

Product Change Notification / SYST-16EQYH046

Date:

17-Mar-2022

Product Category:

8-bit Microcontrollers

PCN Type:

Document Change

Notification Subject:

ERRATA - ATxmega128/64B3 Silicon Errata and Data Sheet Clarification Document Revision

Affected CPNs:

SYST-16EQYH046_Affected_CPN_03172022.pdf SYST-16EQYH046_Affected_CPN_03172022.csv

Notification Text:

SYST-16EQYH046

Microchip has released a new Product Documents for the ATxmega128/64B3 Silicon Errata and Data Sheet Clarification of devices. If you are using one of these devices please read the document located at ATxmega128/64B3 Silicon Errata and Data Sheet Clarification.

Notification Status: Final

Description of Change:

Initial release of this document.

- 1) Content moved from the data sheet and restructured to the new document template
- 2) Added data sheet clarification section 3.2. ADC 12-bit Analog to Digital Converter and added a note in 3.2.1. Overview

Impacts to Data Sheet: None

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 17 Mar 2022

NOTE: Please be advised that this is a change to the document only the product has not been changed.

\ + +		
Attachments:	3 Silicon Errata and Data Sheet Clarificat	ion
Arxinegarzoi 041	3 Sincon Errata and Data Sheet Clarificat	1011
lease contact you	local Microchip sales office with question	ns or concerns regarding this notification.
erms and Conditi	ons:	
ome page select	ve Microchip PCNs via email please register egister then fill in the required fields. You value ail service in the PCN FAQ section.	
	ge your PCN profile, including opt out, plea nyMicrochip account. Select a profile optic ctions.	

SYST-16EQYH046 - ERRATA - ATxmega128/64B3 Silicon Errata and Data Sheet Clarification Document Revision

Affected Catalog Part Numbers (CPN)

ATXMEGA128B3-AU

ATXMEGA128B3-AUR

ATXMEGA128B3-MCU

ATXMEGA128B3-MCUR

ATXMEGA128B3-MCURA0

ATXMEGA128B3-MH

ATXMEGA128B3-MHR

ATXMEGA64B3-AU

ATXMEGA64B3-AUR

ATXMEGA64B3-MH

Date: Thursday, March 17, 2022



ATxmega128/64B3

Silicon Errata and Data Sheet Clarification

Introduction

The ATxmega128/64B3 devices you have received conform functionally to the current device data sheet (https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-8074-8-and-16-bit-AVR-Microcontroller-XMEGA-B-ATxmega64B3-ATxmega128B3_Datasheet.pdf), except for the anomalies described in this document. The errata described in this document will likely be addressed in future revisions of the ATxmega128/64B3 devices.

Note:

· This document summarizes all the silicon errata issues from all revisions of silicon, previous and current.

1. Silicon Issue Summary

Legend

- Erratum is not applicable.
- **X** Erratum is applicable.

		Valid for Silicon Revision	
Peripheral	Short Description	ATxmega64/128B3	
		Rev. A	Rev. C
Device	2.2.1. Power-Down Consumption	Х	-
	2.2.2. Device Revision Number is Unchanged Between Rev. B and Rev. C	-	X
ADC	2.3.1. ADC Conversion Error when x0.5 Gain is used	Х	-
AWeX	2.4.1. AWeX Fault Protection Restore is Not Done Correctly in Pattern Generation Mode	-	X
USART	2.5.1. Disabling of USART Transmitter Does Not Automatically Set the TxD Pin to Input	Х	-

Errata

Note: The following silicon revisions were never released to production:

• Rev. B

2. Silicon Errata Issues

2.1 Errata Details

- **-** Erratum is not applicable.
- **X** Erratum is applicable.

2.2 Device

2.2.1 Power-Down Consumption

After reset, extra power consumption is drawn when the system enters power-down or when ADC is disabled.

Workaround

Set ADC to a configuration different from the Differential Mode.

