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[BLE BASED BEACONS]

BLE BEACON

A beacon in wireless Technology is the concept of broadcasting small pieces of information. The information may be anything, ranging from ambient data(temperature, air pressure, humidity and so forth)to micro-location data(asset tracking,retail,and so forth)or orientation data (acceleration,rotation,and so forth).The transmitted Data is typically static but can also be dynamic and change over time. With the use of Bluetooth low energy, beacons can be designed to run for years on a single coin cell battery.

The non-connectable Beacon is a Bluetooth low energy device in broadcasting mode. It simply transmits information that is stored internally. Because the non-connectable broadcasting does not activate any receiving capabilities, it achieves the lowest possible power consumption by simply waking up, transmit data and going back to sleep. This comes with the drawback of dynamic data being restricted to what is only known to the device, or data being available through external input from example serial protocols (universal asynchronous receiver/transmitter (UART), Serial peripheral interface (SPI), Universal serial bus (USB), and so forth).

A beacon achieves low-power consumption by residing in sleep most of the operating time, only waking up briefly to broadcast data.

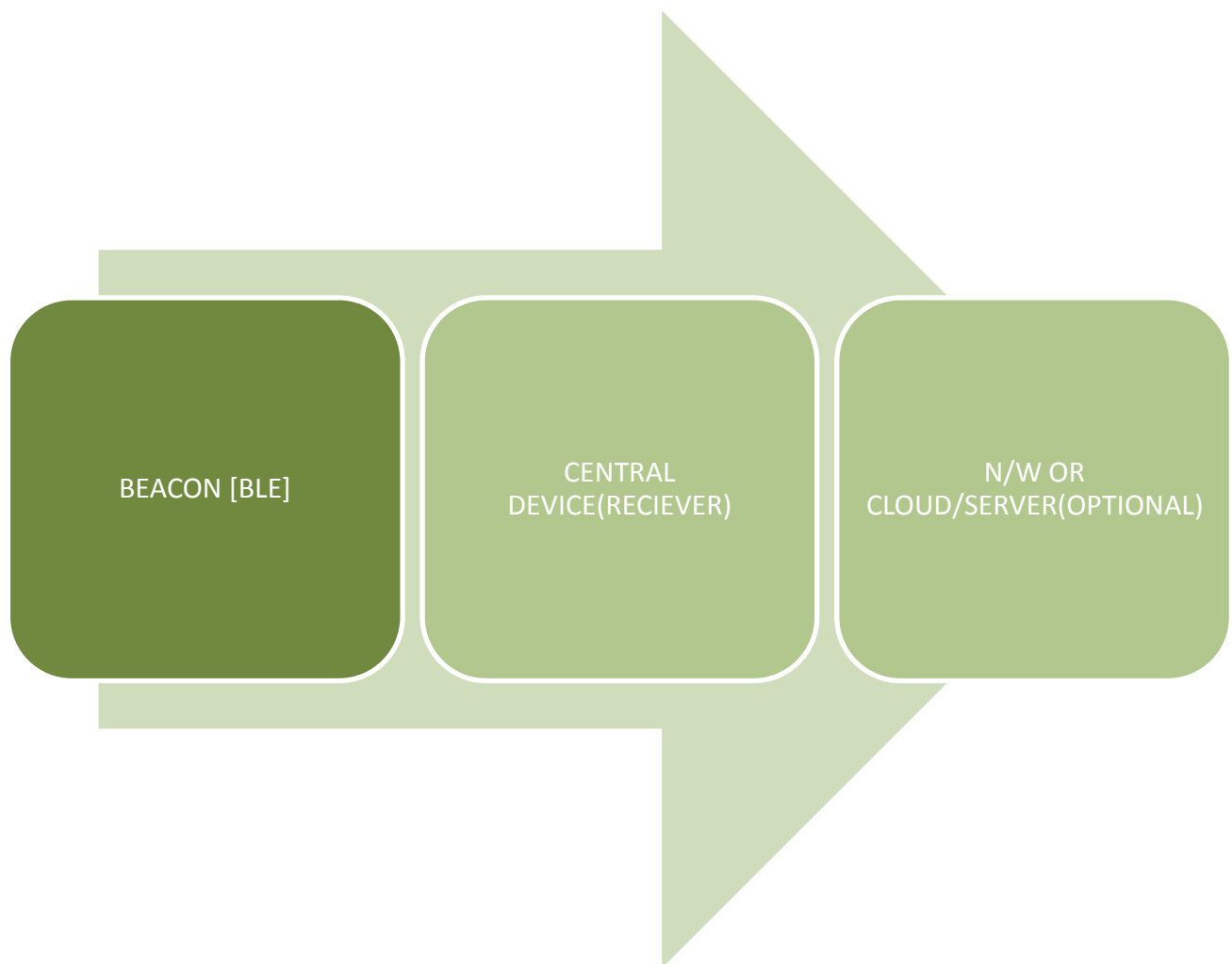
For non-connectable beacons, the interval cannot be smaller Than 100 ms. For connectable beacons, it cannot be smaller than 20ms. To this interval, a 0-10 ms pseudo-random delay is added to ensure that beacons can coexist, even if they might start broadcasting at the same time.

