MCP1602 Evaluation Board User's Guide

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MCP1602 EVALUATION BOARD USER'S GUIDE

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MCP1602 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 MCP1602 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 MCP1602 Evaluation Board as a development tool. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP1602 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 MCP1602 Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the MCP1602 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 MCP1602 Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

MCP1602 Data Sheet, *"2.0 MHz, 500 mA Synchronous Buck Regulator with Power-Good"*, DS22061A

This data sheet provides detailed information regarding the MCP1602 product family.

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

DOCUMENT REVISION HISTORY

Revision A (November 2007)

- Initial Release of this Document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP1602 Evaluation Board demonstrates the features and capabilities of Microchip's MCP1602 Evaluation Board 500 mA PFM/PWM Synchronous Buck Regulator. The MCP1602 is a step-down (Buck) switching regulator with a Power-Good monitor to provide a highly integrated solution for systems that require supply voltage between 0.8V to 4.5V. The MCP1602 requires input voltage range from 2.7V to 5.5V. The MCP1602 Evaluation Board includes a MCP1602 circuit that has a Shutdown feature and a 4-position Dip Switch to select between different output voltages. MCP1602 Evaluation Board is available in 0.8V, 1.2V, 1.8V, 2.5V and 3.3V. Additional test points are available on the MCP1602 Evaluation Board for reviewing the performances and features of MCP1602 Evaluation Board.

This chapter covers the following topics:

- What is the MCP1602 Evaluation Board?
- What the MCP1602 Evaluation Board Kit includes

