



MCP7381X
Low-Cost Li-Ion Battery
Charger Evaluation Board
User's Guide

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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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

FilterLab, Linear Active Thermistor, 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, dsSPEAK, ECAN, ECONOMONITOR, FanSense, In-Circuit Serial Programming, ICSP, ICEPIC, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, PICkit, PICDEM, PICDEM.net, PICTail, PIC³² logo, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rfLAB, Select Mode, 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.

© 2008, 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 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.



MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Table of Contents

Preface	1
Introduction.....	1
Document Layout	1
Conventions Used in this Guide	2
Recommended Reading.....	2
The Microchip Web Site	3
Customer Support	3
Document Revision History	3
Chapter 1. Product Overview	
1.1 Introduction	5
1.2 What is the MCP7381X Li-Ion Battery Charger Evaluation Board?	7
1.3 What the MCP7381X Li-Ion Battery Charger Evaluation Board Kit Includes ..	7
Chapter 2. Installation and Operation	
2.1 Introduction	9
2.2 Features	9
2.3 Getting Started	10
Appendix A. Schematic and Layouts	
A.1 Introduction	13
A.2 Board – Schematic	14
A.3 Board – Top Layer	15
A.4 Board – Top Metal Layer	15
A.5 Board – Bottom Layer	16
Appendix B. Bill Of Materials (BOM)	
Worldwide Sales and Service	18

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

NOTES:



MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD 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 "DSXXXXA", where "XXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MCP7381X Li-Ion Battery Charger Evaluation Board. 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 MCP7381X Li-Ion Battery Charger Evaluation Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP7381X Li-Ion Battery Charger Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with this user's guide and a description of the user's guide.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the MCP7381X Li-Ion Battery Charger Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the MCP7381X Li-Ion Battery Charger Evaluation Board.

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB[®] IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> 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	<u><i>File>Save</i></u>
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

RECOMMENDED READING

This user's guide describes how to use MCP7381X Li-Ion Battery Charger Evaluation Board. The following Microchip documents are available and recommended as supplemental reference resources.

MCP73811/2 Data Sheet, "Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management Controllers", DS22036

This data sheet provides detailed information regarding the MCP73811/2 product family.

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

Customers should contact their distributor, representative or field application engineer (FAE) 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 A (April 2008)

- Initial Release of this Document.

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP7381X Li-Ion Battery Charger Evaluation Board demonstrates the features and abilities for Microchip's MCP7381X Li-Ion Battery Charger Evaluation Board Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management Controllers. The MCP73811/2 are standalone highly integrated linear Li-Ion battery chargers that employ a constant current/constant voltage (CCCV) charge algorithm for cost sensitive and space limited applications.

The MCP7381X Li-Ion Battery Charger Evaluation Board has two independent circuits that are available to evaluate an USB port powered Li-Ion / Li-Polymer battery charger and an ac-dc wall adapter powered Li-Ion / Li-Polymer battery charger. For an ac-dc wall adapter powered battery charger, an external resistor (R_{PROG}) sets the magnitude of the charge current up to 500 mA. When the USB port provides power to the battery charger, the MCP73811 specifically adheres to the current limits governed by the USB specification. The PROG pin selects two preset charge current rates of typical 85 mA (Low) or 450 mA (High) and does not exceed 100 mA (Low) or 500 mA (High) maximum charge current. As for USB regulation, a device may draw either low-power at one unit load or high-power at 5 unit loads. A unit load is defined to be 100 mA. The drawn current per unit load is an absolute maximum value, not an average over time.

This chapter covers the following topics:

- "What is the MCP7381X Li-Ion Battery Charger Evaluation Board?"
- "What the MCP7381X Li-Ion Battery Charger Evaluation Board Kit includes."

