|  |  |
| --- | --- |
| LILLEBAKK cmyk |  |

Datasheet

Project NAME:

Customer: KJELLER VINDTEKNIKK

Features

* …
* …
* …
* …
* …
* …

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# Module Interface

Table 2: Pin description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Pin name** | **Type** | **Domain (V)** | **Description** | **Comments** |
|  |  |  |  |  |
|  |  |  |  |  |
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|  |  |  |  |  |
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|  |  |  |  |  |

# Electrical Characteristics

Verification levels:

1. Specification concept 2 (final product)
   1. Specification concept 1 (pilot)
2. Measurements concept 0 (bench setup)
3. Measurements concept 1 (pilot in field)
4. Measurements concept 2 (final product in field)

Table 3: Electrical characteristics

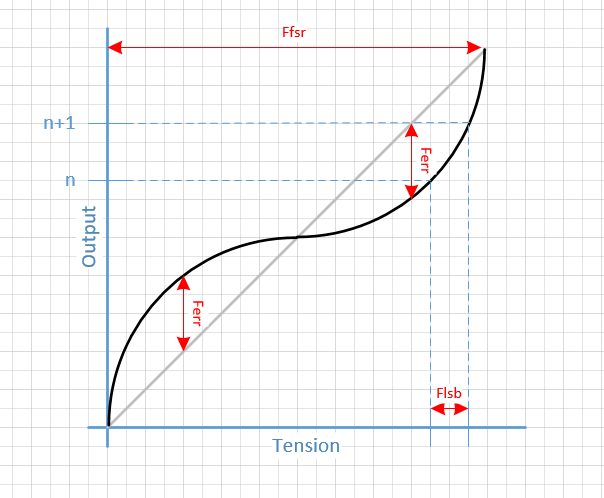
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test #** | **Parameter name** | **Condition** | **Ver. level** | **Min** | **Typical** | **Max** | **Unit** |
| **Operating Conditions** | | | | | | | | |
| Ambient temperature |  | temp |  | I | -20 | 25 | 50 | °C |
| Battery voltage |  | Vbat |  | I | 2,0 | 3,6 | 3,7 | V |
| Battery capacity |  |  | 10 years life time | I | 9 |  | 17 | Ah |
| Ground |  | Gnd |  | I |  | 0 |  | V |
| Supply voltage Load cell[[1]](#footnote-1) |  | Vlc |  | I |  | 3,4 |  | V |
| Supply voltage IA[[2]](#footnote-2) |  | Via |  | I | 4 |  | 16 | V |
| Supply voltage OPAMP |  | Vopa |  | I | 2,3 |  | 5,5 | V |
| Supply voltage RF |  | Vrf |  | I | 3,1 | 3,8 | 4,2 | V |
| Supply voltage MCU |  | Vmcu |  | I | 1,6 |  | 3,6 | V |
| Supply voltage ext MEM |  | Vmem |  | I | 1,8 |  | 5,5 | V |
| Supply voltage REG |  | Vreg |  | I | 1,8 |  | 5,5 | V |
| Sampled data size |  | Ms |  | I |  | 16 |  | B |
| Internal data storage |  | Mint | Program memory | I |  | 16 |  | kB |
| External storage |  | Mext | Non-volatile EEPROM | I |  | 256 |  | kB |
| Sampling rate | 1 | Ts |  | I | 1[[3]](#footnote-3) | 5[[4]](#footnote-4) | 3600 | s |
| Data transmission rate | 2 | ttx |  | I | 60 | 600 | 3600 | s |
| **DC Characteristics** | | | | | | | | |
| Regulator output voltage |  |  |  | I | 3,3 | 3,7 | 4,0 | V |
| Battery lifetime | 3 | Tbat | NB-IoT | I | 2 | 10 |  | years |
| Ia |  | 1[[5]](#footnote-5) |  |
| GPRS | I | 0,2 | 2 |  |
| Ia |  | 1[[6]](#footnote-6) |  |
| Internal storage span |  |  | 16B/second | I |  | 900 |  | s |
| External storage span | 4 |  | 16B/60 seconds | I |  | 10 |  | days |
|  |  |  |  |  |  |  |  |  |
| **Transient Characteristics** | | | | | | | | |
| Supply IR drop |  |  | Including Tx burst. | I |  |  | 200 | mV |
| Transmission time |  |  |  | I |  | 10 |  | ms |
| Wake-up time from sleep |  |  |  | I |  | 100 |  | ms |
| Start-up time from power down |  |  |  | I |  | 5 |  | s |
| Transmission burst time |  |  |  | I |  | 1 |  | ms |
|  |  |  |  |  |  |  |  |  |
| **AC Characteristics** | | | | | | | | |
| Transfer error rate | 5 | TER |  | I |  |  | 5 | % |
| Ia |  |  | 20 |
| PSRR |  |  | During sampling | I | 40[[7]](#footnote-7) |  |  | dB |
| **Sensor Characteristics** | | | | | | | | |
| Tension range | 6 | Ffsr |  | I | 0 |  | 150 | kN |
| Total tension error | 7 | Ferr |  | I | -500 |  | +500 | N |
|  | Ia | -900 |  | +900 |
| Tension step size | 8 | Flsb |  | I |  | 73 |  | N |
|  | Ia |  | 300 |  |
| Output voltage |  | Vfout |  | I | 1,000 |  | 2,000 | V |
|  |  |  |  |  |  |  |  |  |

