

TivaWare for C Series SW-TM4C-RLN-2.2.0.295

Release Notes



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1.1 Trademarks

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1.2 Summary

This version of TivaWare adds a set of new example projects for TM4C LaunchPad's and removes outdated resources to streamline user experience.

Tool Chains Used

- IAR EW-Arm 7.50
- Keil RV-MDK v5.12
- Texas Instruments Code Composer Studio 9.1.0
 - Arm Compiler v18.12.2.LTS

1.3 General Improvements

1.3.1 Changed ROM_ API Calls to MAP_ API Calls Across all Example Projects

All example projects now reflect that MAP_ functions should be used as much as possible to allow updated TivaWare API's take precedence over older ROM_ API's.

1.3.2 Added MAP_ API Equivalents for Various TivaWare API's

As new API's were added to TivaWare over the years, the *rom_map.h* was not updated to reflect all the new API's. With this update, all TivaWare API's should have a MAP_ equivalent available.

1.3.3 Various Spelling Fixes in Code Comments

A number of miscellaneous spelling errors had been reported and have been fixed. As these are not functional adjustments, they will not be detailed further in the Release Notes.

1.3.4 Updated the TivaWare Boot Loader Users' Guide

Dedicated sections to better explain how to use the TivaWare ROM and flash boot loaders have been added. This includes an updated introduction section to walkthrough the differences between the ROM and Flash boot loaders.

1.4 Removal of Outdated Collateral

The TivaWare software package contained a number of example projects and libraries that were either outdated or leveraged obsoleted hardware. This release includes a cleanup of many example project to better reflect the current hardware offerings. Details regarding the library removals are provided in this section, including where to get the latest corresponding libraries to ensure that the most recent firmware packages are used.

1.4.1 Removed CC3100-SDK

The CC3100-SDK was out-of-date, and support for the CC3100 is driven through the SimpleLink SDK so there was no update available to make. As a result, it was removed and support for the CC3100 needs to come from the latest SimpleLink SDK's.

This includes the removal of the following example project folders:

- *ek-tm4c1294xl-boost-cc3100*

1.4.2 Removed IQmath Library

The *IQmath* library is meant to allow non-floating point MCU's to handle floating point arithmetic through optimized algorithms. However, this was a carryover from StellarisWare which supported LM3S devices which required such functionality. All TM4C MCU's process their own floating point hardware accelerators, and therefore the *IQmath* library has been removed.

1.4.3 Removed nfclib

The *nfclib* that was provided in TivaWare was an early version of TI's NFCLink Library and it is out-of-date. A full TI Design, *TIDM-TM4C129XNFC*, has been released involving the use of NFC with TM4C MCU's which can be referenced. As the TI Design provides everything required to leverage the TI NFCLink Library, the *nfclib* in TivaWare has been removed.

This includes the removal of the following example project folders:

- *dk-tm4c129x-boost-dlp7970abp*
- *dk-tm4c129x-em-trf7970atb*
- *ek-tm4c123gxl-boost-dlptrf7970abp*
- *ek-tm4c1294xl-boost-dlptrf7970abp*

1.4.4 Removed Support for the DK-TM4C123G

The DK-TM4C123G Tiva TM4C123G Development Kit has been obsoleted, therefore all TM4C123x evaluation should be done with the EK-TM4C123GXL LaunchPad™ Development Kit. The removal of this example folder has been supplemented by adding a large number of new examples to the EK-TM4C123GXL. A full list of new EK-TM4C123GXL examples can be reviewed in [Section 1.13](#).

1.4.5 Removed Support for the EK-LM4F232

The EK-LM4F232 LaunchPad has been obsolete for many years and will no longer be supported.

1.4.6 Removed Example Projects for 430BOOST-SENSE1

The 430BOOST-SENSE1 BoosterPack has been obsoleted, therefore the example projects for it have been removed from TivaWare. Texas Instruments recommends the MSP430 CapTivate products as the host MCU for Capacitive Touch applications.

This includes the removal of the following example project folders:

- *ek-tm4c123gxl-boost-capsense*

1.4.7 Removed Example Projects for BOOSTXL-BATTPACK

Removed due to newer battery BoosterPack's offerings being provided and having a very limited use case.

This includes the removal of the following example project folders:

- *ek-tm4c123gxl-boostxl-battpack*
- *ek-tm4c1294xl-boostxl-battpack*

1.4.8 Removed Example Projects for BOOSTXL-IOBKOUT

No longer supported due to the single example project being for a very limited use case.

This includes the removal of the following example project folders:

- *ek-tm4c123gxl-boostxl-breakout*

1.5 New Features in TivaWare Peripheral Driver Library

1.5.1 Added SYSCTL_CFG_VCO_240 and SYSCTL_CFG_VCO_160 as Defined Variables to sysctl.h

Due to TM4C129x Errata Item SYSCTL#22, the `SYSCTL_CFG_VCO_xxx` configurations had misleading **variable names** as currently defined since the VCO does not run at the frequency stated in the variable name. To amend this, new **variable name** definitions have been added. The register configuration remains the identical, but now the variable names properly reflect the actual frequency of the VCO.

The old definitions will remain for compatibility with code ported from older versions of TivaWare.

All TM4C129x example projects have been updated to reflect this change.

1.5.2 Added New API to GPIO Driver to Unlock GPIO Pins

The GPIO driver has been updated with a new API, `GPIOUnlockPin`, which enables the unlocking of GPIO which have been locked for JTAG or NMI operation.

1.5.3 Added New APIs to SSI Driver to Enable and Disable Loopback mode

The SSI driver has been updated with new API's, `SSILoopbackEnable` and `SSILoopbackDisable`, which enables and disable SSI Loopback mode respectively.

1.5.4 Updated the ADCClockConfigGet API to Always Look for the Clock Configuration from ADC0_BASE

`ADC0_BASE` is the only ADC base which can have the clock configuration changed, so with this update the correct clock configuration value is always provided. This preserves compatibility with older TivaWare releases while no longer allowing for mistaken inputs.

1.5.5 Updated GPIOPadConfigSet and GPIOPadConfigGet API Calls to Avoid Not Applicable Register Settings for TM4C123x Devices

There were not applicable, but not problematic, register configurations being made for TM4C123x devices which are now gated by a check for if the target device is not TM4C123x.

1.5.6 Added New Configuration Options for TimerConfigure API

Added `TIMER_CFG_A_ONE_SHOT_PWM` and `TIMER_CFG_B_ONE_SHOT_PWM` as new configuration options to allow for the configuration of half-width one shot PWM outputs. This change includes adding `ASSERT` checks for `TIMER_CFG_A_ONE_SHOT_PWM` and `TIMER_CFG_B_ONE_SHOT_PWM`.

1.6 Bug Fixes in TivaWare Peripheral Driver Library

1.6.1 Incorrect Output from GPIOIntTypeGet API of GPIO Driver

The `GPIOIntTypeGet` was missing a parenthesis causing incorrect results to be returned. This has now been fixed.

1.6.2 Incorrect ASSERT Check for ADCClockConfigSet API

The `ASSERT` check in `ADCClockConfigSet` looked for both `ADC0_BASE` and `ADC1_BASE` even though only `ADC0_BASE` can be used. This has now been fixed.

1.6.3 **Incorrect ASSERT Check for ADCClockConfigGet API**

The ASSERT check in *ADCClockConfigGet* looked for both *ADC0_BASE* and *ADC1_BASE* even though only *ADC0_BASE* can be used. This has now been fixed.

1.6.4 **Incorrect ASSERT Check for SSIAAdvDataPutFrameEnd API**

The *SSIAAdvDataPutFrameEnd* API was missing a "~" before the "0xff". The hardware ignores the upper 24 bits of that value so the assertion is supposed to check that those bits are clear. This has now been fixed.

1.6.5 **Incorrect ASSERT Check for SSIAAdvDataPutFrameEndNonBlocking API**

The *SSIAAdvDataPutFrameEndNonBlocking* API was missing a "~" before the "0xff". The hardware ignores the upper 24 bits of that value so the assertion is supposed to check that those bits are clear. This has now been fixed.

1.6.6 **Incorrect ASSERT Check for TimerConfigure API**

The ASSERT checks for *TimerConfigure* did not allow the timeout pin functions to be used when the timer is in full width mode. This has now been fixed.

1.6.7 **Missing ASSERT Check for PWMClockSet API**

The ASSERT checks for *ui32Config* did not correctly check for *PWM_SYSCCLK_DIV_1* as a valid input. This has now been fixed.

1.6.8 **Missing ASSERT Check in all the UARTModem API Calls**

The following API's all were missing ASSERT checks for the correct UART base being passed via the *ui32Base* input. These checks have now been added.

- *UARTModemControlSet*
- *UARTModemControlClear*
- *UARTModemControlGet*
- *UARTModemStatusGet*

1.6.9 **Removed Unused HIBERNATE_OUT_ALT1CLK Variable from hibernate.h**

The defined variable *HIBERNATE_OUT_ALT1CLK* is not valid for the TM4C family and has been removed from TivaWare.

1.7 **Bug Fixes in TivaWare USB Library**

1.7.1 **Fixed USB Composite Device enumeration issue for Windows 10**

Updates were made to address the incorrect Endpoint number assignments in *usblib* which caused Composite Device class enumeration to fail on Windows 10 systems.

1.7.2 **Removed USBHCDPipeStatus API**

This API was never given any functionality and only returned (0); so it has been removed to avoid confusion.

1.7.3 **Incorrect Check in USBHostIntHandlerInternal**

An incorrect check for *psUSBOUTPipes* when setting flags for *psUSBINPipes* has now been fixed.

1.7.4 Added Missing Check in USBHostIntHandlerInternal

Two different calls to `g_sUSBHCD.psUSBINPipes[ui32Idx].psDevice` were made without first checking if the `psDevice` is available, this has now been fixed.

1.7.5 Improvements for Max Packet Size Handling

Improved the USB Library handling of max packet size transfers in `USBHCDPipeWrite` and `USBHCDPipeRead` in `host/usbhostenum.c`. An update to a transfer size comparison in `iDMAUSBTransfer` in `usbdma.c` was also required. These changes impact USB high speed operation.

1.8 New Features in Third Party Packages

1.8.1 Updated Files in the exosite Folder

In order to support the transition from Exosite's Portals Development Kit to the newer Murano IoT platform, the third party files used to plug into the Exosite Cloud platform had to be updated. This update affects all files in the `exosite` third party folder.

Previously, TivaWare was leveraging <http://ti.exosite.com/> as the portal to connect to the Cloud. However, that website will no longer be supported by March 31, 2020.

The `qs_iot` example is being updated to leverage the newer Murano IoT platform from Exosite and it will be re-released via an Application Report.

1.9 Bug Fixes in Third Party Packages

1.9.1 Incorrect Macro Check in a TivaWare Specific lwIP 1.4.1 File

A macro has a check for SRAM space starts by looking at `0x200.0000` instead of `0x2000.0000` in the `tiva-tm4c129.c` file, located at `third_party/lwip-1.4.1/ports/tiva-tm4c129/netif`. This has now been fixed.

1.10 New Features in TivaWare Utility Library

1.10.1 Added SchedulerInitEx API

The `SchedulerInit` API only works for TM4C123x devices due to differences in how to fetch the system clock speed between TM4C123x and TM4C129x devices. In order to support TM4C129x devices, a `SchedulerInitEx` API is now provided.

1.11 Bug Fixes in TivaWare Utility Library

1.11.1 Mismatch of function prototype between `ustdlib.c` and `ustdlib.h`

There was a mismatch of the function prototype in `ustdlib.c` and `ustdlib.h` for the `usprintf` function. The `ustdlib.c` file was missing a `restrict` keyword. This has now been fixed.

1.11.2 UARTwrite API did not stop on the NULL character

The `UARTwrite` function in `uartstdio.c` did not stop printing a string at the `NULL` character as is documented. This has now been fixed.

1.12 Removed Features in DK-TM4C129X Firmware Package

1.12.1 Removed `freertos_demo` Example

Due to the offering of TI-RTOS for Tiva-C, FreeRTOS is no longer being supported. The `freertos_demo` example has been removed from TivaWare to better reflect that no support will be provided for FreeRTOS. The `third_party` FreeRTOS folder will continue to be included.

1.12.2 Removed *ble_btool* Example

The BLE-STACK used for this example is outdated. As a result, the *ble_btool* example has been removed and development for the CC254x should leverage the latest version of the BLE-STACK offered by Texas Instruments.

