

### 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.

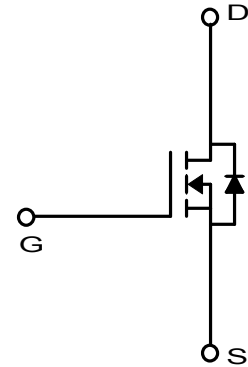
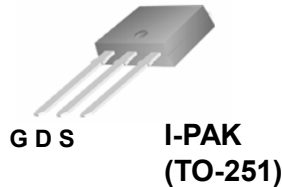
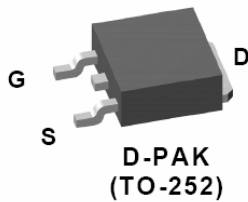
These devices are suitable device for SMPS, high Speed switching and general purpose applications.

### Features

- $V_{DS} = 600V$
- $I_D = 3.5A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 2.0\Omega$  @  $V_{GS} = 10V$

### Applications

- Power Supply
- PFC
- High Current, High Speed Switching



### Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit	
Drain-Source Voltage	$V_{DSS}$	600	V	
Gate-Source Voltage	$V_{GSS}$	±30	V	
Continuous Drain Current	$I_D$	$T_C=25^\circ C$	3.5	A
		$T_C=100^\circ C$	2.2	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	14	A	
Power Dissipation	$P_D$	$T_C=25^\circ C$	67.5	W
		Derate above 25 °C	0.54	W/°C
Repetitive Avalanche Energy <sup>(1)</sup>	$E_{AR}$	6.75	mJ	
Peak Diode Recovery $dv/dt$ <sup>(3)</sup>	$dv/dt$	4.5	V/ns	
Single Pulse Avalanche Energy <sup>(4)</sup>	$E_{AS}$	170	mJ	
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~150	°C	

\*  $I_D$  limited by maximum junction temperature

### Thermal Characteristics

Characteristics	Symbol	MDD4N60 / MDI4N60	Unit
Thermal Resistance, Junction-to-Ambient <sup>(1)</sup>	$R_{\theta JA}$	110	°C/W
Thermal Resistance, Junction-to-Case <sup>(1)</sup>	$R_{\theta JC}$	1.85	

## Ordering Information

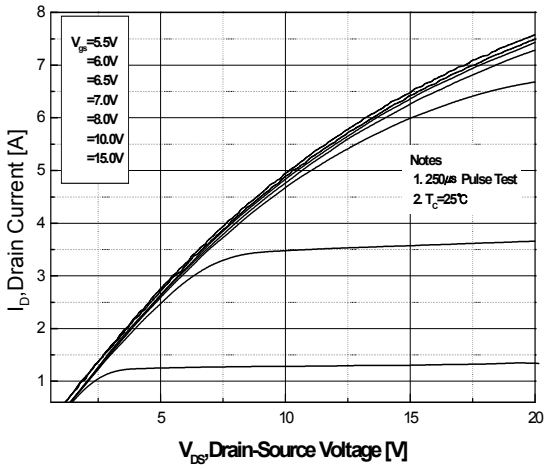
Part Number	Temp. Range	Package	Packing	RoHS Status
MDD4N60RH	-55~150°C	D-pak	Reel	Halogen Free
MDI4N60TH	-55~150°C	I-pak	Tube	Halogen Free

