

## PD69220/PD69208M

## EV82F61A Evaluation Board User Guide

### Introduction

The EV82F61A evaluation board is developed based on Microchip's PD69220 PoE controller and two PD69208M PoE managers.

Microchip's PD69208M Power over Ethernet (PoE) manager IC integrates power, analog, and state-of-the-art logic into a single 56-pin, plastic QFN package. The device is used in Ethernet switches and midspans/injectors to allow network devices to share power and data over the same Ethernet cable.

The PD69208M PoE manager is an 8-port, mixed-signal, and high-voltage PoE driver. Together with the PD69220 PoE controller, it performs as a PSE system. Microchip's PD69220 PoE controller is a pre-programmed MCU designed to implement enhanced mode PoE system.

The PD69208M and PD69220 chipset supports PoE Powered Device (PD) detection, power-up, and protection according to IEEE<sup>®</sup> 802.3af/at/bt standards as well as legacy/pre-standard PD detection. It provides real-time PD protection through the following mechanisms: overload, under-load, over-voltage, over-temperature, and short-circuit, and enables operation in a Standalone mode. It also executes all real-time functions as specified in IEEE 802.3af/at/bt standards.

The chipset supports supply voltages between 44 V and 57 V without additional power sources. Ongoing monitoring of system parameters for the host software is available through communication. For higher reliability, internal thermal protection is implemented in the chip. The PD69208M is the most integrated PSE IC including internal MOSFET and sense resistor to achieve a low power dissipation.

The PD69220 features an eSPI bus for each PD69208M. It is based on the Microchip D21 family. The PD69220 utilizes an I2C or UART interface to the host CPU. It is designed to support software field-upgradable through the communication interface. The evaluation system provides designers with the required environment to evaluate the performance.

The EV82F61A demonstrates the operation of four 4-pair ports and four 2-pair ports, and is based on a PD69220 PSE controller and two PD69208M PSE manager.

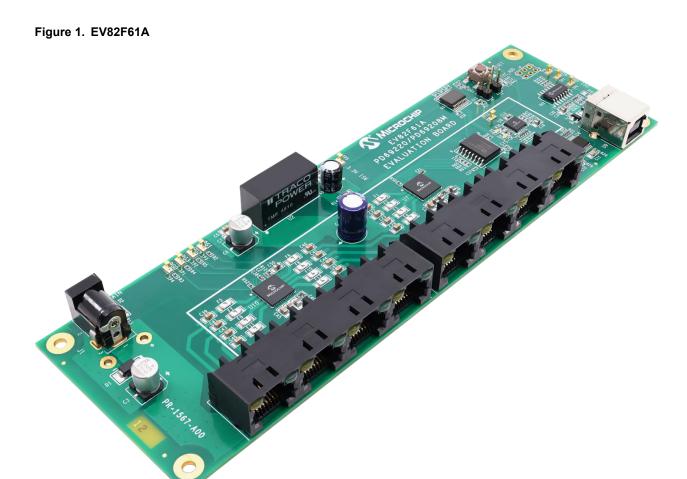
The EVB includes green and yellow bi-color LED-stream, which is generated by the PD69220 and an LED stream circuit.

The LED stream provides visual status of each port by two dedicated LEDs per each port.

A uni-color application is also available, which provides visual status of the port by one color.

The evaluation system has the following features.

- Two RJ45 gangs (each contains four RJ45 connectors)
- Four 4-pair ports and four 2-pair ports structured by two PD69208Ms
- Switch domain isolated from PoE domain
- Switch domain USB interface to be connected to a PC with Microchip GUI
- PoE controller manual Reset and serial communication setting
- Green and yellow bi-color LED status indication for all 8 ports (LED stream)
- Requires a single power source only
- 0 °C to 40 °C operating temperature
- RoHS compliant



Control Signals:

Figure 2. EV82F61A Evaluation System Block Diagram

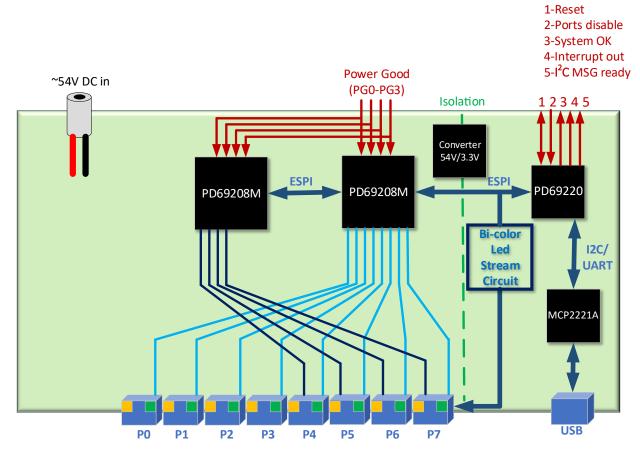


Figure 3. EV82F61A Top View



Note: Actual PoE size is 2.2 cm × 13.5 cm.

## **Table of Contents**

Intr	oductio	on	1
1.	Over	view	5
	1.1.	Power	5
	1.2.	Interface and Control	6
	1.3.	LED Indication	10
	1.4.	RJ45 Connectors Polarity	11
2.	Instal	lation and Setting	12
	2.1.	Ports Matrix	12
	2.2.	Fuses	13
	2.3.	Schematics	13
3.	Revis	ion History	14
The	Micro	chip Website	15
Pro	duct C	hange Notification Service	15
Cus	stomer	Support	15
Mic	rochip	Devices Code Protection Feature	15
Leç	jal Noti	ice	16
Tra	demar	ks	16
Qua	ality Ma	anagement System	17
W <sub>0</sub>	rldwide	a Sales and Service	10

### 1. Overview

This section provides the basic overview of the EV82F61A evaluation board.

### 1.1 Power

The Evaluation Board (EVB) is powered by a single source via the DC connector J1. The input voltage level can be selected according to the IEEE 802.3 PoE standards:

- IEEE 802.3af: 44 V<sub>DC</sub> to 57 V<sub>DC</sub>.
- IEEE 802.3at: 50 V<sub>DC</sub> to 57 V<sub>DC</sub>.

The recommended voltage level is 53  $V_{DC}$  to 55  $V_{DC}$ , which covers all PoE standards.

The EVB has two power domains:

- PoE domain, which is fed directly by the main supply and is the power domain provided by the RJ45.
- Isolated 3.3 V<sub>DC</sub>, which feeds the PD69220, LED stream, and serial communication peripherals.
  - The isolated 3.3 V<sub>DC</sub> is generated by U2 (a DC/DC module).
  - Test points 3.3V\_iso and GND\_ISO can be used for connecting external signals to control the PD69220.

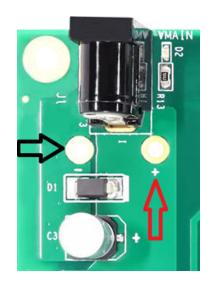
Note: The EVB is polarity sensitive. The correct polarity is shown in the following figure.

Figure 1-1. DC Connector J1 Polarity



**Important:** DC input connector J1 is limited to current level up to 4 A. If higher current is needed, the 2 via holes next to J1 can be used, by soldering a cable to it. The two via holes support up to 10 A to feed the whole EVB.

Figure 1-2. Power via Holes



### 1.2 Interface and Control

This section describes the serial communication, reset pushbutton, PoE ports disable, and power good input (PGD0-PGD3).

#### 1.2.1 Serial Communication

The EVB supports serial communication with the PD69220 by UART and I<sup>2</sup>C. The serial communication is converted to USB by the Microchip MCP2221A (U12) to allow a user-friendly experience using the Microchip dedicated GUI. To use the USB port, install the MCP2221A driver on your PC. The driver can be downloaded from the Microchip website at <a href="https://www.microchip.com/www.microchip.com/www.products/en/MCP2221A">www.microchip.com/www.products/en/MCP2221A</a>

If R62 is installed as 0  $\Omega$ , the USB converter (U12) is disabled, which allows the user to connect directly to the I<sup>2</sup>C bus via the two test points and control the EVB via I<sup>2</sup>C. The ISO\_GND test-point is the GND for the I<sup>2</sup>C bus. For the test points location, see figure I<sup>2</sup>C Bus Test Point and Control Signals.

UART or I<sup>2</sup>C can be select by jumper J3:

- When jumper J3 is not installed, the PD69220 is set to UART mode.
- When jumper J3 is installed, the PD69220 is set to I<sup>2</sup>C mode.
  - In order to select I<sup>2</sup>C address, R40 should be installed according to the following table I<sup>2</sup>C Address Setting.
  - R40 is located next to J3.

