SOT23-3 Voltage Regulator Evaluation Board User's Guide

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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 "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 SOT23-3 Voltage Regulator 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 SOT23-3 Voltage Regulator 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 SOT23-3 Voltage Regulator Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with this evaluation board and a description of the evaluation board operation.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the SOT23-3 Voltage Regulator Evaluation Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the SOT23-3 Voltage Regulator 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 SOT23-3 Voltage Regulator Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **MCP1700A Datasheet, *"Low Quiescent Current LDO"* (DS-22069)**
- **MCP1701A Datasheet, *"2 µA Low Dropout Positive Voltage Regulator"* (DS-21991)**
- **MCP1702 Datasheet, *"250 mA Low Quiescent Current LDO Regulator"* (DS-22008)**
- **MCP1703 Datasheet, *"250 mA, 16V, Low Quiescent Current LDO"* (DS-22049)**

These datasheets provide useful information regarding voltage regulator parameters that may be validated using this evaluation board.

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- 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://support.microchip.com.

DOCUMENT REVISION HISTORY

Revision A (December 2008)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The SOT23-3 Voltage Regulator Evaluation Board is designed to provide functional evaluation of Microchip Voltage Regulators that utilize the SOT23-3 package and the following device pinouts:

Pin No.	U2 Footprint	U1 Footprint
1	V_{IN}	GND
2	GND	V_{OUT}
3	V_{OUT}	V_{IN}

The SOT23-3 Voltage Regulator Evaluation Board does not come with a voltage regulator soldered onto the board. This allows the user to attach the voltage regulator of their choosing to the board and perform quiescent current, ground current, Power Supply Ripple Rejection (PSRR), and other desired tests.

The SOT23-3 Voltage Regulator Evaluation Board is based upon a modulare concept which will allow the user to plug in additional boards to increase the test capability of the voltage regulator. Planned additional modulare plug-in boards currently consist of an Input Voltage Linestep Board, Output Voltage Loadstep Board, and several other device packages.

1.2 WHAT IS THE SOT23-3 VOLTAGE REGULATOR EVALUATION BOARD?

The SOT23-3 Voltage Regulator Evaluation Board is designed to evaluate and test voltage regulators. By soldering the desired device to the evaluation board, the user can easily validate several parameters of the device.

1.2.1 Funtional Blocks

The SOT23-3 Voltage Regulator Evaluation Board can be broken up into 3 functional blocks. These blocks are as follows:

- Input Capacitance
- Ground Current Measurement
- Load Resistor

1.2.2 Input Capacitance

Jumper JP1 connects the input capacitance to the circuit. The input capacitor is disconnected when performing PSRR tests. By default, C1 is populated with a 1 µF, 50V, XR7 ceramic capacitor.

1.2.3 Ground Current Measurement

Jumper JP3 allows measurement of ground current. When a current meter is connected to TP6 and TP7 and jumper JP3 is removed, the ground current of the device may be measured.

1.2.4 Load Resistor

R5 may be populated with the desired load resistor value for the device being evaluated. JP4 connects R5 to the device output.

1.2.5 Output Capacitor

C2 may be populated with the desired surface mount output capacitance. By default, C2 is populated with a 1 µF, 6.3V, XR7 ceramic capacitor.

1.2.6 Power Supply

J1 or TP1 and TP2 are connected to the user's power supply.

1.2.7 Device Selection

JP2 and JP5 select either device U1 or device U2. Placing the jumper on pins 1-2 of JP2 and JP5 selects the device at U2. Placing the jumper on pins 2-3 of JP2 and JP5 selects the device at U1.

1.3 WHAT THE SOT23-3 VOLTAGE REGULATOR EVALUATION BOARD KIT INCLUDES?

This SOT23-3 Voltage Regulator Evaluation Board kit includes:

- SOT23-3 Voltage Regulator Evaluation Board (102-00200)
- Analog and Interface Products Demonstration Boards CD-ROM includes:
  - SOT23-3 Voltage Regulator Evaluation Board User's Guide, (DS51785)

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The SOT23-3 Voltage Regulator Evaluation Board is designed to be used to facilitate the evaluation of Microchip's voltage regulators, or to be used as a stand-alone voltage regulator board. Jumpers have been placed on the board to ease the test of the specific voltage regulator parameters.

