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MCP1612 Evaluation Board User's Guide

Table of Contents

NOTES:

MCP1612 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 MCP1612 Evaluation Board. Items discussed in this chapter include:

- About This Guide
- Recommended Reading
- The Microchip Web Site
- Customer Support

ABOUT THIS GUIDE

Document Layout

This document describes how to use the MCP1612 Evaluation Board. The manual layout is as follows:

- **Chapter 1: Installation and Operation** – Describes how to use the various features of the MCP1612 Evaluation Board.
- **Appendix A: Schematic and Layouts** – Shows the schematic and Printed Circuit Board (PCB) layout diagrams for the MCP1612 Evaluation Board.
- **Appendix B: Bill-of-Materials** – Shows the parts used to build the MCP1612 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
'b*nnnn*	A binary number where *n* is a digit	'b00100, 'b10
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier font:		
Plain Courier	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`
Italic Courier	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
`0x`*`nnnn`*	A hexadecimal number where *`n`* is a hexadecimal digit	`0xFFFF`, `0x007A`
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

The following Microchip documents are available and recommended as supplemental reference resources.

MCP1612 Data Sheet, "Single 1A, 1.4 MHz Synchronous Buck Regulator", DS21921

The data sheet provides detailed information regarding the MCP1612 buck regulator.

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support
- Development Systems Information Line

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

In addition, there is a Development Systems Information Line which lists the latest versions of Microchip's development systems software products. This line also provides information on how customers can receive currently available upgrade kits.

The Development Systems Information Line numbers are:

1-800-755-2345 – United States and most of Canada

1-480-792-7302 – Other International Locations

REVISION HISTORY

Revision A (January 2005)

- Initial Release of this Document.

NOTES:

MCP1612 Evaluation Board User's Guide

Chapter 1. Installation and Operation

1.1 INTRODUCTION

The MCP1612 is a 1A, 1.4 MHz, fully integrated buck regulator. The output voltage is selectable from 0.8V to V_{IN} by use of an external resistor divider. It is available in both the 8L-MSOP and 8L-DFN packages.

The MCP1612 Evaluation Board contains two independent buck regulators featuring the 8L-MSOP and the 8L-DFN packages. The output voltage is set to one of eight different preset values (four per regulator circuit) by use of a two-position DIP switch. Each regulator circuit can supply an output current of 0 to 1A.

1.2 EVALUATION BOARD DESCRIPTION

The MCP1612 Evaluation Board consists of two separate 0 to 1A buck regulator circuits. One circuit (CKT_1) features the 8L-MSOP package, while the other circuit (CKT_2) features the 8L-DFN package. Each circuit has four different preset output voltage (V_{OUT}) settings.

The settings for V_{OUT} on CKT_1 are 0.8V, 1.0V, 1.2V, and 1.4V. Refer to **Section 1.3.1 "CKT_1 Operation"** for an explanation detailing how to set V_{OUT}. The input voltage (V_{IN}) of CKT_1 can be 2.7V to 5.5V for any setting of V_{OUT}.

The settings for V_{OUT} on CKT_2 are 0.8V, 1.7V, 2.4V, and 3.3V. Refer to **Section 1.3.2 "CKT_2 Operation"** for an explanation detailing how to set V_{OUT}. Since the MCP1612 is a buck regulator, V_{OUT} has to be lower than V_{IN}. Therefore, it is recommended that V_{IN} for CKT_2 be greater than V_{OUT} plus 500 mV to 5.5V to ensure proper operation.

1.3 HOW IT IS USED

1.3.1 CKT_1 Operation

1. Connect the 2.7V to 5.5V lab power supply to the V_{IN} (TP1) pin and the GND (TP2) pin.

Note: The MCP1612 will not operate until V_{IN} is above the 2.7V threshold.

2. Connect an electronic or resistive load between V_{OUT} (TP4) pin and GND (TP5) pin.

Note: The MCP1612 is specified to deliver 0 to 1A of load current. The internal overcurrent limit is 2.3A. However, care should be taken not to exceed the 1A current rating of the part.

3. The values of V_{OUT} are predetermined and are selectable by a two-position DIP switch (S1). Table 1-1 lists the switch settings and V_{OUT}.

