



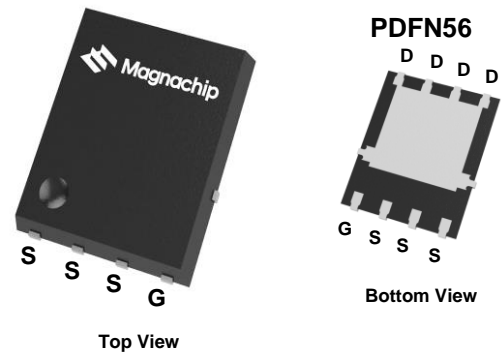
# MDU04N070RH

Single N-channel Trench MOSFET 40V 7.0mΩ 77A

## General description

The MDU04N070RH uses advanced Magnachip's MOSFET technology, which provides high performance in on-state resistance, fast switching performance and excellent quality.

These devices can also be utilized in industrial applications such as synchronous rectification and general purpose applications.

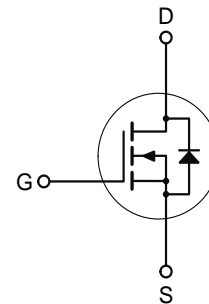


## Features and benefits

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

## Applications

- Switching Applications



## Key performance parameters

$V_{DS}$	40	V
$R_{DS(on), max}$	0.007	$\Omega$
$I_D$	77	A
$Q_G$	33.4	nC
Junction temperature, $_{max}$	150	$^{\circ}C$



## Ordering information

Type / Ordering Code	Package	Marking	Packing	RoHS Status
MDU04N070RH	PDFN56	04N070	Tape & Reel	Halogen Free

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

**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
Drain current	$T_C=25^\circ\text{C}$ Silicon Limited	$I_D$	77	A
	$T_C=100^\circ\text{C}$ Silicon Limited		48	A
<sup>1)</sup> Pulsed drain current	$T_C=25^\circ\text{C}$	$I_{DM}$	308	A
Total power dissipation	$T_C=25^\circ\text{C}$	$P_{tot}$	66	W
	$T_C=100^\circ\text{C}$		26	W
<sup>2)</sup> Avalanche energy, single pulse		$E_{AS}$	61	mJ
Operating and storage temperature		$T_j, T_{stg}$	- 55 ~ 150	$^\circ\text{C}$

**Thermal characteristics**

Parameter		Symbol	Rating	Unit
Thermal resistance, junction - case		$R_{\theta JC}$	1.9	K/W
<sup>3)</sup> Thermal resistance, junction - ambient		$R_{\theta JA}$	50	K/W

**Notes**

- Pulse width limited by  $T_{jmax}$
- Starting  $T_J=25^\circ\text{C}$ ,  $L=1\text{mH}$ ,  $I_{AS}=11\text{A}$ ,  $V_{DD}=20\text{V}$ ,  $V_{GS}=10\text{V}$
- Surface mounted FR-4 board by JEDEC (jesd51-7)

Electrical Characteristics (T<sub>J</sub> = 25°C)

## Static characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	40	-	-	V	V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA
Gate threshold voltage	V <sub>GS(th)</sub>	1.5	1.9	3.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =32 V, V <sub>GS</sub> =0 V
Gate-source leakage current	I <sub>GSS</sub>	-	-	± 100	nA	V <sub>GS</sub> =±20 V, V <sub>DS</sub> =0 V
Drain-source on-state resistance	R <sub>DS(on)</sub>	-	6.1	7.0	mΩ	V <sub>GS</sub> =10 V, I <sub>D</sub> =14 A
		-	8.2	9.5	mΩ	V <sub>GS</sub> =4.5 V, I <sub>D</sub> =11 A
Gate resistance	R <sub>G</sub>	-	2.1	-	Ω	f=1MHz

