20-Pin TSSOP and SSOP Evaluation Board User's Guide

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20-PIN TSSOP AND SSOP EVALUATION BOARD USER'S GUIDE

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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 "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

INTRODUCTION

This chapter contains general information that will be useful to know before using the 20-Pin TSSOP and SSOP Evaluation Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- The Microchip Web Site
- The Microchip Web Site
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the 20-Pin TSSOP and SSOP Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the 20-Pin TSSOP and SSOP Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with this evaluation board.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the 20-Pin TSSOP and SSOP Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts that can be installed onto the 20-Pin TSSOP and SSOP 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...

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

DOCUMENT REVISION HISTORY

Revision A (November 2009)

- Initial Release of this Document.

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the 20-Pin TSSOP and SSOP Evaluation Board and covers the following topics:

- What is the 20-Pin TSSOP and SSOP Evaluation Board?
- What the 20-Pin TSSOP and SSOP Evaluation Board kit includes

1.2 WHAT IS THE 20-PIN TSSOP AND SSOP EVALUATION BOARD?

The 20-Pin TSSOP and SSOP Evaluation Board allows the system designer to quickly evaluate the operation of Microchip Technology's devices in any of the following 20-pin packages:

- TSSOP
- SSOP

Some of the Microchip's family of devices that can be evaluated in the PCB include:

- Digital Potentiometers (Digi-Pots)
- CAN
- IrDA
- Serial Peripherals
- Switching Regulators
- PICmicro® Microcontrollers

1.3 WHAT THE 20-PIN TSSOP AND SSOP EVALUATION BOARD KIT INCLUDES

This 20-Pin TSSOP and SSOP Evaluation Board Kit includes:

- Five 20-Pin TSSOP and SSOP Evaluation Boards - 102-00272
- Important Information sheet

NOTES:

Chapter 2. Installation and Operation

2.1 INTRODUCTION

This blank Printed Circuit Board allows 20-pin devices in the following four package types to be installed:

1. TSSOP-20.
2. SSOP-20.

This board is generic so that any device may be installed. Refer to the device data sheet, however, for suitability of device evaluation.

As well as the device, other desired passive components (resistors and capacitors) and connection posts may be installed. This allows the board to evaluate a minimum configuration for the device. Also, this allows the device to easily be jumpered into an existing system.

The board also has a 6-pin interface (PICkit Serial, ICSP, BFMP,...) whose signals can easily be jumpered to any of the device's pins.

2.2 FEATURES

The 20-Pin TSSOP and SSOP Evaluation Board has the following features:

- Connection terminals may be either through-hole or surface-mount
- Three 20-pin package footprints supported:
  - TSSOP
  - SSOP
- Footprints for optional passive components (SMT 805 footprint) for:
  - Power supply filtering
  - Device bypass capacitor
  - Output filtering
  - Output pull-up resistor
  - Output pull-down resistor
  - Output loading resistor
- Silk-screen area to write specifics of implemented circuit (on back of PCB), such as MCP4331 10 kΩ.
- PICkit Serial Analyzer / PICkit 2 Programming (ICSP) Header

2.3 GETTING STARTED

The 20-Pin TSSOP and SSOP Evaluation Board is a blank PCB that allows the user to configure the circuit to the exact requirements. The passive components use the surface-mount 805 package layout.

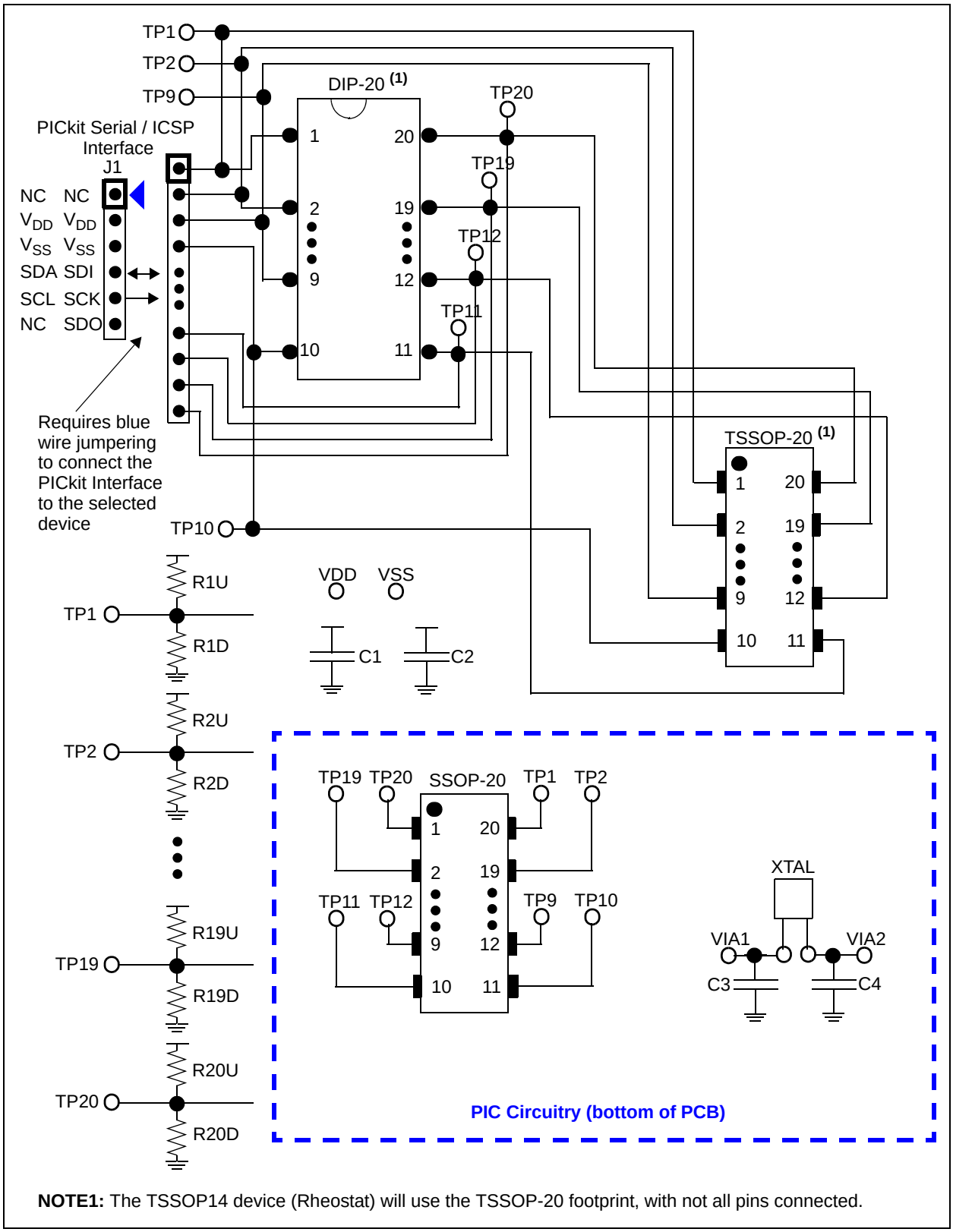
This evaluation board supports the following Microchip device families:

- Digital Potentiometers (Digi-Pots)
- CAN
- IrDA
- Serial Peripherals
- Switching Regulators
- PICmicro® Microcontrollers

Figure 2-1 shows the evaluation board circuit. The pins on the 20-pin devices are tied together pin n to pin n. Pad Pn is tied to pin n of the TSSOP device. The SSOP package is on the bottom, so the pad Bn is tied to pin n of the SSOP device. The footprints for the pull-up (RxU) and pull-down (RxD) devices are labeled in relation to the TSSOP package, pin 1 is connected to R1U and R1D (which is connected to pin 20 of the SSOP device on the bottom of the board).

This circuit allows each pin to individually have any of the following: a pull-up resistor, a pull-down resistor (or a loading/filtering capacitor). Power supply filtering capacitors are connected between the VDD and VSS pads (C1 and C2).

The circuit has a 6-pin header that can be used for PICkit Serial communication as well as PIC ICSP. The signals of this header would need to be jumpered to the appropriate device signal.



NOTE1: The TSSOP14 device (Rheostat) will use the TSSOP-20 footprint, with not all pins connected.

FIGURE 2-1: *20-Pin TSSOP and SSOP Evaluation Board Circuit.*

2.3.1 The Hardware

Figure 2-2 and Figure 2-3 shows the component layout of the 20-Pin TSSOP and SSOP Evaluation Board. This is a four-layer board (3.9" x 2.1" (99.06 mm x 53.34 mm)). There are twenty two connection points/pads that can use either through-hole or surface-mount connector posts.

