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# KC-008104 WMI CARRIER USER MANUAL

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## Revision History

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1.1	15 June 2018	ND	GT	FCC Certification warning details added

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# 1 Introduction

This document describes the KC-008104 WMI Carrier board for the koala® evm Green family and how to begin developing for a STM32F411/STM32F412 series microcontroller.

## 1.1 Purpose

The purpose of this document is to provide an overview of using WMI Carrier board for interfacing wireless koala® connect (aka Joey®) modules with the koala® evm Green.

# 2 System Requirements

- Windows 7/8 PC
- KM-1412xx BT Joey® Module or KM-1531xx Wi-Fi/BT Joey® Module
- Clarinox koala® evm Green board with
  - KC-008104 Clarinox WMI Carrier board
  - USB mini cables for JTAG and debug output

## 2.1 Supported Development Tool-chain

- IAR EWARM
- Keil MDK-ARM

# 3 KC-008104 WMI Carrier Features

- Provides hardware interface between koala® evm Green and Clarinox Wireless Joey® modules
- On-board 128MB Flash memory
- On-board temperature sensor
- 3.3V-5V external power supply
- Micro USB connection
- Test points for JTAG, UART, USB, SPI Joey® signals

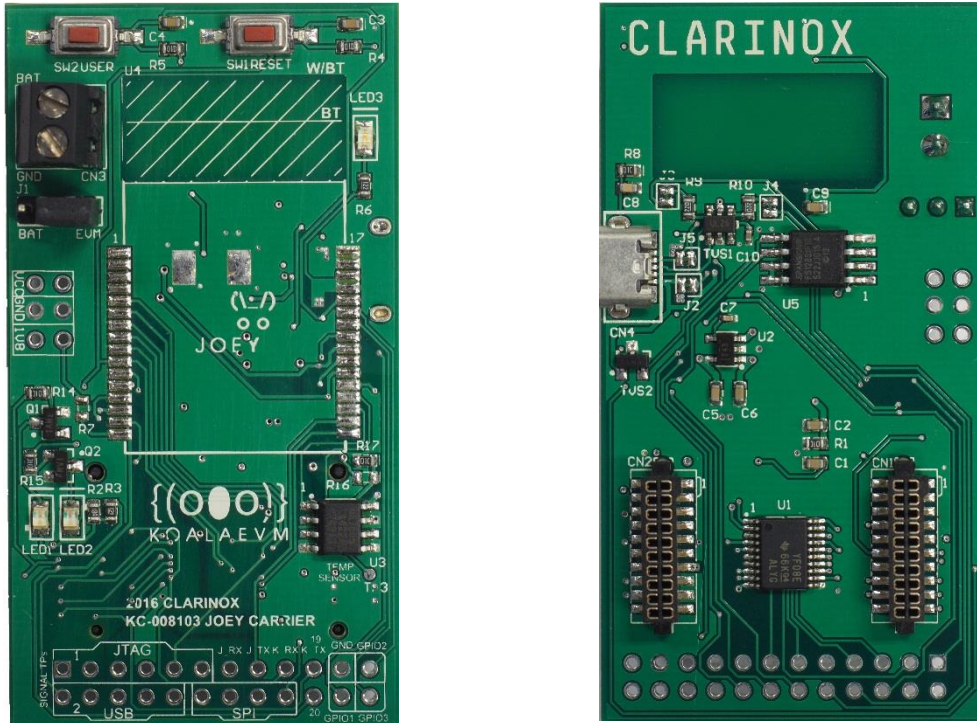


Figure 1: WMI Carrier

## 4 WMI Carrier Block Diagram

The block diagram below shows the interconnection and the functionality of different modules on WMI Carrier board.

