



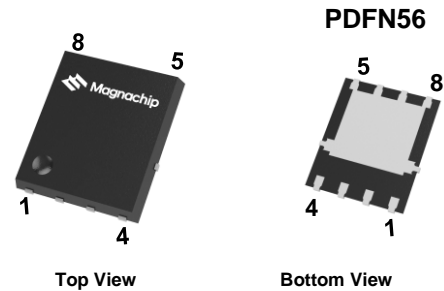
MDU04N027RH

Single N-channel Trench MOSFET 40V 2.7mΩ 70A

General description

The MDU04N027RH uses advanced Magnachip's MOSFET Technology, which provides high performance in on-state resistance, fast switching performance, and excellent quality.

This device can be utilized in application such as BLDC motor inverter and Synchronous Rectification.

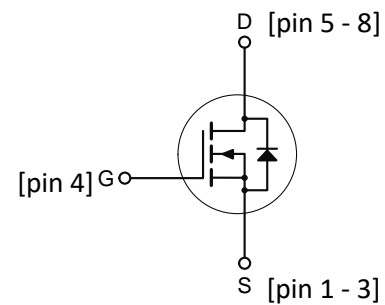


Features and benefits

- Magnachip's MOSFET Technology
- Very low on-resistance $R_{DS(on)}$
- 100% Avalanche / Rg Tested

Applications

- BLDC Motor Inverter
- Synchronous Rectification
- Power Tool



Key performance parameters

V_{DS}	40	V
$R_{DS(on), max}$	0.0027	Ω
I_D	70	A
Q_G	78	nC
Junction temperature _{max}	150	$^{\circ}C$



Ordering information

Type / Ordering Code	Package	Marking	Packing	RoHS Status
MDU04N027RH	PDFN56	04N027	Tape & Reel	Halogen Free

<http://www.magnachip.com/powersolutions>

Maximum ratings, at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Rating	Unit
Drain-source Voltage	V_{DS}	40	V
Gate-source Voltage	V_{GS}	± 20	V
1) Drain current	$T_C=25^\circ\text{C}$ Silicon Limited	I_D	127
	$T_C=25^\circ\text{C}$ Package Limited		70
	$T_C=100^\circ\text{C}$ Silicon Limited		80
Pulsed drain current	$T_C=25^\circ\text{C}$	I_{DM}	280
Total power dissipation	$T_C=25^\circ\text{C}$	P_{tot}	74
	$T_C=100^\circ\text{C}$		29
3) Avalanche energy, single pulse	E_{AS}	162	mJ
Operating and storage temperature	T_j, T_{stg}	- 55 ~ 150	$^\circ\text{C}$

Thermal characteristics

Parameter	Symbol	Rating	Unit
1) Thermal resistance, junction - case	$R_{\theta JC}$	1.7	K/W
Thermal resistance, junction - ambient	$R_{\theta JA}$	50	K/W

Notes

- Surface mounted FR-4 board by JEDEC (jesd51-7)
- Pulse width limited by T_{jmax}
- E_{AS} is tested at starting $T_j = 25^\circ\text{C}$, $L = 1.0\text{mH}$, $I_{AS} = 18\text{A}$, $V_{DD} = 20\text{V}$, $V_{GS} = 10\text{V}$

Electrical Characteristics ($T_J = 25^\circ\text{C}$)

Static characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Drain-source breakdown voltage	$V_{(BR)DSS}$	40	-	-	V	$V_{GS}=0\text{ V}$, $I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1.0	-	3.0	V	$V_{DS}=V_{GS}$, $I_D=250\ \mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=32\text{ V}$, $V_{GS}=0\text{ V}$
Gate-source leakage current	I_{GSS}			± 100	nA	$V_{GS}=\pm 20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.2	2.7	m Ω	$V_{GS}=10\text{ V}$, $I_D=27\text{ A}$
Gate resistance	R_G	-	1.2	-	Ω	$f=1\text{ MHz}$
Transconductance	g_{fs}	-	60	-	S	$V_{DS}=10\text{ V}$, $I_D=27\text{ A}$