TABLE 1-1: S1 SWITCH SETTINGS AND V_{OUT}

S1, Position 1	S1, Position 2	V_{OUT}
Off	Off	0.8V
On	Off	1.0V
Off	On	1.2V
On	On	1.4V

4. With V_{IN} applied, verify that V_{OUT} agrees with the switching settings listed above.
5. A resistor pulls the shutdown ($\overline{SHDN}$), pin up to V_{IN}, making the circuit always enabled. The circuit can be disabled by pulling the $\overline{SHDN}$ (TP3) pin to ground.

1.3.2 CKT$_2$ Operation

1. Connect the 2.7V to 5.5V power supply to the V_{IN} (TP9) pin and the GND (TP10) pin.

Note 1: The MCP1612 will not operate until V_{IN} is above the 2.7V threshold.

2: Since the MCP1612 is a buck regulator, V_{OUT} has to be lower than V_{IN}. Therefore, it is recommended to ensure proper operation that V_{IN} be greater than V_{OUT} plus 500 mV to 5.5V.

2. Connect an electronic or resistive load between V_{OUT} (TP7) pin and GND (TP6) pin.

Note: The MCP1612 is specified to deliver 0 to 1A of load current. The internal overcurrent limit is 2.3A. However, care should be taken not to exceed the 1A current rating of the part.

3. The values of V_{OUT} are predetermined and are selectable by a two-position DIP switch (S2). Table 1-2 lists the switch settings and V_{OUT}.

TABLE 1-2: S2 SWITCH SETTING AND V_{OUT}

S2, Position 1	S2, Position 2	V_{OUT}
Off	Off	0.8V
On	Off	1.7V
Off	On	2.4V
On	On	3.3V

4. With V_{IN} applied, verify that V_{OUT} agrees with the switching settings listed above.
5. A resistor pulls the shutdown ($\overline{SHDN}$) pin up to V_{IN}, making the circuit always enabled. The circuit can be disabled by pulling the $\overline{SHDN}$ (TP8) pin to ground.

1.4 HOW IT WORKS

1.4.1 MCP1612 Functions

The MCP1612 is a fixed 1.4 MHz synchronous buck regulator that has integrated switching and synchronous MOSFETs. Other features integrated into the device include shutdown control, soft start, undervoltage lockout, overcurrent and overtemperature protection. The high switching frequency allows the use of a smaller inductor and filter capacitors which ultimately lead to a space-saving design. The output voltage is set by a simple resistor divider network and compensation is accomplished by a series resistor capacitor to ground.

1.4.2 Power Topology and Output Regulation

The MCP1612 is a buck regulator with integrated switching and synchronous MOSFETs. Under normal operation, current ramps up in the buck inductor when the P-channel MOSFET is on. This current is sensed and compared to the output of the error amplifier. The error amplifier output is the difference between the internal 0.8V reference and the divided down V_{OUT}. When the sensed inductor current ramps up to the point that is equal to the amplifier error signal, the P-channel MOSFET is turned off and the N-channel synchronous MOSFET is turned on until the beginning of the next switching cycle.

NOTES:

Appendix A. Schematic and Board Layouts

A.1 INTRODUCTION

This appendix contains the schematic and Printed Circuit Board (PCB) layout diagrams for the MCP1612 Evaluation Board.

