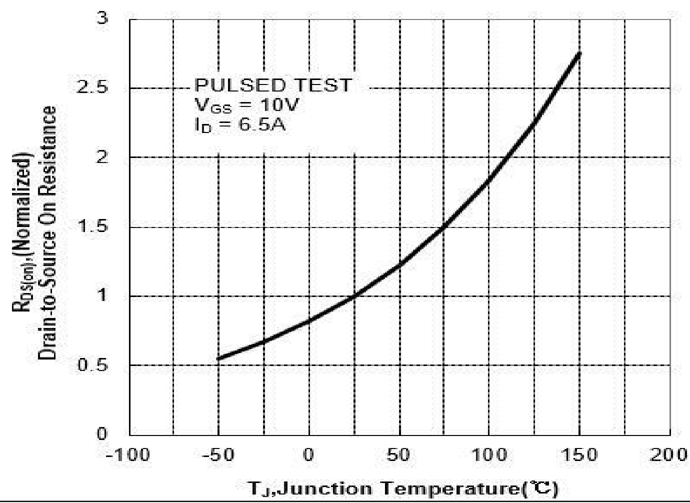

	

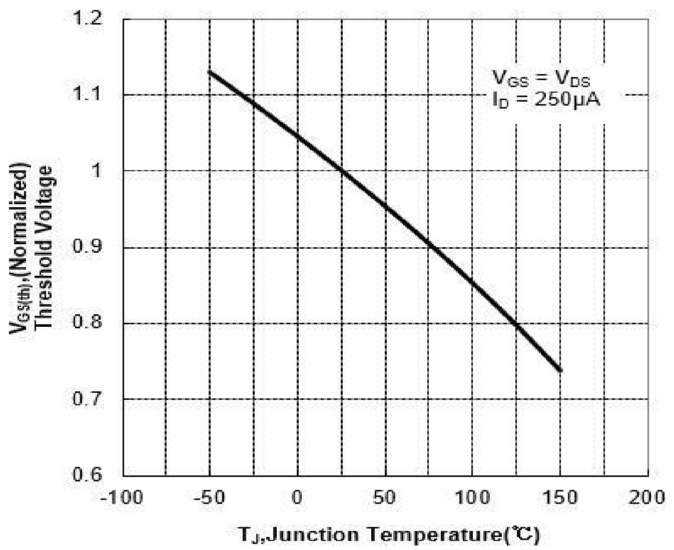
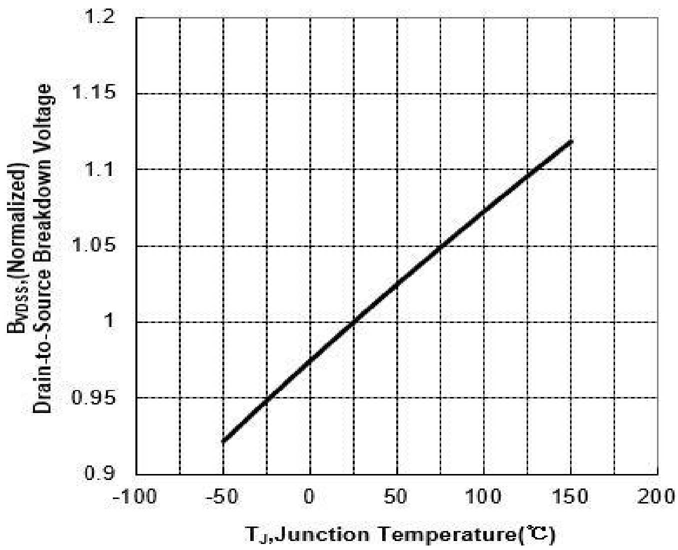
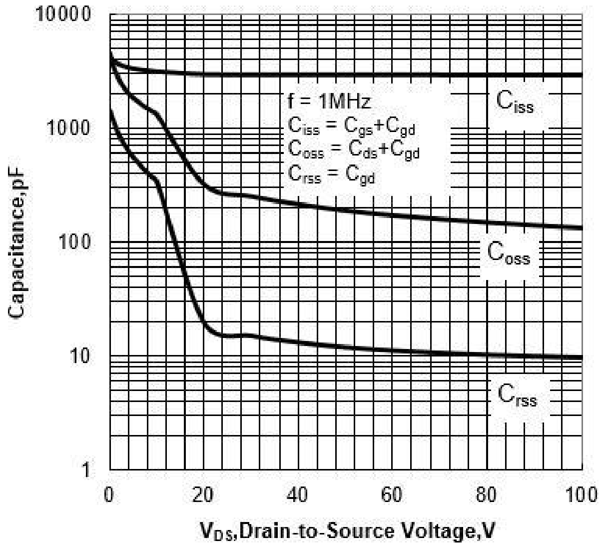
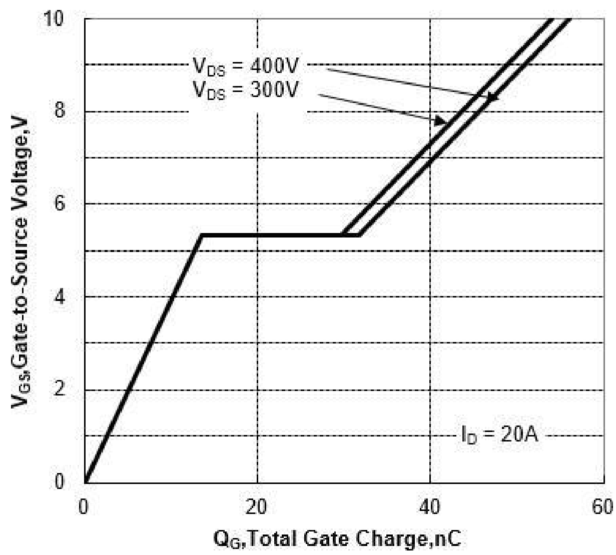
Figure 8 Typical Theshold Voltage vs Junction Temperature	Figure 9 Typical Breakdown Voltage vs Junction Temperature
	

