Document Number: KSDK200KE1XFRN
Rev. 0, 08/2016

Kinetis SDK v2.0.0 Release Notes for MKE1xF Devices

Contents

1 Overview

The Kinetis Software Development Kit (KSDK) 2.0.0 is a collection of software enablement for KE1xF devices that includes peripheral drivers and integrated RTOS support for FreeRTOS OS and µC/OS. In addition to the base enablement, the KSDK is augmented with demo applications and driver example projects, and API documentation to help the customers quickly leverage the support of the Kinetis SDK.

For the latest version of this and other Kinetis SDK documents, see the Kinetis SDK homepage KINETIS-SDK: Software Development Kit for Kinetis MCUs .

2 KSDK 2.0.0

KSDK 2.0.0 is the evolution of KSDK 1.x into a more optimized software solution. KSDK 2.0.0 eliminates the need for a separate HAL and Peripheral Driver, replacing these two layers with a single driver for each peripheral. The single driver provides both the low-level functionality of the HAL and the non-blocking interrupt-based functionality of the Peripheral Driver, enabling customers to select the right level of abstraction for their solution. Peripheral drivers in KSDK 2.0.0 also eliminate external software dependencies. The Operating System Abstraction, Power Manager, and Clock Manager are no longer required by the KSDK 2.0.0 drivers.

At the middleware level, RTCS and MFS have been removed, and the USB stack has been replaced with a BSD licensed solution. KSDK 2.0.0 has also aligned with ARM® architecture through the integration of mbed TLS with our accelerated cryptography drivers. This integration ensures the highest level of performance from our on-chip security peripherals.

The existing MQX™ RTOS support has been deprecated to focus on support of FreeRTOS OS and µC/OS-II and µC/OS-III.

The Real-Time Control Embedded Software Library (RTCESL) and motor control examples for PMSM and BLDC are added to the middleware layer.

3 Development Tools

The Kinetis SDK v2.0.0 was compiled and tested with these development tools:

- IAR Embedded Workbench for ARM® version 7.70.1
- MDK-ARM Microcontroller Development Kit (Keil)® 5.18a
- Kinetis Design Studio IDE v3.2.0
- Makefiles support with GCC revision 5.2-2015-q4-update from ARM Embedded
- Atollic® TrueSTUDIO® 5.5.2

4 Supported Development Systems

This release supports boards and devices listed in this table. Boards and devices in boldface were tested in this release:

Table 1. Supported MCU devices and development boards

Development boards	Kinetis MCU devices
TWR-KE18F	MKE14F256VLL16, MKE14F512VLL16, MKE14F256VLH16, MKE14F512VLH16, MKE16F256VLL16, MKE16F512VLL16, MKE16F256VLH16, MKE16F512VLH16, MKE18F256VLL16, **MKE18F512VLL16**, MKE18F256VLH16, MKE18F512VLH16

5 Release Contents

This table provides an overview of the KSDK release package contents and locations.

Table 2. Release contents

Deliverable	Location
Boards	<install_dir>/boards
Demo applications	<install_dir>/boards/<board_name>/demo_apps
Driver examples	<install_dir>/boards/<board_name>/driver_examples
RTOS examples	<install_dir>/boards/<board_name>/rtos_examples
Documentation	<install_dir>/docs
DMA manager	<install_dir>/middleware/dma_manager_<version>

Table continues on the next page...

Table 2. Release contents (continued)

RTCESL libraries	<install_dir>/middleware/rtcesl_<version>
Motor Control libraries	<install_dir>/middleware/motor_control_<version>
Driver, SoC header files, feature header files, and utilities	<install_dir>/devices/<device_name>
Cortex Microcontroller Software Interface Standard (CMSIS) ARM Cortex®-M header files, DSP library source	<install_dir>/CMSIS
Peripheral Drivers	<install_dir>/devices/<device_name>/drivers
Utilities such as debug console	<install_dir>/devices/<device_name>/utilities
RTOS Kernel Code	<install_dir>/rtos
Tools	<install_dir>/tools

6 Kinetis SDK Release Package

The KSDK 2.0.0 release package contents are aligned with the silicon subfamily it supports. This includes the boards, CMSIS, devices, documentation, middleware, and RTOS support.

