



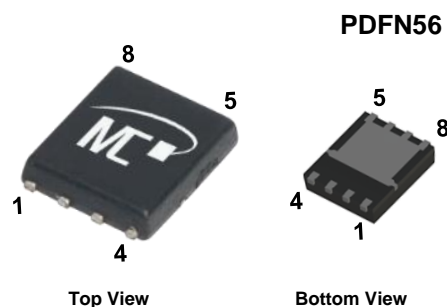
# MDU04N027RH

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

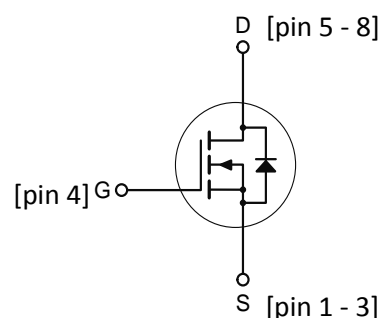
- MagnaChip's MOSFET Technology
- Very low on-resistance  $R_{DS(on)}$
- 100% Avalanche / Rg Tested

## Applications

- BLDC Motor Inverter
- Synchronous Rectification
- Power Tool

## Key performance parameters

$V_{DS}$	40	V
$R_{DS(on), max}$	0.0027	$\Omega$
$I_D$	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	$V_{GS}$	$\pm 20$	V	
1) Drain current	$I_D$	$T_C=25^\circ\text{C}$ Silicon Limited	127	A
		$T_C=25^\circ\text{C}$ Package Limited	70	A
		$T_C=100^\circ\text{C}$ Silicon Limited	80	A
2) Pulsed drain current	$I_{DM}$	280	V	
Total power dissipation	$P_{tot}$	$T_C=25^\circ\text{C}$	74	W
		$T_C=100^\circ\text{C}$	29	W
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  $T_{jmax}$
- EAS 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	$\mu\text{A}$	$V_{DS}=32\text{ V}$ , $V_{GS}=0\text{ V}$
Gate-source leakage current	$I_{GSS}$	-	-	$\pm 100$	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 $\Omega$	$V_{GS}=10\text{ V}$ , $I_D=27\text{ A}$
Gate resistance	$R_G$	-	1.2	-	$\Omega$	f=1MHz
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 MHz
Output capacitance	$C_{oss}$	-	1140	-	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=20\text{ V}$ , f=1 MHz
Reverse transfer capacitance	$C_{rss}$	-	110	-	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=20\text{ V}$ , f=1 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

