

MDD210N40P

40V N-Channel Enhancement Mode MOSFET

1. Description

This N-Channel MOSFET used advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

2. Features

- LOW $R_{DS(ON)}$: $V_{GS}=10V$ typ=1.5m Ω
- Extremely low switching loss
- Excellent reliability and uniformity
- Good stability and uniformity with high E_{AS}

3. Application

- Battery protection
- Power management
- Switched mode power supply

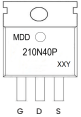
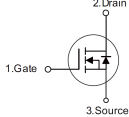
4. Absolute Maximum Ratings ($T_A=25^{\circ}C$ unless otherwise noted)

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	210	A
Pulsed Drain Current (Note 2)	I_{DM}	840	A
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.8	$^{\circ}C/W$
Power Dissipation	P_D	310	W
Junction Temperature	T_J	-55~+150	$^{\circ}C$
Storage Temperature	T_{stg}	-55~+150	$^{\circ}C$

Note: 1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating, pulse width limited by max. junction temperature.

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5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
1	G	Gate			MDD 210N40P	TO-220C-3L
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		$V_{GS}=0V, I_D=250\mu A$	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		$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.65	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance		$V_{GS}=10V, I_D=30A$	—	1.5	2.5	m Ω
	Drain-Source On-State Resistance		$V_{GS}=4.5V, I_D=20A$	—	1.8	2.7	m Ω

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	$V_{GS}=0V$	—	12300	—	pF
C _{oss}	Output Capacitance	$V_{DS}=20V$	—	770	—	pF
C _{rss}	Reverse Transfer Capacitance	$f=1MHz$	—	580	—	pF
Q _g	Total Gate Charge	$V_{GS}=10V$	—	190	—	nC
Q _{gs}	Gate Source Charge	$V_{DS}=20V$	—	35.5	—	nC
Q _{gd}	Gate Drain Charge	$I_D=20A$	—	42	—	nC

8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
t _{d(on)}	Turn on Delay Time	$V_{GS}=10V$ $V_{DD}=30V$ $R_L=15\Omega$ $R_G=2.5\Omega$	—	15	—	ns
t _r	Turn on Rise Time		—	38	—	ns
t _{d(off)}	Turn Off Delay Time		—	100	—	ns
t _f	Turn Off Fall Time		—	30	—	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	—	V
t _{rr}	Body Diode Reverse Recovery Time	$I_F=20A$	—	50	—	ns
Q _{rr}	Body Diode Reverse Recovery Charge	$di/dt=100A/\mu s$	—	90	—	nC

10. Test Circuits And Waveforms

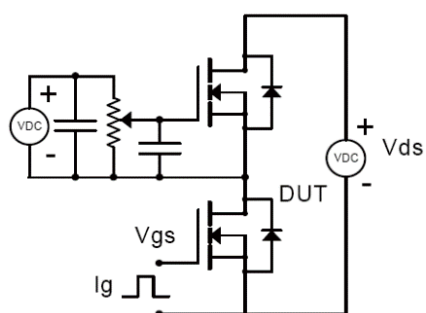


Figure 1. Gate charge test circuit & waveform

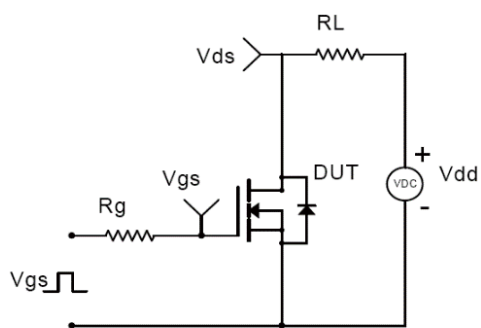
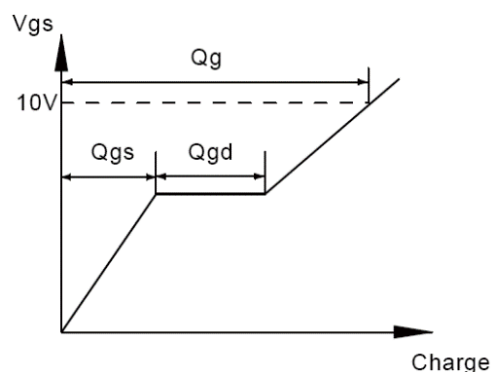


