MDU040N020PSVRH

Single N-channel Trench MOSFET 40V 2.07mΩ

FEATURES

- **Trench power MOSFET technology**
- **Single N-channel trench, normal gate level**
- **Enhanced avalanche ruggedness**
- **100% Avalanche tested**
- **Maximum 175°C junction temperature**



Top View

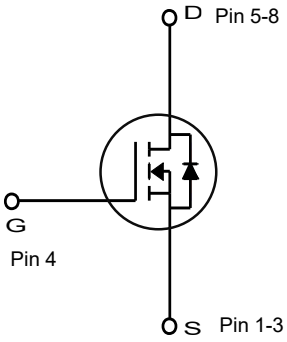
PDFN56



Bottom View

PRODUCT VALIDATION

- **Qualified according to JEDEC Standard**



KEY PERFORMANCE PARAMETERS

V_{DS}	**40**	V
$R_{DS(on),\ typ.}$	**0.00177**	Ω
I_D	**146**	A
Q_g	**29**	nC
Junction temperature, max	**175**	°C

RoHS Compliant
HALOGEN-FREE

ORDERING INFORMATION

Type / Ordering Code	Package	Marking	Packing	RoHS Status
MDU040N020PSVRH	PDFN56	040N020P	Tape & Reel	Halogen Free

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ABSOLUTE MAXIMUM RATINGS, at T_C = 25℃, unless otherwise specified

Parameter		Symbol	Rating	Unit
Drain-source Voltage		V_{DS}	40	V
Gate-source Voltage		V_{GS}	± 20	
Drain current	Tc=25°C	I_D	146	A
	Tc=100°C		103	
[1] Pulsed drain current	Tc=25°C, t_p ≤ 100 μs	I_{DM}	584	
Total power dissipation	Tc=25℃	P_{tot}	75	W
	Tc=100℃		38	
[2] Avalanche energy, single pulse		E_{AS}	122	mJ
Operating and storage temperature		T_j, T_{stg}	- 55 ~ 175	℃

THERMAL CHARACTERISTICS

Parameter	Symbol	Rating	Unit
Thermal resistance, junction - case	$R_{\theta JC}$	2	K/W
[3] Thermal resistance, junction - ambient	$R_{\theta JA}$	50	

ELECTRICAL CHARACTERISTICS (T_j = 25℃)

STATIC CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Drain-source breakdown voltage	$V_{(BR)DSS}$	40	-	-	V	V_{GS}=0 V, I_D=250 μA
Gate threshold voltage	$V_{GS(th)}$	2.25	-	3.75		V_{DS}=V_{GS}, I_D=171 μA
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	V_{DS}=40 V, V_{GS}=0 V
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	V_{GS}=±20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	1.77	2.07	mΩ	V_{GS}=10 V, I_D=50 A
		-	1.90	2.40		V_{GS}=8 V, I_D=50 A
[4] Gate resistance	R_g	-	2.3	-	Ω	f=1 MHz
[4] Transconductance	g_{fs}	-	90	-	S	V_{DS}=10 V, I_D=50 A

[4] DYNAMIC CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Input capacitance	C_{iss}	-	2201	-	pF	V_{GS}=0 V, V_{DS}=20 V, f=1 MHz
Output capacitance	C_{oss}	-	599	-		
Reverse transfer capacitance	C_{rss}	-	27	-		
Turn-on delay time	$t_{d(on)}$	-	20	-	ns	V_{DD}=20 V, V_{GS}=10 V, I_D=50 A, $R_{G,ext}$=3 Ω
Rise time	t_r	-	5	-		
Turn-off delay time	$t_{d(off)}$	-	35	-		
Fall time	t_f	-	10	-		

[4] GATE CHARGE CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Gate to source charge	Q_{gs}	-	10	-	nC	V_{DD}=20 V, I_D=50 A, V_{GS}=0 to 10 V
Gate charge at threshold	$Q_{gs(th)}$	-	6	-		
Gate to drain charge	Q_{gd}	-	5	-		
Switching charge	Q_{sw}	-	9	-		
Gate charge total	Q_g	-	29	-		
Gate plateau voltage	$V_{plateau}$	-	5.1	-	V	

SOURCE-DRAIN DIODE

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
[4] Diode continuous forward current	I_S	-	-	146	A	-
[4] Diode pulse current	$I_{S,pulse}$	-	-	582	A	pulsed; $t_p \leq$ 100 μs
Diode forward voltage	V_{SD}	-	0.8	1.1	V	V_{GS}=0 V, I_F=50 A
[4] Reverse recovery time	t_{rr}	-	32	-	ns	I_F=50 A, di_F/dt=100 A/μs
[4] Reverse recovery charge	Q_{rr}	-	11	-	nC	

Notes

1. Pulse width limited by T_{jmax}
2. Starting T_j=25°C, L=1mH, I_{AS}=15.6A, V_{DD}=36V, V_{GS}=10V
3. Surface mounted FR-4 board by JEDEC (jesd51-7)
4. The parameter is not subject to production testing - guaranteed by design.