Affected Silicon Revisions

ATxmega128/64B3			
Rev. A	Rev. C		
X	-		

2.2.2 Device Revision Number is Unchanged Between Rev. B and Rev. C

Device revision number is unchanged between Rev. B and Rev. C.

Workaround

There is no workaround.

Affected Silicon Revisions

ATxmega128/64B3			
Rev. A	Rev. C		
-	X		

2.3 ADC - Analog to Digital Converter

2.3.1 ADC Conversion Error when x0.5 Gain is used

When setting the gain to x0.5, the conversion result is similar to the gain setting x1.

Workaround

There is no workaround.

Affected Silicon Revisions

ATxmega128/64B3			
Rev. A	Rev. C		
X	-		

2.4 AWeX - Advanced Waveform eXtension

2.4.1 AWEX Fault Protection Restore is Not Done Correctly in Pattern Generation Mode

When a fault is detected, the OUTOVEN register is cleared, and when the fault condition is cleared, OUTOVEN is restored according to the corresponding enabled DTI channels. For Common Waveform Channel Mode (CWCM), as the OUTOVEN is correct after restoring from fault, this has no effect. For Pattern Generation Mode (PGM), OUTOVEN should instead have been restored according to the DTLSBUF register.

Workaround

For CWCM, no workaround is required.

For PGM in Latched Mode, disable the DTI channels before returning from the fault condition. Then, set the correct OUTOVEN value and enable the DTI channels before the direction (DIR) register is written to enable the correct outputs again.

Affected Silicon Revisions

ATxmega128/64B3		
Rev. A	Rev. C	
-	X	

2.5 USART - Universal Synchronous/Asynchronous Receiver/Transmitter

2.5.1 Disabling of USART Transmitter Does Not Automatically Set the TxD Pin to Input

If the USART transmitter is idle with no frames to transmit, setting TXEN to zero will not automatically set the TxD pin direction to input.

Workaround

The TxD pin direction can be set to input using the Port DIR register. Be advised that setting the Port DIR register to input will be immediate. Ongoing transmissions will be truncated.

Affected Silicon Revisions

ATxmega128/64B3			
Rev. A	Rev. C		
X	-		

3. Data Sheet Clarifications

Note the following typographic corrections and clarifications for the latest version of the device data sheet (https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-8074-8-and-16-bit-AVR-Microcontroller-XMEGA-B-ATxmega64B3-ATxmega128B3 Datasheet.pdf).

Note: Corrections are shown in bold. Where possible, the original bold text formatting has been removed for clarity.

3.1 Errata Section in Data Sheet is no Longer Valid

A clarification for the Errata section in the device data sheet has been made.

The errata content has been moved to a separate document, ATxmega128/64B3 (this document).

See the Silicon Errata Issues section of this document for the latest errata.

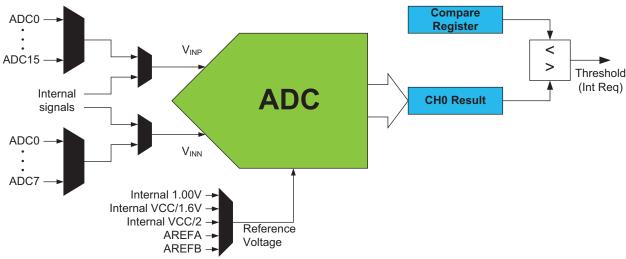
3.2 ADC – 12-bit Analog to Digital Converter

3.2.1 Overview

The ADC converts analog signals to digital values. The ADC has a 12-bit resolution and can convert up to 300 thousand samples per second (ksps). The input selection is flexible, and both single-ended and differential measurements can be done. An optional gain stage is available to increase the dynamic range for differential measurements.

The ADC can provide both signed and unsigned results. The ADC measurements can be started either by application software or an incoming event from another peripheral in the device. The ADC measurements can be started with predictable timing and without software intervention. When conversions are done, it is possible to use DMA to move ADC results directly to memory or peripherals. Both internal and external reference voltages can be used. An integrated temperature sensor is available for use with the ADC. The ADC can also measure the AV_{CC}/10 output and the band gap voltage. The ADC has a Compare function for accurate monitoring of user-defined thresholds with minimum software intervention required.