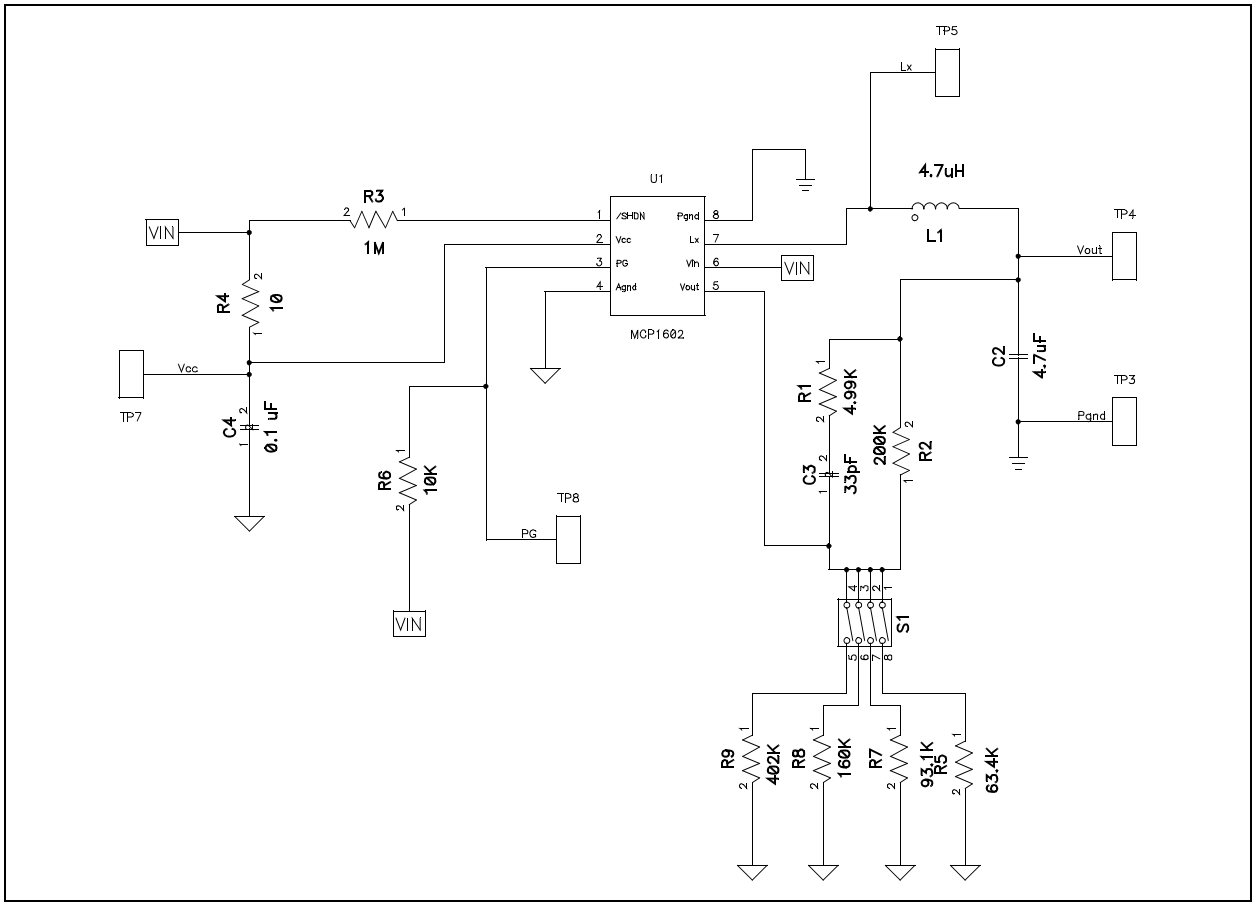

FIGURE 1-1: *MCP1602 Typical Applications With Adjustable Output Voltage.*

1.2 WHAT IS THE MCP1602 EVALUATION BOARD?

The MCP1602 Evaluation Board demonstrates the use of PFM/PWM Synchronous Buck Controller that regulates output voltages from 0.8V to 4.5V with Adjustable version or 1.2V, 1.5V, 1.8V, 2.5V and 3.3V with Fixed-Output version.

The MCP1602 Evaluation Board Evaluation Board is setup to evaluate simple DC-to-DC conversion. This board utilizes Microchip's MCP1602 Evaluation Board (PFM/PWM Synchronous Buck Regulator) that effectively steps down from V_{IN} to regulated V_{OUT}. The Power Good function can be observed via the output signal on the PG pin. The MCP1602 on the MCP1602 Evaluation Board is enabled and can be turned off by pulling the $\overline{SHDN}$ pin low.

The MCP1602 Evaluation Board is designed to observe the performance and features on the circuit 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 extra work.

1.3 WHAT THE MCP1602 EVALUATION BOARD KIT INCLUDES

This MCP1602 Evaluation Board Kit includes:

- MCP1602 Evaluation Board, 102-00120
- MCP1602 Device with adjustable output voltage (Installed)
- Analog and Interface Products Demonstration Boards CD-ROM (DS21912)
  - MCP1602 Evaluation Board User's Guide, DS51691
  - MCP1602 Evaluation Board Data Sheet, *"2..0 MHz, 500 mA Synchronous Buck Regulator with Power-Good"*, DS22061

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Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP1602 Evaluation Board demonstrates Microchip's MCP1602 device. This device is a 500 mA, 2.0 MHz PFM/PWM Step-Down DC/DC Regulators With Power-Good feature. It is available in adjustable and fixed outputs.The MCP1602 features Shutdown, Power-Good Monitor, Output Short Circuit Protection and Over-temperature Protection.

The device requires only minimum components to implement a complete Step-Down DC/DC Circuit. The MCP1602 is designed to operate in PFM (Pulse Frequency Modulation) and PWM (Pulse Width Modulation) modes with various load conditions that is ideal for battery-powered portable applications.

The MCP1602 Evaluation Board provides five regulated output voltages for evaluation. Available output voltages are: 0.8V, 1.2V, 1.8V, 2.5V and 3.3V.

Typical applications for the MCP1602 device are: PDAs, Portable Computers, Portable Media Players, USB-Powered Systems, Digital Cameras, Handheld Medical Instruments, Ultra-Mobile PCs and Portable Communicators.

2.2 FEATURES

The MCP1602 Evaluation Board has the following features:

- Adjustable Output Voltages: 0.8V, 1.2V, 1.8V, 2.5V and 3.3V
- Input Voltage Range: 2.7V to 5.5V
- Shutdown Test Point
- Power-Good Test Point
- Easy V_{OUT} setup with Slide Style Dip Switch
- L_X Test Point for switching behavior observation.

2.3 GETTING STARTED

The MCP1602 Evaluation Board is fully assembled and tested for generating a regulated 0.8V, 1.2V, 1.8V, 2.5V and 3.3V output voltage from the MCP1602 device with a 2.7V to 5.5V input voltage source for $V_{IN} > V_{OUT}$.

