Getting started with the SigmaLink USBi

Revision history

Revision	Description	Date
v3.0r1	Initial Version	29 May 2018
v3.0r2	Update TOC, added introduction to txt2bin	10 Jun 2018

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About SigmaLink USBi

The SigmaLink USBi is a low-budget real-time programming device for the freeDSP and other DSP boards from Analog Devices. It is a new PCB design based on a CY7C68013 chip.
It has the same features and pinout as the Analog Devices USB interface (EVAL-ADUSB2EBZ), such as changing parameters while already using the freeDSP or easy changes of the schematic in SigmaStudio. You also can write your program to the EEPROM when the write protect jumper is installed.

Important information

The SigmaLink USBi is provided to you 'as is'. We make no express or implied warranties whatsoever with respect to its functionality, operability, or use, including, without limitation, any implied warranties of merchantability, fitness for a particular purpose, or infringement. We expressly disclaim any liability whatsoever for any direct, indirect, consequential, incidental or special damages, including, without limitation, lost revenues, lost profits, losses resulting from business interruption or loss of data regardless of the form of action or legal theory under which the liability may be asserted, even if advised of the possibility or likelihood of such damages. Features and specifications might change without prior notice.

Please keep in mind that freeDSP and SigmaLink USBi are open-source spare-time projects. Because the freeDSP is very flexible, many applications are possible. Questions and new ideas can be discussed online with other DIYers. Please use the 'Digital Line Level' subforum @ diyAudio.com to connect with other people working with the freeDSP. Please create individual threads for your topics. Link these threads in the **freeDSP main thread** - so that others can find them. Some questions can be answered by carefully reading this manual. **We cannot provide individual support via email.** Thank you for your understanding!

Overview

Figure 1 shows the key features of the freeUSBi board.

Figure 1 - SigmaLink USBi pod in its case, with written labels.

How to get SigmaLink USBi up and running

The following steps will guide you through the workflow to get your SigmaLink USBi up and running.

Buy a pre-built SigmaLink USBi pod

You can buy assembled and programmed units directly from the creator. You will receive SigmaLink USBi in a pod, along with the cables of your choice in the package.

The pre-built SigmaLink USBi comes with the firmware already installed. The driver install or firmware install steps below can be skipped, except when the device is not identified as an USBi.

Building from scratch

Everything starts with ordering all necessary components. After soldering your board, the way to use it with SigmaStudio is described.

Get everything needed

You will need a soldering iron, a steady hand plus some soldering experience to assemble the 0603 surface mount components and 0.5mm pin pitch chips. Alternatively you need solder paste, paste stencil and a hot air gun. However, we think it is feasible for everyone.

a. You will also need a **USB Type-A to Type-B cable**.

b. Download the SigmaLink USBi adapter files from our website and **manufacture the printed circuit board**. You might want to locally organize centralized buying and board production together with some friends. You can find the necessary KiCAD and GERBER files of the board on the freeDSP website www.freeDSP.cc. If you have a hot air gun or reflow oven, ordering a **solder paste stencil** with the board would come very useful.

c. You will also need to **order all electronic parts** from the part list in the appendix.

d. Optionally, you can **order a project case** to enclose this board in. This board is made to match those ready-made “mini U-Link” cases.

e. You need an optional **EEPROM programmer** if you want to pre-program the EEPROM with the appropriate firmware. Pre-programming the EEPROM allows you to skip the driver installation steps below.

f. Install **SigmaStudio** (free) on your PC as described in the freeDSP Getting Started PDF, if not already done.

g. Install the **freeUSBi Driver** on your PC as described later, if you chose not to pre-program the firmware.

Solder the board

All components except the connectors are surface mount. You need a steady hand and sharp eyes to solder them properly. Be patient! Or if you have ordered the solder paste stencil, you can solder the components using the much easier reflow process.

The flat cable needs to be configured 1:1 as seen in Figure 5.

