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# **MCP7384X Evaluation Kit User's Guide**

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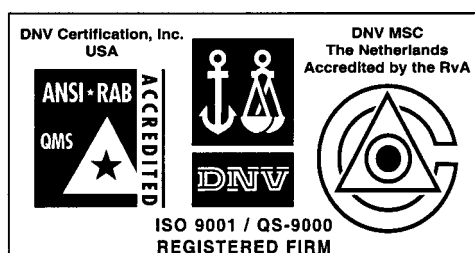
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# MCP7384X EVAL KIT USER'S GUIDE

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## Table of Contents

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|  |    |
|--|----|
| <b>Preface</b> .....                                     | v  |
| <b>Chapter 1. Product Overview</b>                       |    |
| 1.1 What is the MCP7384X Evaluation Board .....          | 1  |
| 1.2 MCP7384X Evaluation Board Kit Components .....       | 1  |
| <b>Chapter 2. MCP7384X Evaluation Board Installation</b> |    |
| 2.1 Features .....                                       | 3  |
| 2.2 Getting Started .....                                | 3  |
| 2.3 Detailed Description .....                           | 4  |
| <b>Appendix A. Schematic and Layouts</b>                 |    |
| A.1 Introduction .....                                   | 7  |
| A.2 Highlights .....                                     | 7  |
| A.3 Board Schematic .....                                | 8  |
| A.4 Board - Top Assembly .....                           | 9  |
| A.5 Board - Top Layer .....                              | 10 |
| A.6 Board - Bottom Layer .....                           | 11 |
| <b>Appendix B. Bill-of-Materials (BOM)</b>               |    |
| <b>Worldwide Sales and Service</b> .....                 | 14 |

# MCP7384X Eval Kit User's Guide

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NOTES:

## Preface

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### INTRODUCTION

This section contains general information that will be useful to know before using the MCP7384X Evaluation Board. This board currently supports the following devices:

- MCP73841, MCP73842, MCP73843, MCP73844

### HIGHLIGHTS

This section covers the following topics:

- About this Guide
- Recommended Reading
- The Microchip Internet Web Site
- Customer Support

### ABOUT THIS GUIDE

#### Document Layout

The User's Guide layout is as follows:

- **Chapter 1: Product Overview** – Important information about the MCP7384X Evaluation Board.
- **Chapter 2: MCP7384X Evaluation Board Installation** – For users evaluating the MCP73841, MCP73842, MCP73843 or MCP73844 devices, this chapter describes how to use the various features of the hardware.

#### Appendices:

- **Appendix A: Schematic and Layouts** – shows the schematic and layout diagrams for the MCP7384X Evaluation Board.
- **Appendix B: Bill of Materials** – lists the parts used to build the MCP7384X Evaluation Board.
- **Worldwide Sales and Service** – gives the address, telephone and fax number for Microchip Technology Inc. sales and service locations throughout the world.

# MCP7384X Eval Kit User's Guide

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## RECOMMENDED READING

For more information regarding the MCP7384X devices, the following is recommended reading.

*MCP7384X Data Sheet (DS21823)*

This document provides detailed information regarding the MCP7384X Advanced Single or Dual Cell Lithium-Ion/Lithium-Polymer Charge Management Controllers.

*Technical Library CD-ROM (DS00161)*

This CD-ROM contains comprehensive application notes, data sheets and technical briefs for all Microchip products. To obtain this CD-ROM, contact the nearest Microchip Sales and Service location (see back page).

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The Hotline numbers are:

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## **Chapter 1. Product Overview**

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### **1.1 WHAT IS THE MCP7384X EVALUATION BOARD**

The MCP7384X Evaluation Board is an evaluation and demonstration tool for Microchip Technology's MCP7384X Advanced Single or Dual Cell Lithium-Ion/Lithium-Polymer 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 MCP7384X devices in a variety of applications.