### Measurement resolution in current system

The information given by the current system states:

* Supply = 3,4V into the load cell
* Measurement range = [1,000, 2,000]V.
* Measurement resolution = 0,5mV.
* Total error of +-500N (100kN version).
* Assuming the total non-linearity is 0,5mV. It’s not stated whether this is the total peak to peak, or any direction. In the best case scenario it is total peak to peak giving +-0,25mV/1V. The resolution of the system would be ~12 bits, hence ~11bits if it is +-0,5mV.
* In the web page it’s stated a resolution of 1/2222 => ~11 bits (100kN version).
* The microcontroller’s ADC is 10 bits only (or even 8), single ended. And the range is from 1-2V, hence it must have 11 bits resolution in that limited area.

### Measurement resolution in the new system



# Data format and storage capacity

# Cost

See: [le\_nb\_iot\_controller\_current\_consumption.xlsx](file:///C:\Users\jan.rune.herheim\Dropbox%20(Lillebakk)\Lillebakk%20Team\herheim\Documents\GitHub\LE_NB_IOT_CONTROLLER\doc\le_nb_iot_controller_current_consumption.xlsx).

# Deliverables

# Module Background

This module is based upon the LPWAN SRD: [..\LE\_LPWAN\_SYSTEM\doc\lpwan\_system\_requirement.docx](file:///C:\Users\jan.rune.herheim\Dropbox%20(Lillebakk)\Lillebakk%20Team\herheim\Documents\GitHub\LE_NB_IOT_CONTROLLER\LE_LPWAN_SYSTEM\doc\lpwan_system_requirement.docx)

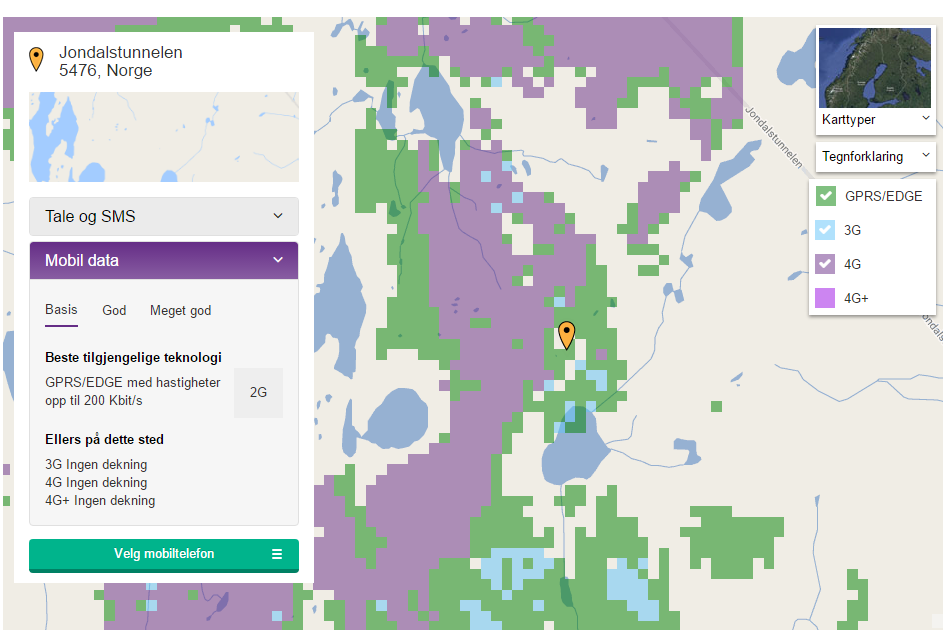
## Initial coverage

Wish from :

Lastcelle i høyspentmast :

|  |  |
| --- | --- |
| **NORD** | 60.1889461  60° 11.3367684'  60° 11' 20.2061'' |
| **ØST** | 6.2401207  6° 14.4072426'  6° 14' 24.43455'' |

