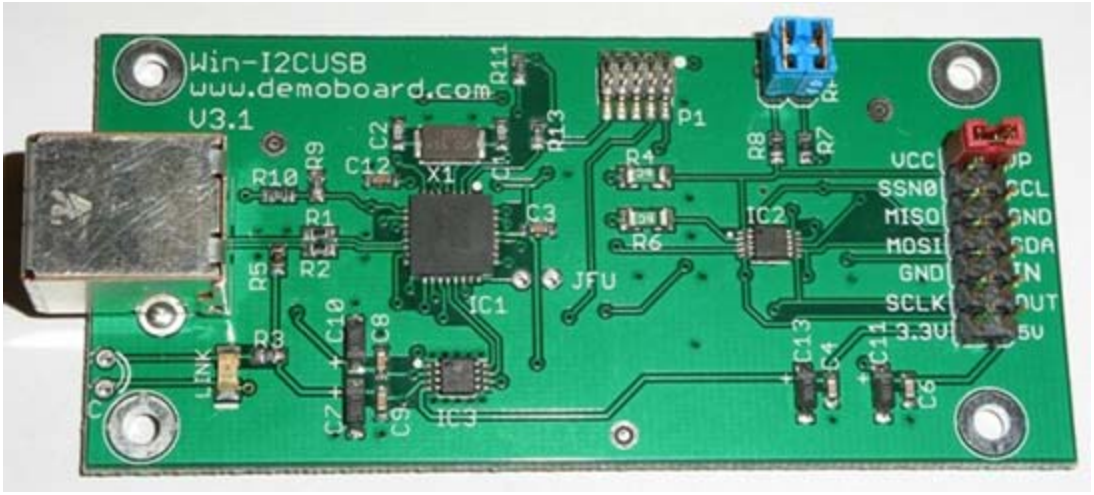
Win-I2CUSB©

Hardware User's Manual



http://www.demoboard.com

Information provided in this document is solely for use with the Win-I2CUSB product from The Boardshop. The Boardshop and SB Solutions, Inc. reserve the right to make changes or improvements to this document at any time without notice. The Boardshop and SB Solutions, Inc. assume no liability whatsoever in the sale or use of this product, including infringement of any patent or copyright. Reasonable efforts have been made to ensure the accuracy of the information presented. However, The Boardshop and SB Solutions, Inc. assume no responsibility for the accuracy of the information.
No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of: The Boardshop, 65 Washington St. # 190, Santa Clara, CA 95050; and S.B. Solutions, Inc., P.O. Box 4506, Cary, NC 27519-4506

Microsoft and Windows ™ are registered trademarks of Microsoft Corporation.
Other brand names are trademarks or registered trademarks of their respective owners.

Copyright © 2004-2011 The Boardshop / SB Solutions, Inc. All rights reserved. Version 3.1

Table of Contents

INTRODUCTION 1
WIN-I2CUSB KIT CONTENTS 1
DISCLAIMER AND WARRANTY 1
GETTING STARTED 2
Assumptions 2
Static Handling Precautions 2
MINIMUM SYSYEM REQUIREMENTS 2
ADAPTER POWER REQUIREMENTS 2
INSTALLATION 2
Win-I2CUSB Software 2
Win-I2CUSB Hardware connection to computer USB port 2
HARDWARE DESCRIPTION 3
SPI Port 4
I²C Port 4
GPIO 4
WIN-I2CUSB HARDWARE TO TARGET CONNECTION 5
Minimum hardware connection between Win-I2CUSB and User Hardware 5
Typical hardware connection between Win-I2CUSB and User Hardware 6
USING WIN-I2CUSB TO POWER USER's SYSTEM 6
SOFTWARE UPDATES 7
TECHNICAL SUPPORT 7
TROUBLESHOOTING 7

INTRODUCTION

The Win-I2CUSB Hardware connects to a standard USB port found on most IBM-compatible PCs and provides bi-directional communication with I²C devices using the I²C protocol. The Hardware is powered directly from the PC's USB port. The LED, located beside the USB connector, illuminates after the Win-I2CUSB Hardware has successfully been enumerated by the PC-USB host.

The Win-I2CUSB v5 software runs on Windows XP, Vista, and is compatible with any PC hardware having a minimum of a Pentium processor and an USB port. The software allows the user to select a memory device (EEPROM, FRAM, or SRAM) from a menu and also provides several Universal modes to allow communication with most I²C devices. The Win-I2CUSB software is designed to operate only with Win-I2CUSB hardware adapters. (Win-2000 is supported in Win-I2CUSB v4).

