Sensor Network for Smart Agriculture

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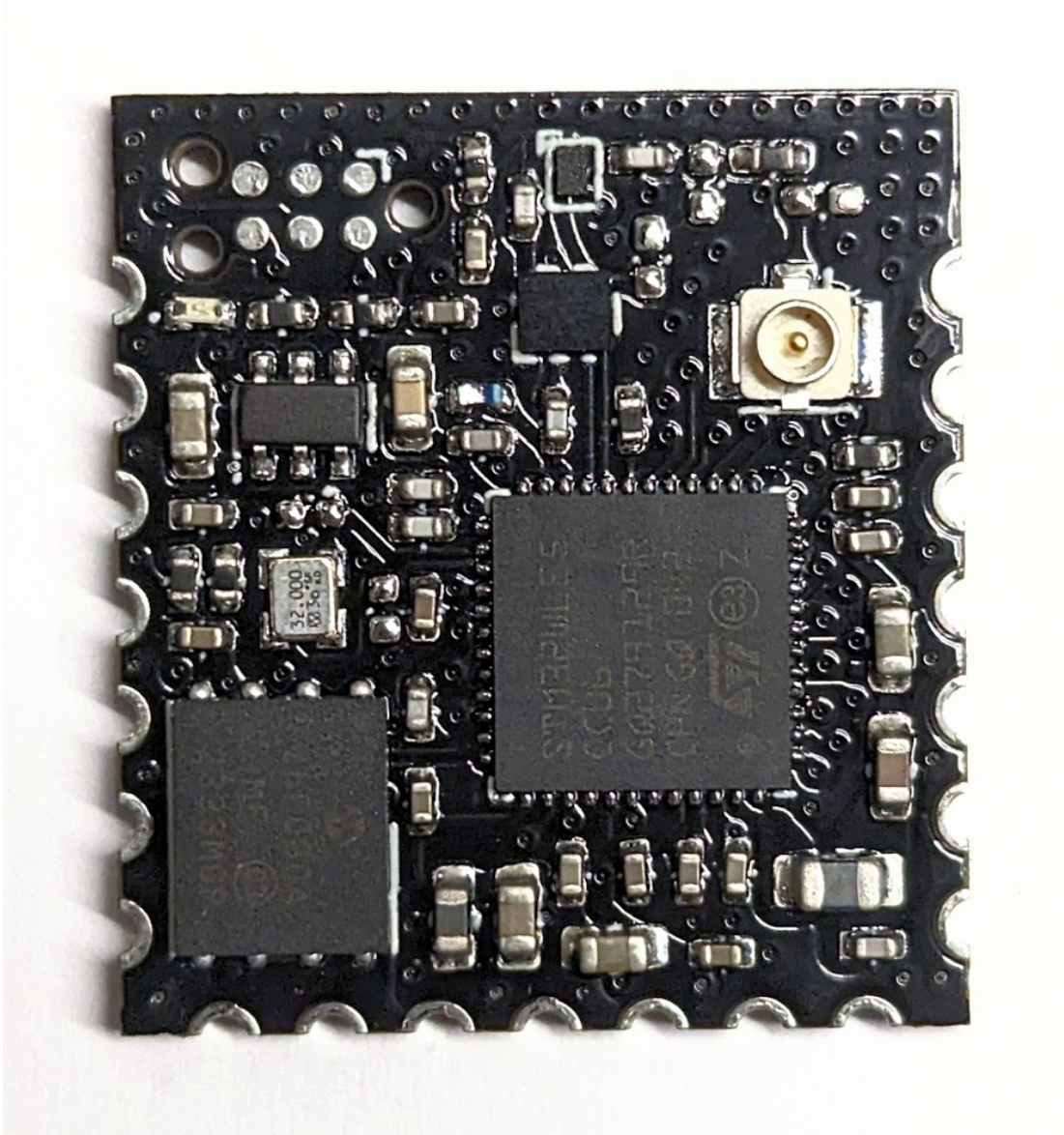
Live Demo

(or visit the link)

Motivation



Goals

Generic LoRa Module

- Design the PCBA
- Implement OTA update
- Validate wireless performance

Soil Moisture Sensor

- Find suitable form–factor
- Design measurement circuit
- Design power management

Implement and Test the MVP

LoRa Module

- 2.8–3.3 V nominal voltage range,
- low power design - support for switchable power rails,
- target the EU868,
- wide temperature range
- minimize the amount of specialized hardware,
- support for OTA updates,
- integrated RF,
- host communication interface,
- minimal footprint,
- low cost.

