KITRA 020L

Data sheet

29/08/2017

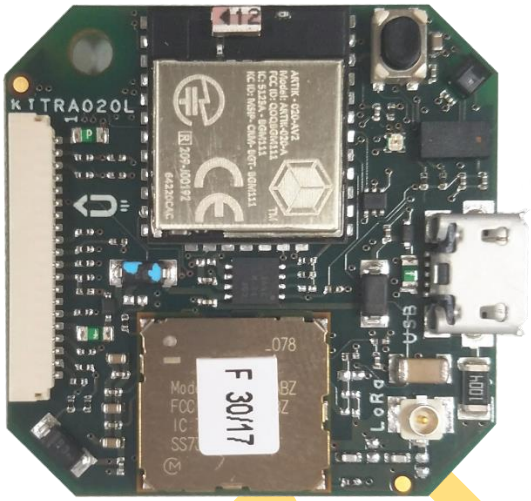
Summary

.1 REVISION HISTORY

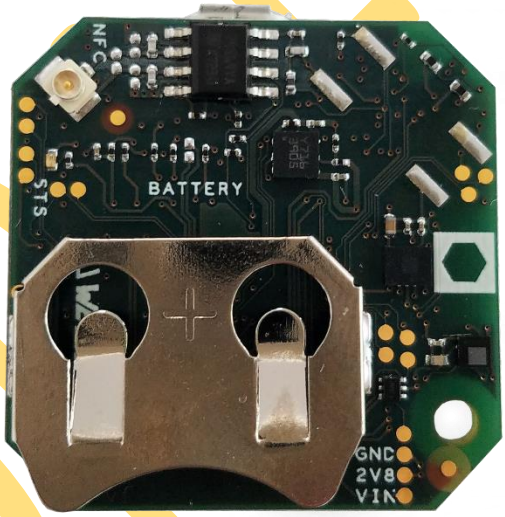
Date	Revision	Description
29/08/2017	0.1	Draft version

.2 KITRA 020L IMAGES

TOP VIEW



BOTTOM VIEW



.3 INTRODUCTION

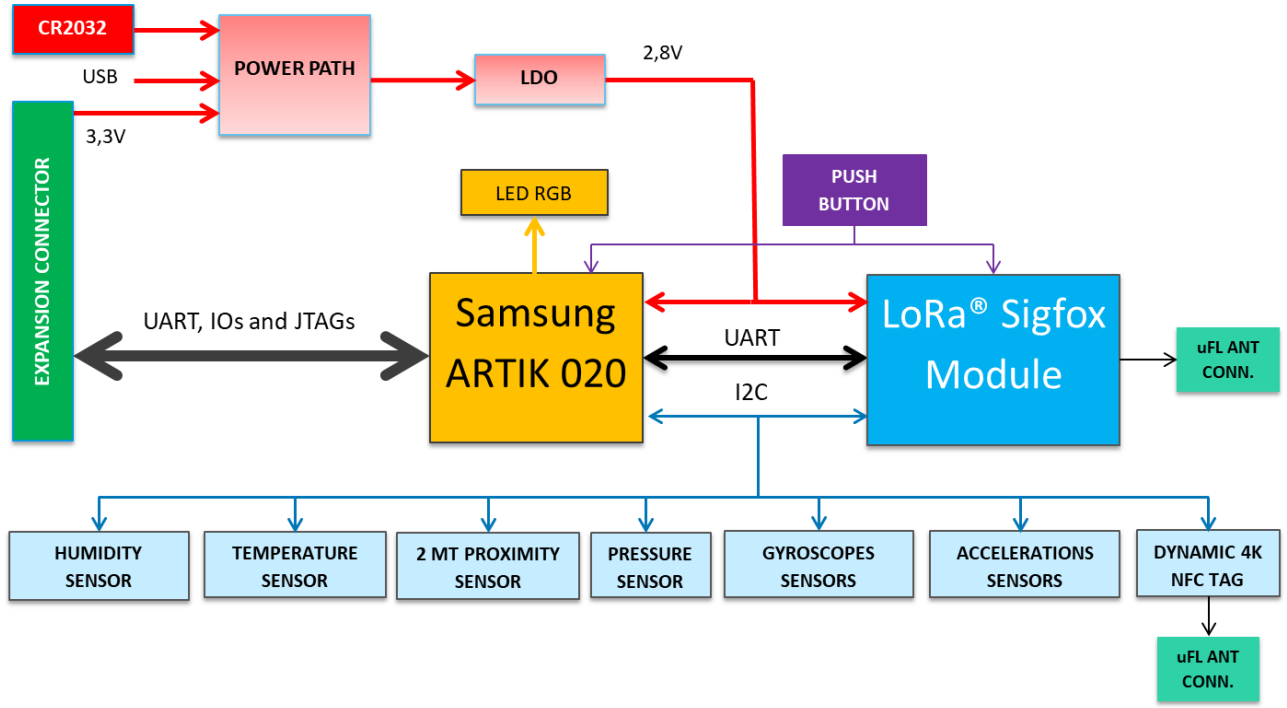
This data sheet provides the description of the KITRA 020Lboard.
KITRA is a family of boards and includes a set of carrier boards for Samsung ARTIK modules, KITRA 020L is a carrier board of the Samsung ARTIK 020 module.
As RushUp electronics platform, KITRA 020L is a product accelerator and can be used from makers, developers, high mix low volume products and from all who want the benefit of an off the shelf industrialized board and doesn't have time and/or money to invest in a custom solution.

For details about RushUp and ARTIK, please visit:
www.rushup.tech
www.artik.io

.4 DESCRIPTION AND BLOCK DIAGRAM OF THE KITRA 020L

KITRA 020L is the product accelerator for IoT Industry 4.0, factory automation, smart home gateway, multimedia applications, video cameras and home appliances and includes multicore processing, memories, crypto, sensors, communication interfaces and GPIO, as well as the power supply circuits.

See below the block diagram of the board.