## Electrical Characteristics (Ta =25°C)

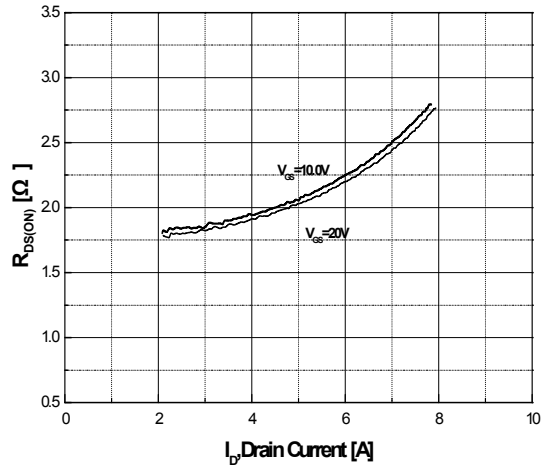
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu A, V_{GS} = 0V$	600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	-	5.0	
Drain Cut-Off Current	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 1.75A$		1.7	2.0	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 30V, I_D = 1.75A$	-	4	-	S
<b>Dynamic Characteristics</b>						
Total Gate Charge	$Q_g$	$V_{DS} = 480V, I_D = 4.0A, V_{GS} = 10V^{(3)}$	-	12.1		nC
Gate-Source Charge	$Q_{gs}$		-	3.5		
Gate-Drain Charge	$Q_{gd}$		-	4.4		
Input Capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	-	506	660	pF
Reverse Transfer Capacitance	$C_{rss}$		-	2.3	3	
Output Capacitance	$C_{oss}$		-	58	75	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 300V, I_D = 4.0A, R_G = 25\Omega^{(3)}$	-	12		ns
Rise Time	$t_r$		-	20		
Turn-Off Delay Time	$t_{d(off)}$		-	27		
Fall Time	$t_f$		-	20		
<b>Drain-Source Body Diode Characteristics</b>						
Maximum Continuous Drain to Source Diode Forward Current	$I_S$		-	4.6	-	A
Source-Drain Diode Forward Voltage	$V_{SD}$	$I_S = 4.0A, V_{GS} = 0V$	-		1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 4.0A, di/dt = 100A/\mu s^{(3)}$	-	243		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	1.5		$\mu C$

Note :

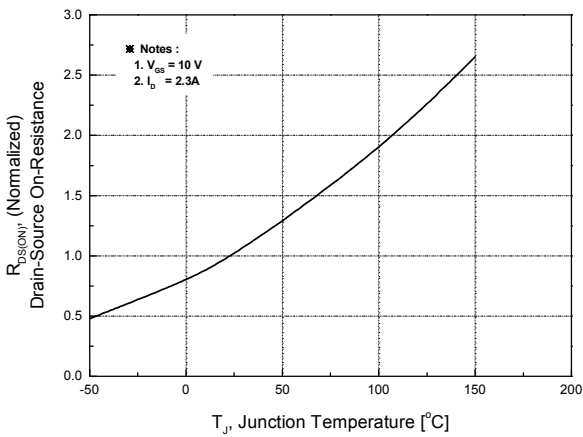
- Pulse width is based on  $R_{\theta JC}$  &  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C.
- Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ , pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ C$ .
- $I_{SD} \leq 4.0A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$
- $L = 17.9mH$ ,  $I_{AS} = 4.0A$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$ ,



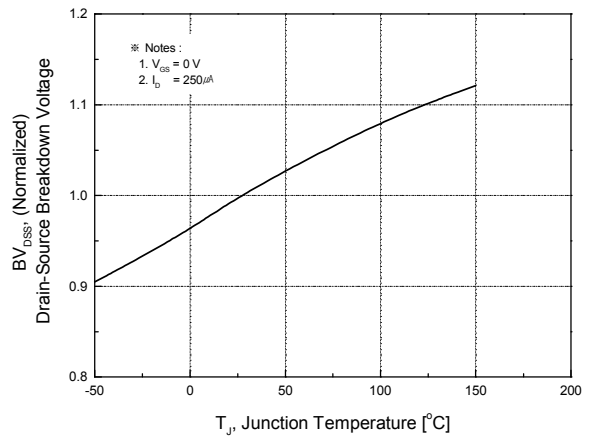
**Fig.1 On-Region Characteristics**



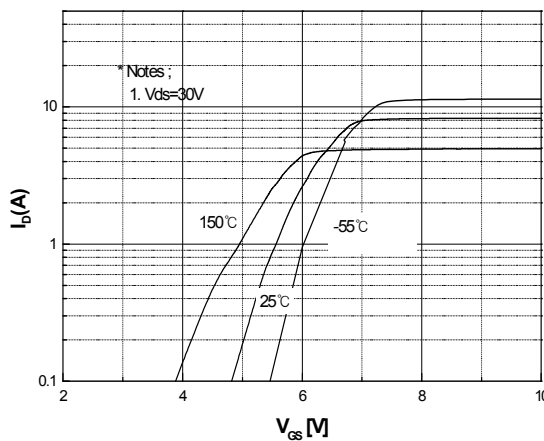
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