The SOT23-3 Voltage Regulator Evaluation Board kit comes with a 1 µF ceramic input and output capacitor soldered to the board. The board has two unpopulated resistor locations that may be used for loads.

2.2 FEATURES

The SOT23-3 Voltage Regulator Evaluation Board has the following features:

- Input and Output headers for future connection to Line Step and Load Step modules
- Ample testpoints to attach multimeters, power supplies, and loads
- Jumper to select ground current measurement
- Jumper to connect output load resistor
- Jumper to connect input capacitor to circuit
- Jumper to select one of two device pinouts

2.3 GETTING STARTED

The SOT23-3 Voltage Regulator Evaluation Board is fully assembled and tested. All that is required for operating is a voltage regulator supplied by the user, and a supply voltage source. Some of the tests that may be completed using the SOT23-3 Voltage Regulator Evaluation Board are described in the next subchapters.

2.3.1 Device Pinout Selection (For All Tests)

For all tests, JP2 and JP5 must be set to select the desired device and footprint.

Jumpers	U1 Footprint	U2 Footprint
JP2 - connect pins	2-3	1-2
JP5 - connect pins	2-3	1-2

2.3.2 Ground Current and Quiescent Current

When measuring ground current, jumper JP3 should be removed, otherwise leave jumper JP3 on. To measure ground current, perform the following steps:

1. Add the desired load resistor to R5.
2. Remove jumpers JP3 and JP4.
3. Connect an ammeter across testpoints TP6(+) and TP7(-). Select the appropriate meter scale for the device that is being evaluated.
4. Connect a voltmeter across testpoints TP9(+) and TP10(-).
5. Add jumper JP1.
6. Apply source voltage to testpoints TP1(+) and TP2(-).
7. Verify that the voltage across testpoints TP9 and TP10 is within the expected range of the tested device.
8. Read the Ground Current directly from the ammeter connected to testpoints TP6 and TP7.
9. Vary the input voltage to obtain data for ground current versus input voltage. With no load attached to the output of the voltage regulator, the measured "ground current" is also called the "quiescent current" of the regulator.
10. Add the load selection jumper, JP4.
11. Read the Ground Current directly from the ammeter connected to testpoints TP6 and TP7.
12. The data collected will be the "ground current" versus load current.

2.3.3 Load Resistance

R5 is used to set the desired load value. One choice is to set R5 to the minimum current wanted for testing.

2.3.4 Line Step

Dynamic Line Step response may be evaluated by connecting an electronically switched input voltage to testpoints TP1(+) and TP2(-), or to connector J1. An oscilloscope is connected to TP3(Ch1 Trigger), TP9(Ch2) and TP10(Gnd). An appropriate load is selected using R5 and JP4. The input voltage is then electronically switched from a low voltage to a high voltage. The corresponding voltage waveform data of the voltage regulator response is captured by the oscilloscope. Microchip will be offering a Line Step module, part #102-00196, that connects directly to connector J1. The Line Step module will be capable of switching between two voltage levels that the user supplies.

2.3.5 Load Step

Dynamic Load Step response may be evaluated by connecting an electronically switched load to testpoints TP9(+) and TP10(-) or to connector P1. An oscilloscope is connected to the electronic load switch signal (Ch1 Trigger) and to TP9 (Ch2) and TP10 (Gnd). The load is then electronically switched from a high resistance to a lower one. The corresponding voltage waveform data of the voltage regulator response is captured by the oscilloscope. Microchip will be offering a Load Step module, part #102-00197, that connects directly to connector P1. The Load Step module will have several selectable load values populated on board to cover a wide range of loads. The load will have the ability to be electronically or manually switched.

2.3.6 Power Supply Rejection Ratio (PSRR)

Power Supply Rejection Ratio tests are performed by removing the input capacitor jumper, JP1, and connecting an appropriate PSRR analyzer to the SOT23-3 Voltage Regulator Evaluation Board. The PSRR analyzer may then sweep the input voltage frequencies and record the corresponding output voltages.

