

MDDG09R02L

90V N-Channel Enhancement Mode MOSFET

1. Description

This N-Channel MV MOSFET is produced using MDD Semiconductor's advanced Power Trench process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

2. Features

- Max $R_{DS(on)}$ = 1.9 m Ω at $V_{GS} = 10$ V, $I_D = 20$ A
- Extremely Low Reverse Recovery Charge, Q_{rr}
- 100% UIS Tested
- 100% dVDS Tested

3. Application

- PWM Application
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter
- Battery management System

4. Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	90	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Note 1)	I_D	160	A
Pulsed Drain Current (Note 2)	I_{DM}	640	A
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	812.25	mJ
Thermal Resistance (Junction to Case)	$R_{\theta JC}$	0.56	$^\circ\text{C}/\text{W}$
Power Dissipation	P_D	380	W
Junction Temperature	T_J	-55~+150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55~+150	$^\circ\text{C}$

Note: 1) Calculated continuous current based on maximum allowable junction temperature.

2) Repetitive rating, pulse width limited by max. junction temperature.

3) E_{AS} condition : $T_J = 25^\circ\text{C}$, $V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $L = 0.5\text{mH}$, $R_g = 25 \Omega$, $I_{AS} = 57\text{A}$.

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
1	G	Gate			MDD G09R02L	TOLL
9-11	D	Drain				
2-8	S	Source				

6. $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	90	—	—	V
I_{GSS}	Gate-Source Leakage Current	Forward	—	—	100	nA
		Reverse	—	—	-100	nA
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=90V, V_{GS}=0V$	—	—	1	μA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=30A$	—	1.3	1.9	m Ω

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS}=0V$	—	11800	—	pF
C_{oss}	Output Capacitance	$V_{DS}=45V$	—	5900	—	pF
C_{rss}	Reverse Transfer Capacitance	$f=1MHz$	—	203	—	pF
Q_g	Total Gate Charge	$V_{GS}=10V$	—	245	—	nC
Q_{gs}	Gate Source Charge	$V_{DS}=40V$	—	68	—	nC
Q_{gd}	Gate Drain Charge	$I_D=80A$	—	60	—	nC