1.12.3 Removed *ble_central* Example

The BLE-STACK used for this example is outdated. As a result, the *ble_central* example has been removed and development for the CC254x should leverage the latest version of the BLE-STACK offered by Texas Instruments.

1.13 New Features in EK-TM4C123GXL Firmware Package

1.13.1 Added *adc_udma_pingpong* Example

Added *adc_udma_pingpong* example to demonstrate ADC sampling with timer trigger and using uDMA Ping-Pong mode for transfers to memory buffers.

1.13.2 Added *boot_demo_uart_rom* Example

Added *boot_demo_uart_rom* example which demonstrates the use of the ROM-based UART boot loader.

1.13.3 Added *boot_demo1* Example

Added *boot_demo1* example to demonstrate the use of a flash-based boot loader.

1.13.4 Added *boot_demo2* Example

Added *boot_demo2* example to demonstrate the use of a flash-based boot loader.

1.13.5 Added *boot_serial* Example

Added *boot_serial*, the flash-based serial interface boot loader. The default interface used is UART. Other available options include SSI and I2C.

1.13.6 Added *boot_usb* Example

Added *boot_usb*, the flash-based USB interface boot loader.

1.13.7 Added *edge_count* Example

Added *edge_count* example which demonstrates the use of a General Purpose Timer in down edge count mode.

1.13.8 Added *hibernate* Example

Added *hibernate* example which demonstrates the use of the Hibernation module with the RTC.

1.13.9 Added *humidity_sht21_simple* Example

Added *humidity_sht21_simple* example which demonstrates quick humidity measurements with the SHT21 and BOOSTXL-SENSHUB Sensor Hub BoosterPack.

1.13.10 Added *pwm_dead_band* Example

Added *pwm_dead_band* example demonstrating the PWM dead-band generator.

1.13.11 Added *pwm_interrupt* Example

Added *pwm_interrupt* example demonstrating how to use the PWM interrupts.

1.13.12 Added *pwm_invert* Example

Added *pwm_invert* example demonstrating the PWM invert function.

1.13.13 Added *usb_dev_keyboard* Example

Added *usb_dev_keyboard* example which turns the EK-TM4C123GXL LaunchPad into a USB keyboard supporting the Human Interface Device class.

1.13.14 Added *watchdog* Example

Added *watchdog* example which demonstrates the use of the Watchdog Timer as a simple heartbeat for the system.

1.14 Removed Features in EK-TM4C123GXL Firmware Package

1.14.1 Removed *freertos_demo* Example

Due to the offering of TI-RTOS for Tiva-C, FreeRTOS is no longer being supported. The *freertos_demo* example project has been removed from TivaWare to better reflect that no support will be provided for FreeRTOS. The third_party FreeRTOS folder will continue to be included.

1.15 Bug Fixes in EK-TM4C123GXL Firmware Package

1.15.1 Fixed *sign conversion issue with compdcm_mpu9150* Example

The *compdcm_mpu9150* example would print out 0 for all values between 0 and -1. This has now been fixed.

1.16 New Features in EK-TM4C1294XL Firmware Package

These additions all apply to the EK-TM4C129EXL Crypto-Connected LaunchPad as well.

1.16.1 Added *adc_udma_pingpong* Example

Added *adc_udma_pingpong* example to demonstrate ADC sampling with timer trigger and using uDMA Ping-Pong mode for transfers to memory buffers.

1.16.2 Added *boot_demo_emac_rom* Example

Added *boot_demo_emac_rom* example which demonstrates the use of the ROM-based Ethernet boot loader.

1.16.3 Added *boot_demo_uart_rom* Example

Added *boot_demo_uart_rom* example which demonstrates the use of the ROM-based UART boot loader.

1.16.4 Added *boot_demo_usb* Example

Added *boot_demo_usb* example which turns the development board into a composite device supporting a mouse via the Human Interface Device class and also publishing runtime Device Firmware Upgrade (DFU) capability.

1.16.5 Added *enet_tcpecho_server* Example

Added *enet_tcpecho_server* example demonstrates an echo server application using the lwIP TCP/IP Stack.

1.16.6 Added hibernate Example

Added a simplistic hibernate with RTC example to supplement the existing but more advanced hibernate calendar mode example.

That original *hibernate* example has been renamed *hibernate_calendar* to reflect that it focuses on calendar mode. The new example is named *hiberate*.

1.16.7 Added humidity_sht21_simple Example

Added *humidity_sht21_simple* example which demonstrates quick humidity measurements with the SHT21 and BOOSTXL-SENSHUB Sensor Hub BoosterPack.

1.16.8 Added pwm_dead_band Example

Added *pwm_dead_band* example demonstrating the PWM dead-band generator.

1.16.9 Added pwm_interrupt Example

Added *pwm_interrupt* example demonstrating how to use the PWM interrupts.

1.16.10 Added pwm_invert Example

Added *pwm_invert* example demonstrating the PWM invert function.

1.16.11 Added ssi_master_slave_xfer Example

Added *ssi_master_slave_xfer* example which demonstrates how to configure and send data between the SSI master and slave.

1.16.12 Added ssi_quad_mode Example

Added *ssi_quad_mode* example which demonstrates how to configure SSIO as a Quad-SSI Master and SSI1 as a Quad-SSI slave.

1.16.13 Added timer_edge_capture Example

Added *timer_edge_capture* example which demonstrates how to use two timers to determine the duration of the high period of an input signal.

1.16.14 Added udma_scatter_gather Example

Added *udma_scatter_gather* example which demonstrates the use of the uDMA controller to transfer data between memory buffers, and to transfer data to and from a UART channel using the scatter-gather mode.

1.16.15 Added usb_dev_cdcserial Example

Added *usb_dev_cdcserial* example which turns the EK-TM4C1294XL LaunchPad into a single-port USB CDC device when connected to a USB host system.

1.16.16 Added UART Output to watchdog Example

The intent of the *watchdog* example was not being clearly communicated, so UART outputs have been added to better explain how the demonstration functions.

1.16.17 Updated the Driver Files for Exosite Applications

In order to support the transition from Exosite's Portals Development Kit to the newer Murano IoT platform, the driver files used to plug into the Exosite Cloud platform had to be updated. The files affected by this change are *exosite_hal_lwip.c* and *exosite_hal_lwip.h*.

Previously, TivaWare was leveraging <http://ti.exosite.com/> as the portal to connect to the Cloud. However, that website will no longer be supported by March 31, 2020.

The *qs_iot* example is being updated to leverage the newer Murano IoT platform from Exosite and it will be re-released via an Application Report.

1.17 Removed Features in EK-TM4C1294XL Firmware Package

1.17.1 Removed *qs_iot* Example

The *qs_iot* example, which was the out-of-box demonstration for the EK-TM4C1294XL Connected LaunchPad, has been removed from TivaWare temporarily because it requires a large update to maintain full functionality.

The example was leveraging <http://ti.exosite.com/> as the portal to connect to the Cloud. However, that website will no longer be supported by March 31, 2020. The *qs_iot* example is being updated to leverage the newer Murano IoT platform from Exosite and it will be re-released via an Application Report.

For the latest information regarding the update of the *qs_iot* example, visit our [TM4C TI E2E™ Forums](#).

1.18 Bug Fixes in EK-TM4C1294XL Firmware Package

These changes all apply to the EK-TM4C129EXL Crypto-Connected LaunchPad as well.

1.18.1 Fixed Sign Conversion Issue with *compdcm_mpu9150* Example

The *compdcm_mpu9150* example would print out 0 for all values between 0 and -1. This has now been fixed.

1.18.2 Fixed Issue with Delays in *bitband* Example

The *bitband* example is supposed to include one second delays to allow the user to observe the changes with the UART output. The delay was designed for TM4C123x devices and did not work correctly for TM4C129x devices. The delay has now been updated and this issue is fixed.

1.19 Bug Fixes in Peripheral Examples Firmware Package

1.19.1 Incorrect Pin Configuration in *spi_master.c* SSI Peripheral Example for TM4C129x Devices

The pin definitions for the SSI TX and RX pins vary between TM4C123x and TM4C129x devices, and only the TM4C123x version was being used in the example. This has been updated to use the correct pin definitions based on the defined Target Device.

1.19.2 Incorrect Pin Configuration in *ti_master.c* SSI Peripheral Example for TM4C129x Devices

The pin definitions for the SSI TX and RX pins vary between TM4C123x and TM4C129x devices, and only the TM4C123x version was being used in the example. This has been updated to use the correct pin definitions based on the defined Target Device.

1.19.3 Updated Output Pin Used for *pwm.c* Timer Peripheral Example

The pins selected for the *pwm.c* peripheral example did not support the same Timer functionality across both TM4C123x and TM4C129x devices. A pair of new pins were selected to allow the same Timer configuration to be used with the correct pin definition being used based on the defined Target Device.

1.19.4 Fixed Issue with Configuration in *interrupt.c* SysTick Peripheral Example for

TM4C129x Devices

The SysTick Interrupt configuration with *SysTickPeriodSet* requires an input that does not exceed 16,777,216. The system clock speed is used as an input for this example to give a one second SysTick interrupt. For TM4C129x devices, the system clock was configured to be 25 MHz and that exceeded the *SysTickPeriodSet* limits and caused a register overflow that resulted in the wrong SysTick interrupt rate. This has now been fixed.

1.19.5 Fixed Incorrect Temperature Reading for *temperature_sensor.c* ADC Example

The formula used for the temperature calculation of the raw ADC value came from the LM3S9B96 datasheet and was not accurate for TM4C devices. This has been changed to the correct formula for TM4C devices.

1.19.6 Fixed Issue with UART Output in *uart_loopback.c* UART Peripheral Example for TM4C129x Devices

The UART output was not properly sending data at 115,200 Baud for TM4C129x devices. This has now been fixed.

1.19.7 Fixed Issue with UART Output in *uart_polled.c* UART Peripheral Example for TM4C129x Devices

The UART output was not properly sending data at 115,200 Baud for TM4C129x devices. This has now been fixed.

1.20 Removed Features in Peripheral Examples Firmware Package

1.20.1 Moved all PWM Peripheral Examples to be Evaluation Kit Specific

The PWM examples have been moved into the *examples/boards* folders for each specific TM4C LaunchPad. This was done due to the high amount of variance on pin selections and PWM register configurations which added significant and unnecessary complexity for each example.

The affected examples are:

- *dead_band.c*
- *interrupt.c*
- *invert.c*

Equivalent projects for each removed example can be found for the EK-TM4C123GXL, EK-TM4C1294XL, and EK-TM4C129EXL LaunchPad's.

1.20.2 Removed *rom_direct* Example from the ROM Peripheral Folder

This was a misleading example because the *rom_mapped* example is what should be referenced instead as it demonstrates the best way to leverage TivaWare ROM APIs.

1.20.3 Removed *edge_count* Example from the Timer Peripheral Folder

The *edge_count* example has been converted into a completed example project for the EK-TM4C123GXL LaunchPad. The new example can be found in the *examples/boards/ek-tm4c123gx1* folder in TivaWare.

1.21 Bug Fixes in TivaWare windows_driver Package

1.21.1 Corrected USB Driver Signature Issue for Windows 10

The USB driver files have been re-signed with the correct dates in order to be fully compatible with Windows 10 systems.

Release Notes for Version 2.1.4 (February 2017)

This version of TivaWare™ includes support for External Ethernet PHY, EEE and WOL mode.

2.1 Tool Chains Used

- IAR EW-Arm® 7.50
- Keil RV-MDK v5.12
- Texas Instruments Code Composer Studio™ 6.0.1
 - Arm Compiler v5.2.6

2.2 Bug Fixes in TivaWare Bootloader

2.2.1 System Clock Configuration for USB Bootloader Incorrect

The System Clock configuration in *bl_usb.c* was using the *PSYSDIV* to divide down the PLL output for system clock generation. This has been corrected to instead use the *PLLFREQ1* register Q divider.

2.3 New Features in TivaWare Peripheral Driver Library

2.3.1 Added New APIs to Ethernet MAC Driver for EEE and WOL mode Support

The Ethernet MAC driver has been updated with the APIs *EMACWoLEnter*, *EMACLPICongfig*, *EMACLPIDelete*, *EMACLPIDeleteLinkSet*, *EMACLPIDeleteLinkClear*, *EMACPHYMMDDWrite* and *EMACPHYMMDDRead* for EEE and Wake-On-LAN mode support.