.5 HARDWARE & COMPONENTS DETAIL

.5.1 Samsung ARTIK 020 module

Samsung ARTIK 020 is the module of the KITRA 020L board and it embeds four specific functions:

- Processing;
- Memory;
- Bluetooth LE;

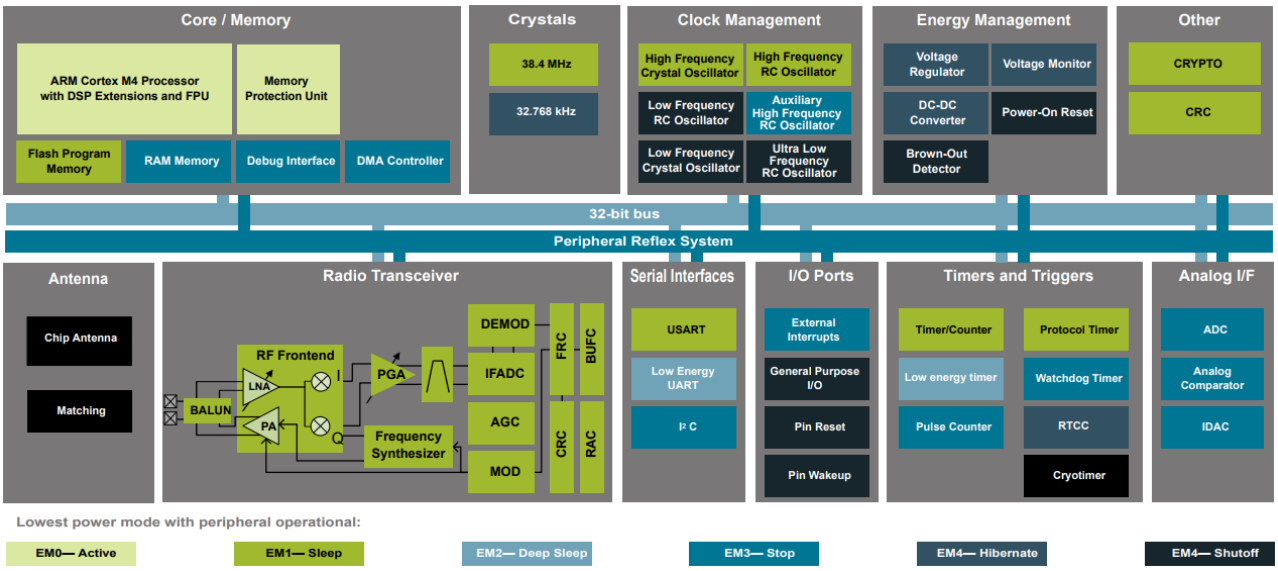
The ARTIK 020 is a Bluetooth® Module targeted for Bluetooth low energy applications where reliable RF, low-power consumption, and easy application development are key requirements. At +8 dBm TX power, ARTIK 020 is ideal for applications requiring short and medium range Bluetooth connectivity. The ARTIK 020 integrates all of the necessary elements required for a Bluetooth application: Bluetooth low energy radio, a software stack, and GATT-based profiles, and it can also host end user applications, which means no external microcontroller is required in size, price or power constrained devices. The ARTIK 020 Bluetooth Module also has highly flexible hardware interfaces to connect to different peripherals or sensors.
ARTIK 020 can be used in a wide variety of applications:

- IoT Sensors and End Devices
- Commercial and Retail
- Health and Wellness
- Industrial
- Home and Building Automation
- Smart Phone
- Tablet and PC Accessories

KEY FEATURES OF THE ARTIK 020 MODULE

- Bluetooth 4.2 Compliant
- Integrated antenna
- TX power: up to +8 dBm
- RX sensitivity: down to -92 dBm
- Range: up to 200 meters
- 32-bit ARM® Cortex®-M4 core at 40 MHz
- Flash memory: 256 kB
- RAM: 32 kB
- Autonomous Hardware Crypto Accelerator and Random Number Generator

- Integrated DC-DC Converter
- Onboard Bluetooth stack



Please refer to www.artik.io website for more details on Samsung ARTIK 020 module.

.5.1.1 Accelerometers - Gyroscopes Sensors

The LSM6DSL is a system-in-package featuring a 3D digital accelerometer and a 3D digital gyroscope performing at 0.65 mA in high-performance mode and enabling always-on low-power features for an optimal motion experience for the consumer.
The LSM6DSL supports main OS requirements, offering real, virtual and batch sensors with 4 kbyte for dynamic data batching.
ST's family of MEMS sensor modules leverages the robust and mature manufacturing processes already used for the production of micromachined accelerometers and gyroscopes.
The various sensing elements are manufactured using specialized micromachining processes, while the IC interfaces are developed using CMOS technology that allows the design of a dedicated circuit which is trimmed to better match the characteristics of the sensing element.
The LSM6DSL has a full-scale acceleration range of ±2/±4/±8/±16 g and an angular rate range of ±125/±245/±500/±1000/±2000 dps.
High robustness to mechanical shock makes the LSM6DSL the preferred choice of system designers for the creation and manufacturing of reliable products.
The LSM6DSL is available in a plastic land grid array (LGA) package.

Features

- Power consumption: 0.4 mA in combo normal mode and 0.65 mA in combo high-performance mode
- "Always-on" experience with low power consumption for both accelerometer and gyroscope
- Smart FIFO up to 4 kbyte based on features set
- Android M compliant
- Hard, soft ironing for external magnetic sensor corrections
- ±2/±4/±8/±16 g full scale
- ±125/±245/±500/±1000/±2000 dps full scale
- Analog supply voltage: 1.71 V to 3.6 V
- Independent IOs supply (1.62 V)
- Compact footprint, 2.5 mm x 3 mm x 0.83 mm
- SPI & I^2C serial interface with main processor data synchronization feature
- Pedometer, step detector and step counter
- Significant motion and tilt function
- Standard interrupts: free-fall, wakeup, 6D/4D orientation, click and double-click
- Embedded temperature sensor

- ECOPACK® , RoHS and “Green” compliant

For any specific information and for the firmware commands and procedures, please refer to the data sheet of the components.

.5.1.2 Humidity and temperature sensors

The HTS221 is an ultra-compact sensor for relative humidity and temperature. It includes a sensing element and a mixed signal ASIC to provide the measurement information through digital serial interfaces.
The sensing element consists of a polymer dielectric planar capacitor structure capable of detecting relative humidity variations and is manufactured using a dedicated ST process.
The HTS221 is available in a small top-holed cap land grid array (HLGA) package guaranteed to operate over a temperature range from -40 °C to +120 °C.

Features

- 0 to 100% relative humidity range
- Supply voltage: 1.7 to 3.6 V
- Low power consumption: 2 µA @ 1 Hz ODR
- Selectable ODR from 1 Hz to 12.5 Hz
- High rH sensitivity: 0.004% rH/LSB
- Humidity accuracy: ± 3.5% rH, 20 to +80% rH
- Temperature accuracy: ± 0.5 °C,15 to +40 °C
- Embedded 16-bit ADC
- 16-bit humidity and temperature output data
- SPI and I²C interfaces
- Factory calibrated
- Tiny 2 x 2 x 0.9 mm package
- ECOPACK® compliant

For any specific information and for the firmware commands and procedures, please refer to the data sheet of the components.

