

Voltage Detector

Features:

- Highly Accurate: $\pm 2\%$
- Low-Power Consumption: $1.0\mu\text{A}$, Typ.
- Detect Voltage Range: 1.6V to 6.0V and 7.7V
- Operating Voltage: 1.5V to 10.0V
- Output Configuration: Open-Drain or CMOS
- Space-Saving 5-Pin SOT-23A Package

Typical Applications:

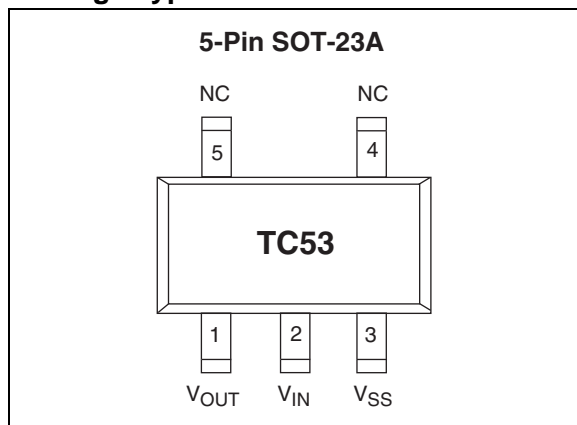
- Microprocessor Reset Circuits
- Battery Life Monitors and Recharge Voltage Monitors
- Memory Battery Backup Circuitry
- Power-On Reset Circuits
- Power Failure Detection
- Delay Circuitry

Device Selection Table

Part Number	Package	Temp. Range
TC53-xxxxxxxxx	5-Pin SOT-23A	-40°C to +85°C

Other output voltages are available. Please contact Microchip Technology Inc. for details.

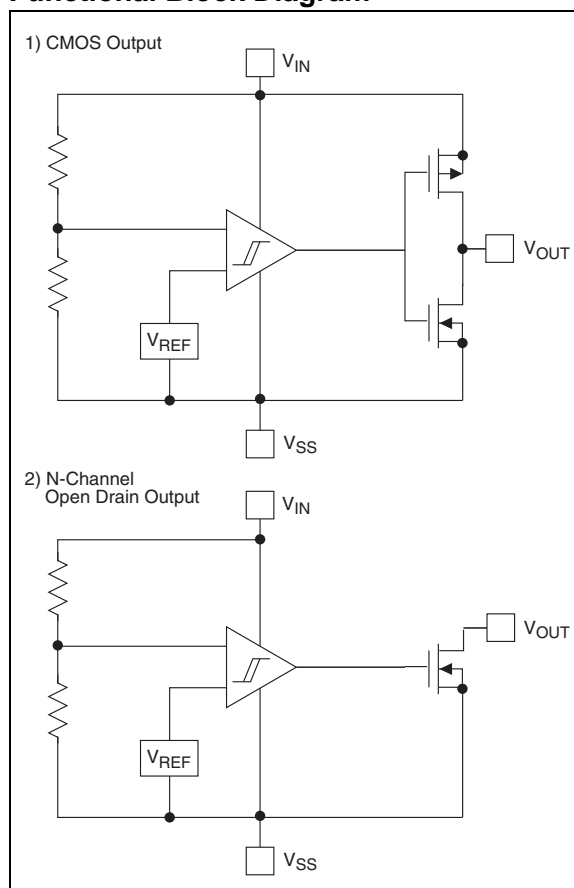
Package Type



General Description:

The TC53 is a low-power voltage detector. Typical supply current consumption is only $1\mu\text{A}$ at an input voltage of 2V. The voltage detection threshold setting is factory-programmed and ensured to $\pm 2\%$ accuracy. Threshold settings are available over a range of 1.6V to 6.0V. The TC53 has both complementary (CMOS) and open drain (NMOS) output configuration options. TC53 is the ideal voltage detector for precision applications in which small size, low installed cost, high accuracy and low supply current consumption are critical.

