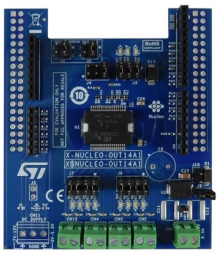

STMicroelectronics X-NUCLEO-OUT14A1 Industrial Digital Output Expansion Board User Guide

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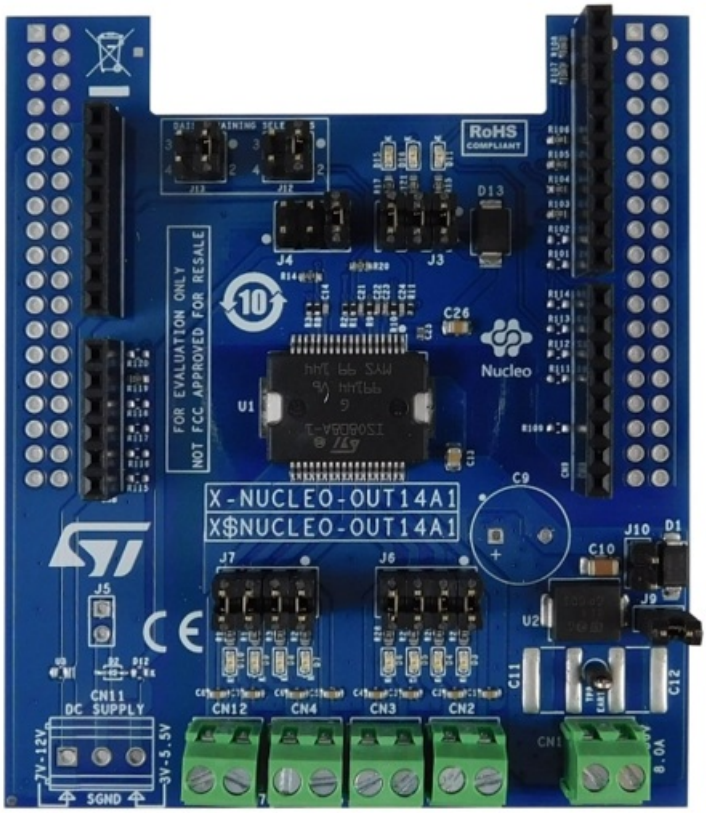
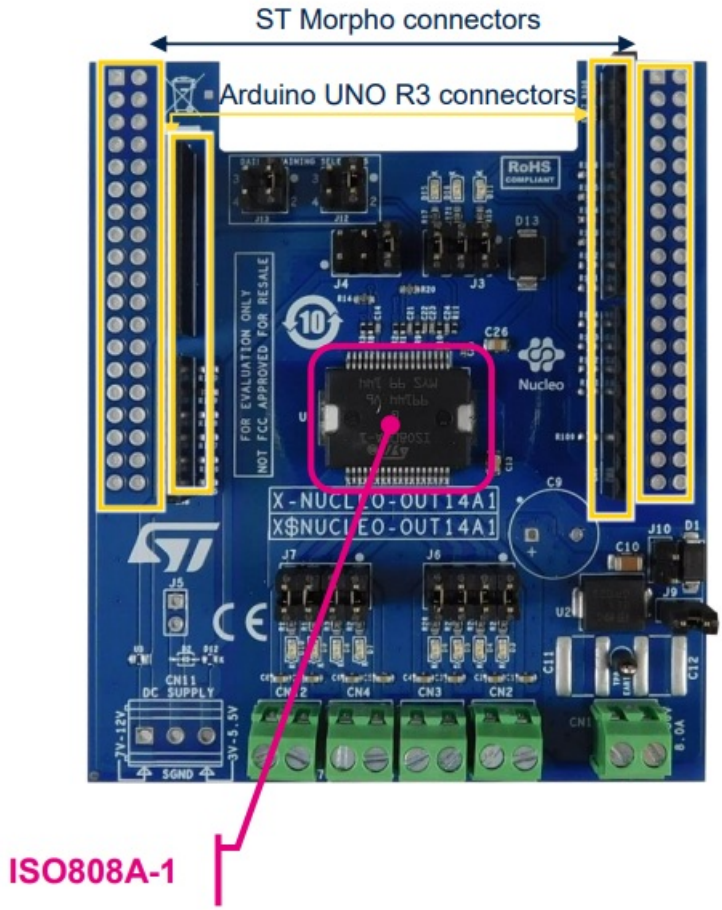
X-NUCLEO-OUT14A1
Industrial digital output expansion board based on ISO808A-1 for STM32 Nucleo

