

# TC1278/TC1279

## 3-Pin Reset Monitors for 5V Systems

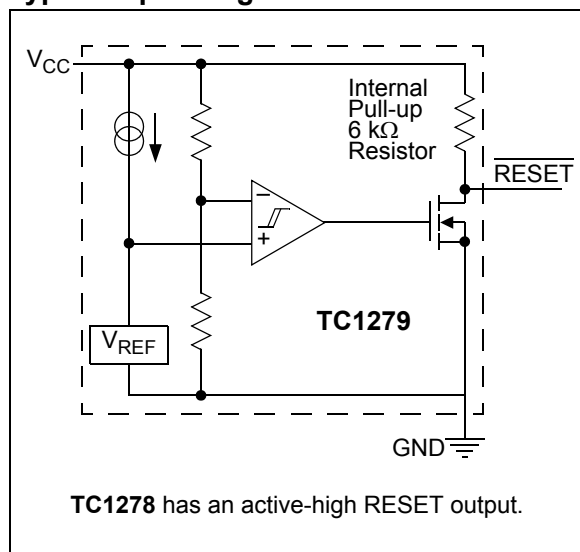
### Features

- Precision  $V_{CC}$  Monitor for 5.0V System Supplies
- 250 ms Minimum RESET Output Duration
- Output Valid to  $V_{CC} = 1.2V$
- $V_{CC}$  Transient Immunity
- Small 3-Pin SOT-23 Package
- No External Components
- Internal Pull-up Resistor
- Available in 3 different voltage detection levels:
  - 4.625V (typ.), -5 suffix
  - 4.375V (typ.), -10 suffix
  - 4.125V (typ.), -15 suffix

### Applications

- Computers
- Embedded Systems
- Battery Powered Equipment
- Critical  $\mu P$  Power Supply Monitoring

### Typical Operating Circuit

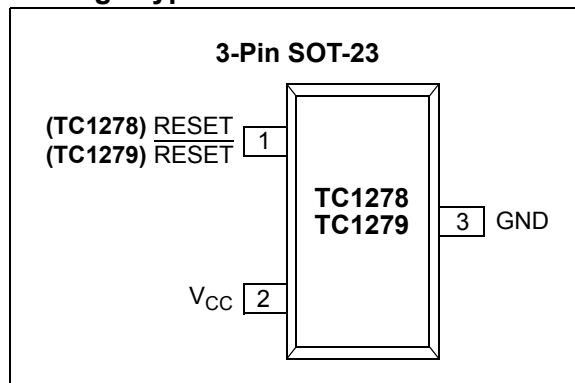


### General Description

The TC1278/TC1279 are cost-effective system supervisor circuits designed to monitor  $V_{CC}$  in digital systems and provide a reset signal to the host processor when necessary. No external components are required. The open-drain output uses an internal pull-up resistor of approximately 6 k $\Omega$ .

The reset output is driven active within 5  $\mu s$  of  $V_{CC}$  falling through the reset voltage threshold. RESET is maintained active for a minimum of 250 ms after  $V_{CC}$  rises above the reset threshold. The TC1278 has an active-high RESET output, while the TC1279 has an active-low RESET output, with both devices having an open-drain output stage. The output is valid down to  $V_{CC} = 1.2V$ . Both devices are available in a 3-Pin SOT-23 package.

### Package Type



# TC1278/TC1279

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

Supply Voltage ( $V_{CC}$ to GND).....	+6.0V
$\overline{\text{RESET}}$ , RESET.....	-0.3V to ( $V_{CC} + 0.3V$ )
Input Current, $V_{CC}$ .....	20 mA
Output Current, RESET.....	20 mA
Power Dissipation ( $T_A \leq 70^\circ\text{C}$ )	
3-Pin SOT-23 (derate 4mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$ )	
.....	230 mW
Operating Temperature Range.....	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature Range.....	$-65^\circ\text{C}$ to $+150^\circ\text{C}$

† 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.

