

Silicon N-Channel Power MOSFET

Description

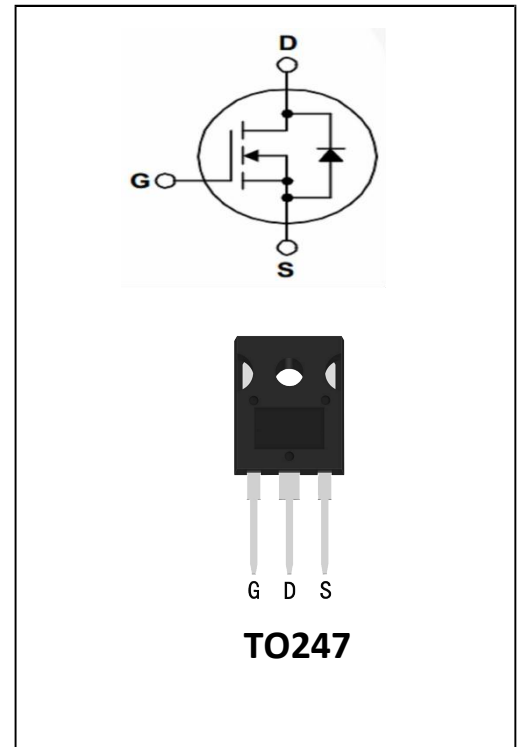
MD40N25 the silicon N-channel Enhanced MOSFETs, is obtained by advanced MOSFET technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor is suitable device for SMPS, high speed switching and general purpose applications.

General Features

- ① $V_{DS}=250V$, $R_{dson}<80m\Omega$ @ $V_{GS}=10V$, $I_D=40A$ (Typ:65m Ω)
- ② Fast Switching
- ③ Low Crss (typical 18pF)
- ④ 100% avalanche tested
- ⑤ Improved dv/dt capability
- ⑥ RoHS product

Application

- ① High frequency switching mode power supply



Package Marking And Ordering Information:

Ordering Codes	Package	Product Code	Packing
MD40N25	TO-247	MD40N25	Tube

ABSOLUTE RATINGS @ $T_a=25^\circ C$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	250	V
I_D	Continuous Drain Current	40	A
	Continuous Drain Current $T_c = 100^\circ C$	26	A
I_{DM}	Pulsed Drain Current(Note1)	160	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy(Note2)	2000	mJ
dv/dt	Peak Diode Recovery dv/dt(Note3)	5.0	V/ns



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MD40N25

PD	Power Dissipation	310	W
	Derating Factor above 25°C	2.78	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 TO-247

Symbol	Parameter	RATINGS	Units
R _{θJC}	Junction-to-Case	0.36	°C/W
R _{θJA}	Junction-to-Ambient	62.5	°C/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	250	--	--	V
ΔBV _{DSS} /Δ T _J	Bvdss Temperature Coefficient	I _D =250μA, Reference 25°C	--	0.18	--	V/°C
I _{DSS}	Drain to Source Leakage Current	V _{DS} =250V, V _{GS} =0V, T _J =25°C	--	--	1	μA
		V _{DS} =200V, V _{GS} =0V, T _J =125°C	--	--	10	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 =20A(Note4)	--	0.065	0.08	Ω



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$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$ (Note4)	2.0	--	4.0	V
g_{fs}	Forward Transconductance	$V_{DS}=40V$, $I_D=20A$ (Note4)	--	27	--	S
Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	$f = 1.0MHz$	--	1.8	--	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} =$ $25V$ $f =$	--	3700	--	PF
C_{oss}	Output Capacitance		--	360	--	
C_{rss}	Reverse Transfer Capacitance		--	2.5	--	
Switching Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = 40A$ $V_{DD} = 125V$ $V_{GS} = 10V$ $R_G = 15\Omega$	--	80	--	ns
t_r	Rise Time		--	620	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	140	--	
t_f	Fall Time		--	183	--	
Q_g	Total Gate Charge	$I_D = 40A$ $V_{DD} = 200V$ $V_{GS} = 10V$	--	40	--	nC
Q_{gs}	Gate to Source Charge		--	14	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	11	--	
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	$TC=25^\circ C$	--	--	40	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	160	A
V_{SD}	Diode Forward Voltage	$I_S=40A$, $V_{GS}=0V$ (Note4)	--	--	1.2	V
T_{rr}	Reverse Recovery Time	$I_S=40A$, $T_j = 25^\circ C$ $dI/dt=100A/us$, $V_{GS}=0V$	--	230	--	ns
Q_{rr}	Reverse Recovery Charge		--	2150	--	nC