The pad labeled VDD is connected to the PCB power plane, while the pad labeled VSS is connected to the PCB ground plane. All the passive components that are connected to VDD or VSS are connected to either the power plane or ground plane.

The twenty remaining PCB pads correspond to the device pins (i.e.; pad 1 connects to pin 1).

Each pad has two passive components associated with them: a pull-up resistor and a pull-down resistor. The pull-up resistor is always RXU and the pull-down resistor is RXD. The "X" is a numeric value that corresponds to a particular pad (1 to 8). As an example, Pad 5's pull-up resistor is R5U. Capacitor C1 and C2 are the power supply filtering capacitors. For whichever pin is the device's VDD, the RxD component footprint can be used for the device's bypass capacitor. Table 2-1 describes the components.

A 6-pin header interface is available that supports the PICkit Serial or the PICmicro In-Circuit Serial Programming (ICSP) interface. For additional information, refer to **Section 2.4.5 "PICkit Serial or In-Circuit Serial Programming (ICSP) Interface (Header J1)"**.

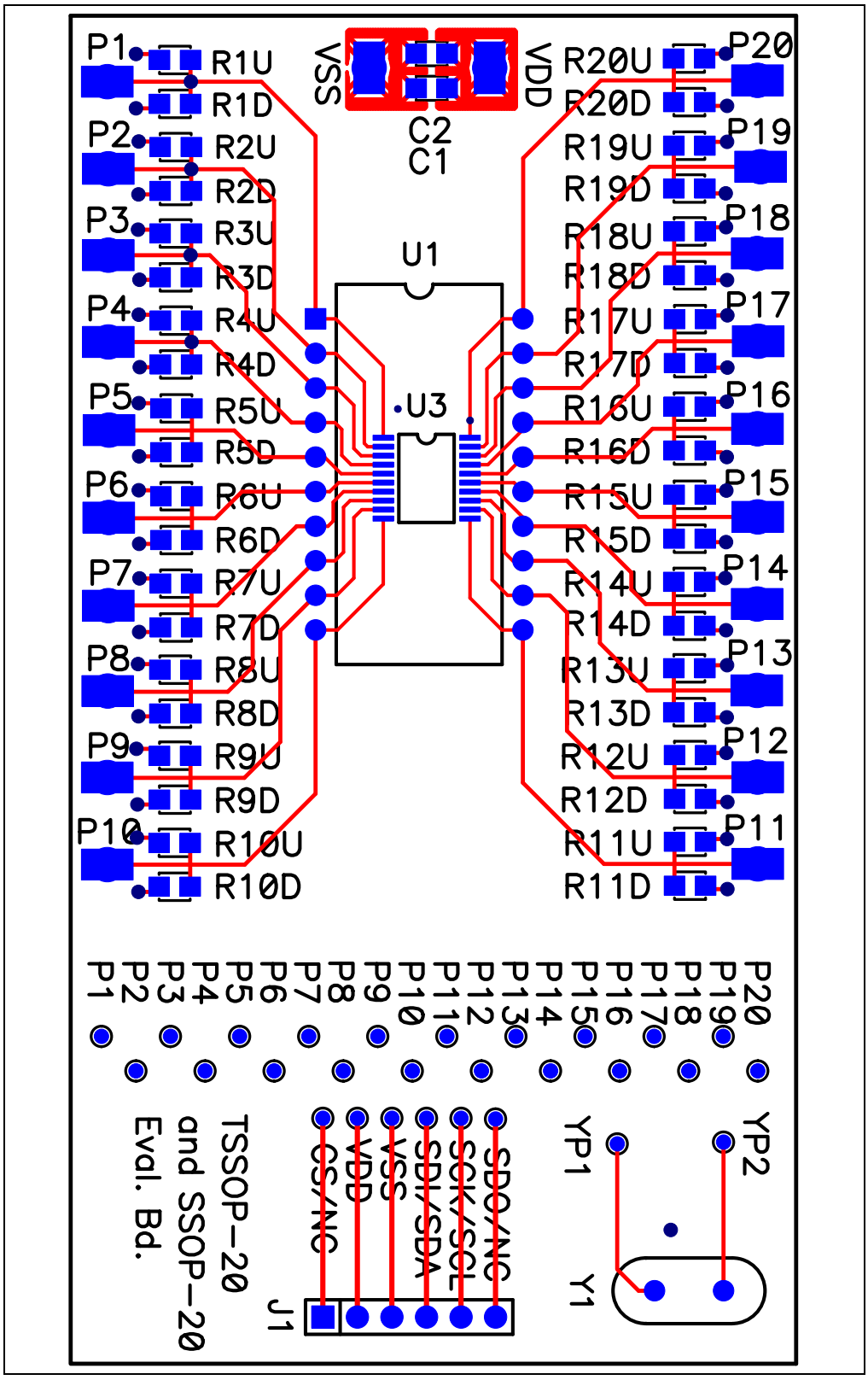


FIGURE 2-2: *20-Pin TSSOP and SSOP Evaluation Board Layout (Top).*

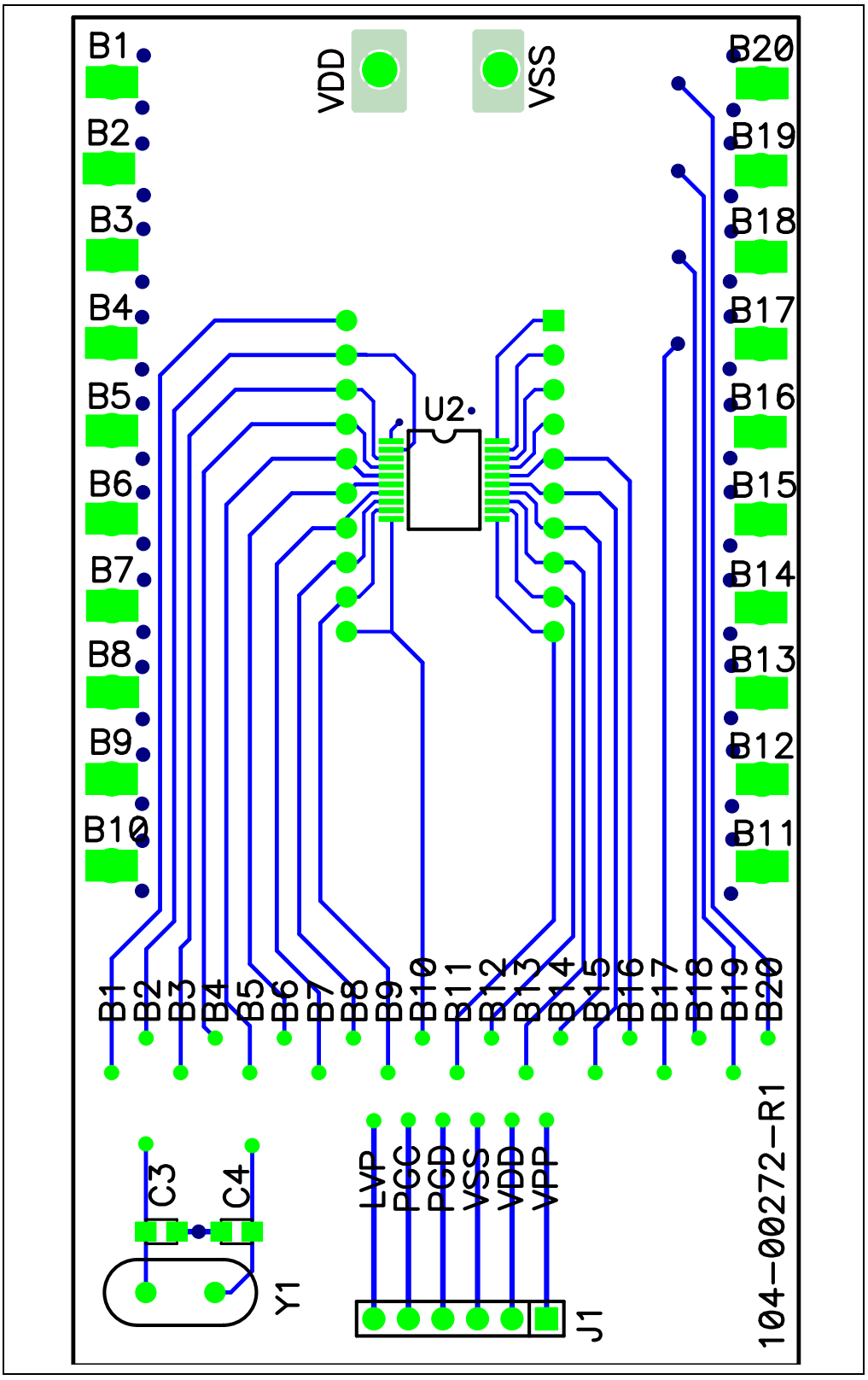


FIGURE 2-3: *20-Pin TSSOP and SSOP Evaluation Board Layout (Bottom).*

TABLE 2-1: OPTIONAL COMPONENTS (2)

Component	Comment
C1, C2	Power supply bypass capacitors
C3, C4	PIC Crystal capacitors
R1U, R2U, R3U, R4U, R5U, R6U, R7U, R8U, R9U, R10U, R11U, R12U, R13U, R14U, R15U, R16U, R17U, R18U, R19U, R20U	Pull-up resistors
R1D, R2D, R3D, R4D, R5D, R6D, R7D, R8D, R9D, R10D, R11D, R12D, R13D, R14D, R15D, R16D, R17D, R18D, R19D, R20D	Pull-down resistors (1)
Y1	Can connect to either PIC' main oscillator or to the Timer oscillator circuit.
J1	PICkit Serial / ICSP header

Note 1: Whichever pin is the device's VDD pin, that corresponding RxD footprint can be used for the device's bypass capacitor. So if Pin 8 is the device's VDD pin, then install the bypass capacitor in the R8D footprint.

