# MCP7382X Evaluation Kit User's Guide

© 2006 Microchip Technology Inc.

**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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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, microID, MPLAB, PIC, PICmicro, PICSTART, PRO MATE, PowerSmart, rfPIC and SmartShunt are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AmpLab, FilterLab, Migratable Memory, MXDEV, MXLAB, 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, Linear Active Thermistor, Mindi, MiWi, MPASM, MPLIB, MPLINK, PICkit, PICDEM, PICDEM.net, PICLAB, PICtail, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rfLAB, 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.

© 2006, 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 PICmicro® 8-bit MCUs, 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.*


© 2006 Microchip Technology Inc.

# MCP7382X EVALUATION KIT USER'S GUIDE

## Table of Contents



© 2006 Microchip Technology Inc.

**NOTES:**


© 2006 Microchip Technology Inc.

# MCP7382X EVALUATION KIT USER'S GUIDE

## Preface

### NOTICE TO CUSTOMERS

**All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.**

**Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.**

## INTRODUCTION

This chapter contains general information that will be useful to know before using the MCP7382X Evaluation Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Customer Support
- Document Revision History

## DOCUMENT LAYOUT

This document describes how to use the MCP7382X Evaluation Kit as a development tool. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information on how to use the MCP7382X Evaluation Board.
- **Chapter 2. "Installation and Operation"** – For users evaluating the MCP73826, MCP73827, or MCP73828 devices, this chapter describes how to use the various features of the hardware.
- **Appendix A. "Schematic and Board Layouts"** – shows the schematic and layout diagrams for the MCP7382X Evaluation Kit.
- **Appendix B. "Bill Of Materials (BOM)"** – lists the parts used to build the MCP7382X Evaluation Kit.

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

**DOCUMENTATION CONVENTIONS**

| Description | Represents | Examples |
|---|---|---|
| **Arial font:** | | |
| Italic characters | Referenced books | *MPLAB® IDE User's Guide* |
| | Emphasized text | ...is the *only* compiler... |
| Initial caps | A window | the Output window |
| | A dialog | the Settings dialog |
| | A menu selection | select Enable Programmer |
| Quotes | A field name in a window or dialog | "Save project before build" |
| Underlined, italic text with right angle bracket | A menu path | *File>Save* |
| Bold characters | A dialog button | Click **OK** |
| | A tab | Click the **Power** tab |
| N'Rnnnn | A number in verilog format, where N is the total number of digits, R is the radix and n is a digit. | 4'b0010, 2'hF1 |
| Text in angle brackets < > | A key on the keyboard | Press <Enter>, <F1> |
| **Courier New font:** | | |
| Plain Courier New | Sample source code | `#define START` |
| | Filenames | `autoexec.bat` |
| | File paths | `c:\mcc18\h` |
| | Keywords | `_asm, _endasm, static` |
| | Command-line options | `-Opa+, -Opa-` |
| | Bit values | `0, 1` |
| | Constants | `0xFF, 'A'` |
| Italic Courier New | A variable argument | *`file`*`.o`, where *`file`* can be any valid filename |
| Square brackets [ ] | Optional arguments | `mcc18 [options]` *`file`* `[options]` |
| Curly brackets and pipe character: { \| } | Choice of mutually exclusive arguments; an OR selection | `errorlevel {0\|1}` |

## RECOMMENDED READING

This user's guide describes how to use MCP7382X Evaluation Kit. For more information regarding the MCP7382X devices, the following are recommended reading.

**MCP7382X Data Sheets**

These data sheets provide detailed information regarding the MCP7382X Single Cell Lithium-Ion Charge Management Controllers:

- MCP73826 Data Sheet (DS21705)
- MCP73827 Data Sheet (DS21704)
- MCP73828 Data Sheet (DS21706)


© 2006 Microchip Technology Inc.

## THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **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 consultant 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

## CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support
- Development Systems Information Line

Customers should contact their distributor, representative or field application engineer for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

## DOCUMENT REVISION HISTORY

### Revision B (July 2006)

- Add disclaimer to Bill of Materials regarding RoHS-Compliant part numbers.

### Revision A (January 2002)

- Initial Release of this Document.

**NOTES:**


© 2006 Microchip Technology Inc.

# Chapter 1. Product Overview

## 1.1 INTRODUCTION

This chapter provides an overview of the MCP7382X Evaluation Kit, and instructions on how to connect the system components.