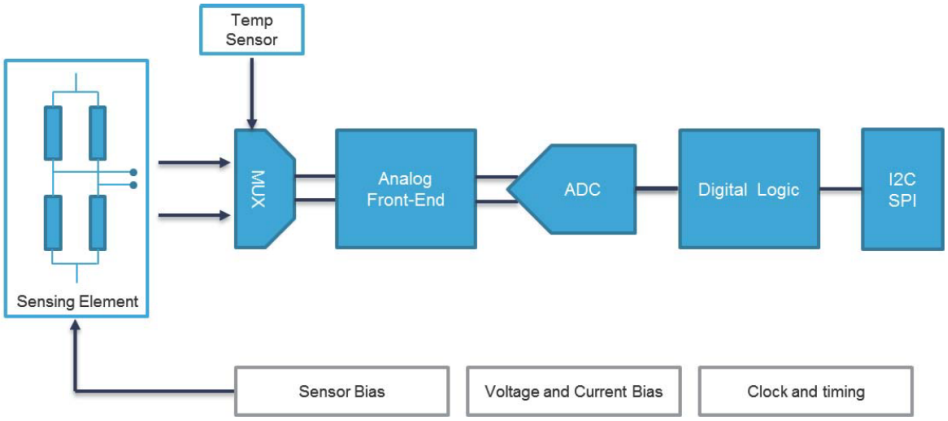
.5.2 Barometer/Pressure sensor

The LPS22HB is an ultra-compact piezo resistive absolute pressure sensor which functions as a digital output barometer.
The device comprises a sensing element and an IC interface which communicates through I2C or SPI from the sensing element to the application.
The sensing element, which detects absolute pressure, consists of a suspended membrane manufactured using a dedicated process developed by ST.
The LPS22HB is available in a full-mold, holed LGA package (HLGA). It is guaranteed to operate over a temperature range extending from -40 °C to +85 °C. The package is holed to allow external pressure to reach the sensing element.

Features

- 260 to 1260 hPa absolute pressure range
- Current consumption down to 3 µA
- High overpressure capability: 20x full-scale
- Embedded temperature compensation
- 24-bit pressure data output • 16-bit temperature data output
- ODR from 1 Hz to 75 Hz
- SPI and I²C interfaces
- Embedded FIFO
- Interrupt functions: Data Ready, FIFO flags, pressure thresholds
- Supply voltage: 1.7 to 3.6 V
- High shock survivability: 22,000 g
- Small and thin package • ECOPACK® lead-free compliant

Block diagram



For any specific information and for the firmware commands and procedures, please refer to the data sheet of the components.

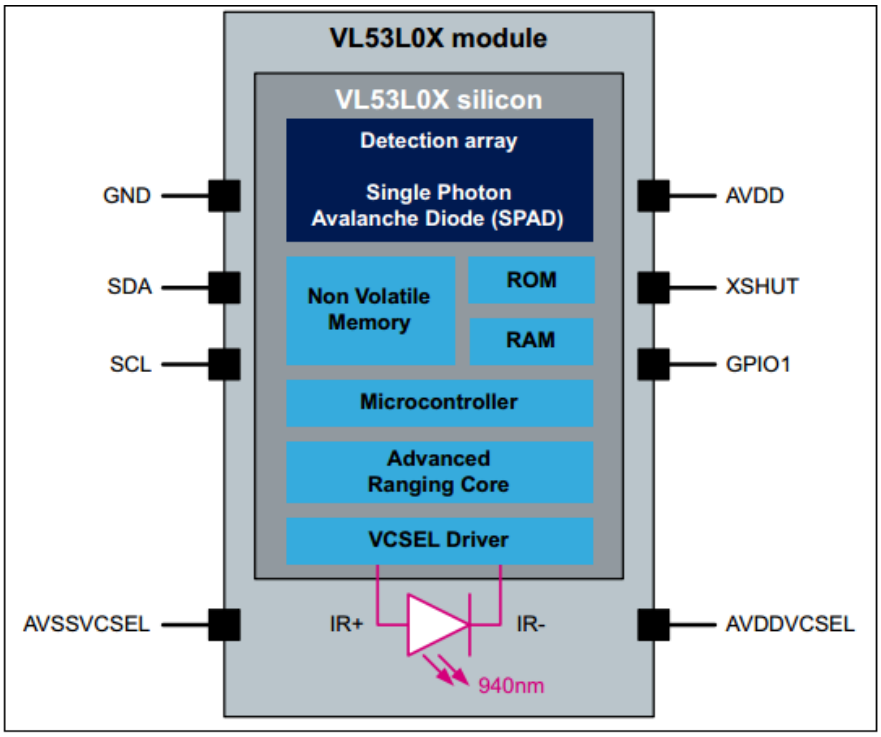
.5.3 Proximity sensor

The VL53L0X is a new generation Time-of-Flight (ToF) laser-ranging module housed in the smallest package on the market today, providing accurate distance measurement whatever the target reflectance unlike conventional technologies. It can measure absolute distances up to 2m, setting a new benchmark in ranging performance levels, opening the door to various new applications.
The VL53L0X integrates a leading-edge SPAD array (Single Photon Avalanche Diodes) and embeds ST's second generation FlightSense patented technology.
The VL53L0X's 940nm VCSEL emitter (Vertical Cavity Surface-Emitting Laser), is totally invisible to the human eye, coupled with internal physical infrared filters, it enables longer ranging distance, higher immunity to ambient light and better robustness to cover-glass optical cross-talk.

Features

- Fully integrated miniature module
  - 940nm Laser VCSEL
  - VCSEL driver
  - Ranging sensor with advanced embedded micro controller
  - 4.4 x 2.4 x 1.0mm
- Fast, accurate distance ranging
  - Measures absolute range up to 2m
  - Reported range is independent of the target reflectance
  - Operates in high infrared ambient light levels
  - Advanced embedded optical cross-talk compensation to simplify cover glass selection
- Eye safe
  - Class 1 laser device compliant with latest standard IEC 60825-1:2014 - 3rd edition
- Easy integration
  - Single reflowable component
  - No additional optics
  - Single power supply
  - I2C interface for device control and data transfer
  - Xshutdown (Reset) and interrupt GPIO
  - Programmable I2C address

Block Diagram



For any specific information and for the firmware commands and procedures, please refer to the data sheet of the components.

