MGC3030
Woodstar Development Kit

User's Guide

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Derek Carlson
VP Development Tools

16-July-2013
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 web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

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 MGC3030 Woodstar Development Kit. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes the installation and use of the MGC3030 Woodstar Development Kit. The document is organized as follows:

- **Chapter 1. "Overview"**
- **Chapter 2. "Getting Started"**
- **Chapter 3. "Woodstar Boards – Hardware Description"**
- **Chapter 4. "System Integration Using Woodstar"**
- **Chapter 5. "Troubleshooting"**
- **Appendix A. "Schematics"**
- **Appendix B. "Sensitivity Profile and Capacitances"**
- **Appendix C. "Driver Installation Manual"**
- **Appendix D. "Glossary"**

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) { ... }`

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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 web site.

RECOMMENDED READING

This user's guide describes how to use the MGC3030 Woodstar Development Kit. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- "*GestIC® Design Guide*" (DS40001716). This document describes the MGC3030/MGC3130 system characteristic parameters and the design process. It enables the user to generate a good electrode design and to parameterize the full GestIC® system.
- *"MGC3030/3130 GestIC® Library Interface Description User's Guide"* (DS40001718). This document is the interface description of the MGC3030/MGC3130 GestIC Library. It outlines the function of the Library's message interface, and contains the complete message reference to control and operate the MGC3030/MGC3130 system.
- *"MGC3030/3130 3D Gesture Controller Data Sheet"* (DS40001667). Consult this document for information regarding the MGC3030/MGC3130 3D Tracking and Gesture Controller.
- *"Aurea Graphical User Interface User's Guide"* (DS40001681). This document describes how to use the Aurea Graphical User Interface.

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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
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- **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.

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- 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://www.microchip.com/support.

REVISION HISTORY

Revision A (November, 2014)

Initial release of the document.

Revision B (January, 2015)

Updated the Recommended Reading section; Other minor corrections.

NOTES:

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Chapter 1. Overview

1.1 INTRODUCTION

MGC3030 is a product based on Microchip's patented GestIC® technology. It is developed as a mixed-signal controller. MGC3030 has one transmit and five very sensitive receive channels that are capable of detecting changes of a transmitted electrical field (E-field) corresponding to capacitive changes in the femtofarad (1 fF = 10^{-15}F) range.

In order to transmit and receive an electrical field, electrodes have to be connected to the transmitting and receiving channels of the MGC3030 controller. The spatial arrangement of the electrodes allows the chip to determine the center of gravity of the electric field distortion, and thus gesture recognition of a user's hand in the detection space.

1.2 WOODSTAR CONCEPT AND DELIVERABLES

The Woodstar Development Kit is designed to support an easy integration of Microchip's MGC3030 3D Gesture Controller into the customer's applications. It provides MGC3030 system setup, related hardware and software references:

- Aurea Software Package with the Aurea Graphical User Interface and GestIC Library
- MGC3030/3130 Software Development Kit (SDK)
- MGC3030/3130 PIC18 Host Reference code

With the help of these tools, the design-in process can be easily performed in five steps:

1. Feature Definition
2. Electrode Design
3. MGC3030 Parameterization
4. Host Application Programming
5. Verification

Tutorial videos for the design-in process can be found on www.microchip.com/videohmidtutorials.

Woodstar hardware builds a complete MGC3030 reference system consisting of three individual PCBs:

- MGC3030 Unit
- I^2C™ to USB Bridge
- Reference Electrode with a 95x60 mm sensitive area

It can be plugged to a PC via a USB cable and used for evaluation of the MGC3030 chip and the GestIC technology. During the customer's design-in process the individual boards can be combined according to the customer's needs.

Three examples are given below:

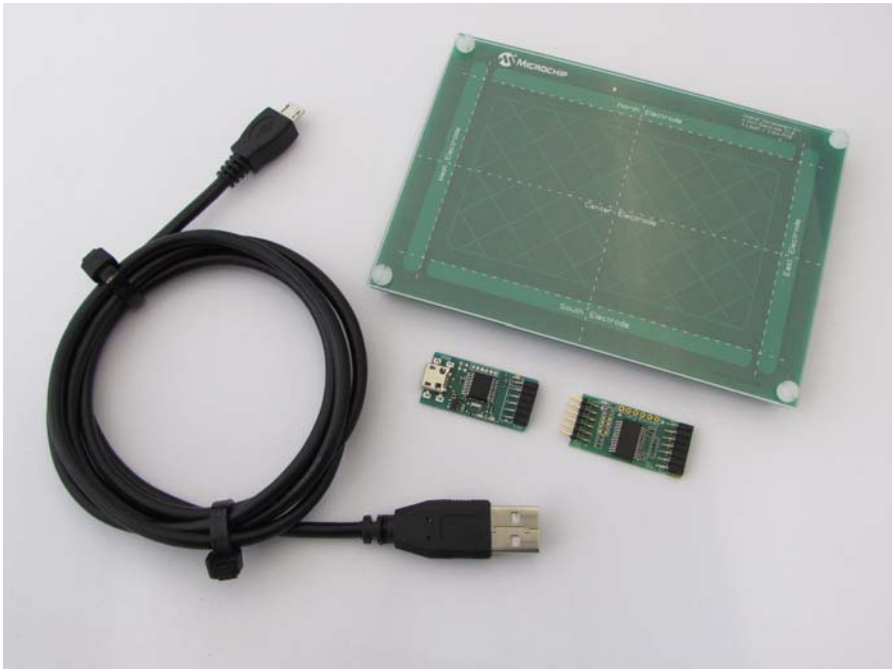
- Combine the MGC3030 unit and the I^2C to USB bridge to evaluate customized electrodes
- Use the I^2C to USB bridge to parameterize and debug the MGC3030 application circuitry in the customer's design
- Combine the MGC3030 unit and electrodes to develop gesture-driven applications for PC-based or embedded software environments

1.3 WOODSTAR DEVELOPMENT KIT PACKAGE CONTENT

The Woodstar Development Kit package content is listed below:

- MGC3030 Module
- I^2C to USB Bridge Module
- Reference Electrode (95x60 mm sensitive area)
- USB Cable for PC Connection

FIGURE 1-1: WOODSTAR DEVELOPMENT KIT



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1.4 GestIC® HARDWARE REFERENCES

The GestIC Hardware References package contains the PCB layouts (Gerber files) for the MGC3030/3130 development kits (Hillstar and Woodstar) and a collection of electrode reference designs fitting both kits. In addition, the package includes designs, parameter files and host code of various demonstrators which represent complete systems for embedded or PC-based applications.

New designs will be added to the package once they are available. The GestIC Hardware Reference package can be downloaded from Microchip's web site via www.microchip.com/gesticresources.

TABLE 1-1: PACKAGE CONTENT (BASED ON V1.0.6)

Module Name	Sensitive Area (mm)	Outline (mm)	PCB Layers	Fit to Hillstar	Fit to Woodstar	Parameter File	Host Code
MGC3130 Unit	—	—	2	√	—	—	—
MGC3030 Unit	—	—	2	—	√	—	—
I^2C™ to USB Bridge	—	—	2	√	√	—	(**Note 1**)
Reference Electrode 30x30 2-Layer	30x30	49x49	2	√	√	—	—
Reference Electrode 30x30 4-Layer	30x30	49x49	4	√	√	√	—
Reference Electrode 50x30 2-Layer	50x30	63x47	2	√	√	—	—
Reference Electrode 80x80 2-Layer	80x80	104x104	2	√	√	—	—
Reference Electrode 95x60 2-Layer	95x60	120x85	2	√	√	—	—
Reference Electrode 95x60 4-Layer	95x60	120x85	4	√	√	√	—
Reference Electrode 100x50 2-Layer	100x50	128x72	2	√	√	—	—
Reference Electrode 100x50 4-Layer	100x50	128x72	4	√	√	√	—
Reference Electrode 140x90 2-Layer	140x90	168x119	2	√	√	—	—
Reference Electrode Ring 95x60	95x60	120x85	2	√	√	√	—
Reference Electrode Ring 128x90	112x76	128x90	2	√	√	√	—
GestIC® Electrode Prototype Kit	85x85	100x110	N/A	—	—	—	—
MGC3130 Sensor Module 30x30	30x30	49x49	4	—	—	√	—
MGC3130 Sensor Module 95x60	95x60	120x85	4	—	—	√	—
MGC3130 Embedded Demo	42x75	60x150	2	—	—	√	√
MGC3130 Gesture Port Demo	D = 50	63.5x63.5	4	—	—	√	—

Note 1: Reference code for the PIC18F14K50 on the I^2C to USB bridge can be found in the PIC18F14K50 Reference Code package on the Microchip web page.

1.5 AUREA SOFTWARE PACKAGE

The Aurea Software Package contains all relevant system software and documentation. The Woodstar Development Kit is supported by Aurea Software Package V1.2 onwards.

The package contains:

- Aurea PC Software
- GestIC Library (firmware) Binary File
- GestIC Parameterization Files
- Windows® CDC Driver
- Documentation

The latest Aurea Software Package can be downloaded from Microchip's web site via www.microchip.com/gesticresources.

Please find a collection of GestIC/Aurea tutorial videos at www.microchip.com/videohmidtutorials.

1.6 MGC3030/3130 SOFTWARE DEVELOPMENT KIT (SDK)

The MGC3030/3130 Software Development Kit (SDK) supports the integration of MGC3030 into a software environment. Thus, it includes a C reference code for GestIC API, a precompiled library for Windows operating systems, and a demo application using the GestIC API interface.

Woodstar Development Kit is supported by MGC3030/3130 SDK V1.1 onwards.

The latest SDK can be downloaded from Microchip's web site via www.microchip.com/gesticresources.

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Chapter 2. Getting Started

The Woodstar Development Kit can be used as a stand-alone GestIC system and evaluated in conjunction with the Aurea PC software. This section describes how to get started.