This chapter covers the following topics:

- What the MCP7382X Evaluation Kit Is
- MCP7382X Evaluation Kit Components

## 1.2 WHAT THE MCP7382X EVALUATION KIT IS

The MCP7382X Evaluation Kit is an evaluation and demonstration tool for Microchip Technology's MCP7382X Single Cell Lithium-Ion Charge Management Controllers. The design provides for dynamic versatility while being able to handle accurate measurements.

When connected, this evaluation board allows for the evaluation of the MCP7382X devices in a variety of applications.

## 1.3 MCP7382X EVALUATION KIT COMPONENTS

The MCP7382X Evaluation Kit contains:

- MCP7382X Evaluation Board (102-00017)
- MCP73826-4.2VCH, MCP73827-4.2VUA, and MCP73828-4.2VUA Devices installed
- Analog and Interface Products Demonstration Boards CD-ROM (DS21912)
  - MCP7382X Evaluation Kit User's Guide

**NOTES:**


© 2006 Microchip Technology Inc.

# Chapter 2. Installation and Operation

## 2.1 DESCRIPTION

The MCP7382X Evaluation Kit is an evaluation kit designed to support Microchip's MCP73826, MCP73827, and MCP73828 single-cell Li-Ion charge management devices. The evaluation kit is fully assembled and tested. The kit is useful for evaluating simple stand-alone operation or for evaluating applications interfaced with a microcontroller.

## 2.2 FEATURES

The MCP7382X Evaluation Board has the following features:

- Evaluation of MCP73827/28 in 8-pin MSOP packages
- Evaluation of MCP73826 in 6-pin SOT-23 package
- Simple Stand-Alone Operation or Microcontroller Compatible
- Powered from external bench supply or voltage regulated wall cube
- Surface-Mount Design
- Fully Assembled and Tested

## 2.3 GETTING STARTED

The MCP7382X Evaluation Board is a fully functional, assembled, and tested surface mount board for evaluation of Microchip's MCP73826/27/28 single-cell Li-Ion battery charger devices. The following steps provide simple stand-alone operation. Refer to the set-up configuration diagram below. Note: Do not turn on the input power until all other set-up steps are complete.

1. Place a jumper on JP4 to select the appropriate device for evaluation.
2. Place a jumper on JP5 to enable the appropriate device for evaluation.
3. Connect an external bench supply or voltage regulated wall cube to JP1. **Observe correct polarity of connection.**
4. Connect a single cell Li-Ion battery pack to JP2. **Observe correct polarity of connection.**
5. For MCP73828 evaluation, connect external battery pack thermistor to JP3.
6. Turn-on bench supply or plug-in wall cube.
7. For MCP73827 evaluation, LED D3 shall be turned off when the charge cycle transitions from controlled current mode to constant voltage mode charge.
8. For MCP73828 evaluation, LED D2 shall illuminate when the battery pack is at full charge.