.5.4 NFC memory

The M24SR64-Y device is a dynamic NFC/RFID tag that can be accessed either from the I2C or the RF interface. The RF and I2C host can read or write to the same memory, that is why only one host can communicate at a time with the M24SR64-Y. The management of the interface selection is controlled by the M24SR64-Y device itself. The RF interface is based on the ISO/IEC 14443 Type A standard. The M24SR64-Y is compatible with the NFC Forum Type 4 Tag specifications and supports all corresponding commands. The I2C interface uses a two-wire serial interface consisting of a bidirectional data line and a clock line. The devices carry a built-in 4-bit device type identifier code in accordance with the I²C bus definition. The device behaves as a slave in the I2C protocol.

I2C mode

M24SR64-Y is powered by VCC. The I2C interface is connected to the M24SR64-Y. The I2C host can communicate with the M24SR64-Y device. 1.1.2

Tag mode

The M24SR64-Y is supplied by the RF field and can communicate with an RF host (RFID reader or an NFC phone). The User memory can only be accessed by the RF commands.

Dual interface mode

Both interfaces, RF and I2C, are connected to the M24SR64-Y and both RF or I2C host can communicate with the M24SR64-Y device. The power supply and the access management are carried out by the M24SR64-Y itself. For further details, please refer to the token mechanism described inside the data sheet of the component.

- Contactless interface
- NFC Forum Type 4 Tag
- ISO/IEC 14443 Type A
- 106 Kbps data rate
- Internal tuning capacitance: 25 pF Memory
- 8-Kbyte (64-kbit) EEPROM
- Support of NDEF data structure
- Data retention: 200 years
- Write cycle endurance:
  - 1 million Write cycles at 25 °C
  - 600k Write cycles at 85 °C
  - 500k Write cycles at 105 °C
- Read up to 246 bytes in a single command

- Write up to 246 bytes in a single command
- 7 bytes unique identifier (UID)
- 128 bits passwords protection

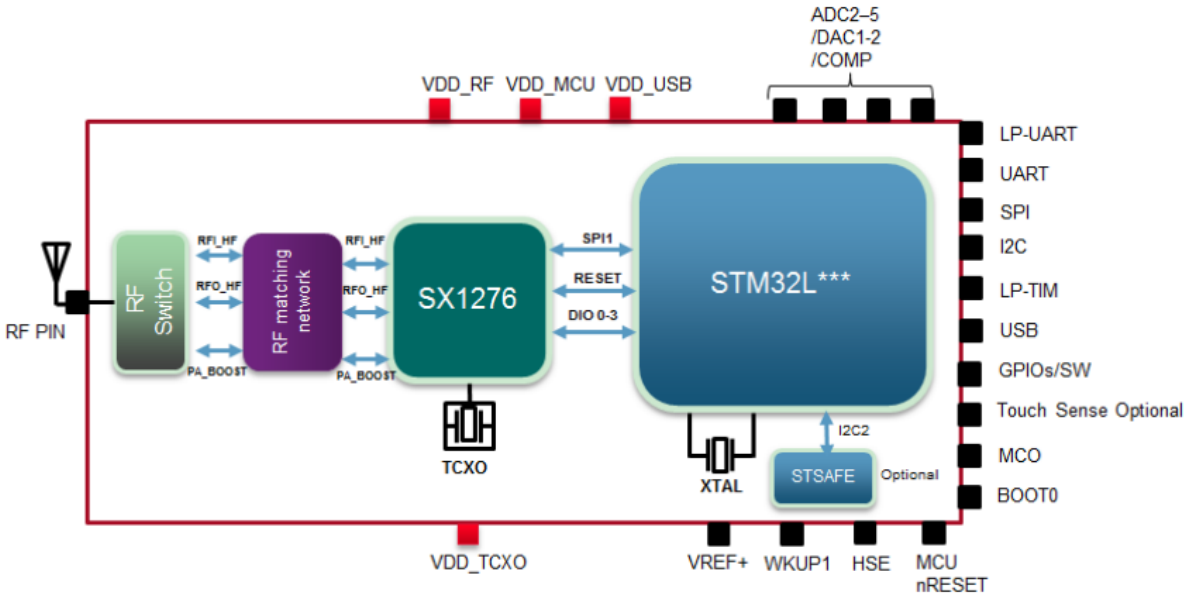
For any specific information and for the firmware commands and procedures, please refer to the data sheet of the components.

.5.5 LoRa/Sigfox module CMWX1ZZABZ-078 (LPWAN module)

LoRa and Sigfox module CMWX1ZZABZ-078 from Murata is mounted on KITRA 020L board.
Type ABZ is a new, compact, low cost, low power wide area network (LPWAN) wireless module that supports the LoRaWAN long range wireless protocol. This new stand-alone module is constructed in a metal shielded package and comprises a Semtech SX1276 ultra long range spread spectrum wireless transceiver and an STMicroelectronics STM32L0 series ARM Cortex-M0+ 32 bit microcontroller (MCU). An integrated TCXO that has robust low drift thermal characteristics provides an accurate clock source for the RF transceiver.
Communication with the module can be achieved via UART by the Samsung ARTIK 020.
The Murata CMWX1ZZABZ module has pre-certified radio regulatory approvals for operating in the 868 and 915 MHz industrial, scientific and medical (ISM) spectrum in most geographical regions of the world.
The normal output power is +14 dBm but a PA boost function can be selected to increase RF output to +20dBm for long range applications or those where the end-device is sited in a poor signal location indoors.
The MCU includes 192 kB flash and 20 kB RAM, and has enough memory to embed customer applications and host other modulation stacks. In addition, an optional STSAFE secure element can be incorporated into the MCU to enhance the network security capabilities.
Typical applications for this module include smart metering, wearables, tracking, M2M and internet of things (IoT) edge nodes.
STM32L082 microcontroller embedded in the LPWAN module has these important features:

- True RNG and firewall protection
- Hardware Encryption Engine AES 128-bit

See below the block diagram of the module.