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ELECTRICAL CHARACTERISTICS DIAGRAMS (25 ℃, unless otherwise noted)

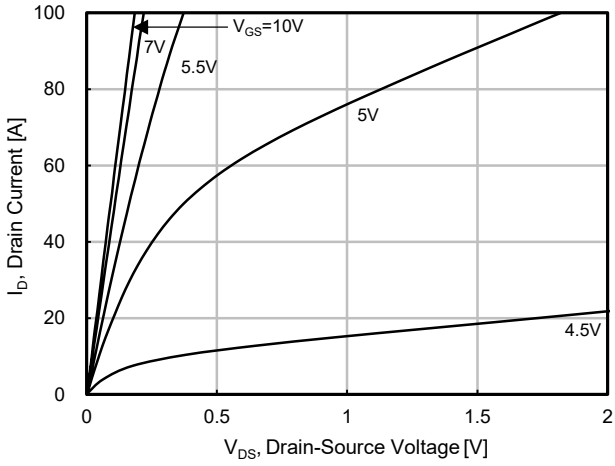


Fig. 1. Typ. Output Characteristics

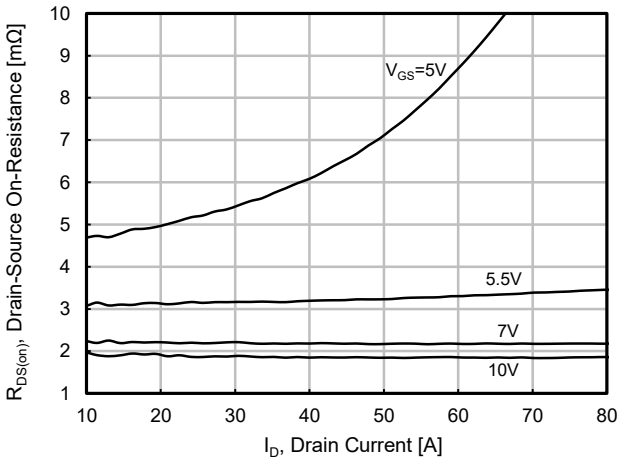


Fig. 2. Typ. Drain to Source On-Resistance

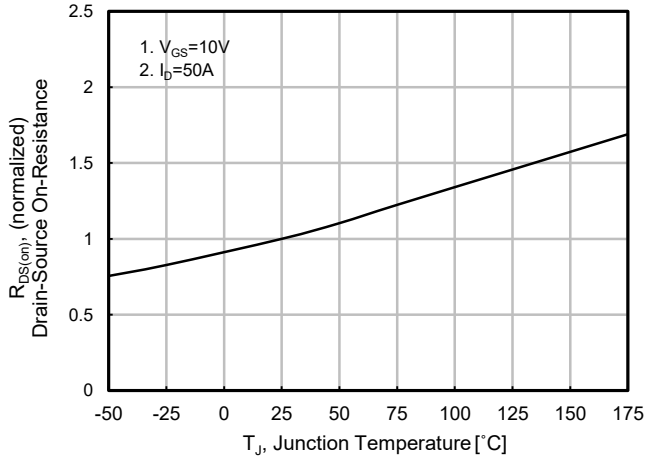


Fig. 3. On-Resistance vs. Junction Temperature

