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MCP2515 PICtail™ DEMO BOARD USER'S GUIDE

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MCP2515 PICtail™ DEMO BOARD USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

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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 MCP2515 PICtail™ Demo 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 MCP2515 PICtail™ Demo Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP2515 PICtail™ Demo Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with this evaluation board.
- **Appendix A. "Schematics and Layouts"** – Shows the schematic and layout diagrams for the MCP2515 PICtail™ Demo Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the MCP2515 PICtail™ Demo 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>

RECOMMENDED READING

For more information regarding the Stand-Alone Controller Area Network (CAN) controller, CAN I/O Expander and CAN transceiver devices, refer to the appropriate data sheet. Table 1 shows the device and associated Data Sheet (DS) literature number. These documents can be downloaded from the Microchip web site at: www.microchip.com.

TABLE 1: DEVICES AND DATA SHEET LITERATURE NUMBERS

Device	Literature #	Device	Literature #
MCP2515	DS21801	**MCP2502X/5X**	DS21664
MCP2551	DS21667		

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- Development Systems Information Line

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

DOCUMENT REVISION HISTORY

Revision A (August 2005)

- Initial release of this document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the MCP2515 PICtail™ Demo Board and covers the following topics:

- What is the MCP2515 PICtail™ Demo Board?
- What the MCP2515 PICtail™ Demo Board kit includes

1.2 WHAT IS THE MCP2515 PICtail™ DEMO BOARD?

The MCP2515 PICtail™ Demo Board allows the system designer to quickly evaluate the operation of the MCP2515 Stand-Alone CAN Controller. The board demonstrates the MCP2515 in a CAN bus environment.

In addition, the kit includes an MCP25020 CAN I/O Expander node which demonstrates the device on a CAN bus.

1.3 WHAT THE MCP2515 PICtail™ DEMO BOARD KIT INCLUDES

This MCP2515 PICtail™ Demo Board Kit includes:

- One MCP2515 PICtail™ Demo Board with two CAN nodes
  - One node includes a PIC16F676, a MCP2515 CAN controller and a MCP2551 transceiver.
  - The other node includes a MCP25020 CAN I/O expander and an MCP2551 transceiver.
  - The CAN nodes can be physically separated by snapping them apart at the perforation.
- One power/bus cable for connecting the two PCB sections together
- MCP2515 Data Sheet (DS21801) (electronic version on CD)
- MCP2502X/5X Data Sheet (DS21664) (electronic version on CD)
- MCP2551 Data Sheet (DS21667) (electronic version on CD)
- MCP2515 PICtail™ Demo Board User's Guide (DS21572) (electronic version on CD)

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Chapter 2. Installation and Operation

2.1 INTRODUCTION

This chapter discusses the setup and operation of the MCP2515 PICtail™ Demo Board.

The MCP2515 PICtail™ Demo Board is designed to demonstrate the MCP2515 and MCP25020 as simple, low-cost CAN nodes. Both nodes monitor an input push button and send CAN messages with the button condition at regular intervals. The CAN message is received by the other node, where a LED is set to mirror the button state.

2.2 FEATURES

The MCP2515 PICtail™ Demo Board has the following features:

- Two (2) CAN nodes consisting of:
  - ***Node A:*** MCP2515, PIC16F676 and a MCP2551 CAN transceiver.
  - ***Node B:*** MCP25020 CAN I/O Expander and MCP2551 CAN transceiver.
- Each node also has one push button and one LED connected to the I/O.
  - The push button state from each node is sent to the other node via a CAN message.
- Two headers on Node A, used for programming the PICmicro® Microcontroller Unit (MCU) using the programming features of the PICkit™ 1 Flash Starter Kit or PICkit™ 2 Microcontroller Programmer. Neither header is populated. Refer to **Appendix A. "Schematics and Layouts"**.