### **1.2 MCP7384X EVALUATION BOARD KIT COMPONENTS**

The MCP7384X Evaluation Kit contains:

- MCP7384X Evaluation Board
- MCP73841-420I/UN, MCP73842-840I/UN and MCP73843-420I/MS Devices installed
- MCP7384X Data Sheet (DS21823)
- MCP7384X Evaluation Kit User's Guide (DS51424)



# MCP7384X Eval Kit User's Guide

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## Chapter 2. MCP7384X Evaluation Board Installation

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### 2.1 FEATURES

The MCP7384X Evaluation Board has the following features:

- Evaluation of MCP73841/42 in 10-pin MSOP packages
- Evaluation of MCP73843/44 in 8-pin MSOP packages
- Simple stand-alone operation or microcontroller compatible
- Powered from external bench supply or voltage regulated wall cube
- Surface-mount design
- Fully assembled and tested

### 2.2 GETTING STARTED

The MCP7384X Evaluation Board is a fully functional, assembled, and tested surface mount board for evaluation of Microchip's MCP7384X Advanced Single or Dual Cell Lithium-Ion/Lithim-Polymer Charge Management Controllers. The following steps provide simple stand-alone operation. Refer to Figure 2-1 for the set-up configuration diagram. The set-up configuration diagram depicts evaluation with circuit 1, MCP73841 operation. **Note:** Do not turn on the input power until all other set-up steps are complete.

1. Connect an external bench supply or voltage regulated wall cube to the appropriate circuit for evaluation.

**CAUTION:** Observe correct polarity of connection. Positive connects to VDDn; negative connects to VSSn; where n represents the circuit to be evaluated.

2. Connect a single or dual cell Li-Ion battery pack to the appropriate circuit for evaluation. Circuits 1 and 3 support single cell applications; circuit 2 supports dual cell applications based on the original devices installed.

**CAUTION:** Observe correct polarity of connection. Positive connects to VBATn; negative connects to VSSn; where n represents the same circuit to be evaluated as step 1.

3. For circuit 1 or circuit 2 evaluation, connect an external battery pack thermistor to the appropriate THERM input. The thermistor should be connected from THERMn to VSSn. If continuous cell temperature monitoring is not desired, utilize circuit 3 or place a 10 k $\Omega$  resistor from THERMn to VSSn.
4. Turn on bench supply or plug in wall cube.
5. A GREEN LED should illuminate to indicate the presence of input power. A RED LED provides status during the charge cycle. Refer to the MCP7384X Data Sheet (DS21823) for details.

# MCP7384X Eval Kit User's Guide

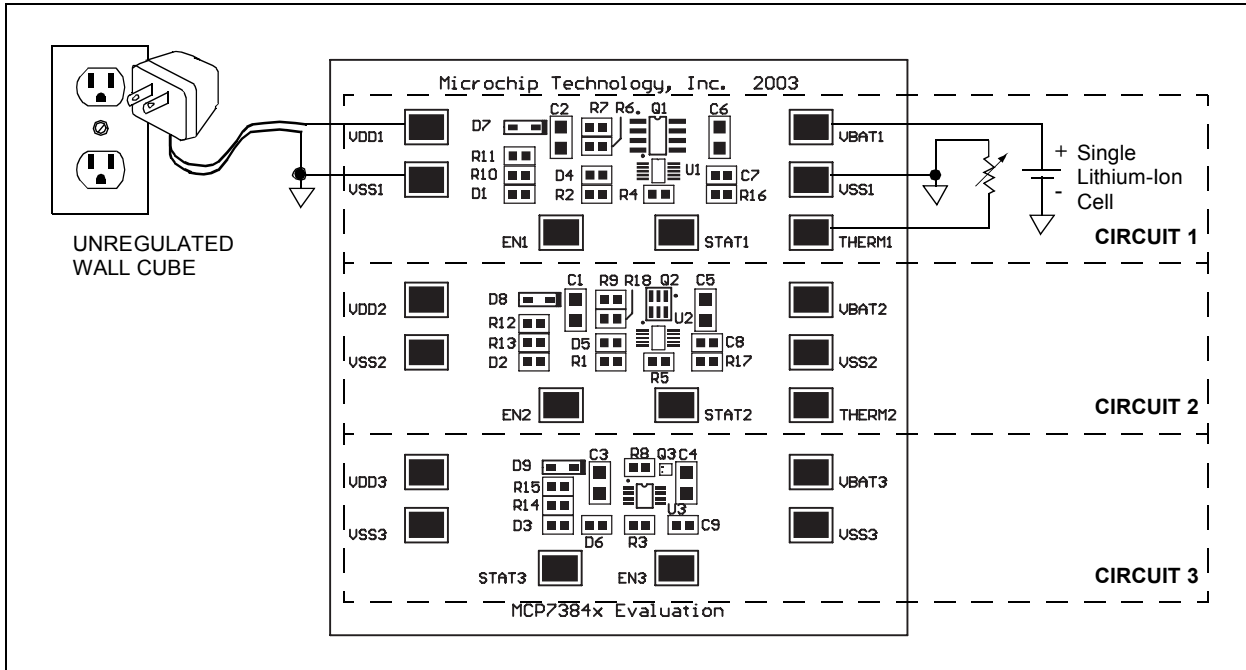


FIGURE 2-1: Set-up Configuration Diagram.

