USB LLD

Release Notes

Applies to Product Release: 01.00.00.19
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TEXAS INSTRUMENTS

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Contents

USB LLD version 01.00.00.19

Overview

This document provides the release information for the latest USB Low Level Driver which should be used by drivers and application that interface with USB and USB IPs.

USB LLD module includes:
- Compiled library (Big and Little) Endian of USB LLD.
- Source code.

LLD Dependencies

LLD and its examples are dependent on following external components delivered in PDK package:
- CSL
- Starterware (needed for AM437, AM335x)
- UART
- I2C
- OSAL
- Board
- Build
- Fatfs (for host mode MSC)
- MMCSD/emmc for examples that access MMCSD or eMMC

Release 1.0.0.19

o Add support for J721E SOC.

o Add BIOS/RTOS examples for USB host MSC, device mode MSC, and device mode bulk.

o USB3.0 support for USB host MSC.

o Add USB CDC for AM335x

Release 1.0.0.18

- o Add SMP examples for AM65xx
- o Use local linker files instead of those from build infrastructure, and match with new DMSC reserved area.

Release 1.0.0.17

- o Add USB bulk performance tool. USB bulk demo has been changed to supported the performance tool
- o Add USB3.0 host support for AM65xx. USB3.0 host testings are still in progress. Not claiming operational USB3.0 at the moment
- o Add USB bulk example for AM572 GP EVM
- o Remove debug_printf in debug build of the USB LLD.
- o Fix race condition involving the bulk state and the bulk semaphores
- o Update MSC device examples to soft-reset USB core and restart USB stack for AM335x device to fix bogus bulk-in transaction that causes failed MSC device re-enumeration
- o Fix audio lag problem during setting USB audio volume on AM335x.

Release 1.0.0.16

- o Fix MSC drive corruption in device mode when cable is unplugged/replugged on AM3
- o Fix USB device MSC drive re-enumeration on Windows
- o Add throughput benchmark tools for AM65x USB dev and host MSC
- o Add USB-eMMC device mode example for BeagleBoneBlack
- o Removed obsoleted USB_EPC registers in MUSB register map

Release 1.0.0.15

- o Add support for AM65xx and add USB MSC (host & device) and device bulk examples
- o Add USB generic USB bulk device demo for OMAP13xx
- o Add USB Dev MSC-EMMC example for AM572 EVM

Release 1.0.0.14

- o Updated buildlib.xs to add RULES_MAKE macro to support build based on custom Rules.make
- o Enable generic USB bulk application on all supported platforms (examples added for K2G, AM4, AM5, AM3)
- o Fix spurious interrupt on K2G USB device mode

Release 1.0.0.13

- o Add support for DRA7xx:
    1. A15 and M4 USB MSC host example projects;
    2. M4 USB MSC device mode example

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- o Organize all .txt project templates and RTSC cfg files to their appropriate sub directories

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- o Fix USB audio crash in AM335x

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- o Fix compilation error with BUILD_PROFILE=debug

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Release 1.0.0.12

- o Added USB MSC Baremetal example for OMAPL13x.
- o Added support for USB audio functionality for OMAPL13x DSP.
- o Added support for AM574x SoC.

Release 1.0.0.11

- o Added USB Dev MSC - MMCSD example for AM335x.

    (USB_DevMsc_mmcsd_evmAM335x_armExampleProject).

    Need MMCSD commit ID to work:
0b130debe6e0b2f2c73df21ecb0f3ee142f0a0a3

    Example has been tested with 32GB/64GB card formatted with FAT32 filesystem.

- Allow handling CPPI DMA interrupt from user application. This would allow handling of USB events in a task or a main loop outside of IRQ context

Release 1.0.0.10

- Added support for OMAPL137 & OMAPL138/C6748.
- Example project name update.

Release 1.0.0.9

- Format the 16MB drive in USB device example with FAT16.
- Fix USB host problem with AM571x
- Fix wrong scratchpad buffer used in xHCI driver. This problem could cause random crashes
- Fix warnings with GCCv.6
- Initialize XHCI/DWC data so that examples still run when APP_UNCACHED_DATA_BLK3_MEM is in a NO_LOAD memory section (as in AM437x SBL loadable example)

Release 1.0.0.8

- Fix critical, warning, and error MISRA C issues for AM57xx platform

Release 1.0.0.7

- Enable DMA for AM335x USB (DMA is enabled by default. Disabling DMA_MODE flag to go back to FIFO mode
- USB LLD now supports cache on AM437x, AM57xx, and K2G. AM3 supported cache already
- Improve shell command usability in USB host examples.
- Fix wrong maxPacketSize in XHCI driver (which affects AM4, AM5, K2G host mode)
- Fix broken bare-metal examples in AM3/AM4
- Migrate AM3/AM4 bare-metal example's interrupt, timer, and UART APIs to those of OSAL and UART LLD.

Release 1.0.0.6

- Intentionally skipped.

Release 1.0.0.5

- o Fix hung issue on some USB2.0 enumeration on K2G USB host
- o Fix Am57xx init sequence that could cause exception in USB start up.

Release 1.0.0.4

- o Support USB3.0 host mode on AM57xx IDK
- o Fix crashes in host example when typing command without parameters
- o Support K2G
- o Support make infrastructure.
- o Allow both USB instances to work in same USB mode (both host or both devices)

Release 1.0.0.3

- o Add USB MSC support for AM571x and AM572x. BIOS/RTOS examples provided. No USB MSC host support for AM572x EVM (Beagle X15).

