RoHS Compliant
HALOGEN-FREE

MagnaChip

MDF13N50

N-Channel MOSFET 500V, 13.0 A, 0.5Ω

General Description

The MDF13N50 uses advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

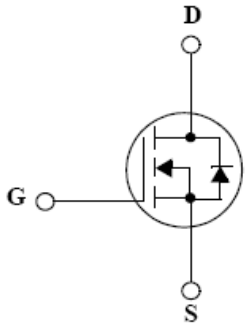
MDF13N50 is suitable device for SMPS, high Speed switching and general purpose applications.

Features

- V_{DS} = 500V
- V_{DS} = 550V @ T_{jmax}
- I_D = 13.0A @ V_{GS} = 10V
- $R_{DS(ON)}$ ≤ 0.5Ω @ V_{GS} = 10V

Applications

- Power Supply
- HID
- Lighting



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	500	V
Drain-Source Voltage @ T_{jmax}		V_{DSS} @ T_{jmax}	550	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current (※)	T_C=25°C	I_D	13	A
	T_C=100°C		8.2	A
Pulsed Drain Current[1]		I_{DM}	52	A
Power Dissipation	T_C=25°C	P_D	41	W
	Derate above 25 °C		0.33	W/°C
Peak Diode Recovery dv/dt[3]		Dv/dt	4.5	V/ns
Single Pulse Avalanche Energy[4]		E_{AS}	580	mJ
Junction and Storage Temperature Range		T_J, T_{stg}	-55~150	°C

※ Id limited by maximum junction temperature

Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal Resistance, Junction-to-Ambient[1]	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case[1]	$R_{\theta JC}$	3.05	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDF13N50TH	-55~150°C	TO-220F	Tube	Halogen Free

Electrical Characteristics (Ta =25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0	-	5.0	
Drain Cut-Off Current	I_{DSS}	V_{DS} = 500V, V_{GS} = 0V	-	-	1	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 6.5A		0.39	0.5	Ω
Forward Transconductance	g_{fs}	V_{DS} = 40V, I_D = 6.5A	-	13	-	S
Dynamic Characteristics						
Total Gate Charge	Q_g	V_{DS} = 400V, I_D = 13A, V_{GS} = 10V(3)	-	33	-	nC
Gate-Source Charge	Q_{gs}		-	10.4	-	
Gate-Drain Charge	Q_{gd}		-	13	-	
Input Capacitance	C_{iss}	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	-	1390		pF
Reverse Transfer Capacitance	C_{rss}		-	6.3		
Output Capacitance	C_{oss}		-	173		
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = 10V, V_{DS} = 250V, I_D = 13A, R_G = 25Ω(3)	-	30.2		ns
Rise Time	t_r		-	52.8		
Turn-Off Delay Time	$t_{d(off)}$		-	60.8		
Fall Time	t_f		-	33.8		
Drain-Source Body Diode Characteristics						
Maximum Continuous Drain to Source Diode Forward Current	I_S		-	13	-	A
Source-Drain Diode Forward Voltage	V_{SD}	I_S = 13A, V_{GS} = 0V	-		1.4	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 13A, dI/dt = 100A/μs(3)	-	325		ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.9		μC

Note :

1. Pulse width is based on $R_{\theta JC}$ & $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width ≤300us, duty cycle≤2%, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
3. I_{SD} ≤9.0A, di/dt≤200A/us, V_{DD}=50V, R_g =25Ω, Starting T_J=25°C
4. L=6.2mH, I_{AS}=13.0A, V_{DD}=50V, R_g =25Ω, Starting T_J=25°C

