dsPIC33FJ32GP302/304, dsPIC33FJ64GPX02/X04 and dsPIC33FJ128GPX02/X04 Family Silicon Errata and Data Sheet Clarification

The dsPIC33FJ32GP302/304, dsPIC33FJ64GPX02/X04 and dsPIC33FJ128GPX02/X04 family devices that you have received conform functionally to the current Device Data Sheet (DS70292**C**), except for the anomalies described in this document.

The silicon issues discussed in the following pages are for silicon revisions with the Device and Revision IDs listed in Table 1. The silicon issues are summarized in Table 2.

The errata described in this document will be addressed in future revisions of the dsPIC33FJ32GP302/304, dsPIC33FJ64GPX02/X04 and dsPIC33FJ128GPX02/X04 silicon.

Note:	This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated in the last column of Table 2 apply to the current silicon revision (**A3**).

Data Sheet clarifications and corrections start on page 8, following the discussion of silicon issues.

The silicon revision level can be identified using the current version of MPLAB® IDE and Microchip's programmers, debuggers and emulation tools, which are available at the Microchip corporate web site (www.microchip.com).

For example, to identify the silicon revision level using MPLAB IDE in conjunction with MPLAB ICD 2 or PICkit™ 3:

1. Using the appropriate interface, connect the device to the MPLAB ICD 2 programmer/debugger or PICkit 3.
2. From the main menu in MPLAB IDE, select *Configure>Select Device*, and then select the target part number in the dialog box.
3. Select the MPLAB hardware tool (*Debugger>Select Tool*).
4. Perform a "Connect" operation to the device (*Debugger>Connect*). Depending on the development tool used, the part number *and* Device Revision ID value appear in the **Output** window.

Note:	If you are unable to extract the silicon revision level, please contact your local Microchip sales office for assistance.

The Device and Revision ID values for the various dsPIC33FJ32GP302/304, dsPIC33FJ64GPX02/X04 and dsPIC33FJ128GPX02/X04 silicon revisions are shown in Table 1.

TABLE 1: SILICON DEVREV VALUES

Part Number	Device ID(1)	Revision ID for Silicon Revision(2)		
		A1	A2	A3
dsPIC33FJ32GP302	0x0605	0x3001	0x3002	0x3002
dsPIC33FJ32GP304	0x0607			
dsPIC33FJ64GP202	0x0615			
dsPIC33FJ64GP204	0x0617			
dsPIC33FJ64GP802	0x061D			
dsPIC33FJ64GP804	0x061F			

Note 1: The Device and Revision IDs (DEVID and DEVREV) are located at the last two implemented addresses in program memory.

2: Refer to the *"dsPIC33F/PIC24H Flash Programming Specification"* (DS70152) for detailed information on Device and Revision IDs for your specific device.

TABLE 1: SILICON DEVREV VALUES (CONTINUED)

Part Number	Device ID(1)	Revision ID for Silicon Revision(2)		
		A1	A2	A3
dsPIC33FJ128GP202	0x0625	0x3001	0x3002	0x3002
dsPIC33FJ128GP204	0x0627			
dsPIC33FJ128GP802	0x062D			
dsPIC33FJ128GP804	0x062F			

Note 1: The Device and Revision IDs (DEVID and DEVREV) are located at the last two implemented addresses in program memory.

2: Refer to the *"dsPIC33F/PIC24H Flash Programming Specification"* (DS70152) for detailed information on Device and Revision IDs for your specific device.

TABLE 2: SILICON ISSUE SUMMARY

Module	Feature	Item Number	Issue Summary	Affected Revisions(1)		
				A1	A2	A3
UART	IR Mode	1.	The 16x baud clock signal on the BCLK pin is present only when the module is transmitting.	X	X	X
UART	High-Speed Mode	2.	When the UART is in 4x mode (BRGH = 1) and using two Stop bits (STSEL = 1), it may sample the first Stop bit instead of the second one.	X	X	X
SPI	Transmit Operation	3.	The SPI Transmit Buffer Full (SPITBF) flag does not get set immediately after writing to the buffer.	X	X	X
SPI	Frame Mode	4.	The SPI module will generate incorrect frame synchronization pulses in Frame Master mode if FRMDLY = 1.	X	X	X
I^2C™	SFR Writes	5.	The BCL bit in I2CSTAT can only be cleared with Word instructions, and can be corrupted with byte instructions and bit operations.	X	X	X
I^2C	10-bit Addressing	6.	When the I^2C module is configured for 10-bit addressing using the same address bits (A10 and A9) as other I^2C devices, A10 and A9 bits may not work as expected.	X	X	X
I^2C	10-bit Addressing	7.	When the I^2C module is configured as a 10-bit slave with an address of 0x102, the I2CxRCV register content for the lower address byte is 0x01 rather than 0x02.	X	X	X
I^2C	—	8.	With the I^2C module enabled, the PORT bits and external Interrupt Input functions (if any) associated with SCL and SDA pins will not reflect the actual digital logic levels on the pins.	X	X	X
I^2C	10-bit Addressing	9.	The 10-bit slave does not set the RBF flag or load the I2CxRCV register, on address match if the Least Significant bits (LSbs) of the address are the same as the 7-bit reserved addresses.	X	X	X
I^2C	—	10.	After the ACKSTAT bit is set when receiving a NACK, it may be cleared by the reception of a Start or Stop bit.	X	X	X
UART	Interrupts	11.	The UART error interrupt may not occur, or may occur at an incorrect time, if multiple errors occur during a short period of time.	X	X	X
UART	IR Mode	12.	When the UART module is operating in 8-bit mode (PDSEL = 0x) and using the IrDA® encoder/decoder (IREN = 1), the module incorrectly transmits a data payload of 80h as 00h.	X	X	X

