MCP73837/8
AC/USB
Dual Input Battery Charger
Evaluation Board
User's Guide

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MCP73837/8 AC/USB EVALUATION BOARD USER'S GUIDE

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Preface

NOTICE TO CUSTOMERS

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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 MCP73837/8 AC/USB Dual Input 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 MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP73837/8 AC/USB Dual Input 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 MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the MCP73837/8 AC/USB Dual Input 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) { ... }`

RECOMMENDED READING

This user's guide describes how to use MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

MCP73837/8 Data Sheet, *"Advanced Stand-Alone Li-Ion / Li-Polymer Battery Charge Management Controller with Autonomous AC-Adapter or USB-Port Source Selection"*, DS22071

This data sheet provides detailed information regarding the MCP73837/8 product family.

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- Technical Support

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

DOCUMENT REVISION HISTORY

Revision A (December 2007)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board demonstrates the features and abilities of Microchip's MCP73837 and MCP73838 Single-Chip Linear Li-Ion Battery Charger with Autonomous AC Adapter or USB-Port Power Source Selection. The MCP73837 and MCP73838 are stand-alone highly integrated linear battery charger management controllers which employ a constant current / constant voltage (CCCV) charge algorithm with selectable preconditioning and charge termination ratio.

The MCP73837 and MCP73838 automatically select the AC-Adapter or USB-Port as the power source for the system. For an AC-Adapter powered system, an external resistor (R_{PROG}) sets the magnitude of the charge current up to a maximum of 1000 mA. With an USB-port providing power to the system, the MCP73837/8 specifically adheres to the current limits governed by the USB specification. The host microcontroller can select from two preset charge current rates of typical 90 mA (low) or 450 mA (High) and will 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 MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board?
- What the MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board Kit includes.

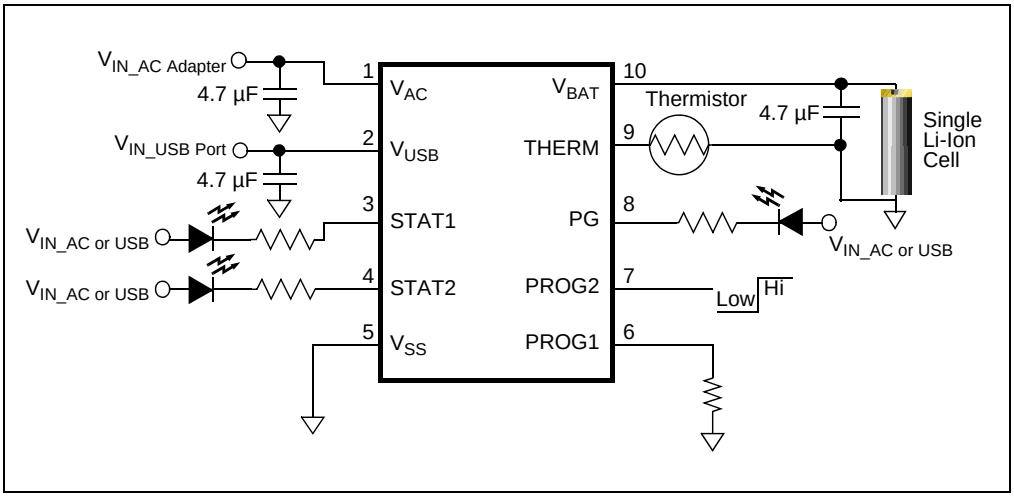

FIGURE 1-1: *MCP73837 Typical Application.*

1.2 WHAT IS THE MCP73837/8 AC/USB DUAL INPUT BATTERY CHARGER EVALUATION BOARD?

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board demonstrates the use of Single-Chip Linear Li-Ion Battery Charger with Autonomous AC-Adapter or USB-Port Power Source Selection.