## Dynamic characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Input capacitance	C <sub>iss</sub>	-	2,085	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =20 V, f=1 MHz
Output capacitance	C <sub>oss</sub>	-	250	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =20 V, f=1 MHz
Reverse transfer capacitance	C <sub>rss</sub>	-	113	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =20 V, f=1 MHz
Turn-on delay time	t <sub>d(on)</sub>	-	13	-	ns	V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =14 A, R <sub>G,ext</sub> =3Ω
Rise time	t <sub>r</sub>	-	4	-	ns	V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =14 A, R <sub>G,ext</sub> =3Ω
Turn-off delay time	t <sub>d(off)</sub>	-	42	-	ns	V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =14 A, R <sub>G,ext</sub> =3Ω
Fall time	t <sub>f</sub>	-	7	-	ns	V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =14 A, R <sub>G,ext</sub> =3Ω

## Gate charge characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Gate to source charge	Q <sub>gs</sub>	-	5.8	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V
Gate charge at threshold	Q <sub>gs(th)</sub>	-	3.8	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V
Gate to drain charge	Q <sub>gd</sub>	-	5.6	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V
Switching charge	Q <sub>sw</sub>	-	7.9	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V
Gate charge total	Q <sub>g</sub>	-	33.4	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V
Gate plateau voltage	V <sub>plateau</sub>	-	3.2	-	V	V <sub>DD</sub> =20 V, I <sub>D</sub> =14 A, V <sub>GS</sub> =0 to 10 V

## Source-drain diode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Diode continuous forward current	I <sub>S</sub>	-	-	77	A	-
Diode pulse current	I <sub>S,pulse</sub>	-	-	308	A	pulsed; t <sub>p</sub> ≤ 10 μs
Diode forward voltage	V <sub>SD</sub>	-	0.8	1.2	V	V <sub>GS</sub> =0 V, I <sub>F</sub> =14 A
Reverse recovery time	t <sub>rr</sub>	-	47	-	ns	I <sub>F</sub> =14 A, d <sub>I</sub> /dt=100 A/μs
Reverse recovery charge	Q <sub>rr</sub>	-	44	-	nC	I <sub>F</sub> =14 A, d <sub>I</sub> /dt=100 A/μs

