

### General Description

These N-channel MOSFET are produced using advanced Magnachip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

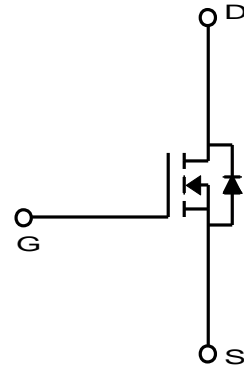
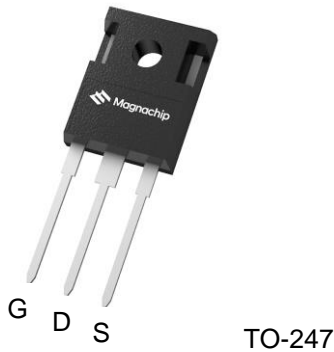
These devices are suitable device for SMPS, high Speed switching and general purpose applications.

### Features

- $V_{DS} = 500V$
- $I_D = 23.0A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.245\Omega$  @  $V_{GS} = 10V$

### 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	$T_C=25^\circ C$	$I_D$	23	A
	$T_C=100^\circ C$		14.6	A
Pulsed Drain Current <sup>(1)</sup>		$I_{DM}$	92	A
Power Dissipation	$T_C=25^\circ C$	$P_D$	290	W
	Derate above $25^\circ C$		2.33	W/ $^\circ C$
Repetitive Avalanche Energy <sup>(1)</sup>		$E_{AR}$	29	mJ
Peak Diode Recovery $dv/dt$ <sup>(3)</sup>		$dv/dt$	4.5	V/ns
Single Pulse Avalanche Energy <sup>(4)</sup>		$E_{AS}$	950	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>	$R_{\theta JA}$	40	$^\circ C/W$
Thermal Resistance, Junction-to-Case <sup>(1)</sup>	$R_{\theta JC}$	0.44	

**Ordering Information**

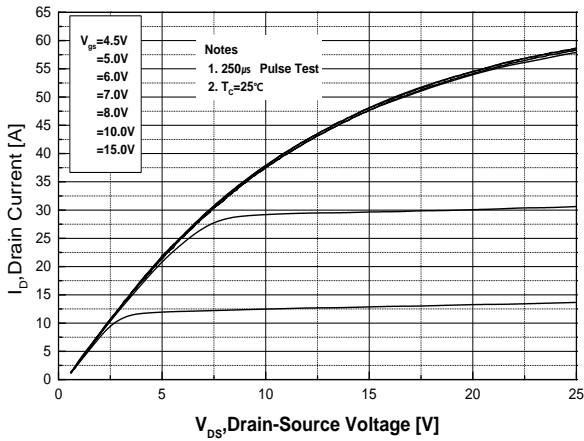
Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MDQ23N50DTP	MDQ23N50D	-55~150°C	TO-247	Tube	Pb Free

**Electrical Characteristics (Ta =25°C)**

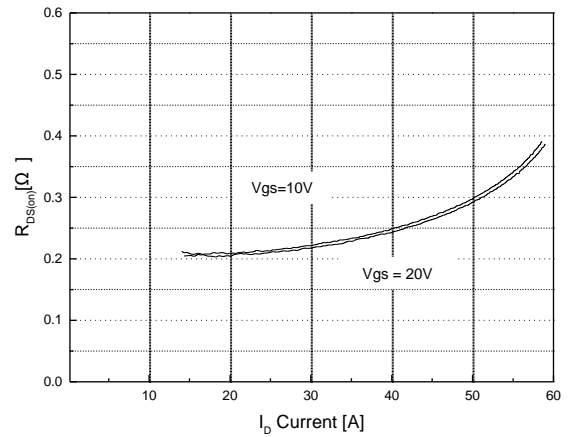
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu A, V_{GS} = 0V$	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	
Drain Cut-Off Current	$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 11.5A$	-	0.2	0.245	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 30V, I_D = 11.5A$	-	13	-	S
<b>Dynamic Characteristics</b>						
Total Gate Charge	$Q_g$	$V_{DS} = 400V, I_D = 23A, V_{GS} = 10V$	-	76	-	nC
Gate-Source Charge	$Q_{gs}$		-	16	-	
Gate-Drain Charge	$Q_{gd}$		-	20	-	
Input Capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	-	3280	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	23	-	
Output Capacitance	$C_{oss}$		-	325	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 250V, I_D = 23A, R_G = 25\Omega$	-	50	-	ns
Rise Time	$t_r$		-	155	-	
Turn-Off Delay Time	$t_{d(off)}$		-	230	-	
Fall Time	$t_f$		-	195	-	
<b>Drain-Source Body Diode Characteristics</b>						
Maximum Continuous Drain to Source Diode Forward Current	$I_S$		-	-	23	A
Source-Drain Diode Forward Voltage	$V_{SD}$	$I_S = 23A, V_{GS} = 0V$	-	-	1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 23A, di/dt = 100A/\mu s^{(3)}$	-	450	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	6	-	$\mu C$