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2.3 GETTING STARTED

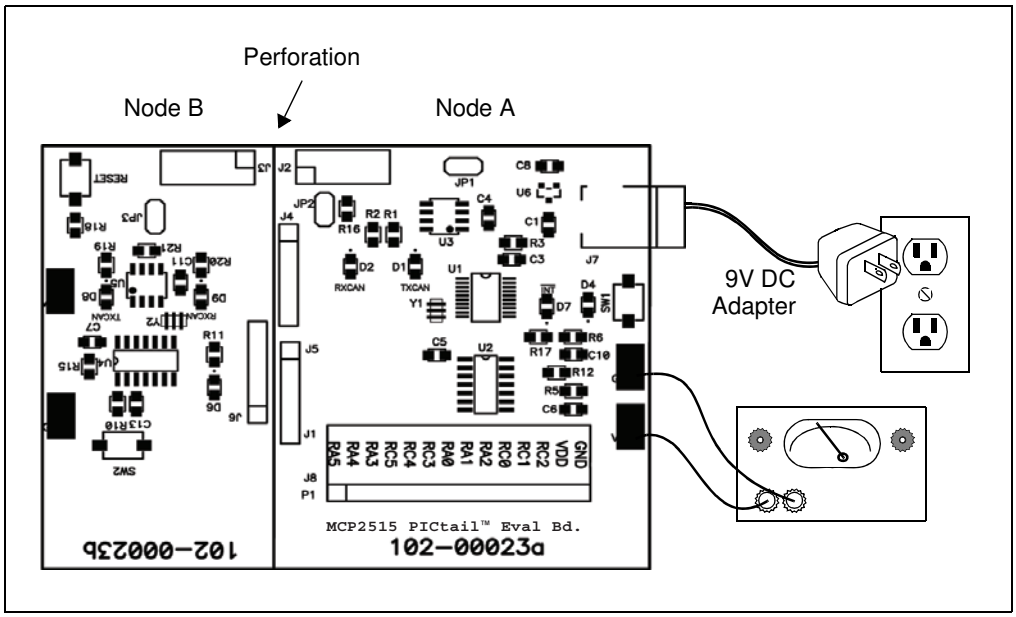
The MCP2515 PICtail™ Demo Board is a fully-functional, assembled and tested board for evaluation of the MCP2515 Stand-Alone CAN controller in a simple CAN environment. In addition, the MCP25020 CAN I/O Expander can be observed in operation. The following describes the basic setup and operation (see Figure 2-1):

1. Either connect a power supply (5 V) using the V_{DD} and GND test points, or plug a 9V power supply or power adapter into the plug.
2. Observe that RXCAN, TXCAN, and $\overline{INT}$ LEDs flash at regular intervals.
3. Node A (MCP2515) samples its input (push button) and sends to Node B instructing it to drive its LED to the input corresponding level of the switch.
4. Node A also requests Node B's I/O status (push button) at the same interval and driveits LED as required.

2.3.1 PICkit™ 1 Flash Starter Kit and PICkit™ 2 Microcontroller Programmer Connections

The MCP2515 PICtail™ Demo Board has two headers (not populated), which allows the PICkit™ 1 Flash Starter Kit or PICkit™ 2 Microcontroller Programmer to be used to reprogram the PICmicro® MCU. Refer to the PICkit™ 2 Microcontroller Programmer User's Guide (DS51553) for more information on programming PICmicro MCUs.

FIGURE 2-1: SETUP CONFIGURATION



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2.4 FIRMWARE DESCRIPTION

See Figure 2-2 and Figure 2-3 for a simple firmware flow diagram for Node A (Node B does not contain any firmware).

1. The firmware first configures the PIC16F676 and the MCP2515.
2. The firmware then checks a global flag bit to determine if a message needs to be sent (a message containing the input button value is transmitted once every 224 ms).

   2a. Node A sends a message to Node B requesting I/O status (i.e., push button status).
3. The firmware checks a global receive flag bit to determine if a message has been received by the MCP2515. If yes, the data is read and the LED is set accordingly.
4. The firmware loops back to #2.

