

MDD60N02D

20V N-Channel Enhancement Mode POWER MOSFET

1. Description

This N-Channel MOSFET is produced using MDD's advanced Power Trench 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 $R_{DS(on)}$ = 5.5m Ω at V_{GS} = 4.5 V, I_D = 20 A
- Extremely Low Reverse Recovery Charge, Q_g
- 100% UIS Tested
- RoHS Compliant

3. Application

- Power Management in Telecom., Industrial Automation
- Motor Drives and Uninterruptible Power Supplies
- Current Switching in DC/DC&AC/DC(SR) Sub-systems

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 10	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}	52.56	mJ
Thermal Resistance, steady-state	$R_{\theta JA}$	35	$^\circ\text{C}/\text{W}$
Power Dissipation	P_D	26	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 : $T_J=25^\circ\text{C}$, $V_{DD}=15\text{V}$, $V_{GS}=10\text{V}$, $L=0.5\text{mH}$, $R_g=25\Omega$, $I_{AS}=14.5\text{A}$.

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
1	G	Gate			MDD 60N02D XX: Date code	TO-252
2	D	Drain				
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	$V_{GS}=0V, I_D=250\mu A$	20	—	—	V	
I_{GSS}	Gate-Source Leakage Current	Forward	$V_{GS}=20V$	—	—	100	nA
		Reverse	$V_{GS}=-20V$	—	—	-100	nA
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V$	—	—	1	μA	
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.45	0.65	1	V	
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=4.5V, I_D=20A$	—	4.9	5.5	$m\Omega$	
		$V_{GS}=2.5V, I_D=10A$	—	6.7	8.5	$m\Omega$	

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS}=0V$ $V_{DS}=10V$ $f=1MHz$	—	1500	—	pF
C_{oss}	Output Capacitance		—	207	—	pF
C_{rss}	Reverse Transfer Capacitance		—	200	—	pF
Q_g	Total Gate Charge	$V_{GS}=0$ to 4.5V $V_{DS}=10V$ $I_D=20A$	—	28	—	nC
Q_{gs}	Gate Source Charge		—	4.1	—	nC
Q_{gd}	Gate Drain Charge		—	7	—	nC

