



**Low-Cost mTouch[®]
Evaluation Kit
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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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 unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, flexPWR, JukeBlox, KEELOQ, KEELOQ logo, Klear, LANCheck, MediaLB, MOST, MOST logo, MPLAB, OptoLyzer, PIC, PICSTART, PIC³² logo, RightTouch, SpyNIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

The Embedded Control Solutions Company and mTouch are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, ECAN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, KlearNet, KlearNet logo, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, RightTouch logo, REAL ICE, SQI, Serial Quad I/O, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, 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.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

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

© 2015, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-63277-997-7

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
= ISO/TS 16949 =

Microchip received ISO/TS-16949:2009 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® MCUs and dsPIC® DSCs, KEELOQ® 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.

Object of Declaration: Low-Cost mTouch® Evaluation Kit User's Guide

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not intended to be a finished appliance, nor is it intended for incorporation into finished appliances that are made commercially available as single functional units to end users. This development/evaluation tool complies with EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.

Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA


Derek Carlson
VP Development Tools

12-Sep-14
Date

PIC16LF1559 mTouch[®] Evaluation Kit User's Guide

NOTES:

Table of Contents

Preface	6
Chapter 1. Low-Cost mTouch Evaluation Kit Overview	
1.1 Introduction	11
1.1.1 Kit Contents	11
1.2 Board Overview	11
1.2.1 Low-Cost Evaluation Board	11
1.2.2 MCP2221 Breakout Module	12
1.3 Board Setup	13
Chapter 2. Communication and System Register	
2.1 Introduction	15
2.1.1 mTouch I ² C communication protocols	15
2.1.1.1 Write Byte	15
2.1.1.2 Read Byte	15
2.1.1.3 Write Block	15
2.1.1.4 Read Block	16
2.1.2 System Register Description	16
Chapter 3. Work with mTouch Dawn GUI	
3.1 Dawn GUI Installation	20
3.2 GUI Overview	21
Appendix A. Low-Cost mTouch Evaluation Board	
Worldwide Sales and Service	26

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 website (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 online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Low-Cost mTouch[®] Evaluation Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- Recommended Reading
- The Microchip Website
- Development Systems Customer Change Notification Service
- Customer Support
- Revision History

DOCUMENT LAYOUT

This document describes how to use the Low-Cost mTouch Evaluation Kit as a development tool to evaluate mTouch 1D solution, as well as how to develop a capacitive sensing application based on this kit. The document is organized as follows:

- **Chapter 1. “Low-Cost mTouch Evaluation Kit Overview”** – Offers information on the hardware of the evaluation kit.
- **Chapter 2. “Communication and System Register”** – Introduces the I²C communication protocol and registers for the mTouch system.
- **Chapter 3. “Work with mTouch Dawn GUI”** – Explains how to use Dawn GUI for this evaluation kit.
- **Appendix A. “Low-Cost mTouch Evaluation Board”** – Provides the schematic and layout for this evaluation kit.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB[®] 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>Save</i></u>
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	<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) { ... }

Low-Cost mTouch[®] Evaluation Kit User's Guide

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip website.

RECOMMENDED READING

This user's guide describes how to use the Low-Cost mTouch[®] Evaluation Kit. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

<http://www.microchip.com>

PIC16LF1554/1559 20-Pin Flash, 8-Bit Microcontroller Data Sheet (DS40001761)

This data sheet provides detailed information regarding the PIC16LF1559.

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website 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

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip website at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators. This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART® Plus and PICkit 2 and 3.

Low-Cost mTouch[®] Evaluation Kit User's Guide

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 website at:

<http://www.microchip.com/support>.

REVISION HISTORY

Revision A (November 2015)

Initial release of this document.

Chapter 1. Low-Cost mTouch® Evaluation Kit Overview

1.1 INTRODUCTION

The Low-Cost mTouch Evaluation Kit provides a simple and flexible platform for demonstrating and developing a variety of capacitive sensing applications. The controller board utilizes the dual high-speed ADCs with automated hardware CVD modules to scan one proximity and five button sensors. The firmware supplied with the controller board has been optimized for moisture resistance and noise immunity.

The kit also includes the MCP2221 breakout module, which allows the controller board to communicate with mTouch Dawn GUI. The Dawn GUI displays touch configuration and signals for real-time debugging.

1.1.1 Kit Contents

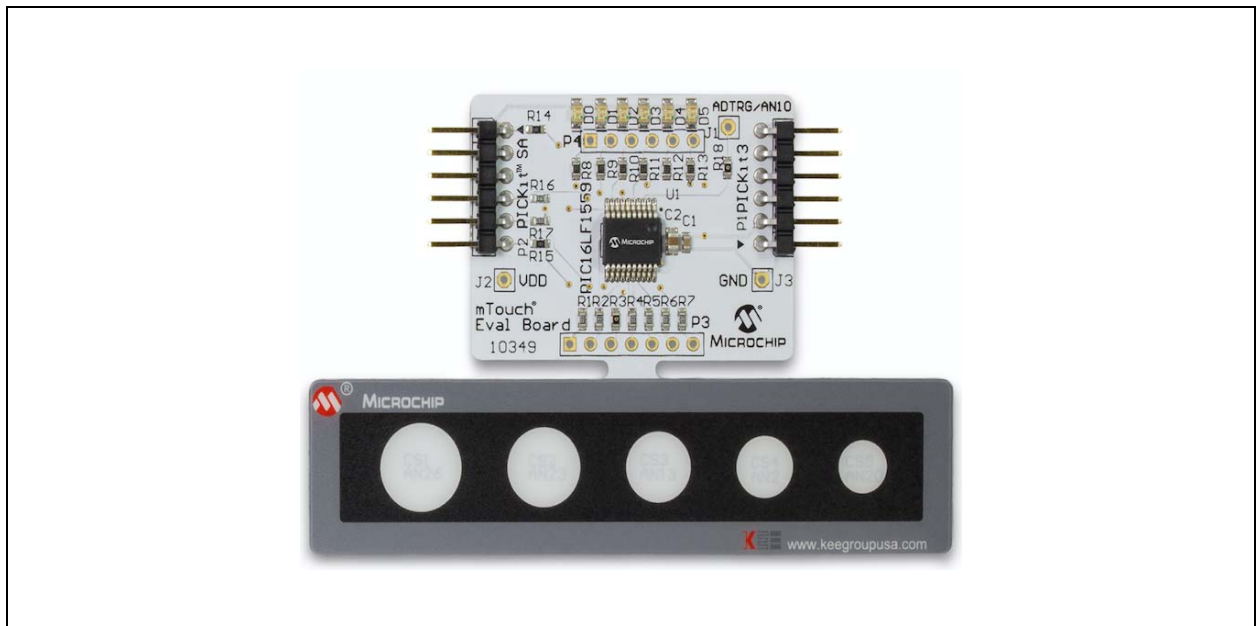
- Low-Cost Controller Board with detachable sensors
- MCP2221 Breakout Module
- Mini to USB B Cable

