



**MCP3423**  
**Evaluation Board**  
**User's Guide**

---

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

---

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

**Trademarks**

The Microchip name and logo, the Microchip logo, Accuron, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, rPIC, SmartShunt and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL, SmartSensor and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, In-Circuit Serial Programming, ICSP, ICEPIC, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, PICkit, PICDEM, PICDEM.net, PICTail, PIC<sup>32</sup> logo, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rLAB, Select Mode, Total Endurance, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2008, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

**QUALITY MANAGEMENT SYSTEM**  
**CERTIFIED BY DNV**  
**== ISO/TS 16949:2002 ==**

*Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC<sup>®</sup> MCUs and dsPIC<sup>®</sup> DSCs, KEELOQ<sup>®</sup> code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*



# MCP3423 EVALUATION BOARD USER'S GUIDE

---

---

## Table of Contents

---

---

<b>Preface</b> .....	<b>1</b>
Introduction.....	1
Document Layout .....	1
Conventions Used in this Guide .....	2
Recommended Reading.....	3
The Microchip Web Site .....	3
Customer Support .....	3
Document Revision History .....	3
<b>Chapter 1. Quick Start Instructions</b>	
1.1 Introduction .....	5
1.2 Description of the MCP3423 Evaluation Board .....	5
1.3 Getting Started with PICKit Serial Analyzer .....	6
1.4 Experiment for CH2 .....	22
<b>Appendix A. Schematic and Layouts</b>	
A.1 Introduction .....	23
A.2 Board – Schematic .....	24
A.3 Board – Top Layer .....	25
A.4 Board – Top Metal Layer .....	26
A.5 Board – Bottom Layer .....	27
A.6 Board – Bottom Metal Layer .....	28
<b>Appendix B. Bill of Materials (BOM)</b>	
<b>Worldwide Sales and Service</b> .....	<b>30</b>

# MCP3423 Evaluation Board User's Guide

---

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](http://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 “DSXXXXA”, where “XXXX” 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 MCP3423 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 MCP3423 Evaluation Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. “Quick Start Instructions”** – this chapter provides an overview of the MCP3423 Evaluation Board and instructions on how to use the MCP3423 Evaluation Board with the PICkit Serial Analyzer.
- **Appendix A. “Schematic and Layouts”** – shows the schematic and layout diagrams for the MCP3423 Evaluation Board.
- **Appendix B. “Bill of Materials (BOM)”** – lists the parts used to build the MCP3423 Evaluation Board.

# MCP3423 Evaluation Board User's Guide

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

### DOCUMENTATION CONVENTIONS

Description	Represents	Examples
<b>Arial font:</b>		
Italic characters	Referenced books	<i>MPLAB<sup>®</sup> IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> 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	<u><i>File&gt;Save</i></u>
Bold characters	A dialog button	Click <b>OK</b>
	A tab	Click the <b>Power</b> 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>
<b>Courier New font:</b>		
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets [ ]	Optional arguments	mcc18 [options] <i>file</i> [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 MCP3423 Evaluation Board. Other useful documents are listed below. The following Microchip document is available and recommended as supplemental reference resources:

### **PICkit™ Serial Analyzer User's Guide (DS51647)**

Consult this document for instructions on how to use the PICkit Serial Analyzer hardware and software.

### **MCP3422/3/4 Data Sheet, "18-Bits, Multi-Channel Delta-Sigma Analog-to-Digital Converter with I<sup>2</sup>C Interface and On-Board Reference" (DS22088)**

This data sheet provides detailed information regarding the MCP3423 product family.

## THE MICROCHIP WEB SITE

Microchip provides online support via our web site at [www.microchip.com](http://www.microchip.com). This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

## CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- 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 (November 2008)**

- Initial Release of this Document.

# MCP3423 Evaluation Board User's Guide

---

NOTES:



---

---

## Chapter 1. Quick Start Instructions

---

---

### 1.1 INTRODUCTION

The following sections provide an overview of the MCP3423 Evaluation Board and demonstrate how to use it with the PICkit™ Serial Analyzer (P/N: DV164122).

The following topics are covered:

- Description of the MCP3423 Evaluation Board
- How to use MCP3423 Evaluation Board with the PICkit Serial Analyzer

### 1.2 DESCRIPTION OF THE MCP3423 EVALUATION BOARD

The MCP3423 Evaluation Board (P/N MCP3423EV) contains a MCP3423 18-Bit  $\Delta\Sigma$  Analog-to-Digital Converter (ADC). The MCP3423 is a 2-channel 18 bit delta-sigma ADC device with various configuration options. The board has analog input connection pads and various test pads.

The user can connect inputs and test the conversion results using the PICkit Serial Analyzer and its PC graphic user interface (GUI). The MCP3423 Evaluation Board has the following interfaces:

- PICkit Serial Analyzer (P/N: DV164122) for writing configuration register bits and reading the conversion data.

<p><b>Note:</b> The user can use this board without the PICkit Serial Analyzer as long as the <math>V_{DD}</math>, SCL, and SDA are provided through J1 connector. This Evaluation Board does not include MCU.</p>
--

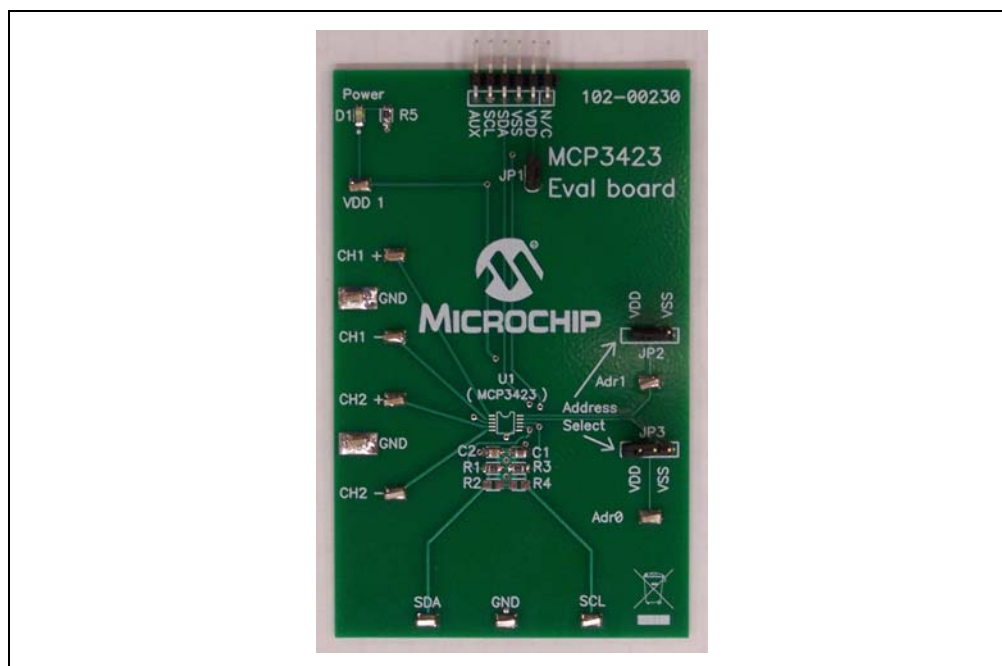
The board has test points for SDL, SDA, and analog inputs. By connecting an oscilloscope to these test points, the user can examine the data communications through the I<sup>2</sup>C™ bus line and observe the resulting conversion output. Refer to **Appendix A. "Schematic and Layouts"**.

#### 1.2.1 I<sup>2</sup>C Address Bits and A0 Address Bit Selection

The I<sup>2</sup>C device code and address bits of the MCP3423 device are:

- Device Code: '1101'
- A2, A1, A0 Address Bits: determined by the JP2 (Adr1 pin) and JP3 (Adr0 pin).
- See Table 1-1 for the I<sup>2</sup>C Device Address bits and JP2 and JP3 connections.

# MCP3423 Evaluation Board User's Guide



**FIGURE 1-1:** Front View of the MCP3423 Evaluation Board.

## 1.3 GETTING STARTED WITH PICKIT SERIAL ANALYZER

Figure 1-1 shows the MCP3423 Evaluation Board, and Figure 1-2 shows the MCP3423 and PICKit Serial Analyzer.

The following describes how to use them together:

1. Connect the MCP3423 Evaluation Board's 6-pin socket to the PICKit Serial Analyzer as shown in Figure 1-2.
2. Connect the oscilloscope probes to the SCL and SDA test pins (optional).
3.  $V_{DD}$  Selection: You can use the  $V_{DD}$  from the PICKit Serial Analyzer or use your own external  $V_{DD}$ . The JP1 connector selects the  $V_{DD}$  path.
  - (a) Connect JP1, if using  $V_{DD}$  from PICKit Serial Analyzer.
  - (b) Disconnect JP1 and apply  $V_{DD}$  at  $V_{DD1}$  pin, if you are using an external  $V_{DD}$ .
4. Address bit selection using JP2 and JP3 connectors.

The I<sup>2</sup>C device code and address bits of the MCP3423 device are:

- MCP3423 I<sup>2</sup>C device code: `1101`
  - A2, A1, A0 Address Bits: determined by the JP2 (Adr1 pin) and JP3 (Adr0 pin)
  - The JP2 and JP3 connectors are external address bit selections. Connect these pins to  $V_{SS}$ ,  $V_{DD}$ , float, or connect any arbitrary voltage
  - See Table 1-1 for the I<sup>2</sup>C Device Address bits and JP2 and JP3 connections
5. **Connecting  $V_{DD}$ :** LED D1 turns on when  $V_{DD}$  is applied. The PICKit Serial Analyzer will provide  $V_{DD}$  automatically, if it is connected to the PC. Make sure LED D1 turns on, when you execute the command using the PICKit Serial Analyzer.

# Quick Start Instructions

6. **Connecting the analog inputs:** If you need to measure a single-ended input, connect the unused pin (example, CHx-) to  $V_{SS}$ .
  - **Connecting the inputs:** The MCP3423 Evaluation Board has input pads for two analog input channels. You can connect all inputs at the same time and multiplex the input channel using configuration register settings. You can also leave the unused channel inputs floating.
7. Use the PICkit Serial Analyzer PC GUI to send I<sup>2</sup>C write and read commands.

## CAUTION

Each analog input pin has an ESD diode. Certain input conditions can damage the device. Please use the following conditions:

- (a) Do not apply an input greater than the input range specified by the MCP3423 Data Sheet.
- (b) Apply the input signal after  $V_{DD}$  is powered-up.