Figure 3-1. ADC Overview



The ADC may be configured for an 8- or 12-bit result. The minimum conversion time (propagation delay) reduces from 3.35 µs for a 12-bit result to 2.3µs for an 8-bit.

ADC conversion results are left or right adjusted with optional '1' or '0' padding, which eases calculation when the result is presented as a signed integer (signed 16-bit number).

PORTB has one ADC. Notation of this peripheral is ADCB.

ATxmega128/64B3

Data Sheet Clarifications

Note: After the ADC is enabled, the first sample may deviate from the expected result. It is recommended to discard the first sample or accumulate several samples.

4. Document Revision History

Note: The document revision is independent of the silicon revision.

4.1 Revision History

Doc. Rev.	Date	Comments	
A	03/2022	Initial release of this document. Content moved from the data sheet and restructured to the new document template Added data sheet clarification section 3.2. ADC – 12-bit Analog to Digital Converter and added a note in 3.2.1. Overview	

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 products:

- 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, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright
- 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. Microchip is committed to continuously improving the code protection features of our products.

Legal Notice

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications 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. Contact your local Microchip sales office for additional support or, obtain additional support at www.microchip.com/en-us/support/ design-help/client-support-services.

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, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, 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, TrueTime, 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, GridTime, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, NVM Express, NVMe, 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, SmartHLS, 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, Symmcom, and Trusted Time 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.

© 2022, Microchip Technology Incorporated and its subsidiaries. All Rights Reserved.