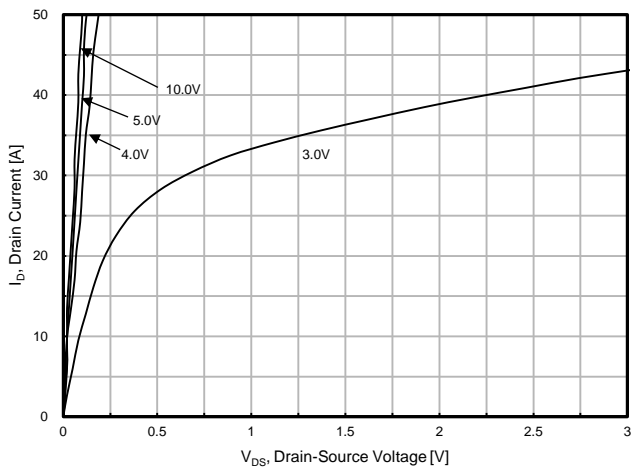


Fig. 1. On-Region Characteristics

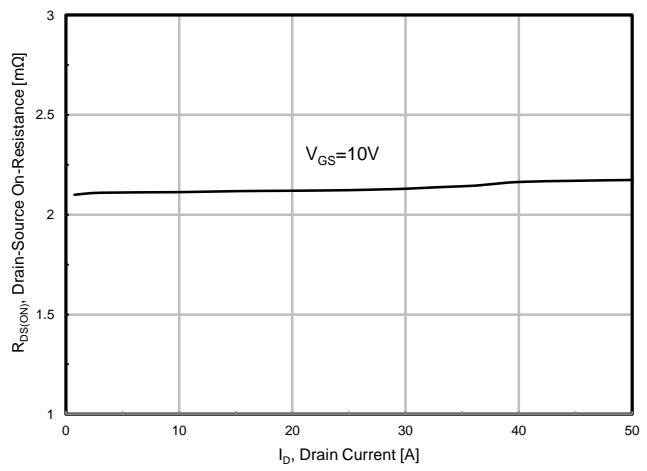


Fig. 2. On-Resistance vs. Drain Current and Gate Voltage

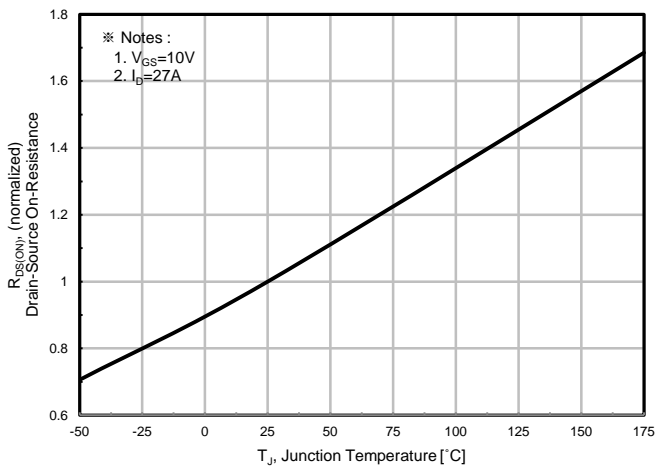


Fig. 3. On-Resistance vs. Junction Temperature

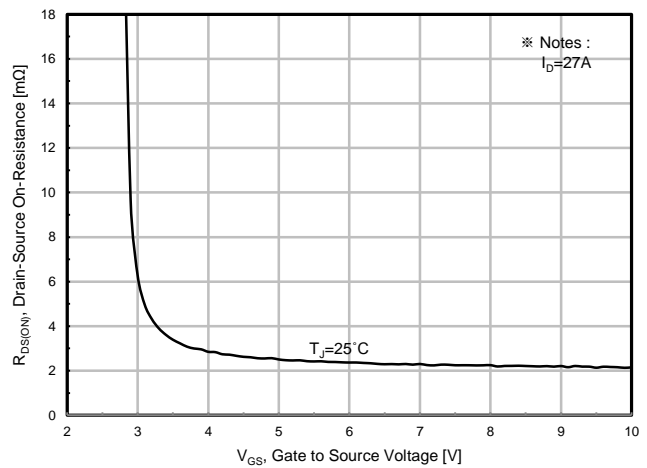


Fig. 4. On-Resistance vs. Gate to Source Voltage

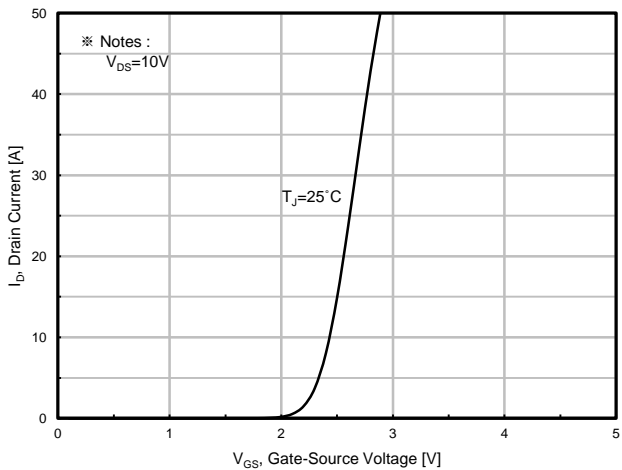