FIGURE 2-2: FIRMWARE FLOW DIAGRAM

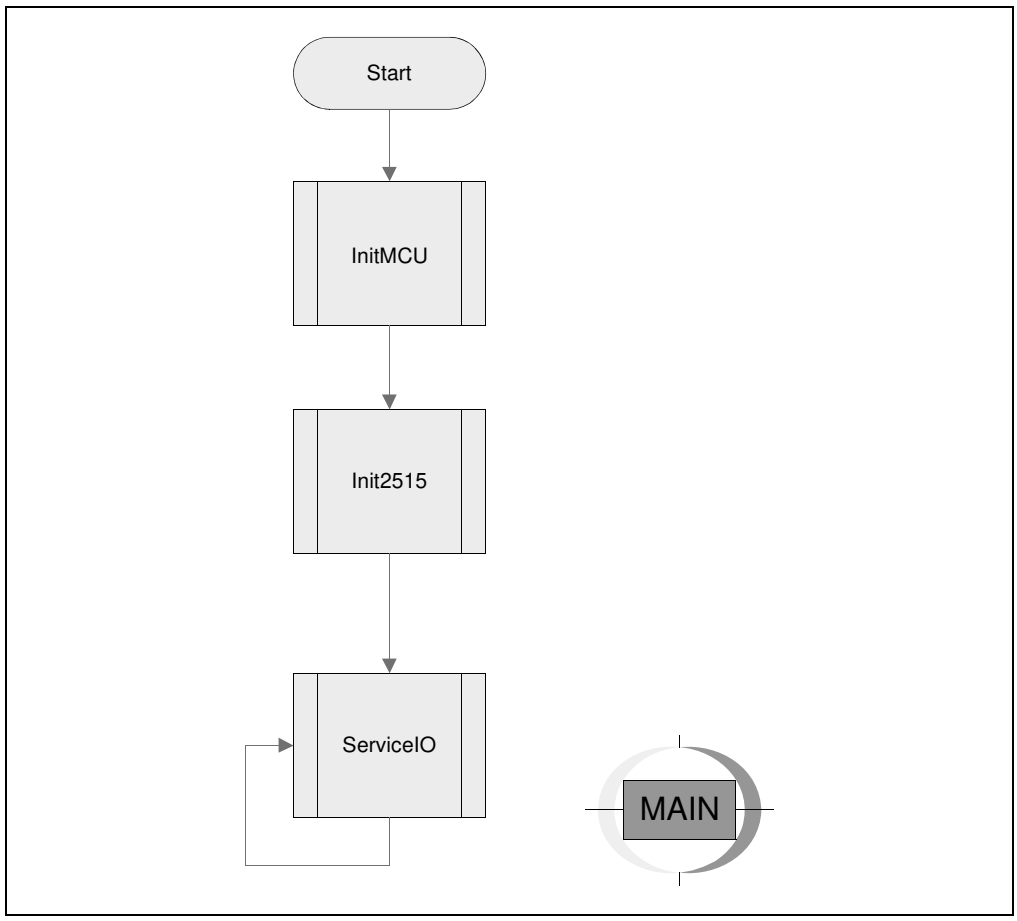