## DC CHARACTERISTICS

Electrical Specifications: Unless otherwise indicated, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ . Typical values are at $T_A = +25^\circ\text{C}$ .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Supply Voltage	$V_{CC}$	1.2	—	5.5	V	<b>Note 1</b>
Low Level @ RESET (TC1278) RESET (TC1279)	$V_{OL}$	—	—	0.4	V	<b>Note 1</b>
Output Current @ 0.4 Volts	$I_{OL}$	+8	—	—	mA	<b>Note 2</b>
Operating Current: <b>TC1278</b>	$I_{CC1}$	—	0.9	2.0	mA	$V_{CC} > V_{CCTP(MAX)}$ , RESET = 1, ( <b>Note 3</b> )
<b>TC1279</b>		—	—	40	$\mu\text{A}$	$V_{CC} > V_{CCTP(MAX)}$ , RESET = 1, <b>Note 4</b>
Operating Current: <b>TC1278</b>	$I_{CC2}$	—	—	40	$\mu\text{A}$	$V_{CC} < V_{CCTP(MIN)}$ , RESET = 0, ( <b>Note 4</b> )
<b>TC1279</b>		—	0.9	2.0	mA	$V_{CC} < V_{CCTP(MIN)}$ , RESET = 0, ( <b>Note 3</b> )
$V_{CC}$ Trip Point (TC1278/9-5)	$V_{CCTP-5}$	4.50	4.625	4.74	V	<b>Note 1</b>
$V_{CC}$ Trip Point (TC1278/9-10)	$V_{CCTP-10}$	4.25	4.375	4.49	V	<b>Note 1</b>
$V_{CC}$ Trip Point (TC1278/9-15)	$V_{CCTP-15}$	4.00	4.125	4.24	V	<b>Note 1</b>
Output Capacitance	$C_{OUT}$	—	9	—	pF	
Internal Pull-Up Resistor	$R_P$	3	6	9	k $\Omega$	

- Note 1:** All voltages referenced to ground.
- 2:** A 1 k $\Omega$  external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1279.  $V_{CC} = 1.8V$ .
- 3:** Operating current is specified with the open-drain output in the active ("ON") condition.
- 4:** Operating current is specified with the open-drain output in the non-active ("OFF") condition.

## AC CHARACTERISTICS

<b>Electrical Specifications:</b> Unless otherwise indicated, $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ . Typical values are at $T_A = +25^{\circ}\text{C}$ .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
RESET Active Time	$t_{\text{RST}}$	250	350	450	ms	
$V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1279)	$t_{\text{RPD1}}$	—	2	5	$\mu\text{s}$	Figure 3-2
$V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1278)	$t_{\text{RPD2}}$	—	2	5	$\mu\text{s}$	Figure 3-4
$V_{\text{CC}}$ Slew Rate (4.75V-4.00V)	$t_{\text{F}}$	300	—	—	$\mu\text{s}$	Figure 3-2, Figure 3-4
$V_{\text{CC}}$ Slew Rate (4.00V-4.75V)	$t_{\text{R}}$	0	—	—	ns	Figure 3-1, Figure 3-3
$V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1279)	$t_{\text{RPU1}}$	250	350	450	ms	Figure 3-1
$V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1278)	$t_{\text{RPU2}}$	250	350	450	ms	Figure 3-3

# TC1278/TC1279

---

## 2.0 PIN DESCRIPTIONS

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

**TABLE 2-1: PIN FUNCTION TABLE**

Pin No.	Symbol	Function
1	$\overline{\text{RESET}}$ (TC1279)	RESET output
1	RESET (TC1278)	RESET output
2	$V_{CC}$	Supply voltage (1.2V to 5.5V).
3	GND	Ground.

### 2.1 $\overline{\text{RESET}}$ (TC1279)

$\overline{\text{RESET}}$  output remains low while  $V_{CC}$  is below the reset voltage threshold, and for 350 ms (250 ms min.) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1279 is open-drain.

### 2.2 RESET (TC1278)

RESET output remains high while  $V_{CC}$  is below the reset voltage threshold, and for 350 ms (250 ms min.) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1278 is open-drain.

### 2.3 $V_{CC}$

Supply voltage (1.2V to 5.5V).

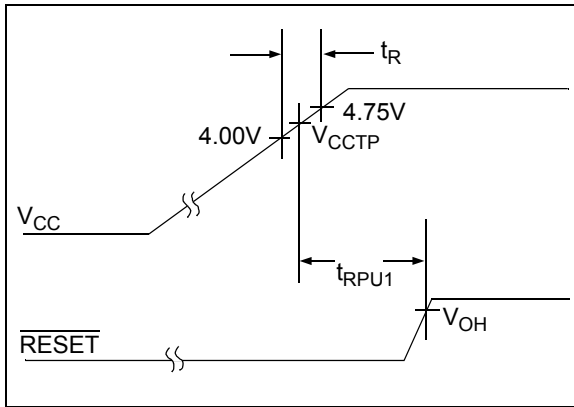
### 2.4 Ground

Device ground.