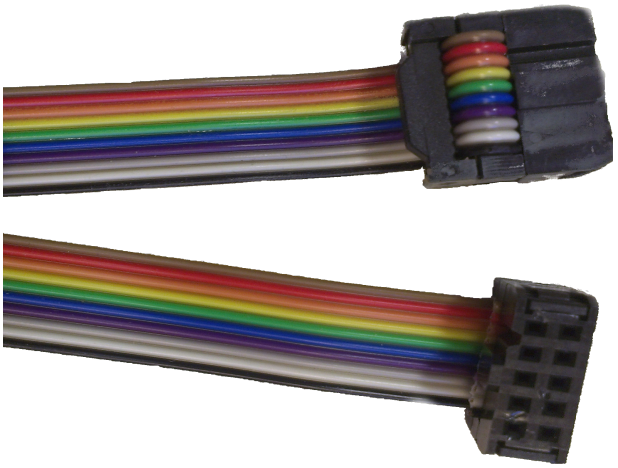

Figure 5 - Flat cable.

Burn the firmware

If you have an EEPROM programmer, you can burn the firmware onto the EEPROM chip before it is soldered to the board. This will allow you to skip the driver installation steps below entirely.

1. Download the 24aa256.txt file from this forum post: http://www.diyaudio.com/forums/digital-line-level/269111-low-cost-usbi-programmer-using-cypress-cy7c68013a-board-post4777018.html

2. Use a hex editor software to convert the contents of this file to a binary file with a file size of exactly 4096 bytes.

   Alternatively you can compile and use the txt2bin utility to convert the downloaded text file into a binary representation.

   The binary file should have the following cryptographic signatures:
   SHA-1: a584add35d1293e2b2710acfaf5aa7586a0c60a4
   SHA-256:
   3da2bda3fa7eba73cffc61592cfa7babdc6eb36d5a4ed0643d9ab8a53596fb61
   MD5: 5f5d20c897840000925b2cbc12c68948

3. Burn the resulting binary file into the EEPROM chip.

Install the driver

1. Download the freeUSBi driver on the freeDSP website www.freeDSP.cc.

2. Search for the file ADI_USBi.spt in your SigmaStudio program folder (e.g., „C:\Program Files\Analog Devices\SigmaStudio 3.11\USB drivers\[x86 or x64]\ADI_USBi.spt“) and copy it into the freeUSBi driver folder you just downloaded: use the folder which corresponds to your operating system (e.g., Win8.1/x86 if you have a 32 bit system or Win8.1/x64 if your system is 64 bit).

3. Connect the board with your PC using a USB cable. Do NOT connect it with the freeDSP yet. (There might be a problem with some USB3 ports. If you get an USB error during programming, please try using a USB2 port if available.)

4. Install the driver from the freeUSBi driver folder which you have already used in step 3, e.g. using the Windows Device Manager. If required by your system, confirm that you want to install this uncertified driver. If any problems occur, please refer to the note below.

5. Reconnect your freeUSBi by unplugging and plugging the USB cable. Do NOT attach the jumper(s).

6. You're done! SigmaStudio should recognize the board as USB interface. It can now be used as USBi programmer for real time programming.

Note:
On Win 8.1 and Win 10 some troubles could occur during the driver installation process. This is due to the strict Windows security policy concerning the installation of unsigned drivers. If your driver installation fails, please try the following workaround:

Win 8.1

A. Make sure that you have an Administrator user account

B. Open the *PC-Settings* and choose the option *Change PC-Settings*

C. Choose the option *Update / Recovery*

D. Choose the option *Recovery*

E. Choose the option *Restart*

F. Wait a moment…

G. Choose the option *Fix Problems*

H. Choose *Further Options*

I. Choose the option *Start Preferences*

J. Choose the option *Restart*

K. Wait a moment…

L. During the restart procedure a further option window occurs: choose the option *Force Deactivation of Driver Signature* by pushing the key *7* (on NumBlock of your keyboard) or *F7*

M. After the system has restarted, please repeat steps 5. to 7. of the driver installation procedure described above
-> The driver installation process should be successful now!