Functional Block Diagram



TC53

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Input Voltage	+12V
Output Current	50 mA
Output Voltage.....	$V_{IN} + 0.3V$ to $V_{SS} - 0.3V$
Power Dissipation	
5-Pin SOT-23A	240 mW
Operating Temperature Range.....	-40°C to +85°C
Storage Temperature Range	-40°C to +125°C

†Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

TC53 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: $T_A = 25^\circ\text{C}$, unless otherwise specified.						
Note 1, Note 2.						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
V_{DF}	Detect Voltage	$V_T \times 0.98$	$V_T \pm 0.5\%$	$V_T \times 1.02$	V	Note 3
V_{HYS}	Hysteresis Range	$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V	
I_{SS}	Supply Current	—	0.9	2.6	μA	$V_{IN} = 1.5V$ $V_{IN} = 2.0V$ $V_{IN} = 3.0V$ $V_{IN} = 4.0V$ $V_{IN} = 5.0V$
V_{IN}	Operating Voltage	1.5	—	10.0	V	$V_{DF} = 2.1$ to $6.0V$
I_{OUT}	Output Current	—	2.2	—	mA	N-ch; $V_{DS} = 0.5V$, $V_{IN} = 1.0V$ $V_{IN} = 2.0V$ $V_{IN} = 3.0V$ $V_{IN} = 4.0V$ $V_{IN} = 5.0V$
		—	7.7	—		
		—	10.1	—		
		—	11.5	—		
		—	13.0	—		
		—	-10.0	—		P-ch; $V_{DS} = 2.1V$, $V_{IN} = 8.0V$ (CMOS Output)
$\Delta V_{DF}/(\Delta T_{OPR} V_{DF})$	Temperature Characteristics	—	± 100	—	ppm/°C	
t_{DLY}	Delay Time ($V_{DR} \rightarrow V_{OUT}$ Inversion)	—	—	0.2	ms	

- Note**
- 1: An additional resistor between the V_{IN} pin and the supply voltage may alter the electrical characteristics due to the increasing values of V_{DR} .
 - 2: The power consumption during power-start to output being stable (release operation) is $2\mu\text{A}$ greater than it is after that period (completion of release operation) because of rush current in the delay circuit.
 - 3: V_T is the factory-programmed voltage detection threshold.

2.0 PIN DESCRIPTIONS

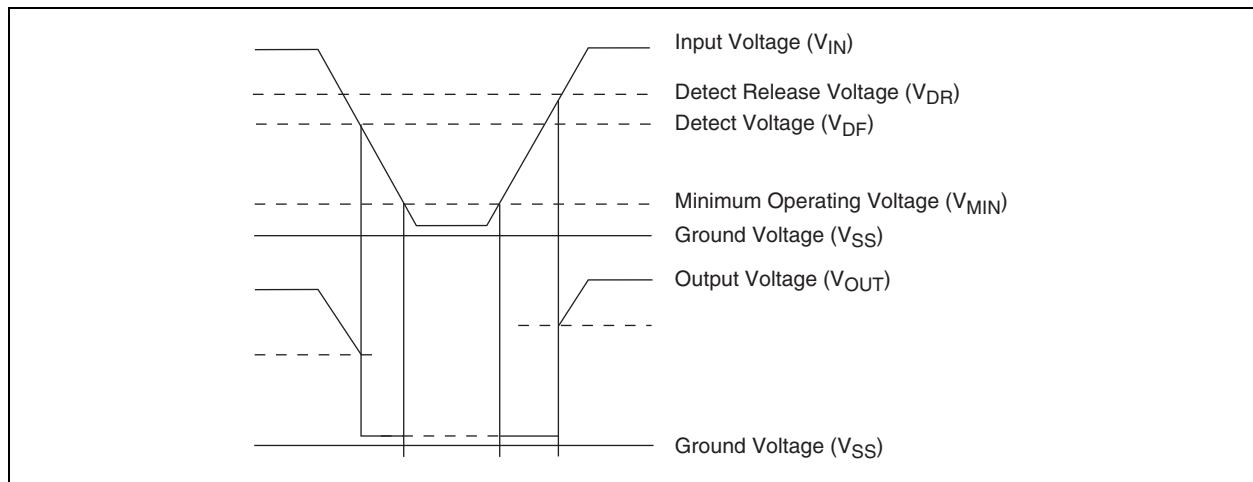
The descriptions of the pins are listed in [Table 2-1](#).