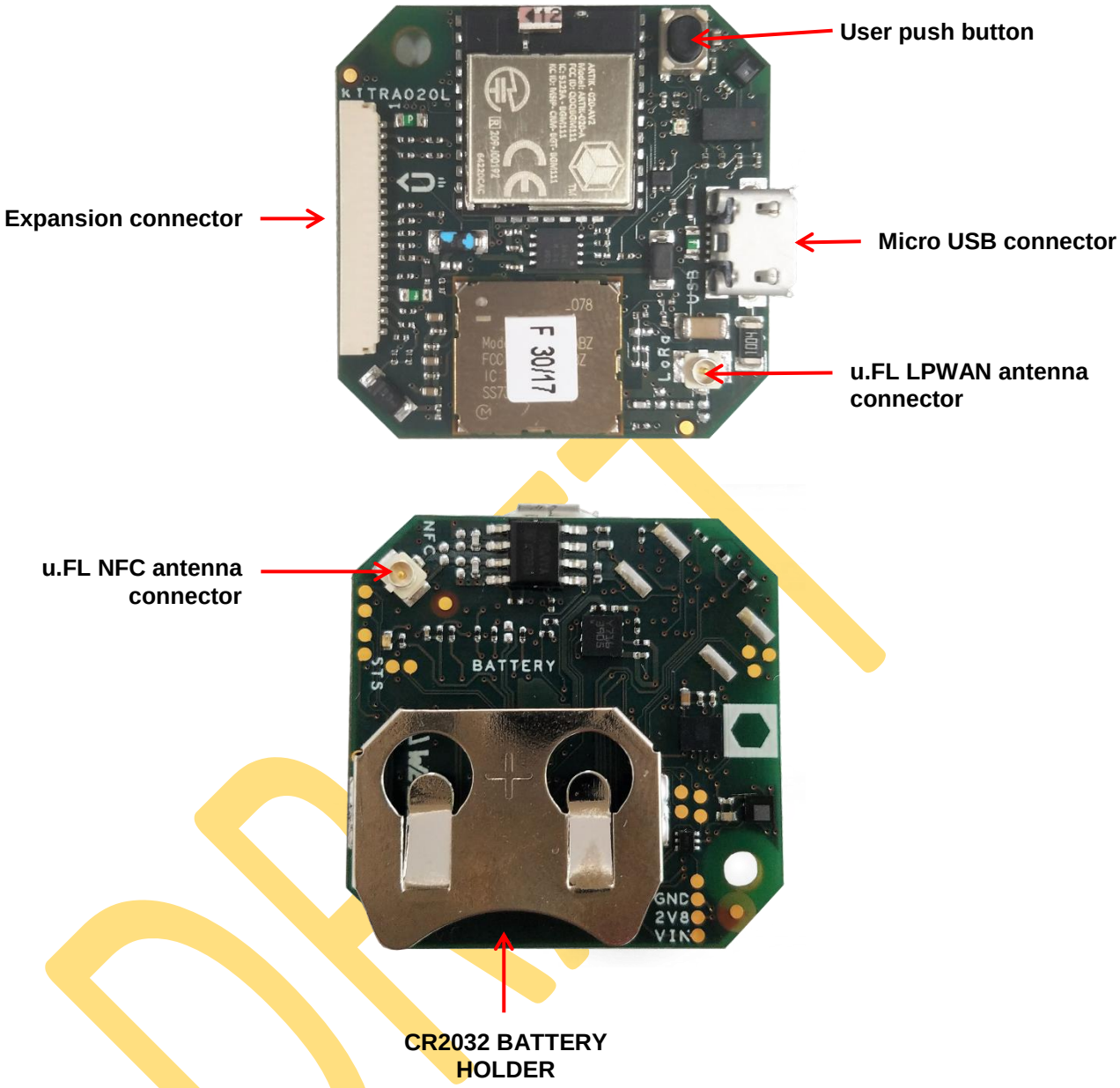


This module supports LoRaWAN & Sigfox long range protocol and has these main features.

- LoRA Supporting EU\US\APAC\INDIA with 1 Firmware
- Sigfox supporting Zone 1, 2, 3, 4 with 1 Firmware

The application in KITRA 020L can be developed also using the STM32 integrated in this module and all the sensors mounted on this board are connected using I2C port that is connected to Samsung ARTIK 020 module and also on the LPWAN module.
The developer can access the STM32 microcontroller using the JTAG presents on the expansion connector.

.6 BOARD CONNECTORS

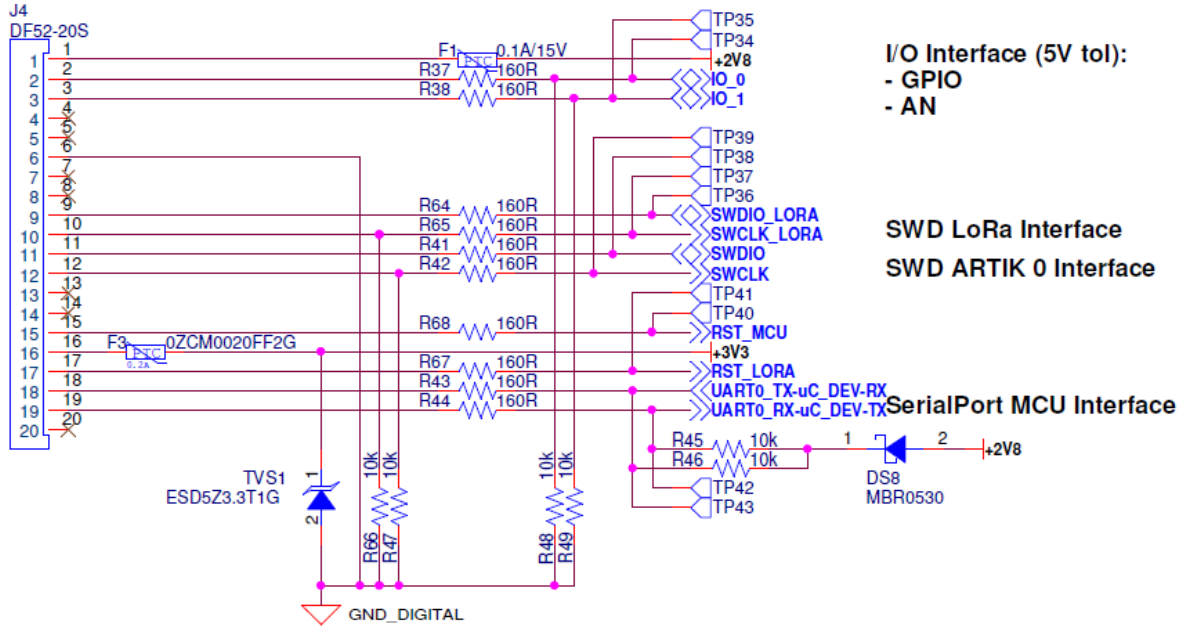


u.FL connector (LPWAN & NFC)	J1 & J2
MICRO USB-B (power supply)	J3
EXPANSION CONNECTOR	J4
KEYSTONE 3034 (battery holder)	BAT1

.6.1 POWER SUPPLY CONNECTOR

Input voltage type: DC
Typical input voltage: 5V
Power Input Max: 1W
Connector type mounted on KITRA 020L: Micro USB B receptacle 10118192-0001LF from Amphenol FCI

.6.2 EXPANSIONS CONNECTOR



FUNCTIONAL NOTES ON EXPANSION CONNECTOR LINES

- Lines IO_0 and IO_1 have a 160ohm internal series resistor so maximum current per output is about 15mA.
- Lines IO_0 and IO_1 have a 10kohm internal pull down resistor.
- UART0_TX/RX lines have 10kohm internal pull up to 2,8V.

