

# NoGrid Handheld Communication System

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## Abstract

The NoGrid Handheld Communication System is a portable peer-to-peer text message-based communication device designed for off-grid use. A long-range radio transceiver module enables NoGrid users to connect and message each other over a large geographic area without the use of cellular infrastructure. A comprehensive user interface makes it easy to use in outdoor environments where access to reliable communication is hard to come by.

## Future Direction

The NoGrid system successfully demonstrates a robust integration of custom hardware and firmware to deliver a decentralized peer-to-peer text messaging platform tailored for use in off-grid environments. Future improvements will focus on messaging platform reliability/range, ensuring security through message encryption, and the addition of further GUI functionality to improve ease of use and provide a polished experience.

## System Design and Tools

**Hardware:** STM32H7A3 microcontroller, E22-900M30S LoRa module (integrates SX1262 transceiver), ILI9341 320 x 240 TFT-LCD module, 38-key QWERTY keypad matrix (with diodes), Piezo-electric buzzer, MicroSD Card, Custom power supply module.

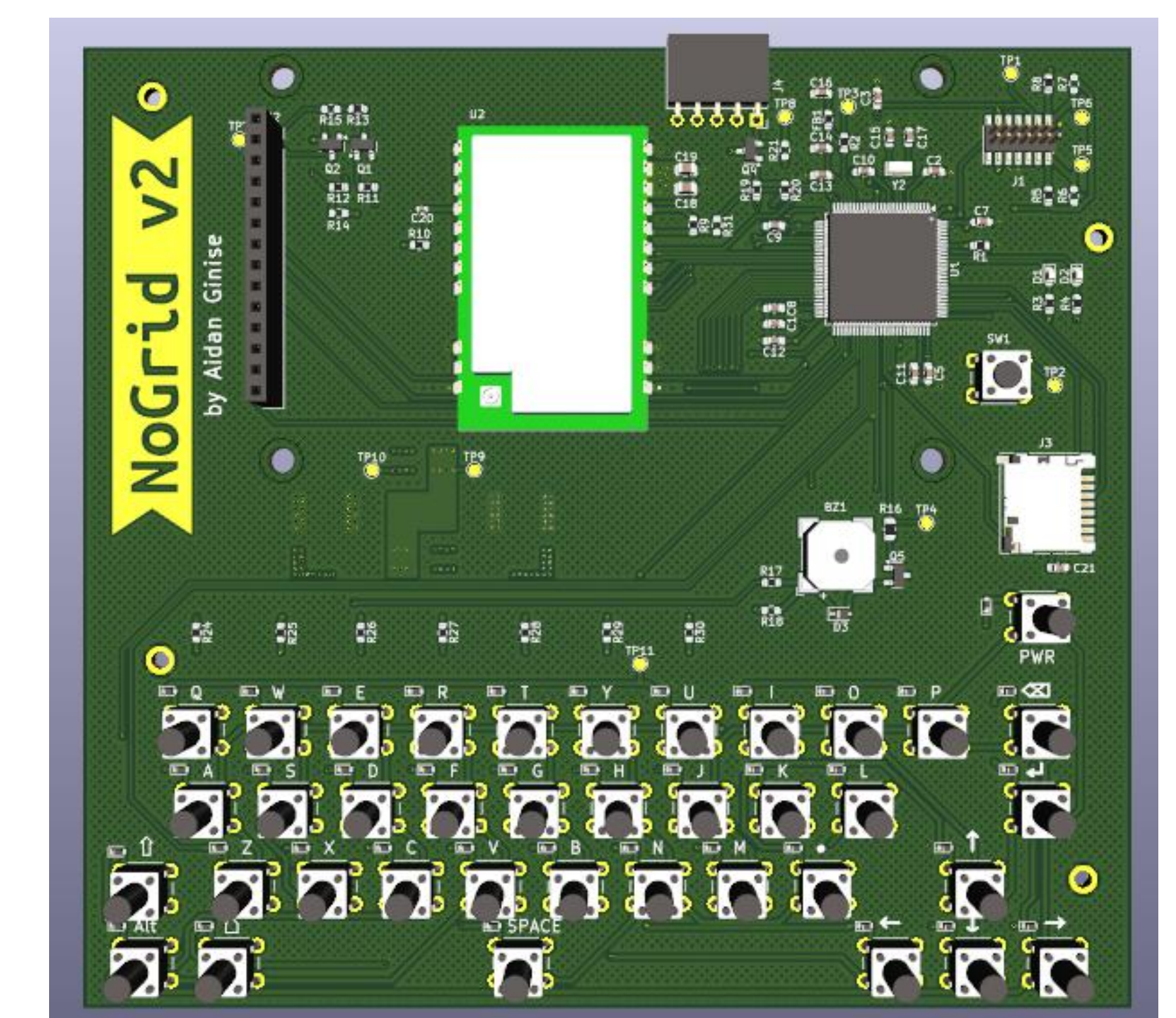
