

1. Introduction

This document is intended for everybody who wishes to use or investigate the Henry Audio USB DAC 128 and QNKTC AB-1.2. The two DACs are identical. Only the logo is different.

Programmers and developers should also read the complete project readme file at https://github.com/amontefusco/sdr-widget/blob/audio-widget-experimental/AW_readme.txt

The contents of this file are:

1.	Introduction	1
2.	Technical Specifications	1
3.	USB Audio Class 1 & 2.....	2
4.	Installation on Windows.....	3
5.	Windows Uninstall Procedure.....	5
6.	Schematic Files	7

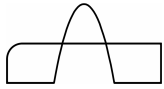
2. Technical Specifications

The USB DAC 128 / AB-1.2 plugs in between your computer and an audio amplifier. It will work on Linux, Mac and Windows. High resolution audio is not guaranteed on Windows XP.

The electrical design focuses on high quality circuit board layout and good components.

Some technical details:

- A fully assembled, tested and packaged DAC which plays music out of the box
- Asynchronous USB Audio powered by Golledge high-quality crystal oscillators at 22.5792 and 24.576MHz
- Supports the common sample rates of 44.1, 48, 88.2, 96, 176.4 and 192ksps
- RCA (phono) stereo outputs
- Asahi Kasei AKM4430 DAC
- Atmel AVR32 general-purpose MCU programmed in open source C
- ASIO driver for Windows programmed in open source C
- Low-noise 3.3V ADP151 LDOs powered from USB. No external power supply.



Henry Audio



- The USB DAC 128 / AB-1.2 is modular. A USB-I2S Module is plugged into an Analog Board.
- The option of experimenting with the power supply.
- Lots of internal headers for experimenting.
- You must provide a USB 2.0 mini-B cable. It is not included. Use a cable shorter than 3m.
- Mechanical size: W: 114.4mm, H: 32.8mm, D: 128mm.
- Computer requirement: The DAC may not work well on computers with processors below the performance of a Core 2-duo / 2GHz CPU. USB Audio Class 2 drivers may not work on Windows XP.

3. USB Audio Class 1 & 2

The USB DAC 128 / AB-1.2 will operate in both USB Audio Class 1 (UAC1) and UAC2. UAC1 is available with built-in drivers on Windows, Mac and Linux. On Mac and Linux UAC2 is readily available without a driver installation. When first powered up the DAC will use UAC1.

To play audio where the source was once a CD, UAC1 will be sufficient. But UAC2 does have certain benefits, and must be selected for higher resolution audio playback.

In UAC1 the DAC supports CD quality and more, up to 24bit/48ksps. In UAC2 it uses up to 32bit/192ksps for high quality audio. The actual DAC chip receives 24-bit samples. The USB audio protocol is *asynchronous* with both UAC1 and UAC2. That means the analog part of the USB DAC / AB-1.2 minimizes jitter errors.

For UAC2 on Windows you must install a driver. The driver installation procedure is shown in the next section. The driver is recommended on all Windows computers even if you don't need UAC2 qualities. The Windows driver will let you play back high quality audio using ASIO capable players such as JRiver Media Center and foobar2000. Windows UAC2 will *not* work in generic Windows programs like web browsers. For that you will have to use UAC1. The good news about that is that "Pling - You Got Mail" will also not play on Windows UAC2. So with the listed players you can listen to music on Windows UAC2 without such interruptions.

Regardless of your computer system, the DAC will sound better if the operating system sends it audio data with the same sample rate as was used to record and store the music. This is typically 44.1ksps. On a Mac you find this under

"Audio MIDI Setup". On Windows UAC1 you find this under bottom-right speaker icon, "Playback Devices", "Properties", "Advanced".

Using UAC2 and ASIO on Windows means the DAC is automatically set up with the correct sample rate. This has considerable audio benefits.

UAC1 is indicated by a green light at the front of the USB DAC 128 / AB-1.2. UAC2 is indicated by a red light. To switch between the two modes do as follows:

- Press the rear Prog button until the light changes
- Keep pressing Prog until the light goes dark
- Press and release Reset
- The USB DAC 128 / AB-1.2 should now be up and running in the new mode

What does *asynchronous USB* mean? It means the DAC is the timing master. In typical digital audio based on S/PDIF (coax) and TOSLINK (optical) cables the audio data and the clock are synchronous. Both travel from the same source. This source is typically a CD drive. Such a drive may or may not be made with a good internal clock circuit.

Synchronous digital audio is also common over USB. Then the timing reference is derived inside the computer. That clock is often very noisy. With synchronous digital audio the DAC is responsible for extracting the clock signal.