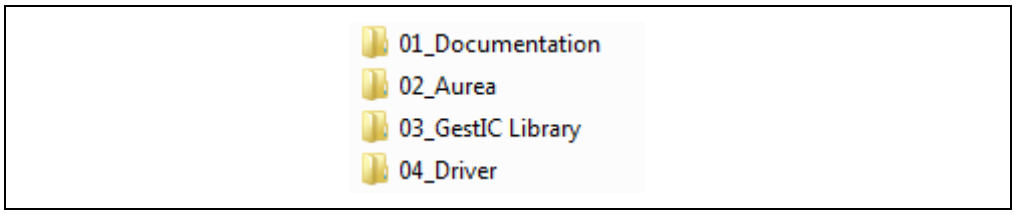
2.1 PREREQUISITES

The following prerequisites have to be fulfilled:

- PC with Windows 7 or Windows 8 operating systems, USB port and minimum screen resolution of 1024x768
- Woodstar Development Kit (MGC3030 unit, I^2C to USB bridge, 95x60 mm frame electrode)
- Aurea Software Package V1.2 onwards

The Aurea Software Package is available as `.zip` file. Unzip the file, run `setup.exe` and install the package to the PC. The folder structure is as shown in Figure 2-1.

FIGURE 2-1: FOLDER STRUCTURE

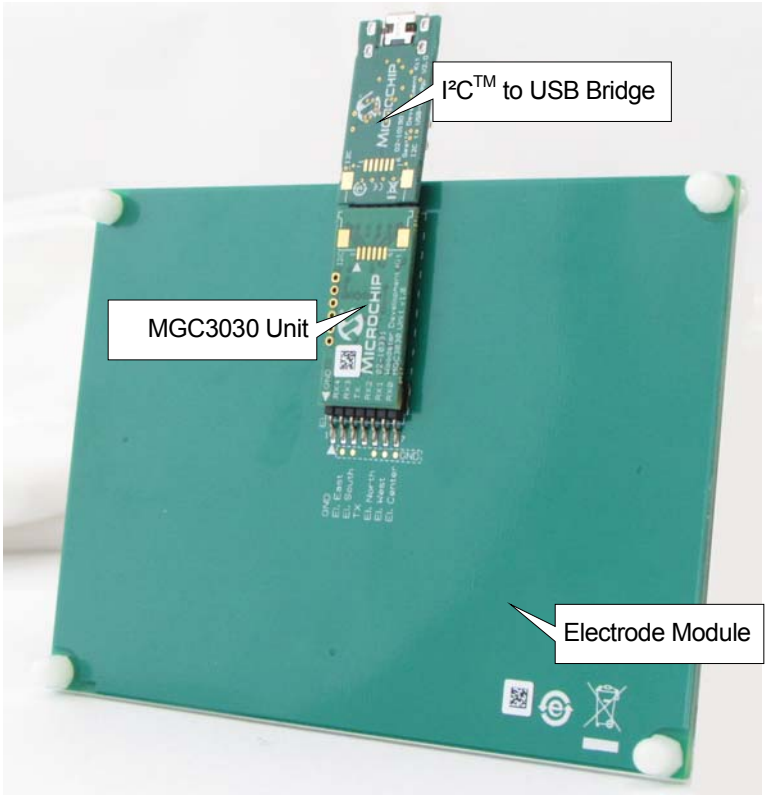


2.2 STEP 1: DEVELOPMENT KIT ASSEMBLY

Connect the electrodes, the MGC3030 unit and the I^2C to USB bridge as shown in Figure 2-2.

Note: Make sure the MGC3030 unit and the I^2C to USB bridge are already connected before plugging in the USB connection.

FIGURE 2-2: WOODSTAR DEVELOPMENT KIT ASSEMBLY



2.3 STEP 2: CONNECTING THE WOODSTAR DEVELOPMENT KIT TO THE PC

Use the supplied USB cable to connect the Woodstar Development Kit to your PC. The power LEDs on both the I^2C to USB bridge and the MGC3030 unit will illuminate. Furthermore, LED 1 on the I^2C to USB bridge will flash very fast (~10 Hz). If LED 1 is flashing slow (~1 Hz), the Windows CDC driver is already installed on your PC. Please skip the next step and go to **Section 2.5 "Step 4: Starting Aurea GUI"**.

2.4 STEP 3: INSTALLING WINDOWS® CDC DRIVER

The Windows CDC driver can be found in the Aurea Software Package in folder `04_Driver`.

When the Woodstar Development Kit is connected to the PC for the first time, Windows requests the appropriate device driver and guides the user through the installation process. Alternatively, the driver can be installed manually, for example, by using the device manager. An example for Windows 7 is given in **Appendix C. "Driver Installation Manual"**.

2.5 STEP 4: STARTING AUREA GUI

Aurea Graphical User Interface, shown in Figure 2-3, is included in the Aurea Software Package in folder `02_Aurea`.

Open `Aurea.exe`. Aurea automatically detects the connected device and is ready for use.

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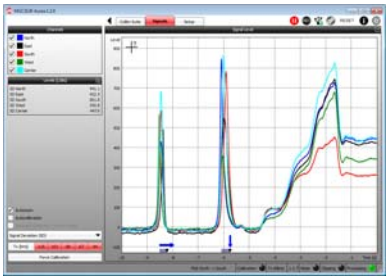
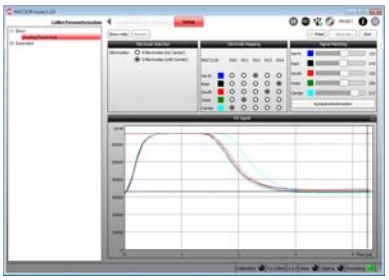
FIGURE 2-3: AUREA GRAPHICAL USER INTERFACE

Evaluate Colibri Suite	Discover Signals	Setup MGC3030
		
1. Gesture Recognition 2. Demo applications	1. View signals 2. Write log file 3. Advanced features	1. AFE parameterisation 2. Colibri Suite parameterization 3. Update GestIC® Library 4. Measure Electrode capacitances

NOTES:

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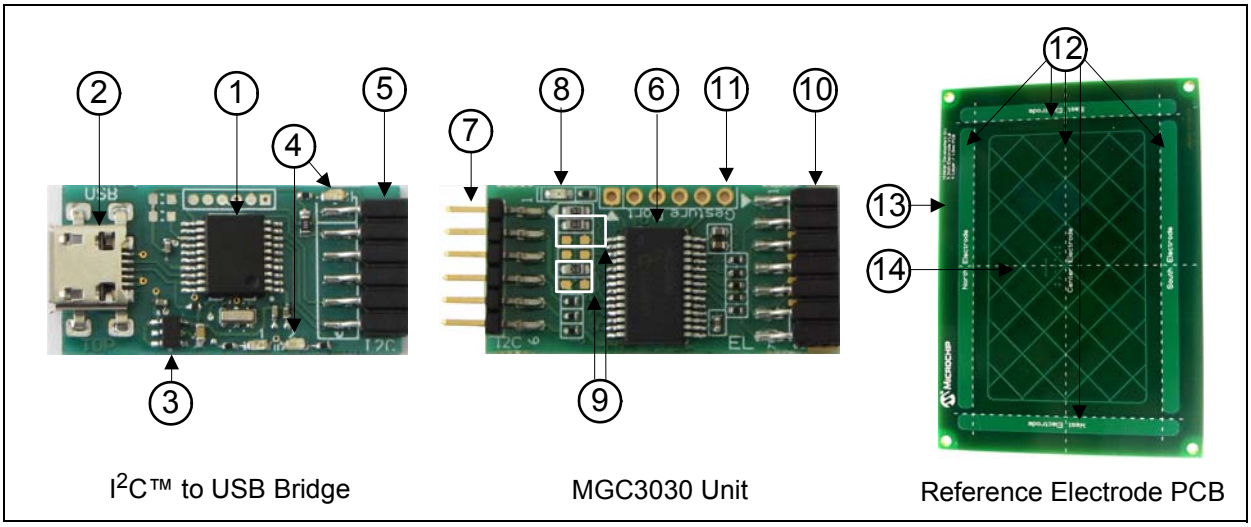
Chapter 3. Woodstar Boards – Hardware Description

3.1 OVERVIEW

The Woodstar key components are listed below and highlighted in Figure 3-1.

FIGURE 3-1: WOODSTAR DEVELOPMENT KIT OVERVIEW



3.1.1 I²C™ to USB Bridge

1. PIC18F14K50 USB microcontroller
2. USB micro-B connector
3. MCP1801T LDO voltage regulator (converts 5V USB to 3.3V board supply)
4. Status LEDs (power, communication status)
5. Data interface: 6-pin socket for data communication and power supply

3.1.2 MGC3030 Unit

6. MGC3030 3D Gesture Controller
7. Data interface: 6-pin header for data communication and power supply
8. Status LED (power)
9. Interface select
10. Electrode interface: 7-pin socket
11. Gesture Port Header

3.1.3 95x60 mm Reference Electrode PCB

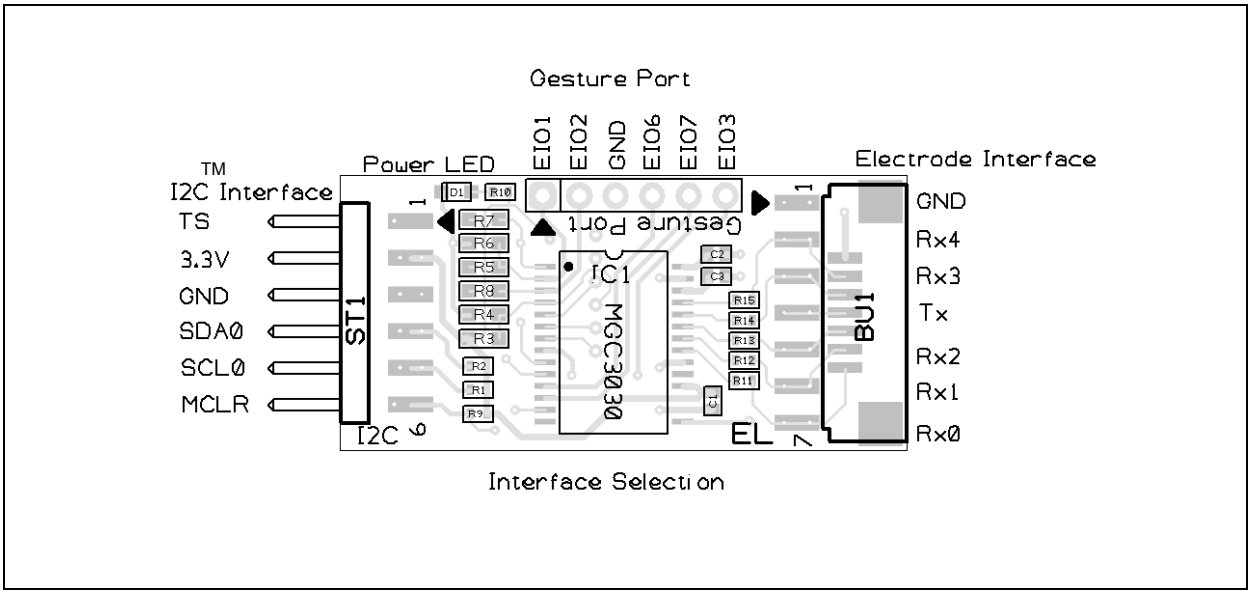
12. Receive electrodes
13. Acrylic cover glass (120 x 85 x 2 mm)
14. Electrode interface: 7-pin header (mounted on backside)

The Gerber data of all Woodstar Development Kit components are included in the GestIC Reference Design package and can be downloaded from Microchip's web site via www.microchip.com/gesticresources.