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board is set up to evaluate single-cell Li-Ion Battery Charge Management. This board utilizes Microchip's MCP73837 and MCP73838 (Li-Ion Battery Charge Management Controllers) that effectively charge Li-Ion batteries with ±0.5% high accuracy preset voltage regulation. The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board comes with two pre-installed circuits: DFN-10 MCP73837 and MSOP-10 MCP73838. Both circuits are ready to charge Li-Ion battery at a maximum charge current rate up to 1000 mA when AC Adapter is present and a maximum charge current rate up to 500 mA when USB-Port is present. A mechanical dip switch is built in to select High (maximum 500 mA) or Low (maximum 100 mA) for the USB-Port powered system.

Two built-in LEDs are ready to indicate charge status: STAT1 and STAT2. The MCP73837 has a Power-Good Monitor that can be observed via the 3rd LED indicator on the board.

Note: Please refer to Table 2-1 for MCP73837/8 Charge Status Outputs.

The MCP73838 has Timer-Enable to active and disable the internal safety timer for charge special applications which can be selected from $\overline{TE}$ test point pin.

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board is also designed for easy modifications to support both MCP73837 in 10-pin DFN and MSOP packages and MCP73838 in 10-pin DFN and MSOP packages. R_{PROG} (R6 and R12) are located in the open area for quick charge current programming.

The MCP73837/8 AC/USB Dual Input 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 MCP73837/8 AC/USB DUAL INPUT BATTERY CHARGER EVALUATION BOARD KIT INCLUDES

This MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board kit includes:

- MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board, 102-00120
- MCP73837 DFN-10 and MCP73838 MSOP-10 (Pre-Installed)
- Analog and Interface Products Demonstration Boards CD-ROM (DS21912)
  - MCP73837/8 AC/USB Evaluation Board User's Guide, DS51684

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board demonstrates Microchip's stand-alone Linear Li-Ion Battery Chargers - MCP73837 and MCP73838. The MCP73837 device features a Power-Good Monitor while the MCP73838 device uses the same pin for the Timer-Enable function.

The MCP73837/8 require only minimum components to implement a complete battery charge management circuit. The MCP73837/8 are designed to select AC-Adapter or USB-Port Power Source automatically where AC-Adapter provides the charge current when both sources are present.

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board comes with a 10-pin DFN MCP73837 and a 10-pin MSOP MCP73838 pre-installed. The different packages can be easily evaluated by replacing the device, a resistor and a LED where the patterns have been pre-designed on the board layout.

Typical applications for the MCP73837/8 devices are Smart Phones, PDA, Portable Media Players, MP3 Players, USB-Powered Systems, Digital Cameras, Handheld Medical Instruments, Handheld Devices, Battery Chargers, Bluetooth headsets, Ultra-Mobile PC and Portable Communicators.

2.2 FEATURES

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board has the following features:

- DFN-10 and MSOP-10 package patterns for either MCP73837 or MCP73838
- 1000 mA maximum charge current for AC-Adapter Input Power
- 100 mA (low) and 500 mA (high) for USB-Port Input Power
- V_{AC} provides when both inputs are present at the same time
- Two status LEDs to indicate charge status
- Additional LED to indicate Power-Good ($\overline{PG}$) (Available only for MCP73837)
- Timer Enable ($\overline{TE}$) Test Point to enable/disable safety timer (Available only for MCP73838)
- 2-position Dip Switch for USB charge current control High and Low
- Available THERM pin on the board for temperature monitoring with a thermister

2.3 GETTING STARTED

The MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board is fully assembled and tested for charging a single-cell Li-Ion or Li-Polymer battery with a regulated 5V AC-Adapter or USB-Port.

2.3.1 Power Input and Output Connection

2.3.1.1 POWERING THE MCP73837/8 AC/USB DUAL INPUT BATTERY CHARGER EVALUATION BOARD

1. Connect the positive battery terminal to V_{BAT+} and negative battery terminal to V_{BAT-}.
2. Connect the DC power supply Negative Terminal to GND.
3. Connect the 5V DC power supply Positive Terminal to V_{AC} for AC-Adapter Power Source.
4. Connect the DC power supply Negative Terminal to GND.
5. Connect the 5V DC power supply Positive Terminal to V_{USB} for USB-Port Power Source.
6. It should initiate the battery charging cycle when either power source is present. When both power sources are present, the AC-Adapter Power Source will provide the input power.
7. Position the DIP Switch high for maximum up to 500 mA charge rate and low for maximum up to 100 mA charging rate. Charging current should be able to read off multi-meter that is in series with battery.

