Koala EVM
Quick Start Manual

Revision History

Edit	Date	Design	Approval	Description
01	22 January 2014	JZ	GT	Initial draft
02	17 July 2014	JZ	GT	Update formatting, layout, descriptions

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1 Introduction

This document describes beginning development for the Koala EVM board with the STM32F407IGT6/STM32F429IIT6 microcontroller.

1.1 Purpose

The purpose of this document is to discuss how to use the Clarinox Koala EVM, and WMI Wi-Fi and/or Bluetooth modules. This document will lead the user through required steps for hardware and software setup and the debugging of applications.

1.2 System Requirements

- Windows 7 or later
- 2 x USB mini cable for JTAG and debug output
- Optional peripherals include LCD module, camera module and micro USB cable

1.3 Supported Development Tool Chains

- IAR EWARM
- Keil MDK-ARM

2 Getting started

Figure 1: Koala EVM PCB Layout

1. The Koala EVM must be supplied with 5v power. Power can be supplied with a 5v DC adapter via CN20 screw terminal or CN18 barrel connector, or via USB by connecting CN11 mini USB port to a standard COM port of the PC.
2. To program the board:
    i. connect CN11 mini USB port to a PC,
    ii. configure the tool chain to use ST-LINK JTAG, and
    iii. connect appropriate jumpers from ST-LINK to programming target (main MCU or WMI module).
3. Use the provided demo applications for test and development.
4. Connect any additional project accessories (LCD, camera, wireless modules, USB or Ethernet cables)
5. Download and run the software applications using the preferred tool-chain.

**Figure 2: Populated Koala EVM Board**

3 Configuring the Koala EVM Hardware

The Koala EVM hardware is configured by setting on board jumpers.

3.1 CAN Bus Termination

For high speed or long distance transmission, it is recommended to enable the CAN termination resistor. This is done by shorting J2 pins.

Figure 3: Jumpers shorting J2 pins – enables CAN termination resistor

3.2 USART2 / FSMC (LCD) Selection

A UART peripheral and the LCD controller share a data line on the Koala EVM, and the required function must be selected accordingly.

If any of the WMI modules require access to USART2, then CN21 pins 1-2 must be connected.
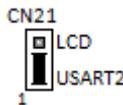
Figure 4: Jumpers shorting CN21 pins 1-2 – enables USART2

To enable LCD functionality, CN21 pins 2-3 must be connected.
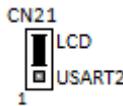
Figure 5: Jumpers shorting CN21 pins 2-3 – enables LCD functionality

4 ST-LINK Configuration: Programming / Debugging the Koala EVM

The embedded ST-LINK can be used to program the on board microcontroller and debug applications. Configure the jumpers as shown below to enable ST-LINK program/debug.
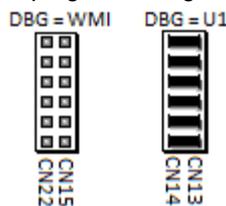
Figure 6: Jumpers between CN13 and CN14 pins – selects STM32F407IGT6/STM32F429IIT6 MCU to program/debug

For further information, consult the Koala EVM user manual or STMicroelectronics documentation

5 Wireless Module Interfaces

5.1 Connecting Modules

The Koala EVM features a 100 pin COM8 socket for connecting Wi-Fi / Bluetooth modules. The connector is marked "COM8" and is notched. Position of the notch must be observed to avoid damaging the module.

Figure 7: COM8 connector. The notch is located on the bottom-right corner of the connector.

Clarinox WMI modules may also be connected to the Koala EVM with the dedicated WMI connectors. The WMI module is to be inserted in both connectors, observing the notches for correct placement of the module.


Figure 8: WMI connector

5.2 Hardware interface

When connecting a module to the COM8 connector, the following methods are to be used for interfacing with the STM32F407IGT6/STM32F429IIT6 Microcontroller.