WIN-I2CUSB KIT CONTENTS

- Win-I2CUSB Hardware adapter
- Win-I2CUSB software installation CD-ROM (optional) which loads the following files:
  - Software license agreement
  - Win-I2CUSB user Registration Form
  - Win-I2CUSB Software User's Manual
  - Win-I2CUSB Hardware User's Manual
  - Win-I2CUSB Installation and User's Guide
  - Win-I2CUSB application
  - Win-SPIUSB application
  - I²C and SPI DLL and examples

DISCLAIMER AND WARRANTY

Proper use of Win-I2CUSB is the sole responsibility of the user. The Boardshop is not responsible for any damage resulting from misuse or improper installation.

The Boardshop will, at our option, repair or replace a defective Win-I2CUSB hardware within thirty (30) days of the purchase date. Return shipping is the responsibility of the user.

GETTING STARTED

Assumptions

We are assuming the user of this product has experience with the I²C Bus protocol. The I^2C Bus specification is a good source of detailed information about the I^2C Bus. The complete specification can be downloaded from the NXP Semiconductors website.

Static Handling Precautions

The Win-I2CUSB hardware contains CMOS devices that can be damaged by ESD. It is recommended to use a ground strap or touching the PC case or other grounded source before unpacking or handling the Win-I2CUSB hardware.

MINIMUM SYSYEM REQUIREMENTS

- ✓ PC Pentium 60 processor (or equivalent), 8 MB RAM, and 16 MB of hard drive space
- ✓ One USB port (either 2.0 or 1.1 compatible)
- ✓ Windows ™ XP, Vista, and 7
- ✓ CD-ROM Drive for installation (note that we recommend using the latest installation package available for download from our website): http://www.demoboard.com/updates

ADAPTER POWER REQUIREMENTS

The Win-I2CUSB hardware obtains its power from the computer's USB port. It should not be powered by an external power source.

INSTALLATION

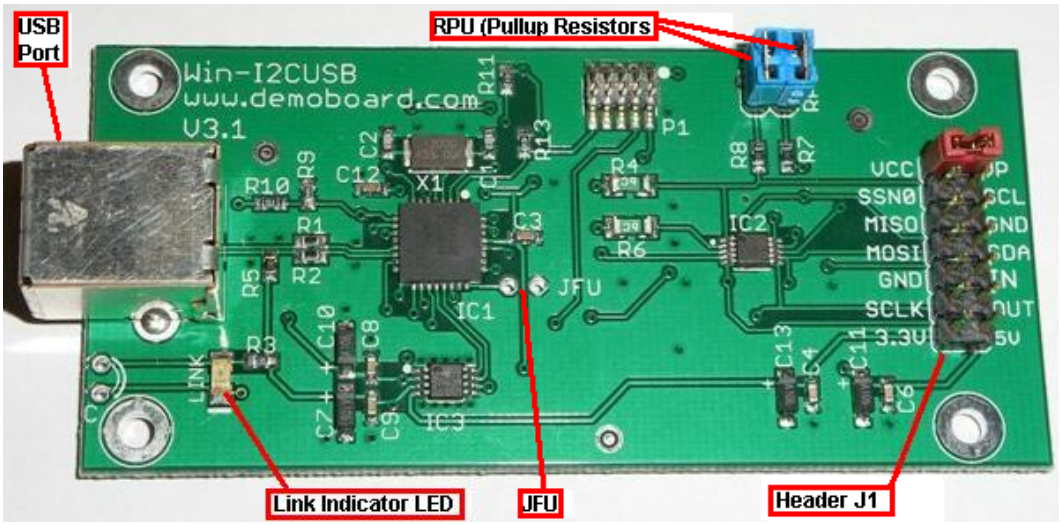
Win-I2CUSB Software

- You must have Administrator privileges to install the software.
- Insert the Win-I2CUSB installation CD-ROM into the appropriate drive.
- The installation software should automatically start
  - If the installation software does not start automatically, double-click on the Setup.exe file on the CD-ROM
- Complete and send in the registration form (regfrm.txt) via email

Win-I2CUSB Hardware connection to computer USB port

- Neutralize any ESD (static charge) by touching the bare metal on the rear of your computer before removing the Win-I2CUSB Hardware from the packaging
- Connect the Win-I2CUSB Hardware to a USB PC Port using a standard USB cable
- The "LINK" LED beside the USB port should illuminate (after successful driver install)

HARDWARE DESCRIPTION



The figure above shows the Win-I2CUSB v3.1 hardware, with the functions and connectivity described below:

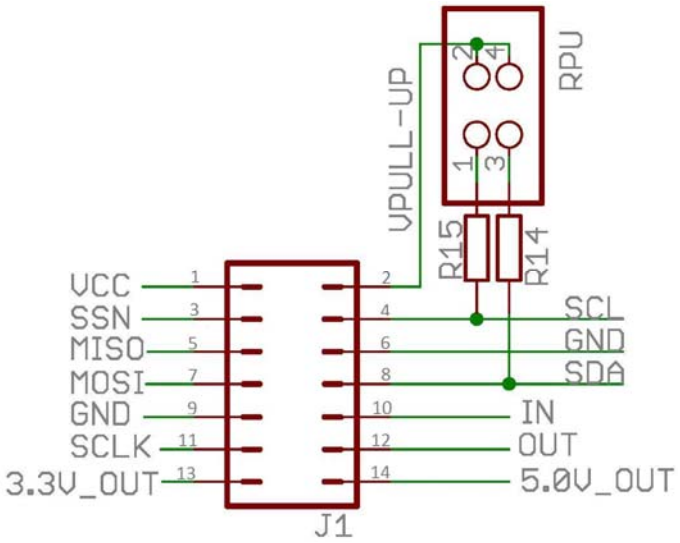
USB Port – USB cable connection to host PC running Win-I2CUSB application.

JFU – Configuration jumper; normally open (closed enables firmware update, if needed).

LINK Indicator LED – the LED should be illuminated when the cable has been connected between the PC and the Win-I2CUSB hardware, and the software has been installed correctly.

J1 Header - Contains the connections to a user target application for connection to a 14-pin or other desired ribbon cable to target I2C/SPI devices. Signal-Pin definitions:

Signal	Pin #	Ribbon cable wire color (optional)
VCC	1	Brown
VP	2	Red
SSN	3	Orange
SCL	4	Yellow
MISO	5	Green
GND	6	Blue
MOSI	7	Violet
SDA	8	Gray
GND	9	White
IN	10	Black
SCLK	11	Brown
OUT	12	Red
3.3V	13	Orange
5V	14	Yellow



VCC is the 3.3V power for the Win-I2CUSB hardware. This supply is active whenever the hardware is plugged into a USB port, and provides 3.3v supply for the I2C pull-up resistors (VCC-VP jumper). VCC can also be used to power a user's target hardware.

VP – supplies the power to the I²C pull-up resistors (see RPU). Note that the Win-I2CUSB hardware by default has the jumpers connected at RPU and it is up to the user to ensure that a voltage source is connected to the VP pin. A pull-up voltage, up to 5.5V maximum, may be applied to the VP pin. If pull-up resistors are not required, please remove the two jumpers at connector RPU. It is not be necessary to apply a voltage at VP if the RPU jumpers are not installed.

SPI Port – the SPI signals are connected to the target system from this port. Note that these signals drive a 3.3V output.

To communicate with a SPI slave, you require four signals and GND:

SSN – Slave Select (also known as CS or Chip Select)

MISO – Master In Slave Out is connected to the SPI slave output

MOSI – Master Out Slave In is connected to the SPI slave input

SCLK – **S**erial **Cl**ock outputs the clock to the slave device

The SPI pins may be used as IO pins controlled by the DLL, if not used for SPI functionality.

I²C Port – connect these two pins (SDA and SCL) and GND to your target system. Details can be found in the section titled "Win-I2CUSB Hardware To Target Connection" of this document.

SCL – is the serial clock generated by the Win-I2CUSB hardware. Clock stretching is supported.

SDA – is the bidirectional I²C data pin.

Supply a voltage at VP for the pull-up resistors or remove the jumpers at RPU before using the I2C port. It is advisable to remove the jumpers when connecting the Win-I2CUSB hardware to a target system, assuming the target already has pull-up resistors. This will allow you to use the Win-I2CUSB hardware at the voltage of your target system.

The I²C pins may be used as open-drain IO pins controlled by the DLL, if not used for I2C functionality.

GPIO – the Win-I2CUSB hardware has one general purpose input and one general purpose input.

IN pin operates as an input with the following characteristics:

INPUT PORT CHARACTERISTICS	
Vil : low level input voltage	**0.3*VDD = 0.99V**
Vih : high level input voltage	**0.7*VDD = 2.31V**

Note that the microcontroller is a 3.3V device but this input is 5V tolerant.