Note1: Pulse width limited by maximum junction temperature

Note2: $L=10mH$, $V_{DS}=50V$, Start $T_J=25^\circ C$

Note3: $I_{SD} = 40A$, $di/dt \leq 100A/us$, $V_{DD} \leq BV_{DS}$, Start $T_J=25^\circ C$

Note4: Pulse width $t_p \leq 300\mu s$, $\delta \leq 2\%$

Characteristics Curves

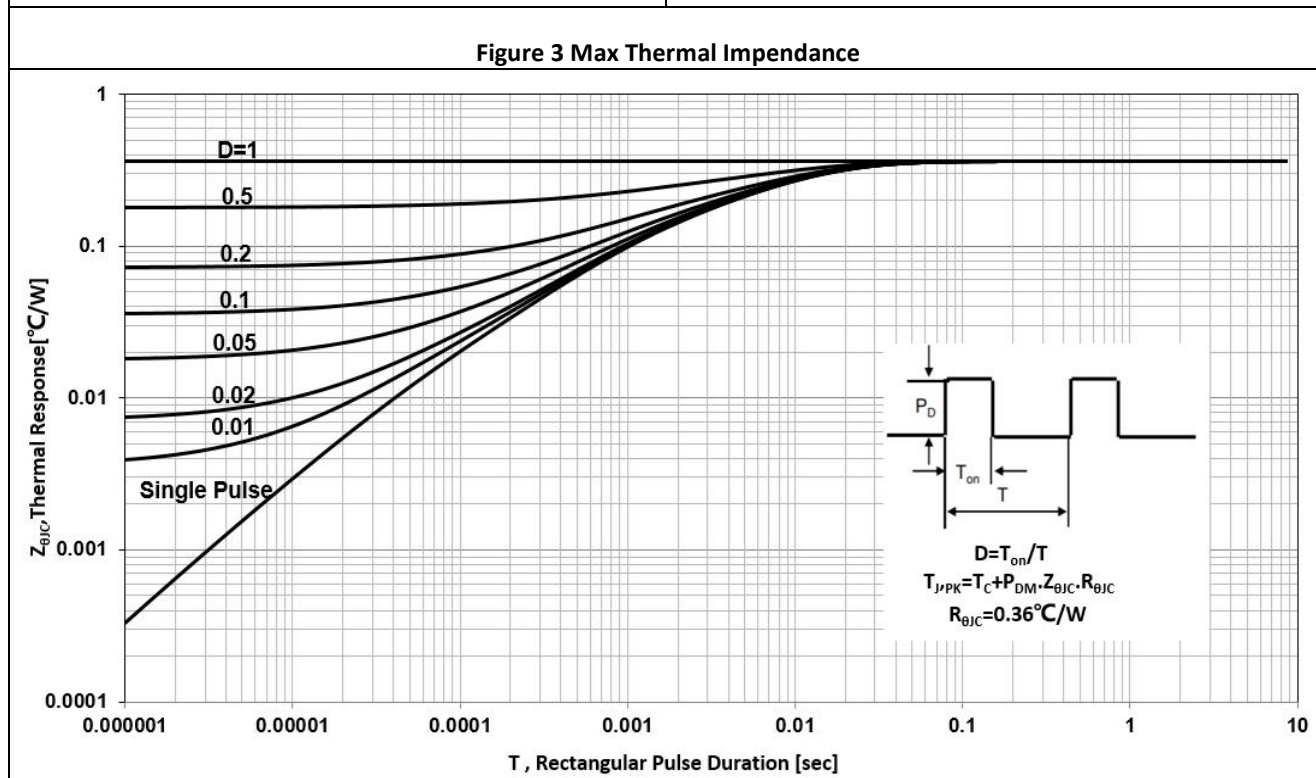
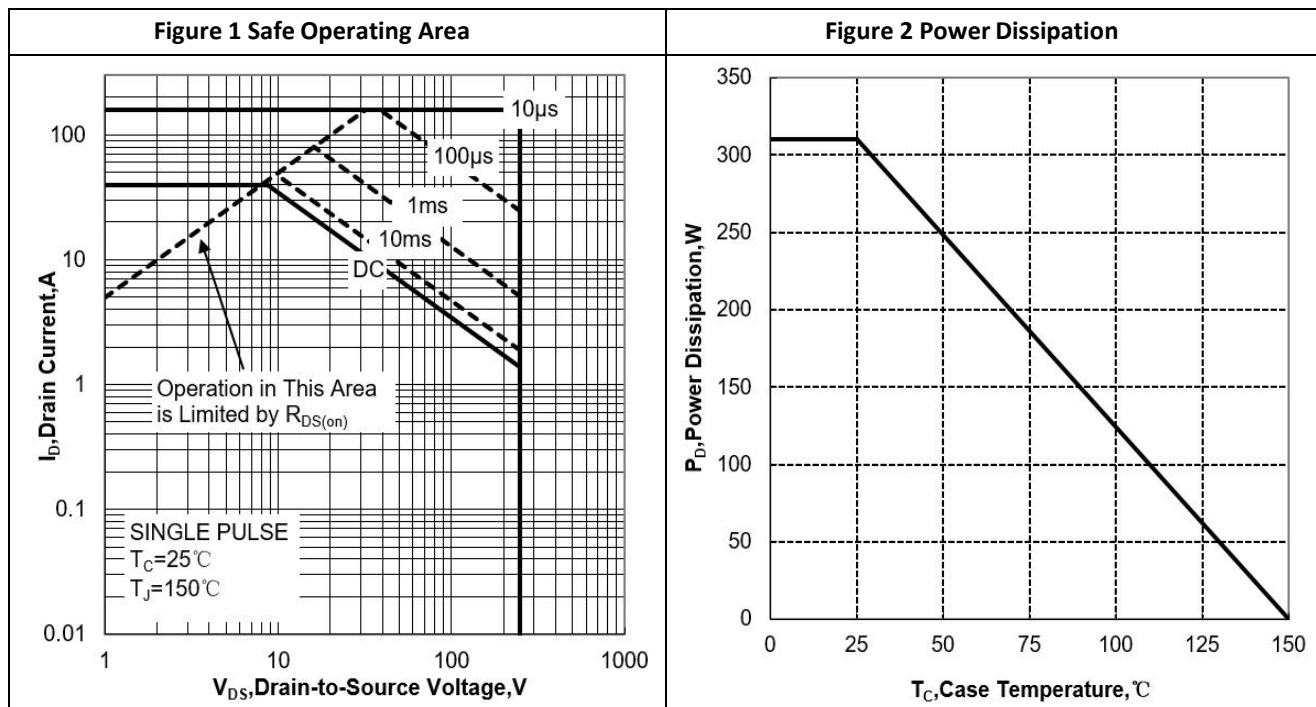