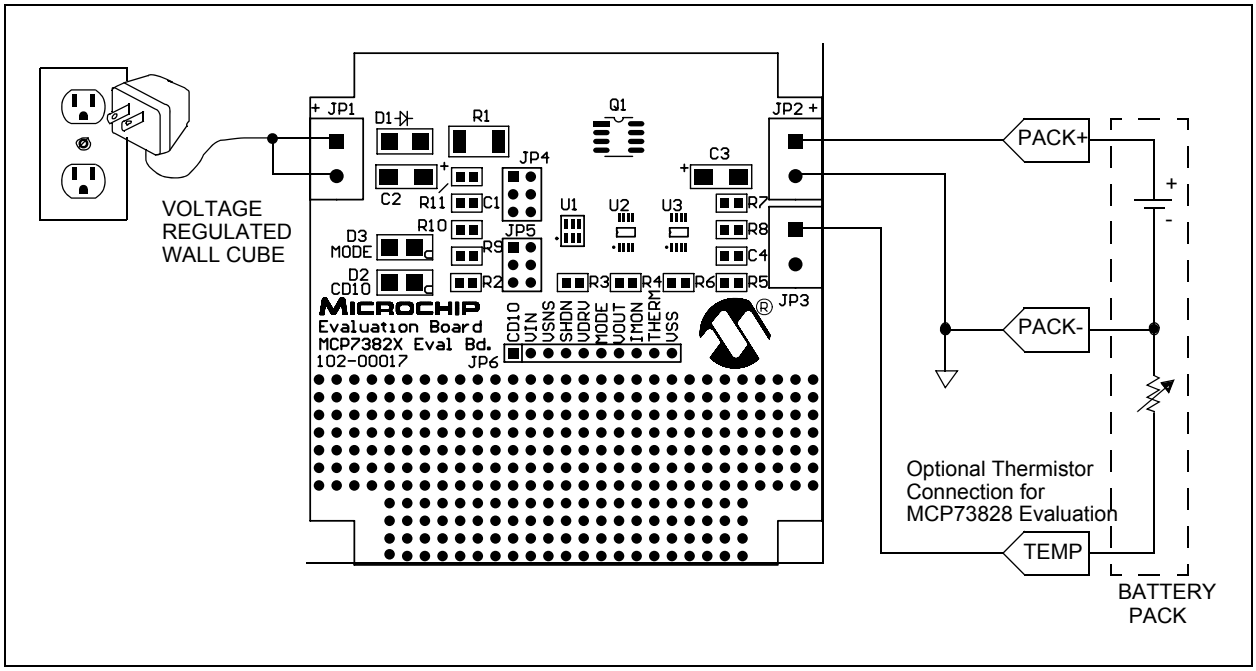



***FIGURE 2-1:*** *Set-Up Configuration Diagram*


© 2006 Microchip Technology Inc.

## 2.4 DETAILED DESCRIPTION

The MCP7382X Evaluation Board is set-up to evaluate simple, stand-alone, linear charging of single cell Li-Ion battery packs. Each of the three Li-Ion battery chargers can be evaluated independently. The chargers provide controlled current charging followed by constant voltage charging. The MCP73826, U1, is provided in a 6-pin SOT23 package and is equipped with shutdown control. The MCP73827, U2, is provided in an 8-pin MSOP package. In addition to shutdown control, the MCP73827 signals when the charge cycle transitions from controlled current mode to constant voltage mode. An LED, D3, is illuminated during the controlled current mode. A voltage representation of the charge current, $I_{MON}$, is provided for a host microcontroller to monitor the charge profile. The MCP73828, U3, is also provided in an 8-pin MSOP package. In addition to shutdown control, the MCP73828 signals when the charge current has diminished below ten percent of the peak charge current. An LED, D2, is illuminated indicating full charge. A thermistor input is provided to inhibit charging when the cell temperature is outside a pre-defined window. Refer to the appropriate data sheets for details on the individual device features.

### 2.4.1 Input Source

The MCP7382X Evaluation Board is designed to provide an output current of 1A, typical. A 5V ±10%, 6W input source should be utilized to power the evaluation kit. JP1 terminal 1 is the positive input source connection. JP1 terminal 2 is the negative input source connection.

Higher or lower output currents can be obtained by adjusting the value of the sense resistor, R1. A corresponding higher or lower power input source may need to be utilized. Care should be taken not to over stress the pass transistor, Q1, with excessive power dissipation when higher output currents are desired.

### 2.4.2 Reverse Blocking Protection

The MCP7382X Evaluation Board is designed to provide reverse blocking protection in the event a reversed polarity input source is connected to JP1. The reverse blocking protection diode, D1, also ensures that a faulted or shorted input source will not adversely effect the battery pack.

### 2.4.3 Battery Headers

Two headers, JP2 and JP3 are used to connect to an external Li-Ion battery pack and optional protection thermistor. JP2 terminal 1 is the battery pack positive connection, JP2 terminal 2 is the negative battery pack connection. JP3 terminal 1 is for connection to a 10 k ohm NTC thermistor situated in the battery pack for temperature sensing. JP3 terminal 2 is the negative reference for the thermistor.

| | |
|---|---|
| **Note:** | Improper connection of the battery may result in damage to the battery and the possibility of personal injury. It is also important to avoid shorting the battery terminals together. |

### 2.4.4 Device Support Options

The MCP7382X Evaluation Board provides evaluation of three Li-Ion battery chargers: MCP73826, MCP73827, or MCP73828. Device selection is performed by placing shunts on JP4 and JP5 as indicated in the table below. JP4 determines which device is controlling the pass transistor. JP5 is used to enable the appropriate device.

**TABLE 2-1: SHUNT JUMPERS**

| Device Type | JP4 Shunt Location | JP5 Shunt Location |
|---|---|---|
| MCP73826 | 5, 6 | 1, 2 |
| MCP73827 | 3, 4 | 3, 4 |
| MCP73828 | 1, 2 | 5, 6 |

### 2.4.5 Microcontroller Option

JP6 provides an easily accessible location for interface to a host microcontroller. The host microcontroller can be used to disable the charger, monitor charge status, monitor the charge profile, or terminate a charge.

A proto-typing area is provided for generation of a self-contained microcontroller solution.

