

MDD50P02Q

20V P-Channel Enhancement Mode MOSFET

1. Description

This P-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 $R_{DS(on)}$ = 8.5m Ω at V_{GS} = -4.5 V, I_D = -12 A
- Extremely Low Reverse Recovery Charge, Q_g
- 100% UIS Tested
- 100% dVDS Tested

3. Application

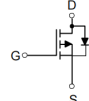
- Power Management in Telecom., Industrial Automation
- Motor Drives and Uninterruptible Power Supplies
- Current Switching in DC/DC&AC/DC(SR) Sub-systems

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}	± 12	V
Continuous Drain Current (Note 1)	I_D	-50	A
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	36	mJ
Thermal Resistance, steady-state	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$
Power Dissipation	P_D	60	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: $T_J=25^{\circ}\text{C}$, $V_{DD}=-20\text{V}$, $V_{GS}=-10\text{V}$, $L=0.5\text{mH}$, $R_g=25\Omega$, $I_{AS}=-12\text{A}$.

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
4	G	Gate			MDD 50P02Q XXY: Date code	PDFN3*3-8L
5-8	D	Drain				
1-3	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	$V_{GS}=\pm 12V$	—	—	± 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	-0.6	-0.95	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=-4.5V, I_D=-12A$	—	6.2	8.5	m Ω
		$V_{GS}=-2.5V, I_D=-10A$	—	8.0	10.5	m Ω

7. Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS}=0V$ $V_{DS}=-10V$ $f=1.0MHz$	—	3845	—	pF
C_{oss}	Output Capacitance		—	400	—	pF
C_{rss}	Reverse Transfer Capacitance		—	356	—	pF
Q_g	Total Gate Charge	$V_{GS}=-4V$ $V_{DS}=-10V$ $I_D=-15A$	—	50	—	nC
Q_{gs}	Gate Source Charge		—	8	—	nC
Q_{gd}	Gate Drain Charge		—	16	—	nC

8. Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{d(on)}$	Turn on Delay Time	$V_{GS}=-10V$ $V_{DD}=-20V$ $I_D=-10A$ $R_G=3\Omega$	—	7	—	ns
t_r	Turn on Rise Time		—	105	—	ns
$t_{d(off)}$	Turn Off Delay Time		—	135	—	ns
t_f	Turn Off Fall Time		—	175	—	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	$I_F=-10A$	—	19	—	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$di/dt=-100A/\mu s$	—	11	—	nC

