Freescale USB Stack v4.0.3 Release Notes

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How to Reach Us:

Home Page:
www.freescale.com

Web Support:
http://www.freescale.com/support

USA/Europe or Locations Not Listed:
Freescale Semiconductor, Inc.
Technical Information Center, EL516
2100 East Elliot Road
Tempe, Arizona 85284
1-800-521-6274 or +1-480-768-2130
www.freescale.com/support

Europe, Middle East, and Africa:
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+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
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Japan:
Freescale Semiconductor Japan Ltd.
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ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064
Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

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China
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Fax: +1-303-675-2150
LDCForFreescaleSemiconductor@hibbertgroup.com

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1 Read Me First

This release note documents the Freescale USB Stack version 4.0.3 released for Freescale Kinetis ARM$^®$ CortexM0+, Cortex M4, ColdFire and HCS08 and microcontroller families.

1.1 Requirements

1.1.1 Development Tools

This Freescale USB Stack Release was compiled and tested with the following development tools:

- CodeWarrior Development Studio for Microcontrollers Version 10.2 and 10.3 BETA 2
  - Support available for Kinetis, ColdFire and HCS08 devices

- IAR Embedded Workbench for ARM Version 6.40.2
  - Support available for Kinetis ARM$^®$ CortexM4 devices

- Keil uVision4 Integrated Development Environment Version 4.50
  - Support available for Kinetis ARM$^®$ CortexM4 devices

1.1.2 Desktop System Requirements

The system requirements are defined by the development tools requirements. There are no special host system requirements for hosting the Freescale USB Stack distribution itself.

Minimum PC configuration:
   As required by Development and Build Tools

Recommended PC configuration:
   2 GHz processor – 2 GB RAM - 2 GB free disk space.

Software requirements:
   OS: As required by Development and Build tools (Windows XP SP2 or later)

1.1.3 Embedded Target Platforms Requirements

The Freescale USB Stack in this release supports the evaluation boards mentioned below. There are no special requirements for the target hardware which would be out of scope of what each board requires for its operation (power supply, cabling, jumper settings etc). More details about board-specific setup for USB operation are available in the "USBHWCONFIG.pdf" and the "USBUG.pdf" documents.

Evaluation boards supported:

Kinetis ARM® Cortex M0+

- FREEDOM-KL25Z Evaluation Board
- TWR-KL25Z48M Evaluation Board

Kinetis ARM® Cortex M4

- TWR-K40X256 Evaluation Board
- TWR-K60N512 Evaluation Board
- TWR-K53N512 Evaluation Board
- TWR-K70FN1M Evaluation Board
- TWR-K20DX50 Evaluation Board
- TWR-K40D72M Evaluation Board
- TWR-K20D72M Evaluation Board
- TWR-K21D50M Evaluation Board

ColdFire V1

- TWR-MCF51JE Evaluation Board
- TWR-MCF51MM Evaluation Board
- TWR-MCF51JF Evaluation Board
- EVB51JM128 Evaluation Board
- DEMOJM Evaluation Board with MCF51JM128 Flexis daughter card

ColdFire V2

- M52221DEMO Evaluation Board
- M52259EVB Evaluation Board
- M52259DEMOKIT Evaluation Board
- TWR-MCF52259 Evaluation Board
- M52277EVB Evaluation Board

HCS08

- TWR-S08MM128 Evaluation Board
- TWR-S08JE128 Evaluation Board
- DEMOJM Evaluation Board with MC9S0851JM16 Flexis daughter card
- DEMOJM Evaluation Board with MC9S0851JS16 Flexis daughter card
- DEMOJM Evaluation Board with MC9S0851JM60 Flexis daughter card

2 What's New & Change Log

This section describes the major changes and new features implemented in USB Stack releases.