### 2.4.6 Output Voltage Options

The MCP7382X Evaluation Board is provided with a constant voltage mode output voltage of 4.2V. Evaluation with a constant voltage mode output voltage of 4.1V can be achieved by replacing U1, U2, or U3 with the appropriate device. Refer to the appropriate data sheets for device ordering information.

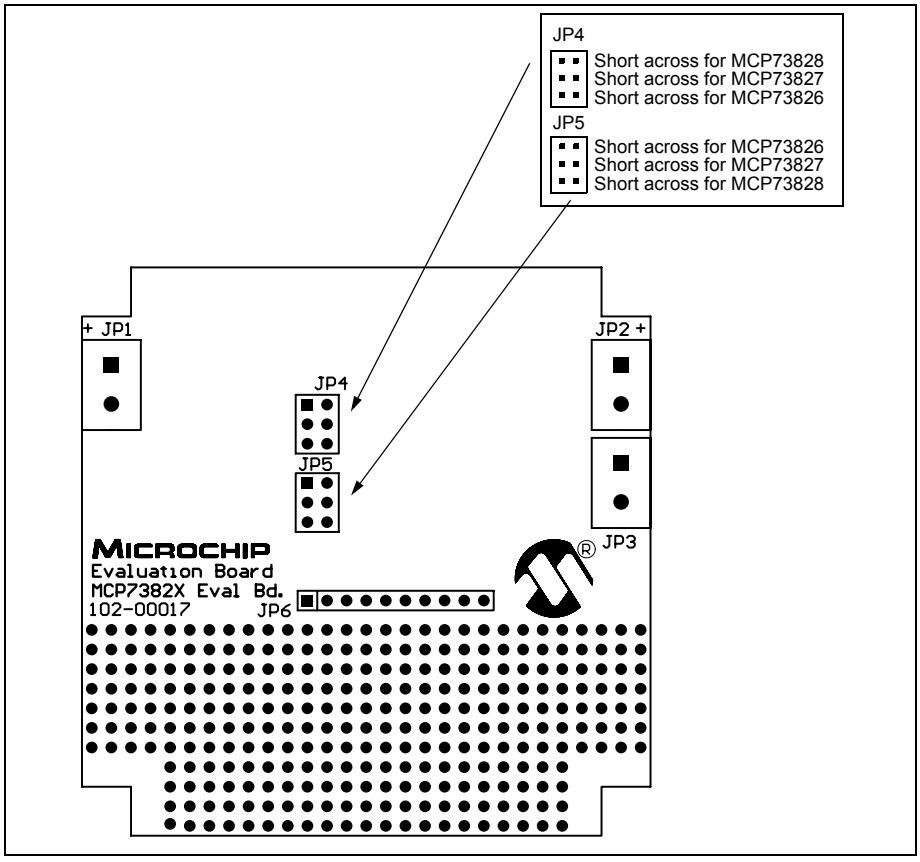



***FIGURE 2-2:*** *Jumper Locations on the MCP7382X Evaluation Board.*


© 2006 Microchip Technology Inc.

# Appendix A. Schematic and Board Layouts

## A.1 INTRODUCTION

This appendix contains the schematic and board layouts for the MCP7382X Evaluation Kit.