2: All passive components use the surface mount 805 footprint.

2.4 20-PIN TSSOP AND SSOP EVALUATION BOARD DESCRIPTION

The 20-Pin TSSOP and SSOP Evaluation Board PCB is designed to be flexible in the type of device evaluation that can be implemented.

The following sections describe each element of this evaluation board in further detail.

2.4.1 Power and Ground

The 20-Pin TSSOP and SSOP Evaluation Board has a VDD pad and a VSS pad. These pads can have connection posts installed that allows easy connection to the power (V_{DD}) and ground (V_{SS}) planes. The layout allows either through-hole or surface-mount connectors.

The power and ground planes are connected to the appropriate passive components on the PCB (such as power plane to RXU and ground plane to RXD components).

2.4.2 PCB Pads

For each package pin (pins 1 to 8), there is a PCB pad (pads 1 to 8). The device will have some power pins (V_{DD}) and some ground pins (V_{SS}). To ease connections on the PCB, vias to the power and ground plane have been installed close to each PCB pad. This allows any pad to be connected to the power or ground plane, so when power is connected to the VDD and VSS pads, the power is connected to the appropriate device pin (see Figure 2-4).

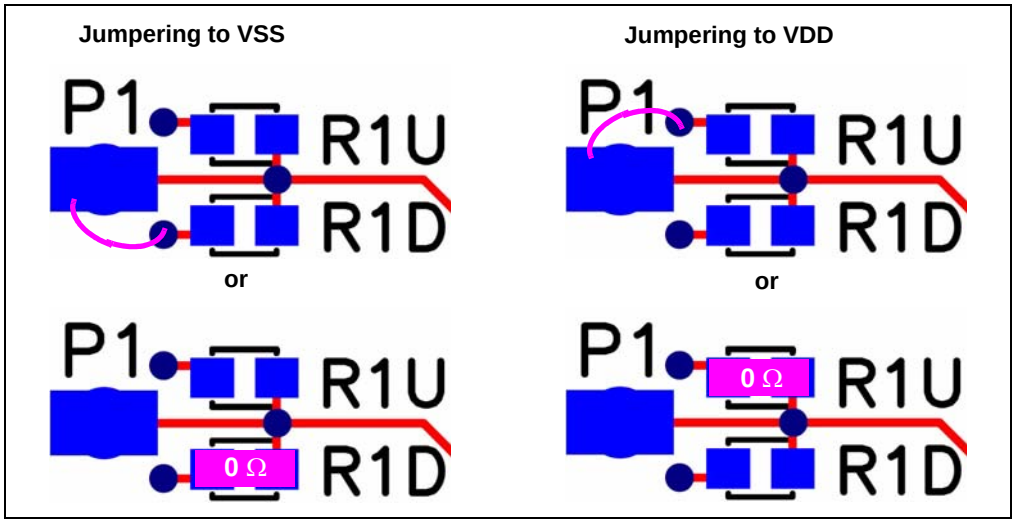


FIGURE 2-4: *Connecting the PCB pad to either VDD or VSS.*

2.4.3 Passive Components (RXU, RXD, C1, and C2)

The footprints for these components are present to allow maximum flexibility in the use of this PCB to evaluate a wide range of devices. The purpose of these components may vary depending on the device under evaluation and how it is to be used in the desired circuit. Refer to the device data sheet for the recommended components that should be used when evaluating that device.

- Component RXU allows a pull-up resistor to be installed for the device pin
- Component RXD allows a pull-down resistor or a a capacitive load/filter to be installed for the device pin
- Component C1 and C2 allows power supply filtering capacitors to be installed

2.4.4 Device Footprints

This section describes the characteristics of the component footprints so that you are better able to determine if the desired component(s) are compatible with the board.

2.4.4.1 TSSOP-20

The 20-pin TSSOP footprint has been layed out for packages that have a typical pitch of 0.65 mm (BSC), a maximum lead width of 0.30 mm, and a molded package width of 4.50 mm (BSC). Twenty-lead (or less, such as sixteen-lead and fourteen-lead) TSSOP packages that meet these characteristics should be able to be used with this board.

2.4.4.2 SSOP-20

The 20-pin SSOP footprint has been layed out for packages that have a typical pitch of 0.65 mm (BSC), a maximum lead width of 0.38 mm, and a maximum molded package width of 5.60 mm. Twenty-lead (or less) SSOP packages that meet these characteristics should be able to be used with this board.

2.4.4.3 DIP-20

The 20-pin DIP footprint has been layed out for packages that have a typical pitch of 100 mil (BSC), a maximum lead width of 22 mil and a molded package width of 600 mil.

2.4.4.4 PASSIVE COMPONENTS

All passive components (RxU, RxD, and Cx) use a surface mount 805 footprint. Any component that has a compatible footprint could be used with this board.

2.4.4.5 HEADER (1X6)

The header has a typical pitch of 100 mil (BSC). This header is designed to be compatible with the PICkit Serial Analyzer and PICkit 2 Programmer.

2.4.5 PICkit Serial or In-Circuit Serial Programming (ICSP) Interface (Header J1)

Figure 2-5 shows the interface connection of Header J1. The VDD and VSS signals are connected to the appropriate power or ground plane. The other 4 signals are open and can be easily jumpered to any of the 20 P1 (B20) through P20 (B1) connection points.

The top layer silk screen indicates the common PICkit Serial signal names, while the bottom layer silk screen indicates the ICSP signal names.