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

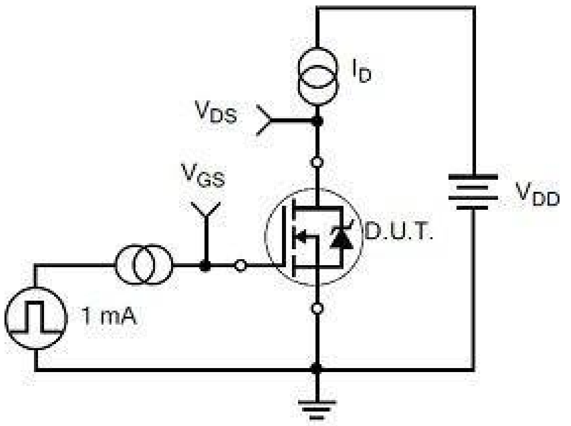


Figure 13 Gate Charge Waveforms

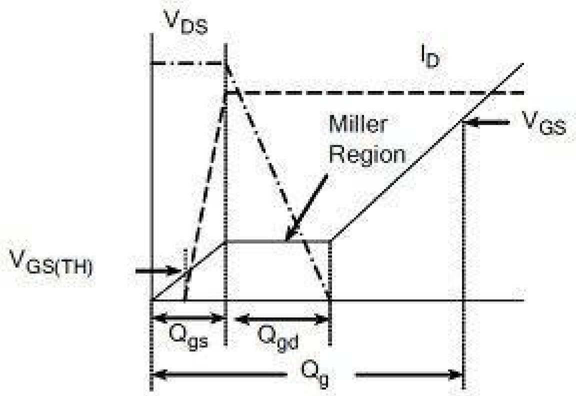


Figure 14 Resistive Switching Test Circuit

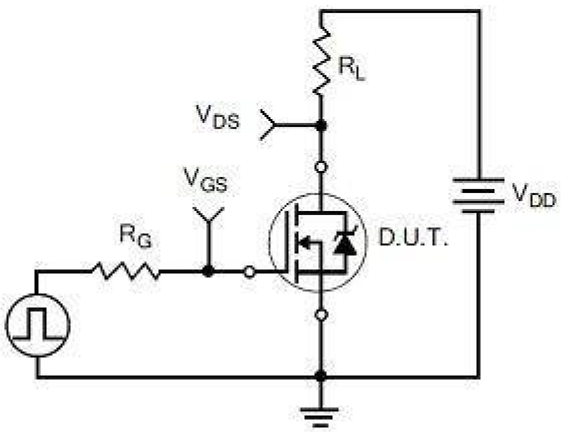


Figure 15 Resistive Switching Waveforms

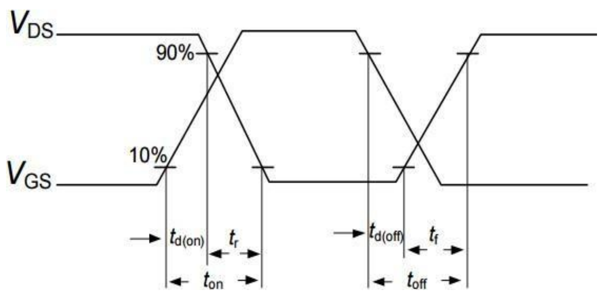


Figure 16 Diode Reverse Recovery Test Circuit

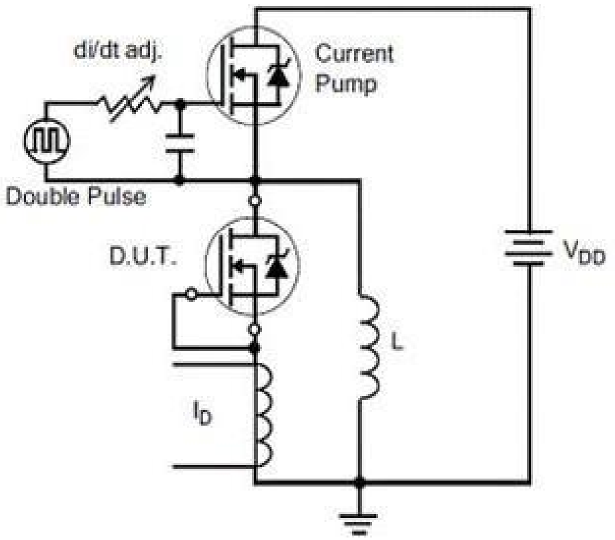


Figure 17 Diode Reverse Recovery Waveform

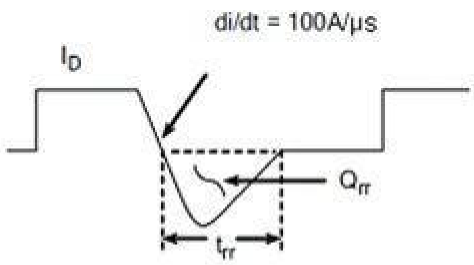
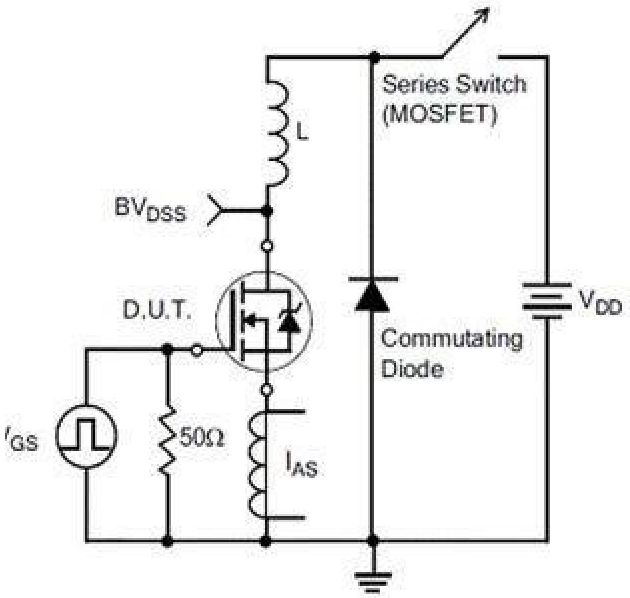
