

MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board User's Guide

© 2011 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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC^{32} 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.

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

Printed on recycled paper.

ISBN: 978-1-61341-454-5

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

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.

© 2011 Microchip Technology Inc.

MCP73830L 2X2 TDFN LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Table of Contents

Preface 5

Introduction 5

Document Layout 5

Conventions Used in this Guide 6

Recommended Reading 7

The Microchip Web Site 7

Customer Support 7

Document Revision History 7

Chapter 1. Product Overview

1.1 Introduction 9

1.2 What is the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board? 10

1.3 What the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board Kit Includes 10

Chapter 1. Installation and Operation

1.1 Introduction 11

1.2 Features 11

1.3 Getting Started 12

Appendix A. Schematic and Layouts

A.1 Introduction 13

A.2 Board – Schematic 14

A.3 Board – Top Layer 15

A.4 Board – Top Copper 15

A.5 Board – Bottom Copper 16

Appendix B. Bill of Materials

Worldwide Sales and Service 18

© 2011 Microchip Technology Inc.

MCP73830L 2X2 TDFN 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 "DSXXXXXA", where "XXXXX" 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 MCP73830L 2x2 TDFN 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 MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board.
- **Chapter 1. "Installation and Operation"** – Includes instructions on how to get started with MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board and a description of the user's guide.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board.
- **Appendix B. "Bill of Materials"** – Lists the parts used to build the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board.

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}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

© 2011 Microchip Technology Inc.

RECOMMENDED READING

This user's guide describes how to use MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **MCP73830L Data Sheet - *"Single-Cell Li-Ion/Li-Polymer Battery Charge Management Controllers in 2x2 TDFN"* (DS25049)**

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 (August 2011)

- Initial Release of this Document.

NOTES:

© 2011 Microchip Technology Inc.

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board demonstrates the features and abilities of Microchip's MCP73830L Single-Chip Linear Li-Ion Battery Charger. The MCP73830L is a stand-alone, highly integrated linear battery charge management controller that employs a constant current / constant voltage (CCCV) charge algorithm with selectable preconditioning and charge termination. The charge algorithm is provided for Li-Ion / Li-Polymer battery packs to achieve optimal capacity in the shortest charging time possible.

The MCP73830L uses an external resistor (R_{PROG}) to set the magnitude of the charge current up to a maximum of 200 mA.

This chapter covers the following topics:

- "What is the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board?"
- "What the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board Kit Includes."

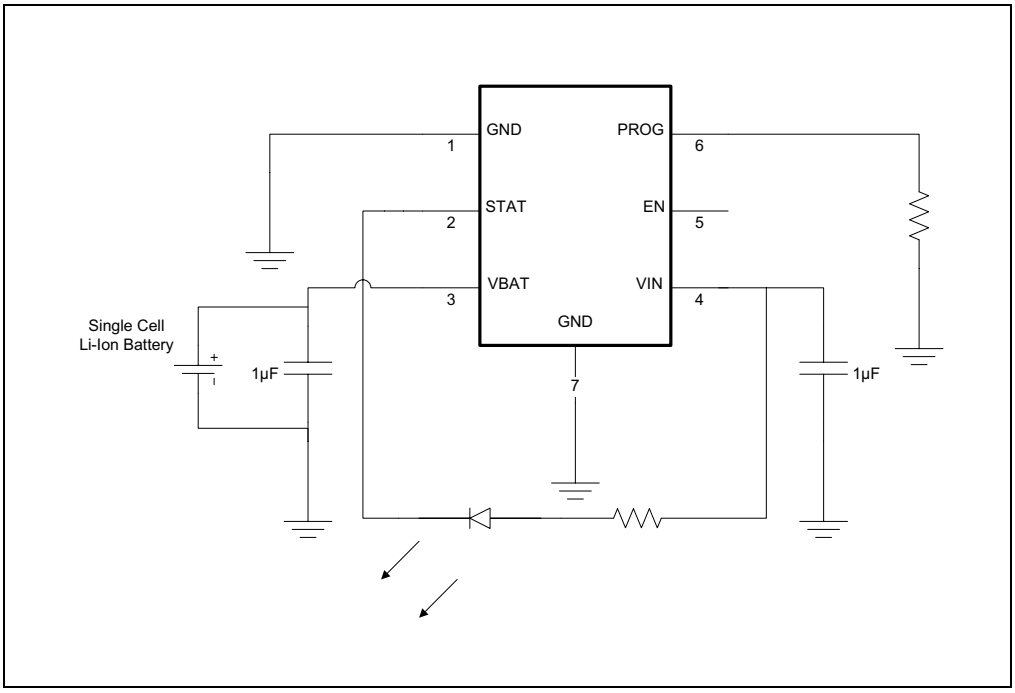


FIGURE 1-1: MCP73830L *Typical Application Circuit.*

1.2 WHAT IS THE MCP73830L 2X2 TDFN LI-ION BATTERY CHARGER EVALUATION BOARD?

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board demonstrates the use of Single-Chip Linear Li-Ion Battery Charger with programmable charge current.