Instead, with an asynchronous protocol, the source of the audio data becomes the timing slave. Commands are sent on the USB cable from the DAC to tell the computer to speed up or slow down. This enables the DAC to use precision crystal oscillators instead of a complex clock regenerator. The audible result is that many of the typically digital artifacts are significantly reduced.

4. Installation on Windows

Follow these steps to install the USB DAC 128 / AB-1.2 on a Windows 7 computer. The Windows 8 installation is similar. Windows XP functionality is not guaranteed.

This section is based on using JRiver Media Center as a player program. Some users prefer foobar2000. You may download that program instead. If so, do remember to install its ASIO plug-in.

1. Do not plug in the USB DAC 128 / AB-1.2 yet.
2. Download and install the driver from https://github.com/borgestrand/widget_binaries/blob/master/AWSetup_20130211.zip

3. If you have an earlier version of the driver installed, first follow the uninstall instructions in the next section.
4. Answer Yes and OK to all questions. You may have to approve that an unsigned driver may be installed.
5. Download and install Media Center from <http://www.jriver.com/download.html>
6. Plug in the USB DAC 128 / AB-1.2
7. Given 5 minutes or less, Windows should be able to find and install all drivers

You now have 2 choices; you may listen to music up to 24bits / 48ksps in any Windows program. This uses USB Audio Class 1 (UAC1). Or you may listen to music up to 24 bits / 192ksps in only those Windows programs which support the ASIO protocol. This is done using USB Audio Class 2 (UAC2).

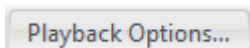
Please see the previous section on toggling the DAC between UAC1 and UAC2. The first time you change between them, Windows may have to install additional drivers. It should be able to do that fully automatically.

J-River Media Center is set up to use the default sound output device. Here is how to set it up to use the USB DAC 128/ AB-1.2 with UAC2 and ASIO. This will enable you to listen to hi-res music.

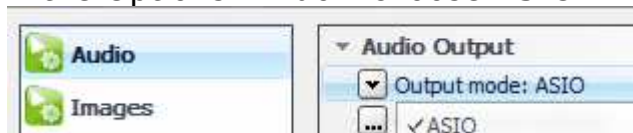
1. First do as above to select UAC2 and a red front LED color
2. Start J-River Media Center
1. Click the top-right bars icon:



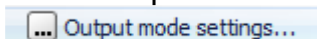
2. In the Tools window choose Playback Options:



3. In the Options window choose ASIO:



4. Click Output Mode Settings:



5. In the ASIO Settings window choose Device = ASIO UAC2:

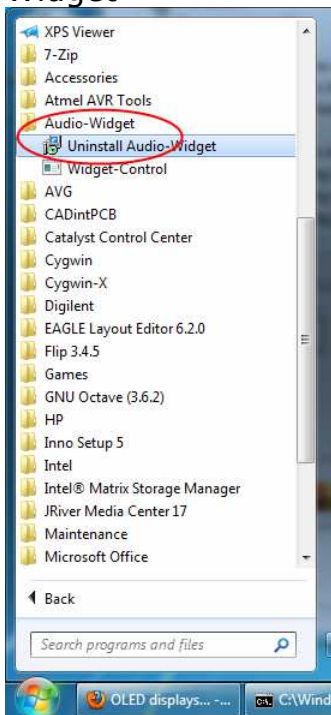


6. Click OK in all windows to close them
7. Use the file menu to open up your music files and play them

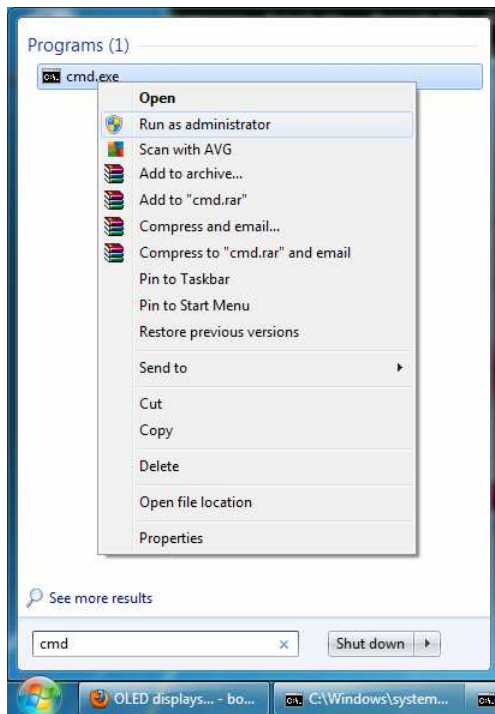
5. Windows Uninstall Procedure

This text applies if you have installed an UAC2 ASIO driver from before 2013-02-11. If you already have that version successfully installed, or if you have no UAC2 ASIO driver installed, you may safely ignore this section.