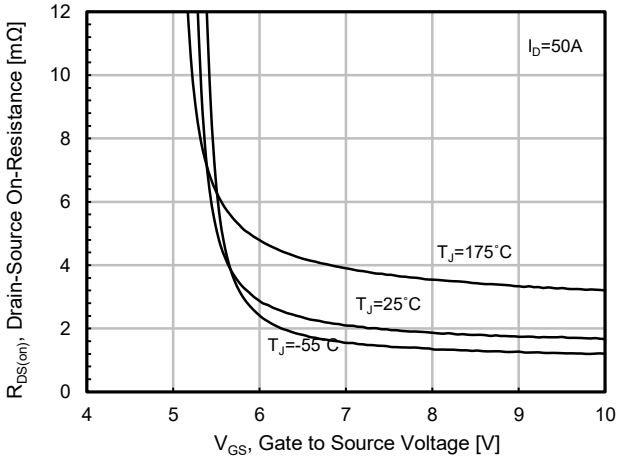


Fig. 4. On-Resistance vs. Gate to Source Voltage

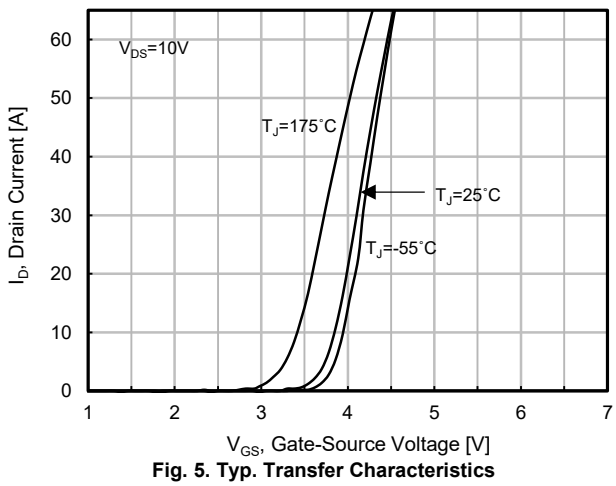


Fig. 5. Typ. Transfer Characteristics

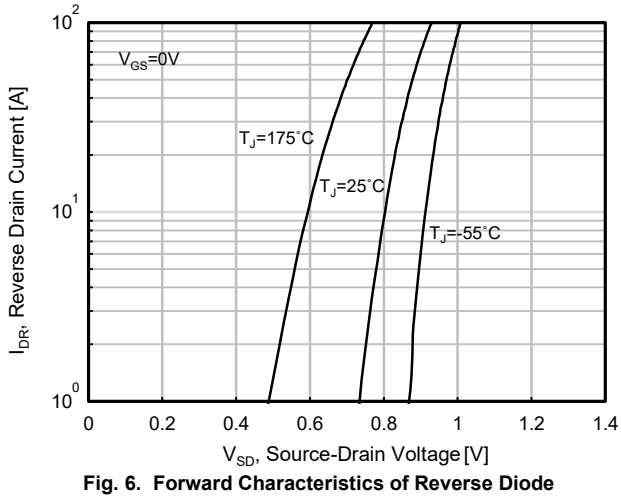


Fig. 6. Forward Characteristics of Reverse Diode

ELECTRICAL CHARACTERISTICS DIAGRAMS (25 ℃, unless otherwise noted)