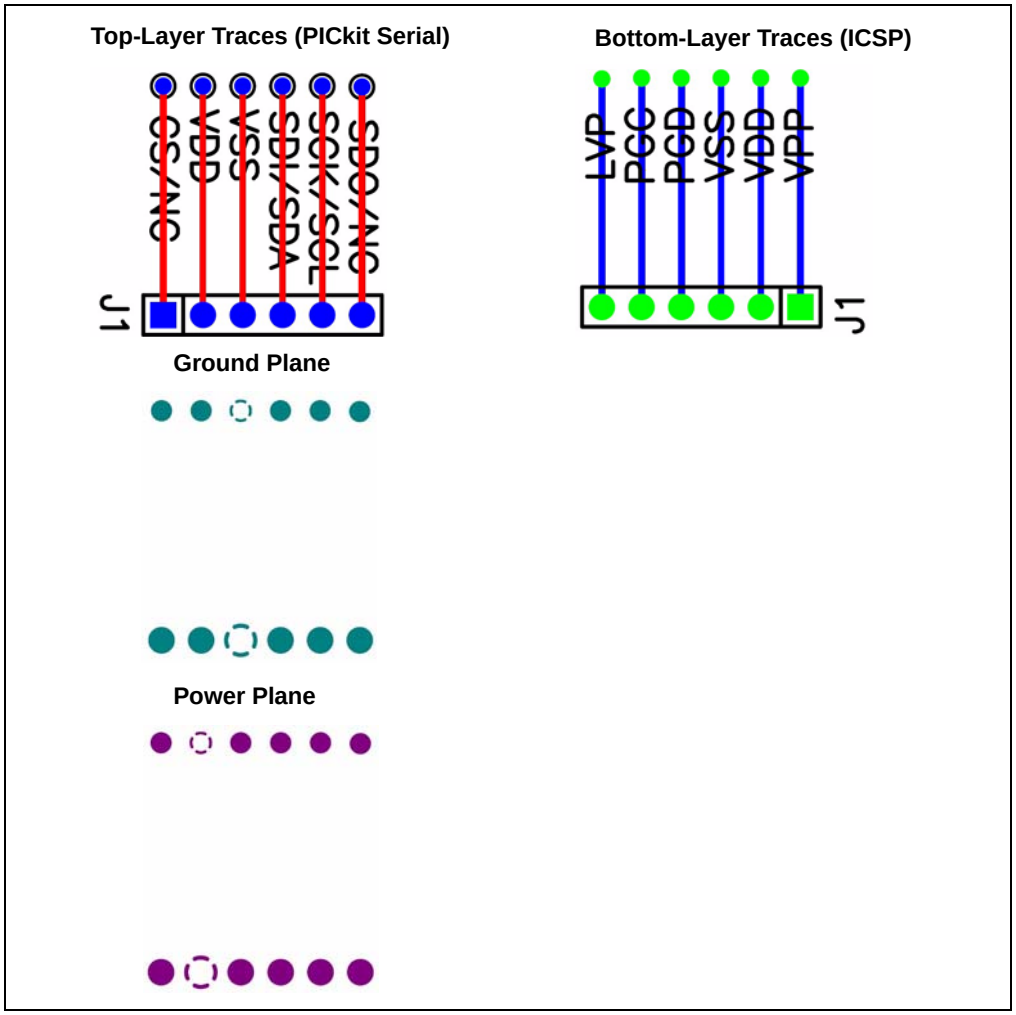


FIGURE 2-5: *PICkit Serial / ICSP Interface Connections.*

2.4.5.1 PICKIT SERIAL INTERFACE

Table 2-2 shows the pin number assignment for the different signals for each of the supported interface protocols (SPI, I^2C,...).

TABLE 2-2: PICKIT SERIAL HEADER SIGNALS

Pin Number	PICkit Serial Header Signal					Comments
	SPI	I^2C	USART	Microwire	LIN	
1	CS	—	TX	CS	TX	
2	VDD	VDD	VDD	VDD	—	
3	VSS	VSS	VSS	VSS	VSS	
4	SDI	SDA	—	SDI	CS/WAKE	
5	SCK	SCL	—	SCK	FAULT/TXE	
6	SDO	—	RX	SDO	RX	

2.4.5.2 ICSP INTERFACE

The ICSP interface allows a PICmicro MCU device to be programmed with programmers that support this interface, such as the PICkit 2 programmer (part number PG164120). Table 2-3 shows the pin number assignment for the ICSP signals.

TABLE 2-3: ICSP HEADER SIGNALS

Pin Number	ICSP Signal	Comments
1	VPP	High Voltage Signal
2	VDD	
3	VSS	
4	PCD	ICSP™ Data
5	PCC	ICSP™ Clock
6	—	

2.4.6 Evaluating the MCP4361 Device (A Digital Potentiometer)

The MCP4361 is a Digital Potentiometer that is in a 20-lead TSSOP package with an SPI serial interface. This allows the device to be communicated to by the PICkit Serial Analyzer. For this to occur, the PICkit Serial Analyzer signals must be connected to the correct MCP4018 signals. These connections are shown in Figure 2-7.

Other Digital Potentiometers that are supported by this evaluation board are shown in Table 2-4.

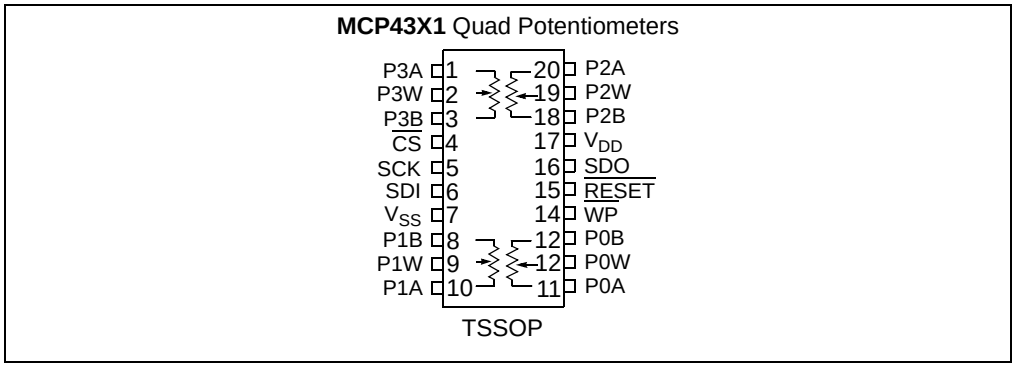


FIGURE 2-6: *MCP43X1 (MCP4361) Pin Out.*

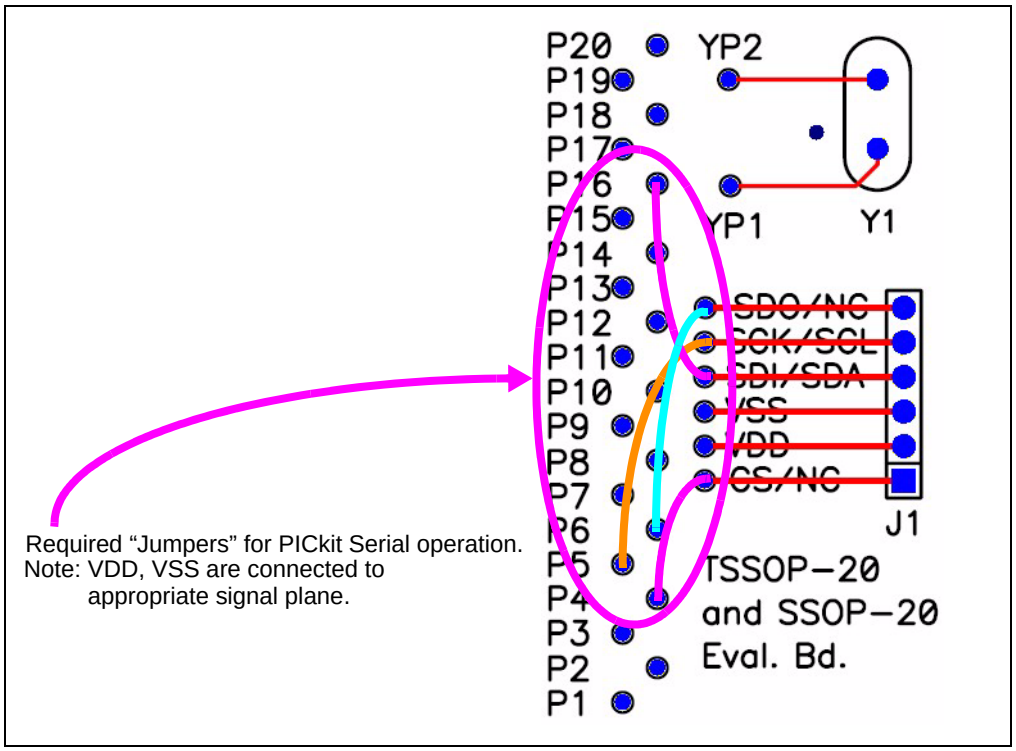


FIGURE 2-7: *PICkit Serial / ICSP Header and Example Connections (for MCP4361).*

TABLE 2-4: SUPPORTED DIGITAL POTENTIOMETERS

Device	TSSOP	SSOP	Comment
MCP4331	Yes	—	
MCP4332	Yes	—	
MCP4341	Yes	—	
MCP4342	Yes	—	
MCP4351	Yes	—	
MCP4352	Yes	—	
MCP4361	Yes	—	
MCP4362	Yes	—	
MCP4231	Yes	—	14-pin TSSOP
MCP4241	Yes	—	14-pin TSSOP
MCP4251	Yes	—	14-pin TSSOP
MCP4261	Yes	—	14-pin TSSOP
MCP4631	Yes	—	14-pin TSSOP
MCP4641	Yes	—	14-pin TSSOP
MCP4651	Yes	—	14-pin TSSOP
MCP4661	Yes	—	14-pin TSSOP

2.4.7 Evaluating the PIC24F16KA101 Device (nanoWatt XLP PIC Microcontroller)

The PIC24F16KA101 is a nanoWatt XLP PIC Microcontroller that is offered in a 20-lead SSOP package. This device can be installed on the bottom side of the PCB. Figure 2-8 shows the PIC24F16KA101's pin out, while Figure 2-9 shows an example connection for the ICSP interface and the connection of the crystal circuit to the secondary oscillator.

Other nanoWatt XLP PIC Microcontrollers that are supported by this evaluation board are shown in Table 2-5.

