

### General Description

The MDF9N50F uses advanced Magnachip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

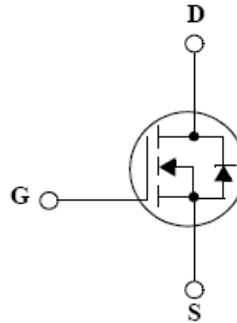
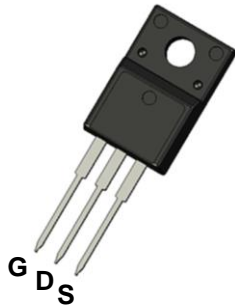
MDF9N50F is suitable device for SMPS, HID and general purpose applications.

### Features

- $V_{DS} = 500V$
- $I_D = 8.0A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.97\Omega$  @  $V_{GS} = 10V$

### Applications

- Power Supply
- HID
- Lighting



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

Characteristics		Symbol	Rating	Unit
Drain-Source Voltage		$V_{DSS}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$T_C = 25^\circ C$	$I_D$	8.0	A
	$T_C = 100^\circ C$		4.8	A
Pulsed Drain Current <sup>(1)</sup>		$I_{DM}$	32	A
Power Dissipation	$T_C = 25^\circ C$	$P_D$	38	W
	Derate above $25^\circ C$		0.3	W/ $^\circ C$
Peak Diode Recovery $dv/dt$ <sup>(3)</sup>		$Dv/dt$	4.5	V/ns
Single Pulse Avalanche Energy <sup>(4)</sup>		$E_{AS}$	300	mJ
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55~150	$^\circ C$

※  $I_D$  limited by maximum junction temperature

### 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 <sup>(1)</sup>	$R_{\theta JC}$	3.3	

## Ordering Information

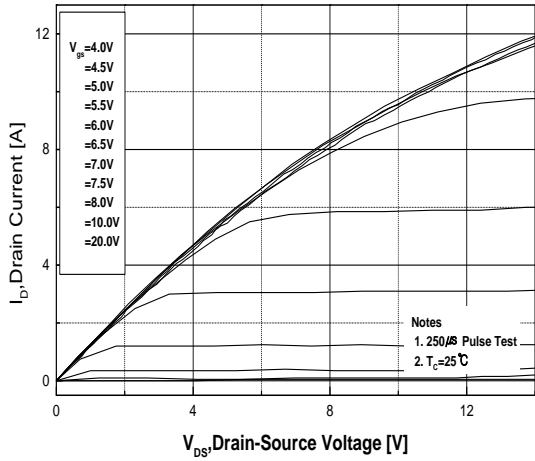
Part Number	Temp. Range	Package	Packing	RoHS Status
MDF9N50FTH	-55~150°C	TO-220F	Tube	Halogen Free

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

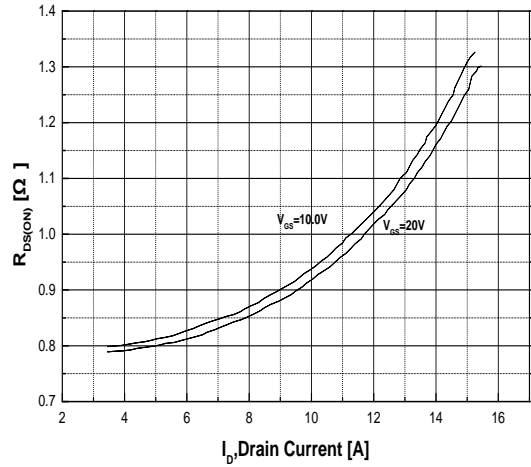
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V	500	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.5	-	4.5	
Drain Cut-Off Current	I <sub>DSS</sub>	V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V	-	-	10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	-	-	100	nA
Drain-Source ON Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4.0A		0.75	0.97	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 30V, I <sub>D</sub> = 4.0A	-	4.2	-	S
<b>Dynamic Characteristics</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 400V, I <sub>D</sub> = 8.0A, V <sub>GS</sub> = 10V <sup>(3)</sup>	-	16.3	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	5.8	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	6.1	-	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	-	781	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	1.83	-	
Output Capacitance	C <sub>oss</sub>		-	96.1	-	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 250V, I <sub>D</sub> = 8.0A, R <sub>G</sub> = 25Ω <sup>(3)</sup>	-	20.0	-	ns
Rise Time	t <sub>r</sub>		-	47.5	-	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	28.0	-	
Fall Time	t <sub>f</sub>		-	24.0	-	
<b>Drain-Source Body Diode Characteristics</b>						
Maximum Continuous Drain to Source Diode Forward Current	I <sub>S</sub>		-	8.0	-	A
Source-Drain Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = 8.0A, V <sub>GS</sub> = 0V	-	-	1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8.0A, di/dt = 100A/μs <sup>(3)</sup>	-	94.5	-	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	0.24	-	μC

