DV102014 Projected Capacitive Multi-Touch with 3D GestIC® Sensing Development Kit User's Guide

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Object of Declaration: DV102014 Projected Capacitive with 3D GestIC® Sensing Development Kit

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USA

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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.

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

Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our 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 "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE 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 DV102014 Projected Capacitive Multi-Touch with 3D GestIC® Sensing Development Kit. Topics discussed in this chapter include:

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

DOCUMENT LAYOUT

This user's guide provides important details for using the projected capacitive 2D and 3D GestIC Sensing assembly as quick as possible. The document is organized as follows:

- **Chapter 1. "Overview"** – provides details on the kit contents, theory of operation and the block diagram.
- **Chapter 2. "Getting Started"** – includes information on the hardware and software setup, first-time parameterization and overview of the GUI.
- **Appendix A. "Schematics"** – includes reference material for the schematics, recommendations for adding a display and details about the PCAP touch screen.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

WARRANTY REGISTRATION

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RECOMMENDED READING

This user's guide describes how to configure the DV102014 Projected Capacitive with 3D GestIC assembly. Other useful documents are listed below. The following documents are available and recommended as supplemental reference resources:

MTCH6303 Projected Capacitive Touch Controller Data Sheet (DS40001803)

This data sheet provides specific information about the features and adjustable parameters of the MTCH6303, useful for configuring and tuning your application.

MGC3030/3130 3D Tracking and Gesture Controller Data Sheet (DS40001667)

This document provides specific information about the features and adjustable parameters of the MGC3130, useful for configuring and tuning your application.

MTCH650/2 Programmable Voltage Boost with Built-in Level Shifters and Serial Interface with Output Enable (DS40001749)

This document provides information to configure the MTCH652 in your application.

For the 2D-3D AUREA Utility software application and more information about Microchip's human interface portfolio, visit:

www.microchip.com/DV102014.

To obtain any of Microchip's documents, visit the Microchip website at www.microchip.com.

THE MICROCHIP WEBSITE

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- **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
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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 non-production development programmers such as PICSTART® Plus and PICkit 2 and 3.

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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 (February 2016)

Initial release of this document.

NOTES:

Chapter 1. Overview

1.1 INTRODUCTION

Microchip's DV102014 development kit builds a complete reference system for evaluation and design of 2D multi-touch and 3D gesture human-machine interfaces. This combination enables user command input with multi-touch detection on surfaces as well as natural hand movements in free space.

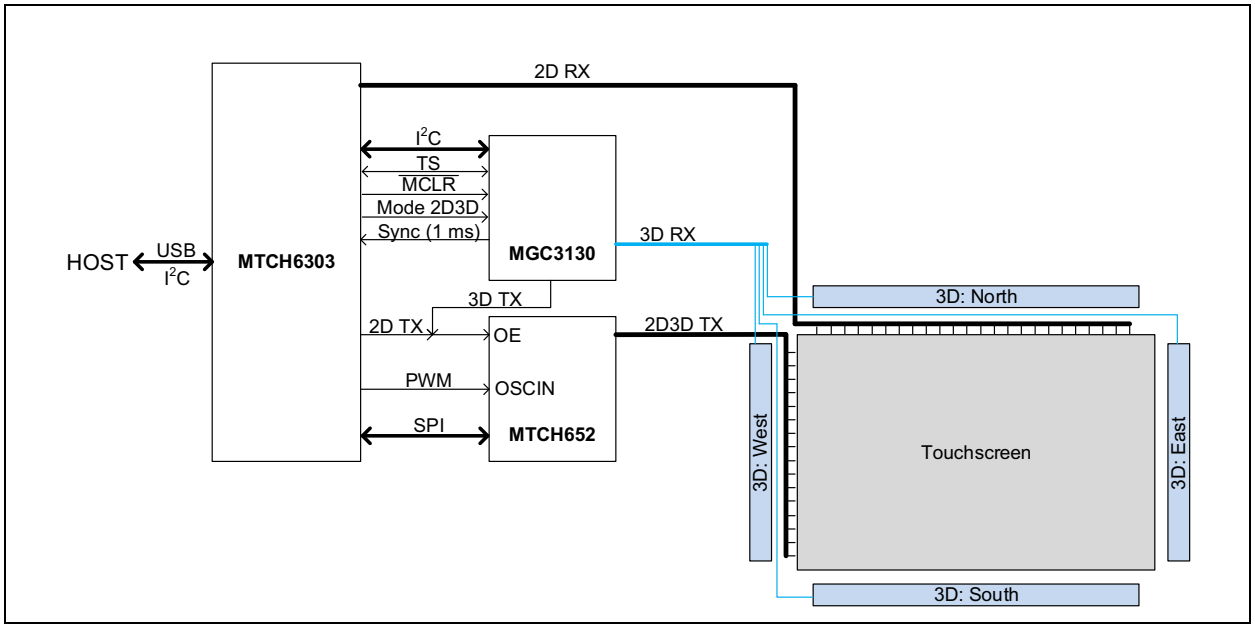
The kit content is described below:

- 2D/3D Electronics Board with Microchip parts:
  - MTCH6303 2D PCAP (Projected Capacitive) controller
  - MGC3130 3D GestIC® controller
  - MTCH652 high-voltage driver
- 2D/3D Sensor Module
  - 8" PCAP touch screen
  - 3D Printed Circuit Board (PCB) electrodes
- Micro-USB cable

1.2 WORKING PRINCIPLE

This combined 2D/3D technology solution uses Microchip's MTCH6303 2D PCAP Controller, the MGC3130 3D GestIC Controller, and the MTCH652 High-Voltage Driver. The system works in Time-Multiplex mode that dynamically detects 2D and 3D operations.

FIGURE 1-1: BLOCK DIAGRAM



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Chapter 2. Getting Started

Follow the following steps to get started:

1. Download and install the 2D/3D design-in utility AUREA 2.x to your Windows® 7/8/10 PC from www.microchip.com/DV102014.
2. Connect the micro-USB cable to the 2D/3D Electronics Board and your PC, as shown in Figure 2-1.

FIGURE 2-1: BACKSIDE VIEW

3. Carefully turn the assembled hardware over and lay on a flat table surface. The six stand-offs support the hardware, creating a flat level touch surface.