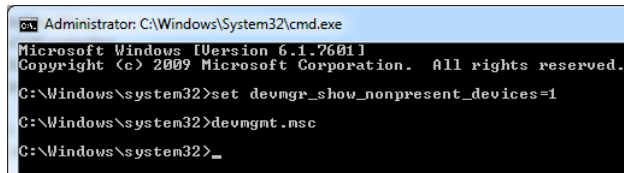
1. Unplug USB DAC 128 / AB-1.2 from your computer
2. Uninstall Audio-Widget in Start menu or C:\Program Files (x86)\Audio-Widget



3. Open the Start menu and type in "cmd". On the icon on top, right-click and choose "Run as Administrator". Click "OK" in the User Account Control window.



4. At the command prompt, type in "set devmgr_show_nonpresent_devices=1" and press Enter. See next picture.
5. On the next command prompt line, type "devmgmt.msc" and press Enter. This will launch the Windows Device Manager Console.

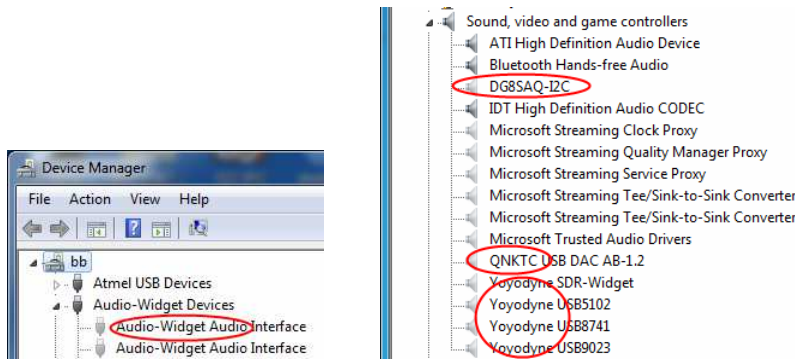


6. In the Device Manager Console, from the View menu, select "Show Hidden Devices".



7. Search under tabs for "libusbK USB Devices", "Sound, video...", "Audio-Widget...", "UAC2..."

Under all those tabs, delete and uninstall all drivers and anything resembling:
 "Audio-Widget", "SDR-Widget", "DG8SAQ", "QNKTC", "Henry Audio", "Yoyodyne", "UAC2"



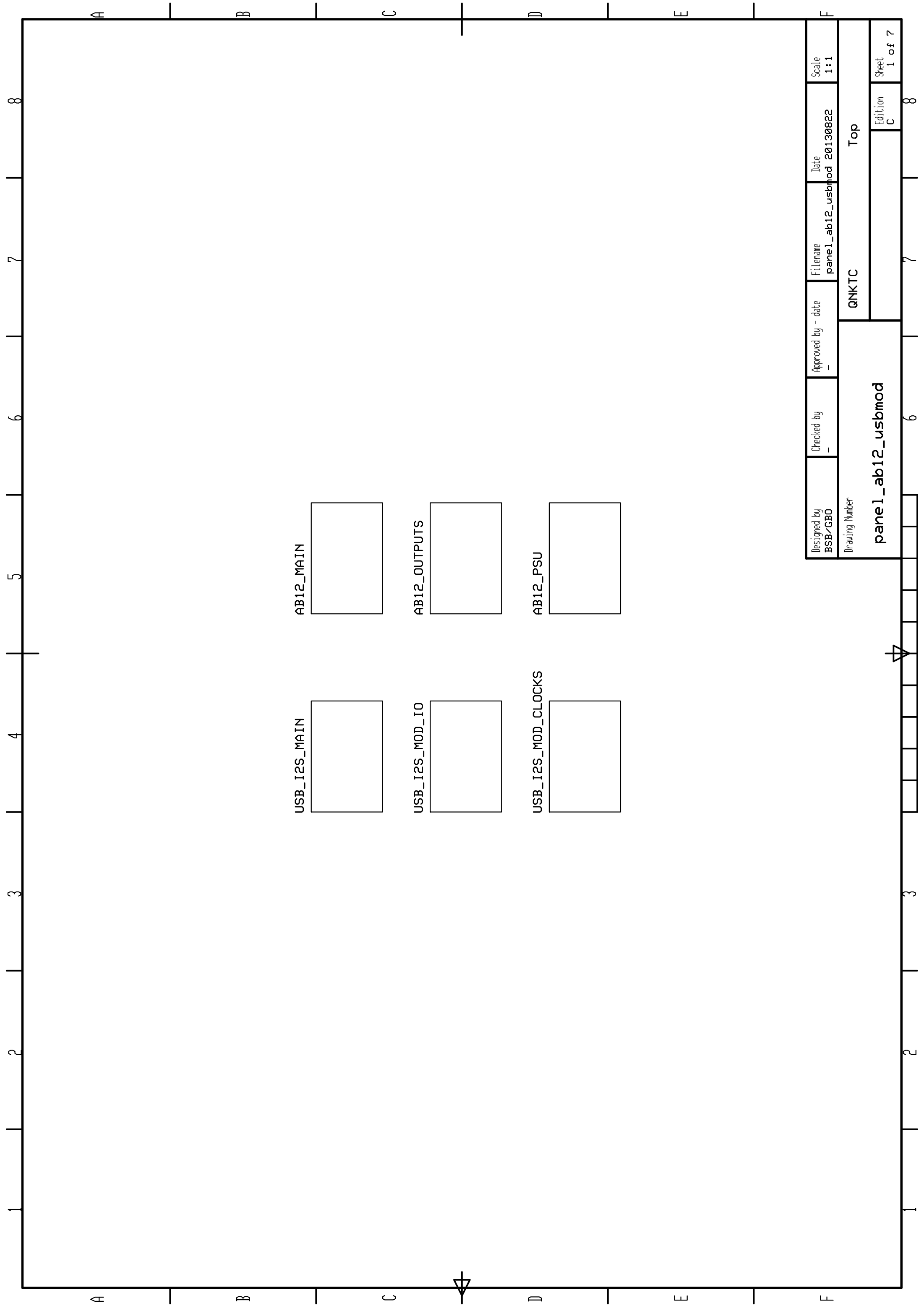
8. You should now be ready to install the new fresh version of the drivers as shown in the previous section.