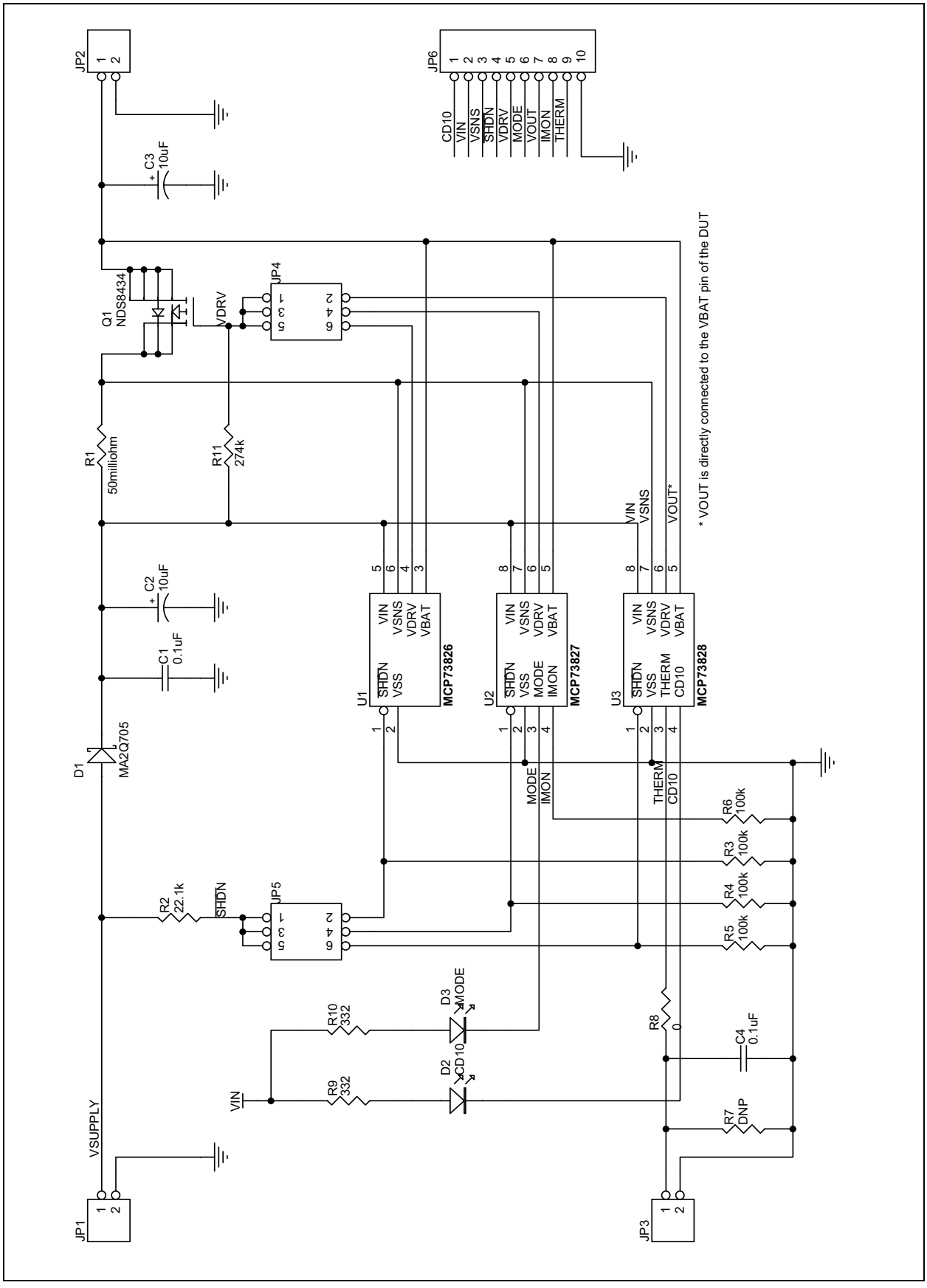
## A.2 HIGHLIGHTS

Diagrams included in this appendix:

- Board Schematic
- Board Layout - Top Assembly
- Board Layout - Top Layer
- Board Layout - Bottom Layer

© 2006 Microchip Technology Inc.