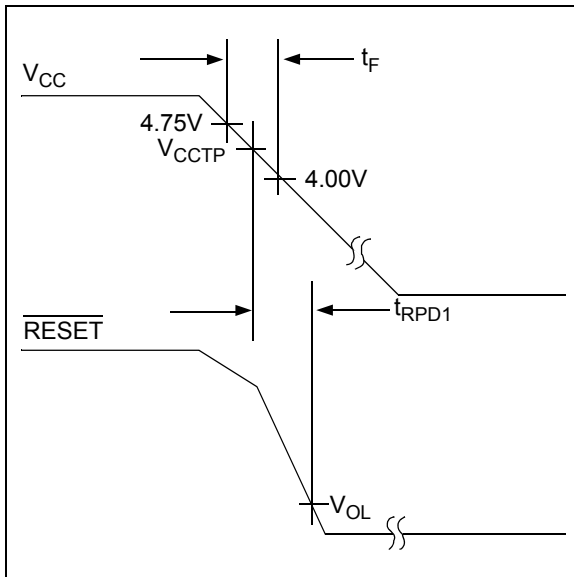
## 3.0 APPLICATIONS INFORMATION

### 3.1 Operation – Power Monitor

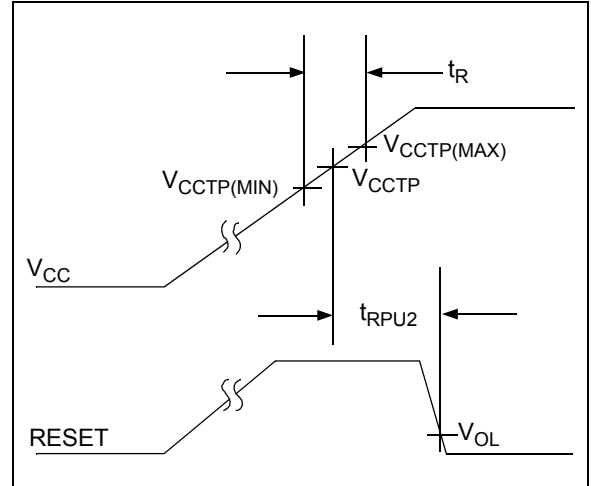
The TC1278/TC1279 provide the function of detecting out-of-tolerance power supply conditions and warning a processor-based system of impending power failure. When  $V_{CC}$  is detected as out-of-tolerance, the RESET signal is asserted. On power-up, RESET is kept active for approximately 350 ms after the power supply has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before RESET is released.



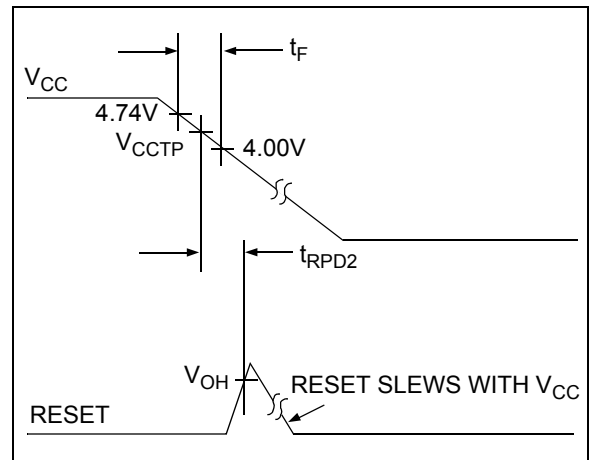
**FIGURE 3-1:** TC1279 Power Up Timing Diagram.