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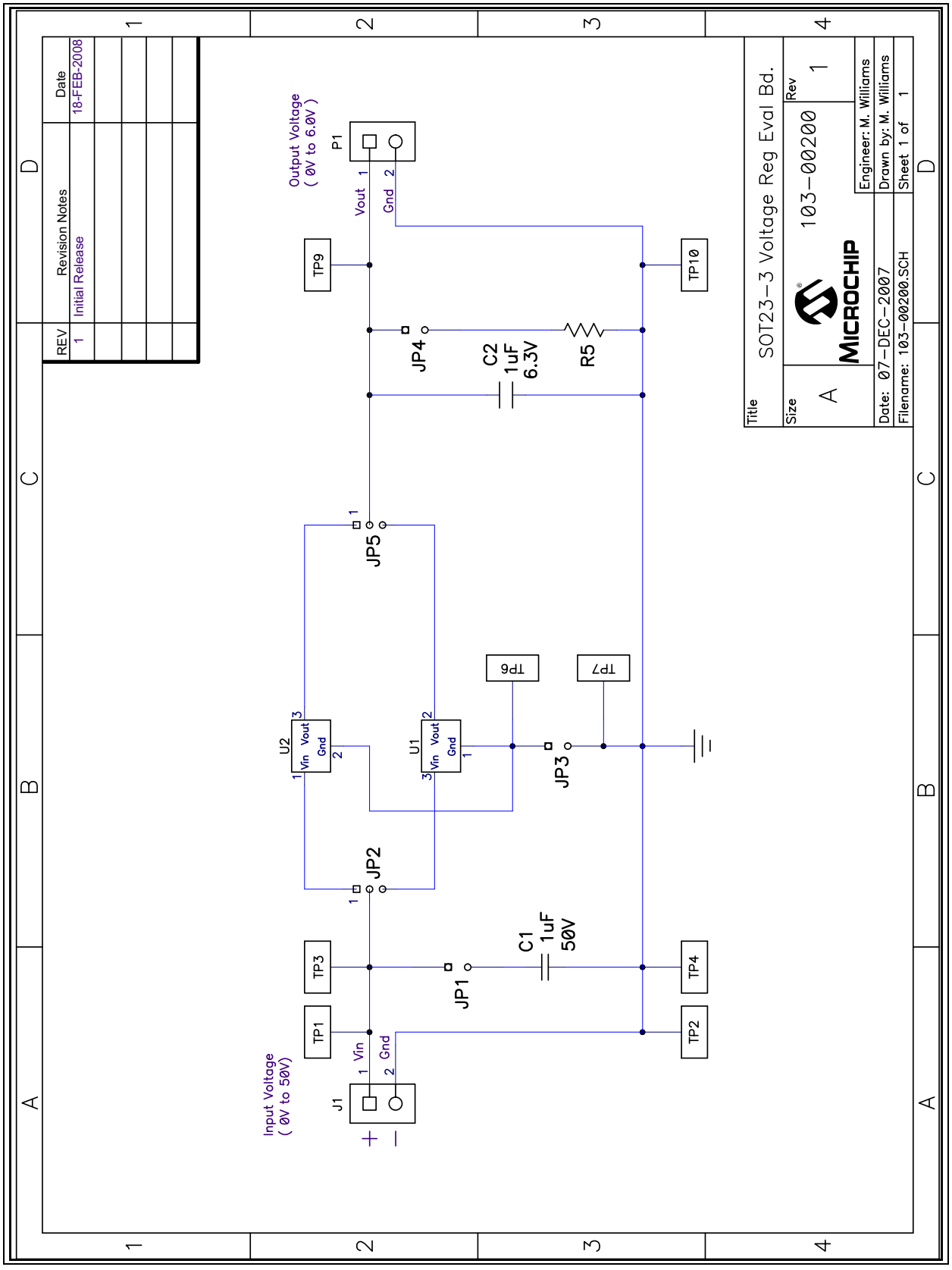
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