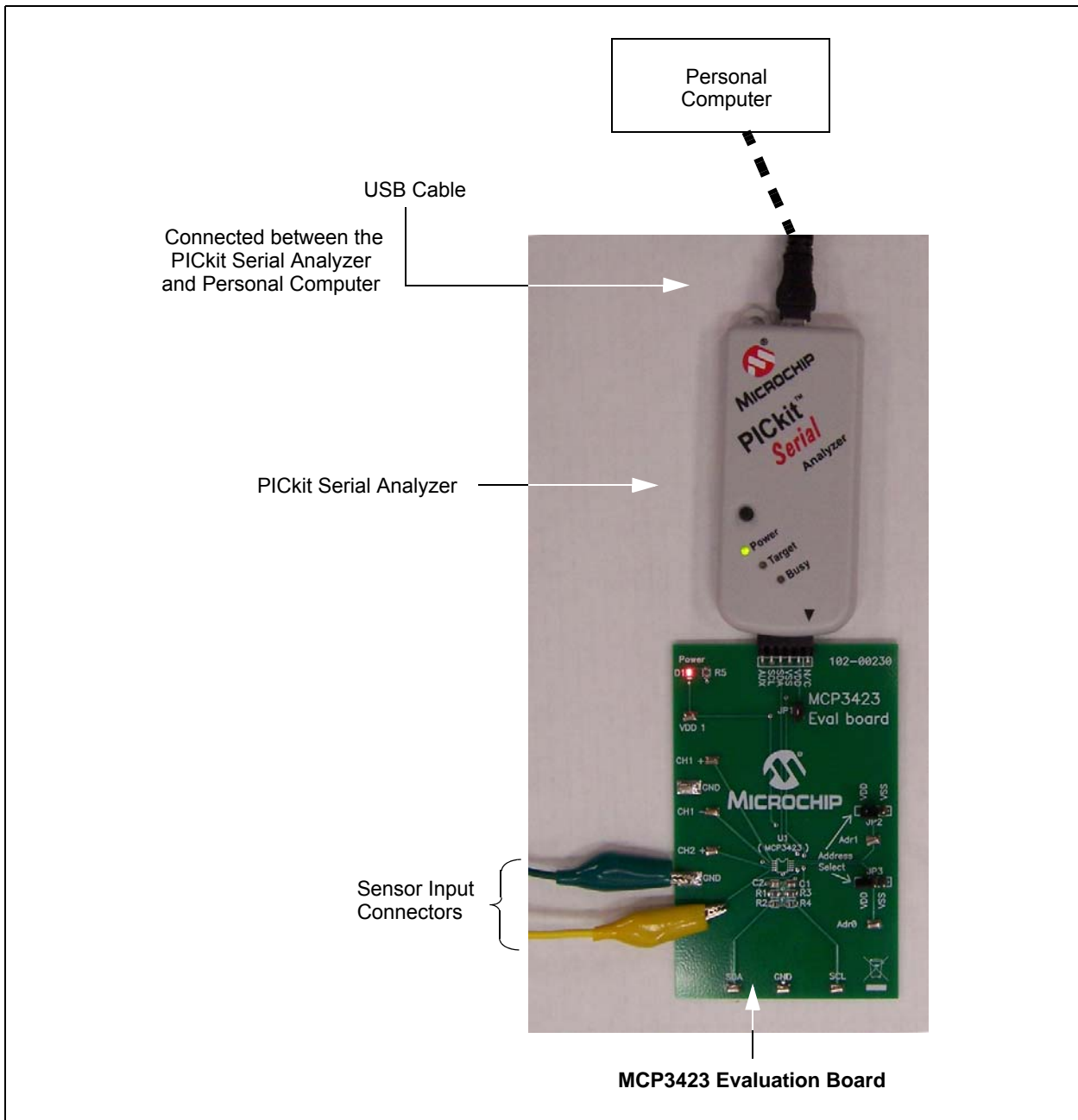
TABLE 1-1: I<sup>2</sup>C ADDRESS BITS VS. JP2 AND JP3 CONNECTORS

I <sup>2</sup> C Device Address Bits	JP2 (Adr1 Pin)	JP3 (Adr0 Pin)
1101 000 $\overline{W/R}$	Connected to $V_{SS}$	Connected to $V_{SS}$
1101 001 $\overline{W/R}$	Connected to $V_{SS}$	Float
1101 010 $\overline{W/R}$	Connected to $V_{SS}$	Connected to $V_{DD}$
1101 100 $\overline{W/R}$	Connected to $V_{DD}$	Connected to $V_{SS}$
1101 101 $\overline{W/R}$	Connected to $V_{DD}$	Float
1101 110 $\overline{W/R}$	Connected to $V_{DD}$	Connected to $V_{DD}$
1101 011 $\overline{W/R}$	Float	Connected to $V_{SS}$
1101 111 $\overline{W/R}$	Float	Connected to $V_{DD}$
1101 000 $\overline{W/R}$	Float	Float

**Note 1:**  $\overline{W/R}$  bit = "0" for writing, "1" for reading.

**Note 2:** Float: (a) Leave pin without connecting to anything, or (b) apply Addr\_Float voltage. See MCP3423 Data Sheet for more details.

# MCP3423 Evaluation Board User's Guide



**FIGURE 1-2:** MCP3423 Evaluation Board with the PICkit Serial Analyzer.

## 1.3.1 PICkit Serial Analyzer PC Software Setup for the MCP3423 Evaluation Board

The following steps describe how to set up and use the PICkit Serial Analyzer PC Graphic User Interface (GUI).

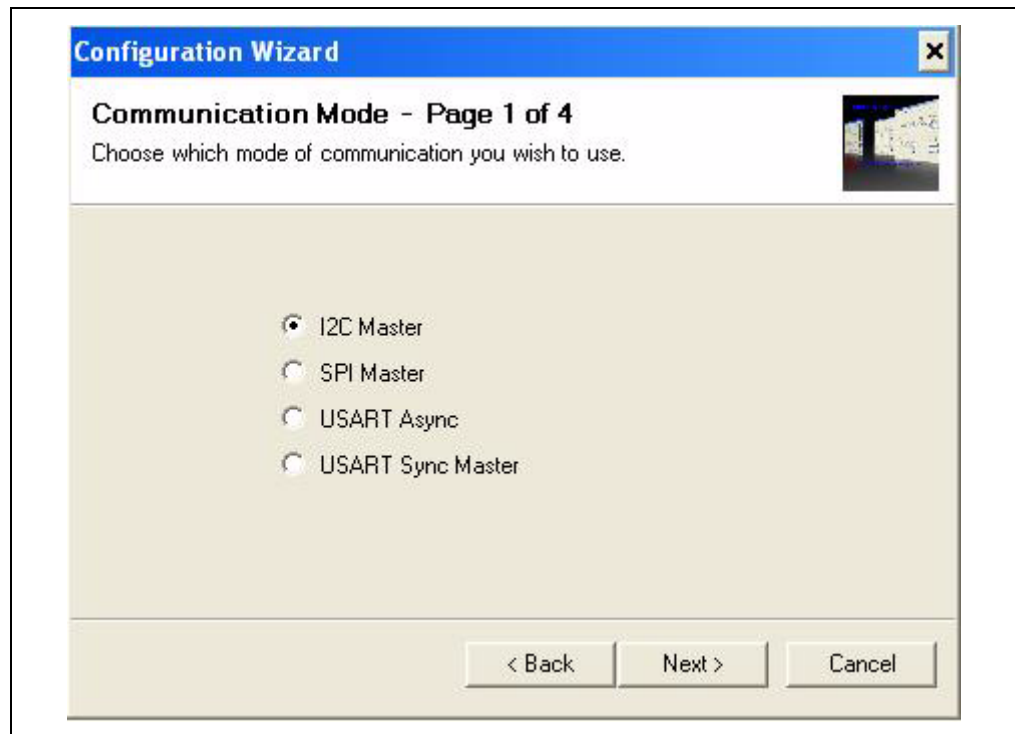
1. Install the PICkit Serial Analyzer software onto your personal computer (PC).
2. Connect the USB cable between the PICkit Serial Analyzer and the PC.
3. Run the PICkit Serial PC Software - it will open to the following GUI:



**FIGURE 1-3:** PICkit Serial Analyzer Configuration Window welcome window.

Click the **Next** button and follow the instructions.

4. Select the Communication Mode type: **I2C Master**, and click the **Next** button.

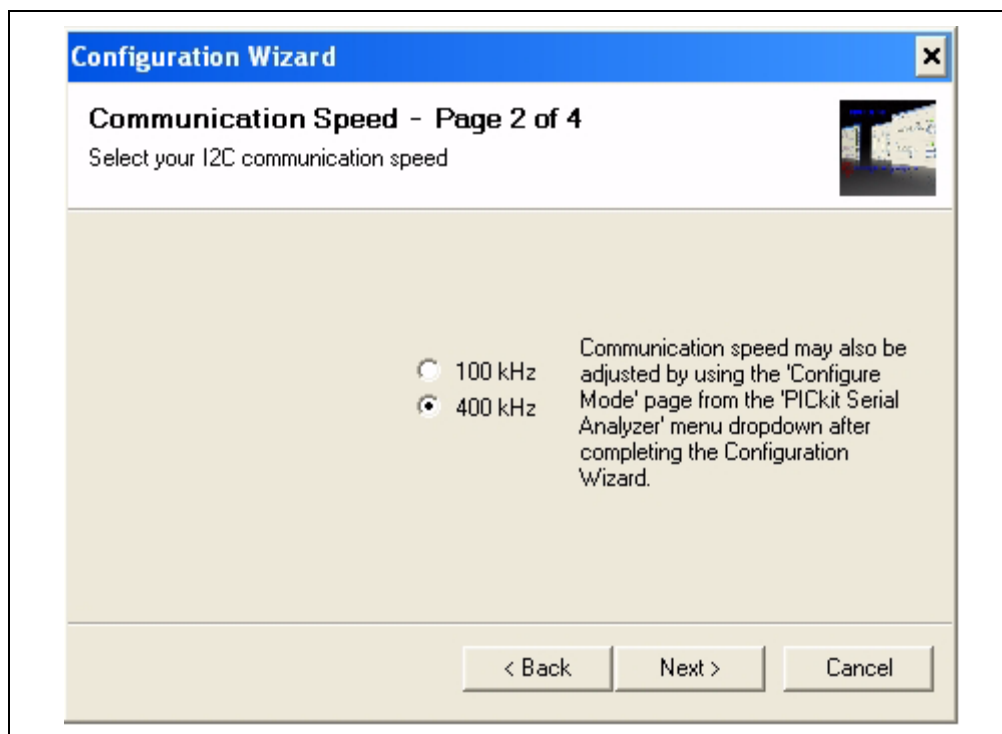


**FIGURE 1-4:** Step 1 - Communication Mode selection.

# MCP3423 Evaluation Board User's Guide

---

5. In the new window, select "100 kHz" or "400 kHz". Either one will be fine. Click the **Next** button.

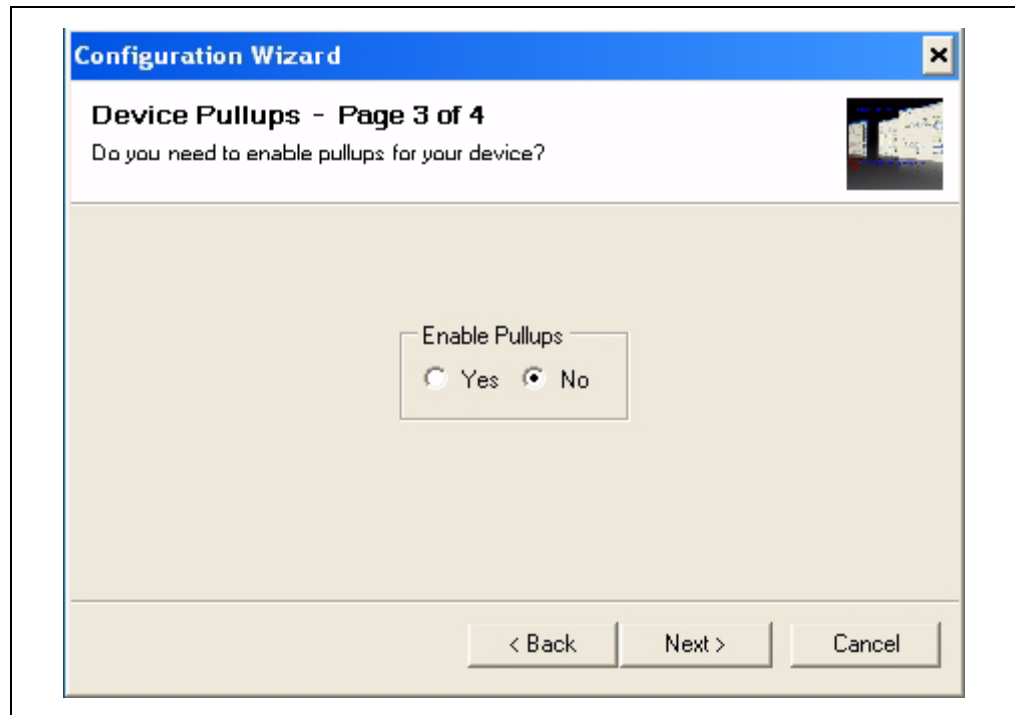


**FIGURE 1-5:** Step 2 - I<sup>2</sup>C Communication Speed window.

**Note:** The MCP3423 device supports the I<sup>2</sup>C bus data rate up to 3.4 MHz, but the current version of the PICkit Serial Analyzer supports the I<sup>2</sup>C bus data rate up to 400 kHz only.