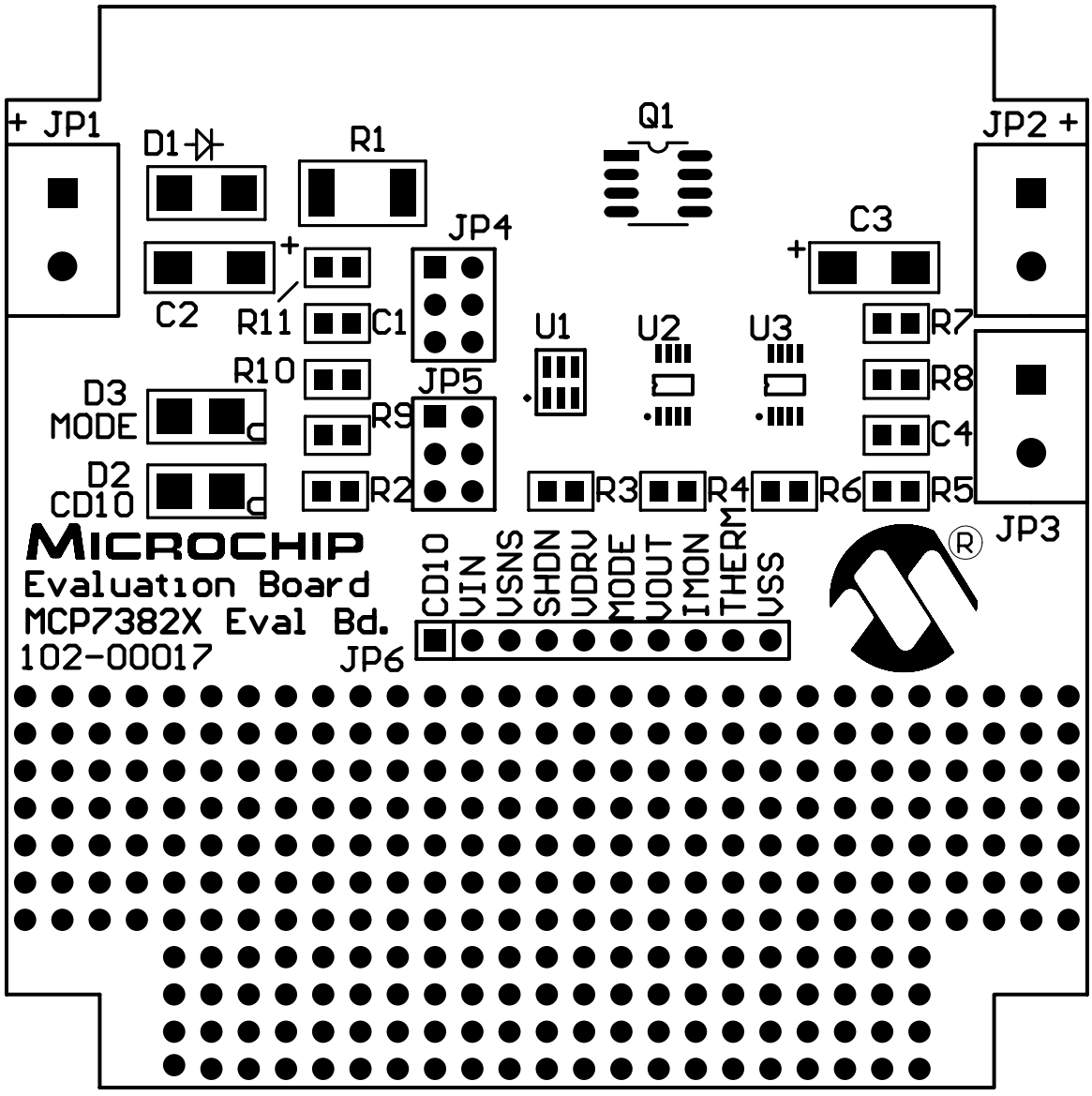
## A.3 BOARD SCHEMATIC