Figure 2. Switching time test circuit & waveforms

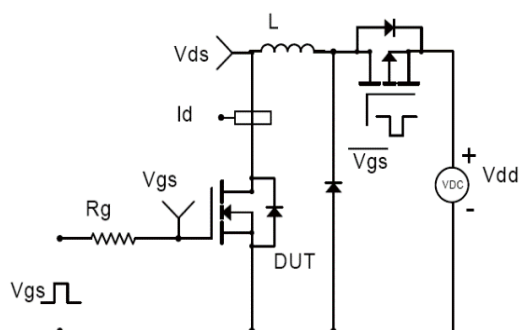
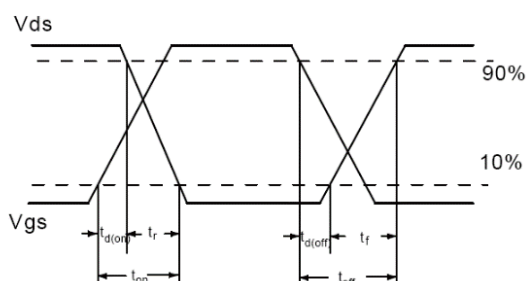


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

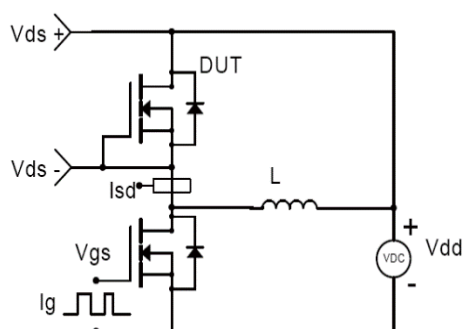
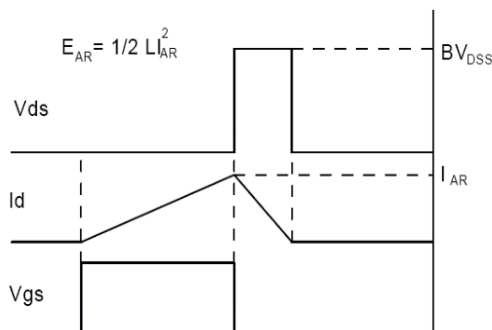
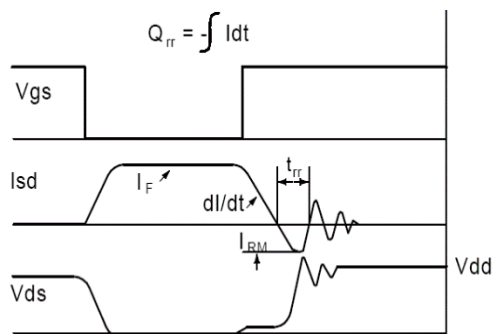


