

MDD4438

60V N-Channel Enhancement Mode MOSFET

1. Description

This N-Channel MOSFET is based on MDD's unique device design to achieve low $R_{DS(ON)}$, fast switching performance. The low V_{th} series is specially designed to use in synchronous rectification power systems with low driving voltage.

2. Features

- LOW $R_{DS(ON)}$
- Extremely low switching loss
- Excellent reliability and uniformity
- Fast switching and soft recovery

3. Application

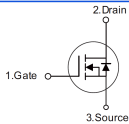
- Battery protection
- Power management
- Switched mode power supply

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Note 1)	I_D	8.2	A
Pulsed Drain Current (Note 2)	I_{DM}	40	A
Thermal Resistance, $t < 10\text{s}$	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, steady-state	$R_{\theta JA}$	75	$^{\circ}\text{C}/\text{W}$
Power Dissipation	P_D	3.1	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.

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
4	G	Gate			Q4438	SOP-8
5-8	D	Drain				
1,2,3	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		$V_{GS}=0V, I_D=250\mu A$	60	—	—	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		$V_{DS}=60V, V_{GS}=0V$	—	—	1	μA
$V_{GS(TH)}$	Gate Threshold Voltage		$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance		$V_{GS}=10V, I_D=8.2A$	—	16	20	m Ω
	Drain-Source On-State Resistance		$V_{GS}=4.5V, I_D=7.6A$	—	18	28	m Ω

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	$V_{GS}=0V$	—	2000	—	pF
C _{oss}	Output Capacitance	$V_{DS}=30V$	—	140	—	pF
C _{rss}	Reverse Transfer Capacitance	$f=1MHz$	—	116	—	pF
Q _g	Total Gate Charge	$V_{GS}=10V$	—	50	—	nC
Q _{gs}	Gate Source Charge	$V_{DS}=30V$	—	7	—	nC
Q _{gd}	Gate Drain Charge	$I_D=10A$	—	14	—	nC

8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
t _{d(on)}	Turn on Delay Time	$V_{GS}=10V$ $V_{DD}=30V$ $I_D=2A$ $R_G=3\Omega$	—	10	—	ns
t _r	Turn on Rise Time		—	21	—	ns
t _{d(off)}	Turn Off Delay Time		—	35	—	ns
t _f	Turn Off Fall Time		—	18	—	ns

9. Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V _{SD}	Drain-Source Diode Forward Voltage	$I_S=8.2A, V_{GS}=0V$	—	0.8	—	V
t _{rr}	Body Diode Reverse Recovery Time	$I_F=20A$	—	22	—	ns
Q _{rr}	Body Diode Reverse Recovery Charge	$di/dt=500A/\mu s$	—	12	—	nC