TABLE 2-1: PIN FUNCTION TABLE

Pin No. (5-Pin SOT-23A)	Symbol	Description
1	V_{OUT1}	Output.
2	V_{IN}	Supply voltage input.
3	V_{SS}	Ground terminal.
4	NC	Not connected.
5	NC	Not connected.

3.0 DETAILED DESCRIPTION

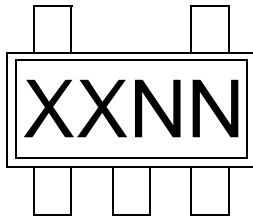
FIGURE 3-1: TIMING DIAGRAM



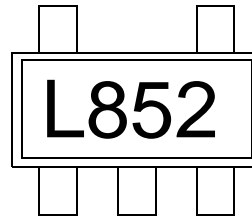
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

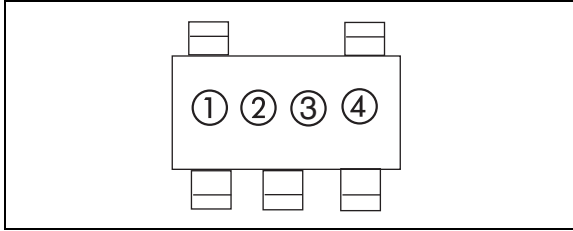
5-Lead SOT-23A



Example



Legend:	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.
Note:	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.	



① represents output configuration and first integer of voltage

Symbol	Output	Voltage
A	CMOS	0.
B	CMOS	1.
C	CMOS	2.
D	CMOS	3.
E	CMOS	4.
F	CMOS	5.
H	CMOS	6.

Symbol	Output	Voltage
K	Nch	0.
L	Nch	1.
M	Nch	2.
N	Nch	3.
P	Nch	4.
R	Nch	5.
S	Nch	6.

② represents first decimal of output voltage

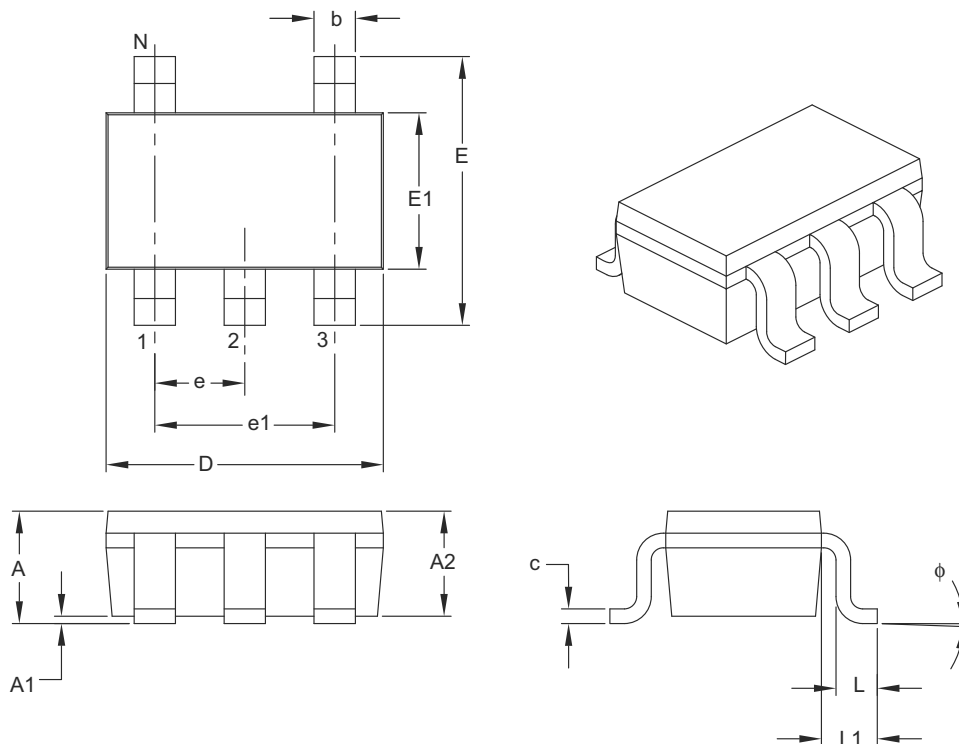
Symbol	Voltage
0	.0
1	.1
2	.2
3	.3
4	.4
5	.5
6	.6
7	.7
8	.8
9	.9

