Demo3 – USB 3.0 Host System Selection

Is your PC up to speed?

Introduction

Aptina's Demo3 interface board uses USB 3.0 ("Super Speed" USB) to provide improved performance over its predecessor. Since this technology is roughly 10 times faster than previously used on the Demo2/2X, the host system requirements have changed. This presents Demo3 users with new considerations when selecting a desktop or laptop system. This document will discuss options for new equipment purchasers or those attempting to upgrade their existing systems.

Background

To fully realize the performance of the Demo3, it must be attached to a computer that contains a USB 3.0 host controller. USB 3.0 was a relatively young technology at the launch of Demo3 (mid-2012). The availability of integrated USB 3.0 hosts was sparse, but has increased steadily. For now, it is necessary to characterize system support of USB 3.0 (and subsequently Demo3) into the following categories:

- **Integrated** – A USB 3.0 host controller is provided by the system motherboard, either incorporated into the chipset or via a dedicated part. Users in need of new systems should consider this route.

- **Add-in (compatible)** – The system will accept an add-in card that provides the USB 3.0 host. Users wishing to upgrade their existing machines should consider this option.
    - Desktops – Typically, a free PCI Express (PCIe) x1 slot is required. The slot must be complaint with the PCIe 2.0 specification (sometimes referred to as Generation 2 or Gen2).
    - Laptops – An ExpressCard slot is required. The slot must be compliant with the ExpressCard 2.0 specification.

- **Add-in (limited functionality)** – Some machines may physically accept the add-in solutions, but do not meet the specification requirements. So for example, an older desktop with PCIe 1.0 compliant slots will only operate the USB 3.0 adapter card at half-speed. This is not a recommend option and should only be considered as a temporary solution. Users should be aware of the following points and decide accordingly:
    - Pros – Faster than USB 2.0 speed. More available bus power to the device, 900mA vs. 500mA.
    - Cons – Half of USB 3.0 speed. Timing critical issues may be hidden. Not supported, the Demo3 Team will not be able to fix any problems specifically arising from this usage.

- **Incompatible** - Legacy systems incapable of accepting adapter cards **or** systems that have compatibility issues with the Demo3.

  As this technology matures and is widely adopted, we expect this to be less critical to track.

Desktop System Compatibility

The following table lists the level of USB 3.0 support available from various desktop systems tested by the Demo3 Team. This data is subject to change and was last audited: 7/31/2014.

Desktop/Motherboard Model	Compatibility Type/Status	Notes
Dell Precision 380	**Add-in (limited functionality)**	Gen1 PCIe slots.
Dell Precision 390	**Add-in (limited functionality)**	Gen1 PCIe slots.
Dell Precision 490	**Add-in (limited functionality)**	Gen1 PCIe slots.
Dell Precision T3400	**Add-in (limited functionality)**	Gen1 PCIe slots.
Dell Precision T3500	**Add-in (compatible)**	Gen2 PCIe slots. Recommended system BIOS updated to Rev A11 or higher.
Dell Precision T3600	**Integrated**	NEC/Renesas µPD720200
Gigabyte GA-X58A-UD7 Rev2.0	**Integrated**	NEC/Renesas µPD720200
Gigabyte GA-P67A-UD3-B3	**Integrated**	NEC/Renesas µPD720200A
Intel DZ68DB	**Integrated**	NEC/Renesas µPD720200

Laptop System Compatibility

The following table lists the level of USB 3.0 support available from various laptop systems tested by the Demo3 Team. This data is subject to change and was last audited: 7/31/2014.

