



MICROCHIP

**MCP1710
Demo 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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC, SST, SST Logo, SuperFlash 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, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.


Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscent Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale 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.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. & KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2012, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-62076-604-0

**QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
= ISO/TS 16949 =**

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.

Object of Declaration: MCP1710 Demo Board User's Guide

EU Declaration of Conformity

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.

Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA



Derek Carlson
VP Development Tools

02-May-12
Date

MCP1710 Demo Board User's Guide

NOTES:

Table of Contents

Preface	7
Introduction.....	7
Document Layout	7
Conventions Used in this Guide	8
Recommended Reading.....	9
The Microchip Web Site	9
Customer Support	9
Document Revision History	9
Chapter 1. Product Overview	
1.1 Introduction	11
1.2 MCP1710 Short Overview	11
1.3 What Is the MCP1710 Demo Board?	12
1.4 MCP1710 Demo Board Kit Contents	12
Chapter 2. Installation and Operation	
2.1 Introduction	13
2.2 Getting Started	13
Appendix A. Schematic and Layouts	
A.1 Introduction	15
A.2 Board – Schematic	16
A.3 Board – Top Layer	17
A.4 Board – Top Copper	17
A.5 Board – Bottom Copper	18
Appendix B. Bill of Materials	
Worldwide Sales and Service	20

NOTES:

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 online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MCP1710 Demo 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 MCP1710 Demo Board. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Important information about the MCP1710 Demo Board.
- **Chapter 2. “Installation and Operation”** – Includes instructions on how to get started with the MCP1710 Demo Board and a description of the user’s guide.
- **Appendix A. “Schematic and Layouts”** – Shows the schematic and layout diagrams for the MCP1710 Demo Board.
- **Appendix B. “Bill of Materials”** – Lists the parts used to build the MCP1710 Demo Board.

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 the MCP1710 Demo Board. Another useful document is listed below. The following Microchip document is available and recommended as a supplemental reference resource:

- **MCP1710 Data Sheet – “Ultra-Low Quiescent Current LDO Regulator” (DS25158)**

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://www.microchip.com/support>.

DOCUMENT REVISION HISTORY

Revision A (October 2012)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the MCP1710 Demo Board and covers the following topics:

- MCP1710 Short Overview
- What Is the MCP1710 Demo Board?
- MCP1710 Demo Board Kit Contents

1.2 MCP1710 SHORT OVERVIEW

The MCP1710 is a 200 mA for $V_{OUT} < 3.5V$, 100 mA for $V_{OUT} > 3.5V$, Low Dropout (LDO) linear regulator that provides high-current and low-output voltages, while maintaining an ultra-low 20 nA of quiescent current while the device is running. The MCP1710 also can be shutdown for an even lower 0.1 nA (typical) supply current draw. The MCP1710 comes in five standard fixed-output voltage versions 1.2V, 1.8V, 2.5V, 3.3V and 4.2V. The 200 mA output current capability, combined with the low output voltage capability, make the MCP1710 a good choice for new ultra-long-life LDO applications that have high-current demands but require ultra-low power consumption while operating in sleep mode.

The MCP1710 is stable using ceramic output capacitors that inherently provide lower output noise and reduce the size and cost of the entire regulator solution. Only 1 μF (2.2 μF recommended) of output capacitance is needed to stabilize the LDO.

The MCP1710's ultra-low quiescent and shutdown current allows it to be paired with other ultra-low current draw devices like Microchip's XLP nanoWatt technology devices, for a complete ultra-low power solution.

