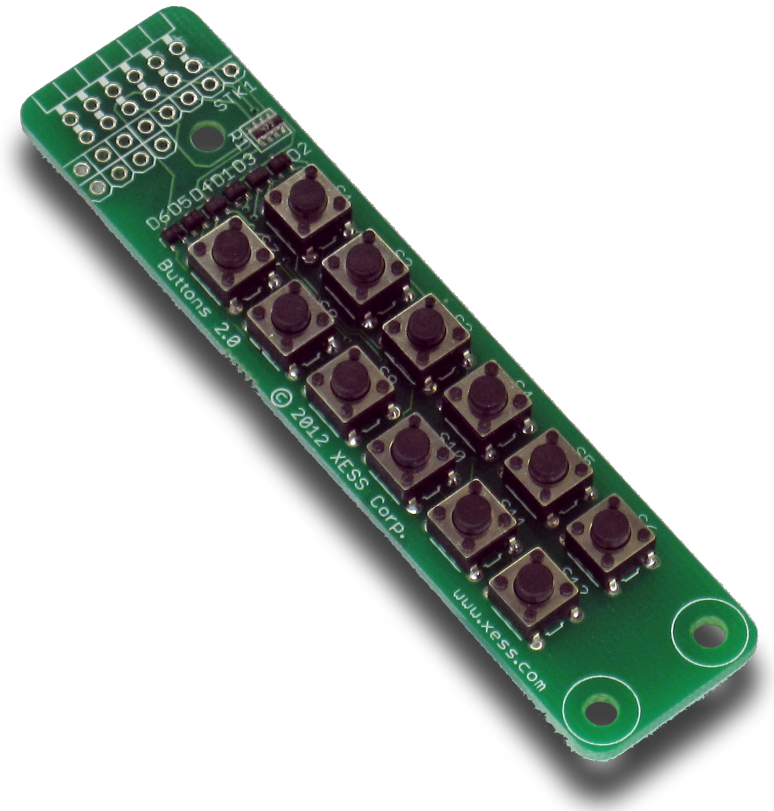
XESS Corporation

StickIt! Buttons Manual

How to install and use your new StickIt! Buttons Module



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StickIt! Buttons Manual
MAN004 (V2.0) Dave VandenboutDave VandenboutDave VandenboutDave VandenboutOctober 17, 2013

The following table shows the revision history for this document.

Date	Version	Revision
01/18/2012	1.0	Initial release for StickIt! Buttons module V1.0.
10/17/2013	2.0	Image changes for StickIt! Buttons module V2.0.

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C.1 Preliminaries

Here's some helpful information before getting started.

Getting Help!

Here are some places to get help if you encounter problems:

- If you can't get the StickIt! Buttons module to work, send an e-mail message describing your problem to help@xess.com or submit a problem report at http://www.xess.com/help.php. Our web site also has
  - answers to frequently-asked-questions,
  - example designs, application notes and tutorials,
  - a forum where you can post questions.

Take Notice!

It's pretty hard to get in trouble with this module.

Packing List

Here is what you should have received in your package:

- a StickIt! Buttons module.
- PMOD™ male header.
- Wing male headers (8-pin & 4-pin).

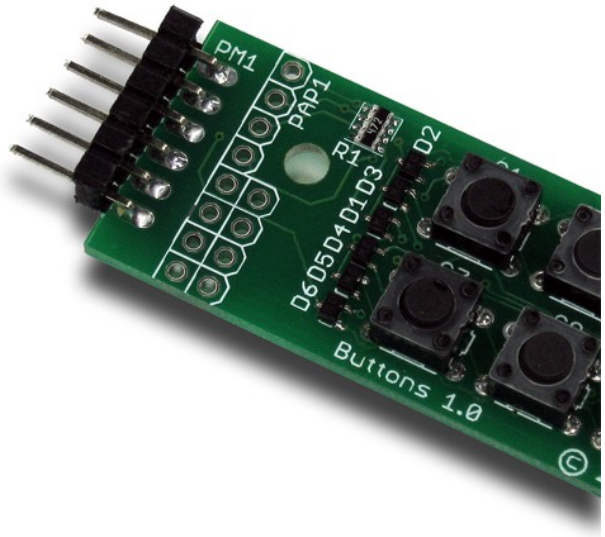
C.2 Setup

The StickIt! Buttons module provides an array of twelve pushbuttons that you can insert into a four-bit or eight-bit PMOD or a Wing socket on your StickIt! board.