Dynamic characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Input capacitance	C_{iss}	-	4360	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	1140	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{riss}	-	110	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	16	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=27\text{ A}$, $R_{G,ext}=3\ \Omega$
Rise time	t_r	-	14	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=27\text{ A}$, $R_{G,ext}=3\ \Omega$
Turn-off delay time	$t_{d(off)}$	-	67	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=27\text{ A}$, $R_{G,ext}=3\ \Omega$
Fall time	t_f	-	22	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=27\text{ A}$, $R_{G,ext}=3\ \Omega$

Gate charge characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Gate to source charge	Q_{GS}	-	11	-	nC	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{GS(th)}$	-	8	-	nC	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	Q_{GD}	-	15	-	nC	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{SW}	-	18	-	nC	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total	Q_g	-	78	-	nC	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	2.9	-	V	$V_{DD}=20\text{ V}$, $I_D=27\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$

Source-drain diode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Diode continuous forward current	I_S	-	-	70	A	-
Diode pulse current	$I_{S,pulse}$	-	-	280	A	pulsed; $t_p \leq 10\ \mu\text{s}$
Diode forward voltage	V_{SD}	-	1.0	1.2	V	$V_{GS}=0\text{ V}$, $I_S=50\text{ A}$
Reverse recovery time	t_{rr}	-	47.5	-	ns	$I_F=27\text{ A}$, $dI_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}	-	52	-	nC	$I_F=27\text{ A}$, $dI_F/dt=100\text{ A}/\mu\text{s}$

