

### General Description

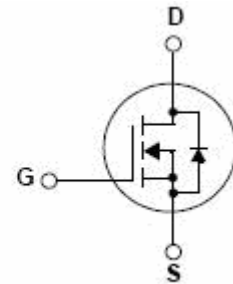
The MDP13N50 uses advanced Magnachip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality. MDP13N50 is suitable device for SMPS, HID and general purpose applications.

### 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	$T_C=25^\circ C$	13	A
	$T_C=100^\circ C$	8.2	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	52	A
Power Dissipation	$T_C=25^\circ C$	187	W
	Derate above 25 °C	1.49	W/°C
Peak Diode Recovery $dv/dt$ <sup>(3)</sup>	$Dv/dt$	4.5	V/ns
Single Pulse Avalanche Energy <sup>(4)</sup>	$E_{AS}$	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 <sup>(1)</sup>	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case <sup>(1)</sup>	$R_{\theta JC}$	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
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu A, V_{GS} = 0V$	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	-	5.0	V
Drain Cut-Off Current	$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 6.5A$		0.39	0.5	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 40V, I_D = 6.5A$	-	13	-	S
<b>Dynamic Characteristics</b>						
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	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 250V, I_D = 13A, R_G = 25\Omega^{(3)}$	-	30.2		ns
Rise Time	$t_r$		-	52.8		
Turn-Off Delay Time	$t_{d(off)}$		-	60.8		
Fall Time	$t_f$		-	33.8		
<b>Drain-Source Body Diode Characteristics</b>						
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	$t_{rr}$	$I_F = 13A, di/dt = 100A/\mu s^{(3)}$	-	325		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	2.9		$\mu C$

Note :

- Pulse width is based on  $R_{\theta JC}$  &  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C.
- Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ , pulse width limited by junction temperature  $T_J(MAX)=150^\circ C$ .
- $I_{SD} \leq 9.0A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD}=50V$ ,  $R_G = 25\Omega$ , Starting  $T_J=25^\circ C$
- $L=6.2mH$ ,  $I_{AS}=13.0A$ ,  $V_{DD}=50V$ ,  $R_G = 25\Omega$ , Starting  $T_J=25^\circ C$

