Onethinx Sprouty

Multi-Sensor Agriculture IoT kit
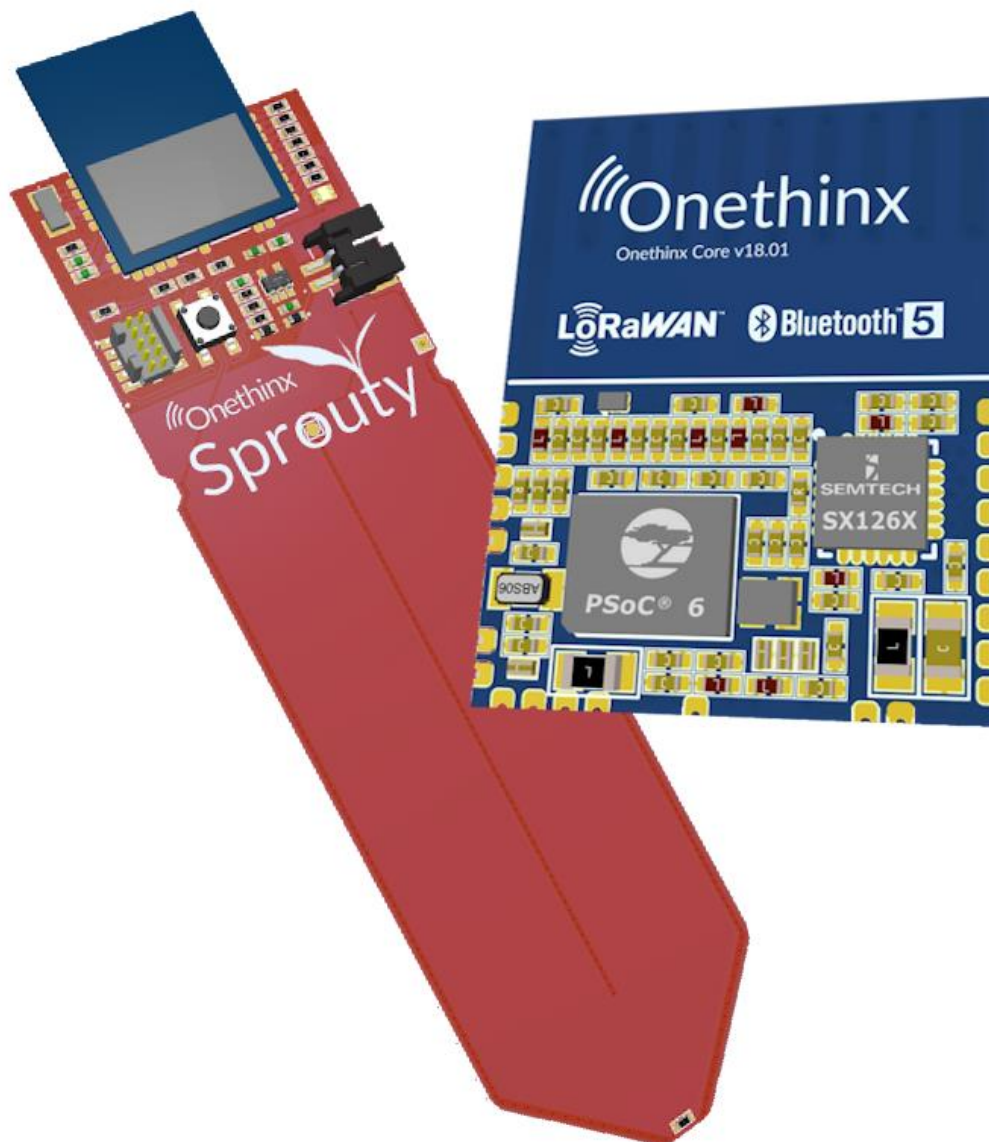
1 Contents

2 General description

The Internet of Things (IoT) is transforming agriculture by creating a network of interconnected devices that collect and share data to optimize farming operations. These IoT devices include sensors and smart equipment that monitor crop health, soil moisture, weather conditions, and livestock. By providing real-time data, these devices enable farmers to make informed decisions, improve efficiency, reduce waste, and increase crop yields. For example, soil moisture sensors can alert farmers when irrigation is needed, reducing water usage and preventing overwatering. Additionally, weather monitoring systems can provide timely forecasts and alerts to help farmers protect their crops from adverse conditions. This technological integration not only enhances productivity but also promotes sustainable farming practices, addressing global food security challenges.