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

8. For MCP73838, $\overline{TE}$ pull low to enable the internal safety timer while high to disable the internal safety timer.
9. Fast Charge Current can be programmed with various resistors that based on the Figure 2-1.

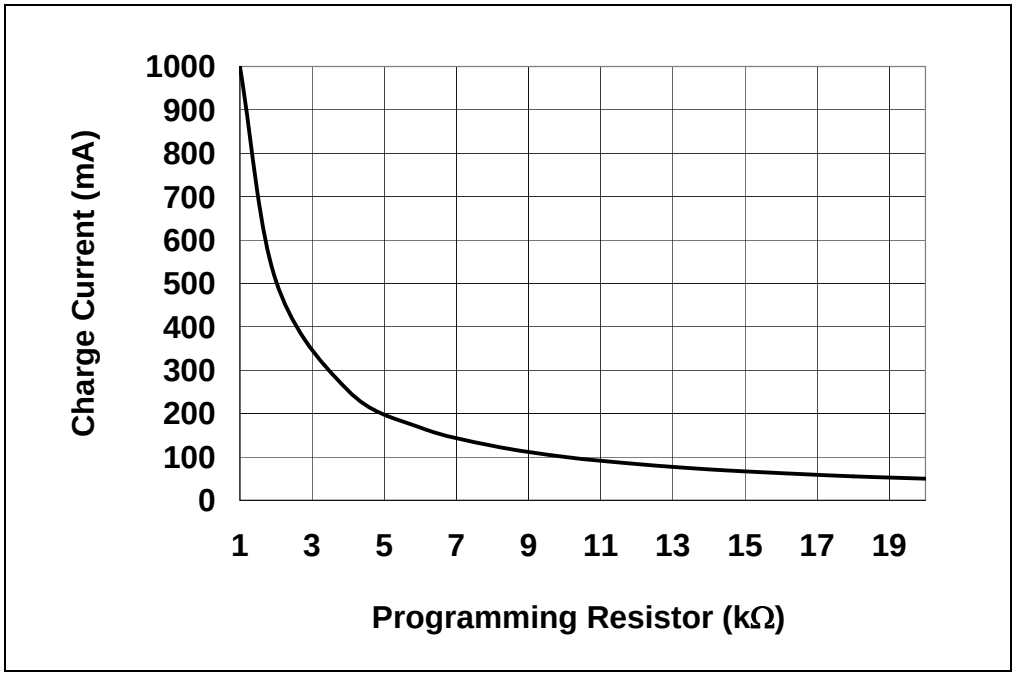

FIGURE 2-1: *Charge Current (I_{OUT}) vs. Programming Resistor (R_{PROG}).*

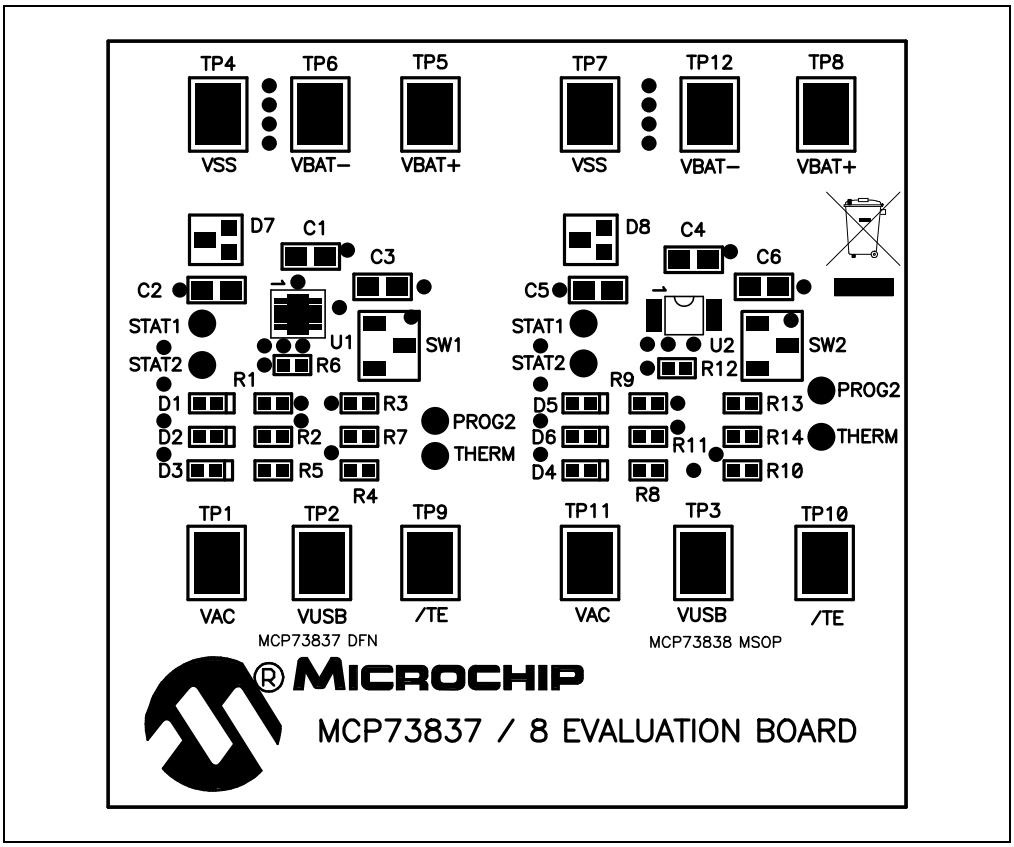

FIGURE 2-2: *Board Top Assembly.*

TABLE 2-1: MCP73837/8 CHARGE STATUS OUTPUTS

CHARGE CYCLE STATE	STAT1 GREEN	STAT2 YELLOW	$\overline{PG}$ RED
Shutdown	Hi-Z	Hi-Z	Hi-Z
Standby	Hi-Z	Hi-Z	L
Precondition	L	Hi-Z	L
Constant Current Fast Charge	L	Hi-Z	L
Constant Voltage	L	Hi-Z	L
Charge Complete - Standby	Hi-Z	L	L
Temperature Fault	Hi-Z	Hi-Z	L
System Test Mode	L	L	L

Note: Power-Good ($\overline{PG}$) option is only available on MCP73837. The $\overline{PG}$ option is an open-drain output. The $\overline{PG}$ is low whenever the input to the MCP73837 is above the UVLO (Undervoltage Lockout) threshold and greater than the battery voltage.

NOTES:

Appendix A. Schematic and Layouts

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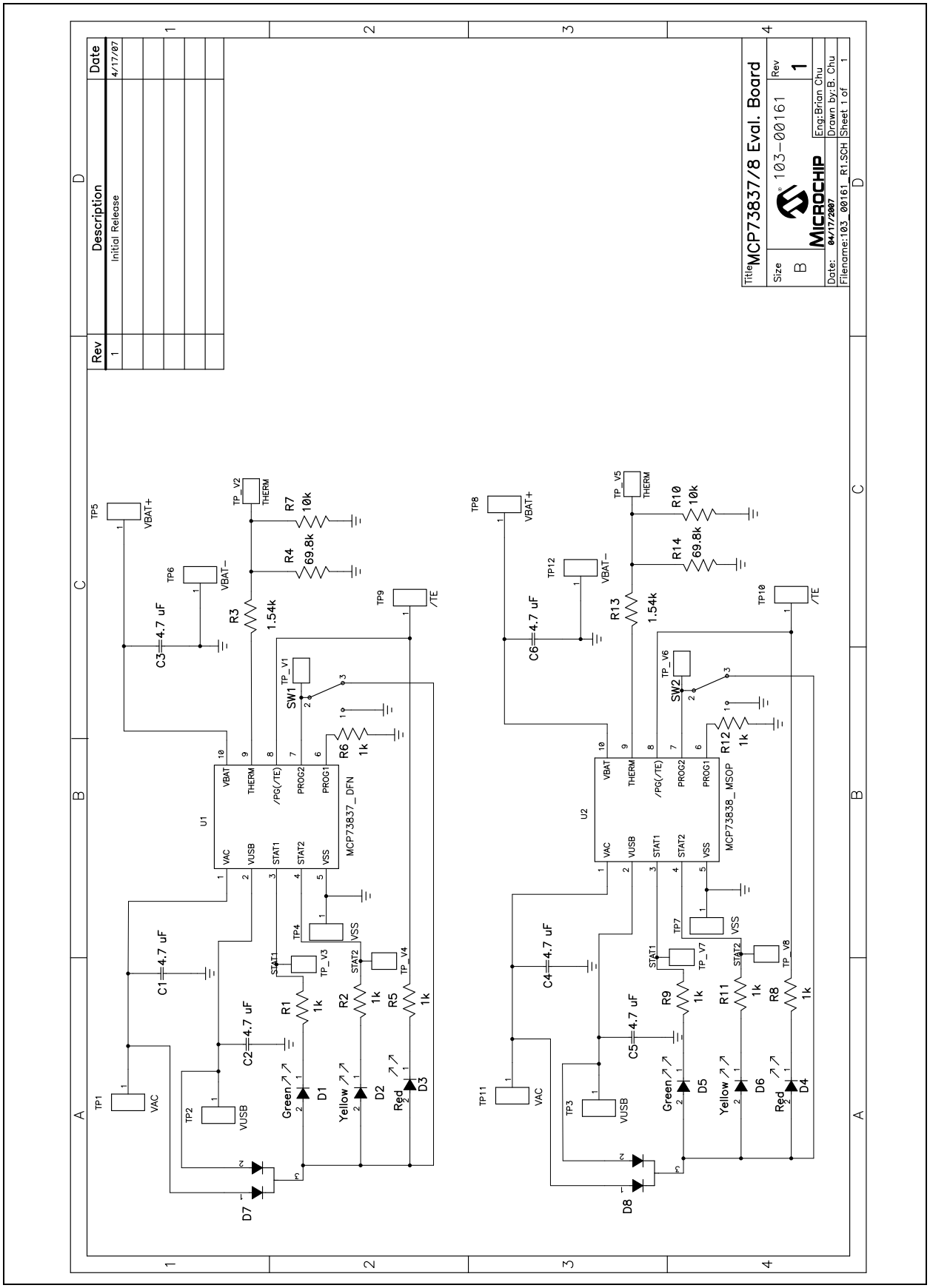
A.1 INTRODUCTION