STM32 Open Development Environment
Quick Start Guide Contents



Contents

Hardware overview



Hardware Description

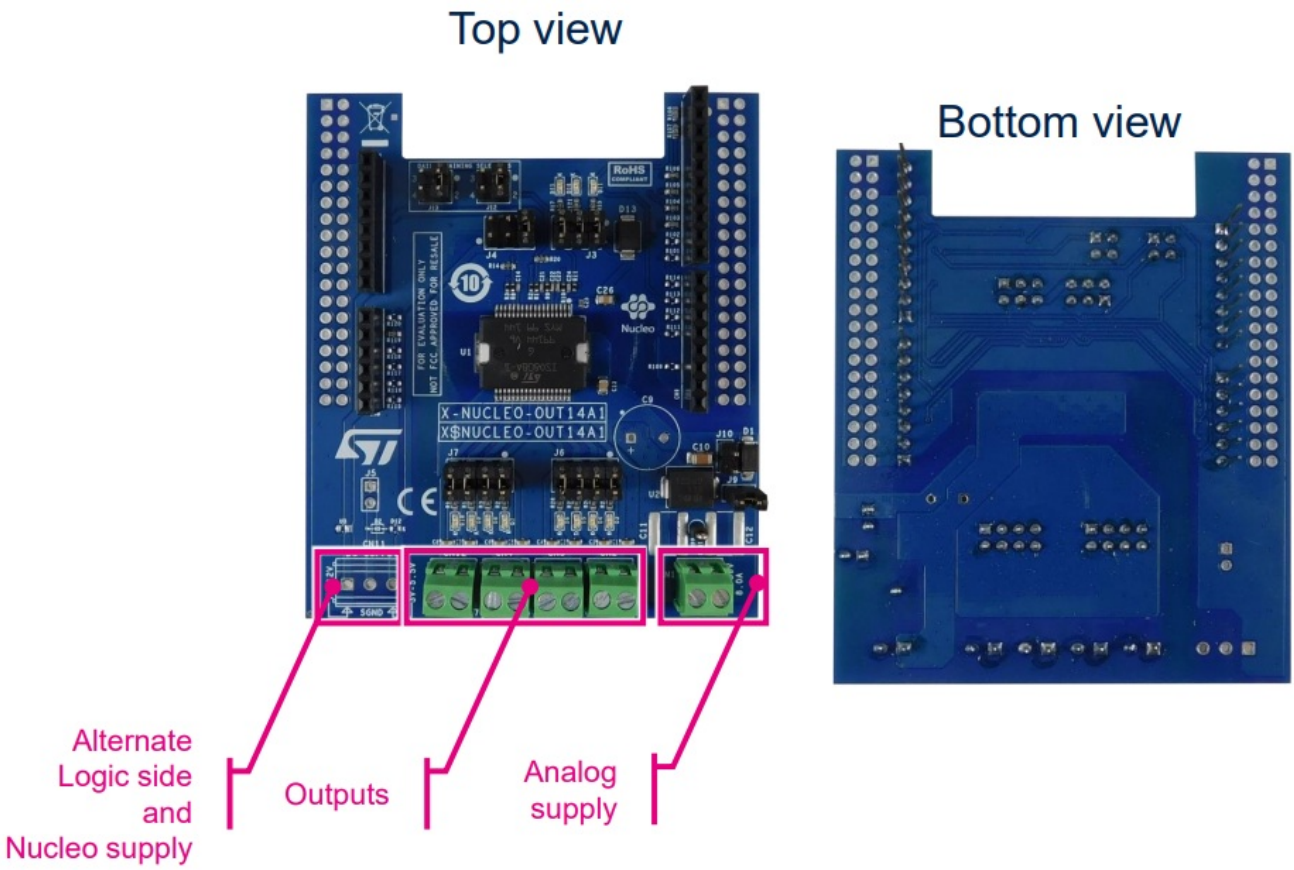
- The X-NUCLEO-OUT14A1 industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the ISO808A-1 (Octal High Side Switch, with embedded galvanic isolation, 20 MHz SPI, overtemperature and Power Good diagnostics, high inductive load driving capability) in a digital output module connected to 1.0 A (max. per channel) industrial loads.
- The X-NUCLEO-OUT14A1 directly interfaces the microcontroller on the STM32 Nucleo by Arduino UNO R3 (default configuration) and ST morpho (optional, not mounted) connectors. The galvanic isolation between the logic side and process side of the system is guaranteed by the 2k VRMS isolation embedded in the ISO808A-1. The expansion board can be connected to either a NUCLEO-F401RE or NUCLEO-G431RB development board.
- It is also possible to evaluate a system composed by two stacked X-NUCLEO-OUT14A1 enabling the supported daisy chaining, or systems combining X-NUCLEO-OUT14A1 with other expansion boards, provided the compatibility with signals mapped on Arduino connectors.