## 2.3 DETAILED DESCRIPTION

The MCP7384X Evaluation Board is designed to evaluate simple, stand-alone, linear charging of single or dual cell Lithium-Ion/Lithium-Polymer battery packs. Two single cell reference designs and one dual cell reference design are provided. Each reference design can be evaluated independently and utilizes a different pass transistor, each in a unique package, to demonstrate the versatility of the MCP7384X charge management controllers. The reference designs provide constant current charging followed by constant voltage charging with automatic charge termination. Three levels of constant current, one for each reference design, are demonstrated: 500 mA, 1A and 275 mA for the two single cell reference designs and the dual cell reference design, respectively. The MCP73841 is provided in a 10-pin MSOP package and is equipped with shutdown control, status indicator, safety timer, and continuous cell temperature monitor. The MCP73842 is provided in a 10-pin MSOP package and is equipped with the same features as the MCP73841. The MCP73841 and MCP73842 provide charge management for single and dual cell Lithium-Ion/Lithium-Polymer battery packs, respectively. Alternatively, the MCP73843 is provided in an 8-pin MSOP package. The MCP73843 provides charge management for single cell Lithium-Ion/Lithium-Polymer battery packs. The MCP73843 is equipped with all the features of the MCP73841 and MCP73842, with the exception of the cell temperature monitor. Refer to the MCP7384X data sheet (DS21823) for details on the individual device features.

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### 2.3.1 Input Source

The MCP7384X Evaluation Board is designed to provide typical fast charge currents of 1 A, 275 mA and 500 mA for circuits 1, 2 and 3, respectively. A 5V  $\pm$ 10%, 7.5W input source should be utilized to power the evaluation kit when evaluating the single cell charge management devices (MCP73841 and MCP73843). A 10V  $\pm$ 10%, 5W input source should be utilized to power the evaluation kit when evaluating the dual cell charge management device (MCP73842). Independent input source connections are provided for each reference design.

Higher or lower fast charge currents can be obtained by adjusting the value of the sense resistors (R6//R7, R9//R18 and R8 for circuits 1, 2 and 3, respectively). A corresponding higher or lower power input source may need to be utilized. Care should be taken not to over-stress the pass transistors with excessive power dissipation when higher fast charge currents are desired.

### 2.3.2 Reverse-Blocking Protection

The MCP7384X Evaluation Board is designed to provide reverse-blocking protection in the event a reversed polarity input source is connected. The reverse-blocking protection diodes also ensure that a faulted or shorted input source will not adversely effect the battery pack.

### 2.3.3 Battery Headers

Independent battery connections are provided for each reference design. For the MCP73841 and MCP73842 reference designs, a connection is provided for a nominal 10 k $\Omega$  at 25°C NTC thermistor situated in the battery pack for temperature sensing. Installed resistors provide a charging window when the cell temperature is between -5°C and +55°C when a thermistor with a sensitivity index ( $\beta$ ) of 3982 is utilized. When the cell temperature deviates outside the preset window, charging is inhibited. The desired charging window for a variety of thermistors can be obtained by changing the values of resistors R4 and R16 or R5 and R17 for circuits 1 and 2, respectively. Refer to the MCP7384X data sheet (DS21823) for details.

|  |
|--|
| <p><b>CAUTION:</b> 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.</p> |
|--|

### 2.3.4 Device Support Options

The MCP7384X Evaluation Board supports the entire MCP7384X family and provides three reference designs utilizing the MCP73841, MCP73842, and MCP73843. Alternate devices can be substituted in order to evaluate the different MCP7384X family options.

### 2.3.5 Microcontroller option

Connection points provide easily accessible locations for interface to a host microcontroller. The host microcontroller can be used to disable the charger, monitor charge status or terminate a charge.