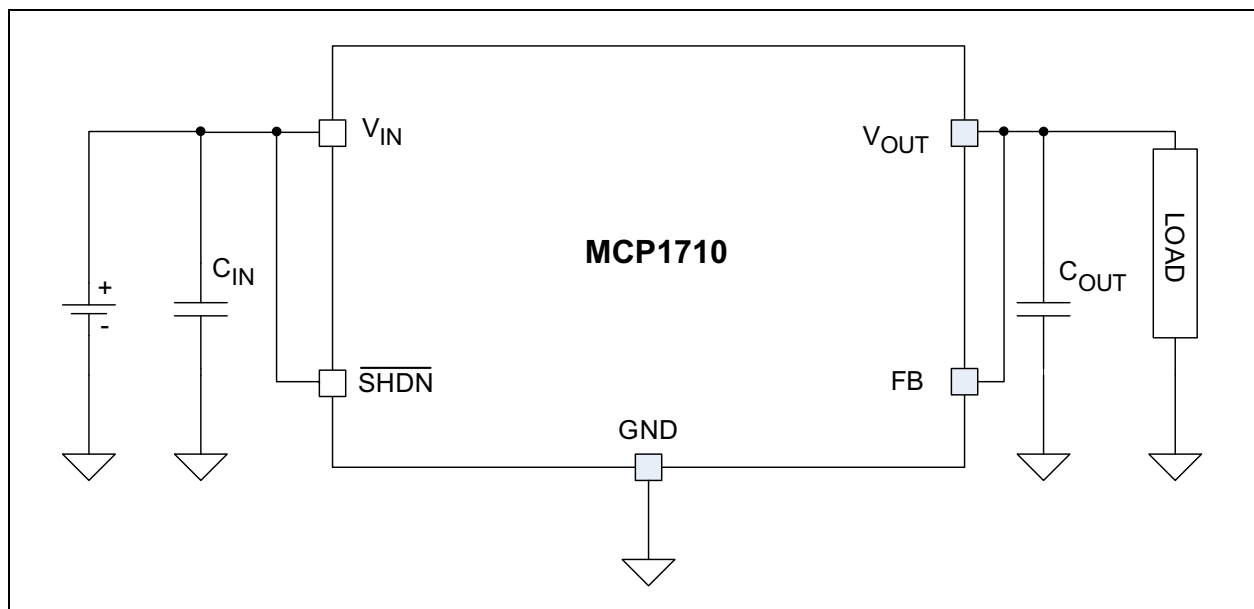


FIGURE 1-1: Typical MCP1710 Application.

1.3 WHAT IS THE MCP1710 DEMO BOARD?

The MCP1710 Demo Board is designed to operate from a 2.7V to 5.5V input and regulate the output voltage to a specified fixed value. Test points for input voltage and output voltage are provided to demonstrate the capability of the demo board over the entire range. The MCP1710 Demo Board was designed using small surface-mount components to show application size for an ultra-low power, high-current, voltage regulator application.

1.4 MCP1710 DEMO BOARD KIT CONTENTS

This MCP1710 Demo Board kit includes the following items:

- MCP1710 Demo Board
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 INTRODUCTION

2.1.1 MCP1710 Features

The MCP1710 device has been developed to provide ultra-low power applications with a precise, regulated rail.

The key features of the MCP1710 include:

- Ultra-low 20 nA (typical) quiescent current
- Ultra-low shutdown supply current: 0.1 nA (typical)
- 200 mA output current capability for $V_{OUT} < 3.5V$
- 100 mA output current capability for $V_{OUT} > 3.5V$
- Input operating voltage range: 2.7V to 5.5V
- Standard output voltages:
 - 1.2V, 1.8V, 2.5V, 3.3V, 4.2V
- Low dropout voltage: 450 mV (maximum) at 200 mA
- Stable with 1.0 μF ceramic output capacitor
- Over-current protection
- Space-saving, 8-lead plastic 2x2 VDFN-8

2.1.1.1 MCP1710 DEMO BOARD FEATURES

The MCP1710 Demo Board is developed to demonstrate how the MCP1710 device operates over a wide input voltage and load range. Test points are provided for input and output, allowing the demo board to be connected directly to a system.

