

# MDP14N050TH

## Single N-channel Trench MOSFET 135V, 120A, 5.0mΩ

**MDP14N050TH – Single N-Channel Trench MOSFET 135V**

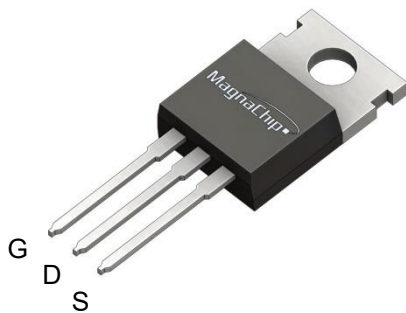
### General Description

The MDP14N050TH, Magnachip's latest generation of MV MOSFET Technology, which provides high performance in the lowest  $R_{ds(on)}$ , fast switching performance, and excellent quality.

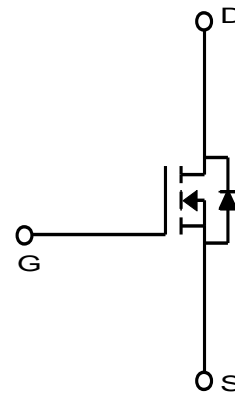
These devices can also be utilized in industrial applications such as Low Power Drives of E-bike, Light electric vehicles, DC/DC converter, and general purpose applications

### Features

- $V_{DS} = 135V$
- $I_D = 120A @ V_{GS} = 10V$
- Very low on-resistance  $R_{DS(ON)} < 5.0 m\Omega @ V_{GS} = 10V$
- 175°C operating temperature
- 100% UIL Tested
- 100% Rg Tested
- 100%  $\Delta V_{DS}$  Tested



**TO-220**



### Absolute Maximum Ratings ( $T_J = 25^\circ C$ )

Characteristics		Symbol	Rating	Unit
Drain-Source Voltage		$V_{DSS}$	135	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Continuous Drain Current <sup>(1)</sup>	$T_C=25^\circ C$ (Silicon Limited)	$I_D$	193	A
	$T_C=100^\circ C$ (Silicon Limited)		136	
	$T_C=25^\circ C$ (Package Limited)		120	
Pulsed Drain Current <sup>(2)</sup>		$I_{DM}$	480	
Power Dissipation	$T_C=25^\circ C$	$P_D$	375	W
	$T_C=100^\circ C$		187	
Single Pulse Avalanche Energy <sup>(3)</sup>		$E_{AS}$	450	mJ
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55~175	$^\circ C$

### Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal Resistance, Junction-to-Ambient <sup>(1)</sup>	$R_{\theta JA}$	62.5	$^\circ C/W$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.4	

## Ordering Information

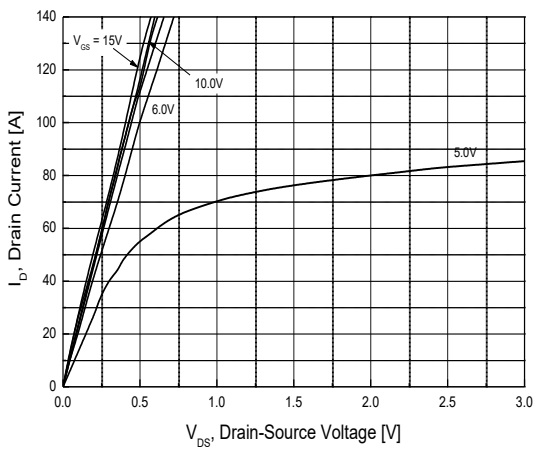
Part Number	Temp. Range	Package	Packing	RoHS Status
MDP14N050TH	-55~175°C	TO-220	Tube	Halogen Free

