

General Description

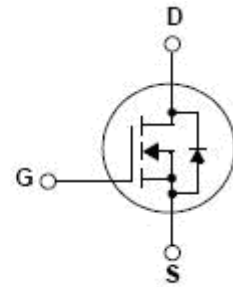
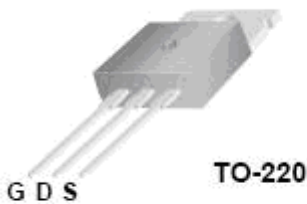
The MDP13N50 uses advanced Magnachip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality. MDP13N50 is suitable device for SMPS, HID and general purpose applications.

Features

- $V_{DS} = 500V$
- $I_D = 13.0A$ @ $V_{GS} = 10V$
- $R_{DS(ON)} < 0.5\Omega$ @ $V_{GS} = 10V$

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	I_D	$T_C=25^\circ C$	13	A
		$T_C=100^\circ C$	8.2	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	52	A	
Power Dissipation	P_D	$T_C=25^\circ C$	187	W
		Derate above 25 °C	1.49	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	

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⁾	$R_{\theta JC}$	0.67	

Ordering Information

Part Number	Temp. Range	Package	Packing	ROHS status
MDP13N50TH	-55~150°C	TO-220	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	V
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	I _S = 13A, V _{GS} = 0V	-	13	-	A
Source-Drain Diode Forward Voltage	V _{SD}		-		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 :