6. Schematic Files

The schematics of the USB DAC 128 / AB-1.2 are appended to this document. They are part of the open source Audio Widget project.

ASIO is a trademark and software of Steinberg Media Technologies GmbH.





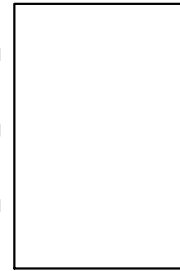
USB_I2S_MAIN



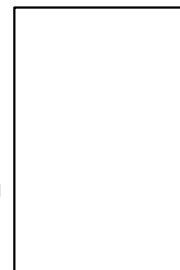
AB12_MAIN



USB_I2S_MOD_IO



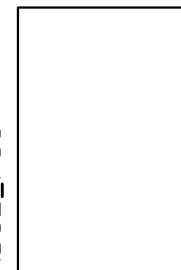
AB12_OUTPUTS



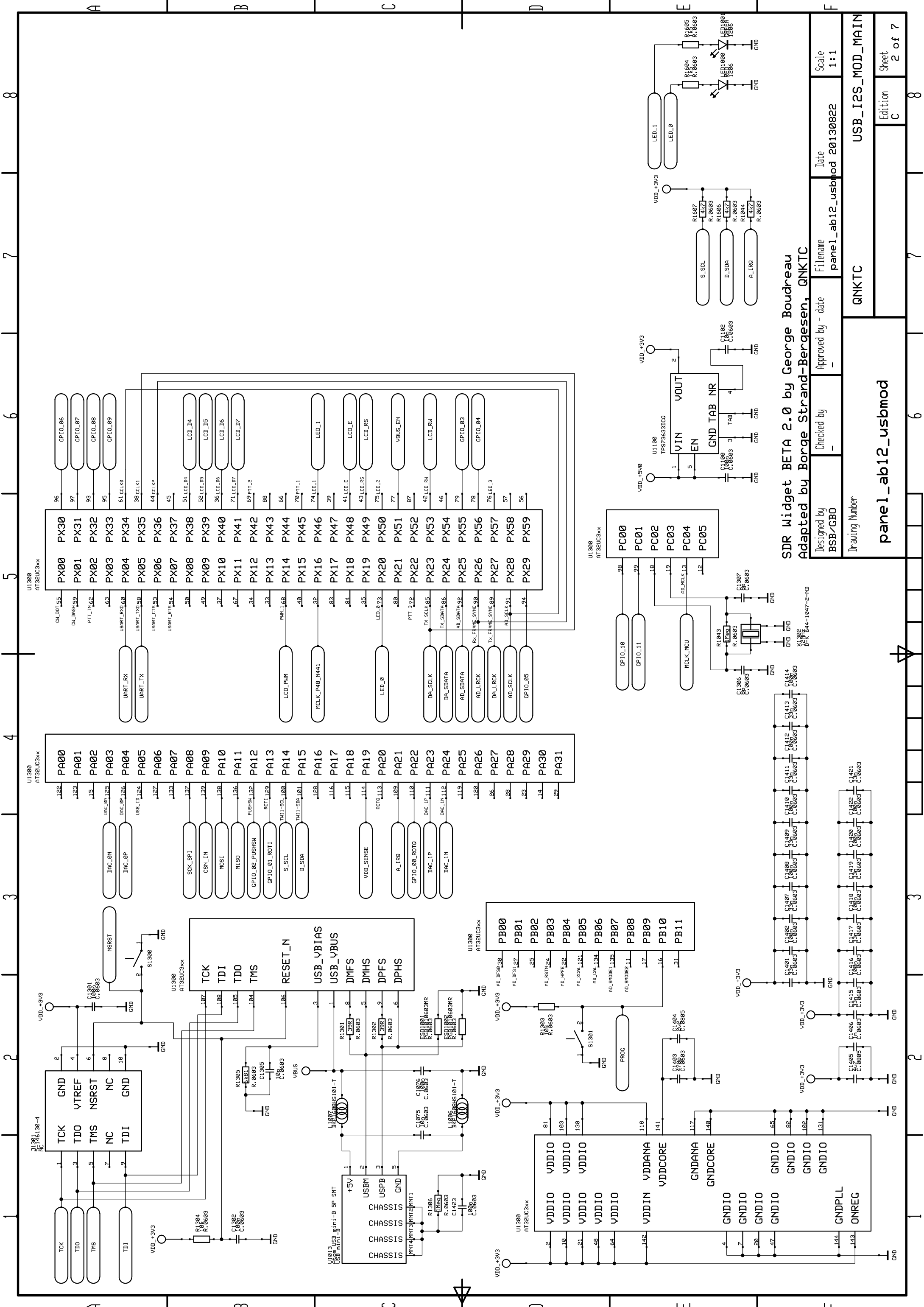
USB_I2S_MOD_CLOCKS



AB12_PSU

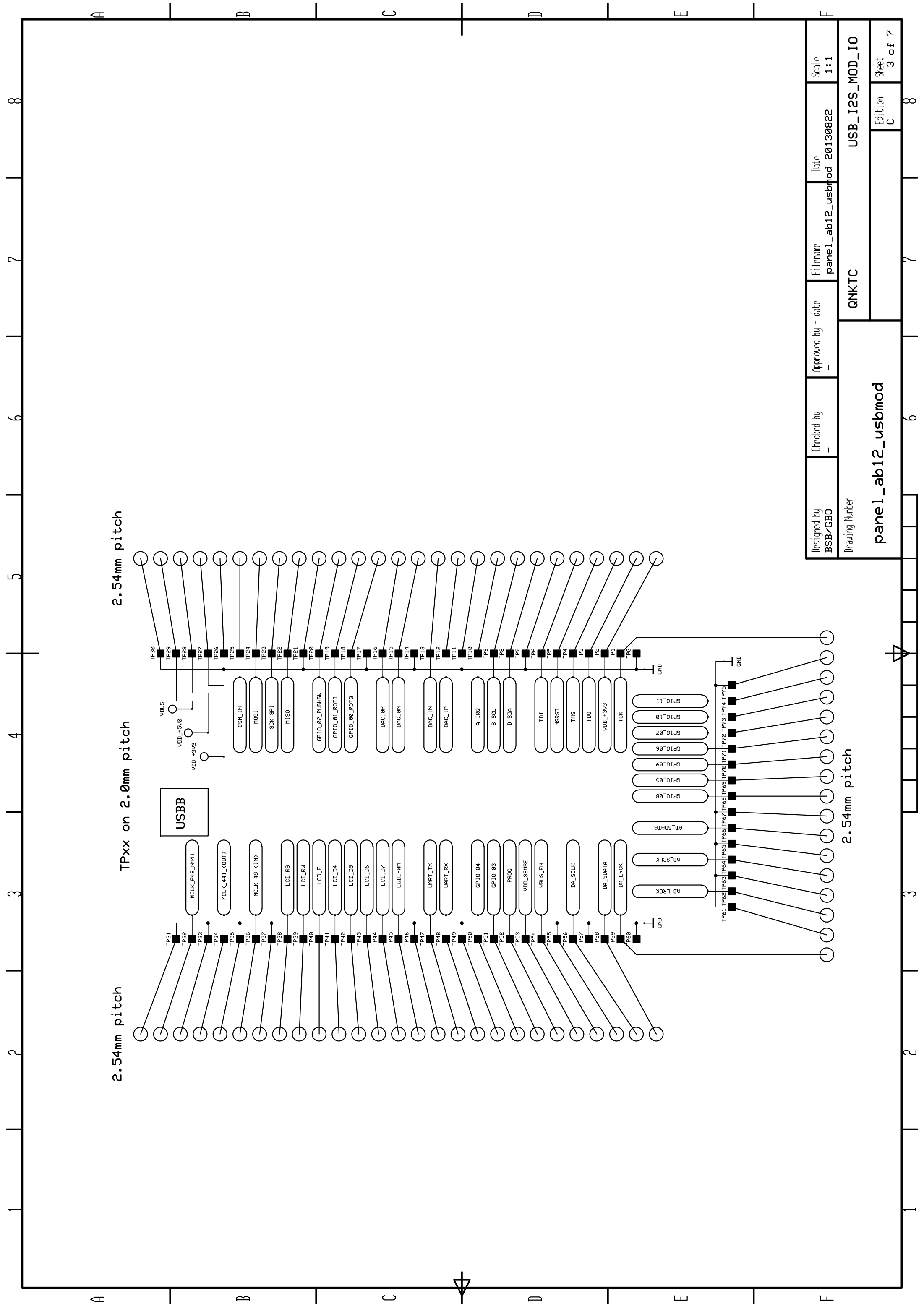


Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			Top		
			Edition C	Sheet 1 of 7	



SDR Widget BETA 2.0 by George Boudreau
 Adapted by Borge Strand-Bergesen, QNKTC

Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			QNKTC		
			Edition C		
			Sheet 2 of 7		



