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MCP1810 Evaluation Board User's Guide

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Object of Declaration: MCP1810 Evaluation Board

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.
This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.
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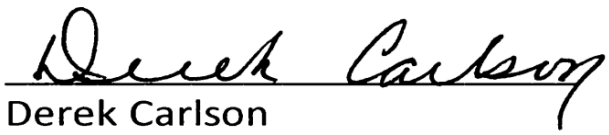

Derek Carlson
VP Development Tools

11-NOV-16
Date

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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 "DSXXXXXXXXA", where "XXXXXXXX" 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 MCP1810 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 MCP1810 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 MCP1810 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on installing and starting the Microchip Chip Manager application.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the MCP1810 Evaluation Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the MCP1810 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 the MCP1810 Evaluation Board. Other useful documents are listed below. The following Microchip document is available and recommended as a supplemental reference resource:

MCP1810 Data Sheet – *"MCP1810 Ultra-Low Quiescent Current LDO Regulator"* (DS20005623)

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
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- Field Application Engineer (FAE)
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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 (January 2017)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter covers a short overview of the MCP1810 Evaluation Board and includes the following topics:

- MCP1810 Short Overview
- MCP1810 Evaluation Board Description
- MCP1810 Evaluation Board Kit Contents

1.2 MCP1810 SHORT OVERVIEW

The MCP1810 Low Dropout (LDO) linear regulator can supply a 150 mA load (for output voltages, $V_R \leq 3.5V$) or 100 mA load if the output voltage is higher than 3.5V. The MCP1810 will maintain a 20 nA quiescent current if no load is present. Even more significant, when in shutdown, the MCP1810 draws a 1 nA current (typical).

MCP1810 comes in six standard fixed output voltage versions: 1.2V, 1.8V, 2.5V, 3.0V, 3.3V and 4.2V.

The MCP1810 device's characteristics of low output voltage, and up to 150 mA of output current, make the MCP1810 a good candidate for ultra long life LDO applications that require high output current to be combined with ultra low-power consumption during the Sleep state.

The LDO is stable with output ceramic capacitors, which inherently provide lower output noise and reduce the size of the whole regulator solution. MCP1810 is in regulation with only a 1 µF output capacitor; however, a 2.2 µF capacitor is recommended for optimum performance.

The MCP1810 device's ultra low quiescent current and shutdown current allow it to be paired with other ultra low-current consumption devices, such as Microchip's XLP technology devices, for a complete ultra low-power solution.