1.2 BOARD OVERVIEW

This kit includes the Low-Cost mTouch Controller Board and MCP2221 Breakout Module. They work in conjunction to provide real-time configuration and touch data to PC GUI.

1.2.1 Low-Cost Evaluation Board

FIGURE 1-1: LOW-COST EVALUATION BOARD



Low-Cost mTouch[®] Evaluation Kit User's Guide

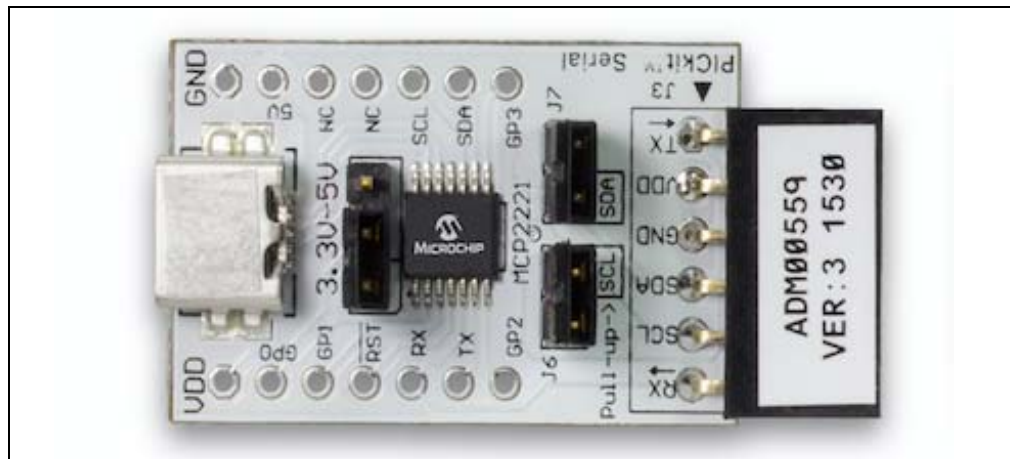
Figure 1-1 shows the Low-Cost mTouch Evaluation board. It includes a proximity loop sensor, five touch button sensors, six LEDs, an ICSP[™] header and PICKit[™] Serial interface.

The default firmware scans the proximity and touch buttons periodically, and uses the LEDs to indicate the proximity and button state. If a proximity or touch event is detected, the corresponding LED will be lit. An I²C interface is also implemented to communicate with a host system through the header marked with "PICKit SA", which accommodates the PICKit Serial Analyzer pin-out. This feature allows the system not only to report its sensor data in real-time, but to be configured by a host device as well.

1.2.2 MCP2221 Breakout Module

The Evaluation Kit comes with the MCP2221 Breakout Module (ADM00559) as shown in Figure 1-2. This module works as an I²C to USB bridge in this evaluation kit.

FIGURE 1-2: MCP2221 BREAKOUT MODULE



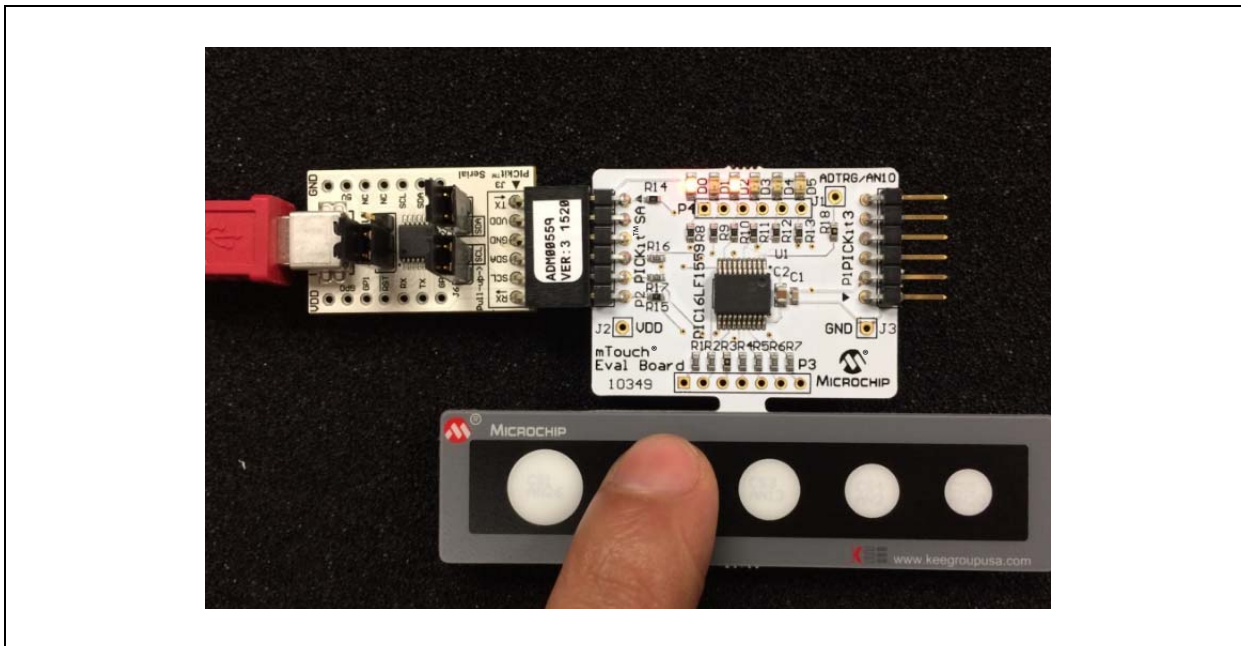
Refer to *MCP2221 Breakout Module User's Guide* for more information on this breakout module.