Electrical characteristics diagrams

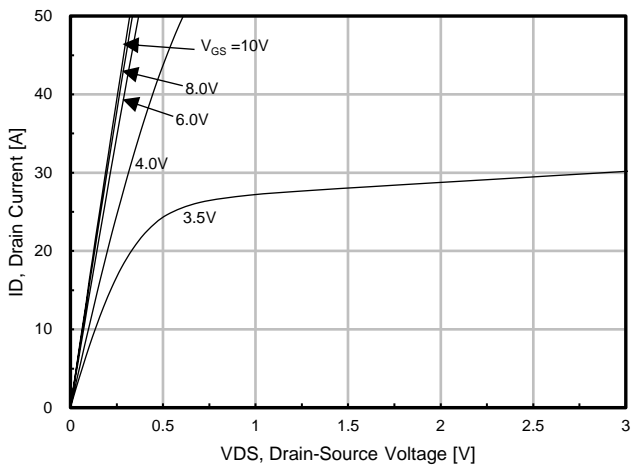


Fig. 1. Output Characteristics

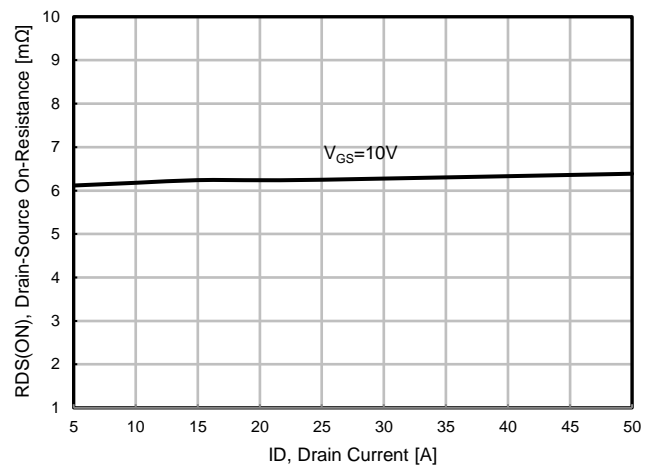


Fig. 2. Static On-Resistance Variation

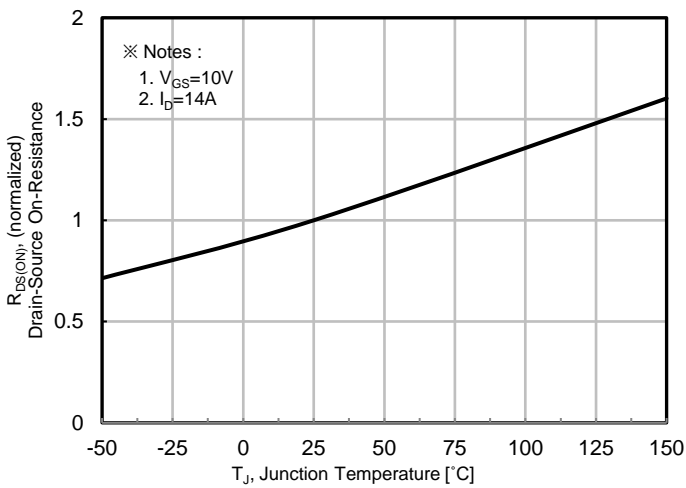


Fig. 3. On-Resistance vs. Junction Temperature

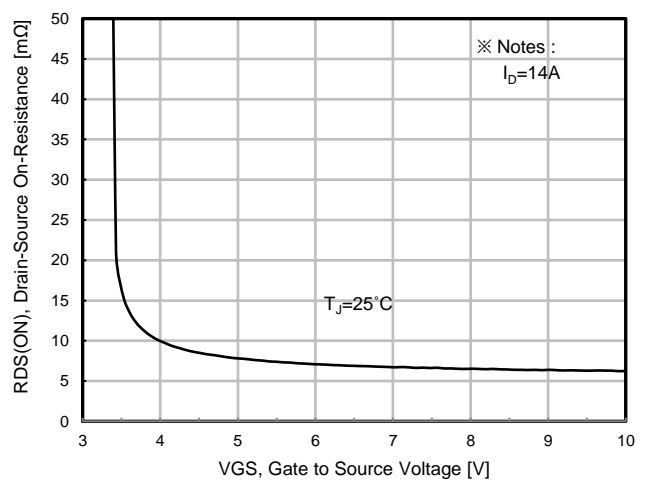


Fig. 4. On-Resistance vs. Gate to source Voltage

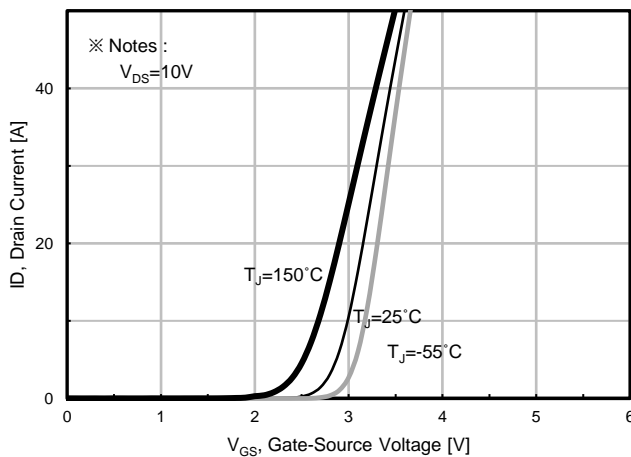


Fig. 5. Transfer Characteristics

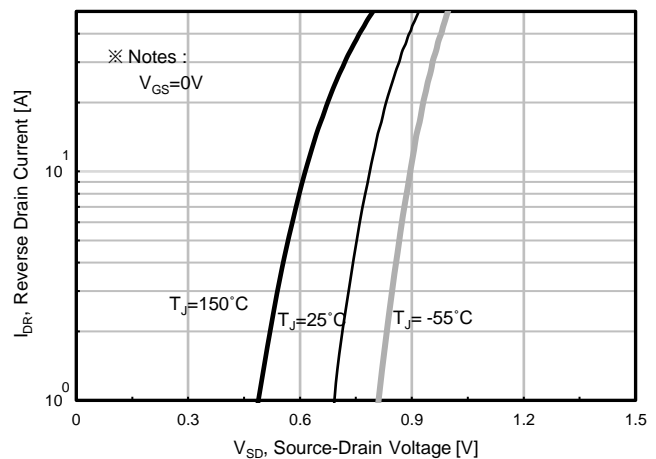


Fig. 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Electrical characteristics diagrams