Note :

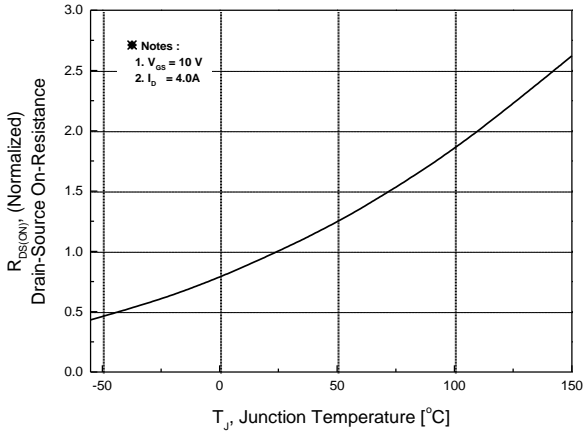
- Pulse width is based on R<sub>θJC</sub> & R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
- Pulse test: pulse width ≤300us, duty cycle≤2%, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
- I<sub>SD</sub> ≤8.0A, di/dt≤200A/us, V<sub>DD</sub>=50V, R<sub>G</sub> =25Ω, Starting T<sub>J</sub>=25°C
- L=6.5mH, I<sub>AS</sub>=8.0A, V<sub>DD</sub>=50V, R<sub>G</sub> =25Ω, Starting T<sub>J</sub>=25°C



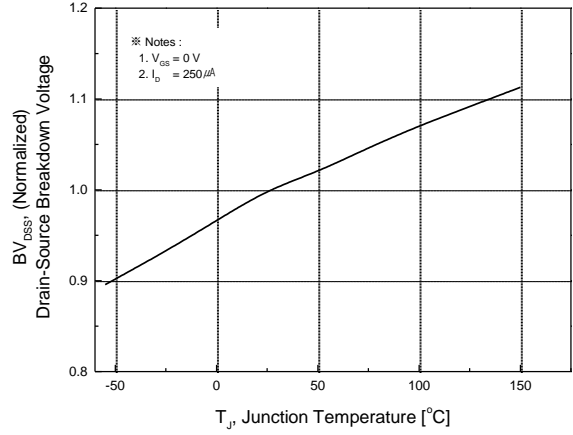
**Fig.1 On-Region Characteristics**



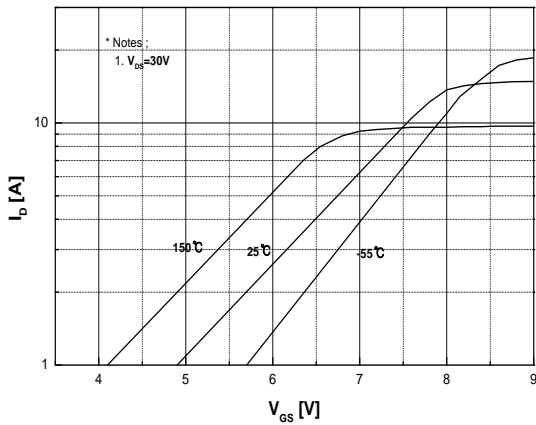
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



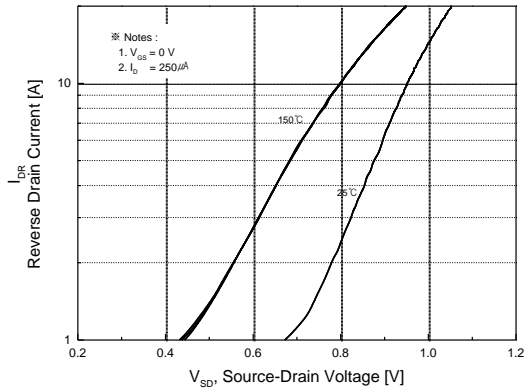
**Fig.3 On-Resistance Variation with Temperature**