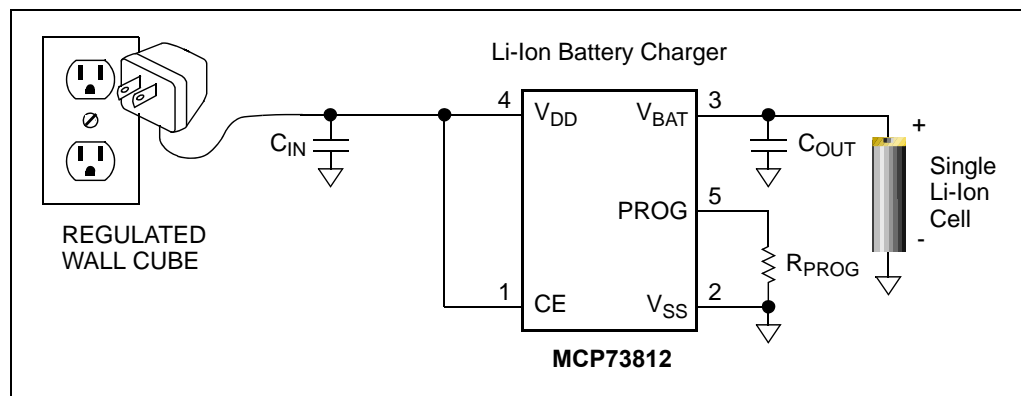


FIGURE 1-1: MCP73812 Typical Application.

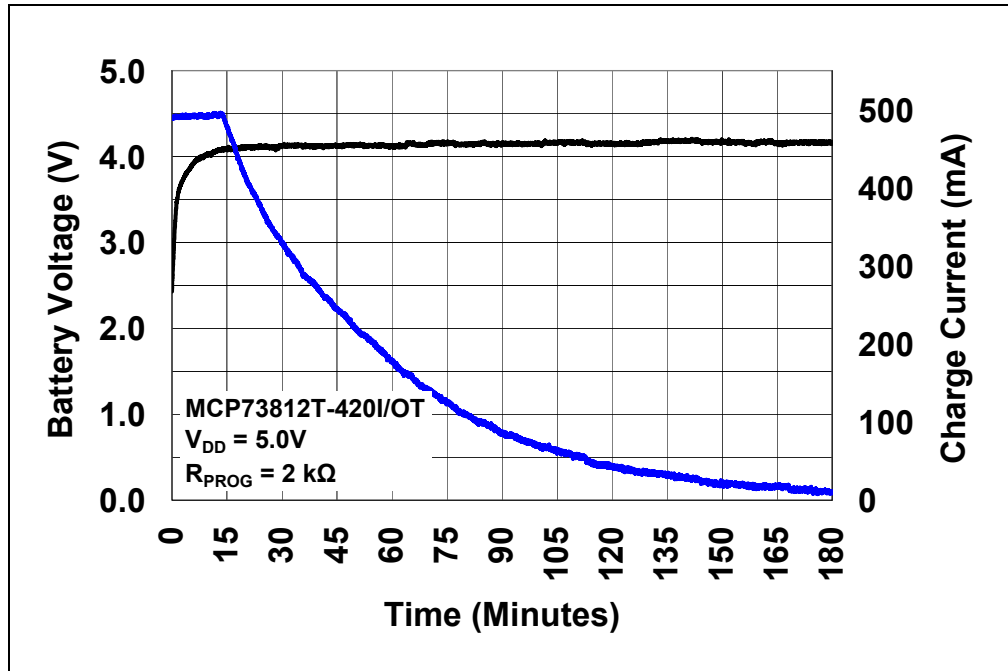


FIGURE 1-2: Typical MCP73812 Charge Profile (950 mAh Li-Ion Battery Pack).

