STEVAL-STWINBX1

Data brief

STWIN.box - SensorTile Wireless Industrial Node Development Kit

Product summary	
STWIN.box - SensorTile Wireless Industrial Node Development Kit	STEVAL-STWINBX1
Software example for STEVAL-STWINBX1	FP-SNS-DATALOG2
Ultra-low-power with FPU Arm Cortex-M33 with Trust Zone	STM32U585AII6Q
High-accuracy, High-resolution, Low-power, 2-axis Digital Inclinometer with Embedded Machine Learning Core	IIS2ICLX
Ultra-wide bandwidth, low-noise, 3-axis digital vibration sensor	IIS3DWB
Applications	Factory Automation / Industrial Sensors

Features

- Multisensing wireless platform for vibration monitoring and ultrasound detection
- Built around STWIN.box core system board with processing, sensing, connectivity, and expansion capabilities
- Ultra-low power Arm® Cortex®-M33 with FPU and TrustZone at 160 MHz, 2048 kBytes Flash memory (STM32U585AI)
- MicroSD card slot for standalone data logging applications
- On-board Bluetooth® low energy v5.0 wireless technology (BlueNRG-M2), Wi-Fi (EMW3080) and NFC (ST25DV04K)
- Option to implement authentication and brand protection secure solution with STSAFE-A110
- Wide range of industrial IoT sensors:
  - Ultra-wide bandwidth (up to 6 kHz), low-noise, 3-axis digital vibration sensor (IIS3DWB)
  - 3D accelerometer + 3D gyro iNEMO inertial measurement unit (ISM330DHCX) with Machine Learning Core
  - High-performance ultra-low-power 3-axis accelerometer for industrial applications (IIS2DLPC)
  - Ultra-low power 3-axis magnetometer (IIS2MDC)
  - High-accuracy, high-resolution, low-power, 2-axis digital inclinometer with Embedded Machine Learning Core (IIS2ICLX)
  - Dual full-scale, 1.26 bar and 4 bar, absolute digital output barometer in full-mold package (ILPS22QS)
  - Low-voltage, ultra low-power, 0.5°C accuracy I²C/SMBus 3.0 temperature sensor (STTS22H)
  - Industrial grade digital MEMS microphone (IMP34DT05)
  - Analog MEMS microphone with frequency response up to 80 kHz (IMP23ABSU)
- Expandable via a 34-pin FPC connector

Description

The STWIN.box (STEVAL-STWINBX1) is a development kit and reference design that simplifies prototyping and testing of advanced industrial sensing applications in IoT contexts such as condition monitoring and predictive maintenance.

It is an evolution of the original STWIN kit (STEVAL-STWINKT1B) and features a higher mechanical accuracy in the measurement of vibrations, an improved robustness, an updated BoM to reflect the latest and best-in-class MCU and industrial sensors, and an easy-to-use interface for external add-ons.

The STWIN.box kit consists of an STWIN.box core system, a 480mAh LiPo battery, an adapter for the ST-LINK debugger, a plastic case, an adapter board for DIL 24 sensors and a flexible cable.

The many on-board industrial-grade sensors and the ultra-low power MCU enable applications that feature: ultra-low power, 9 DoF motion sensing, wide-bandwidth vibration analysis, audio and ultrasound acoustic inspection, very precise local temperature, and environmental monitoring.

A rich set of software packages is available in source code. Optimized firmware libraries and a complete companion cloud application help to speed up the design cycle to develop end-to-end solutions.

The kit supports a broad range of connectivity options, including the built-in RS485 transceiver, BLE, Wi-Fi, and NFC.