3.2 THE MGC3030 UNIT

The key element of the MGC3030 unit is Microchip's MGC3030 3D Gesture Controller. The layout print of the unit is shown in Figure 3-2.

FIGURE 3-2: THE MGC3030 UNIT



The unit provides a 2 mm 7-pin board-to-board connector (socket) to connect the electrode. The interface includes the following signals: GND, Rx4, Rx3, Tx, Rx2, Rx1, and Rx0. Alternatively, the board-to-board connector can be replaced by a 1 mm Flexible Printed Circuitry (FPC) connector which is prepared as a design option. The five Rx channels of the MGC3030 (Rx0…Rx4) are connected to the receive electrodes via 10 kΩ resistors in order to suppress irradiated high-frequency signals (R11, R12, R13, R14, and R15). The MGC3030 signal generator is connected via the Tx signal to the transmit electrode. The access to the MGC3030 Gesture Port pins is provided by six pads at the side of the board (EIO1, EIO2, EIO6, EIO7, EIO3, and GND).

The data connection to the Woodstar I^2C to USB bridge is done by a 2 mm 6-pin board-to-board connector (header). The interface includes the following signals: EIO0, 3.3V, GND, SDA0, SCL0, and $\overline{MCLR}$. Alternatively, it is possible to use a 1 mm FPC connector which can be assembled to the bottom side.

The MGC3030 unit acts as an I^2C slave device. Table 3-1 shows the configuration of the MGC3030 interface selection pins (IS1, IS2), which can be pulled to V_{DD} or to GND via resistors (R3, R4, R5, and R6) to select the I^2C slave address. The I^2C device address 0x42 is set as default.

TABLE 3-1: MGC3030 UNIT I^2C™ INTERFACE SELECTION

MGC3030 Interface Selection Pins		Mode (Address)	Assembly Option			
IS2	IS1		R3	R4	R5	R6
0	0	I^2C™0 Slave Address = 0x42 (default)	n.p.	10 kΩ	n.p.	10 kΩ
1	0	I^2C™0 Slave Address = 0x43	10 kΩ	n.p.	n.p.	10 kΩ

For schematics, layout and bill of material of the MGC3030 unit, please refer to **Appendix A. "Schematics"**.

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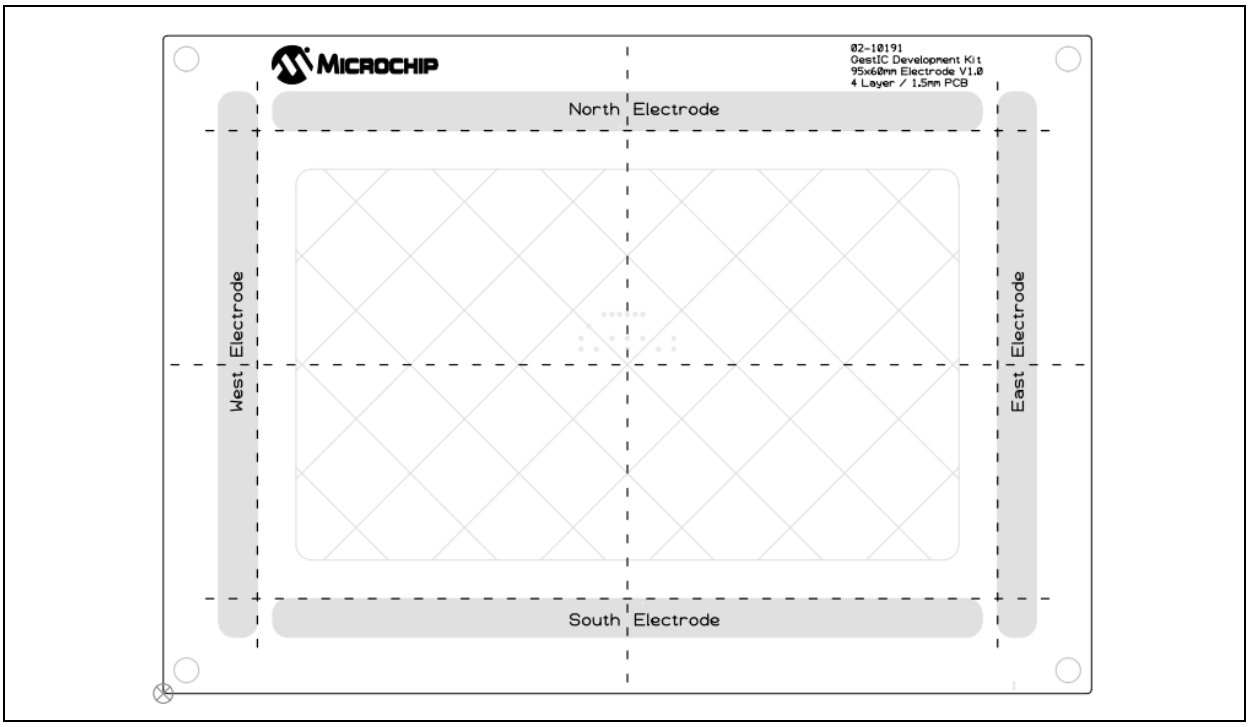
3.3 95x60 mm REFERENCE ELECTRODE

The 95x60 mm reference electrode provided with the Woodstar Development Kit consists of one Tx and a set of five Rx electrodes (north, east, south, west, center), which are placed in two different layers. An additional ground layer is placed underneath the Tx electrode to shield the electrode's back from external influences.

FIGURE 3-3: ELECTRODE LAYOUT



The PCB is connected to the MGC3030 unit by the 2 mm 7-pin board-to-board connector. The interface includes the following signals: GND, Rx4, Rx3, Tx, Rx2, Rx1, and Rx0.

The dimension of the board is 120 x 85 mm; the sensitive area is 95 x 60 mm.

The five Rx electrodes include four frame electrodes and one center electrode, as shown in Figure 3-3. The frame electrodes are named according to their cardinal directions: North, East, South and West. The dimensions of the four Rx frame electrodes define the maximum sensing area. The center electrode is structured (cross-hatched) to get a similar input signal level as the four frame electrodes.

The Tx electrode spans over the complete area underneath the Rx electrodes. It is cross-hatched to reduce the capacitance between Rx and Tx (C_{RxTx}). The Tx area underneath the center electrode covers 50% of the copper plane, the area around the center electrode covers only 20%.

The Rx feeding lines are embedded into the Tx electrode in the third layer (refer to Figure 3-4 and Figure 3-5). This supports shielding of the feeding lines. Dimensions are given in Table 3-2.

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FIGURE 3-4: ELECTRODE LAYOUT

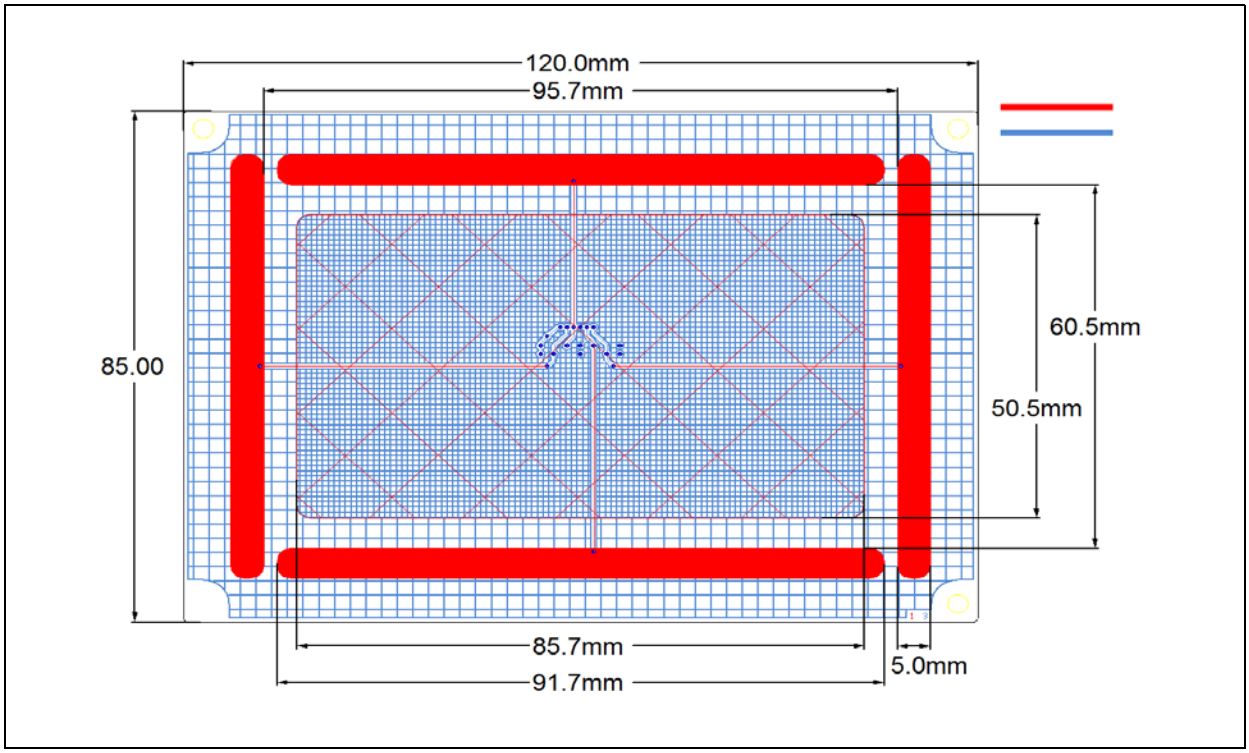

TABLE 3-2: WOODSTAR ELECTRODE DIMENSIONS

Part	Length	Width	Design
Horizontal Electrodes (Rx)	91.7 mm	5 mm	Solid
Vertical Electrodes (Rx)	70.5 mm	5 mm	Solid
Center Electrode (Rx)	85.7 mm	50.5 mm	3% cross-hatched
Tx Electrode (refer to Figure 3-4) Part I (under center electrode) Part II (outside Part I)	120 mm 85.7 mm 120 mm	85 mm 50.5 mm 85 mm	 50% cross-hatched 20% cross-hatched
Ground Area	120 mm	85 mm	Solid

The electrode PCB is based on a 4-layer PCB design using FR4 material. Three functional layers are used:

- Layer 1 (Top): Rx electrodes
- Layer 3: Tx electrode and Rx feeding lines
- Layer 4 (Bottom): Ground

Layer 2 is not used.