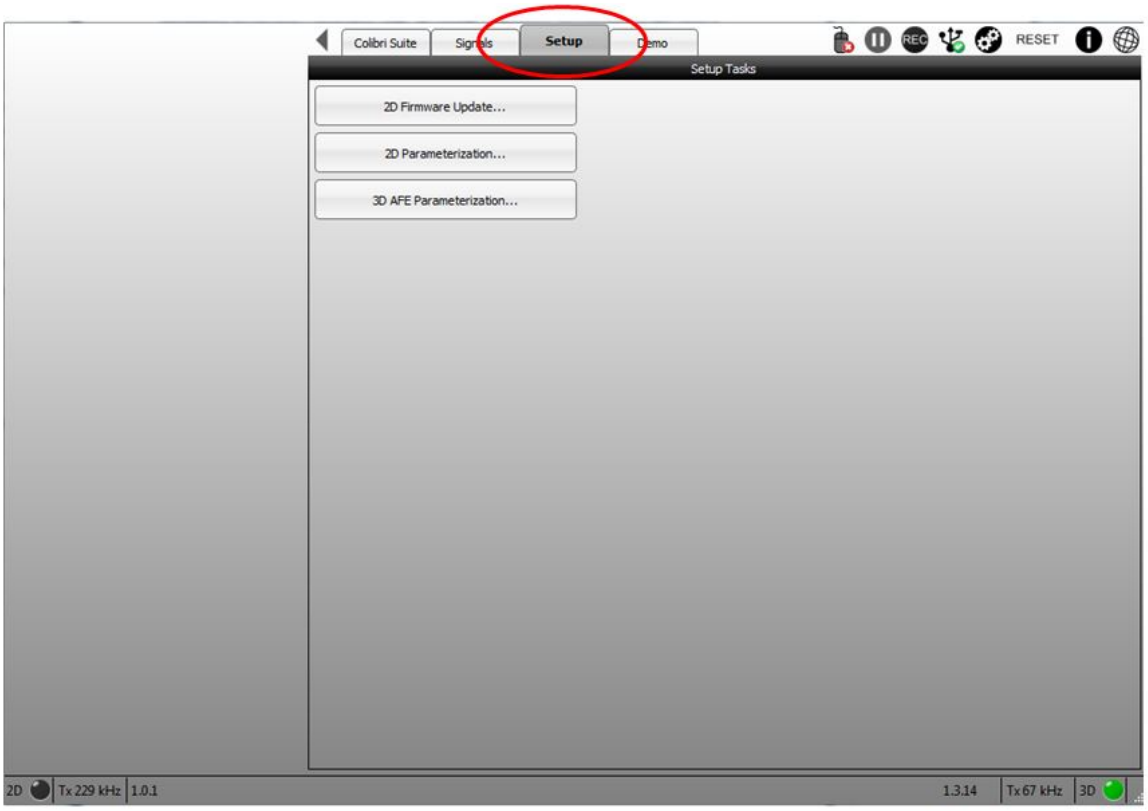
FIGURE 2-2: TOPSIDE VIEW

2.1 SETUP

1. Launch the Aurea 2.x Software Utility, (note the green check on the USB symbol to indicate a successful connection).

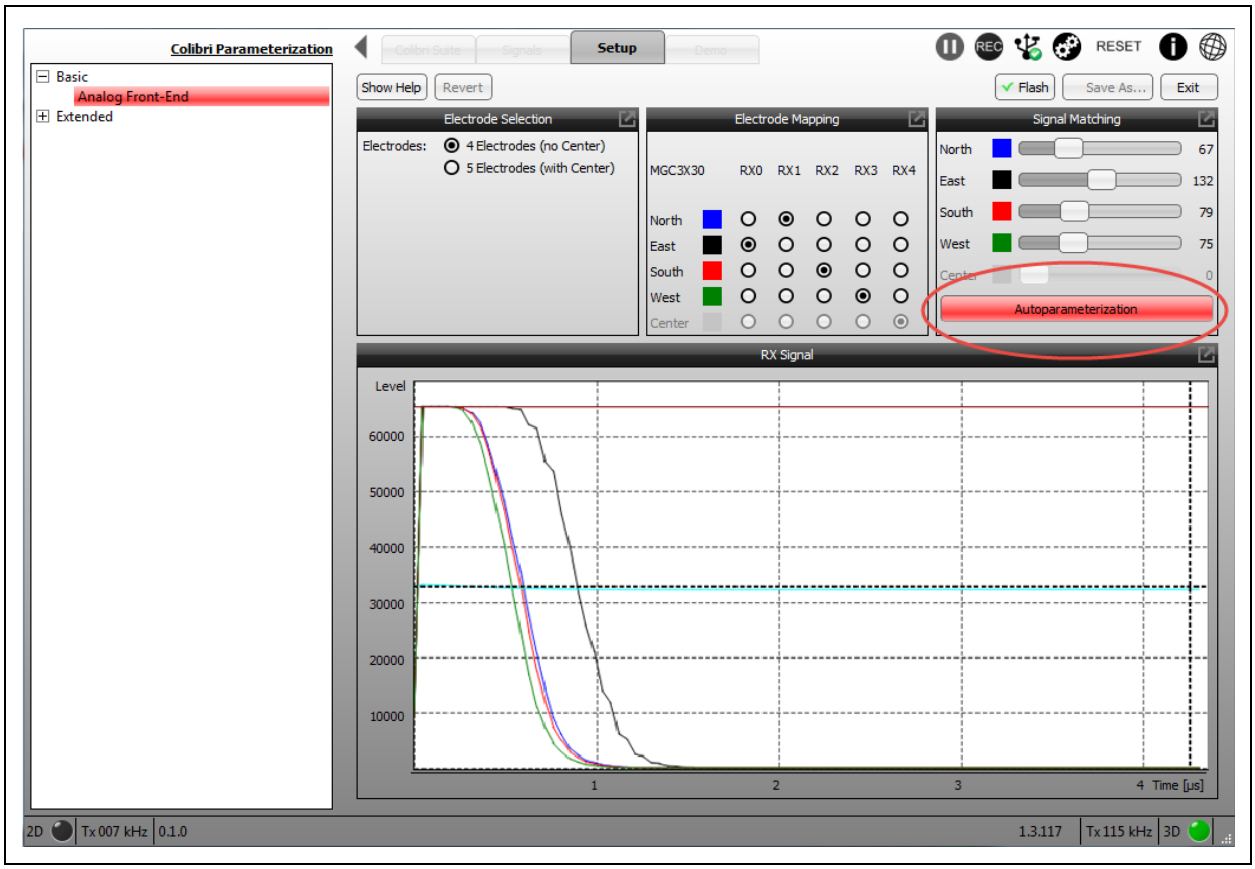
2. Navigate to the **Setup** tab and select 3D Parameterization (see Figure 2-3).