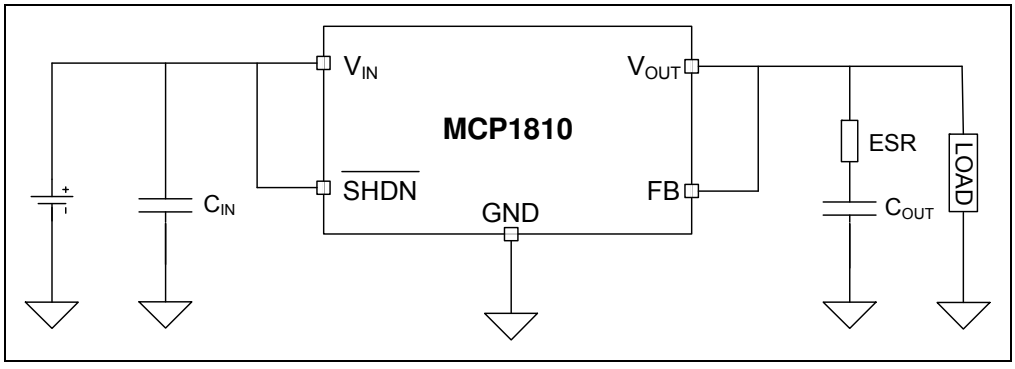


FIGURE 1-1: *MCP1810 Typical Application*

1.2.1 MCP1810 Features

- Ultra Low Quiescent Current: 20 nA (typical)
- Ultra Low Shutdown Supply Current: 1 nA (typical)
- 150 mA Output Current Capability for $V_R \leq 3.5V$ (where V_R is the regulated output voltage)
- 100 mA Output Current Capability for $V_R > 3.5V$
- Input Operating Voltages Range: 2.5V to 5.5V
- Standard Output Voltages (V_R): 1.2V, 1.8V, 2.5V, 3.0V, 3.3V, 4.2V
- Dropout Voltage (V_{DROP}): 380 mV @ 150 mA
- Stable with 1.0 µF Ceramic Output Capacitor with X7R or X5R Dielectric
- Overcurrent Protection
- Space-Saving, 8-Lead Very Thin Plastic Dual Flat No Lead Package, 2 x 2 mm Body VDFN

1.3 MCP1810 EVALUATION BOARD DESCRIPTION

The MCP1810 Evaluation Board operates with an input supply voltage range of 2.5V, up to 5.5V, and outputs a fixed regulated voltage according to the MCP1810 rating.

The board comes with test points that allow for easy integration into a test setup. The MCP1810 Evaluation Board also has an unpopulated part and capacitors in order to allow the customer to experiment with other voltage options and/or capacitor configurations.

1.3.1 MCP1810 Evaluation Board Features

The MCP1810 Evaluation Board was developed to showcase the MCP1810 device's performances over a wide input voltage range and load current range. The board comes with a MCP1810 fixed 3.3V output voltage, and access is given to the input and output pins, the $\overline{SHDN}$ pin and Ground pins. The MCP1810 is powered on when the voltage on the enable pin is at least 70% of V_{IN} and is turned off when the voltage on the $\overline{SHDN}$ pin drops below 30% of V_{IN}.

The user can experiment with different ESR values of the output capacitor by replacing the 0Ω series resistor. Also, the MCP1810 Evaluation Board comes with an unpopulated MCP1810 and capacitor footprints, which allow the user to experiment with different output voltage options for the MCP1810 and output capacitor sizes.

1.4 MCP1810 EVALUATION BOARD KIT CONTENTS

The MCP1810 Evaluation Board kit includes the following items:

- MCP1810 Evaluation Board (ADM00808)
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 GETTING STARTED

The MCP1810 Evaluation Board is fully assembled and tested to evaluate and demonstrate the characteristics of the MCP1810.

2.1.1 Powering the MCP1810 Evaluation Board

Apply the positive input voltage to the test point marked as V_{IN} and the return ground connection to the test point marked as GND. The input voltage needs to be a minimum of 4.1V in order to test the 3.3V output voltage option ($V_{IN} = V_R + 0.8V$). DO NOT APPLY a voltage higher than 5.5V or you may damage the part. The MCP1810 will be on, but as a default option, it can be turned on with a pull-up resistor to V_{IN}. The part can be shut down by placing a jumper on the $\overline{SHDN}$ connector. Note that current will flow through the resistor when trying to measure the quiescent current; that being said, it is advisable to remove the pull-up resistor and place a wire or zero ohm resistor in its place if you're attempting to measure the quiescent or shutdown current.

The output current capabilities can be tested using resistive loads or an electronic load set to constant resistance. The positive terminal of the load must be connected to V_{OUT} and the negative terminal to the corresponding test point marked with GND.

Note:	Note that an electronic load will have the tendency to sink a current when the output of the LDO is 0V.

2.1.2 Board Testing

2.1.2.1 TESTING THE DEFAULT CONFIGURATION – TOP SIDE OF THE BOARD

To test the board, follow these steps:

1. Apply the appropriate input voltage, $V_{IN} = 5V$
2. Use a multimeter and measure the input voltage and output voltage. V_R should be 3.3V.
3. Connect a resistor with 66Ω to the V_{OUT} and GND terminal as a load and test V_R; it should be 3.3V.
4. Connect a jumper on the $\overline{SHDN}$ header. Test V_R; it should be 0V.
5. Remove the jumper from the $\overline{SHDN}$ header; V_R should be 3.3V.

