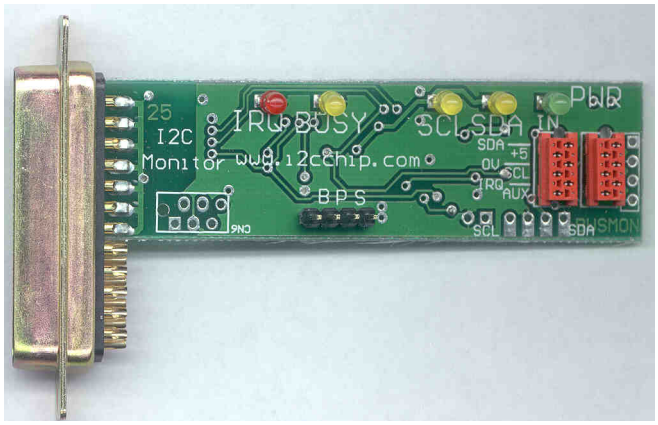
I2C Bus Monitor

May 29, 2010

Contents

1 Introduction

I2CMON is a very simple hardware tool for monitoring I2C buses. It is especially useful for debugging hardware problems and to get I2C firmware operating in the first place. The I2CMON is *very* low cost: It is a useful, but limited tool.



The Bus Monitor has:

- 5 LEDS for SDA, SCL, BUS BUSY, IRQ, POWER
- Captures transitions so you can easily see activity
- Schmitt trigger inputs.
- START, STOP, BUS_BUSY trigger outputs to synchronise oscilloscopes to messages
- place to measure VCC current drawn by slave.
- 0.1" headers for adapting to Philips pinout
- Galvanic isolated interface for PC based protocol analyser (optional)

You can use it in several ways:

- Use LED's to check I2C bus state, and to check that you firmware generated START and STOP conditions correctly.
- Synchonise an oscilloscope to the bus transfers using the BUSY, START, STOP outputs
- With I2CMON software running on a PC with LPT port, to decode I2C bus messages.

1.1 Triggering an Oscilloscope

The BUSY test point is *high* between an I2C Start, and the next I2C Stop.

Triggering off BUSY should give you a stable synchonous view of the message. Of course the I2C bus allows repeated starts, so start and stop aren't always paired. There is a 2us pulse at the START and STOP test points.

The LED's have pulse stretchers so you can see single pulses.

SDA, SCL, and IRQ leds are lit when those lines go *low*.

1.2 Monitoring VDD Current.

A current monitoring resistor R1 is fitted in series with VDD between the two I2C connectors, CN1 and CN2. CN1 is the input. CN2 connects to the device whose current you are measuring.

Normally this is short circuited by a pcb track. Cut the PCB track. Change R1 to a more suitable value if necessary.

2 I2CMON Software

To use the I2CMON software you need the version with DB25 and ADUM1300A coupler fitted, not the basic version.

I2CMON monitors an I2C bus through a standard printer port. The PC is electrically isolated from the I2C Bus. The PC side is powered by the printer port, no external power is needed.

When the I2CMON software is running, the PC is totally occupied monitoring. No data is displayed until you exit the monitor mode. A proper keyboard is required, not a USB keyboard.

2.1 Starting I2CMON

I2CMON is a >Linux program not *a Windows* program. It is suppplied on a Linux boot CD. the bus.

I2C Bus monitor will boot your PC from the CD using DSL. Nothing is installed or altered on your hard drive. You need to make sure your bios is set to boot from the cdrom. After fixing your bios reboot your computer with the CD in your drive.

After it boots, you can press F4 to see a help screen with more information. You can either run it from the console or the GUI.

On the GUI there are icons for I2CMON and Documentation. Double click the I2CMON gui to start a window.

```
i2cmon --help       Display the commandline options.
```

Always look at the commandline help first!

2.2 Monitoring an Address

To monitor only transactions involving a single address, use the -a option.

2.3 Saving to monitor file

Use the -f option to save the capture to a file.

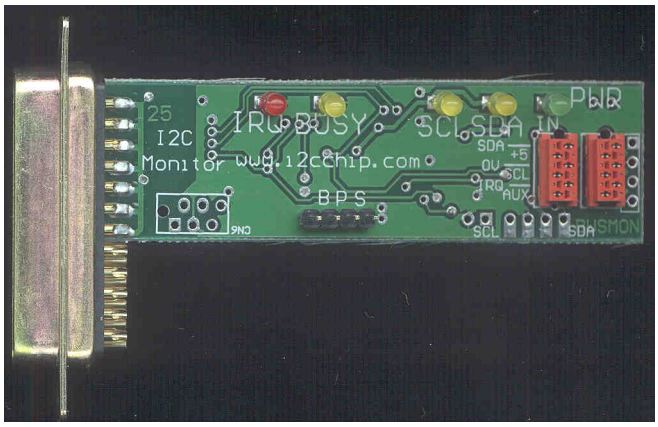
You will need to add a file device to DSL before you can copy out to a memorty stick, harddrive etc.