2.3.2 Added New API to Flash Driver to Commit Values of all USER_REG Registers

The Flash driver has been updated with the API *FlashAllUserRegisterSave* to commit (or save) the values written to the registers *USER_REG0* to *USER_REG3*, using the API *FlashAllUserRegisterSet*.

2.3.3 Added New APIs to GPIO Driver to Register/Unregister GPIO Pin Interrupts

The GPIO driver has been updated with the APIs *GPIOIntRegisterPin* and *GPIOIntUnregisterPin* to register and unregister GPIO pin interrupts for peripherals that have this capability.

2.4 Bug Fixes in TivaWare Peripheral Driver Library

2.4.1 Hardcoded Base Address in ADC Configuration API.

The ADC driver API *ADCSequenceConfigure* uses the define *ADC0_BASE* instead of the variable *ui32Base* for configuration of the Trigger Select. This has been fixed.

2.4.2 Incorrect Configuration in ADC Software Oversampling API

The ADC driver API *ADCSoftwareOversampleStepConfigure* and *ADCSoftwareOversampleDataGet* were using the over sampling factor with a single dimensional array for *ADC0*. This has been corrected by changing the array to a two dimensional array for both *ADC0* and *ADC1*.

2.4.3 Missing define for API ROM_ADCSequenceConfigure

The API *ROM_ADCSequenceConfigure* was missing for TM4C123 device in the ROM driver. This has not been corrected.

2.4.4 Reverted changes for CANIntClear API of CAN Driver

The CAN driver API *CANIntClear* changes made in *TivaWare 2.1.3* was causing retransmission of successful messages.

2.4.5 Updated Define for EMACIntStatus API of EMAC Driver

The EMAC driver API *EMACIntStatus* has been updated because of the change to the define *EMAC_NON_MASKED_INTS*.

2.4.6 Dynamic Interrupts Cannot be Registered for GPIO Ports R, S and T

The global array of GPIO driver that holds the GPIO interrupt mapping, has missing entries for ports R, S and T. Due to these missing entries, an error occurs when the API *GPIOIntRegister* and *GPIOIntUnregister* are called with the parameters *GPIO_PORTR_BASE*, *GPIO_PORTS_BASE* and *GPIO_PORTT_BASE* on TM4C129 devices. These missing entries have been added.

2.4.7 Incorrect ASSERT in GPIOIntTypeSet API of GPIO Driver

The ASSERT condition in the API *GPIOIntTypeSet* was not checking for the validity of the flag *GPIO_DISCRETE_INT* for GPIO ports P and Q. This has now been fixed.

2.4.8 Incorrect Return Value in GPIOPinWakeStatus API of GPIO Driver

The return value in the API *GPIOPinWakeStatus* was not returning the value of the *GPIOWAKESTAT* register. This has now been fixed.

2.4.9 Added ROM_CANIntClear API for ROM

The ROM API for *ROM_CANIntClear* has been added.

2.4.10 Removed ROM_EMACIntStatus API for ROM

The ROM API for *ROM_EMACIntStatus* has been removed.

2.4.11 Removed ROM_GPIOPinWakeStatus API for ROM

The ROM API for *ROM_GPIOPinWakeStatus* has been removed.

2.4.12 System Clock Configuration Does not Wait for MOSC Power Up

The System Control driver API *SysCtlClockFreqSet* does not wait for MOSC to power up when the application selects MOSC as either the system clock source or the clock source for the PLL. This has been fixed.

2.5 Bug Fixes in DK-TM4C123G Firmware Package

2.5.1 Missing Driverlib Error Handler Call in blinky Application

The *blinky* application was not calling the error handler. `__error__`. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.6 New Features in DK-TM4C129X Firmware Package

2.6.1 *boot_demo_emac* Application Updated for External PHY Support

The *boot_demo_emac* application has been updated for supporting an external ethernet PHY. The changes have been made in the *lwipopts.h* file with two new compile time defines of *EMAC_PHY_IS_EXT_MII* and *EMAC_PHY_IS_EXT_RMII*.

2.6.2 *enet_io* Application Update for External PHY Support

The *enet_io* application has been updated for supporting an external ethernet PHY. The changes have been made in the *lwipopts.h* file with two new compile time defines of *EMAC_PHY_IS_EXT_MII* and *EMAC_PHY_IS_EXT_RMII*

2.6.3 *enet_lwip* Application Update for External PHY Support

The *enet_lwip* application has been updated for supporting an external ethernet PHY. The changes have been made in the *lwipopts.h* file with two new compile time defines of *EMAC_PHY_IS_EXT_MII* and *EMAC_PHY_IS_EXT_RMII*

2.6.4 *qs_weather* Application Update for External PHY Support

The *qs_weather* application has been updated for supporting an external ethernet PHY. The changes have been made in the *lwipopts.h* file with two new compile time defines of *EMAC_PHY_IS_EXT_MII* and *EMAC_PHY_IS_EXT_RMII*

2.7 Bug Fixes in DK-TM4C129X Firmware Package

2.7.1 *Missing Driverlib Error Handler Call in blinky Application*

The *blinky* application was not calling the error handler. *__error__*. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.8 Bug Fixes in EK-LM4F232 Firmware Package

2.8.1 *Missing Driverlib Error Handler Call in blinky Application*

The *blinky* application was not calling the error handler. *__error__*. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.9 Bug Fixes in EK-TM4C123GXL Firmware Package

2.9.1 *Missing Driverlib Error Handler Call in blinky Application*

The *blinky* application was not calling the error handler. *__error__*. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.9.2 *gplib_demo* Application for EK-TM4C123GXL-BOOSTXL-KENITEC-S1 Board has Incorrect Pragma

An incorrect pragma (*i16DMAControlTable*) is used instead of *psDMAControlTable* for CCS in the *gplib_demo* application for *EK-TM4C123GXL-BOOSTXL-KENITEC-S1* board. This has been corrected.

2.10 New Features in EK-TM4C1294XL Firmware Package

2.10.1 Added Ethernet Boot Loader Examples

The examples for Ethernet Bootloader, *boot_emac_flash*, and the associated application *boot_demo_emac_flash*, have been added to the *EK-TM4C1294XL* board.

2.11 Bug Fixes in EK-TM4C1294XL Firmware Package

2.11.1 Missing Driverlib Error Handler Call in blinky Application

The *blinky* application was not calling the error handler. `__error__`. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.11.2 Ethernet Client lwIP Driver Does Not Resolve Host Name if IP Address is Used

The API *EthClientDNSResolve* in the file *drivers/eth_client_lwip.c* does not handle the condition correctly when an IP Address of the server is used instead of a URL. This has now been fixed.

2.11.3 The API *exoHAL_SocketRecv* in Exosite HAL lwIP Driver does not wait for the Receive Buffer to be Filled

The API *exoHAL_SocketRecv* in the file *drivers/exosite_hal_lwip.c* does not wait for the receive buffer to be filled by the Network Events Handler (*exoHAL_ExositeEnetEvents*) due to a bug. This has now been fixed.

2.11.4 *enet_lwip* Application Does Not Acquire AutoIP

The *enet_lwip* application uses busy wait loop to blink an LED in the *lwIPHostTimerHandler*. The *lwIPHostTimerHandler* is called from an interrupt. Due to this busy loop in the interrupt context the AutoIP is not acquired. The busy loop has been removed.

2.11.5 EK-TM4C1294XL-BOOST-DLPTRF7970ABP Board has Unnecessary Drivers

The *drivers* folder for the board *EK-TM4C1294XL-BOOST-DLPTRF7970ABP* has drivers that are not used by the applications for this board. The unnecessary drivers has been removed.

2.11.6 *glib_demo* Application for EK-TM4C1294XL-BOOSTXL-KENTEC-S1 Board has Incorrect Pragma

An incorrect pragma (*i16DMAControlTable*) is used instead of *psDMAControlTable* for CCS in the *glib_demo* application for *EK-TM4C1294XL-BOOSTXL-KENTEC-S1* board. This has been corrected.

2.12 Bug Fixes in EK-TM4C129EXL Firmware Package

2.12.1 Missing Driverlib Error Handler Call in blinky Application

The *blinky* application was not calling the error handler. `__error__`. This error handler is called by the peripheral driver library in debug mode, when an *ASSERT* condition returns a false. The error handler has been added.

2.12.2 *enet_lwip* Application Does Not Acquire AutoIP

The *enet_lwip* application uses busy wait loop to blink an LED in the *lwIPHostTimerHandler*. The *lwIPHostTimerHandler* is called from an interrupt. Due to this busy loop in the interrupt context the AutoIP is not acquired. the busy loop has been removed.

2.13 New Features in Third Party Packages

2.13.1 Added Support for EEE Mode and External Ethernet PHY in lwIP Porting Layer

The porting layer file `ports/tiva-tm4c129/netif/tiva-tm4c129.c` for lwIP-1.4.1 has been updated to support External Ethernet PHY and EEE mode when using an external PHY.

2.14 Bug Fixes in TivaWare USB Library

2.14.1 USB CDC Error Flags not updated correctly

The USB device API `USBDCDCSerialStateChange` was not updating the serial state conditions correctly. This has been fixed.

2.14.2 USB Enumeration for Audio Devices Does Not Support IN and OUT Endpoints Simultaneously

The USB host enumeration function for Audio Devices does not support IN and OUT endpoints simultaneously. This has been corrected in usbhostenum.c.

2.15 New Features in TivaWare Utility Library

2.15.1 Added Support for External PHY, EEE mode and WOL mode

The lwiplib.c has been updated for supporting external PHY, EEE mode and WOL mode.

2.16 Bug Fixes in TivaWare windows_driver Package

2.16.1 Corrected USB Driver Files for Windows Double Hash Signature

The USB driver files have been re-signed for windows double hash signature required for USB device examples to run on windows machines.

2.17 Related Documentation

- *Stellaris® Boot Loader Users' Guide* ([SPMU134](#))
- libusb-win32: <http://sourceforge.net/projects/libusb-win32/>
- FreeRTOS Update to Version 7.6.0: <http://www.FreeRTOS.org/>

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3.1 Summary

This version of TivaWare for C Series adds support for CC3100 SDK v1.1.0 and Resource Explorer meta data.

Tool chains used:

- IAR EW-Arm 7.50
- Keil RV-MDK v5.12
- Texas Instruments Code Composer Studio 6.0.1
 - Arm Compiler v5.2.6

3.2 New Features in TivaWare Peripheral Driver Library

3.2.1 Added New API to Sysctl Driver to Get PLL VCO Value for TM4C129 Devices

The Sysctl driver was updated with a new API, SysCtlVCOGet, to get the PLL VCO value for programming USB and ADC clock dividers on TM4C129 devices.

3.2.2 Added Hardware Floating Point Support

The Peripheral Driver library is built with hardware floating-point support using the option `-mfloat-abi=hard`.

3.3 Bug Fixes in TivaWare Peripheral Driver Library

3.3.1 Incorrect Programming in ADCSequencerConfigure API of ADC Driver

When reading the ADC_PC register, the value was not OR-ed with the value read from ADC_CC register causing it to overwrite the return value. This has now been fixed.

3.3.2 Incorrect Processing in ADCClockConfigGet API of ADC Driver

When using the PWM generators for triggering the ADC, the incorrect programming was resulting in wrong PWM generator being selected. This has been now fixed.

3.3.3 Incorrect Processing in CANIntClear API in CAN Driver

When clearing an interrupt for a received message, the CAN_IF1CMSK_CLRINTPND is written to the CAN_IF1CMSK register, causing it to clear the read-write bits of the register. This has been fixed by performing a read-modified-write.

3.3.4 Incorrect Programming in SysCtlClockFreqSet API in Sysctl Driver

When programming the system clock from PLL for TM4C129x devices, the API leaves the RSCLKCFG register with the OSCSRC register bit as main oscillator. The programming model also has to be changed due to a bug in the design, which causes the system clock to exceed device specifications.

3.3.5 Incorrect ASSERT in TimerConfigure API

The Assert condition in TimerConfigure() API of ADC driver was missing TIMER_CFG_A_CAP_COUNT_UP and TIMER_CFG_A_CAP_TIME_UP causing it to not assert an error for incorrect programming values. This has now been fixed.

