

MDDG04R06Q

40V N-Channel Enhancement Mode MOSFET

1. Description

This N-Channel 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 $R_{DS(on)}$ = 5.5 m Ω at V_{GS} = 10 V, I_D = 20A
- 100% UIS Tested
- 100% dVDS Tested

3. Application

- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter
- DC to DC converters

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

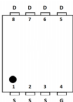
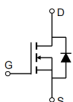
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Note 1)	I_D	60	A
Pulsed Drain Current (Note 2)	I_{DM}	240	A
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	26	mJ
Thermal Resistance, steady-state	$R_{\theta JA}$	45	$^{\circ}\text{C}/\text{W}$
Power Dissipation	P_D	40	W
Junction Temperature	T_J	$-55 \sim +150$	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	$-55 \sim +150$	$^{\circ}\text{C}$

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: $T_J=25^{\circ}\text{C}$, $V_{DD}=20\text{V}$, $V_{GS}=10\text{V}$, $L=0.1\text{mH}$, $R_g=25\Omega$, $I_D=23\text{A}$

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
4	G	Gate			MDD G04R06Q	PDFN3*3-8L
5-8	D	Drain				
1-3	S	Source				

6. T_A=25°C unless otherwise specified

Symbol	Parameter		Condition	Min	Typ	Max	Unit
V _{(BR)DSS}	Drain-Source Breakdown Voltage		V _{GS} =0V, I _D =250μA	40	—	—	V
I _{SS}	Gate-Source Leakage Current	Forward	V _{GS} =20V	—	—	100	nA
		Reverse	V _{GS} =-20V	—	—	-100	nA
I _{DSS}	Drain-Source Leakage Current		V _{DS} =40V, V _{GS} =0V	—	—	1	μA
V _{GS(TH)}	Gate Threshold Voltage		V _{DS} =V _{GS} , I _D =250μA	1.0	1.35	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance		V _{GS} =10V, I _D =20A	—	4.5	5.5	mΩ
			V _{GS} =4.5V, I _D =15A	—	5.9	8.5	mΩ

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} =0V	—	875	—	pF
C _{oss}	Output Capacitance	V _{DS} =20V	—	524	—	pF
C _{rss}	Reverse Transfer Capacitance	f=1MHz	—	16	—	pF
Q _g	Total Gate Charge	V _{GS} =0 to 10V	—	17	—	nC
Q _{gs}	Gate Source Charge	V _{DS} =20V	—	5	—	nC
Q _{gd}	Gate Drain Charge	I _D =20A	—	2	—	nC

8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
t _{d(on)}	Turn on Delay Time	V _{GS} =10V V _{DD} =20V I _D =30A R _Θ =6Ω	—	6.5	—	ns
t _r	Turn on Rise Time		—	56	—	ns
t _{d(off)}	Turn Off Delay Time		—	26	—	ns
t _f	Turn Off Fall Time		—	84	—	ns

9. Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V _{SD}	Drain-Source Diode Forward Voltage	I _S =10A, V _{GS} =0V	—	0.8	—	V
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A	—	25	—	ns
Q _{rr}	Body Diode Reverse Recovery Charge	di/dt=100A/μs	—	9.6	—	nC

10. Test Circuits And Waveforms

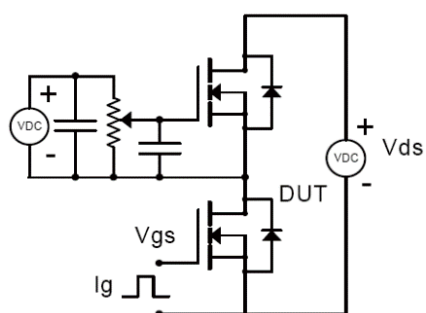


Figure 1. Gate charge test circuit & waveform

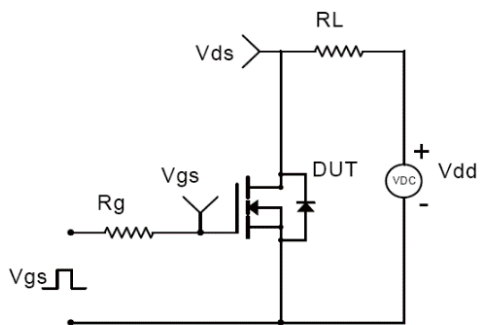
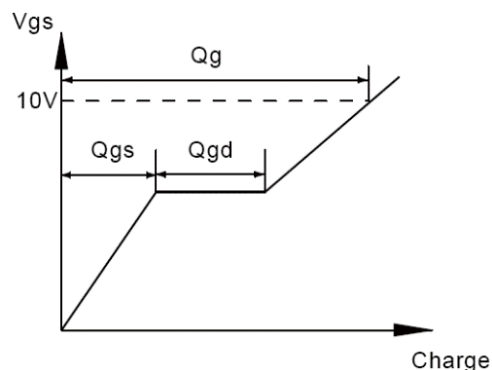