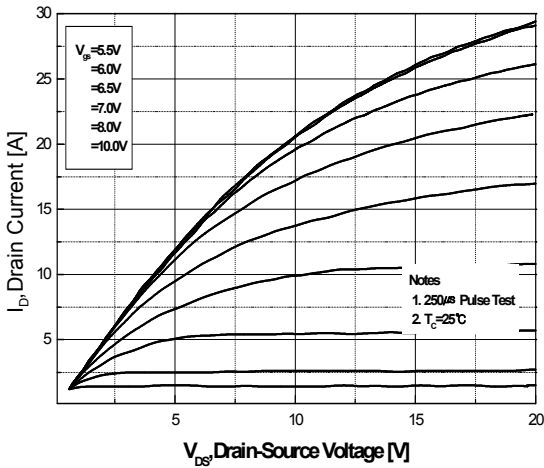


Fig.1 On-Region Characteristics

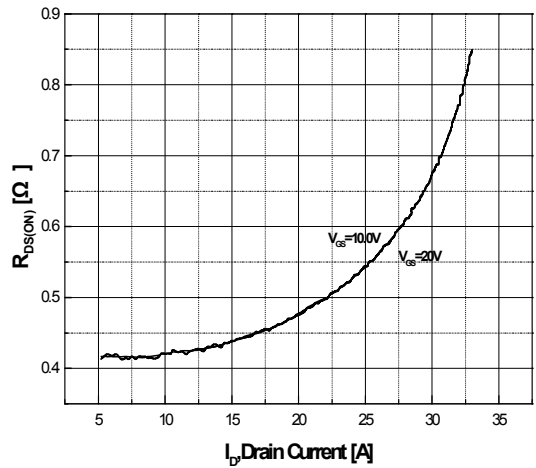


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

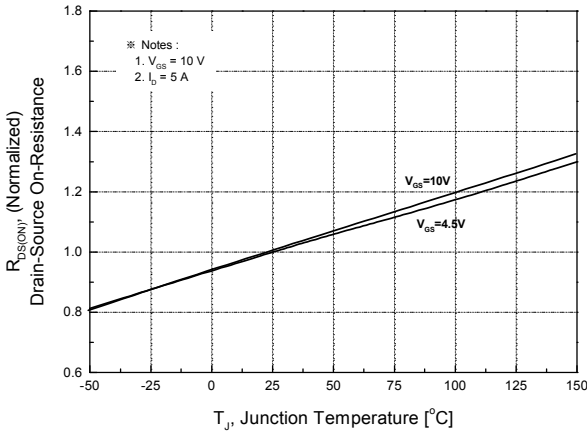


Fig.3 On-Resistance Variation with Temperature

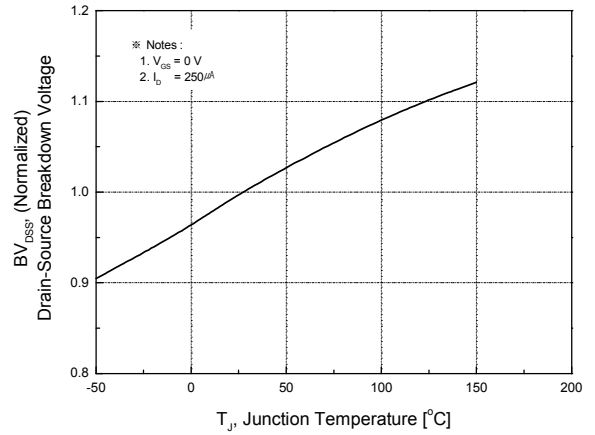


Fig.4 Breakdown Voltage Variation vs. Temperature

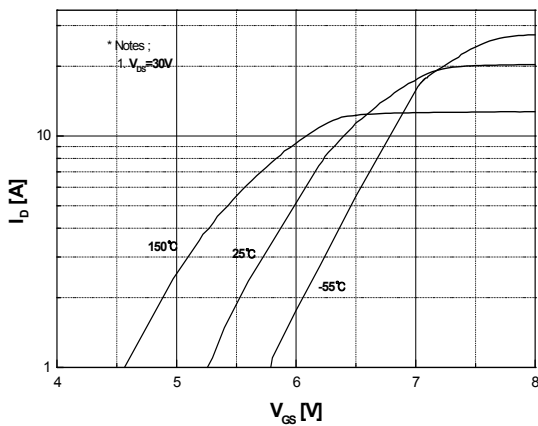