Laptop Model	Compatibility Type/Status	Notes
Alienware M17x R4	**Integrated**	Intel 7-Series chipset, Demo3 needs to be updated to E.106/E.20B boot/firmware or later. Additionally, a USB 3.0 hub w/external power will need to be connected between the laptop and Demo3. Direct connection may limit the Demo3 to USB 2.0 bandwidth since the onboard ports do not seem to supply enough power.
Apple MacBook Pro (15" Retina)	**Integrated**	Intel 7-Series chipset, Demo3 needs to be updated to E.106/E.20B boot/firmware or later. Note: System tested had pure Win7 installed, Boot Camp Win7 should also work. Native OSX or virtualized environments (VMware, Parallels, etc.) are not supported at this time.
ASUS G51J Series	**Incompatible**	USB2.0 and CardBus, cannot be updated.
ASUS G73JW Series	**Incompatible**	Fresco Logic FL 1000G incompatible with Demo3. No ExpressCard slot.
Dell E6400	**Integrated**	NEC/Renesas µPD720200A
Dell Latitude D620	**Incompatible**	USB2.0 and CardBus, cannot be updated.
Lenovo ThinkPad T420s	**Integrated / Not Recommended**	NEC/Renesas µPD720200A This system has shown streaming failures using some products - not recommended.
Lenovo ThinkPad T430	**Integrated**	Intel 7-Series chipset, Demo3 needs to be updated to E.106/E.20B boot/firmware or later.
Lenovo ThinkPad W520	**Integrated / Not Recommended**	NEC/Renesas µPD720200A This system has shown streaming failures using some products - not recommended.
Lenovo ThinkPad W530	**Integrated**	Intel 7-Series chipset, Demo3 needs to be updated to E.106/E.20B boot/firmware or later.
MSI GT70	**Integrated**	Intel 7-Series chipset (HM77), Demo3 needs to be updated to E.106/E.20B boot/firmware or later.
MSI GT783R	**Integrated /**	NEC/Renesas µPD720200A

	Not Recommended	
Sony VPCF215FX/BI	**Integrated /** **Not Recommended**	NEC/Renesas µPD720200A

USB 3.0 Chip Vendors

The following section contains information regarding specific USB 3.0 chip vendors. Since it is impractical to test every combination of system & USB 3.0 host controller with the Demo3, this may give some general indication of compatibility when specific data does not exist.

AMD – Advanced Micro Devices Inc.

Working with Renesas, AMD added USB 3.0 support to their chipsets in 2011. This began with the A70M and A75 Fusion controller hubs (FCH). **Cypress Semiconductor has confirmed Demo3 functionality (exact model TBD).**

ASMediaTechnology Inc.

(http://www.cypress.com/?id=4&rID=58617)
Cypress Semiconductor has documented issues with the ASM104x using driver version 1.14.1.0. They recommend downgrading to the driver version 1.10.1.0 when using FX3 based devices. From the Demo3 Team's testing with HighPoint Technology's RocketU 1144A card, we have not seen this solution to work for the Demo3. **At this time** (7/31/2014) **we do not recommend solutions based off the ASMedia part.**

Fresco Logic Inc.

Early examples have shown to have compatibility issues with USB devices in general and specifically do not recognize the Demo3. Cypress Semiconductor has indicated from their testing that first generation Fresco Logic parts are not completely USB 3.0 compliant. Recent solutions have not been tested for improvement. **Fresco Logic based solutions are not recommended at this time** (7/31/2014)**.**