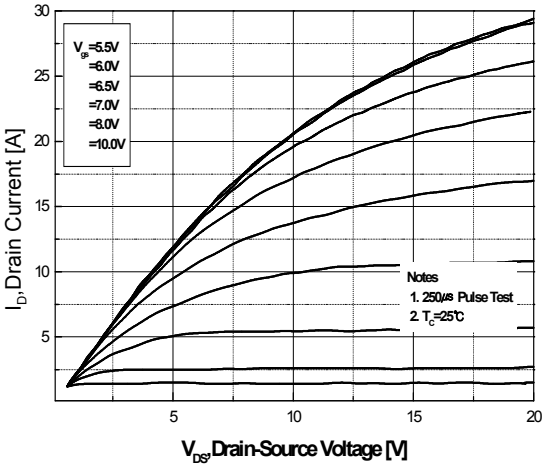


Fig.1 On-Region Characteristics

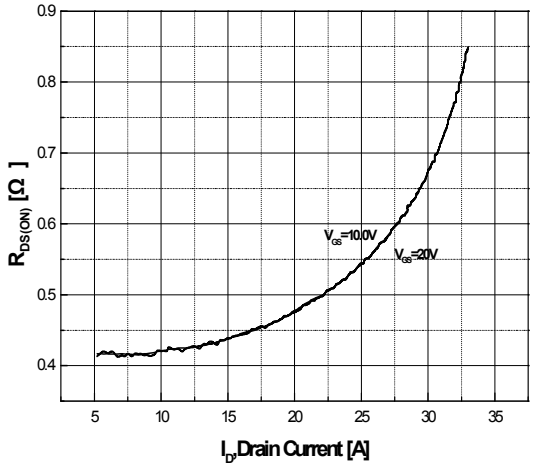


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

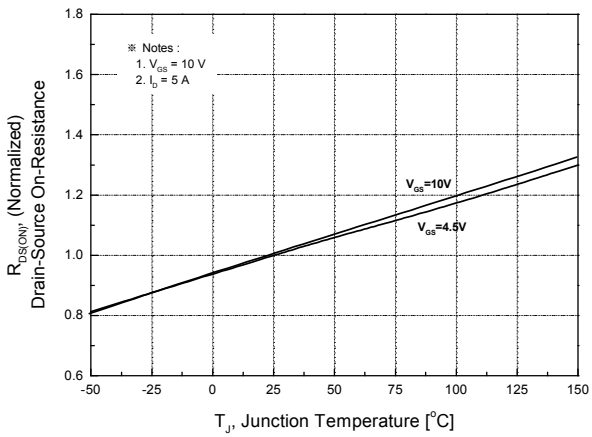


Fig.3 On-Resistance Variation with Temperature

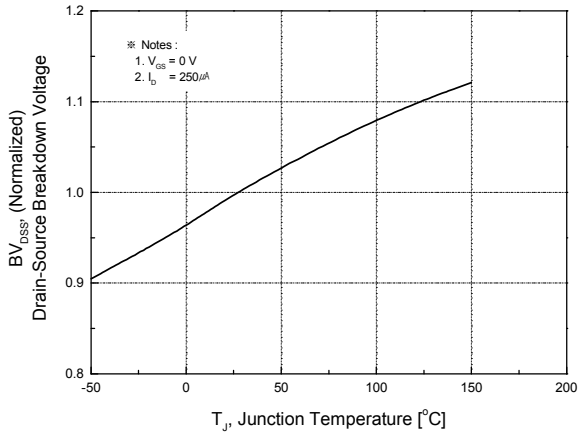


Fig.4 Breakdown Voltage Variation vs. Temperature

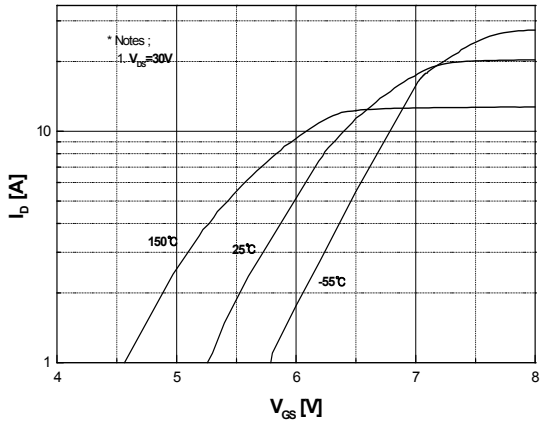


Fig.5 Transfer Characteristics

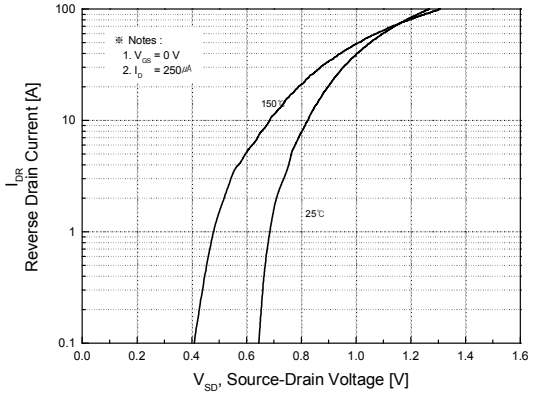


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

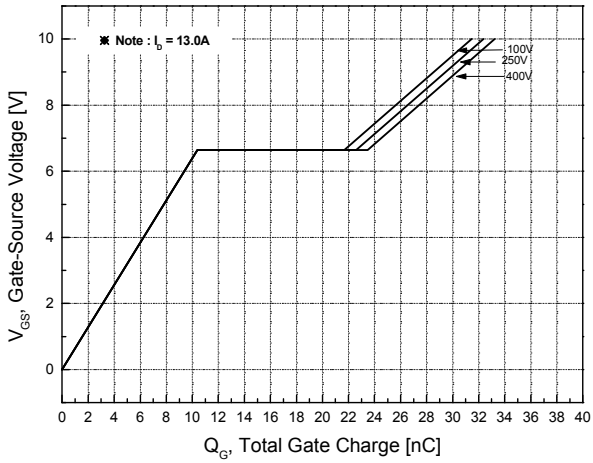


Fig.7 Gate Charge Characteristics

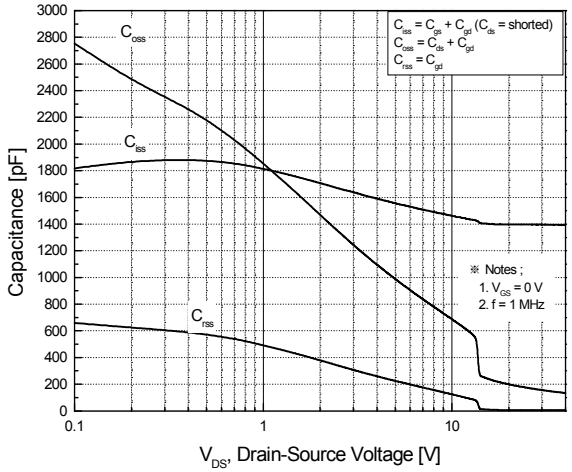


Fig.8 Capacitance Characteristics

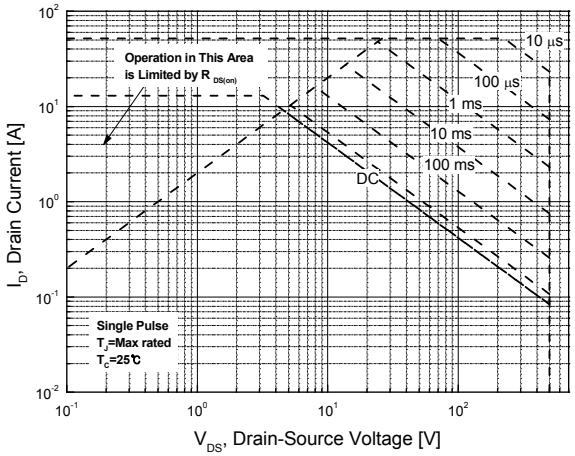


Fig.9 Maximum Safe Operating Area

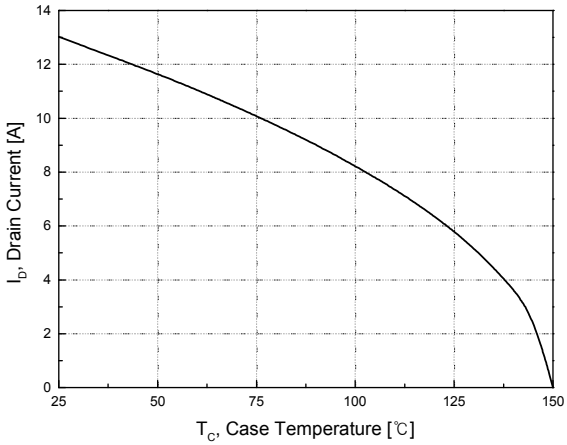


Fig.10 Maximum Drain Current vs. Case Temperature