Low-Cost mTouch[®] Evaluation Kit Overview

1.3 BOARD SETUP

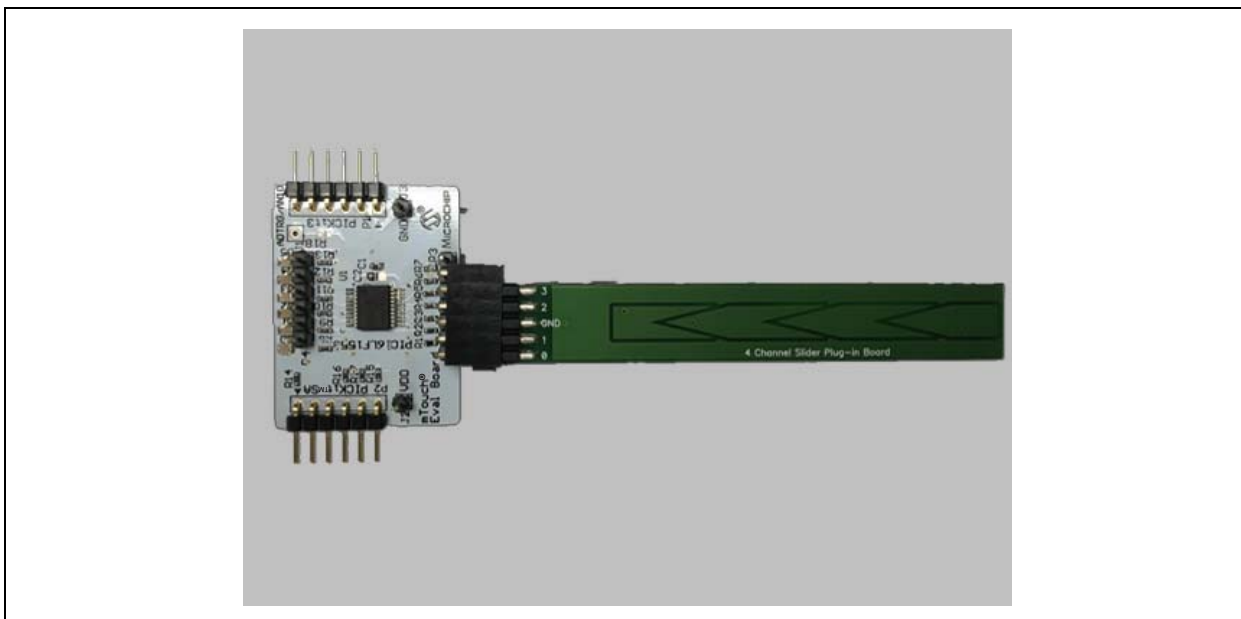
Before evaluating the kit, two boards in the kit need to be connected as shown in [Figure 1-3](#), and then powered by the mini USB cable. After powering the kit, the proximity and touch functions will work out-of-box. The LEDs will reflect the state of proximity sensor and each touch button.

FIGURE 1-3: BOARD SETUP



The sensor portion of the low-cost board can be snapped off from the whole board, so that a different sensor can be connected to the controller through the P3 connector. This provides flexibility for quick prototyping and evaluating different sensor designs. In [Figure 1-4](#), a four-channel slider is connected to the controller board through the P3 connector.

FIGURE 1-4: SLIDER SENSOR EXAMPLE



Low-Cost mTouch[®] Evaluation Kit User's Guide

NOTES:

Chapter 2. Communication and System Register

2.1 INTRODUCTION

The default firmware on the Low-cost Evaluation Board communicates with host system through a register-based I²C communication protocol.

2.1.1 mTouch I²C communication protocols

The default I²C slave address for this evaluation board is 0x28 (7-bit address). The evaluation board supports the following protocols: Read Byte, Write Byte, Read Block, and Write Block. Please note that the system register referred in this document is on the firmware level, not the PIC[®] microcontroller registers in the data sheet.

2.1.1.1 WRITE BYTE

The Write Byte protocol is used to write one byte of data to a specific register as shown in [Table 2-1](#).

TABLE 2-1: WRITE BYTE PROTOCOL

Start	Slave address	W	ACK	Register Address	ACK	Register Data	ACK	Stop
1->0	0b101000	0	0	XXh	0	XXh	0	0->1

2.1.1.2 READ BYTE

The Read Byte protocol is used to read one byte of data from the register shown in [Table 2-2](#).

TABLE 2-2: READ BYTE PROTOCOL

Start	Slave address	W	ACK	Register Address	ACK	Start	Slave address	R	ACK	Register Data	Nack	Stop
1->0	0b101000	0	0	XXh	0	1->0	0b101000	1	0	XXh	1	0->1

2.1.1.3 WRITE BLOCK

The Write Block protocol is used to write multiple bytes to a group of contiguous registers as shown in [Table 2-3](#). The internal Address Pointer will be automatically incremented after every byte is received.