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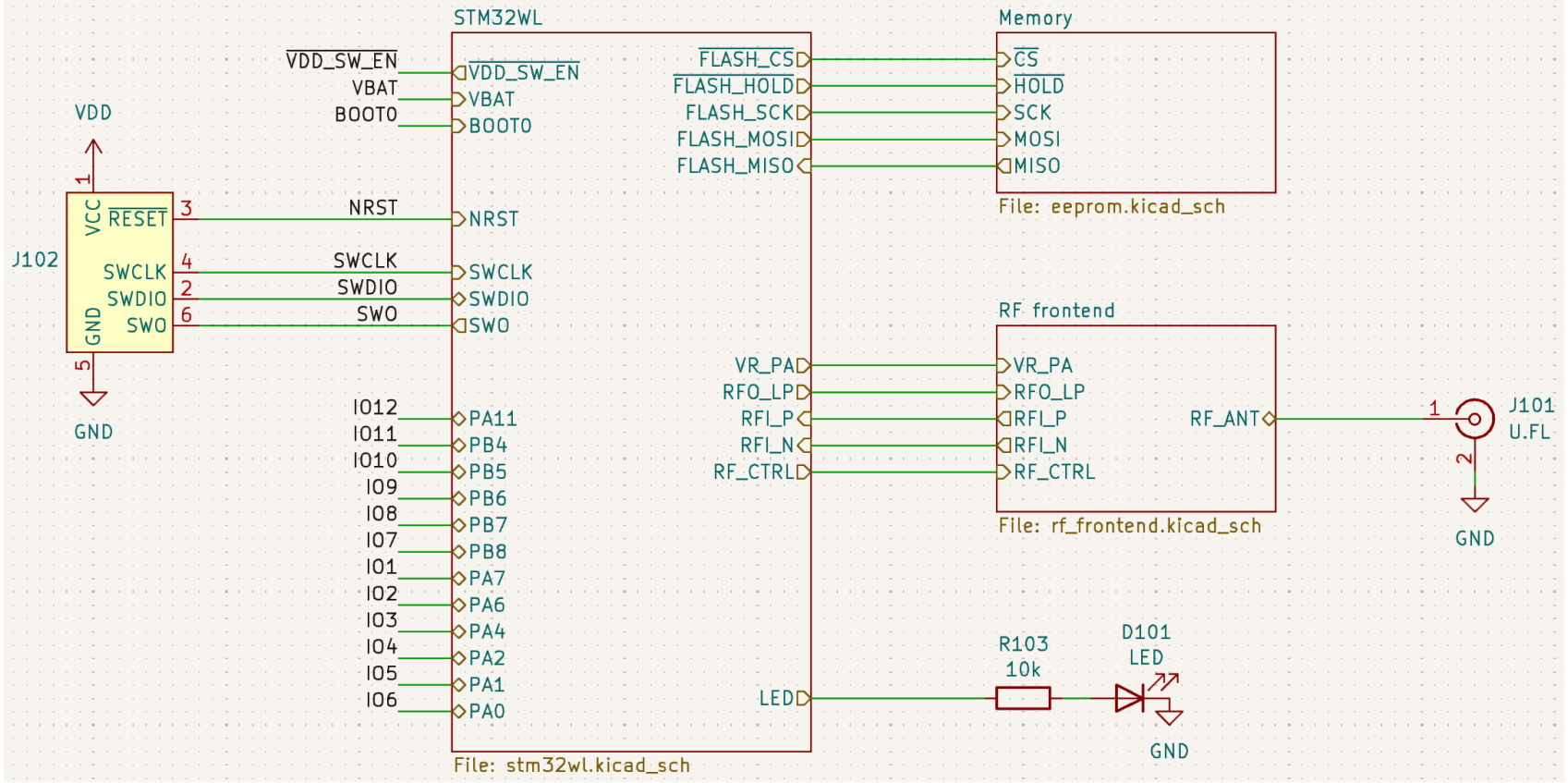
LoRa Module