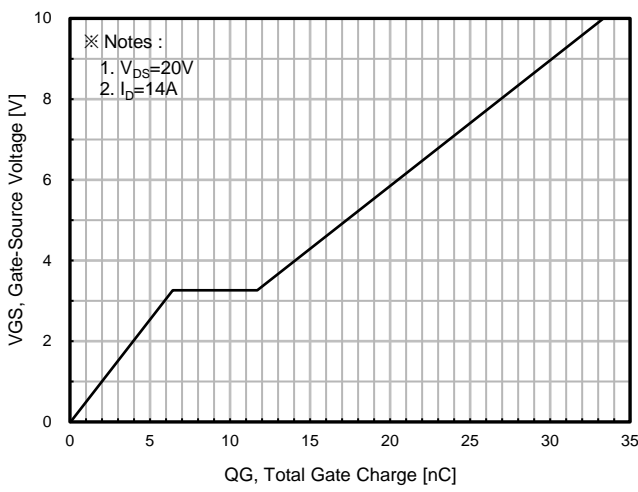


Fig. 7. Gate Charge

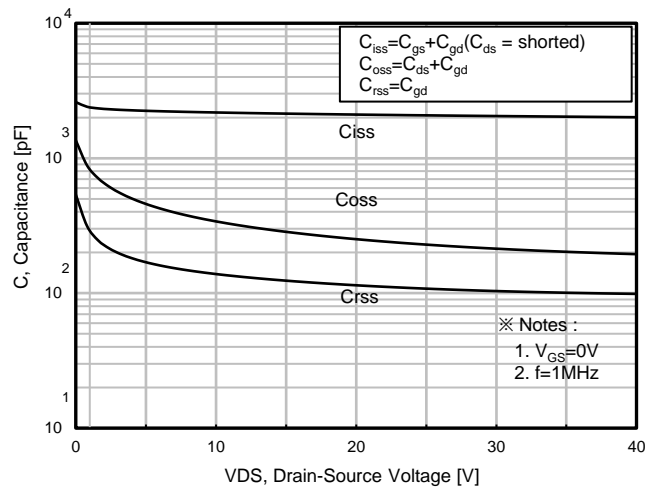


Fig. 8. Capacitance

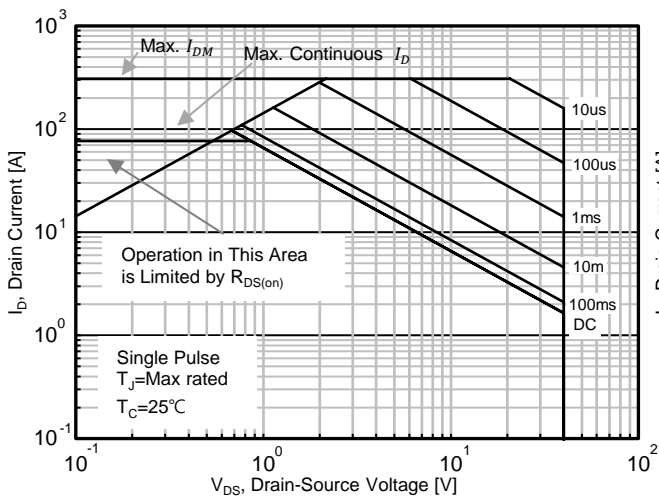


Fig. 9. Safe Operating Area, Junction-to-Ambient

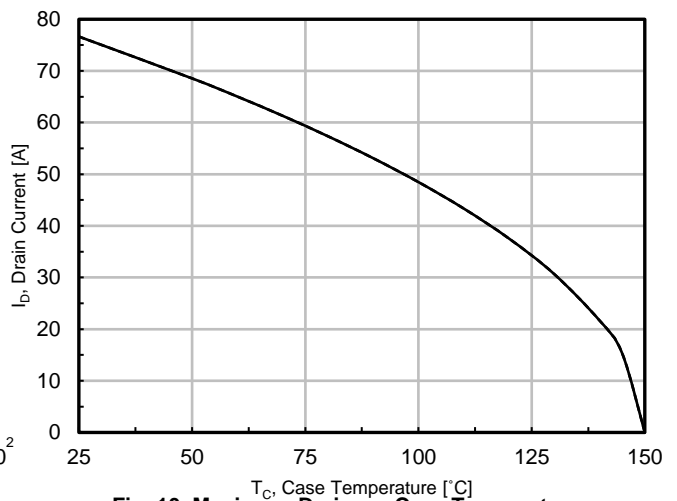


Fig. 10. Maximum Drain vs. Case Temperature

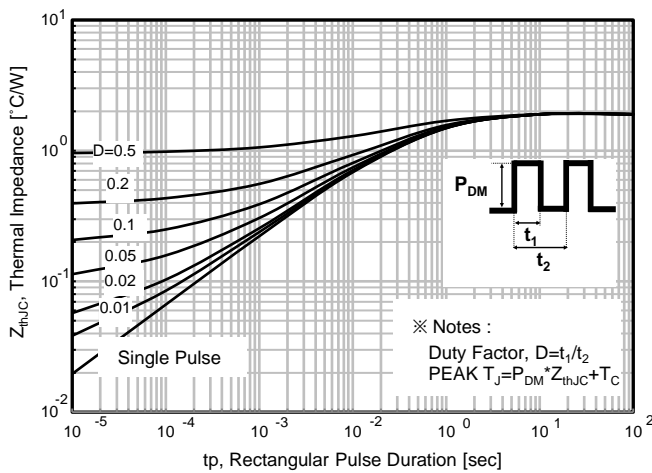