TABLE 2-3: WRITE BLOCK PROTOCOL

Start	Slave address	W	ACK	Register Address	ACK	Register Data	ACK	...	Register Data	ACK	Stop
1->0	0b101000	0	0	XXh	0	XXh	0	...	XXh	0	0->1

data @ start address

data @ (start address + n)

Low-Cost mTouch[®] Evaluation Kit User's Guide

2.1.1.4 READ BLOCK

The Read Block protocol is used to read multiple data bytes from a group of contiguous registers as shown in [Table 2-4](#). The internal Address Pointer will be automatically incremented after every byte is received.

TABLE 2-4: READ BLOCK PROTOCOL

Start	Slave address	W	ACK	Register Address	ACK	Start	Slave address	R	ACK	Register Data	ACK
1->0	0b101000	0	0	XXh	0	1->0	0b101000	1	0	XXh	0
...	Register Data n	Nack	Stop	data @ (start address + n)							
...	XXh	1	0->1								

data @ start address

2.1.2 System Register Description

The protocol packet that is described above only contains one byte for system register address, so the addressing range is from 0 to 255 locations for a single command. To extend the addressing range, the firmware has partitioned the system memory in “banks”. Each bank has 256 locations and you can switch the active bank by writing the bank index to the bank register, which will be shown in the following tables.

The registers shown in [Table 2-5](#) are accessible from the communication protocol described above. [Table 2-6](#) describes the details of each register.

TABLE 2-5: REGISTER MAP

Register Bank	Register Addresses	R/W	Register Name	Function	Default Values
0x00	0x01	R	Touch State Mask	Returns the touch state of proximity/touch sensor inputs	0x00
0x00	0x10	R	Proximity Signal Deviation	Stores the delta count for proximity sensor	0x00
0x00	0x11	R	Button 0 Signal Deviation	Stores the delta count for touch button 0	0x00
0x00	0x12	R	Button 1 Signal Deviation	Stores the delta count for touch button 1	0x00
0x00	0x13	R	Button 2 Signal Deviation	Stores the delta count for touch button 2	0x00
0x00	0x14	R	Button 3 Signal Deviation	Stores the delta count for touch button 3	0x00
0x00	0x15	R	Button 4 Signal Deviation	Stores the delta count for touch button 4	0x00
0x00	0x40	R/W	Proximity Threshold	Stores the delta count threshold for proximity sensor	0x64
0x00	0x41	R/W	Button 0 Threshold	Stores the delta count threshold for touch button 0	0x40
0x00	0x42	R/W	Button 1 Threshold	Stores the delta count threshold for touch button 1	0x40
0x00	0x43	R/W	Button 2 Threshold	Stores the delta count threshold for touch button 2	0x40
0x00	0x44	R/W	Button 3 Threshold	Stores the delta count threshold for touch button 3	0x40
0x00	0x45	R/W	Button4 Threshold	Stores the delta count threshold for touch button 4	0x40
0x00	0x70	R/W	Calibration State Mask	Return the calibration state of proximity/touch sensors inputs	0x00

Communication and System Register

TABLE 2-5: REGISTER MAP

Register Bank	Register Addresses	R/W	Register Name	Function	Default Values
0x00	0x80	R/W	Proximity Scaling Factor	Stores the delta count scaling factor for proximity sensor	0x0A
0x00	0x81	R/W	Button 0 Scaling Factor	Stores the delta count scaling factor for button 0	0x0A
0x00	0x82	R/W	Button 1 Scaling Factor	Stores the delta count scaling factor for button 1	0x0A
0x00	0x83	R/W	Button 2 Scaling Factor	Stores the delta count scaling factor for button 2	0x0A
0x00	0x84	R/W	Button 3 Scaling Factor	Stores the delta count scaling factor for button 3	0x0A
0x00	0x85	R/W	Button 4 Scaling Factor	Stores the delta count scaling factor for button 4	0x0A
0x00	0xB0	R/W	Reading Gain	Store the reading gain for all sensor inputs	0x02
0x00	0xB1	R/W	Baseline Gain	Store the baseline gain for all sensor inputs	0x04
0x00	0xB2	R/W	Baseline Rate	Store the Baseline Rate fro all sensor inputs	0x10
0x00	0xC0	R/W	Negative Delta Count	Store the threshold of consecutive number of negative delta	0x10
0x00	0xC1	R/W	Press Timeout	Store the timeout count for pressed sensor inputs	0x0A
0x00	0xC2	R/W	Debounce	Store the debounce count for all sensor inputs	0x00
0x01	0x10	R	Proximity Reading	Store the unscaled proximity sensor readings	0x000000
0x01	0x11	R			
0x01	0x12	R			
0x01	0x13	R	Button 0 Reading	Store the unscaled button 0 readings	0x000000
0x01	0x14	R			
0x01	0x15	R			
0x01	0x16	R	Button 1 Reading	Store the unscaled button 1 readings	0x000000
0x01	0x17	R			
0x01	0x18	R			
0x01	0x19	R	Button 2 Reading	Store the unscaled button 2 readings	0x000000
0x01	0x20	R			
0x01	0x21	R			
0x01	0x22	R	Button 3 Reading	Store the unscaled button 3 readings	0x000000
0x01	0x23	R			
0x01	0x24	R			
0x01	0x25	R	Button 4 Reading	Store the unscaled button 4 readings	0x000000
0x01	0x26	R			
0x01	0x27	R			
0x02	0x10	R	Proximity Baseline	Store the unscaled proximity sensor baseline	0x000000
0x02	0x11	R			
0x02	0x12	R			