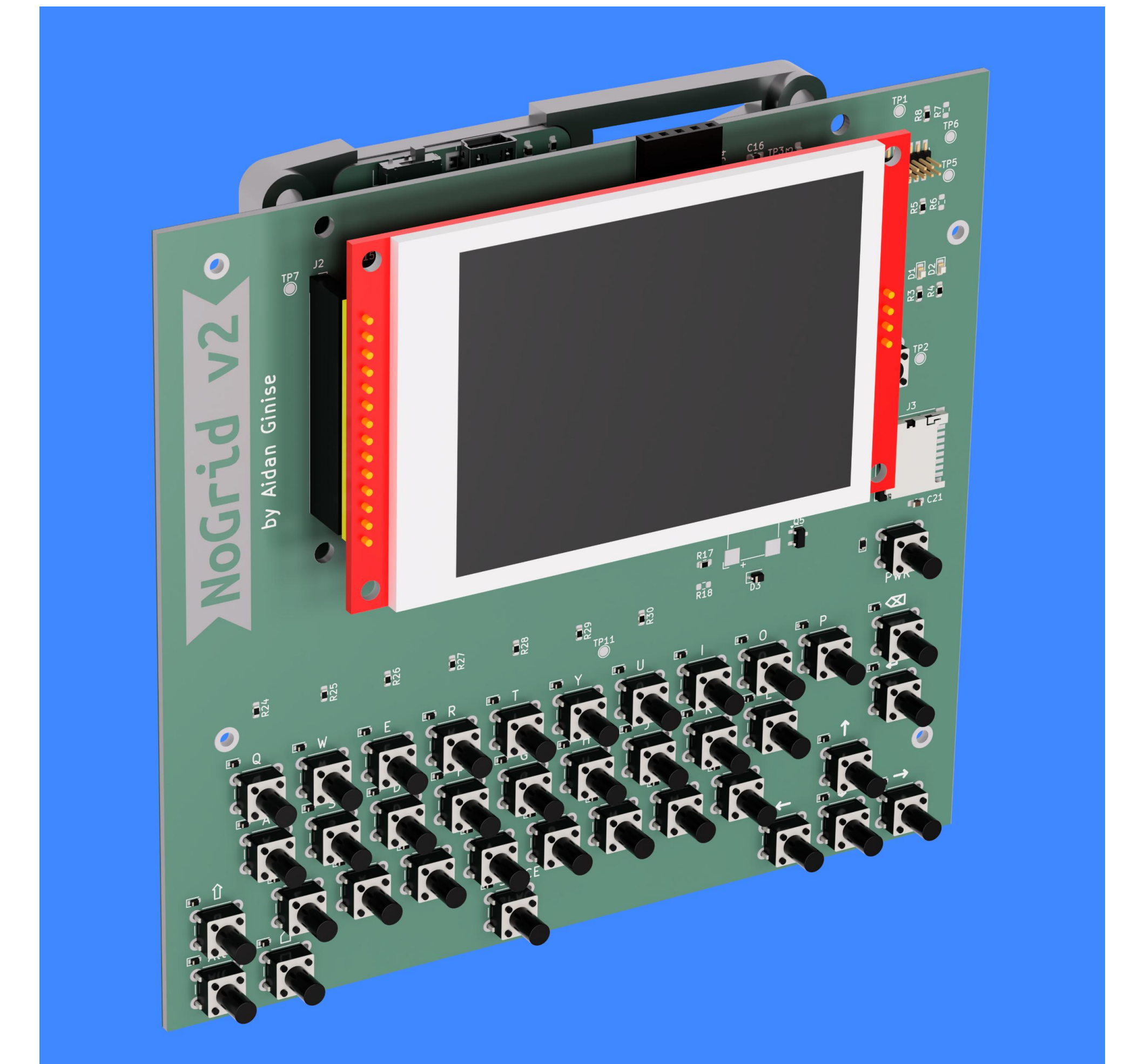
**Software:** STM32CubeIDE, FreeRTOS, KiCad, GitLab, Fusion360

**Tools:** STLINK-V3, 18650 battery, antenna, 3D printer, soldering iron, reflow oven, soldering stencil, multimeter, power supply, computer.

The STM32 integrates each of these peripherals and handles functionality such as sending messages and rendering the UI.

## Results

Message exchange between communicators has been tested up to around 1000 feet and demonstrates reliable low-latency communication at this distance. For these tests, messages were sent in broadcast mode. However, as only two units were used for these tests the messaging was entirely peer-to-peer and verified that communication between communicators was possible. For these short-range tests, message transmission latency fell below 200 ms, meeting system requirements. Range seems to be limited by the existing SX1262 hardware configuration and can be improved with future programming revisions.



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