- In the Device Pullups window, select **No** on “Enable Pull-ups” and click the **Next** button.

**Note:** The MCP3423 Evaluation Board has its own pull-up resistors.



**FIGURE 1-6:** Step 3 - Device Pullups window.

- In this step, you have to select the  $V_{DD}$  voltage of the MCP3423 Evaluation Board, then click the **Next** button.

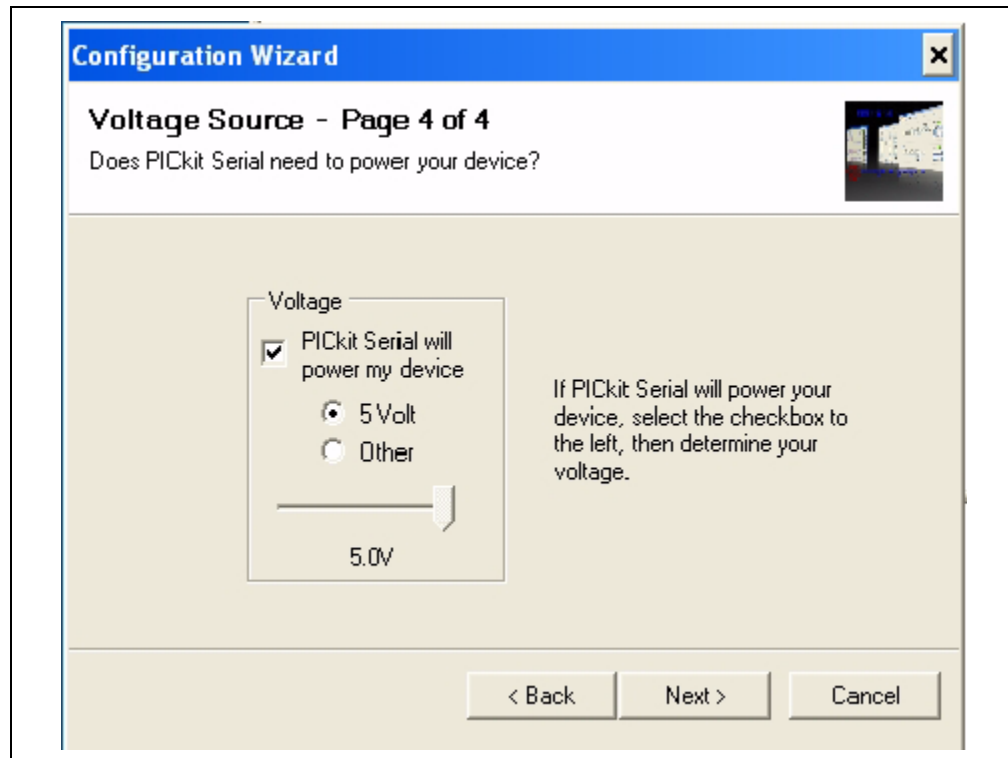
### Case 1: When you use $V_{DD}$ from the PICKit Serial Analyzer:

If you choose **PICKit Serial will power your device** and **5 Volts** as shown in Figure 1-7, the MCP3423 Evaluation Board is powered by the 5V DC from the PICKit Serial Analyzer through the JP1 jumper. In this case, make sure that the JP1 jumper on the MCP3423 Evaluation Board is connected.

### Case 2: When you use your own $V_{DD}$ :

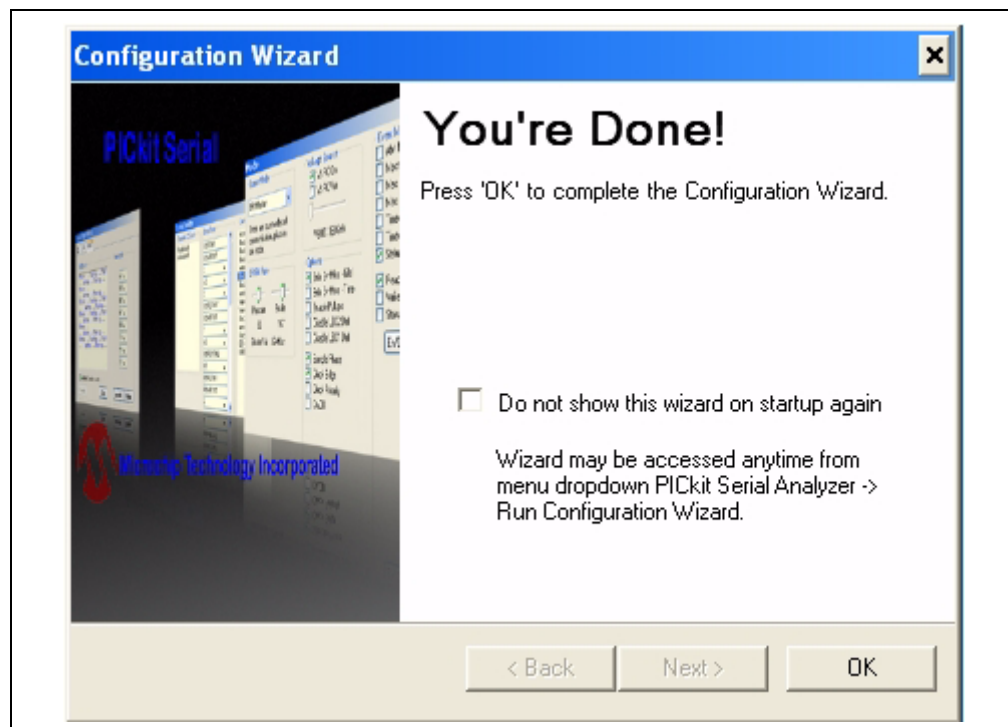
You can also provide your own  $V_{DD}$  voltage by applying a  $V_{DD}$  voltage at VD1 test point. In this case, make sure that the JP1 jumper is disconnected.

# MCP3423 Evaluation Board User's Guide



**FIGURE 1-7:** Step 4 - Voltage Source selection window.

8. Click the **OK** button. You have made all of the PICkit Serial Analyzer Configuration Setups. You are now ready to program the MCP3423 Evaluation Board using the PICkit Serial Analyzer.



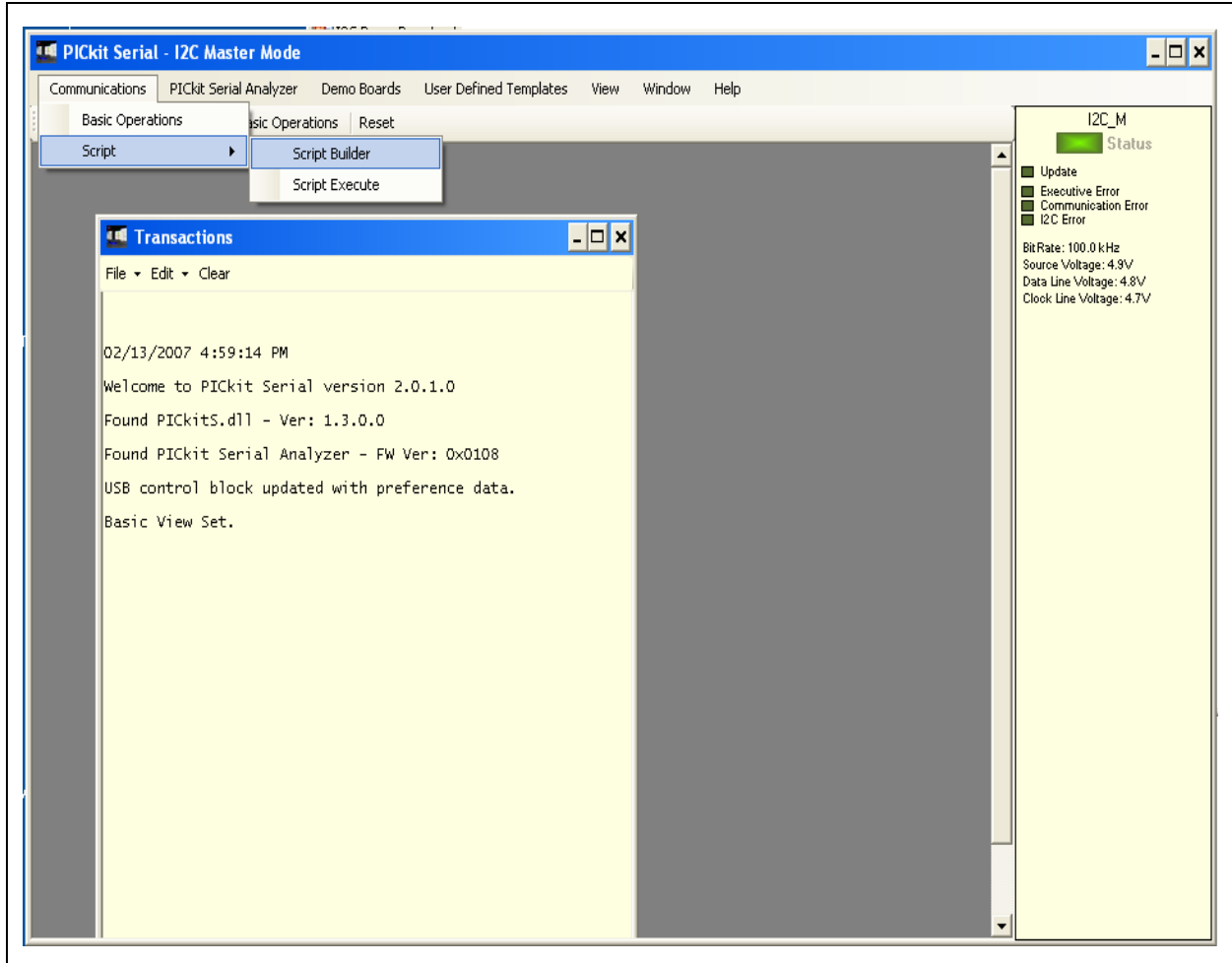
**FIGURE 1-8:** Configuration Wizard - Finishing step.



## 1.3.2 Creating Script Files

In order to make a communication connection between the PICkit Serial Analyzer and the MCP3423 Evaluation Board, a script file is needed. Figure 1-9 shows how to create script files and how to use them.

- In the PICkit Serial Analyzer window, select from the menu Communications>Script>Script Builder .