6.1 Kinetis device support

The device folder contains all available software enablement for the specific SoC subfamily. This folder includes clock-specific implementation, device register header file, device register feature header file, CMSIS-derived device SVD, and the system configuration source files. Included with the standard SoC support are folders containing peripheral drivers, toolchain support, and a simple debug console.

The device-specific header files provide a direct access to the Kinetis MCU peripheral registers. The device header file provides an overall System-on-Chip (SoC) memory mapped register definition. In addition to the overall device memory mapped header file, the Kinetis SDK also includes the feature header file for each peripheral instantiated on the SoC.

The toolchain folder contains the startup code and linker files for each supported toolchain. The startup code is a CMSIS-compliant startup that efficiently transfers the code execution to the main() function.

6.1.1 Kinetis board support

The boards folder provides the board-specific demo applications, driver examples, RTOS, and middleware examples.

6.1.2 Demo applications and other examples

The demo applications demonstrate the usage of the peripheral drivers to achieve a system level solution. Each demo application contains a readme file that describes the operation of the demo and required setup steps.

The driver examples demonstrate the capabilities of the peripheral drivers. Each example implements a common use case to help demonstrate the driver functionality.

The RTOS folder contains examples demonstrating the use of the included source.

6.2 Middleware

6.2.1 RTOS

The Kinetis SDK is preintegrated with FreeRTOS OS, µC/OS-II OS, and µC/OS-III OS.

6.2.2 CMSIS

The Kinetis SDK is shipped with the standard CMSIS development pack, including the prebuilt libraries.

6.2.3 Real Time Control Embedded Software Library (RTCESL)

RTCESL contains a set of functions for the real time control. See documentation in <install_dir>/middleware/rtcesl_<version>.

6.2.4 Motor control examples

Motor control examples include examples for PMSM and the BLDC control. See the motor control documentation in <install_dir>/docs/MC.

7 MISRA Compliance

All KSDK drivers comply to MISRA 2004 rules with below exceptions.

Exception Rules	Description
1.1	All code shall conform to ISO 9899:1990 Programming languages - C, amended and corrected by ISO/IEC 9899/COR1:1995, ISO/IEC 9899/AMD1:1995, and ISO/IEC
2.4	Sections of code should not be commented out.
5.1	Identifiers (internal and external) shall not rely on the significance of more than 31 characters.
6.3	typedefs that indicate size and signedness should be used in place of the basic types.
6.4	Bitfields shall only be defined to be of type unsigned int or signed int.
8.1	Functions shall have prototype declarations and the prototype shall be visible at both the function definition and call.
8.5	There shall be no definitions of objects or functions in a header file.
8.1	All declarations and definitions of objects or functions at file scope shall have internal linkage unless external linkage is required.
8.12	When an array is declared with external linkage, its size shall be stated explicitly or defined implicitly by initialization.
10.1	The value of an expression of integer type shall not be implicitly converted to a different underlying type if: a. it is not a conversion to a wider integer type of the same signedness, or b. the expression is complex, or c. the expression is not constant and is a function argument, or d. the expression is not constant and is a return expression.
10.3	The value of a complex expression of integer type shall only be cast to a type that is not wider and of the same signedness as the underlying type of the expression.
11.3	A cast should not be performed between a pointer type and an integral type.
11.4	A cast should not be performed between a pointer to object type and a different pointer to object type.
11.5	A cast shall not be performed that removes any const or volatile qualification from the type addressed by a pointer.
12.2	The value of an expression shall be the same under any order of evaluation that the standard permits.
12.4	The right-hand operand of a logical && or | | operator shall not contain side effects.
12.6	The operands of logical operators (&&, | |, and !) should be effectively boolean. Expressions that are effectively boolean should not be used as operands to operators other than (&&, | |, !, =, ==, !=, and ?:).
12.13	The increment (++) and decrement (--) operators should not be mixed with other operators in an expression.
14.3	Before preprocessing, a null statement shall only occur on a line by itself; it may be followed by a comment, provided that the first character following the null statement is a whitespace character.
14.5	The continue statement shall not be used.
14.7	A function shall have a single point of exit at the end of the function.
16.1	Functions shall not be defined with a variable number of arguments.
17.4	Array indexing shall be the only allowed form of pointer arithmetic.
18.4	Unions shall not be used.
19.1	#include statements in a file should only be preceded by other preprocessor directives or comments.
19.1	In the definition of a function-like macro, each instance of a parameter shall be enclosed in parentheses unless it is used as the operand of # or ##.
20.4	Dynamic heap memory allocation shall not be used.
20.9	The input/output library <stdio.h> shall not be used in production code.

