xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform Hardware Manual

IN THIS DOCUMENT

The xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform is a complete hardware and reference software platform targeted at high resolution stereo DAC and Headphone Amplifier applications.

The platform hardware is based around the XHRA-2HPA xCORE-AUDIO processor; an xCORE-AUDIO device with an integrated High Speed USB 2.0 PHY. The xCORE-AUDIO HiRes-2 DAC/HPA platform supports a high speed USB interface, streaming 2 output channels of bit-perfect audio at up to 384kHz. Ideal for high resolution stereo DAC and headphone amplifier applications.

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XMOS

1 Features

The diagram below shows the key features of the xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform:

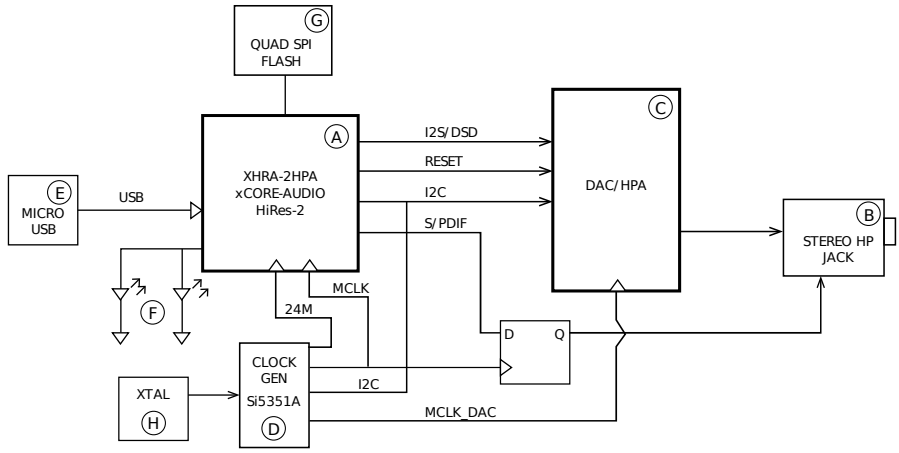

Figure 1: xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform block diagram

- A: xCORE-AUDIO (XHRA-2HPA) audio processing device
- B: Combined S/PDIF / stereo 3.5mm output jack
- C: 384kHz 32b audio DAC
- D: An ultra low-jitter programmable audio phase lock loop
- E: USB 2.0 micro-B jack
- F: Two general purpose LEDs
- G: 2MB Quad SPI flash memory
- H: 24MHz Oscillator

2 xCORE-AUDIO processor device

xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform is based on an xCORE-AUDIO device (XHRA-2HPA). The xCORE-AUDIO HiRes family includes 2-channel, 5.1 and 7.1 USB audio high resolution interfaces. Audio data from PC, Mac, smartphones and tablets can be streamed through the device to I2S, DSD and/or S/PDIF interfaces. Sample rates of up to 384kHz, and sample depths of up to 32 bits are supported.

For information on xCORE-AUDIO processors see the xCORE-AUDIO High Resolution Audio for Consumer Products[1].

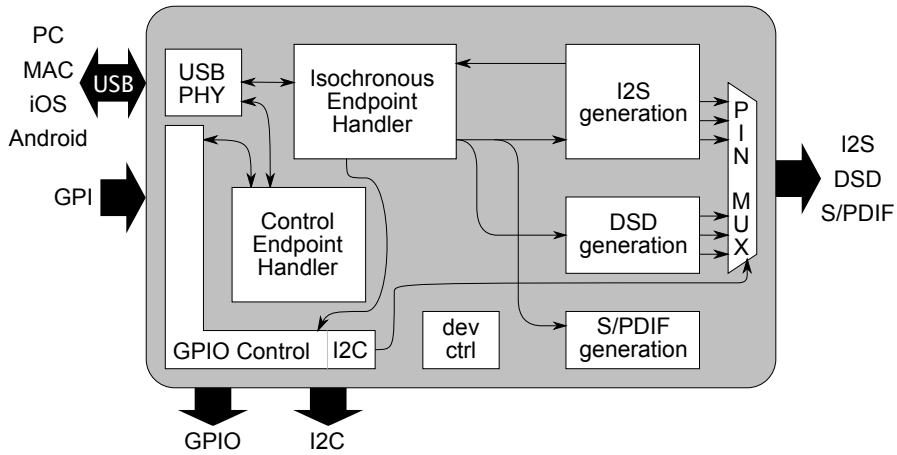

Figure 2: xCORE-AUDIO device

[1] https://www.xmos.com/products/silicon/xcore-audio

3 Analog audio output

Two single-ended analog output channels are provided. Each is fed from an ESS 9018Q2C DAC. The analog output uses a combined DLT13M1 connector.