**FIGURE 1-9:** Creating a script file with Script Builder.

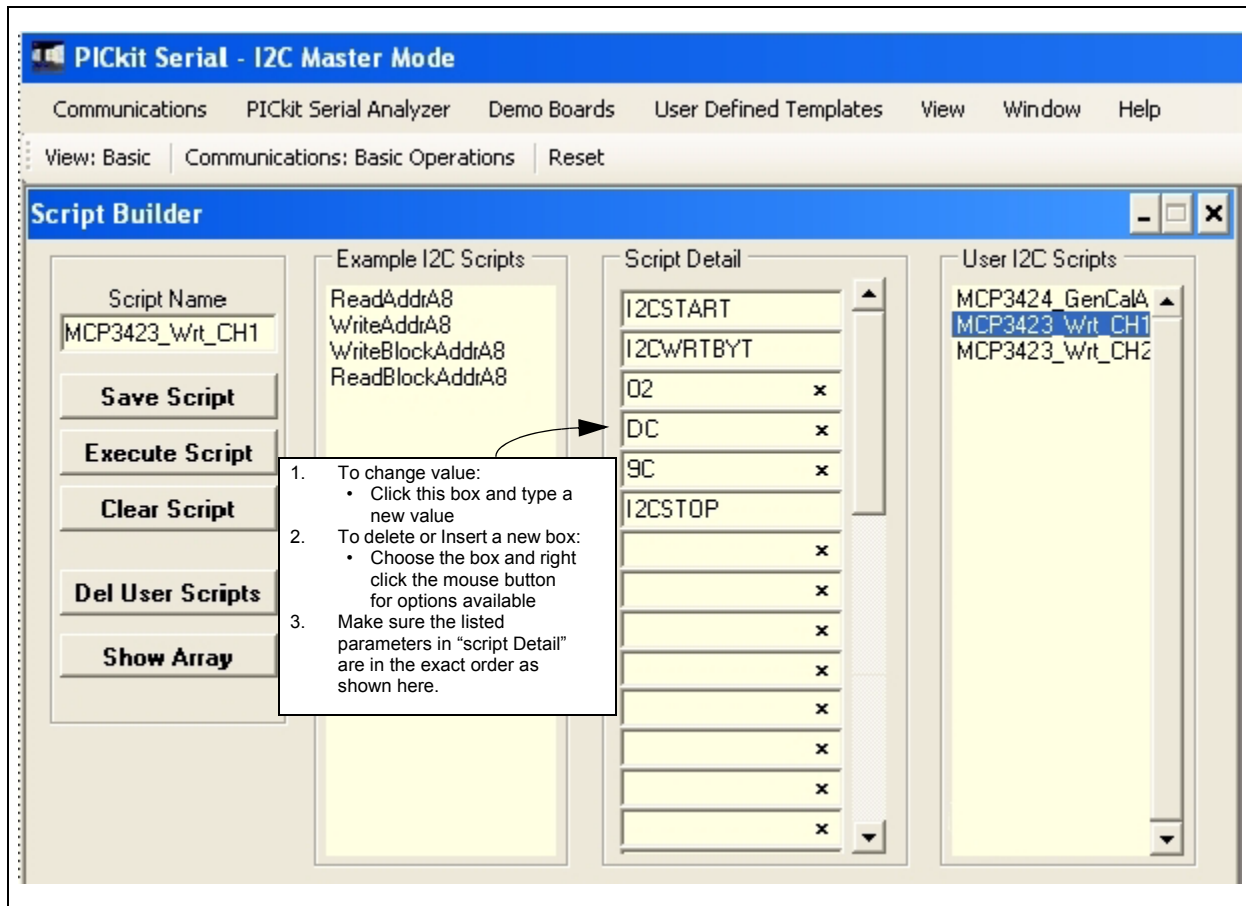
### 1.3.2.1 CREATING SCRIPT FILE FOR CONFIGURATION BYTE WRITING

1. Click on **WriteBlockAddrA8** in “Example I<sup>2</sup>C Scripts” column.  
This will result in filling in the spaces under the “Script Detail” column.  
You can now modify the “Script Detail” column parameters by right-clicking the mouse.

#### **How to modify the parameters box in Script Details:**

1. Under the “Script Detail” box, select the item in the parameter box.
2. Right click the mouse button and an option box appears to the right of your selection. These are the options available for the parameter selected.
3. Select the desired option and delete or insert the parameter box.
4. Keep the parameters in order as shown in Figure 1-10:

# MCP3423 Evaluation Board User's Guide

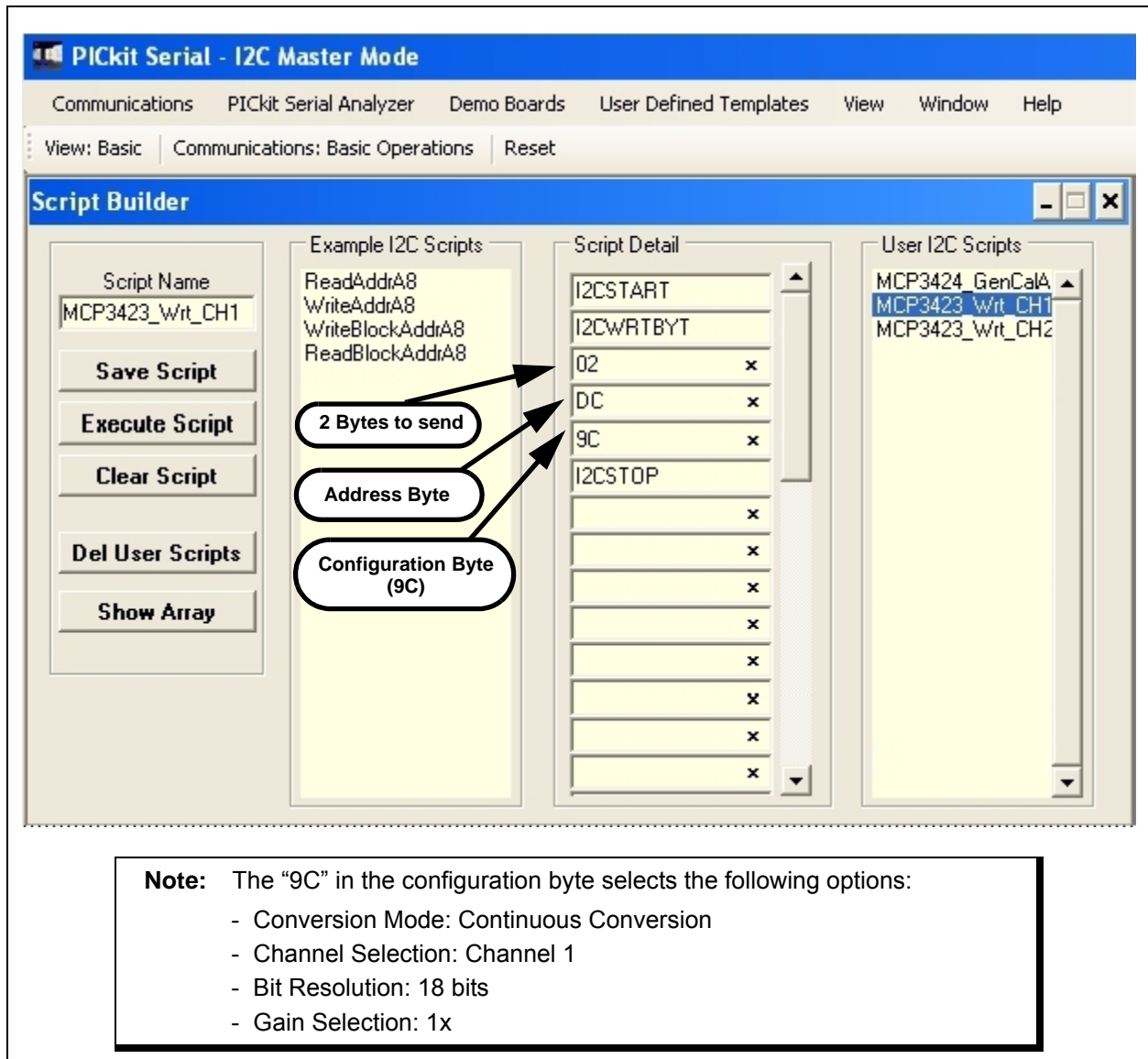


**FIGURE 1-10:** Modifying parameters in Script Builder window.

4. Change the parameter value:

Script Detail	
I2CSTART	*
I2CWRTBYT	*
02	—————▶ This means there are two bytes to send
DC	—————▶ 1st Write Byte: Address byte with W/R bit = 1101-1100
9C	—————▶ 2nd Write Byte: 1001-1100
I2CSTOP	*

**Note:** All six parameters above must be listed in order. The parameter above marked with \* character are not modifiable. Address bits (A2, A1, A0) = (1,1,0) if both JP2 and JP3 are tied to V<sub>DD</sub>. You can use different address bits by rearranging the connectors. See MCP3423 Data Sheet for more information on address bit sections.



**FIGURE 1-11:** Script file example for I<sup>2</sup>C Write Command.

### 1.3.2.2 SAVE THE SCRIPT FILE AND PROGRAMMING THE MCP3423 CONFIGURATION REGISTER

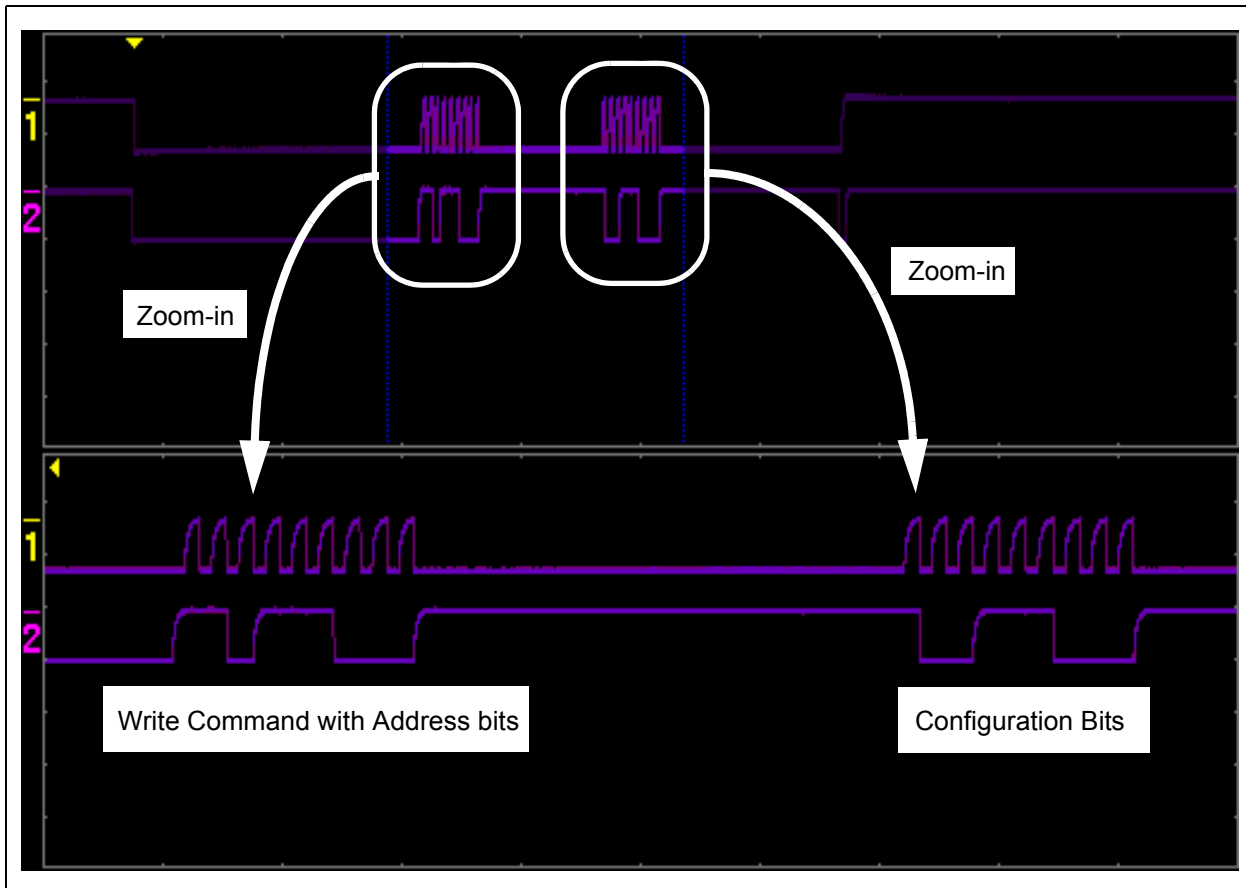
1. Change the 2<sup>nd</sup> and 3<sup>rd</sup> data bytes you want in the Script Detail.
2. Type in any script name (i.e., MCP3423\_Write) in the space below the “Script Name” menu.
3. Click **Save Script** button.
4. Click **Execute Script** button.

