



# dsPIC33EPXXXMC504 and PIC24EPXXXMC204

## dsPIC33EPXXXMC504 and PIC24EPXXXMC204 Plug-In Module (PIM) Information Sheet for Motor Control (MC) Devices Using External Op amps

The dsPIC33EPXXXMC504 and PIC24EPXXXMC204 PIM is designed to demonstrate the capabilities of the dsPIC33EPXXXMC504 and PIC24EPXXXMC204 Motor Control devices using external Op amps with development boards such as the dsPICDEM™ MCLV, MCHV, and MCSM (DM330021, DM330023, and DM330022), which support 100-pin PIM interfaces.

The dsPIC33EPXXXMC504 is a high-performance, 16-bit Digital Signal Controller (DSC) within a small 44-pin QFN package. The PIC24EPXXXMC204 microcontroller (MCU) is similar in that it shares many of the same peripheral features; however, it is not equipped with the Digital Signal Processing (DSP) engine or other DSP features.

The dsPIC33EPXXXMC504 and PIC24EPXXXMC204 devices are equipped with Peripheral Pin Select (PPS), which allows many of the digital peripherals to be remapped to use any number of pins on the device.

The PIM takes advantage of PPS by using zero ohm resistors to connect the I/O to one of the 100-pin development boards previously listed. Simply removing the zero ohm resistors and using the test points associated with each I/O pin (i.e., pin 1, pin 2, etc.), allows a designer to re-route the pin to any of the available pins on of the development boards. This capability enables easier and faster design times.

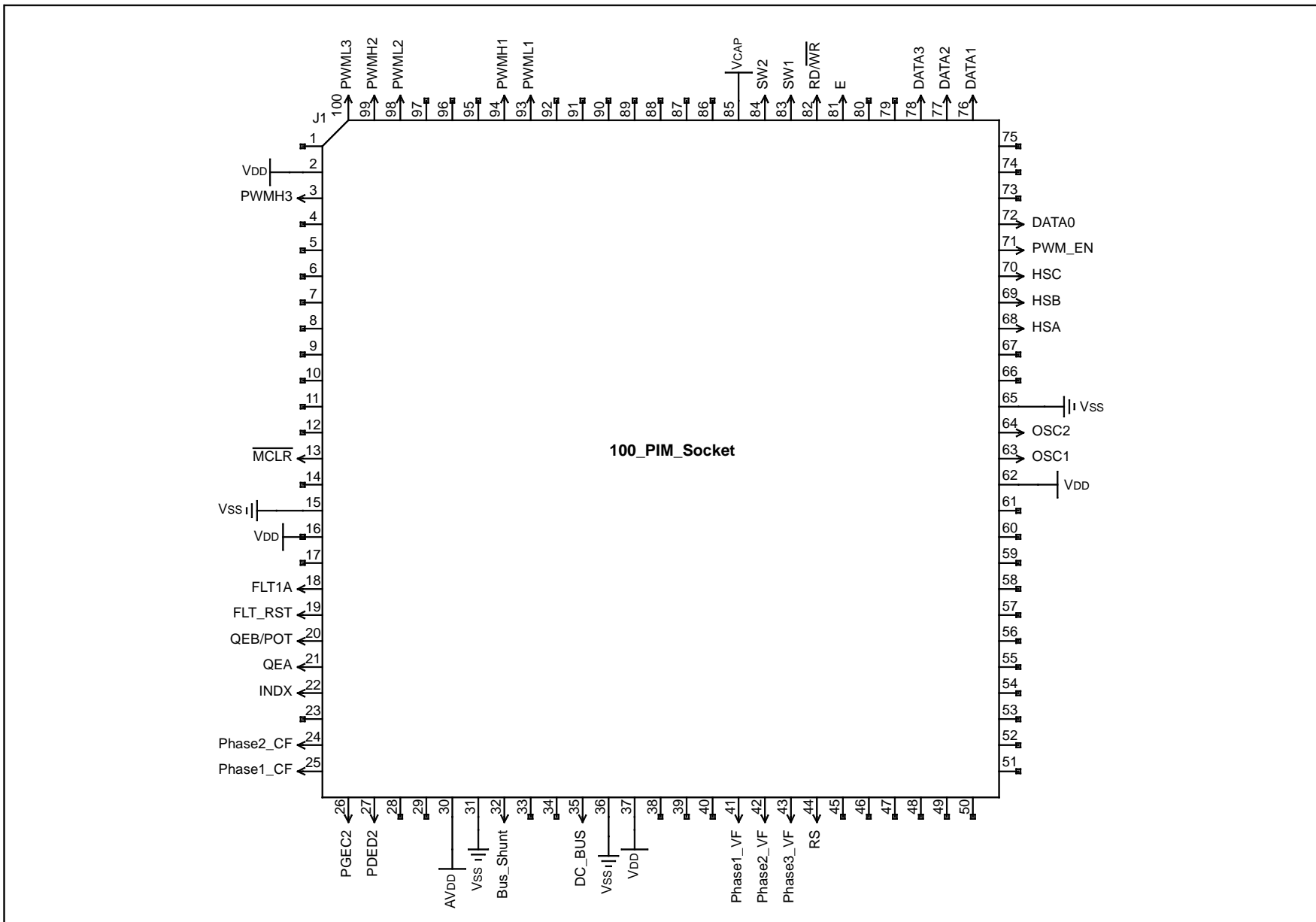
[Table 1](#) shows the mapping between the development board functions and the device pins.