The **OUT** pin has the following characteristics:

OUTPUT PORT CHARACTERISTICS
V_{oh} : 2.9V (min @ 4 mA)
V_{ol} : 0.4V (max @ 3.2mA)

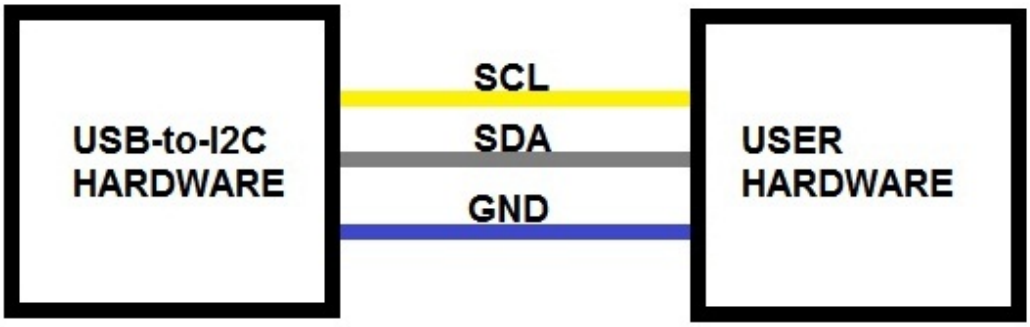
3.3V Switched Output – provides the user with the ability to power a low power target system at 3.3V. The Win-I2CUSB software has the ability to switch this output on and off. The total current provided by the Win-I2CUSB Hardware to the target system should not exceed 40mA. It is the user's responsibility to ensure that excessive current is not drawn from this supply pin.

5V Switched Output – provides the user with the ability to power a low power target system at 5V. The Win-I2CUSB software has the ability to switch this output on and off. The total current provided by the Win-I2CUSB Hardware to the target system should not exceed 40mA. It is the user's responsibility to ensure that excessive current is not drawn from this supply pin.

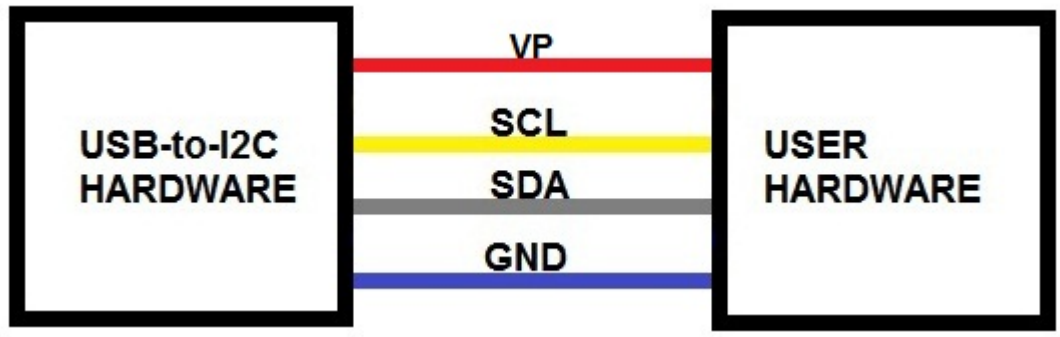
Jumper RPU allows the user to connect 3.3Kohm pull-up resistors, which are connected between the I²C pins (SDA and SCL) and the VP pull-up voltage. The jumpers should be removed when connecting the Win-I2CUSB hardware to a target system, if pull-up resistors are already available on the target system.

WIN-I2CUSB HARDWARE TO TARGET CONNECTION

When connecting the Win-I2CUSB Hardware to an I²C target system, a cable with a minimum of three (3) wires will be required. The SDA, SCL, and GND on the Win-I2CUSB Hardware must be connected to their corresponding signals on the target.
The Win-I2CUSB Hardware has 3.3KΩ pull-up resistors connected to pin VP on the 14-pin header. If the VP is not connected, you must remove the jumpers at RPU. If the jumpers are left in the circuit, ensure that VP has a voltage source applied, and note that the total I²C sink current of 3mA is not exceeded when the target pull-ups and Win-I2CUSB pull-ups are taken into consideration.
The SDA and SCL lines may be pulled up to a voltage range between 3.3V and 5.5V. It may work at voltages down to 2.5V; however, the noise margins will be lower.