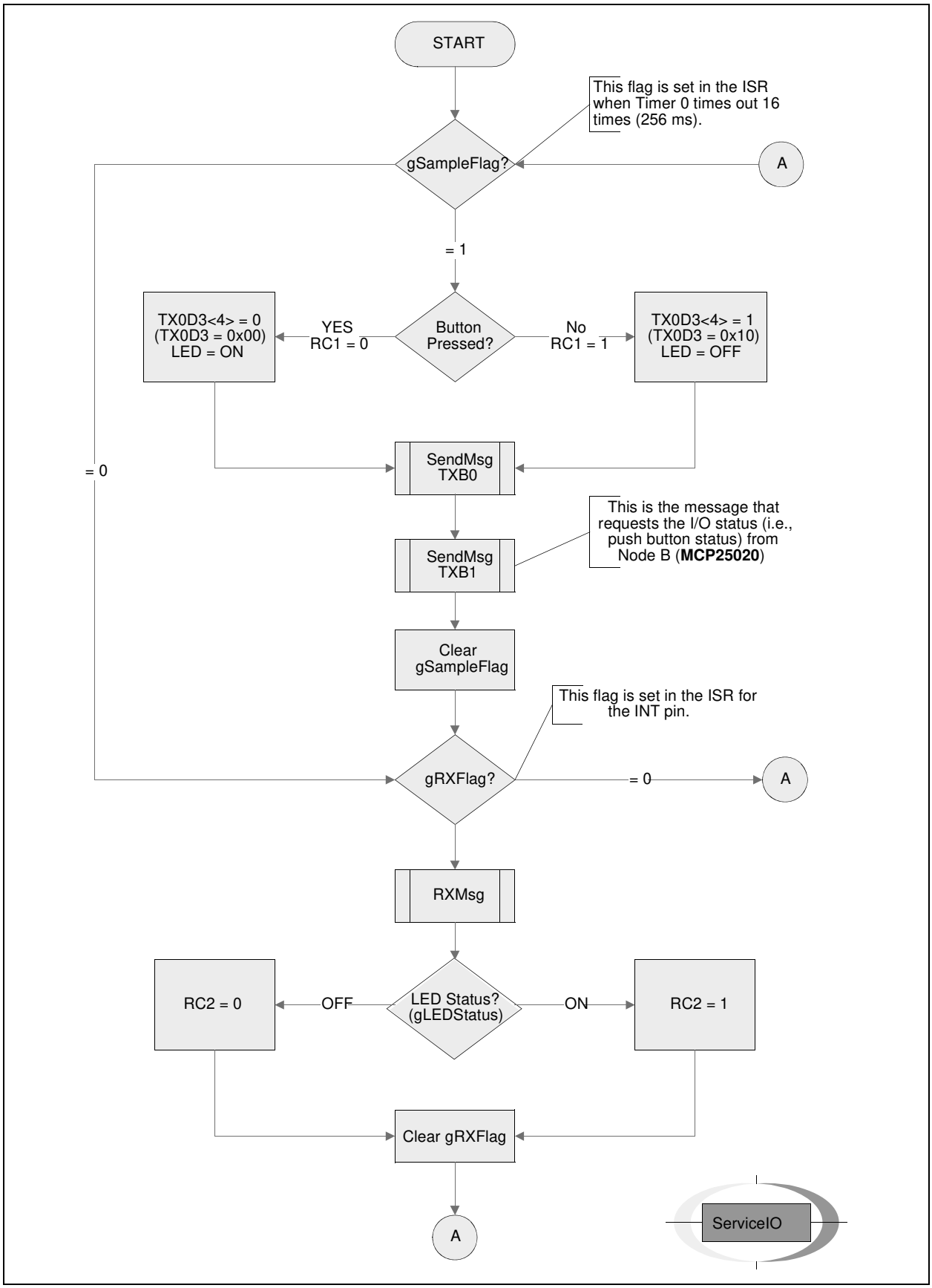