2.4 Exit Button

This version has not been released, is not on the CD, and is not supported. You can get the code by special request.

The last version of I2CMON (not on the CD) added provision for a hardware exit button connecting pin 15 to ground.

This was added to get around the need for a standard physical keyboard to exit the monitoring mode. The picture shows this button added to the BUSMON.



2.5 Source

Source code is located at:www.i2cchip.com/i2cmon/i2cmon_source.tar.bz2

It was last compiled from within KDevelop3 on Linux 2.4. KDevelop is not needed. I2CMON makes use of a special kernel mode. This works on Linux 2.4, but I have not tested on later kernels.

2.6 Acknowledgements

The I2CMON software is based on the lmilk “Warmcat” by Andy Green.

I2CMON uses Damn Small Linux! DSL Authors: John Andrews John@damnsmalllinux.org Robert Shingledecker Robert@damnsmalllinux.org

3 Production Test

Connect to Bus 2 of I2C2PC adaptor.

Set J5 to CS.

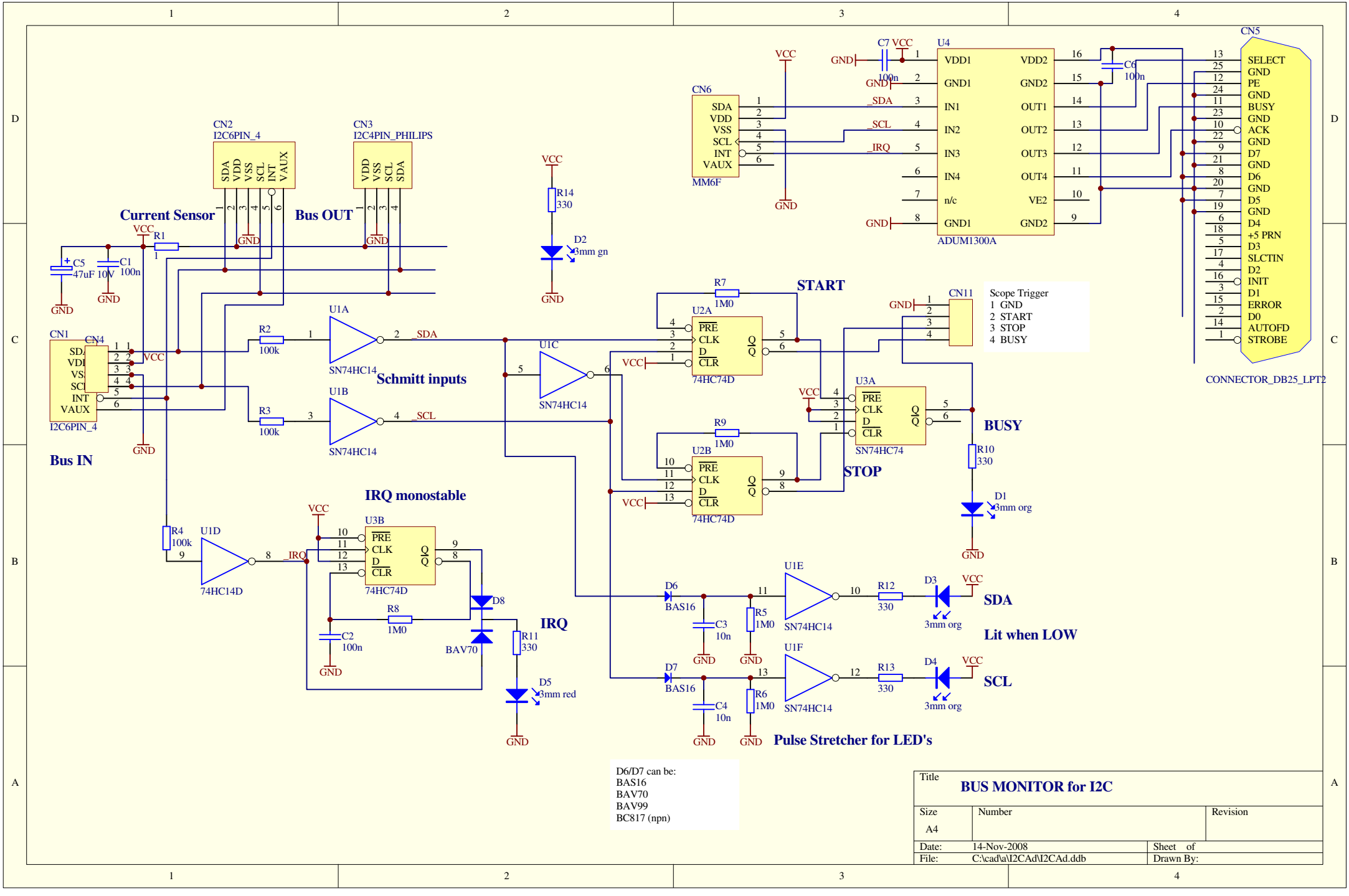
Send the test file *BusMon_Bus2_J5-CS.dat*