Release 1.0.0.2

- o Initial release for USB driver. Release includes bare metal / RTOS USB MSC Host and Device Examples and support.
- o The following IRs have been raised:
  - o SDOCM00118998 : USB device MSC re-enumeration failed
  - o SDOCM00119010 : USB host MSC fails to re-enumerate
  - o SDOCM00119111: USB examples need to run with cache enabled
  - o SDOCM00120579: USB LLD fails if both USB hardware instances are configured as both USB host or both USB device

Licensing

Please refer to the software Manifest document for the details.

Delivery Package

There is no separate delivery package. The USB LLD is being delivered as part of PDK.

Installation Instructions

The LLD is currently bundled as part of Platform Development Kit (PDK). Refer installation instruction to the release notes provided for PDK.

Directory structure

The following table explains each individual directory:

Directory Name	Description
`ti/drv/usb`	The top level directory contains the following:- 1. *Environment configuration batch file* The file "`setupenv.bat`" is used to configure the build environment for the USB low level driver. 2. *XDC Build and Package files* These files (`config.bld, package.xdc` etc) are the XDC build files which are used to create the USB package. 3. *Exported Driver header file* Header files which are provided by the USB low level driver and should be used by the application developers for driver customization and usage.
`ti/drv/usb/build`	The directory contains internal XDC build related files which are used to create the USB low level driver package.
`ti/drv/usb/device`	The directory contains the device specific files for the USB low level driver.
`ti/drv/usb/docs`	The directory contains the USB low level driver documentation.
`ti/drv/usb/example`	The "`example`" directory in the USB low level driver has the infrastructure mode example.
`ti/drv/usb/include`	The "include" directory has private USB low level driver header files. These files should not be used by application developers.
`ti/drv/usb/lib`	The "`lib`" folder has pre-built Big and Little Endian libraries for the USB low level driver along with their *code/data size information*.
`ti/drv/usb/package`	Internal USB low level driver package files.
`ti/drv/usb/src`	Source code for the USB low level driver.

Customer Documentation List

Table 1 lists the documents that are accessible through the **/docs** folder on the product installation CD or in the delivery package.

Table 1   Product Documentation included with this Release

Document #	Document Title	File Name
1	API documentation (generated by Doxygen)	docs/usblldDocs.chm
3	Software Manifest	docs/USB_LLD_SoftwareManifest.pdf

Steps To rebuild USB Library

- Set following environment variables with appropriate tool path by sourcing or running the pdksetupenv.sh or pdksetupeenv.bat
    source pdksetupenv.sh
- Command to build
    gmake all

Steps to rebuild USB MSC Examples

Bellow is example to build various USB examples. Please replace the pdk_am437x_1_0_0 directory mentioned with your actual directory name (which matches with your current PDK)

Bare metal examples:

- Host and Device MSC example currently are built as two simple makefile projects. They are at
ti/drv/usb/examples/usb_host/msc/build/am437x and
ti/drv/usb/examples/usb_dev/msc/build/am437x respectively

- Build these examples (assuming the PDK is installed at c:\ti\pdk_am437x_1_0_0)
cd c:\ti\pdk_am437x_1_0_0\packages
pdksetupenv.bat

    o USB Host MSC example:
    cd c:\ti\pdk_am437x_1_0_0\packages\ti\drv\usb\example\usb_host\msc\build\am437x
    gmake

    o USB Device MSC example:
    cd c:\ti\pdk_am437x_1_0_0\packages\ti\drv\usb\example\usb_dev\msc\build\am437x
    gmake

From here we have .out files that can be loaded to the EVM by CCS

RTOS examples:

Use the following commands to create CCS USB RTOS examples

    cd c:\ti\pdk_am437x_1_0_0\packages
    pdksetupenv.bat

    run pdkProjectCreate.bat to create the example RTOS projects. Please refer to PDK
document for command syntax.

    Examples CCS projects will be created under MyExampleProjects under
pdk_am437x_1_0_0\packages

    Import these CCS projects to build the examples

Example demos:

USB Host MSC:

- Load the .out built from step mentioned above by CCS. The program counter should be now at main().

- The AM437 USB host MSC demo is built to use the USB port 1 as a host port (customer can configure the example code to use the OTG port #0 as host if needed).

- Connect a USB Memory stick to the USB host port of the AM437x EVM.

- Connect a serial cable between your PC and the COM port on the AM437 EVM. This serial port is used as a shell in which the example code showing the content of the file system in the said USB memory stick. Run a terminal program of your choice and connected to the serial port of the EVM. The baud-rate should be 115200 with 8 bit, No parity, 1 stop bit, no flow control.

- Run the USB host demo program from CCS.

- The UART console should print the demo message and a command prompt. The supported commands are: "ls", "cat", "cd", "help". Cat with direction operation can be used to copy files in the memory stick. Run "help" for more command options.

USB Device MSC:

- Load the .out built from step mentioned above with CCS.
- Run the program.
- The Device mode MSC demo is using AM437EVM / AM335EVM USB port #0 for device mode. Connect this USB#0 port with a PC's USB port
- The PC connected to this USB device will notify a USB drive plugged in, and it will ask user to format the drive. Just need to format it before files can be copied and read out.