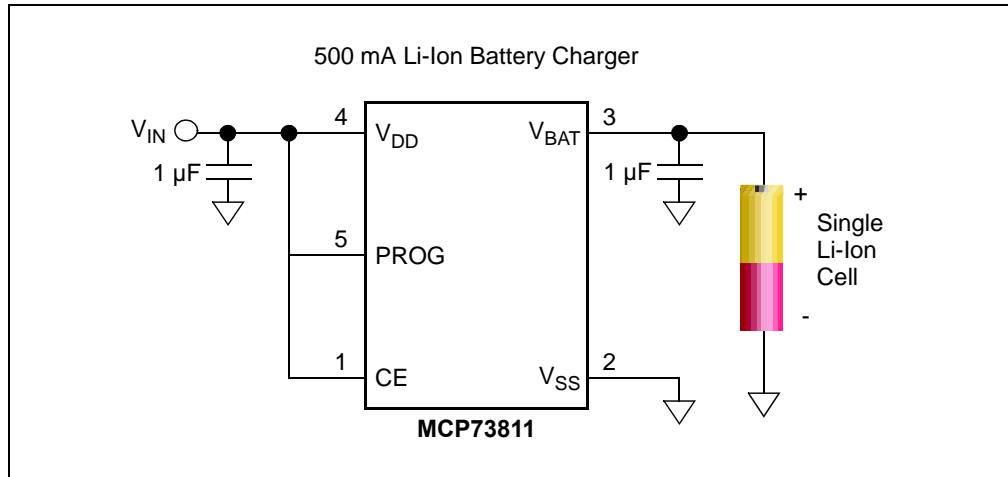


FIGURE 1-3: Typical MCP73811 Applications.

1.2 WHAT IS THE MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD?

The MCP7381X Li-Ion Battery Charger Evaluation Board demonstrates the use of the MCP73811/2 Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charger Management Controllers.

The MCP7381X Li-Ion Battery Charger Evaluation Board is setup to evaluate low cost single-cell Li-Ion / Li-Polymer battery chargers. This board utilizes Microchip's MCP7381X Li-Ion Battery Charger Evaluation Board that efficiently charge Li-Ion / Li-Polymer batteries with a preset $\pm 1\%$ voltage accuracy regulation at 4.2V. The MCP7381X Li-Ion Battery Charger Evaluation Board comes with two pre-installed circuits: An ac-dc adapter powered Li-Ion /Li-Polymer battery charger and an USB port powered Li-Ion / Li-Polymer battery charger.

The MCP73811 is available for the USB port powered circuit while the MCP73812 is designed for the ac-dc wall adapter powered circuit. A SOT-23-5 MCP73811 is pre-installed on the evaluation board with a mechanical dip switch which selects charge current High (450 mA) or Low (85 mA) for the USB port powered battery charger system. A SOT23-5 MCP73812 is pre-installed on the evaluation board with a programming resistor R_{PROG} which delivers 500 mA from the ac-dc wall adapter source. When the Chip Enable (CE) pin is in "High" condition, that particular circuit is ready to charge single-cell Li-Ion batteries.

<p>Note: The systems are designed in operation mode with CE pin High and can be disabled when driving CE pin Low.</p>
--

The two dashed silk screen areas on the evaluation board show the required circuit size for the printed circuit board (PCB) layout and provide system / product designers a visual aid prior design the system.

The MCP7381X Li-Ion Battery Charger Evaluation Board is designed to observe the performance and features via multiple test points that are available on the circuits. Users are able to discover the compact size of the layout in addition to the device itself. The circuit can also be implemented into suitable applications without any additional works.

1.3 WHAT THE MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD KIT INCLUDES

The MCP7381X Li-Ion Battery Charger Evaluation Board kit includes:

- MCP7381X Li-Ion Battery Charger Evaluation Board, 102-00172
- Pre-installed 5-Lead SOT-23 MCP73811, 5-Lead SOT-23 MCP73812 and required components.
- Analog and Interface Products Demonstration Boards CD-ROM (DS21912)
 - MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide, (DS51729)
 - MCP73811/2 Data Sheet, "Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management Controllers", (DS22036)

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

NOTES:



MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP7381X Low-Cost Li-Ion Battery Charger Evaluation Board demonstrates Microchip's Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management Controllers, MCP73811 and MCP73812. The MCP73811 is powered from USB port to charge Li-Ion / Li-Polymer batteries. The charge current is logic selectable between High (500 mA) and Low (100 mA). The MCP73812 is designed to charge Li-Ion / Li-Polymer batteries with programmable charging current up to 500 mA by a single resistor from a regulated 5V ac-dc wall adapter.