Main Features:

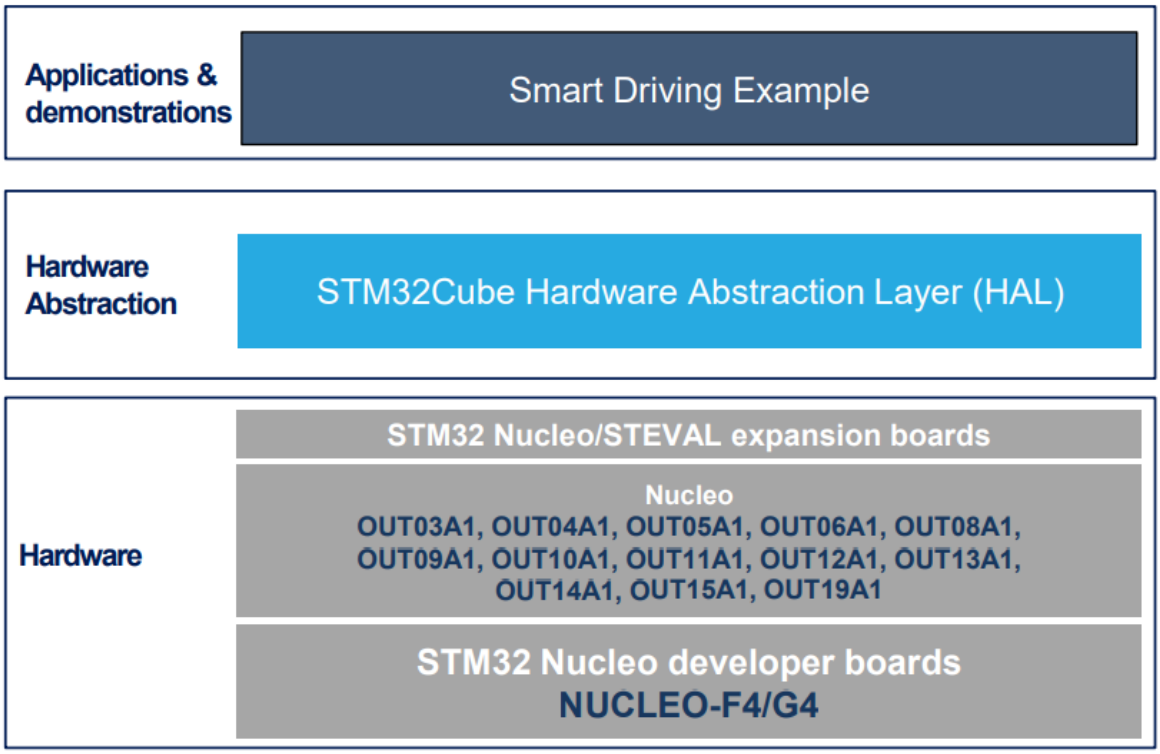
- A single expansion board allows you to evaluate an octal-channel digital output module with 1.0 A (max.) per-channel capability
- Operating range up to 36 V/8.0 A
- Low power dissipation (RON(MAX) = 260 mΩ)
- Fast decay for huge inductive loads

- 20MHz SPI Control mode
- Output enable signal
- Under-voltage lock-out
- Overload and over-temperature protections
- Power Good detection and alert diagnostic
- PowerSO36 package

Key Products on the Nucleo expansion board: ISO808A-1
Octal High Side Switch with embedded galvanic isolation, SPI and high inductive load driving capability Latest info available at **www.st.com**
X-NUCLEO-OUT14A1