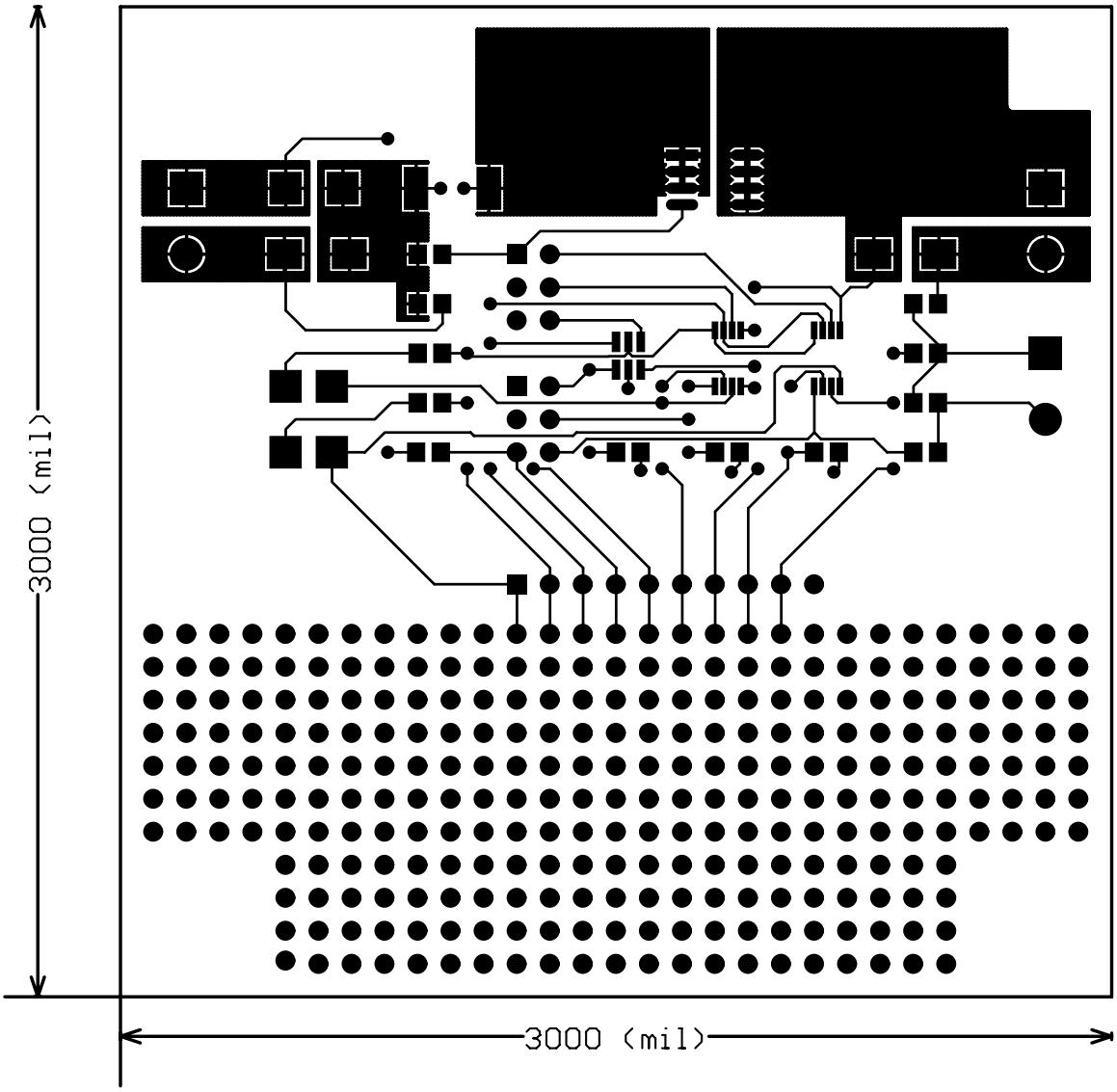
© 2006 Microchip Technology Inc.