Electrical characteristics diagrams

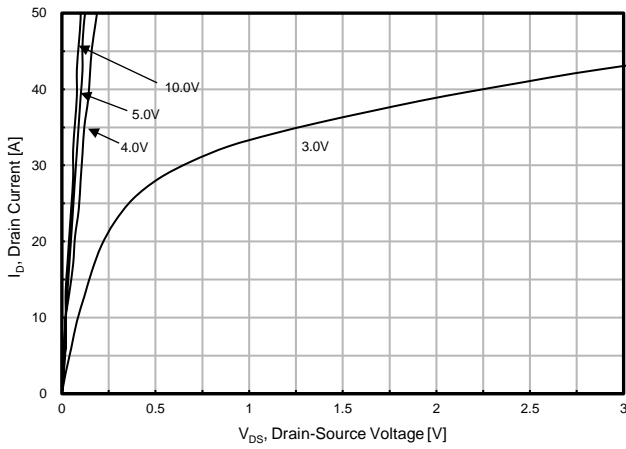


Fig. 1. On-Region Characteristics

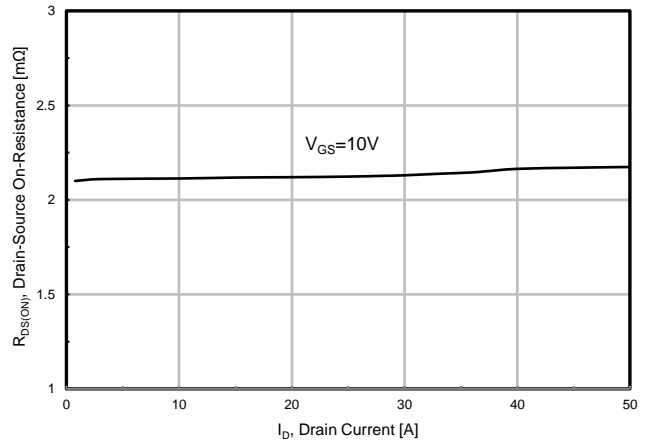


Fig. 2. On-Resistance vs. Drain Current and Gate Voltage

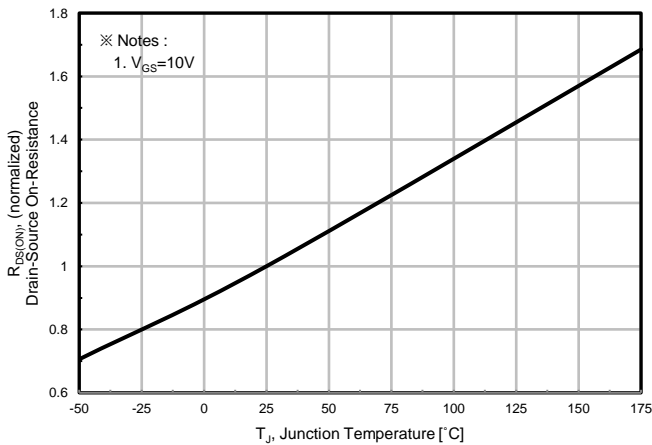


Fig. 3. On-Resistance vs. Junction Temperature

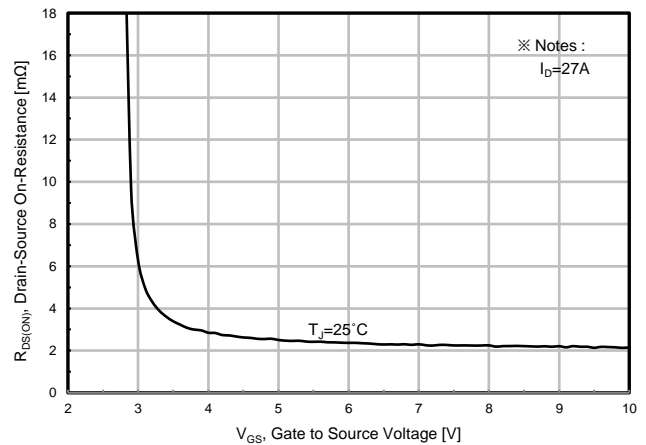


Fig. 4. On-Resistance vs. Gate to Source Voltage

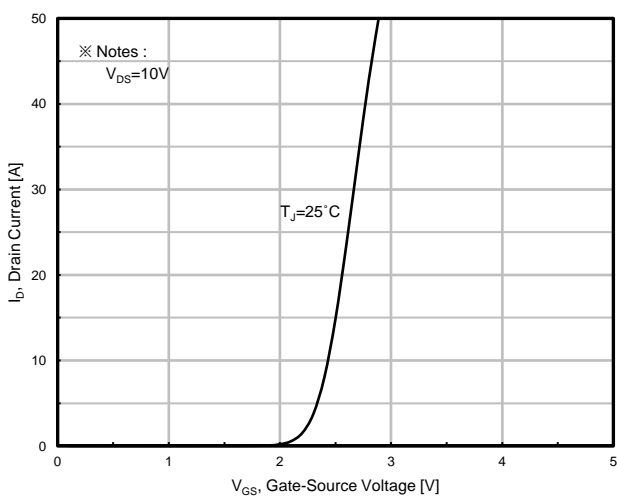


Fig. 5. Transfer Characteristics

