EK-TM4C1294XL-BOOST-CC3100 Firmware Development Package

USER'S GUIDE

SW-EK-TM4C1294XL-BOOST-CC3100-UG-2.1.4.178

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Revision Information

This is version 2.1.4.178 of this document, last updated on February 22, 2017.

Table of Contents

Copyright 2
Revision Information 2
1 Introduction 5
2 Example Applications 7
2.1 CC3100 HTTP Server Example (cc3100_http_server) 7
3 Buttons Driver 9
3.1 Introduction 9
3.2 API Functions 9
3.3 Programming Example 10
4 Pinout Module 13
4.1 Introduction 13
4.2 API Functions 13
4.3 Programming Example 14
IMPORTANT NOTICE 16

1 Introduction

The Texas Instruments® Tiva™ EK-TM4C1294XL-BOOST-CC3100 evaluation board (Tiva C Series TM4C1294 Connected LaunchPad) is a low cost platform that can be used for software development and prototyping a hardware design. A variety of BoosterPacks are available to quickly extend the LaunchPad's features.

The EK-TM4C1294XL includes a Tiva ARM® Cortex™-M4-based microcontroller and the following features:

- Tiva™ TM4C1294NCPDT microcontroller
- Ethernet connector
- USB OTG connector
- 2 user buttons
- 4 User LEDs
- 2 BoosterPack XL sites
- On-board In-Circuit Debug Interface (ICDI)
- Power supply option from USB ICDI connection, USB OTG connection or external power connection
- Shunt jumper for microcontroller current consumption measurement

This document describes the example applications that are provided for the EK-TM4C1294XL when paired with the BOOST-CC3100 BoosterPack.

2 Example Applications

The example applications show how to utilize features of this evaluation board. Examples are included to show how to use many of the general features of the Tiva microcontroller, as well as the feature that are unique to this evaluation board.

A number of drivers are provided to make it easier to use the features of this board. These drivers also contain low-level code that make use of the TivaWare peripheral driver library and utilities.

There is an IAR workspace file (`ek-tm4c1294xl-boost-cc3100.eww`) that contains the peripheral driver library project, along with all of the board example projects, in a single, easy-to-use workspace for use with Embedded Workbench

There is a Keil multi-project workspace file (`ek-tm4c1294xl-boost-cc3100.mpw`) that contains the peripheral driver library project, along with all of the board example projects, in a single, easy-to-use workspace for use with uVision.

All of these examples reside in the `examples/boards/ek-tm4c1294xl-boost-cc3100` subdirectory of the firmware development package source distribution.

2.1 CC3100 HTTP Server Example (cc3100_http_server)

This application demonstrates web-based I/O control using CC3100 Boosterpack (on Boosterpack 2 header) and EK-TM4C1294XL, which allows the end-users to communicate and control with EK-TM4C1294XL using standard web-browsers.

The CC3100 acts as an Access Point and uses the SSID <app_mode_SSID> that can be modified statically by updating the value of the define SSID_AP_MODE in the file sl_common.h.

The information and debug messages are transmitted over UART0, which can be accessed with a terminal window at 115200 baud with the settings 8-N-1.

This application is built with Webpages, that can be uploaded to the serial flash on CC3100 Boosterpack by pressing and holding USR_SW1 during reset. These webpages take preference over the default ones that come with the CC3100 BoosterPack.

Once a WIFI station connects to CC3100, domain name and authorization parameters are displayed on the terminal window. Use the domain name on a standard browser to access the webserver and enter authorization details when prompted.

The I/O control can be achieved via the webpage “IO Control Demo”, which uses JavaScript running in the web browser to send HTTP requests to control the Animation LED (LED D1) and the Toggle LED (LED D2). Responses generated by the board are returned to the browser and inserted into the page’s HTML dynamically by more JavaScript code.

Source files for the internal file system image can be found in the “fs” directory. If any of these files are changed, the file system image (cc3100_fsdata.h) should be rebuilt by running the following command from the project root directory:

../../../../tools/bin/makefsfile -i fs -o cc3100_fsdata.h -r -h -q

3 Buttons Driver

Introduction 9
API Functions 9
Programming Example 10

3.1 Introduction

The buttons driver provides functions to make it easy to use the push buttons on this evaluation board. The driver provides a function to initialize all the hardware required for the buttons, and features for debouncing and querying the button state.

This driver is located in `examples/boards/ek-tm4c1294xl-boost-cc3100/drivers`, with `buttons.c` containing the source code and `buttons.h` containing the API declarations for use by applications.

3.2 API Functions

Functions

- void ButtonsInit (void)
- uint8_t ButtonsPoll (uint8_t *pui8Delta, uint8_t *pui8RawState)

3.2.1 Function Documentation

3.2.1.1 ButtonsInit

Initializes the GPIO pins used by the board pushbuttons.

Prototype:
```
void
ButtonsInit(void)
```

Description:
This function must be called during application initialization to configure the GPIO pins to which the pushbuttons are attached. It enables the port used by the buttons and configures each button GPIO as an input with a weak pull-up.