By adjusting the input voltage or load, while still maintaining nominal operating conditions, the LDO will remain in regulation.

2.1.2.2 TESTING A CUSTOM CONFIGURATION – BOTTOM SIDE OF THE BOARD

This area can be populated with a different MCP1810 voltage and it allows the user to use different options for the output capacitor. Tantalum capacitors in packages compatible with the B style case or lower can be used.

Also, the access to the enable pin is provided via the $\overline{\text{SHDN}}$ test point.

After soldering the part and capacitors, follow Steps 1 to 4 from **Section 2.1.2.1 "Testing the Default Configuration – Top Side of the Board"** to evaluate the performance of the part.

In order to test the shutdown functionality, a jumper wire is required to connect the $\overline{\text{SHDN}}$ pin to a ground terminal.

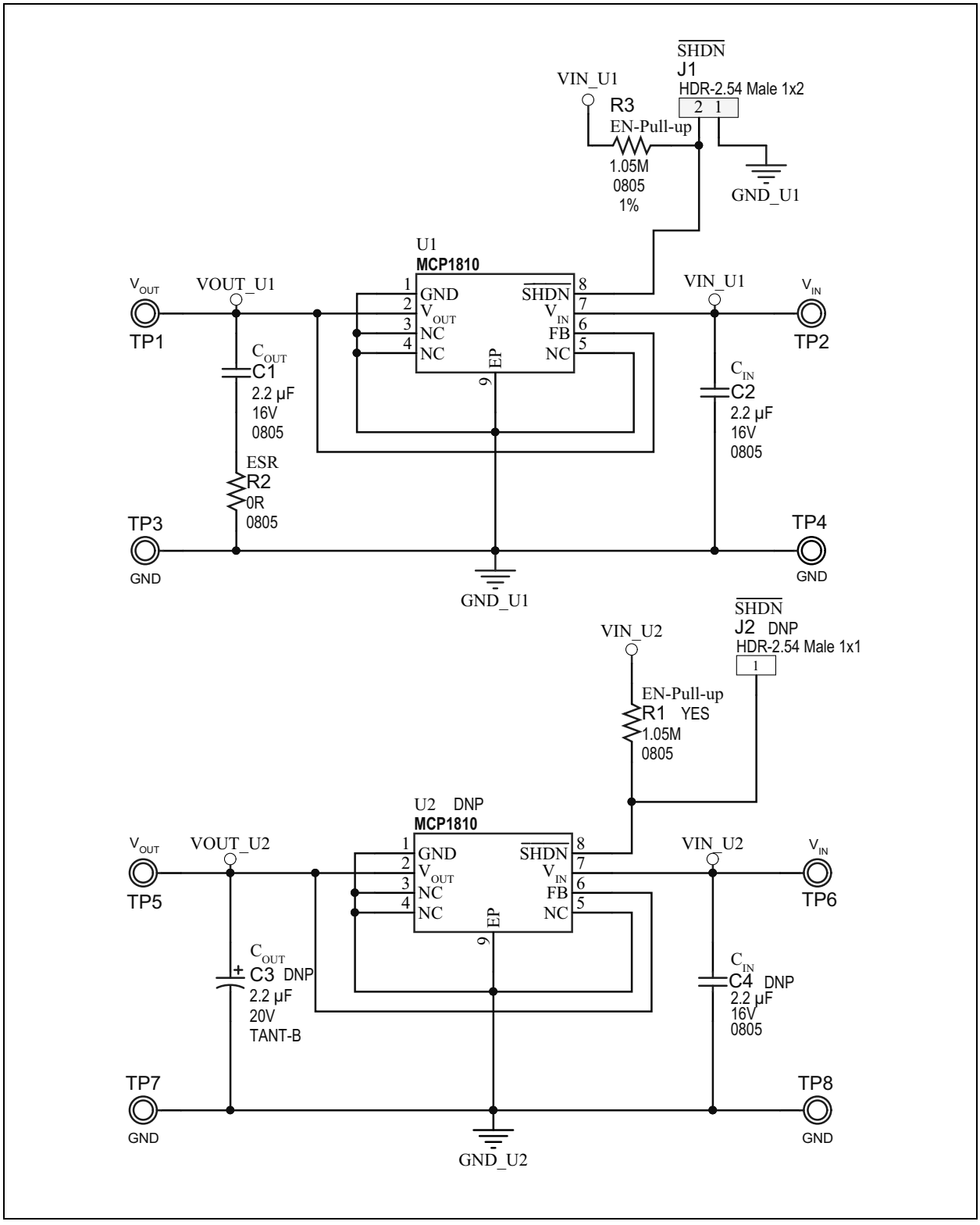
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

