XMOS USB System Requirements Guide

Version 0v1

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1   Summary

This document outlines the USB system requirements for products based on XMOS XS1-L family devices utilizing the XMOS USB Device (XUD) Driver component (version 1V0 or later), and products based on the XMOS USB Audio Class 2.0 (UAC2) reference designs.

This document also covers limitations in the following XMOS reference designs, that arise from UAC2 behaviors:

- XMOS UAC2 Reference Design (version 3V0 or later) running on an XS1-L1 or XS1-L1-THS (-C5 speed grade only)

- XMOS UAC2 Multi Channel Reference Design (version 5V0 or later) running on an XS1-L2 or XS1-L2-THS (-C5 speed grade only)

This document does not apply to any USB or USB audio products based on the XS1-G series of devices.

2   XUD USB System Requirements

2.1   Clock Speed and Thread Speed

The XS1-L XUD component runs in a single thread which must run at a minimum of 80 MIPS. Additionally, the minimum system clock speed at which XUD is operational is 400MHz.

For example, a -C5 device (running at 500MHz) that has 6 active threads meets the requirements, but a -C5 device running 7 threads does not.

Likewise, a -C4 device that has 5 active threads would meet the requirements, but a -C4 device running 6 threads would not.

2.2   High Speed Hubs

XUD operates correctly when connected via up to three HS hubs. Operation downstream from more than three HS hubs chained together is not supported.

2.3   Host Chipsets

Old PC chip sets often have USB controllers which are not fully compliant with the latest UHCI, OHCI and EHCI specifications and may cause interoperability problems with XUD.

Based on a review of common PC chipsets (http://en.wikipedia.org/wiki/List_of_Intel_chipsets), XMOS recommends that XUD is not used with computers introduced before January 2006.

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3   USB Audio Class 2.0 System Limitations

The XMOS USB Audio Class 2.0 (UAC2) Reference Designs based on the XS1-L1 and XS1-L2 devices have additional USB related requirements/limitations because of the real-time nature of streaming audio and its use of the isochronous transfer type, and the interaction with the driver.

3.1   XS1 Device Speed Grades

Both UAC2 reference designs are only tested by XMOS using C5 speed grade parts and therefore the reference designs do not directly support the use of C4 speed grade devices. However it is possible to derive alternative designs using a cut down feature set from the UAC2 Reference Designs which will run on a C4, but these need to be designed and tested on a case by case basis.

3.2   Full Speed (FS) operation

The XMOS Multichannel USB Audio 2.0 (XS1-L2 based) product always operates in HS mode, and utilizes the EHCI controller in the host.

Only the XMOS USB Audio 2.0 (XS1-L1 based) reference design is capable of FS operation. If enabled for UAC2 when connected to a FS hub, it will fall back to UAC1, FS mode. Alternatively the reference design can be forced to always run in UAC1 mode.

3.2.1   FS Operation with UHCI and OHCI Host Controllers

Topologies which have a FS Hub connected directly to the host controller are not supported by the UAC2 reference Designs. Topologies involving up to three hubs are supported as long as the host controller is not directly connected to a FS hub.

When an FS Hub is connected directly to the FS UHCI or FS OHCI host controller, there may be problems with SOF timing. These SOF problems originate in the FS hub and cause some SOFs to be issued very close together. Isochronous streaming audio relies upon precise SOF timing, so streaming audio is rendered unusable.

This problem does not arise if the XMOS UAC2 Reference Design (XS1-L1) operating in UAC1 mode is directly connected to the host controller. It also does not arise when operating in FS (UAC1) mode via a HS hub which is directly connected to the

host (which would activate the EHCI host controller rather than the UHCI or OHCI host).

3.3   Plugging and Unplugging Coexisting Devices

Plugging in and unplugging the coexisting devices may result in momentary glitches.

3.4   File Transfers and High Bandwidth Coexisting Devices

Bulk transfers from devices such as memory sticks or isochronous streams from devices such as webcams connected to the same hub as the XMOS USB Audio 2.0 product, can cause glitches when coexisting with streaming audio. Simultaneous operation of streaming audio and other high bandwidth transfers from the same hub is therefore not supported.

3.5   USB 3.0

Use of the UAC2 Reference Designs with USB 3.0 ports is not supported.

When a high-speed USB 2.0 device is plugged into a USB 3.0 port (blue socket) it is connected to a USB 3.0 xHCI controller. At this time Microsoft has not yet released an xHCI driver stack and insteadaA third party bus driver such as the NEC/Renesas driver will be installed on the host PC. However, there are quite a number of third party bus drivers and at this time XMOS does not test against any of them.

3.6   Drivers

A suitable UAC2 compliant driver is available in MacOS X 10.6.4 and higher.

XS1-L1-THS or XS1-L2-THS parts come with a UAC2 compliant driver against which the parts and the UAC2 reference designs are fully tested by XMOS. The User Manual for this driver is entitled *TUSBAudio User Manual* and is available as part of the Thesycon driver package from the XMOS website.

Otherwise, for Windows platforms a UAC2 compliant driver must be installed. The Theyscon TUSB driver can be used for this purpose or an alternative UAC2 compliant driver can be used. Both the TUSB driver and other UAC2 drivers have their own system requirements which must be taken into account. For the TUSB driver, these requirements are detailed in the TUSB User Guide.

4   Testing Guidelines

The XMOS USB Audio 2.0 reference designs have been tested under the following configurations:

1. Intel PC running Windows XP(SP3) with Theyscon TUSBAudio UAC2 Class Driver installed, utilizing native WDM and ASIO.

2. Intel PC running Windows Vista with Theyscon TUSBAudio UAC2 Class Driver installed, utilizing native WDM and ASIO.

3. Intel PC running Windows 7 with Theyscon TUSBAudio UAC2 Class Driver installed, utilizing native WDM and ASIO.

4. AMD PC running Windows 7 with Theyscon TUSBAudio UAC2 Class Driver installed, utilizing native WDM and ASIO.

5. Mac Mini running MacOS X 10.6.5. MacOS X 10.6.4 is also supported.

6. Goldtree style interoperability testing utilizing up to 3 HS and FS hubs and coexisting devices

Please refer to the XMOS Reference Design release notes to determine which version of the TUSBAudio driver has been tested against any given release.

XMOS supports all the defined use modes (for which please see the reference design documentation) of its UAC2 reference designs in the tested configurations above. Substantially different configurations of either the reference design (including modifications or untested combinations of build options) or the host platform must be fully tested by the customer.

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