2.54mm pitch

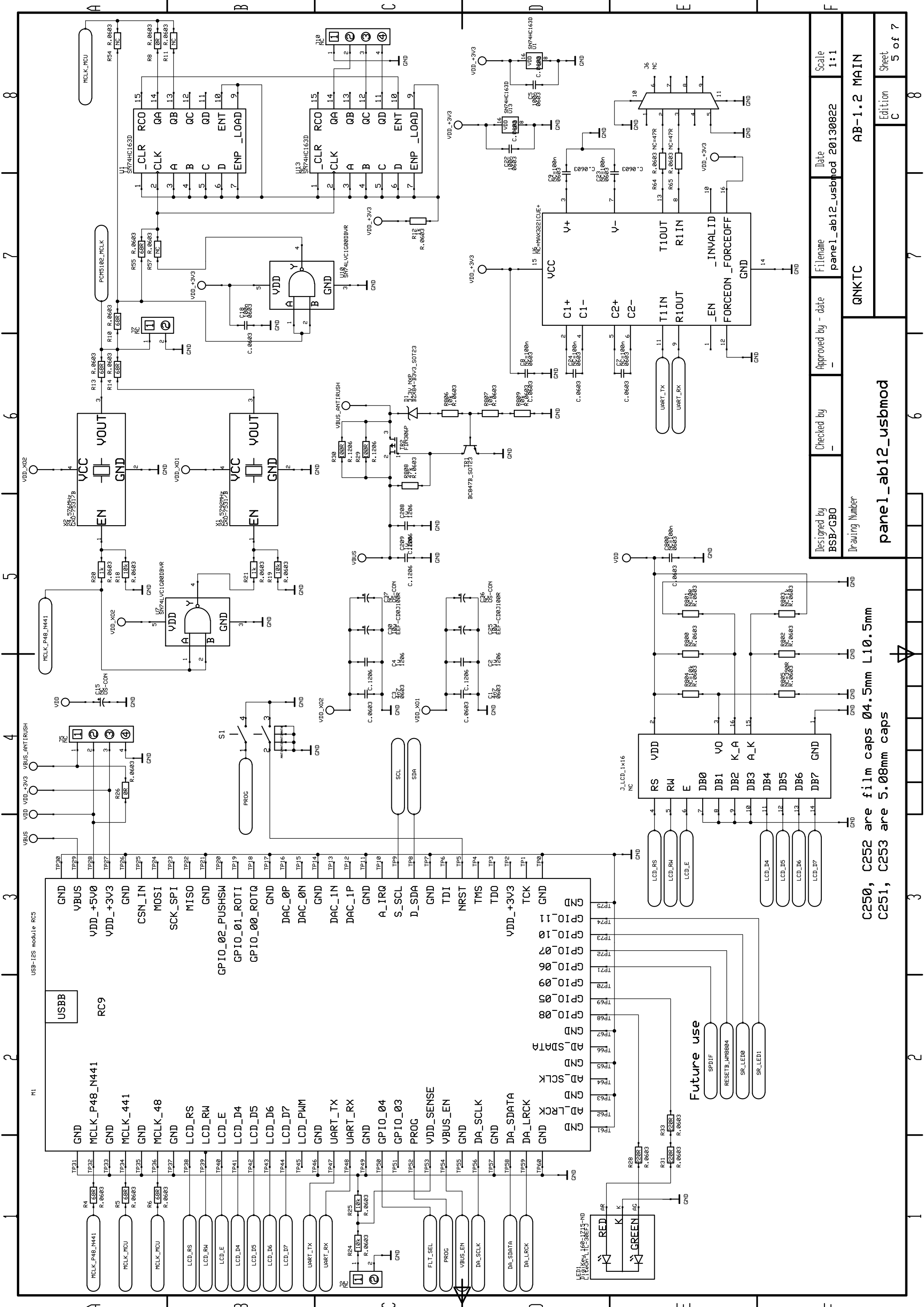
TPxx on 2.0mm pitch

2.54mm pitch

2.54mm pitch