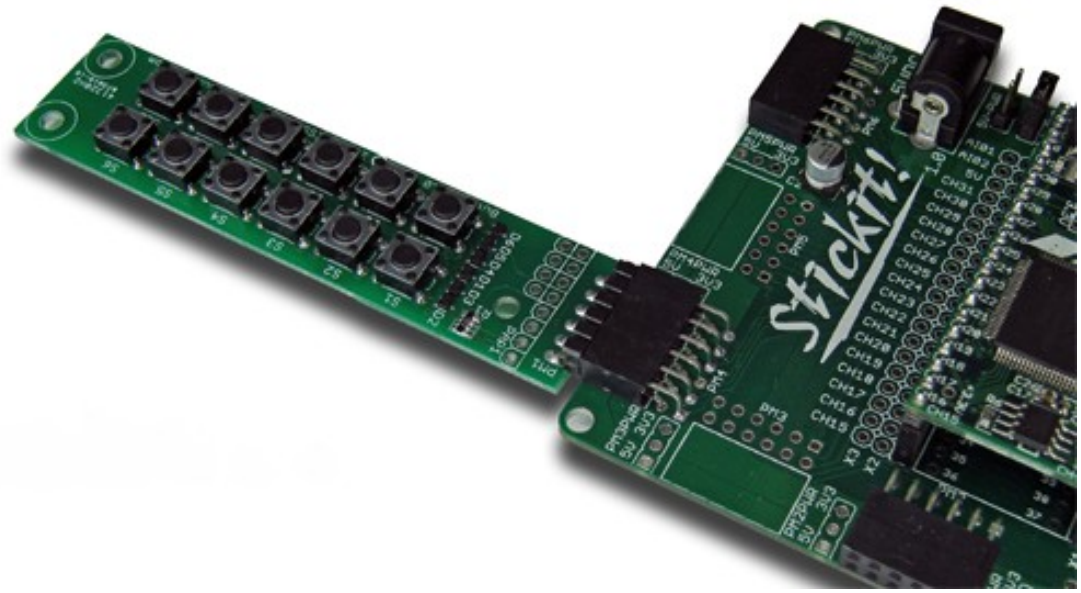
Inserting Your StickIt! Buttons Module Into Your StickIt! Board

Inserting Into a PMOD Socket

To use the StickIt! Buttons module with a PMOD socket, first solder the included male PMOD header to the module as shown. (**To insure a stable connection, only use a header with 0.025" square pins.**)

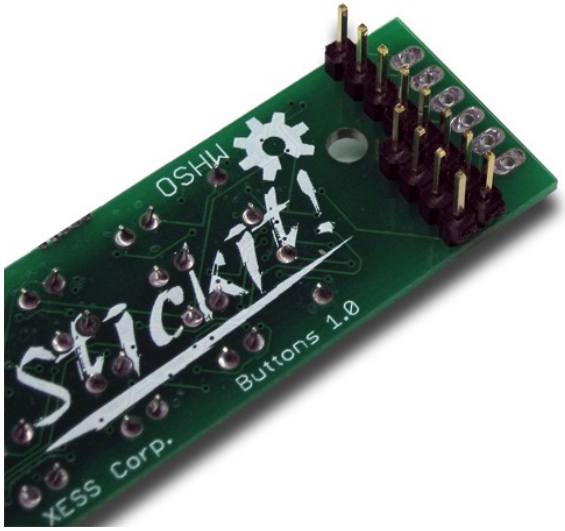


Then insert the module into one of the PMOD sockets on the StickIt! Board. (This module does not directly connect to any power supply so there is no need to change the setting of the voltage selection jumper of the PMOD socket.)