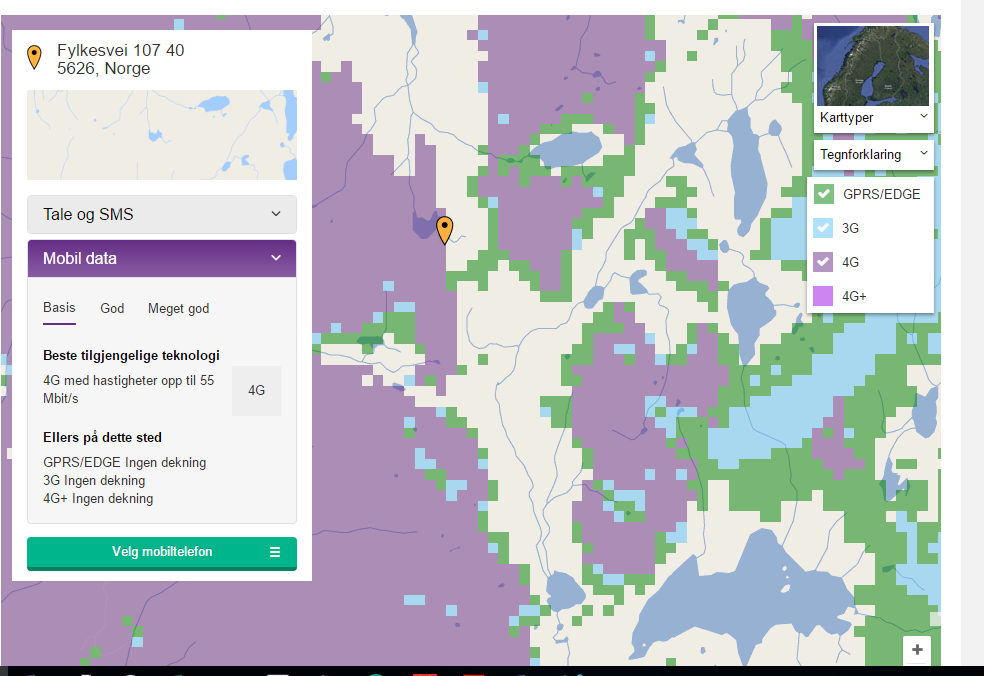




Mulig prøvespenn:

|  |  |
| --- | --- |
| **NORD** | 60.1616694  60° 9.7001652'  60° 9' 42.00991'' |
| **ØST** | 6.1779481  6° 10.6768846'  6° 10' 40.61308'' |





# Control Modes

Table 6: States

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Inputs** | | | **Outputs** | | |  |
|  |  |  |  |  |  | **Comments** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

Table 7: Calibration

|  |  |  |  |
| --- | --- | --- | --- |
| **Signals** | **Descriptions** | **Settings** | **Results** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

# Operation system description

AT commands are listed in: quectel\_docs\Quectel\_BC95\_AT\_Commands\_Manual\_V1.0.pdf

## Block diagram



## Operation system overview

tbd

## Error messages

Tbd.

## Init master

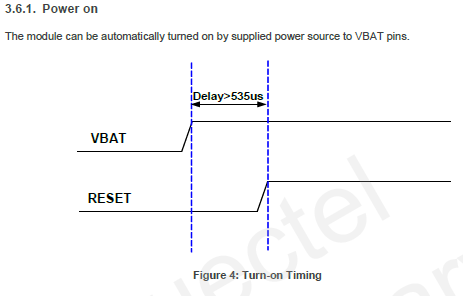
MCU setup

## Measure master

MCU measure

## Init RF

### Power on and HW reset



### Init ID

## Tx RF

## Rx RF

## Schematics

<Delete this text and paste snapshots of the schematics here (max recommended width on pictures is 25cm)>

# Test Plan

Table 8: Test conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Temperature** |  |  |  |  |
|  |  |  |  |
| **Supply** |  |  |  |  |
|  |  |  |  |
| **Load** |  |  |  |  |
|  |  |  |  |

## Test Modes for this Module

<Explain clearly what kind of test modes are implemented in the module>

## Prototype Verification and Characterization

<Explain clearly how the prototype should be verified and characterized. List and sequence the signals that should be applied for each parameter>

## Production Test

<List and explain the tests that should be carried out in production to be able to catch the defective devices.>

## Probe Points

<Delete this text and paste the layout snapshot picture with marked probe points>

Figure 1 : Probe points on the module.

Table 9: List of probe points

|  |  |  |
| --- | --- | --- |
| **Probe point #** | **Node** | **Test usage** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. Information labelled on the load cell. [↑](#footnote-ref-1)
2. 5V is explicitly written, but there is a figure of common mode range where the supply is +-2V. [↑](#footnote-ref-2)
3. 1 second for wave/resonance detection. Is this the same measurements that the accelerometer should measure? [↑](#footnote-ref-3)
4. Current iokeys minimum setting, with 18 hours at max. [↑](#footnote-ref-4)
5. Adding more battery capacity for safety. [↑](#footnote-ref-5)
6. Adding more battery capacity for safety. [↑](#footnote-ref-6)
7. <1mV for a 100mV noise @ vref=1V and 10 bits ADC. [↑](#footnote-ref-7)