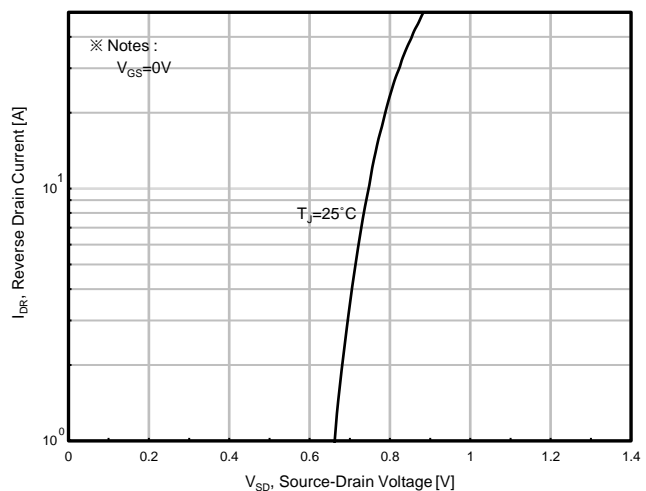


Fig. 6. Source-Drain Diode Forward Voltage

Electrical characteristics diagrams

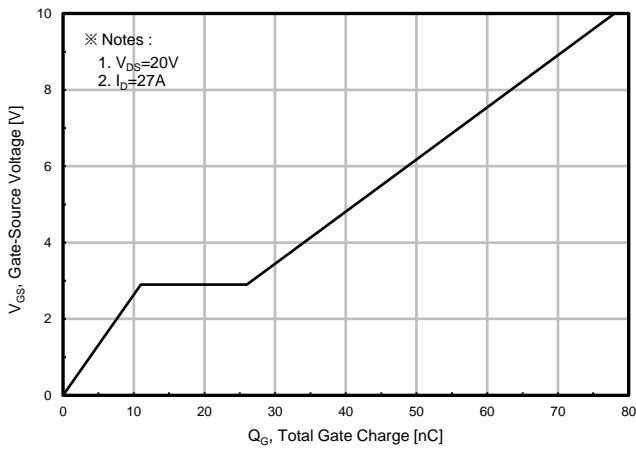


Fig. 7. Gate Charge

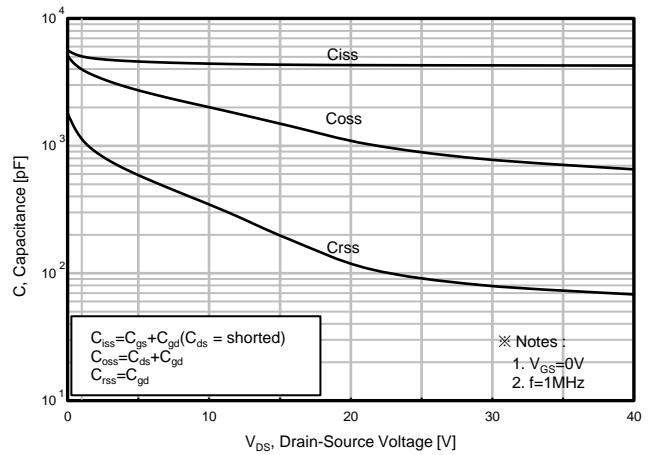


Fig. 8. Capacitance

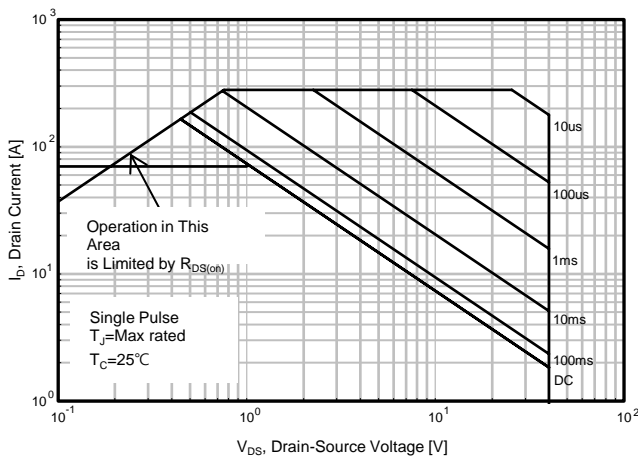


Fig. 9. Safe Operating Area, Junction-to-Ambient

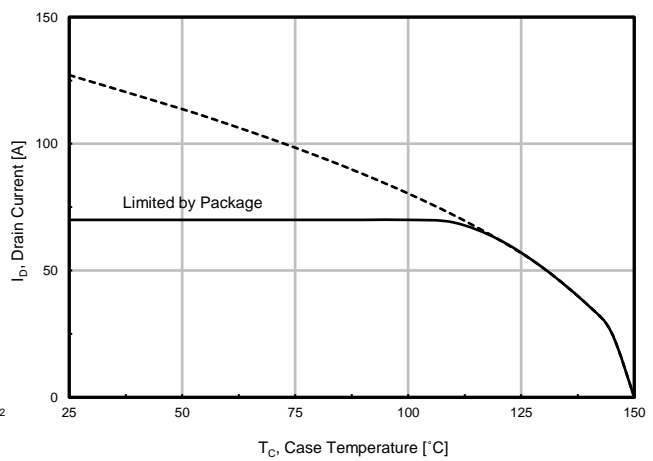


Fig. 10. Maximum Drain vs. Case Temperature

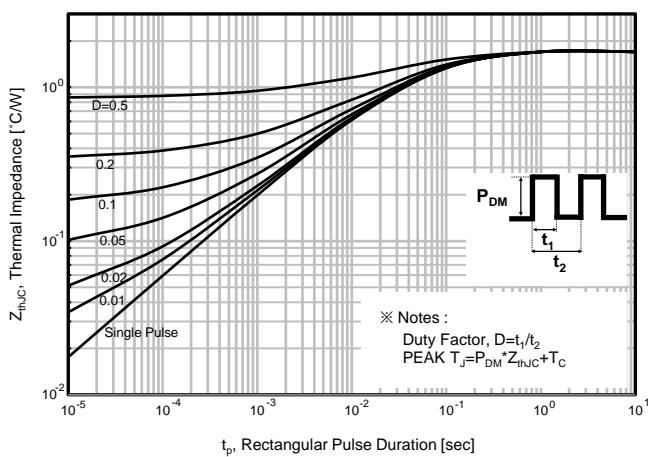