A copper via connected to the EN input can be used to turn the MCP1710 on and off. Turning the device on, ($EN > 70\%$ of V_{IN}) will enable the device. When the EN pin is less than 30% of V_{IN} , the device output is turned off.

2.2 GETTING STARTED

The MCP1710 Demo Board is fully assembled and tested to evaluate and demonstrate the MCP1710.

2.2.1 Power Input and Output Connection

2.2.1.1 POWERING THE MCP1710 DEMO BOARD

The MCP1710 Demo Board is fully assembled, tested and ready to begin evaluation. Apply positive input voltage to the V_{IN} terminal and its return to the GND terminal. The maximum input voltage should not exceed 5.5V. An electronic load or resistive load can be used for evaluation or the intended system load can be connected. Electronic loads can attempt to sink current at 0V during startup, therefore a resistive load or constant resistance is recommended for startup evaluation. Connect the positive voltage terminal of the load to the V_{OUT} terminal on the demo board, and connect the negative, or return side of the load, to the GND terminal.

2.2.1.2 BOARD TESTING

To test the board, follow these steps:

1. Apply input voltage.
2. An internal pull up resistor is connected from V_{IN} to the EN input of the MCP1710. Once the input voltage is greater than the set output voltage plus $V_{DROPOUT}$ (DS), and after a 30 ms startup delay, the output voltage will be in regulation.
3. Adjusting the input voltage and load should not cause the output to vary more than a few mV over the operating range of the converter.



MCP1710 DEMO BOARD USER'S GUIDE

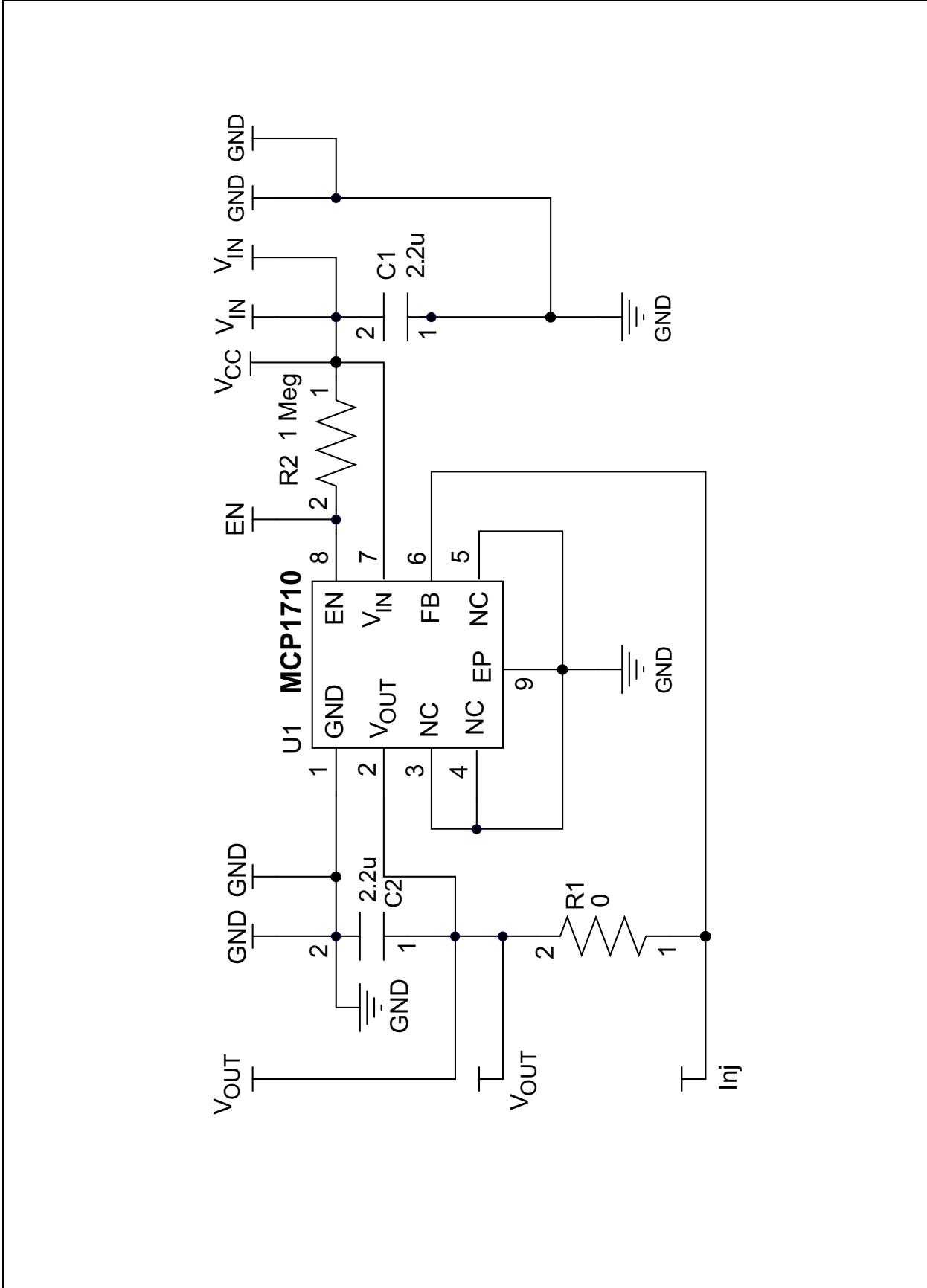
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