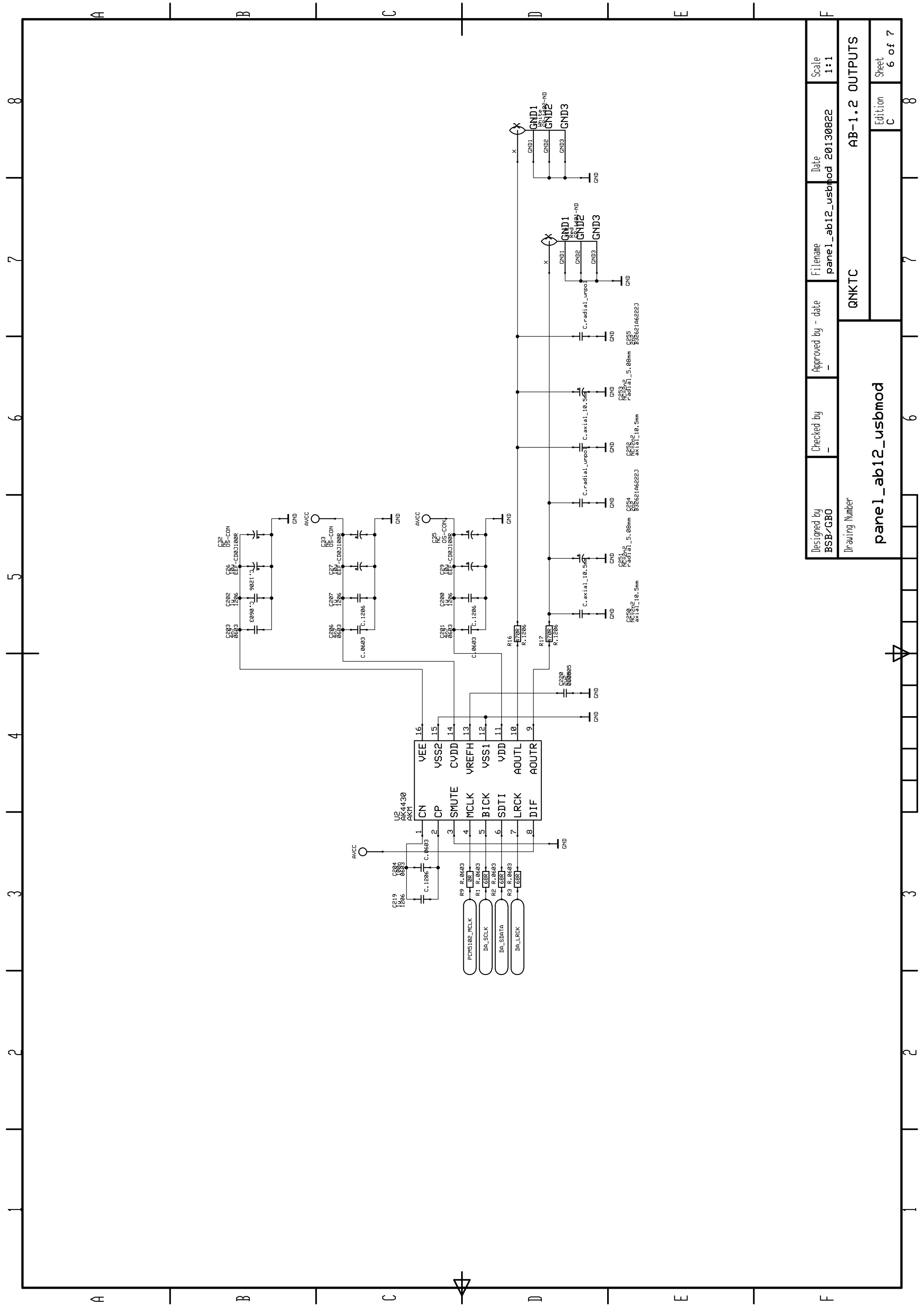
Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			QNKTC		
Edition C			Sheet 3 of 7		