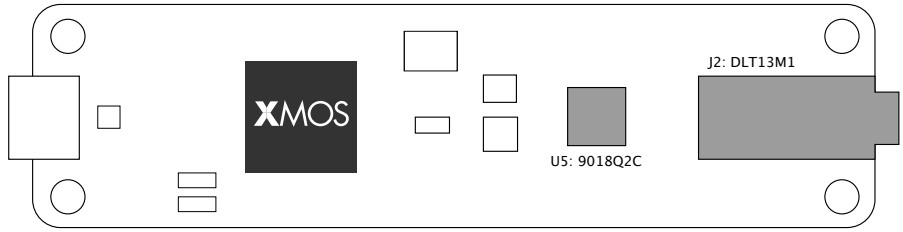

Figure 3: Analog audio output

4 Digital audio output

An optical digital audio transmitter is provided to enable digital audio output in IEC60958 consumer mode (S/PDIF).

The data stream from the xCORE-AUDIO is re-clocked using the external master clock to synchronize the data into the audio clock domain. This is achieved using a simple external D-type flip-flop.

The optical output uses a combined DLT13M1 connector.

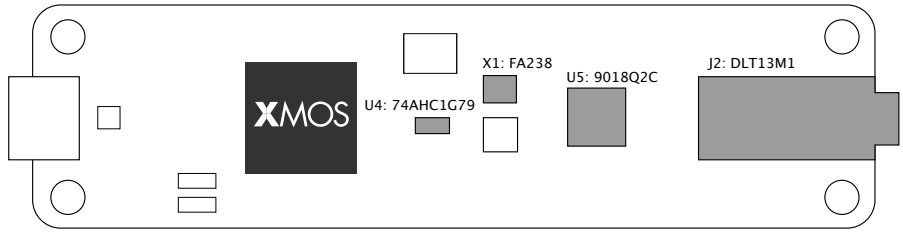

Figure 4: Optical audio output

5 Audio clocking

A flexible clocking scheme is used for the xCORE-AUDIO processor and audio paths.

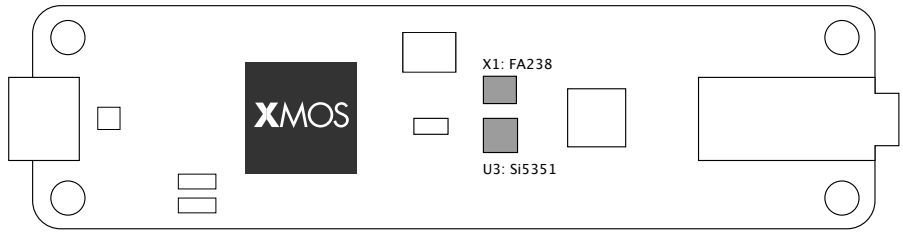

Figure 5: Clocking circuit

To accommodate a multitude of clocking options, the low-jitter master clock is generated locally using a frequency multiplier PLL chip. The chip used is a Silabs 5351A, which is pre-programmed to provide a 24MHz clock as a main processor clock to the xCORE-AUDIO device, and either a 24.576 MHz or 22.5792MHz for the audio path.

The Silabs 5351A device is controlled using I2C interface operating at 100KHz. See the XHRA-2HPA datasheet for further information on the I2C bus.

6 USB Connectivity

The xCORE-AUDIO HiRes-2 DAC/HPA platform includes a micro-USB Type B connector for digital connections to devices running Windows, Mac OS X, iOS and Android.

The figure below shows the layout of the USB subsection:

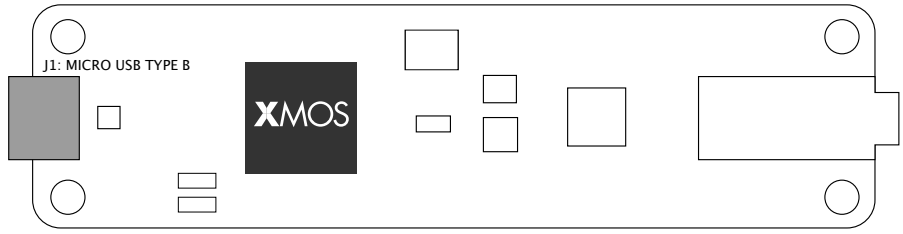

Figure 6: USB section

The connector is connected to the XHRA-2HPA device, which incorporates a dedicated USB 2.0 PHY device.