Fig.5 Transfer Characteristics

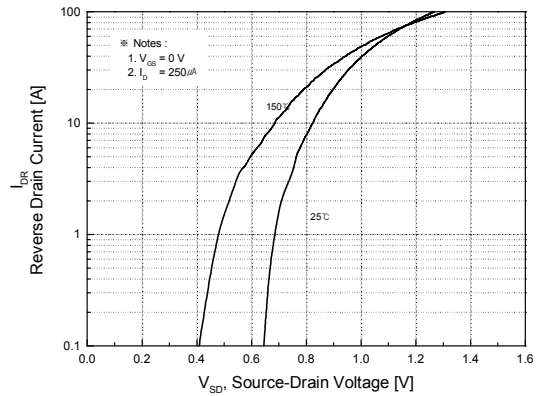


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

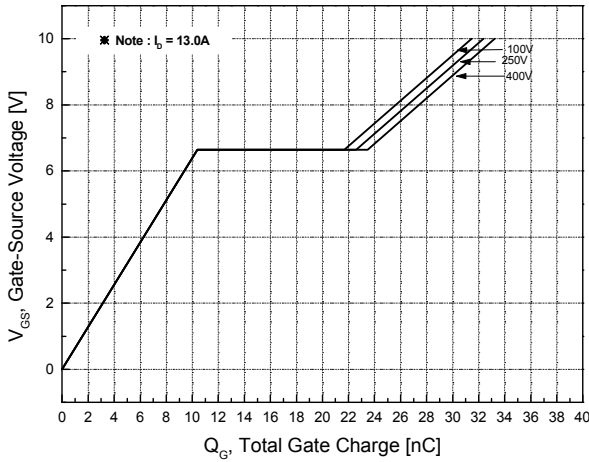


Fig.7 Gate Charge Characteristics

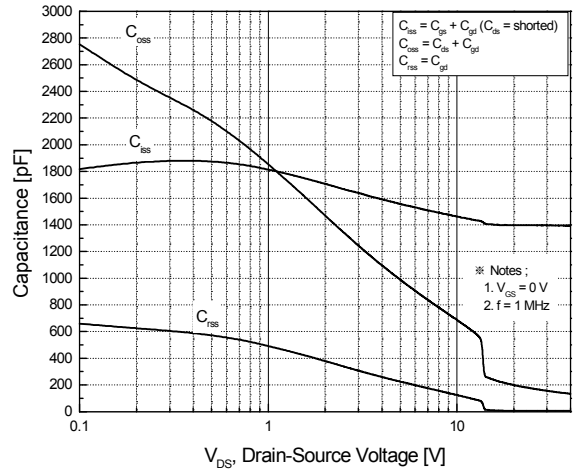


Fig.8 Capacitance Characteristics

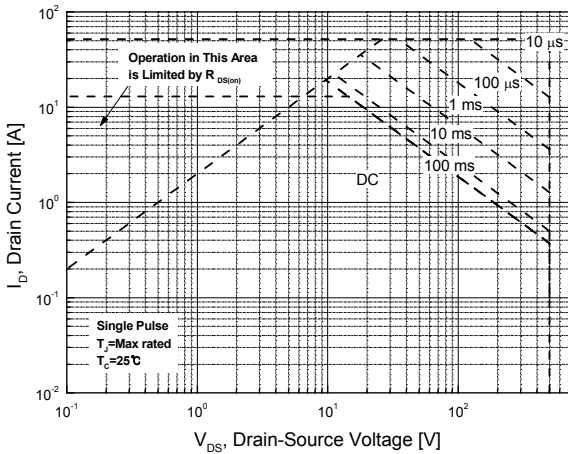


Fig.9 Maximum Safe Operating Area

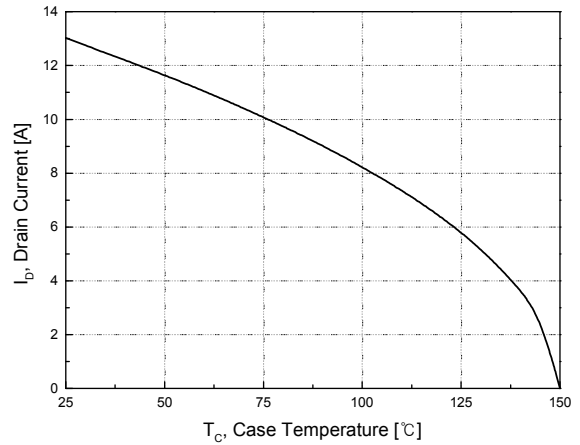