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board is set up to evaluate single-cell Li-Ion battery charge management. This board utilizes Microchip's MCP73830L that effectively charges Li-Ion batteries with high-accuracy, preset-voltage regulation. The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board comes with a pre-installed 2 mm x 2 mm TDFN-6 MCP73830L. This circuit is ready to charge Li-Ion batteries at a maximum charge current rate up to 200 mA.

A built-in LED is used to display the charge status (STAT).

The MCP73830L has an internal safety timer and will terminate the charge cycle when the timer has expired.

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board is designed to observe the performance and features on the circuits via multiple test points. Users can also discover the compact size of the layout in addition to the device itself. The circuit can also be implemented into suitable applications without additional work.

1.3 WHAT THE MCP73830L 2X2 TDFN LI-ION BATTERY CHARGER EVALUATION BOARD KIT INCLUDES

This MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board kit includes:

- MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board, 102-00313-R1
- Important Information Sheet

© 2011 Microchip Technology Inc.

MCP73830L 2X2 TDFN LI-ION BATTERY CHARGER EVALUATION BOARD USER'S GUIDE

Chapter 1. Installation and Operation

1.1 INTRODUCTION

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board demonstrates Microchip's stand-alone Linear Li-Ion Battery Charger in a simple and compact design.

The MCP73830L requires only a minimum number of components to implement a complete battery charge management circuit.

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board comes with a 6-pin TDFN MCP73830L pre-installed.

Typical applications for MCP73830L are MP3 players, USB-powered systems, handheld medical instruments, Bluetooth headsets and portable devices.

1.2 FEATURES

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board has the following features:

- 2x2 TDFN-6 Package Size
- Programmable charge current between 20 mA to 200 mA
- A status LED to indicate charge status
- EN pin to enable/disable charger
- A preset internal safety timer
- Built-in Under Voltage Current Limit Control

1.3 GETTING STARTED

The MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board is fully assembled and tested for charging a single-cell Li-Ion or Li-Polymer battery with an input supply of 3.75V to 6V.

1.3.1 Power Input and Output Connection

1.3.1.1 POWERING THE MCP73830L 2X2 TDFN LI-ION BATTERY CHARGER EVALUATION BOARD

1. Connect the positive battery terminal to V_{BAT} and negative battery terminal to GND.
2. Connect the DC power supply Negative terminal to GND.
3. Connect the 5V DC power supply Positive terminal to V_{IN}.
4. It should initiate the battery charging cycle when the power source is present.

Note: The battery voltage needs to be below 4.05V (typical) in order to initiate a new charging cycle.

5. Charging current should be able to read off the multi-meter that is in series with battery.

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

6. Pulling EN pin high disables charging activities.
7. Fast Charge Current can be programmed with various resistors that are based on Figure 1-1.