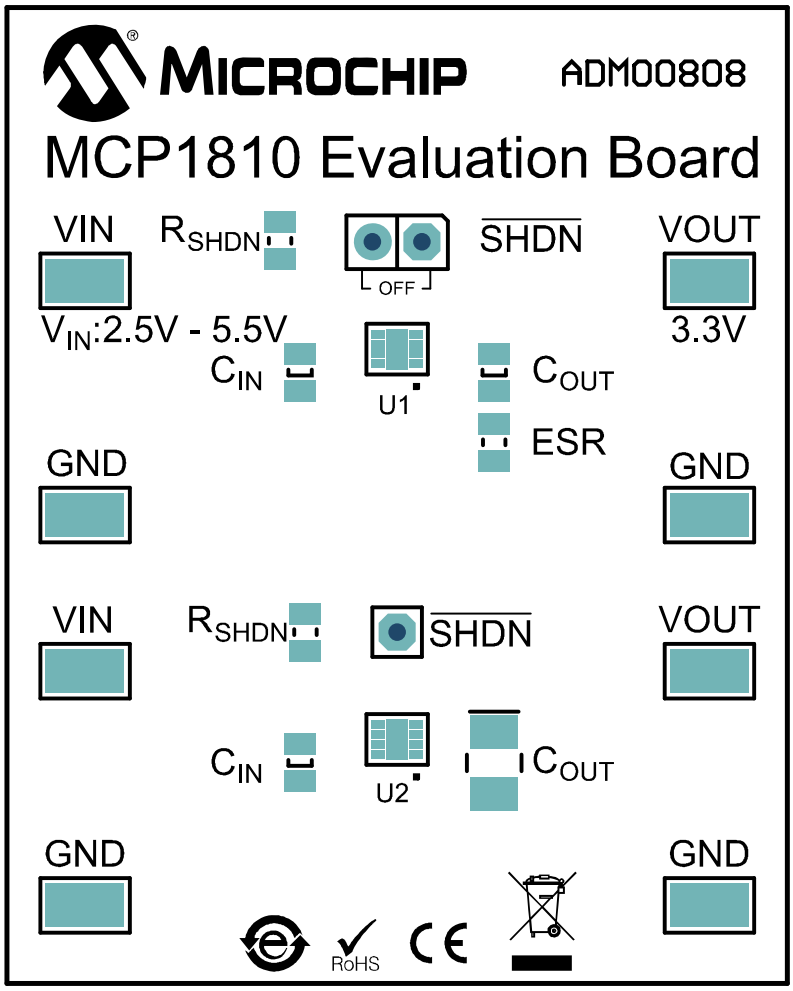
This appendix contains the following schematics and layouts for the MCP1810 Evaluation Board:

- Board – Schematic
- Board – Top Silk
- Board – Top Copper and Silk
- Board – Top Copper
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