Fig. 5. Transfer Characteristics

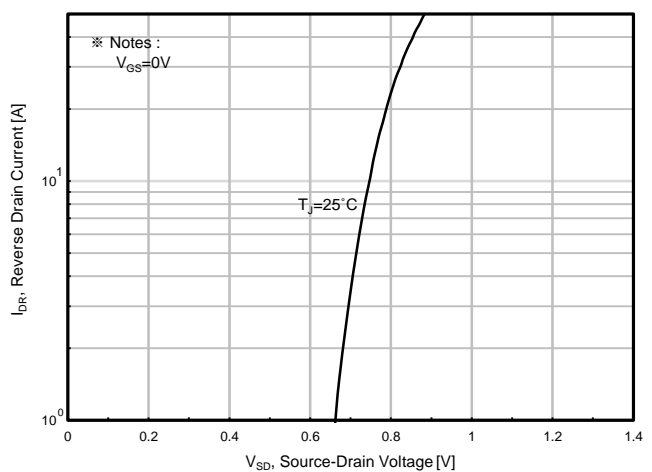


Fig. 6. Source-Drain Diode Forward Voltage

Electrical characteristics diagrams

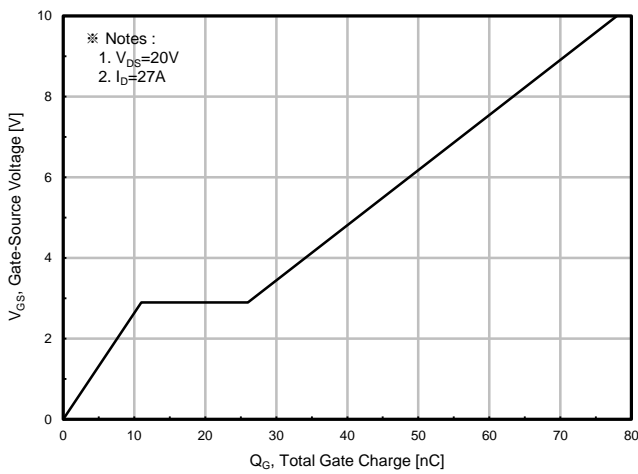


Fig. 7. Gate Charge

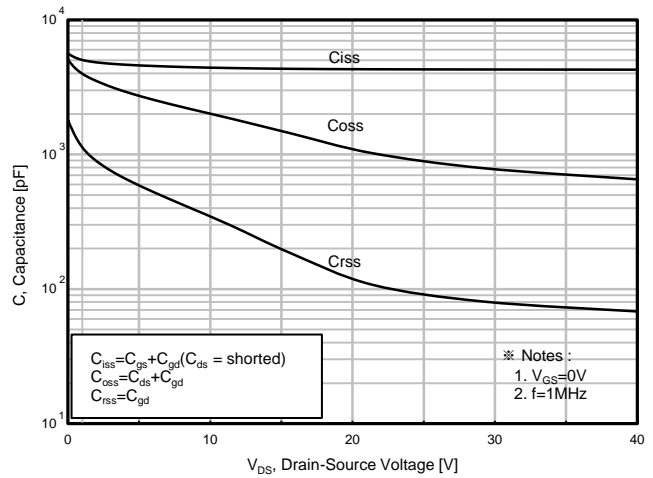


Fig. 8. Capacitance

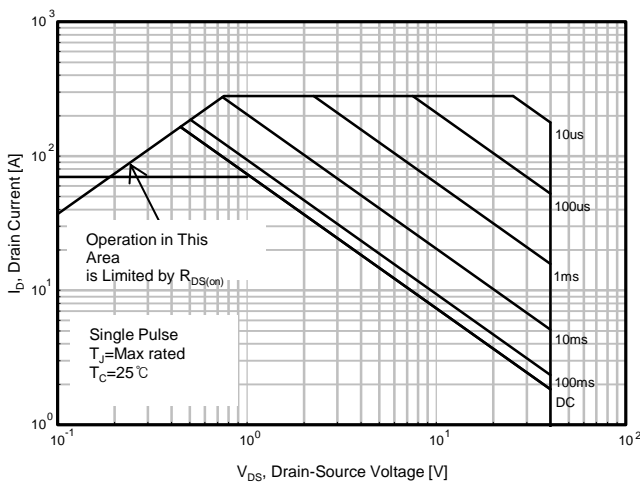


Fig. 9. Safe Operating Area, Junction-to-Ambient