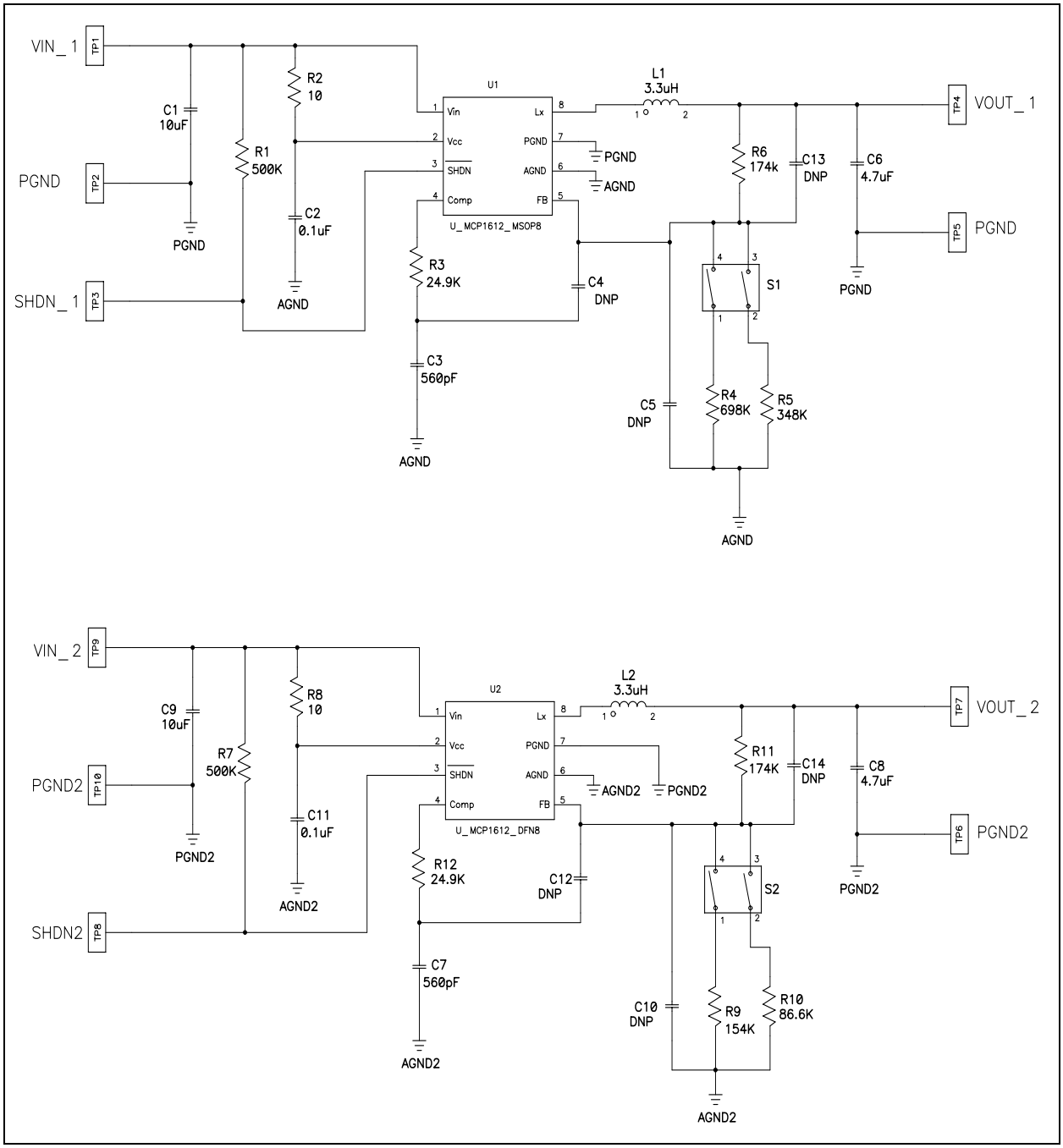
A.1.1 Highlights

The MCP1612 Evaluation Board is constructed using a two-layer PCB. The top and bottom layers are for components and traces.

