DK-TM4C123G-EM-CC3000 Firmware Development Package

USER'S GUIDE

SW-DK-TM4C123G-EM-CC3000-UG-2.1.0.12573

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Revision Information

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1 Introduction

The Texas Instruments® Tiva™ DK-TM4C123G-EM-CC3000 development board is a platform that can be used for software development and prototyping a hardware design. It can also be used as a guide for custom board design using a Tiva microcontroller.

The DK-TM4C123G-EM-CC3000 includes a Tiva ARM® Cortex™-M4-based microcontroller and the following features:

- Tiva™ TM4C123G microcontroller
- Four 20V analog inputs
- 9 Axis Fusion Data Digital Sensor (Accel, Gyro, Mag)
- On-board temperature sensor
- Bright 96 x 64 16-bit color OLED display
- 5 user buttons
- User LED
- Shunt for microcontroller current consumption measurement
- MicroSD card connector
- USB OTG connector
- On-board In-Circuit Debug Interface (ICDI)
- Coin cell backup battery for Hibernate feature
- Power supply option from USB ICDI connection, or OTG connection

This document describes the board-specific drivers and example applications that are provided for this development board when paired with the CC3000 EM Header daughter card.

2 Example Applications

The example applications show how to utilize features of the DK-TM4C123G development 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 development board.

A number of drivers are provided to make it easier to use the features of the DK-TM4C123G. These drivers also contain low-level code that make use of the TivaWare peripheral driver library and utilities.

There is an IAR workspace file (`dk-tm4c123g-em-cc3000.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 version 5.

There is a Keil multi-project workspace file (`dk-tm4c123g-em-cc3000.uvmpw`) 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/dk-tm4c123g-em-cc3000` subdirectory of the firmware development package source distribution.

2.1 CC3000 Basic WiFi Example (cc3000_basic_wifi_application)

This is a basic WiFi application for the CC3000 BoosterPack. This application is a command line wrapper for various functions that the CC3000 can provide. Please refer to the CC3000 wiki at `http://processors.wiki.ti.com/index.php/CC3000` for more information on the commands provided.

To see available commands type “help” at the serial terminal prompt. The terminal is connected in 8-N-1 mode at 115200 baud.

To use this example you must first connect to an existing unencrypted wireless network. This can be done by using the “smartconfig” command with the associated smartphone application. Alternatively, the connection can be made manually by using the ’connect’ command. Once connected you can do any of the following.

Configure an IP address:

1. To use DHCP to allocate a dynamic IP address “ipconfig” or “ipconfig 0 0 0” or,
2. To allocate a static IP address use “ipconfig a.b.c.d” where “a.b.c.d” is the required, dotted-decimal format address.

Send and receive UDP data:

1. Open a UDP socket “socketopen UDP”.
2. Bind the socket to a local port “bind 8080”.
3. Send or receive data “senddata 192.168.1.101 8080 helloworld” or “receivedata”. In the send-data case, the provided parameters identify the IP address of the remote host and the remote port number to which the data is to be sent.

Send and receive TCP data:

1. Open a TCP socket “socketopen TCP”.

2. Bind the socket to a local port “bind 8080”.
3. Send a request to the remote server “senddata 192.168.1.101 8080 helloworld”. On the first “senddata” after opening the socket, the socket is connected to the specified remote host and port. On further “senddata” requests, the remote address and port are ignored and the existing connection is used.
4. Receive data from the remote server “receivedata”.

Note that, in the current implementation, the application only supports acting as a TCP client. The CC3000 also supports incoming connections as required to operate as a TCP server but this example does not yet include support for this feature.

Send mDNS advertisement:

1. “mdnsadvertise cc3000”

Close the open socket:

1. “socketclose”

Disconnect from network:

1. “disconnect”

Reset the CC3000:

1. “resetcc3000”

Delete connection policy:

This deletes the connection policy from CC3000 memory so that the device won’t auto connect whenever it is reset in future.

1. “deletepolicy”

2.2 CC3000 Firmware Patch Programmer (cc3000_patch_programmer)

This is the Patch Programmer tool for the CC3000 BoosterPack running on an EK-TM4C123GXL LaunchPad. Run the application to download new firmware and driver patches to the CC3000 processor. Status is output via UART0 which is available via the virtual COM port provided by the ICDI debug interface.

Two patches are downloaded using this tool with the patch data is linked directly into the application binary. The driver patch can be found in an array named “wlan_drv_patch” and the firmware patch can be found in “fw_patch”. When new patches are available, these arrays must be replaced with versions containing those new patches and then the application rebuilt and run to apply the patches to the CC3000 hardware.

To view output from the application, set your host system’s serial terminal to use 115200bps, 8-N-1.

For information on the CC3000 software stack and API, please consult the wiki at `http://processors.wiki.ti.com/index.php/CC3000`.

2.3 CC3000 WiFi Access Point SSID Scanning Example (cc3000_ssid_scan)

This example requires a CC3000 WiFi BoosterPack attached to the DK-TM4C123G Development Kit. After booting and initializing the CC3000, the application initiates a WiFi scan for access points. When the scan completes, the SSID, BSSID and security protocol supported by each detected access point are output on the UART0 connection available over the virtual COM port connection provided by the board's ICDI debug interface.

To view output from the application, set your host system's serial terminal to use 115200bps, 8-N-1.

For information on the CC3000 software stack and API, please consult the wiki at `http://processors.wiki.ti.com/index.php/CC3000`.

3 Buttons Driver

3.1 Introduction

The buttons driver provides functions to make it easy to use the push buttons on the DK-TM4C123G 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/dk-tm4c123g-em-cc3000/drivers`, with `buttons.c` containing the source code and `buttons.h` containing the API declarations for use by applications.

3.2 API Functions

3.3 Programming Example

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

```
//
// 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(SELECT_BUTTON, ucState, ucDelta))
    {
        ...
        // SELECT button action
    }
}
```

4 Display Driver

4.1 Introduction

The display driver offers a standard interface to access display functions on the CrystalFontz 96x64 16-bit color OLED display and is used by the TivaWare Graphics Library and widget manager. In addition to providing the `tDisplay` structure required by the graphics library, the display driver also provides an API for initializing the display.

This driver is located in `examples/boards/dk-tm4c123g-em-cc3000/drivers`, with `cfal96x64x16.c` containing the source code and `cfal96x64x16.h` containing the API declarations for use by applications.

4.2 API Functions

Functions

- void CFAL96x64x16Init (void)

Variables

- const tDisplay g_sCFAL96x64x16

4.2.1 Function Documentation

4.2.1.1 CFAL96x64x16Init

Initializes the display driver.

Prototype:

```
void
CFAL96x64x16Init(void)
```

Description:

This function initializes the SSD1332 display controller on the panel, preparing it to display data.

Returns:

None.

4.2.2 Variable Documentation

4.2.2.1 g_sCFAL96x64x16

Definition:

```
const tDisplay g_sCFAL96x64x16
```

Description:

The display structure that describes the driver for the Crystalfontz CFAL9664-F-B1 OLED panel with SSD 1332 controller.

4.3 Programming Example

The following example shows how to initialize the display and prepare to draw on it using the graphics library.

```
tContext sContext;

//
// Initialize the display.
//
CFAL96x64x16Init();

//
// Initialize a graphics library drawing context.
//
GrContextInit(&sContext, &g_sCFAL96x64x16);
```

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