FIGURE 2-3: SETUP TAB



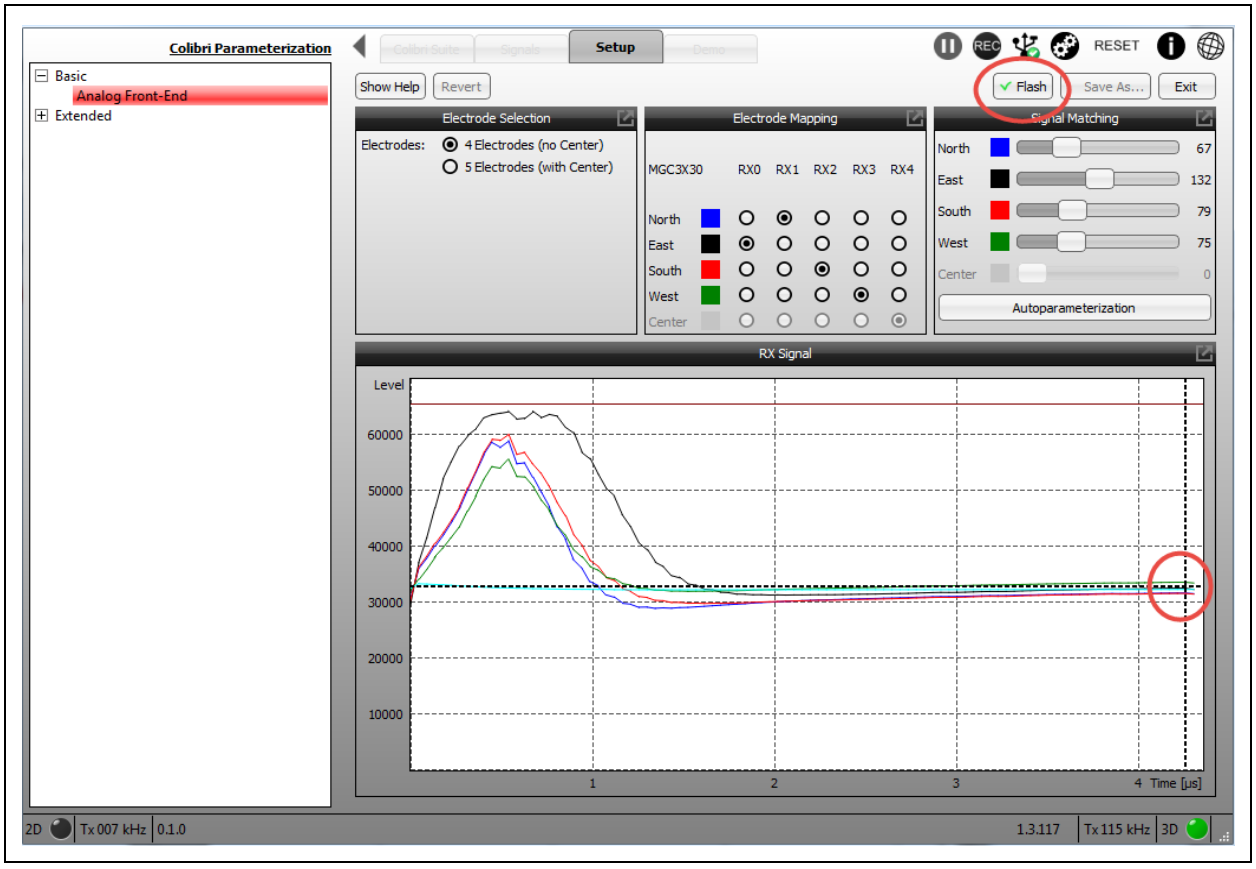
3. Select Start Autoparameterization (this step automatically optimizes the settings for the development kit by pushing the **Autoparameterization** button).

FIGURE 2-4: AUTOPARAMETERIZE



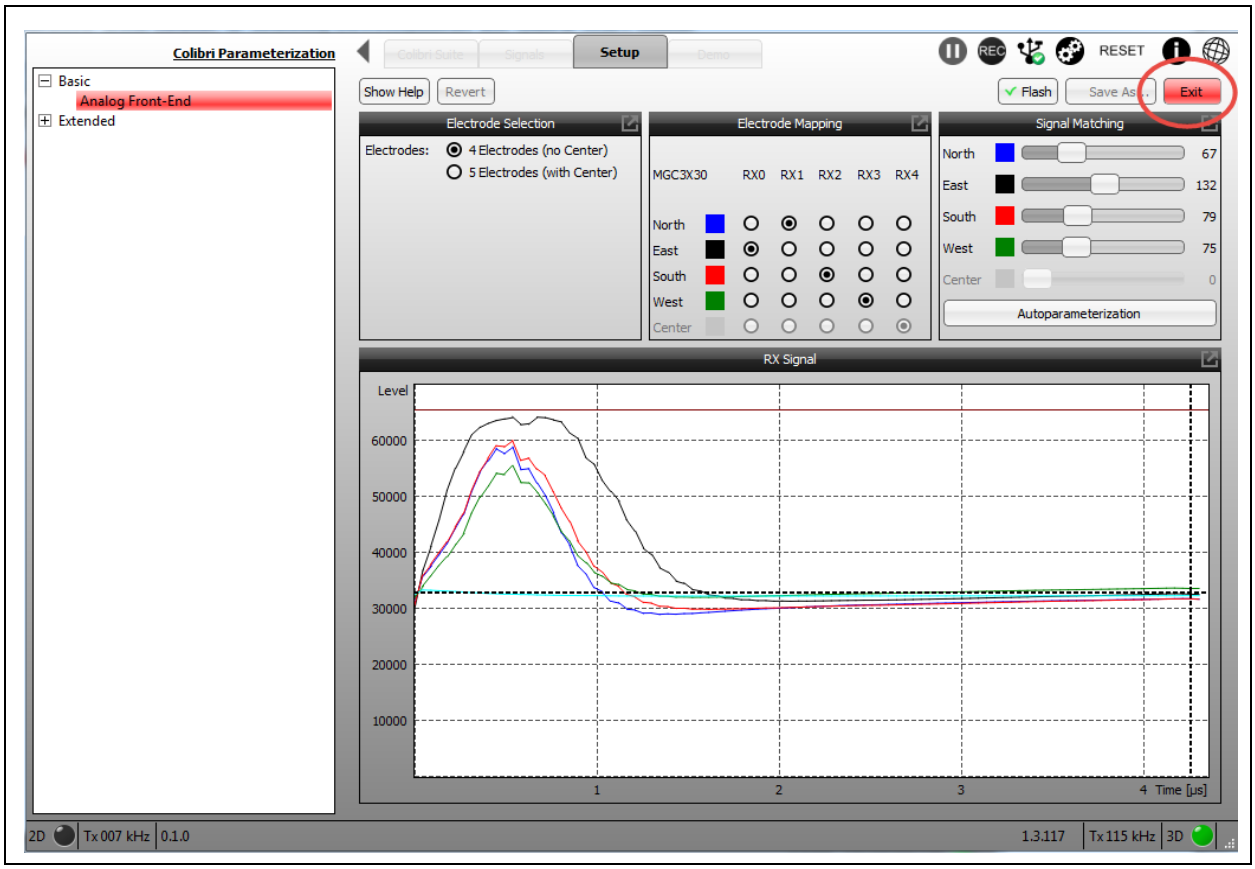
4. The signals can be noticed in Figure 2-5 coming together and running through the center of the graph on the sample point (the dotted vertical line on the right side).
5. Once this happens, click **Flash** to save the new automatically-tuned parameters.

FIGURE 2-5: FLASH NEW SETTINGS



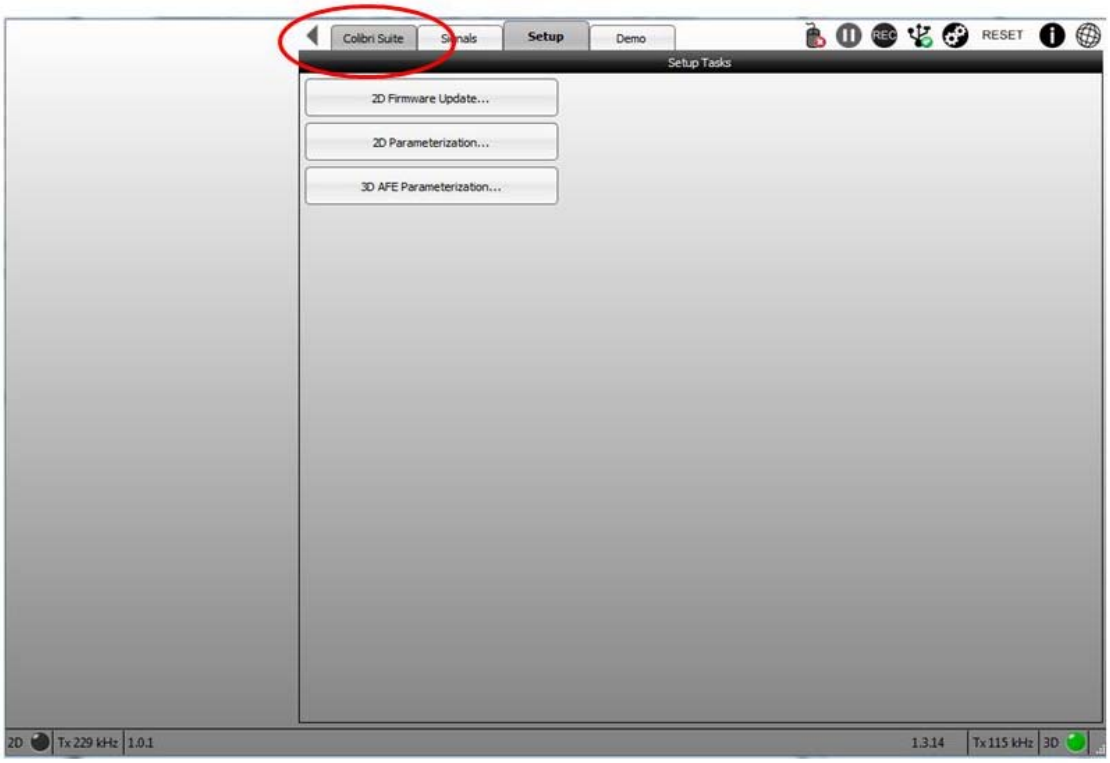
6. The **Flash** button will display a green check mark; exit this screen using the **Exit** button.