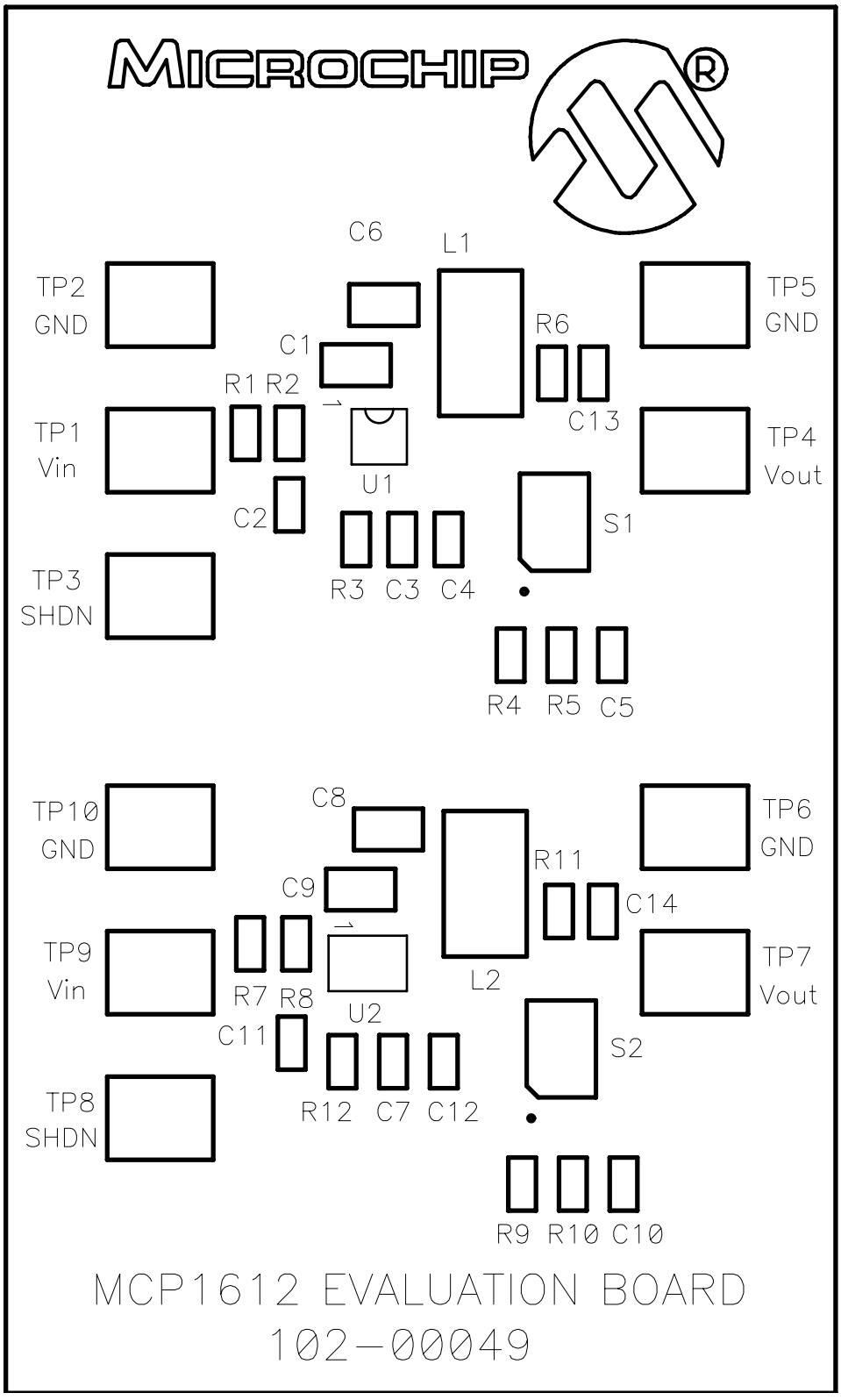
Diagrams included in this appendix:

- Schematic
- Top Silk-Screen Layer
- Top Metal Layer
- Bottom Metal Layer
- Bottom Silk-Screen Layer