All lights will operate in sequence.

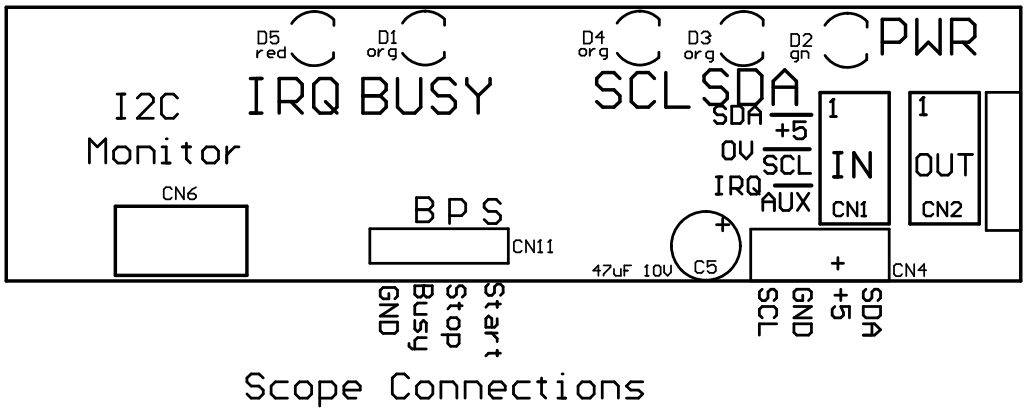
BusMon CD is programmed from: a/dsln/iso/mydsl.iso

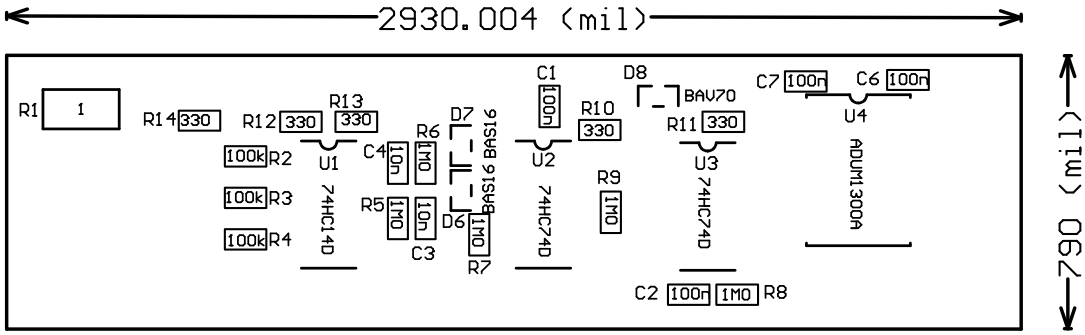
4 Drawings

4.1 Circuit Diagram


Current Sensor
Bus OUT
Bus IN
Schmitt inputs
IRQ monostable
START
STOP
BUSY
IRQ
SDA
SCL
Lit when LOW
Pulse Stretcher for LED's
CONNECTOR_DB25_LPT2
ADUM1300A
MM6F
I2C6PIN_4
SN74HC14
74HC74D
SN74HC74
74HC14D
BAS16
BAV70
Scope Trigger
1 GND
2 START
3 STOP
4 Bbusy
D6/D7 can be:
BAS16
BAV70
BAV99
BC817 (npn)
Title
BUS MONITOR for I2C
Size
A4
Number
Revision
Date:
14-Nov-2008
Sheet of
File:
C:\cad\a\I2CAd\I2CAd.ddb
Drawn By:

4.2 PCB Drawings





5 Revision History

Date	Rev#	Changes
24 May 2010	1	