WLAN communications are through SDIO interface, as shown in the following diagram.
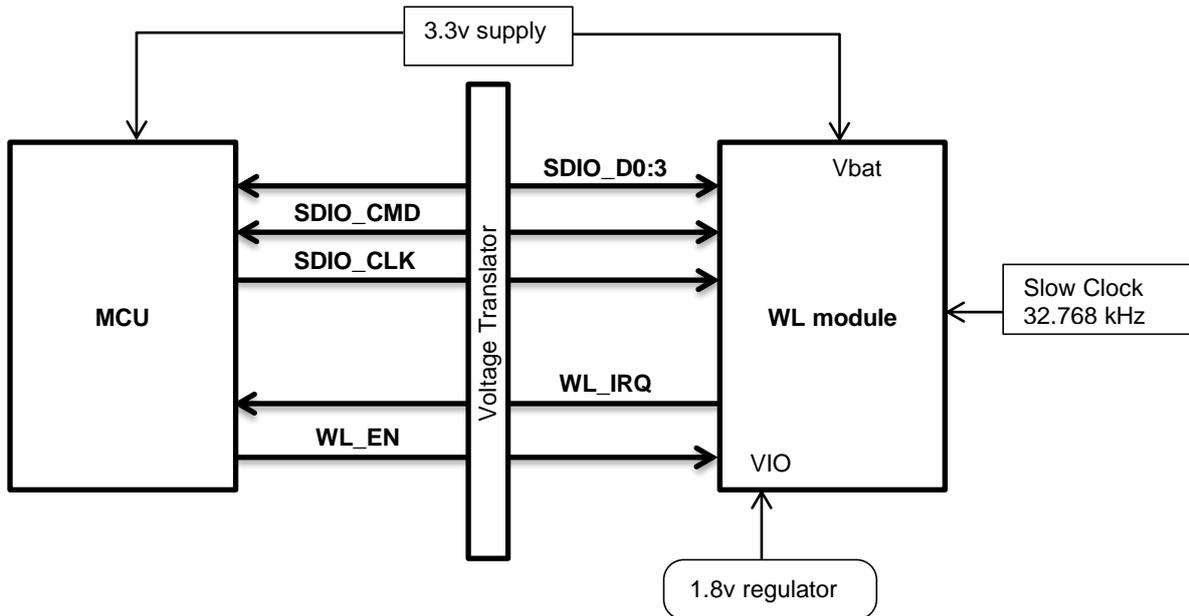
Figure 9: Wi-Fi communication hardware layout and signals

Bluetooth HCI is connected to USART6 of the microcontroller. Cross connection of TX/RX and RTS/CTS lines must be observed according to the following diagram.
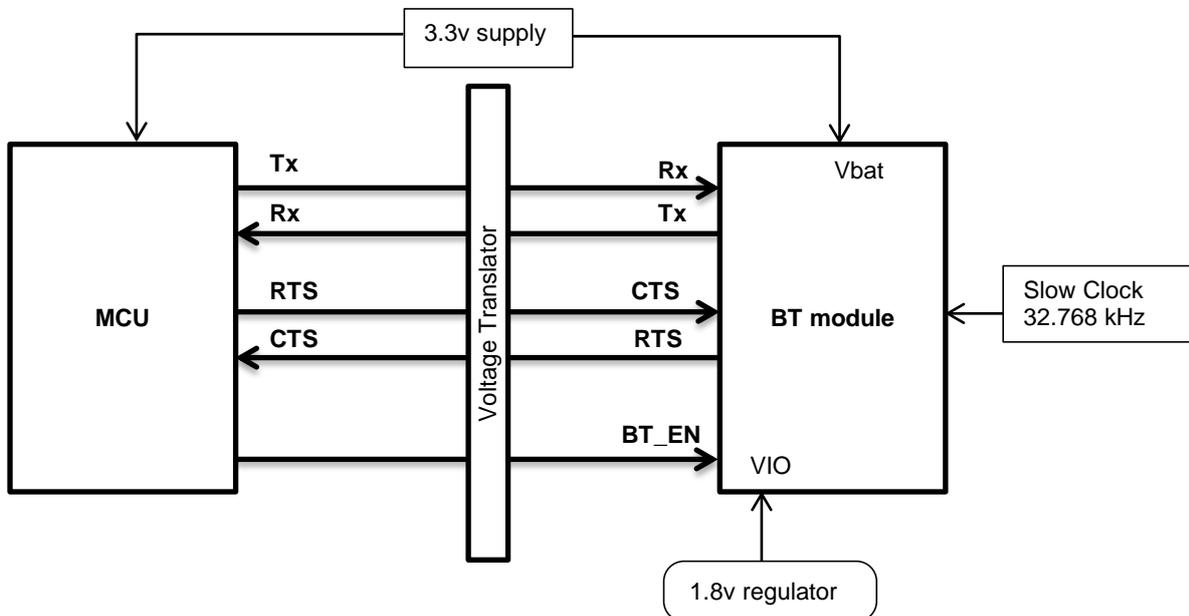
Figure 10: Bluetooth communications hardware layout and signals

Bluetooth and Wi-Fi both have their own select/enable line. An interrupt line is also provided for Wi-Fi.

The Koala EVM board provides level translation and slow clock for interfacing to the attached COM8 module.

Output to ClarinoxDebugger is provided through USART2 of the microcontroller. ClarinoxDebugger is a powerful GUI tool for remotely debugging ClarinoxSoftFrame-based applications. For more information on the debugger, refer to the ClarinoxDebugger user manual.

