




# TivaWare™ for C Series Release Notes

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## Revision Information

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## 1.1 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

## 1.2 New Features in TivaWare Peripheral Driver Library

### 1.2.1 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.

### 1.2.2 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.

### 1.2.3 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.

### 1.2.4 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.

### 1.2.5 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.

### 1.2.6 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.



## 1.2.7 OneWire driver added to DriverLib

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

## 1.3 Bug Fixes in TivaWare Peripheral Driver Library

### 1.3.1 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.

### 1.3.2 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.

### 1.3.3 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.

### 1.3.4 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.

### 1.3.5 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.

### 1.3.6 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.

### 1.3.7 HibernateIntStatus() documentation updated

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

### 1.3.8 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 which, obviously, implements the older sequence.

### 1.3.9 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.

### 1.3.10 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.

### 1.3.11 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.

### 1.3.12 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.

### 1.3.13 USBLPMEndpointGet() returning the wrong data type

The USBLPMEndpointGet() function was returning the index of the endpoint and not the USB\_EP\_[0-7] value which 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.

### 1.3.14 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.

### 1.3.15 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.

### 1.3.16 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.

### 1.3.17 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.

### 1.3.18 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.

## 1.4 New Features in TivaWare Graphics Library

### 1.4.1 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 command-line access to low level graphics primitives and various test patterns intended to highlight problems in new display driver implementations.

## 1.5 Bug Fixes in TivaWare Graphics Library

### 1.5.1 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.

## 1.5.2 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.

## 1.6 Bug Fixes in TivaWare Sensor Library

### 1.6.1 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.

## 1.7 Bug Fixes in Third Party Packages

### 1.7.1 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 we are no longer redistributing these files, anyone needing libusb-win32 is encouraged to download any files they need from the project site at <http://sourceforge.net/apps/trac/libusb-win32/wiki>.

## 1.8 New Features in TivaWare USB Library

### 1.8.1 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.

## 1.9 Bug Fixes in TivaWare USB Library

### 1.9.1 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.

### 1.9.2 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.

### 1.9.3 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.

### 1.9.4 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.

## 1.10 Bug Fixes in TivaWare Utility Library

### 1.10.1 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)

## 1.11 New Features in DK-TM4C129X Firmware Package

### 1.11.1 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.

### 1.11.2 Added usb\_host\_keyboard example to release.

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

### 1.11.3 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.

### 1.11.4 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.

### 1.11.5 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.

### 1.11.6 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.

### 1.11.7 Graphics Driver Test Tool Added

A new example, gllib\_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 command-line access to low level graphics primitives and various test patterns intended to highlight problems in new display driver implementations.

### 1.11.8 Added USB serial device example to dk-tm4c129x

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

### 1.11.9 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.

### 1.11.10 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.

## 1.12 Bug Fixes in DK-TM4C129X Firmware Package

### 1.12.1 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.

### 1.12.2 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.

### 1.12.3 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.



## 1.12.4 Korean translation correction

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

## 1.13 New Features in DK-TM4C123G Firmware Package

### 1.13.1 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.

## 1.14 Bug Fixes in DK-TM4C123G Firmware Package

### 1.14.1 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.

## 1.15 Bug Fixes in EK-LM4F232 Firmware Package

### 1.15.1 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.

## 1.16 New Features in EK-TM4C123GXL Firmware Package

### 1.16.1 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.

### 1.16.2 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.

### 1.16.3 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.

## 1.17 Bug Fixes in EK-TM4C123GXL Firmware Package

### 1.17.1 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.

## 1.18 New Features in EK-TM4C1294XL Firmware Package

### 1.18.1 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.

## **1.19 Bug Fixes in EK-TM4C1294XL Firmware Package**

### **1.19.1 Korean translation correction**

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

## **1.20 New Features in TivaWare Firmware Development Package**

### **1.20.1 FreeRTOS update to version 7.6.0**

Updated third\_party/freertos/ to version 7.6.0. See <http://www.freertos.org/History.txt> for more information.



## 2 Release Notes for Version 2.0.1 (October 8, 2013)

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### 2.1 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

### 2.2 New Features in TivaWare Peripheral Driver Library

#### 2.2.1 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(), SysCtlLDODeepSleepGet(), SysCtlSleepPowerSet(), and SysCtlDeepSleepPowerSet().