Figure 4 Typical Output Characteristics

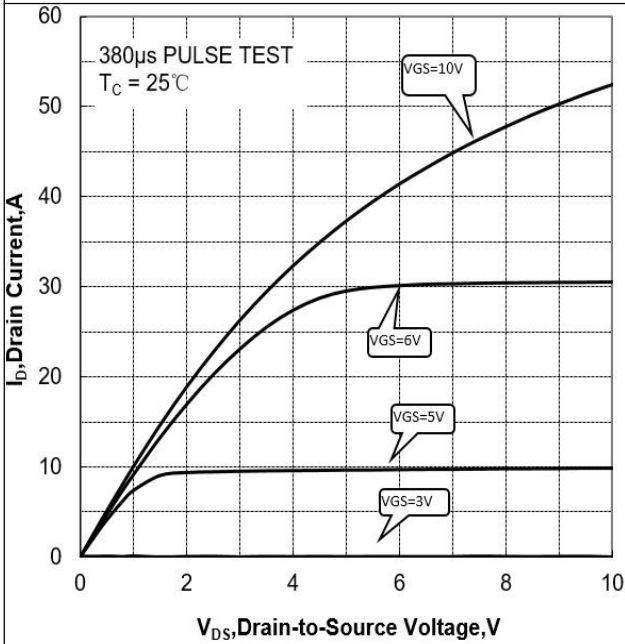


Figure 5 Typical Transfer Characteristics

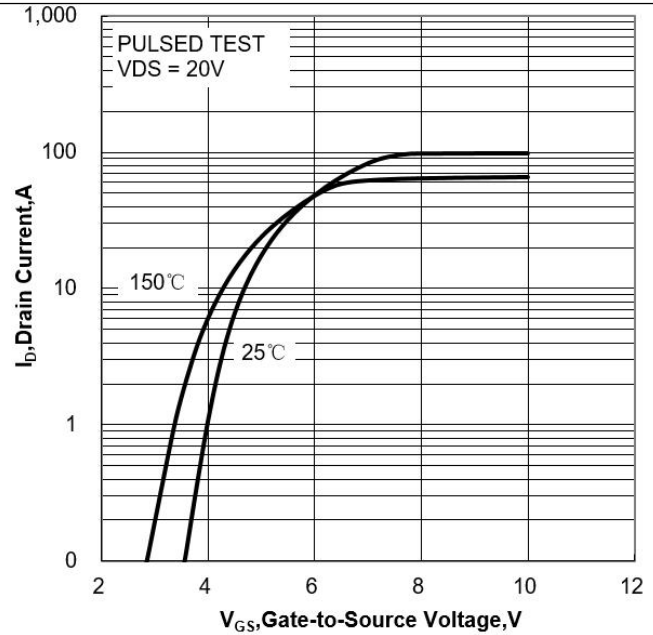


Figure 6 Typical Drain to Source ON Resistance vs Drain Current

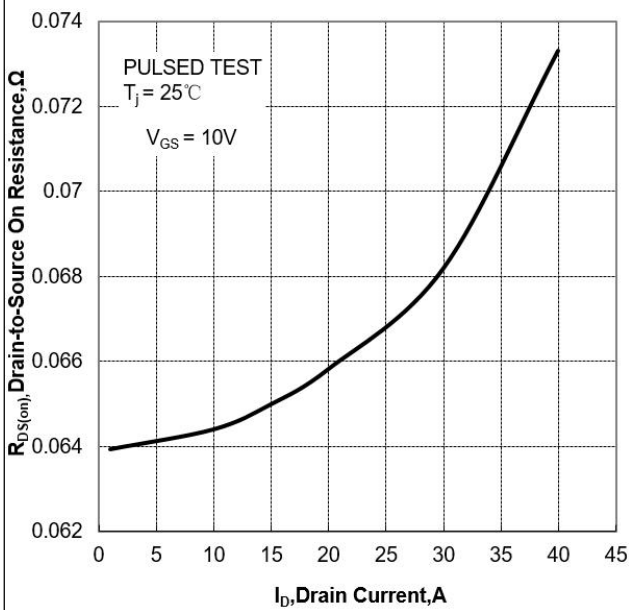