**FIGURE 3-2:** TC1279 Power-Down Timing Diagram.



**FIGURE 3-3:** TC1278 Power-Up Timing Diagram.

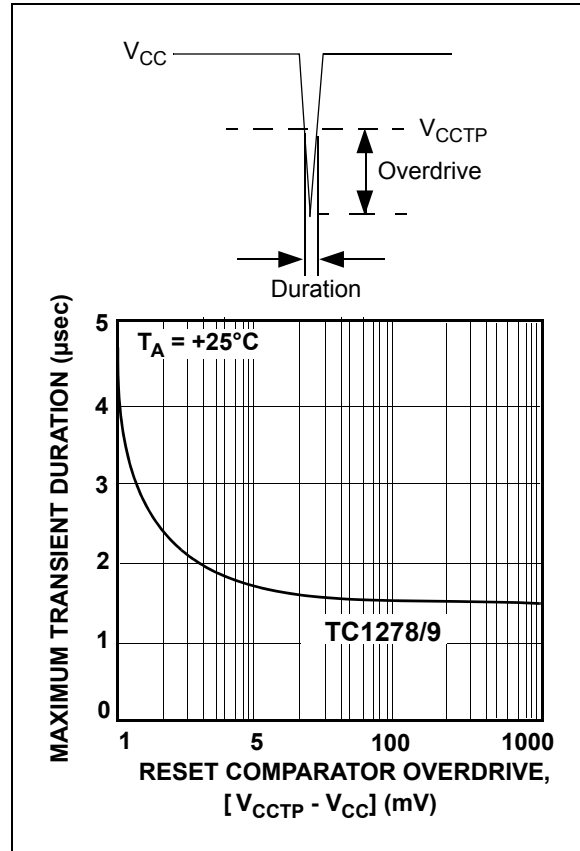


**FIGURE 3-4:** TC1278 Power-Down Timing Diagram.

# TC1278/TC1279

## 3.2 $V_{CC}$ Transient Rejection

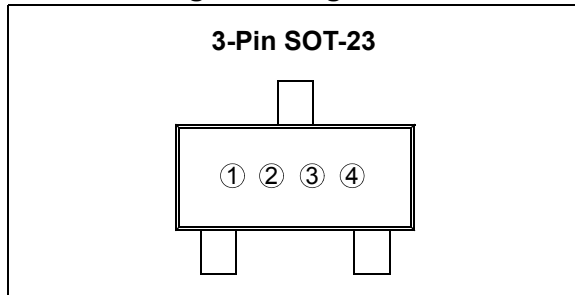
The TC1278/TC1279 provides accurate  $V_{CC}$  monitoring and reset timing during power-up, power-down, and brownout/sag conditions. Furthermore, it rejects negative-going transients (glitches) on the power supply line. Figure 3-5 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive that lays under the curve will not generate a reset signal. Combinations above the curve are detected as a brownout or power-down. Transient immunity can be improved by adding a capacitor in close proximity to the  $V_{CC}$  pin of the TC1278/TC1279.