Returns:
None.

3.2.1.2 ButtonsPoll

Polls the current state of the buttons and determines which have changed.

Prototype:

```
uint8_t
ButtonsPoll(uint8_t *pui8Delta,
            uint8_t *pui8RawState)
```

Parameters:

pui8Delta points to a character that will be written to indicate which button states changed since the last time this function was called. This value is derived from the debounced state of the buttons.

pui8RawState points to a location where the raw button state will be stored.

Description:

This function should be called periodically by the application to poll the pushbuttons. It determines both the current debounced state of the buttons and also which buttons have changed state since the last time the function was called.

In order for button debouncing to work properly, this function should be called at a regular interval, even if the state of the buttons is not needed that often.

If button debouncing is not required, the the caller can pass a pointer for the *pui8RawState* parameter in order to get the raw state of the buttons. The value returned in *pui8RawState* will be a bit mask where a 1 indicates the buttons is pressed.

Returns:

Returns the current debounced state of the buttons where a 1 in the button ID's position indicates that the button is pressed and a 0 indicates that it is released.

3.3 Programming Example

The following example shows how to use the buttons driver to initialize the buttons, debounce and read the buttons state.

```
//
// Map Left button to the GPIO Pin 0 of the button port.
//
#define LEFT_BUTTON             GPIO_PIN_0

//
// The button example
//
void
ButtonExample(void)
{
    unsigned char ucDelta, ucState;

    //
    // Initialize the buttons.
    //
    ButtonsInit();

    //
    // From timed processing loop (for example every 10 ms)
    //
    {
        //
        // Poll the buttons.  When called periodically this function will
        // run the button debouncing algorithm.
```

```
            //
            ucState = ButtonsPoll(&ucDelta, 0);

            //
            // Test to see if the SELECT button was pressed and do something
            //
            if(BUTTON_PRESSED(LEFT_BUTTON, ucState, ucDelta))
            {
                //
                // TODO: SELECT button action code
                //
            }
        }
    }
```

4 Pinout Module

Introduction 13
API Functions 13
Programming Example 14

4.1 Introduction

The pinout module is a common function for configuring the device pins for use by example applications. The pins are configured into the most common usage; it is possible that some of the pins might need to be reconfigured in order to support more specialized usage.

This driver is located in `examples/boards/ek-tm4c1294xl-boost-cc3100/drivers`, with `pinout.c` containing the source code and `pinout.h` containing the API declarations for use by applications.

4.2 API Functions

Functions

- void LEDRead (uint32_t *pui32LEDValue)
- void LEDWrite (uint32_t ui32LEDMask, uint32_t ui32LEDValue)
- void PinoutSet (bool bEthernet, bool bUSB)

4.2.1 Function Documentation

4.2.1.1 LEDRead

This function reads the state to the LED bank.

Prototype:

```
void
LEDRead(uint32_t *pui32LEDValue)
```

Parameters:

pui32LEDValue is a pointer to where the LED value will be stored.

Description:

This function reads the state of the CLP LEDs and stores that state information into the variable pointed to by pui32LEDValue.

Returns:

None.

4.2.1.2 LEDWrite

This function writes a state to the LED bank.

Prototype:

```
void
LEDWrite(uint32_t ui32LEDMask,
         uint32_t ui32LEDValue)
```

Parameters:

ui32LEDMask is a bit mask for which GPIO should be changed by this call.

ui32LEDValue is the new value to be applied to the LEDs after the ui32LEDMask is applied.

Description:

The first parameter acts as a mask. Only bits in the mask that are set will correspond to LEDs that may change. LEDs with a mask that is not set will not change. This works the same as GPIOPinWrite. After applying the mask the setting for each unmasked LED is written to the corresponding LED port pin via GPIOPinWrite.

Returns:

None.

4.2.1.3 PinoutSet

Configures the device pins for the standard usages on the EK-TM4C1294XL.

Prototype:

```
void
PinoutSet(bool bEthernet,
          bool bUSB)
```

Parameters:

bEthernet is a boolean used to determine function of Ethernet pins. If true Ethernet pins are configured as Ethernet LEDs. If false GPIO are available for application use.

bUSB is a boolean used to determine function of USB pins. If true USB pins are configured for USB use. If false then USB pins are available for application use as GPIO.

Description:

This function enables the GPIO modules and configures the device pins for the default, standard usages on the EK-TM4C1294XL. Applications that require alternate configurations of the device pins can either not call this function and take full responsibility for configuring all the device pins, or can reconfigure the required device pins after calling this function.

Returns:

None.

4.3 Programming Example

The following example shows how to configure the device pins.

```
//
// The pinout example.
//
void
PinoutExample(void)
{
    //
    // Configure the device pins.
    // First argument determines whether the Ethernet pins will be configured
    // in networking mode for this application.
    // Second argument determines whether the USB pins will be configured for
    // USB mode for this application.
    //
    PinoutSet(true, false);
}
```

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