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

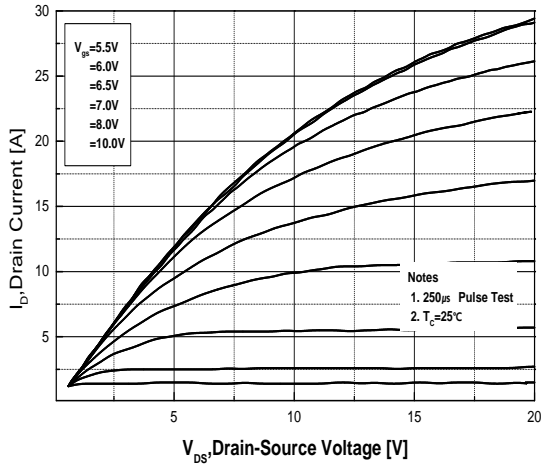


Fig.1 On-Region Characteristics

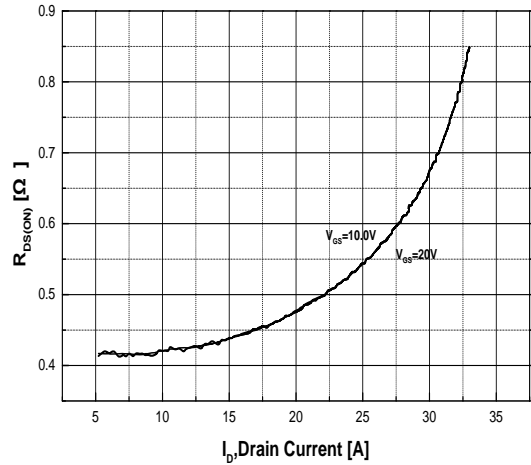


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

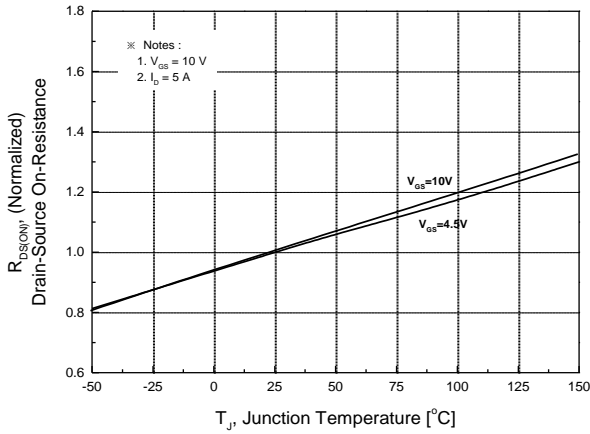


Fig.3 On-Resistance Variation with Temperature

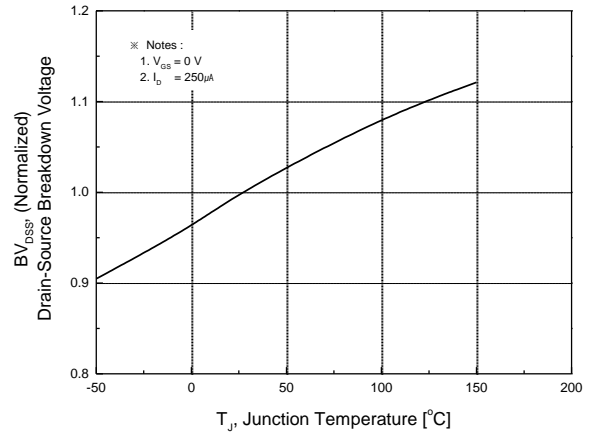


Fig.4 Breakdown Voltage Variation vs. Temperature

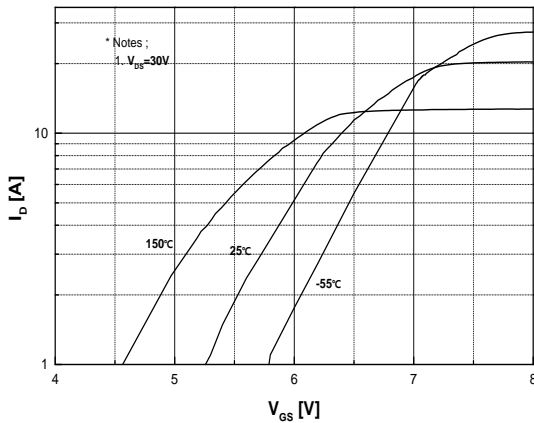


Fig.5 Transfer Characteristics

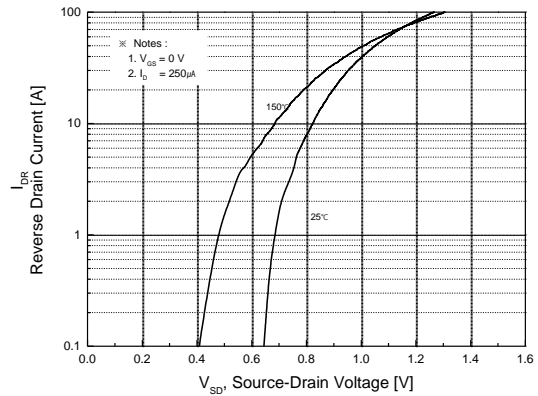


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

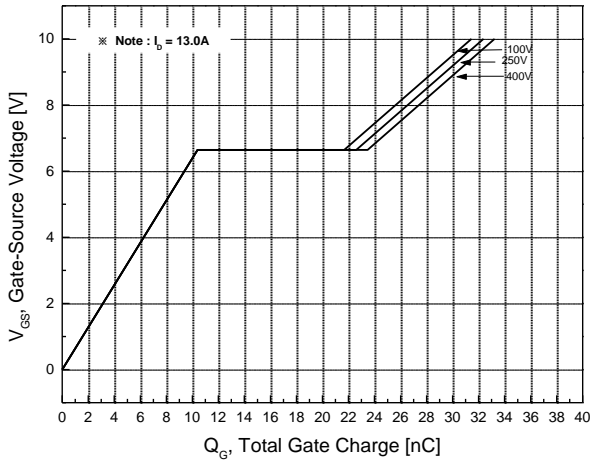


Fig.7 Gate Charge Characteristics

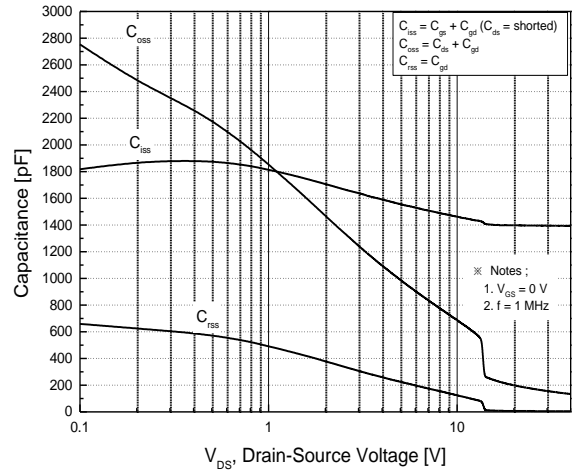


Fig.8 Capacitance Characteristics

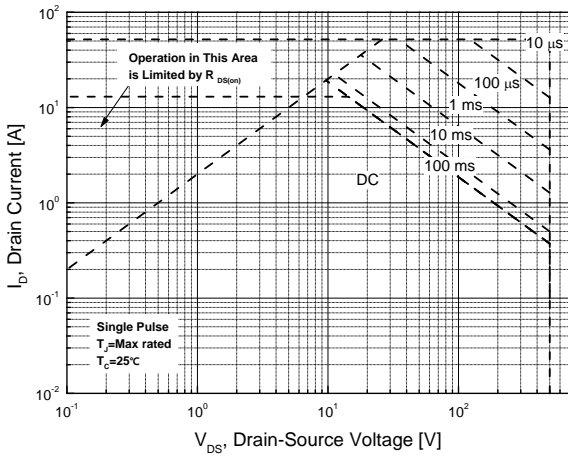