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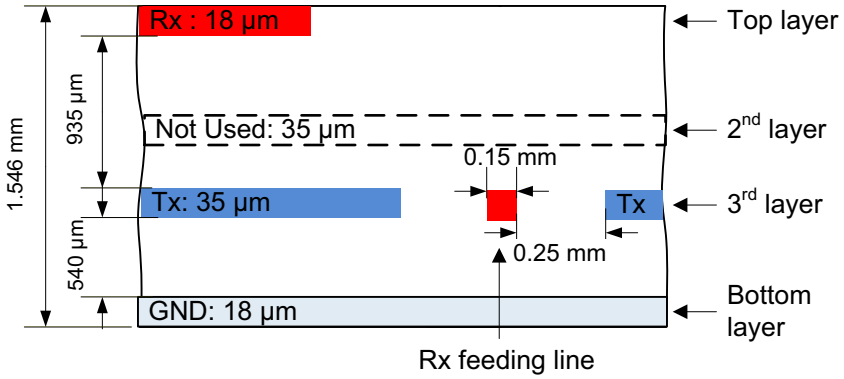
FIGURE 3-5: PCB LAYER STACK



In a target system design the GND layer is not required. It is added for the Woodstar sensing electrode as a shielding layer and shall simulate the presence of static components which are placed in a target device underneath the sensing electrodes.

Note: Please refer to the *"GestIC® Design Guide"* for the electrodes equivalent circuitry, capacitances (C_{RxTx}, C_{RxG}, Tx_{RxG}) and their typical values.

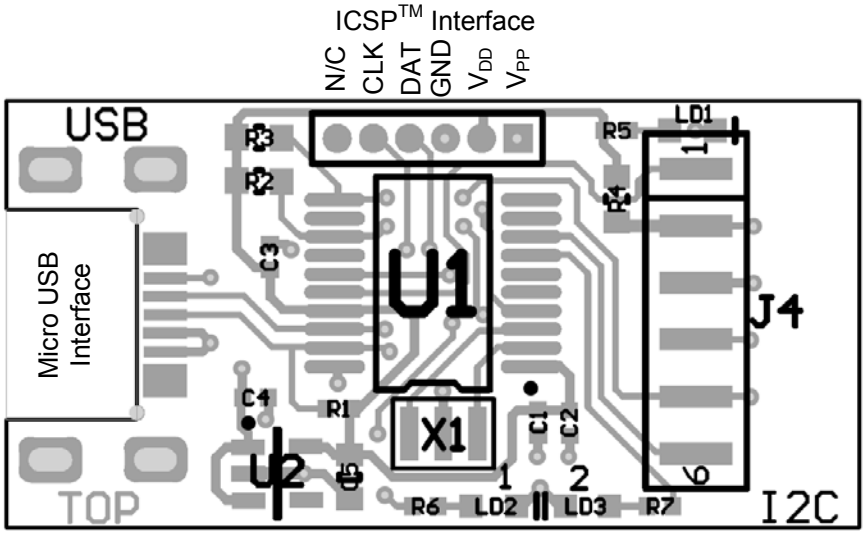
3.4 I²C TO USB BRIDGE

Connecting the MGC3030 unit to a PC requires an I²C to USB bridge. The GestIC bridge works as a composite device class (CDC). It controls the USB transfer towards the host PC and handles the I²C communication with the MGC3030 unit. Moreover, it provides 3.3V power supply and the MCLR signal to the MGC3030 unit.

The bridge function is handled by Microchip's PIC18F14K50 USB microcontroller.

The board is equipped with a micro-USB connector (Type B) and a 2 mm 6-pin female board-to-board connector for the I²C interface. The interface to the MGC3030 unit includes the following signals: EIO0, 3.3V, GND, SDA0, SCL0, and MCLR. Please refer to Figure 3-6.

FIGURE 3-6: I²C™ TO USB BRIDGE



The I²C to USB bridge is powered via the USB port. Microchip's Low Dropout (LDO) Voltage Regulator MCP1801 is used to transform the 5V USB power to 3.3V required for the PIC18F14K50. By default, 3.3V are also routed to the MGC3030 unit via the I²C interface. The 3.3V power supply towards the MGC3030 unit can be cut by removing the 0Ω resistor R7.

The LEDs indicate the following:

- Power – signals that the I²C to USB bridge is powered (3.3V)
- LED1 blinks fast (~10 Hz) – indicates that there is no USB connection established
- LED1 blinks slow (~1 Hz) – indicates that the USB connection is established
- LED 2 is ON when there is data on the I²C bus
- LED 2 is OFF when there is no data on the I²C bus

The communication between bridge and the MGC3030 unit is accomplished via a 2-wire I²C compatible serial port. Please refer to Figure 3-7.

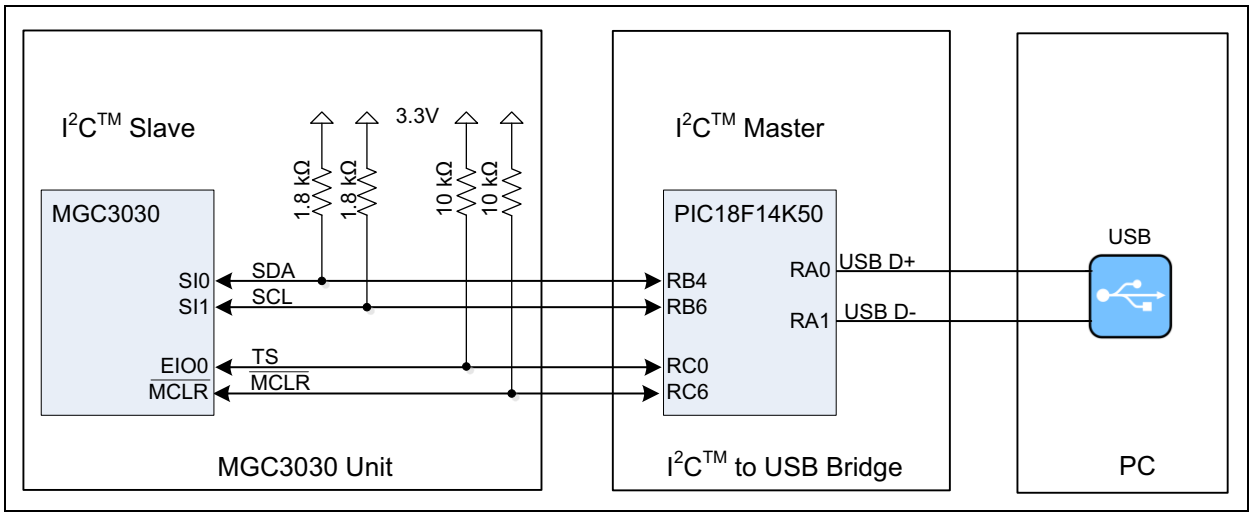
In addition, the Woodstar Development Kit integrates an open-drain transfer status line (TS) and the MGC3030 MCLR signal, according to the MGC3030 reference circuitry. TS is connected to the RC0 pin of the PIC18F14K50 and MCLR to RC6.

For a detailed description of the I²C interface refer to the *"MGC3030/3130 3D Gesture Controller Data Sheet"* (DS40001667).

The default I²C address of the bridge is set to 0x42 but it can also be switched to 0x43 by changing the firmware running on the PIC18F14K50.

Note: To update the PIC18F14K50 firmware, please refer to the MGC3030/3130 PIC18F14K50 Host Reference Code, available on Microchip's web site via www.microchip.com/gesticresources.

FIGURE 3-7: I²C™ AND USB DATA INTERFACE



For schematics, layout and bill of material of the I²C to USB bridge, please refer to **Appendix A. "Schematics"**.

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Chapter 4. System Integration Using Woodstar

4.1 INTRODUCTION

The Woodstar Development Kit is designed to support an easy integration of Microchip's MGC3030 3D Gesture Controller into the customer's applications.

The three Woodstar PCBs can be plugged to a PC via a USB cable and used for evaluation of the MGC3030 chip and the GestIC technology.

During the customer's design-in process the individual boards can be combined according to the customer's needs.

Three examples are given below:

- Combine MGC3030 unit and I^2C to USB bridge to evaluate customized electrodes
- Use I^2C to USB bridge to parameterize and debug the MGC3030 application circuitry in the customer's design (in-circuit)
- Combine MGC3030 unit and electrodes to develop gesture-driven applications for PC-based or embedded software environments

For in-circuit parameterization and debugging it is mandatory to control the MGC3030 unit via Aurea Control Software. For that purpose, the customer's application should provide an appropriate hardware or software interface.

4.2 INTEGRATION EXAMPLES

The following figures show typical hardware circuits for the integration of MGC3030 into a customer's application.

Figure 4-1 and Figure 4-2 show the control via I^2C and an external PC. The Woodstar I^2C to USB bridge acts as an I^2C master. The application processor I^2C should be:

- Switched OFF – I^2C lines configured as high Z (refer to Figure 4-1)
- Switched to Slave or Listen mode
- Disconnected through an external switch (refer to Figure 4-2)

As an alternative, it is also possible to establish a USB connection between the application processor and a PC without using an I^2C to USB bridge. Please refer to Figure 4-3.