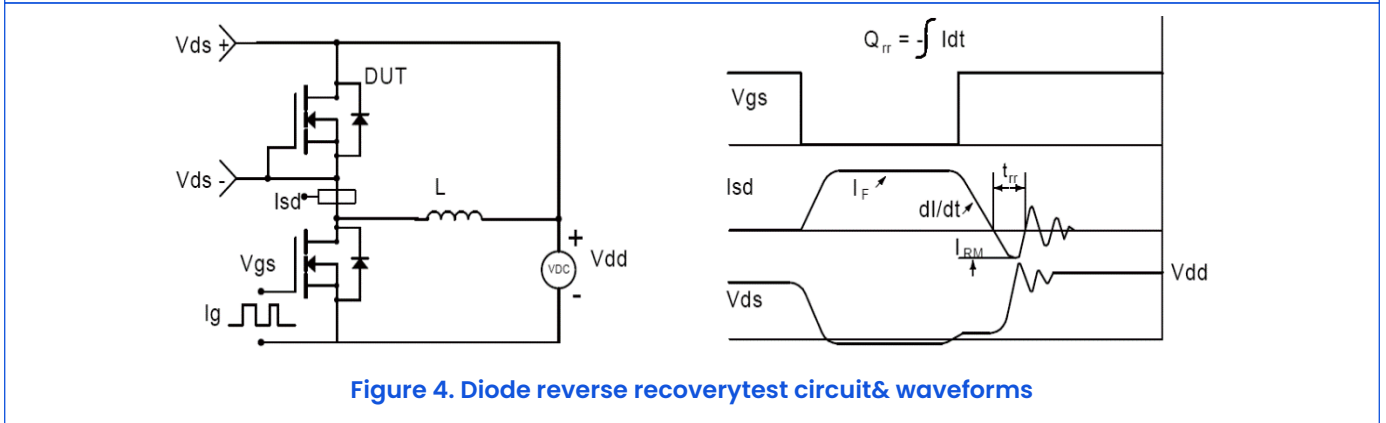
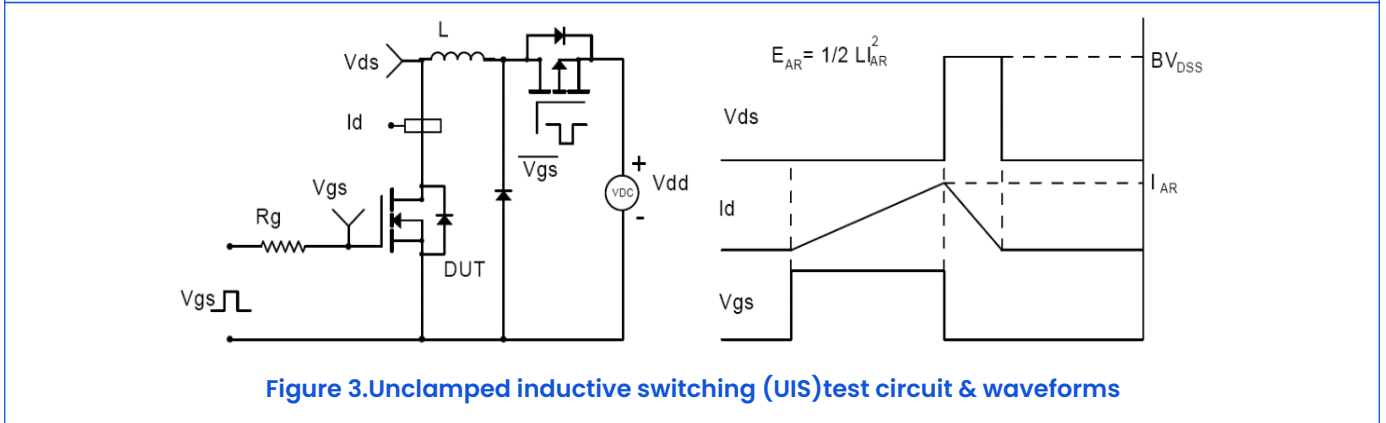
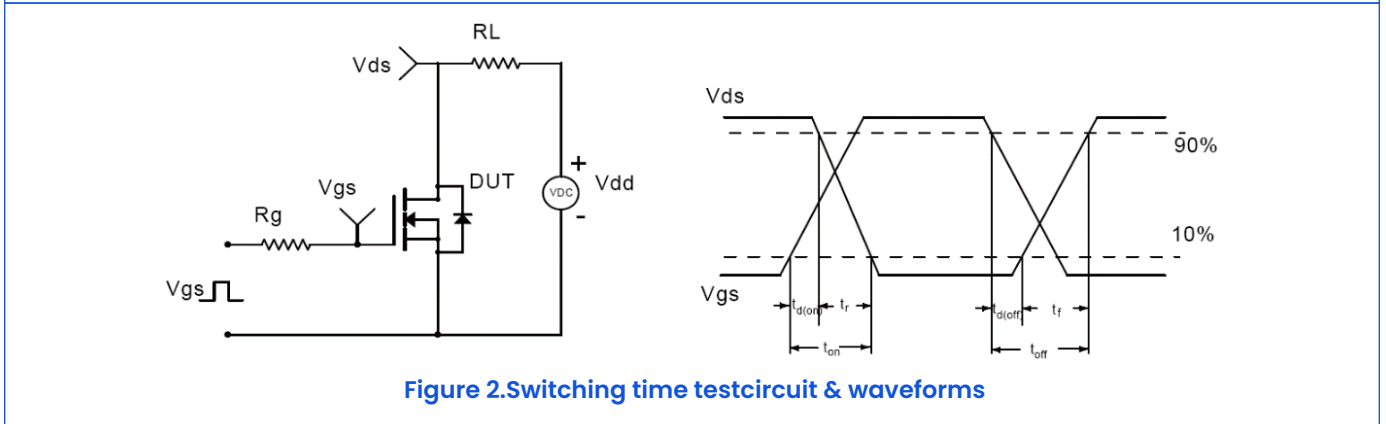
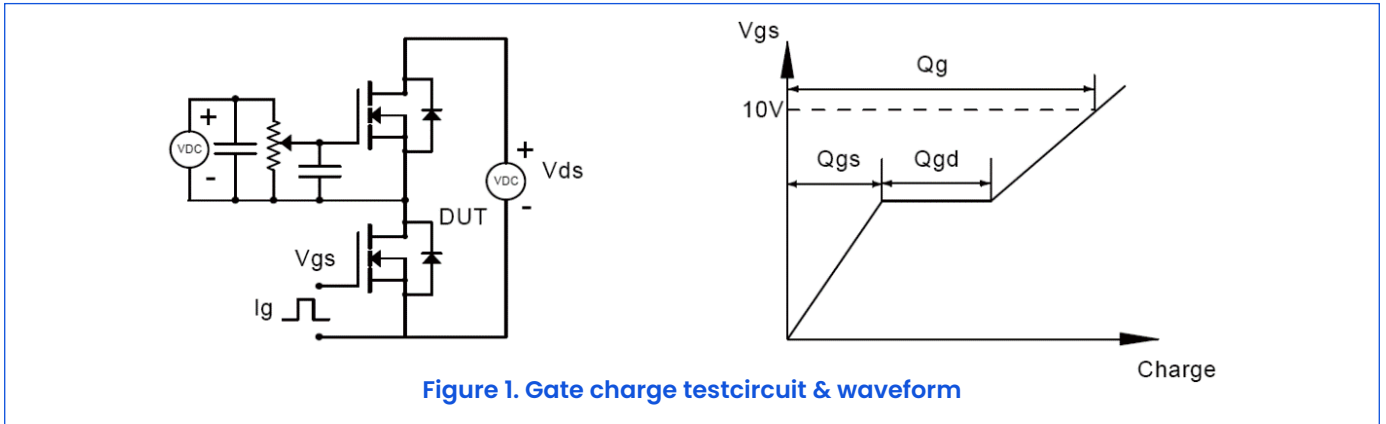
8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{d(on)}$	Turn on Delay Time	$V_{GS}=4.5V$ $V_{DD}=10V$ $I_D=10A$ $R_G=3\Omega$	—	13	—	ns
t_r	Turn on Rise Time		—	56	—	ns
$t_{d(off)}$	Turn Off Delay Time		—	60	—	ns
t_f	Turn Off Fall Time		—	75	—	ns

9. Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{SD}	Drain-Source Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	—	0.8	1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20A$ $di/dt=100A/\mu s$	—	33	—	ns
Q_{rr}	Body Diode Reverse Recovery Charge		—	28	—	nC

10. Test Circuits And Waveforms



II. Electrical Characteristics Diagrams

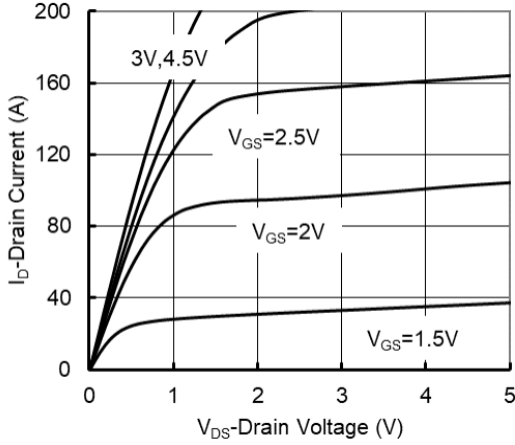


Figure 1. Typ. output characteristics

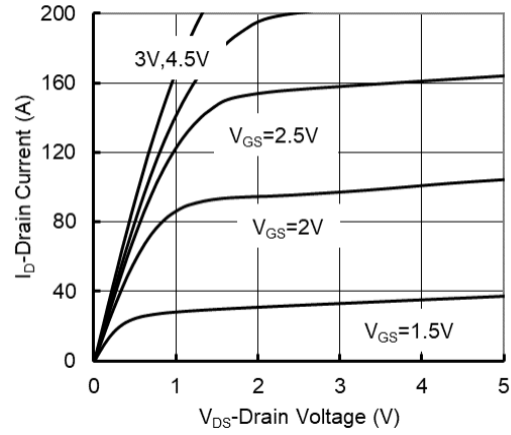


Figure 2. Typ. transfer characteristics