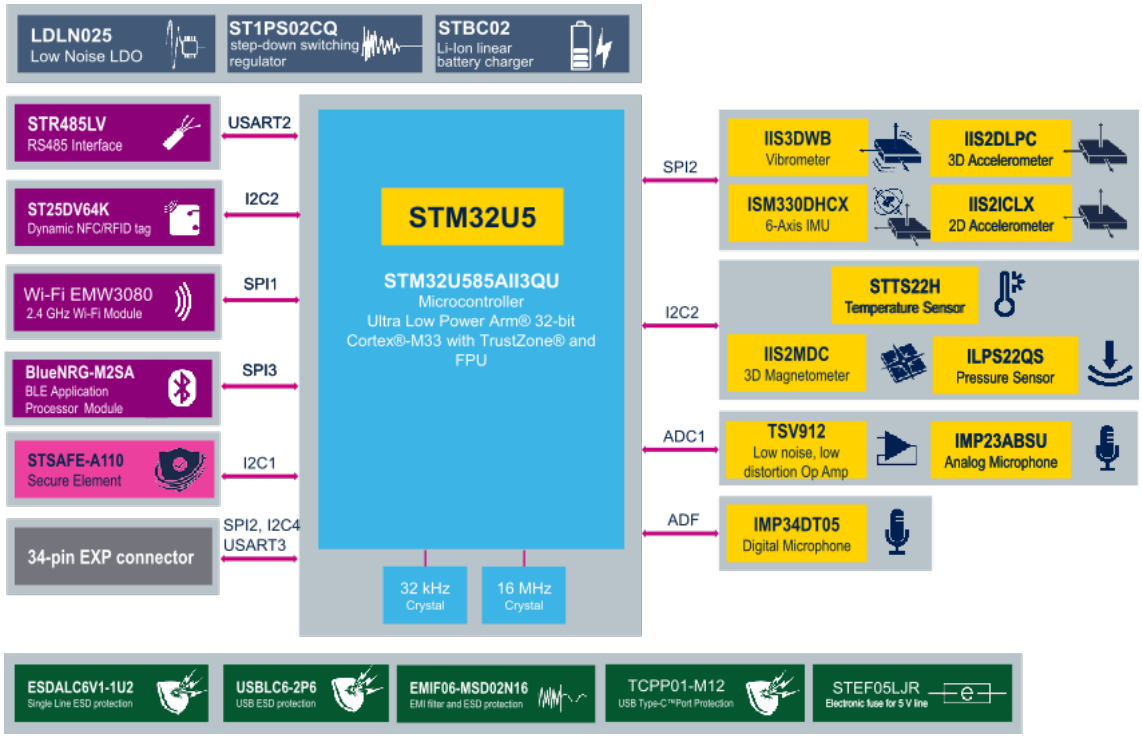
The STWIN.box also includes a 34-pin expansion connector for small form factor daughter boards associated with the STM32 family, such as the STEVAL-C34KAT1 vibrometer and temperature sensors expansion board.

The STWIN.box is suitable for field trials, demonstrations, and PoC for industrial IoT applications that use ST software and third-party software.

1 Solution overview

Predictive maintenance applications collect and process data from a wide variety of sensors in order to identify potential failures in machinery before they happen. A principal requirement of such applications is that the condition monitoring equipment is placed very close to relevant machine componentry for the data to be reliable, which is why the STWIN.box node is designed to be small but robust, self-powered and capable of wireless communication. Another application issue is the high volumes of preferably real-time data processing involved, which can overwhelm centralized monitoring and control systems, and corresponding communication networks. Distributed (or decentralized) computing architectures represent a valid solution to this problem by performing data preprocessing and analytical operations directly on the node. The STWIN kit supports and can demonstrate this concept through sample applications in the firmware package running on the STM32U5 ultra-low-power microcontroller embedded on the core system board. An additional possibility is provided by the embedded processing capabilities of the IIS2ICLX and the ISM330DHCX sensors, thanks to their programmable finite state machine and machine learning core.

Figure 1. STEVAL-STWINBX1 functional block diagram



2 Kit versions

Table 1. STEVAL-STWINBX1 versions

PCB version	Schematic diagrams	Bill of materials
STEVAL$STWINBX1A (1)	STEVAL$STWINBX1A schematic diagrams	STEVAL$ISTWINBX1A bill of materials

1. *This code identifies the STEVAL-STWINBX1 evaluation kit first version. The STEVAL-STWINBX1 kit contains the STEVAL$STWBXCS1A main board, the STEVAL$C34DIL24A expansion board, the STEVAL$FLTCB01A flexible cable, and the STEVAL$MKIGIBV4A adapter.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
15-Dec-2022	1	Initial release.
25-Jan-2023	2	Updated Product summary and Section 1 Solution overview.