FIGURE 2-3: SERVICE I/O FIRMWARE FLOW



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Appendix A. Schematics and Layouts

A.1 INTRODUCTION

This appendix contains the schematic and PCB layout for the MCP2515 PICtail™ Demo Board. Diagrams included:

- Board Schematic – Sheet 1 of 2
- Board Schematic – Sheet 2 of 2
- Board – Top Layer (with silk-screen)
- Board – Bottom Layer

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FIGURE A-1: BOARD SCHEMATIC – SHEET 1 OF 2

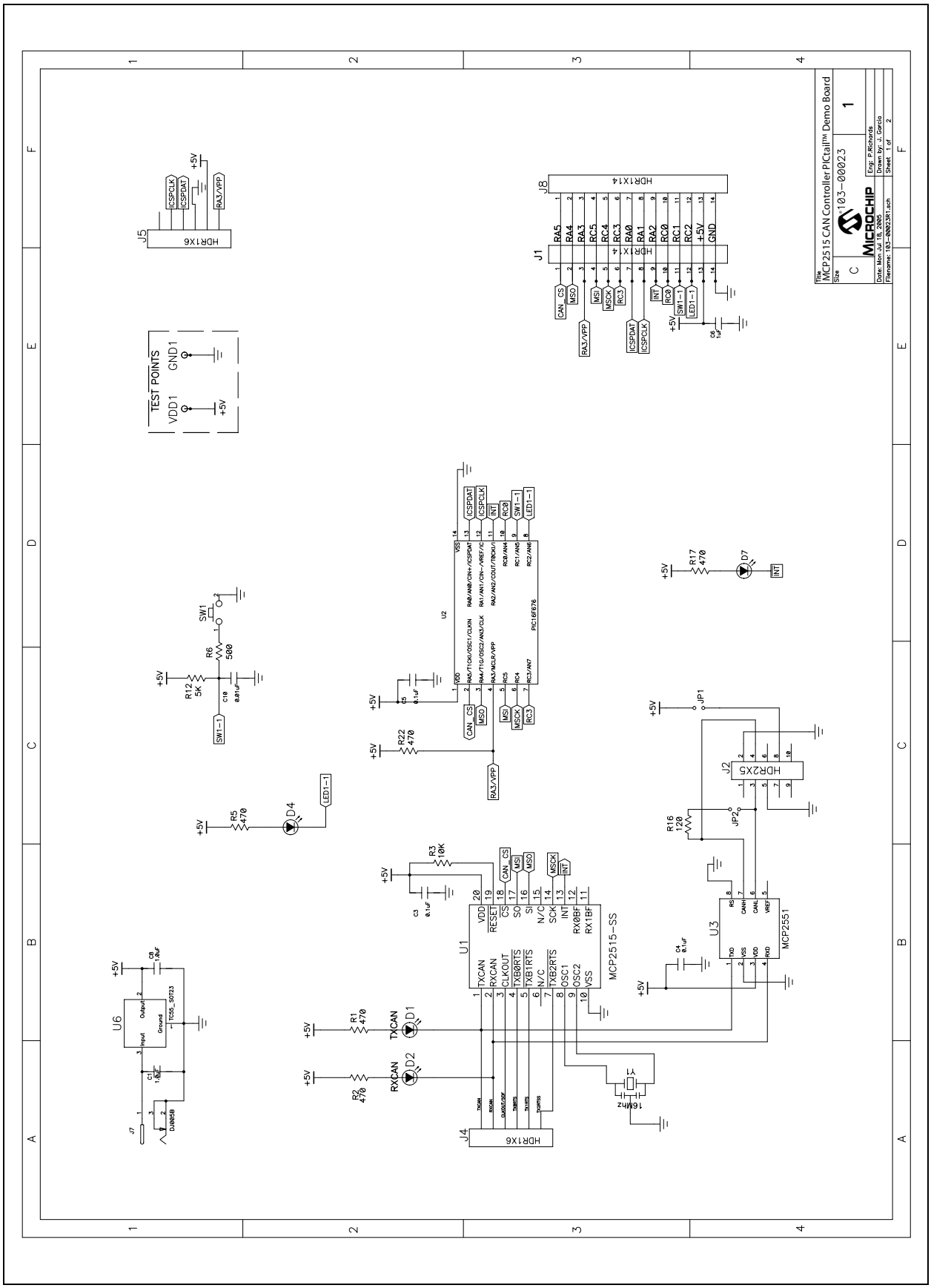

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FIGURE A-2: BOARD SCHEMATIC – SHEET 2 OF 2