The MCP73811/2 require only minimum components to implement a completed circuit of Li-Ion / Li-Polymer battery charge management in any systems. The development of MCP73811/2 meets the challenges of today's cost-sensitive and space-limited applications.

The MCP7381X Low-Cost Li-Ion Battery Charger Evaluation Board comes with a pre-installed 5-Lead SOT-23 MCP73811 and a pre-installed 5-Lead SOT-23 MCP73812.

Typical applications for MCP73811/2 are Rechargeable Toys, Low-Cost Lithium-Ion / Lithium-Polymer Battery Chargers, Electronic Cigarettes, Rechargeable Portable Electronic Devices, Bluetooth Headsets or USB Chargers.

2.2 FEATURES

The MCP7381X Low-Cost Li-Ion Battery Charger Evaluation Board has the following features:

- Color coded test points ensuring the proper connections: Red for V_{DD} and V_{BAT+} ; Black for GND & V_{BAT-} ; White for CE (Chip Enable).
- 2-position Dip Switch for charge current selections between USB_Low and USB_High.
- Chip Enable (CE) Pin to disable the system when drive Low.
- Evaluating different charge current rates by changing R_{PROG} (Programming Resistor) values. See Figure 2-1

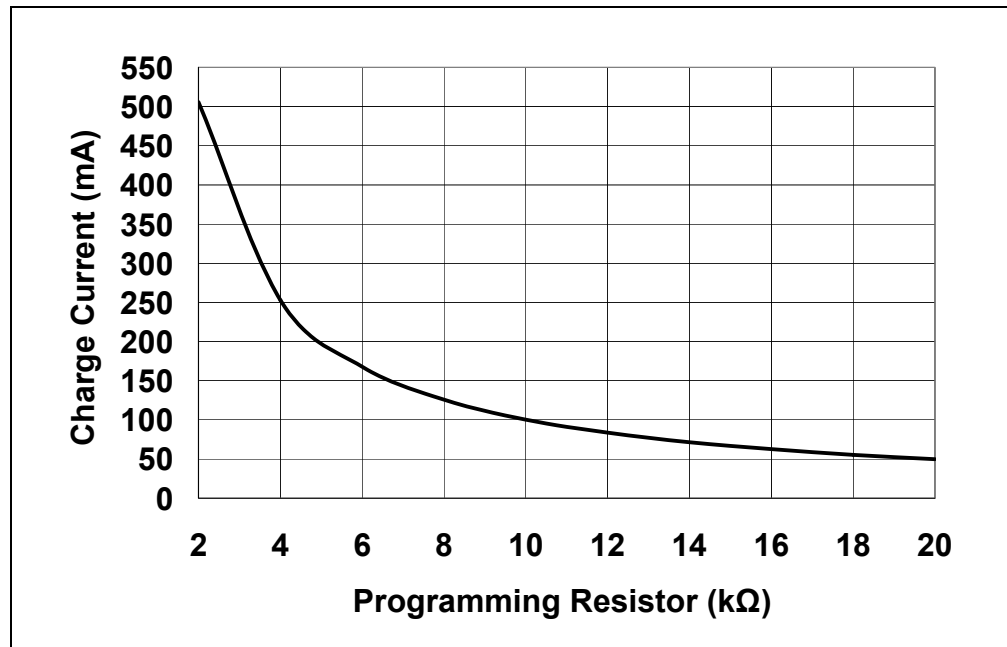


FIGURE 2-1: Charge Current (I_{OUT}) vs. Programming Resistor (R_{PROG}).

2.3 GETTING STARTED

The MCP7381X Low-Cost Li-Ion Battery Charger Evaluation Board is fully assembled and tested for charging single-cell Li-Ion / Li-Polymer batteries with a regulated 5V DC source or USB port.