FIGURE 4-1: MGC3030 PARAMETERIZATION CIRCUIT WITH INTERNAL SWITCH

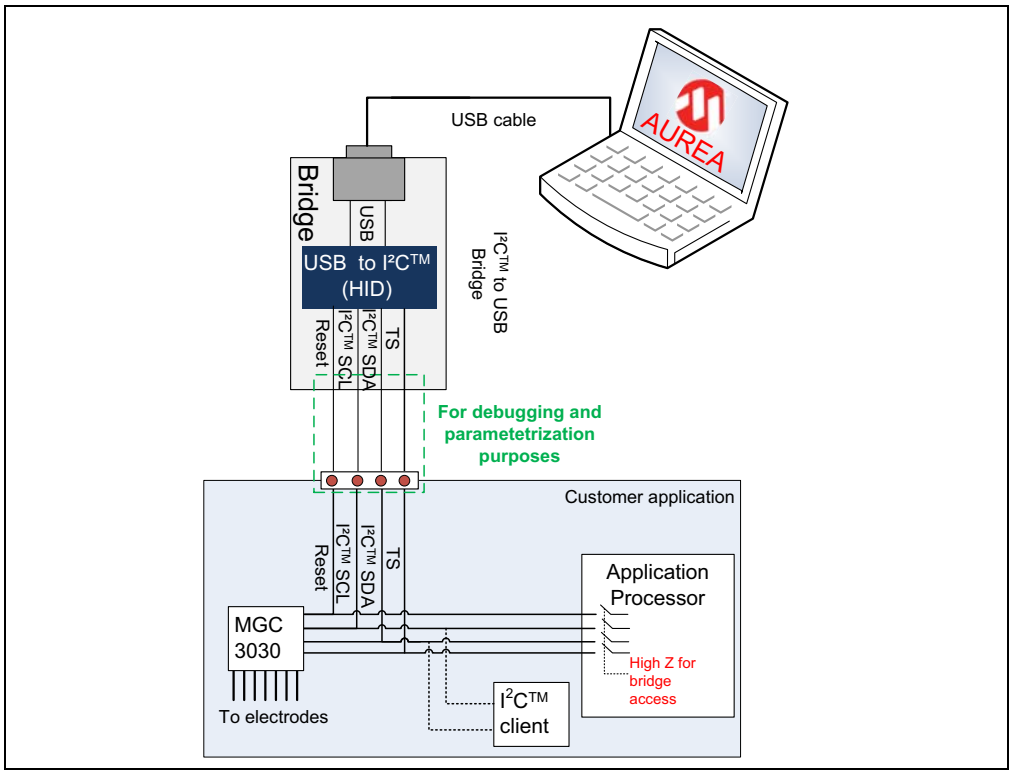

FIGURE 4-2: MGC3030 PARAMETERIZATION CIRCUIT WITH EXTERNAL SWITCH

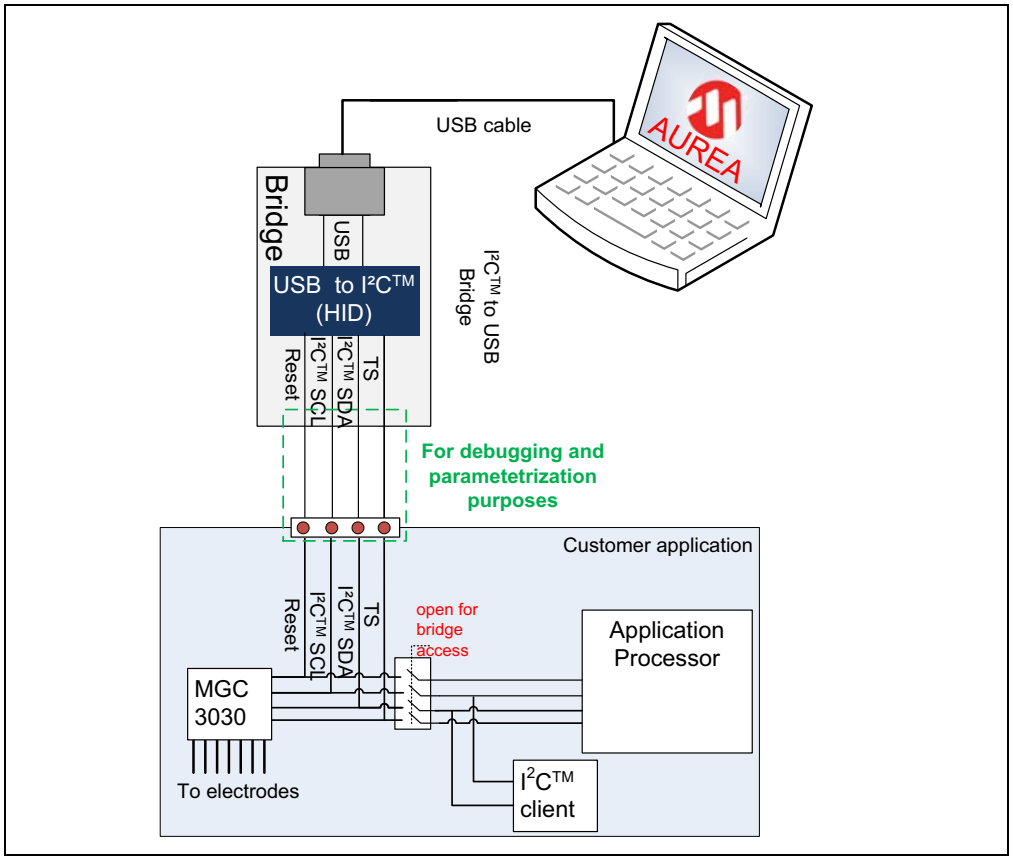

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FIGURE 4-3: MGC3030 PARAMETERIZATION CIRCUIT FOR USB-BASED APPLICATIONS

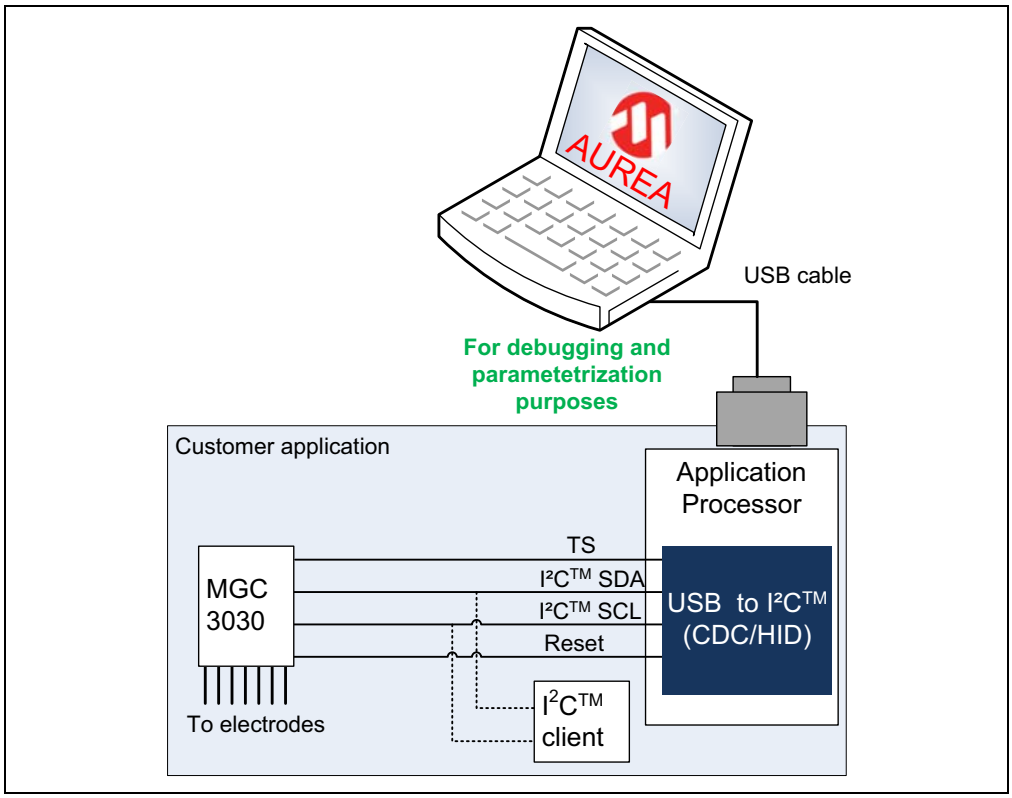

TABLE 4-1: MGC3030 PARAMETERIZATION CIRCUITS COMPARISON

Parameterization Circuit	Advantages	Drawbacks
With Internal Switch	Easy approach	Processor pins need to be switchable to high Z
	Low hardware efforts	No other clients can be controlled during Aurea access
With External Switch	Communication to other I²C™ clients not interrupted	Additional hardware switch
USB-Based Applications	No hardware efforts	Additional software efforts
	Works if other I²C™ clients connected to the bus	

NOTES:

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Chapter 5. Troubleshooting

5.1 POWER LED DOES NOT ILLUMINATE

If the power LED does not illuminate, it is likely that the board is not powered.

Possible solutions:

- Check the board is connected to your PC's USB port.
- Change the USB cable or use a different USB port on your PC.
- Check if the PC is switched on.

5.2 LED 1 BLINKS FAST

When LED 1 blinks fast (~10 Hz), the USB connection is not established towards the PC.

Possible solutions:

- Make sure the Windows CDC driver is installed (refer to **Appendix C. "Driver Installation Manual"**).
- Make sure the MGC3030 unit and the I^2C to USB bridge are already connected before plugging in the USB connection (refer to **Section 2.2 "Step 1: Development Kit Assembly"**).
- Reconnect the board by unplugging the USB connection and plugging it in again.

5.3 SIGNAL STREAMING STOPS

Signal stream in Aurea GUI stops when there is no approach towards the sensing area. This behavior is intended. When using the Aurea GUI, the Wake-up on Approach feature is automatically enabled.

Possible solutions:

Disable the Wake-up on Approach feature in the Real-Time Control bar of Aurea by unchecking the Approach Detection/Power Saving check box for continuous signal streaming.