Tested under Win 8.1 Pro x64

Win 10

A. Make sure that you have an Administrator user account

B. Open the *PC-Settings*

C. Choose the option *Update / Security*

D. Choose the option *Recovery*

E. Choose the option *Extended Restart*

F. Press *Restart Now*

G. Wait a moment…

H. Choose the option *Fix Problem*

I. Choose *Further Options*

J. Choose the option *Start Preferences*

K. Choose the option *Restart*

L. Wait a moment…

M. During the restart procedure a further option window occurs: choose the option *Force Deactivation of Driver Signature* by pushing the key *7* (on Num Block of your keyboard) or *F7*

N. After the system has restarted, please repeat steps 3. to 7. of the driver installation procedure described above
-> The driver installation process should be successful now!

Tested under Win 10 x64

Troubleshooting

1. Please take the time to carefully read this getting started guide. **Please keep in mind that freeUSBi and freeDSP are open-source spare-time projects.** Thank you for your understanding!
2. Maybe your issue has already been discussed in the **freeDSP forum**. There might already be a solution for the problem you are facing. Please use the 'Digital Line Level' subforum @ diyAudio.com to connect with other people working with the freeDSP. Please create individual threads for your topics. Link these threads in the **freeDSP main thread** - so that others can find them.
3. **We cannot provide support via email or the contact form on the website.** We hope that you understand that freeDSP is not a commercial product. It is an **open-source spare-time project**. We hope that questions can be answered together with the freeDSP community in the freeDSP forum. Please be patient and remember that forums work on a voluntary basis. If you post to a **forum**, please provide:

a. The version of the freeDSP board you are working with. A good resolution photo of your soldered board from top and bottom. If you made some changes to the original design, please describe them in detail.

b. A detailed and clear explanation of the symptoms you are seeing.

c. A description of the troubleshooting steps you already performed and the results obtained.

Appendix

Part list

All parts in the following list are needed for the SigmaLink USBi.

Table 1 - Part list.

Part	Description	Label	Qty.	LCSC Part number
C1, C2	Electrolytic capacitor, SMD 6.3mm, 220µF/10V[1]	220 10V	2	C81994
C3, C4	MLCC, SMD 0603, 22pF	-	2	C1653
C5-C13	MLCC, SMD 0603, 100nF	-	9	C85997
D1	LED, 3mm, blue	-	1	C86881
D2	LED, 3mm, red/green, common anode	-	1	C13559
D3	LED, 3mm, amber	-	1	C85160
F1	Polyfuse, SMD 0805, 750mA 6.3V	7	1	C20979
J1	USB Type-B connector	-	1	C46392
J2	Jumper, 2.54mm, do not populate	-	1	-
J3	Boxed header, side, 14 pins	-	1	C146622
R1, R4, R5, R8	Resistor, 0603, 10kΩ 1%	01C	4	C25804
R2, R3, R7	Resistor, 0603, 4.64kΩ 1%	65B	3	C181996
R6	Resistor, 0603, 49.9Ω, 1%	68X	1	C133200
RN1	Resistor network, 0603x4, 510Ω 5%	511	1	C136824
U1	AMS1117-3.3, SOT223-3	AMS1117-3.3	1	C165482
U2	AT24C64D-SSHM-T, SO-8[2]	64DM	1	C6487
U3	CY7C68013A-56LTXC, QFN-56	CY7C68013A	1	C14912
U4	MAX809STRG, SOT23-3	SPTP	1	C9965
U5	SN74LVC2G66DCUR, VSSOP-8	66CZ	1	C181970
U6	TPS2051BDBVR, SOT23-5	PLJI	1	C24593
Y1	24MHz, SMD 5032 2p	24.000MHz	1	C122520
-	Flat cable, 14 pin	-	1	C14605[3]
-	IDC socket, 14-pin, with cable clamp	-	2	C110603

[1] Exact capacitance doesn't matter much, as long as it is larger than 47µF

[2] Any I2C EEPROM in SO-8 package, with a density equal to or larger than 32 kibibits and no larger than than 512 kibibits will work. AT24C64D-SSHM-T just happened to be the part I have lying in my spare bin during this writing.