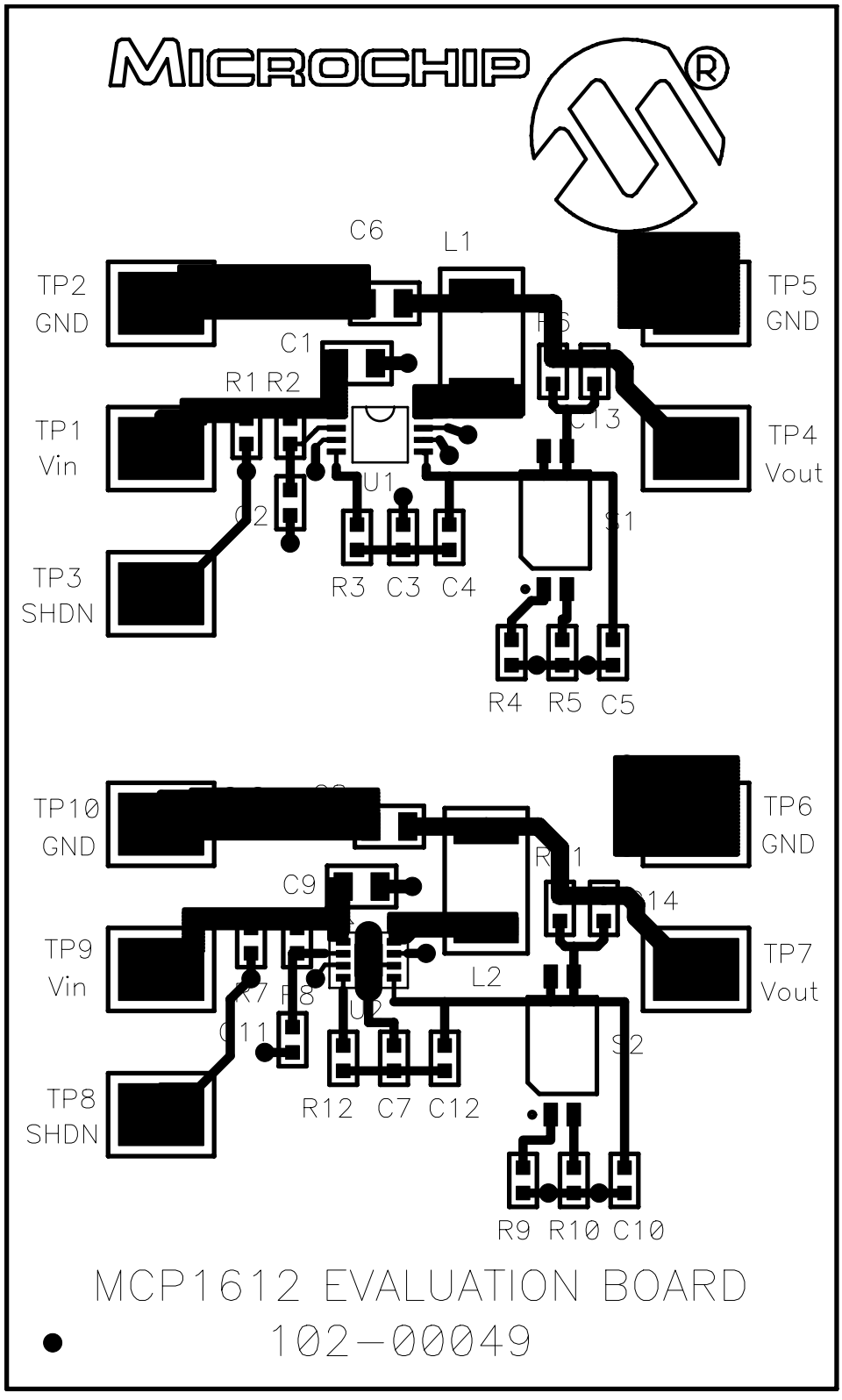
A.2 SCHEMATIC



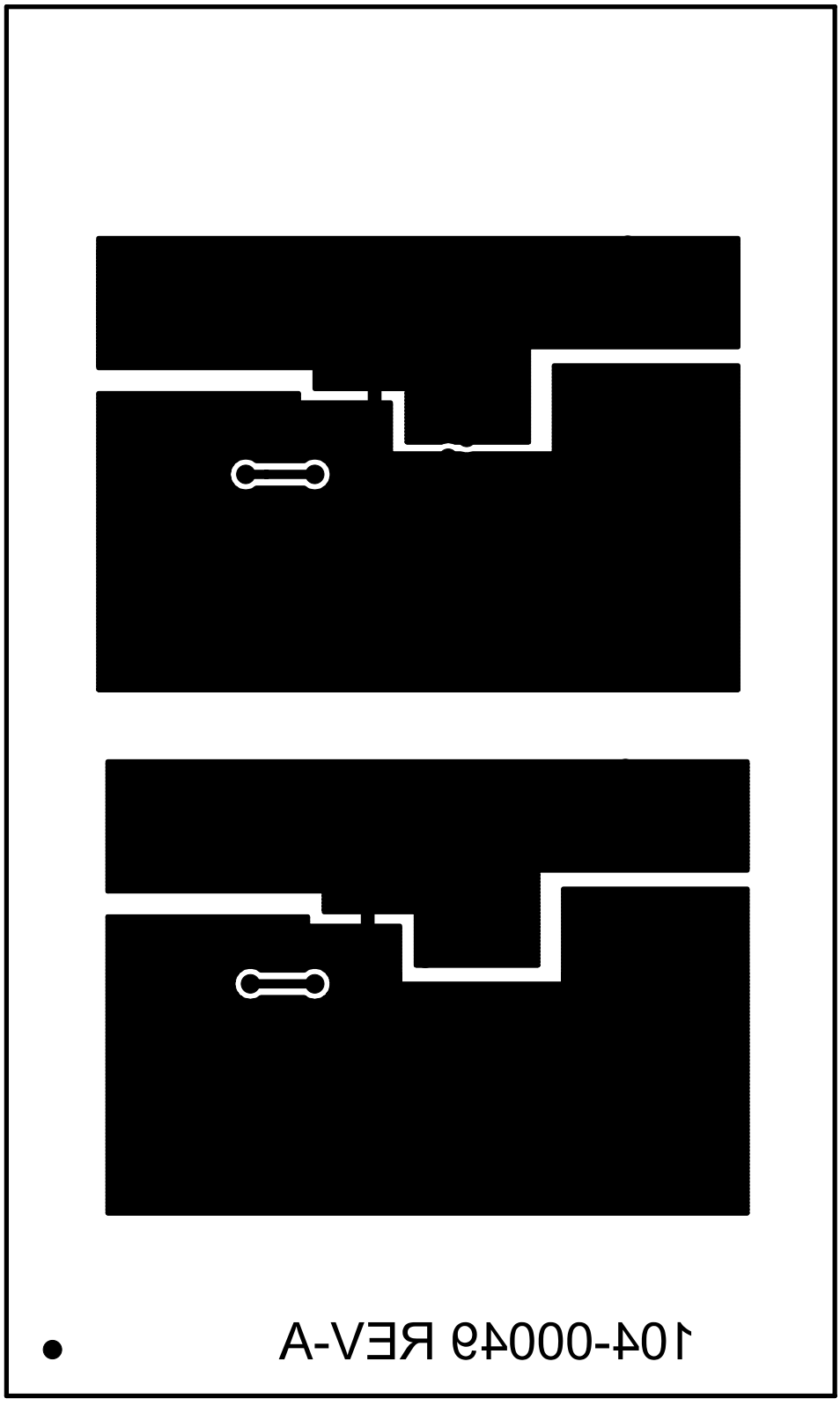
A.3 TOP SILK-SCREEN LAYER



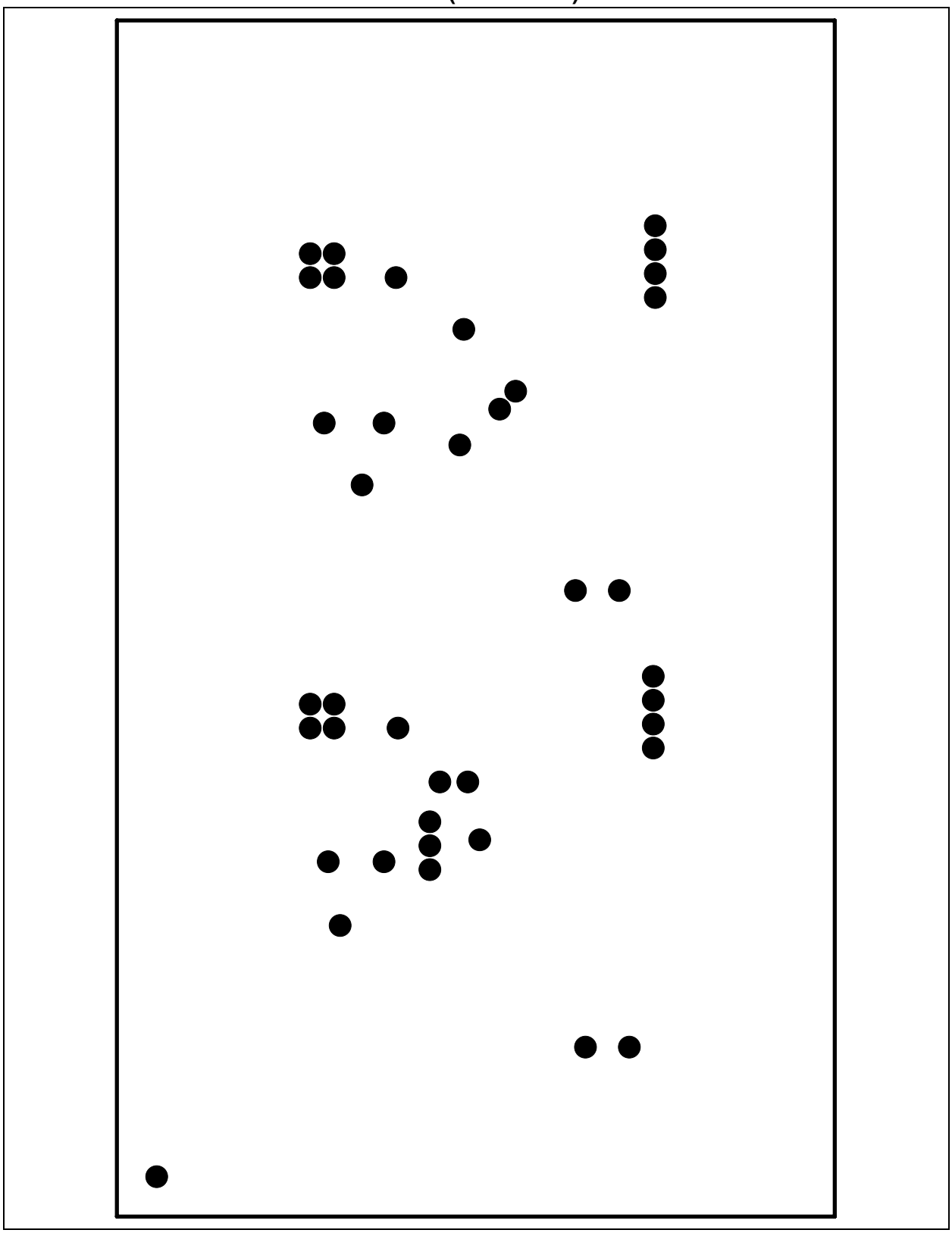
A.4 TOP METAL LAYER



A.5 BOTTOM METAL LAYER



A.6 BOTTOM SILK-SCREEN LAYER (TOP VIEW)



Appendix B. Bill-of-Materials (BOM)

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

Qty	Reference	Description	Manufacture	Manufacture P/N
2	C2, C11	Capacitor, 0.1 µF, 0603	KEMET Electronics®	C0603C104J4RACTU
2	C6, C8	Capacitor, 4.7 µF, 0805	Panasonic - ECG	ECJ-2FB1C475K
2	C1, C9	Capacitor, 10 µF, 0805	MuRata Electronics®	GRM21BR61A106KE19L