Figure 1. MISRA exceptions

8 Known Issues

8.1 Maximum file path length in Windows® 7 Operating System

Windows 7 operating system imposes a 260 character maximum length for file paths. When installing the Kinetis SDK, place it in a directory close to the root to prevent file paths from exceeding the maximum character length specified by the Windows operating system. The recommended location is the `C:\nxp` folder.

8.2 Motor Control examples known issue

The supported IDEs are IAR/KDS/KEIL IDEs only. Atollic TrueSTUDIO and ARM GCC IDEs are not supported.

8.3 IAR CMSIS-DAP debugger option

There is a problem using IAR with the CMSIS-DAP debugger interface when the option 'Custom (default)' reset is selected. Error and warning messages will appear during debug process. To work around this issue, select "System" reset strategy in the CMSIS-DAP configuration window.

8.4 DAPLink firmware issue

With the pre-installed DAPLink firmware on the board, the MCU aborts entering low power mode. To fix this issue, download the latest firmware from the NXP website and replace the pre-installed one.

9 Driver Log

ACMP

Current ACMP driver version is 2.0.2.

- 2.0.1
  - Bug Fix:
    - Fix the bug of the function "ACMP_SetRoundRobinConfig". It will not continue execution but return directly after disabling round robin mode;
- 2.0.2
  - Coding style changes:
    - Change coding style of peripheral base address from "s_acmpBases" to "s_acmpBase";

ADC12

Current ADC12 driver version is 2.0.0.

- 2.0.0
  - Initial version.

DAC32

Current DAC32 driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - Bug fix:
    - Move the default DAC32_Enable(..., true) from DAC32_Init() to application code, so that users can enable the DAC's output when possible.

DMAMUX

Current DMAMUX driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - Bug fix:
    - Fix build warning while setting DMA request source in DMAMUX_SetSourceChange issue, by changing the type of the parameter source from uint8_t to uint32_t.

EDMA

Current EDMA driver version is 2.0.2.

- 2.0.0
  - Initial version.
- 2.0.1

    - Bug fix:
        - Fix the eDMA callback does not check valid status issue in EDMA_HandleIRQ API.

- 2.0.2
    - Bug fix:
        - Fix incorrect minorLoopBytes type definition in _edma_transfer_config struct. Define minorLoopBytes as uint32_t instead of uint16_t.

FLASH

Current FLASH driver version is 2.1.0.

- 2.0.0
    - Initial version.
- 2.1.0
    - New Features:
        - Support FTFL device in FLASH_Swap API.
        - Support various pflash start addresses.
        - Add support for KV58 in cache clear function.
    - Bug Fix:
        - Compiled execute-in-ram functions as PIC binary code for driver use.
        - Added missed flexram properties.
        - Fixed unaligned variable issue for execute-in-ram function code array.

FLEXCAN

Current FLEXIO driver version is 2.1.0.

- 2.0.0
    - Initial version.

- 2.1.0
    - Bug fix:
        - Fix wrong function name spelling: FlEXCAN_XXX() -> FLEXCAN_XXX();
        - Move Freeze Enable/Disable setting from FLEXCAN_Enter/ExitFreezeMode() to FLEXCAN_Init();
        - Fix wrong helper macro values.
            - Other changes:
        - Hide FLEXCAN_Reset() to user.
        - Use NDEBUG macro to wrap FLEXCAN_IsMbOccupied() function instand of DEBUG macro.

FLEXIO_UART

Current FLEXIO_UART driver version is 2.1.2.