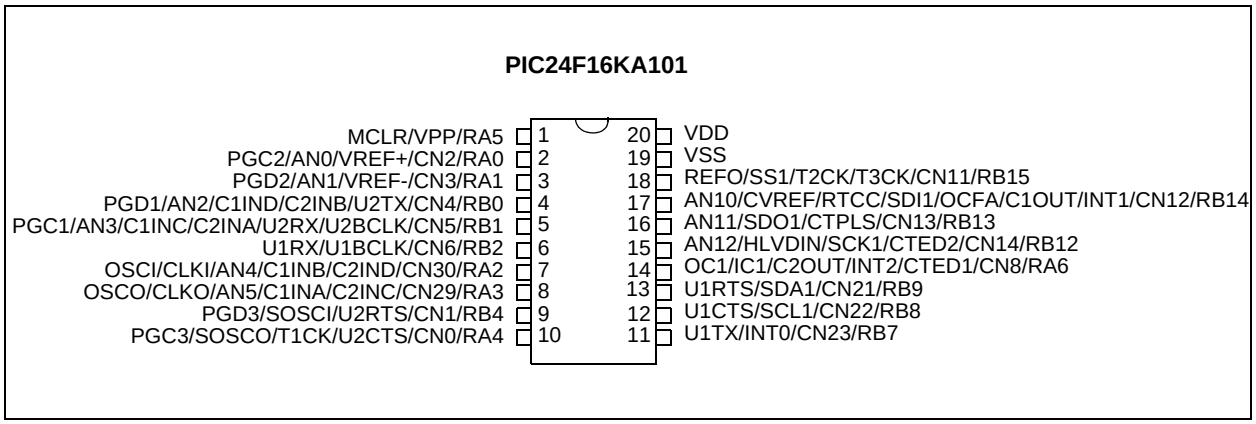


FIGURE 2-8: *PIC24F16KA101 Pin Out.*

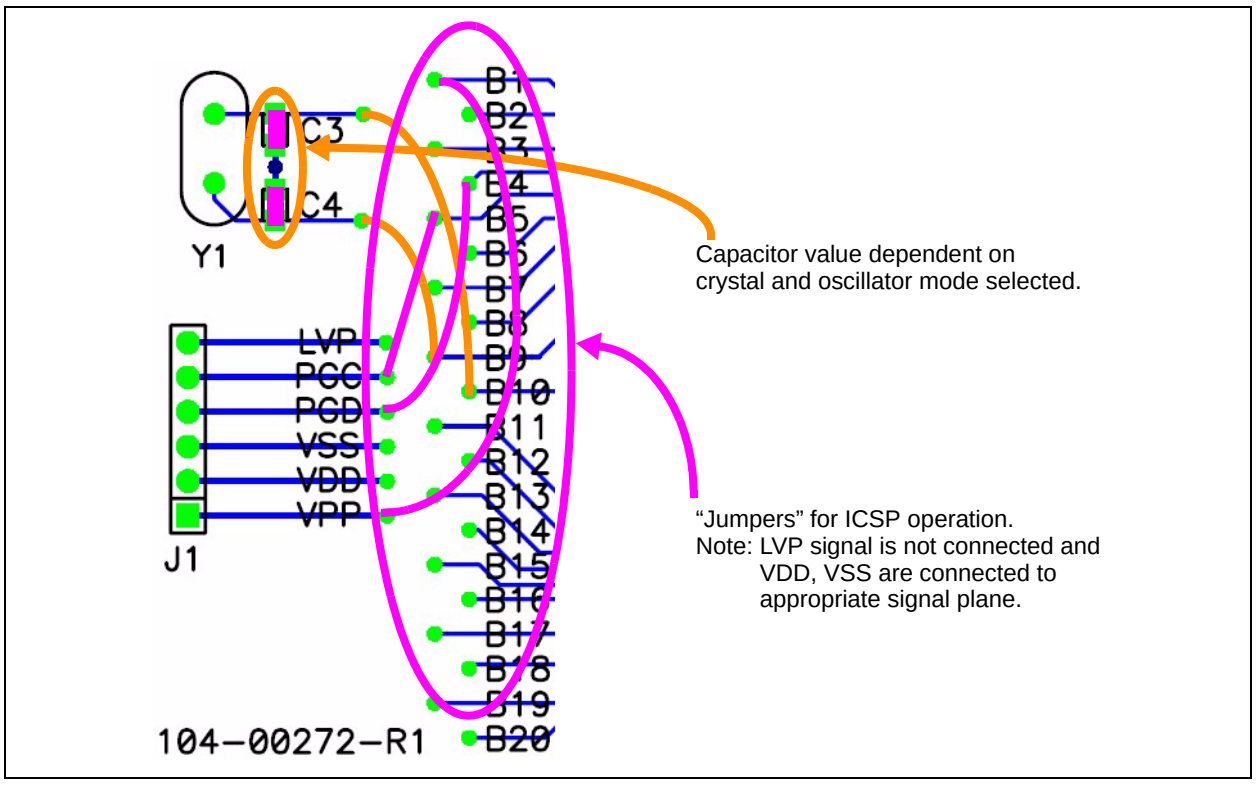


FIGURE 2-9: *PIC ICSP Header Example Connections (for PIC24F16KA101).*

TABLE 2-5: SUPPORTED NANOWATT XLP PIC MICROCONTROLLERS

Device	TSSOP	SSOP	Comment
PIC24F16KA101	—	Yes	
PIC24F08KA101	—	Yes	
PIC24F04KA201	—	Yes	
PIC18F13K22	—	Yes	
PIC18F13K50	—	Yes	
PIC18F14K22	—	Yes	
PIC18F14K50	—	Yes	

NOTES:

Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the schematic and layouts for the 20-Pin TSSOP and SSOP Evaluation Board. Diagrams included in this appendix:

- Board Schematic
- Board Layout – Top Layer and Silk-Screen
- Board Layout – Bottom Layer
- Board Layout – Power Plane
- Board Layout – Ground Plane
- Board Layout – Top Components
- Board Layout – Bottom Silk

A.2 SCHEMATICS AND PCB LAYOUT

Section A.3 "Board Schematic" shows the schematic of the 20-Pin TSSOP and SSOP Evaluation Board.

Section A.4 "Board Layout – Top Layer and Silk-Screen" shows the layout for the top layer of the 20-Pin TSSOP and SSOP Evaluation Board. The layer order is shown in Figure A-1.