### 2.3.6 Output voltage options

The MCP7384X Evaluation Board is provided with a constant voltage mode output voltage of 4.2V and 8.4V for single or dual cell Lithium-Ion/Lithium-Polymer battery packs, respectively. Evaluation with a constant voltage mode output voltage of 4.1V or 8.2V can be achieved by replacing U1, U2 or U3 with the appropriate device. Refer to the MCP7384X data sheet (DS21823) for device ordering information.

# MCP7384X Eval Kit User's Guide

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## **Appendix A. Schematic and Layouts**

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### **A.1 INTRODUCTION**

This appendix contains the schematics and layouts for the MCP7384X Evaluation Board.

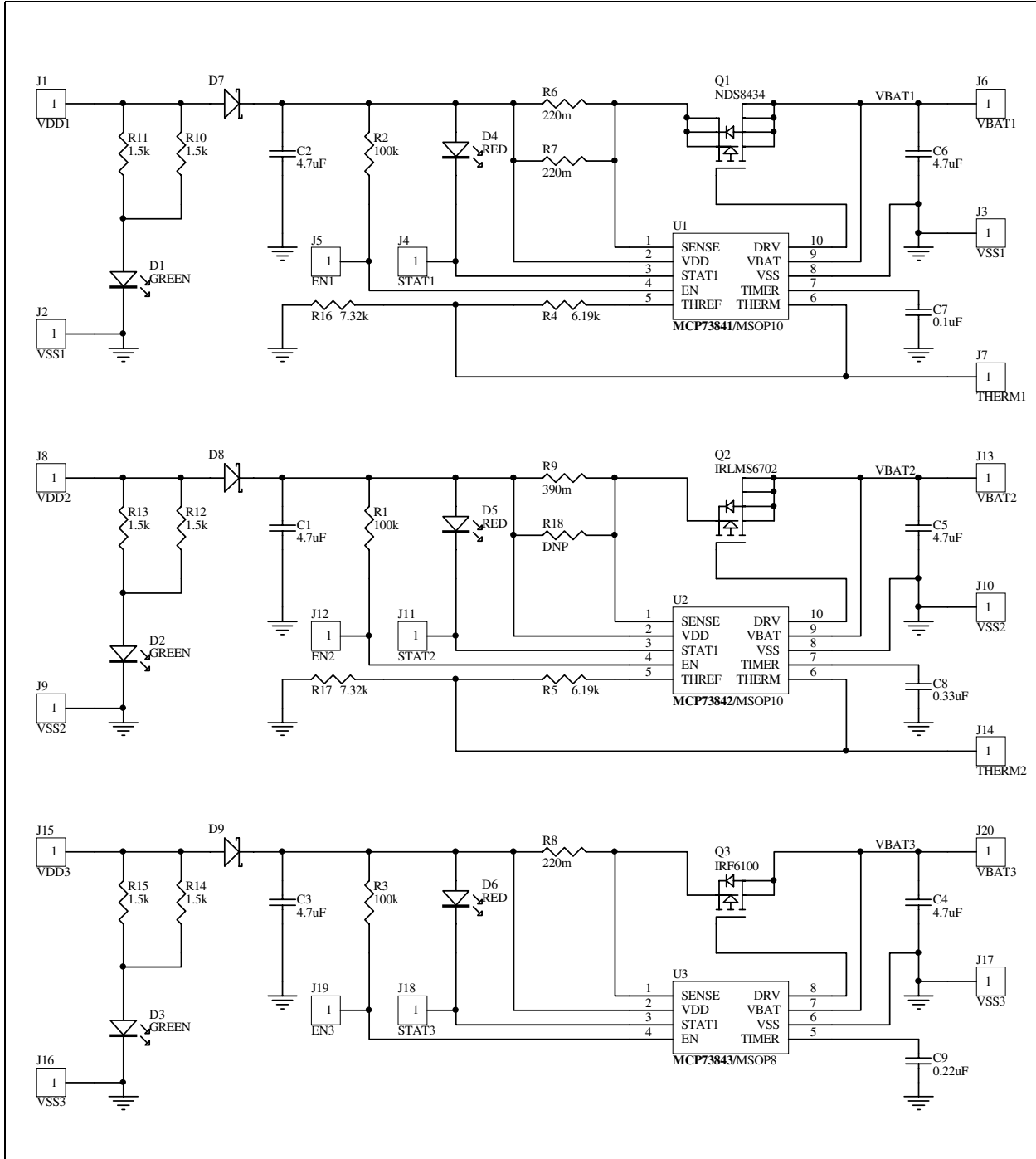
### **A.2 HIGHLIGHTS**

Diagrams included in this appendix:

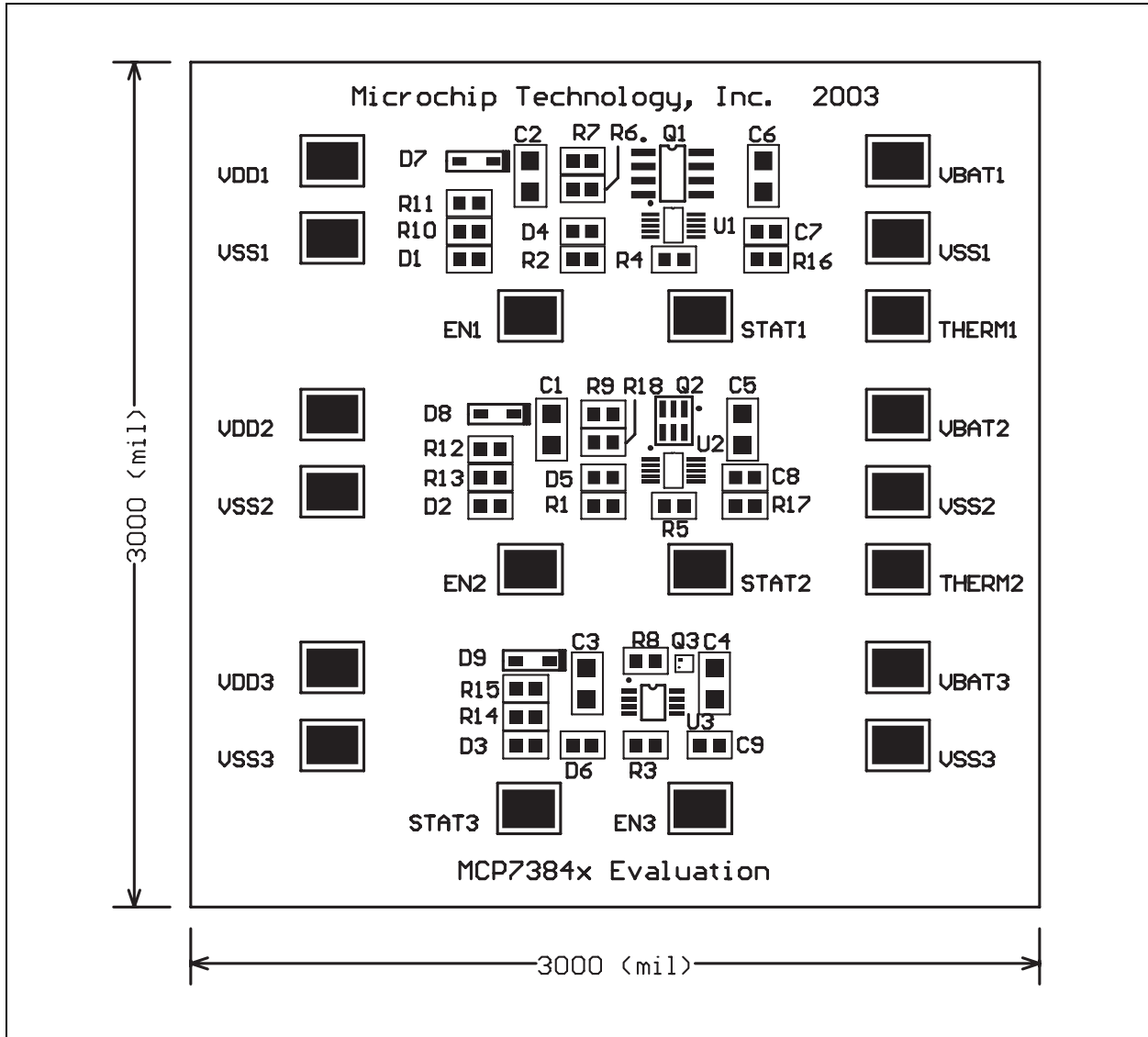
- Board Schematic
- Board - Top Assembly
- Board - Top Layer
- Board - Bottom Layer