ISBN: 978-1-5224-9897-1

Quality Management System

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



Worldwide Sales and Service

AMERICAS ASIA/RACIFIC ASIA/RACIFIC EUROPE 2355 West Chandler Blvd Tel: 61-2-9868-6733 India - Bangafore Tel: 43-7242-2244-39 Tel: 43-7242-2244-39 Chandler, AZ 55/24-6199 China - Beejing India - New Dehi Fex: 43-7242-2244-39 Tel: 43-7242-2244-39 Fax: 480-792-7270 Tel: 86-10-8669-7000 Tel: 91-11-4160-8331 Dommark - Copenhagen Fax: 480-792-7277 China - Chengdu India - Pune Tel: 48-4485-5910 Tachicial Support: Tel: 86-22-8809-5886 Tel: 91-12-01-12-10-141 Fex: 45-4485-2829 Www.microtip.com China - Chongqiing Japan - Tokyo Final 68-68-2829 Allanta Tel: 86-876-8702-980 Tel: 81-3-6880-3770 Tel: 33-16-93-56-20 Fax: 678-98-79-961 Tel: 86-876-8702-980 Tel: 81-3-6880-3770 Tel: 32-16-93-56-20 Fax: 678-98-71-455 China - Hangrhou Korea - Daegu Fex: 33-16-93-90-97 Tel: 678-95-79-61 Tel: 68-82-78-872-815 Tel: 82-25-472-400 Tel: 42-25-472-400 Tel: 678-96-87-1455 China - Hong Kong SAR Tel: 82-872-474-401 Tel: 42-9-893-19700 Tel: 577-760-0807				
2355 West Chandler Blvd. Chandler, AZ 82224-199 China - Beigling Tel: 480-792-7270 Tel: 480-792-7277 China - Chengdu Tel: 86-10-8568-7000 Tel: 86-10-8568-70	AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Chandler, AZ 85224-8199 Tell: 480-792-7277 Tell: 480-8698-8000 Tell: 480-292-8900 Tell: 480-292-8900 Tell: 480-292-8900 Tell: 480-292-8900-8688 Tell: 480-292-890-8688 Tell: 480-292-890-8688 Tell: 480-292-890-8688 Tell: 480-890-892-892-822-822-822-822-822-822-822-822	Corporate Office	Australia - Sydney	India - Bangalore	Austria - Wels
Tel: 48-07-92-7200	2355 West Chandler Blvd.	Tel: 61-2-9868-6733	Tel: 91-80-3090-4444	Tel: 43-7242-2244-39
Fax: 480-792-7277	Chandler, AZ 85224-6199	China - Beijing	India - New Delhi	Fax: 43-7242-2244-393
Technical Support	Tel: 480-792-7200	Tel: 86-10-8569-7000	Tel: 91-11-4160-8631	Denmark - Copenhagen
New Microchip cond Sepo	Fax: 480-792-7277	China - Chengdu	India - Pune	Tel: 45-4485-5910
Web Address:	Technical Support:	Tel: 86-28-8665-5511	Tel: 91-20-4121-0141	Fax: 45-4485-2829
Atlanta	www.microchip.com/support	China - Chongqing	Japan - Osaka	Finland - Espoo
Atlanta	Web Address:	Tel: 86-23-8980-9588	Tel: 81-6-6152-7160	Tel: 358-9-4520-820
Duluth, CA	www.microchip.com	China - Dongguan	Japan - Tokyo	France - Paris
Tel: 68-08-79-614	Atlanta	Tel: 86-769-8702-9880	Tel: 81-3-6880- 3770	Tel: 33-1-69-53-63-20
Fax: 678-957-1455	Duluth, GA	China - Guangzhou	Korea - Daegu	Fax: 33-1-69-30-90-79
Austin, TX	Tel: 678-957-9614	Tel: 86-20-8755-8029	Tel: 82-53-744-4301	Germany - Garching
Tel: 512-257-3370	Fax: 678-957-1455	China - Hangzhou	Korea - Seoul	Tel: 49-8931-9700
Boston	Austin, TX	Tel: 86-571-8792-8115	Tel: 82-2-554-7200	Germany - Haan
Westborough, MA	Tel: 512-257-3370	China - Hong Kong SAR	Malaysia - Kuala Lumpur	Tel: 49-2129-3766400
Tel: 774-760-0087	Boston	Tel: 852-2943-5100	Tel: 60-3-7651-7906	Germany - Heilbronn
Tel: 774-76-0087	Westborough, MA	China - Nanjing	Malaysia - Penang	Tel: 49-7131-72400
Tel: 86-532-8502-7355	=	Tel: 86-25-8473-2460	Tel: 60-4-227-8870	Germany - Karlsruhe
Itasca, IL	Fax: 774-760-0088	China - Qingdao	Philippines - Manila	Tel: 49-721-625370
Itasca, IL	Chicago	Tel: 86-532-8502-7355	Tel: 63-2-634-9065	Germany - Munich