2.3.1 Power Input and Output Connection

2.3.1.1 POWERING THE MCP1602 EVALUATION BOARD

1. Connect the negative terminal of the DC power supply to P_{GND}.
2. Connect the positive terminal of the DC power supply to V_{IN}.
3. Connect the positive terminal of the multimeter to V_{OUT} and the negative terminal to P_{GND}. The multimeter should display a regulated output voltage.
4. Adjust the DIP Switch to the desired value and the multimeter should read the desired output voltage. Refer to Table 2-1 for the voltage regulation.

Note: The number labels on the DIP SWITCH may have slightly different way to demonstrate the mark, but will not affect the performance of the board.

5. The $\overline{SHDN}$ pin defaults to the enabled position on the MCP1602 Evaluation Board. To enter the shutdown mode, drive the $\overline{SHDN}$ pin low.
6. The L_X pin is available to observe the switching waveforms. By adjusting a variable load that is connected to V_{OUT}, the transitions between PFM/PWM can be easily observed.
7. The PG pin is available to monitor the Power-Good signal.

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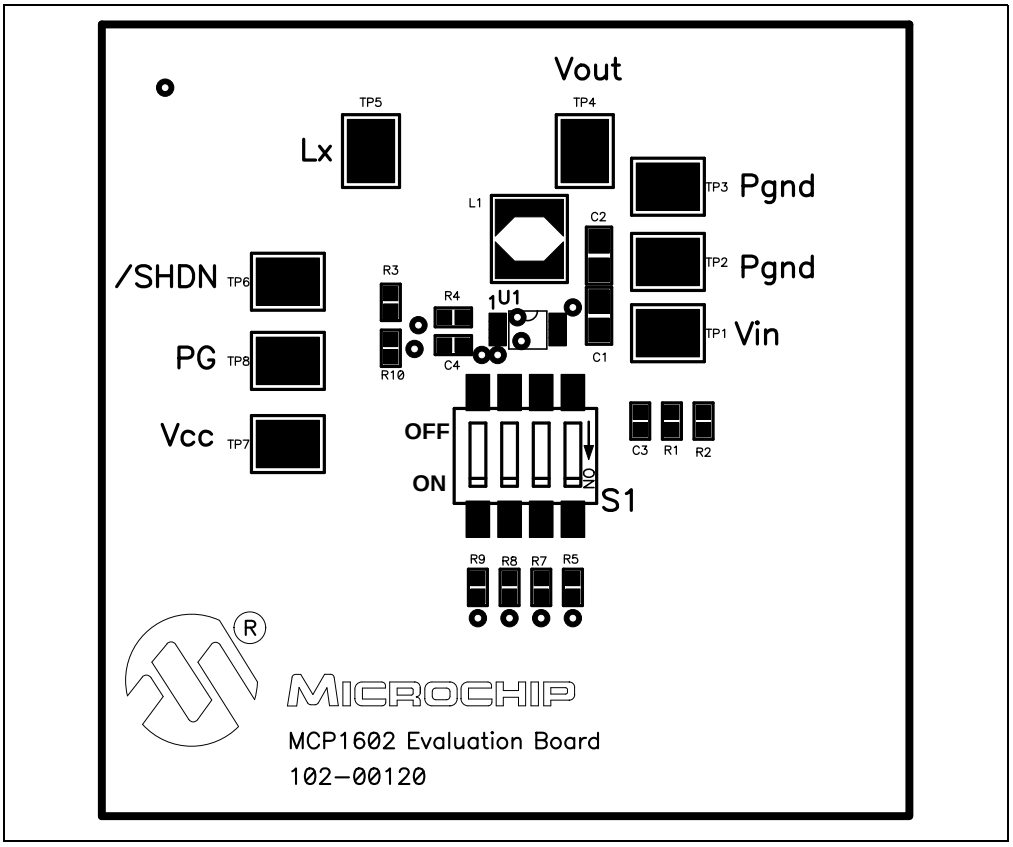

FIGURE 2-1: *Board Top Assembly.*

TABLE 2-1: OUTPUT VOLTAGE REGULATION DIP POSITION

Voltage (V)	1	2	3	4
0.8V	OFF	OFF	OFF	OFF
1.2V	ON	OFF	OFF	OFF
1.8V	OFF	ON	OFF	OFF
2.5V	OFF	OFF	ON	OFF
3.3V	OFF	OFF	OFF	ON

NOTES:

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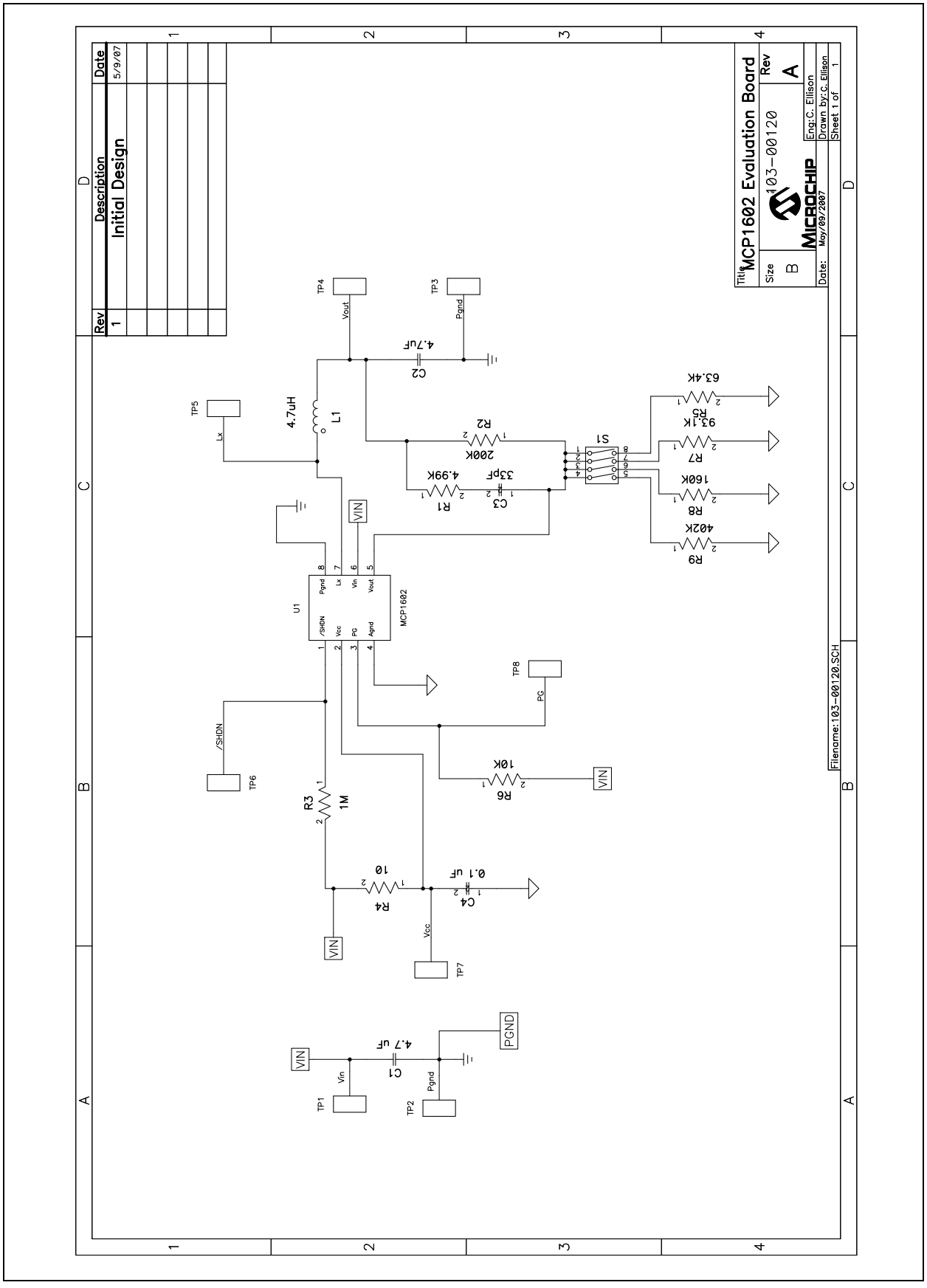
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP1602 Evaluation Board:

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

A.2 BOARD – SCHEMATIC



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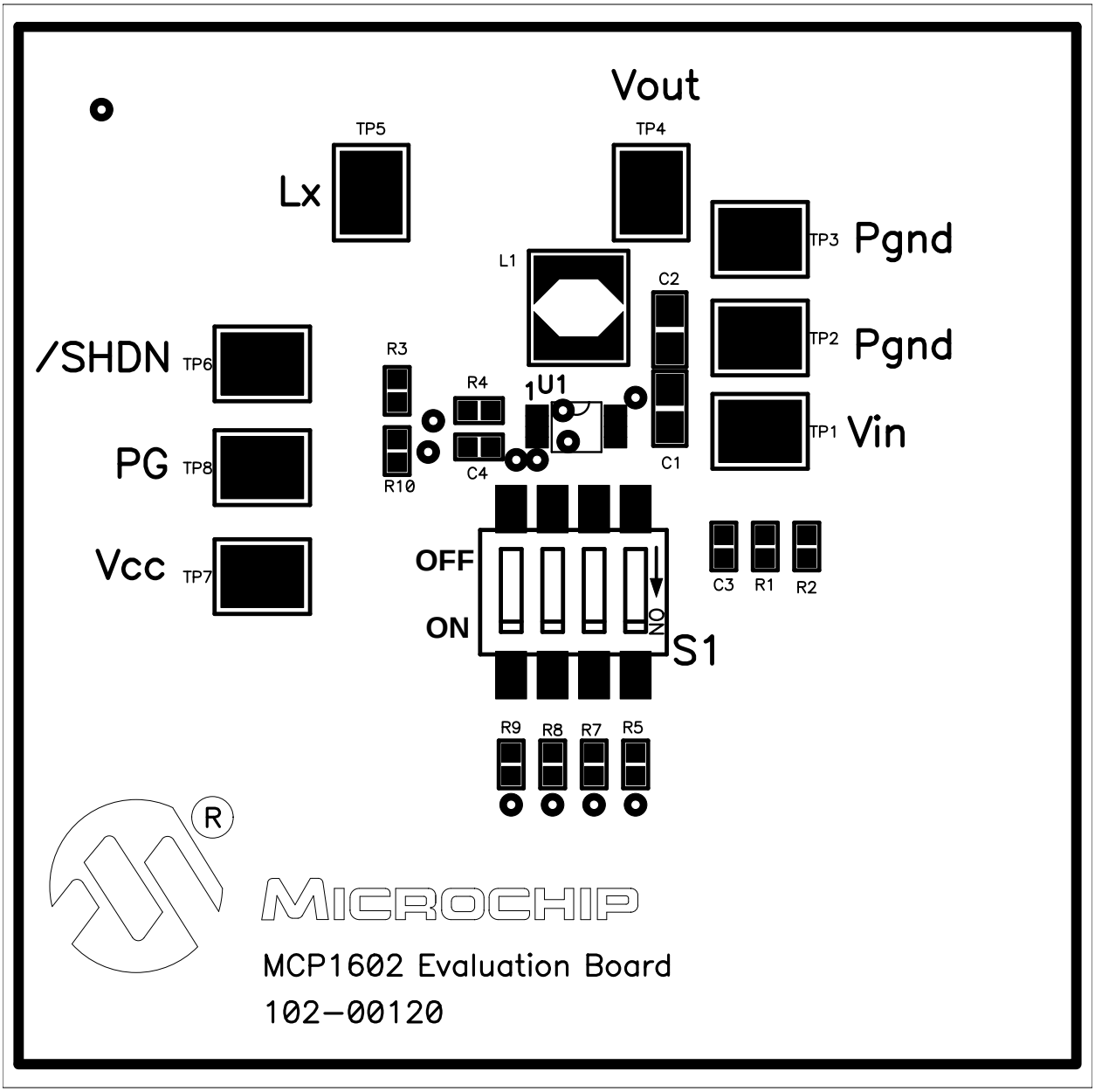
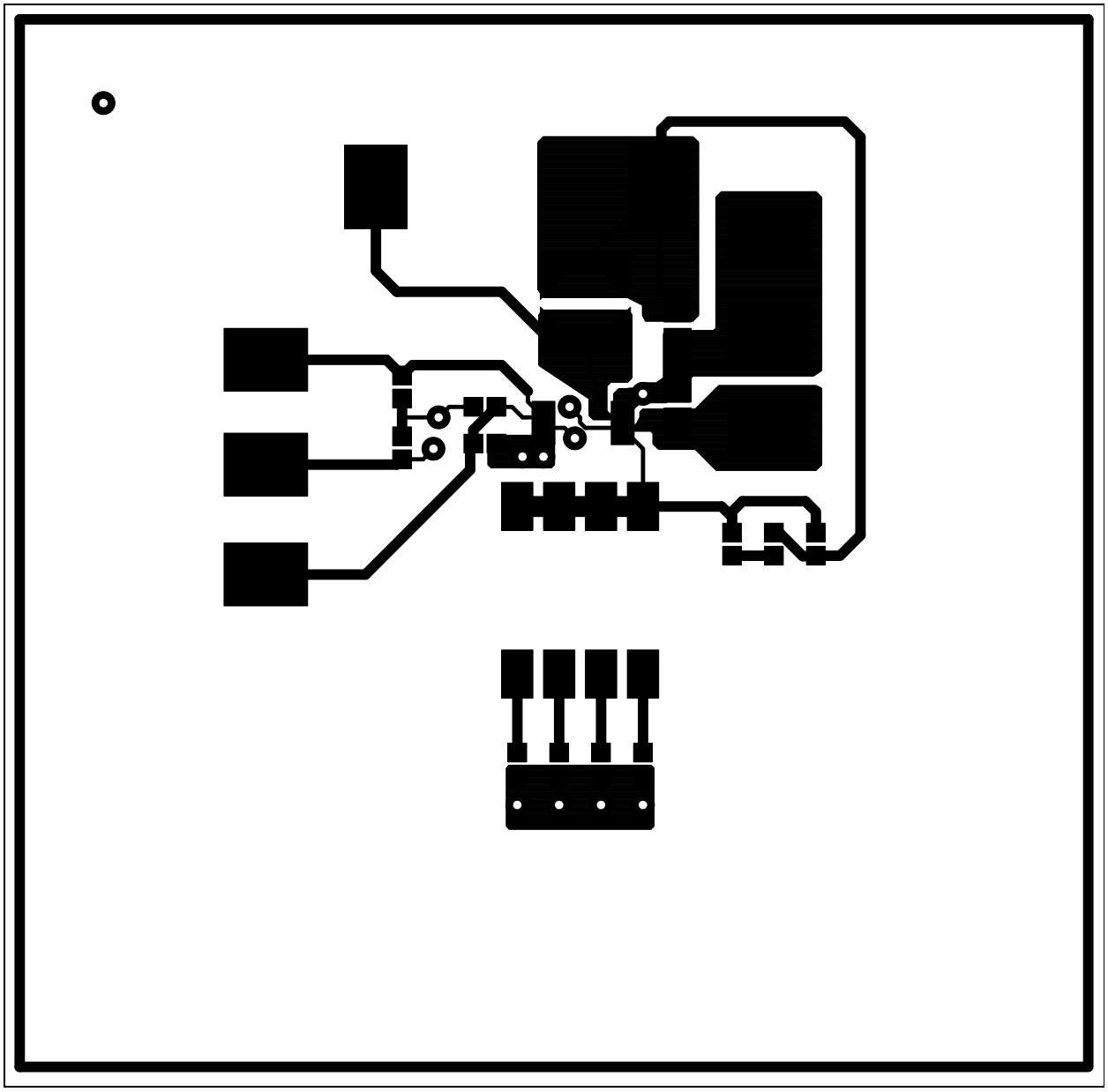
A.3 BOARD – TOP LAYER