7 General purpose user interface

Two green LEDs are provided for general purpose user interfacing. See the XHRA-2HPA datasheet for further information on accessing user GPIO. The default firmware of this hardware platform uses D3 LED for USB connected status and D2 LED for audio stream active status.

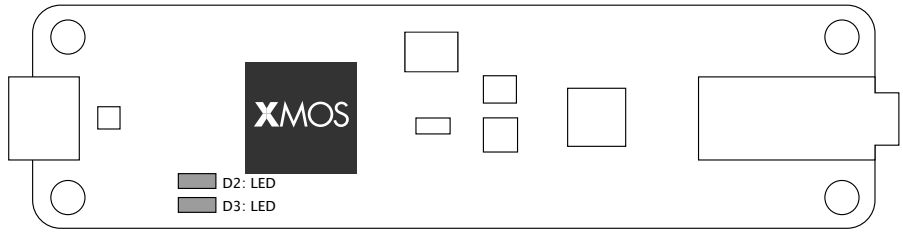

Figure 7: User LEDs

8 Quad SPI Flash Memory

A 2MByte Quad SPI flash memory is provided to store xCORE-AUDIO device firmware binary and configuration information. Configuration information includes the USB Vendor and Product Identification (VID/PID), serial number, and GPIO and I2C control commands. See Appendix A.2 of the XHRA-2HPA datasheet for further information.

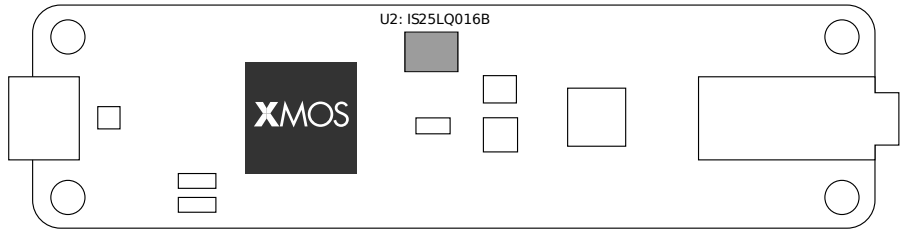

Figure 8: Quad SPI Flash

9 Power connector

The xCORE-AUDIO HiRes-2 DAC/HPA Platform has a 5V power source input via the micro-USB cable.

The voltage is converted by the on-board regulator to the 1V and 3V3 supplies used by the components. A separate ultra low-noise 3V3 voltage regulator is used to power up the analog part of the DAC.

10 Operating requirements

This product is, like most electronic equipment, sensitive to Electrostatic Discharge (ESD) events. Users should operate the xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform with appropriate ESD precautions in place.

11 Dimensions

The xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform dimensions are 20x75mm. The mounting holes are 2mm in diameter.