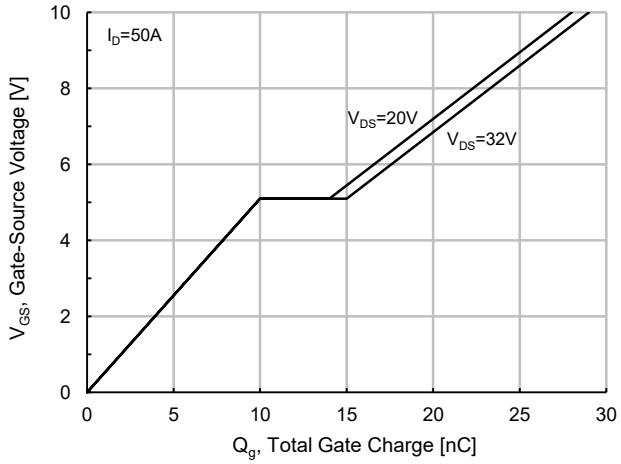


Fig. 7. Typ. Gate Charge

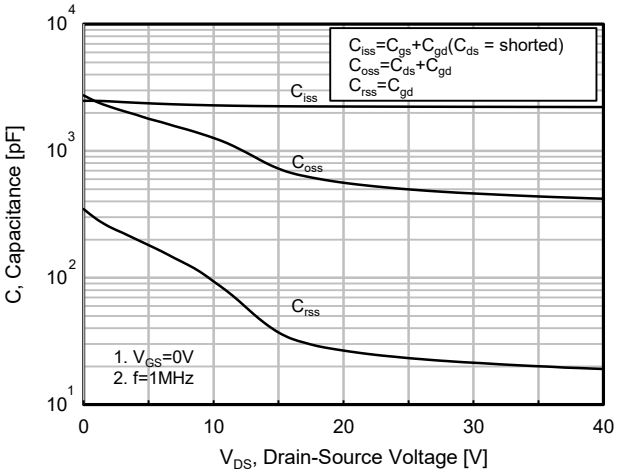


Fig. 8. Typ. Capacitances

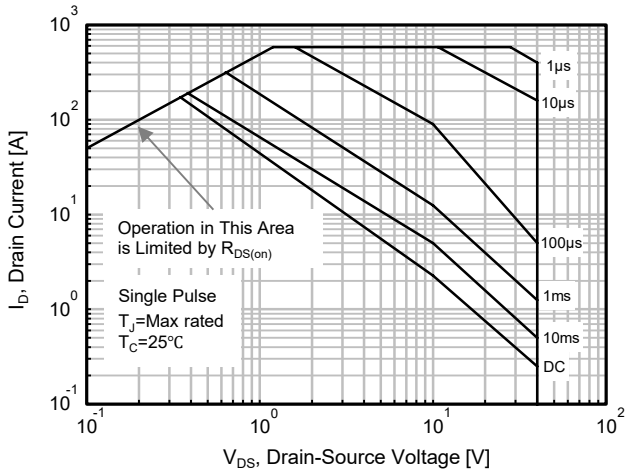


Fig. 9. Safe Operating Area

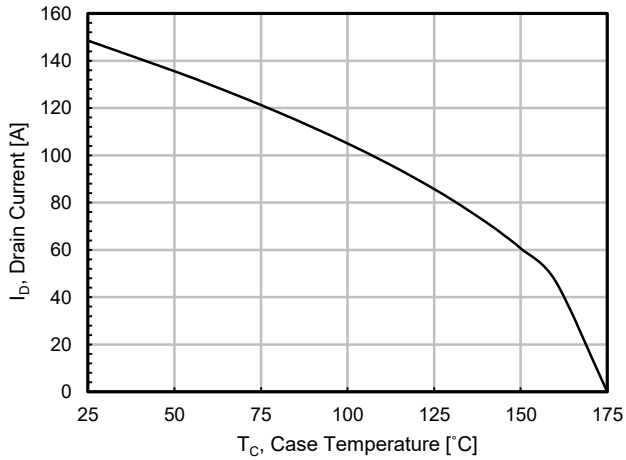


Fig. 10. Drain Current vs. Temperature

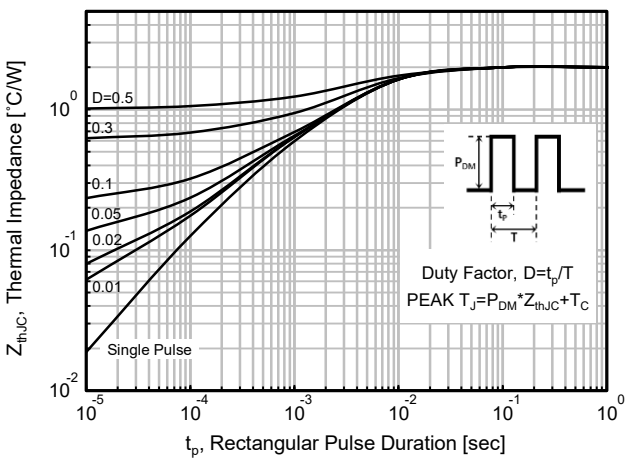


Fig. 11. Transient Thermal Impedance

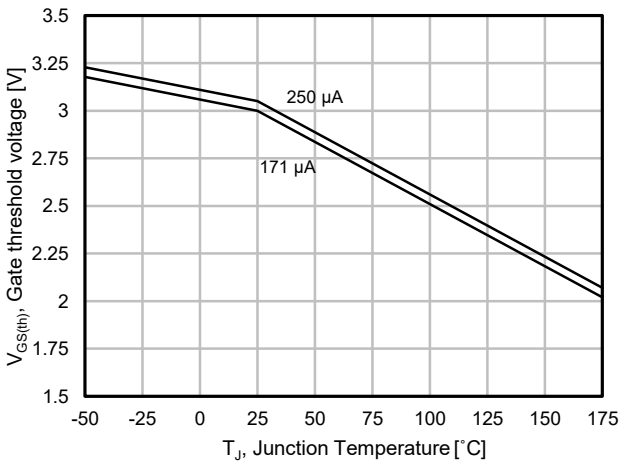


Fig. 12. $V_{GS(th)}$ Variation with Temperature (Normalized)

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ELECTRICAL CHARACTERISTICS DIAGRAMS (25 ℃, unless otherwise noted)