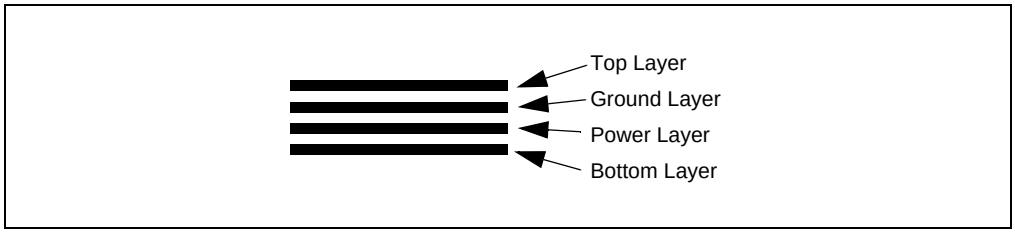
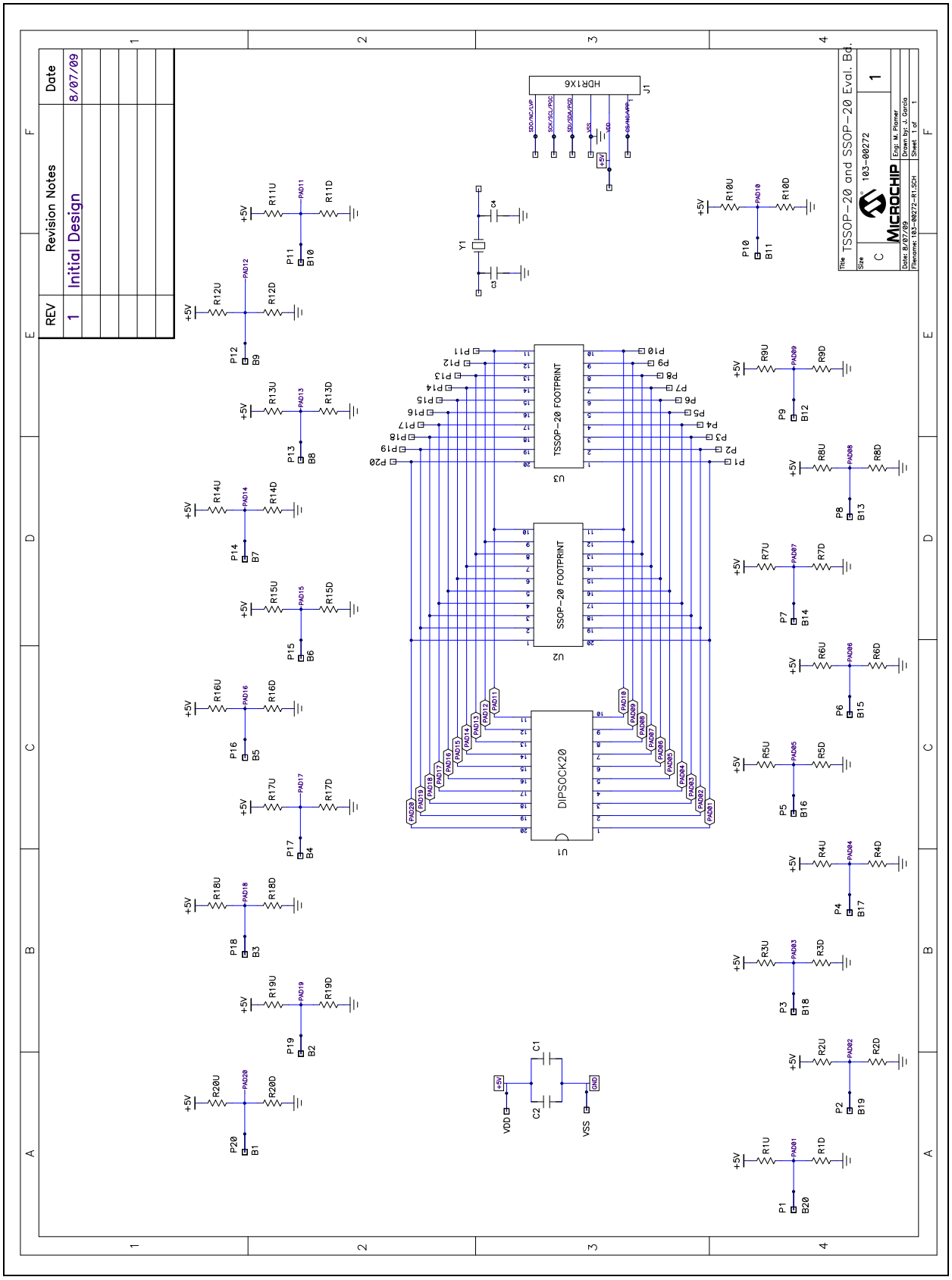
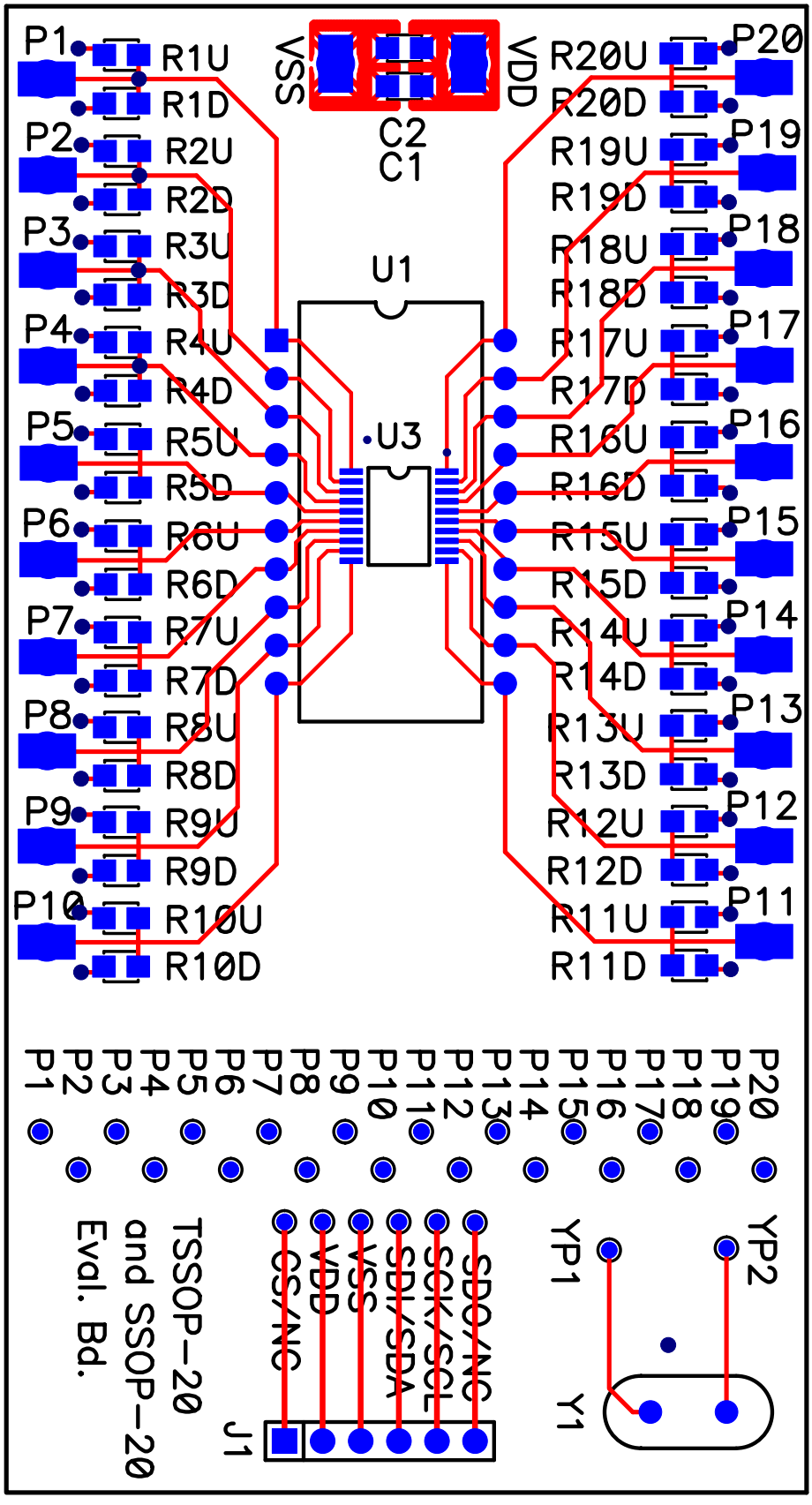