2	C3, C7	Capacitor, 560 pF, 0603	TDK Electronics Co., LTD	C1608C0G1H561J
4	C4, C5, C10, C12, C13, C14	Do Not Populate	–	–
2	L1, L2	3.3 µH Inductor	Coilcraft®	DO1608C-332
1	U2	MCP1612 DFN	Microchip Technology Inc.	MCP1612-ADJI/MF
1	U1	MCP1612 MSOP	Microchip Technology Inc.	MCP1612-ADJI/MS
2	R2, R8	Resistor, 10Ω, 0603	Yageo America	9C06031A10R0FKHFT
2	R3, R12	Resistor, 24.9 kΩ, 0603	Yageo America	9C06031A2492FKHFT
1	R10	Resistor, 86.6 kΩ, 0603	Yageo America	9C06031A8662FKHFT
1	R9	Resistor, 154 kΩ, 0603	Yageo America	9C06031A1543FKHFT
2	R6, R11	Resistor, 174 kΩ, 0603	Yageo America	9C06031A1743FKHFT
1	R5	Resistor, 348 kΩ, 0603	Yageo America	9C06031A3483FKHFT
2	R1, R7	Resistor, 500 kΩ, 0603	Yageo America	9C06031A5003FKHFT
1	R4	Resistor, 698 kΩ, 0603	Yageo America	9C06031A6983FKHFT
2	S1, S2	DIP Switch	ITT Industries, C&K Div.	TDA02H0SK1
10	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	SMT Test Point	Keystone Electronics®	5016

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Fax: 43-7242-2244-393

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Fax: 45-4485-2829

France - Massy
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