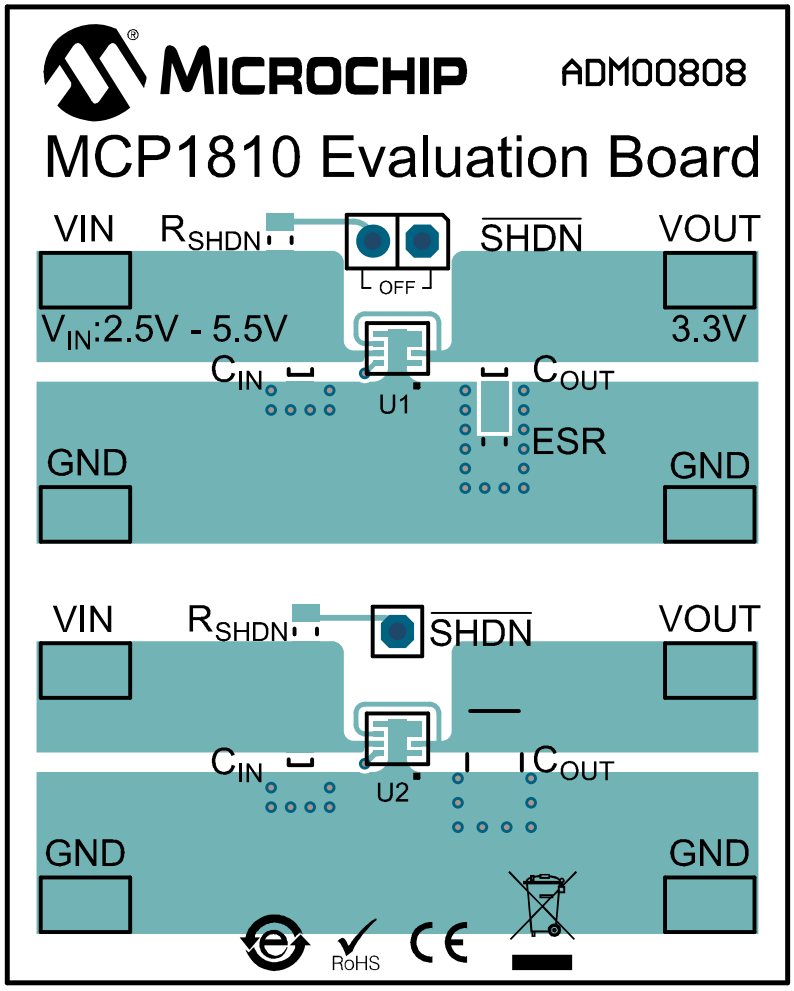
A.2 BOARD – SCHEMATIC



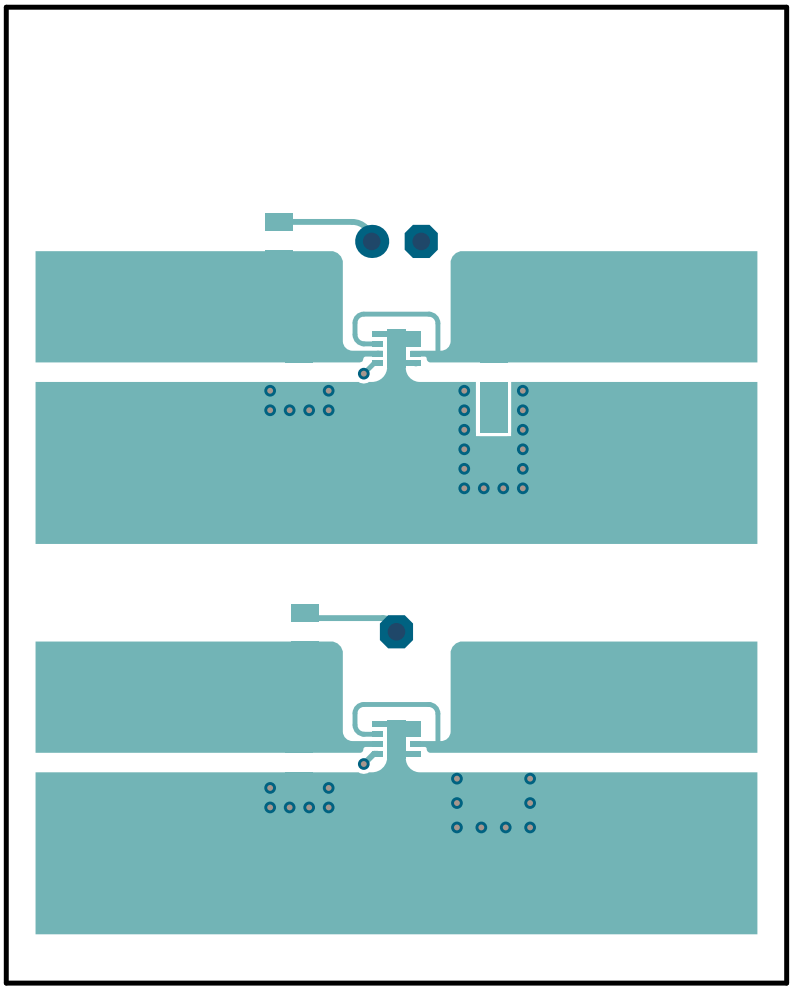
A.3 BOARD – TOP SILK



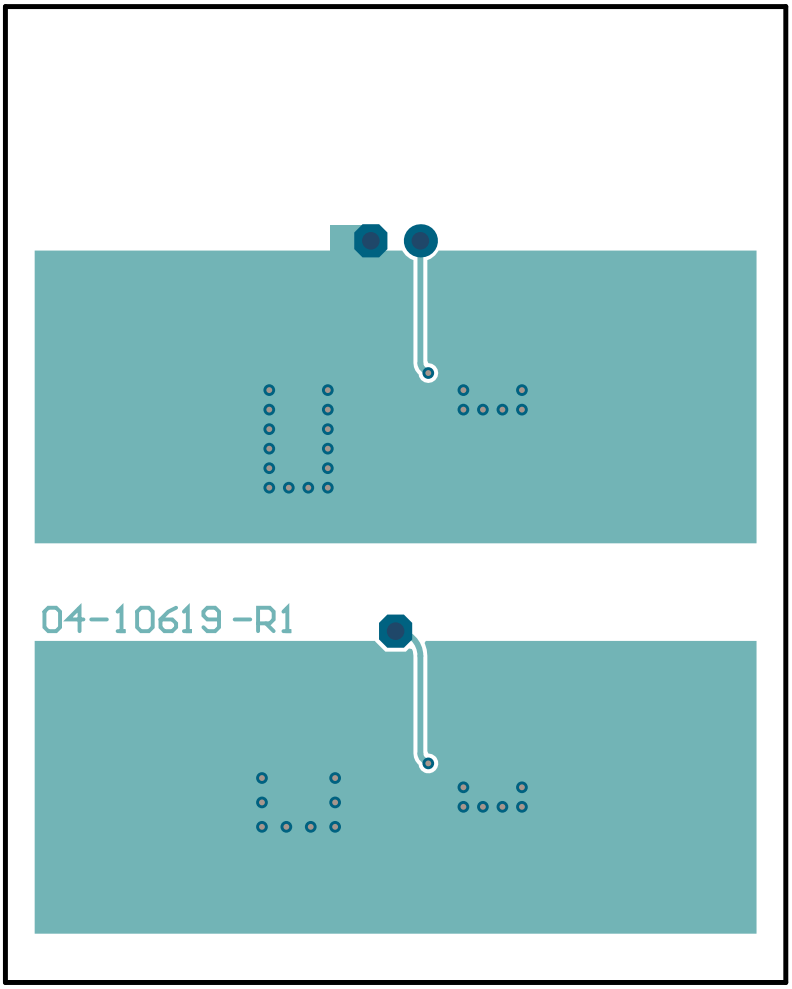
A.4 BOARD – TOP COPPER AND SILK



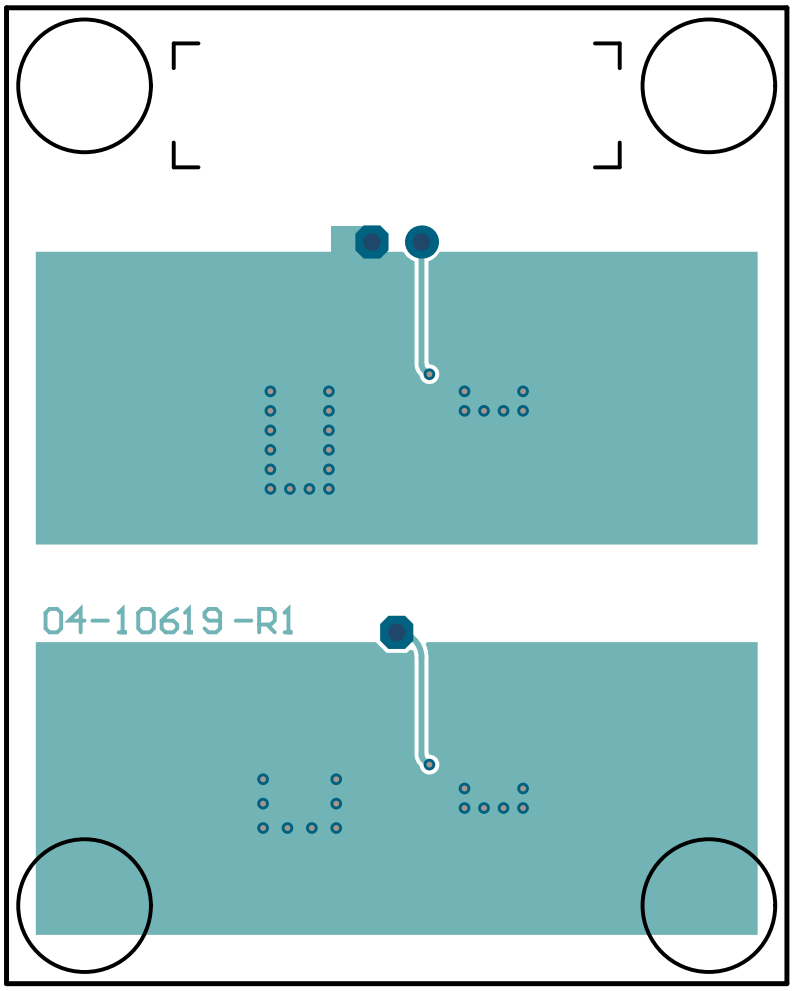
A.5 BOARD – TOP COPPER



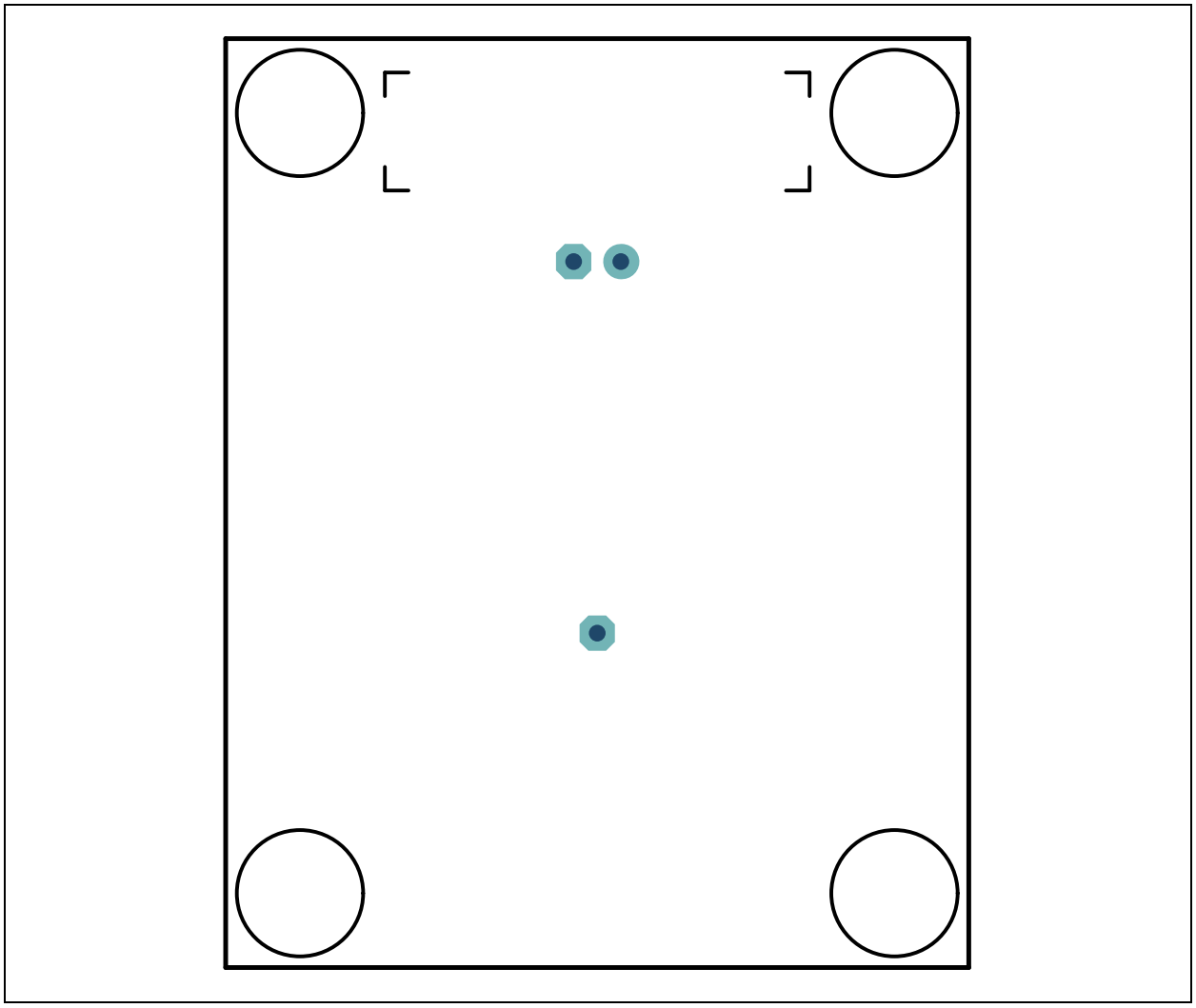
A.6 BOARD – BOTTOM COPPER