Figure 4. Diode reverse recovery test circuit & waveforms



II. Electrical Characteristics Diagrams

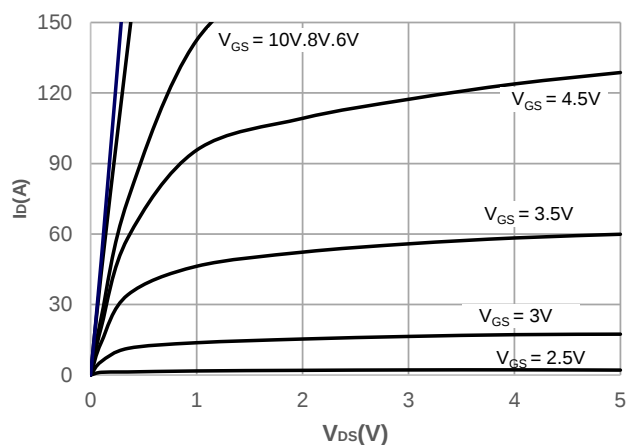


Figure 1. Typ. output characteristics

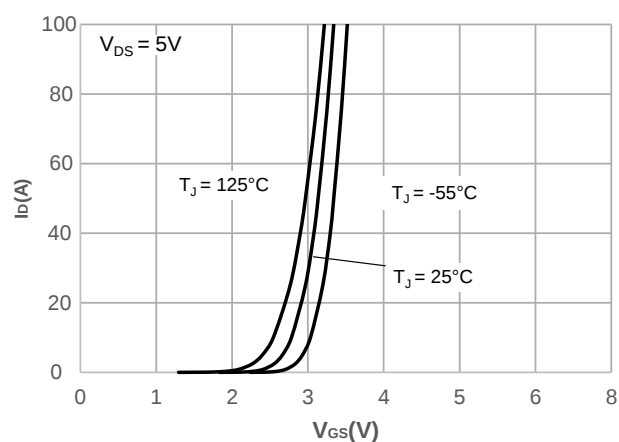


Figure 2. Typ. transfer characteristics

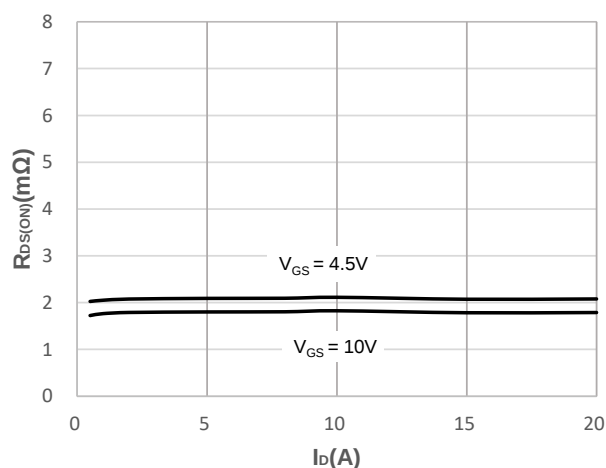


Figure 3. On-Resistance vs. Drain Current

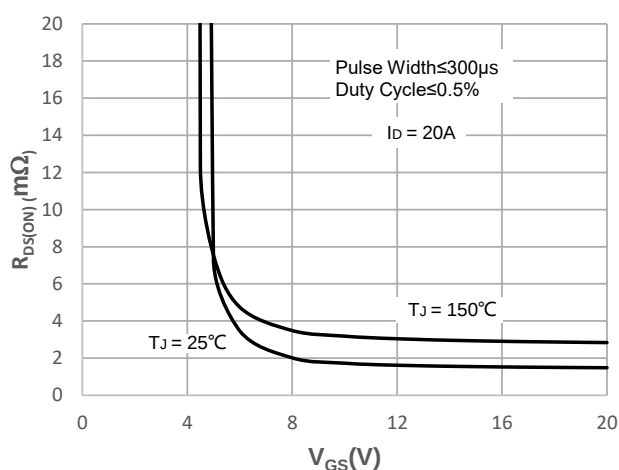