10. Test Circuits And Waveforms

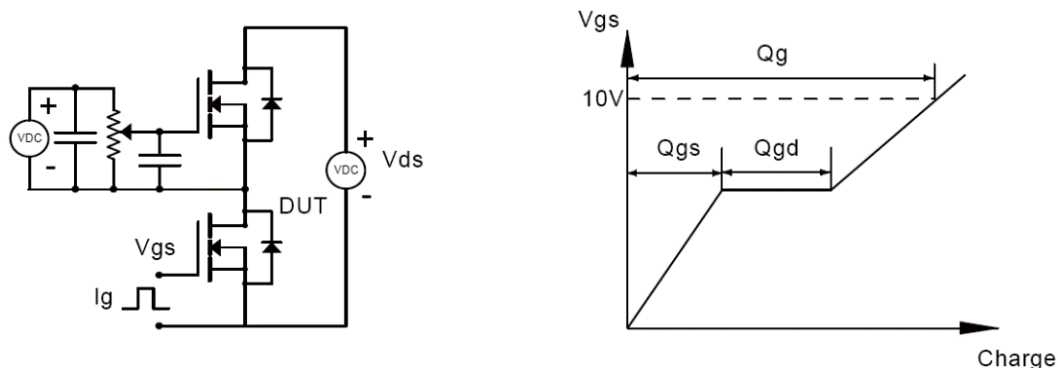


Figure 1. Gate charge test circuit & waveform

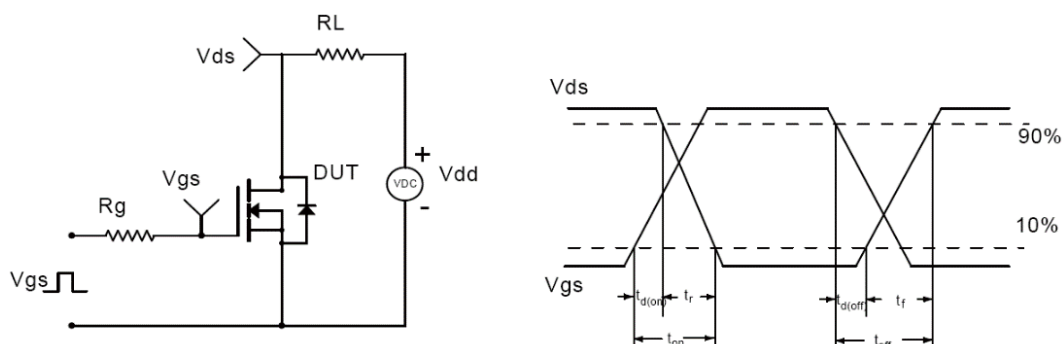


Figure 2. Switching time test circuit & waveforms

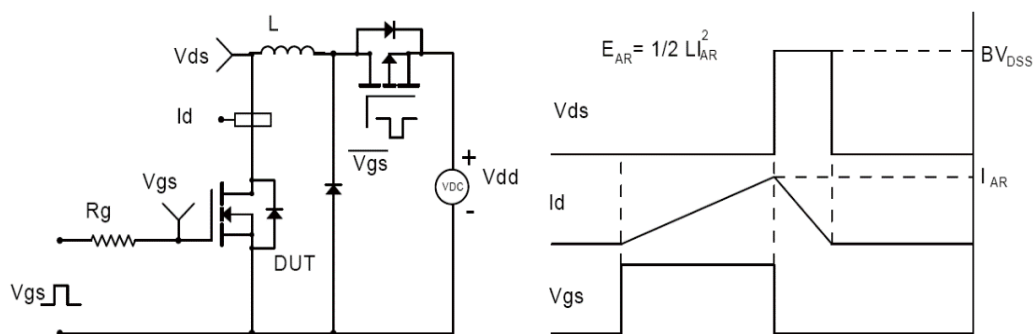


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

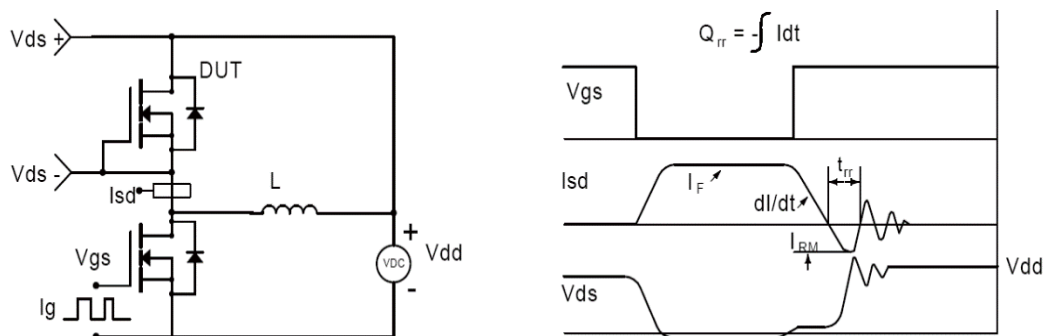


Figure 4. Diode reverse recovery test circuit & waveforms

11. Electrical Characteristics Diagrams

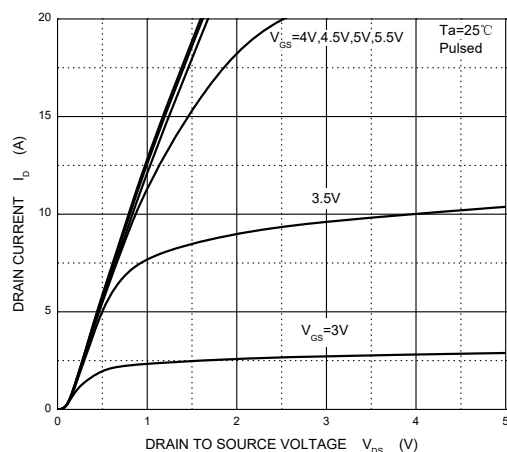


Figure 1. Typ. output characteristics

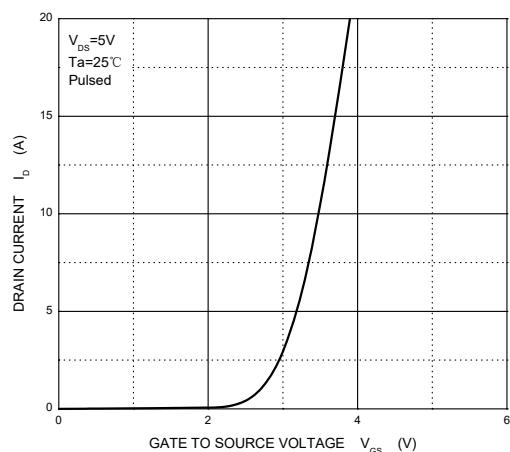


Figure 2. Typ. transfer characteristics

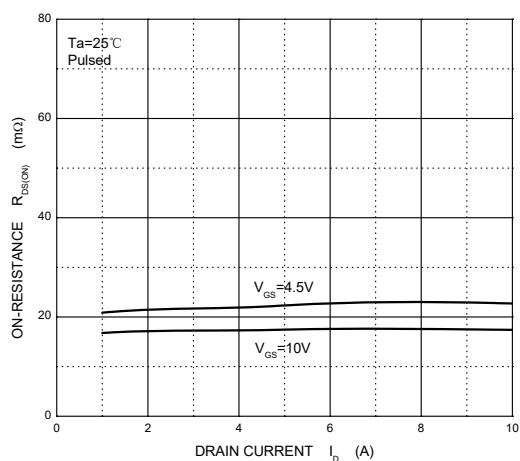