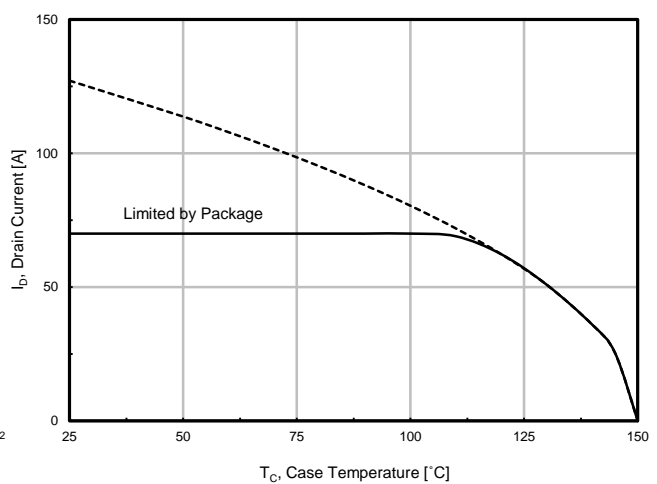


Fig. 10. Maximum Drain vs. Case Temperature

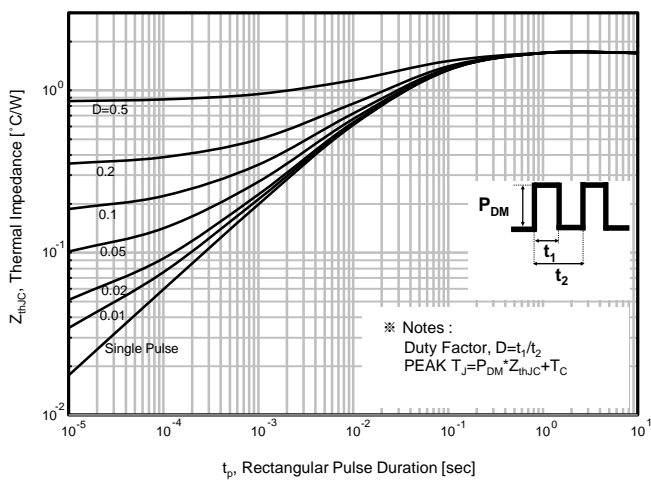
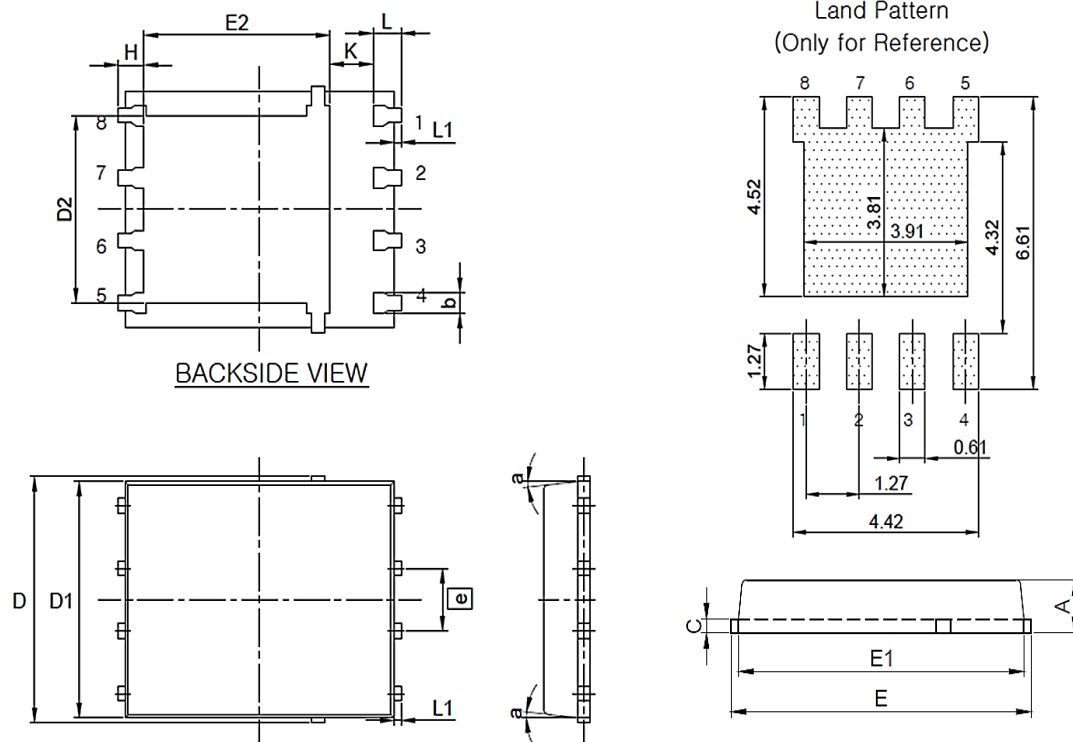


Fig. 11. Thermal Transient Impedance, Junction-to-Case

# 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 burs.			

**DISCLAIMER :**

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.

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