LoRaWAN (Long Range Wide Area Network) plays a crucial role in advancing IoT applications in agriculture by offering a cost-effective and efficient communication protocol for connecting remote sensors and devices. Designed for low power consumption and long-range connectivity, LoRaWAN is ideal for agricultural settings where sensors may be distributed across vast and remote areas. This technology allows data from IoT devices to be transmitted over several kilometers without requiring significant infrastructure investments, such as cellular towers or extensive wiring. The scalability and reliability of LoRaWAN make it a powerful tool for enhancing precision agriculture and enabling farmers to harness the full potential of IoT technologies.

With this in mind, Onethinx has developed an innovative Agriculture IoT LoRaWAN Kit, named "Sprouty," designed to simplify and accelerate the adoption of LoRaWAN technology in the agricultural sector. Central to this kit is the Onethinx LoRaWAN module, which features a LoRa Alliance-certified stack integrated with an omnidirectional LoRaWAN antenna optimized for both US and EU frequencies. The module is powered by an Infineon dual-core PSoC 6 microcontroller, where the M4 core is available for user applications, while the M0+ core securely hosts the locked LoRaWAN stack, ensuring reliable and secure communication. Additionally, the module incorporates Semtech SX126x chip for efficient LoRa modulation, enabling robust long-range connectivity with low power consumption. The "Sprouty" kit measures key environmental parameters such as soil temperature, soil moisture, air temperature, and light intensity, providing vital data for optimizing agricultural practices. This comprehensive kit provides users with a seamless entry point into IoT-enabled agriculture, offering a versatile and scalable solution that supports a wide range of applications.

3 Feature overview

Sprouty is an advanced IoT solution developed by Onethinx to facilitate the integration of LoRaWAN technology in agriculture. Designed as a comprehensive kit, Sprouty enables farmers to monitor critical environmental parameters such as soil moisture, soil temperature, air temperature, and light intensity:

- **Soil Moisture measurement**

  Sprouty measures soil moisture by utilizing PCB traces to create a capacitor, which is connected to an oscillator built with an integrated operational amplifier (op-amp). This setup generates a frequency that varies with soil moisture levels. The signal is then fed into an integrated comparator to convert it from analog to digital form. This digital signal is counted using the onboard counter of the PSoC 6 chip within the Onethinx module, providing soil moisture readings.

- **Soil Temperature measurement**

  For soil temperature measurement, Sprouty employs a resistor divider circuit that includes a 10k NTC (Negative Temperature Coefficient) thermistor (NCP18XH103F03RB). As the soil temperature changes, the resistance of the NTC changes, altering the voltage across the divider. This voltage change is measured and processed by the PSoC 6 chip to determine the soil temperature accurately.