**Note:** At this point, the PICKit Serial transmits the I<sup>2</sup>C Write Command to the MCP3423 device. The saved file name will appear in “Users I2C Scripts” column, and can be re-used any time by selecting the file name.

# MCP3423 Evaluation Board User's Guide

5. You can also see the SCL and SDA waveforms using the Oscilloscope.

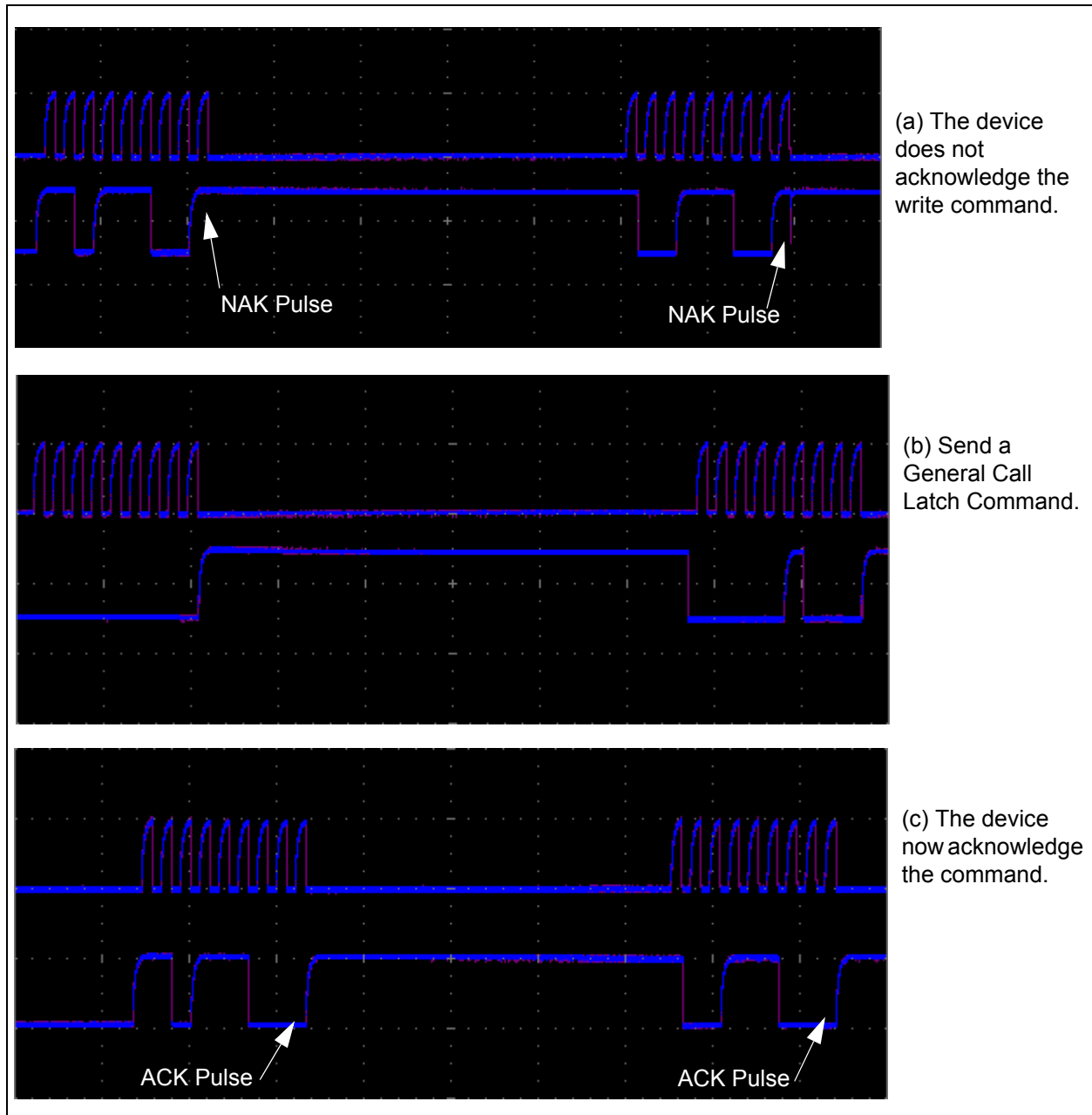
**Note:** When you click on the “Execute Script” menu, the “Busy” LED on the PICkit Serial Analyzer will momentarily turn on and then turn off. If the LED remains ON, a communications problem has occurred. Remove the PICkit Serial Analyzer from your computer and recheck the parameter values including the order of parameters under the “Script Detail” column, and try again until the “Busy” LED turns OFF immediately after sending the I<sup>2</sup>C command.



**FIGURE 1-12:** I<sup>2</sup>C Write Command Waveforms for the MCP3423.

## 1.3.3 Trouble Shooting: If the device does not acknowledge the commands

If the device is powered up initially with unstable  $V_{DD}$  from the PICKit Serial, there is a chance that the device can latch a wrong address bits from the external address pins, and therefore it may not acknowledge the command bytes correctly since the address bits are not matched. In this case, send a General Call Latch Command after the  $V_{DD}$  is stabilized (after about 20 seconds the PICKit Serial is powered). See the example in Figure 1-13. Another method is power-up the PICKit Serial first by connecting to the PC, then insert the MCP3423 EV board to the PICKit Serial about 20 seconds later.



**FIGURE 1-13:** Examples when the device is not acknowledging the write command. Send the General Call Latch Command when the  $V_{DD}$  is stabilized.

# MCP3423 Evaluation Board User's Guide

## 1.3.4 Reading the Conversion Data using the PICkit Serial Analyzer

You can read back the conversion data with the following steps.

### 1.3.4.1 CREATING SCRIPT FILE TO READ CONVERSION DATA

1. Click on **ReadAddrA8** in "Example I2C Scripts" column.

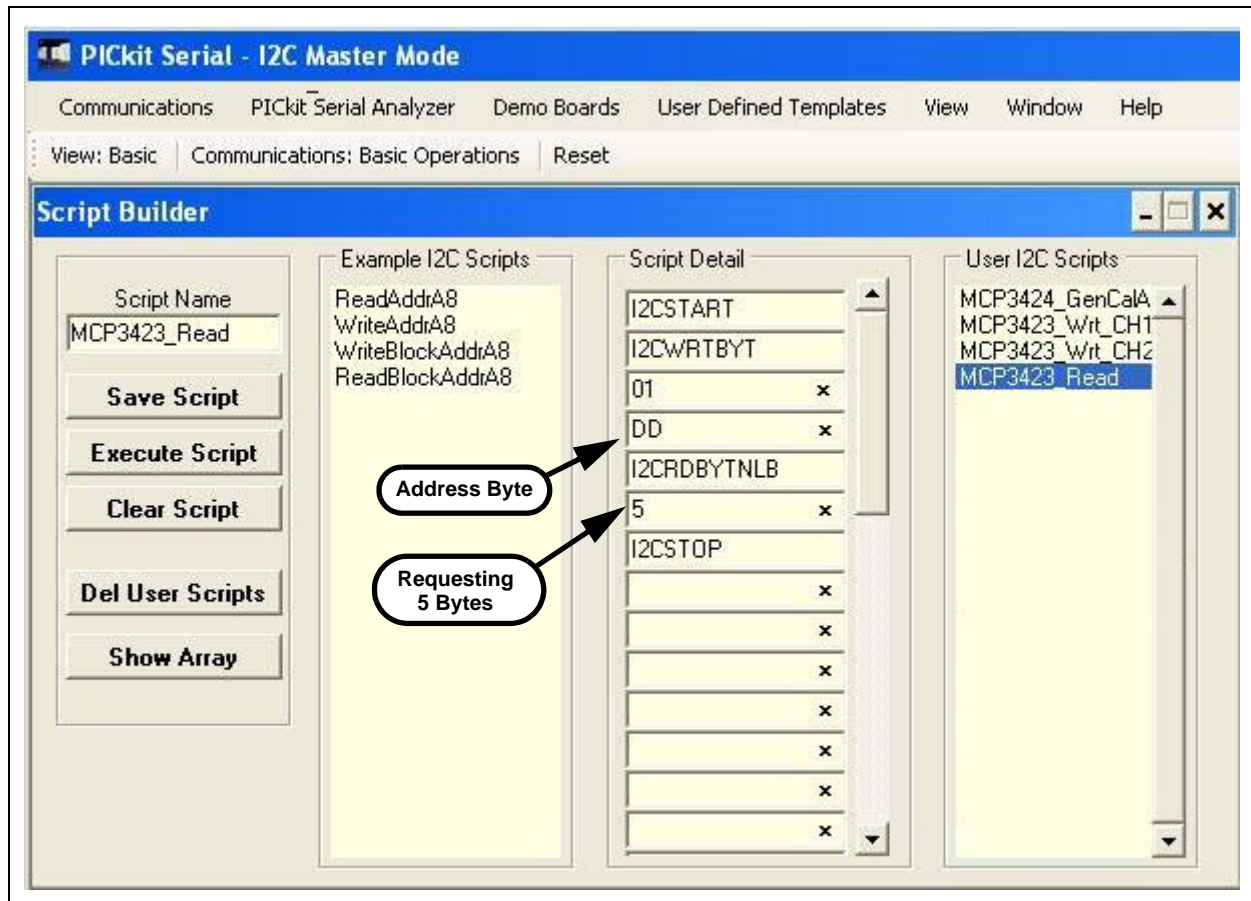
This will result in filling in the spaces under "Script Detail" column.

Now you can modify the parameter boxes (delete or insert) in the "Script Detail" column with options. The list of options will appear if you right-click the mouse in the parameter box. You can delete the parameter box or add a new one.

2. Make sure you have the "Script Detail" parameters listed in order as follows:

Script Detail	
I2CSTART	*
I2CWRTBYT	*
01	→ This means there is <u>one</u> byte for address
DD	→ Address byte with W/R bit = 1101-1101
I2CRDBYTNLB	*
5	→ 5 bytes to read
I2CSTOP	*

**Note:** All seven parameters above must be listed in order. The parameters above marked with \* character are not modifiable.  
Address bits (A2, A1, A0) = (1, 1, 0) if both JP2 and JP3 are tied to  $V_{DD}$ . You can use different address bits by rearranging the JP1 and JP2 connectors. See MCP3423 Data Sheet for more information on address bit selections.



**FIGURE 1-14:** Script File sample to read conversion data.

3. Type in any script name (i.e., MCP3423\_Read) in the space below the “Script Name” menu.
4. Click **Save Script** button.
5. Click **Execute Script** button.

**Note:** At this point, the PICKit Serial transmits the I<sup>2</sup>C Read Command to the MCP3423 device. The saved file name will appear in “Users I2C Scripts” column, and can be re-used any time by selecting the file name.

6. You can also see the SCL and SDA waveforms using the Oscilloscope.

**Note:** When you click on the “Execute Script” menu, the “Busy” LED on the PICKit Serial Analyzer will momentarily turn on and then turn off. If the LED remains ON, a communications problem has occurred. Remove the PICKit Serial Analyzer from your computer and recheck the parameter values including the order of parameters under the “Script Detail” column, and try again until the “Busy” LED turns OFF immediately after sending the I<sup>2</sup>C command.