6 Brief Description of Key Peripherals

Power supply
The Koala EVM is powered by USB or external supply (5v). The board features both a screw terminal (CN20) and barrel connector (CN18) for external power supply of 5v to supply on board regulators and USB-OTG VBUS. Regulators provide 3.3v for MCU and peripherals and 1.8v for wireless module.
5v and 3.3v are supplied to WMI connector.

USB
The Koala EVM supports USB-OTG HS. The USB micro connector (CN2) allows the user to connect to a host or peripheral device in full speed operation without a PC.

A USB mini connector (CN9) is also featured which enables direct communication with a PC by converting USB to serial (USART).

Camera interface
The Koala EVM features a digital camera interface (DCMI connector) to acquire images from a camera accessory. Single frame or continuous capture is supported in an 8 to 12 bit parallel interface. Crop and several image formats are also supported by the MCU.
The DCMI interface is most compatible with OV9655 cameras.

Figure 11: OV9655 camera connected to DCMI port

LCD Interface
The Koala EVM Board includes an interface for a LCD module with touch screen.
Display is controlled through the FSMC interface. Touch screen data is read through SPI interface and GPIOs are used for touch screen interrupts.
The connector assumes a LCD controller IC is built into the LCD module.
To use the LCD, a jumper must be placed across CN21 pins 2 and 3, as illustrated in Figure 5.

CAN Bus
The Koala EVM utilizes a driver (SN65HVD230) to interface to an external CAN Bus. This allows the MCU to create a node on the bus and communicate with other peripherals in an automotive setting.

Ethernet
The Koala EVM features an Ethernet interface and physical layer (DP83848I), allowing it to connect to a wired network for communicating with other LAN devices.

7 Instructions for Using Demo Application Binaries

The following software required for PC

- STM32 ST-LINK Utility program
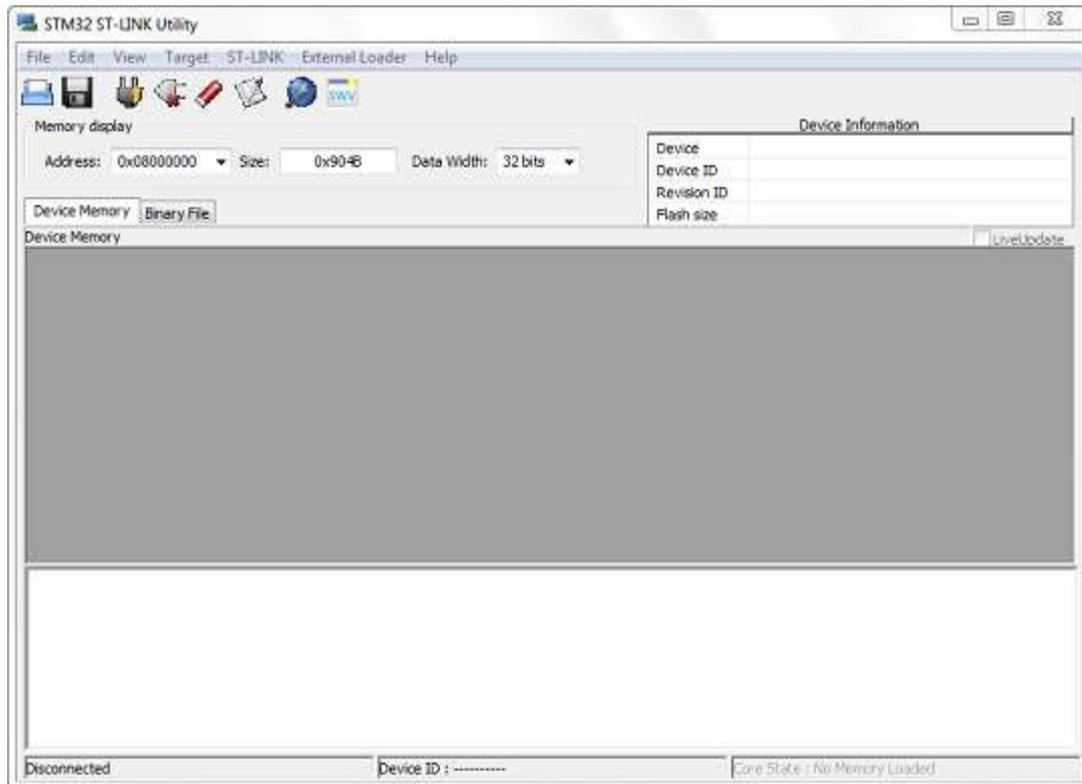
Figure 12: STM32 ST-LINK Utility application