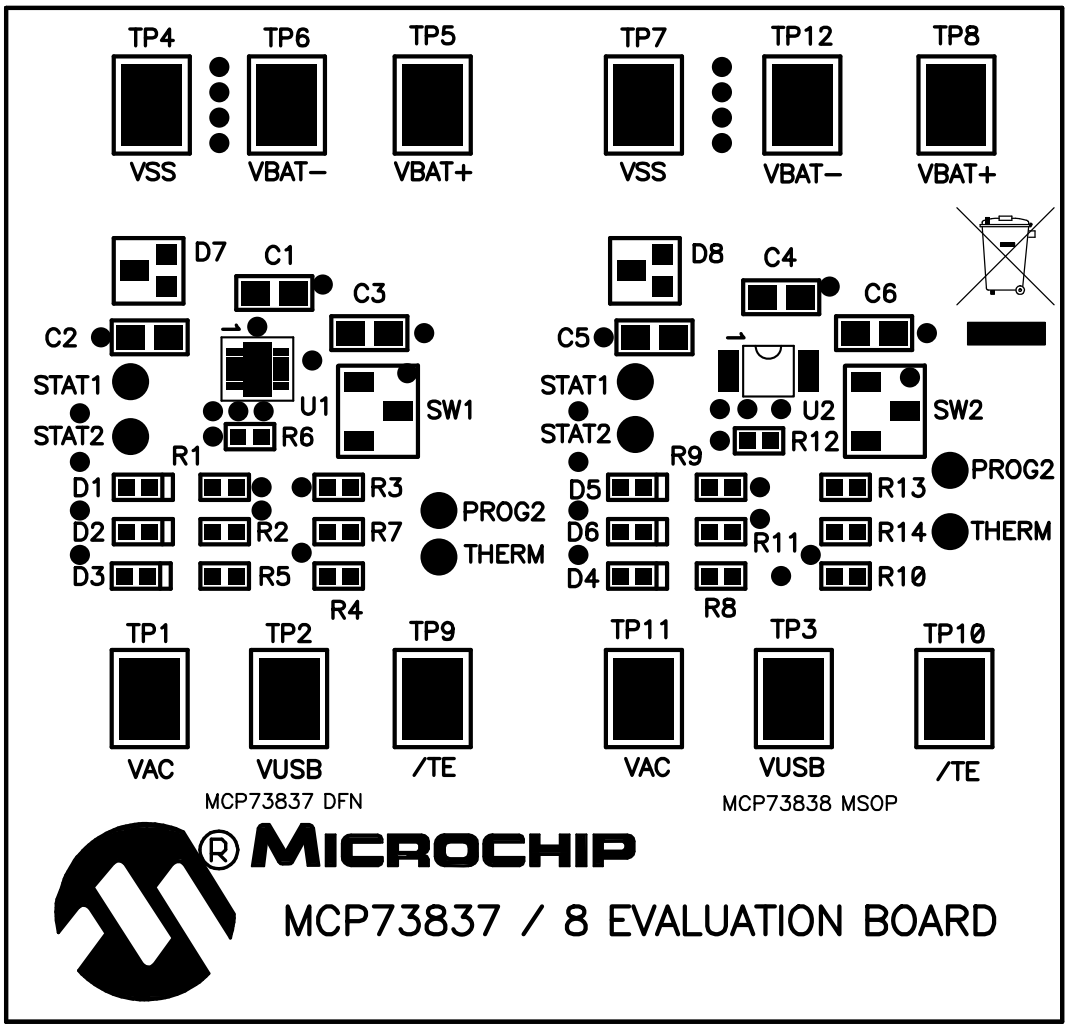
This appendix contains the following schematics and layouts for the MCP73837/8 AC/USB Dual Input Battery Charger Evaluation Board:

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

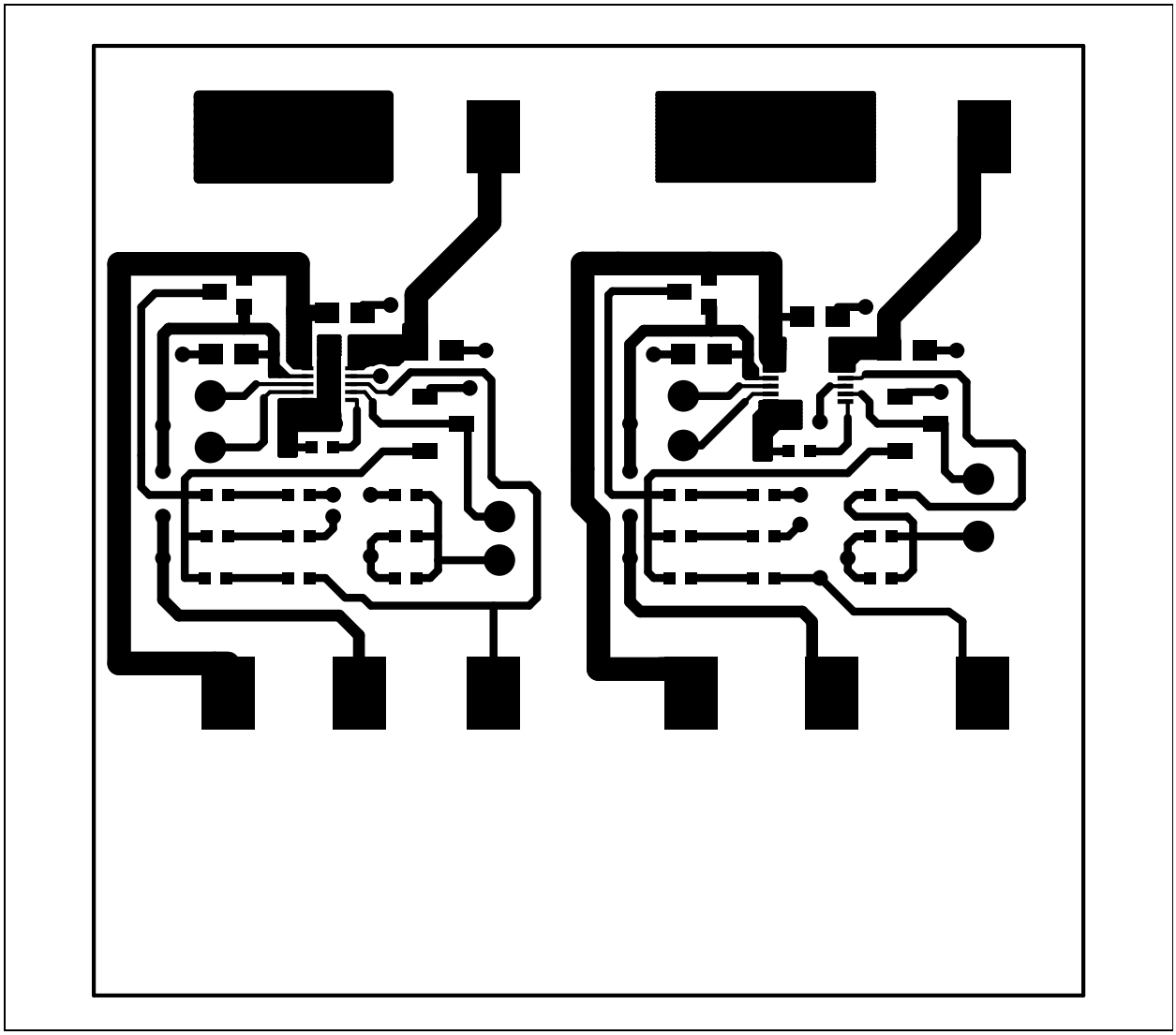
A.2 BOARD – SCHEMATIC



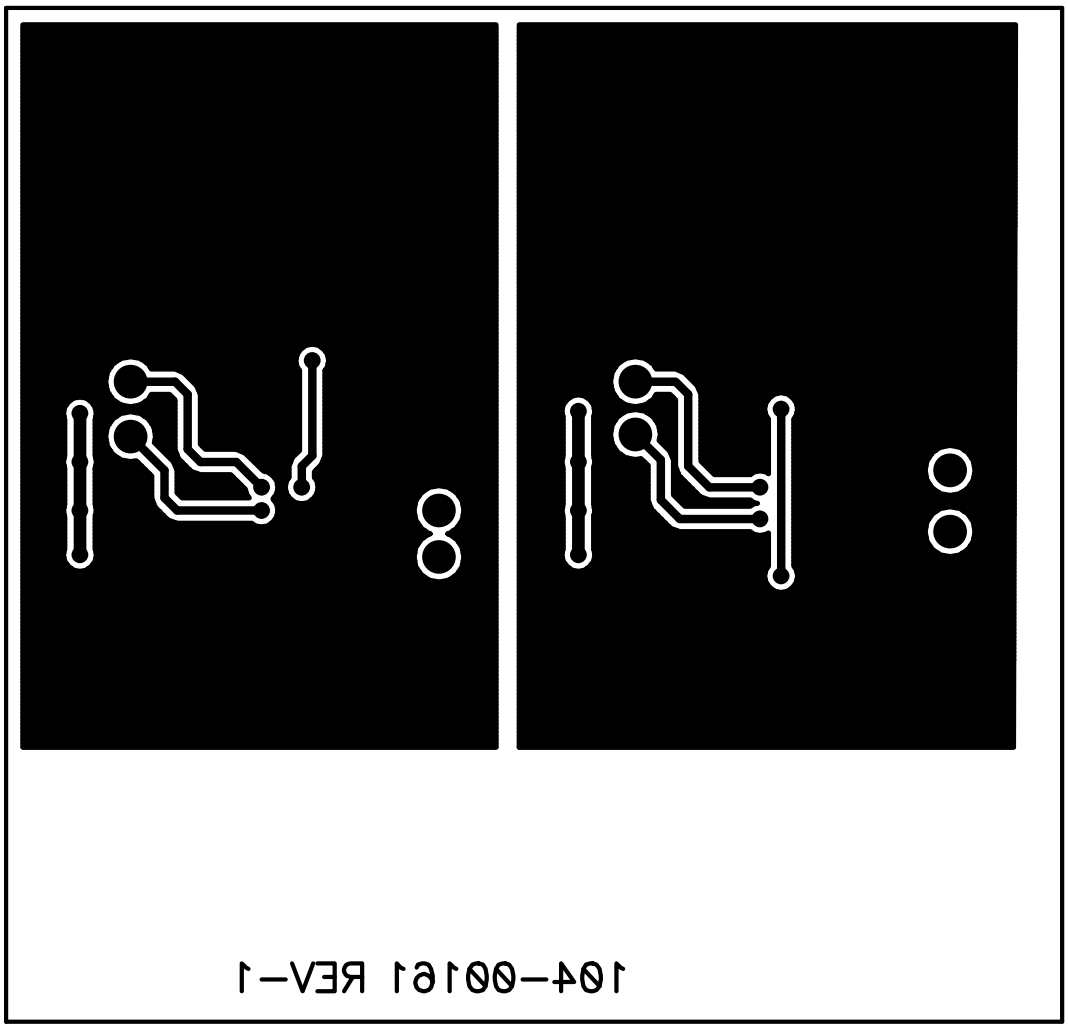
A.3 BOARD – TOP LAYER



A.4 BOARD – TOP METAL LAYER



A.5 BOARD – BOTTOM LAYER



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Appendix B. Bill Of Materials (BOM)

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TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
4	Bump	BUMPON HEMISPHERE .44X.20 WHITE	3M	SJ5003-9-ND
6	C1, C2, C3, C4, C5, C6	CAP CERAMIC 4.7 µF 6.3V X5R 0805	Panasonic® - ECG	ECJ-GVB0J475M
2	D1, D5	LED SUPER GREEN 0603 SMD	Para Light Corp. (USA)	L-C191KGCT-U1
2	D2, D6	LED SUPER YELLOW 0603 SMD	Para Light Corp. (USA)	L-C191KYCT-U1
1	D3	LED SUPER RED CLEAR 0603 SMD	Para Light Corp. (USA)	L-C191KRCT-U1
2	D7, D8	DIODE SWITCH DUAL CC 50V SOT23	On Semiconductor®	BAV74LT1G
1	---	Printed Circuit Board	—	104-00161-R1
8	R1, R2, R5, R6, R8, R9, R11, R12	RES 1K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1001V
2	R3, R13	RES 1.54K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1541V
2	R4, R14	RES 69.8K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF6982V
2	R7, R10	RES 10K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1002V
1	SW1, SW2	SWITCH SLIDE SPDT SMD J-LEAD	COPAL ELECTRONICS INC	CJS-1200TA
12	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12	PC Test Point Compact SMT	Keystone Electronics®	5016
1	U1	Single-Chip Linear Li-Ion Battery Charger with Autonomous USB-Port	Microchip Technology, Inc	MCP73837-FC/MF
1	U2	Single-Chip Linear Li-Ion Battery Charger with Autonomous USB-Port	Microchip Technology, Inc	MCP73838-FC/UN

Note: 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.

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Fax: 82-53-744-4302

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Fax: 82-2-558-5932 or
82-2-558-5934

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Fax: 60-4-227-4068

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Fax: 63-2-634-9069

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Fax: 886-3-572-6459

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Fax: 39-0331-466781

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Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9