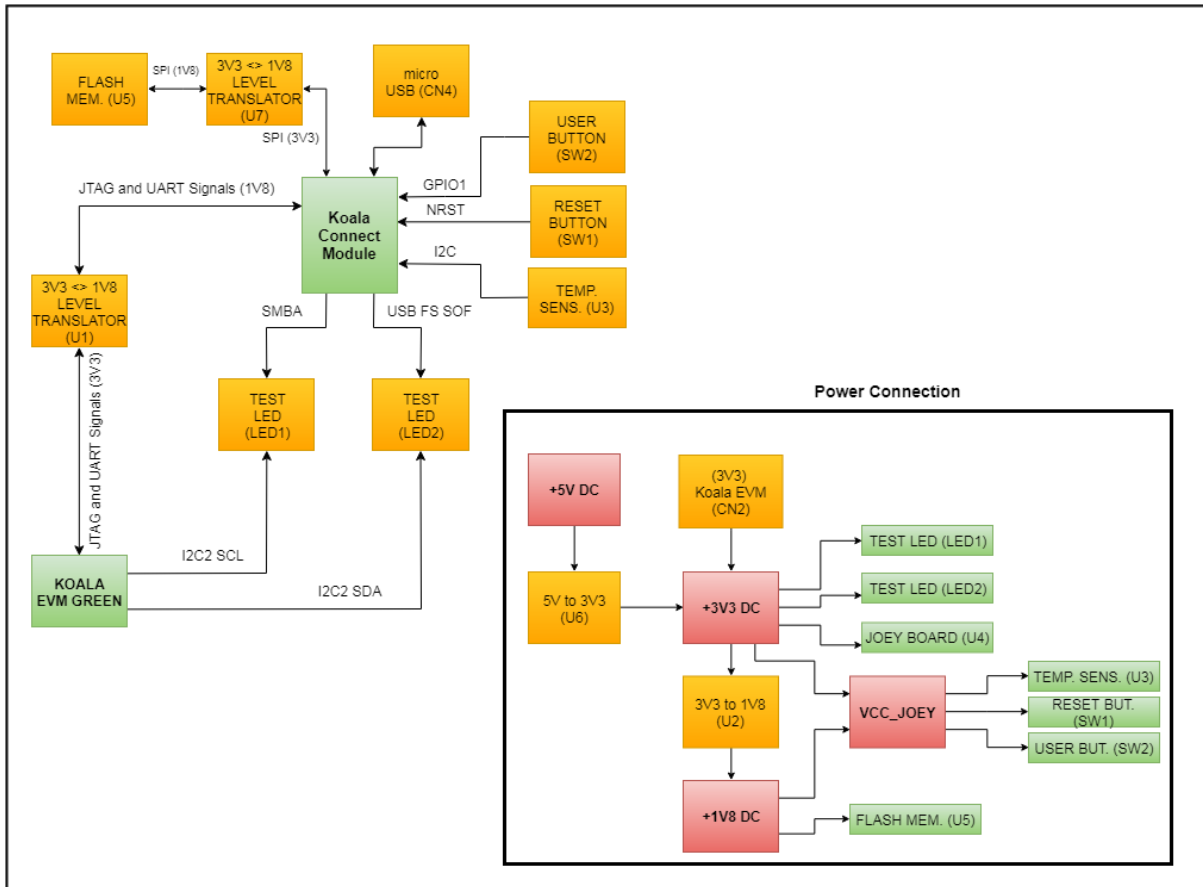


Figure 2: WMI Carrier Block Diagram

- Both KM-1412xx and KM-1531xx Joey® modules can be assembled onto KC-008104 WMI Carrier board since the Joey® wireless modules consist of the same compatible pinouts.
- WMI Carrier facilitates the Joey®s by extending those pinouts into more convenient test points. Please refer to KM-1412xx and KM-1531xx Joey® modules user manuals for more details about their pinouts.

## 5 Using with KM-153103 Koala® Connect Module

Following figure shows KM-153102 Joey® module assembled on KC-008104 WMI Carrier board.





Figure 3: KM-153103 Wi-Fi/Bluetooth Koala® Connect Module attached to WMI Carrier

## 5.1 KM-153103 Module Certification Details

KM-153103 Koala® Connect module complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) The device may not cause harmful interference and
- (2) The device must accept any interference received, including interference that may cause undesired operation of the device.

Clarinox Technologies declares that the radio equipment type RF module is in compliance with Directive 2014/53/EU.

The compliance has been verified in the operating frequency band of 2400-2483.5 MHz. Developers and integrators that incorporate the KM-153103 Module in any end products are responsible for obtaining applicable regulatory approvals for such end product.

The KM-153103 has been tested in the 2400 MHz-2483.5 MHz ISM frequency band at 3.3 V with a maximum peak power of 19.7 dBm EIRP across the temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  and tolerance.

### 5.1.1 Federal Communications Commission (FCC) Statement

KM-153103 device complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure limits. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## 5.1.2 End Product Labelling

KM-153103 module is designed to comply with the FCC statement, FCC ID: 2AN5P1531. The host system using this module must display a visible label indicating the following text: "Contains FCC ID: 2AN5P1531"

## 5.2 Important Notice to OEM Integrators

This module is limited to OEM installation ONLY.

This module is limited to installation in mobile or fixed applications, according to FCC Part 2.1091(b). The separate approval is required for all other operating configurations, including portable configurations with respect to FCC Part 2.1093 and different antenna configurations

For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).

## 5.3 Antenna Installation

The antenna must be installed such that 20 cm is maintained between the antenna and users,

The transmitter module may not be co-located with any other transmitter or antenna.