5.4 ELECTRODE SIGNALS ARE ZERO

Signal matching parameters have been mismatched and accidentally stored into the Flash.

Possible solutions:

- Perform "Autoparameterization" in the AFE Parameterization of the **Aurea Setup** tab. Make sure there is no hand approach towards the electrodes during the autoparamterization process.
- Restore the default Signal Matching parameters by re-flashing the original MGC3030 GestIC Library file.

5.5 LED 1 AND 2 ON I²C TO USB BRIDGE ARE OFF

When LED 1 and LED 2 on the I²C to USB bridge are OFF but the power LED is ON, the PIC18F14K50 is in Bootloader Update mode and therefore not operating code. The PIC18F14K50 will start in Bootloader Update mode in case the MGC3030 unit is not connected to the I²C to USB bridge.

Possible solutions:

- Please disconnect the I²C to USB bridge from the USB. Connect the MGC3030 unit and the I²C to USB bridge first and then plug in the USB connection.

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Appendix A. Schematics

A.1 INTRODUCTION

This appendix contains the MGC3030 Woodstar Development Kit schematic and bill of materials.

A.2 BILL OF MATERIALS

TABLE A-1: I²C™ TO USB BRIDGE BILL OF MATERIALS

Qty.	Description	Name
1	Connector, Micro USB 5-pin Type B, SMD	BU1
1	Connector, 2 mm socket 6-pin, SMD	BU2
1	Capacitor, 100 nF, 10%, X7R, SMD 0402	C1
3	Capacitor, 1 µF, 10%, X5R, 10 V, SMD 0402	C2, C3, C5
1	Capacitor, 10 µF, 20%, X5R, 6.3 V, SMD 0603	C4
3	LED, 571 nm, green clear, 0603 SMD	D1, D2, D3
1	IC, MCP1801T LDO, Voltage Regulator, 3.3V, 150 mA, 5-Pin SOT-23	IC1
1	IC, PIC18F14K50 USB Flash Microcontroller, 20-Pin SSOP	IC2
3	Resistor, 1 kΩ, 1%, 1/16W, SMD 0402	R3, R4, R6
1	Resistor, 150 kΩ, 1%, 1/16W, SMD 0402	R5
1	Resistor, 0 kΩ, 1%, 1/16W, SMD 0603	R7
1	Crystal, 12 MHz, 33 pF, SMD	XTAL1

TABLE A-2: I²C™ TO USB BRIDGE MOUNTING OPTION

Qty.	Description	Name
1	Connector, 1 mm FPC 6-pin, SMD	ST1

TABLE A-3: MGC3030 UNIT BILL OF MATERIALS

Qty.	Description	Name
1	Connector, 2mm socket 7pin, SMD	BU1
1	Connector, 2mm header 6pin, SMD	ST1
1	Capacitor, 100nF, 10%, X7R, SMD 0402	C1
2	Capacitor, 4.7µF, 20%, X5R, 6.3V, SMD 0402	C2, C3
1	LED, 571nm green clear, 0603 SMD	D1
1	IC, MGC3030 3D Gesture Controller, 28 Pin SSOP	IC1
2	Resistor, 1.8kΩ, 1%, 1/16W, SMD 0402	R1, R2
3	Resistor, 10kΩ, 1%, 1/16W, SMD 0603	R4, R6, R7
6	Resistor, 10kΩ, 1%, 1/16W, SMD 0402	R9, R11, R12, R13, R14, R15
1	Resistor, 1kΩ, 1%, 1/16W, SMD 0402	R10

TABLE A-4: MGC3030 UNIT MOUNTING OPTION

Qty.	Description	Name
1	Connector, 1 mm FPC 6-pin, SMD	ST3

TABLE A-5: REFERENCE ELECTRODE BILL OF MATERIALS

Qty.	Description	Name
1	Connector, 1 mm FPC 6-pin, SMD	ST2

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A.3 BOARD SCHEMATICS AND LAYOUT

FIGURE A-1: MGC3030 UNIT SCHEMATIC

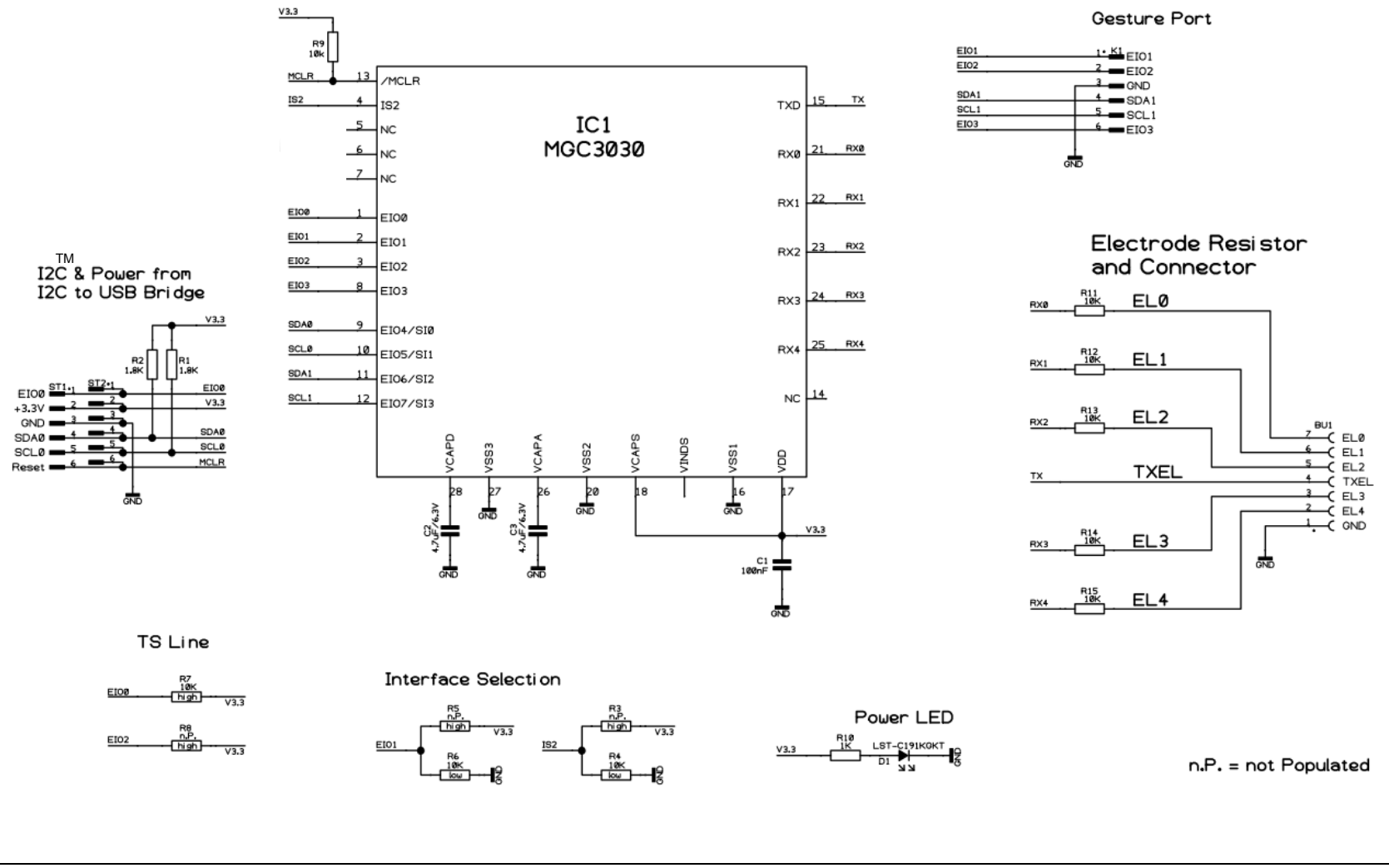
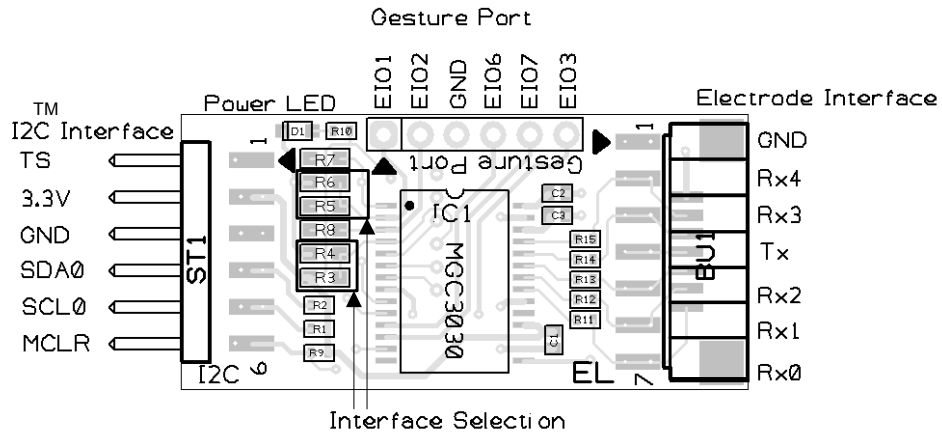
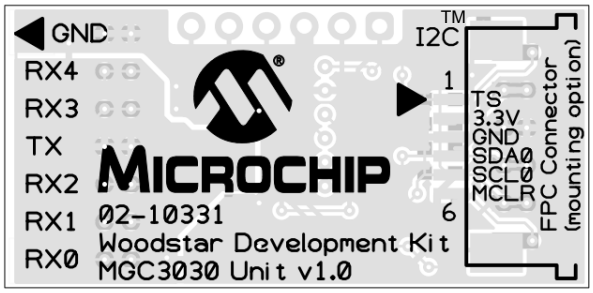


FIGURE A-2: ASSEMBLY OF MGC3030 UNIT



Top View



Bottom View

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FIGURE A-3: I²C™ TO USB BRIDGE SCHEMATIC