Low-Cost mTouch® Evaluation Kit User's Guide

TABLE 2-5: REGISTER MAP

Register Bank	Register Addresses	R/W	Register Name	Function	Default Values
0x02	0x13	R	Button 0 Baseline	Store the unscaled button 0 baseline	0x000000
0x02	0x14	R			
0x02	0x15	R			
0x02	0x16	R	Button 1 Baseline	Store the unscaled button 1 baseline	0x000000
0x02	0x17	R			
0x02	0x18	R			
0x02	0x19	R	Button 2 Baseline	Store the unscaled button 2 baseline	0x000000
0x02	0x20	R			
0x02	0x21	R			
0x02	0x22	R	Button 3 Baseline	Store the unscaled button 3 baseline	0x000000
0x02	0x23	R			
0x02	0x24	R			
0x02	0x25	R	Button 4 Baseline	Store the unscaled button 4 baseline	0x000000
0x02	0x26	R			
0x02	0x27	R			
Available in all banks	0xF0	R/W	Active Bank	Store the current active bank value	0x00
	0xF1	R	Sensor Input Count	Return the count of sensor inputs	0x06
	0xF7	R	Product ID	Store a fixed value that identifies each product (Little Endian)	0x00000001
	0xF8	R			
	0xF9	R			
	0xFA	R			
	0xFB	R	Manufacture ID	Store a fixed value that identifies Microchip (Little Endian)	0x0001
	0xFC	R			
	0xFD	R	Build Number	Stores a fixed value that represents the build number	0x00
	0xFE	R	Minor Version	Stores a fixed value that represents the minor version number	0x00
	0xFF	R	Major Version	Stores a fixed value that represents the major version number	0x01

Communication and System Register

TABLE 2-6: REGISTER DESCRIPTION

Register Name	Description
Touch State Mask	Bit 0 represents the touch state of proximity loop sensor, bit 1-5 represent the touch state of button 1-5, respectively. '0' means no touch, '1' means touch detected.
Proximity/Button Signal Deviation	This signal deviation register stores an 8-bit 2's compliment signed value to represent the sensor delta value, which then compares with threshold to determine if a touch has been detected.
Proximity/Button Threshold	The Proximity/Button Threshold registers store the signal deviation threshold that is used to determine if a touch has been detected.
Calibration State Mask	Bit 0 represents the calibration state of proximity loop sensor, bit1-5 represent the calibration state of touch button 1-5, respectively. '0' means calibration completed, '1' means calibration is in process. Write '1' to a bit in this register will force a calibration on the corresponding sensor.
Proximity/Button Scaling Factor	This register controls the sensitivity of proximity/touch detection. The smaller the value is, the more sensitivity the sensor gets. The range is from 0 to 15.
Reading Gain	This register controls the low pass filter gain for sensor reading. The range is from 0 to 3.
Baseline Gain	This register controls the low pass filter gain for sensor baseline. The range is from 0 to 3.
Reading Rate	This register value represents how many scan cycles before baseline update. The range is from 1 to 255.
Negative Delta Count	This register value determines how many consecutive negative signal deviation samples will trigger the baseline recalibration. The range is from 1 to 255.
Debounce	This register value determines how many consecutive signal deviation samples across the threshold will trigger the proximity/button touch event. The range is from 1 to 255.

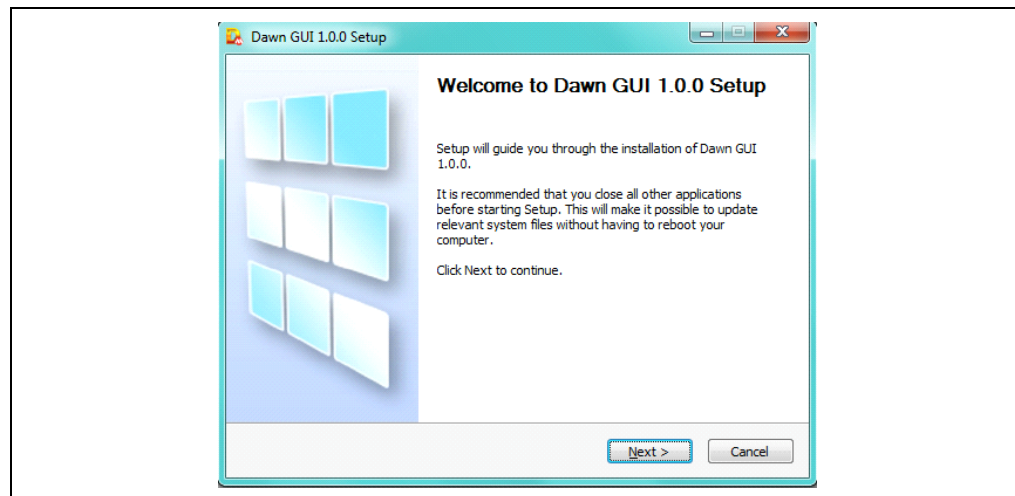
Chapter 3. Work with mTouch[®] Dawn GUI

The mTouch Dawn GUI can be installed on a Windows-based computer with a USB port, in order to further evaluate the performance and features of the PIC16LF1559 touch solution. The MCP2221 board works as the I²C host, polling data from the PIC16LF1559 evaluation board at a fixed time interval, communicating then with the Dawn GUI through USB communication.

3.1 DAWN GUI INSTALLATION

Download the “Dawn 1.0 setup.zip” file from Microchip website (<http://www.microchip.com/DM160227/>). Unzip the file and run Dawn 1.0 setup.exe program. Figure 3-1 shows the initial installation screen, which displays briefly as the setup program loads, and follows the GUI installation to finish the setup.