**Notes :**

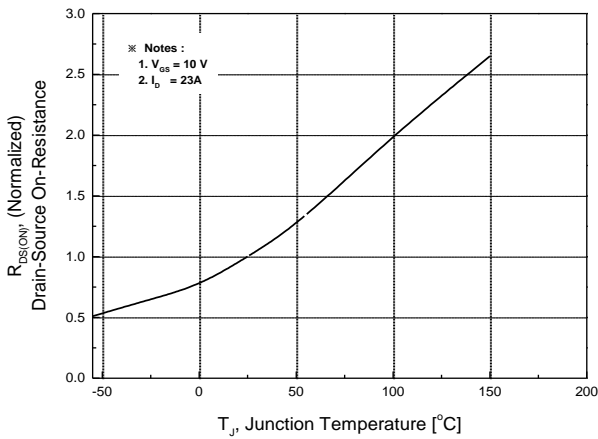
1. Pulse width is based on  $R_{\theta JC}$  &  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ , pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ C$ .
3.  $I_{SD} \leq 23A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$
4.  $L = 3.24mH, I_{AS} = 23A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$



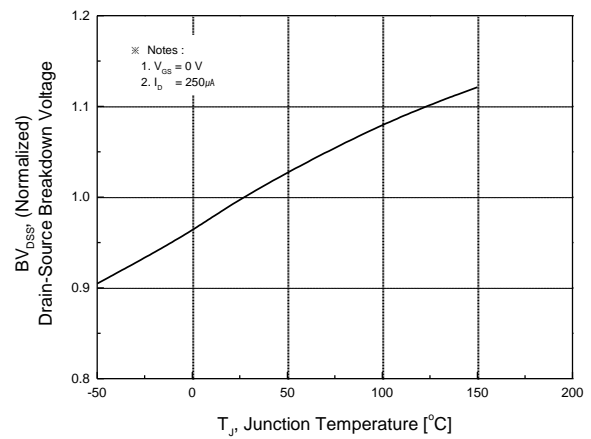
**Fig.1 On-Region Characteristics**



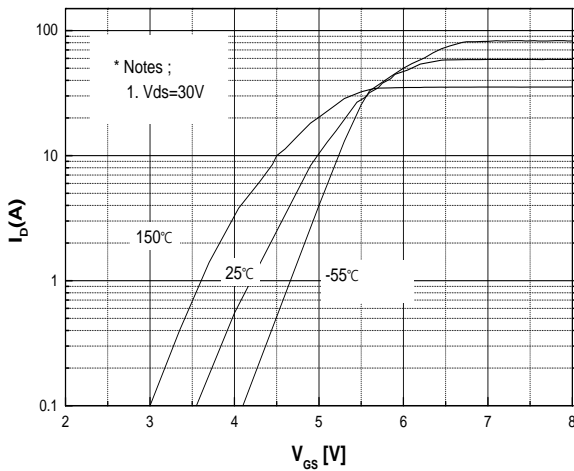
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



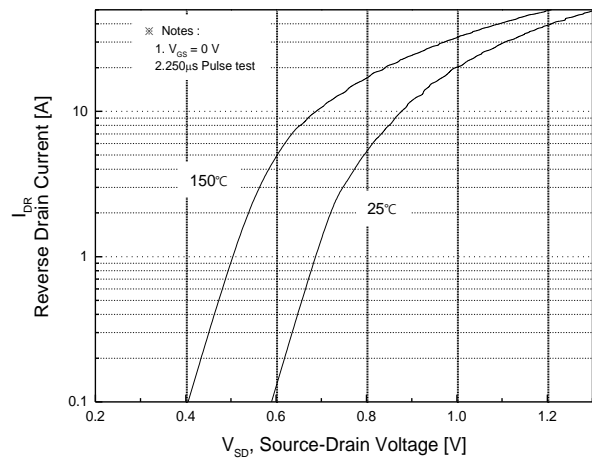
**Fig.3 On-Resistance Variation with Temperature**