## A.4 BOARD LAYOUT - TOP ASSEMBLY




**Note:** The $V_{OUT}$ connected on JP6 is directly connected to the $V_{BAT}$ pin of the DUT

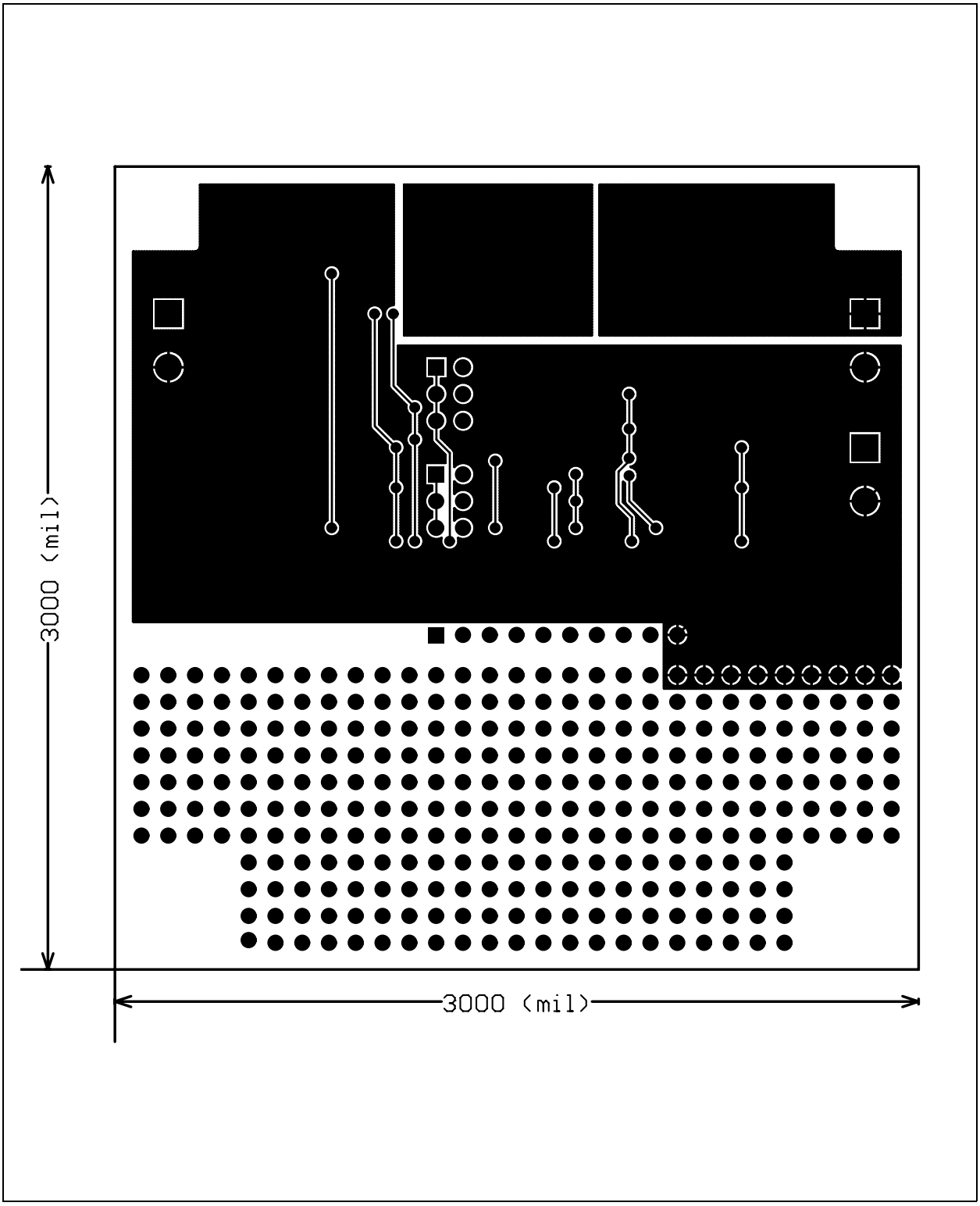
## A.5 BOARD LAYOUT - TOP LAYER





© 2006 Microchip Technology Inc.

## A.6 BOARD LAYOUT - BOTTOM LAYER



**NOTES:**


© 2006 Microchip Technology Inc.

# Appendix B. Bill Of Materials (BOM)

**TABLE B-1: BILL OF MATERIALS (BOM)**

| Qty | Reference | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 2 | C1, C4 | 0.1 µF, 25V, Y5U Ceramic, 0805 | Panasonic | ECJ-2VF1E104Z |
| 2 | C2, C3 | 10 µF, 25V, Tantalum, SMC, Input/Output | Panasonic | ECS-T1EC106R |
| 1 | D1 | 1.5 A Shottky Diode, Reverse Protection | Panasonic | MA2Q705 |
| 2 | D2, D3 | Red LED, Surface Mount | Lumex | SML-LX2832GC |
| 3 | JP1, JP2, JP3 | Screw Header | Weidmuller | 171602 |
| 1 | JP4, JP5 | Dual In-Line Header, "0.100, 3x2 Position | Sullins | PTC36DAAN(1) |
| 1 | JP6 | Single In-Line Header, "0.100, 10x1 Position | Sullins | PTC36SYAN(2) |
| 1 | Q1 | P-channel MOSFET, SOIC8 | Fairchild | NDS8434 |
| 1 | R1 | 50 milliohm sense resistor | Panasonic | ERJ-L1WKF50MU |
| 1 | R2 | 22.1 kohm, 1/10W, 1%, Thick Film Chip, 0805 | Panasonic | ERJ-6ENF2212V |
| 4 | R3, R4, R5, R6 | 22.1 kohm, 1/10W, 1%, Thick Film Chip, 0805 | Panasonic | ERJ-6ENF2212V |
| 0 | R7 | Not populated, 0805 | | |
| 1 | R8 | 0.0 ohm Jumper, 0805 | Phycomp | 9C08052A0R00JLH |
| 2 | R9, R10 | 332 ohm, 1/10W, 1%, Thick Film Chip, 0805 | Panasonic | ERJ-6ENF3320V |
| 1 | R11 | 274 kohm, 1/10W, 1%, Thick Film Chip, 0805 | Panasonic | ERJ-6ENF2743V |
| 1 | U1 | Lithium-Ion Battery Charger, SOT23-6 | Microchip | MCP73826-4.2VCH |
| 1 | U2 | Lithium-Ion Battery Charger, MSOP8 | Microchip | MCP73827-4.2VUA |
| 1 | U3 | Lithium-Ion Battery Charger, MSOP8 | Microchip | MCP73828-4.2VUA |
| 2 | — | Header Shunts | Sullins | STC02STAN |
| 4 | — | Bumpons - Protective Products | 3M | SJ5003-0 |

**Note 1:** JP4, JP5 are ordered as a 36x2 strip header. Cut to fit. One for every 5 boards built.

**2:** JP6 is ordered as a 36x1 strip header. Cut to fit. One for every 3 boards built.

**3:** The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

# 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**
Alpharetta, GA
Tel: 770-640-0034
Fax: 770-640-0307

**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
Habour 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: 86-28-8676-6200
Fax: 86-28-8676-6599

**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: 43-7242-2244-3910
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


07/21/06


© 2006 Microchip Technology Inc.