[3] LCSC doesn't carry native 14-conductor IDC cable. This is a 40-pin one, you should cut off the 26 unused wires.

Assembly print

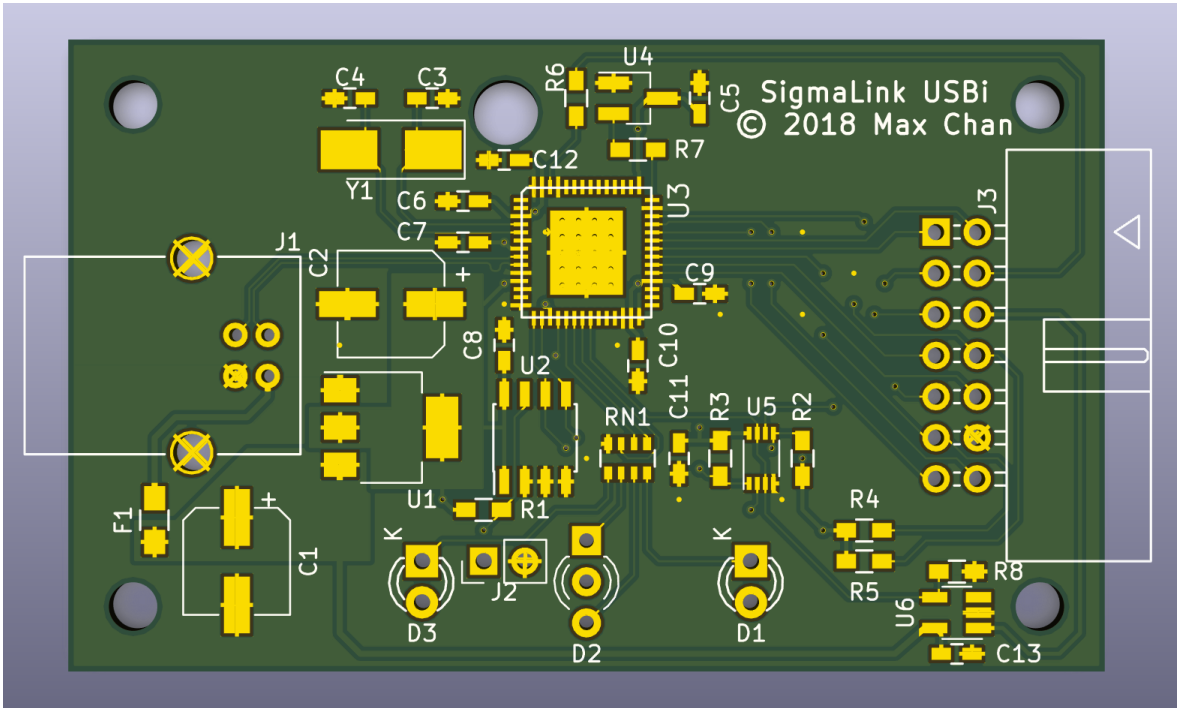

Figure 6 - Board silkscreen and parts placement for SigmaLink USBi v1r2.