USB v4.0.3
- MSD host stack, MSD and FAT File System example fixes
- Enable support for the 96MHz system clock for the supporting Kinetis parts.
- Processor Expert components inheritance re-architecture

USB v4.0.2
- TWR-KL25Z48M and FREEDOM-KL25Z Evaluation Boards support
- Kinetis L2K family support
- L2K USB device Processor Expert components compatible with MQX Lite
- Various fixes and improvements

USB v4.0.1
- TWR-K21D50M Evaluation Board and K21/K22 Kinetis families support
- Improved compatibility of the MSD class host implementations with the various brands of non-standard USB sticks on the market
- P0 K20 initialization fixes

USB v4.0.0
- Video device class support and virtual camera demo applications.
- Composite USB device support and associated demo applications: MSD/CDC and HID/Audio/Video.
- Support for SDHC cards in the MSD device applications via the SPI and Kinetis eSDHC interfaces.
- Processor Expert USB ColdFire and Kinetis components for the HID, CDC and MSD classes over the device, host and OTG stacks.
- Keil uVision4 Integrated Development Environment v4.50 support for the USB stack running on Kinetis devices.
- Discontinued support for USB application projects created for "classic" CodeWarrior IDEs (for Microcontrollers v6.x and for ColdFire v7.x).

USB v3.2.0
- Kinetis K70 USB high speed device, Enhanced Host Control Interface (EHCI) and high speed USB On-The-Go support on the TWR-K70FN1M plus TWR-SER2 board setup
- Kinetis K20 and K40 72MHz devices on TWR-K40D72M and TWR-K20D72M boards support in the stack and applications
- Kinetis K70 USB full speed applications on the IAR Embedded Workbench IDE

USB v3.1.3

- Kinetis K20 50MHz devices and TWR-K20DX50 support in the stack and applications

- Bugfixes

    o FAT File System applications fixes for supporting partitions larger than 4GB

USB v3.1.2

- Kinetis K70 full speed USB support

- Bugfixes

    o MCF51JF128 DFU application fixes

    o MSD & HID classes OTG application fixes

USB v3.1.1

- Asynchronous feedback support in the Kinetis audio devices, as defined in USB 2.0 section 5.12.4.2

- HC(S)08 applications optimizations:

    o Optimized the standard request functions

    o Decreased ram usage

    o Interrupt processing time was reduced by shifting processing outside the interrupt context.

- Bugfixes

    o USB Command verifier tests fixes

    o MSD class demo applications fixes

    o MSD & HID classes OTG application fixes

USB v3.1.0

- New Boards supported:

    o TWR-K60N512 Evaluation Board

    o TWR-K53N512 Evaluation Board

    o TWR-MCF51JF Evaluation Board

- New classes supported:

    o Battery Charging Class on the following boards:

        ▪ TWR-K60N512 Evaluation Board

        ▪ TWR-K53N512 Evaluation Board

        ▪ TWR-MCF51JF Evaluation Board

        ▪ TWR-K40X256 Evaluation Board

- Latest FAT FS 3rd party code integration

- Device Stack API now is completely synchronized with the MQX one.

- HID applications now support "OUT" endpoint.

- Plugging a device in a suspended HUB will suspend the device also.

- CodeWarrior 6.3 CF v1 projects now have default flash configuration.

3 Release Contents

This section gives an overview about the release folder structure.

Folder	Description
Freescale USB Stack v4.0.0	
DFU PC Host Demo	DFU PC GUI
Documentation	Documentation
ProcessorExpert	Processor Expert Components
Source	
Device	
app	Device Demo Applications
app_composite	Composite Device Demo Applications
source	Device Stack Sources
Host	
examples	Host Examples
source	Host Stack Sources
OTG	
examples	OTG Examples
source	OTG Stack Sources

4 Known Issues and Limitations

- Because of dynamic memory allocation needs, the limited SRAM available on some devices might not be sufficient to run some host and On-The-Go applications. Also, memory usage and heap management differences may appear depending on the tool chain (IDE) used.

- L2K devices do not have the DCD module, therefore the battery charging class support is not available for these parts.

- Because the TWR-K20DX50 board has the D+ and D- USB lines hardwired to the on-board micro-USB connector, the OTG and DCD (battery charging) support has not been tested using a MAX3353 charge pump circuit. The OTG and DCD support in the applications included in this package is based on designs which include a MAX3353 circuit, which is used for VBUS detection purposes.