FIGURE A-1: *Layer Order.*

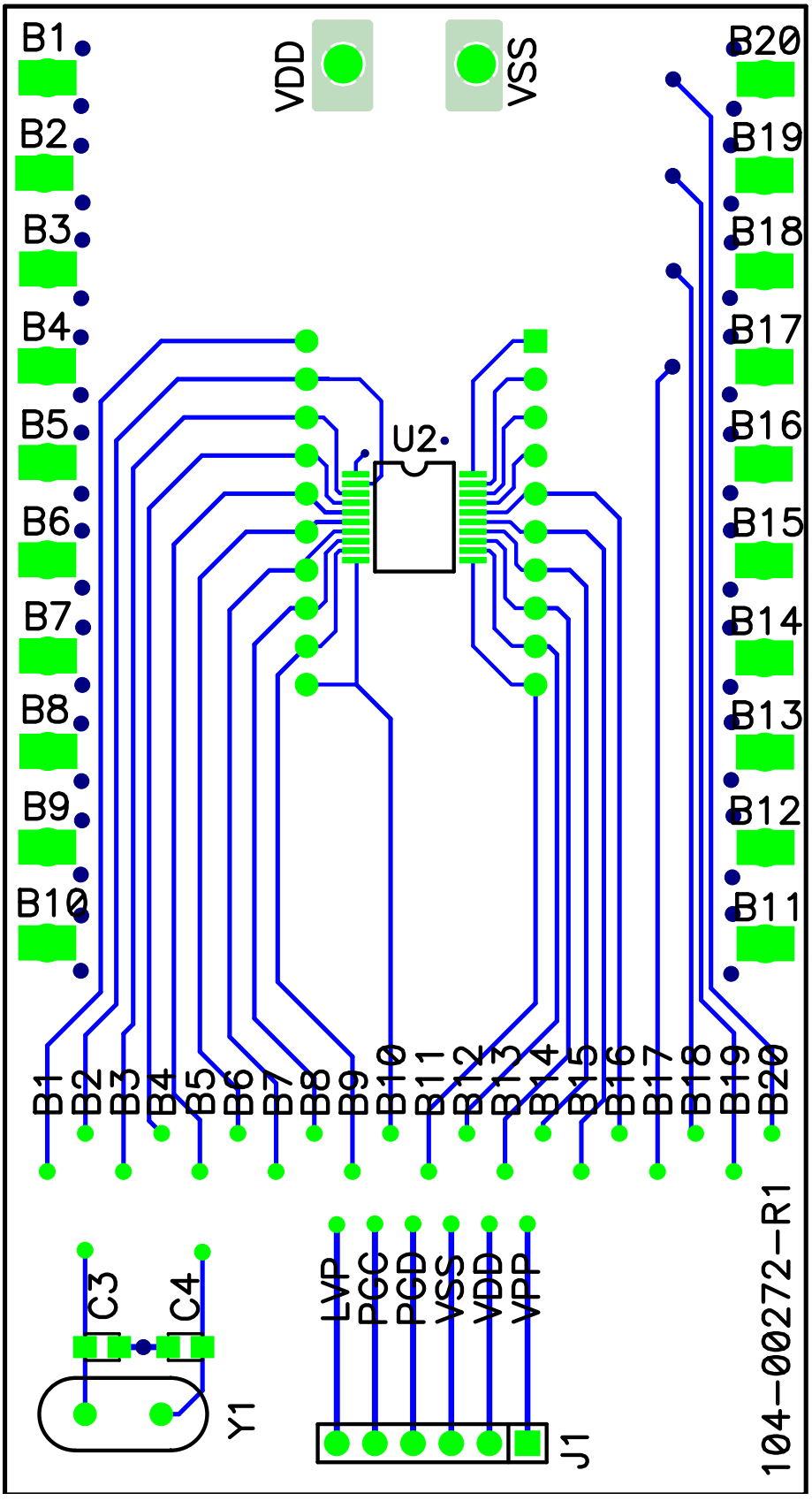
A.3 BOARD SCHEMATIC



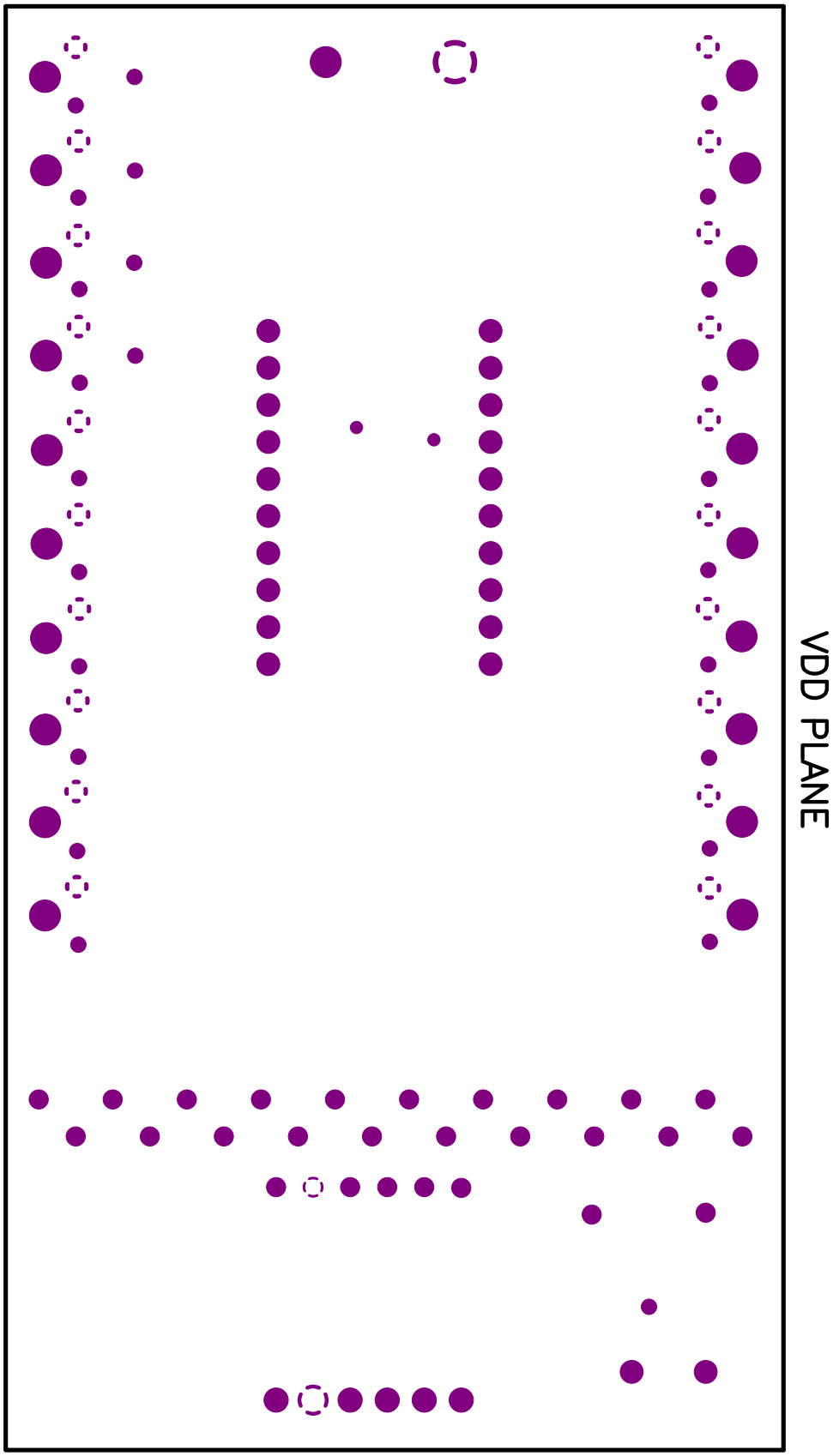
A.4 BOARD LAYOUT – TOP LAYER AND SILK-SCREEN