**FIGURE 3-5:** Maximum Transient Duration vs. Overdrive For Glitch Rejection At  $+25^\circ\text{C}$ .

## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information



① & ② = part number code + temperature range and voltage

Part Number	Code
TC1278-5ENB	PA
TC1278-10ENB	PB
TC1278-15ENB	PC

TC1279-5ENB	RA
TC1279-10ENB	RB
TC1279-15ENB	RC

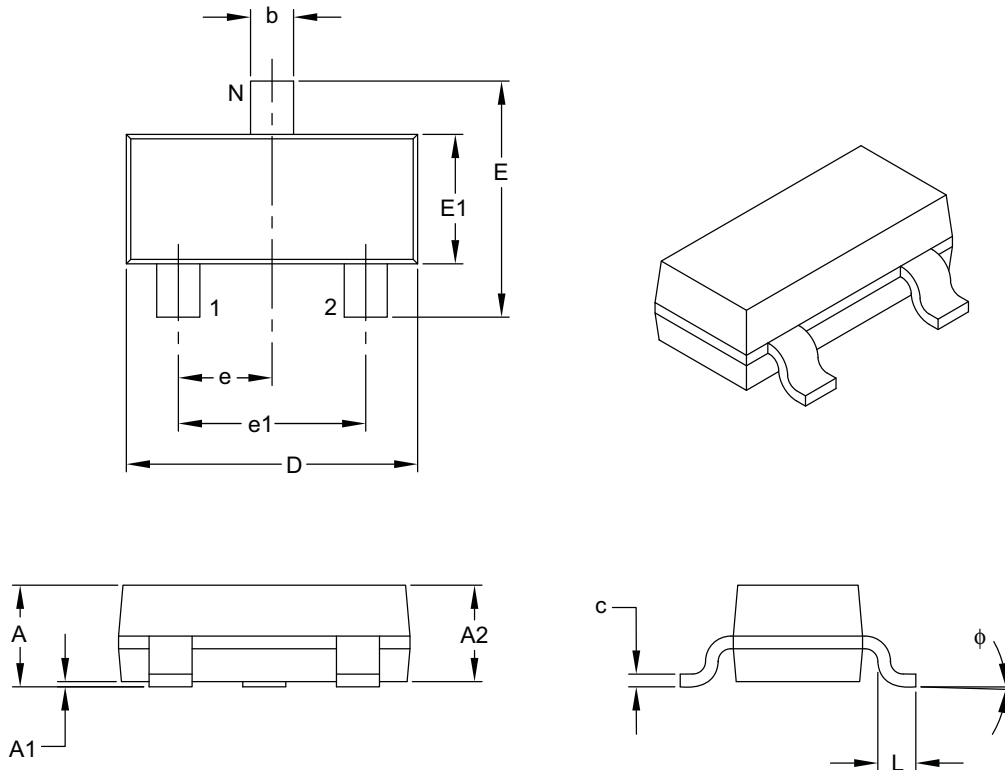
③ represents year and 2-month code

④ represents production lot ID code

# TC1278/TC1279

## 3-Lead Plastic Small Outline Transistor (TT or NB) [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	3		
Lead Pitch	e	0.95 BSC		
Outside Lead Pitch	e1	1.90 BSC		
Overall Height	A	0.89	–	1.12
Molded Package Thickness	A2	0.79	0.95	1.02
Standoff	A1	0.01	–	0.10
Overall Width	E	2.10	–	2.64
Molded Package Width	E1	1.16	1.30	1.40
Overall Length	D	2.67	2.90	3.05
Foot Length	L	0.13	0.50	0.60
Foot Angle	φ	0°	–	10°
Lead Thickness	c	0.08	–	0.20
Lead Width	b	0.30	–	0.54

**Notes:**

- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-104B



## 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>-XX</u>	<u>X</u>	<u>XX</u>
Device	Reset V <sub>CC</sub> Threshold	Temperature Range	Package
Device	TC1278: 3-Pin Reset Monitor for 5V Systems TC1279: 3-Pin Reset Monitor for 5V Systems		
Reset V <sub>CC</sub> Threshold:	5 = 4.625V 10 = 4.375V 15 = 4.125V		
Temperature Range	E = -40°C to +85°C		
Package	NBTR = Plastic Small Outline Transistor, (SOT23), 3-lead (Tape and Reel)		

### Examples:

- a) TC1278-5ENBTR: 4.625 Reset
- b) TC1278-10ENBTR: 4.375 Reset
- c) TC1278-15ENBTR: 4.125 Reset
  
- a) TC1279-5ENBTR: 4.625 Reset
- b) TC1279-10ENBTR: 4.375 Reset
- c) TC1279-15ENBTR: 4.125 Reset

# TC1278/TC1279

---

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, Accuron, dsPIC, KEELOQ, KEELOQ logo, microID, MPLAB, PIC, PICmicro, PICSTART, PRO MATE, PowerSmart, rPIC, and SmartShunt are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AmpLab, FilterLab, Linear Active Thermistor, Migratable Memory, MXDEV, MXLAB, PS logo, SEEVAL, SmartSensor 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, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, ECAN, ECONOMONITOR, FanSense, FlexROM, fuzzyLAB, In-Circuit Serial Programming, ICSP, ICEPIC, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, PICkit, PICDEM, PICDEM.net, PICLAB, PICtail, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rLAB, rfPICDEM, Select Mode, Smart Serial, SmartTel, Total Endurance, UNI/O, 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.

© 2007, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

**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 Mountain View, California. 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.*



---

---

## 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](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

**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 - Fuzhou**  
Tel: 86-591-8750-3506  
Fax: 86-591-8750-3521

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

**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 - Shunde**  
Tel: 86-757-2839-5507  
Fax: 86-757-2839-5571

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

**China - Xian**  
Tel: 86-29-8833-7250  
Fax: 86-29-8833-7256

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-4182-8400  
Fax: 91-80-4182-8422

**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 - Gumi**  
Tel: 82-54-473-4301  
Fax: 82-54-473-4302

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

**Malaysia - Penang**  
Tel: 60-4-646-8870  
Fax: 60-4-646-5086

**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: 886-3-572-9526  
Fax: 886-3-572-6459

**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