EDDYSTONE

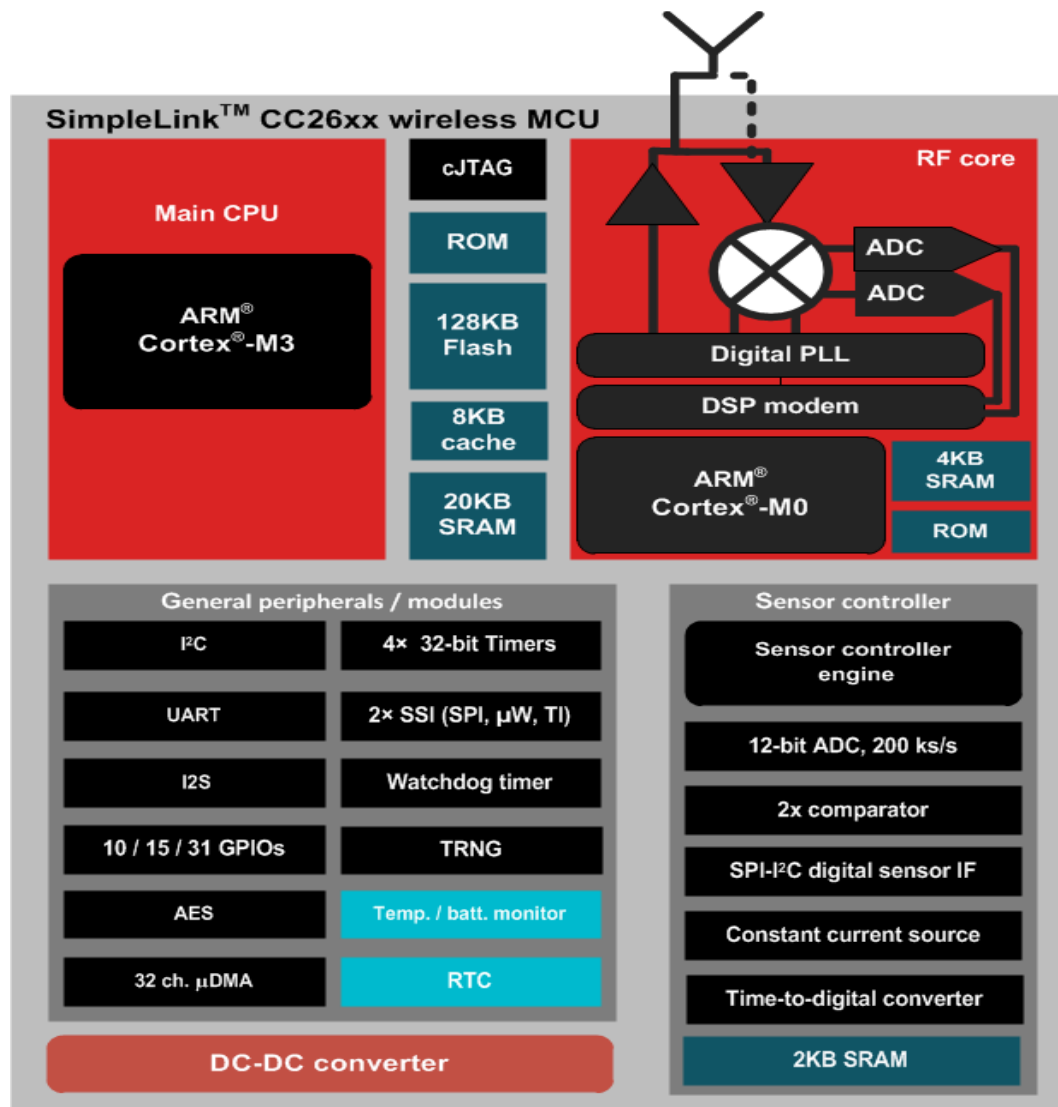
Eddystone™ is an open beacon protocol specification from Google [in response to I beacon from APPLE] aimed at improving proximity-based experiences, with support for both Android and iOS smart device platforms. These experiences are implemented by specifying various beacon payload formats, defined as frames-types, as well as a corresponding set of APIs used to access these payloads from the smart device (such as an Android Smartphone).The Eddystone model by Google gives user the option of switching to peripheral mode rather than just transmitting advertisements mode of Ibeacons,that is entering into connectable mode.