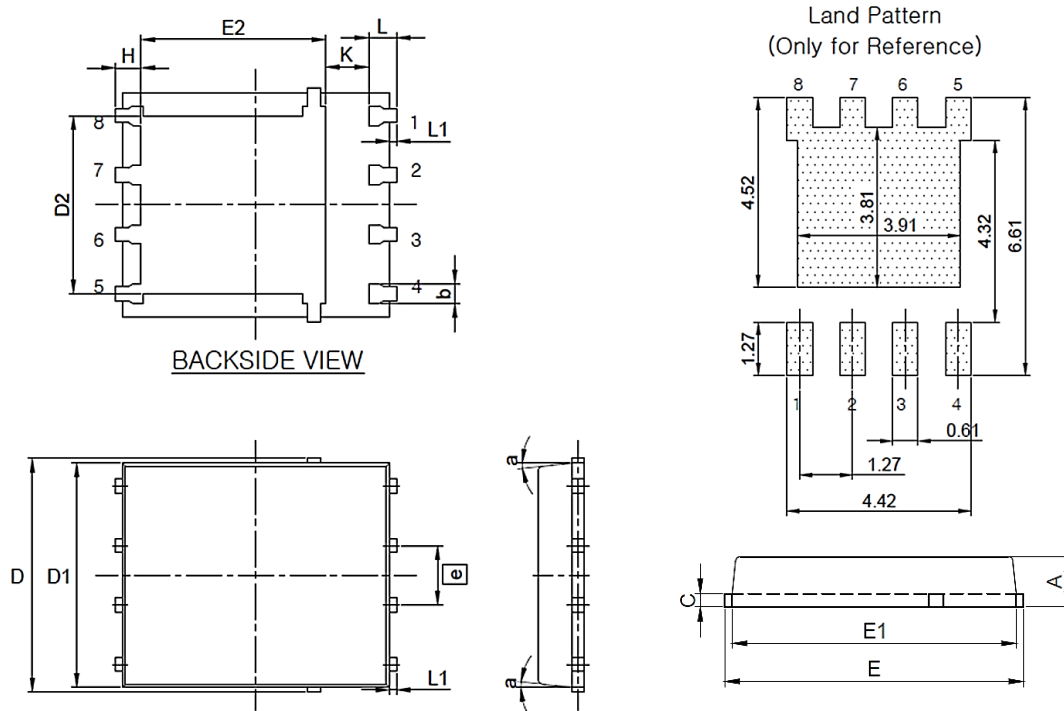


Fig. 11. Thermal Transient Impedance, Junction-to-Case

Package information

PDFN56




Symbol	Dimension (mm)		
	Min.	Norm.	Max.
A	0.90	-	1.10
B	0.33	-	0.51
C	0.20	-	0.34
D	4.50	-	5.30
D1	4.50	-	5.10
D2	3.61	-	4.22
E	5.90	-	6.30
E1	5.50	-	6.10
E2	3.38	-	4.30
e	1.27 BSC		
H	0.41	-	0.71
K	0.20	-	-
L	0.51	-	0.71
L1	0.06	-	0.20
a	0°	-	12°

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

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