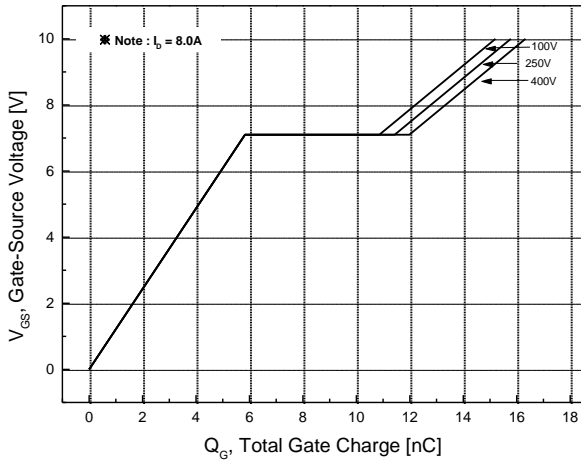
**Fig.4 Breakdown Voltage Variation vs. Temperature**



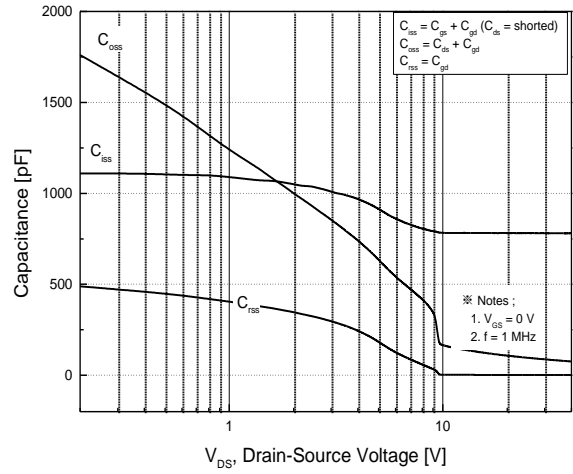
**Fig.5 Transfer Characteristics**



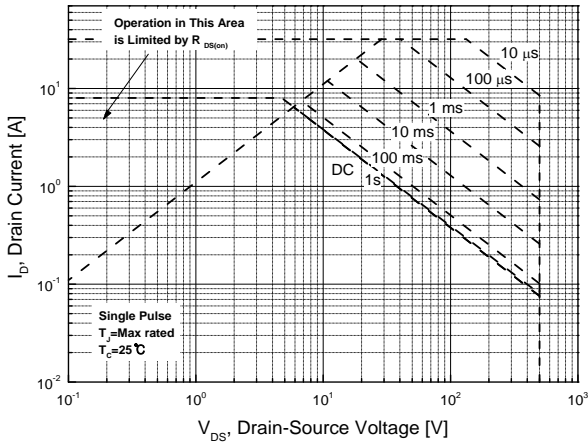
**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**