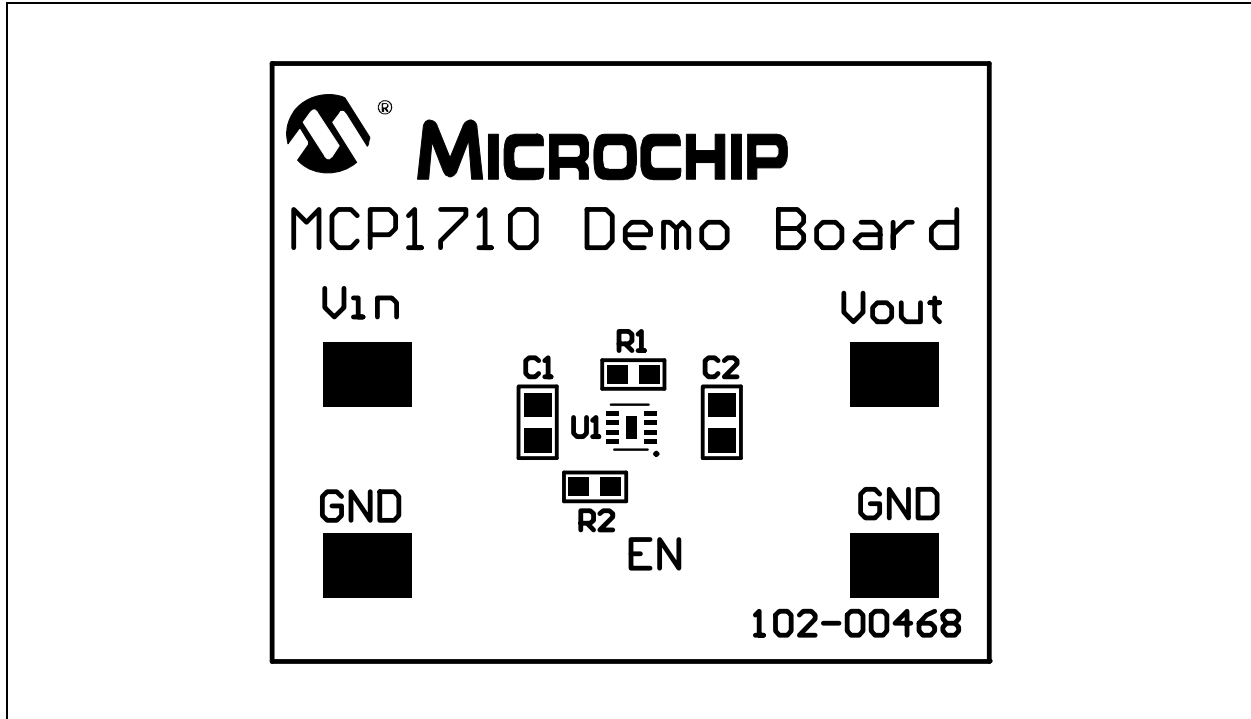
This appendix contains the following schematics and layouts for the MCP1710 Demo Board:

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

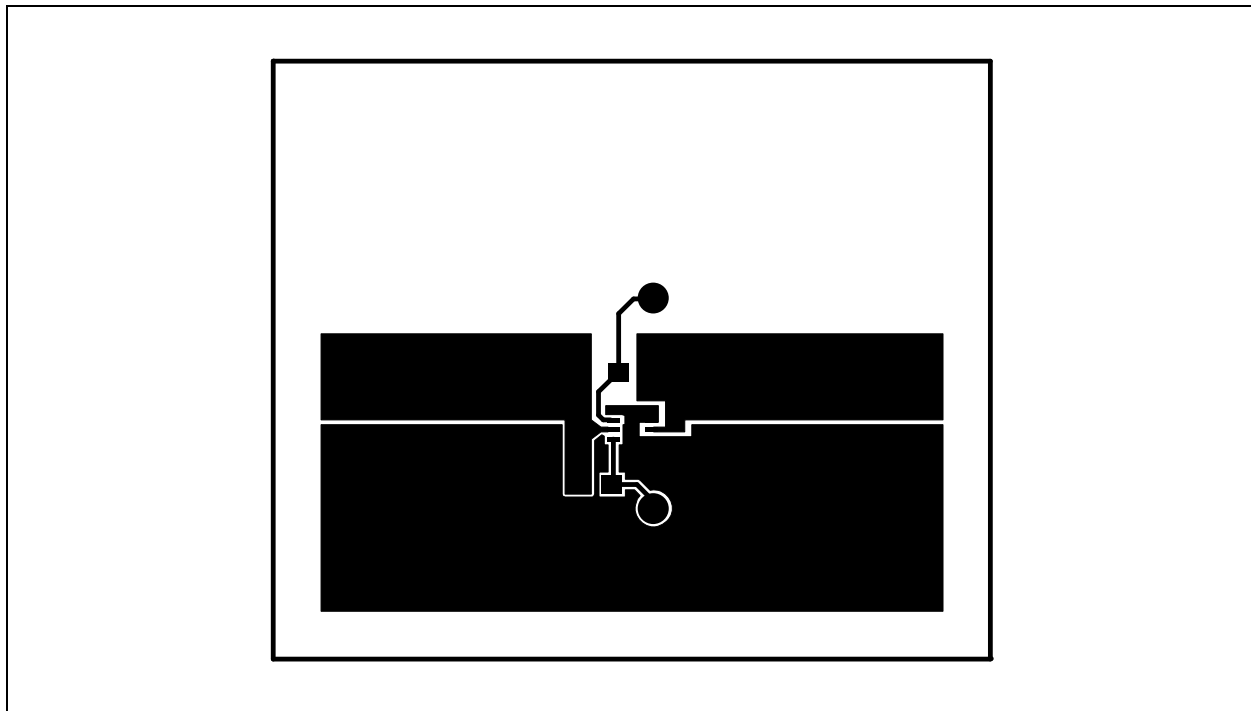
A.2 BOARD – SCHEMATIC



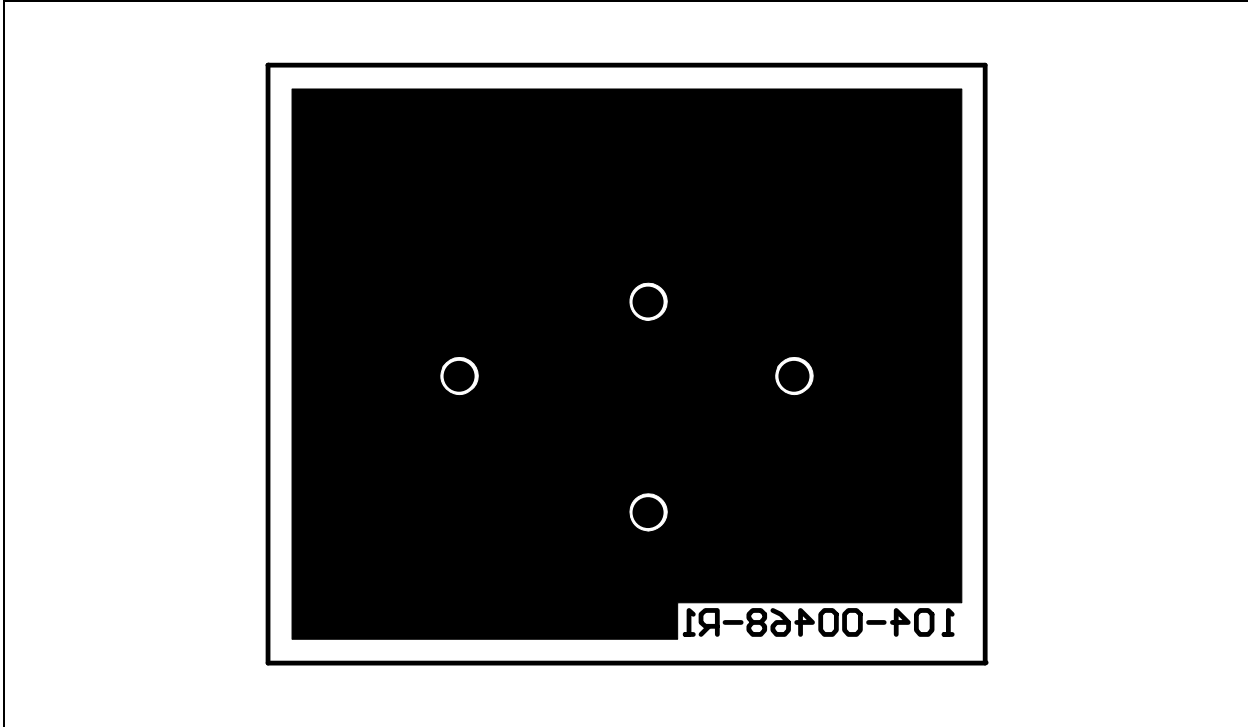
A.3 BOARD – TOP LAYER



A.4 BOARD – TOP COPPER



A.5 BOARD – BOTTOM COPPER



Appendix B. Bill of Materials

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
2	C1, C2	Cap. 2.2uF 16V ceramic X7R 0805 10%	TDK Corporation	C2012X7R1C225K
1	PCB	MCP1710 2.7 to 5.5V V_{IN} , 2.5V $_{OUT}$ printed circuit board	Microchip Technology Inc.	
1	R1	Res. 0.0 Ohm 1/10W 0603 SMD	Panasonic® - ECG	ERJ-3GEY0R00V
1	R2	Res. 1M Ohm 1/10W 5% 0603 SMD	Stackpole Electronics, Inc.	RMCF0603JT1M00
1	U1	MCP1710 ultra-low quiescent current LDO 2X2 DFN-8	Microchip Technology Inc.	
4	V_{IN} , V_{OUT} , GND, GND	PC test point compact SMT	Keystone Electronics Corp.	5016

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.



MICROCHIP

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 - Osaka
Tel: 81-66-152-7160
Fax: 81-66-152-9310

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

11/29/11