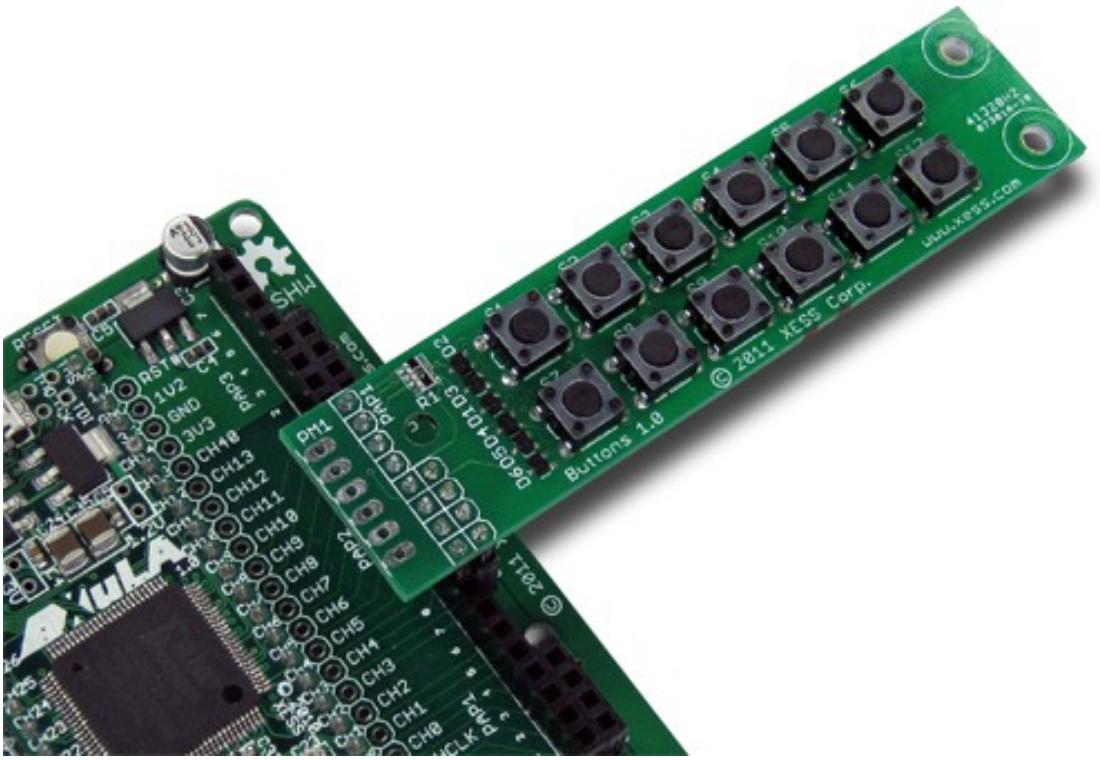


Inserting Into a Wing Socket

To use the StickIt! Buttons module with a Wing socket, first solder the included male Wing headers to the module as shown. (**To insure a stable connection, only use a header with 0.025" square pins.**)



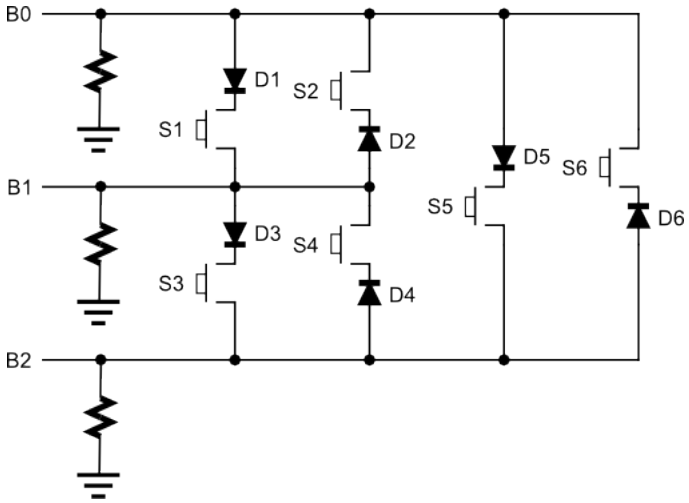
Then insert the module into one of the eight-bit Wing sockets on the StickIt! board.