STM32WL
Memory
VDD_SW_EN
VBAT
BOOT0
VDD
J102
VCC
RESET
SWCLK
SWDIO
GND
SWO
NRST
SWCLK
SWDIO
SWO
GND
IO12
IO11
IO10
IO9
IO8
IO7
IO1
IO2
IO3
IO4
IO5
IO6
PA11
PB4
PB5
PB6
PB7
PB8
PA7
PA6
PA4
PA2
PA1
PA0
FLASH_CS
FLASH_HOLD
FLASH_SCK
FLASH_MOSI
FLASH_MISO
CS
HOLD
SCK
MOSI
MISO
File: eeprom.kicad_sch
RF frontend
VR_PA
RFO_LP
RFI_P
RFI_N
RF_CTRL
RF_ANT
J101
U.FL
GND
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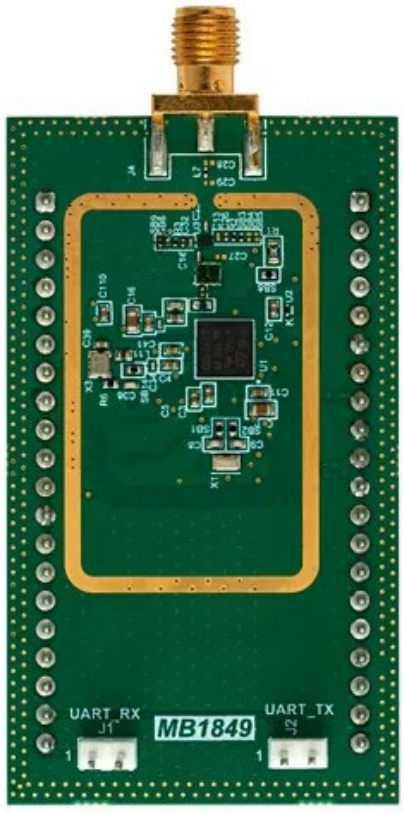
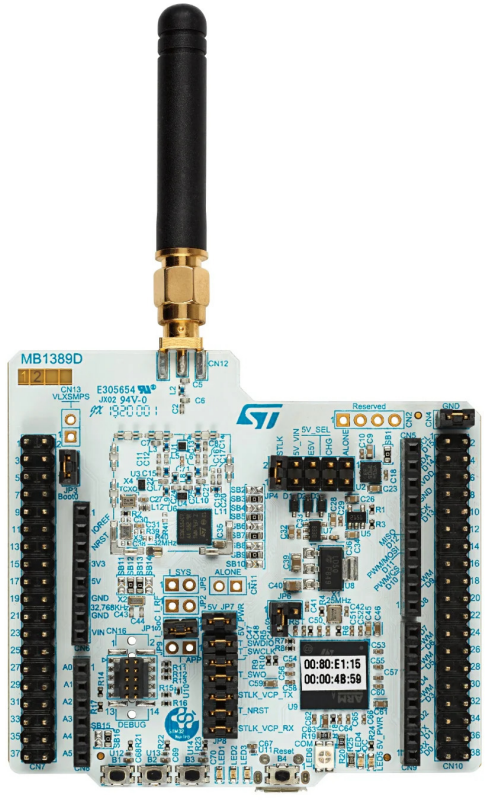
LED
R103
10k
D101
LED
GND
File: stm32wl.kicad_sch