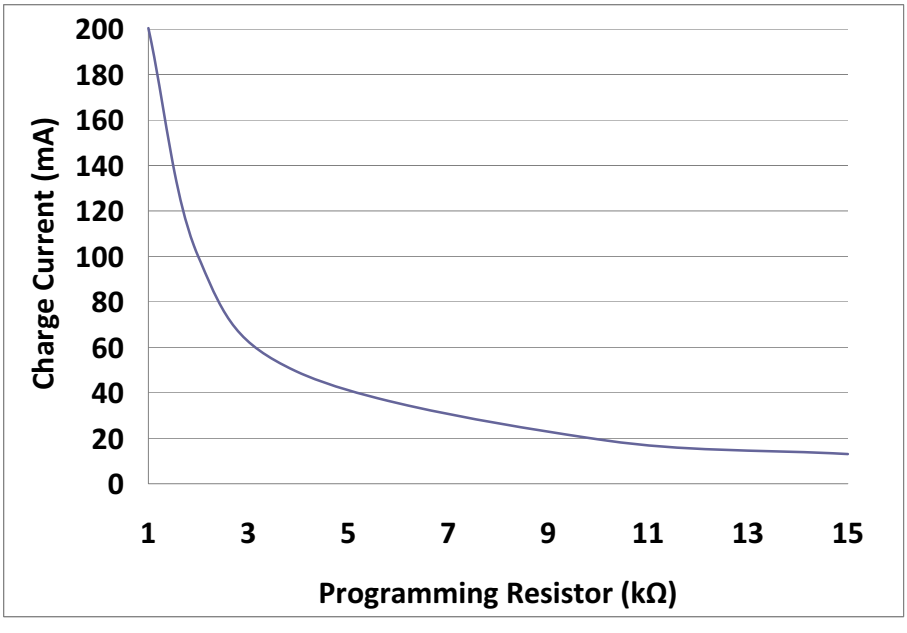


FIGURE 1-1: *Resistor vs. Charge Current.*

© 2011 Microchip Technology Inc.

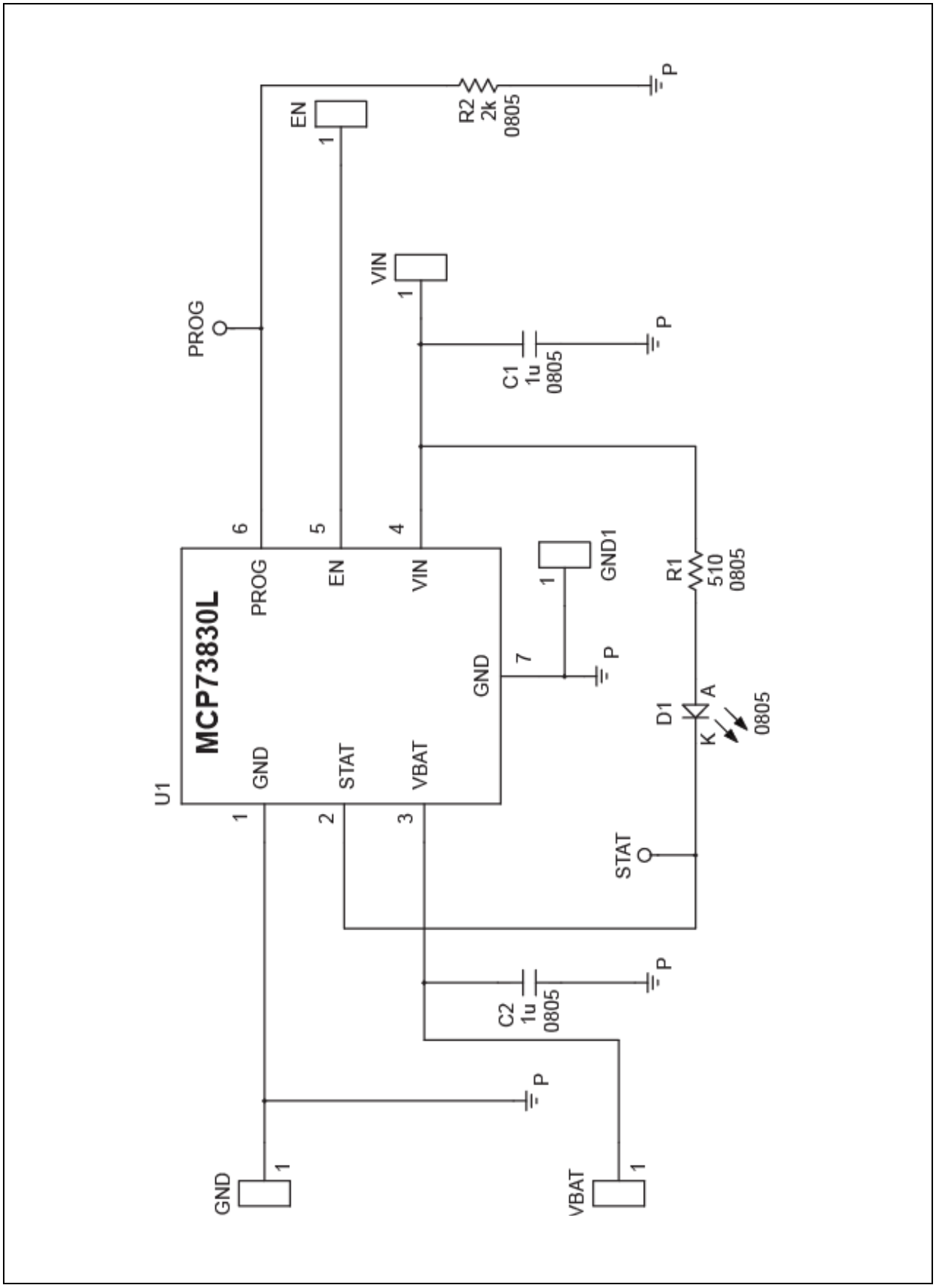
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP73830L 2x2 TDFN Li-Ion Battery Charger Evaluation Board:

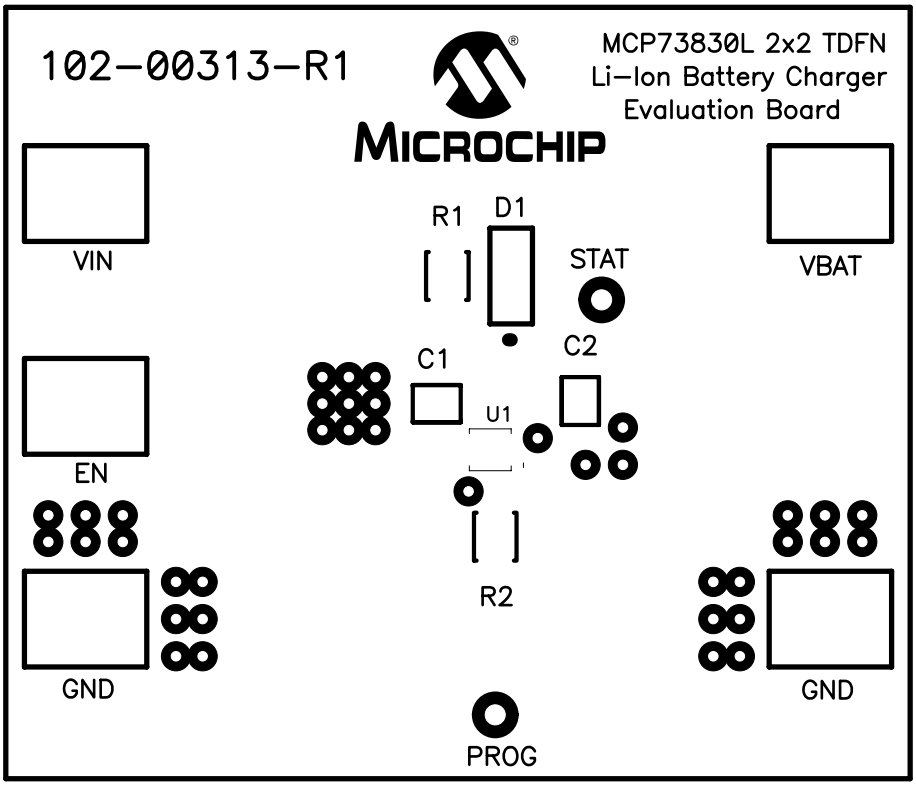
- Board – Schematic
- Board – Top Layer
- Board – Top Copper Layer
- Board – Bottom Copper Layer

