

# Freescal e USB Stack v4.1.1

## Release Notes

|                         |                                     |
|-------------------------|-------------------------------------|
| <b>PRODUCT:</b>         | Freescal e USB Stack                |
| <b>PRODUCT VERSION:</b> | 4.1.1                               |
| <b>DESCRIPTION:</b>     | Freescal e USB Stack, version 4.1.1 |
| <b>RELEASE DATE:</b>    | April 23 <sup>rd</sup> , 2013       |



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## 1 Read Me First

This release note documents the Freescale USB Stack version 4.1.1 released for Freescale Kinetis ARM<sup>®</sup> 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 10.3 or later.
  - o Support available for Kinetis, ColdFire and HCS08 devices
- IAR Embedded Workbench for ARM Version 6.50.3
  - o Support available for Kinetis devices
- Keil uVision4 Integrated Development Environment Version 4.50
  - o Support available for Kinetis ARM<sup>®</sup> 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-K60D100M Evaluation Board
- TWR-K53N512 Evaluation Board
- TWR-K70FN1M Evaluation Board
- TWR-K20D50M 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 v4.1.1

- Bus suspend/resume and sleep mode added for TWR-K20D50M
- Bugfixes
  - o Optimization errors fixes
  - o MSD and PHDC devices are not enumerated correctly fixes
  - o Various GCC specific fixes

### USB v4.1.0

- Printer class support and printer host and device demo applications.
- Processor Expert Printer class and Host MSD class examples.
- New examples for Processor Expert components.
- Various fixes and improvements.

### 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-K20D50M 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:

- 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 3<sup>rd</sup> 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.

|  |  |
|--|--|
| <ul style="list-style-type: none"> <li>▲  Freescale USB Stack v4.0.0</li> <li>▶  DFU PC Host Demo</li> <li>▶  Documentation</li> <li>▶  ProcessorExpert</li> <li>▲  Source <ul style="list-style-type: none"> <li>▲  Device <ul style="list-style-type: none"> <li>▶  app</li> <li>▶  app_composite</li> <li>▶  source</li> </ul> </li> <li>▲  Host <ul style="list-style-type: none"> <li>▶  examples</li> <li>▶  source</li> </ul> </li> <li>▲  OTG <ul style="list-style-type: none"> <li>▶  examples</li> <li>▶  source</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>_____ DFU PC GUI</li> <li>_____ Documentation</li> <li>_____ Processor Expert Components</li> <li>_____ Device Demo Applications</li> <li>_____ Composite Device Demo Applications</li> <li>_____ Device Stack Sources</li> <li>_____ Host Examples</li> <li>_____ Host Stack Sources</li> <li>_____ OTG Examples</li> <li>_____ OTG Stack Sources</li> </ul> |
|--|--|

## 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-K20D50M 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.

## 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        |            |            |            |             |
|-------------------------|-------------|------------|------------|------------|-------------|
| <b>CLASS</b>            | MC9S08JE128 | MC9S08JS16 | MC9S08JM60 | MC9S08JM16 | MC9S08MM128 |
| <b>CDC</b>              | CW 10.x     | CW 10.x    | CW 10.x    | CW 10.x    | CW 10.x     |
| <b>HID</b>              | CW 10.x     | CW 10.x    | CW 10.x    | CW 10.x    | CW 10.x     |
| <b>Audio</b>            | CW 10.x     | N/A        | CW 10.x    | N/A        | CW 10.x     |
| <b>Battery Charging</b> | N/A         | N/A        | N/A        | N/A        | N/A         |
| <b>DFU</b>              | CW 10.x     | CW 10.x    | CW 10.x    | CW 10.x    | CW 10.x     |
| <b>MSD</b>              | CW 10.x     | N/A        | CW 10.x    | N/A        | CW 10.x     |
| <b>PHDC</b>             | CW 10.x     | CW 10.x    | CW 10.x    | CW 10.x    | CW 10.x     |