- ST-LINK driver
- Silicon Labs CP120x driver (USB to UART serial bridge)
- Terminal emulation software with support for telnet and serial port connections (Tera Term, Putty, HyperTerminal are suitable options)

7.1 Programming Binaries Using ST-LINK

1. Ensure jumpers on Koala EVM are installed. Required jumper installation is illustrated in Figure 6; jumpers between CN13 and CN14 pins selects MCU to program/debug.
2. Connect CN11 (DEBUG) mini USB port to PC using USB mini cable. Note, the ST-LINK driver must be installed for the board to be successfully recognised.
3. Open the **STM32 ST-LINK Utility** program:
   i. connect to the target board (Target menu → Connect)
   ii. perform a full erase of the Flash memory (Target menu → Erase Chip or CTRL+E)
   iii. open the binary or hex file for the example project (File menu → Open file or CTRL+O)
   iv. write the binary or hex file to the Flash memory (Target menu → Program and Verify or CTRL+P)
   v. disconnect the board (Target menu → Disconnect or CTRL+D)
4. Reset the Koala EVM. The RESET button (SW1) is located near the USB-Serial connector.

7.2 USB to Serial example (printf)

Silicon Labs CP120X PC driver may be required for USB-UART peripheral.

1. Connect USB-Serial to PC with a second USB mini cable. The Debug cable is required for programming the binary with ST-LINK and for power if an external power supply is not in use.
2. Program the USB to Serial example binary using STM32 ST-LINK Utility
3. Open a serial port console (Tera Term, Putty, HyperTerminal):
   - select the USB serial port (COM1, COM2, …)

■ configure settings: 921600 baud rate, 8 bit data, no parity, 1 stop bit, no flow control

The Koala EVM will display characters from the terminal.

7.3 IAP Ethernet example
1. Connect the Koala EVM to an Ethernet network
2. Program the IAP Ethernet example binary using STM32 ST-LINK Utility

Enter the IP address "192.168.0.243" in a web browser. This should open the IAP application demo website.
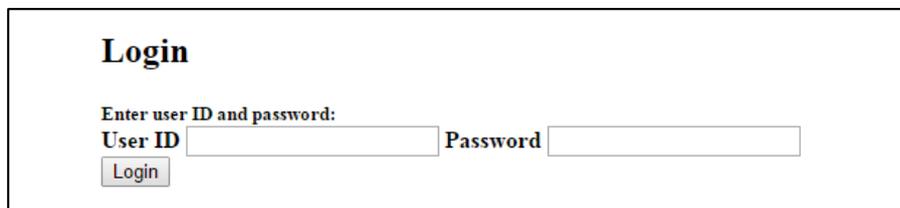
Figure 13: IAP application demo website with simple login form

Credentials are required to access the server:
■ User ID: "user"
■ Password: "stm32"

This will open a webpage with the option to upload a binary file into Flash memory of MCU.
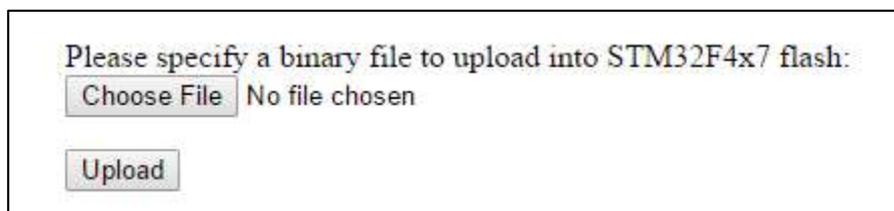

Figure 14: Successful login grants user the option to upload binary file into Flash memory

7.4 Ethernet to UART Application
Silicon Labs CP120X PC driver may be required for USB-UART peripheral.

1. Connect USB-Serial to PC with a second USB mini cable. Debug cable is required for programming the binary with ST-LINK and for power if an external power supply is not in use.
2. Program the Ethernet to UART example binary using STM32 ST-LINK Utility
3. Open a serial port console:
   ■ select the USB serial port (COM1, COM2, …)
   ■ configure settings: 921600 baud rate, 8 bit data, no parity, 1 stop bit, no flow control
4. Connect the Koala EVM to an Ethernet network and connect to it via TCP
5. Open a telnet console and connect to TCP 192.168.0.243, port 8080 or enter 192.168.0.243:8080 in a web browser.

Any characters from the network should appear in the serial console.

7.5 USB HID Device Example
1. Connect the Koala EVM to PC with USB micro cable from CN2 (USB-OTG connector)
2. Program the USB HID Device example binary using STM32 ST-LINK Utility

The PC cursor should move in a straight direction.