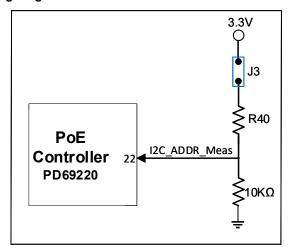
The EVB is set to I<sup>2</sup>C address 0x2C (R40= 11K).

J3 should be installed or removed before the EVB is powered up, so during the EVB initialization, the PD69220 identifies the communication method.

Table 1-1. I<sup>2</sup>C Address Setting

I <sup>2</sup> C Address Setting	Address (Hex)	R40 (kΩ)
#0	UART	N.C.
#1	0x4	147
#2	0x8	86.6
#3	0xC	57.6
#4	0x10	43.2
#5	0x14	34
#6	0x18	26.7
#7	0x1C	22.1
#8	0x20	18.2
#9	0x24	15.4
#10	0x28	13
#11	0x2C	11
#12	0x30	9.31
#13	0x34	7.87
#14	0x38	6.49
#15	0x3C	5.49

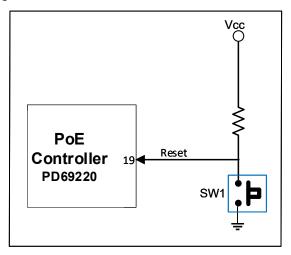
Figure 1-3. I<sup>2</sup>C Address Setting Diagram



#### 1.2.2 Reset Pushbutton

The pushbutton is connected to the Reset pin of the PD69220 (pin 19). Pressing on SW1 will connect the Reset pin to GND, and the PoE system will reset.

Figure 1-4. Reset Control Diagram



#### 1.2.3 PoE Ports Disable

J2 is connected to the Disable pin of the PD69220 (pin 31). When jumper J2 is installed, the Disable pin is connected to GND, and all ports are disabled.

Figure 1-5. Ports Disable Control Jumper Diagram

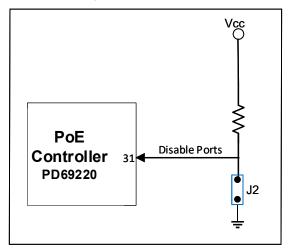
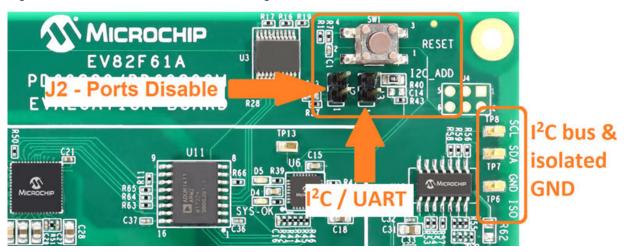


Figure 1-6. I<sup>2</sup>C Bus Test Point and Control Signals



### 1.2.4 Power Good Input (PGD0-PGD3)

The EVB supports feeding from up to four power supplies, which means 16 power banks (bank0 to bank15). Each power supply should generate a digital signal (0  $V_{DC}$  or 3.3  $V_{DC}$ ), which indicates the power supply is active. That signal should be connected to one of the PGD pins of the PD69208M (pins 41, 46, 47, 56). On the EVB, the four PGD pins are pulled down with a 10K resistor to DGND, which set the default power bank to 0x00.

In order to set a bank different than 0x00, the user can use the PG0-PG3 tests points located next to U2. The four PGD signals are referenced to the AGND of the PoE domain and can be used with the AGND via hole seen in figure Power via Holes.

Figure 1-7. PGD0-PGD3 Test Points Diagram

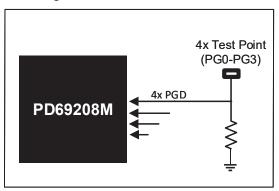
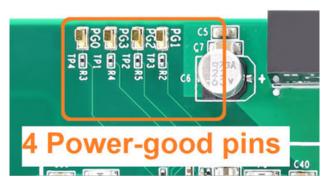


Figure 1-8. PGD0-PGD3 Test Points



### 1.3 LED Indication

The evaluation board contains status indication LEDs, listed in the following table.