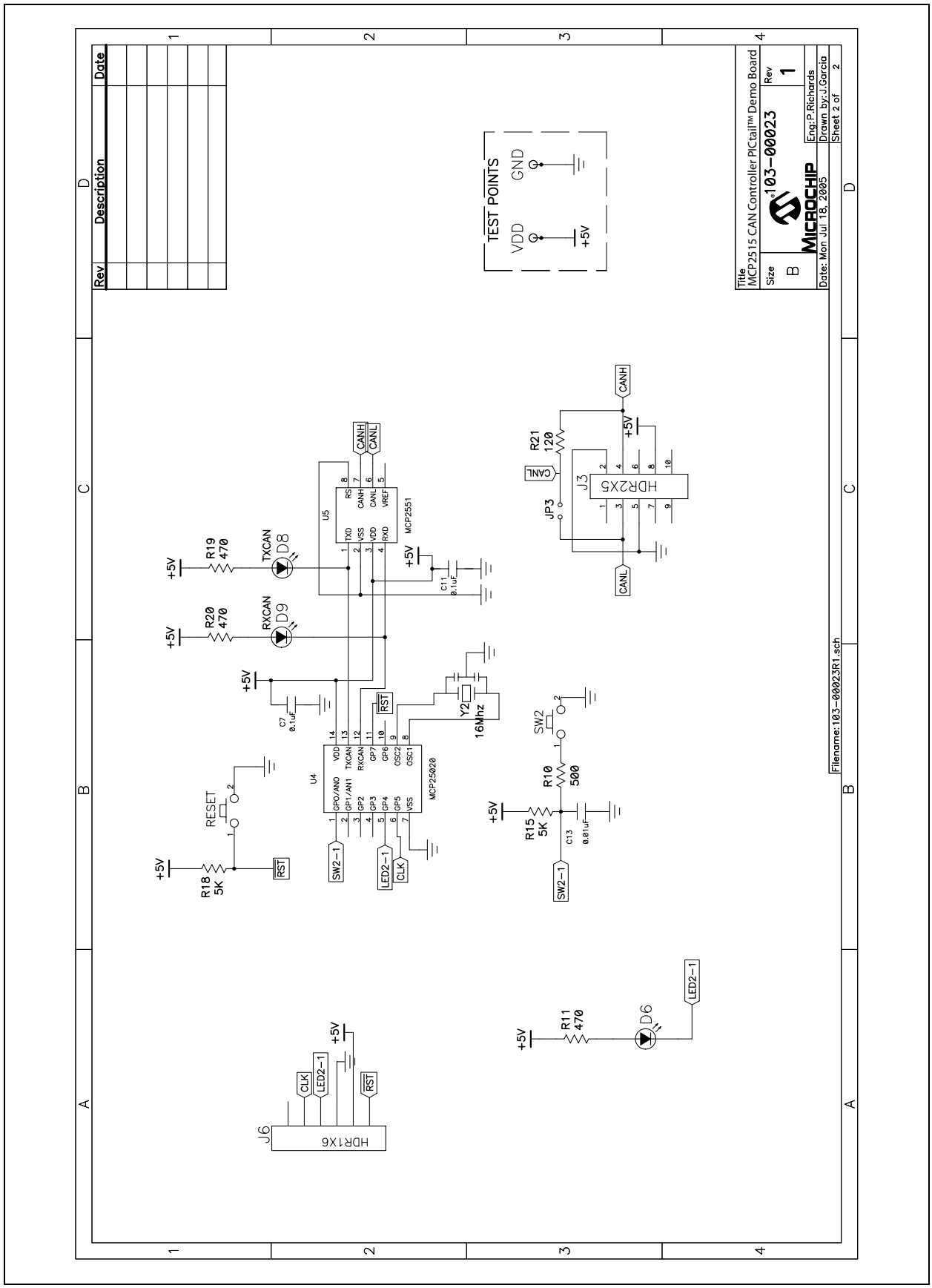


FIGURE A-3: BOARD – TOP LAYER (WITH SILK-SCREEN)