Schematic

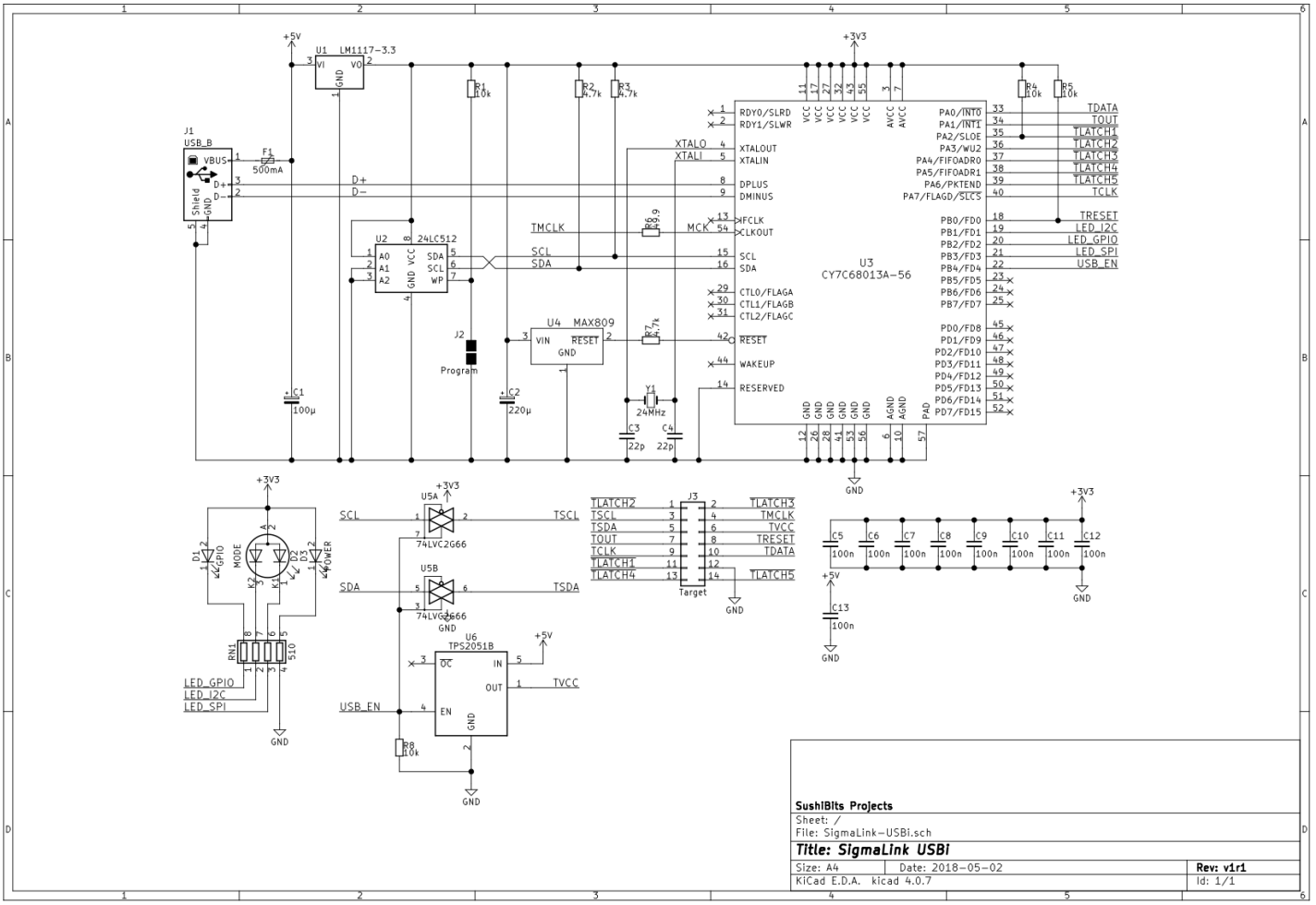

Figure 7 - Schematic of the SigmaLink USBi v1r1. Please zoom in to see more details.

Pinout of the USBi connector

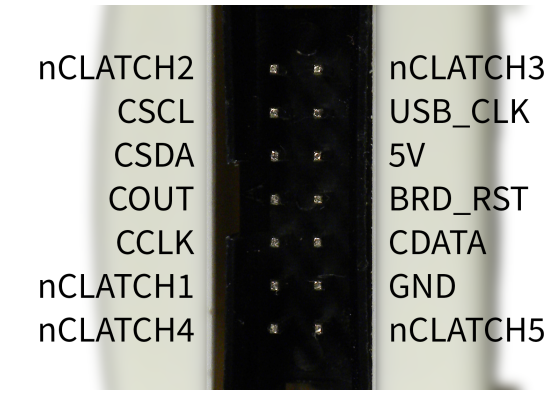

Figure 8 - Pinout of the USBi connector.