SW architecture overview



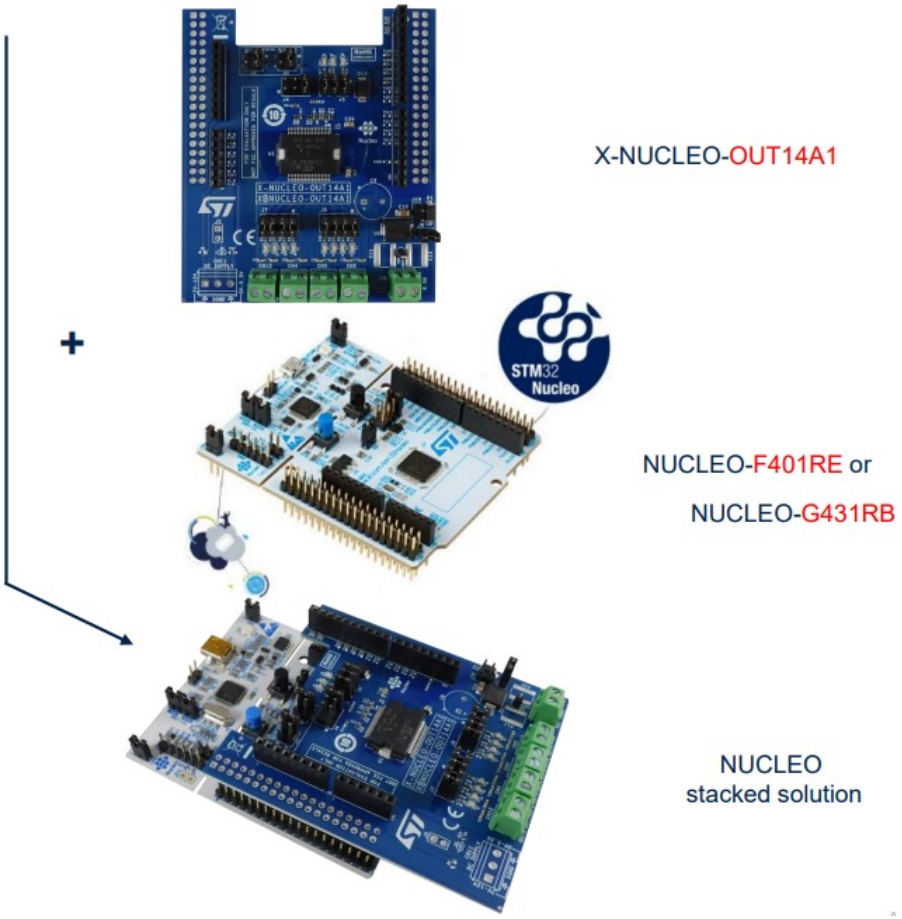
Software Description :
The X-CUBE-IPS expansion software package for STM32Cube runs on the STM32 microcontroller and includes a driver to control the expansion boards hosting Intelligent Power Switches ICs.
The software provides an affordable and easy-to-use solution for the development of single, dual, quad and octal digital output modules for 0.7A, 1.0A, 2.5 A and 5.7A applications, letting you easily evaluate the driving and diagnostic capabilities of the Intelligent Power Switches.
The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers. It is compatible with NUCLEO-F401RE or NUCLEOG431RB development boards.

Key Features:

- Sample application to evaluate basic digital output modules by stacking XNUCLEO-OUT12A1 or X-NUCLEO-OUT14A1. The software also uses a PWM timer to generate the periodic patterns on the output channel for the expansion boards.
- 20MHz SPI Control mode
- Daisy chaining support
- Sample application to interact with the STSW-IFAPGUI PC Software.