### Table 1-2. LED List

Designation	Function		
D2	V <sub>MAIN</sub> ON		
D3	Isolated 3.3 V <sub>DC</sub> ON (powers the PD69220, LED stream, USB comm)		
D4	System OK (active low) Driven by PD69220 pin 32.		
D5	Interrupt out (active low) Driven by PD69220 pin 25.		
Port (0–7)	Green and yellow LED per port:  LED off= Port is off Green LED on= 4-pair port is on Yellow LED on= 2-pair port is on Green LED blinking= Port is off due to error/under load/power management		

### 1.4 RJ45 Connectors Polarity

The four ports of J5 are 2-pair up to 32 W each, and the four ports of J6 are 4-pair up to 64 W each. The polarity of the port is listed in the following tables.

Table 1-3. J5/RJ45 Connector 2-Pair Port (Ports 0-3)

Pin Number (Each RJ45 Port)	Polarity
1, 2	N.A.
3, 6	N.A.
4, 5	Positive Alt B
7, 8	Negative Alt B

Table 1-4. J6/RJ45 Connector 4-Pair Port (Ports 4-7)

Pin Number (Each RJ45 Port)	Polarity
1, 2	Negative Alt A
3, 6	Positive Alt A
4, 5	Positive Alt B
7, 8	Negative Alt B

Figure 1-9. Port Numbering



### 2. Installation and Setting

This section describes the steps required for installing and operating the EVB.

Take the following precautions before starting the installation:

- Ensure that the power supply of the board is turned off before plugging in the DC connecter.
- · Only after the DC connector is plugged in, turn the main supply ON.
- If using the DC connector J1, ensure that the power banks are set to 250 W.
- Ensure the correct polarity of the power supply cable. The polarity of the power supply cable is as shown in figure DC Connector J1 Polarity.

### 2.1 Ports Matrix

Ensure the ports matrix is configured according to the following table.

Ports that do not exist on the EVB (ports 8-47) should be configured as 255, 255.

Table 2-1. Ports Matrix

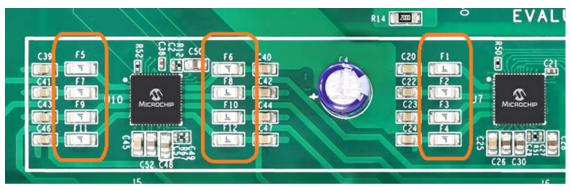
Logical Port	Physical Port A	Physical Port B
0	255 (0xFF)	8
1	255	9
2	255	10
3	255	11
4	0	12
5	1	13
6	2	14
7	3	15
8	255	255
9 47	255	255

### 2.2 Fuses

On the main board, there are 12 fuses for the two PD69208M, located on the top side next to the PD69208M (U7 and U10). The fuse is connected on the Vport Neg pin of each port, and marked F1... F12.

IEC62368-1 Ed2 (released in October 2018 and effective December 2020) requires per-port fuses for a system power supply greater than 250 W.

Figure 2-1. Fuses



### 2.3 Schematics

The full schematics are available on the Microchip website at www.microchip.com/DevelopmentTools/ProductDetails/PartNO/EV82F61A.

# 3. Revision History

Revision	Date	Description
Α	06/2021	Initial Revision

## The Microchip Website

Microchip provides online support via our website at www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

- Product Support Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- General Technical Support Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- Business of Microchip Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

### **Product Change Notification Service**

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to www.microchip.com/pcn and follow the registration instructions.

### **Customer Support**

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- **Technical Support**

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

## Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable." Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

**User Guide** DS00003989A-page 15

### **Legal Notice**

Information contained in this publication is provided for the sole purpose of designing with and using Microchip products. Information regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

#### **Trademarks**

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, Anyln, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2021, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-8175-1

# **Quality Management System**

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.