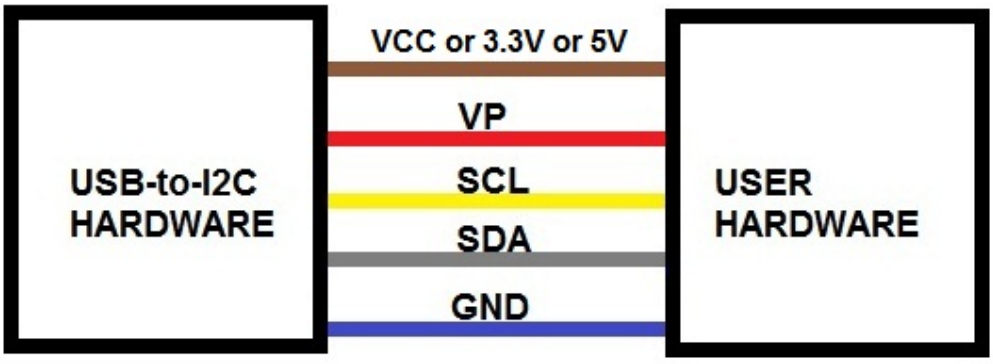
Minimum hardware connection between Win-I2CUSB and User Hardware (Jumpers at RPU removed)



Typical hardware connection between Win-I2CUSB and User Hardware (Internal pull-up resistors jumpers at RPU)

USING WIN-I2CUSB TO POWER USER'S SYSTEM

When connecting the Win-I2CUSB Hardware to the user's hardware, the target system can be self-powered or it may be powered from the VCC, 3.3V or 5V connectors on the Win-I2CUSB hardware (max: 40mA!)
The 3.3V and 5V power outputs can be turned on and off using the Win-I2CUSB software or DLL. To turn on the power, select the appropriate item under the Options menu. A check mark will be shown in the menu beside an enabled power output. The status bar at the bottom of the Win-I2CUSB software will also indicate if a power output is enabled. Note that the 3.3V and 5V power outputs are disabled upon hardware reset.
To use the Win-I2CUSB hardware in a 3.3V environment, you will need to connect the SCL, SDA, GND and 3.3V (or the VCC pin) to your target system. The pull-up resistors may be left in the circuit or they may be removed by removing the jumpers at RPU. If using the on-board pull-up resistors, you should connect an appropriate voltage to VP.



Win-I2CUSB Hardware used to power a user application

Important note: the total current consumed by the Win-I2CUSB hardware and the target system must be limited to 100mA by the user when using the power outputs. The Win-I2CUSB hardware uses about 60mA so **the target system can consume a maximum of 40mA.**

SOFTWARE UPDATES

The Win-I2CUSB software has a built-in update feature which allows you to check for updates whenever your PC has an internet connection. This feature can be found under the Options menu. Win-I2CUSB updates can also be downloaded manually from the following website:
http://www.demoboard.com/updates
Check our website periodically for update announcements and information.

TECHNICAL SUPPORT

Technical Support for Win-I2CUSB is available via an email to: sales@demoboard.com.

TROUBLESHOOTING

- If you have problems with the software installation, ensure that you have Admin Privileges.
- If the installer application doesn't launch when the CD-ROM is inserted, then manually browse the CD-ROM and find the Setup.exe file in the root directory of the CD. Double-click on the Setup.exe file to start the installation process.
- The Adapter has 3.3kΩ pull-up resistors connected to the I^2C bus lines. Ensure that additional pull-up resistors in the connected target system do not bring the pull-up resistance below 1.6kΩ for 5V systems or 1.1KΩ for 3.3V systems. The on-board pull-up resistors can be removed from the system by removing the pull-up resistor jumpers RPU (see Hardware Description above).
- Win-I2CUSB monitors the communications on the I^2C bus for proper operation of connected peripherals; any errors on the bus are detected and reported by the software. Bus communication is stopped if errors are detected and can be resumed when the (hardware) problem is corrected and the transmission retried.
- Keep the original Win-I2CUSB installation CD-ROM in the event the software needs to be re-installed. Future Win-I2CUSB updates from our Website may require a previous installation from the original media.
- If you get a Timeout message when using the software, make sure that there is a pull-up connected to the SDA and SCL pins. The Timeout occurs when either, or both, of the I2C pins are held low for more than 0.5 seconds. If pull-ups are connected, remove the connection to the target system (check SDA and SDL for ground shorts). Reset the hardware by removing the USB cable and reinserting it. Make sure that all three jumpers are connected then try sending an I2C message. If you still get a Timeout, then microcontroller has probably been damaged, and the Win-I2CUSB hardware adapter will need to be returned for repair.

If all else fails, email a description of the problem you are having to: sales@demoboard.com.
Note that all technical support requests must begin with an email to this email address.