FIGURE 2-6: EXIT AUTOPARAMETERIZATION



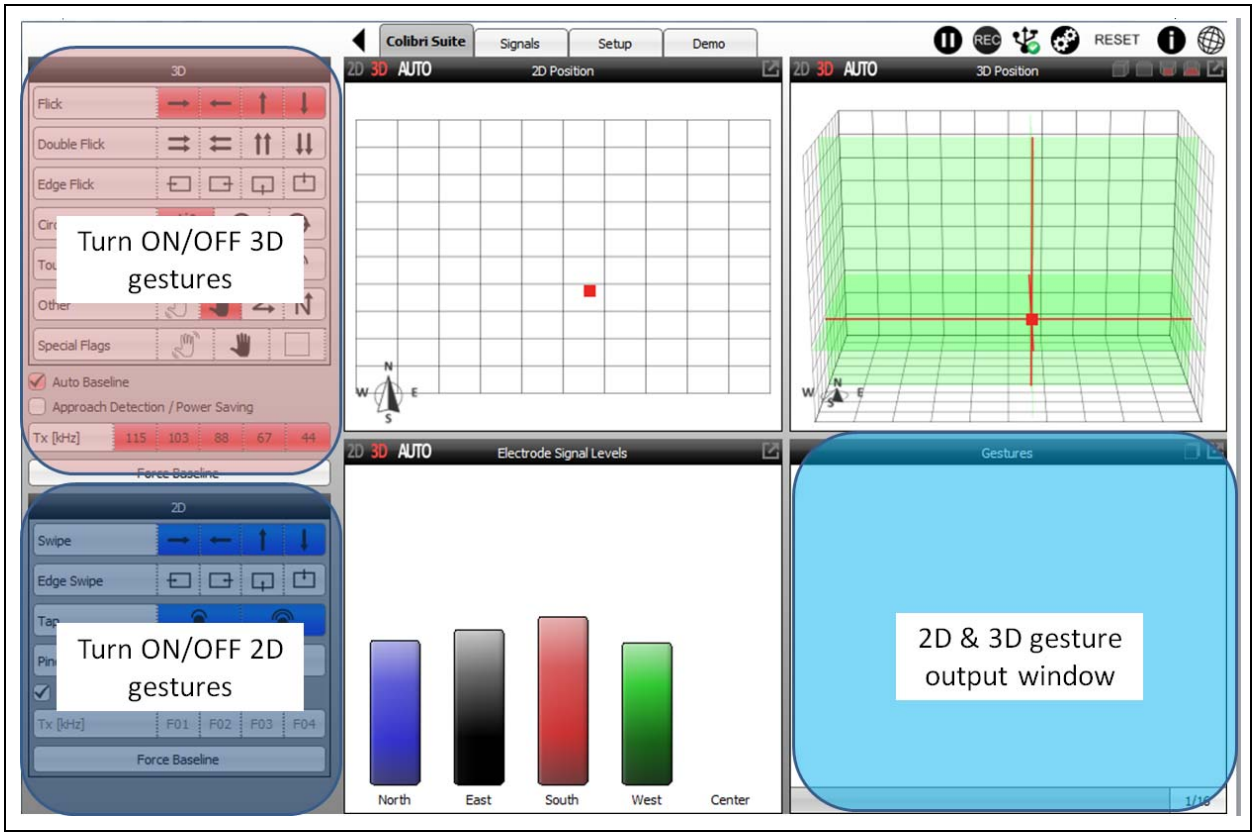
7. Navigate to the **Colibri Suite** tab to demonstrate 2D and 3D capabilities, as briefly described below. See the utility documentation for a more detailed introduction to the various built-in features.

FIGURE 2-7: COLIBRI SUITE TAB



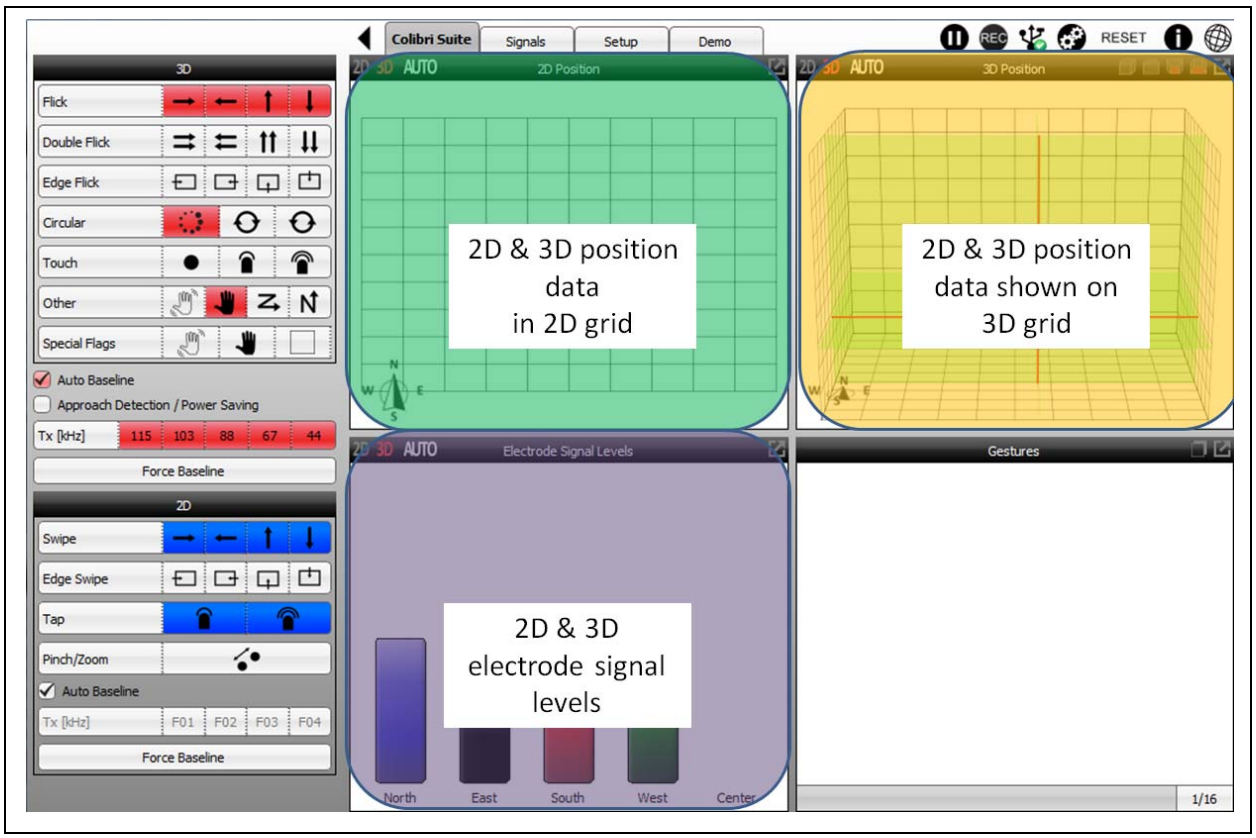
8. The **Colibri Suite** tab allows the user to turn on/off the 2D and 3D gesture reporting. These controls are found on the left side of the program and help simulate the conditions and features of the user's application. Gestures that are performed by the user are seen in the Gesture output window in the bottom right corner.