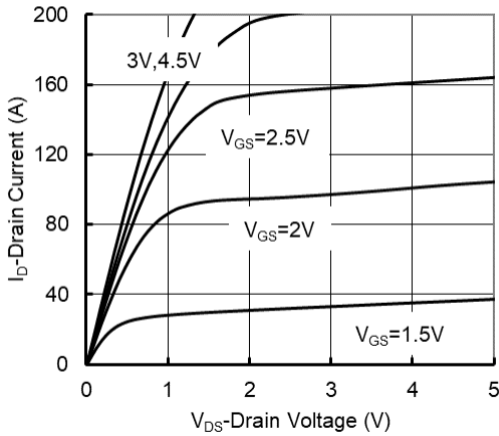


Figure 3. On-Resistance vs. Drain Current

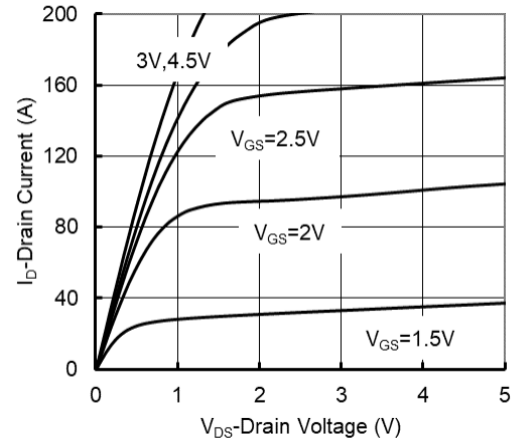


Figure 4. Gate Charge Characteristics

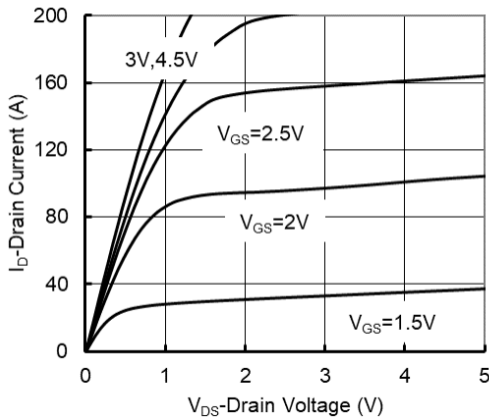


Figure 5. Normalized on Resistance vs. Junction Temperature

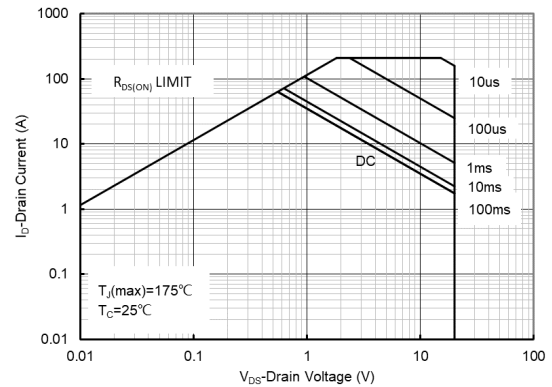
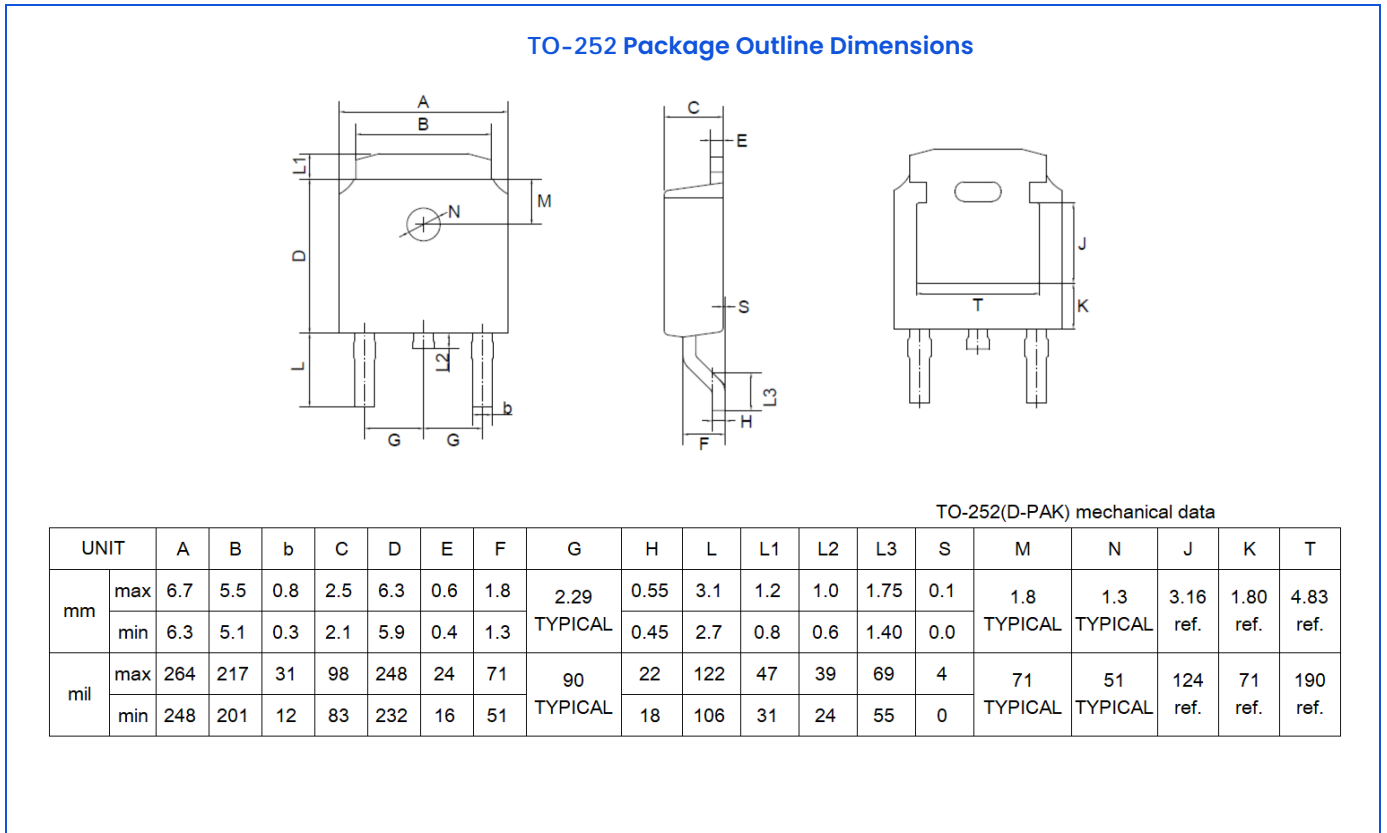


Figure 6. Safe Operation Area

12. Outline Drawing



13. Important Notice and Disclaimer

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