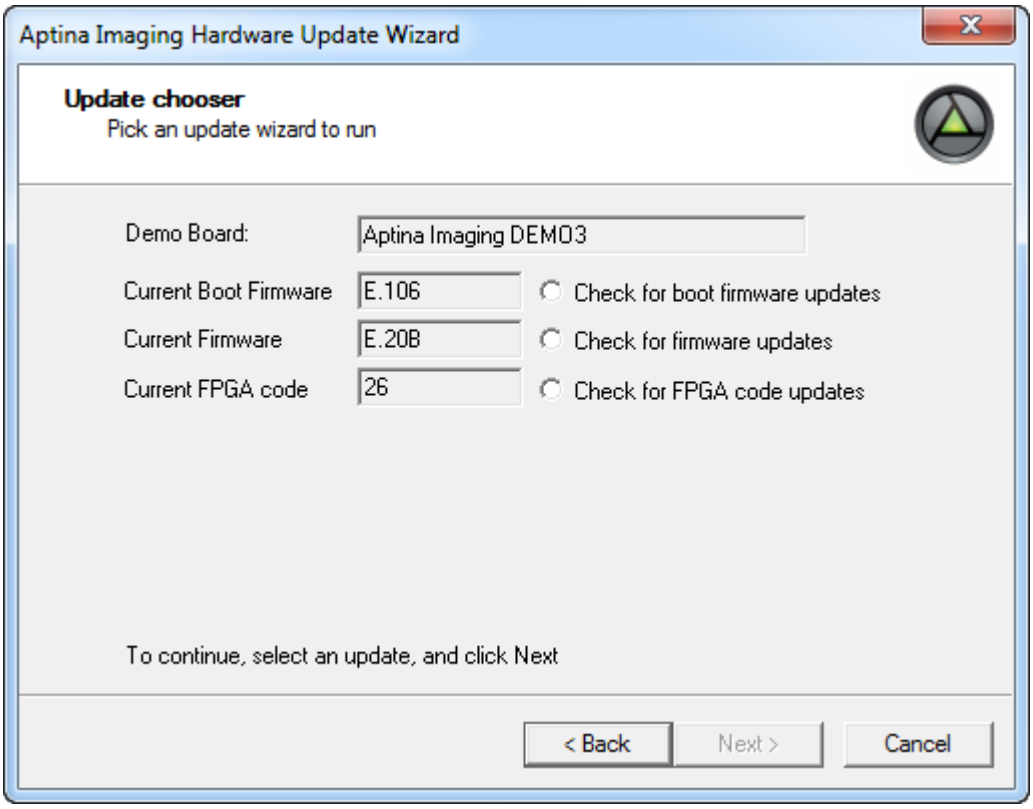
Intel Corporation

The 7 Series Chipset family is the first Intel chipset to integrate a USB 3.0 host controller. This is also the chipset that supports the Ivy Bridge family of CPUs (3rd generation Core Family) and was released in mid-2012.

Intel 7 Series Chipsets are recommended for use with the Demo3.

Tip: if a system contains a Core i7/i5/i3 3xxx series processor, then it uses a 7 Series Chipset.

Required: For proper operation with Intel 7 Series chipsets, the Demo3 needs to be running E.106 (boot firmware), E.20B (firmware), 26 (FPGA), or later. Use the HardwareUpdate Tool to check the current firmware loaded on the Demo3 and update the Demo3 if necessary. Note that newest available version will be displayed on the next dialog as each item is selected, and it may not match the versions listed here.



Ex. HardwareUpdate Tool listing Demo3 boot firmware, firmware and FPGA versions.

NEC/Renesas Electronics

(http://www.renesas.com/products/soc/usb_assp/index.jsp)
One of the initial USB 3.0 implementers on the market was NEC, after a merger this technology was marketed under the Renesas branding. Typically older drivers and software will reference the NEC name, while newer releases reference Renesas.

NEC/Renesas have had roughly a 1-1.5 year head start over every other manufacturer, so their solutions are most commonly available (although this will change over time as support moves to the chipset). As such, they have had the most development and maturity. Due to these stability factors, the bulk of Demo3 testing has been conducted with NEC/Renesas based USB 3.0 host adapters. There are 3 generations of NEC/Renesas parts:

1) µPD720200
2) µPD720200A
3) µPD720201 & µPD720202

These are recommended for use with the Demo3.

NEC/Renesas does not produce their own solution; they supply their USB 3.0 part to 3rd party motherboard and add-in adapter vendors. Most vendors just copy the reference design, so all the add-in adapters will appear approximately the same and are able to use a common driver. There is no one solution better than another and this allows flexibility in purchasing. Some known NEC/Renesas based add-in adapter models for reference (in no way comprehensive):

Brand	Model	Notes
Aluratek	AUPC100F	PCIe adapter
Buffalo	IFC-PCIE2U3	PCIe adapter
Inland	HOST Adapter Card (PCB reads “AC921_09691_3C”	PCIe adapter
Iomega	HBU-33NC	PCIe adapter
Iomega	USB 3.0 ExpressCard Adapter	ExpressCard adapter
LaCie	USB 3.0 PCI Express Card	PCIe adapter
LaCie	USB 3.0 ExpressCard34 For Laptop	ExpressCard adapter
Pluggable	PCIE-USB3-SP	PCIe adapter

VIA Labs, Inc.