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

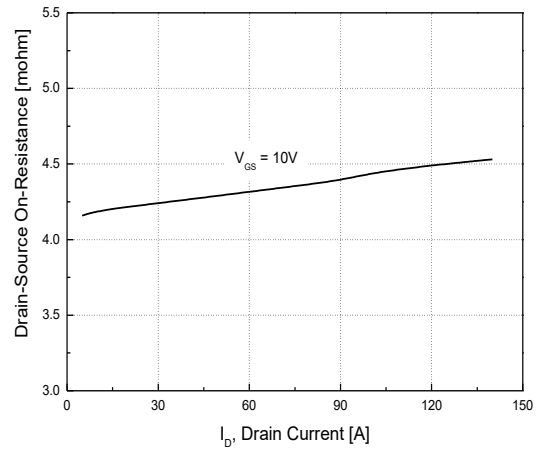
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V	135	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.5	-	3.9	
Drain Cut-Off Current	I <sub>DSS</sub>	V <sub>DS</sub> = 135V, V <sub>GS</sub> = 0V	-	-	1.0	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	-	-	±0.1	
Drain-Source ON Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A	-	4.2	5.0	mΩ
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 10V, I <sub>D</sub> = 50A	-	122	-	S
<b>Dynamic Characteristics</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 70V, I <sub>D</sub> = 50A, V <sub>GS</sub> = 10V	-	123	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	41	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	22	-	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 70V, V <sub>GS</sub> = 0V, f = 1.0MHz	-	9,267	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	27	-	
Output Capacitance	C <sub>oss</sub>		-	923	-	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 70V, I <sub>D</sub> = 50A, R <sub>G</sub> = 3.0Ω	-	36	-	ns
Rise Time	t <sub>r</sub>		-	21	-	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	83	-	
Fall Time	t <sub>f</sub>		-	13	-	
Gate Resistance	R <sub>g</sub>	f=1 MHz	-	3	-	Ω
<b>Drain-Source Body Diode Characteristics</b>						
Source-Drain Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = 50A, V <sub>GS</sub> = 0V	-	0.9	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50A, di/dt = 125A/μs	-	117	-	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	538	-	nC

Note :

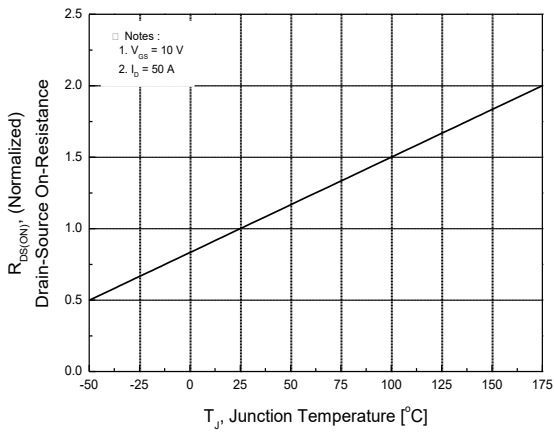
1. Surface mounted FR-4 board by JEDEC (jesd51-7)
2. Pulse width limited by T<sub>Jmax</sub>
3. E<sub>AS</sub> is tested at starting T<sub>J</sub> = 25°C, L = 1.0mH, I<sub>AS</sub> = 30A, V<sub>GS</sub> = 10V



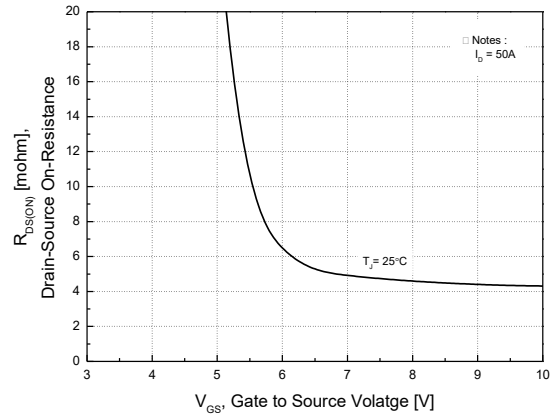
**Fig.1 On-Region Characteristics**



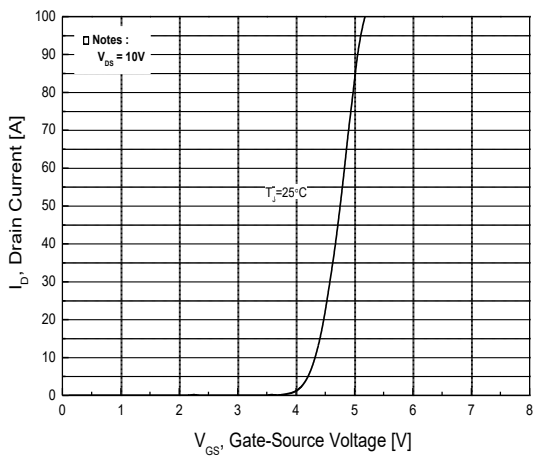
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