Fig.9 Maximum Safe Operating Area

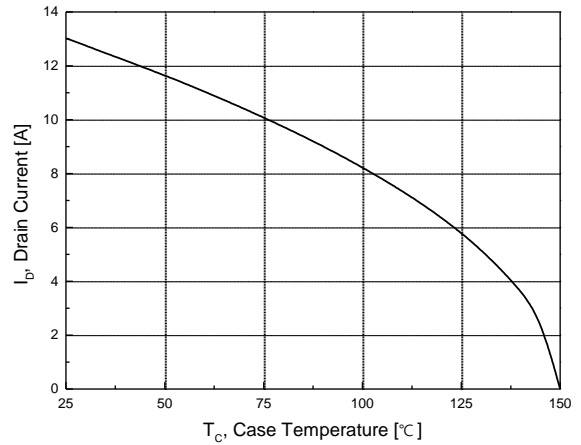


Fig.10 Maximum Drain Current vs. Case Temperature

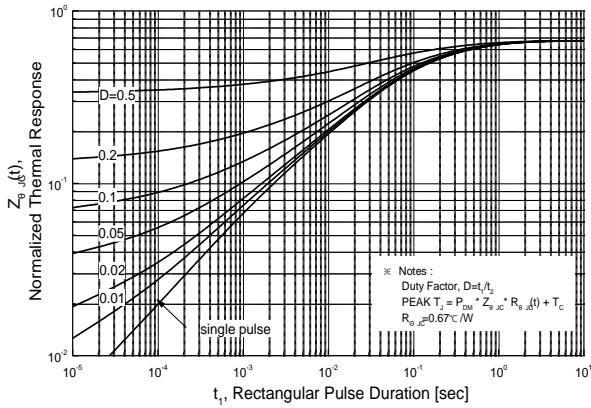


Fig.11 Transient Thermal Response Curve

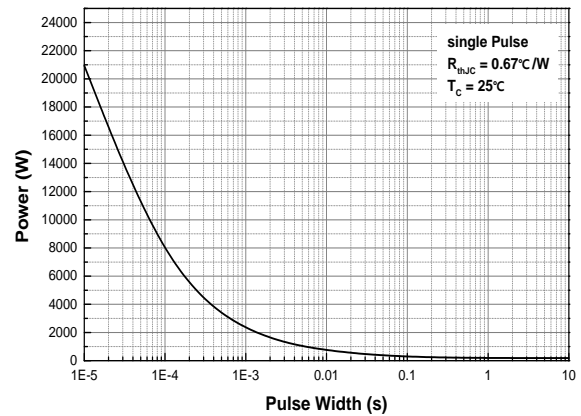
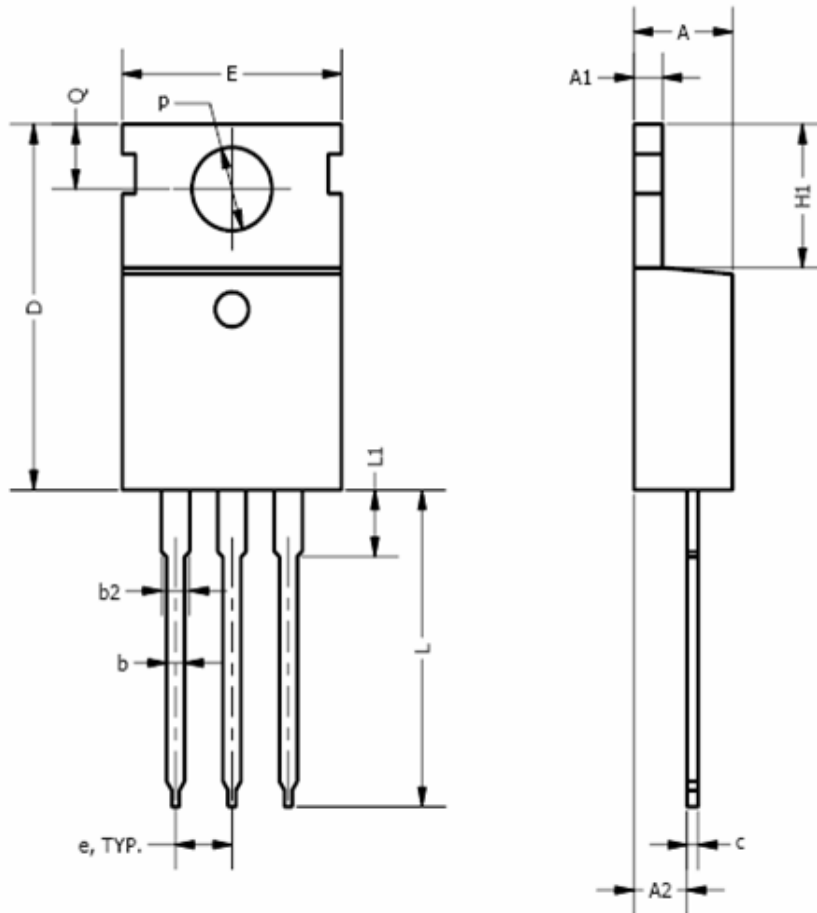


Fig.12 Single Pulse Maximum Power Dissipation

Physical Dimension

TO220, 3L

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
ϕP	3.53		4.09
Q	2.54		3.43

Note : 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.

Magnachip reserves the right to change the specifications and circuitry without notice at any time. Magnachip does not consider responsibility for use of any circuitry other than circuitry entirely included in a Magnachip product.  Magnachip is a registered trademark of Magnachip Semiconductor Ltd.