C.3 Operation

This chapter describes the operation of the StickIt! Buttons module using a simplified schematic. You can find a complete schematic at the end of this manual.

By adding a few diodes, twelve normally-open buttons can be scanned using only four I/O signals. You can see how this works by examining a simpler case of scanning six buttons using three I/Os.



Driving signal B0 and sensing the level on B1 will detect whether button S1 is open or closed. If closed, then B1 is driven high by B0; if open, then B1 is pulled low by the attached pulldown resistor. In either case, the state of button S2 will not have any effect because diode D2 blocks B0 from driving B1.

Next, by reversing their roles and driving B1 while sensing B0, the state of S2 is determined. Now diode D2 conducts while D1 prevents button S1 from interfering with the scan.

Using this technique, all six buttons can be scanned by sequentially driving each of the signals while sensing the other two.

Note that this fails if two or more buttons are pressed at the same time. For example, if B0 is driven and S1 and S3 are both pressed, then a high level is sensed on B1 and it continues from there through D3 and S3 to also be sensed on B2. But this is indistinguishable from the case when S1 and S5 are both pressed, because B1 and B2 would both be high then as well. Multiple button presses are detected by looking for scans where more than one sense line is driven high and ignoring the results of the entire scan.

The table below shows which button on the StickIt! Buttons module is scanned when a particular signal is driven and another is sensed.

		Drive			
		B0	**B1**	**B2**	**B3**
Sense	**B0**	N/A	S4	S5	S6
	B1	S1	N/A	S9	S10
	B2	S2	S7	N/A	S12
	B3	S3	S8	S11	N/A

C.4 Using the Module

To use the StickIt! Buttons module, you will need to do the following:

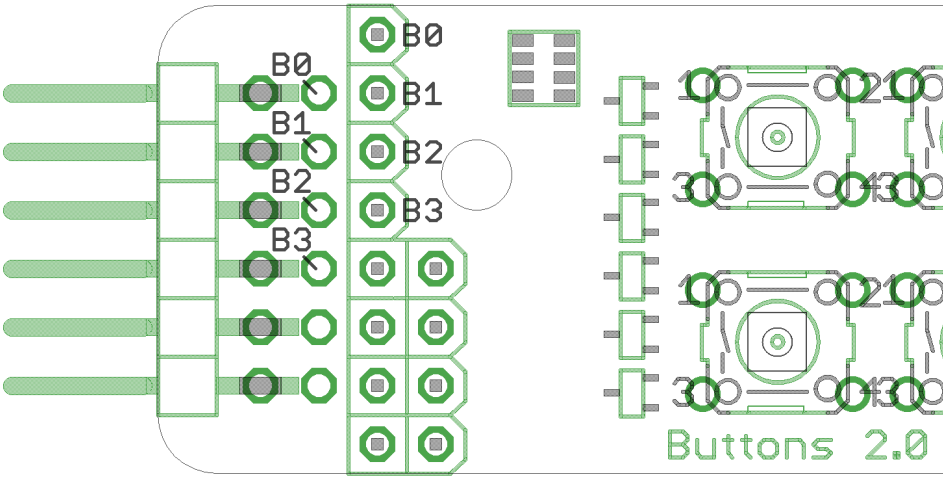
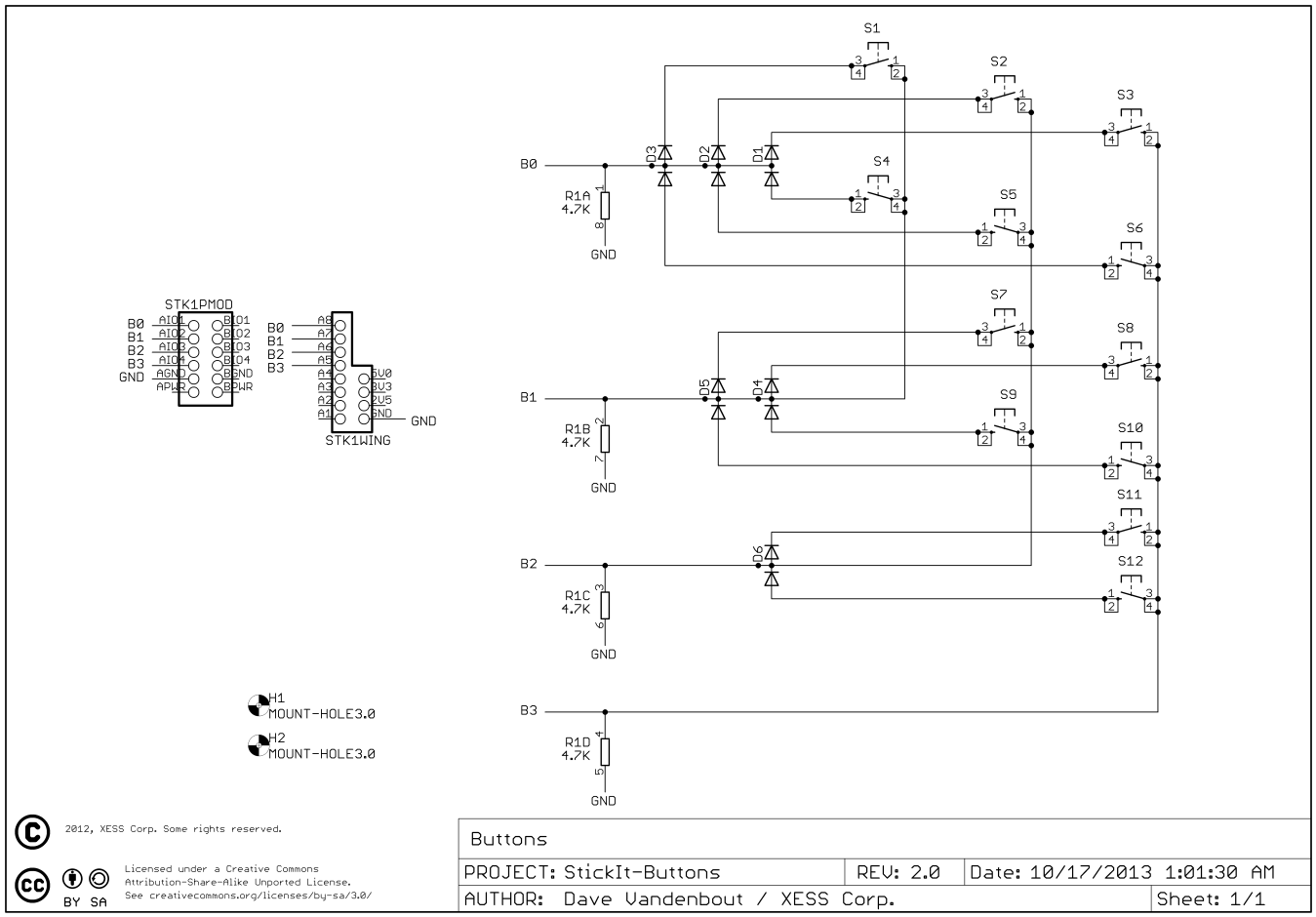
- Create a Xilinx ISE FPGA project and write some HDL code for scanning the buttons.
- Attach the module to either a PMOD or Wing socket on the StickIt! board.
- Determine the channel signals on the PMOD or Wing socket that connect to each I/O pin of the module.
- Find which FPGA pin of the XuLA board connects to each channel signal.
- Make a UCF file associating each FPGA pin with an I/O pin of the module.
- Include the UCF file in your ISE project.

That's a lot of work just to scan some buttons, so we've done most of it for you. Just go to http://github.com/xesscorp/StickIt. There, you will find a subdirectory with a Xilinx ISE project that includes:

- a button-scanning HDL module,
- an example that uses the button-scanning module and an LED Charlieplexing module to detect and display the pressed button,
- and a UCF file containing the FPGA pin assignments to use when installing the StickIt! Buttons module into any of the PMOD or Wing sockets.

A.1 I/O Locations

The connections of the I/O signals to the PMOD and Wing headers of the StickIt! Buttons module are shown below.



A.2 Schematic