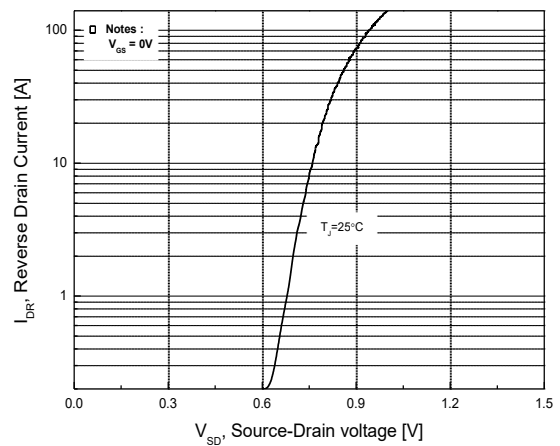
**Fig.3 On-Resistance Variation with Temperature**



**Fig.4 On-Resistance Variation with Gate to Source Voltage**



**Fig.5 Transfer Characteristics**



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

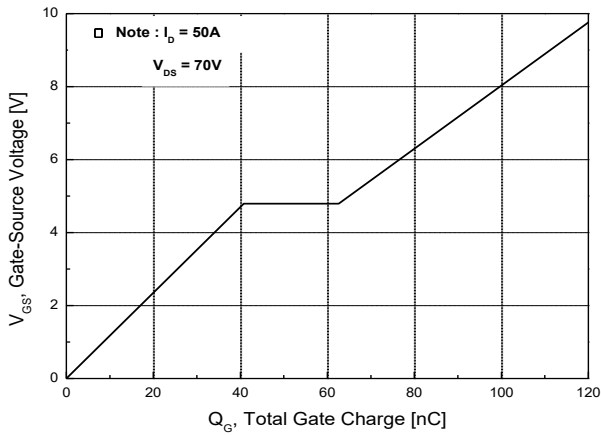


Fig.7 Gate Charge Characteristics

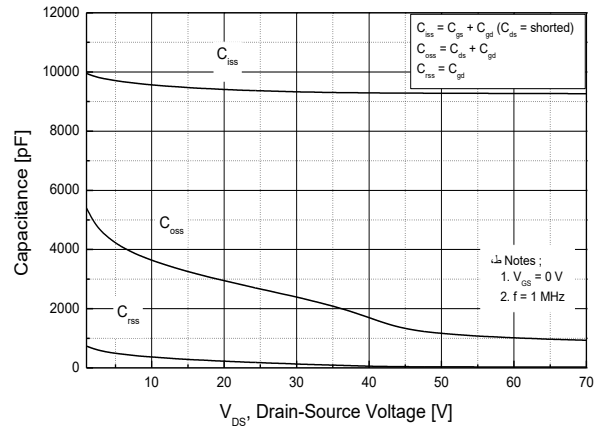


Fig.8 Capacitance Characteristics

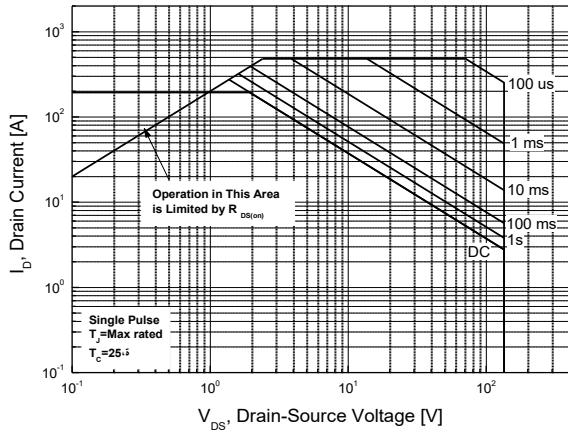


Fig.9 Maximum Safe Operating Area

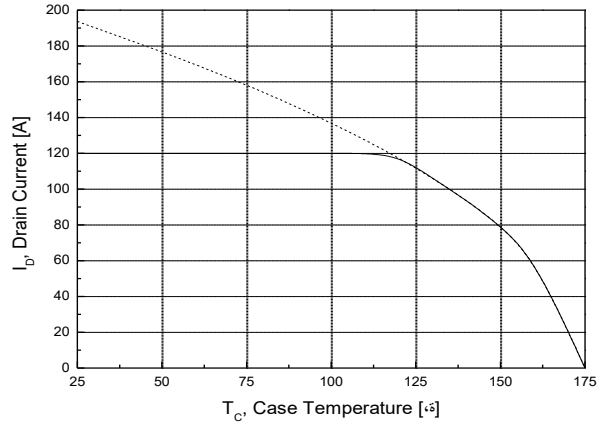