Latest info available at **www.st.com**
X-CUBE-IPS

Demo Example: Bill Of Material
HW pre-requisites

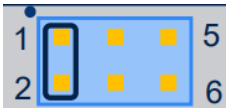
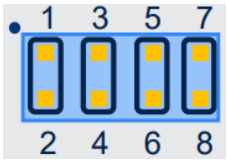
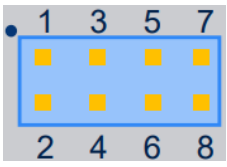


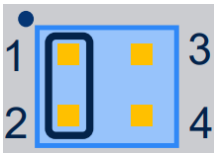
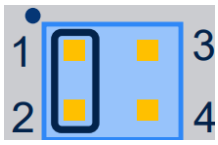
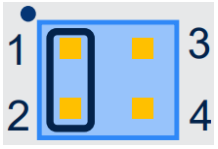
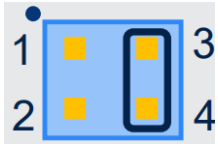
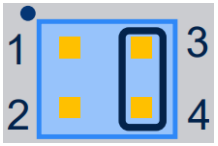
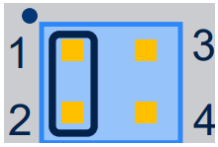
- 1x description expansion board (X-NUCLEO-OUT14A1)
- 1x STM32 Nucleo development board of NUCLEO-F401RE, NUCLEO-G431RB
- 1x USB type A to mini-B cable (for NUCLEO-F401RE) or 1x USB type A to micro-B cable (for NUCLEO-G431RB
- 1x Laptop/PC with Windows 7, 8 or above

A to mini-B
USB Cable

A to micro-B
USB Cable

Hardware setup
Jumpers' configuration

J4		Logic Side of ISO808A-1 supplied by the 3v3 rail
		Logic Side of ISO808A-1 supplied by the EXT_Vdd rail
J3		STATUS, PGOOD and OUT_EN signals not pulled up (D11, D15 and D16 not active)
		STATUS and OUT_EN signals pulled up (D11 and D15 active)
J9		Disables EMC protection on supply rail (analog supply ≤ 33V)
		Enables EMC protection on supply rail (analog supply ≤ 36V)
J10		Enables the reverse polarity protection on analog supply rail
		Disables the reverse polarity protection on analog supply rail
J6, J7		Enables the green LEDs D3 to D6, and D7 to D10
		Disables the green LEDs D3 to D6, and D7 to D10

J12	J13	
		Single board (daisy chaining OFF)
		Board 0 Configuration (daisy chaining ON)
		Board 1 Configuration (daisy chaining ON)

Demo Example: software tools
SW pre-requisites

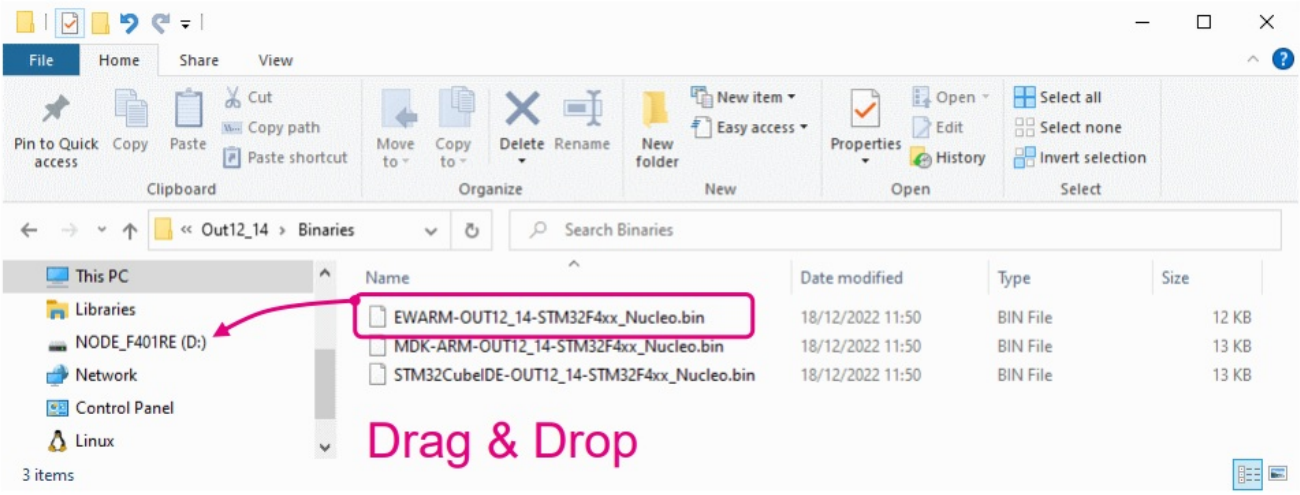
• STM32CubeProg: All-in-one multi-OS software tool for programming STM32 products or STSW-LINK009: ST-LINK/V2-1 (NUCLEO-F401RE), ST-LINK/V3 (NUCLEO-G431RB) USB driver
• X-CUBE-IPS: software package including the application examples for NUCLEO-F401RE, NUCLEO-G431RB to be associated with the X-NUCLEO-OUT03A1, X-NUCLEO-OUT04A1, X-NUCLEO-OUT05A1, X-NUCLEO-OUT06A1, XNUCLEO-OUT08A1, X-NUCLEO-OUT09A1, X-NUCLEO-OUT10A1, X-NUCLEO- UT11A1, X-NUCLEO-OUT12A1, X-NUCLEO-OUT13A1, X-NUCLEO-OUT14A1, X-NUCLEO-OUT15A1, X-NUCLEO-OUT19A1