PIN TABLE

PIN NAME	KITRA 020L PIN CONNECTOR	SPECIFICATIONS
+2V8	J4-1	Voltage source that can be used to power external sensors. Maximum current 100mA, protected by a resettable fuse.
IO_0	J4-2	12 bit resolution. The input has 160ohm series and 10kohm pull down. Consider that the reference of the ADC conversion can be configured via SW in order to have three ranges: • 1,25V • 2,5V • 5V
IO_1	J4-3	12 bit resolution. The input has 160ohm series and 10kohm pull down. Consider that the reference of the ADC conversion can be configured via SW in order to have three ranges: • 1,25V • 2,5V 5V
Not connected	J4-4	Not connected
Not connected	J4-5	Not connected
GND	J4-6	GND of the board.
Not connected	J4-7	Not connected
Not connected	J4-8	Not connected
SWDIO_LORA	J4-9	SWDIO of the Murata module (STM32)
SWCLK_LORA	J4-10	SWCLK of the Murata module (STM32)
SWDIO	J4-11	SWDIO of the ARTIK 020 module

SWCLK	J4-12	SWCLK of the ARTIK 020 module
Not connected	J4-13	Not connected
Not connected	J7-14	Not connected
RST_MCU	J7-15	Reset pin of the ARTIK 020 module. Active low.
+3,3V	J7-16	Power input 3,3V maximum 200mA protected by a resettable fuse.
RST_LORA	J7-17	Reset pin of the Murata module. Active low.
UART0_TX	J7-18	ARTIK 020 module UART0 TX pin PF3
UART0_RX	J7-19	ARTIK 020 module UART0 RX pin PF4
Not connected	J7-20	Not connected

Connector type mounted on KITRA 020L: Hirose DF52-20S P/N SM20B-SURS-TF(LF)(SN)

.6.3 ANTENNA CONNECTORS

ARTIK 020 module embeds all the wireless functionalities related to Bluetooth and the other antennas for LPWAN and NFC are connected throught the embedded u.FL connectors.

Caution: *Do not apply power (enable) the radio chips before connecting antennas or damage to the chip may result*.
The U.FL-R-SMT Hirose connector is used for both the BT/Wi-Fi and the 802.15.4 for ZigBee or Thread antenna connectors on the ARTIK 020 Module.
The mechanical size of the connector (receptacle) is described here in after, for suggestions on mating plug and more details on the connector, please contact Hirose Electric Co., LTD.

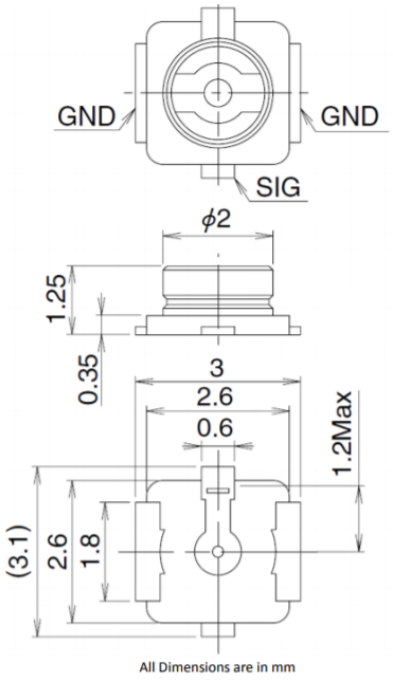


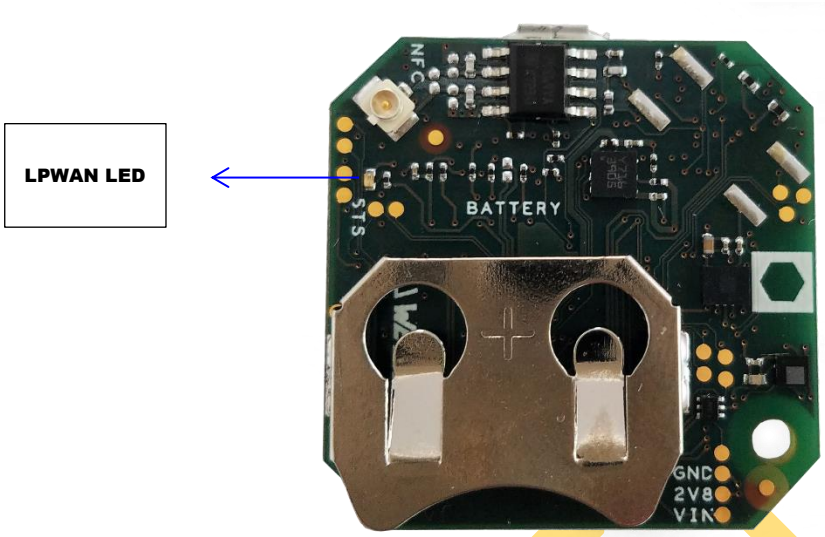
Figure 7. RF Connector for BT/Wi-Fi and ZigBee/Thread