Note 1: Only those issues indicated in the last column apply to the current silicon revision.

TABLE 2: SILICON ISSUE SUMMARY (CONTINUED)

Module	Feature	Item Number	Issue Summary	Affected Revisions(1)		
				A1	A2	A3
Comparator	Output Pin	13.	When CMCON<CxOUTEN> is set, the Comparator output pin cannot be used as a general purpose I/O pin even if the Comparator is disabled.	X	X	X
Internal Voltage Regulator	Sleep Mode	14.	When the VREGS (RCON<8>) bit is set to a logic '0' the device may reset and higher Sleep current may be observed.	X	X	X
PSV Operations	—	15.	An address error trap occurs in certain addressing modes when accessing the first four bytes of any PSV page.	X	X	X
ECAN	Sleep Mode	16.	The WAKIF bit in the CxINTF register cannot be cleared by software instruction after the device is interrupted from Sleep due to activity on the CAN bus.	X	X	X
ECAN	Receive Operation	17.	The ECAN module may not store the received data in the correct location.	X	X	X
CPU	EXCH Instruction	18.	The EXCH instruction does not execute correctly if the PLL is enabled.	X	X	X
SPI	Transmit Operation	19.	Writing to the SPIxBUF register as soon as TBF bit is cleared will cause SPI module to ignore the written data.	X	X	X
UART	Break Character Generation	20.	The UART module will not generate back-to-back Break characters.	X	X	X

Note 1: Only those issues indicated in the last column apply to the current silicon revision.

Silicon Errata Issues

Note:	This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated by the shaded column in the following tables apply to the current silicon revision (**A3**).

1. Module: UART

When the UART is configured for IR interface operations (UxMODE<9:8> = 11), the 16x baud clock signal on the BCLK pin is present only when the module is transmitting. The pin is idle at all other times.

Work around

Configure one of the output compare modules to generate the required baud clock signal when the UART is receiving data or in an Idle state.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

2. Module: UART

When the UART is in 4x mode (BRGH = 1) and using two Stop bits (STSEL = 1), it may sample the first Stop bit instead of the second one.

This issue does not affect the other UART configurations.

Work around

Use the 16x baud rate option (BRGH = 0) and adjust the baud rate accordingly.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

3. Module: SPI

The SPI Transmit Buffer Full (SPITBF) flag does not get set immediately after writing to the buffer.

Work around

After a write to the SPI buffer, poll the SPITBF flag until the flag gets set, indicating that the transmit buffer is not full. Afterwards, poll the SPITBF flag again until the flag gets cleared, indicating that the transmit has started and that the transmit buffer is empty and another write can occur.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

4. Module: SPI

The SPI module will generate incorrect frame synchronization pulses when configured in Frame Master mode if the start of data is selected to coincide with the start of the frame synchronization pulse (FRMEN = 1, SPIFSD = 0, FRMDLY = 1). However, the module functions correctly in Frame Slave mode, and also in Frame Master mode if FRMDLY = 0.

Work around

If DMA is not being used, manually drive the SSx pin (x = 1 or 2) high using the associated PORT register, and then drive it low after the required 1 bit-time pulse-width. This operation needs to be performed when the transmit buffer is written.

If DMA is being used, and if no other peripheral modules are using DMA transfers, use a timer interrupt to periodically generate the frame synchronization pulse (using the method described above) after every 8 or 16-bit periods (depending on the data word size, configured using the MODE16 bit).

If FRMDLY = 0, no work around is needed.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

5. Module: I^2C

The BCL bit in I2CSTAT can only be cleared with Word instructions, and can be corrupted with byte instructions and bit operations.