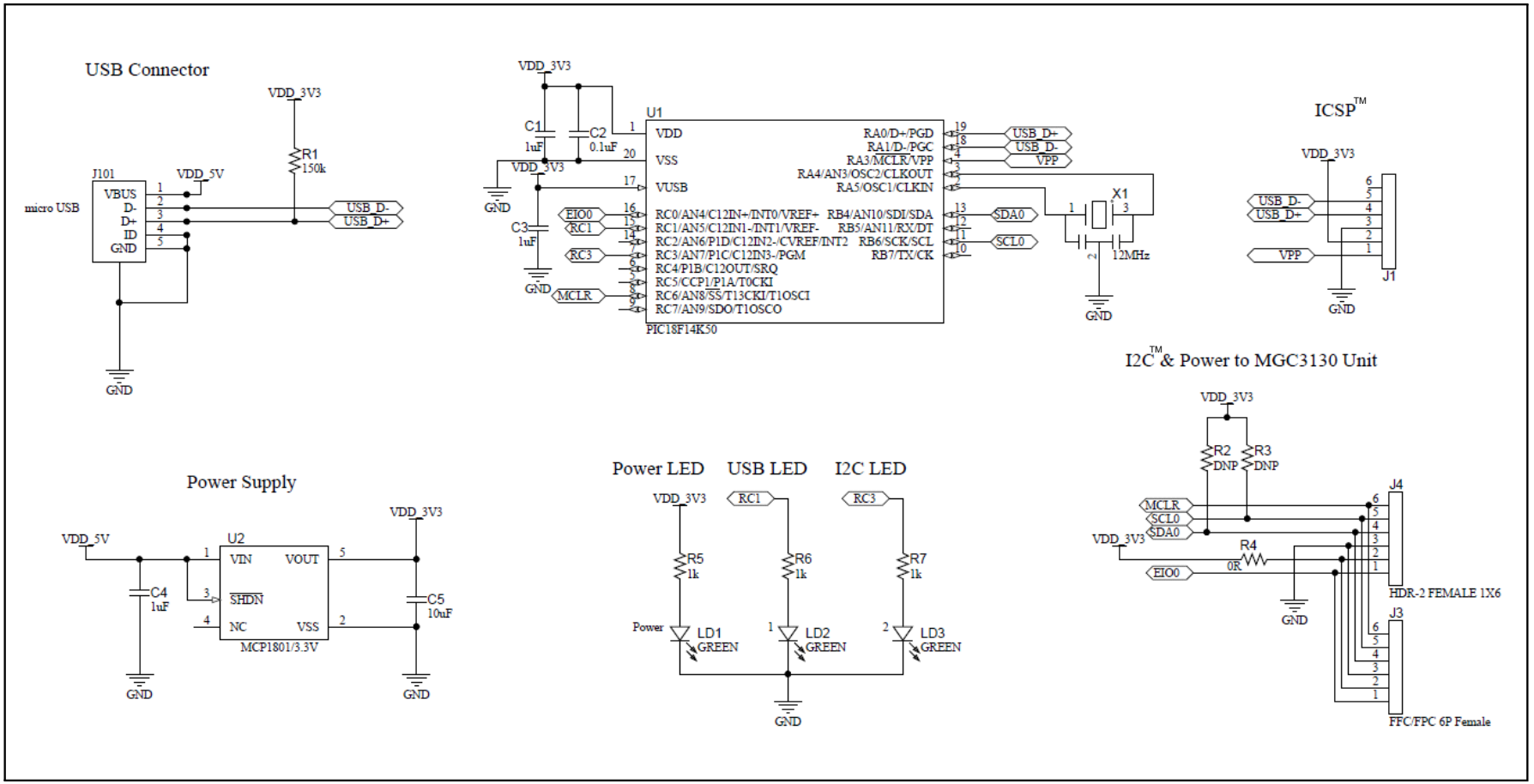

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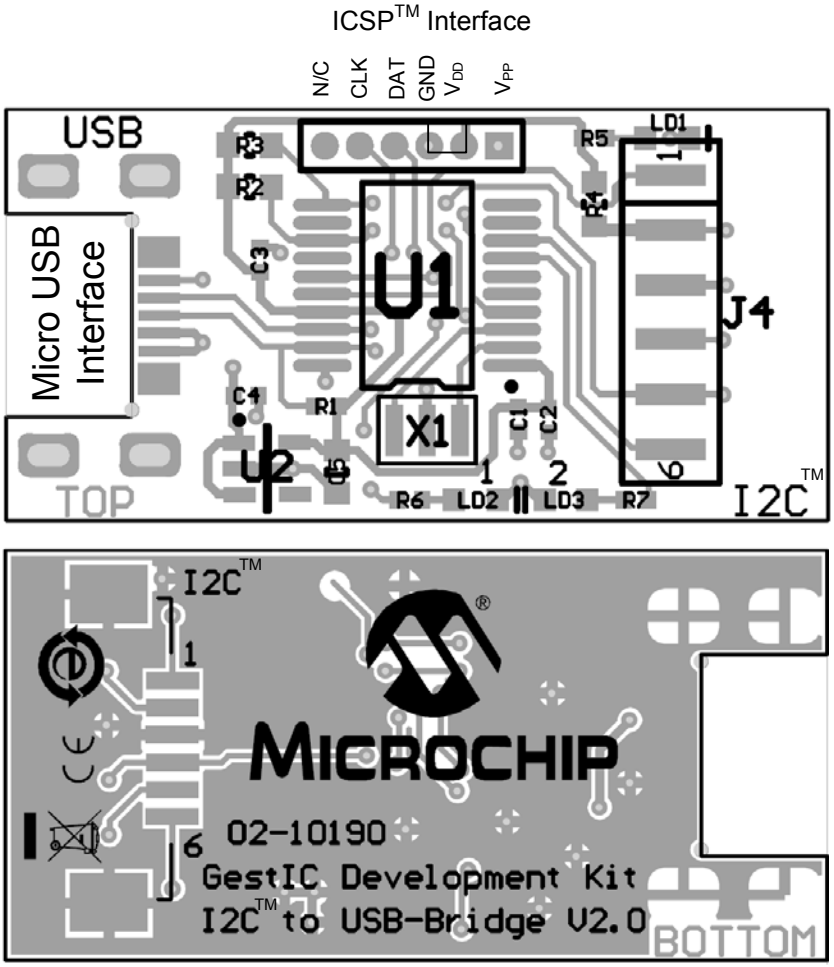
FIGURE A-4: ASSEMBLY OF I²C™ TO USB BRIDGE



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Appendix B. Sensitivity Profile and Capacitances

B.1 INTRODUCTION

This appendix contains the sensitivity profile and the electrode capacitances of the Woodstar Development Kit hardware.

The measurement procedure of both the sensitivity profile and the electrode capacitances are outlined in "*GestIC® Design Guide*" (DS40001716).

B.2 SENSITIVITY PROFILES

The sensitivity profiles were conducted using a 40x40x70 mm artificial hand at a constant height of 30 mm above the electrode's surface.

FIGURE B-1: SENSITIVITY PROFILE FROM WEST TO EAST

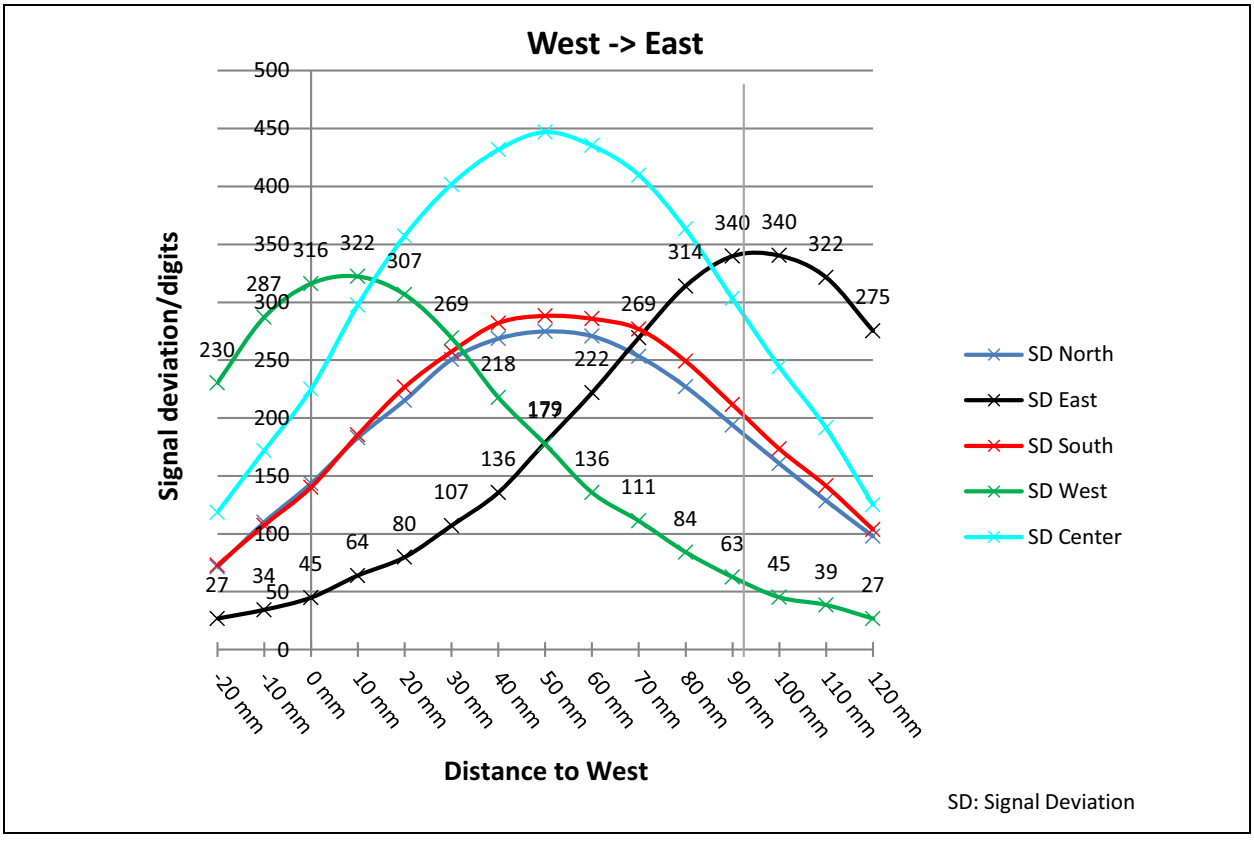
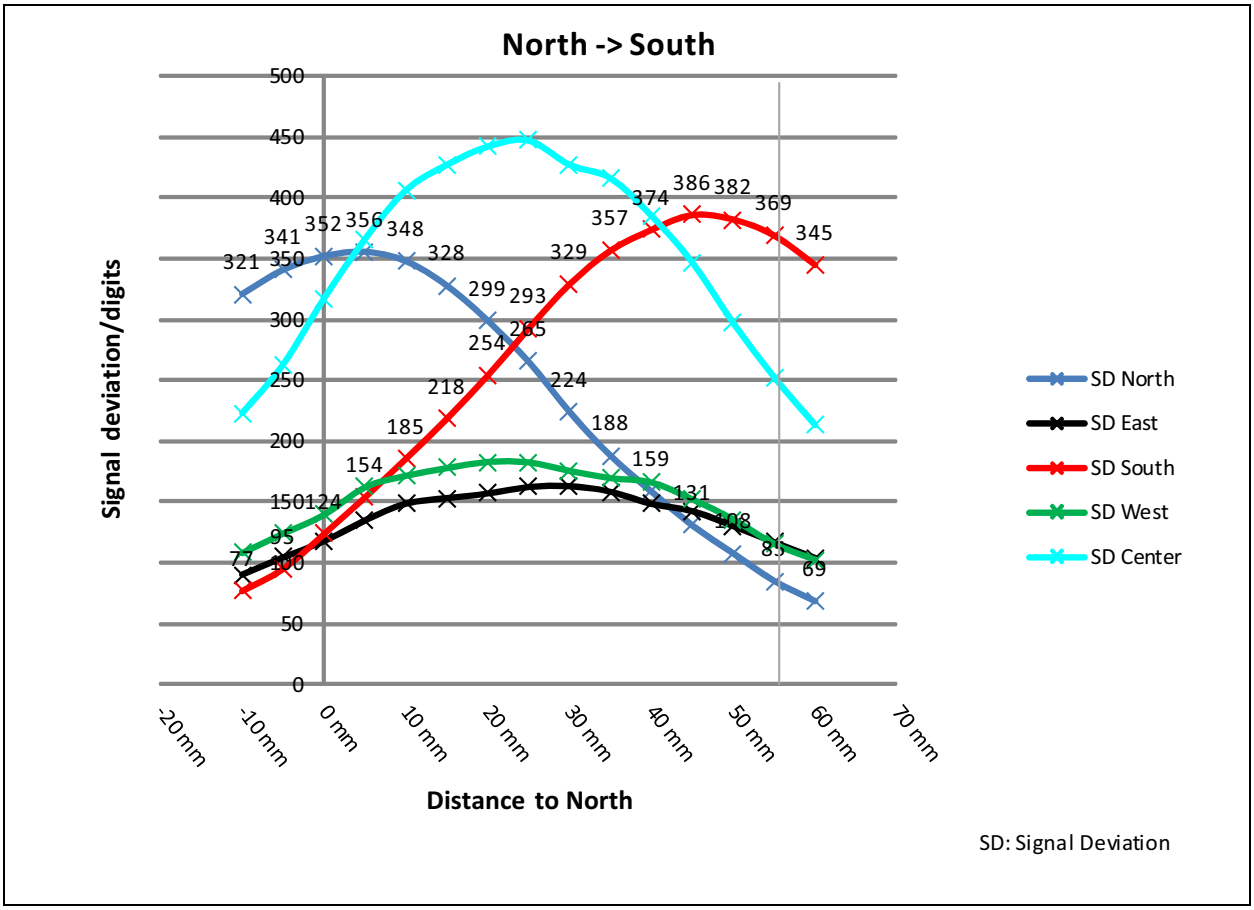