The ATN016008LCD2442MA1 antenna with -1.41 dBi gain was verified in the conformity testing.

Radiated transmit power must be equal to or lower than that specified in the FCC Grant of Equipment Authorization for FCC ID: 2AN5P1531. A separate approval is required for all other antenna type, or higher gain antenna.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

## 5.4 Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

## 5.5 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## **5.6 Radiation Exposure Statement**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

## 6 Interfaces

### 6.1 Interface to the koala® evm Green

- The WMI carrier board KC-008104 acts as an interface between the Wireless Joey® module and the koala® evm Green.
- The Joey® wireless modules can be soldered on top of the WMI carrier board which is then fitted on to the WMI connectors on the koala® evm Green board.
- The koala® evm WMI interface provides power, JTAG programming support and IOs including USART and I2C to Joey® Modules via WMI Carrier.

The table below describes WMI Carrier to koala® evm Green connector pins which contain signals from the koala® evm board.

Pin (WMI Carrier)	Function (koala® evm Green)	Function (STM32F41X)
7 – CN1	USART6 TX	USART1 RX
8 – CN1	USART6 RX	USART1 TX
11 – CN1	I2C2 SCL	
12 – CN1	I2C2 SDA	
14 – CN1	JTAG TDO	JTAG TDO
15 – CN1	JTAG TDI	JTAG TDI
16 – CN1	JTAG TMS	JTAG TMS
17 – CN1	JTAG TCK	JTAG TCK
18 – CN1	JTAG NRST	JTAG NRST
19 – CN1	JTAG JNRST	JTAG JNRST
13 – CN2	3.3V	Power Supply
15 – CN2	GND	GND
16 – CN2	GND	GND
17 – CN2	GND	GND
18 – CN2	GND	GND

**Table 1: WMI Carrier to koala® evm Interface**

Please refer to koala® evm Green and Joey® module user manuals for more details. Following figure shows WMI Carrier with Joey® module attached to koala® evm Green