- Regarding the usage of USB flash drives with the FAT File System MSD host projects, there have been issues reported, unrelated to the USB stack, for various such commercially available devices, such as:

  - Non-strict conformance to the USB MSD class
  - Non-strict conformance to the FAT format specification, for instance in the BIOS parameter block, the boot signature (offset 0x1FE) may differ from 0xAA55 or the "FAT" string may differ for FAT12/16 (offset 0x36) or for FAT32 (0x52)
  - Hidden partitions at the beginning of the memory space
  - Non-strict conformance to the 500 milliseconds device readiness before the host polls it requirement in the USB 2.0 specification
  - U3 smart USB drives are not supported

- The RAM Disk support in the MSD Device applications must be tailored to the available RAM on the respective part by configuring the **`LENGTH_OF_EACH_LBA`** and **`TOTAL_LOGICAL_BLOCKS_ADDRESS`** constants in the ***disk.h*** header file.

- The USB high speed device and EHCI support on K70 requires the TWR-SER2 peripheral board for the SMSC USB3300 ULPI transceiver circuit mounted on it. This board should be used in a TWR setup with the TWR-K70FN1M controller tower board.

- Before running the Device and OTG examples, because there are some limitations in the generated code of the USB_LLD component, after generating the code with Processor Expert, there are some changes needed in the code before building:

  - Edit ***Project_Name\Generated_Code\PE_LDD.h*** and pack the structure **`LDD_USB_Device_TTD_Head`** as shown below:

```
#pragma pack(1)

typedef struct LDD_USB_Device_TTD_Head_Struct {
uint8_t    EpNum;      /* Endpoint number */
LDD_TData *BufferPtr;  /* Buffer address */
uint16_t   BufferSize; /* Buffer size */
uint8_t    Flags;      /* Transfer flags - see constants definition */
} LDD_USB_Device_TTD_Head;

#pragma pack()
```

  - Edit ***Project_Name\Generated_Code\USB_LDD.c*** and pack the structure **`USB_LDD_TTD_Struct`** as shown below:

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```
#pragma pack(1)

typedef struct USB_LDD_TTD_Struct {
  bool                            Active;
  bool                            ZLT;
  struct USB_LDD_TTD_Struct       *pNextTD;
  uint8_t                         *BufferPtr;
  uint16_t                         RemainingData;
  LDD_USB_Device_TTD              *UserTDPtr;
} USB_LDD_TTD;

#pragma pack()
```

- Edit *Project_Name\Generated_Code\USB_LDD.c* and in the third for loop in function `USB_LDD_DeviceDisableAllEp` add the following 3 highlighted lines:

```
for (x = 0x00U; x <= MAX_EP_IDX; x++) {/* Discard all pending transfers */
(void)USB_LDD_DeviceAbortAllTransfers(DevDataPtr, &DevDataPtr->EpData[x]);

if (DevDataPtr->EpData[x].pCurrentTD != NULL)
        if (DevDataPtr->EpData[x].pCurrentTD->UserTDPtr != NULL)
                DevDataPtr->EpData[x].pCurrentTD->UserTDPtr->CallbackFnPtr = 0;
}
```

- Edit the *Project_Name\Generated_Code\USB_LDD.c* file, at `case LDD_USB_OTG_A_WAIT_VFALL` in the `USB_LDD_OtgStateMachine` function, as shown below:

```
case LDD_USB_OTG_A_WAIT_VFALL:
        if ((InSignalsState & USB_LDD_OTG_ID) != 0x00U) {  /* ID != Host? */
                USB_LDD_EnterNewState(DevDataPtr, LDD_USB_OTG_A_IDLE); /* Yes,
new state = A_IDLE */
        }
        else if (((InSignalsState & (USB_LDD_OTG_A_SESSION_VALID |
USB_LDD_OTG_B_CONN)) == 0x00U)) { /* (~A_SessionValid & ~B_CON)? */
                USB_LDD_EnterNewState(DevDataPtr, LDD_USB_OTG_A_IDLE); /* New
state = A_IDLE */
        }
        break;
```

5 User Documentation Included in This Release

The following user level documentation can be found in the "***Documentation***" folder of this release***:***

USBAPIRM.pdf – USB Device API Reference

USBHOSTAPIRM.pdf – USB Host API Reference

USBHOSTUG.pdf – USB Host User's Guide

USBOTGAPIRM.pdf – USB OTG API Reference

USBOTGUG.pdf – USB OTG User's Guide

USBUG.pdf – USB Device User's Guide

USBHWCONFIG.pdf – USB Hardware (Board) Configuration

USBPEXQSG.pdf – USB Processor Expert Components Quick Start Guide

6 Device, Host and On-The-Go Supported Platforms Overview

This release supports the USB stack and example applications for USB classes for a variety of HCS08, ColdFire and Kinetis microcontrollers. The matrices of supported demo applications on devices and IDEs are found below.

6.1 DEVICE

6.1.1 HCS08

DEVICE	PART				
CLASS	MC9S08JE128	MC9S08JS16	MC9S08JM60	MC9S08JM16	MC9S08MM128
CDC	CW 10.x	CW 10.x	CW 10.x	CW 10.x	CW 10.x
HID	CW 10.x	CW 10.x	CW 10.x	CW 10.x	CW 10.x
Audio	CW 10.x	N/A	CW 10.x	N/A	CW 10.x
Battery Charging	N/A	N/A	N/A	N/A	N/A
DFU	CW 10.x	CW 10.x	CW 10.x	CW 10.x	CW 10.x
MSD	CW 10.x	N/A	CW 10.x	N/A	CW 10.x
PHDC	CW 10.x	CW 10.x	CW 10.x	CW 10.x	CW 10.x

6.1.2 ColdFire

DEVICE	PART						
CLASS	MCF51JE256	MCF51JM128	MCF51MM256	MCF51JF128	MCF52259	MCF52221	MCF52277
CDC	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
HID	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
Audio	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	N/A
Battery Charging	N/A	N/A	N/A	CW 10.X	N/A	N/A	N/A
DFU	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
MSD	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
PHDC	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X

6.1.3 Kinetis

DEVICE	KL2x	K2x	K40	K50	K60	K70
CLASS	MKL25Z	PK20X128VLH MK20DX256VLL7 PK21DN512	MK40N512VMD100 MK40DX256VLL7	MK53N512CMD100	MK60N512	PK70FN1M0VMJ12
CDC	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
HID	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
Audio	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
Battery Charging	N/A	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
DFU	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
MSD	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x
PHDC	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x

6.2 HOST

6.2.1 HCS08

No host applications are available for HCS08 architectures due to memory limitations.

6.2.2 ColdFire

HOST	PART						
CLASS	MCF51JE256	MCF51JM128	MCF51MM256	MCF51JF128	MCF52259	MCF52221	MCF52277
CDC	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
HID	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
Audio	CW 10.X	N/A	CW 10.X	CW 10.X	CW 10.X	CW 10.X	N/A
FAT FS	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	N/A
MSD	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X
PHDC	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X	CW 10.X

6.2.3 Kinetis

HOST	KL2x	K2x	K40	K50	K60	K70
CLASS	MKL25Z	PK20X128VLH MK20DX256VLL7 PK21DN512	MK40N512VMD100 MK40DX256VLL7	MK53N512CMD100	MK60N512VMD100	PK70FN1M0VMJ12
CDC	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
HID	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
Audio	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
FAT FS	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
MSD	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
PHDC	N/A	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X

6.3 OTG

6.3.1 Kinetis

OTG	KL2x	K2x	K40	K50	K60	K70
CLASS	MKL25Z	PK20X128VLH MK20DX256VLL7 PK21DN512	MK40N512VMD100 MK40DX256VLL7	MK53N512CMD100	MK60N512VMD100	PK70FN1M0VMJ12
HID	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X
MSD	CW 10.X, IAR EW 6.X	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X, uV 4.x	CW 10.X, IAR EW 6.X

6.3.2 ColdFire

OTG	PART	
CLASS	MCF51JF128	MCF51JM128
HID	CW 10.X	CW 10.X
MSD	CW 10.X	CW 10.X