FIGURE 2-8: COLIBRI SUITE – 2D AND 3D GESTURES



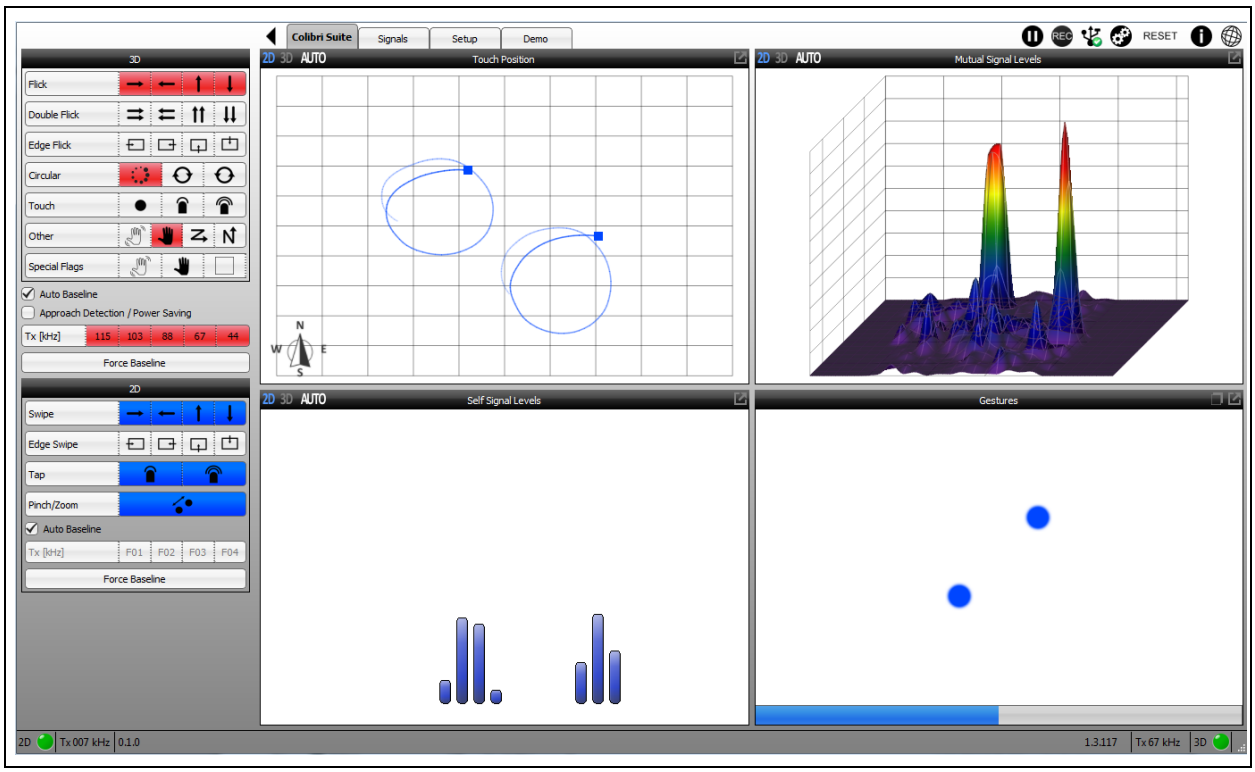
9. Real-time position data is provided in the other three windows. The Auto-default setting presents the real-time 2D or 3D data transmitted by the electronics. Selecting **2D** or **3D** will limit the output window visualization to the desired setting.

FIGURE 2-9: COLIBRI SUITE – 2D AND 3D DATA



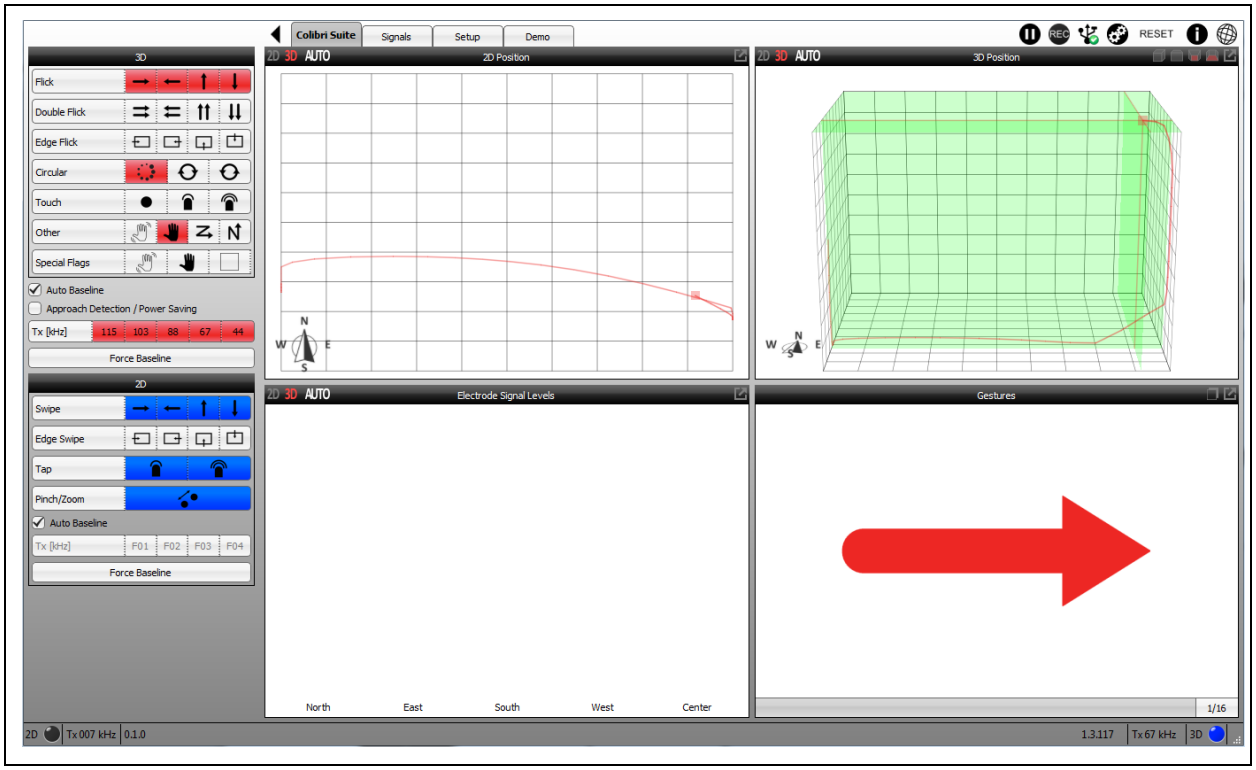
10. Use your finger(s) to draw a circle on the touch screen surface area inside the black borders and verify that the points in the top center 2D Measurement window follow your circular motion.