FIGURE 3-1: GUI INSTALLATION

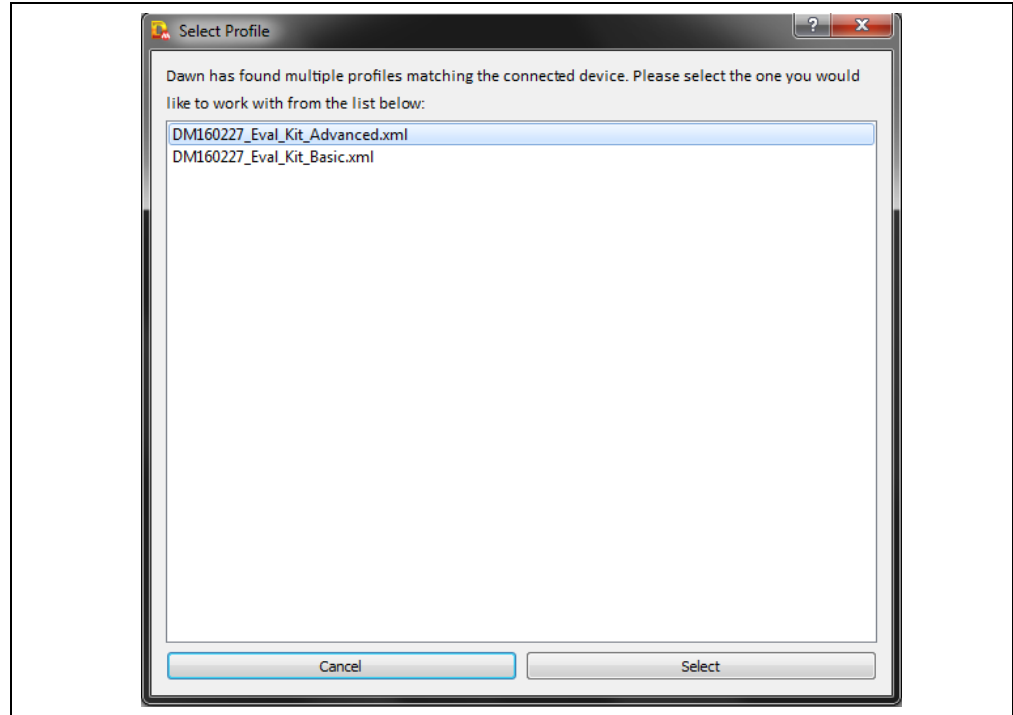


3.2 GUI OVERVIEW

Before opening the Dawn GUI, connect the evaluation kit to the PC via USB.

When the GUI is launched for the first time, a dialog window will show up to select the profile for this kit, as shown in [Figure 3-2](#).

FIGURE 3-2: PROFILE SELECTION

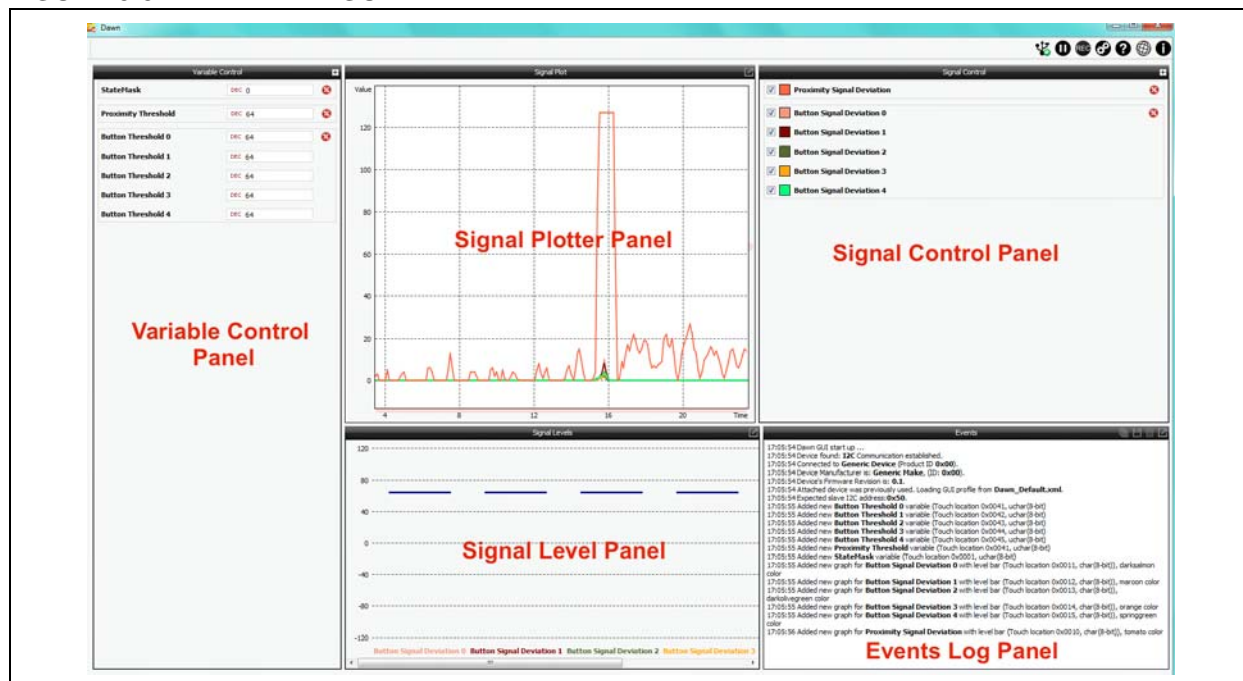


There are two predefined profiles for this kit, which configures the registers that are displayed in the GUI. The “DM160227_Eval_Kit-Basic” configures the basic and mostly used registers, while the “DM160227_Eval_Kit_Advanced” displays all the mTouch registers.

Low-Cost mTouch® Evaluation Kit User's Guide

The Dawn GUI contains five panels: Variable Control Panel, Signal Plotter Panel, Signal Level Panel, Signal Control Panel and Event Log Panel, as shown in Figure 3-3.

FIGURE 3-3: DAWN GUI



Variable Control Panel: Display system register value in text box at a fixed fresh rate, and also allow updating writable register values.

Signal Control Panel: Configure the register values that are displayed in Signal Plotter and Signal Level Panels.

Signal Plotter Panel: Display the register values configured in Signal Control Panel in the plot diagram fashion.