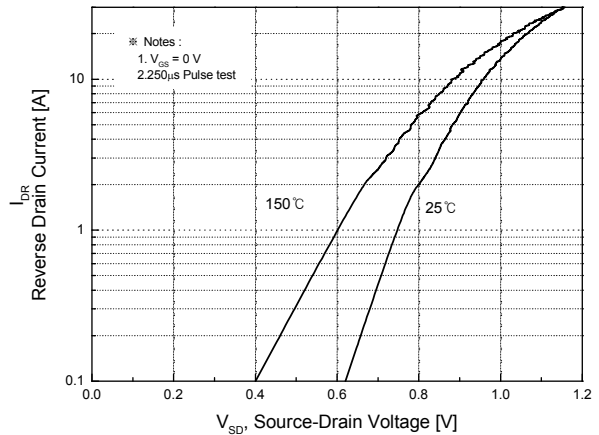
**Fig.3 On-Resistance Variation with Temperature**



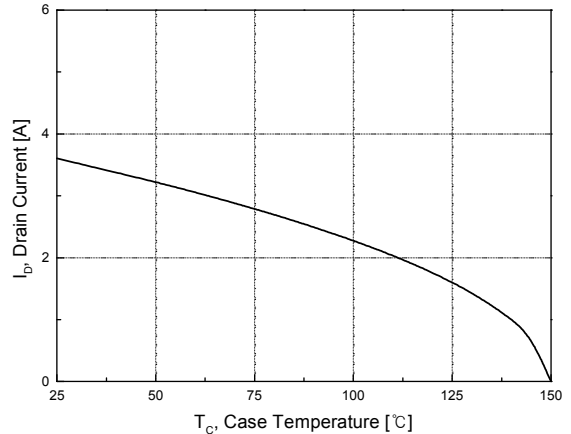
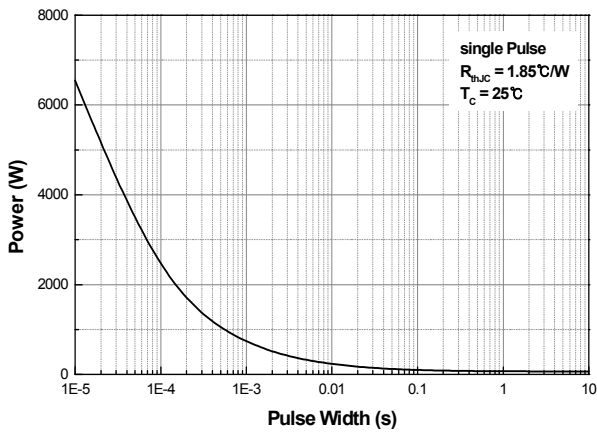
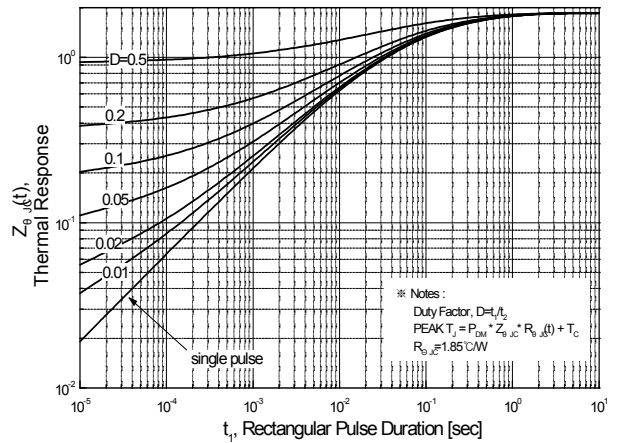
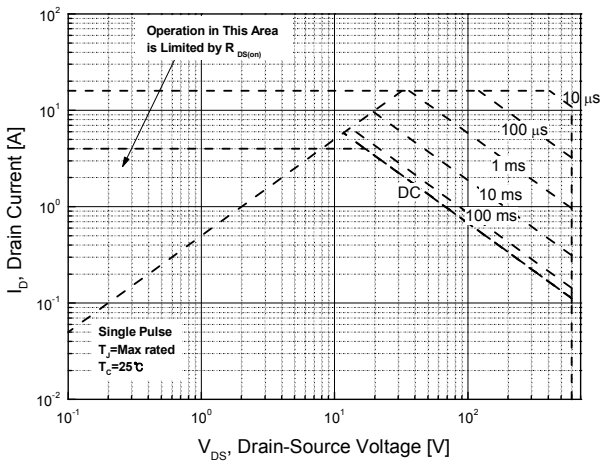
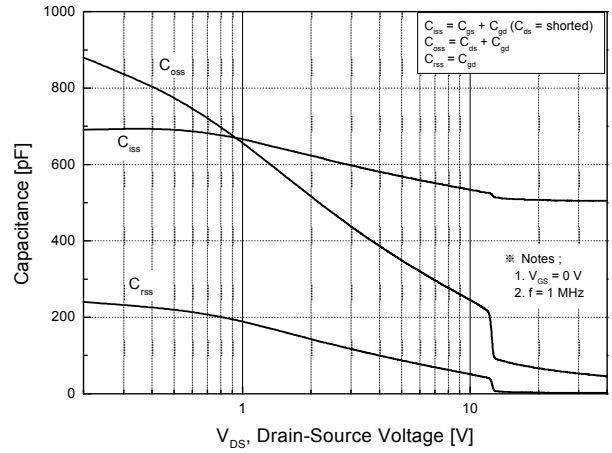
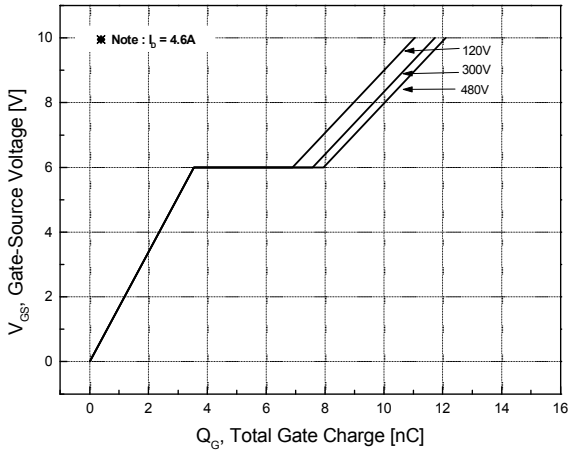
**Fig.4 Breakdown Voltage Variation vs. Temperature**