# MCP7384X Eval Kit User's Guide

## A.3 BOARD SCHEMATIC



## A.4 BOARD - TOP ASSEMBLY

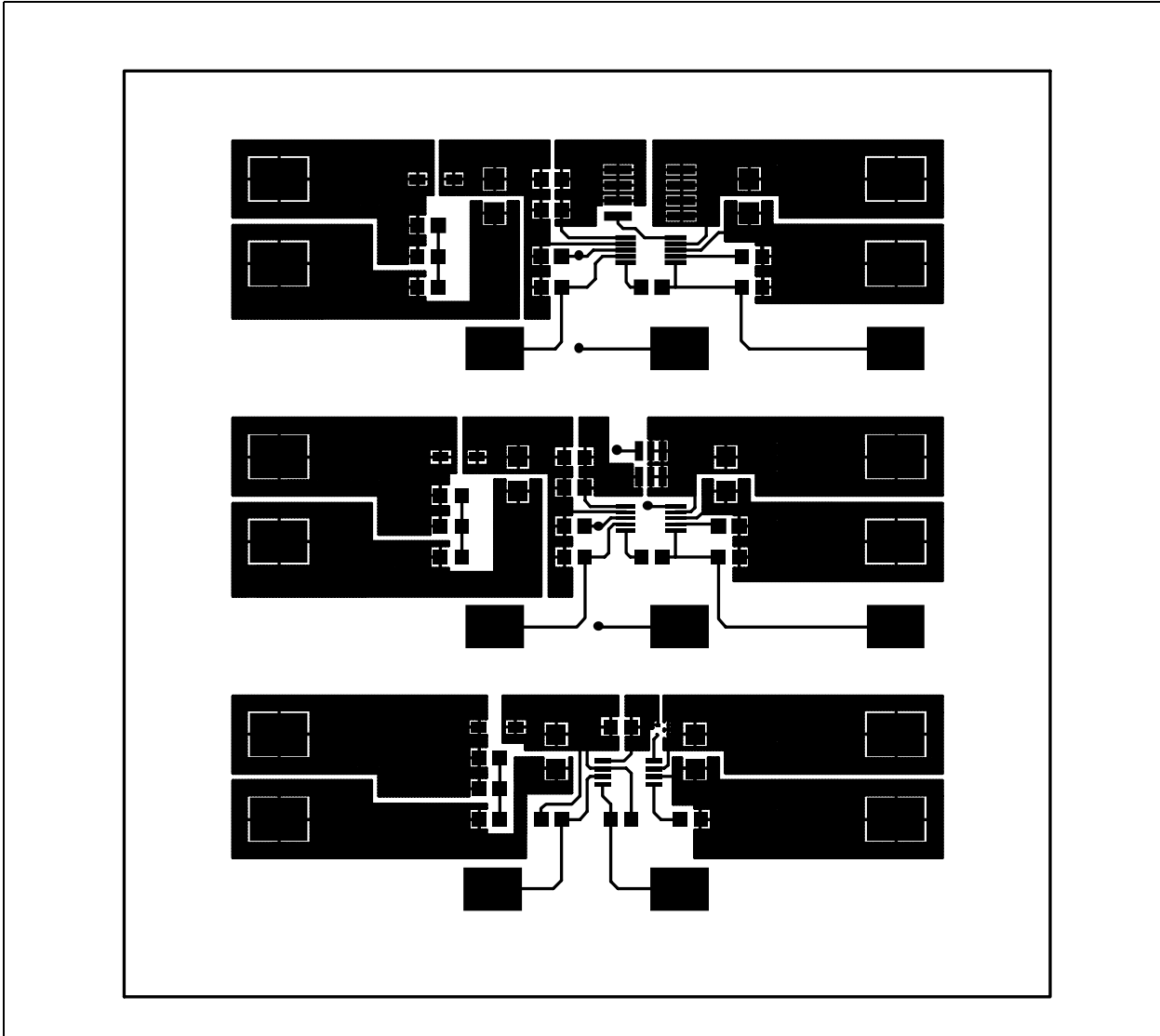




# MCP7384X Eval Kit User's Guide

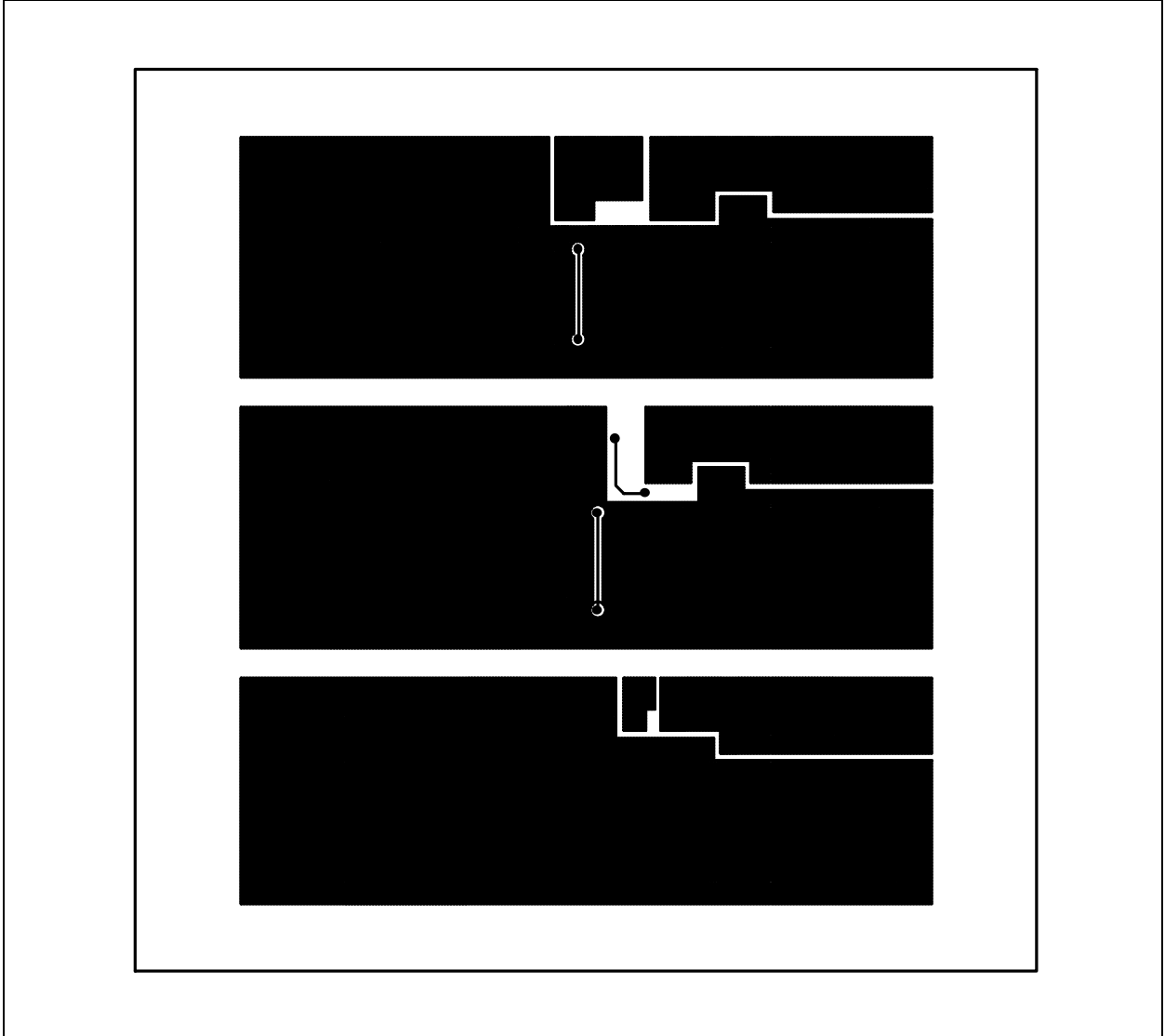
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## A.5 BOARD - TOP LAYER



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## A.6 BOARD - BOTTOM LAYER



# MCP7384X Eval Kit User's Guide

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**Appendix B. Bill-of-Materials (BOM)**