Demo Examples for different operating modes

X-NUCLEO-OUT14A1 comes with 2 demo FW binary sets (per nucleo board)

- Application example binaries for the three reference IDEs in the package X-CUBE-IPS
- EWARM-OUT12_14-STM32F4xx_Nucleo.bin | EWARM-OUT12_14-STM32G4xx_Nucleo.bin
- MDK-ARM-OUT12_14-STM32F4xx_Nucleo.bin | MDK-ARM-OUT12_14-STM32G4xx_Nucleo.bin
- STM32CubeIDE-OUT12_14-STM32F4xx_Nucleo.bin | STM32CubeIDE-OUT12_14-STM32G4xx_Nucleo.bin
- Application example binaries (per nucleo boards) compatible with STSW-IFAPGUI
- STSW-OUT12F4
- STSW-OUT12G4

Once the Nucleo board is plugged into the PC, an USB_STORAGE like device is detected, the FW binary can be programmed into the Nucleo board by just a drag & drop operation



Interact with the STSW-IFAPGUI

- The Firmware binaries STSW-OUT12F4.bin and STSW-OUT12G4.bin allow the interaction of the X-NUCLEOOUT14A1 with a SW application running on PC (STSW-IFAPGUI).
- The SW app (STSW-IFAPGUI) is available for free download at the following link.
- For the usage of the STSW-IFAPGUI, please refer to the document available at: https://www.st.com/en/embedded-software/stsw-ifapgui.html#documentation
- Planned availability for the X-NUCLEO-OUT14A1 management through STSW-IFAPGUI: Q1-2023

Documents & related resources

All documents are available in the DOCUMENTATION tab of the related products webpage

X-NUCLEO-OUT14A1

- DB4836: Industrial digital output expansion board based on ISO808A-1 for STM32 Nucleo – Data Brief
- UM3082: Getting started with the X-NUCLEO-OUT14A1 industrial digital output expansion board for STM32 Nucleo – User manual
- Schematics, Gerber files, BOM

X-CUBE-IPS

- DB4735: Software expansion for STM32Cube driving industrial digital output based on IPS – Data Brief
- UM3035: Getting started with X-CUBE-IPS industrial digital output software for STM32 Nucleo – User manual

STSW-IFAPGUI (Avail. Q1-2023)

- DB3775: Graphical user interface for the industrial IPS evaluation boards based on STM32 Nucleo – Data Brief
- UM2509: STSW-IFAPGUI, common graphical user interface for the expansion boards of Intelligent Power Switches – User manual