FIGURE 2-10: COLIBRI SUITE – 2D TEST



11. Use your hand to swipe left to right over the 2D/3D sensor module. Verify that the red gesture arrows follow your movements in the bottom right Gestures window. The hand distance should be ~10 cm (up to 20 cm) above the sensor. Always check that the desired gesture is actually activated in the 2D and/or 3D overview on the left side of the screen.

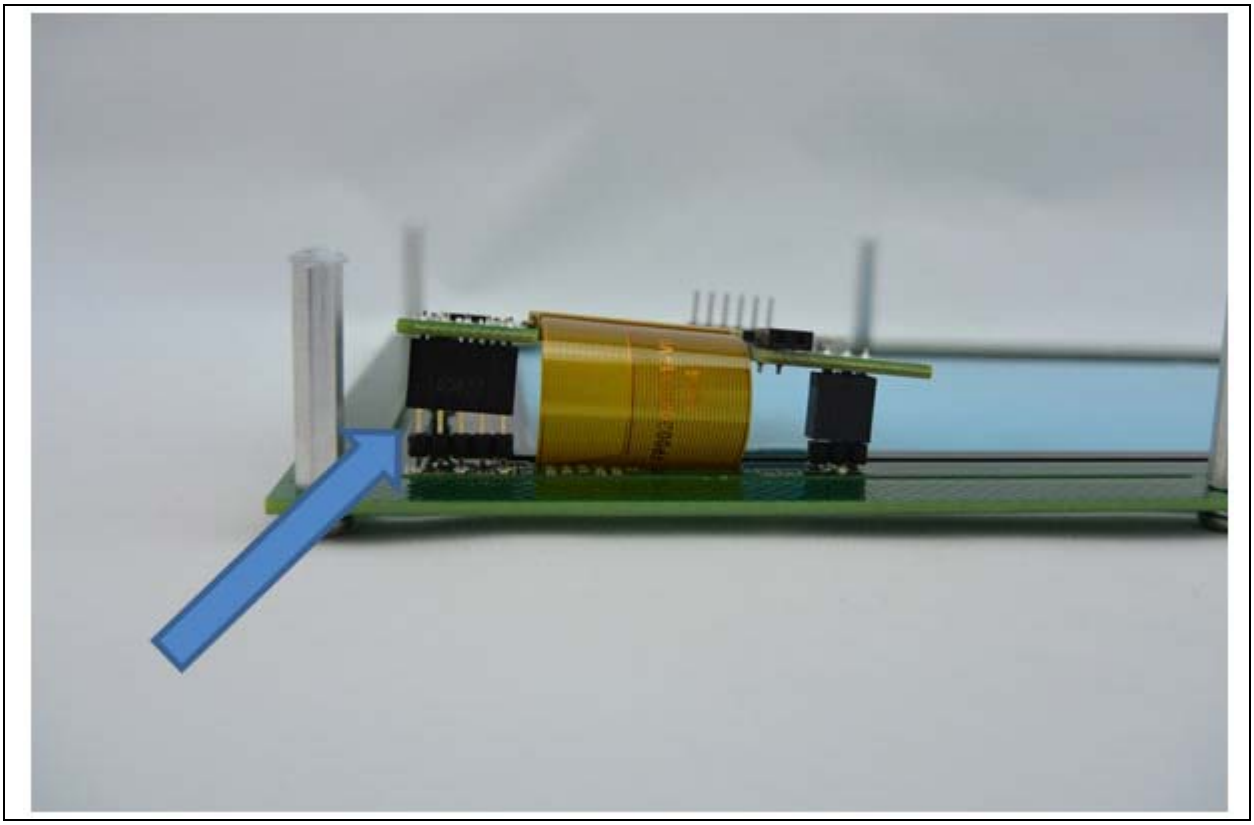
FIGURE 2-11: COLIBRI SUITE – 3D TEST



2.2 TROUBLESHOOTING

- In case of problems, make sure the 2D/3D electronics board connection is secure; a loose connection may result in poor performance (see Figure 2-12).
- Check the AUREA HTML documentation for the latest news on the available code updates for the MTCH6303 and MGC3130 devices.

FIGURE 2-12: TROUBLESHOOTING – CHECK CONNECTIONS



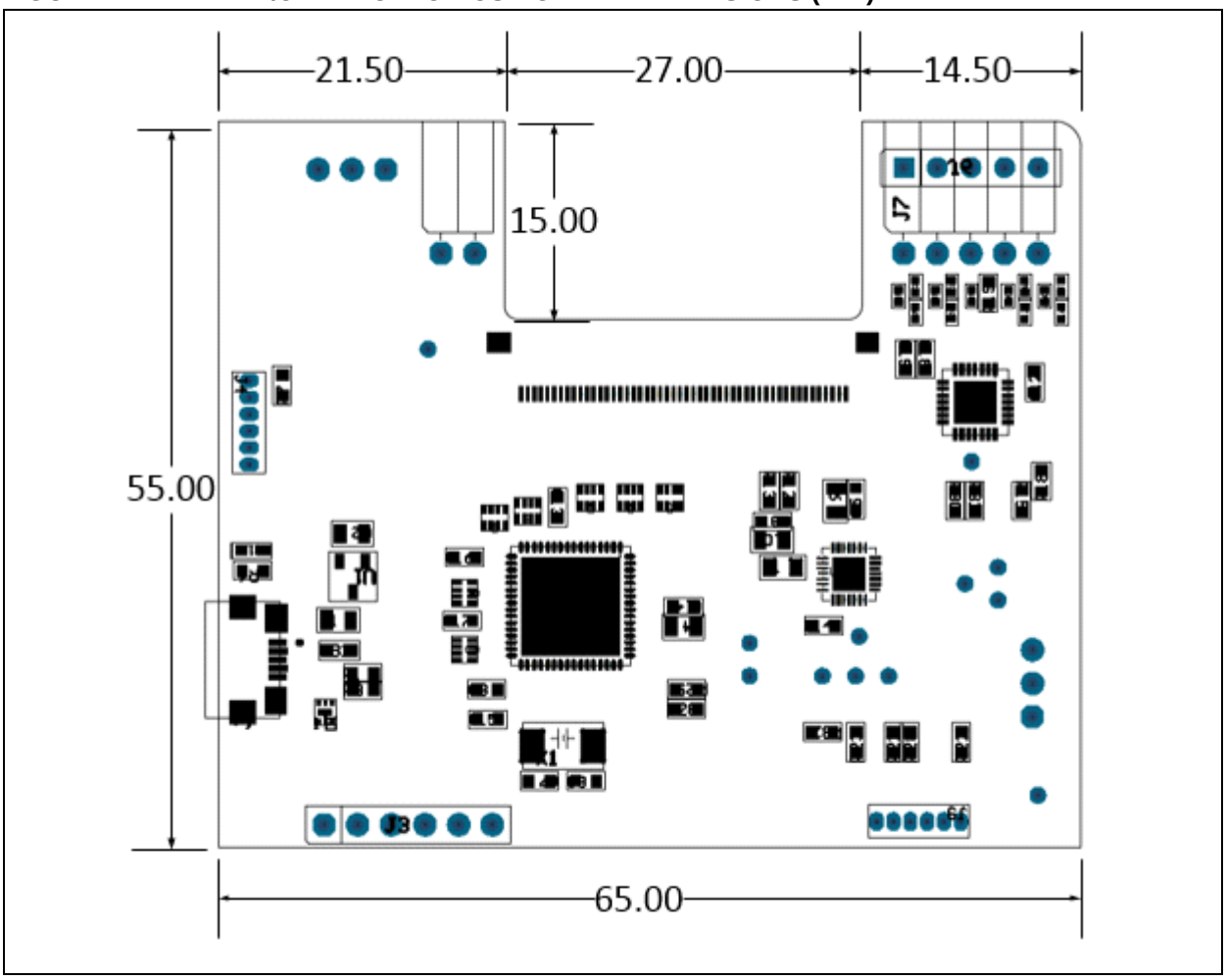
- References: additional information about Microchip's 2D and 3D electronic solutions may be found on the Microchip website at:
  - MTCH6303 – 2D PCAP touch controller www.microchip.com/mtch6303
  - MGC3130 – 3D GestIC® controller www.microchip.com/mgc3130
  - MTCH652 – High-voltage driver www.microchip.com/mtch652