### 2.3 Bug Fixes in TivaWare Peripheral Driver Library

#### 2.3.1 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(), EPIWorkaroundHWordWrite(), 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.

## 2.4 New Features in TivaWare Graphics Library

### 2.4.1 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.

## 2.5 New Features in TivaWare USB Library

### 2.5.1 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.

## 2.6 Bug Fixes in TivaWare USB Library

### 2.6.1 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.

### 2.6.2 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.

### 2.6.3 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.

## 2.7 New Features in TivaWare Utility Library

### 2.7.1 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.

## 2.8 Bug Fixes in DK-TM4C129X Firmware Package

### 2.8.1 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.

### 2.8.2 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.

### 2.8.3 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.

### 2.8.4 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.

## **2.9 New Features in DK-TM4C123G Firmware Package**

### **2.9.1 Graphics library example application added**

A new example application, `gplib_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.



## 3 Release Notes for Version 2.0 (August 29, 2013)

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### 3.1 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

### 3.2 New Features in TivaWare Peripheral Driver Library

#### 3.2.1 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.

#### 3.2.2 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.

## **3.3 New Features in TivaWare Graphics Library**

### **3.3.1 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.

## **3.4 New Features in TivaWare Sensor Library**

### **3.4.1 Added driver for the TMP100**

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

## **3.5 Bug Fixes in TivaWare USB Library**

### **3.5.1 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.

### **3.5.2 USB Library Not Properly Resetting Data Toggle**

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

### **3.5.3 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.

### **3.5.4 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.

### 3.5.5 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.

## 3.6 New Features in DK-TM4C129X Firmware Package

### 3.6.1 Added DK-TM4C129X development kit

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

## 3.7 Bug Fixes in EK-TM4C123GXL Firmware Package

### 3.7.1 `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.



## 4 Release Notes for Version 1.1 (July 2, 2013)

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### 4.1 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

### 4.2 New Features in TivaWare Boot Loader

#### 4.2.1 CRC checking option added to boot\_loader

A new feature has been added to the boot loader 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. Please refer to the Boot Loader Users' Guide for more details.

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.

## 4.3 New Features in TivaWare Peripheral Driver Library

### 4.3.1 Software CRC module moved into DriverLib

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

## 4.4 Bug Fixes in TivaWare Peripheral Driver Library

### 4.4.1 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.

### 4.4.2 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.

## 4.5 New Features in TivaWare Sensor Library

### 4.5.1 Added driver for the L3GD20H

Added a driver for the ST L3GD20H gyroscope.

### 4.5.2 Added driver for the LSM303DLHC

Added a driver for the ST LSM303DLHC accelerometer/magnetometer.

### 4.5.3 Added driver for the KXTI9

Added a driver for the Kionix KXTI9 accelerometer.

#### 4.5.4 Added driver for the LSM303D

Added a driver for the ST LSM303D accelerometer/magnetometer.

#### 4.5.5 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.

### 4.6 Bug Fixes in TivaWare Sensor Library

#### 4.6.1 Fixed soft reset sequence for MPU6050/MPU9150

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

#### 4.6.2 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.

#### 4.6.3 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.

#### 4.6.4 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).

## 4.7 New Features in TivaWare Host Tools

### 4.7.1 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 CRC-enabled boot loaders.

### 4.7.2 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.

## 4.8 Bug Fixes in TivaWare Host Tools

### 4.8.1 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.

### 4.8.2 Memory leak in lmusbdll fixed.

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

## 4.9 New Features in TivaWare USB Library

### 4.9.1 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.



## **4.10 Bug Fixes in TivaWare USB Library**

### **4.10.1 Report disconnect events in device mode**

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

## **4.11 New Features in TivaWare Utility Library**

### **4.11.1 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.

## **4.12 New Features in DK-TM4C123G Firmware Package**

### **4.12.1 Added support for DK-TM4C123G**

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

## **4.13 New Features in TivaWare Firmware Development Package**

### **4.13.1 Updated FatFS to version 0.09**

FatFS in third\_party/fatfs has been updated to version 0.09.



## 5 Release Notes for Version 1.0 (April 11, 2013)

Summary ..... 35

### 5.1 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

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## Applications

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Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
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