Figure 7 Typical Drain to Source on Resistance vs Junction Temperature

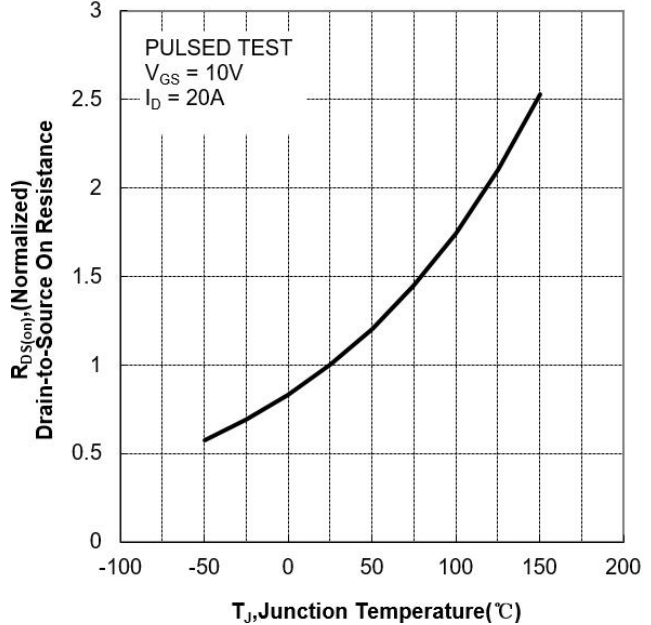


Figure 8 Typical Theshold Voltage vs Junction Temperature

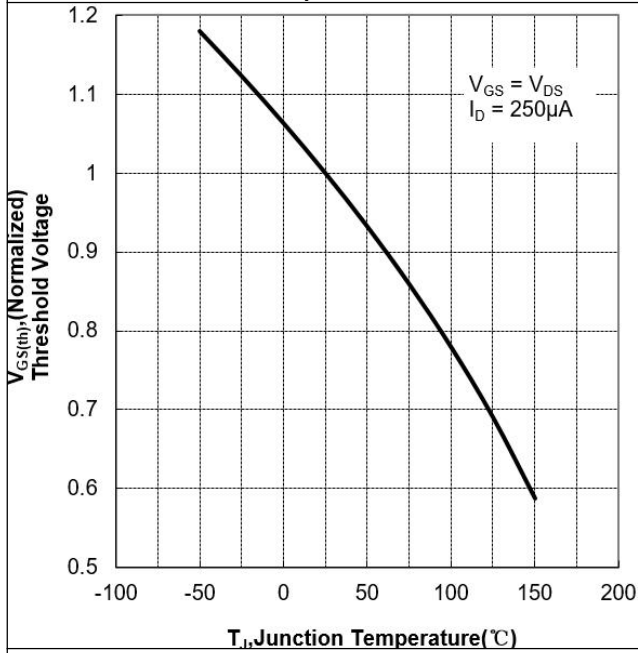