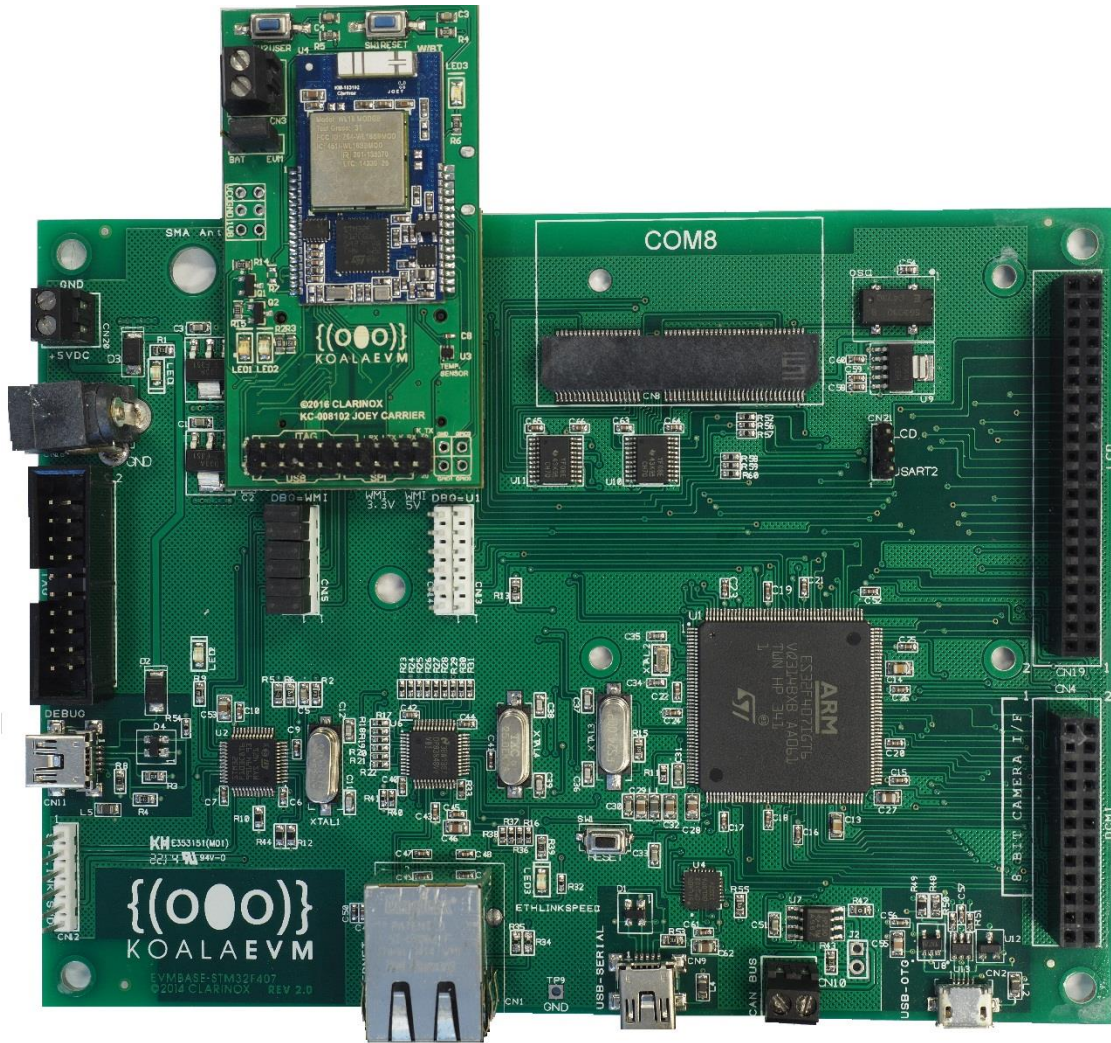


Figure 4: WMI Carrier Mounted on koala® evm Green

### 6.1.1 Programming the Joey® Modules on WMI Carrier

The koala® evm Green features an embedded ST-LINK for programming the Joey® modules and debugging them. In order to enable this feature, CN22 and CN14 jumpers on the koala® evm must be configured as following picture.

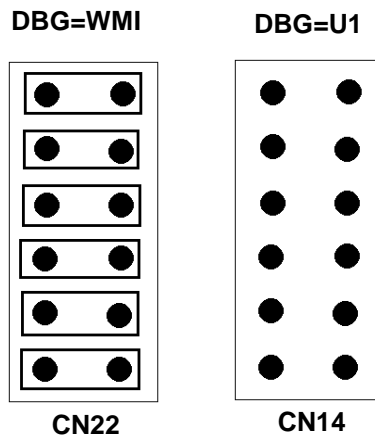


Figure 5: Jumper Connection on koala® evm Green to Program Joey® Modules on WMI Carrier

Please refer to Joey® module's user manual for hardware details for programming.

## 7 Hardware Details on WMI Carrier

### 7.1 On-board Flash Memory

WMI Carrier consists of 128MB additional flash memory to be used to program Joey®s. The following table provides information on the Joey® modules' microcontroller pins required to access the Flash memory on WMI carrier.

Joey® Module Pin Number	Flash Memory	Microcontroller STM32F41X port
24	SPI MOSI	PA7
25	SPI MISO	PA6
26	SPI SCK	PA5
27	SPI NSS	PA4

**Table 2: Flash Memory interface between WMI Carrier and Joey®**

### 7.2 On-board Temperature Sensor

The temperature sensor (DS7505S) on WMI Carrier is interfaced via I2C and the following table provides information on pin/signal connection.

Joey® Module Pin Number	Temperature Sensor	Microcontroller STM32F41X port
30	SDA	PB9
29	SCL	PB8

**Table 3: Temperature Sensor interface between WMI Carrier and Joey®**

### 7.3 Micro USB Connection

The Micro USB connection on the WMI Carrier is not connected to STM32F41X microcontroller on Joey® modules by default. In order to use micro USB connection, the resistor pads R8, R11, R12 and R13 should be connected. Following table provides information on the corresponding pins/ports on Joey® module microcontroller.

Joey® Module Pin Number	Micro USB	Microcontroller STM32F41X port
11	USB FS DP	PA12
12	USB FS DM	PA11
13	USB FS ID	PA10
14	USB FS VBUS	PA9
15	USB FS SOF	PA8

**Table 4: Micro USB interface between WMI Carrier and Joey®**

### 7.4 Power Connection

Apart from the 3V3 power supplied by the koala® evm, WMI Carrier consists of an external power connector to supply power when used as standalone. J1 jumper connection determines the source of power drawn by WMI Carrier.

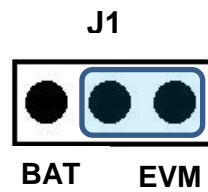


Figure 6: Jumper Connection on WMI Carrier to draw power from koala® evm

## 8 Operating Specifications

Below are the ratings of WMI Carrier board under normal operation.

### 8.1 KC-008104

Specification	Value	Unit
Voltage supply	3.3 - 5	V
Current draw (idle)	30	mA
Operating temperature (ambient)	-40 to +85	°C
Storage temperature	-40 to +105	°C

Table 5: KC-008104 Typical Operating Conditions