12 xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform schematics

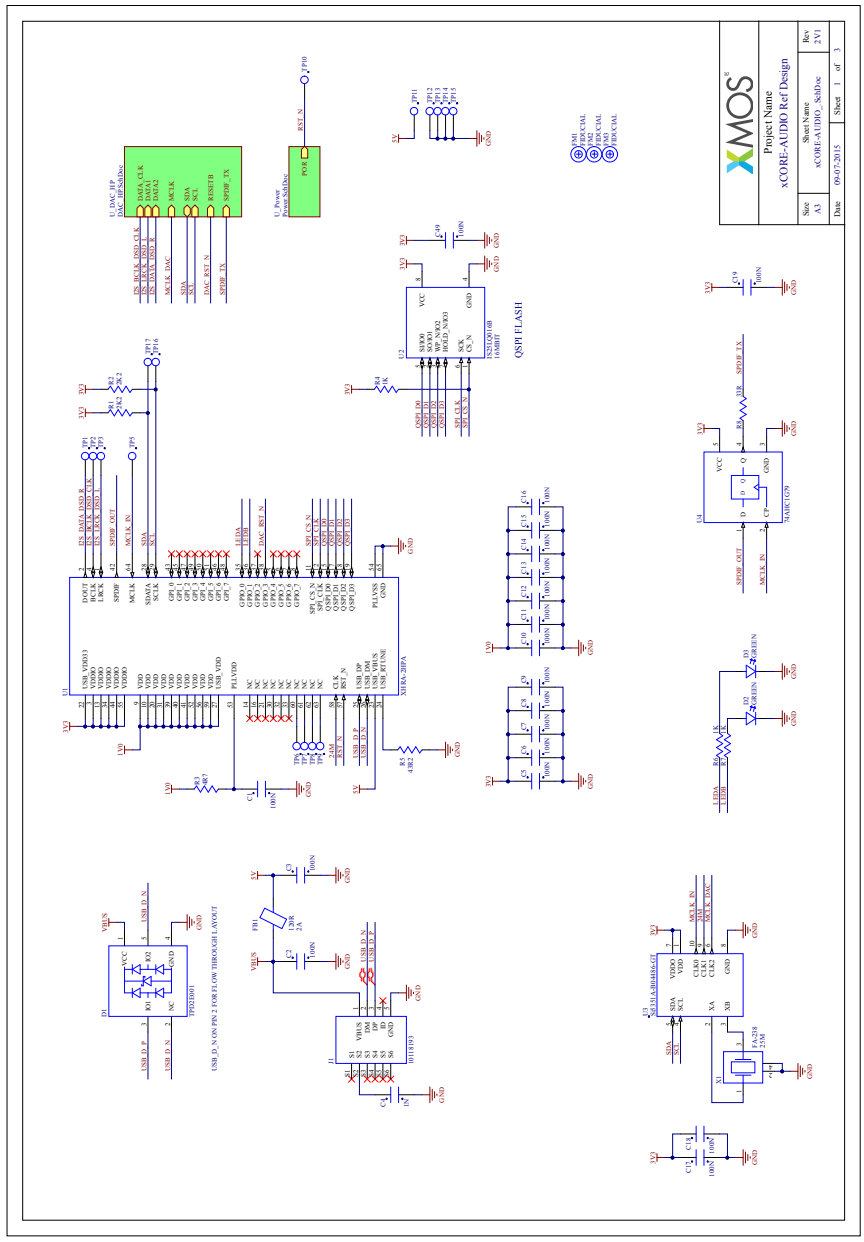

Figure 9: xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform schematic (1 of 3)

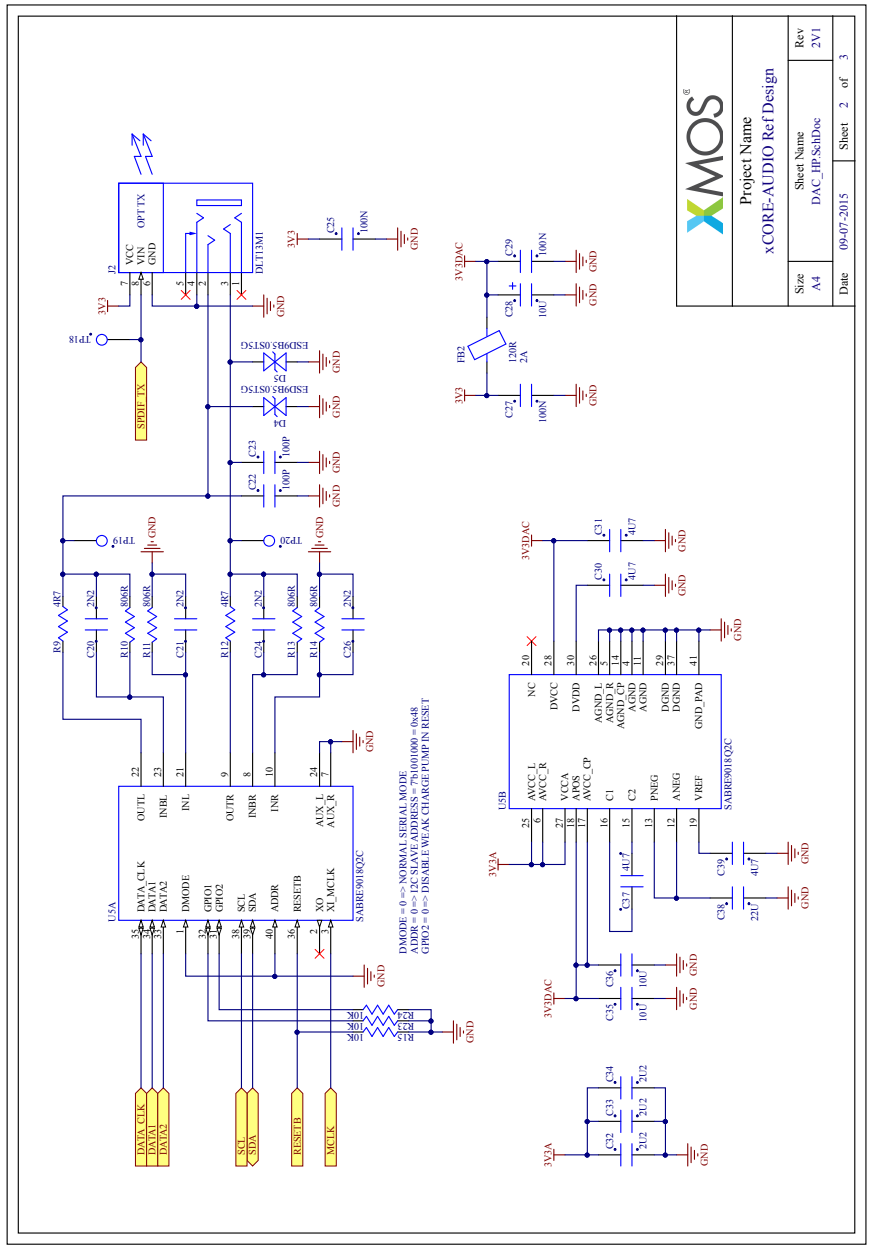

Figure 10: xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform schematic (2 of 3)