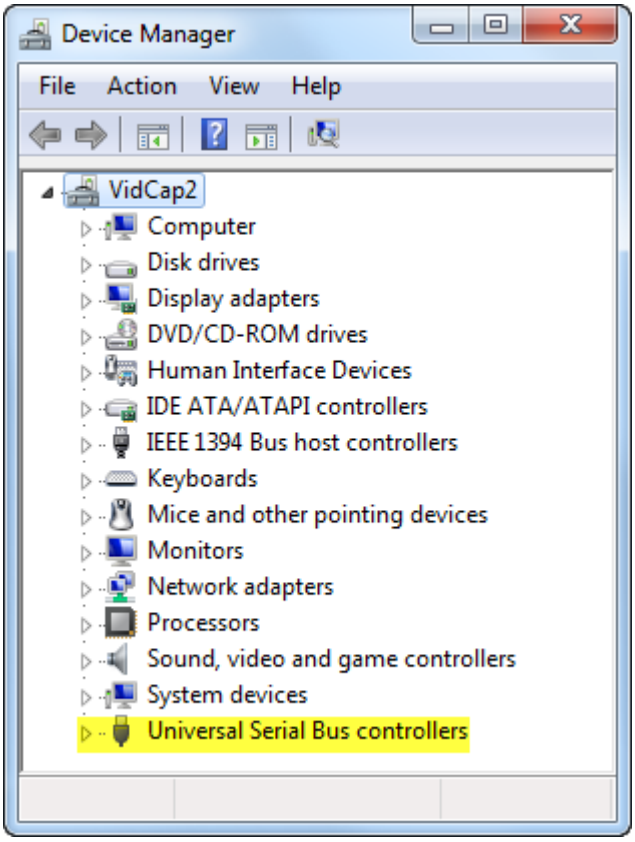
External hub and PCIe adapter card solutions using the VIA VL800 part have been tested in-house with the Demo3.
The VL800 is recommended for use with the Demo3.

Others

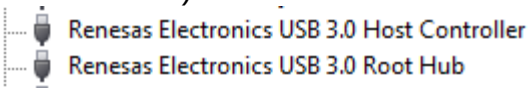
Nvidia, Texas Instruments, etc. are also known to be working on or have released USB 3.0 host controller solutions. Demo3 has not yet been tested with any of these.

USB 3.0 Chip Identification

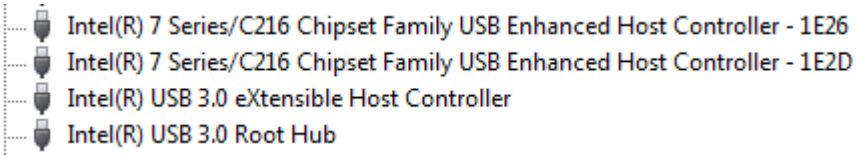
There are various techniques than can be utilized to determine what USB 3.0 chip is used on a system. The Windows Device Manager may provide some clues if a manufacturer does not specify and you have access to the system. At the bottom of the Device Manager expand the ***Universal Serial Bus controllers*** section:



Example from a Windows7 desktop machine, entries showing NEC/Renesas controller (in this particular case, built into the motherboard):