USB_I2S_MOD_IO

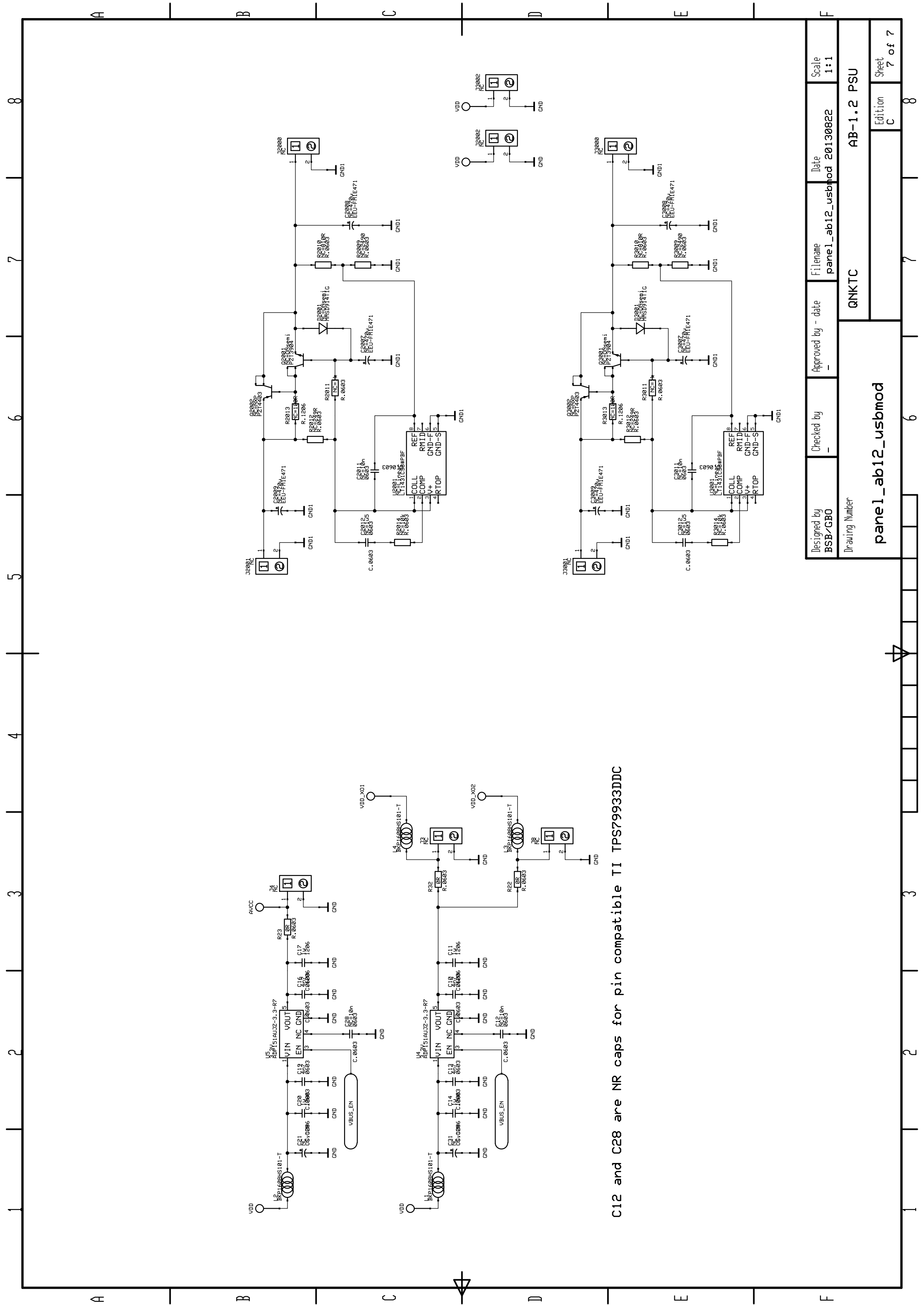


C250, C252 are film caps 04.5mm L10.5mm
 C251, C253 are 5.08mm caps

Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			QNKTC		
			AB-1.2 MAIN		
			Edition C		
			Sheet 5 of 7		



Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			QNKTC		
AB-1.2 OUTPUTS			Edition C		
Sheet 6 of 7			8		



C12 and C28 are NR caps for pin compatible TI TPS79933DDC

Designed by BSB/CBO	Checked by -	Approved by - date -	Filename panel_ab12_usbmod	Date 20130822	Scale 1:1
Drawing Number panel_ab12_usbmod			QNKTC		
AB-1.2 PSU			Edition C		
7 of 7			Sheet 7 of 7		