Fig.10 Maximum Drain Current vs. Case Temperature

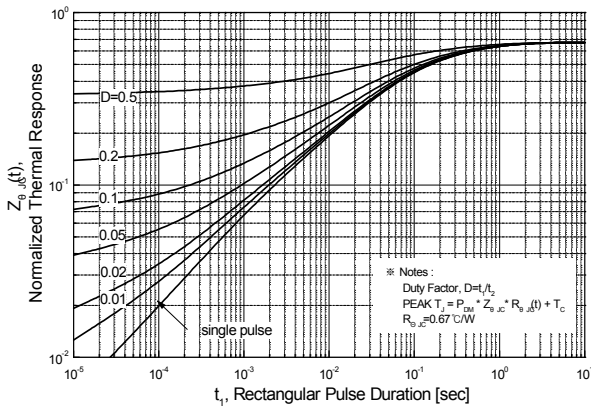


Fig.11 Transient Thermal Response Curve

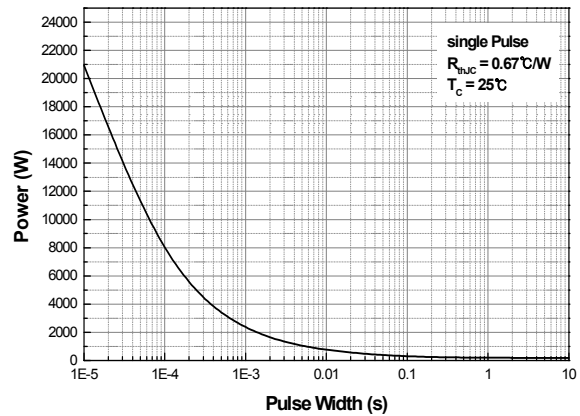
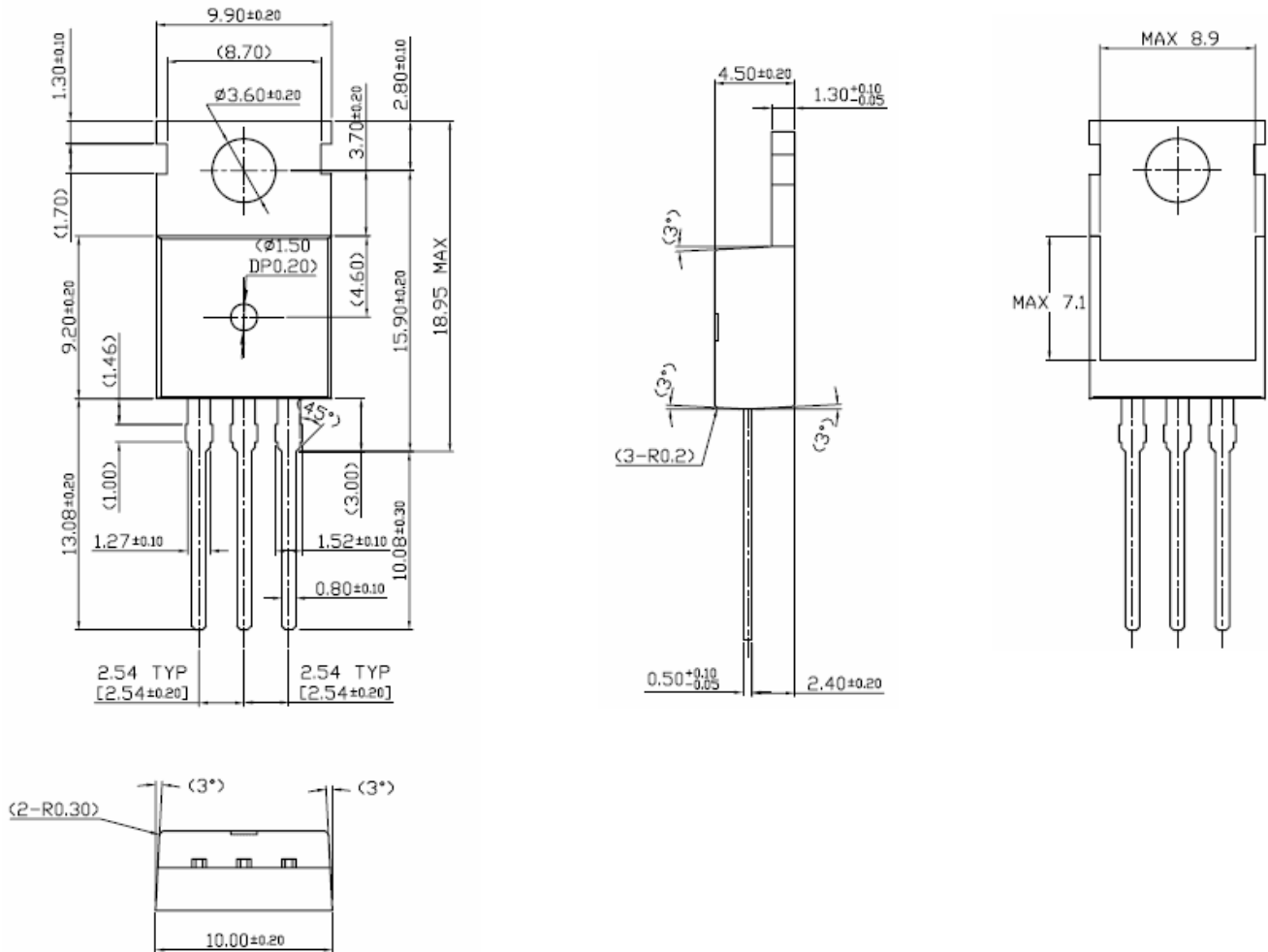


Fig.12 Single Pulse Maximum Power Dissipation

Physical Dimension

TO220, 3L

Dimensions are in millimeters, unless otherwise specified



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