Figure 3. On-Resistance vs. Drain Current

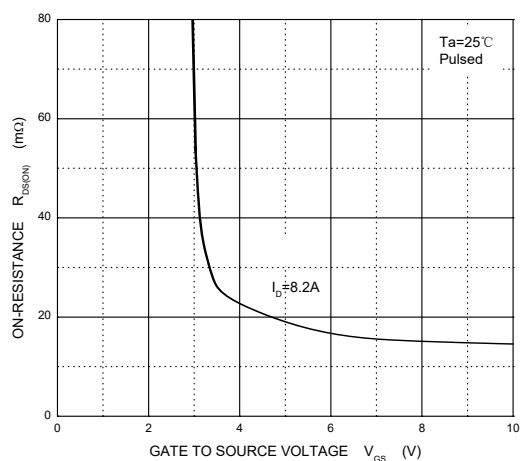


Figure 4. On-Resistance vs. Gate Voltage

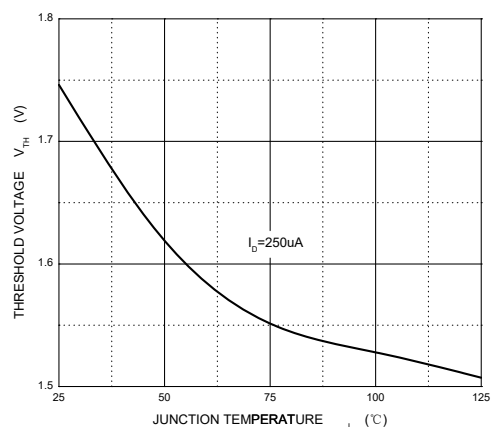


Figure 5. Typ. Threshold Voltage characteristics

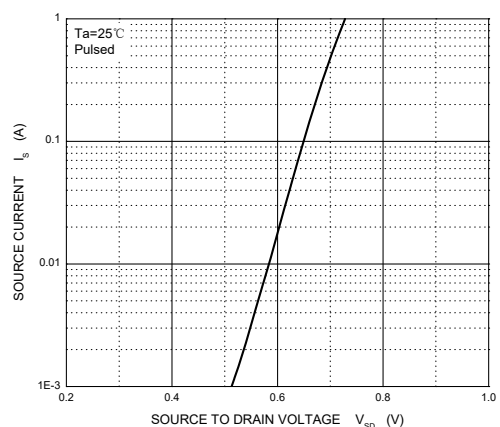
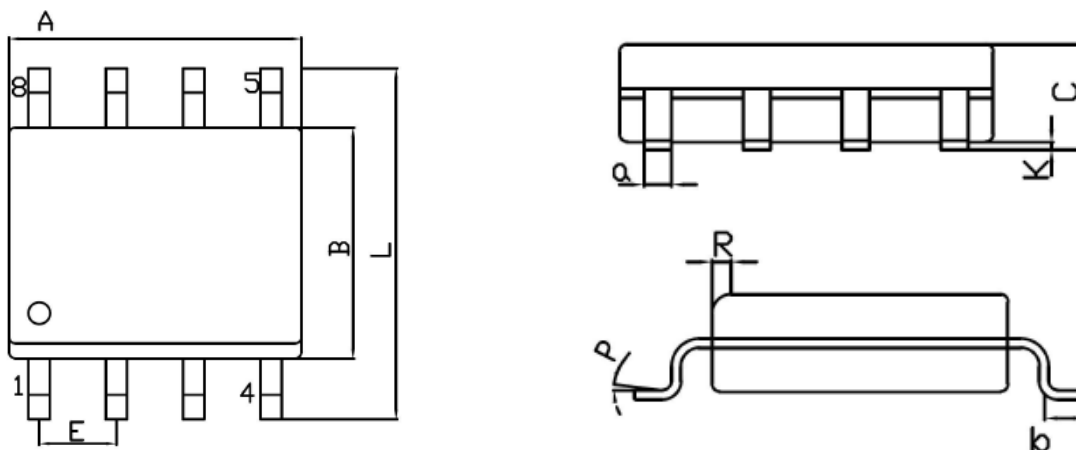


Figure 6. Forward characteristic of body diode

12. Outline Drawing

SOP-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	4.70	5.10	C	1.35	1.75
B	3.70	4.10	a	0.35	0.49
L	5.80	6.20	R	0.30	0.60
E	1.27BSC		P	0°	7°
K	0.10	0.22	b	0.40	1.25

13. Important Notice and Disclaimer

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