STSW-OUT12F4

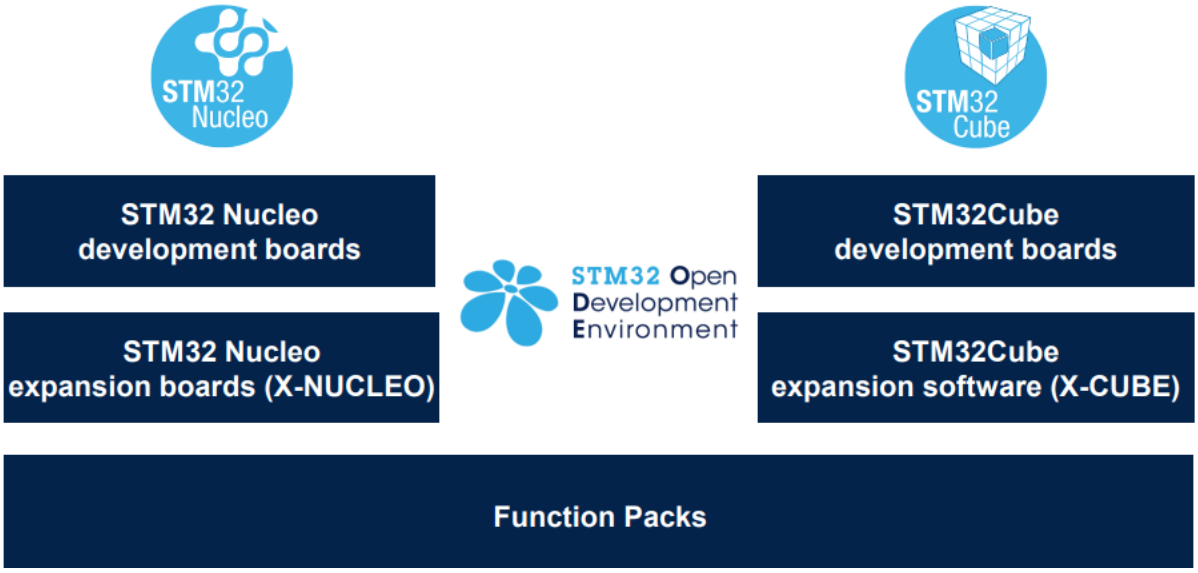
- DB4925: Demonstration firmware for NUCLEO-F401RE enabling STSW-IFAPGUI on X-NUCLEO-OUT12A1 and X-NUCLEO-OUT14A1 expansion board – Data Brief

STSW-OUT12G4

- DB4926: Demonstration firmware for NUCLEO-G431RB enabling STSW-IFAPGUI on X-NUCLEO-OUT12A1 and X-NUCLEO-OUT14A1 expansion board – Data Brief

STM32 ODE Ecosystem

FAST, AFFORDABLE PROTOTYPING AND DEVELOPMENT



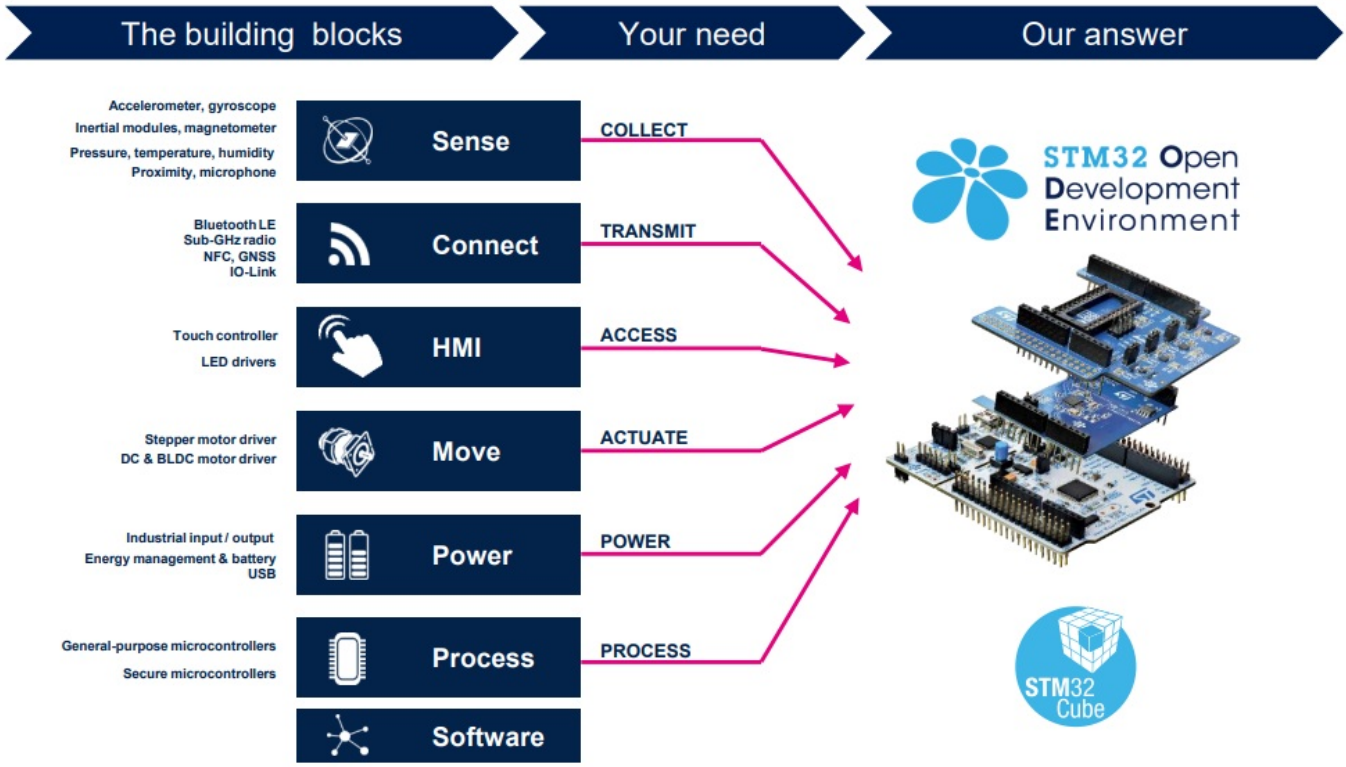
The STM32 Open Development Environment (ODE) is an open, flexible, easy and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