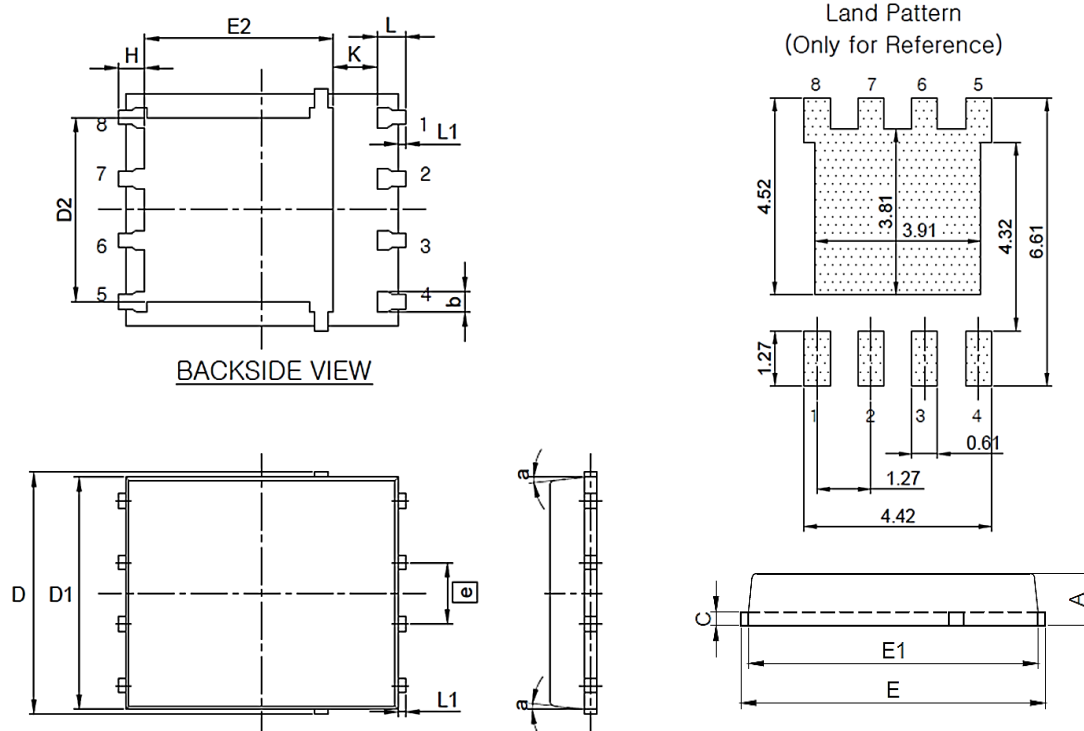


Fig. 11. Transient Thermal Impedance

# 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°

## Notes

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

**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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