**Fig.5 Transfer Characteristics**



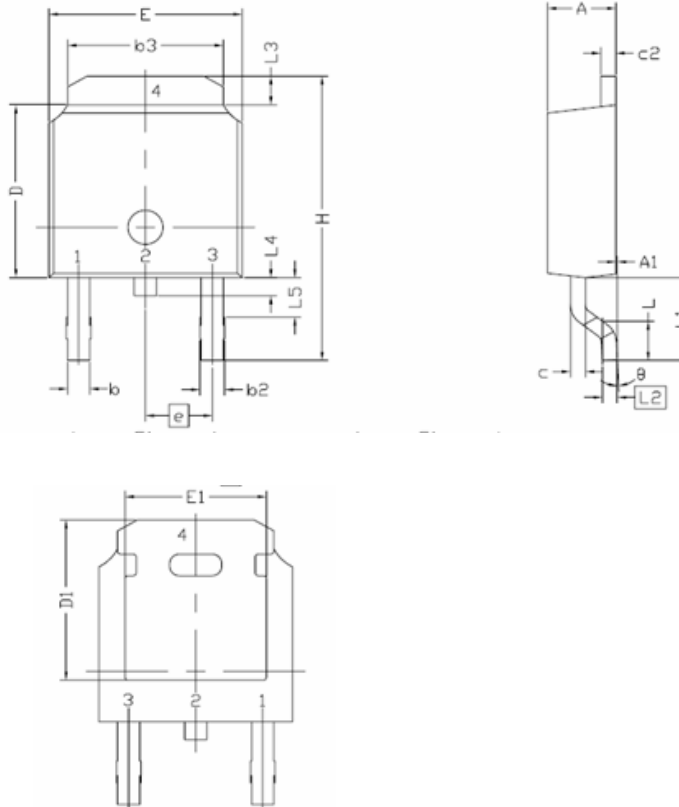
**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**