Tel: 630-285-0071 Fax: 630-285-0075 China - Shenyang Dallas Tel: 86-24-233-28-29 Addison, TX China - Shenyhen Tel: 86-24-2334-2829 Addison, TX China - Shenyhen Tel: 86-24-2334-2829 Tel: 86-357-8366 Tel: 48-8031-354-560 Israel - Ra'aman Tel: 49-8031-354-560 Israel - Ra'aman Tel: 49-8031-354-560 Israel - Ra'aman Tel: 49-8-8031-354-560 Tel: 48-84-84-210 Tel: 86-75-8864-2200 Tel: 886-3-77-8380 Tel: 919-844-7510 Novi, MI China - Suzhou Tel: 88-75-8868 Tel: 88-75-808-800 Tel: 88-75-808-800 Tel: 88-75-808-800 Tel: 88-75-808-800 Tel: 88-75-808-800 Tel: 88-75-800 Tel: 88-75-808-800 Tel: 919-844-7510 New York, NY Tel: 68-73-8010 Tel: 48-80-809-4654 Tel: 48-80-809-4654 Tel: 48-80-809-4654 UK - Wokingham Tel: 44-118-921-5800 Tel: 44-118-921-5800 Tel: 995-695-1980	_	China - Shanghai	Singapore	-
Dallas	Tel: 630-285-0071	Tel: 86-21-3326-8000		Fax: 49-89-627-144-44
Dallas	Fax: 630-285-0075	China - Shenyang	Taiwan - Hsin Chu	Germany - Rosenheim
Tel: 972-818-7423 Tel: 86-755-8864-2200 China - Suzhou Tel: 86-86-2-5980-8600 Tel: 86-86-2-5980-5300 Tel: 86-2-698-8600 Tel: 86-2-698-8600 Tel: 86-2-698-8600 Tel: 39-0331-742611 Tel: 39-0331-742611 Tel: 39-0331-742611 Tel: 248-848-4000 Tel: 86-27-5980-5300 Tel: 66-2-694-1351 Tel: 86-28-94-9583 Tel: 86-29-833-7252 Tel: 86-39-2388138 Tel: 317-773-8323 China - Zhuhai Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 99-844-7510 New York, NY Tel: 919-844-7510 New York, NY Tel: 68-2-69-1980 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 905-695-1980	Dallas		Tel: 886-3-577-8366	-
Tel: 972-818-7423 Tel: 972-818-7423 Tel: 86-755-8864-2200 China - Suzhou Tel: 86-86-32-31526 Tel: 86-86-32-31526 Tel: 86-86-32-31526 Tel: 86-86-22-31-742611 Tel: 248-848-4000 Tel: 36-27-5980-5300 Tel: 36-2-698-8600 Tel: 39-0331-742611 Tel: 39-031-742611 Tel: 39-0331-742611 Tel: 39-0391-742611 Tel: 39-031-742611 Tel: 39-031-742611 Tel: 39-031-742611 Tel: 39-031-742611 Tel: 39-031-742611 Tel: 39-031-742611 Tel: 39-031-74261 Tel: 39-03	Addison, TX	China - Shenzhen	Taiwan - Kaohsiung	Israel - Ra'anana
Detroit Tel: 86-186-6233-1526 Tel: 886-2-2508-8600 Tel: 39-0331-742611 Novi, MI China - Wuhan 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: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 84-28-5448-2100 Netherlands - Drunen Tel: 31-416-690399 Fax: 31-416-690340 Tel: 31-773-5453 Tel: 86-592-2388138 Tel: 86-592-2388138 Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 31-416-690340 Tel: 48-22-3325737 Romania - Bucharest Tel: 49-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-91110 Tel: 408-735-91110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 905-705-705-705-7	Tel: 972-818-7423	Tel: 86-755-8864-2200		Tel: 972-9-744-7705
Detroit Tel: 86-186-6233-1526 Tel: 886-2-2508-8600 Tel: 39-0331-742611 Novi, MI China - Wuhan 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: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 86-29-8833-7252 Tel: 84-28-5448-2100 Netherlands - Drunen Tel: 31-416-690399 Fax: 31-416-690340 Tel: 31-773-5453 Tel: 86-592-2388138 Tel: 86-592-2388138 Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 31-416-690340 Tel: 48-22-3325737 Romania - Bucharest Tel: 49-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-91110 Tel: 408-735-91110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 905-705-705-705-7	Fax: 972-818-2924	China - Suzhou	Taiwan - Taipei	Italy - Milan
Novi, MI	Detroit	Tel: 86-186-6233-1526	•	· ·
Houston, TX	Novi, MI	China - Wuhan		Fax: 39-0331-466781
Houston, TX	Tel: 248-848-4000	Tel: 86-27-5980-5300		Italy - Padova
Tel: 281-894-5983 ITel: 86-29-8833-7252 China - Xiamen Noblesville, IN Tel: 86-592-2388138 China - Zhuhai Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-90 Fax: 34-91-708-08-91 Tel: 46-31-708-08-91 Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Canada - Toronto Tel: 905-695-1980	Houston, TX	China - Xian	Vietnam - Ho Chi Minh	_