Figure 4. On-Resistance vs. Gate Voltage

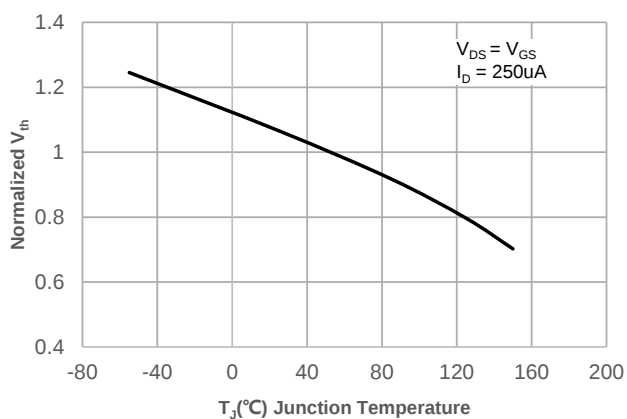


Figure 5. Normalized Threshold Voltage vs. Junction Temperature

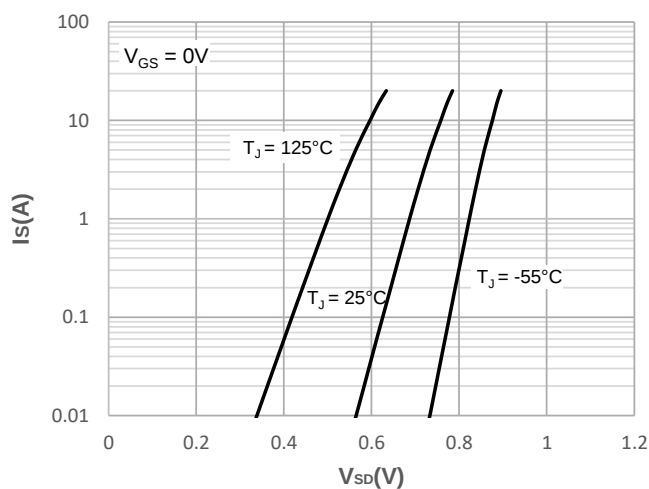
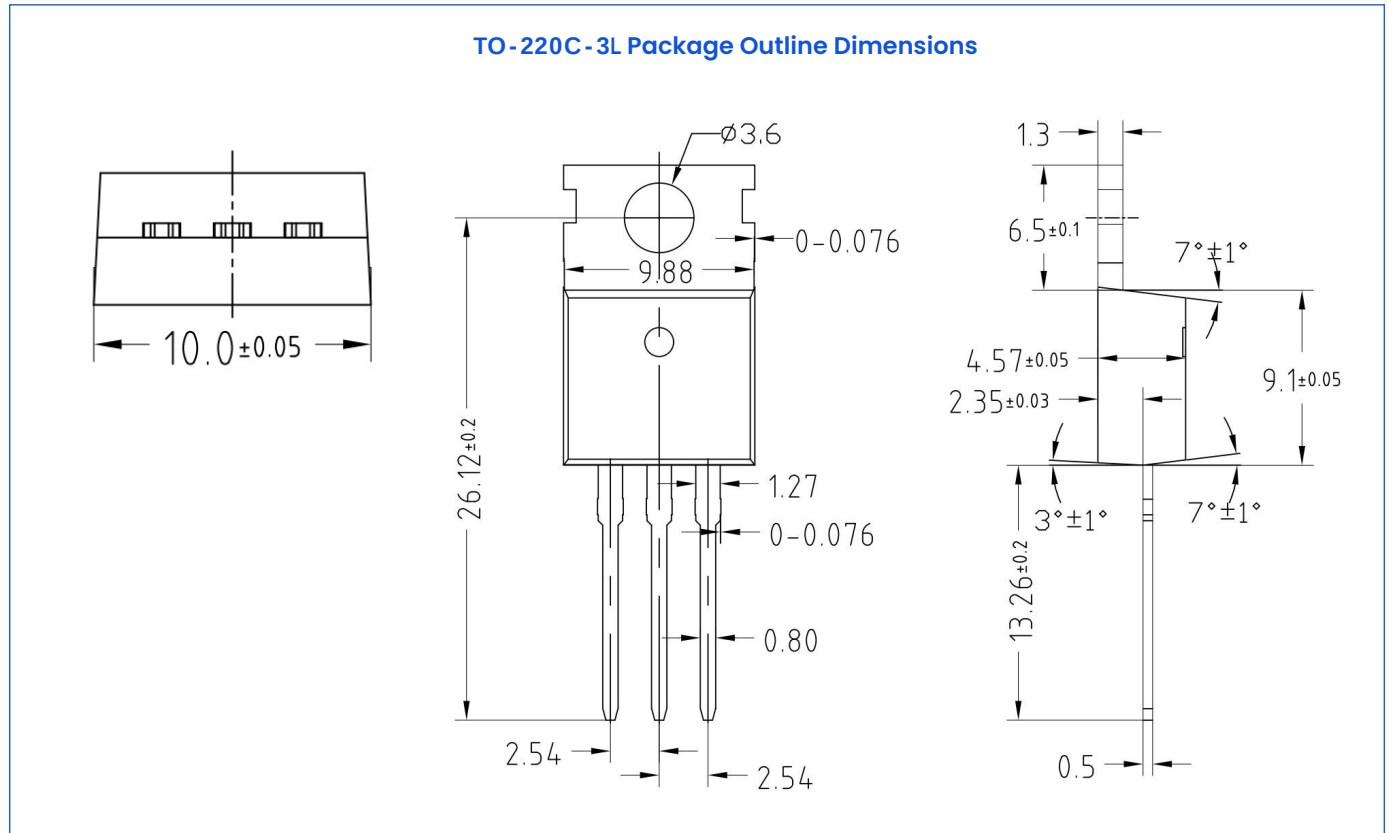


Figure 6. Forward characteristic of body diode

12. Outline Drawing



13. Important Notice and Disclaimer

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