**Physical Dimension**

**TO-252 (DPAK)**

Dimensions are in millimeters, unless otherwise specified

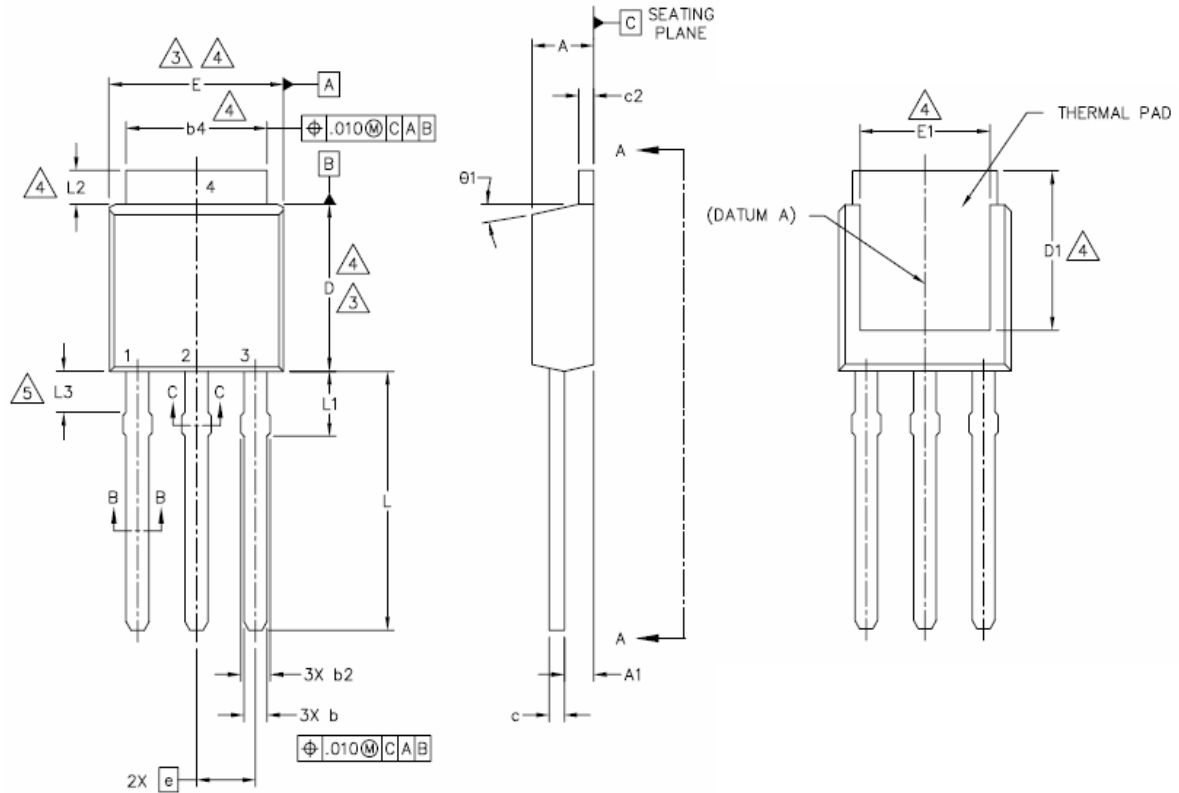


Symbol	Min.	Nom.	Max.
E	6.35	-	6.73
L	1.40	1.52	1.78
L1	2.74 REF		
L2	0.508 BCS		
L3	0.89	-	1.27
L4	-	-	1.02
L5	1.14	-	1.52
D	5.97	6.10	6.22
H	9.40	-	10.41
b	0.64	-	0.89
b2	0.76	-	1.14
b3	4.95	-	5.46
e	2.286 BSC		
A	2.18	-	2.39
A1	-	-	0.13
c	0.46	-	0.61
c2	0.46	-	0.89
D1	5.21	-	-
E1	4.32	-	-
⌀	0.00	-	10.00

**Physical Dimension**

**TO251 (I-PAK)**

Dimensions are in millimeters, unless otherwise specified



SYMBOL	MIN	NOM	MAX
A	2.18	-	2.39
A1	0.89	-	1.14
b	0.64	-	0.89
b1	0.64	0.71	0.79
b2	0.76	-	1.14
b4	4.95	-	5.46
c	0.46	-	0.61
c2	0.46	-	0.89
D	5.97	6.10	6.22
D1	4.75	-	
E	6.35	-	6.73
E1	4.32	-	0.00
e	2.30 BSC		
L	8.89	-	9.65
L1	1.80	-	2.29
L2	0.70	-	1.27
L3	1.14	-	1.52

**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  
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**Taiwan R.O.C**

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 Tel : 886-2-2657-7898  
 Fax : 886-2-2657-8751  
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**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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