SOLUTION

For the given assignment, I have decided to present the ideas of designing a BLE Beacon using TI's CC2640. This application note describes how to implement an example Eddystone beacon device using the TI BLE-Stack™ V2.2 SDK on the SimpleLink™ CC2640 Bluetooth Smart wireless MCU. The lower power consumption and wide operating voltage capability make the CC2640 an ideal platform for implementing battery-powered Eddystone beacons.



IMPLEMENTING USING CC2640



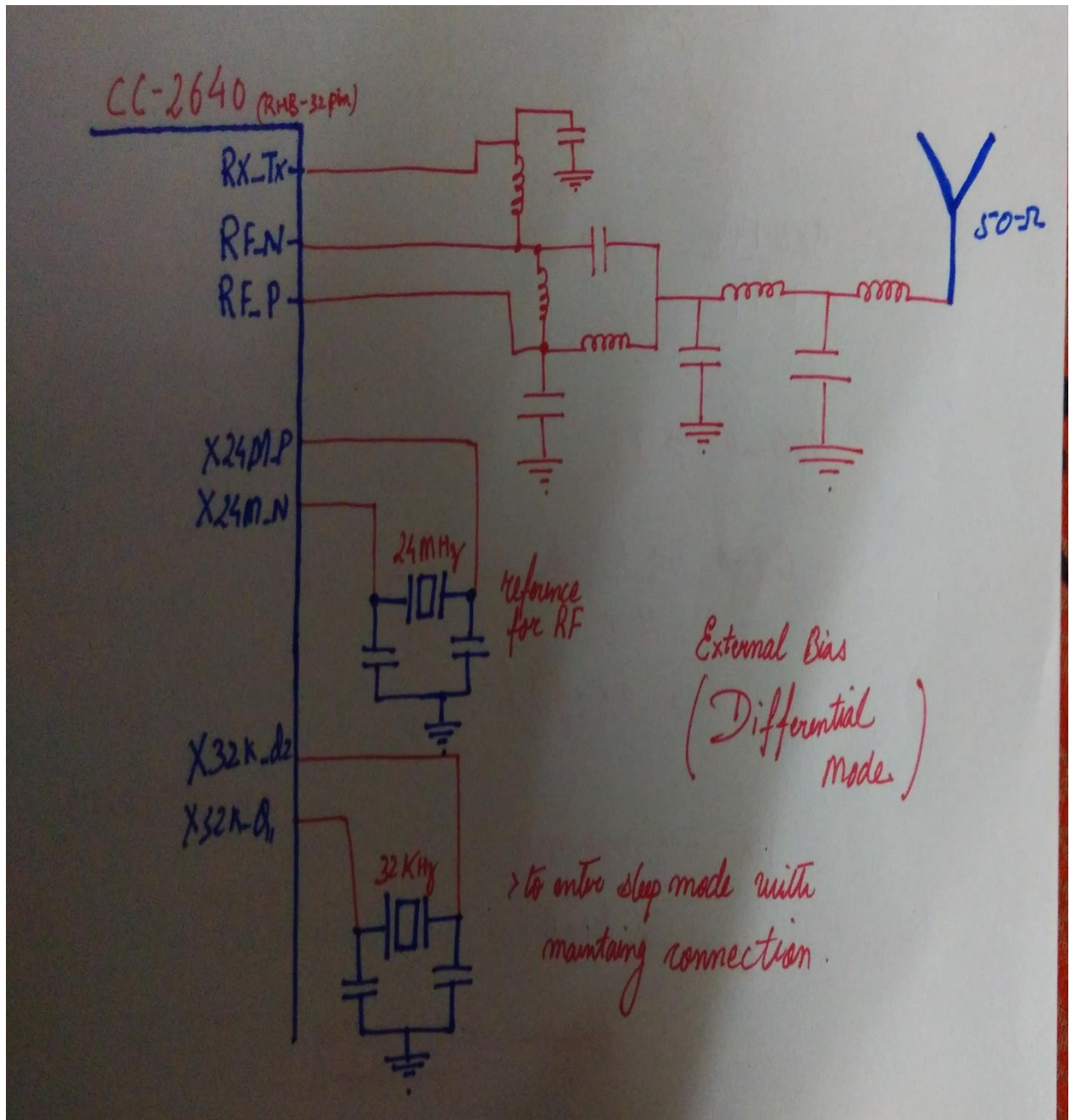
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The SimpleLink CC2640 Wireless MCU contains an ARM Cortex-M3 (CM3) 32-bit CPU, which runs the application and the higher layers of the protocol stack.