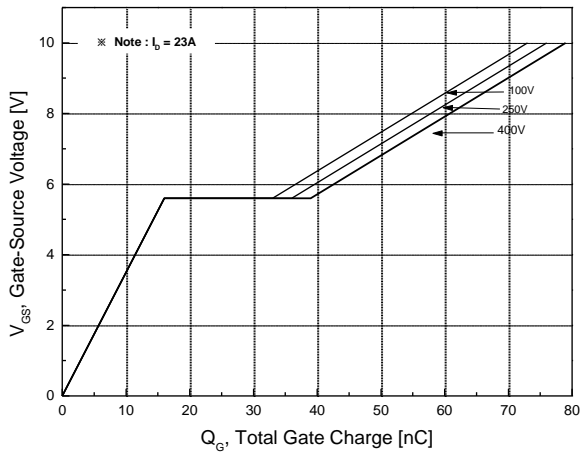
**Fig.4 Breakdown Voltage Variation vs. Temperature**



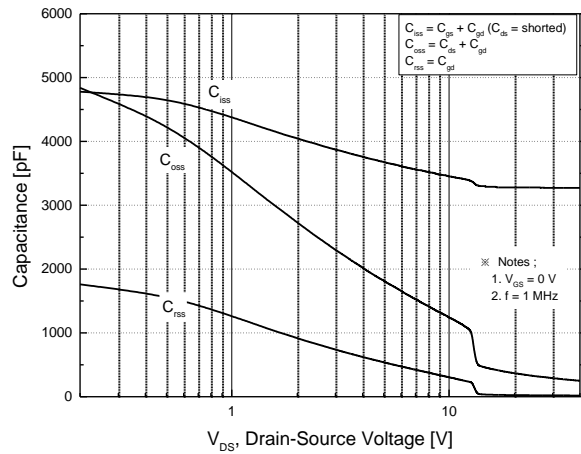
**Fig.5 Transfer Characteristics**



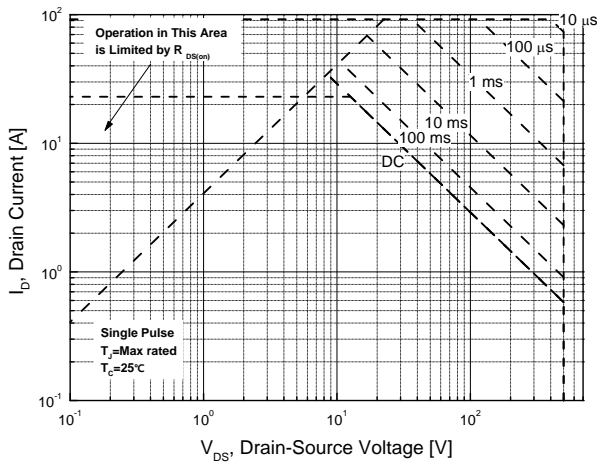
**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**