3.3.6 Deprecate functions in rom.h

The functions ROM_ADCSequencerConfigure, ROM_CANIntClear and ROM_SysCtlClockFreqSet have now been deprecated. The corresponding functions in flash have been fixed.

3.4 New Features in TivaWare Graphics Library

3.4.1 Added Hardware Floating-Point Support

The Graphics library is built with hardware floating point support using the option `-mfloat-abi=hard`.

3.5 New Features in TivaWare Sensor Library

3.5.1 Added Hardware Floating-Point Support

The Sensor library is built with hardware floating point support using the option `-mfloat-abi=hard`.

3.6 New Features in Third Party Packages

3.6.1 Updated Fat File System Port to Add BoosterPack Header Configuration

The porting layer of FatFs has been updated to support both BoosterPacks on the EK-TM4C1294XL and EK-TM4C129EXL LaunchPads.

3.7 New Features in TivaWare USB Library

3.7.1 Added Hardware Floating-Point Support

The USB library is built with hardware floating point support using the option `-mfloat-abi=hard`.

3.8 Bug Fixes in TivaWare USB Library

3.8.1 Corrected Parameter for USBLibDMAInit API

Corrected Parameter for USBLibDMAInit API.

3.9 New Features in DK-TM4C123G Firmware Package

3.9.1 Added project0 Example

Added project0 example to DK-TM4C123G development board.

3.10 New Features in DK-TM4C129X Firmware Package

3.10.1 Added project0 Example

Added project0 example to DK-TM4C129X development board.

3.10.2 Added Explicit Configuration of USB Functional Clock to all USB Examples

All USB examples for host, device or OTG mode have been updated to:

- Call the new API SysCtlVCOGet to get the PLL VCO
- Explicitly pass the PLL VCO and system clock frequency to the USB library

3.11 Bug Fixes in DK-TM4C129X Firmware Package

3.11.1 usb_host_audio_in Example is Incorrectly Configured

The parameter for USBSoundInputFormatSet has been corrected for mono microphone instead of stereo microphone.

3.12 New Features in EK-TM4C123GXL Firmware Package

3.12.1 Added Support for New Kentec BoosterPack

Support for BOOSTXL-K350QVG-S1 BoosterPack added. The display and touch drivers can be found in the drivers folder under examples/boards/ek-tm4c123gxl-boostxl-kentec-s1.

3.13 New Features in EK-TM4C1294XL Firmware Package

3.13.1 Added project0 Example

Added project0 example to EK-TM4C1294XL connected launchpad.

3.13.2 Added Support for CC3100 BoosterPack

Support for CC3100 WiFi BoosterPack has been added to TivaWare. A part of the CC3100 SDK, necessary to run applications, has been included in the cc3100-sdk directory at the top level of TivaWare installation.

3.13.3 Added Support for New Kentec BoosterPack

Support for BOOSTXL-K350QVG-S1 BoosterPack added. The display and touch drivers can be found in the drivers folder under examples/boards/ek-tm4c1294xl-boostxl-kentec-s1.

3.13.4 Added Explicit Configuration of USB Functional Clock to all USB Examples

All USB examples for host, device or OTG mode have been updated to:

- Call the new API SysCtlVCOGet to get the PLL VCO
- Explicitly pass the PLL VCO and system clock frequency to the USB library

3.13.5 Removed Support for BOOSTXL-KENTEC-L35 BoosterPack

Support for BOOSTXL-KENTEC-L35 BoosterPack is now removed as it is no longer in production.

3.14 New Features in EK-TM4C129EXL Firmware Package

3.14.1 Added project0 Example

Added project0 example to EK-TM4C129EXL crypto-connected launchpad.

3.14.2 Added Explicit Configuration of USB Functional Clock to all USB Examples

All USB examples for host, device or OTG mode have been updated to:

- Call the new API SysCtlVCOGet to get the PLL VCO
- Explicitly pass the PLL VCO and system clock frequency to the USB library

3.15 Bug Fixes in Peripheral Examples Firmware Package

3.15.1 ADC Examples Use Incorrect GPIOs

The ADC examples differential and single_ended incorrectly use GPIOs PE7 and PE6 for channels AIN0 and AIN1. This has been corrected to use GPIOs PE3 and PE2, respectively.

3.16 New Features in TivaWare Firmware Development Package

3.16.1 Updated Default Floating Point Settings for GCC

Default GCC floating point settings (-mfloat-abi) set to “hard” in the file makedefs in TivaWare root directory. Note that all libraries are also built with this option.

3.16.2 Added TI Resource Explorer Support

Added TI Resource Explorer meta data to TivaWare.

3.17 Bug Fixes in TivaWare Firmware Development Package

3.17.1 Corrected Signature for the Windows Driver

The windows drivers for USB were not correctly signed in earlier release. This has now been corrected.

3.18 Known Issues

3.18.1 Incorrect Analog Values Displayed for qs-logger Example on DK-TM4C123G

The analog values shown on the display are not correlating with the actual input.

Release Notes for Version 2.1.2 (Dec 14, 2015)

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4.1 Summary

This version of TivaWare for C Series adds support for the EK-TM4C129EXL Crypto Connected Launchpad.

Tool chains used:

- IAR EW-Arm 7.30
- Keil RV-MDK v5.12
- Texas Instruments Code Composer Studio 6.0.1
 - Arm Compiler v5.2.6

4.2 New Features in TivaWare Bootloader

4.2.1 *Crystal Selection Based Look-Up for PLL Configuration Added for TM4C129 Devices*

On TM4C129 devices, the PLL M, N and Q look up values have been added for the crystal values selected to configure the PLL for use with boot loader.

4.2.2 *Flash-Based Bootloader can be Configured to Work With any Instance of a Peripheral*

UART, I2C and SSI flash based bootloaders can be configured to work with any instance of the respective peripheral.

4.3 Bug Fixes in TivaWare Bootloader

4.3.1 *USBConfigurePins API Checks Incorrect Register for Peripheral Ready*

USBConfigurePins API checks SYSCTL_RCGCGPIO register to determine if the peripheral is ready. It should be checking SYSCTL_PRGPIO register. Also the API did not consider if SYSCTL_RCGCGPIO corresponding to VBUS and ID pins have been set. This caused the function to hang. These have been fixed.

4.3.2 *Incorrect Comment for ENFORCE_CRC in bl_main.c*

The comment for ENFORCE_CRC in the bl_main.c was swapped between the if and else condition. This has been fixed.

4.3.3 *Removed Unsupported Crystal Frequency for USB Operation*

The crystal frequency of 4MHz is not supported for USB operation on TM4C123. This is removed.

4.4 New Features in TivaWare Peripheral Driver Library

4.4.1 *Added New APIs to Flash Driver to Set and Get Values of all USER_REG Registers*

The Flash driver has been updated with the APIs FlashAllUserRegisterSet and FlashAllUserRegisterGet to set and get value of registers USER_REG0 to USER_REG3.

4.4.2 *Added New APIs to GPIO Driver*

The GPIO driver has been updated with the APIs GPIOPinTypeOneWire, GPIOPinTypeDIVSCLK, GPIOPinTypeHibernateRTCCLK and GPIOPinTypeTrace for TM4C129 devices.

4.4.3 *Added I2C Glitch Filter Function for TM4C123 Devices*

The I2CMasterGlitchFilterConfigSet of I2C driver has been updated to configure the glitch filter for TM4C123 devices.

4.4.4 Added New API to I2C Driver to Enable Loopback Mode

The I2C driver has been updated with the API I2CLoopbackEnable to configure an I2C peripheral in internal loopback mode.

4.4.5 Added New Filter Control APIs to QEI Driver

The QEI driver has been updated with the new APIs QEIFilterEnable, QEIFilterDisable and QEIFilterConfigure to configure the filter function in QEI module.

4.4.6 Added New API to UART Driver to Enable Loopback Mode

The UART driver has been updated with the API UARTLoopbackEnable to configure a UART peripheral in internal loopback mode.

4.5 Bug Fixes in TivaWare Peripheral Driver Library

4.5.1 Incorrect Define for ADC External Reference Voltage

The define for ADC_REF_EXT_1V is not a valid value for TM4C123 and TM4C129 devices and has been removed.

4.5.2 Incorrect ASSERT in ADCClockConfigSet and ADCClockConfigGet APIs

The Assert condition in ADCClockConfigSet and ADCClockConfigGet APIs of the ADC driver was missing ADC1_BASE. Also the clock divider check was incorrectly performed causing it to not assert an error for incorrect programming values. This has now been fixed.

4.5.3 HibernateTamperIOEnable API Does Not Allow Values to be Cleared From the HIB_TPIO Register

In the HibernateTamperIOEnable API, the HIB_TPIO is read and then OR-ed with the new configuration due to which existing set bit cannot be cleared. This has now been fixed.

4.5.4 Incorrect Parameter Call in I2CIntRegister API

The parameter for callback function for I2CIntregister API was missing the pointer typecase. This has now been fixed.

4.5.5 Updated ROM Header to Map All Functions for TM4C123 RB2 and TM4C129 RA2

Some ROM functions were not mapped for TM4C123 RB2 and TM4C129 RA2. This has been fixed.

4.5.6 Improper Defines in UDMA Driver

The defines UDMA_INT_SW and UDMA_INT_ERROR in the UDMA driver header are for TM4C123 devices. When used on TM4C129 devices, incorrect interrupts are enabled in the NVIC. This has now been fixed.

4.6 New Features in Third Party Packages

4.6.1 Updated FreeRTOS Version to 8.2.3

Updated third_party/freertos/ to version 8.2.3. For more information, see <http://www.freertos.org/History.txt>.

4.7 New Features in TivaWare USB Library

4.7.1 *ULPI Mode Updated to Source Clock From External PHY*

The ULPI PHY can send clock to the USB controller when configured for ULPI mode. The file "usbdenum.c" is updated to set the clock source as external PHY when the PLL divider is not set in USBCC register.

4.7.2 *Updated Bulk Packet Size to 512 Bytes for High Speed Mode*

When USB high speed mode is selected with ULPI, and if the feature is set in device mode parameters then 512 bytes packet size is used in bulk mode instead of full speed packet size of 64 bytes.

4.8 New Features in DK-TM4C123G Firmware Package

4.8.1 *blinky Application Updated*

The blinky application for dk-tm4c123g board is updated to use TivaWare API's instead of direct register macro access.

4.8.2 *Removed Support for EM-CC3000 WiFi Board*

The support for CC3000 is removed as it is no longer recommended for new designs.

4.9 New Features in DK-TM4C129X Firmware Package

4.9.1 *blinky Application Updated*

The blinky application for dk-tm4c129x board is updated to use TivaWare API's instead of direct register macro access.

4.9.2 *Removed Support for BOOST-C3000 and EM-CC3000 WiFi Board*

The support for CC3000 is removed as it is no longer recommended for new designs.

4.9.3 *Updated freertos_demo Application to Work With Latest Version of FreeRTOS*

The "freertos_demo" application of dk-tm4c129x board is updated to work with FreeRTOS version 8.2.3.

4.9.4 *qs_weather Application Updated to Use Latest APIs to Connect to Server*

OpenWeatherMap has modified their APIs due to which, a HTTP GET request from "qs_weather" results in "401" response. The app has been updated to use the latest API.

4.10 Bug Fixes in DK-TM4C129X Firmware Package

4.10.1 *light_isl29023 Application Shows a Precision of Only Two Decimal Places*

The "light_isl29023" application for "dk-tm4c129x-boostxl-senshub" board shows a precision of only two decimal places at maximum illumination. This is updated to show a precision of 3 decimal places.

4.10.2 *usb_host_audio Application - Does Not Show Error Message for Certain Conditions*

The "usb_host_audio" application for dk-tm4c129x board does not show "File system error!" when no sd card is present and does not show "No USB Device" when no audio device is connected on startup. This has now been fixed.

4.11 New Features in EK-LM4F232 Firmware Package

4.11.1 *blinky Application Updated*

The blinky application for ek-lm4f232 board is updated to use TivaWare API's instead of direct register macro access.

4.12 New Features in EK-TM4C123GXL Firmware Package

4.12.1 *blinky Application Updated*

The blinky application for ek-tm4c123gxl board is updated to use TivaWare API's instead of direct register macro access.

4.12.2 *Removed Support for BOOST-C3000 WiFi Board*

The support for CC3000 is removed as it is no longer recommended for new designs

4.12.3 *Updated freertos_demo Application to Work With Latest Version of FreeRTOS*

The "freertos_demo" application of ek-tm4c129x board is updated to work with FreeRTOS version 8.2.3.