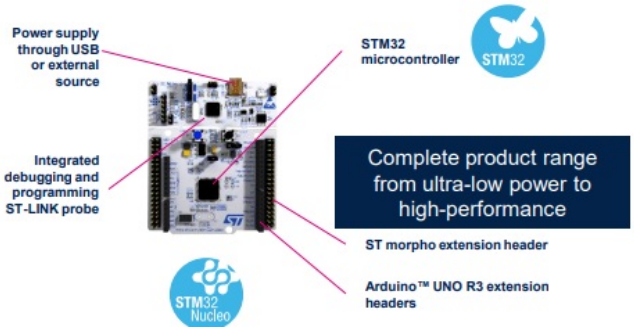
The STM32 ODE includes the following five elements:

- STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer
- STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards
- STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator
- STM32Cube expansion software. Expansion software provided free of charge for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework
- STM32Cube Function Packs. Set of function examples for some of the most common application cases built by leveraging the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

  The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, mbed and GCC-based environments.

STM32 Open Development Environment: all that you need





The combination of a broad range of expandable boards based on leading-edge commercial products and modular software, from driver to application level, enables fast prototyping of ideas that can be smoothly transformed into final designs.

To start your design:

- Choose the appropriate STM32 Nucleo development board (MCU) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control etc.) for the functionality you need
- Select your development environment (IAR EWARM, Keil MDK, and GCC-based IDEs) and use the free STM32Cube tools and software.
- Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.
- Compile your design and upload it to the STM32 Nucleo development board.
- Then start developing and testing your application. Software developed on the STM32 Open Development Environment prototyping hardware can be directly used in an

  advanced prototyping board or in and end product design using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.

Visit www.st.com for the complete list

Documents / Resources

	STMicroelectronics X-NUCLEO-OUT14A1 Industrial Digital Output Expansion Board [pdf] User Guide X-NUCLEO-OUT14A1 Industrial Digital Output Expansion Board, X-NUCLEO-OUT14A1, Industrial Digital Output Expansion Board, Digital Output Expansion Board, Output Expansion Board, Expansion Board, Board

References

- STMicroelectronics: Our technology starts with you
- STM32 Open Development Environment - STMicroelectronics
- STM32CubeProg - STM32CubeProgrammer software for all STM32 - STMicroelectronics
- STSW-LINK009 - ST-LINK, ST-LINK/V2, ST-LINK/V2-1, STLINK-V3 USB driver signed for Windows7, Windows8, Windows10 - STMicroelectronics
- STM32 Nucleo Expansion Boards - STMicroelectronics
- STM32 Nucleo Development Boards (supports Arduino) - STMicroelectronics
- STM32 ODE Function Packs - STMicroelectronics
- STM32Cube Expansion Software - STMicroelectronics
- STM32Cube Development Software - STM32 Open Development Environment - STMicroelectronics
- STSW-IFAPGUI - Graphical user interface for the industrial IPS and IO-Link transceiver evaluation boards based on STM32 Nucleo - STMicroelectronics
- STSW-IFAPGUI - Graphical user interface for the industrial IPS and IO-Link transceiver evaluation boards based on STM32 Nucleo - STMicroelectronics
- X-CUBE-IPS - Software expansion for STM32Cube driving industrial digital output based on IPS - STMicroelectronics