LoRa Module

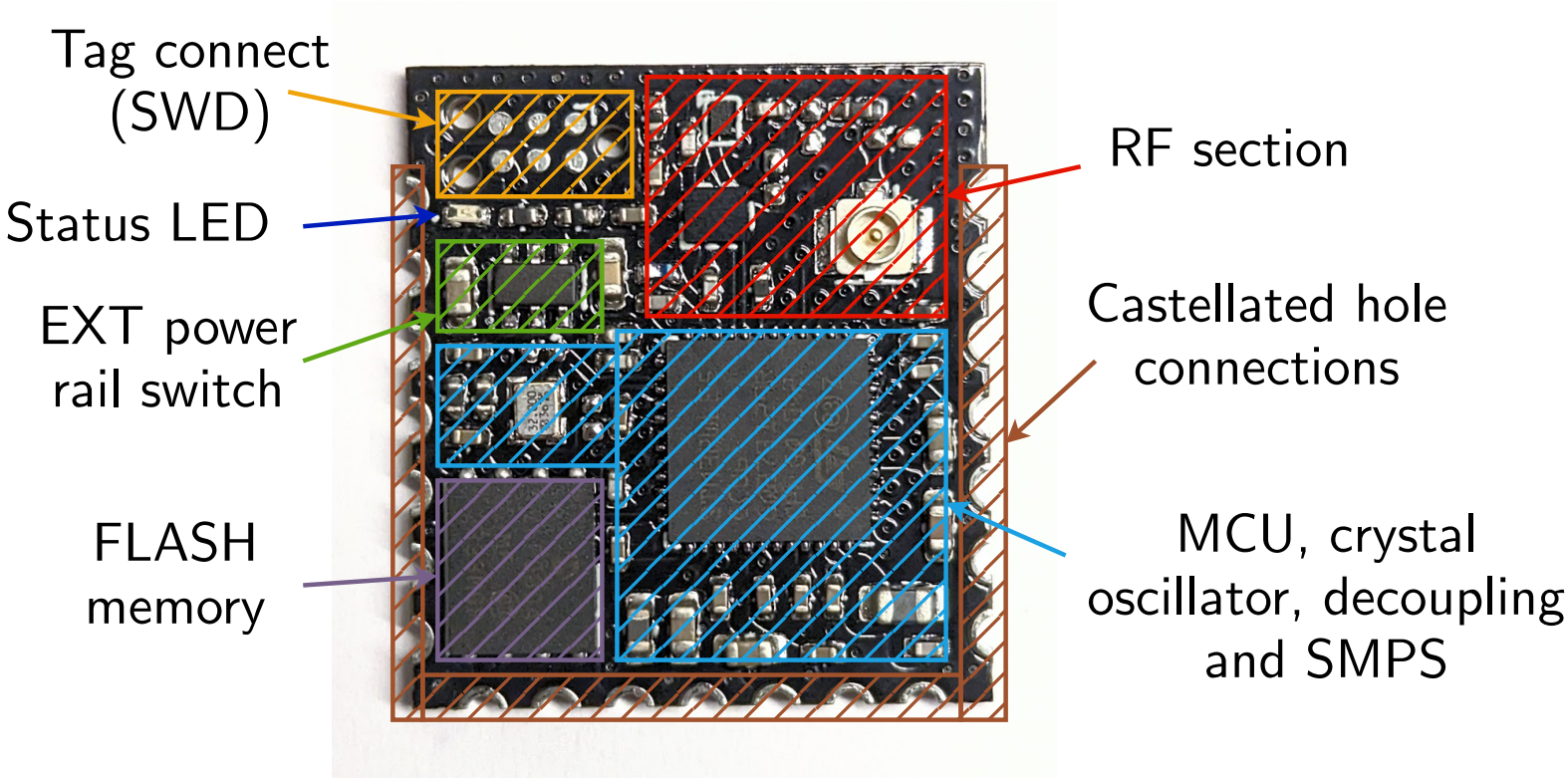


STDES-WL5U4ILH



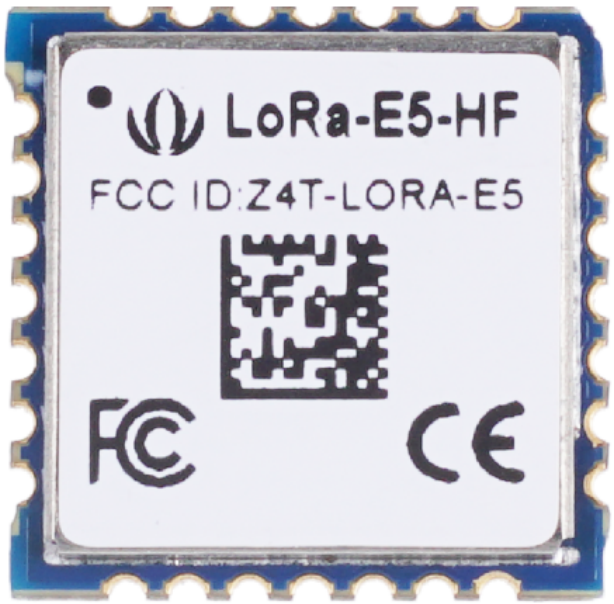
Nucleo-WL55JC

LoRa Module



- STM32WLE5CC
- 868 MHz, 13 dBm
- 20.32 × 22.48 mm
- 1 MB FLASH
- 2.3–3.5 V
- 16 IO pins

Existing solution?