4.12.4 *enet_weather Application Updated to Use Latest APIs to Connect to Server*

OpenWeatherMap has modified their APIs due to which, a HTTP GET request from "enet_weather" results in "401" response. The app has been updated to use the latest API.

4.13 New Features in EK-TM4C1294XL Firmware Package

4.13.1 *blinky Application Updated*

The blinky application for ek-tm4c1294xl board is updated to use TivaWare API's instead of direct register macro access.

4.13.2 *Added Serial Bootloader and Demo Code*

Serial bootloader configuration (boot_serial) for ek-tm4c1294xl board has been added. Also two applications to demonstrate the use of this serial bootloader (boot_demo1 and boot_demo2) are provided for ek-tm4c1294xl board.

4.13.3 *Removed Support for BOOST-C3000 WiFi Board*

The support for CC3000 is removed as it is no longer recommended for new designs.

4.13.4 *Updated senshub_iot Application to Work With Latest Version of FreeRTOS*

The "senshub_iot" application of "ek-tm4c1294xl-boostxl-senshub" board is updated to work with FreeRTOS version 8.2.3.

4.14 New Features in EK-TM4C129EXL Firmware Package

4.14.1 *Added Support for EK-TM4C129EXL Crypto Connected LaunchPad*

Board support and example applications have been added for the new EK-TM4C129EXL Crypto Connected Launchpad.

4.15 New Features in Peripheral Examples Firmware Package

4.15.1 Updated I2C Loopback Example to Use the New Loopback API

Updated the i2c/master_slave_loopback peripheral example to demonstrate the use of the newly created I2C internal loopback API.

4.15.2 Added UART Loopback Example to Use the New Loopback API

Added a new example uart/uart_loopback peripheral example to demonstrate the use of the newly created UART internal loopback API.

4.16 Bug Fixes in Peripheral Examples Firmware Package

4.16.1 Corrected PWM Examples for PWM Pulse Width Function Call

The PWM examples pwm/dead_band, pwm/invert and pwm/reload_interrupt call the API PWMPulseWidthSet to set the pulse width of the PWM channel with the argument as PWM_OUT_0 instead of PWM_GEN_0. This has been corrected.

4.17 Known Issues

4.17.1 qs-logger Example- Analog Values Were Not Correct for EK-TM4C1294XL

The analog values shown on the display are not correlating with the actual input.

4.17.2 Change Directory Command Does Not Work With Examples Using FatFs for IAR Binaries

The bug was noticed with IAR EW-Arm 7.30.1. With IAR toolchain version 7.40.2 the examples work fine.

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5.1 Summary

This version of TivaWare for C Series adds support for the TM4C129x Rev 3.

Tool chains used:

- IAR EW-Arm 7.30
- Keil RV-MDK v4.72
- Texas Instruments Code Composer Studio 6.0.1

5.2 Bug Fixes in TivaWare Bootloader

5.2.1 *TM4C129x Support Added to boot_loader*

TM4C129x support was broken for the flash-based bootloader. This has now been updated.

5.3 New Features in TivaWare Peripheral Driver Library

5.3.1 *Added GPIOPinTypeComparatorOutput() API for Configuring Comparator Output Pin*

A new API, GPIOPinTypeComparatorOutput(), for configuring the Comparator Output pin was added to the GPIO driver.

5.3.2 *Added OneWire Hardware Definition File*

The OneWire hardware definition file was missing in the inc folder. This has now been added. Also, the OneWire peripheral driver has been included in the pre-compiled library.

5.3.3 *Updates to ROM Header File*

TM4C129x rev 3 support added to ROM header file.

5.4 Bug Fixes in TivaWare Peripheral Driver Library

5.4.1 *ADCIntRegister() and ADCIntUnregister() APIs Registered and Unregistered Wrong Interrupt*

The internal _ADCIntNumberGET() function always returned the ADC0 interrupt number for the TM4C123x devices. This resulted in ADCIntRegister() and ADCIntUnregister() APIs registering and unregistering the ADC0 interrupt, even when ADC1 was requested. This has now been fixed.

5.4.2 *Incorrect ASSERT in ADCClockConfigSet() API*

In the ADCClockConfigSet() API, the check for the clock divisor is not correct. This has been fixed in this release.

5.4.3 *Incorrect Configuration Option for CRCCConfigSet() API*

One of the configuration options to the CRCCConfigSet() API, CRC_CFG_ENDIAN_SBHW, has a wrong value defined in the CRC driver header file. This has now been fixed.

5.4.4 *Incorrect ASSERT in GPIOPinConfigure() API*

The Assert condition in GPIOPinConfigure() API of GPIO driver does not perform a check for ports R, S and T on TM4C129x devices. This has now been fixed.

5.4.5 *Incorrect Assert in I2CMasterBurstLengthSet() API*

In the I2CMasterBurstLengthSet() API, the check on burst transfer value argument is incorrect. This has now been fixed.

5.4.6 ROM_ADCIntClearEx() Clears all Active Interrupts

The ROM_ADCIntClearEx() function contains an error which clears all ADC interrupts marked as active rather than only those specified by the caller. This has been fixed in TivaWare and the function (ADCIntClearEx) now only clears interrupts described in the ui32IntFlags parameter. The ROM_ADCIntClearEx() function has been removed from the rom header file (rom.h).

5.4.7 ROM_EMACInt() Does Not Disable MMC Interrupts in Revision 1

The MMC interrupts of Ethernet MAC peripheral (on TM4C129x) are enabled by default in hardware and must be explicitly disabled. The EMACInit() API in TivaWare and the ROM_EMACInit() function in silicon revision 2 disables these interrupts. But ROM_EMACInit() function on silicon revision 1 does not disable these interrupts. Hence it has been removed from the rom header file for silicon revision 1.

5.4.8 SSISetExpClk() API Does Not Use Output Disable in Slave Mode

The SSISetExpClk() API in SSI driver does not use SSI_MODE_SLAVE_OD as a parameter when configuring the SSI controller in slave mode.

5.4.9 SysCtlClockGet() API Never Returns 80 MHz

SysCtlClockGet() API returns 66 MHz even though system clock is set to 80 MHz. This has now been fixed.

5.4.10 SysCtlClockFreqSet() Documentation Updated

The SysCtlClockFreqSet() documentation has been updated to include information about the pre-defined values that can be used to set the frequency when external crystal is used.

5.4.11 Wrong SysClk Frequency to Flash Memory Timing Parameters Mapping in SYSCTL Driver

For TM4C129x devices, the mapping of system clock frequency to flash memory timing parameters is wrong for 40MHz system clock in SYSCTL driver. This has now been fixed.

5.4.12 Missing Check for TIMER6 and TIMER7 in SYSCTL Driver

In the SYSCTL driver, the check for valid peripherals has TIMER6 and TIMER7 missing for TM4C129x devices. This has now been fixed.

5.4.13 Missing TIMER6 and TIMER7 Base Address Check on TM4C129x Devices in Timer Driver

The base address check function _TimerBaseValid() in Timer driver does not have the macro for TIMER6 and TIMER7. This has now been fixed.

5.4.14 Incorrect ASSERT in uDMAChannelAssign() API

In the uDMAChannelAssign() API, the ASSERT statement was not checking for channels from 5 to 8. This has now been fixed.

5.5 New Features in TivaWare Sensor Library

5.5.1 Added Slave Address Encoding and Interrupt Acknowledge Function to Capella CM3218

The Capella CM3218 uses alternate slave address to acknowledge an interrupt request. A function to acknowledge the interrupt is added along with the slave address encoding.

5.6 Bug Fixes in Third Party Packages

5.6.1 *Fat File System Port for TM4C129x Devices Updated for Port Configuration*

The fat file system port for ek-tm4c1294 board used incomplete pin configuration with QSSI-0 controller. It now uses the QSSI-1 controller with complete port and peripheral configuration for sd-card reference design.

5.6.2 *Memory Leak Due to Bug in TM4C129x lwIP Driver*

lwIP driver for TM4C129x device causes a pbuf memory leak, because of which the TM4C129x device stops responding to Ethernet traffic while receiving lots of packets. This driver has been updated to fix the issue.

5.7 New Features in TivaWare USB Library

5.7.1 *Added Application Callback Function to USB Device Stack*

Application call back function added to the USB device stack to inform the application about device configuration changes.

5.8 Bug Fixes in TivaWare USB Library

5.8.1 *USB Host Enumeration Hangs if USB Cable Disconnected*

When the USB cable is unplugged during enumerations, the code gets stuck in USBHCDPipeRead() function in usbhstenum.c. This has now been fixed.

5.8.2 *Workspace Void Pointer Used by USB Buffer Modified to Use Private Structure*

The workspace void pointer element (pvWorkspace) of the USB buffer structure tUSBBuffer has been converted to a private structure in the file usbbuffer.c. Due to this modification all the application specific files that declare receive and transmit buffers, of type tUSBBuffer, are also changed.

5.9 Bug Fixes in TivaWare Utility Library

5.9.1 *Update SMBusMasterI2CWriteRead() API to Handle State m/c Correctly*

The SMBusMasterI2CWriteRead() API does not handle an "I2C Write Read" operation properly when the Write Length is one byte and the Read Length is one byte. The operation ends with a SMBUS_DATA_SIZE_ERROR. The API does not stage the SMB state machine properly for receiving of one byte. After the 1-byte write sequence, the SMB state machine should start at SMBUS_STATE_READ_ONE but it starts at SMBUS_STATE_READ_FIRST instead, where more than one byte is expected.

5.10 Bug Fixes in DK-TM4C129X Firmware Package

5.10.1 *Calibrate Application Updated*

The calibrate application for dk-tm4c129x board is updated to correctly interpret the touch screen calibration algorithm described by Carlos E. Videles.

5.10.2 *enet_uip Application Modified to Use MAP_ APIs*

enet_uip application for dk-tm4c129x kit is updated to use MAP_ APIs instead of ROM_ APIs.

5.11 Bug Fixes in EK-TM4C123GXL Firmware Package

5.11.1 *boostxl_battpack Application has Wrong Units for Voltage*

The boostxl_battpack application for the ek-tm4c123gxl-boostxl-battpack and ek-tm4c1294xl-boostxl-battpack kits incorrectly displays the units of voltage as mV while the computation is done for V.

5.12 Bug Fixes in EK-TM4C1294XL Firmware Package

5.12.1 *enet_uip Application Modified to Use MAP_ APIs*

enet_uip application for ek-tm4c1294xl kit is updated to use MAP_ APIs instead of ROM_ APIs.

5.12.2 *qs_iot Application Fails to Reconnect on Loss of IP Address*

The qs_iot application for the ek-tm4c1294xl kit fails to reconnect to Exosite server after loss of IP address. This is because, after re-acquiring IP address, a request for a new socket returns bad pointer. This is now fixed by updating the Ethernet client module.

5.12.3 *qs_iot Application Does Not Handle Continuous Error Codes From Exosite Server*

The qs_iot application for the ek-tm4c1294xl kit quits trying to send message to Exosite server once it receives continuous error codes from Exosite server. The qs_iot application is updated to handle these error codes in a more robust manner.

5.12.4 *enet_io Application Has a Delay Loop in Interrupt Context*

The enet_io application for the ek-tm4c1294xl board has a delay loop for animation LED in the function lwipHostTiemrHandler(). This results in autoip taking about 10 minutes to establish a connection. This loop has now been removed.

5.13 New Features in Peripheral Examples Firmware Package

5.13.1 *Added TM4C129x Support for Peripheral Examples*

All example codes kept in the examples and peripheral folder were hard coded for the TM4C123x device. Support for TM4C129x devices has now been added.

5.14 New Features in TivaWare Firmware Development Package

5.14.1 *Updated Source Address of the Data Segment Initialization*

The source address of the data segment initialization was updated to __data_load__ instead of __etext. The startup routine (ResetISR) in the GCC start up files copies data segment initializers from flash to RAM and it should be setting the source address to the __data_load__ symbol instead of __etext (because of the fact that the linker script allocates .rodata after __etext, and before __data_load__, so setting the source address as __etext incorrectly copies the .rodata as well).

5.14.2 *Updated Linker Script File for CCS GCC*

- The interrupt vector section name is updated as intvecs for CCS GCC.
- KEEP directive for some sections were removed to enable discarding of empty sections.
- Default GCC float support (-mfloat-abi) set to "hard" for Tiva™ devices.