A.2 BOARD – SCHEMATIC

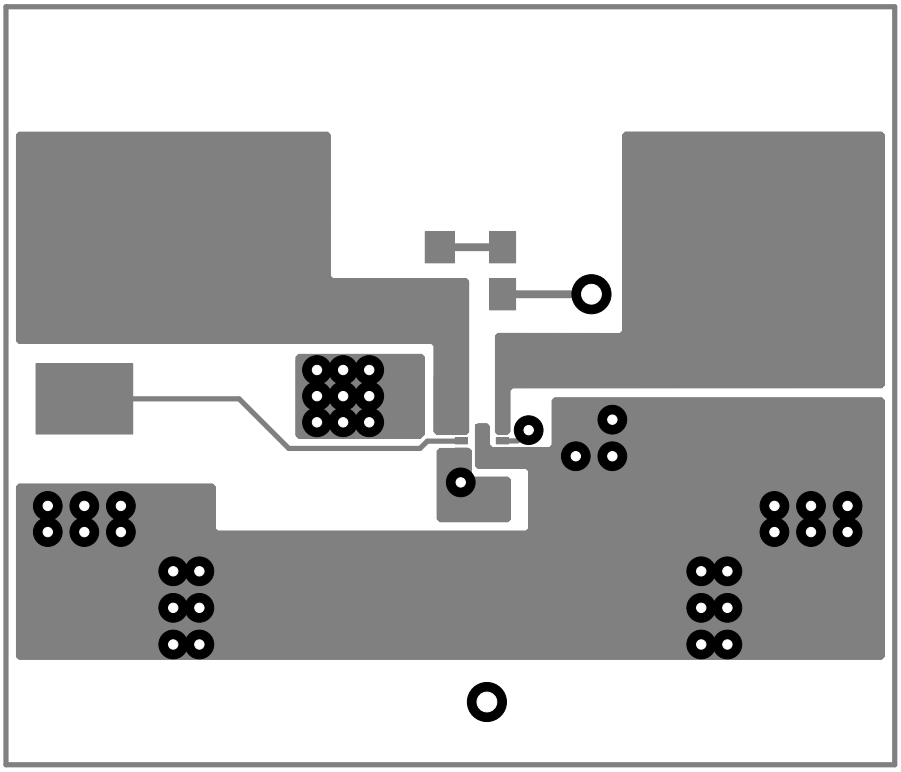


© 2011 Microchip Technology Inc.

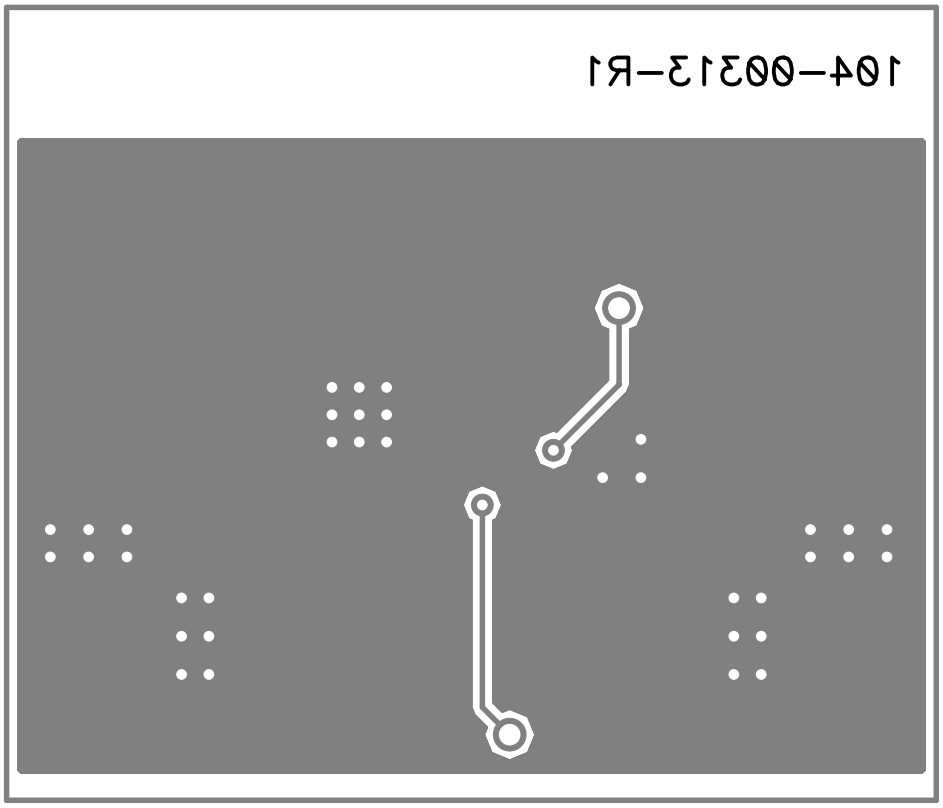
A.3 BOARD – TOP LAYER



A.4 BOARD – TOP COPPER



A.5 BOARD – BOTTOM COPPER



© 2011 Microchip Technology Inc.

Appendix B. Bill of Materials

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
1	–	Printed circuit board	Microchip Technology Inc.	102-00313
2	C1,C2	CAP CER 1.0uF 10V 10% X5R 0805	Panasonic® - ECG	GRM219R61A105KC01D
1	D1	LED ALINGAP RED CLEAR 0805 SMD	Panasonic - ECG	598-8110-107F
1	R1	RES 510 OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF5100V
1	R2	RES 2.00K OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF2001V
1	U1	Single-Chip Linear Li-Ion Battery Charger	Microchip Technology Inc.	MCP73830L

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://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

© 2011 Microchip Technology Inc.