The CM3 processor provides a high-performance; low-cost platform that meets the system requirements of minimal memory implementation, and low-power consumption, while delivering outstanding computational performance and exceptional system response to interrupts.

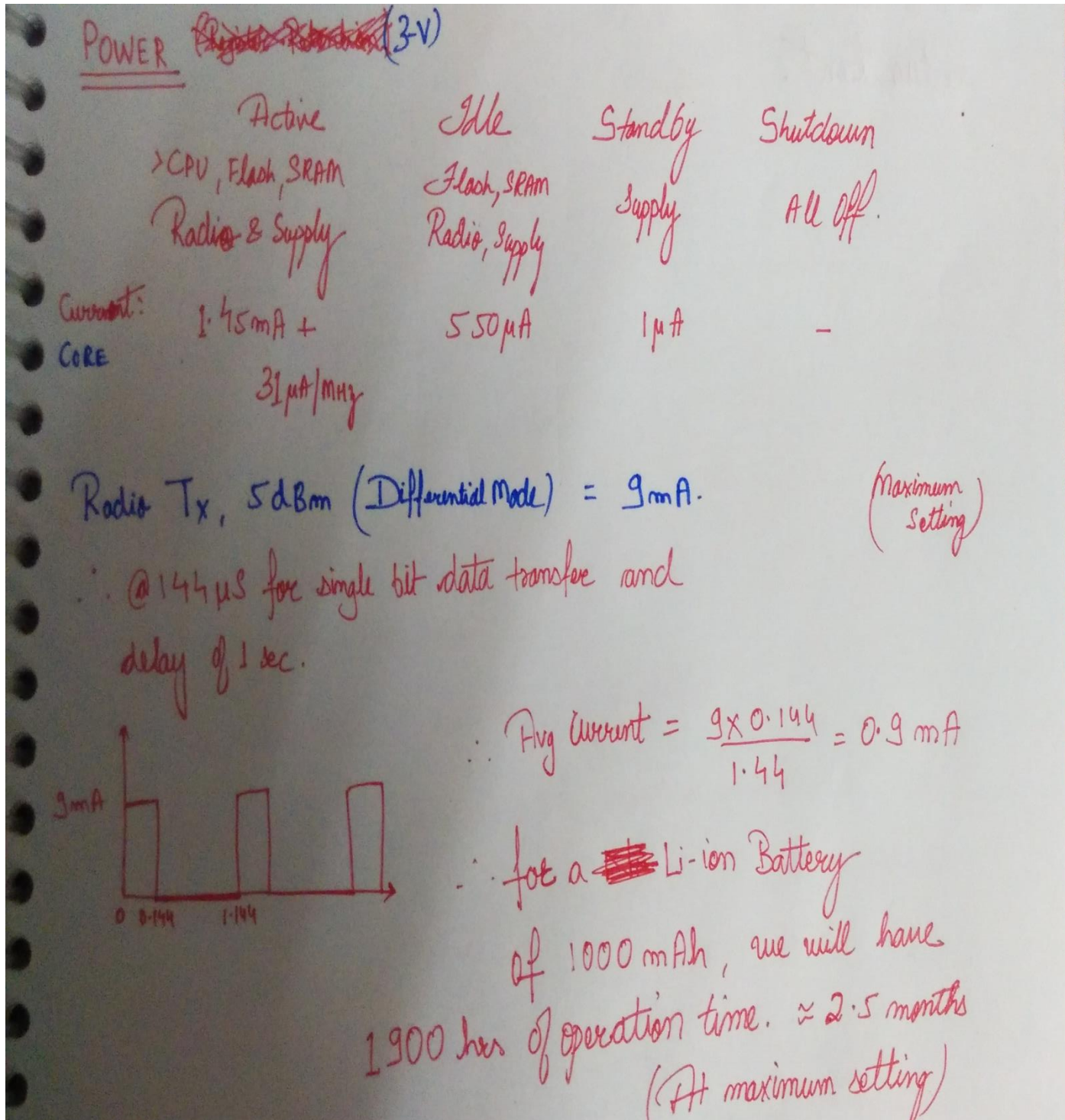
The main CPU that is Cortex M3 needs to be programmed via TI-BLE Stack V2.0. ,For constant broadcasting mode and thus generating a unique UID code.