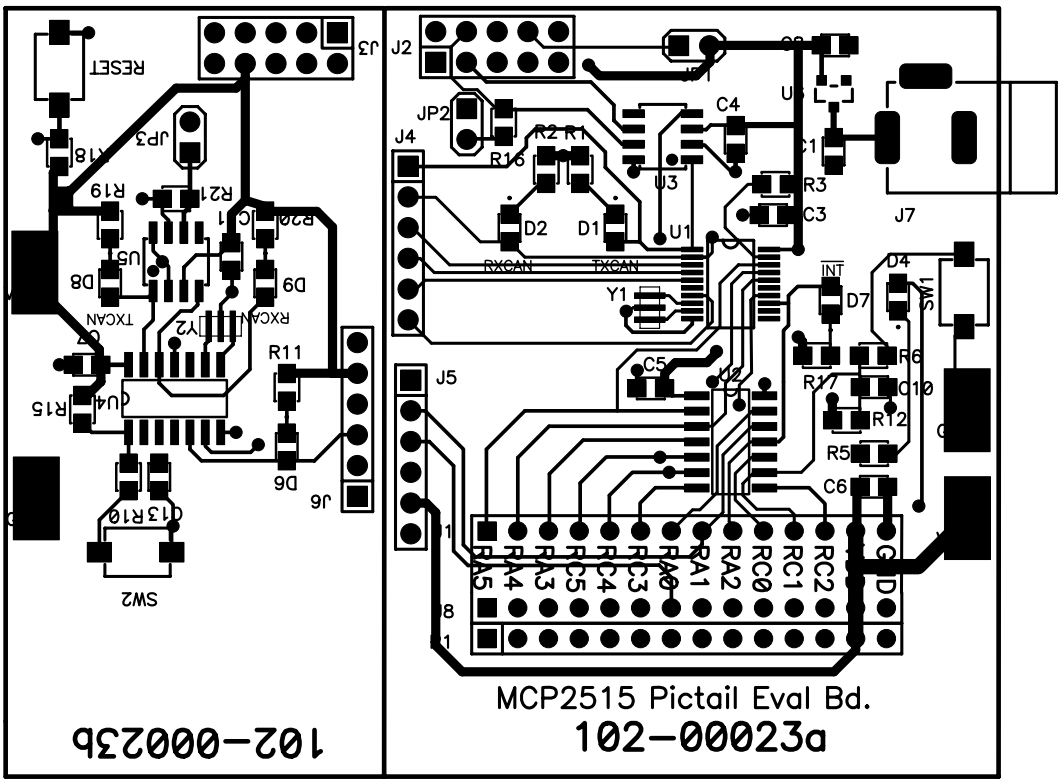
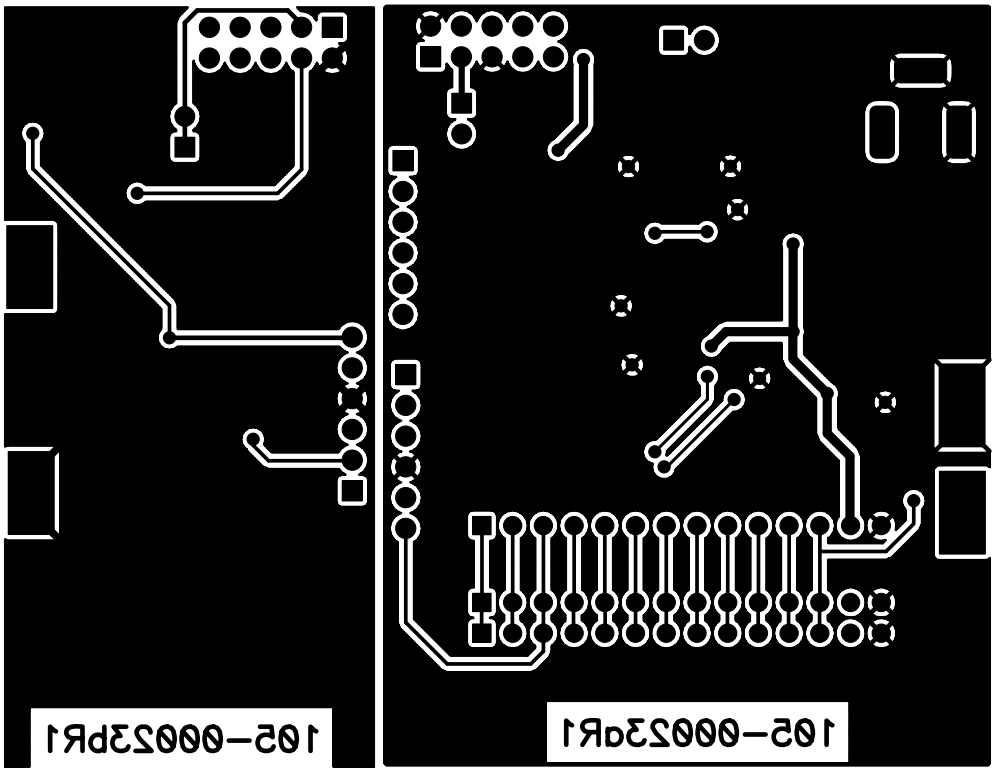