A.7 BOARD – BOTTOM COPPER AND SILK



A.8 BOARD – BOTTOM SILK



Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)[1]

Qty.	Reference	Description	Manufacturer	Part Number
2	C1, C2	Capacitor Ceramic, 2.2 µF, 16V, 10%, X7R, SMD, 0805	TDK Corporation	C2012X7R1C225K125AB
1	J1	Connector Header – 2.54 Male, 1x2, Tin, 6.75 MH TH, Vertical	Molex®	0901200122
4	PAD1, PAD2, PAD3, PAD4	Mechanical HW, Rubber Pad, Hemisphere, D6.4 H1.9, Clear	3M	SJ5382
1	PCB	Printed Circuit Board – MCP1810 Evaluation Board	Microchip Technology Inc.	04-10619
2	R1, R3	Resistor TKF, 1.05M, 1%, 1/8W, SMD, 0805	Yageo Corporation	RC0805FR-071M05L
1	R2	Resistor TKF, 0R, 1/8W, SMD, 0805	Panasonic®	ERJ-6GEY0R00V
8	TP1, TP2, TP3, TP4,TP5, TP6, TP7, TP8	Connector TP, TAB, Silver Mini, 3.8x2.03, SMD	Keystone Electronics Corp.	5019
1	U1	Microchip Analog LDO, 3.3V, MCP1810T-33I VDFN-8	Microchip Technology Inc.	MCP1810T-33I/J8A

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.

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