Signal Level Panel: Display the register values configured in Signal Control Panel in the bar diagram fashion.

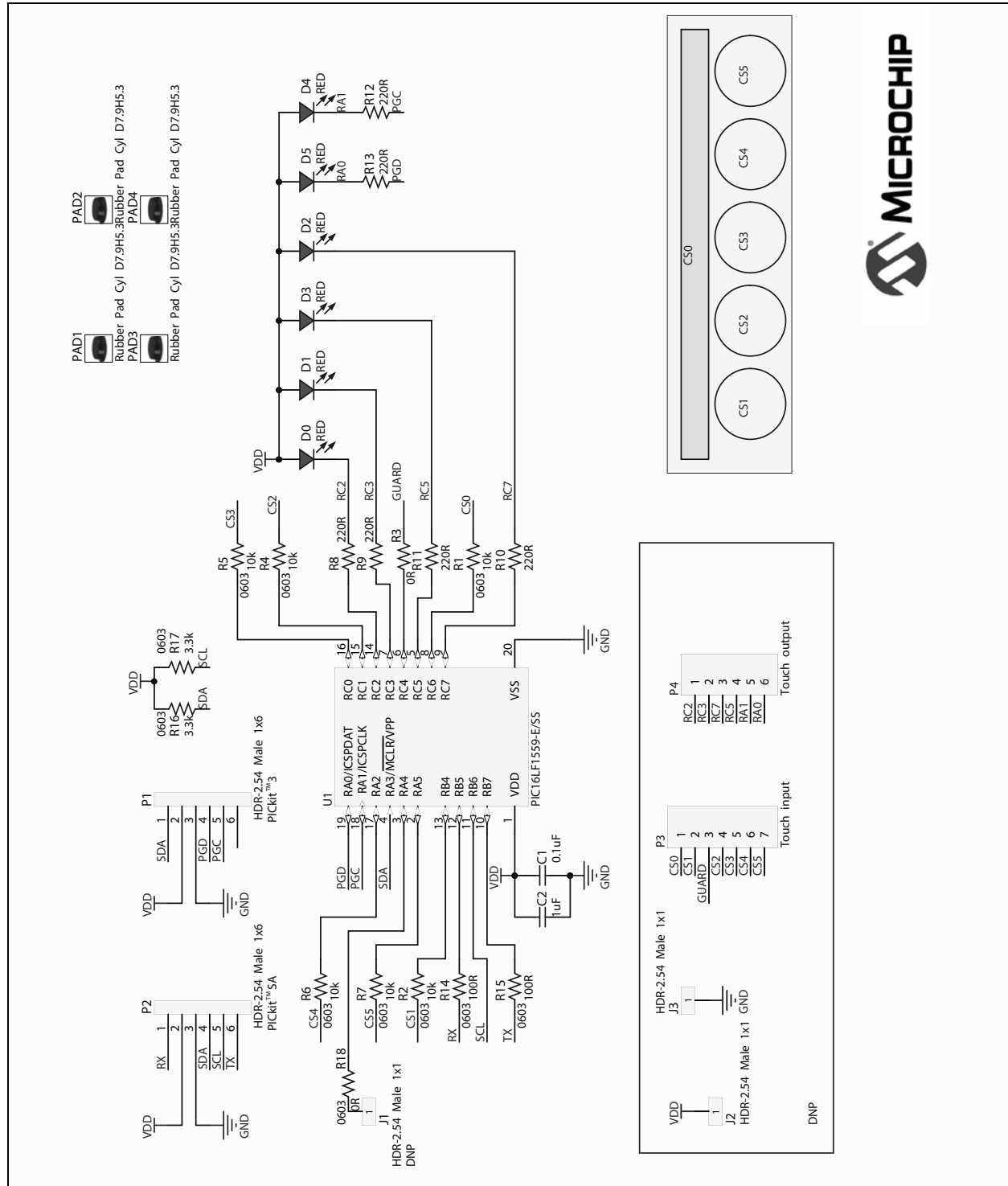
Event Log Panel: Display the board, signals, and variables information.

More details on the GUI can be found in the mTouch Dawn GUI User's Guide.

NOTES:

Appendix A. Low-Cost mTouch[®] Evaluation Board

FIGURE A-1: LOW-COST mTouch[®] EVALUATION BOARD SCHEMATIC



Low-Cost mTouch® Evaluation Board

FIGURE A-2: LOW-COST mTouch® EVALUATION BOARD LAYOUT (1 OF 2)