Fig.10 Maximum Drain Current vs. Case Temperature

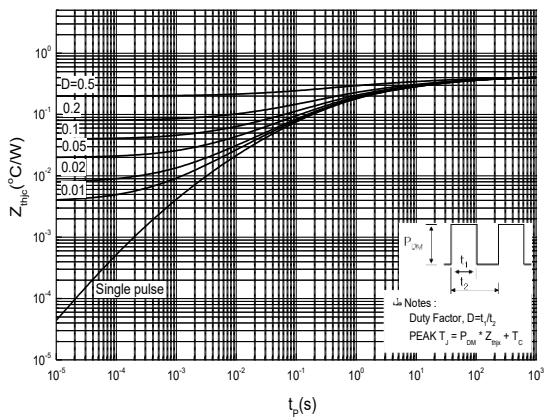
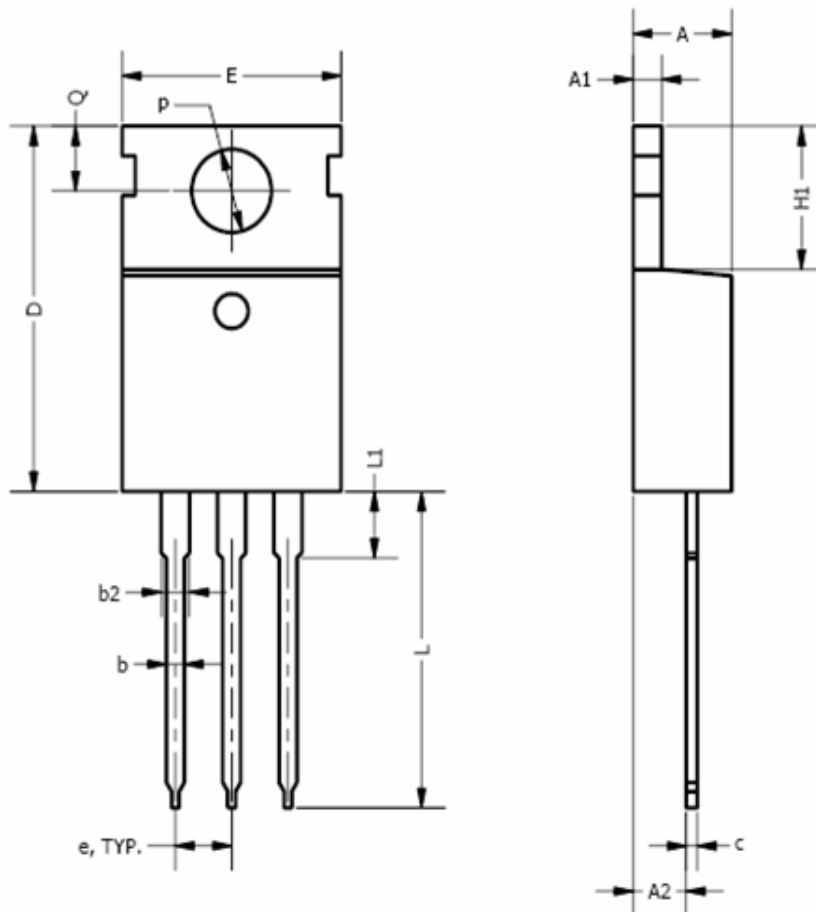


Fig.11 Transient Thermal Response Curve

## Package Dimension

### 3 Leads, TO-220

Dimensions are in millimeters unless otherwise specified



Symbol	Min	Nom	Max
A	3.56		4.83
A1	0.50		1.40
A2	2.03		2.92
b	0.38	0.69	1.02
b2	1.14	1.45	1.78
c	0.36		0.61
D	14.22		16.51
e	2.54 TYP		
E	9.65		10.67
H1	5.84		6.86
L	12.70		14.73
L1			6.35
$\phi P$	3.53		4.09
Q	2.54		3.43

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