Seeed Studio Wio-E5

$>$

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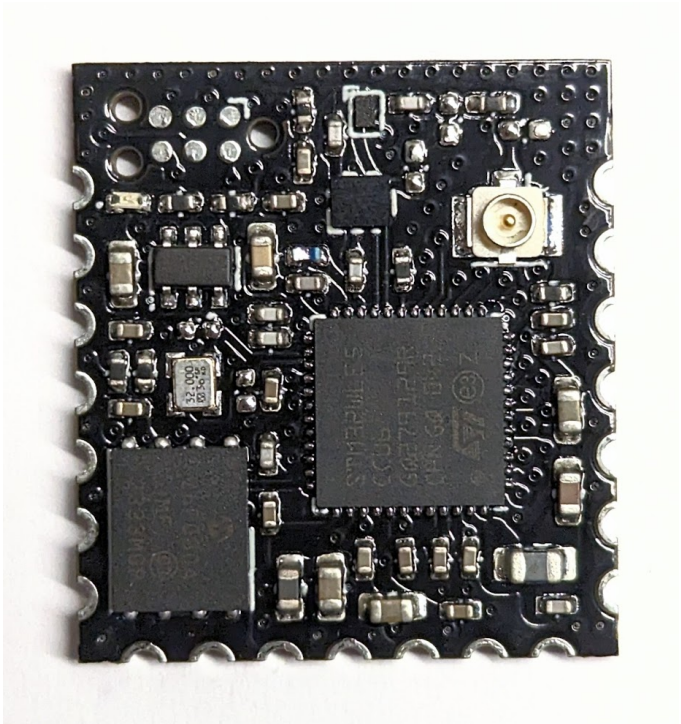