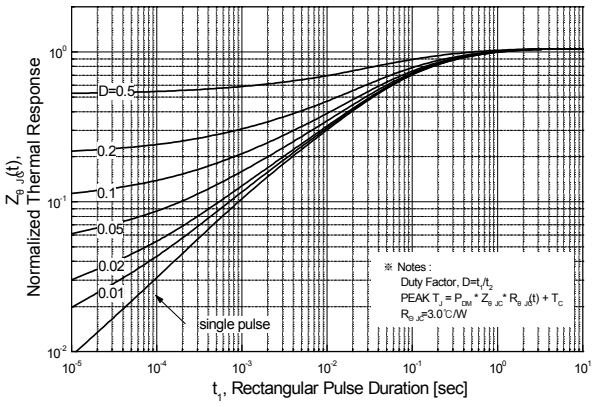


Fig.11 Transient Thermal Response Curve

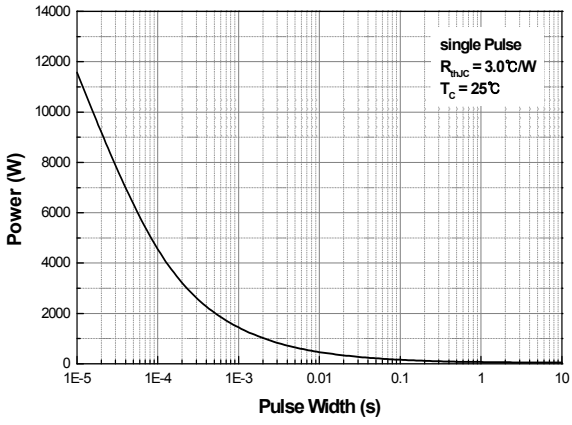
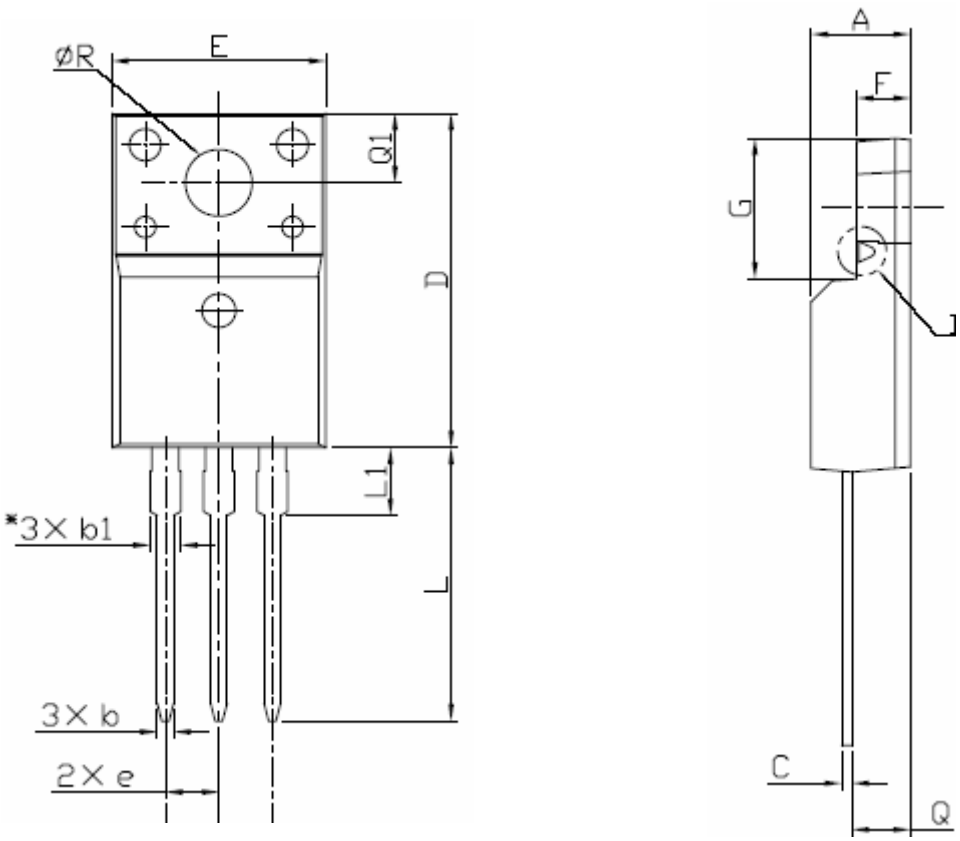


Fig.12 Single Pulse Maximum Power Dissipation

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
ØR	3.00		3.55

Worldwide Sales Support Locations

U.S.A
Sunnyvale Office
787 N. Mary Ave. Sunnyvale
CA 94085 U.S.A
Tel : 1-408-636-5200
Fax : 1-408-213-2450
E-Mail : usasales@magnachip.com

U.K
Knyvett House The Causeway,
Staines Middx, TW18 3BA,U.K.
Tel : +44 (0) 1784-895-000
Fax : +44 (0) 1784-895-115
E-Mail : uksales@magnachip.com

Japan
Osaka Office
3F, Shin-Osaka MT-2 Bldg 3-5-36
Miyahara Yodogawa-Ku
Osaka, 532-0003 Japan
Tel : 81-6-6394-9160
Fax : 81-6-6394-9150
E-Mail : osakasales@magnachip.com

Taiwan R.O.C
2F, No.61, Chowize Street, Nei Hu
Taipei,114 Taiwan R.O.C
Tel : 886-2-2657-7898
Fax : 886-2-2657-8751
E-Mail : taiwansales@magnachip.com

China
Hong Kong Office
Suite 1024, Ocean Centre 5 Canton Road,
Tsim Sha Tsui Kowloon, Hong Kong
Tel : 852-2828-9700
Fax : 852-2802-8183
E-Mail : chinasales@magnachip.com

Shenzhen Office
Room 2003B, 20/F
International Chamber of Commerce Tower
Fuhua Road3 CBD, Futian District, China
Tel : 86-755-8831-5561
Fax : 86-755-8831-5565
E-Mail : chinasales@magnachip.com

Shanghai Office
Room E, 8/F, Liaoshen International Building 1068
Wuzhong Road, (C) 201103
Shanghai, China
Tel : 86-21-6405-1521
Fax : 86-21-6505-1523
E-Mail : chinasales@magnachip.com

Korea
891, Daechi-Dong, Kangnam-Gu
Seoul, 135-738 Korea
Tel : 82-2-6903-3451
Fax : 82-2-6903-3668 ~9
Email : koreasales@magnachip.com

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