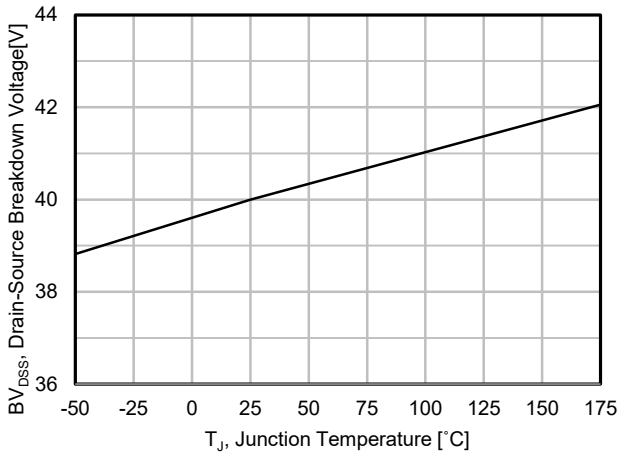


Fig. 13. BV_{DSS} Variation with Temperature

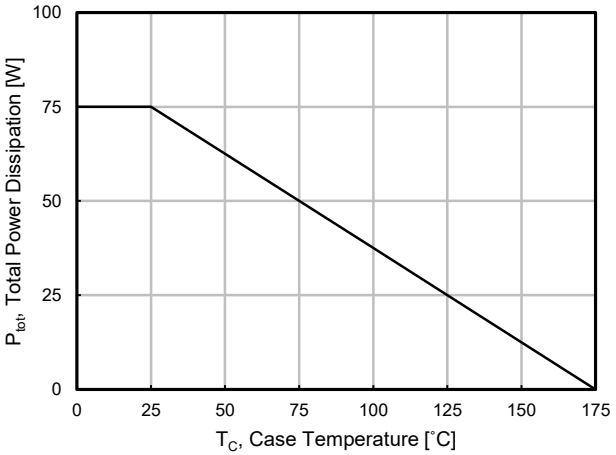
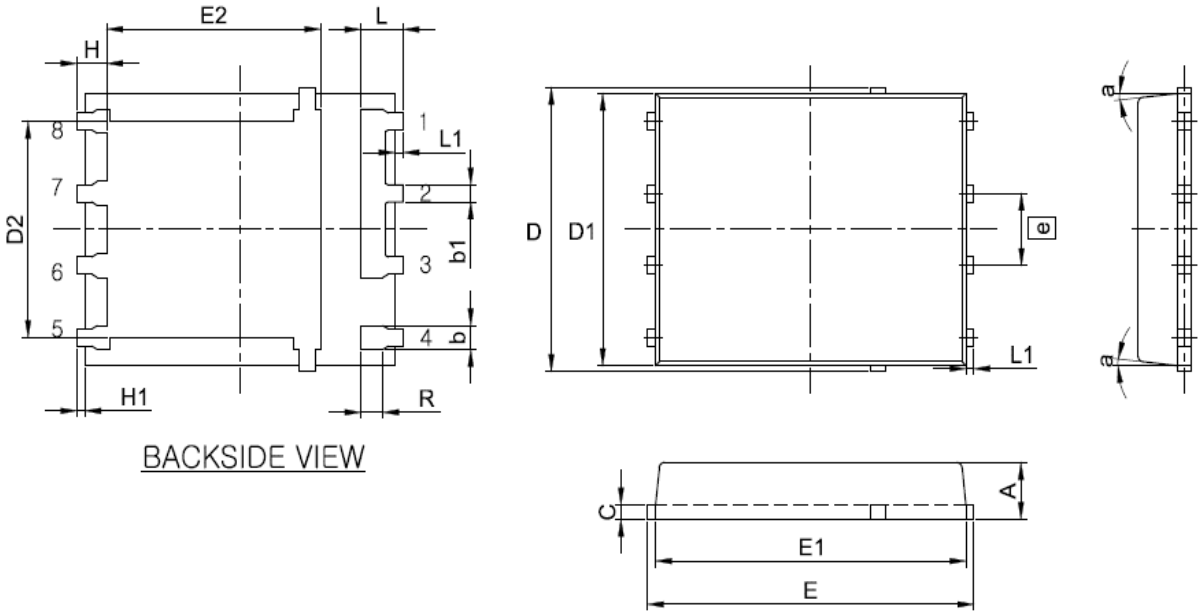


Fig. 14. Power Dissipation

Package Outlines

PDFN56



Symbol	Dimension (mm)		
	Min	Nom	Max
A	0.90	–	1.10
b	0.33	–	0.49
b1	0.26	–	1.36
C	0.20	0.25	0.34
D	4.50	5.15	5.30
D1	4.50	5.00	5.10
D2	3.65	–	3.95
E	5.90	6.15	6.30
E1	5.85	6.00	6.10
E2	3.46	–	3.86
e	1.27 BSC		
H	0.50	–	0.71
H1	0.03	–	0.13
L	0.74	–	0.84
L1	0.03	–	0.13
R	0.48	–	0.58
a	0°	–	12°

Notes

Package body size, length and width do not include mold flash, protrusions and gate burrs.

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