A.4 BOARD – TOP METAL LAYER



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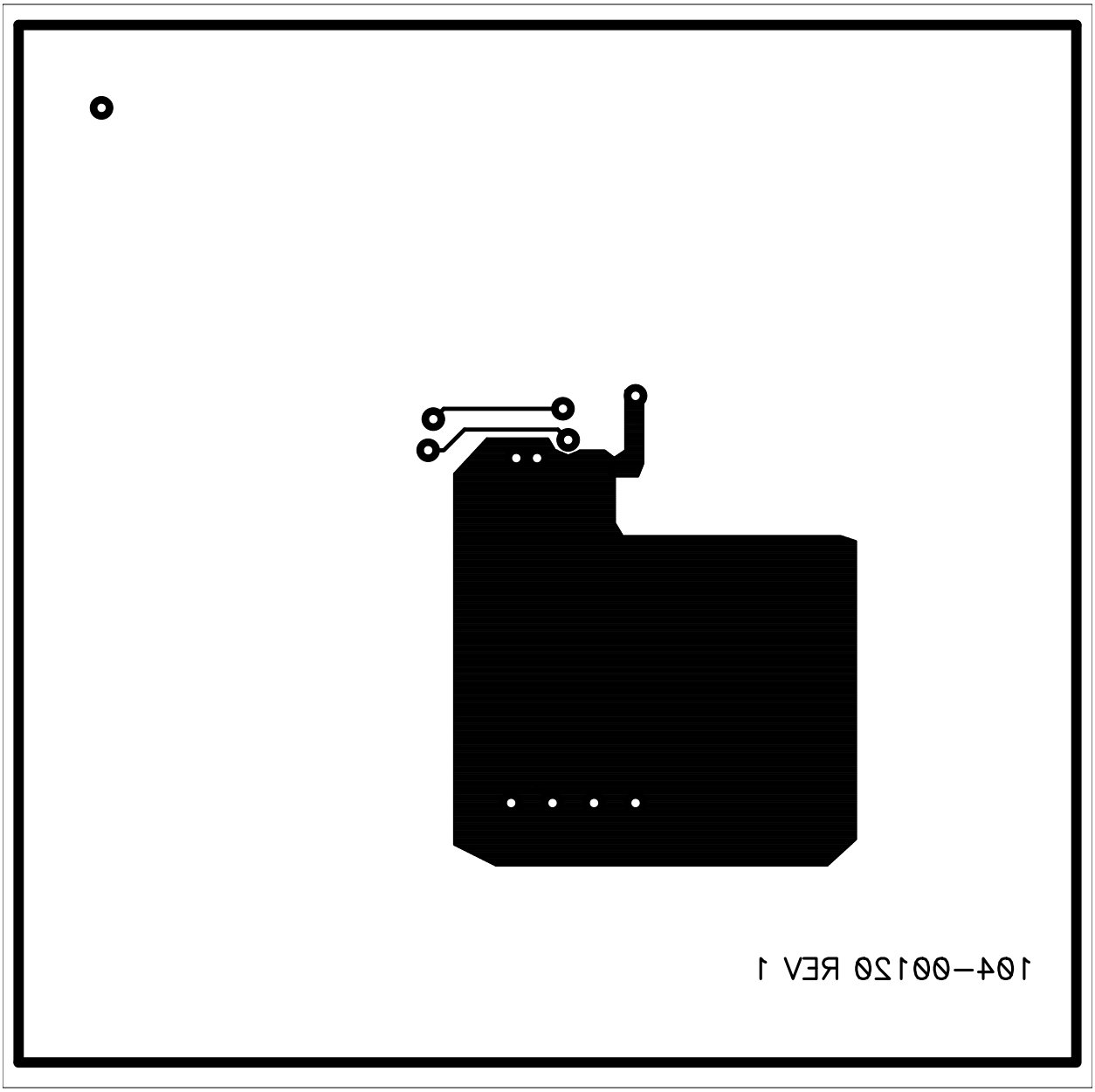
A.5 BOARD – BOTTOM LAYER



NOTES:

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Appendix B. Bill Of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
2	C1, C2	CAP CERAMIC 4.7 µF 16V X5R 0805	Panasonic® - ECG	ECJ-2FB1C475K
1	C3	CAP CERAMIC 33 pF 25V NP0 0201	Panasonic - ECG	ECJ-ZEC1E330J
1	C4	CAP CERAMIC .1 µF 16V X7R 0603	Panasonic - ECG	ECJ-1VB1C104K
1	R1	RES 4.99K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4991V
1	R2	RES 200K OHM 1/10W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ204V
1	R3	RES 1.00M OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1004V
1	R4	RES 10.0 OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF10R0V
1	R5	RES 63.4K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF6342V
1	R6	RES 10.0K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1002V
1	R7	RES 93.1K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF9312V
1	R8	RES 160K OHM 1/10W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ164V
1	R9	RES 402K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4023V
1	S1	SWITCH DIP SPST SEALED 4POS SMD	Copal Electronics Inc	SD04H1SB
1	L1	INDUCTOR POWER SHIELD 4.7µH SMD	Coiltronics	SD18-4R7-R
8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	PC Test Point Compact SMT	Keystone Electronics®	5016
1	U1	500 mA PFM/PWM Synchronous Buck Regulator	Microchip Technology, Inc	MCP1602-ADJI/MF
1	---	Printed Circuit Board	—	104-00120-R1

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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- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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