#### 6.1.2 ColdFire

| DEVICE                  | PART       |            |            |            |          |          |          |
|-------------------------|------------|------------|------------|------------|----------|----------|----------|
| <b>CLASS</b>            | MCF51JE256 | MCF51JM128 | MCF51MM256 | MCF51JF128 | MCF52259 | MCF52221 | MCF52277 |
| <b>CDC</b>              | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>HID</b>              | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>Audio</b>            | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | N/A      |
| <b>Battery Charging</b> | N/A        | N/A        | N/A        | CW 10.X    | N/A      | N/A      | N/A      |
| <b>DFU</b>              | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>MSD</b>              | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>PHDC</b>             | 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                         |
|-------------------------|---------------------|---|---------------------------------|-----------------------------|-----------------------------|-----------------------------|
| <b>CLASS</b>            | MKL25Z              | PK20X128VLH<br>MK20DX256VLL7<br>PK21DN512 | MK40N512VMD100<br>MK40DX256VLL7 | MK53N512CMD100              | MK60N512                    | PK70FN1M0VMJ12              |
| <b>CDC</b>              | 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 |
| <b>HID</b>              | 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 |
| <b>Audio</b>            | 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 |
| <b>Battery Charging</b> | 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 |
| <b>DFU</b>              | 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 |
| <b>MSD</b>              | 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 |
| <b>PHDC</b>             | 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 |
| <b>Printer</b>          | CW 10.X, IAR EW 6.X | CW 10.X, IAR EW 6.x                       | CW 10.X, IAR EW 6.X             | CW 10.X, IAR EW 6.X         | CW 10.X, IAR EW 6.X         | CW 10.X, IAR EW 6.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       |            |            |            |          |          |          |
|---------------|------------|------------|------------|------------|----------|----------|----------|
| <b>CLASS</b>  | MCF51JE256 | MCF51JM128 | MCF51MM256 | MCF51JF128 | MCF52259 | MCF52221 | MCF52277 |
| <b>CDC</b>    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>HID</b>    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>Audio</b>  | CW 10.X    | N/A        | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | N/A      |
| <b>FAT FS</b> | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | N/A      |
| <b>MSD</b>    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X    | CW 10.X  | CW 10.X  | CW 10.X  |
| <b>PHDC</b>   | 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                    |
|----------------|---------------------------|---|---------------------------------|--------------------------------|--------------------------------|------------------------|
| <b>CLASS</b>   | MKL25Z                    | PK20X128VLH<br>MK20DX256VLL7<br>PK21DN512 | MK40N512VMD100<br>MK40DX256VLL7 | MK53N512CMD100                 | MK60N512VMD100                 | PK70FN1M0VMJ12         |
| <b>CDC</b>     | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>HID</b>     | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>Audio</b>   | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>FAT FS</b>  | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>MSD</b>     | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>PHDC</b>    | CW 10.X,<br>IAR EW<br>6.X | CW 10.X, IAR EW<br>6.X, uV 4.x            | CW 10.X, IAR EW<br>6.X, uV 4.x  | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW 6.X,<br>uV 4.x | CW 10.X, IAR EW<br>6.X |
| <b>Printer</b> | CW 10.X<br>IAR EW<br>6.X  | CW 10.X, IAR EW<br>6.X                    | CW 10.X, IAR EW<br>6.X          | CW 10.X, IAR EW 6.X            | CW 10.X, IAR EW 6.X            | CW 10.X, IAR EW<br>6.X |

### 6.3 OTG

#### 6.3.1 Kinetis

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

#### 6.3.2 ColdFire

| OTG          | PART       |            |
|--------------|------------|------------|
| <b>CLASS</b> | MCF51JF128 | MCF51JM128 |
| <b>HID</b>   | CW 10.X    | CW 10.X    |
| <b>MSD</b>   | CW 10.X    | CW 10.X    |