2.3.1 Power Input and Output Connection

2.3.1.1 POWERING THE MCP7381X LOW-COST LI-ION BATTERY CHARGER EVALUATION BOARD

1. Connect the negative battery terminal to V_{BAT-} pin on the evaluation board and positive battery terminal to V_{BAT+} pin on the evaluation board.
2. Connect 5V DC power supply negative terminal to GND pin on the evaluation board.
3. Connect 5V DC power supply positive terminal to V_{DD} pin on the evaluation board. Slowly increase the supply voltage to 5V.

Note: Make sure the current limit of the DC power supply is not set below the charge current.

4. The battery charge cycle initiates when minimum supply voltage is present. The charge current can be measured by placing a current meter in series between V_{BAT+} pin on the evaluation board and positive battery terminal.
5. Position the DIP Switch to USB_Hi for a maximum charge rate up to 500 mA and USB_Low for maximum charge rate up to 100 mA.

Note: Remove protection film before using the DIP Switch. This may be done by the manufacturer prior shipping.

Installation and Operation

- Fast Charge Current for MCP73812 can be programmed with various resistors that based on the Figure 2-1. R_{PROG} is represented as R1 on the evaluation board.

Note: The battery can be replaced with test circuit or electronic load that can sink current with DC power supply.

- Pull CE pin on the evaluation board Low to disable the system or terminate the charge.

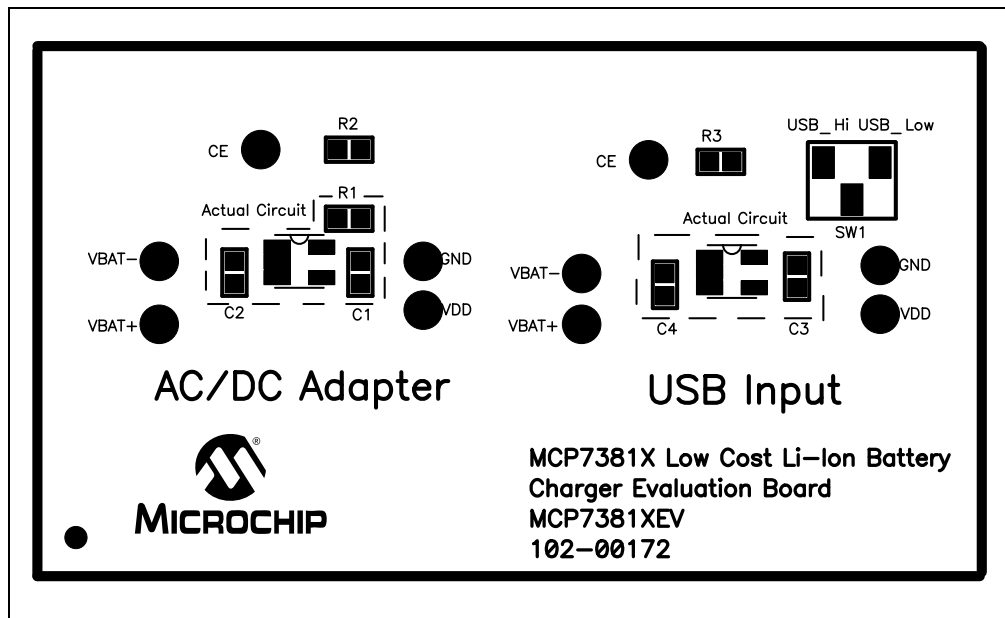


FIGURE 2-2: MCP7381X Low Cost Li-Ion Battery Charger Evaluation Board Top Silk Layout.