FIGURE A-4: BOARD – BOTTOM LAYER



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Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
5	C3, C4, C5, C7, C11	CAP .1 µF 16V CERAMIC X7R 0805	Panasonic® - ECG	ECJ-2VB1C104K
1	C6	CAP 1.0 µF 10V CERAMIC X7R 0805	Kemet®	C0805C105K8RACTU
2	C10, C13	CAP 10000PF 50V CERAMIC X7R 0805	Kemet	C0805C103K5RACTU
6	D1, D2, D4, D6, D7, D8, D9	LED RED CLEAR 0805 SMD	Lite-On Trading USA Inc	LTST-C170CKT
8	GND, GND1, TP1, TP2, TP3, TP4, TP4, VDD, VDD1	PC TEST POINT COMPACT SMT	Keystone Electronics®	5016
2	J2, J3	CONN HEADER 10POS .100 VERT TIN	Molex®/Waldom® Electronics Corp	10-88-1101
1	J4	CONN HEADER 6POS .100 VERT TIN	Molex/Waldom Electronics Corp	22-28-4061
2	J5, J6	CONN HEADER 6POS.100 VERT TIN Header Not Installed	Molex/Waldom Electronics Corp	22-28-4062
2	JP1, JP2	CONN HEADER 2POS .100 VERT TIN	Molex/Waldom Electronics Corp	22-28-4021
1	JP3	CONN HEADER 2POS.100 VERT TIN Jumper Not Installed	Molex/Waldom Electronics Corp	22-28-4022
1	P1	CONN HEADER 14POS.100 R/A TIN Header Not Installed	Molex/Waldom Electronics Corp	22-28-8140
7	R1, R2, R5, R11, R17, R19, R20	RES 475 OHM 1/10W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF4750V
1	R3	RES 10.0K OHM 1/8W 1% 0805 SMD	Yageo America	9C08052A1002FKHFT
2	R,6, R10	RES 510 OHM 1/8W 5% 0805 SMD	Panasonic - ECG	ERJ-6GEYJ511V
3	R12,R15,R18	RES 4.99K OHM 1/10W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF4991V
2	R16,R21	RES 121 OHM 1/10W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF1210V
3	SW1, SW2, SW5	SWITCH LT TOUCH 6X3.5 100GF SMD	Panasonic - ECG	EVQ-PJS04K
1	U1	Stand-alone Controller Area Network (CAN) controller	Microchip Technology Inc.	MCP2515-I/ST
1	U2	PIC® 14-Pin Flash-based 8-Bit CMOS Microcontroller	Microchip Technology Inc.	PIC16F676-I/SN
2	U3,U5	High-Speed CAN Transceiver	Microchip Technology Inc.	MCP2551-I/SL
1	U4	CAN I/O Expander for a Controller Area Network (CAN) system,	Microchip Technology Inc.	MCP25020-I/SL
1	Y1,Y2	Resonator 16.0 MHZ Ceramic	Murata® Electronics North America	CSTCE16M0V53-R0

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