# **Worldwide Sales and Service**

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office	Australia - Sydney	India - Bangalore	Austria - Wels
2355 West Chandler Blvd.	Tel: 61-2-9868-6733	Tel: 91-80-3090-4444	Tel: 43-7242-2244-39
Chandler, AZ 85224-6199	China - Beijing	India - New Delhi	Fax: 43-7242-2244-393
Tel: 480-792-7200	Tel: 86-10-8569-7000	Tel: 91-11-4160-8631	Denmark - Copenhagen
Fax: 480-792-7277	China - Chengdu	India - Pune	Tel: 45-4485-5910
Technical Support:	Tel: 86-28-8665-5511	Tel: 91-20-4121-0141	Fax: 45-4485-2829
www.microchip.com/support	China - Chongqing	Japan - Osaka	Finland - Espoo
Web Address:	Tel: 86-23-8980-9588	Tel: 81-6-6152-7160	Tel: 358-9-4520-820
www.microchip.com	China - Dongguan	Japan - Tokyo	France - Paris
Atlanta	Tel: 86-769-8702-9880	Tel: 81-3-6880- 3770	Tel: 33-1-69-53-63-20
Duluth, GA	China - Guangzhou	Korea - Daegu	Fax: 33-1-69-30-90-79
Tel: 678-957-9614	Tel: 86-20-8755-8029	Tel: 82-53-744-4301	Germany - Garching
Fax: 678-957-1455	China - Hangzhou	Korea - Seoul	Tel: 49-8931-9700
Austin, TX	Tel: 86-571-8792-8115	Tel: 82-2-554-7200	Germany - Haan
Tel: 512-257-3370	China - Hong Kong SAR	Malaysia - Kuala Lumpur	Tel: 49-2129-3766400
Boston	Tel: 852-2943-5100	Tel: 60-3-7651-7906	Germany - Heilbronn
Westborough, MA	China - Nanjing	Malaysia - Penang	Tel: 49-7131-72400
Tel: 774-760-0087	Tel: 86-25-8473-2460	Tel: 60-4-227-8870	Germany - Karlsruhe
Fax: 774-760-0088	China - Qingdao	Philippines - Manila	Tel: 49-721-625370
Chicago	Tel: 86-532-8502-7355	Tel: 63-2-634-9065	Germany - Munich
Itasca, IL	China - Shanghai	Singapore	Tel: 49-89-627-144-0
Tel: 630-285-0071	Tel: 86-21-3326-8000	Tel: 65-6334-8870	Fax: 49-89-627-144-44
Fax: 630-285-0075	China - Shenyang	Taiwan - Hsin Chu	Germany - Rosenheim
Dallas	Tel: 86-24-2334-2829	Tel: 886-3-577-8366	Tel: 49-8031-354-560
Addison, TX	China - Shenzhen	Taiwan - Kaohsiung	Israel - Ra'anana
Tel: 972-818-7423	Tel: 86-755-8864-2200	Tel: 886-7-213-7830	Tel: 972-9-744-7705
Fax: 972-818-2924	China - Suzhou	Taiwan - Taipei	Italy - Milan
Detroit	Tel: 86-186-6233-1526	Tel: 886-2-2508-8600	Tel: 39-0331-742611
Novi, MI	China - Wuhan	Thailand - Bangkok	Fax: 39-0331-466781
Tel: 248-848-4000	Tel: 86-27-5980-5300	Tel: 66-2-694-1351	Italy - Padova
Houston, TX	China - Xian	Vietnam - Ho Chi Minh	Tel: 39-049-7625286
Tel: 281-894-5983	Tel: 86-29-8833-7252	Tel: 84-28-5448-2100	Netherlands - Drunen
Indianapolis	China - Xiamen	161. 64-26-6440-2100	Tel: 31-416-690399
Noblesville, IN	Tel: 86-592-2388138		Fax: 31-416-690340
Tel: 317-773-8323	China - Zhuhai		Norway - Trondheim
Fax: 317-773-5453	Tel: 86-756-3210040		Tel: 47-72884388
Tel: 317-536-2380	Tel. 80-730-3210040		Poland - Warsaw
Los Angeles			Tel: 48-22-3325737
Mission Viejo, CA			Romania - Bucharest
Tel: 949-462-9523			Tel: 40-21-407-87-50
Fax: 949-462-9608			<b>Spain - Madrid</b> Tel: 34-91-708-08-90
Tel: 951-273-7800			
Raleigh, NC			Fax: 34-91-708-08-91
Tel: 919-844-7510			Sweden - Gothenberg
New York, NY			Tel: 46-31-704-60-40
Tel: 631-435-6000			Sweden - Stockholm
San Jose, CA			Tel: 46-8-5090-4654
Tel: 408-735-9110			UK - Wokingham
Tel: 408-436-4270			Tel: 44-118-921-5800
Canada - Toronto			Fax: 44-118-921-5820
Tel: 905-695-1980			
Fax: 905-695-2078			