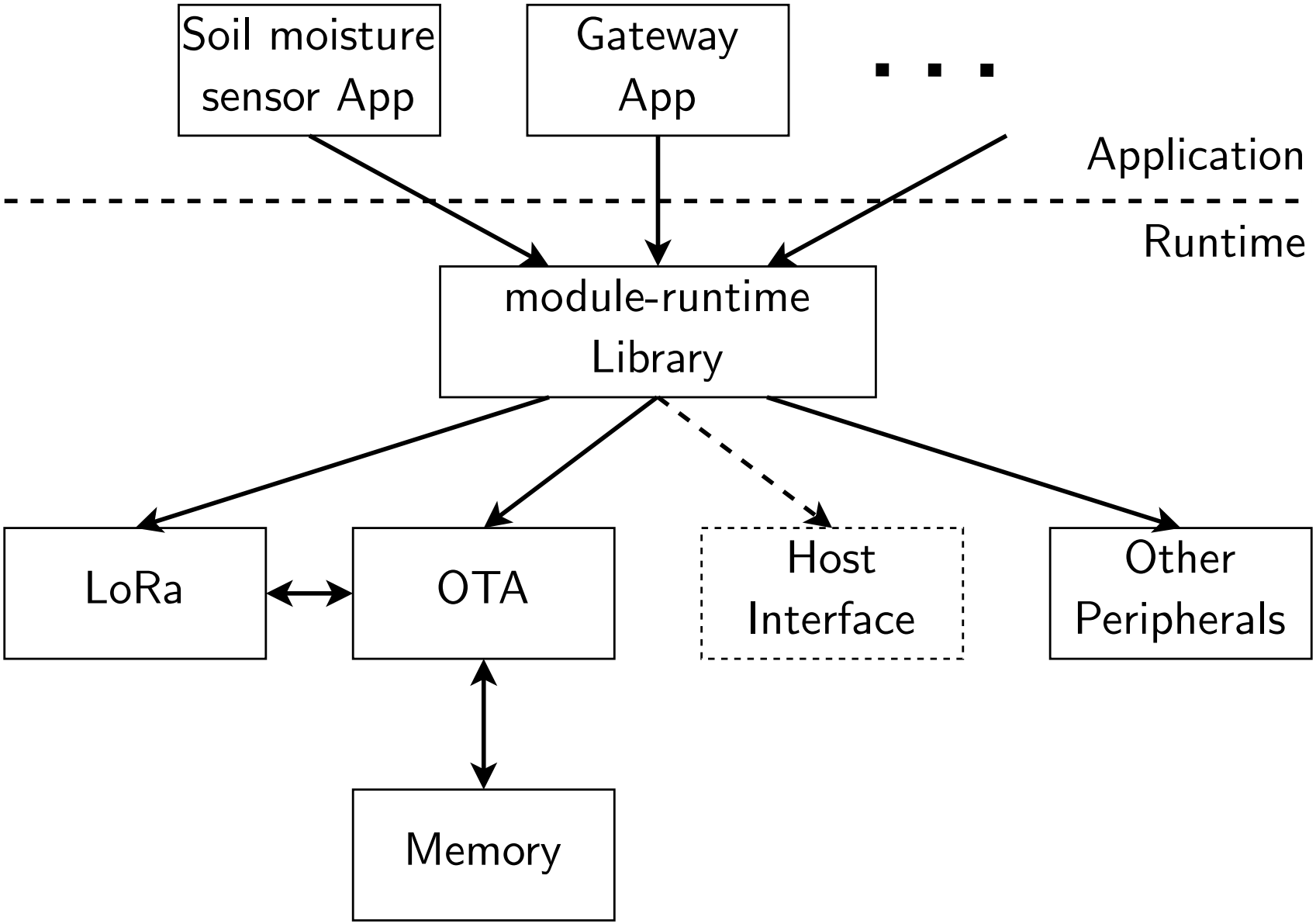
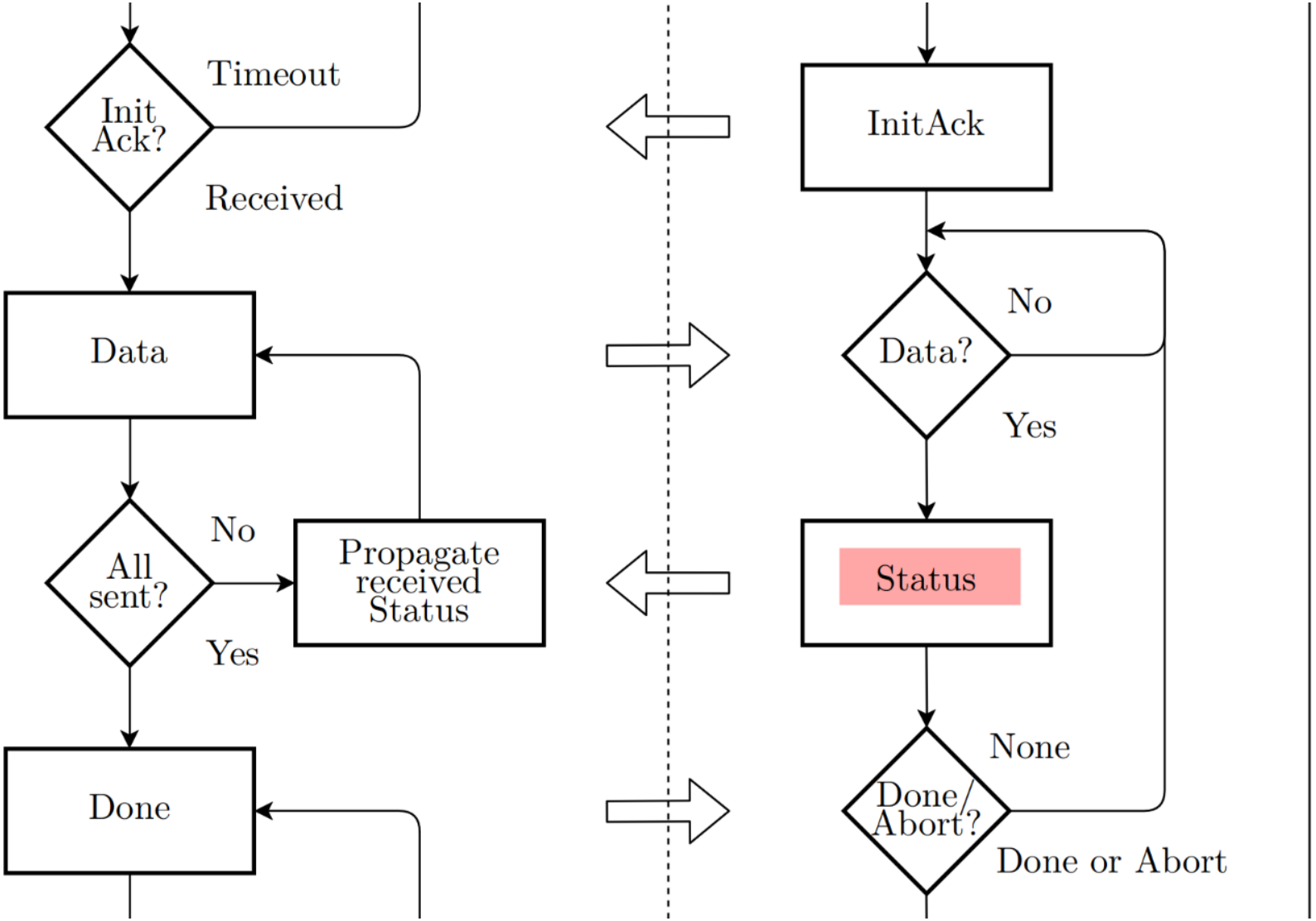