5.15 Known Issues

5.15.1 *qs-logger Example- Analog Values Were Not Correct for TM4c1294xl*

The analog values shown on the display are not correlating with the actual input.

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6.1 Summary

This version of TivaWare for C Series adds support for the EK-TM4C1294XL kit.

Tool Chains Used:

- IAR EW-Arm 6.60.1
- Keil RV-MDK 4.72
- Texas Instruments CCS 5.40

6.2 New Features in TivaWare Peripheral Driver Library

6.2.1 *ADCSequenceConfigure Can Now Select PWM Module for Triggers*

Additional options have been added to the ui32Trigger parameter to ADCSequenceConfigure to allow the source of PWM triggers to be selected. In previous releases, PWM triggers were always configured to derive from PWM0. On parts containing multiple PWM modules triggers, however, this left the application having to use direct register access to configure triggers from PWM1. Applications may now OR ADC_TRIGGER_PWM_MOD0 or ADC_TRIGGER_PWM_MOD1 into the ui32Trigger parameter to determine the source of the PWM trigger in use.

6.2.2 *Added Support to Set Sample/Hold Times to ADCSequenceStepConfigure()*

The ADCSequenceStepConfigure() function now supports setting the Sample and Hold time for an ADC sequencer on TM4C129 Tiva devices. This API addition allows applications to control the sample period for an ADC sequencer in terms of ADC clocks.

6.2.3 *SysCtlClockSet() Start Up Delay Reduced*

The SysCtlClockSet() function was delaying longer than necessary causing longer than required delays before returning. This only effected cases where the main oscillator was in use. The function now checks for the main oscillator power up sequence and the large fixed delays have been removed.

6.2.4 *Add New Deep Sleep Settings to SysCtlDeepSleepPowerSet()*

Deep sleep modes have been added to support the new deep sleep settings available on the TM4C129 devices. The new options are to put the LDO into a sleep mode when entering deep sleep and allowing the temperature sensor to be put in a low power mode when entering deep sleep.

6.2.5 *TimerUpdateMode() API Added to Allow Synchronous Update of Timers*

The default behavior for updates to timer load and match values using TimerLoadSet(), TimerLoadSet64(), TimerMatchSet(), and TimerMatchset64() is to update the values immediately. However, the timers also allow for synchronous updates of the load and match values when the timer hits the timeout value. The TimerUpdateMode() API was added to allow these updates to happen when the time reaches a timeout value of zero. This allows for predictable changes to the timers when running in PWM mode and adjusting the duty cycle or period of the waveform.

6.2.6 *SysCtlClockFreqSet() Memory Timings Updated*

The table used by SysCtlClockFreqSet() to set the flash and memory timings has been updated for the TM4C129 class devices. The ROM version is still valid and can be used by applications, but the updated flash version has been modified to produce slightly more efficient flash memory timings at higher speeds.

6.2.7 *OneWire Driver Added to DriverLib*

A driver for the OneWire peripheral found on several TM4C129 devices has been added to the Peripheral Driver Library.

6.3 Bug Fixes in TivaWare Peripheral Driver Library

6.3.1 Added ADCClockConfigSet() and ADCClockConfigGet() APIs

The ADCClockConfigSet() and ADCClockConfigGet() have been added to replace the now deprecated SysCtlADCSpeedSet() and SysCtlADCSpeedGet() APIs which are no longer valid for any Tiva C class devices. The new ADCClockConfigSet() function allows for complete control over the clocking and conversion rates of the ADC peripherals.

6.3.2 SysCtlLDOConfigSet() Removed

The function SysCtlLDOConfigSet() has been removed from the Peripheral Driver Library API. This function accessed a register that is no longer present in any Tiva C devices.

6.3.3 SysCtlAltClkConfig() Had Invalid Clocking Options

The options available to the SysCtlAltClkConfig() had unsupported and invalid encodings for some options. The SYSCTL_ALTCLKCFG_ALTCLK_HIBRTC is now more accurately called SYSCTL_ALTCLKCFG_ALTCLK_RTCOSC to match the definitions in the datasheet and the SYSCTL_ALTCLKCFG_ALTCLK_LFIOOSC option now has the correct value for the LFIOOSC encoding.

6.3.4 Updates to ROM Header Files

The following Peripheral Driver Library APIs have been updated in the ROM header files.

SysCtlADCSpeedSet() and SysCtlADCSpeedGet(). These functions have been moved to the ADC module. The System Control APIs in the ROM header files are no longer valid and not supported.

SysCtlGPIOAHBEnable() and SysCtlGPIOAHBDisable(). These APIs are not valid for TM4C129 devices and have been removed from the ROM header files for these devices.

64-Bit Timer APIs have been removed from the ROM header files for TM4C129 devices.

USBLPMEndpointGet() - This API has been removed from the ROM header files.

6.3.5 Removed Redundant LCD_DMA_PRIORITY_x Options From LCD Driver

Labels of the form LCD_DMA_PRIORITY_x have been removed from lcd.c and lcd.h. These labels were documented as being valid in calls to LCDDMAConfigSet and allegedly allowed the DMA priority for the LCD controller to be modified. The priority is, however, fixed in TM4C129x parts so these flags had no effect.

6.3.6 SysCtlADCSpeedSet() Removed

The function SysCtlADCSpeedSet() has been removed from the Peripheral Driver Library API. This function should have been removed in the StellarisWare to TivaWare transition but was accidentally left in the release. It accesses a register no longer present in Tiva devices and attempts to use it could cause problems with the system clock configuration. Applications needing to set the ADC sampling rate should call the function ADCClockConfigSet() instead.

6.3.7 HibernatIntStatus() Documentation Updated

The HibernatIntStatus() documentation has been updated to reflect the correct values returned for Tiva TM4C129 devices.

6.3.8 EEPROMInit() Reworked

On advice from our hardware designers, the sequence of operations performed during the EEPROMInit() function has been changed slightly. The prior sequence contained code that checked for errors that are not actually reported by the hardware and could cause problems in some error recovery situations. As a result of this change, customers are advised to use the flash-based version of EEPROMInit() and not the version in ROM that, obviously, implements the older sequence.

6.3.9 EEPROM_RC_INVPL Has Been Deprecated

The return code EEPROM_RC_INVPL which was intended to indicate an EEPROM programming error due to invalid programming voltage has been deprecated and should no longer be used. No current Tiva part provides this information in its EEDONE register so the flag is redundant.

6.3.10 SysCtlClockGet() Does Not Return Correct Values for All System Divisors

The SysCtlClockGet() function does not return the correct system frequency when the system divisor is limited by the hardware. SysCtlClockSet() allows the user to request invalid system divisors that can put the system clock above its maximum value. The hardware automatically limits the system divisor to a valid value, but SysCtlClockGet() did not recognize this and returned frequency above the actual operating system frequency. This only affected system divisors when using the PLL.

6.3.11 Remove Invalid System Control Settings

Remove the following from the list of system control interrupt source: SYSCTL_INT_CUR_LIMIT, SYSCTL_INT_IOSC_FAIL, SYSCTL_INT_PO, and SYSCTL_INT_PLL_FAIL. These are not valid for any Tiva C class devices. There were also two peripherals enables(SYSCTL_PERIPH_COMP1 and SYSCTL_PERIPH_COMP2) that are not present in Tiva C class devices that needed to be removed as well. These still exist but are not enabled/disabled in the same way as non Tiva C devices.

6.3.12 MCU Class Names Replaced by Part Numbers

Previous releases of TivaWare used MCU class names, Blizzard and Snowflake, within the source. These names are no longer used within the datasheets and so have been removed from TivaWare too. This affects two sets of labels that are used in customer applications. The previous ROM-selection labels TARGET_IS_BLIZZARD_REVxx and TARGET_IS_SNOWFLAKE_REVxx have been replaced with TARGET_IS_TM4C123_REVxx and TARGET_IS_TM4C129_REVxx respectively. Also, the macros used to determine the class of silicon on which an application is running, as defined in inc/hw_types.h, have been renamed from CLASS_IS_BLIZZARD and CLASS_IS_SNOWFLAKE to CLASS_IS_TM4C123 and CLASS_IS_TM4C129, respectively.

6.3.13 USBLPMEndpointGet() Returning the Wrong Data Type

The USBLPMEndpointGet() function was returning the index of the endpoint and not the USB_EP_[0-7] value that is used by all other USB APIs. The function now returns the correctly formatted value so that the return value can be used with other USB APIs.

6.3.14 Correct GPIO Drive Strength Register Write Order in GPIOPadConfigSet()

For Tiva parts that support GPIO drive strengths of 6mA/10mA/12mA, the GPIOPC[EDMn] value must be set prior to writing the drive strength registers. GPIOPadConfigSet() wrote this register last and thus attempting to set drive strengths of 10mA or 12mA provided no improvement over 6mA. The GPIOPC[EDMn] encoding is now written first. Along with this register order change, the GPIO_STRENGTH_8MA and GPIO_STRENGTH_8MA_SC defines were adjusted to use a GPIOPC[EDMn] setting of 0x3. This define change has no impact on Tiva parts that do not support GPIOPC[EDMn] encodings.

6.3.15 Removed Legacy EPI General-Purpose Mode Configuration Options

The EPI general purpose configuration API EPIConfigGPMModeSet() accepted several legacy or invalid options that are not appropriate for Tiva MCUs. These options have been removed and include: EPI_GPMODE_FRAMEPIN, EPI_GPMODE_READ2CYCLE, EPI_GPMODE_RDYEN and EPI_GPMODE_WORD_ACCESS. As a part of these changes, the EPIConfigGPMModeSet() ui32MaxWait parameter is no longer used.

6.3.16 Count Limit for EPIDMATxCount Has Been Corrected

In previous releases, function EPIDMATxCount() limited the ui32Count parameter to values less than 255 even though the uDMA controller is capable of transfers up to 1024 units and the underlying EPI transmit count register is 16-bits wide. This limit has now been increased to 1024 to allow transfers whose length matches the maximum imposed by the uDMA controller.

6.3.17 Deprecated uDMAChannelSelectDefault() and uDMAChannelSelectSecondary()

Functions uDMAChannelSelectDefault() and uDMAChannelSelectSecondary() are redundant for all Tiva parts and have been deprecated. New software should call uDMAChannelAssign() instead to perform the same function.

6.3.18 Ethernet Descriptor Fields Now Volatile

Various fields in the Ethernet MAC DMA descriptor structure are modified by the hardware during packet transmission or reception but were not declared as “volatile” in the structure definition. As a result, compilers may have optimized out accesses to the descriptors in some cases resulting in incorrect software operation. These fields have now been modified to correctly include the “volatile” modifier.

6.4 New Features in TivaWare Graphics Library

6.4.1 Graphics Driver Test Tool Added

A new example, grlib_driver_test, has been added to the dk-tm4c129x release. This tool is intended to be used by developers of display drivers for the TivaWare graphics library and offers commandline access to low level graphics primitives and various test patterns intended to highlight problems in new display driver implementations.

6.5 Bug Fixes in TivaWare Graphics Library

6.5.1 Fixed Naming Error in SliderVerticalSet

An errant script renamed the graphics library macro SliderVerticalSet to SliderVerticali32Set in the previous release. This problem has now been fixed and the correct macro name restored.

6.5.2 GrTransparentImageDraw Could Generate Incorrect Output in Some Cases

Previously, GrTransparentImageDraw could generate incorrect output with some display drivers if the first line of the image being drawn contained only transparent pixels. This bug has now been fixed.

6.6 Bug Fixes in TivaWare Sensor Library

6.6.1 BMP180DataPressureGetFloat() Issue in Data Conversion to Floating Point

Fixed an issue in the conversion from raw sensor reading to floating point. The error created a condition where a sensor reading was erroneously interpreted as negative.

6.7 Bug Fixes in Third Party Packages

6.7.1 Redundant libusb-win32 Files Removed

A redundant group of libusb-win32 driver files have been removed from the third_party/windows directory of the TivaWare release. These have not been used in StellarisWare or TivaWare for several years. Although these files are no longer redistributed, anyone needing libusb-win32 is encouraged to download the files they need from the project site at <http://sourceforge.net/apps/trac/libusb-win32/wiki>.