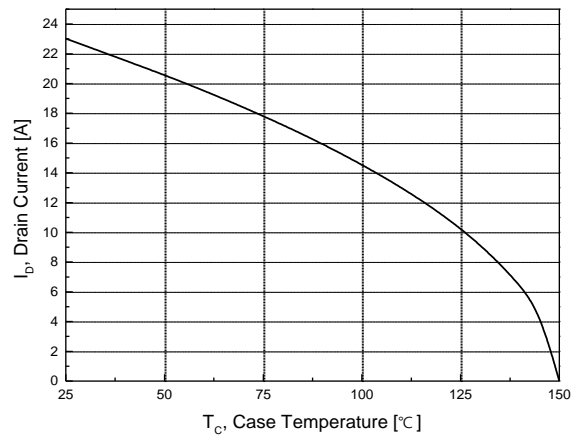
**Fig.7 Gate Charge Characteristics**



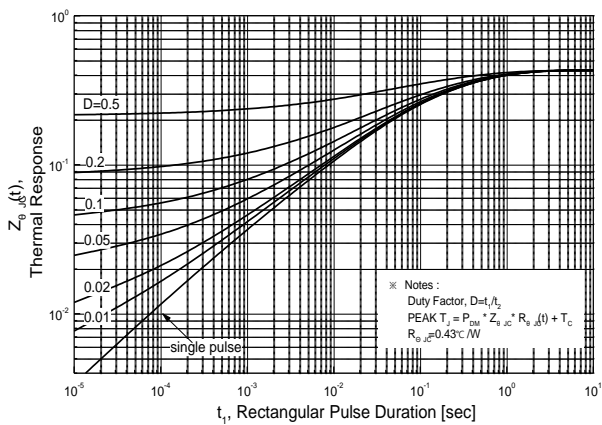
**Fig.8 Capacitance Characteristics**



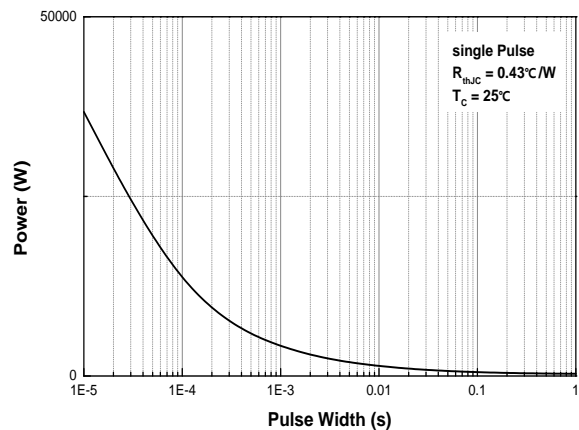
**Fig.9 Maximum Safe Operating Area**



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



**Fig.11 Transient Thermal Response Curve**

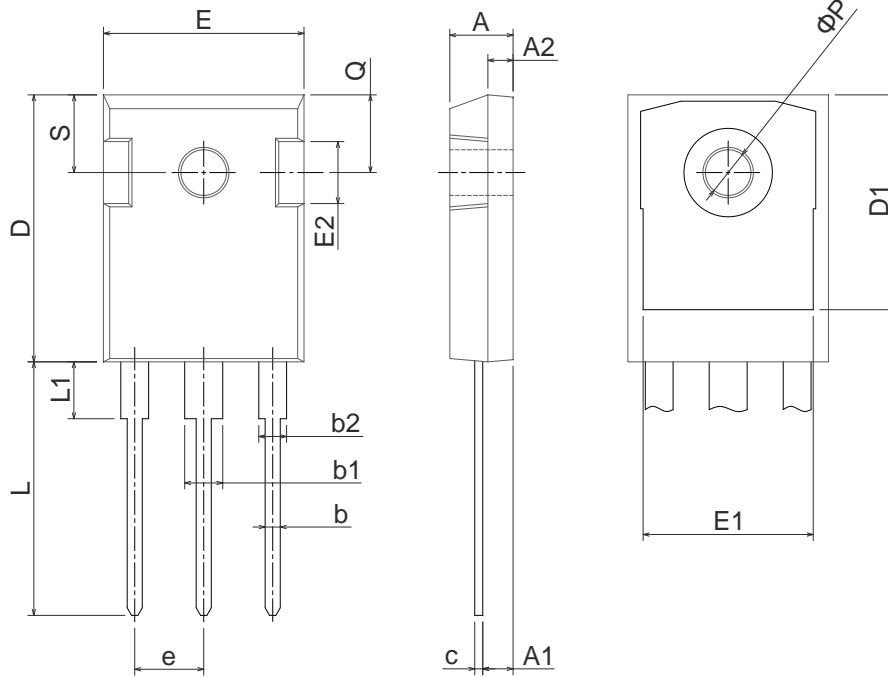


**Fig.12 Single Pulse Maximum Power Dissipation**

**Physical Dimension**

**TO-247**

Dimensions are in millimeters, unless otherwise specified




Dimension	Min(mm)	Max(mm)
A	4.70	5.31
A1	2.20	2.60
A2	1.50	2.49
b	0.99	1.40
b1	2.59	3.43
b2	1.65	2.39
c	0.38	0.89
D	20.30	21.46
D1	13.08	-
E	15.45	16.26
E1	13.06	14.02
E2	4.32	5.49
e	5.45BSC	
L	19.81	20.57
L1	-	4.50
ΦP	3.50	3.70
Q	5.38	6.20
S	6.15BSC	



**RoHS Compliant**  
HALOGEN-FREE

**DISCLAIMER:**

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