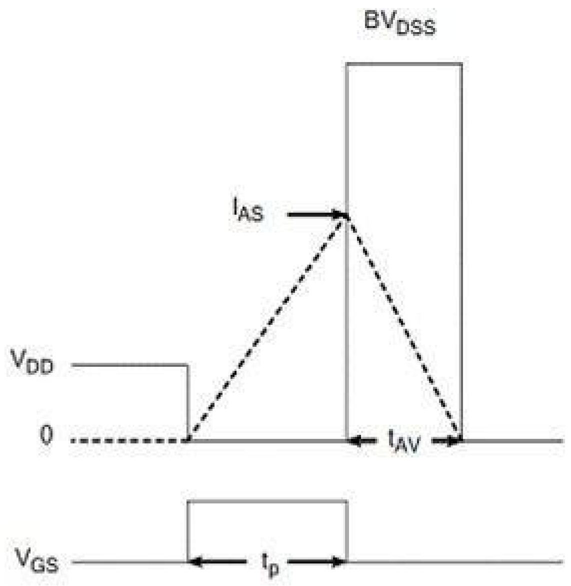
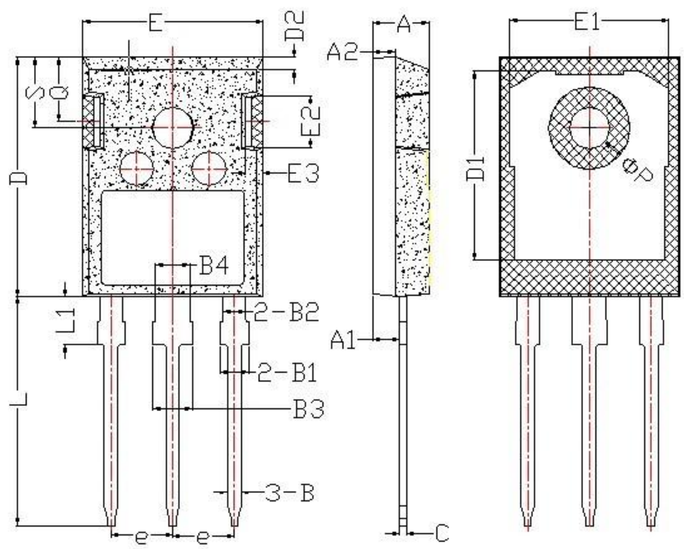


Figure 18 Unclamped Inductive Switching Test Circuit	Figure 19 Unclamped Inductive Switching Waveform
	

Package Description



Items	Values(mm)	
	MIN	MAX
A	4.6	5.2
A1	2,2	2.6
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.60	21.30
D1	16	18
E	15.5	16.10
E1	13	14.7
E2	3.80	5.3
E3	0.8	2.60
e	5.2	5.7
L	19	20.5
L1	3.9	4.6
ΦP	2.5	3.70
Q	5.2	6.00
S	5.8	6.6

TO-247 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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