6.8 New Features in TivaWare USB Library

6.8.1 USB Device PowerStatusSet() Functions Replaced With USDCDFeatureSet()

The various USB device mode classes had individual methods for setting the same power status information using APIs at the USB device class level. These functions have been deprecated and replaced by the USDCDFeatureSet() API using the USBLIB_FEATURE_POWER feature option. These APIs are not typically used by applications but could be used by custom USB devices classes which should switch to the USDCDFeatureSet() API.

6.9 Bug Fixes in TivaWare USB Library

6.9.1 USBHCDPipeWrite() Hangs With Certain Data Sizes

If USBHCDPipeWrite() is called with a data size that is greater than 64 and not a multiple of 64 and the USB pipe is not using DMA then the call incorrectly attempted to send the full number of bytes requested. This also caused the call to USBHCDPipeWrite() to hang waiting for more bytes than can be sent. The call now correctly sends only the remaining bytes and returns correctly.

6.9.2 USB Device Enumeration Failed With Descriptors Larger Than 256 Bytes

The USB library failed to enumerate when a device is created with a descriptor that is larger than 256 bytes. The library was using an 8-bit index for the descriptors and now has been fixed to use a 16-bit index allowing for descriptors of up to 65536 bytes in size.

6.9.3 USB Library not Properly Handling DMA With All Packet Sizes

The USB library was not handling all cases of DMA transfer sizes which could cause USB pipes that use DMA to not complete transfers. This was effecting isochronous audio transfers that can send variable sized data packets that were smaller than the initial DMA request. These requests are now handled properly and the DMA transfer is reset with the smaller transfer if needed.

6.9.4 USB Host Keyboard Class Issues With Multiple Keys Pressed

The USB library's host HID keyboard class was not properly handling multiple key presses causing multiple press events for most cases where more than one key was pressed. This has been fixed and the library can now handle up to six keys down at a time.

6.10 Bug Fixes in TivaWare Utility Library

6.10.1 smbus.c typo When Configuring I2C6

Under "case I2C6_BASE" there is a macro typo regarding TM4C129X devices. MAP_IntEnable(INT_I2C7_SNOWFLAKE) was changed to MAP_IntEnable(INT_I2C6_SNOWFLAKE).

6.11 New Features in DK-TM4C129X Firmware Package

6.11.1 New Button Driver Added

The dk-tm4c129x board now has a button driver similar to the other development boards. This provides button de-bouncing and handles reading the three separate GPIO ports for the buttons. The application has the choice of which buttons that it wants to enable as well.

6.11.2 Added usb_host_keyboard Example to Release

Added a USB host keyboard example to the examples for the dk-tm4c129x development board.

6.11.3 Added USB Device Mouse Example to dk-tm4c129x

This release adds a USB device mouse example to the dk-tm4c129x board examples. This uses the touch screen of the dk-tm4c129x as a touch pad mouse in device mode.

6.11.4 Added a USB Composite Device Example

Added a USB composite device example the dk-tm4c129x kit software. This example enumerates as a composite HID device with both mouse and keyboard interfaces. The touch screen is used as the input for both keyboard and mouse.

6.11.5 Added usb_host_audio Example

Added the usb_host_audio example to demonstrate the use of an isochronous audio device in host mode on the dk-tm4c129x.

6.11.6 Added usb_host_audio_in Example

Added the usb_host_audio_in example to demonstrate the use of an isochronous audio device input device in host mode on the dk-tm4c129x.

6.11.7 Graphics Driver Test Tool Added

A new example, grlib_driver_test, has been added to the dk-tm4c129x release. This tool is intended to be used by developers of display drivers for the TivaWare graphics library and offers commandline access to low level graphics primitives and various test patterns intended to highlight problems in new display driver implementations.

6.11.8 Added USB Serial Device Example to dk-tm4c129x

This release adds a USB serial device example to the dk-tm4c129x board examples.

6.11.9 Extended Peripheral Interface SDRAM Example Added

An example illustrating configuration of the TM4C129's Extended Peripheral Interface (EPI) for use with SDRAM memory has been added to the examples/peripherals/epi directory.

6.11.10 CC3000 WiFi BoosterPack and EM Support Added

Support for the CC3000 WiFi BoosterPack and Evaluation Module has been added to TivaWare. The host-side drivers and stack code can be found in the cc3000 directory at the top level of the TivaWare installation. Example applications for each supported board include a firmware patch programmer, an SSID scanner and a basic, command-line driven tool allowing connection to access points and transfer of data via TCP or UDP packets.

6.12 Bug Fixes in DK-TM4C129X Firmware Package

6.12.1 qs-weather Application Fails to Display Temperatures Correctly

The qs-weather application for the dk-tm4c129x kit incorrectly displays temperatures when the temperatures go into the negative Celcius range. The temperature conversion has been corrected to properly handle negative values.

6.12.2 qs-weather not Updating After Lost Ethernet Link

The qs-weather application was failing to continue updating if the Ethernet link was lost while updating city information. The application now properly resets the update state for cities that were had requests in progress when the Ethernet link was lost.

6.12.3 MCU Class Names Replaced by Part Numbers

Previous releases of TivaWare used MCU class names, Blizzard and Snowflake, within the source. These names are no longer used within the datasheets and so have been removed from TivaWare too. This affects two sets of labels that are used in customer applications. The previous ROM-selection labels TARGET_IS_BLIZZARD_REVxx and TARGET_IS_SNOWFLAKE_REVxx have been replaced with TARGET_IS_TM4C123_REVxx and TARGET_IS_TM4C129_REVxx respectively. Also, the macros used to determine the class of silicon on which an application is running, as defined in inc/hw_types.h, have been renamed from CLASS_IS_BLIZZARD and CLASS_IS_SNOWFLAKE to CLASS_IS_TM4C123 and CLASS_IS_TM4C129, respectively.

6.12.4 Korean Translation Correction

The lang_demo example has been updated to correct an error in the Korean translation of one string.

6.13 New Features in DK-TM4C123G Firmware Package

6.13.1 CC3000 WiFi BoosterPack and EM Support Added

Support for the CC3000 WiFi BoosterPack and Evaluation Module has been added to TivaWare. The host-side drivers and stack code can be found in the cc3000 directory at the top level of the TivaWare installation. Example applications for each supported board include a firmware patch programmer, an SSID scanner and a basic, command-line driven tool allowing connection to access points and transfer of data via TCP or UDP packets.

6.14 Bug Fixes in DK-TM4C123G Firmware Package

6.14.1 MCU Class Names Replaced by Part Numbers

Previous releases of TivaWare used MCU class names, Blizzard and Snowflake, within the source. These names are no longer used within the datasheets and so have been removed from TivaWare too. This affects two sets of labels that are used in customer applications. The previous ROM-selection labels TARGET_IS_BLIZZARD_REVxx and TARGET_IS_SNOWFLAKE_REVxx have been replaced with TARGET_IS_TM4C123_REVxx and TARGET_IS_TM4C129_REVxx respectively. Also, the macros used to determine the class of silicon on which an application is running, as defined in inc/hw_types.h, have been renamed from CLASS_IS_BLIZZARD and CLASS_IS_SNOWFLAKE to CLASS_IS_TM4C123 and CLASS_IS_TM4C129, respectively.

6.15 Bug Fixes in EK-LM4F232 Firmware Package

6.15.1 MCU Class Names Replaced by Part Numbers

Previous releases of TivaWare used MCU class names, Blizzard and Snowflake, within the source. These names are no longer used within the datasheets and so have been removed from TivaWare too. This affects two sets of labels that are used in customer applications. The previous ROM-selection labels TARGET_IS_BLIZZARD_REVxx and TARGET_IS_SNOWFLAKE_REVxx have been replaced with TARGET_IS_TM4C123_REVxx and TARGET_IS_TM4C129_REVxx respectively. Also, the macros used to determine the class of silicon on which an application is running, as defined in inc/hw_types.h, have been renamed from CLASS_IS_BLIZZARD and CLASS_IS_SNOWFLAKE to CLASS_IS_TM4C123 and CLASS_IS_TM4C129, respectively.

6.16 New Features in EK-TM4C123GXL Firmware Package

6.16.1 Added a USB HID Gamepad Example

This release added a new example for the USB device HID gamepad class. The example acts as a USB HID gamepad device with 2 buttons and 3 axis.

6.16.2 Added a USB HID Gamepad Example

This release added a new example for the USB device HID gamepad class. The example acts as a USB HID gamepad device with 3 buttons and 2 axis using the on board buttons as well as the touch screen for the X and Y axis.

6.16.3 CC3000 WiFi BoosterPack and EM Support Added

Support for the CC3000 WiFi BoosterPack and Evaluation Module has been added to TivaWare. The host-side drivers and stack code can be found in the cc3000 directory at the top level of the TivaWare installation. Example applications for each supported board include a firmware patch programmer, an SSID scanner and a basic, command-line driven tool allowing connection to access points and transfer of data via TCP or UDP packets.

6.17 Bug Fixes in EK-TM4C123GXL Firmware Package

6.17.1 MCU Class Names Replaced by Part Numbers

Previous releases of TivaWare used MCU class names, Blizzard and Snowflake, within the source. These names are no longer used within the datasheets and so have been removed from TivaWare too. This affects two sets of labels that are used in customer applications. The previous ROM-selection labels TARGET_IS_BLIZZARD_REVxx and TARGET_IS_SNOWFLAKE_REVxx have been replaced with TARGET_IS_TM4C123_REVxx and TARGET_IS_TM4C129_REVxx respectively. Also, the macros used to determine the class of silicon on which an application is running, as defined in inc/hw_types.h, have been renamed from CLASS_IS_BLIZZARD and CLASS_IS_SNOWFLAKE to CLASS_IS_TM4C123 and CLASS_IS_TM4C129, respectively.

6.18 New Features in EK-TM4C1294XL Firmware Package

6.18.1 CC3000 WiFi BoosterPack and EM Support Added

Support for the CC3000 WiFi BoosterPack and Evaluation Module has been added to TivaWare. The host-side drivers and stack code can be found in the cc3000 directory at the top level of the TivaWare installation. Example applications for each supported board include a firmware patch programmer, an SSID scanner and a basic, command-line driven tool allowing connection to access points and transfer of data via TCP or UDP packets.

6.19 Bug Fixes in EK-TM4C1294XL Firmware Package

6.19.1 Korean Translation Correction

The lang_demo example has been updated to correct an error in the Korean translation of one string.

6.20 New Features in TivaWare Firmware Development Package

6.20.1 FreeRTOS Update to Version 7.6.0

Updated third_party/freertos/ to version 7.6.0. For more information, see <http://www.freertos.org/History.txt>.

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7.1 Summary

This version of TivaWare for C Series adds support for the new TM4C129 series of devices (the Snowflake class) and the DK-TM4C129X development kit.

Tool chains used:

- IAR EW-Arm 6.60.1
- Keil RV-MDK 4.72
- Mentor CodeBench 2011.07-52
- Texas Instruments CCS 5.40

7.2 New Features in TivaWare Peripheral Driver Library

7.2.1 Add New System Control Sleep and Deep Sleep APIs

The system control APIs were missing support for some LDO and power settings related to sleep and deep sleep. The following APIs were added to allow support for these features: SysCtlLDOSleepSet(), SysCtlLDOSleepGet(), SysCtlLDODeepSleepSet(), SysCtlLDODeepSleep- Get(), SysCtlSleepPowerSet(), and SysCtlDeepSleepPowerSet().

7.3 Bug Fixes in TivaWare Peripheral Driver Library

7.3.1 EPI Functions Added as TM4C129 Erratum Workaround

A collection of functions intended to aid applications storing data in external memory mapped to the 0x10000000 EPI aperture has been added to the DriverLib API. These functions, EPIWorkaround-ByteRead(), EPIWorkaroundByteWrite(), EPIWorkaroundHWordRead(), EPIWorkaroundHWord-Write(), EPIWorkaroundWordRead() and EPIWorkaroundWordWrite() can be used by applications to safely read and write memory in the 0x10000000 aperture on TM4C129 parts affected by an erratum which can cause data corruption in some cases. Note that these access functions need not be used if external memory is mapped to the 0x60000000 aperture.

7.4 New Features in TivaWare Graphics Library

7.4.1 Added Raster Mode LCD Controller Example Drivers

An example application illustrating how to use the TM4C129 LCD controller with raster-mode display panels has been added along with TivaWare Graphics Library drivers supporting 1, 4, 8 and 16bpp frame buffers for raster devices. The new code can be found installed under examples/ peripherals/lcd.