**TABLE 1: 44-PIN TO 100-PIN PINOUT**

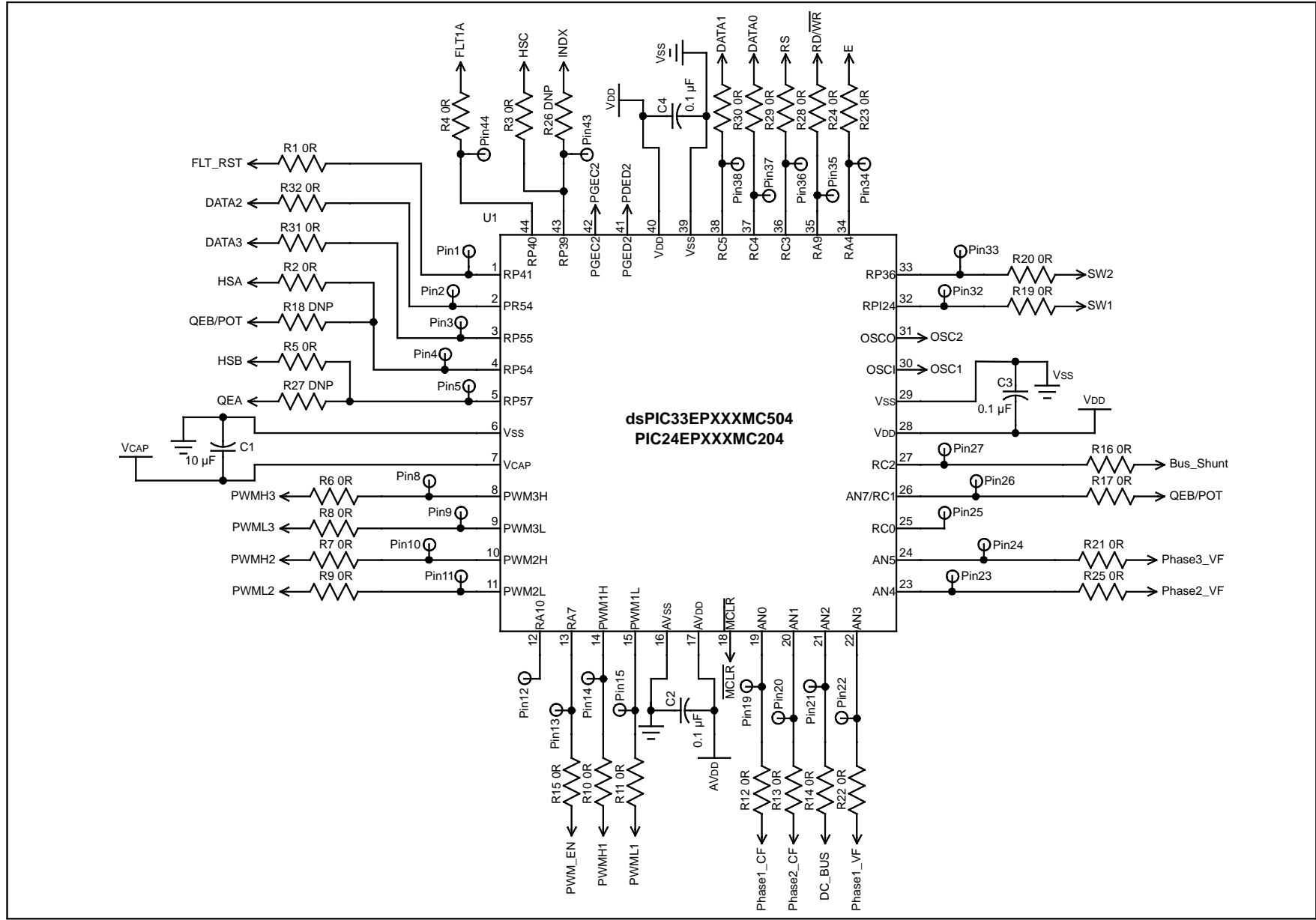
Device Pin Number	dsPIC33EPXXXMC504 and PIC24EPXXXMC204	PIM Pin Number	Functional Description
1	TMS/ASDA1/RP41/RB9	19	Fault Reset
2	RP54/RC6	77	Data 2
3	RP55/RC7	78	Data 3
4	RP56/RC8	68, 20	Hall Sensor A/ QEB_POT
5	RP57/RC9	69, 21	Hall Sensor B/ QEA
6	Vss	65	N/A
7	VCAP	85	VCAP
8	RP42/PWM3H/RB10	3	PWMH3
9	RP43/PWM3L/RB11	100	PWML3
10	RPI44/PWM2H/RB12	99	PWMH2
11	RPI45/PWM2L/CTPLS/RB13	98	PWML2
12	TDO/RA10	—	N/A
13	TDI/RA7	71	PWM Enable
14	RP46/PWM1H/T3CK/RB14	94	PWMH1
15	RP47/PWM1L/T5CK/RB15	93	PWML1
16	AVss	31	N/A
17	AVDD	30	N/A
18	MCLR	13	Master Clear
19	AN0/OA2OUT/RA0	25	Phase 1 Current Feedback
20	AN1/C2IN1+/RA1	24	Phase 2 Current Feedback
21	PGED3/VREF-/AN2/C2IN1-/SS1/RPI32/CTED2/RB0	35	DC Bus
22	PGEC3/VREF+/AN3/OA1OUT/RPI33/CTED1/RB1	41	Phase 1 Voltage Feedback