10. Electrical Characteristics Diagrams

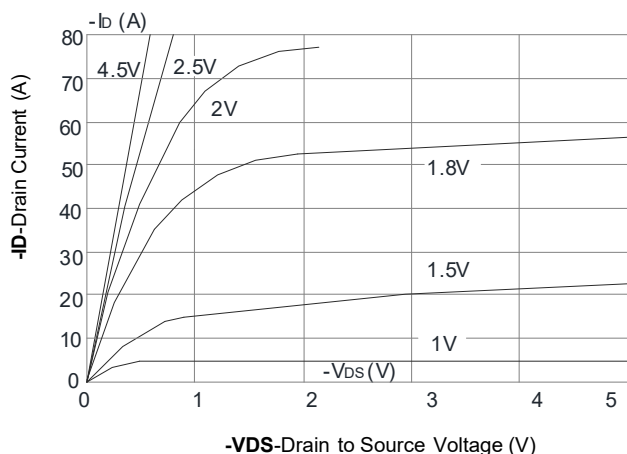


Figure 1. Typ. output characteristics

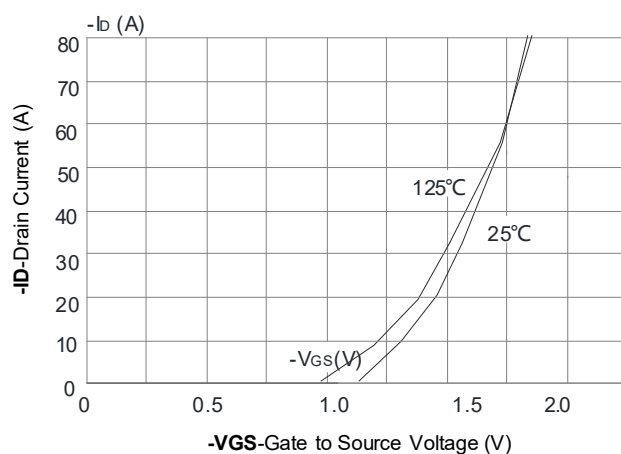


Figure 2. Typ. transfer characteristics

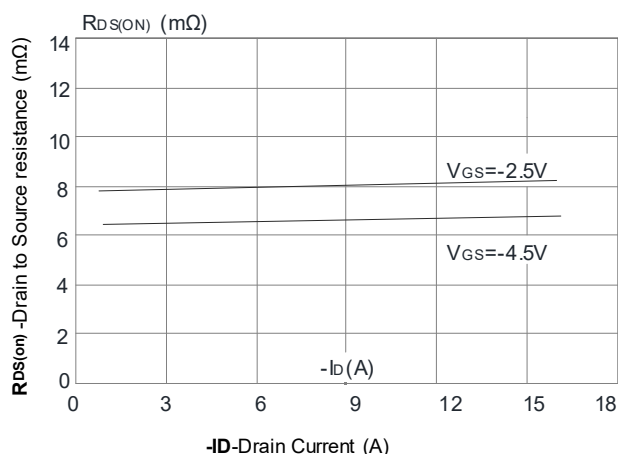


Figure 3. On-Resistance vs. Drain Current

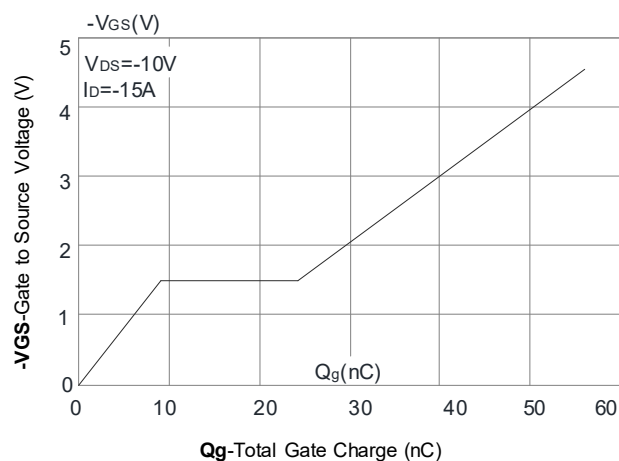


Figure 4. Gate Charge Characteristics

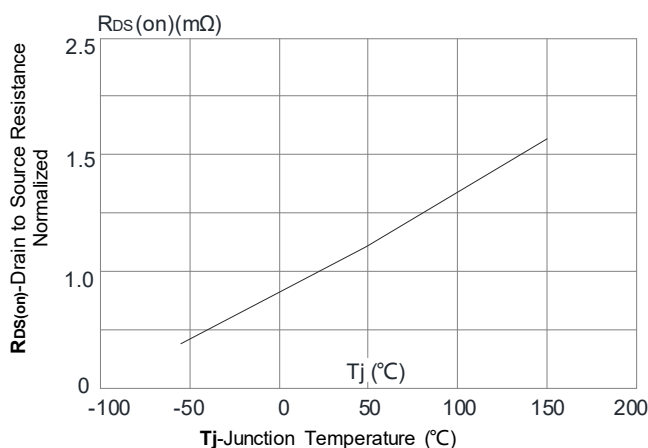


Figure 5. Normalized on Resistance vs. Junction Temperature

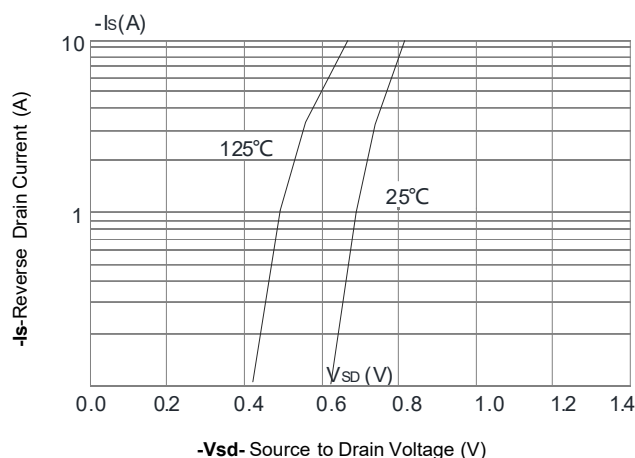
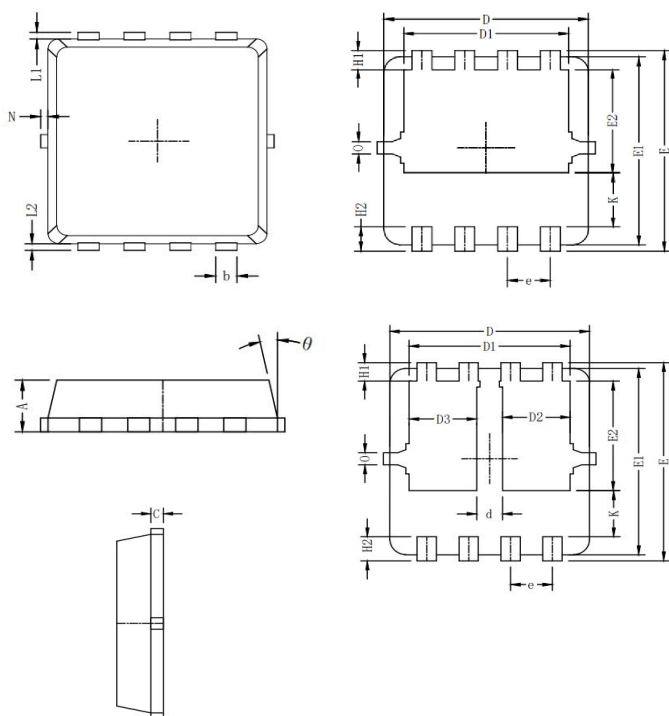


Figure 6. Forward characteristic of body diode

11. 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.		

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