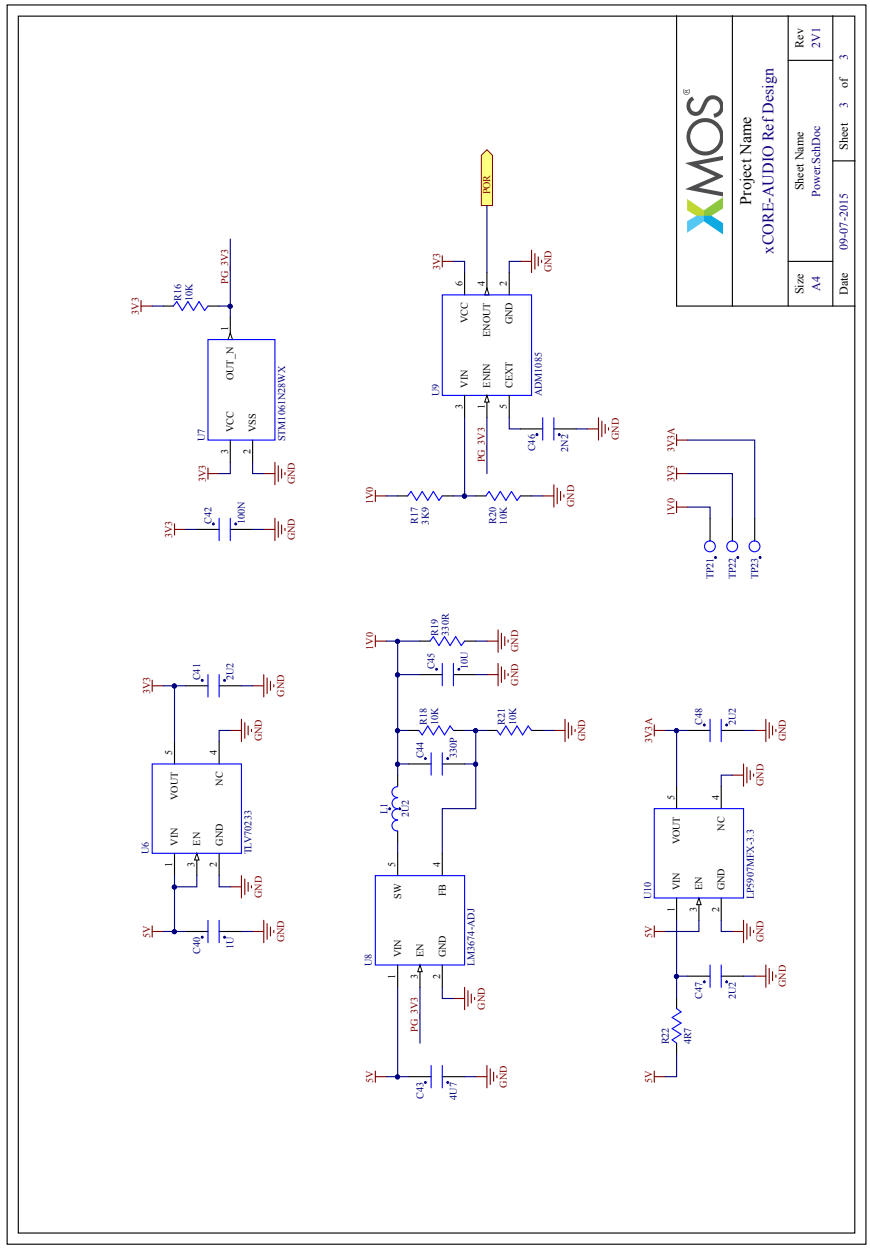

Figure 11: xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform schematic (3 of 3)

13 RoHS and REACH

The xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform complies with appropriate RoHS2 and REACH regulations and is a Pb-free product.

The xCORE-AUDIO HiRes-2 DAC/HPA Reference Platform is subject to the European Union WEEE directive and should not be disposed of in household waste. Alternative requirements may apply outside of the EU.