Figure 9 Typical Breakdown Voltage vs Junction Temperature

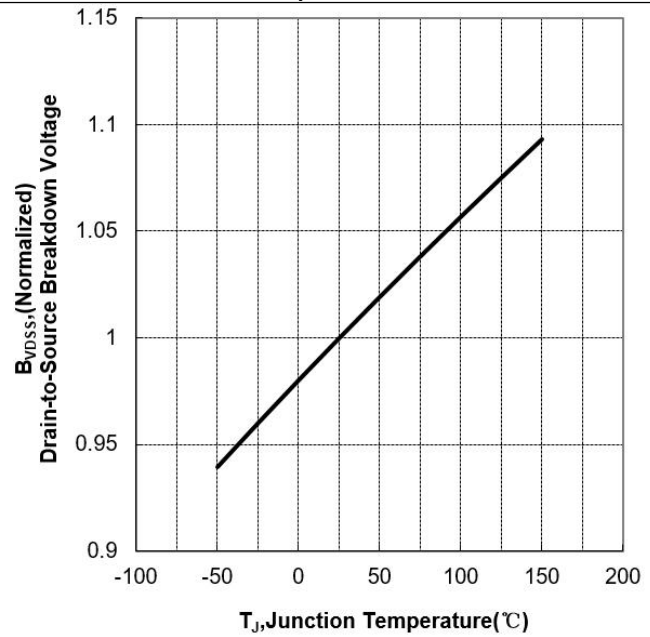


Figure 10 Typical Capacitance vs Drain to Source Voltage

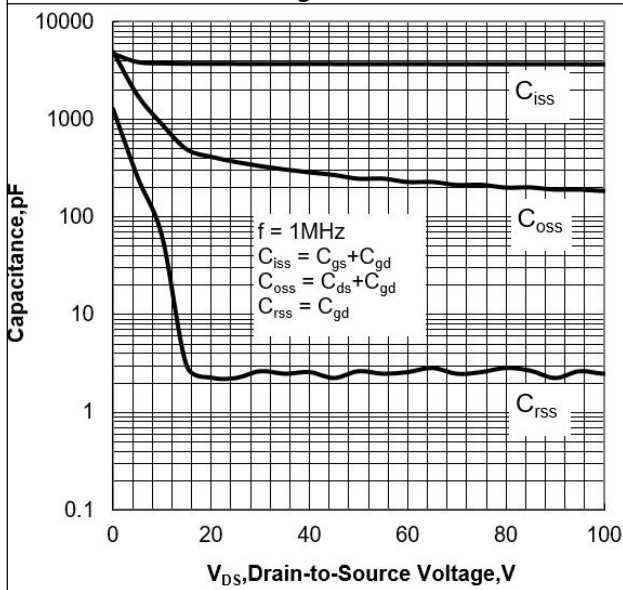
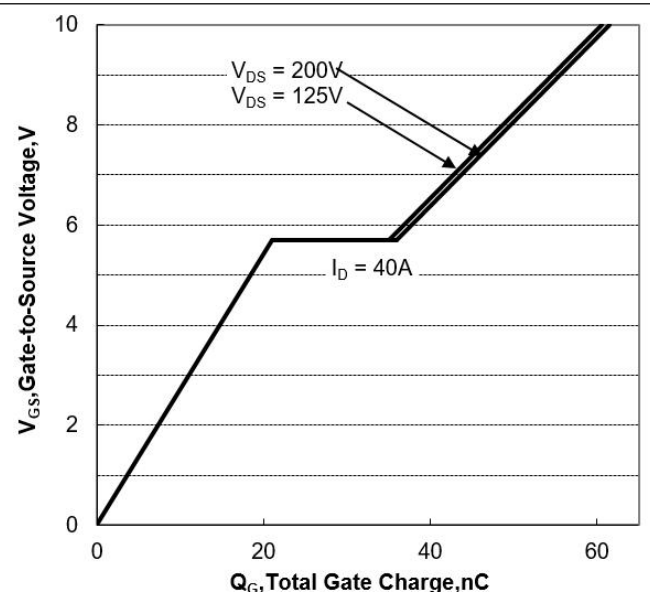
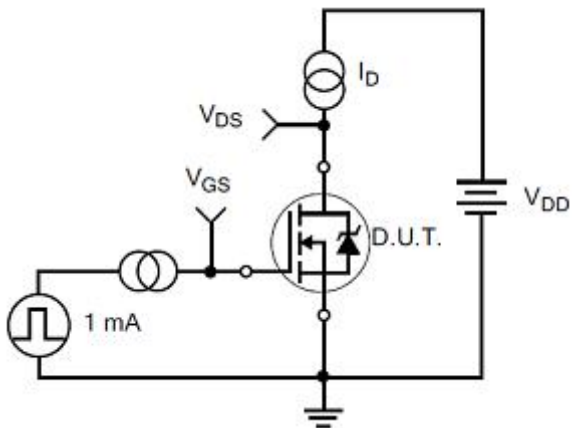