③ represents delay function and delay time
3 = no delay function

④ represents assembly lot code

5-Lead Plastic Small Outline Transistor (CT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	5		
Lead Pitch	e	0.95 BSC		
Outside Lead Pitch	e1	1.90 BSC		
Overall Height	A	0.90	–	1.45
Molded Package Thickness	A2	0.89	–	1.30
Standoff	A1	0.00	–	0.15
Overall Width	E	2.20	–	3.20
Molded Package Width	E1	1.30	–	1.80
Overall Length	D	2.70	–	3.10
Foot Length	L	0.10	–	0.60
Footprint	L1	0.35	–	0.80
Foot Angle	ϕ	0°	–	30°
Lead Thickness	c	0.08	–	0.26
Lead Width	b	0.20	–	0.51

Notes:

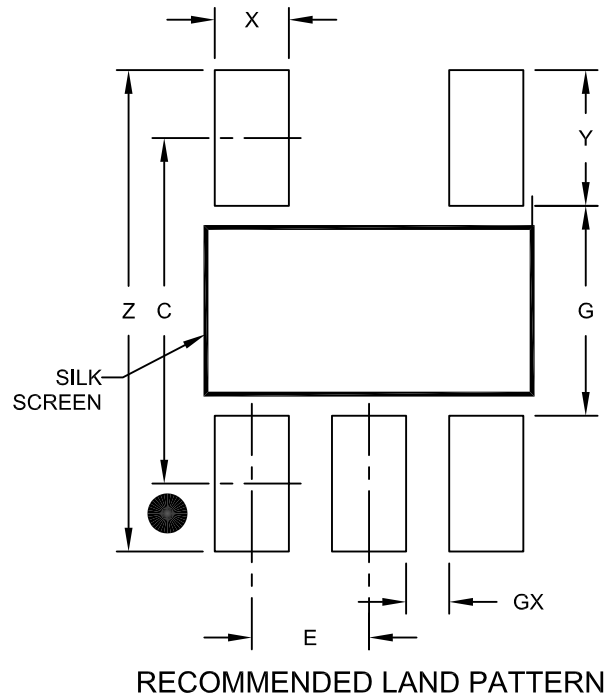
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-091B

5-Lead Plastic Small Outline Transistor (CT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	0.95 BSC		
Contact Pad Spacing	C		2.80	
Contact Pad Width (X5)	X			0.60
Contact Pad Length (X5)	Y			1.10
Distance Between Pads	G	1.70		
Distance Between Pads	GX	0.35		
Overall Width	Z			3.90

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2091A

TC53

NOTES:

APPENDIX A: REVISION HISTORY

Revision D (August 2011)

- Changed status from active to end-of-life (EOL)

Revision C (July 2002)

- Undocumented changes

Revision B (May 2002)

- Undocumented changes

Revision A (March 2001)

- Original Release of this Document.

TC53

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X</u>	<u>XX</u>	<u>XX</u>	<u>XX</u>	<u>XX</u>	<u>XX</u>
Device	Output Configuration	Detected Voltage	Tolerance	Temperature Range	Package	Tapping Direction
Device:	TC53: Low-power voltage detector					
Output Configuration:	N = NMOS C = CMOS					
Detected Voltage:	22 = 2.2V 27 = 2.7V 29 = 2.9V					
Tolerance:	02 = ±2%					
Temperature Range:	E = -40°C to +125°C(Extended)					
Package:	CT: 5-Pin SOT-23A Package					
Taping Direction:	TR: Standard Taping					
Examples:						
a) TC53C2202ECTTR: CMOS, 2.2V, ±2% tolerance, Extended Temperature, 5LD SOT-23A, Standard Tapping.						
b) TC53N2702ECTTR: NMOS, 2.7V, ±2% tolerance, Extended Temperature, 5LD SOT-23A, Standard Tapping.						
c) TC53N2902ECTTR: NMOS, 2.9V, ±2% tolerance, Extended Temperature, 5LD SOT-23A, Standard Tapping.						

TC53

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, PIC³² logo, rfPIC 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, Omniscient 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.

© 2001-2011, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-61341-465-1

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[®] 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.

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

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 - 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

08/02/11