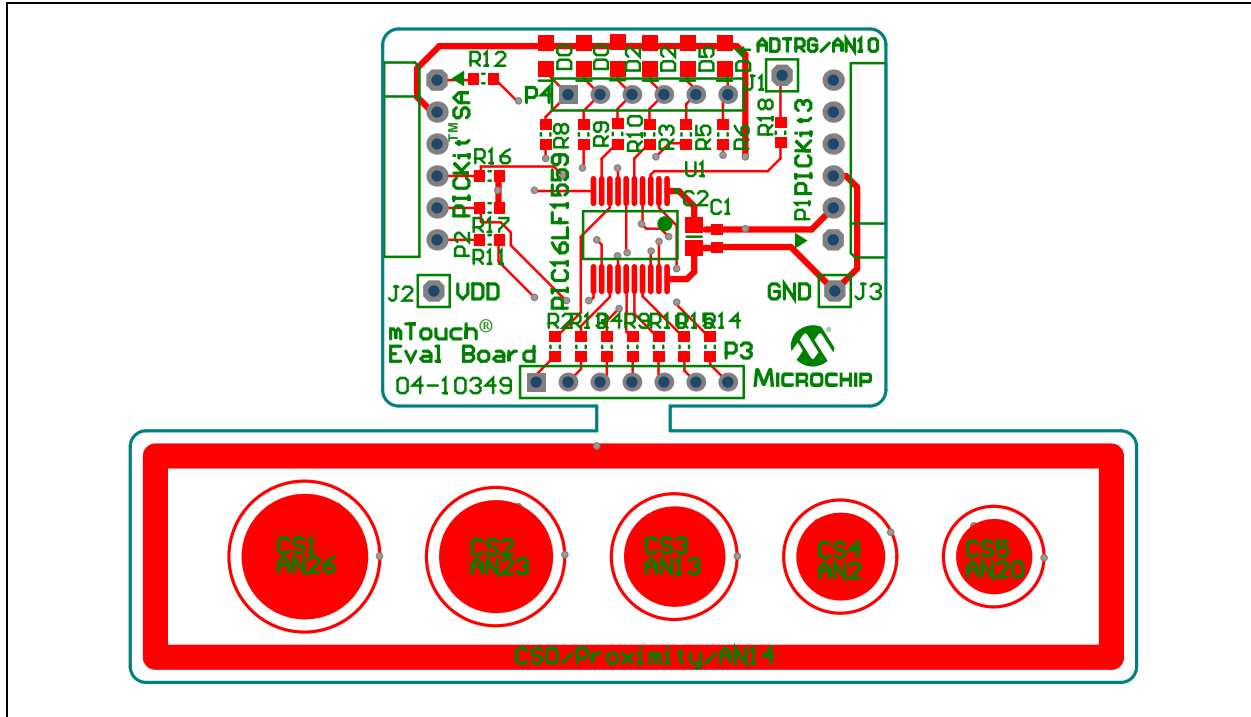
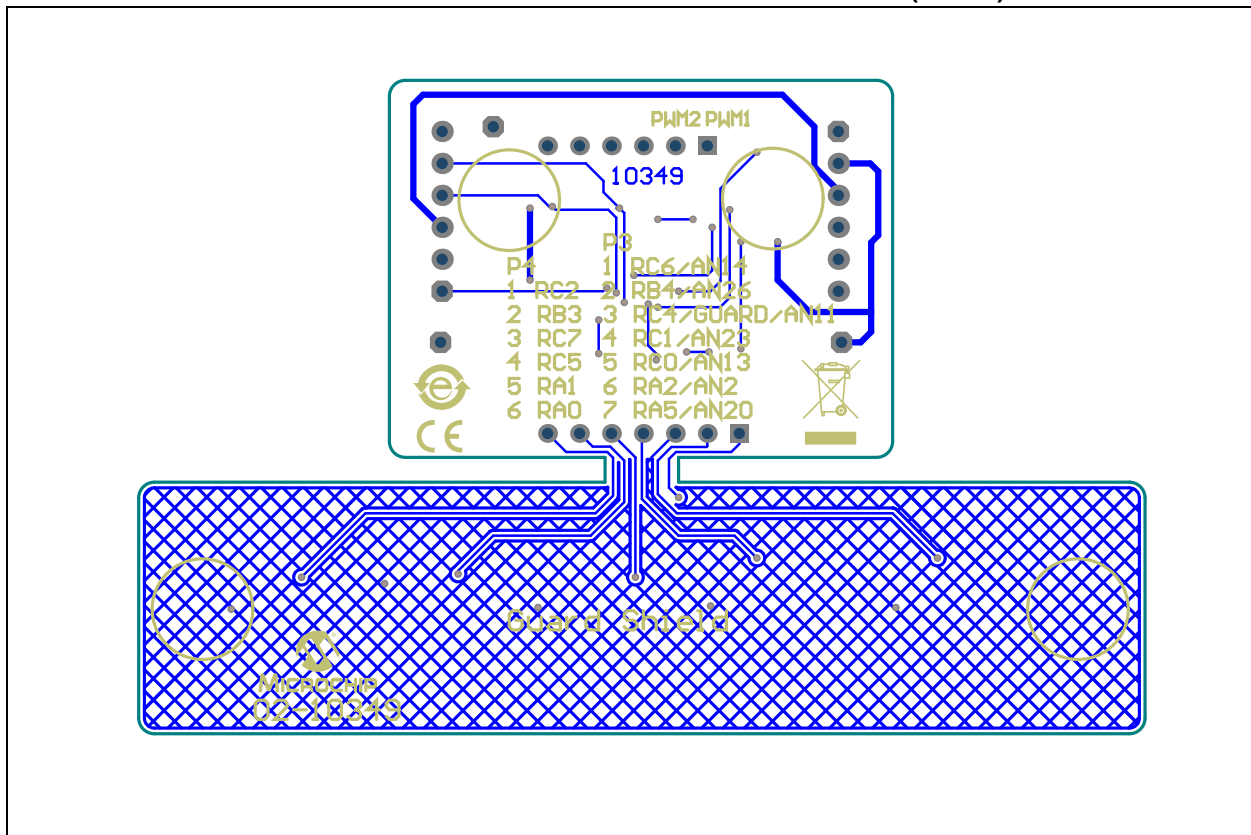


FIGURE A-3: LOW-COST mTouch® EVALUATION BOARD LAYOUT (2 OF 2)



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://www.microchip.com/support>
Web Address:
www.microchip.com

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

Austin, TX
Tel: 512-257-3370

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

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

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

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

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

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

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110

Canada - Toronto
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: 852-2943-5100
Fax: 852-2401-3431

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

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

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

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Dongguan
Tel: 86-769-8702-9880

China - Hangzhou
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

China - Hong Kong SAR
Tel: 852-2943-5100
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: 86-755-8864-2200
Fax: 86-755-8203-1760

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

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

ASIA/PACIFIC

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

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

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

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

India - Pune
Tel: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

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: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7828

Taiwan - Taipei
Tel: 886-2-2508-8600
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 - Dusseldorf
Tel: 49-2129-3766400

Germany - Karlsruhe
Tel: 49-721-625370

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

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

Italy - Venice
Tel: 39-049-7625286

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

Poland - Warsaw
Tel: 48-22-3325737

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

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331