My LoRa Module

Firmware


Soil moisture sensor App
Gateway App
Application
Runtime
module-runtime Library
LoRa
OTA
Host Interface
Other Peripherals
Memory

Over The Air Update



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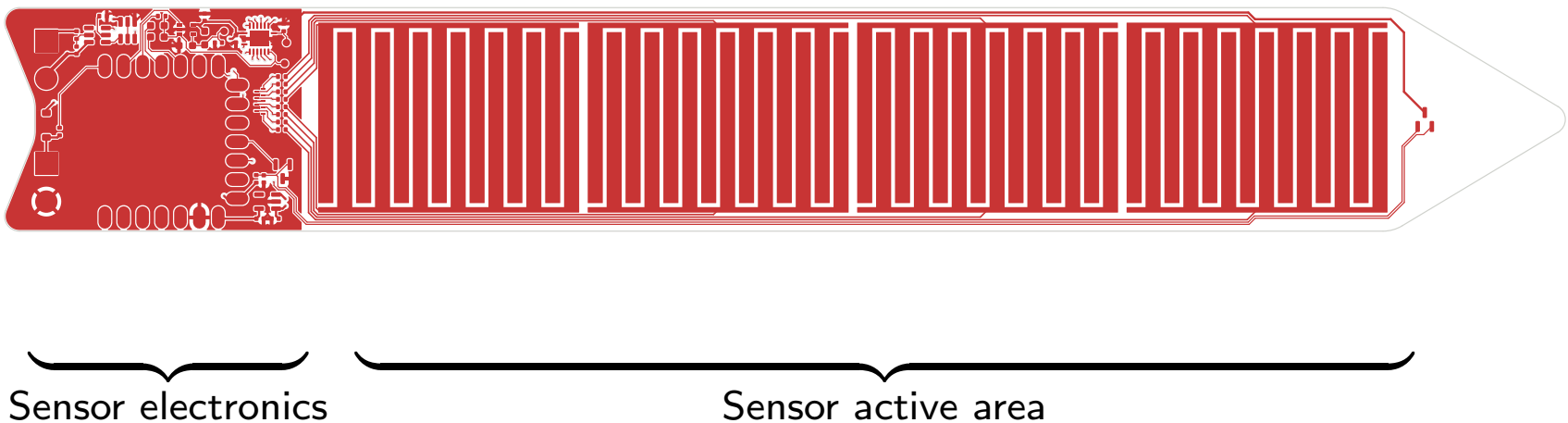
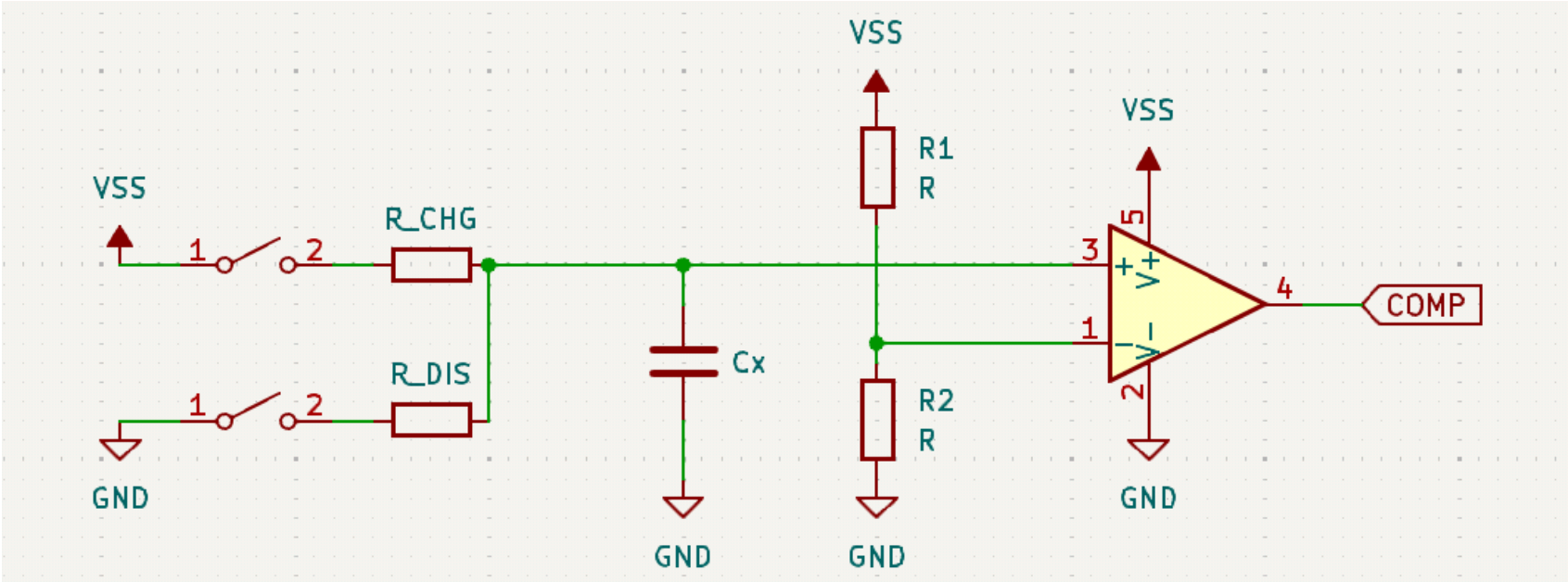
Soil Moisture Sensor

- PCB construction
- 4 capacitive zones (15 cm total depth)
- Solar powered



Soil Moisture Sensor



Soil Moisture Sensor