7.5 New Features in TivaWare USB Library

7.5.1 Added USB HID gamepad Support to USB Library

The USB library now has USB HID gamepad support in device mode. This allows Tiva C devices to act as USB HID gamepad devices when connected to a host controller. The HID gamepad support provides a default 3 axis 8 button gamepad, but also enables full customization of the HID descriptor to allow for any types of inputs available to a HID gamepad.

7.6 Bug Fixes in TivaWare USB Library

7.6.1 Registering Tick Handlers Allocating Incorrectly

The InternalUSBRegisterTickHandler() was allocating all handlers when a request was made to allocate a single handler. This could have affected applications that used more than one device class.

7.6.2 Incorrect ASSERT() in uDMAUSBUnitSizeSet()

The ASSERTs in uDMAUSBUnitSizeSet() were incorrectly using define values for a DriverLib API and not the correct numerical values in the ASSERT. This affected any builds of the USB library with DEBUG defined.

7.6.3 USB Device MSC not Responding Correctly When Media Ejected

The USB library mass storage class device mode was not responding correctly when the removable media was not present. The library now responds by failing Test Unit Ready requests when the media is not present.

7.7 New Features in TivaWare Utility Library

7.7.1 Updated lwIP Wrapper Module to Support FreeRTOS

The lwIP wrapper module is updated to support FreeRTOS. To use FreeRTOS, define NO_SYS to 0 and RTOS_FREERTOS to 1 in lwipopts.h project- specific file.

7.8 Bug Fixes in DK-TM4C129X Firmware Package

7.8.1 Checksum Offload Enabled in lwIP Examples Applications

An error in the lwipopts.h configuration header used by the enet_lwip, enet_io and qs_weather example applications resulted in the lwIP TCP/IP stack using software to calculate all IP, UDP, TCP and ICMP packet checksums even though the hardware was also configured to calculate and insert these values. This resulted in a reduction in performance but, more seriously, caused all ICMP packets to be transmitted with 0 inserted as their checksum. As a result, attempts to “ping” boards running these example applications would fail.

Following this fix, all lwIP examples now perform checksum calculations only in hardware and ICMP packets are now correct.

7.8.2 DMA Transactions are Now Stopped When udma_demo ends

In the previous version of udma_demo, DMA transactions continued even after the application indicated that it was finished. The example has now been updated to stop the transactions when the application ends.

7.8.3 Minor Text Clipping Fixed in lang_demo

A minor widget sizing error caused the bottom line of German and Italian text in the lang_demo example to be clipped. This problem has now been fixed.

7.8.4 UART Baud Rate Corrected

Various example applications in the previous build instructed the user to set the UART to 115000bps when, in fact, 115200bps is the correct value. These have been updated to show the expected rate.

7.9 New Features in DK-TM4C123G Firmware Package

7.9.1 Graphics Library Example Application Added

A new example application, grlib_demo, has been added to the dk-tm4c123g release of TivaWare. This example illustrates the use of the low level graphics primitive functions in the TivaWare Graphics Library.

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8.1 Summary

This version of TivaWare for C Series adds support for the new TM4C129 series of devices (the Snowflake class) and the DK-TM4C129X development kit.

Tool chains used:

- IAR EW-Arm 6.60.1
- Keil RV-MDK 4.72
- Mentor CodeBench 2011.07-52
- Texas Instruments CCS 5.40

8.2 New Features in TivaWare Peripheral Driver Library

8.2.1 Added Support for the TM4C129 Family

Drivers have been added and updated to support the new TM4C129 family of microcontrollers. New drivers have been added for the EPI, Ethernet, LCD, and CCM modules.

8.2.2 Added Support for Tamper Feature of Hibernate Module

To support the Tamper feature on TM4C129 family, new APIs have been added to the hibernate driver.

8.3 New Features in TivaWare Graphics Library

8.3.1 Add On-Screen Keyboard to Graphics Library

There is a new configurable on screen keyboard to the graphics library. The current keyboard supports only a US keyboard mapping, but is customizable to any number of keys in any size or mapping. This allows an application to define its own keyboard or simply use the standard keyboard provided with the graphics library. Details on using and customizing the keyboard are provided in the graphics library documentation.

8.4 New Features in TivaWare Sensor Library

8.4.1 Added Driver for the TMP100

Add a driver for the Texas Instruments TMP100 digital temperature sensor.

8.5 Bug Fixes in TivaWare USB Library

8.5.1 Bulk Only Mass Storage Reset Issue

The USB library was not properly handling the USB Bulk Only Mass Storage Reset and causing mass storage devices to not enumerate. The USB library now responds to this and has added better support to stall unknown requests to non-zero endpoints.

8.5.2 USB Library Not Properly Resetting Data Toggle

The USB library was not properly resetting the data toggle when re-assigning USB pipes to new devices. The library now always resets the data toggle when allocating a new USB data pipe.

8.5.3 USB_EVENT_UNKNOWN_CONNECTED Event Returning Incorrect Data

The USB library was returning incorrect data when the USB_EVENT_UNKNOWN_CONNECTED event occurred. The USB_EVENT_UNKNOWN_CONNECTED now returns instance data that can be used with other USB library APIs.

8.5.4 USB Library Incorrectly Clearing Endpoint Status

The USB library was incorrectly clearing Host IN status bits when clearing Host OUT endpoint status. The library now properly masks off only the IN or OUT status bits depending on which type of request is being handled.

8.5.5 USB Library Not Releasing Configuration Descriptor on Disconnect

The USB library is not releasing the configuration descriptor when a device is disconnected from the controller in host mode. This caused devices with larger configuration descriptors to not enumerate after devices with smaller configuration descriptors were already connected.

8.6 New Features in DK-TM4C129X Firmware Package

8.6.1 Added DK-TM4C129X Development Kit

Board support and example applications have been added for the new DK-TM4C129X development board.

8.7 Bug Fixes in EK-TM4C123GXL Firmware Package

8.7.1 *usb_dev_serial* Does Not Enumerate

The *usb_dev_serial* example was not properly configuring the USB library to operate in device only mode. This caused the application to fail to enumerate when attached to a USB host controller.

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9.1 Summary

This version of TivaWare for C Series adds support for the DK-TM4C123G development kit.

Tool chains used:

- IAR EW-Arm 6.60.1
- Keil RV-MDK 4.72
- Mentor CodeBench 2011.07-52
- Texas Instruments CCS 5.40

9.2 New Features in TivaWare Bootloader

9.2.1 CRC Checking Option Added to boot_loader

A new feature has been added to the bootloader that allows an image's embedded CRC32 to be verified on each system reset. When CHECK_CRC is defined in bl_config.h, the boot loader only transfers control to a main application image if it can find a header structure above the application vector table and if the CRC32 value embedded in that header matches the value calculated for the image by the boot loader. For more details, see the *Stellaris® Boot Loader Users' Guide* ([SPMU134](#)).

A new tool, binpack, has been added to the tools directory of the release that allows CRC32 values to be calculated and embedded into application images. This tool is described in greater detail in the tools user's guide (packaged as part of TivaWare).

9.3 New Features in TivaWare Peripheral Driver Library

9.3.1 Software CRC Module Moved Into DriverLib

The software CRC module has been moved from the utils directory into the Peripheral Driver Library.

9.4 Bug Fixes in TivaWare Peripheral Driver Library

9.4.1 SysCtlClockGet() Returns an Incorrect Value in Some Configurations

The SysCtlClockGet() function was not properly breaking out of the internal oscillator cases and returned the incorrect processor speed in some configurations. The two failing configurations occurred when SysCtlClockSet() is called with either the SYSCTL_RCC_OSCSRC_INT or SYSCTL_RCC_OSCSRC_INT4 parameter selected for the system clock.

9.4.2 Incorrect ASSERT in HibernateClockConfig()

The ASSERT in HibernateClockConfig was incorrectly causing a debug assert when valid values were passed in to the function. The values HIBERNATE_OSC_HIGHDRIVE and HIBERNATE_OSC_LOWDRIVE were also defined incorrectly and have been changed to match the correct hardware definitions.

9.5 New Features in TivaWare Sensor Library

9.5.1 Added Driver for the L3GD20H

Added a driver for the ST L3GD20H gyroscope.

9.5.2 Added Driver for the LSM303DLHC

Added a driver for the ST LSM303DLHC accelerometer/magnetometer.

9.5.3 Added Driver for the KXTI9

Added a driver for the Kionix KXTI9 accelerometer.

9.5.4 Added Driver for the LSM303D

Added a driver for the ST LSM303D accelerometer/magnetometer.

9.5.5 Added Utility Functions for Working With Quaternions

Added functions for generating a quaternion from a set of Euler angles, calculating the inverse and magnitude of a quaternion, for multiplying two quaternions, and for finding the angle between two quaternions.

9.6 Bug Fixes in TivaWare Sensor Library

9.6.1 Fixed Soft Reset Sequence for MPU6050/MPU9150

The soft reset sequence in the MPU6050 and MPU9150 drivers have been made more robust.

9.6.2 Added Error Resiliency to CompDCM

The update function for the complementary DCM algorithm now checks for NaN (not a number) values in the resulting matrix and replaces the entire matrix with the unity matrix in this case. While the resulting attitude is momentarily incorrect, it recovers proper attitude estimation after a period of time. Previously, the NaN values would stick and the attitude estimation was forever invalid.

9.6.3 Corrected Error Handling in I2C Driver

The error handling in the I2C driver has been adjusted to be more robust and better handle the various error conditions that can occur during an I2C transaction.

9.6.4 Corrected Conversion Factors for ST L3GD20H Gyro

The conversion of raw angular velocity into radians per second was incorrect yielding angular velocities that were orders of magnitude too small. The effect of reporting incorrectly (small) rotations is a long settling time as the complimentary filter fusion algorithm corrects the device orientation with the accelerometer (assuming the gyro is weighted much heavier than the accelerometer).

9.7 New Features in TivaWare Host Tools

9.7.1 Tool, binpack, Added to Embed CRC32 Values Inside Application Binaries

A new utility, binpack, has been added to the tools directory of the TivaWare release. This tool can be used to embed CRC32 values into application images that are intended for use with CRCenabled boot loaders.

9.7.2 Added Tools Document

A document has been added that describes the contents of the tools directory within TivaWare. Previously, this content had been provided in the individual board documents.

9.8 Bug Fixes in TivaWare Host Tools

9.8.1 Cell Width Error in ftrasterize Corrected

The ftrasterize tool has been updated to fix a problem that could cause the font cell width to be reported as smaller than the widest character in the font. Because this change causes the reported dimensions of some fonts to change, a new switch, -x, has been added to revert to the old behavior. This new switch may be used by existing applications that rely upon the incorrectly reported sizes.

In addition, the -m option has been updated to allow monospaced fonts to be created in all supported output formats. Previously this option was limited to basic ASCII fonts created without the -r or -u switches.

9.8.2 Memory Leak in ImusbdlI Fixed

In previous versions of ImusbdlI, calls to OpenDevice() or OpenDeviceByIndex() contained a memory leak, which would occur if no compatible device was connected. This has been corrected.

9.9 New Features in TivaWare USB Library

9.9.1 USB HID Vendor-Specific Usage Macros Added

Two new macros, UsageVendor() and UsagePageVendor(), have been added to usbdhid.h. These macros allow vendor-specific usages and usage pages to be easily included in a HID device's report descriptor.

9.10 Bug Fixes in TivaWare USB Library

9.10.1 Report Disconnect Events in Device Mode

Fixed an issue in the device mode code that prevented delivery of disconnect events.

9.11 New Features in TivaWare Utility Library

9.11.1 Added utils Document

An API document has been added that describes the contents of the utils directory within TivaWare. Previously, this content had been provided in the individual board documents.

9.12 New Features in DK-TM4C123G Firmware Package

9.12.1 Added Support for DK-TM4C123G

Support has been added for the DK-TM4C123G development kit.

9.13 New Features in TivaWare Firmware Development Package

9.13.1 Updated FatFS to Version 0.09

FatFS in third_party/fatfs has been updated to version 0.09.

Release Notes for Version 1.0 (April 11, 2013)

10.1 Summary

This is the initial version of TivaWare for C Series.

Tool chains used:

- IAR EW-Arm 6.40.1
- Keil RV-MDK 4.54
- Mentor CodeBench 2011.07-52
- Texas Instruments CCS 5.30

Revision History

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• Added new Chapter 1 .	12

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