Noblesville, IN Tel: 86-592-2388138 China - Zhuhai Tel: 317-773-8323 Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 47-72884388 Tel: 47-72884388 Tel: 48-22-3325737 Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Tel: 46-31-704-60-40 Tel: 46-31-704-60-40 Tel: 408-735-9110 Tel: 408-436-4270 Tel: 905-695-1980	•	Tel: 86-29-8833-7252	Tel: 84-28-5448-2100	Netherlands - Drunen
Tel: 317-773-8323	Indianapolis	China - Xiamen		Tel: 31-416-690399
Fax: 317-773-5453 Tel: 86-756-3210040 Tel: 47-72884388 Poland - Warsaw Tel: 48-22-3325737 Romania - Bucharest Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-136-4270 Tel: 905-695-1980	Noblesville, IN	Tel: 86-592-2388138		Fax: 31-416-690340
Fax: 317-773-5453 Tel: 86-756-3210040 Tel: 47-72884388 Tel: 317-536-2380 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 Spain - Madrid Tel: 951-273-7800 Tel: 34-91-708-08-90 Raleigh, NC Fax: 34-91-708-08-91 Tel: 919-844-7510 Sweden - Gothenberg New York, NY Tel: 46-31-704-60-40 Tel: 408-735-6000 Sweden - Stockholm Tel: 408-735-9110 UK - Wokingham Tel: 408-436-4270 Tel: 44-118-921-5800 Canada - Toronto Fax: 44-118-921-5820		China - Zhuhai		Norway - Trondheim
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 Spain - Madrid Tel: 951-273-7800 Tel: 34-91-708-08-90 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	Fax: 317-773-5453	Tel: 86-756-3210040		
Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Roward - Gothen Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Tel: 34-91-708-08-91 Tel: 34-91-708-08-91 Tel: 46-31-704-60-40 Sweden - Gothenberg Tel: 46-31-704-60-40 Tel: 46-8-5090-4654 UK - Wokingham Tel: 408-436-4270 Fax: 44-118-921-5820	Tel: 317-536-2380			Poland - Warsaw
Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	Los Angeles			Tel: 48-22-3325737
Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	Mission Viejo, CA			Romania - Bucharest
Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Tel: 34-91-708-08-90 Fax: 34-91-708-08-90 Fax: 34-91-708-08-90 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800	<u>=</u>			Tel: 40-21-407-87-50
Raleigh, NC Fax: 34-91-708-08-91 Tel: 919-844-7510 Sweden - Gothenberg New York, NY Tel: 46-31-704-60-40 Seeden - Stockholm Sweden - Stockholm San Jose, CA Tel: 46-8-5090-4654 UK - Wokingham UK - Wokingham Tel: 408-436-4270 Tel: 44-118-921-5800 Canada - Toronto Fax: 44-118-921-5820	Fax: 949-462-9608			Spain - Madrid
Raleigh, NC Fax: 34-91-708-08-91 Tel: 919-844-7510 Sweden - Gothenberg New York, NY Tel: 46-31-704-60-40 Seeden - Stockholm Sweden - Stockholm San Jose, CA Tel: 46-8-5090-4654 UK - Wokingham UK - Wokingham Tel: 408-436-4270 Tel: 44-118-921-5800 Canada - Toronto Fax: 44-118-921-5820	Tel: 951-273-7800			Tel: 34-91-708-08-90
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: 44-118-921-5820				Fax: 34-91-708-08-91
Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	Tel: 919-844-7510			Sweden - Gothenberg
Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	New York, NY			_
Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	·			Sweden - Stockholm
Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	San Jose, CA			Tel: 46-8-5090-4654
Tel: 408-436-4270 Tel: 44-118-921-5800 Canada - Toronto Tel: 905-695-1980 Tel: 905-695-1980				UK - Wokingham
Canada - Toronto Fax: 44-118-921-5820 Tel: 905-695-1980 Fax: 44-118-921-5820				
Tel: 905-695-1980				
Fax: 905-695-2078	Fax: 905-695-2078			