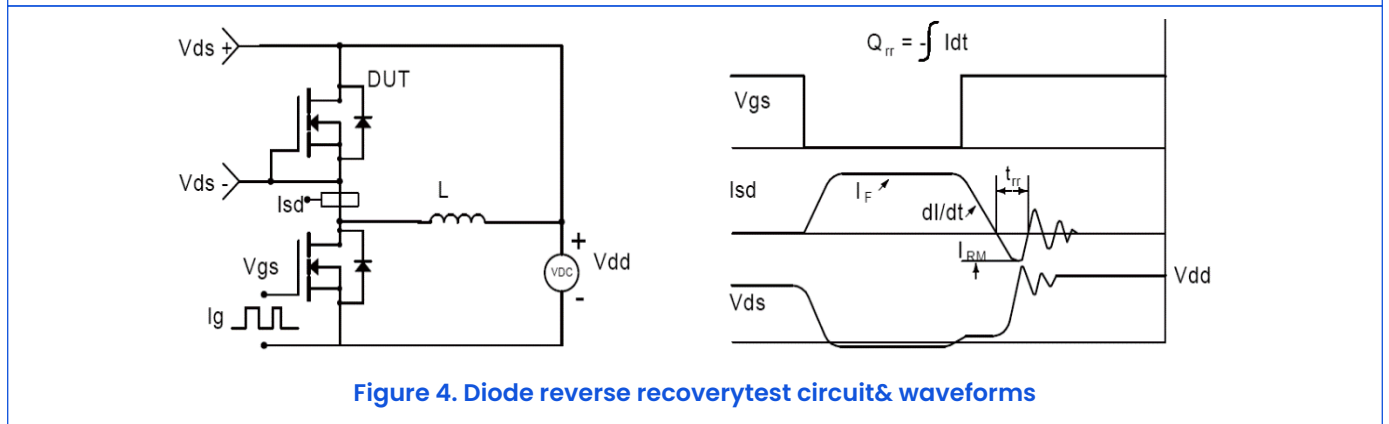
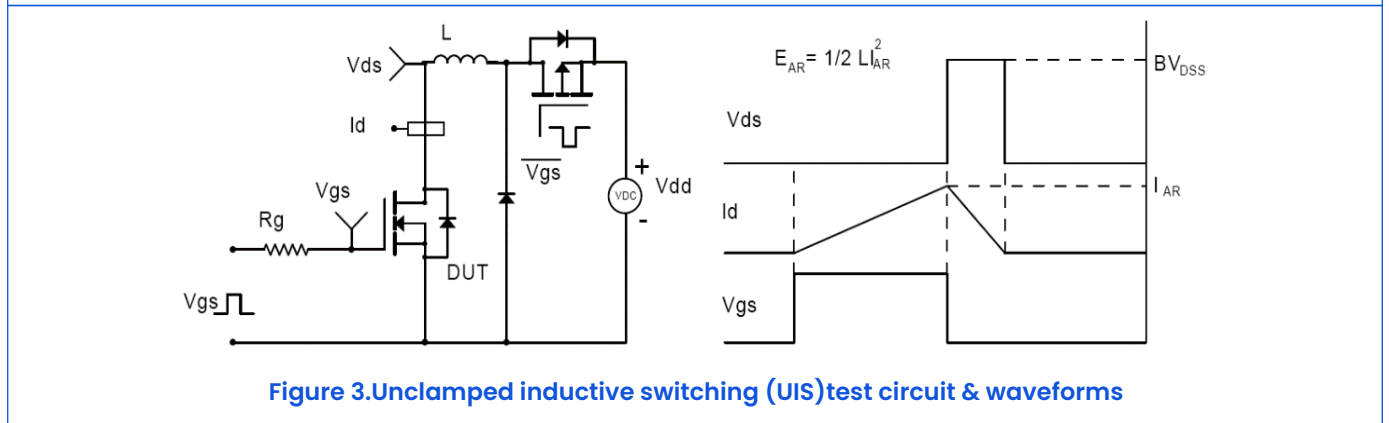
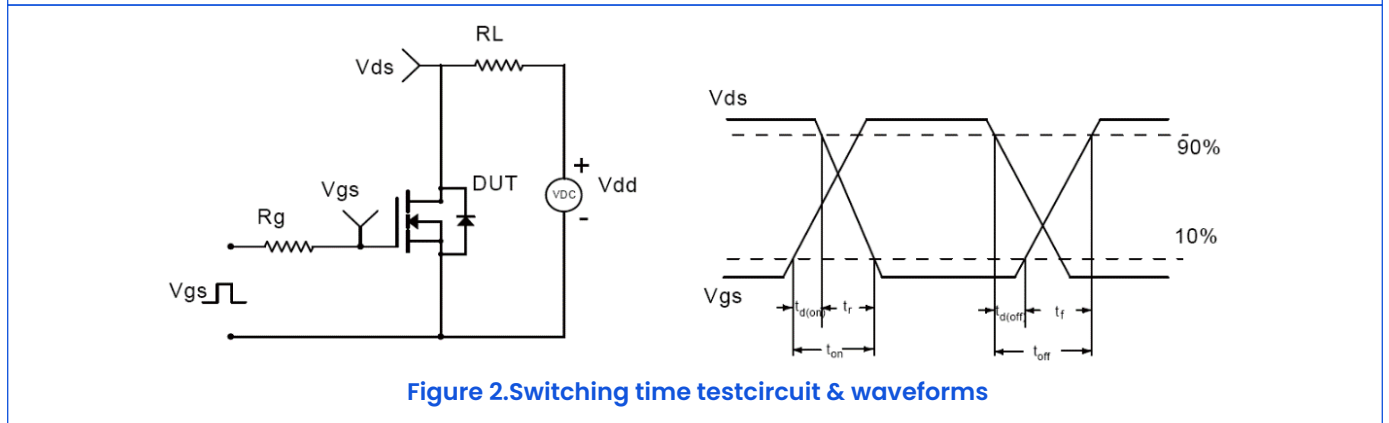
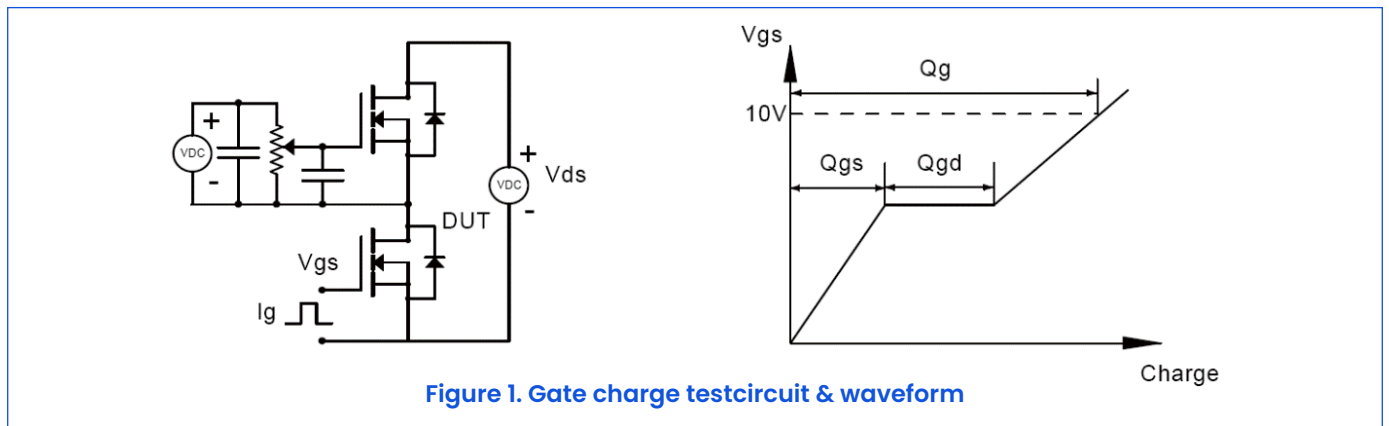
8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{d(on)}$	Turn on Delay Time	$V_{GS}=10V$ $V_{DD}=40V$ $I_D=80A$ $R_G=1.6\Omega$	—	45	—	ns
t_r	Turn on Rise Time		—	35	—	ns
$t_{d(off)}$	Turn Off Delay Time		—	120	—	ns
t_f	Turn Off Fall Time		—	33	—	ns

9. Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{SD}	Drain-Source Diode Forward Voltage	$I_S=50A, V_{GS}=0V$	—	0.8	1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F=160A$	—	110	—	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$di/dt=100A/\mu s$	—	325	—	nC

10. Test Circuits And Waveforms



II. Electrical Characteristics Diagrams

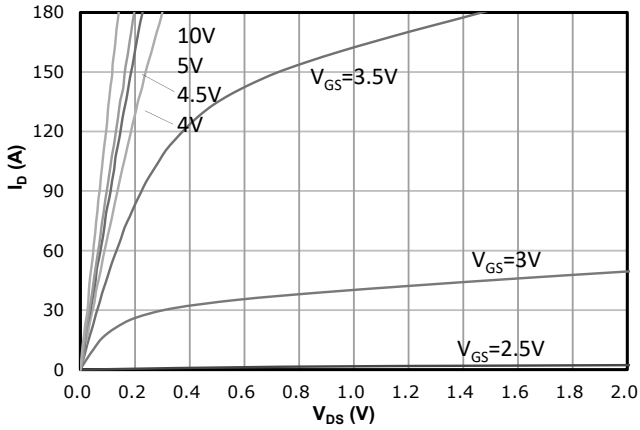


Figure 1. Typ. output characteristics

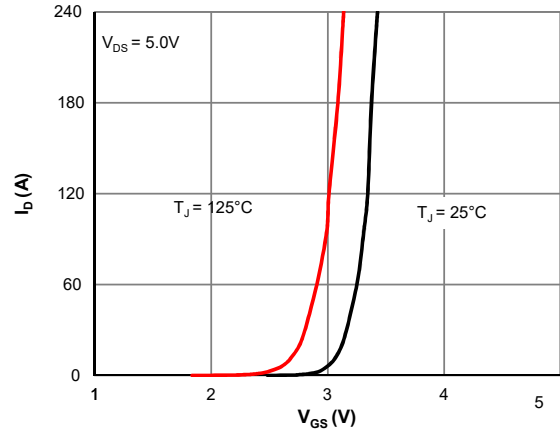


Figure 2. Typ. transfer characteristics

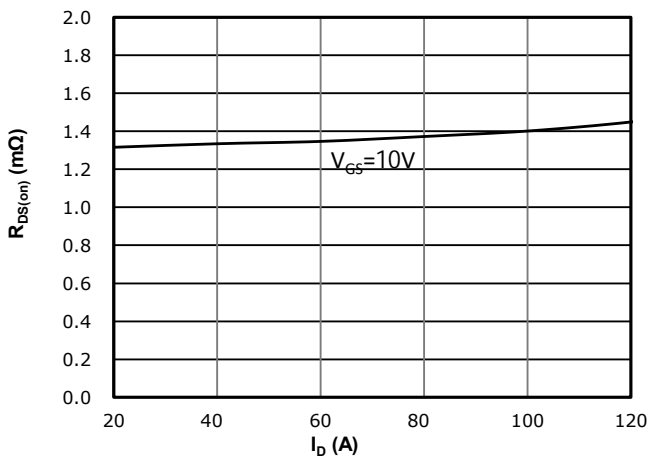


Figure 3. On-Resistance vs. Drain Current

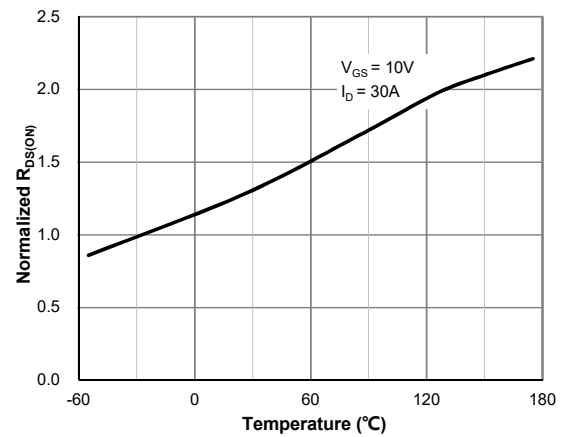


Figure 4. On-Resistance vs. Junction Temperature

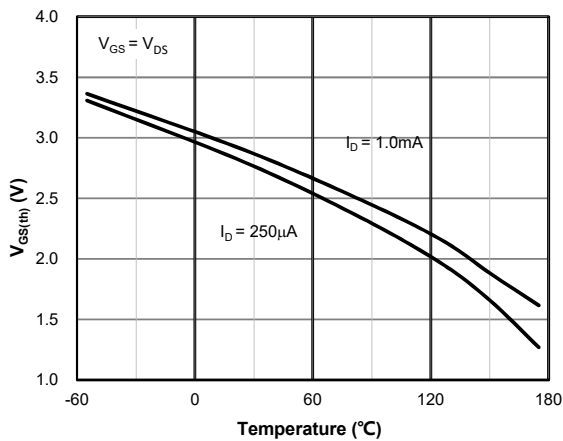


Figure 5. Normalized Threshold Voltage vs. Junction Temperature

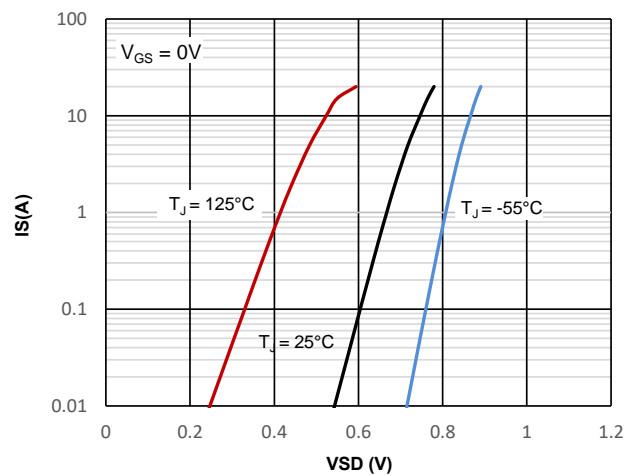


Figure 6. Forward characteristic of body diode