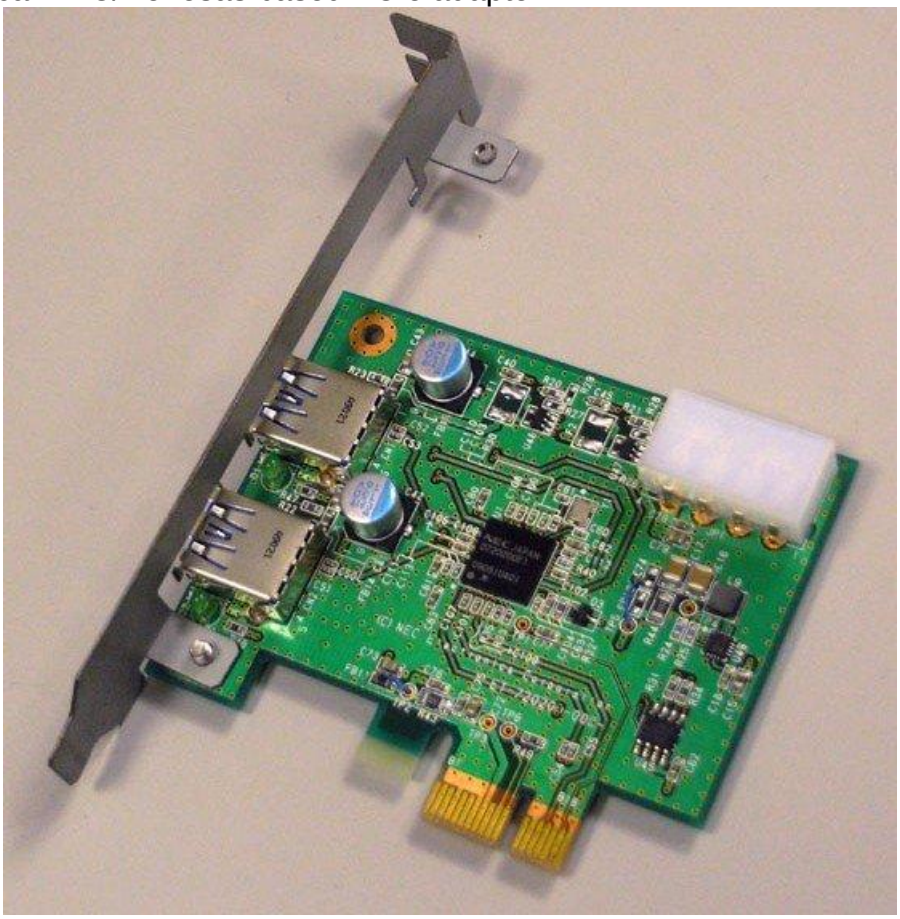


Example from a Windows 7 laptop, entries showing USB support from the Intel 7 Series chipset. The first two entries pertain to USB 2.0 portion, while last two entries pertain to the USB 3.0 portion:

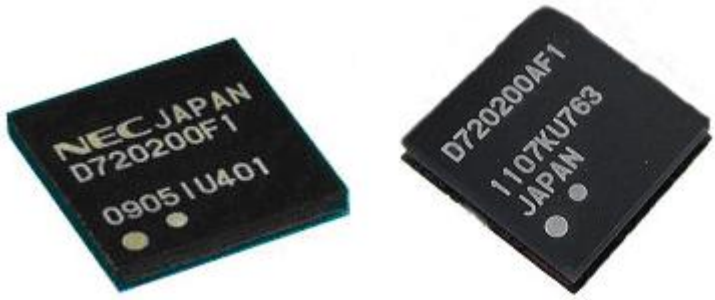


Alternatively, a visual inspection can confirm the USB 3.0 part. This will be simpler with add-in adapter cards and motherboard based solutions. Integrated laptop solutions will require disassembly.

Example of typical NEC/Renesas based PCIe adapter:



Close-up of 1st generation NEC/Renesas parts (µPD720200):



Questions and Comments

Please contact Email imaging_demo_bugs@aptina.com.

History

Initial document	9/7/2012
Minor edits and updates.	9/13/2012
Updates: 1) Change status of Intel Series-7 chipset compatibility 2) Added alternate 1st gen Renesas chip image.	10/08/2012
Updates: 1) Rewording *Background* section so it is less likely to get dated. 2) Changed all references to E.106/E.20B/26 (boot/FW/FPGA). - HardwareUpdate image - Recommended minimum for Intel 7 Series chipset usage 3) Additions to *Desktop/Laptop System Compatibility* tables.	4/3/2013
Removed internal references.	4/19/2013
Added note regarding unique Alienware M17x R4 usage case.	5/7/2013
Added VIA VL800 compatibility results.	5/22/2013
Not recommending systems with Renesas.	7/31/2014