.7 LEDS

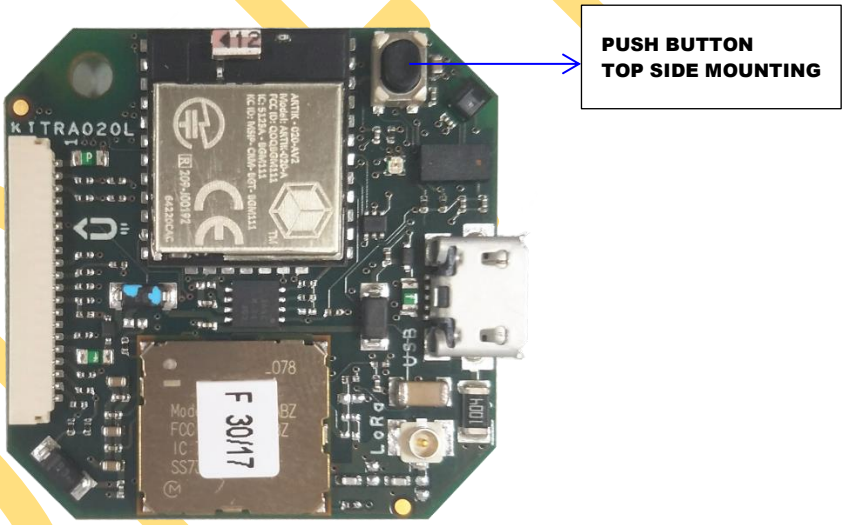
KITRA 020L provides one RGB LED connected to 3 output lines of the ARTIK 020 that can be managed by application software.
PD13 → R (red). Active low to turn on the LED
PD14 → G (green). Active low to turn on the LED
PD15 → B (blue). Active low to turn on the LED

PROGRAMMABLE RGB LED

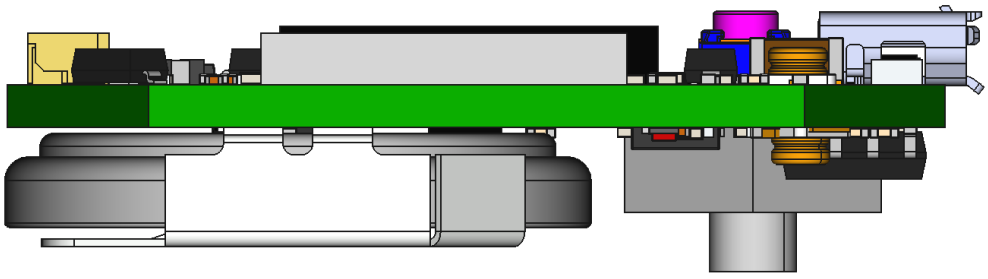
The board embeds also a green LED useful connected to the LPWAN module.
PB2 → G (green). Active high to turn on the LED



.8 BUTTON



KITRA 020L in equipped by a push button that can be mounted on TOP and on BOTTOM side of the board. By default the push botton is mounted on TOP and is connected in parallel to both the modules (ARTIK 020 and LPWAN) as indicated here in after.
PB13 (ARTIK 020) → When pressed the line goes at low level. Active low.
PA0/WKP1 (LPWAN) → When pressed the line goes at low level. Active low. This is also the wake up pin of the Murata module.
The second position of the push button (in BOTTOM side) is referred to a different P/N and has a mechanical dimension that give the possibility to use the board as mechanical button when a particular rubber housing is used. See the 3D rendering below that show this mechanical solution.



.9 KITRA 020L DEVELOPMENT BOARD BOOTING

Using the JTAG/SWD ports present at the expansion connector you can develop and debug both the MCU integrated in the board and present in the ARTIK 020 module (Cortex-M4) and in the LPWAN module (STM32L082).
Under development

.9.1 ARTIK 020 MODULE

Use the ARTIK 020 JTAG tools (IAR, J-Link…)
Under development

.9.2 LPWAN MODULE

Use the STM32L082 JTAG tools (IAR, J-Link, ST-Link, Cube-Mx,…)
Under development

POWER ON THE KITRA 020L

There are three options to power the board:

1. Micro USB connector.
2. Expansion connector.
3. CR2032 battery.

KITRA 020L integrate also a power path that automatically open the battery line when USB o Expansion connector voltage sources are present (at least one between USB and Expansion connector).
USB power source is 5V input and Expansion connector (pin J17.16) is 3,3V input.
In case 5V from USB or 3,3V form Expansion connector are not present, the power path activate immediately the line connected to the battery that will became the power source of the board.

.10 RF ELECTRICAL SPECIFICATIONS

.10.1 ARTIK 020 MODULE

The ARTIK 020 module includes a high-performance, integrated chip-antenna. The table below includes performance specifications for the integrated chip-antenna.

Parameter	With optimal layout	Note
Efficiency	-2 dB to -3 dB	Efficiency and peak gain depend on the application PCB layout and mechanical design
Peak gain	1.0 dBi	

.10.1.1 2,4GHz RF transceiver characteristics

.10.1.1.1 RF Transmitter General Characteristics for the 2.4 GHz Band

From the data sheet of the ARTIK module.
Unless otherwise indicated, typical conditions are: TOP = 25 °C,VDD = 3.3 V, DC-DC on. Crystal frequency at 38.4 MHz. RF center frequency 2.45 GHz. Conducted measurement from the antenna feedpoint.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Maximum TX power	$POUT_{MAX}$		—	+8	—	dBm
Minimum active TX Power	$POUT_{MIN}$	CW		-26	—	dBm
Output power step size	$POUT_{STEP}$	-5 dBm < Output power < 0 dBm	—	1	—	dB
		0 dBm < output power < $POUT_{MAX}$	—	0.5	—	dB
Output power variation vs supply at $POUT_{MAX}$	$POUT_{VAR\_V}$	1.85 V < $V_{VREGVDD}$ < 3.3 V, PAVDD connected directly to external supply, for output power = 8 dBm.	—	3.8	—	dB
		1.85 V < $V_{VREGVDD}$ < 3.3 V using DC-DC converter	—	2.2	—	dB
Output power variation vs temperature at $POUT_{MAX}$	$POUT_{VAR\_T}$	From -40 to +85 °C, PAVDD connected to DC-DC output	—	1.5	—	dB
Output power variation vs RF frequency at $POUT_{MAX}$	$POUT_{VAR\_F}$	Over RF tuning frequency range	—	0.4	—	dB
RF tuning frequency range	F_{RANGE}		2400	—	2483.5	MHz

.10.1.1.2 RF Receiver General Characteristics for the 2.4 GHz Band

From the data sheet of the ARTIK module.
Unless otherwise indicated, typical conditions are: TOP = 25 °C,VDD = 3.3 V, DC-DC on. Crystal frequency at 38.4 MHz. RF center frequency 2.440 GHz. Conducted measurement from the antenna feedpoint.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
RF tuning frequency range	F_{RANGE}		2400	—	2483.5	MHz
Receive mode maximum spurious emission	$SPUR_{RX}$	30 MHz to 1 GHz	—	-57	—	dBm
		1 GHz to 12 GHz	—	-47	—	dBm
Max spurious emissions during active receive mode, per FCC Part 15.109(a)	$SPUR_{RX\_FCC}$	216 MHz to 960 MHz, Conducted Measurement	—	-55.2	—	dBm
		Above 960 MHz, Conducted Measurement	—	-47.2	—	dBm
Level above which RFSENSE will trigger[1]	$RFSENSE_{TRIG}$	CW at 2.45 GHz	—	-24	—	dBm
Level below which RFSENSE will not trigger[1]	$RFSENSE_{THRES}$		—	-50	—	dBm

Note:
1. RFSENSE performance is only valid from 0 to 85 °C. RFSENSE should be disabled outside this temperature range.