# MCP3423 Evaluation Board User's Guide

**PICKit Serial - I2C Master Mode**

Communications PICKit Serial Analyzer Demo Boards User Defined Templates View Window Help

View: Basic Communications: Basic Operations Reset

**Script Builder**

Script Name: MCP3423\_Read

Save Script Execute Script Clear Script Del User Scripts Show Array

Example I2C Scripts: ReadAddrA8 WriteAddrA8 WriteBlockAddrA8 ReadBlockAddrA8

Script Detail:

I2CSTART	
I2CWRTBYT	
01	x
DD	x
I2CRDBYTNLB	
5	x
I2CSTOP	
	x
	x
	x
	x
	x
	x

User I2C Scripts: MCP3424\_GenCalA MCP3423\_Wrt\_CH1 MCP3423\_Wrt\_CH2 MCP3423\_Read

**Transactions**

File Edit Clear

10:24:44 AM Sent script from Script Builder page, 10 bytes:

[S\_] [W\_] [01] [DD] [RN] [05] [P\_] [S\_] [00] [F9] [07] [1C] [9C] [P\_]

Reading Data using a Read Command

5th byte: Repeated Byte for Configuration byte  
 4th byte: Configuration Byte (note that RDYbit is "0")  
 3rd byte: Data Byte  
 2nd byte: Data Byte  
 1st byte: Data Byte

**Results:**

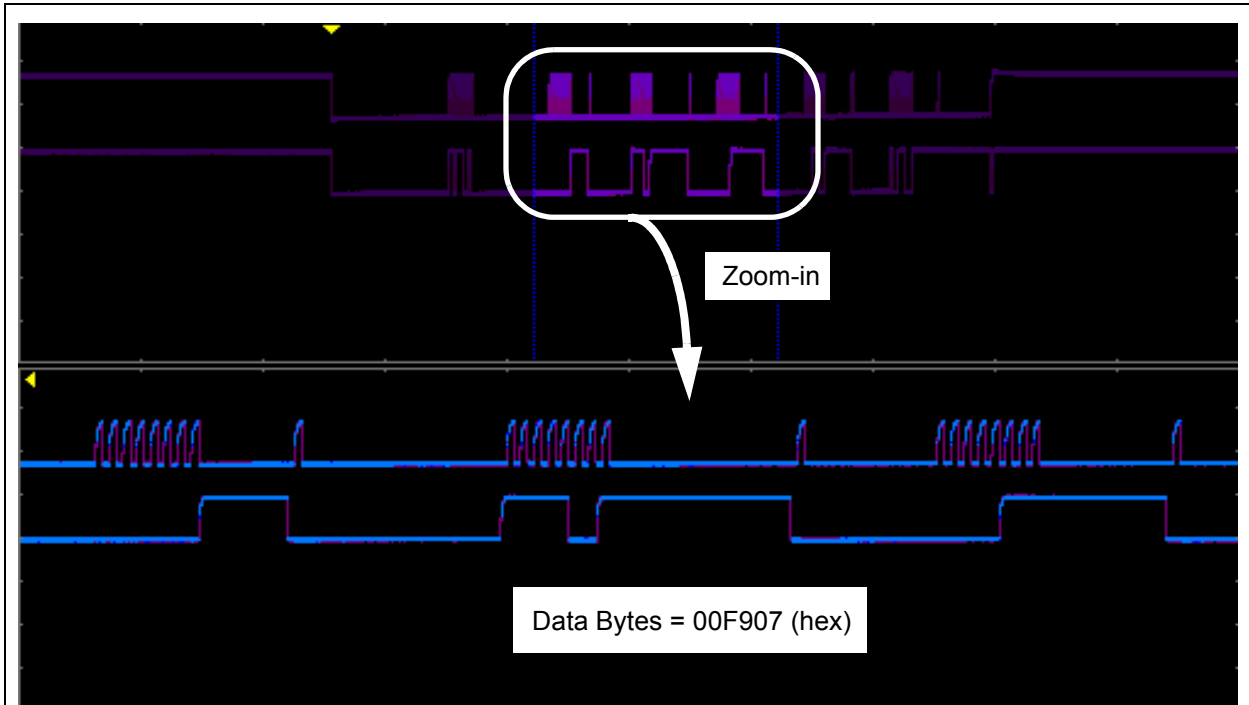
Output code: F907 in hex (= 63751 in decimal)

Output Voltage=  $63751 \times \frac{15.625 \mu\text{V (LSB)}}{\text{PGA}} = 0.996 \text{ Volts with PGA} = 1$

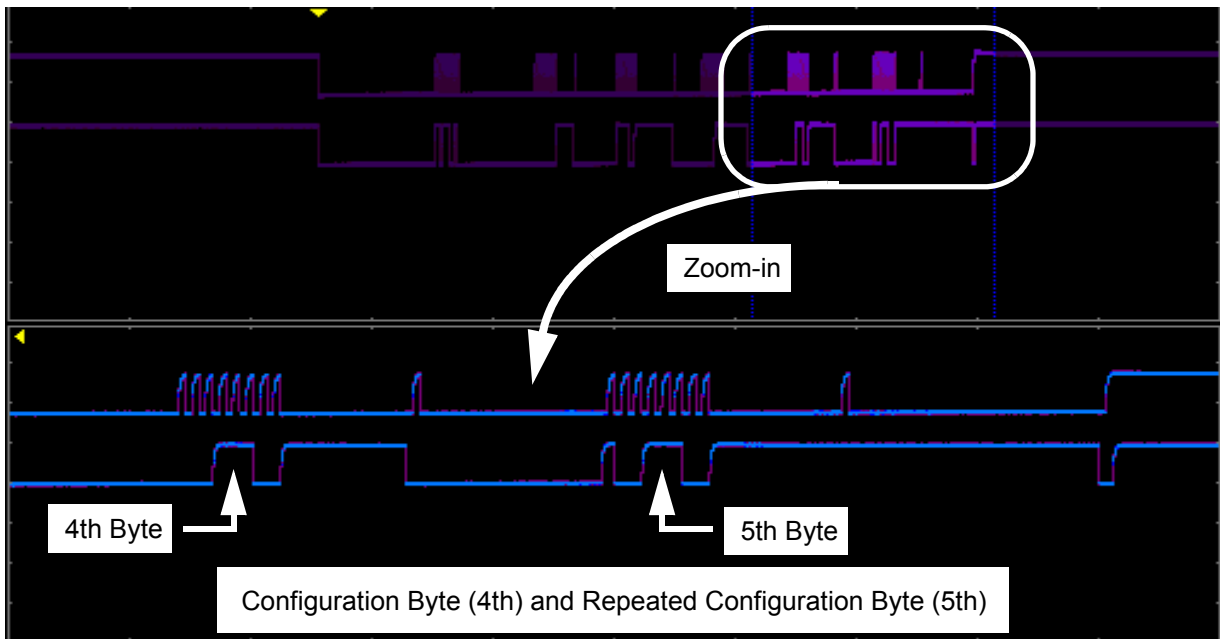
Note that if the differential input voltage is negative (CH- > CH+), the MSB of the first byte will be "1". In this case, the voltage is calculated after converting the output code to 2's complement and then multiply the LSB.  
 See Section 4.9 of the MCP3423 Data Sheet (DS22088) for more information.

**FIGURE 1-15:** Reading Conversion Results: Note that the Input = 0.996V is applied to CH1. The reading indicates the measured value is 0.996 Volts.





(a) Read command and outputs. The 3 data bytes are zoomed in for better clarity.



(b) Read command and outputs. The last two data bytes are zoomed in for better clarity.

**FIGURE 1-16:** Read Command and Data on I<sup>2</sup>C bus. Note the  $\overline{RDY}$  bit in 4th byte is “0”. This means the conversion data just read is the latest conversion data. The  $\overline{RDY}$  bit becomes “1” in the 5th byte (repeated byte). This means the device is now in the process of new conversion and the new result is not ready yet.

## 1.4 EXPERIMENT FOR CH2

Repeat the instructions from **Section 1.3.2 “Creating Script Files”** to **Section 1.3.4 “Reading the Conversion Data using the PICKit Serial Analyzer”** for the input channel 2.



# MCP3423 EVALUATION BOARD USER'S GUIDE

---

---

## Appendix A. Schematic and Layouts

---

---

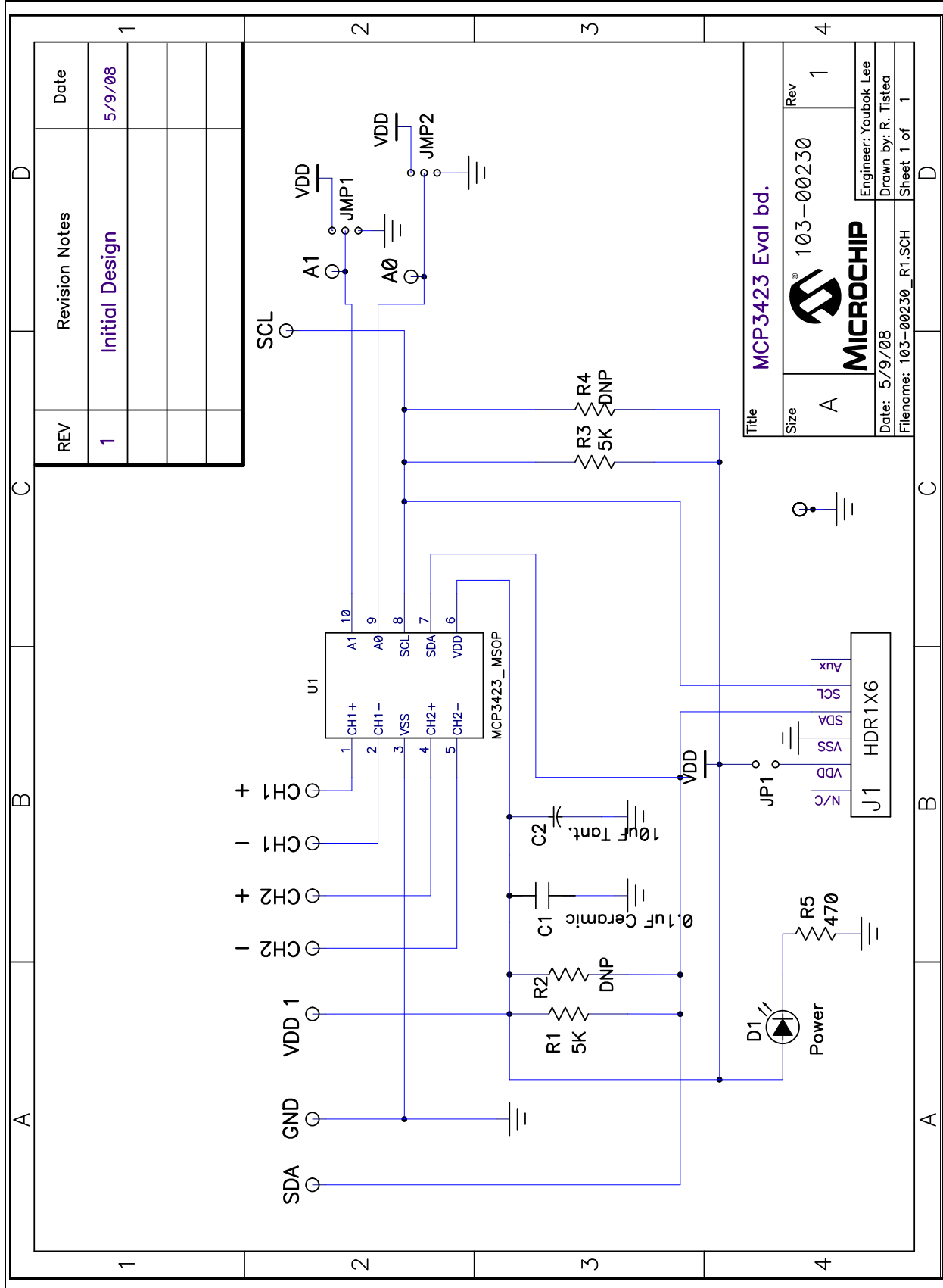
### A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP3424 Evaluation Board:

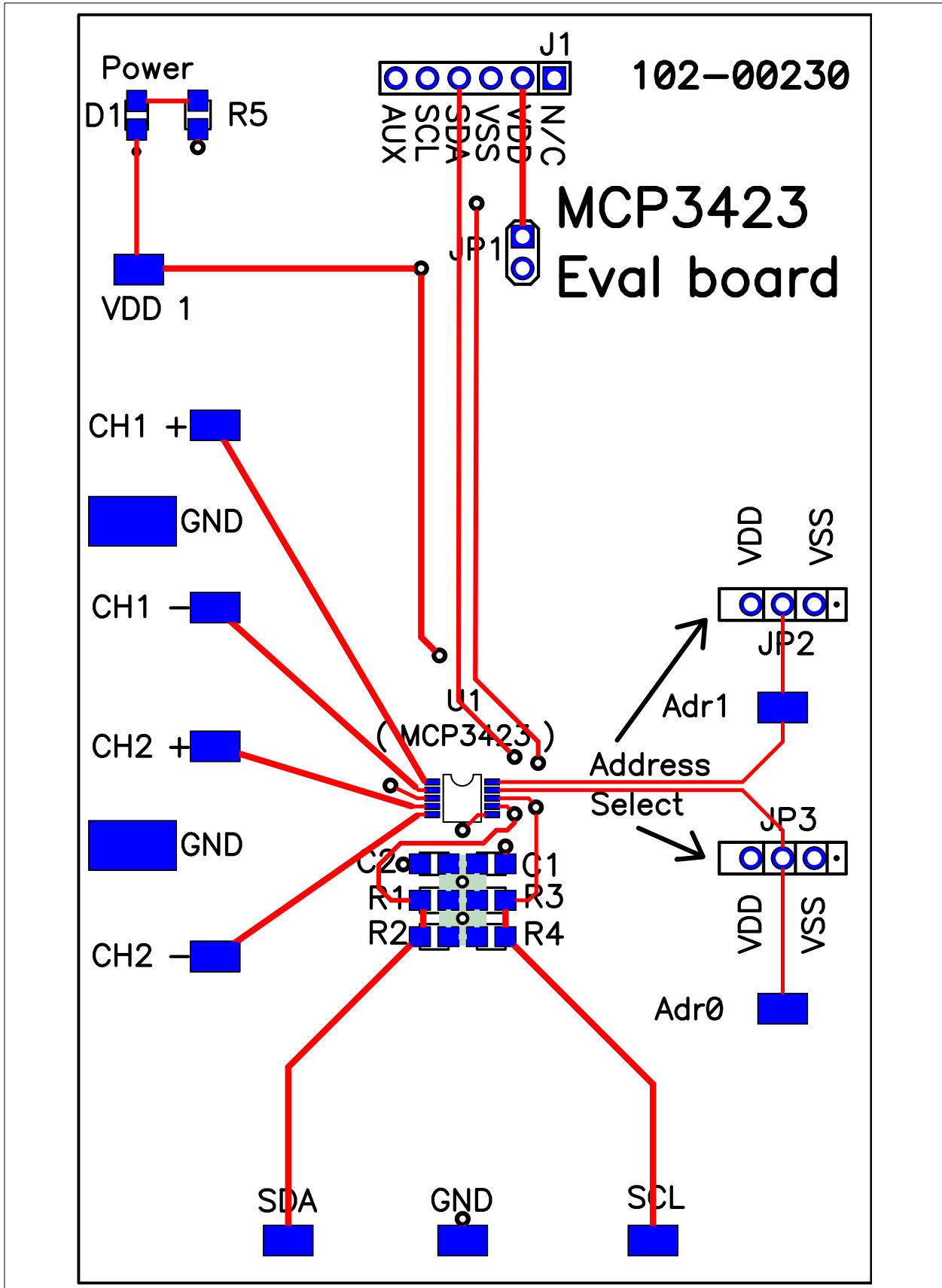
- Board – Schematic
- Board – Top Layer
- Board – Top Metal Layer
- Board – Bottom Layer
- Board – Bottom Metal Layer