**TABLE B-1: BILL OF MATERIALS**

| Reference Designator | Quantity | Description                                  | Manufacturer              | Manufacturer Part Number |
|----------------------|----------|--|---------------------------|--------------------------|
| C1 - C6              | 6        | 4.7 $\mu$ F, X5R Ceramic, 16V, 1206          | Panasonic™                | ECJ-3YB1C475K            |
| C7                   | 1        | 0.1 $\mu$ F, X7R Ceramic, 16V, 0603          | Panasonic                 | ECJ-1VB1C104K            |
| C8                   | 1        | 0.33 $\mu$ F, X5R Ceramic, 16V, 0603         | Panasonic                 | ECJ-1VB1A334K            |
| C9                   | 1        | 0.22 $\mu$ F, X5R Ceramic, 16V, 0603         | Panasonic                 | ECJ-1VB1A224K            |
| D1 - D3              | 3        | Green LED, 0603                              | Lumex™                    | SML-LX0603GW             |
| D4 - D6              | 3        | Red LED, 0603                                | Lumex                     | SML-LX0603SRW            |
| D7 - D9              | 3        | Schottky Diode, 1A, 25V, SOD-323             | Panasonic                 | MA2YD23                  |
| J1 - J20             | 20       | Surface Mount Test Point, 5016               | Keystone                  | 5016                     |
| Q1                   | 1        | P-Channel Power MOSFET, SOIC8                | Fairchild                 | NDS8434                  |
| Q2                   | 1        | P-Channel Power MOSFET, TSOP6                | IR                        | IRLMS6702                |
| Q2                   | 1        | P-Channel Power MOSFET, FlipFET              | IR                        | IRF6100                  |
| R1 - R3              | 3        | 100 k $\Omega$ , 1/16W, Chip Resistor, 0603  | Panasonic                 | ERJ-3EKF1003V            |
| R4 - R5              | 2        | 6.19 k $\Omega$ , 1/16W, Chip Resistor, 0603 | Panasonic                 | ERJ-3EKF6192V            |
| R6 - R8              | 3        | 0.22 $\Omega$ , 1/10W, Chip Resistor, 0603   | Panasonic                 | ERJ-3RQFR22V             |
| R9                   | 3        | 0.39 $\Omega$ , 1/10W, Chip Resistor, 0603   | Panasonic                 | ERJ-3RQFR39V             |
| R10 - R15            | 6        | 1.5 k $\Omega$ , 1/10W, Chip Resistor, 0603  | Panasonic                 | ERJ-3GEYJ152V            |
| R16 - R17            | 2        | 7.32 k $\Omega$ , 1/16W, Chip Resistor, 0603 | Panasonic                 | ERJ-3EKF7322V            |
| R18 (Note)           | 0        | DNP  |                           |                          |
| U1                   | 1        | Single Cell Lithium-Ion Charger, MSOP10      | Microchip Technology Inc. | MCP73841-420I/UN         |
| U2                   | 1        | Dual Cell Lithium-Ion Charger, MSOP10        | Microchip Technology Inc. | MCP73842-840I/UN         |
| U3                   | 1        | Single Cell Lithium-Ion Charger, MSOP8       | Microchip Technology Inc. | MCP73843-420I/MS         |

**Note:** R18 is not installed in the original factory installation. Pads are provided for a surface-mount chip resistor in a 0603 package. R18 can be installed in parallel with R9 to adjust the charge current of circuit 2. Refer to the schematic and the MCP7384X data sheet (DS21823) for more information on choosing the value of the sense resistor.



## WORLDWIDE SALES AND SERVICE

### AMERICAS

#### Corporate Office

2355 West Chandler Blvd.  
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Technical Support: 480-792-7627  
Web Address: <http://www.microchip.com>

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Fax: 770-640-0307

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San Jose, CA 95131  
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#### Toronto

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Tel: 905-673-0699  
Fax: 905-673-6509

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#### Australia

Suite 22, 41 Rawson Street  
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#### China - Beijing

Unit 915  
Bei Hai Wan Tai Bldg.  
No. 6 Chaoyangmen Beidajie  
Beijing, 100027, No. China  
Tel: 86-10-85282100  
Fax: 86-10-85282104

#### China - Chengdu

Rm. 2401-2402, 24th Floor,  
Ming Xing Financial Tower  
No. 88 TIDU Street  
Chengdu 610016, China  
Tel: 86-28-86766200  
Fax: 86-28-86766599

#### China - Fuzhou

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Fuzhou 350001, China  
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#### China - Hong Kong SAR

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Fax: 852-2401-3431

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Fax: 86-21-6275-5060

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Kaohsiung Branch  
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Min Chuan 2nd Road  
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Fax: 886-7-536-4803

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Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

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#### Austria

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Fax: 31-416-690340

#### United Kingdom

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Wokingham  
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Tel: 44-118-921-5869  
Fax: 44-118-921-5820

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