Figure 2. Switching time test circuit & waveforms

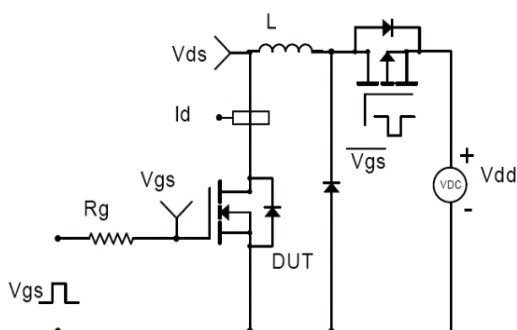
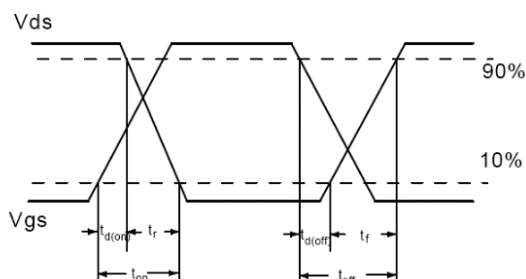


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

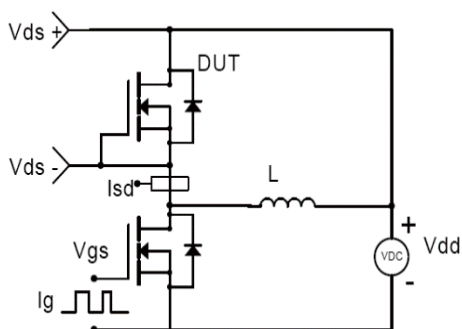
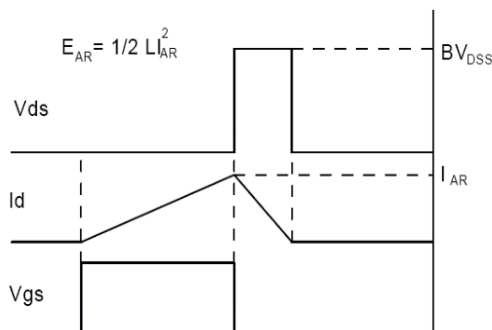
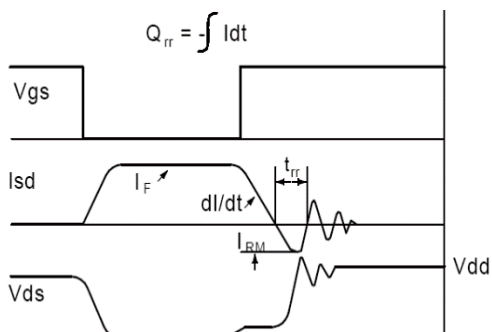