Device Pin Number	dsPIC33EPXXXMC504 and PIC24EPXXXMC204	PIM Pin Number	Functional Description
23	PGEC1/AN4/C1IN1+/RPI34/RB2	42	Phase 2 Voltage Feedback
24	PGED1/AN5/C1IN1-/RP35/RB3	43	Phase 3 Voltage Feedback
25	AN6/OA3OUT/C4IN1+/OCFB/RC0	—	N/A
26	AN7/C3IN1-/C4IN1-/RC1	20	QEB_POT
27	AN8/C3IN1+/U1RTS/BCLK1/FLT3/RC2	32	Bus Shunt
28	VDD	16	N/A
29	Vss	15	N/A
30	OSC1/CLKI/RA2	63	OSC1
31	OSC2/CLKO/RA3	64	OSC2
32	SDA2/RPI24/RA8	83	Switch 1
33	FLT32/SCL2/RP36/RB4	84	Switch 2
34	CVREF20/SDO1/RP20/T1CK/RA4	81	Enable
35	SDI1/RPI25/RA9	82	RD/WR
36	SCK1/RPI51/RC3	44	RS
37	SDA1/RPI52/RC4	72	Data 0
38	SCL1/RPI53/RC5	76	Data 1
39	Vss	36	N/A
40	VDD	37	N/A
41	PGED2/ASDA2/RP37/RB5	27	Debug
42	PGEC2/ASCL2/RP38/RB6	26	Debug
43	RP39/INT0/RB7	22, 70	Index/Hall Sensor C
44	TCK/CVREF10/ASCL1/RP40/T4CK/RB8	18	Fault A

**FIGURE 1: 100-PIN HEADER SCHEMATIC**



**FIGURE 2: 44-PIN DEVICE SCHEMATIC**



# dsPIC33EPXXMC504 and PIC24EPXXMC204

---

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.

---

Information contained in this publication 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. 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 ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. 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.

**Trademarks**

The Microchip name and logo, the Microchip logo, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC<sup>32</sup> logo, rPIC and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscent Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rfLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock 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.

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

© 2011, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-61341-598-6

*Microchip received ISO/TS-16949:2009 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<sup>®</sup> MCUs and dsPIC<sup>®</sup> DSCs, KEELOQ<sup>®</sup> 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.*

**QUALITY MANAGEMENT SYSTEM**  
**CERTIFIED BY DNV**  
**== ISO/TS 16949:2009 ==**



# MICROCHIP

## 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://www.microchip.com/support>  
Web Address:  
[www.microchip.com](http://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

**Indianapolis**  
Noblesville, IN  
Tel: 317-773-8323  
Fax: 317-773-5453

**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: 86-10-8569-7000  
Fax: 86-10-8528-2104

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

**China - Chongqing**  
Tel: 86-23-8980-9588  
Fax: 86-23-8980-9500

**China - Hangzhou**  
Tel: 86-571-2819-3187  
Fax: 86-571-2819-3189

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

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

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

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-3090-4444  
Fax: 91-80-3090-4123

**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: 886-3-5778-366  
Fax: 886-3-5770-955

**Taiwan - Kaohsiung**  
Tel: 886-7-536-4818  
Fax: 886-7-330-9305

**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 - Druenen**  
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

08/02/11