NOTES:

Appendix A. Schematics

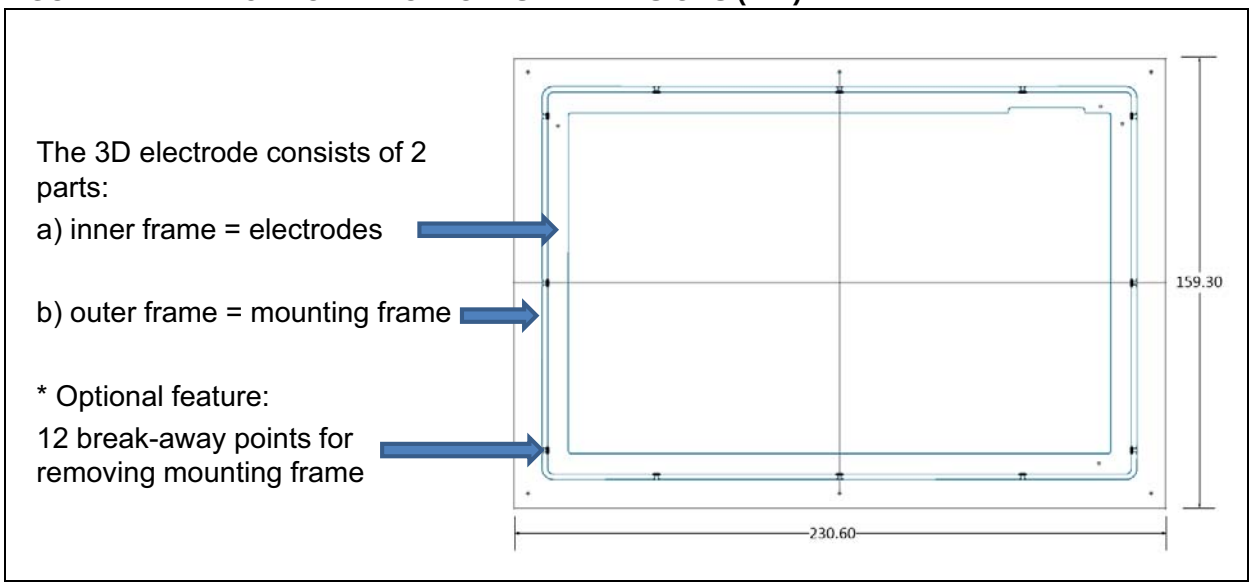
A.1 2D AND 3D BOARDS

FIGURE A-1: 2D/3D ELECTRONICS BOARD – DIMENSIONS (mm)



Full schematics, BOM and gerbers are available on the DV102014 Development Kit website www.microchip.com/DV102014.

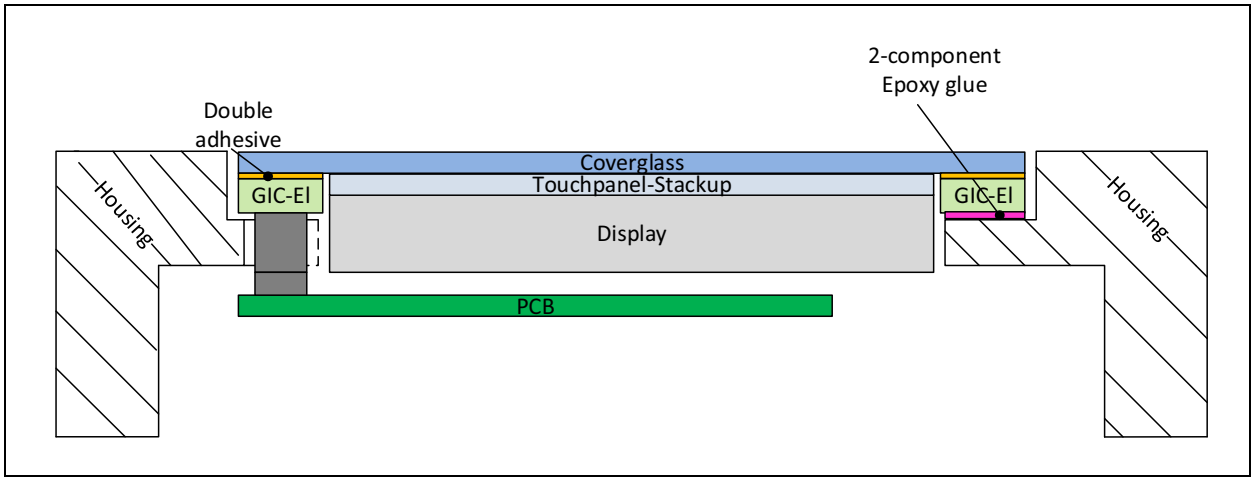
FIGURE A-2: 3D PCB ELECTRODES – DIMENSIONS (mm)



A.2 DEMONSTRATOR CROSS-SECTION EXAMPLE

When building up a demo, the following mechanical setup can be used:

FIGURE A-3: MECHANICAL SETUP WITH DISPLAY



Full schematics, BOM and gerbers are available on the DV102014 Development Kit website www.microchip.com/DV102014.