- **Air Temperature measurement**

  Air temperature is measured using a similar method to soil temperature. Sprouty uses a resistor divider circuit with a 10k NTC thermistor (NCP18XH103F03RB). Changes in air temperature cause variations in the thermistor's resistance, which in turn affects the voltage across the divider. This voltage is measured by the PSoC 6 chip to calculate the air temperature.
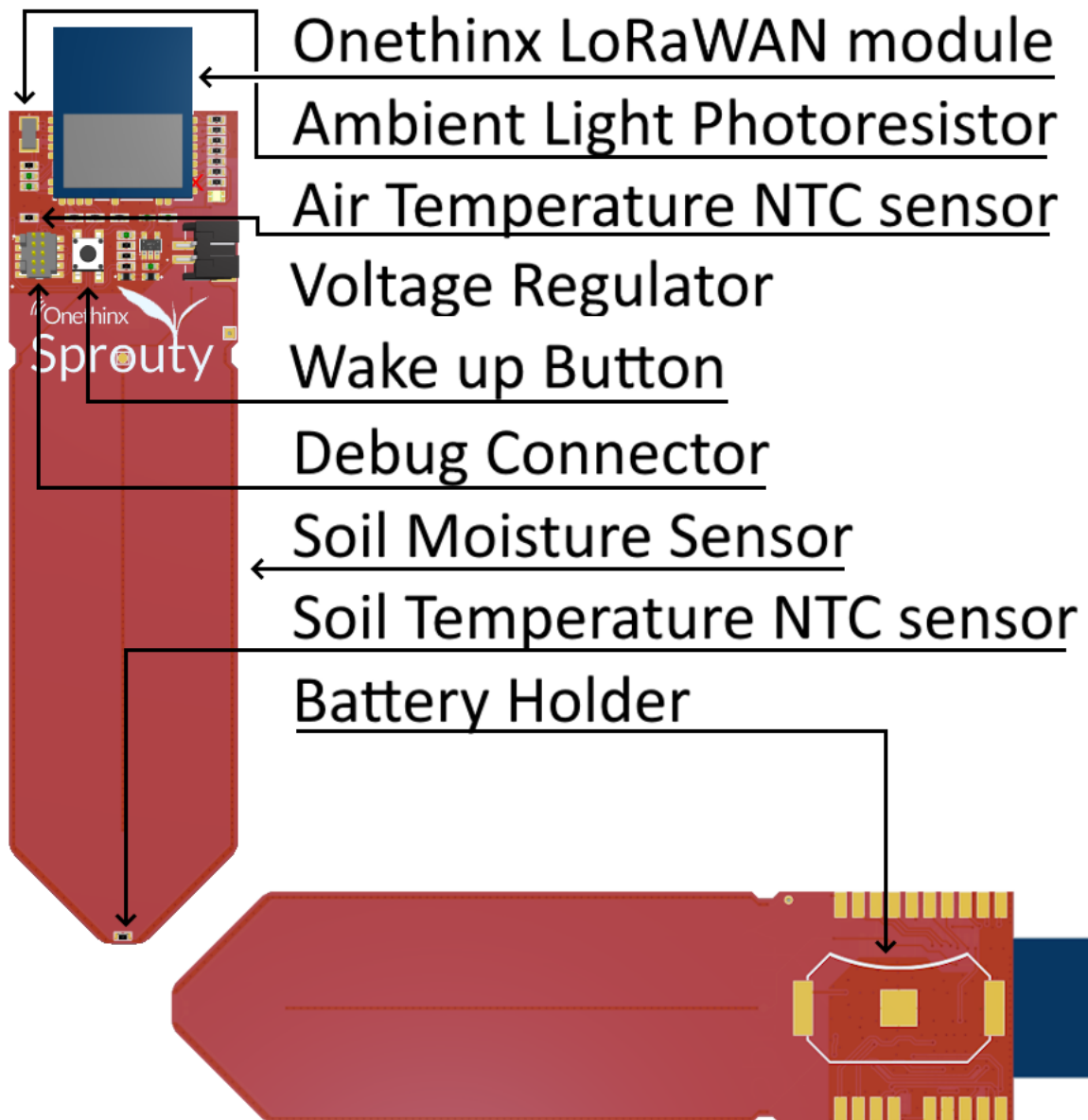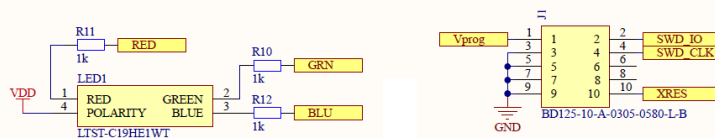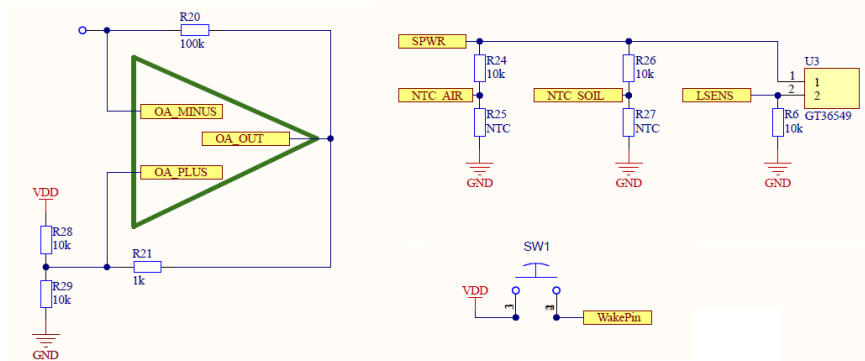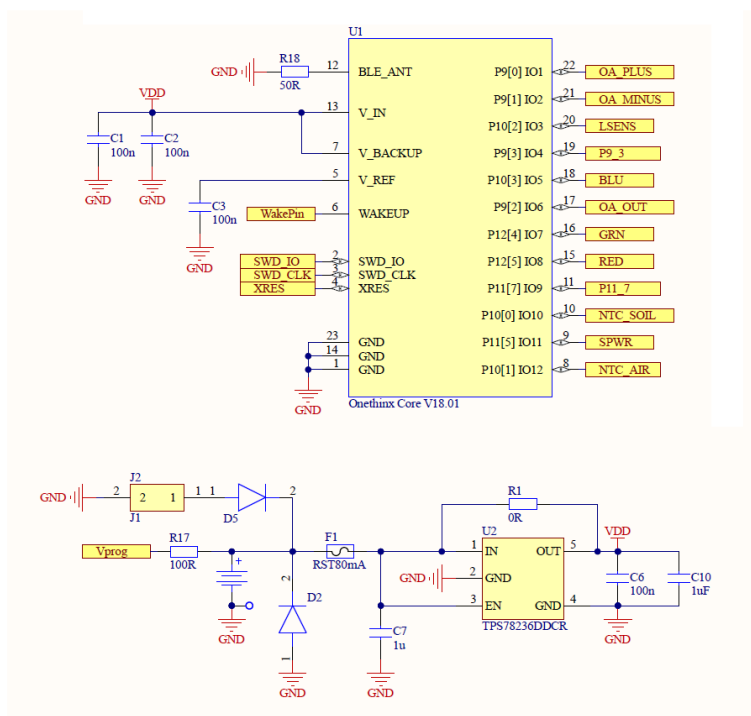
- **Light intensity measurement**

