EK-TM4C123GXL-BOOSTXL-SENSHUB Firmware Development Package

USER'S GUIDE

SW-EK-TM4C123GXL-BOOSTXL-SENSHUB-UG-2.0

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1 Introduction

The Texas Instruments® Tiva™ C Series EK-TM4C123GXL-BOOSTXL-SENSHUB is a low cost platform that can be used for software development and to prototype a hardware design. A variety of BoosterPacks are available to quickly extend the LaunchPads features.

This document describes the example applications that are provided for the EK-TM4C123GXL-BOOSTXL-SENSHUB when paired with the BOOSTXL-SENSHUB BoosterPack. This BoosterPack provides a variety of motion and environmental sensors. It also provides an EM expansion option for attachement of additional peripherals such as the CC2533EMK or CC4000EMK. These examples utilize the TivaWare™ for C Series Sensor Library to extract and process information from the BOOSTXL-SENSHUB.

2 Example Applications

The example applications show how to use features of the Cortex-M4F microprocessor, the peripherals on the Tiva C Series microcontroller, and the drivers provided by the peripheral driver library. These applications are intended for demonstration and as a starting point for new applications.

There is an IAR workspace file (`ek-tm4c123gxl-boostxl-senshub.eww`) that contains the peripheral driver library project, USB library project, and all of the board example projects, in a single, easy to use workspace for use with Embedded Workbench version 6.

There is a Keil multi-project workspace file (`ek-tm4c123gxl-boostxl-senshub.mpw`) that contains the peripheral driver library project, USB library project, and 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-tm4c123gxl-boostxl-senshub` subdirectory of the firmware development package source distribution.

2.1 Motion Air Mouse (airmouse)

This example demonstrates the use of the Sensor Library, TM4C123G LaunchPad and the SensHub BoosterPack to fuse nine axis sensor measurements into motion and gesture events. These events are then transformed into mouse and keyboard events to perform standard HID tasks.

Connect the device USB port on the side of the LaunchPad to a standard computer USB port. The LaunchPad with SensHub BoosterPack enumerates on the USB bus as a composite HID keyboard and mouse.

Hold the LaunchPad with the buttons away from the user and toward the computer with USB Device cable exiting the right and bottom corner of the board.

- Roll or tilt the LaunchPad to move the mouse cursor of the computer up, down, left and right.
- The buttons on the LaunchPad perform the left and right mouse click actions. The buttons on the SensHub BoosterPack are not currently used by this example.
- A quick spin of the LaunchPad generates a PAGE_UP or PAGE_DOWN keyboard press and release depending on the direction of the spin. This motion simulates scrolling.
- A quick horizontal jerk to the left or right generates a CTRL+ or CTRL- keyboard event, which creates the zoom effect used in many applications, especially web browsers.
- A quick vertical lift generates an ALT+TAB keyboard event, which allows the computer user to select between currently open windows.
- A quick twist to the left or right moves the window selector.
- A quick jerk in the down direction selects the desired window and closes the window selection dialog.

This example also supports the RemoTI low power RF Zigbee® human interface device profile. The wireless features of this example require the CC2533EMK expansion card and the CC2531EMK USB Dongle. For details and instructions for wireless operations see the

Wiki at http://processors.wiki.ti.com/index.php/Tiva_C_Series_LaunchPad and http://processors.wiki.ti.com/index.php/Wireless_Air_Mouse_Guide.

2.2 Nine Axis Sensor Fusion with the MPU9150 and Complimentary-Filtered DCM (compdcm_mpu9150)

This example demonstrates the basic use of the Sensor Library, TM4C123G LaunchPad and SensHub BoosterPack to obtain nine axis motion measurements from the MPU9150. The example fuses the nine axis measurements into a set of Euler angles: roll, pitch and yaw. It also produces the rotation quaternions. The fusion mechanism demonstrated is complimentary-filtered direct cosine matrix (DCM) algorithm is provided as part of the Sensor Library.

Connect a serial terminal program to the LaunchPad's ICDI virtual serial port at 115,200 baud. Use eight bits per byte, no parity and one stop bit. The raw sensor measurements, Euler angles and quaternions are printed to the terminal. The RGB LED begins to blink at 1Hz after initialization is completed and the example application is running.

2.3 Humidity Measurement with the SHT21 (humidity_sht21)

This example demonstrates the basic use of the Sensoror Library, TM4C123G LaunchPad and SensHub BoosterPack to obtain temperature and relative humidity of the environment using the Sensirion SHT21 sensor.

Connect a serial terminal program to the LaunchPad's ICDI virtual serial port at 115,200 baud. Use eight bits per byte, no parity and one stop bit. The humidity and temperature as measured by the SHT21 is printed to the terminal. The RGB LED begins to blink at 1Hz after initialization is complete and the example application is running.

2.4 Light Measurement with the ISL29023 (light_isl29023)

This example demonstrates the basic use of the Sensor Library, TM4C123G LaunchPad and the SensHub BoosterPack to obtain ambient and infrared light measurements with the ISL29023 sensor.

Connect a serial terminal program to the LaunchPad's ICDI virtual serial port at 115,200 baud. Use eight bits per byte, no parity and one stop bit. The raw sensor measurements are printed to the terminal. The RGB LED blinks at 1Hz once the initialization is complete and the example is running.

2.5 pressure Measurement with the BMP180 (pressure_bmp180)

This example demonstrates the basic use of the Sensor Library, TM4C123G LaunchPad and the SensHub BoosterPack to obtain air pressure and temperature measurements with the BMP180 sensor.

Connect a serial terminal program to the LaunchPad's ICDI virtual serial port at 115,200 baud. Use eight bits per byte, no parity and one stop bit. The raw sensor measurements are printed to the terminal. The RGB LED blinks at 1Hz once the initialization is complete and the example is running.

2.6 Temperature Measurement with the TMP006 (temperature_tmp006)

This example demonstrates the basic use of the Sensor Library, TM4C123G LaunchPad and the SensHub BoosterPack to obtain ambient and object temperature measurements with the Texas Instruments TMP006 sensor.

Connect a serial terminal program to the LaunchPad's ICDI virtual serial port at 115,200 baud. Use eight bits per byte, no parity and one stop bit. The raw sensor measurements are printed to the terminal. The RGB LED blinks at 1Hz once the initialization is complete and the example is running.

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