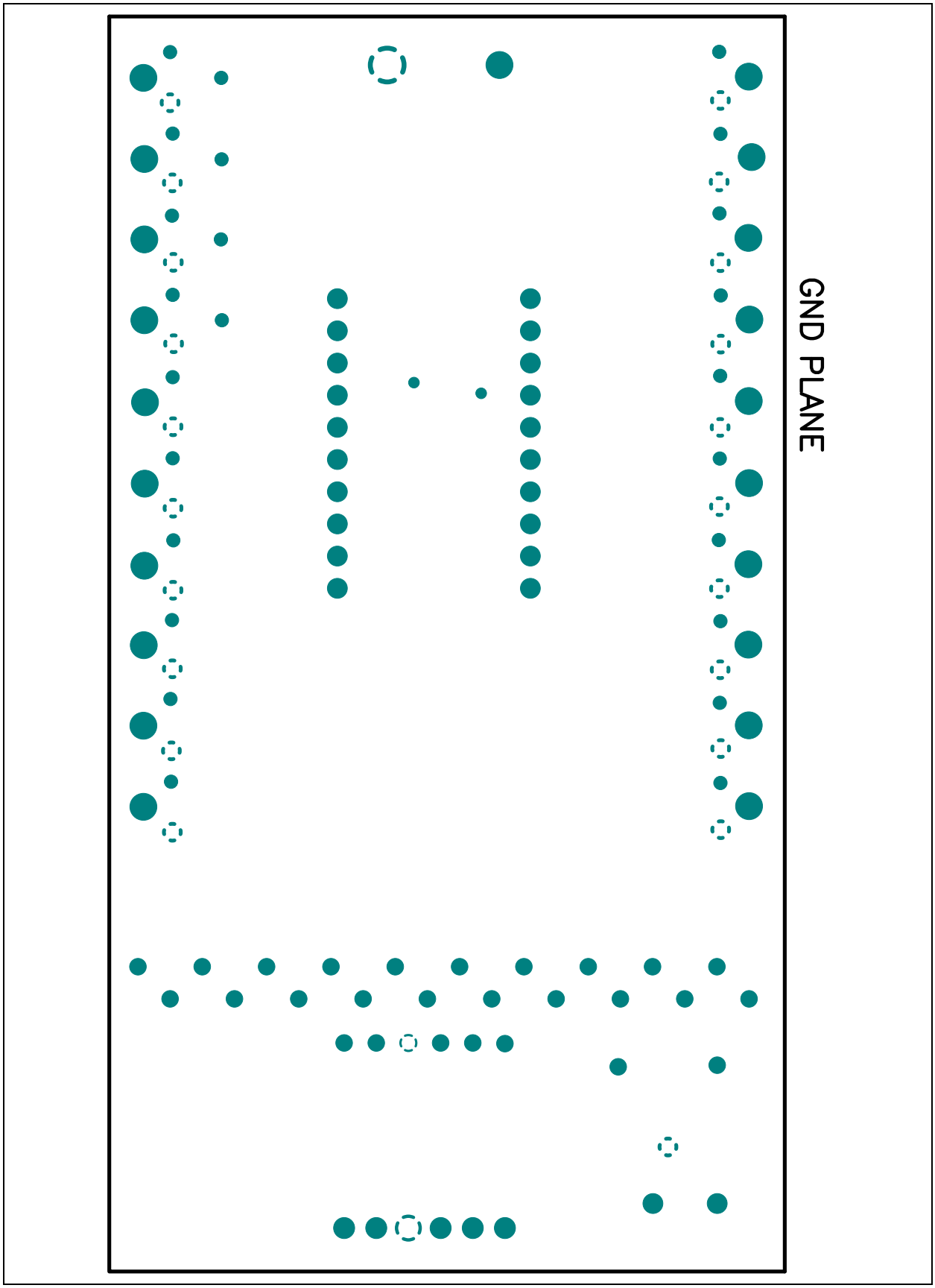
A.5 BOARD LAYOUT – BOTTOM LAYER



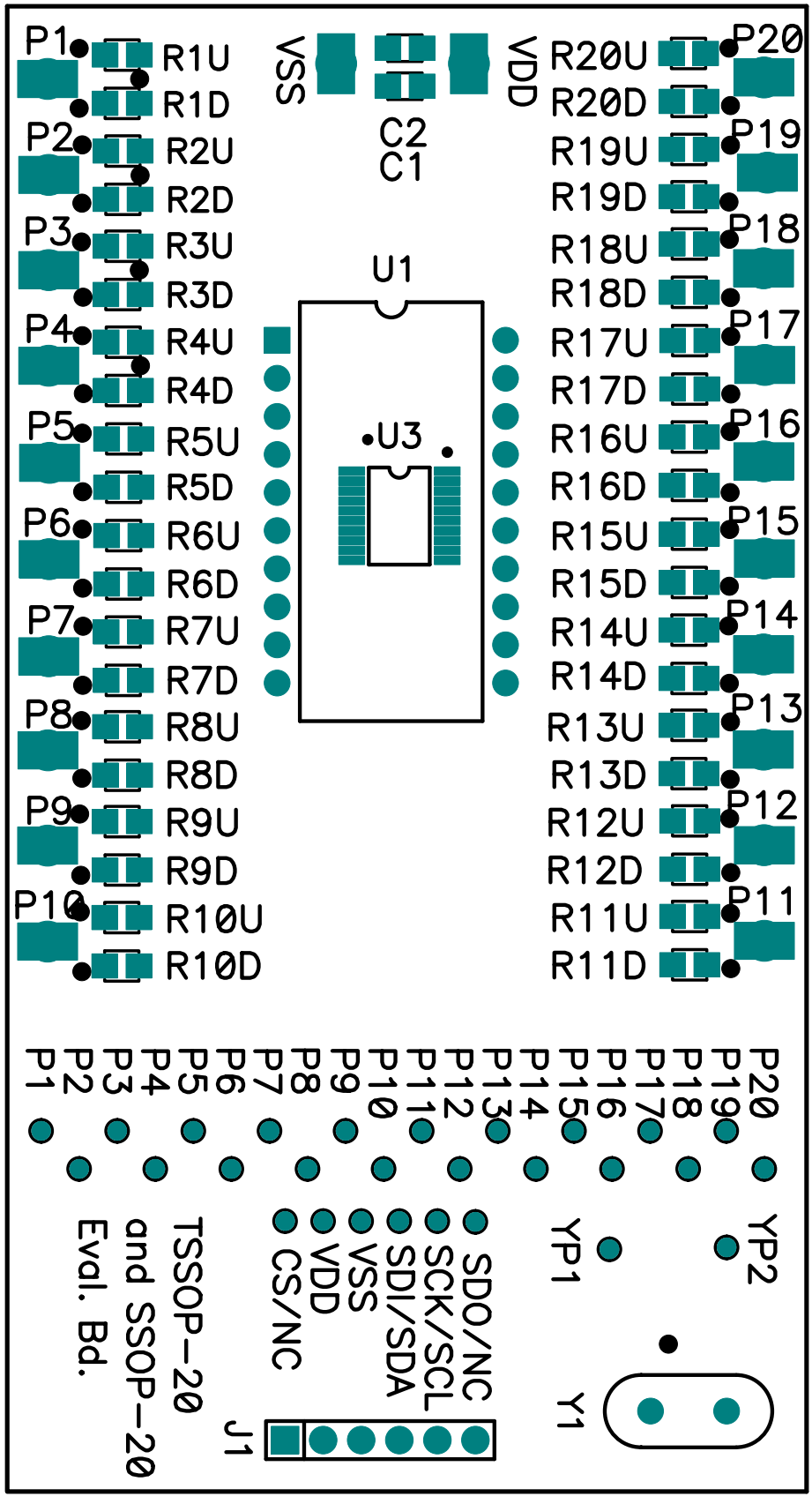
A.6 BOARD LAYOUT – POWER PLANE



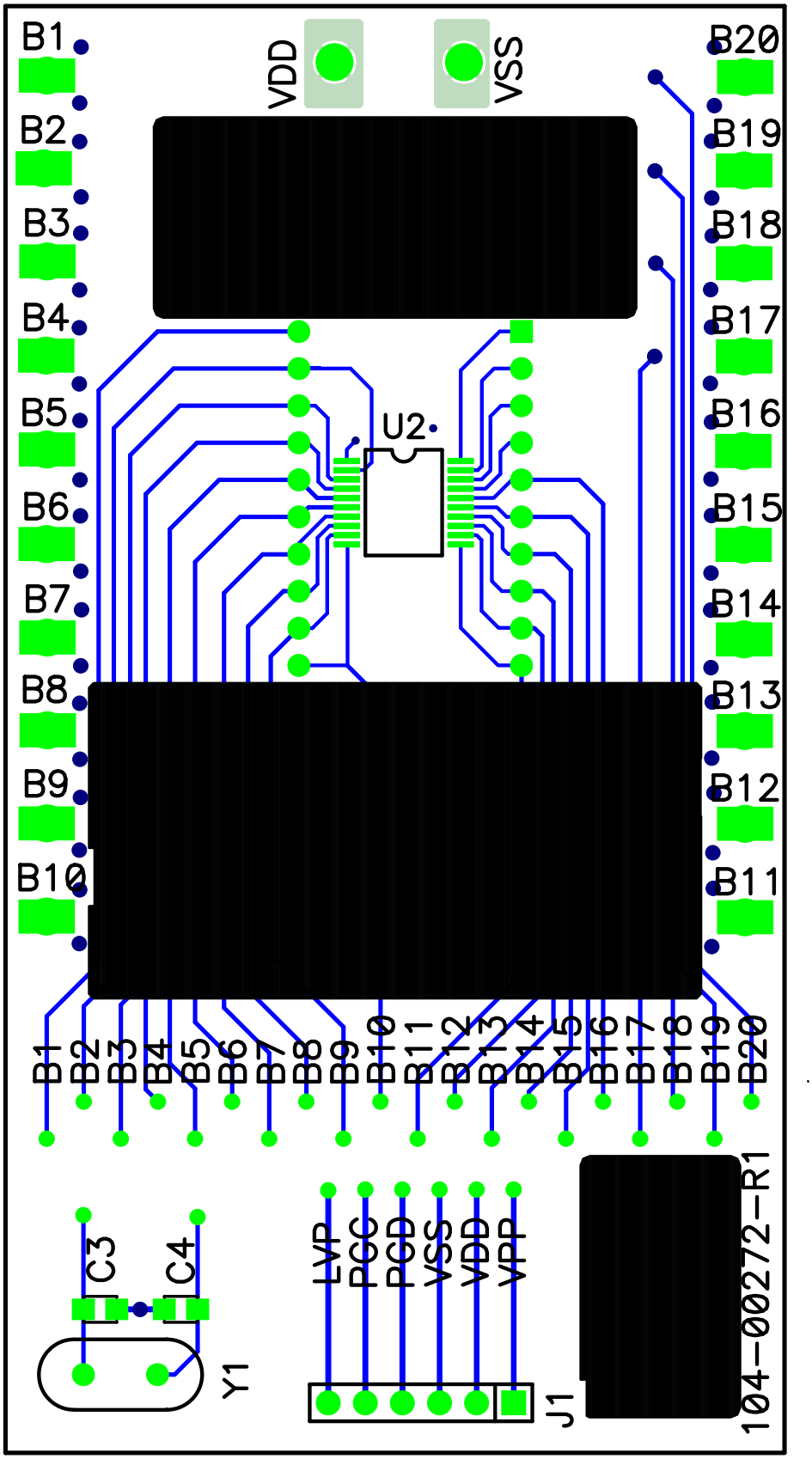
A.7 BOARD LAYOUT – GROUND PLANE



A.8 BOARD LAYOUT – TOP COMPONENTS



A.9 BOARD LAYOUT – BOTTOM SILK



Appendix B. Bill Of Materials (BOM)

TABLE B-1: BILL OF MATERIALS

Qty	Reference	Description	Manufacturer	Part Number
5	PCB	RoHS Compliant Bare PCB, 20-pin TSSOP and SSOP Evaluation Board	Microchip Technology Inc.	102-00272

Note: No Assembly required on this PCB.

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03/26/09