  Sprouty measures light intensity using a resistor divider circuit that includes a photoresistor. The photoresistor's resistance changes with the amount of light it is exposed to, affecting the voltage across the divider. This voltage change is monitored by the PSoC 6 chip, allowing Sprouty to accurately assess light intensity levels.

Moreover, Sprouty is designed for low-power operation, utilizing the Onethinx module's advanced low-power sleep modes to conserve energy. Users can further reduce power consumption by disabling sensors via a GPIO pin, allowing for extremely efficient performance. This makes Sprouty ideal for remote agricultural applications where energy efficiency is crucial.
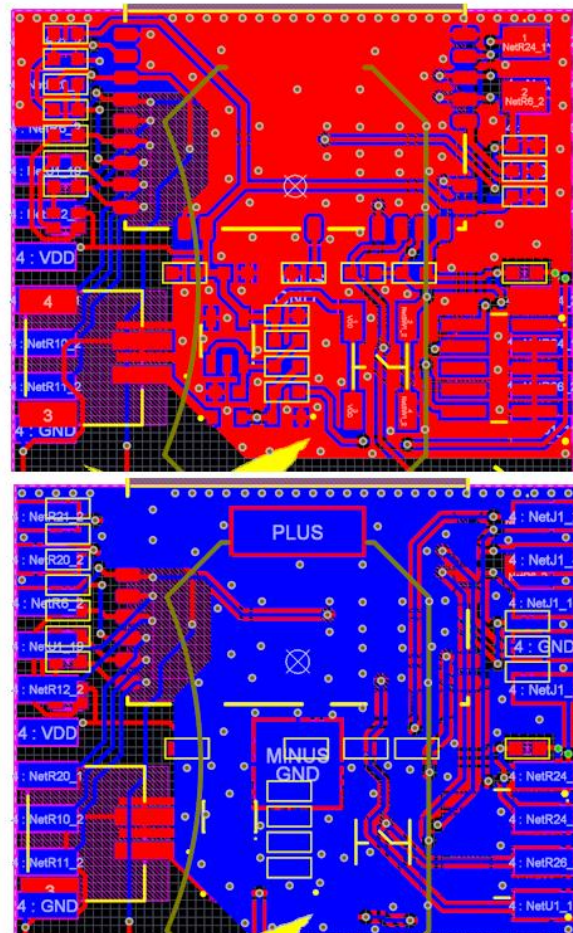
4 Design
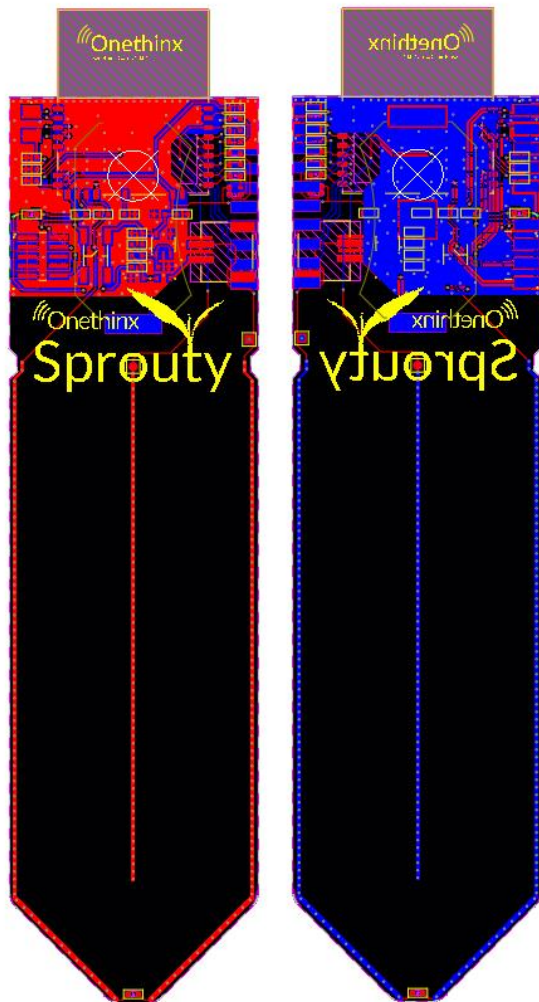