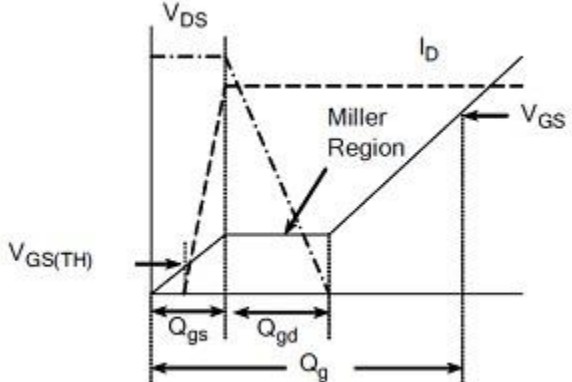
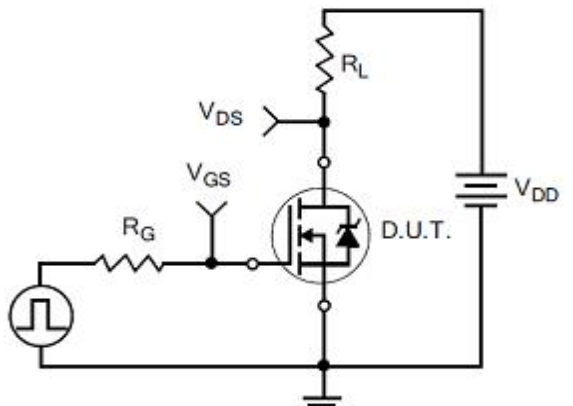
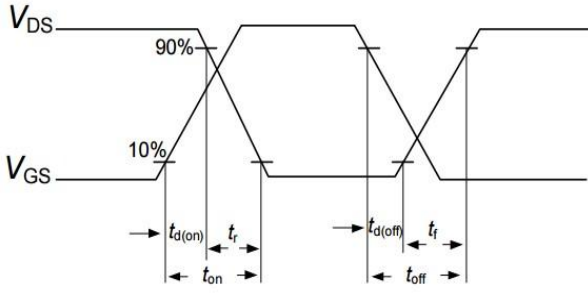
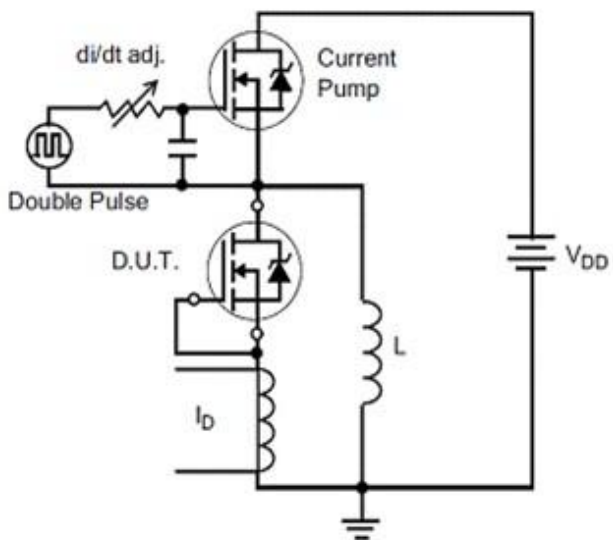
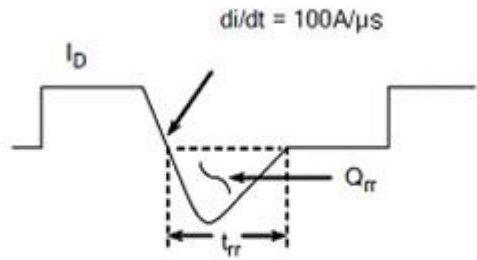
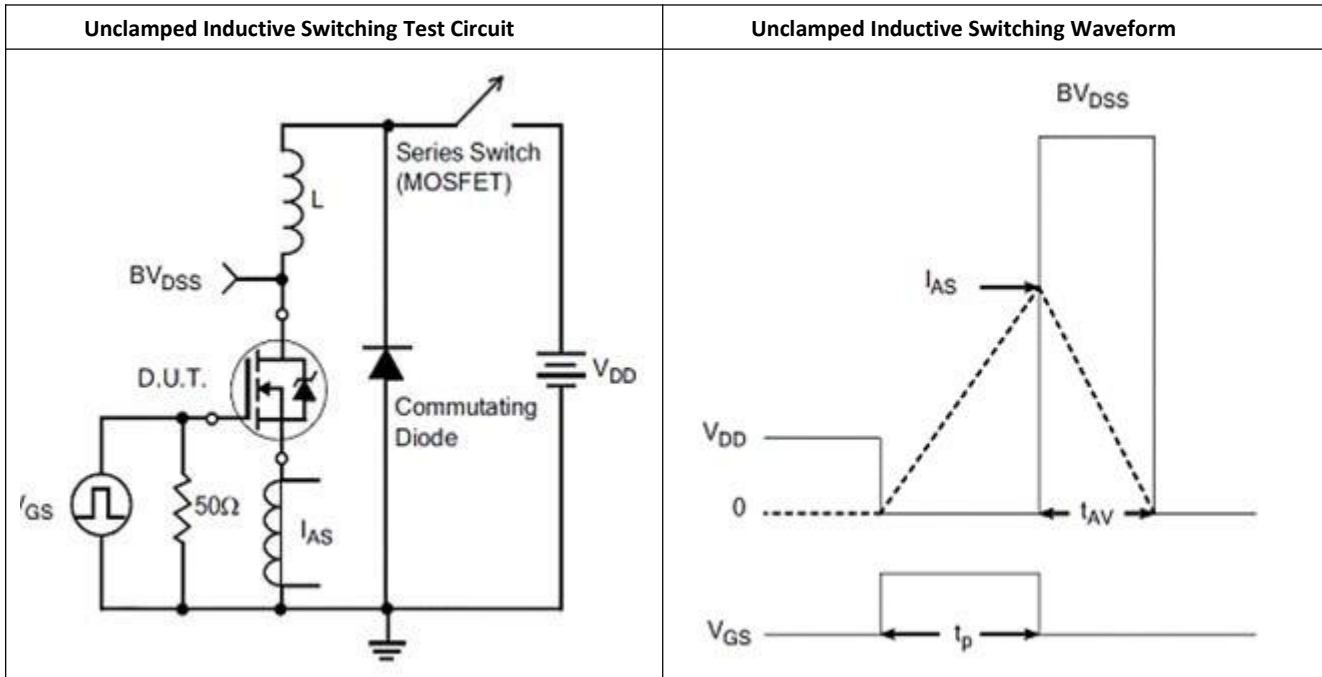