- 2.1.0
    - New Features:
        - Add Transfer prefix in transactional APIs.
        - Add txSize/rxSize in handle structure to record the transfer size.
    - Bug Fix:
        - Add error handle to handle the data count is zero or data buffer is NULL situation.
- 2.1.1
    - Bug Fix:
        - Change the API name FLEXIO_UART_StopRingBuffer to FLEXIO_UART_TransferStopRingBuffer to align with the definition in C file.
- 2.1.2
    - Bug Fix:
        - Fix the transfer count calculation issue in FLEXIO_UART_TransferGetReceiveCount, FLEXIO_UART_TransferGetSendCount, FLEXIO_UART_TransferGetReceiveCountDMA, FLEXIO_UART_TransferGetSendCountDMA, FLEXIO_UART_TransferGetReceiveCountEDMA and FLEXIO_UART_TransferGetSendCountEDMA

FLEXIO_I2C

Current FLEXIO_I2C driver version is 2.1.2.

- 2.1.0
  - New Features:
    - Add Transfer prefix in transactional APIs.
    - Add transferSize in handle structure to record the transfer size.
- 2.1.1
  - Bug Fix:
    - Implement the FLEXIO_I2C_MasterTransferBlocking API which defined in header file but has no implementation in C file.
- 2.1.2
  - Fix the FLEXIO I2C master can not receive data from I2c slave in high baudrate issue.

FLEXIO_SPI

Current FLEXIO_SPI driver version is 2.1.0.

- 2.1.0
  - New Features:
    - Add Transfer prefix in transactional APIs.
    - Add transferSize in handle structure to record the transfer size.
  - Bug Fix:
    - Fix the error register address return for 16-bit data write in FLEXIO_SPI_GetTxDataRegisterAddress.
    - Provide independent IRQHandler/transfer APIs for Master and slave to fix the baudrate limit issue.

FLEXIO_I2S

Current FLEXIO_I2S driver version is 2.1.1.

- 2.1.0
  - New Features:
    - Add Transfer prefix in transactional APIs.
    - Add transferSize in handle structure to record the transfer size.
- 2.1.1
  - Bug Fix:
    - Fix flexio I2s RX data read error and edma address error.
    - Fix flexio I2s slave timer compare setting error.

FTM

Current FTM driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - Bug Fix:
    - Update the FTM driver to fix write to ELSA and ELSB bits.
    - FTM combine mode: set the COMBINE bit before writing to CnV register.

GPIO

Current GPIO driver version is 2.1.0.

- 2.1.0:
  - API Interface Change
    - Adds "pins" or "pin" to some APIs' names.
    - Renames "GPIO_PinConfigure" to "GPIO_PinInit".

LMEM

Current LMEM driver version is 2.0.0.

- 2.0.0:
  - Initial version.

LPI2C

Current LPI2C driver version is 2.1.0.

- 2.0.0
  - Initial version.
- 2.1.0
  - API name change:
    - LPI2C_MasterTransferCreateHandle -> LPI2C_MasterCreateHandle
    - LPI2C_MasterTransferGetCount -> LPI2C_MasterGetTransferCount
    - LPI2C_MasterTransferAbort -> LPI2C_MasterAbortTransfer
    - LPI2C_MasterTransferHandleIRQ -> LPI2C_MasterHandleInterrupt
    - LPI2C_SlaveTransferCreateHandle -> LPI2C_SlaveCreateHandle
    - LPI2C_SlaveTransferGetCount -> LPI2C_SlaveGetTransferCount
    - LPI2C_SlaveTransferAbort -> LPI2C_SlaveAbortTransfer
    - LPI2C_SlaveTransferHandleIRQ -> LPI2C_SlaveHandleInterrupt

LPIT

Current LPIT driver version is 2.0.0.

- 2.0.0
  - Initial version.

LPSPI

Current LPSPI driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - Bug Fix:
    - The clock source should divided by PRESCALE setting in LPSPI_MasterSetDelayTimes function.
    - Fix the bug that LPSPI_MasterTransferBlocking function would hang in some corner cases.

LPTMR

Current LPTMR driver version is 2.0.0

- 2.0.0
  - Initial version.

LPUART

Current LPUART driver version is 2.2.1.

- 2.1.0
  - Update transactional APIs.
- 2.1.1
  - Remove needless check of event flags and assert in LPUART_RTOS_Receive.
  - Wait always for RX event flag in LPUART_RTOS_Receive.
- 2.2.0
  - Add seven data bits and msb support.
- 2.2.1
  - Add separate RX, TX irq number support.

MPU

Current MPU driver version is 2.1.0.