Figure 4. Diode reverse recovery test circuit & waveforms



11. Electrical Characteristics Diagrams

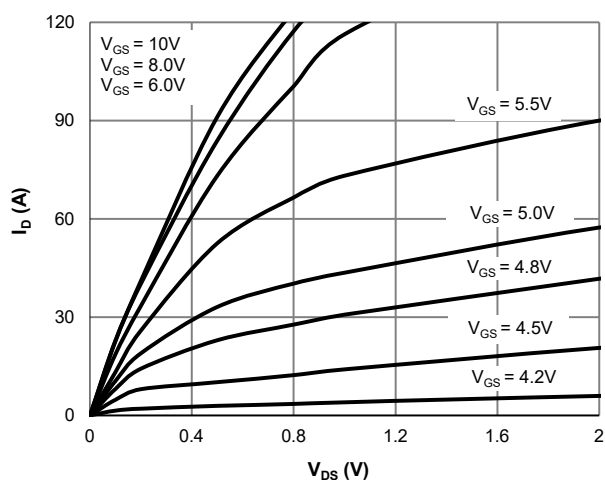


Figure 1. Typ. output characteristics

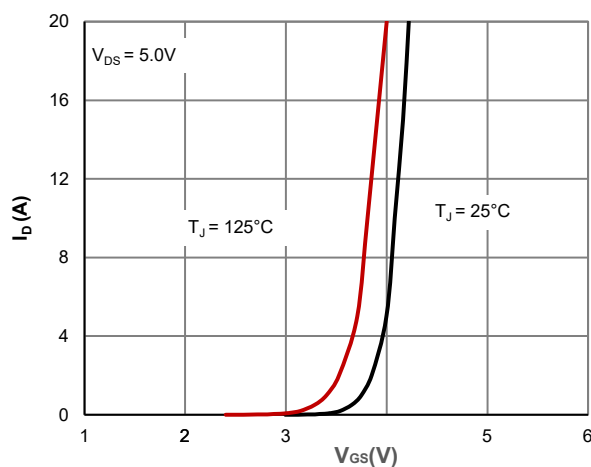


Figure 2. Typ. transfer characteristics

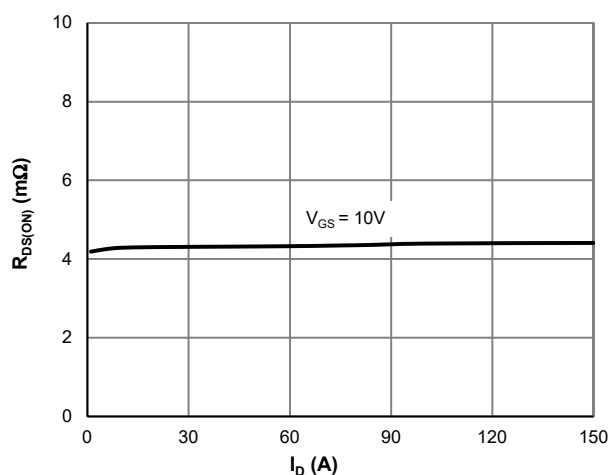


Figure 3. On-Resistance vs. Drain Current

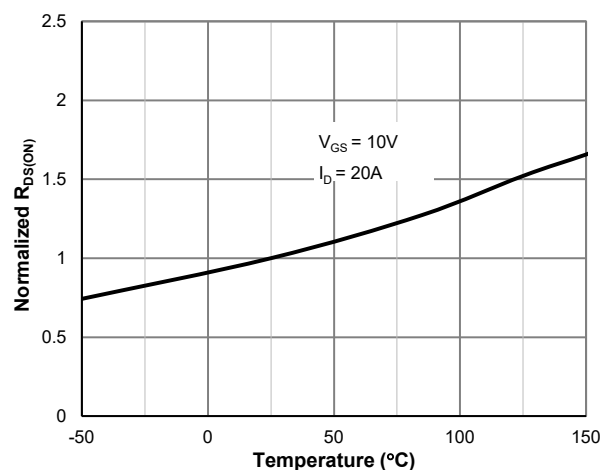


Figure 4. $R_{DS(on)}$ vs. Junction Temperature

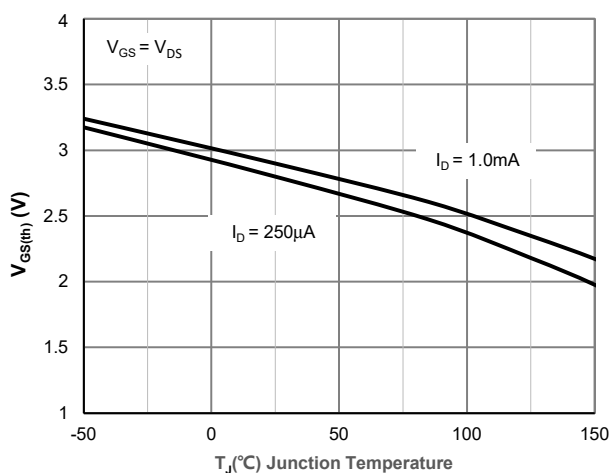


Figure 5. Normalized Breakdown Voltage vs. Junction Temperature

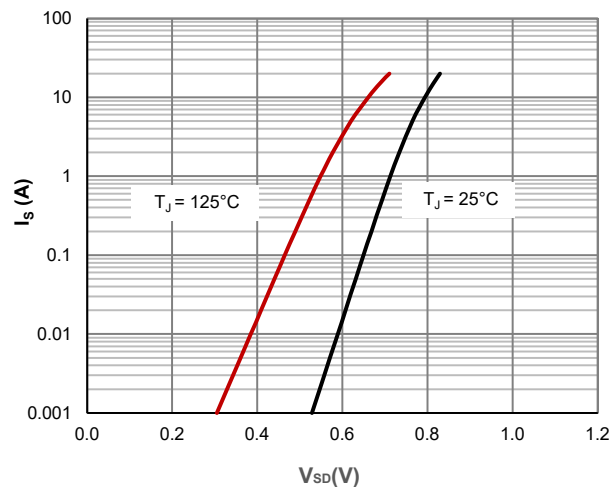


Figure 6. Forward characteristic of body diode

40V N-Channel Enhancement Mode MOSFET

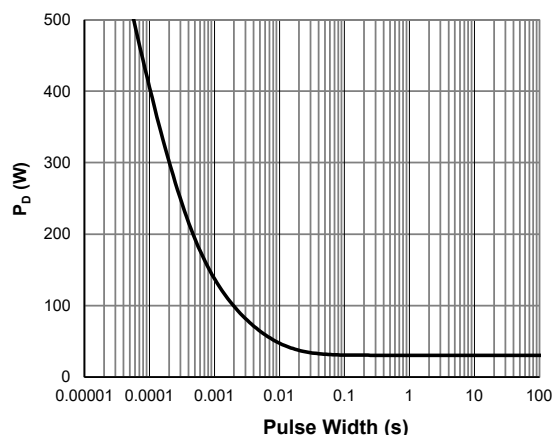


Figure 7. Single Pulse Power Rating

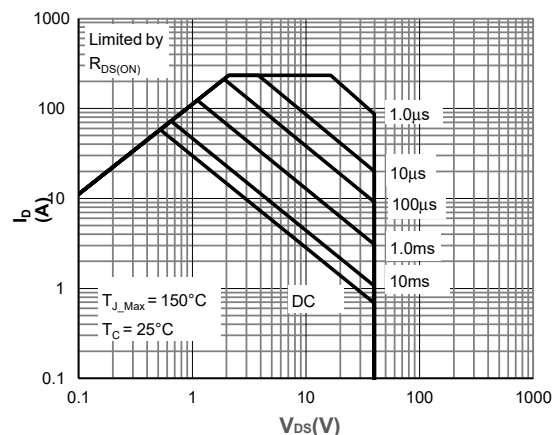
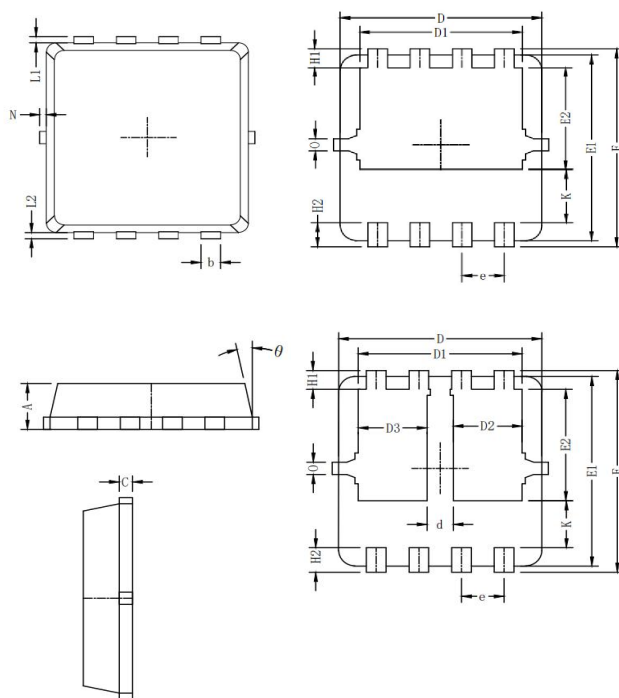


Figure 8. Maximum Safe Operating Area

12. Outline Drawing

PDFN3*3-8L Package Outline Dimensions



Symbol	mm		
	Min	Nom	Max
A	0.700	0.800	0.900
b	0.250	0.325	0.400
C	0.150	0.200	0.250
D	3.050	3.150	3.250
D1	2.400	2.500	2.600
D2/D3	1.000	1.050	1.100
d	0.300	0.400	0.500
E	3.200	3.300	3.400
E1	2.900	3.000	3.100
E2	1.720	1.820	1.920
e	0.65 BSC.		
H1	0.315	0.415	0.515
H2	0.300	0.400	0.500
K	0.670	0.770	0.870
L1/L2	0.100	0.150	0.200
θ	11°	12°	13°
N	0.000	-	0.150
O	0.2 REF.		

13. Important Notice and Disclaimer

Microdiode Electronics (Shenzhen) reserves the right to make changes to this document and its products and specifications at any time without notice. Customers should obtain and confirm the latest product information and specifications before final design, purchase or use.

Microdiode Electronics (Shenzhen) makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Microdiode Electronics (Shenzhen) assume any liability for application assistance or customer product design. Microdiode Electronics (Shenzhen) does not warrant or accept any liability with products which are purchased or used for any unintended or unauthorized application.

No license is granted by implication or otherwise under any intellectual property rights of Microdiode Electronics (Shenzhen).

Microdiode Electronics (Shenzhen) products are not authorized for use as critical components in life support devices or systems without express written approval of Microdiode Electronics (Shenzhen).