CIRCUIT CONNECTION



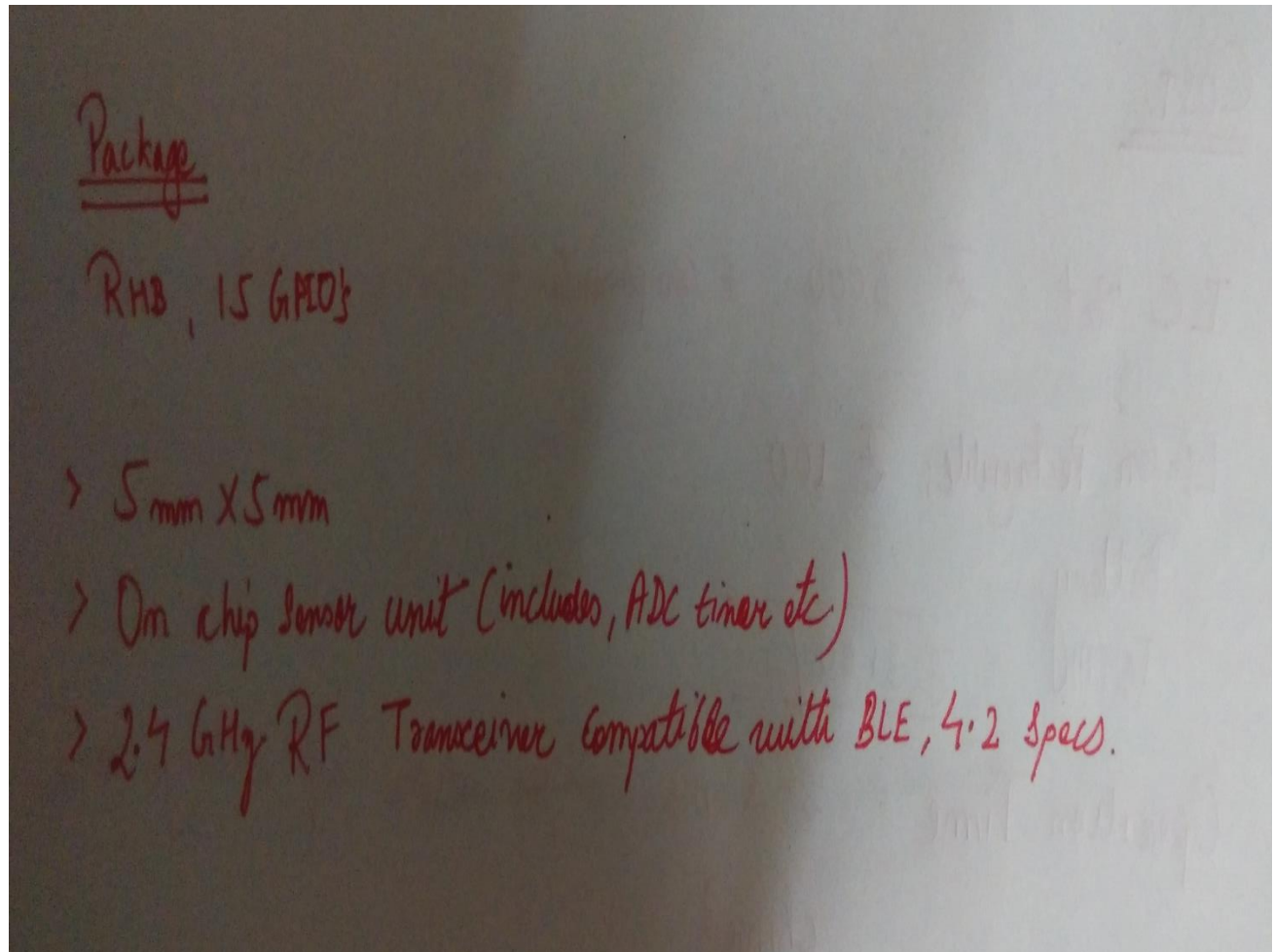
OPERATING IN DIFFERENTIAL MODE FOR MAXIMUM PERFORMANCE /CAN BE SWITCHED TO SINGLE ENDED MODE FOR COST AND SIZE REDUCTION.