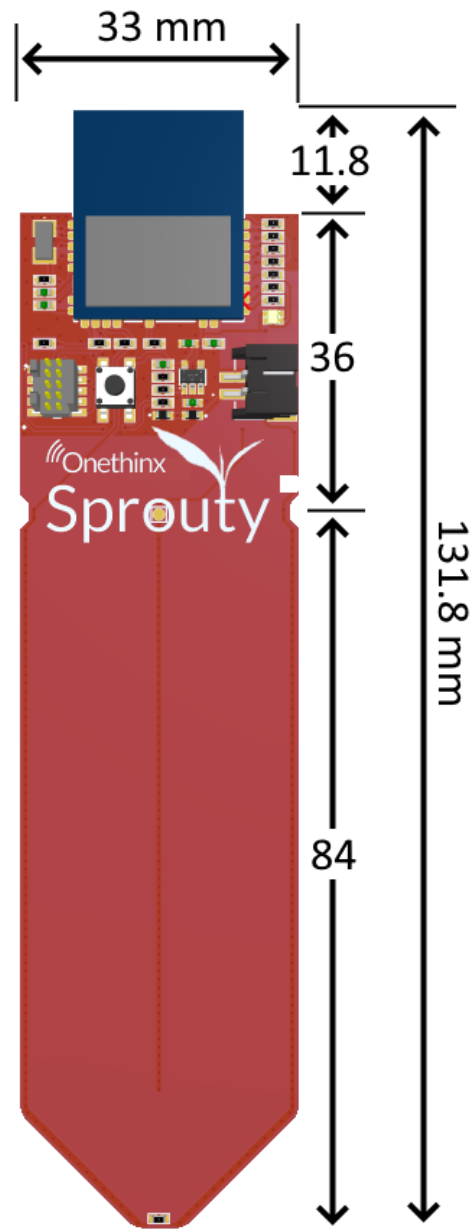Onethinx LoRaWAN module
Ambient Light Photoresistor
Air Temperature NTC sensor
Voltage Regulator
Wake up Button
Debug Connector
Soil Moisture Sensor
Soil Temperature NTC sensor
Battery Holder

5 Schematics

6 PCB Layout

7 Dimensions

8 Important Links

Onethinx Website: https://onethinx.com/

Onethinx Github: https://github.com/onethinx

Sprouty Github: https://github.com/onethinx/Sprouty_Workshop

Sprouty Workshop Video:
https://www.youtube.com/live/nHW3JxO2J5Y?si=abicz4Fy1AoeYcIA&t=8403

Onethinx Facebook: https://www.facebook.com/Onethinx

Contact: info@onethinx.com

9 Revision history

Revision	Author	Date	Changes
A	TB	13-08-2024	Document creation

Table 1: Revision history

Important Notice

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Onethinx assumes no liability for any errors in this document, or for the application or design described herein. Onethinx reserves the right to make changes to the product or this document at any time without notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Onethinx warrants performance of its products to the specifications applicable at the time of sale, and all sales are made in accordance with the Onethinx' standard terms and conditions of sale.

ONETHINX PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR IN NUCLEAR APPLICATIONS IN WHICH THE FAILURE COULD BE REASONABLY EXPECTED TO RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION OF ONETHINX PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Onethinx products for any such unauthorized application, the customer shall indemnify and hold Onethinx and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

The Onethinx name and logo are registered trademarks. All other trademarks and trade names mentioned may be marks and names of the respective companies. Onethinx reserves the right to make changes to, or discontinue any products described in this document without further notice. Onethinx makes no warranty, representation or guarantee, express or implied, regarding the suitability of its products for any particular purpose. All rights reserved.

More info:
onethinx.com

Onethinx.com Gouverneurlaan 3, 6002 EC Weert, The Netherlands
T +31 (0)88 100 4600   **E** info@onethinx.com