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

NOTES:



MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Appendix A. Schematic and Layouts

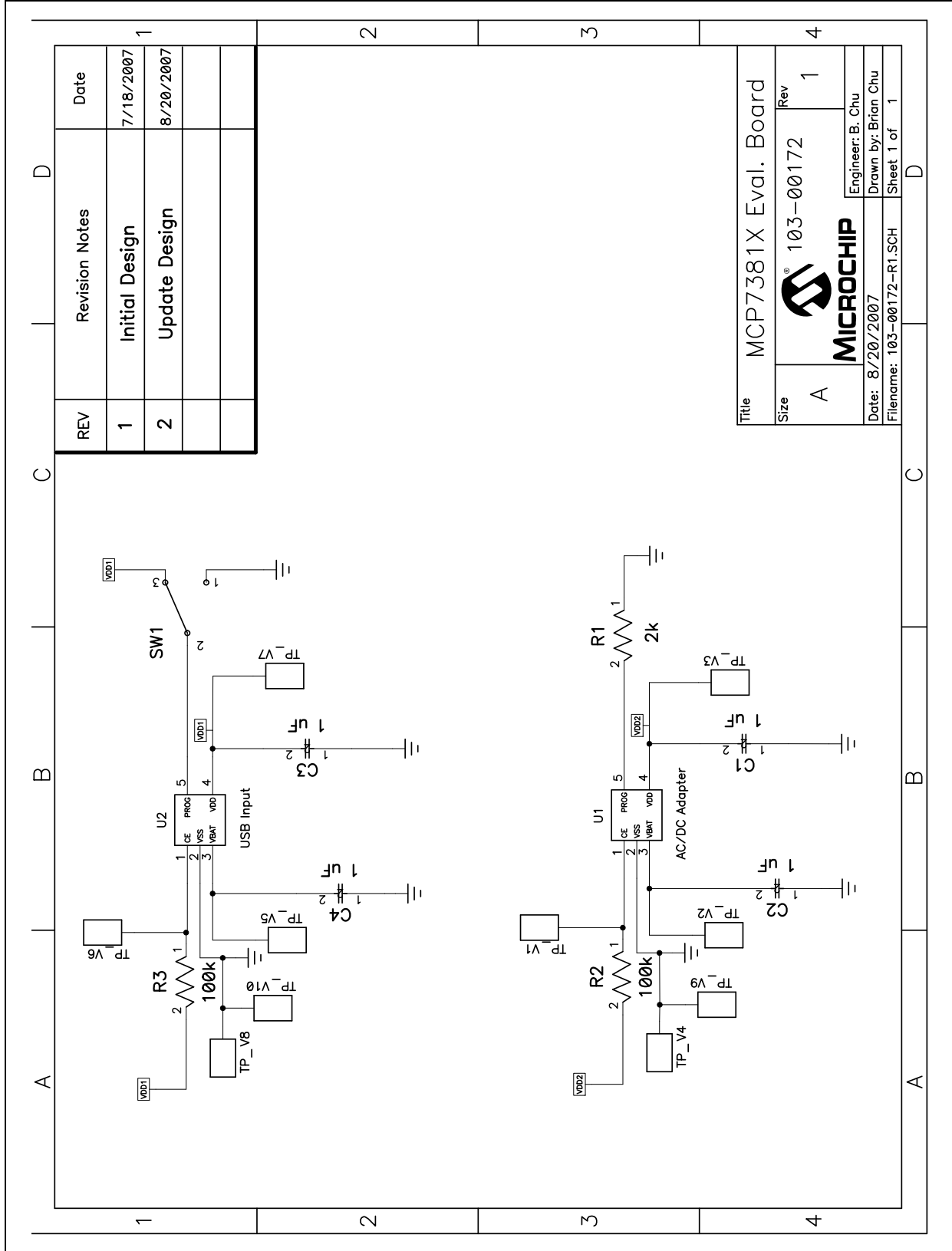
A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP7381X Low Cost Li-Ion Battery Charger Evaluation Board:

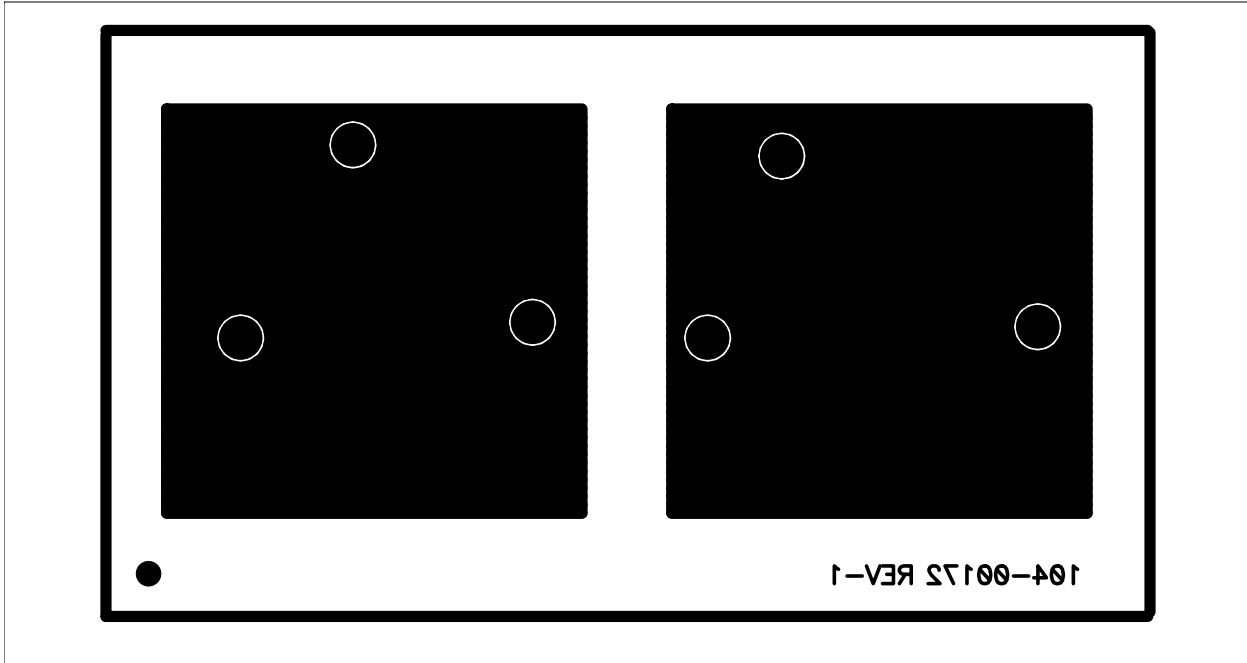
- Board – Schematic
- Board – Top Layer
- Board – Top Metal Layer
- Board – Bottom Layer

MCP7381X Li-Ion Battery Charger Evaluation Board User's Guide

A.2 BOARD – SCHEMATIC



A.5 BOARD – BOTTOM LAYER





MCP7381X LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Appendix B. Bill Of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

QTY	Reference	Description	Manufacture	MFG PART #
4	C1, C2, C3, C4	CAP CERAMIC 2.2 μ F 10V X5R 0603 SMD	Taiyo Yuden	LMK107BJ225KA-T
1	R1	RES 2K OHM 1/10W 1% 0603 SMD	Yageo Corp.	RC0603FR-072KL
2	R2, R3	RES 100K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1003V
1	SW1	SWITCH SLIDE SPDT SMD J-LEAD	COPAL ELECTRONICS INC	CJS-1200TA
4	Bump	BUMPON HEMISPHERE.44X.20 WHITE	3M	SJ5003-9-ND
1	U1	Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management controllers: Programmable Charge Current	Microchip Technology, Inc	MCP73812T-420I/OT
1	U2	Simple, Miniature Single-Cell, Fully Integrated Li-Ion / Li-Polymer Charge Management controllers: Selectable Charge Current	Microchip Technology, Inc	MCP73811T-420I/OT
1	PCB	Printed Circuit Board	—	104-00172-R1

Note 1: 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

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 - 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: 91-80-4182-8400
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 - 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: 886-3-572-9526
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