.10.1.1.3 RF Receiver Characteristics for Bluetooth Smart in the 2.4 GHz Band

From the data sheet of the ARTIK module.
Unless otherwise indicated, typical conditions are: TOP = 25 °C,VDD = 3.3 V. Crystal frequency at 38.4 MHz. RF center frequency 2.440 GHz. DC-DC on. Conducted measurement from the antenna feedpoint.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Max usable receiver input level, 0.1% BER	SAT	Signal is reference signal[1]. Packet length is 20 bytes.	—	10	—	dBm
30.8% Packet Error Rate[2]	SENS	With non-ideal signals as specified in RF-PHY.TS.4.2.2, section 4.6.1	—	-92	—	dBm
Signal to co-channel interferer, 0.1% BER	C/I_{CC}	Desired signal 3 dB above reference sensitivity	—	8.3	—	dB
Blocking, 0.1% BER, Desired is reference signal at -67 dBm. Interferer is CW in OOB range.	$BLOCK_{OOB}$	Interferer frequency 30 MHz ≤ f ≤ 2000 MHz	—	-27	—	dBm
		Interferer frequency 2003 MHz ≤ f ≤ 2399 MHz	—	-32	—	dBm
		Interferer frequency 2484 MHz ≤ f ≤ 2997 MHz	—	-32	—	dBm
		Interferer frequency 3 GHz ≤ f ≤ 12.75 GHz	—	-27	—	dBm
Intermodulation performance	IM	Per Core_4.1, Vol 6, Part A, Section 4.4 with n = 3	—	-25.8	—	dBm
Upper limit of input power range over which RSSI resolution is maintained	$RSSI_{MAX}$		4	—	—	dBm
Lower limit of input power range over which RSSI resolution is maintained	$RSSI_{MIN}$		—	—	-101	dBm
RSSI resolution	$RSSI_{RES}$	Over $RSSI_{MIN}$ to $RSSI_{MAX}$	—	—	0.5	dB

Note:

1. Reference signal is defined 2GFSK at -67 dBm, Modulation index = 0.5, BT = 0.5, Bit rate = 1 Mbps, desired data = PRBS9; interferer data = PRBS15; frequency accuracy better than 1 ppm
2. Receive sensitivity on Bluetooth Smart channel 26 is -86 dBm

.10.2 LPWAN MODULE

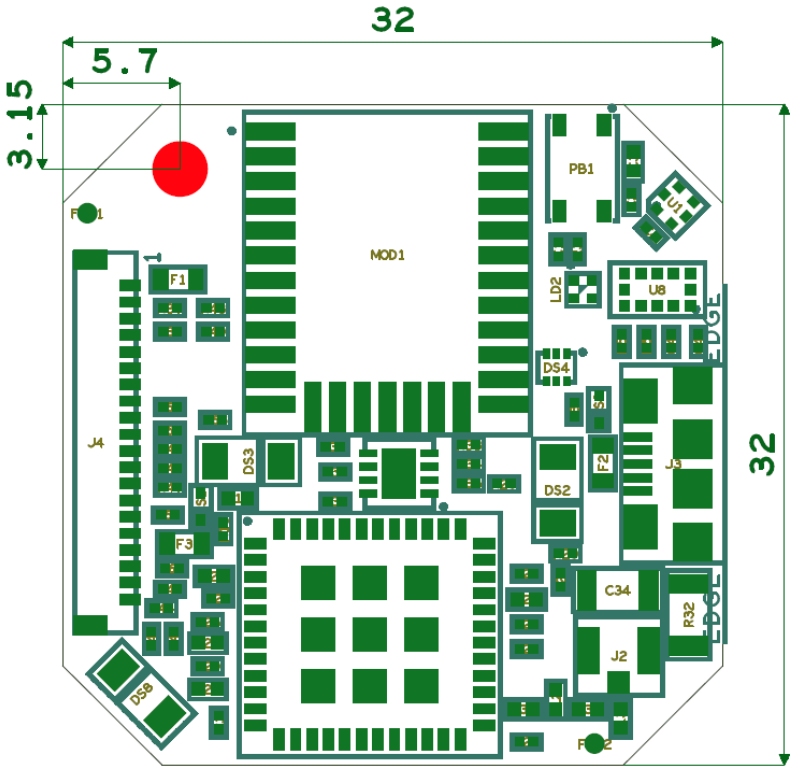
Under development…

.11 SPECIFICATIONS

Parameter	Minimum	Typical	Maximum	Conditions
External power supply	3V	5V	6V	Standard micro USB
Power rating			1W	
Operation temperature	-20° C	-	70°C	Without heatsink
Storage temperature	-40	-	85°C	Electronics board

Wireless standard	Frequency band low	Frequency band high	Transmitted power
Bluetooth LE	2400 MHz	2483,5 MHz	8 dBm

.12 MECHANICAL SPECIFICATIONS



The measures are in mm and the view is TOP side.

.13 HOUSING PRESCRIPTION

KITRA 020Lis PCBA (Printed Circuit Board Assembly) system and so it is not a final product, it's necessary to close the board in a specific housing or mechanical box.
The housing, in addition to achieve the desired functionality, musts be fireproof (in case of unexpected failure of the electronic board component that produce a little spark, a fire will be blocked).

.14 PACKAGING (STARTER KIT)

Standard package of the KITRA 020Lbundle kit is made up with the next items:

- KITRA 020Lelectronics board;
- 868-915MHz uFL antenna.
- Passive NFC 13,56MHz u.FL antenna.

.15 DECLARATION OF CONFORMITY

Pending

.16 OPERATING ENVIRONMENT

The operating environment excludes special environments (extreme temperatures, dust, humidity, vibrations, flammable gases, corrosive or explosive atmosphere, etc.).

.17 DICLAIMERS

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