Work around

Use Word instructions to clear BCL.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

6. Module: I²C

If there are two I²C devices on the bus, one of them is acting as the Master receiver and the other as the Slave transmitter. If both devices are configured for 10-bit Addressing mode, and have the same value in the A10 and A9 bits of their addresses, then when the Slave select address is sent from the Master, both the Master and Slave acknowledge it. When the Master sends out the read operation, both the Master and the Slave enter into Read mode and both of them transmit the data. The resultant data will be the ANDing of the two transmissions.

Work around

In all I²C devices, the addresses as well as bits A10 and A9 should be different.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

7. Module: I²C

When the I²C module is configured as a 10-bit slave with and address of 0x102, the I2CxRCV register content for the lower address byte is 0x01 rather than 0x02; however, the module acknowledges both address bytes.

Work around

None.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

8. Module: I²C

With the I²C module enabled, the PORT bits and external interrupt input functions (if any) associated with the SCL and SDA pins do not reflect the actual digital logic levels on the pins.

Work around

If the SDA and/or SCL pins need to be polled, these pins should be connected to other port pins in order to be read correctly. This issue *does not* affect the operation of the I²C module.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

9. Module: I²C

In 10-bit Addressing mode, some address matches don't set the RBF flag or load the receive register I2CxRCV, if the lower address byte matches the reserved addresses. In particular, these include all addresses with the form XX0000XXXX and XX1111XXXX, with the following exceptions:

- 001111000X
- 011111001X
- 101111010X
- 111111011X

Work around

Ensure that the lower address byte in 10-bit Addressing mode does not match any 7-bit reserved addresses.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

10. Module: I²C

When the I²C module is operating in either Master or Slave mode, after the ACKSTAT bit is set when receiving a NACK, it may be cleared by the reception of a Start or Stop bit.

Work around

Store the value of the ACKSTAT bit immediately after receiving a NACK from the master.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

11. Module: UART

The UART error interrupt may not occur, or may occur at an incorrect time, if multiple errors occur during a short period of time.

Work around

Read the error flags in the UxSTA register whenever a byte is received to verify the error status. In most cases, these bits will be correct, even if the UART error interrupt fails to occur.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

12. Module: UART

When the UART is operating in 8-bit mode (PDSEL = 0x) and using the IrDA encoder/decoder (IREN = 1), the module incorrectly transmits a data payload of 80h as 00h.

Work around

None.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

13. Module: Comparator

If CMCON<CxOUTEN> is set and the comparator module CMCON<CxEN> is disabled, the remappable comparator output pins, C1OUT and C2OUT, cannot be used as general purpose I/O pins.

Work around

When the comparator module is disabled the CMCON<CxOUTEN> bit should be reset so that the remappable comparator output pins C1OUT and C2OUT are not driven onto the output pad.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

14. Module: Internal Voltage Regulator

When the VREGS (RCON<8>) bit is set to a logic '0', the device may reset and a higher Sleep current may be observed.

Work around

Ensure VREGS (RCON<8>) bit is set to a logic '1' for device Sleep mode operation.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

15. Module: PSV Operations

An address error trap occurs in certain addressing modes when accessing the first four bytes of an PSV page. This only occurs when using the following addressing modes:

- MOV.D
- Register Indirect Addressing (Word or Byte mode) with pre/post-decrement

Work around

Do not perform PSV accesses to any of the first four bytes using the above addressing modes. For applications using the C language, MPLAB C30 version 3.11 or higher, provides the following command-line switch that implements a work around for the erratum.

```
-merrata=psv_trap
```

Refer to the `readme.txt` file in the MPLAB C30 v3.11 tool suite for further details.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

16. Module: ECAN

The WAKIF bit in the CxINTF register cannot be cleared by software instruction after the device is interrupted from Sleep due to activity on the CAN bus.

When the device wakes up from Sleep due to CAN bus activity, the ECAN module is placed in operational mode. The ECAN Event interrupt occurs due to the WAKIF flag. Trying to clear the flag in the Interrupt Service Routine (ISR) may not clear the flag. The WAKIF bit being set will not cause repetitive Interrupt Service Routine execution.

Work around

Although the WAKIF bit does not clear, the device Sleep and ECAN Wake function continue to work as expected. If the ECAN event is enabled, the CPU will enter the Interrupt Service Routine due to the WAKIF flag getting set. The application can maintain a secondary flag, which tracks the device Sleep and Wake events.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

17. Module: ECAN

The ECAN module may not store received data in the correct location. When this occurs, the receive buffers will become corrupted. In addition, it is also possible for the transmit buffers to become corrupted. This issue is more likely to occur as the CAN bus speed approaches 1 Mbps.