FIGURE A-4: DV102014 SCHEMATIC

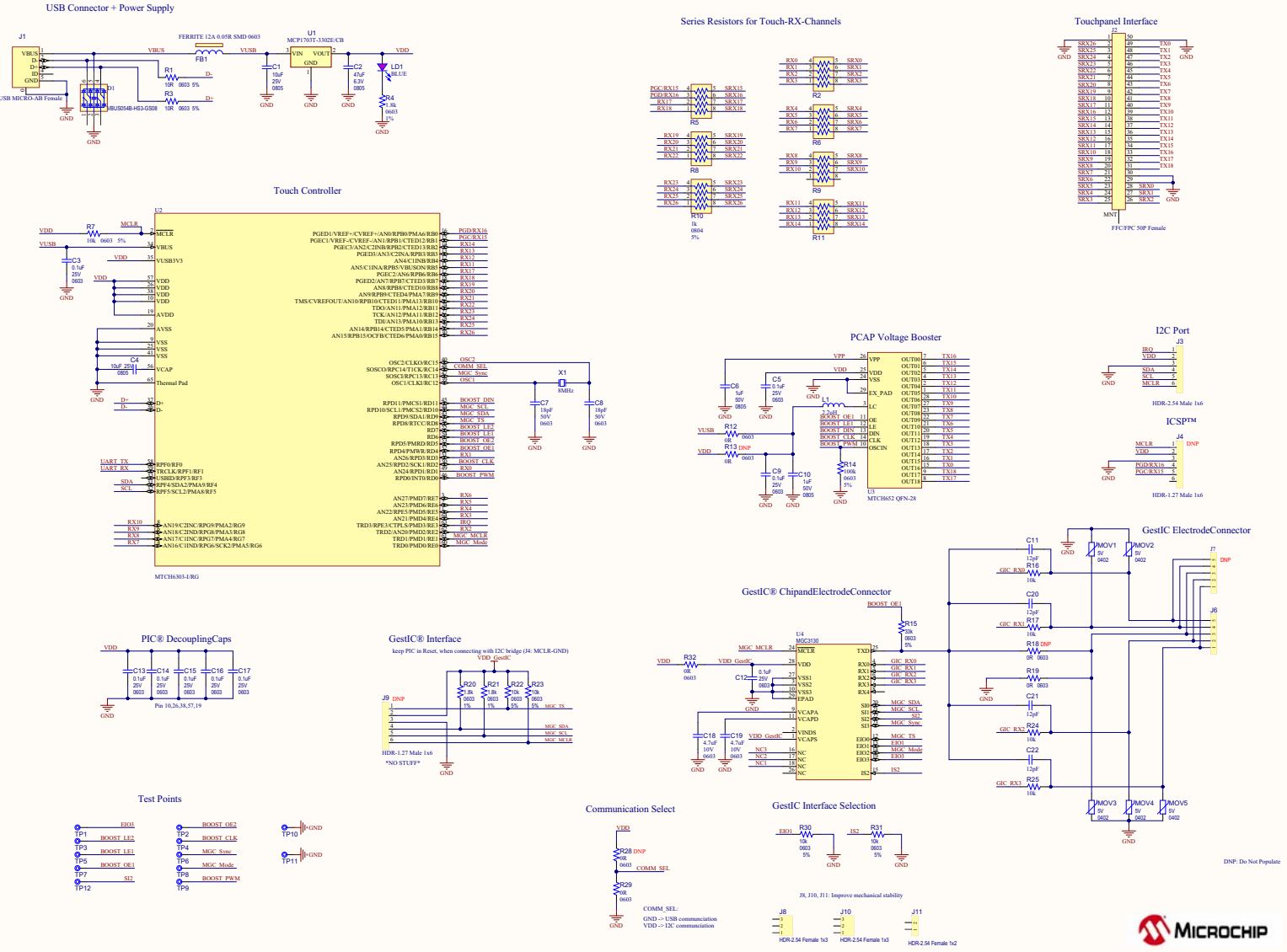
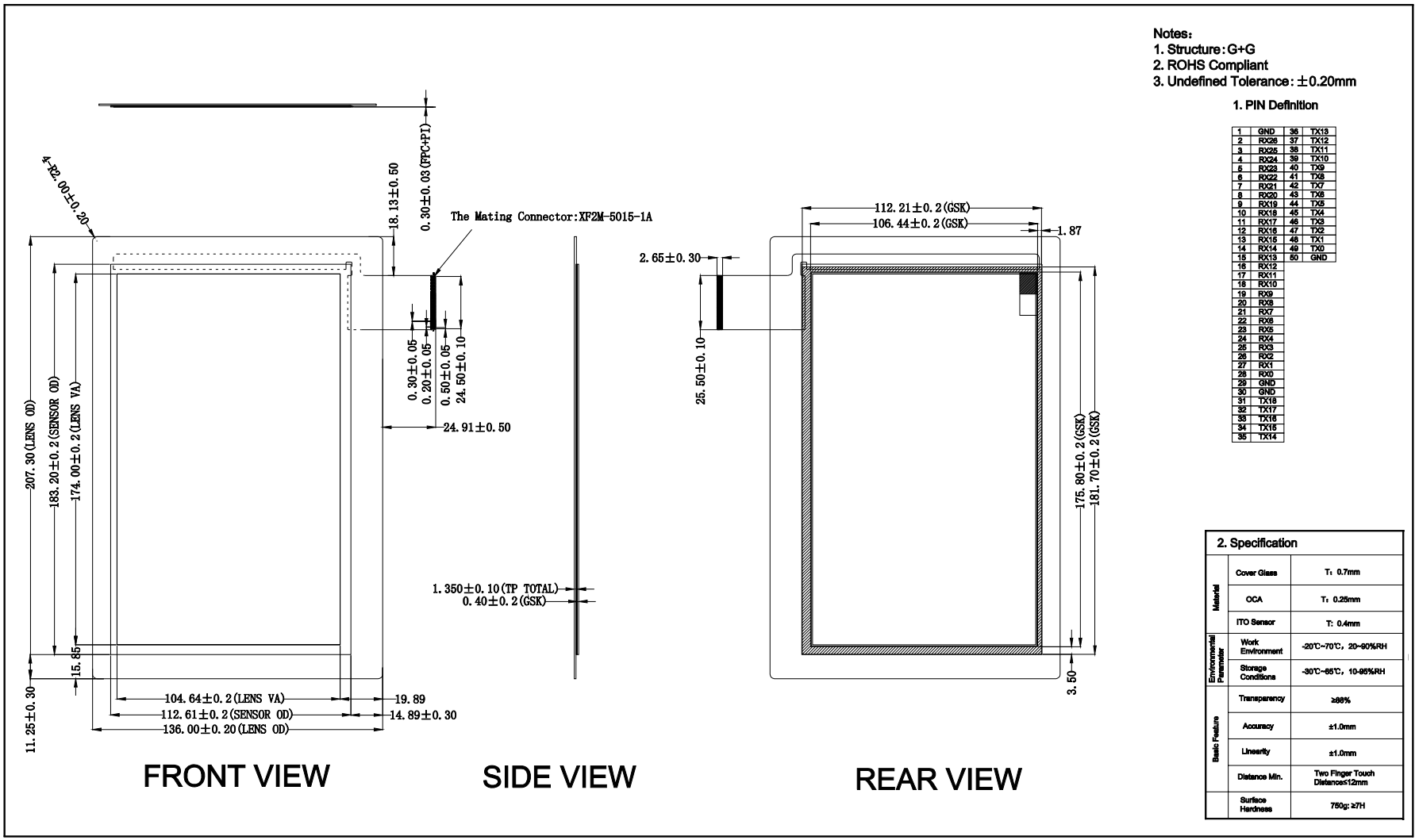


FIGURE A-5: 2D 8" PROJECTED CAPACITIVE TOUCH PANEL – PART NUMBER TXP080BA02



1	GND	36	TX13
2	RX26	37	TX12
3	RX25	38	TX11
4	RX24	39	TX10
5	RX23	40	TX9
6	RX22	41	TX8
7	RX21	42	TX7
8	RX20	43	TX6
9	RX19	44	TX5
10	RX18	45	TX4
11	RX17	46	TX3
12	RX16	47	TX2
13	RX15	48	TX1
14	RX14	49	TX0
15	RX13	50	GND
16	RX12		
17	RX11		
18	RX10		
19	RX9		
20	RX8		
21	RX7		
22	RX6		
23	RX5		
24	RX4		
25	RX3		
26	RX2		
27	RX1		
28	RX0		
29	GND		
30	GND		
31	TX18		
32	TX17		
33	TX16		
34	TX15		
35	TX14		

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