- 2.0.0
  - Initial version.
- 2.1.0
  - API changes:
    - Change the mpu_region_num_t and mpu_master_t to uint32_t.
    - Change the mpu_low_masters_access_rights_t, mpu_high_masters_access_rights_t to mpu_rwxrights_master_access_control_t, and mpu_rwrights_master_access_control_t.
    - Change the MPU_SetRegionLowMasterAccessRights(), MPU_SetRegionHighMasterAccessRights() to MPU_SetRegionRwxMasterAccessRights(), and MPU_SetRegionRwMasterAccessRights().

PDB

Current PDB driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - Change PDB register base array to const.

PORT

Current PORT driver version is 2.0.2.

- 2.0.1:
  - Miscellaneous Changes:
    - Adds "const" in function parameter.
    - Updates some enumeration variables' names.
- 2.0.2:
  - Miscellaneous Changes:
    - Adds feature guard macros in the driver.

PWT

Current PWT driver version is 2.0.0.

- 2.0.0
  - Initial version.

RCM

Current RCM driver version is 2.0.1.

- 2.0.0
  - Initial version.
- 2.0.1
  - [KPSDK-10249] Fix kRCM_SourceSw bit shift issue.

RTC

Current RTC driver version is 2.0.0.

- 2.0.0
  - Initial version.

SIM

Current SIM driver version is 2.0.0.

- 2.0.0
  - Initial version.

SMC

Current SMC driver version is 2.0.2.

- 2.0.0
  - Initial version.
- 2.0.1
  - Miscellaneous Changes:
    - Update for KL8x.
- 2.0.2
  - Bug Fix:
    - Add DSB before WFI, add ISB after WFI.
  - Misc Changes:
    - Update SMC_SetPowerModeVlpw implementation.
- 2.0.3
  - Add APIs SMC_PreEnterStopModes, SMC_PreEnterWaitModes, SMC_PostExitWaitModes, and SMC_PostExitStopModes.

TRGMUX

Current TRGMUX driver version is 2.0.0.

- 2.0.0
  - Initial version.

WDOG32

Current WDOG32 driver version is 2.0.0.

- 2.0.0
  - Initial version.

10 Middleware Log

DMA_MANAGER

Current DMA_MANAGER driver version is 2.0.0

- 2.0.0
  - Initial version

MOTOR_CONTROL for KSDK

Current version is 1.1.0

- 1.1.0
  - Initial version

RTCESL for KSDK

Current version is 4.3

- 4.3
  - Intiial version

11 RTOS Log

FreeRTOS OS for KSDK

The current version is FreeRTOS OS 8.2.3. The original package is available at freertos.org.

- 8.2.3
  - New features:
    - Added tickless idle mode support
    - Added a template application for Kinetis Expert (KEx) tool (template_application)
  - Changes:
    - Reduced the folder structure to keep only Kinetis-related information

µC/OS-II OS for KSDK

The current version is µC/OS-II OS V2.92.11

- 2.92.11
  - New features:
    - Added a template application for the Kinetis Expert (KEx) tool (template_application)
  - Changes:
    - Reduced the folder structure to keep only Kinetis-related information
    - Added wrappers to adaptat PendSV_Handler and SysTick_Handler. Related files are located in rtos \ucosii_<version>\uCOS-II\Ports\ARM-Cortex-Mx\Generic\<compiler>\fsl_isr_wrapper.S

µC/OS-III OS for KSDK

The current version is µC/OS-III OS V3.05.01

- V3.05.01
  - New features:
    - Added a template application for the Kinetis Expert (KEx) tool (template_application)
  - Bug fix:
    - [KPSDK-7247] Downgraded port files from V3.05.01 to V3.05.00 because of the context switch issue
  - Changes:
    - Reduced the folder structure to keep only Kinetis-related information

12 Additional notes

When installing Segger J-Link, its DLL Updater cannot recognize Atollic TrueSTUDIO when replacing JLinkARM.dll. The user needs to make the replacement manually, in other words, copy <JLink_install_dir>\JLink_V600\JLinkARM.dll to <Atollic_install_dir>\TrueSTUDIO for ARM 5.5.2\Servers\J-Link_gdbserver.

13 Revision history

This table summarizes the revisions to this document.

Table 3. Revision history

Revision number	Date	Substantiave changes
0	08/2016	Initial release

How to Reach Us:

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