Work around

Do not use the DMA with ECAN in Peripheral Indirect mode. Use the DMA in Register Indirect mode, Continuous mode enabled and Ping Pong mode disabled. The receive DMA channel count should be set to 8 words. The transmit DMA channel count should be set for the actual message size (maximum of 7 words for Extended CAN messages and 6 words for Standard CAN Messages). To simplify application error handling while using this mode, only one TX buffer should be used. While message filtering is not affected, messages will not be stored at distinct RX buffers. Instead all messages are stored contiguously in memory. The start of this memory is pointed to by the receive DMA channel. The application must still clear RXFUL flags and other interrupt flags. The application must manage the RX buffer memory.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

18. Module: CPU

The `EXCH` instruction does not execute correctly if the PLL is enabled.

Work around

If writing source code in assembly, the recommended work around is to replace:

```
EXCH Wsource, Wdestination
```

with:

```
PUSH Wdestination
MOV Wsource, Wdestination
POP Wsource
```

If using the MPLAB C30 C compiler, specify the compiler option: `-merrata=exch` (*Project > Build Options > Projects > MPLAB C30 > Use Alternate Settings*).

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

19. Module: SPI

Writing to the SPIxBUF register as soon as the TBF bit is cleared will cause the SPI module to ignore the written data. Applications which use SPI with DMA will not be affected by this erratum.

Work around

After the TBF bit is cleared, wait for a minimum duration of one SPI Clock before writing to the SPIxBuf register.

Alternatively, do one of the following:

a) Poll the RBF bit and wait for it to get set before writing to the SPIxBUF register.
b) Poll the SPI interrupt flag and wait for it to get set before writing to the SPIxBUF register.
c) Use an SPI Interrupt Service Routine.
d) Use DMA.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

20. Module: UART

The UART module will not generate consecutive break characters. Trying to perform a back-to-back Break character transmission will cause the UART module to transmit the dummy character used to generate the first Break character instead of transmitting the second Break character. Break characters are generated correctly if they are followed by non-Break character transmission.

Work around

None.

Affected Silicon Revisions

A1	A2	A3					
X	X	X					

Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet (DS70292**C**):

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

1. Module: Electrical Characteristics

In **Section 30.2 "AC Characteristics and Timing Parameters"**, some of the Audio DAC Module Specifications were incorrectly reported and have been updated as shown in Table 30-42 and Table 30-43.

TABLE 30-42: AUDIO DAC MODULE SPECIFICATIONS

DC CHARACTERISTICS			Standard Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial -40°C ≤ TA ≤ +125°C for Extended				
Param No.	Symbol	Characteristic	Min.	Typ	Max.	Units	Conditions
Clock Parameters							
DA01	VOD+	Positive Output Differential Voltage	—	1.15	—	V	See **Note 1**
DA02	VOD-	Negative Output Differential Voltage	—	-1.15	—	V	See **Note 1**
DA03	VRES	Resolution		**16**		**bits**	—
DA04	**GERR**	Gain Error	—	**3.1**	—	**%**	—

Note 1: Measured across DAC positive and negative outputs with no load and FORM bit (DACxCON<8>) = 0.

TABLE 30-43: AUDIO DAC MODULE SPECIFICATIONS

AC CHARACTERISTICS			Standard Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial -40°C ≤ TA ≤ +125°C for Extended				
Param No.	Symbol	Characteristic	Min.	Typ	Max.	Units	Conditions
Clock Parameters							
DA08	**FDAC**	Clock frequency	—	—	25.6	MHz	**—**
DA09	**FSAMP**	Sample Rate	0	—	100	kHz	—
DA10	**FINPUT**	Input data frequency	0	—	45	kHz	Sampling frequency = 100 kHz
DA11	**TINIT**	Initialization period	1024	—	—	Clks	Time before first sample
DA12	**SNR**	Signal to Noise Ratio	—	**61**	—	dB	Sampling frequency = 96 kHz

APPENDIX A: REVISION HISTORY

Rev A Document (3/2009)

Initial release of this document; issued for revision A1, A2 and A3 silicon.

Includes silicon issues 1 (UART), 2 (UART), 3-4 (SPI), 5-10 (I^2C), 11 (UART), 12 (UART), 13 (Comparator), 14 (Internal Voltage Regulator), 15 (PSV Operations), 16-17 (ECAN), 18 (CPU) and 19 (SPI).

This document replaces the following errata document:

- DS80371, *"dsPIC33FJ32GP302/304, dsPIC33FJ64GPX02/X04 and dsPIC33FJ128GPX02/X04 Rev. A1/A2/A3 Silicon Errata"*

Rev B Document (4/2009)

Corrected part numbers.

Rev C Document (8/2009)

Added silicon issue 20 (UART).

Added Data Sheet Clarification 1 (Electrical Characteristics).

NOTES:

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

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "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.

Trademarks

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO/TS 16949:2002

Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://support.microchip.com
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Kokomo
Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8528-2100
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4080

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Yokohama
Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-6578-300
Fax: 886-3-6578-370

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-536-4803

Taiwan - Taipei
Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

03/26/09