Figure 11 Typical Gate Charge vs Gate to Source Voltage

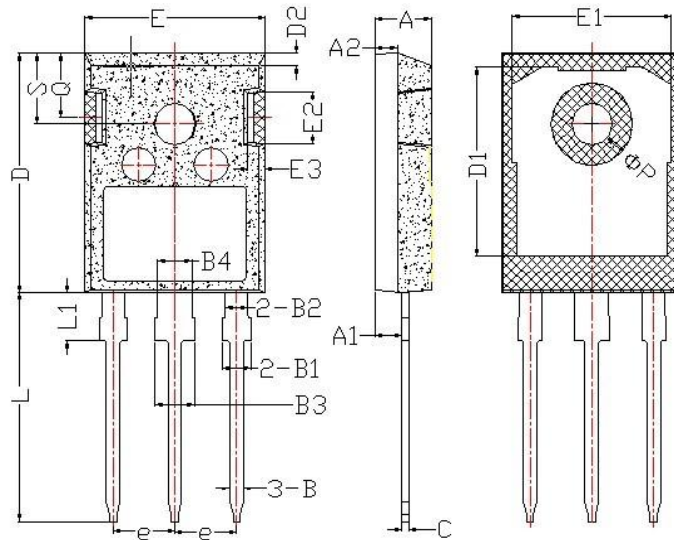


Test Circuit and Waveform

<p style="text-align: center;">Gate Charge Test Circuit</p>  <p>The diagram shows a MOSFET (D.U.T.) in a common-emitter configuration. The gate is driven by a 1 mA current source. The drain is connected to a load resistor and a current source I_D. The supply voltage is V_{DD}. The gate voltage is V_{GS} and the drain voltage is V_{DS}.</p>	<p style="text-align: center;">Gate Charge Waveforms</p>  <p>The graph plots V_{GS} and I_D against gate charge. Key points include $V_{GS(TH)}$ (threshold voltage), the Miller Region (where V_{GS} is constant while V_{DS} falls), and total gate charge Q_g (sum of Q_{gs} and Q_{gd}).</p>
<p style="text-align: center;">Resistive Switching Test Circuit</p>  <p>The diagram shows a MOSFET (D.U.T.) in a common-emitter configuration. The gate is driven by a current source through a resistor R_G. The drain is connected to a load resistor R_L and the supply V_{DD}. The gate voltage is V_{GS} and the drain voltage is V_{DS}.</p>	<p style="text-align: center;">Resistive Switching Waveforms</p>  <p>The graph shows V_{GS} and V_{DS} waveforms. Key timing parameters are $t_{d(on)}$, t_r, t_{on}, $t_{d(off)}$, t_f, and t_{off}. The V_{DS} waveform shows a 90% rise and 10% fall.</p>
<p style="text-align: center;">Diode Reverse Recovery Test Circuit</p>  <p>The diagram shows a MOSFET (D.U.T.) in a common-emitter configuration. The gate is driven by a double pulse through a di/dt adjuster. The drain is connected to a current pump, a diode, and an inductor L. The supply is V_{DD}. The diode current is I_D.</p>	<p style="text-align: center;">Diode Reverse Recovery Waveform</p>  <p>The graph shows the diode current I_D during reverse recovery. Key parameters are $di/dt = 100A/\mu s$, reverse recovery charge Q_{rr}, and reverse recovery time t_{rr}.</p>



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 without prior notice.

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