POWER CONSUMPTION



EVEN AT MAXIMUM OPERATING CONDITION A SINGLE LI-ION RECHARGEABLE BATTERY CAN SUPPORT THIS DEVICE FOR ALMOST 3 MONTHS.

PACKAGE/DIMENSION



THE DIMENSION OF THE IC IS JUST 5*5 mm, SO EVEN AFTER INSTALLING THE 50OHM ANTENNA AND REST OF THE CIRCUITARY IT SHOULD BE AROUND 10CM CONSIDERING ANTENNA LENGTH.

COST

COST:

IC cost: ₹ 3000 + components

Li-ion Rechargeable: ₹ 100

Battery
TOTAL = ₹ 3100/-

Operation Time = 2-3 months or more if settings are changed.

IC cost can be reduced since its not a custom made IC & there are several components that are redundant.

ANTENNA PARAMETERS

Considering even the most redundant type of antenna that is a small dipole type that has its far field range parameters as follows:

$$d=(2*D^2)/\lambda$$

Even if we use this then for a range of 5m we get around 0.5m of antenna length which is obviously too big to look good, therefore using logarithmic or zigzag antenna the length can be reduced significantly by size of PCB antenna .

BIBLIOGRAPHY

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CHALLENGES FROM MY SIDE AND ABOUT ME

Hailing from a Defense background I was instilled with a continuous sense of improvement and strive for excellence.

Coming from an AVR background working on ARM based system would be good challenge for me, which I am certainly ready to accept.

Being from one of the top 10 engineering colleges in the subcontinent I believe my skills with Analog and Digital electronics are quite good, which I intend to pass onto my embedded section, for which I believe your company will be a good platform.

The only reason I hesitant to apply for bigger giants is because of my medical conditions which prevents me from leaving this city, and the opportunities for an ECE under-grad [CORE] is quite limited in this part of country, so I believe that your Start-Up which focuses on IOT would be a good experience for me for my further development, in the field of embedded electronics. For my further background do visit:

<https://github.com/xeoncesta>

CV @:

<https://drive.google.com/open?id=0B533ea6hdZSYeIR5QThESGJpYkk>