FIGURE B-2: SENSITIVITY PROFILE FROM NORTH TO SOUTH



B.3 ELECTRODE CAPACITIES

The capacitances between the Rx electrodes and GND (C_{RxG}) do not include the 5 pF input capacitance of the MGC3030 Rx input buffer (C_{Buf}).

TABLE B-1: GestIC® ELECTRODE CAPACITIES(1)

Channel	CRXG	CRXTX
North	9 pF	20 pF
East	9 pF	18 pF
South	9 pF	20 pF
West	8 pF	18 pF
Center	7 pF	65 pF

Note 1: C_{TxG} = 590 pF

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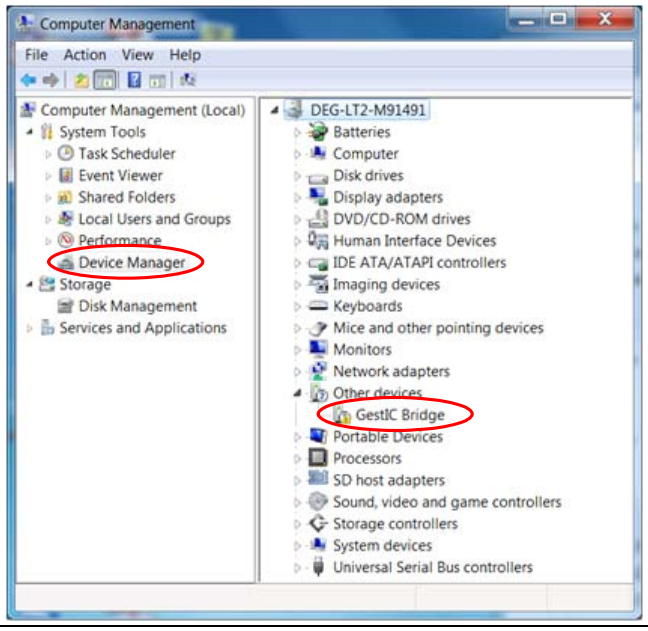
Appendix C. Driver Installation Manual

This section lists the steps to be taken in order to manually install the Windows CDC Driver on the PC.

C.1 OPEN DEVICE MANAGER

While the Woodstar Development Board is connected to the PC press **Start**, right-click on **Computers** and select **Manage**. This will bring up the Computer Management window shown in Figure C-1. On the left sidebar select **Device Manager**.

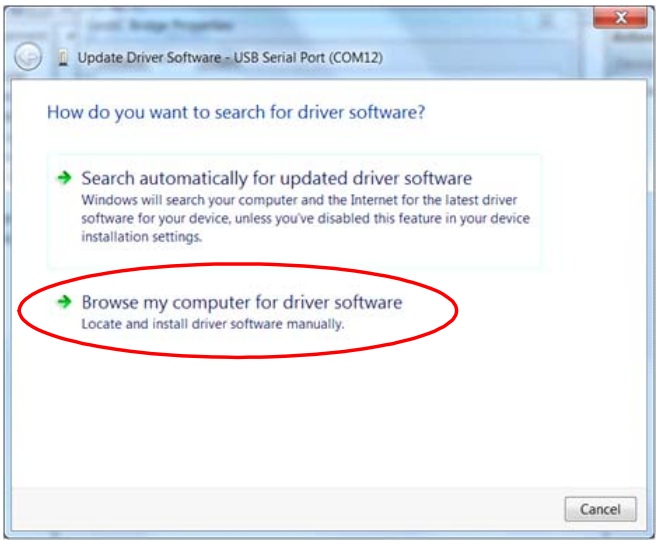
FIGURE C-1: COMPUTER MANAGEMENT



C.2 SELECT DEVICE

1. Right Click on **GestIC Bridge** and select **Update Driver Software**.
2. Select **Search Method**
3. The window shown in Figure C-2 will open. Choose **Browse my Computer** for driver software.

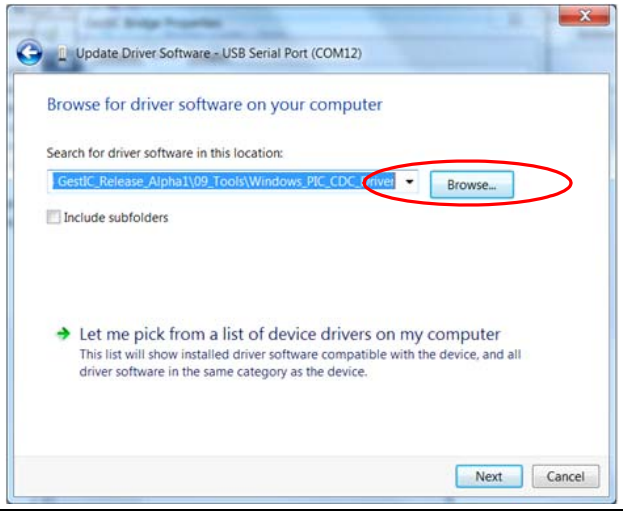
FIGURE C-2: Update Driver Software



C.3 LOCATE DRIVER

1. Click **Browse** and navigate to the driver files on your local drive (refer to Figure C-3).
2. Press **Next** and the driver will be installed.

FIGURE C-3: Browse for Driver Software



C.4 VERIFY COMMUNICATION

The driver is properly installed and the communication between the PC and the Woodstar Development Board is successfully established when LED 1 and LED 2 blink alternatively.

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Appendix D. Glossary

TABLE D-1: GLOSSARY

Term	Definition
AFE	Analog Front End
Application Host	PC or embedded controller which controls the MGC3030
Aurea	MGC3030/3130 PC control software with graphical user interface
Colibri Suite	Embedded DSP suite within the GestIC® Library
Deep Sleep	MGC3030/3130 Power-Saving mode
E-field	Electrical field
Frame Electrodes	Rectangular set of four electrodes for E-field sensing
GestIC® Technology	Microchip's patented technology providing 3D free-space gesture recognition utilizing the principles of electrical near-field sensing
GestIC® Library	Includes the implementation of MGC3030/3130 features and is delivered as a binary file preprogrammed on the MGC3030
Gesture Recognition	Microchip's stochastic HMM classifier to automatically detect and classify hand movement patterns
Gesture Set	A set of provided hand movement patterns
HMM	Hidden Markov Model
MGC3130	Single-Zone 3D Gesture and Motion Tracking Controller
MGC3030	Single-Zone 3D Gesture Sensing Controller
Position Tracking	GestIC® technology feature
Self Wake-up	MGC3030/3130 Power-Saving mode
Sensing Area	Area enclosed by the four frame electrodes
Sensing Space	Space above sensing area
Signal Deviation	Term for the delta of the sensor signal on approach of the hand versus non-approach
SPU	Signal Processing Unit
Approach Detection	GestIC® technology feature: Power-Saving mode of the MGC3030/3130 with approach detection

NOTES:

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