# MCP3423 Evaluation Board User's Guide

## A.2 BOARD – SCHEMATIC

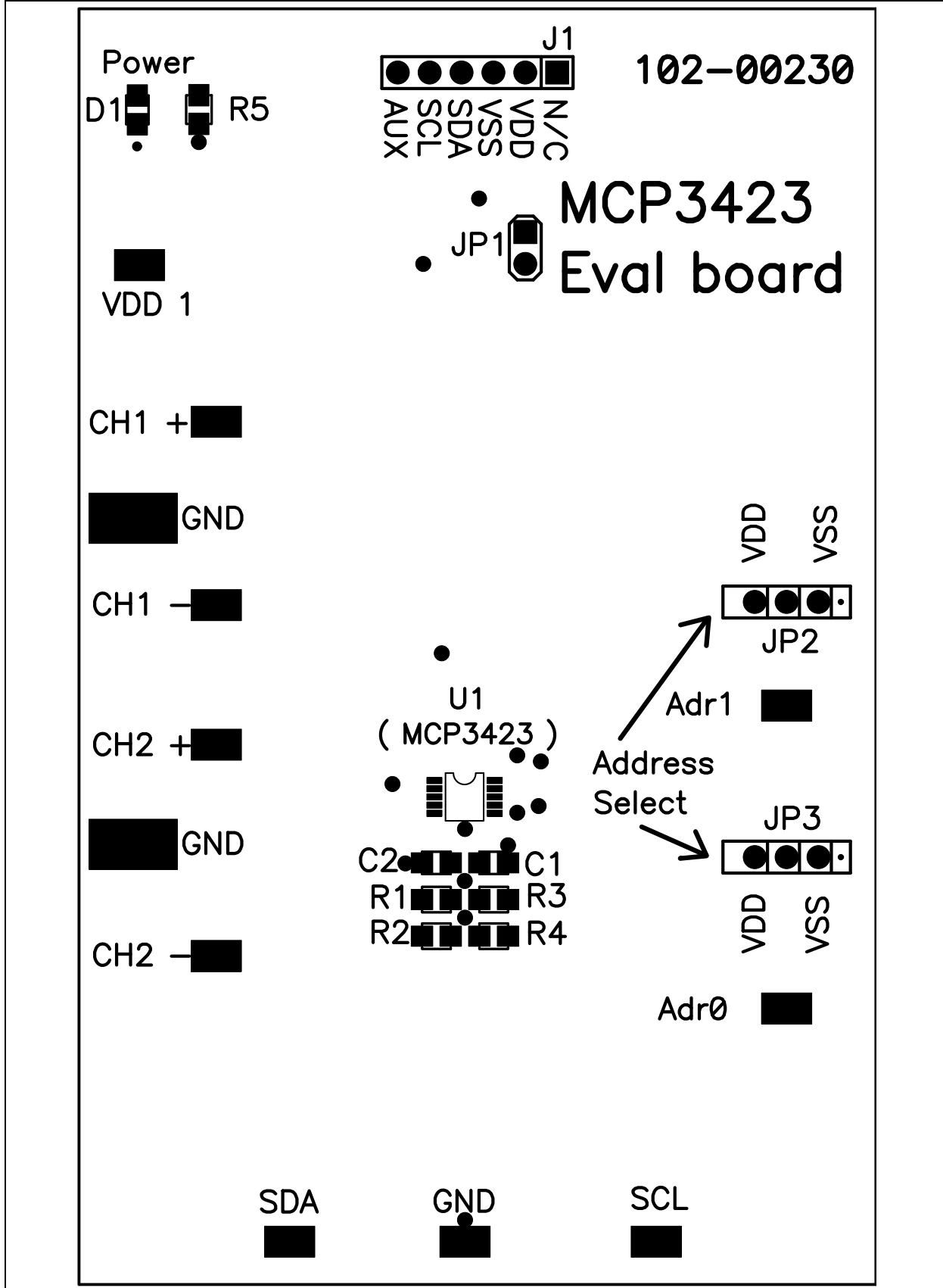


## A.3 BOARD – TOP LAYER

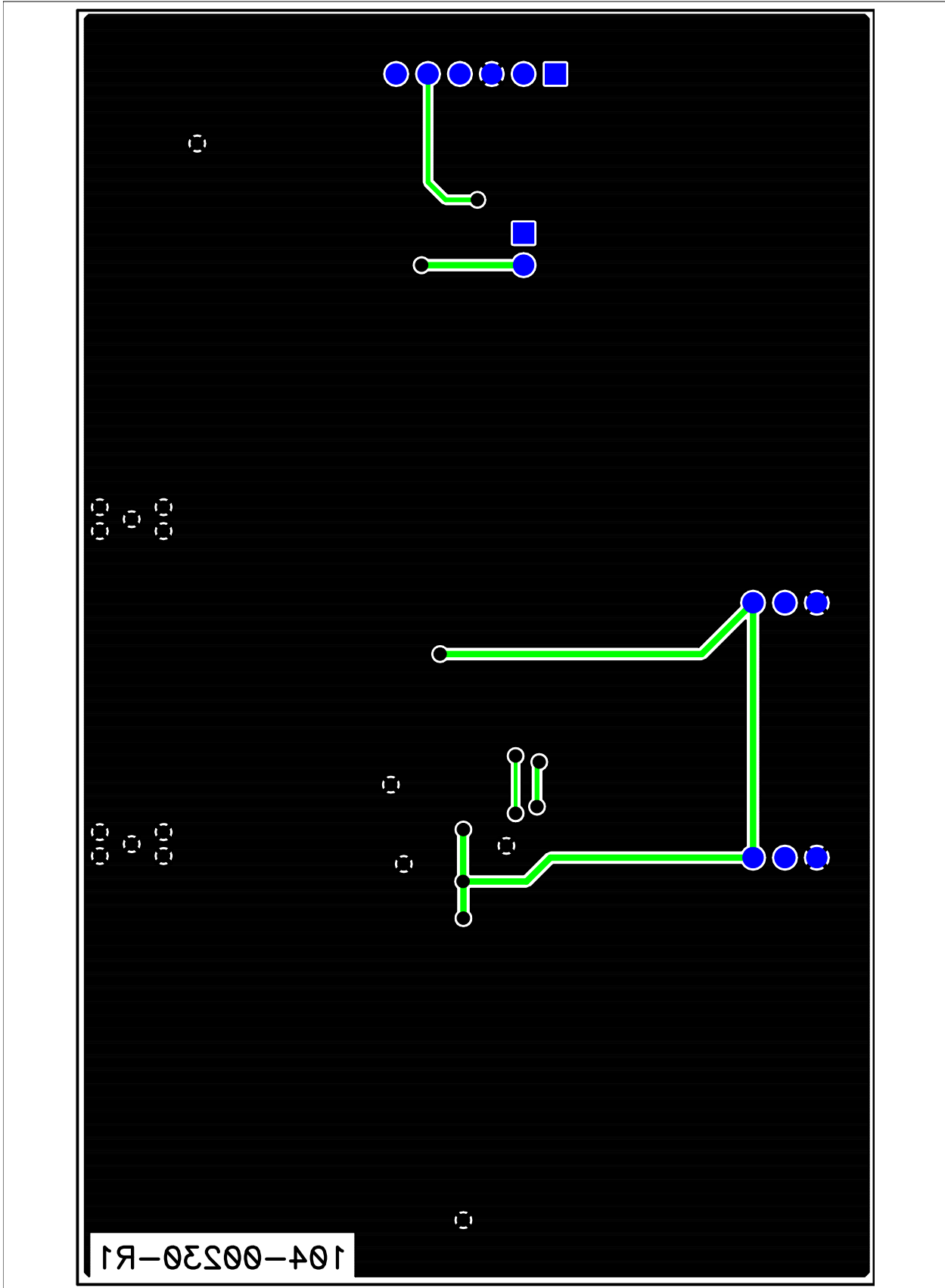


# MCP3423 Evaluation Board User's Guide

## A.4 BOARD – TOP METAL LAYER

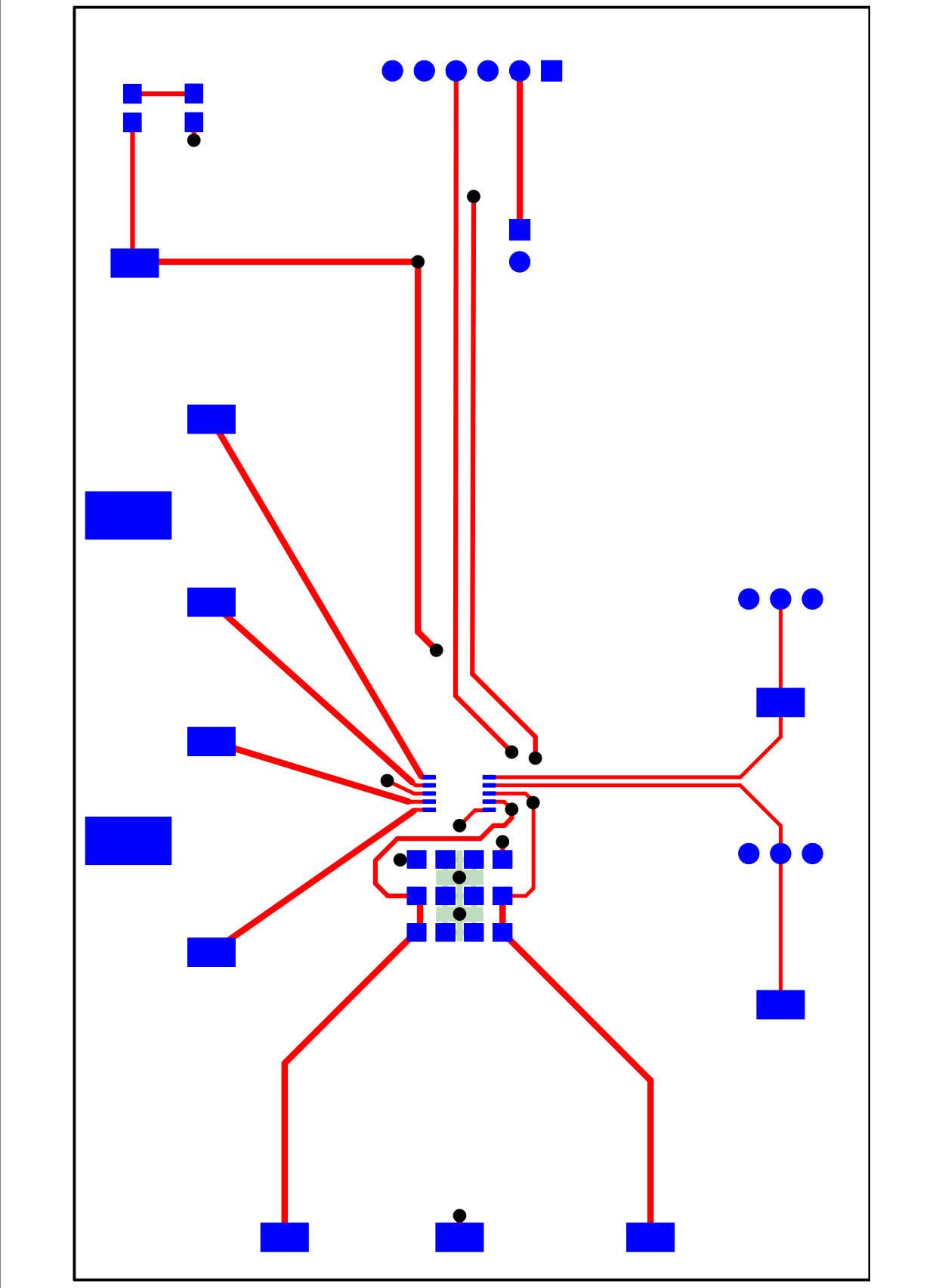


## A.5 BOARD – BOTTOM LAYER



# MCP3423 Evaluation Board User's Guide

## A.6 BOARD – BOTTOM METAL LAYER





**Appendix B. Bill of Materials (BOM)**

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

Qty	Reference	Description	Manufacturer	Part Number
1	C1	CAP .1UF 25V CERAMIC X7R 0805	Panasonic® - ECG	ECJ-2VB1E104K
1	C2	CAP CERAMIC 10UF 6.3V X5R 0805	Panasonic - ECG	ECJ-2FB0J106K
1	D1	LED RED ORANGE CLEAR 0805 SMD	LITE-ON INC	LTST-C170EKT
2	R1,R3	RES 4.99K OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF4991V
1	R5	RES 470 OHM 1/8W 5% 0805 SMD	Panasonic - ECG	ERJ-6GEYJ471V
1	J1	CONN HEADER 6POS .100 R/A TIN	Molex®/ Waldom® Electronics	22-05-2061
1	JP1	CONN HEADER 2POS .100 VERT TIN	Molex/Waldom Electronics	22-03-2021
2	JP2,JP3	CONN HEADER 3POS .100" STR TIN	Molex/Waldom Electronics	90120-0123
1	PCB	RoHS Compliant Bare PCB, MCP3423 Evaluation Board for PICKit Serial	Microchip Technology Inc.	104-00230
3	Shunts for JP1, JP2, JP3	100" Shorting Block with Handle	JAMECO Value-Pro	2012JH-R
2	R2,R4	DO NOT POPULATE	—	—
1	U1	2 Channel 18 Bit Data Sigma ADC	Microchip Technology Inc.	MCP3423-E/ST
14	VDD1, CH1+, CH1-, CH2+, CH2-, A0, A1, SCL, SDA, GND	TEST POINT PC COMPACT SMT	Keystone Electronics®	5016

**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.



---

---

## WORLDWIDE SALES AND SERVICE

---

---

### AMERICAS

**Corporate Office**  
2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7200  
Fax: 480-792-7277  
Technical Support:  
<http://support.microchip.com>  
Web Address:  
[www.microchip.com](http://www.microchip.com)

**Atlanta**  
Duluth, GA  
Tel: 678-957-9614  
Fax: 678-957-1455

**Boston**  
Westborough, MA  
Tel: 774-760-0087  
Fax: 774-760-0088

**Chicago**  
Itasca, IL  
Tel: 630-285-0071  
Fax: 630-285-0075

**Dallas**  
Addison, TX  
Tel: 972-818-7423  
Fax: 972-818-2924

**Detroit**  
Farmington Hills, MI  
Tel: 248-538-2250  
Fax: 248-538-2260

**Kokomo**  
Kokomo, IN  
Tel: 765-864-8360  
Fax: 765-864-8387

**Los Angeles**  
Mission Viejo, CA  
Tel: 949-462-9523  
Fax: 949-462-9608

**Santa Clara**  
Santa Clara, CA  
Tel: 408-961-6444  
Fax: 408-961-6445

**Toronto**  
Mississauga, Ontario,  
Canada  
Tel: 905-673-0699  
Fax: 905-673-6509

### ASIA/PACIFIC

**Asia Pacific Office**  
Suites 3707-14, 37th Floor  
Tower 6, The Gateway  
Harbour City, Kowloon  
Hong Kong  
Tel: 852-2401-1200  
Fax: 852-2401-3431

**Australia - Sydney**  
Tel: 61-2-9868-6733  
Fax: 61-2-9868-6755

**China - Beijing**  
Tel: 86-10-8528-2100  
Fax: 86-10-8528-2104

**China - Chengdu**  
Tel: 86-28-8665-5511  
Fax: 86-28-8665-7889

**China - Hong Kong SAR**  
Tel: 852-2401-1200  
Fax: 852-2401-3431

**China - Nanjing**  
Tel: 86-25-8473-2460  
Fax: 86-25-8473-2470

**China - Qingdao**  
Tel: 86-532-8502-7355  
Fax: 86-532-8502-7205

**China - Shanghai**  
Tel: 86-21-5407-5533  
Fax: 86-21-5407-5066

**China - Shenyang**  
Tel: 86-24-2334-2829  
Fax: 86-24-2334-2393

**China - Shenzhen**  
Tel: 86-755-8203-2660  
Fax: 86-755-8203-1760

**China - Wuhan**  
Tel: 86-27-5980-5300  
Fax: 86-27-5980-5118

**China - Xiamen**  
Tel: 86-592-2388138  
Fax: 86-592-2388130

**China - Xian**  
Tel: 86-29-8833-7252  
Fax: 86-29-8833-7256

**China - Zhuhai**  
Tel: 86-756-3210040  
Fax: 86-756-3210049

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-4182-8400  
Fax: 91-80-4182-8422

**India - New Delhi**  
Tel: 91-11-4160-8631  
Fax: 91-11-4160-8632

**India - Pune**  
Tel: 91-20-2566-1512  
Fax: 91-20-2566-1513

**Japan - Yokohama**  
Tel: 81-45-471- 6166  
Fax: 81-45-471-6122

**Korea - Daegu**  
Tel: 82-53-744-4301  
Fax: 82-53-744-4302

**Korea - Seoul**  
Tel: 82-2-554-7200  
Fax: 82-2-558-5932 or  
82-2-558-5934

**Malaysia - Kuala Lumpur**  
Tel: 60-3-6201-9857  
Fax: 60-3-6201-9859

**Malaysia - Penang**  
Tel: 60-4-227-8870  
Fax: 60-4-227-4068

**Philippines - Manila**  
Tel: 63-2-634-9065  
Fax: 63-2-634-9069

**Singapore**  
Tel: 65-6334-8870  
Fax: 65-6334-8850

**Taiwan - Hsin Chu**  
Tel: 886-3-572-9526  
Fax: 886-3-572-6459

**Taiwan - Kaohsiung**  
Tel: 886-7-536-4818  
Fax: 886-7-536-4803

**Taiwan - Taipei**  
Tel: 886-2-2500-6610  
Fax: 886-2-2508-0102

**Thailand - Bangkok**  
Tel: 66-2-694-1351  
Fax: 66-2-694-1350

### EUROPE

**Austria - Wels**  
Tel: 43-7242-2244-39  
Fax: 43-7242-2244-393

**Denmark - Copenhagen**  
Tel: 45-4450-2828  
Fax: 45-4485-2829

**France - Paris**  
Tel: 33-1-69-53-63-20  
Fax: 33-1-69-30-90-79

**Germany - Munich**  
Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

**Italy - Milan**  
Tel: 39-0331-742611  
Fax: 39-0331-466781

**Netherlands - Drunen**  
Tel: 31-416-690399  
Fax: 31-416-690340

**Spain - Madrid**  
Tel: 34-91-708-08-90  
Fax: 34-91-708-08-91

**UK - Wokingham**  
Tel: 44-118-921-5869  
Fax: 44-118-921-5820

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А