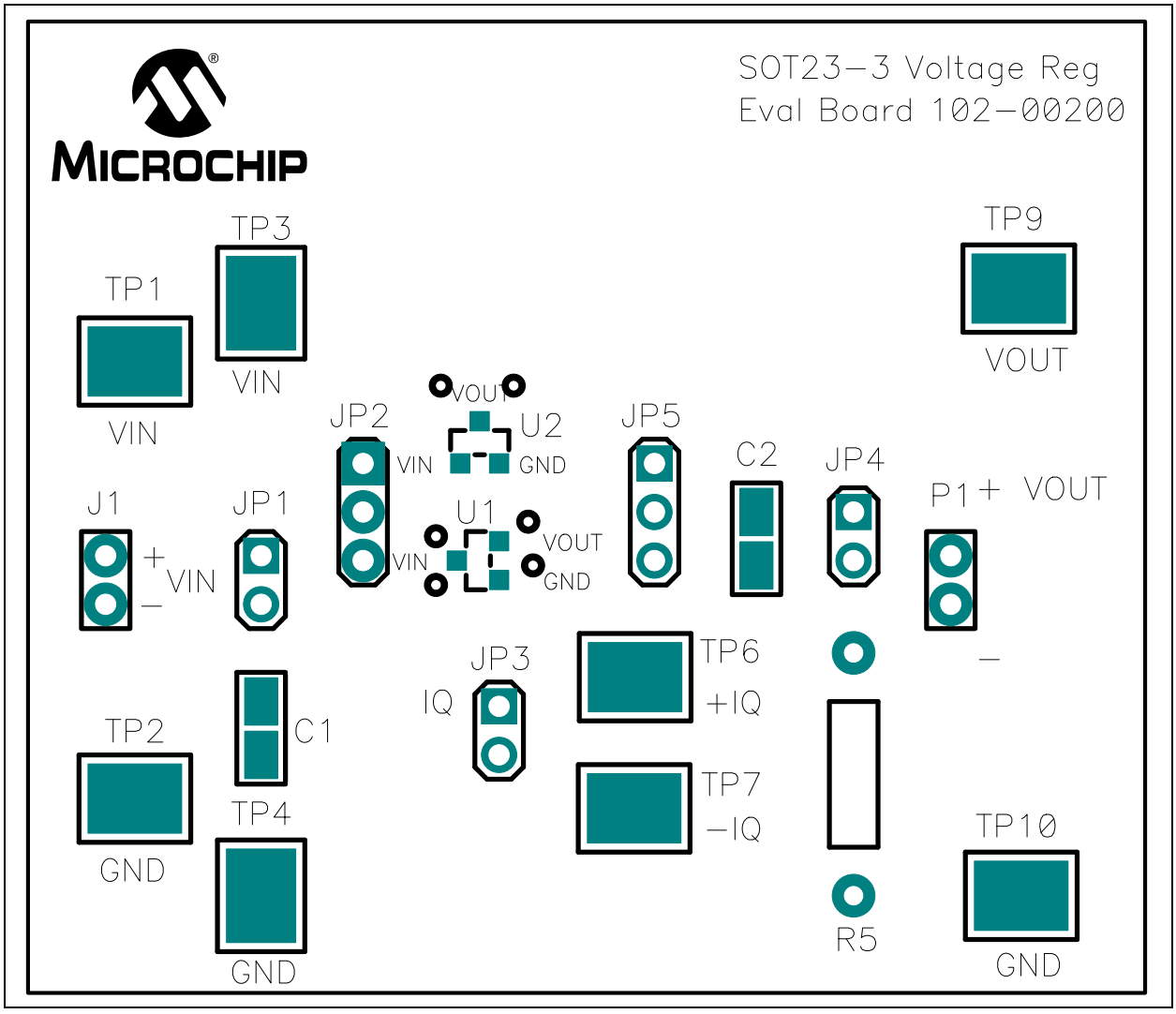
This appendix contains the following schematis and layouts for the SOT23-3 Voltage Regulator Evaluation Board:

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

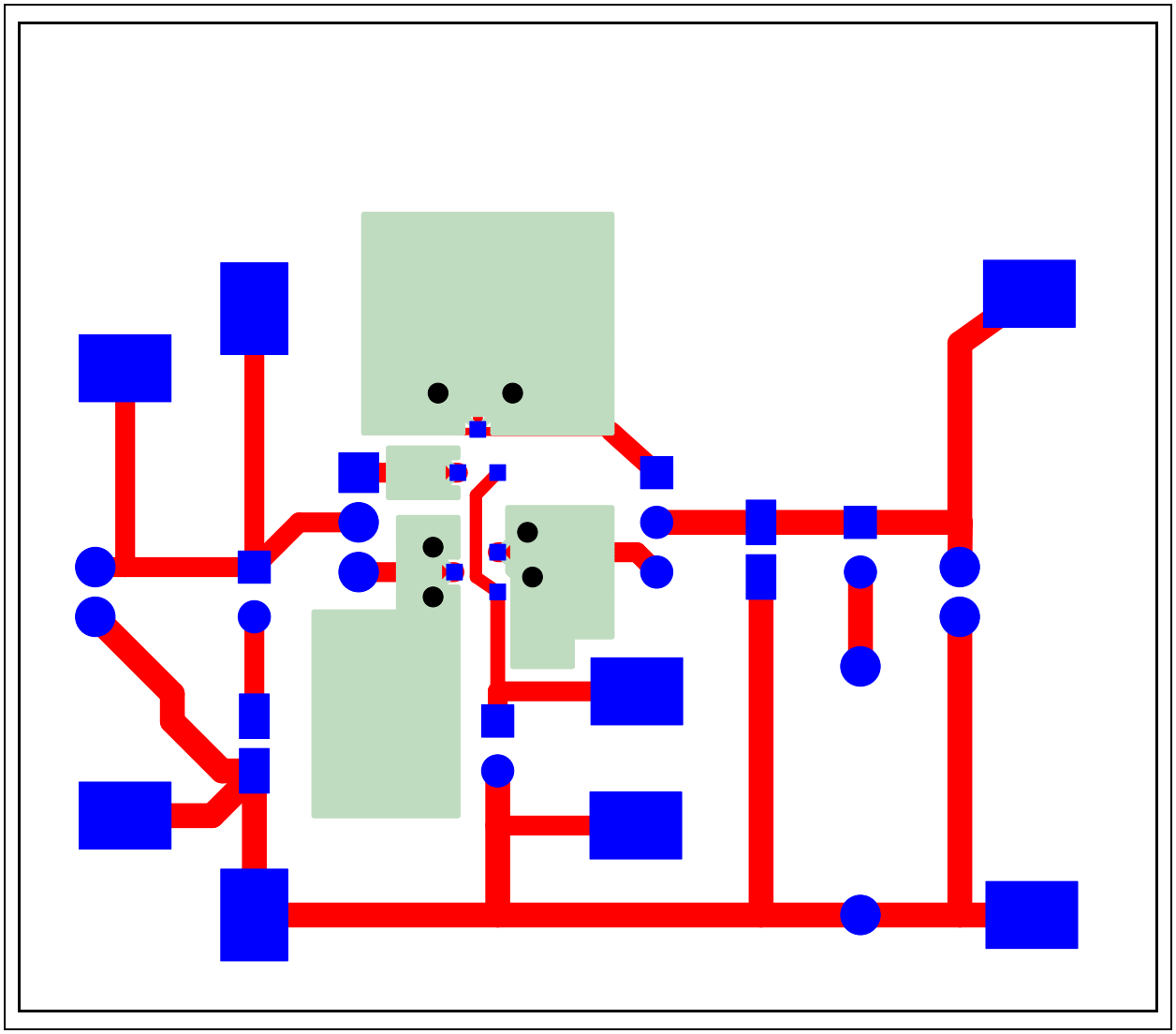
A.2 BOARD - SCHEMATIC



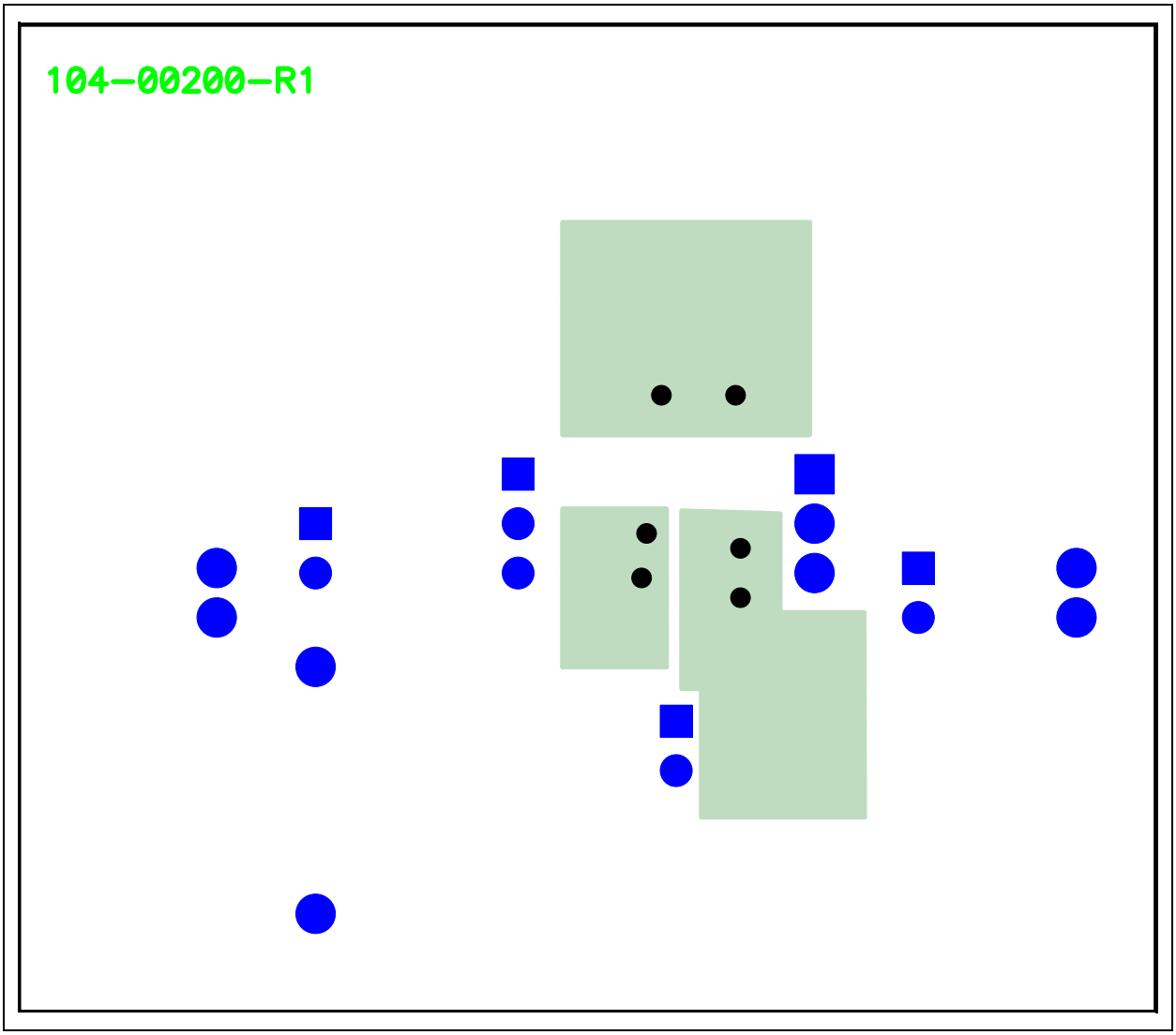
A.3 BOARD - TOP SILK AND PADS



A.4 BOARD - TOP COPPER



A.5 BOARD - BOTTOM COPPER



NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
1	C1	CAP CERAMIC 1.0 µF 50V X7R 0805	Murata Electronics®	GRM21BR71H105KA12L
1	C2	CAP CERAMIC 1.0 uF 16V X7R 0805	Kemet® Electronics Corp.	C0805C105K4RACTU
1	J1	2 pin RA header, 0.100 centers, 0.025 sq pins, 0.070 pcb to pin center height, 36 pins to a strip (yields 18 headers)	3M	929835-01-36-RK
3	JP1, JP3, JP4	2 pin header, 0.100 centers, 0.025 sq pins, 0.070 pcb to pin center height, 36 pins to a strip (yields 18 headers)	Molex® Electronics	22-28-4360
2	JP2, JP5	3 pin header, 0.100 centers, 0.025 sq pins, 0.070 pcb to pin center height, 36 pins to a strip (yields 12 headers)	Molex Electronics	22-28-4360
5	JP1, JP2, JP3, JP4, JP5	Connector, Shorting jumper, Tin, 0.100”	Sullins	STC02SYAN
1	P1	RA socket, 0.100 centers, 0.025 sq pins, 0.070 pcb to pin center height	Sullins	PPPC021LGBN-RC
1	PCB	RoHS Compliant Bare PCB, SOT23-3 Voltage Regulator Evaluation Board	Microchip Technology Inc.	104-00200
1	R5	DO NOT POPULATE	–	–
8	TP1, TP2, TP3, TP4, TP6, TP7, TP9, TP10	SMT Testpoint	Keystone Electronics®	5016
2	U1,U2	DO NOT POPULATE	–	–
4	On Each Corner	Bumpon Hemisphere 0.44 x 0.20 Clear	3M	SJ-5303 (Clear)

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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