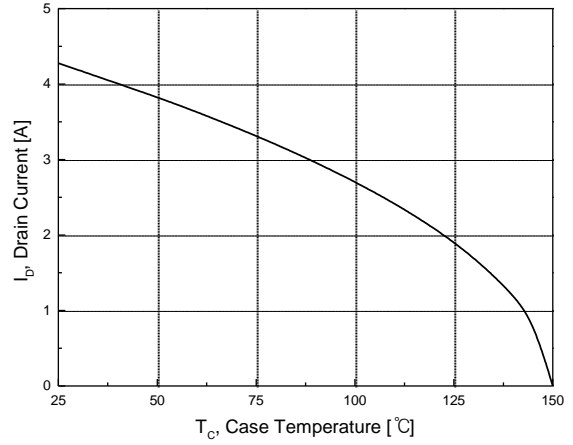
**Fig.7 Gate Charge Characteristics**



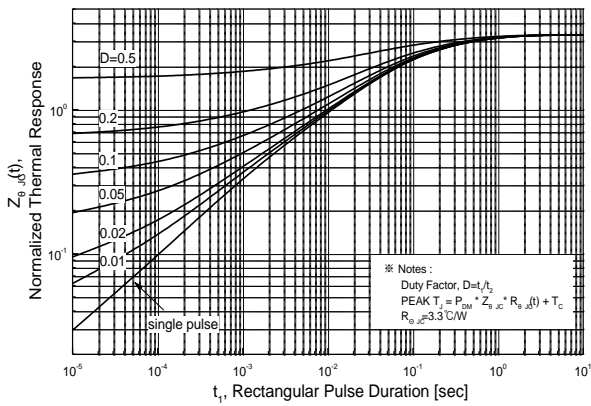
**Fig.8 Capacitance Characteristics**



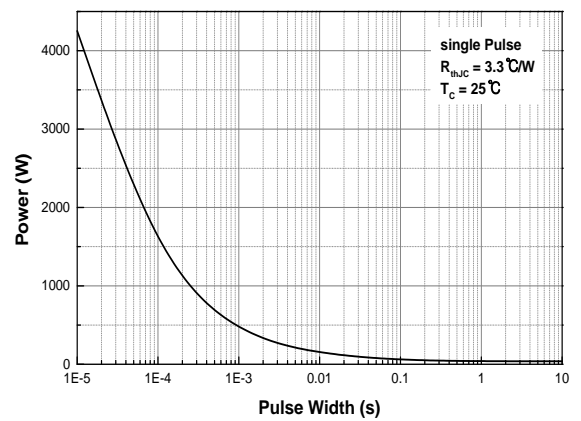
**Fig.9 Maximum Safe Operating Area**



**Fig.10 Maximum Drain Current vs. Case Temperature**



**Fig.11 Transient Thermal Response Curve**

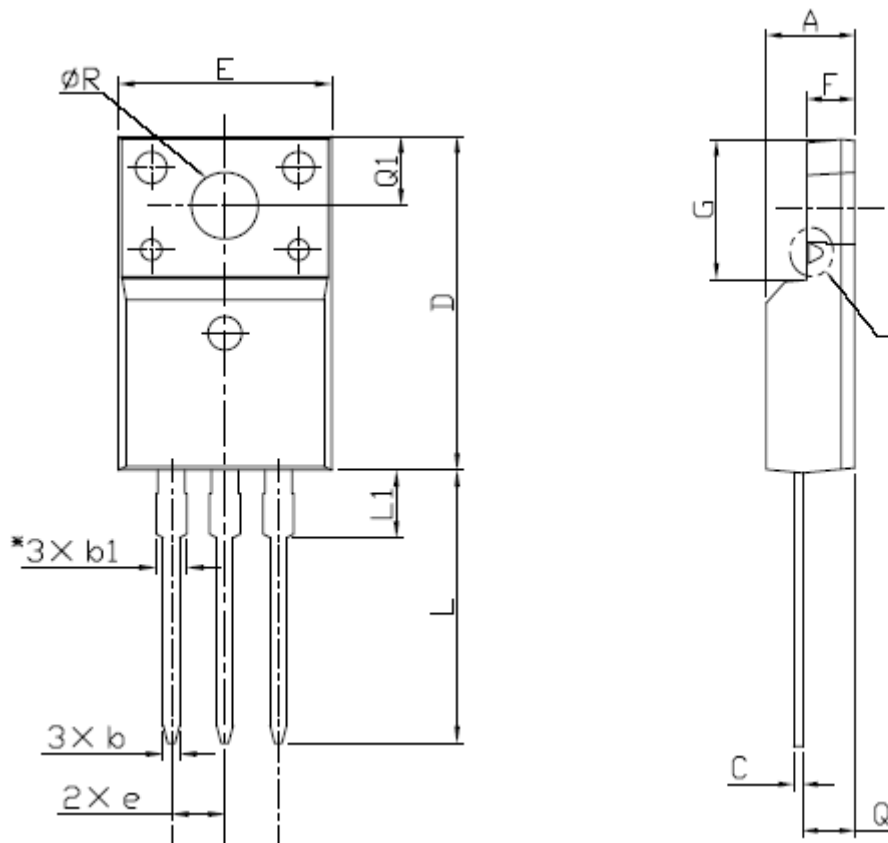


**Fig.12 Single Pulse Maximum Power Dissipation**

## Physical Dimensions

### 3 Leads, TO-220F

Dimensions are in millimeters unless otherwise specified



Symbol	Min	Nom	Max
A	4.50		4.93
b	0.63		0.91
b1	1.15		1.47
C	0.33		0.63
D	15.47		16.13
E	9.60		10.71
e		2.54	
F	2.34		2.84
G	6.48		6.90
L	12.24		13.72
L1	2.79		3.67
Q	2.52		2.96
Q1	3.10		3.50
$\varnothing R$	3.00		3.55

**DISCLAIMER:**

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