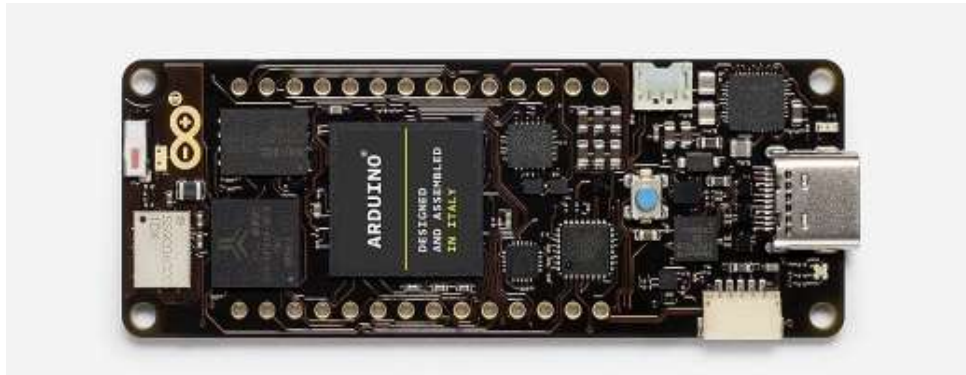




# PORTENTA H7

Code: 7630049202252



WiFi 32 bit ARM 100 mA 3.3V Large (~70) LiPo

The Portenta H7 will be ready for shipment approximately at the end of March 2020.

Program it with high-level languages and AI while performing low-latency operations on its customizable hardware.

Portenta H7 simultaneously runs high level code along with real time tasks. The design includes two processors that can run tasks in parallel. For example, is possible to execute Arduino compiled code along with MicroPython one, and have both cores to communicate with one another. The Portenta functionality is two-fold, it can either be running like any other embedded microcontroller board, or as the main processor of an embedded computer. Use the [Portenta Carrier board](#) to transform your H7 into an eNUC computer and expose all of the H7 physical interfaces.

Portenta can easily run processes created with TensorFlow™ Lite, you could have one of the cores computing a computer vision algorithm on the fly, while the other could be making low level operationis like controlling a motor, or acting as a user interface.

Use Portenta when performance is key, among other cases, we envision it to be part of:

- High-end industrial machinery
- Laboratory equipment
- Computer vision
- PLCs
- Industry-ready user interfaces
- Robotics controller
- Mission-critical devices
- Dedicated stationary computer
- High-speed booting computation (ms)

## Two Parallel Cores

H7's main processor is the dual core STM32H747 including a Cortex® M7 running at 480 MHz and a Cortex® M4 running at 240 MHz. The two cores communicate via a *Remote Procedure Call* mechanism that allows calling functions on the other processor seamlessly. Both processors share all the in-chip peripherals and can run:

- Arduino sketches on top of the Arm® Mbed™ OS
- Native Mbed™ applications
- MicroPython / JavaScript via an interpreter
- TensorFlow™ Lite

## Graphics Accelerator

Probably one of the most exciting features of the Portenta H7 is the possibility of connecting an external monitor to build your own dedicated embedded computer with a user interface. This is possible thanks to the STM32H747 processor's on-chip GPU, the Chrom-ART Accelerator™. Besides the GPU, the chip includes a dedicated JPEG encoder and decoder.

## A new standard for pinouts

The Portenta family adds **two 80 pin high density connectors** at the bottom of the board. This ensures scalability for a wide range of applications by simply upgrading your Portenta board to the one suiting your needs.

## On-board Connectivity

The onboard wireless module allows to simultaneously manage WiFi and Bluetooth® connectivity. The WiFi interface can be operated as an Access Point, as a Station or as a dual mode simultaneous AP/STA and can handle up to 65 Mbps transfer rate. Bluetooth® interface supports Bluetooth Classic and BLE. It is also possible to expose a series of different wired interfaces like UART, SPI, Ethernet, or I2C, both through some of the MKR styled connectors, or through the new Arduino industrial 80 pin connector pair.

## USB-C Multipurpose Connector

The board's programming connector is a USB-C port that can also be used to power the board, as a USB Hub, to connect a DisplayPort monitor, or to deliver power to OTG connected devices.

## Multiple options in one board

Order the default Arduino Portenta H7 (codename H7-15EUNWAD) that comes with:

- STM32H747 dual-core processor with graphics engine
- 8MB SDRAM
- 16MB NOR Flash
- 10/100 Ethernet Phy
- USB HS
- NXP SE050C2 Crypto
- WiFi/BT Module
- Ceramic Antenna
- DisplayPort over USB-C

If you need more memory, Portenta H7 can host up to 64 MByte of SDRAM, and 128 MByte of QSPI Flash. Order it with an external UFL connector for adding a higher-gain antenna to the board. Decide between crypto-chips from Microchip® and NXP. The board is highly customizable in volumes, ask our sales representatives for options.

The basic configurations you can consider to get the board to accommodate to your needs and budget are:

Option	Description	Option Codes
SDRAM	external SDRAM memory	0 - None 1 - 8 MByte 2 - 16 MByte 3 - 32 MByte 4 - 64 MByte
FLASH	external QSPI Flash Memory	0 - None 1 - 2 MByte (NOR) 5 - 16 MByte (NOR) 8 - 128 MByte (NAND)
Ethernet	10/100 Ethernet PHY	0 - None E - Fitted
HS USB	High Speed USB PHY	0 - None U - Fitted
Crypto	Crypto Chip	0 - None M - ATECC608A N - SE050C2
Wireless	Wireless Module	0 - None W - Fitted
Antenna	Antenna option	0 - None A - on board ceramic antenna C - UFL connector
Video	Displayport output over USB-C	0 - None D - Fitted

## Need Help?

Check the Arduino Forum for questions about the [Arduino Language](#), or how to make your own [Projects with Arduino](#). Need any help with your board please get in touch with the official Arduino User Support as explained in our [Contact Us](#) page.

## Warranty

You can find [here](#) your board warranty information.

<https://www.arduino.cc/en/Main/warranty>

The Arduino Portenta H7 is based on the STM32H747 microcontroller, XI series.

Microcontroller	STM32H747XI dual Cortex®-M7+M4 32bit low power ARM MCU ( <a href="#">datasheet</a> )
Radio module	Murata 1DX dual WiFi 802.11b/g/n 65 Mbps and Bluetooth 5.1 BR/EDR/LE ( <a href="#">datasheet</a> )
Secure Element (default)	NXP SE0502 ( <a href="#">datasheet</a> )
Board Power Supply (USB/VIN)	5V
Supported Battery	Li-Po Single Cell, 3.7V, 700mAh Minimum (integrated charger)
Circuit Operating Voltage	3.3V
Current Consumption	2.95 $\mu$ A in Standby mode (Backup SRAM OFF, RTC/LSE ON)
Display Connector	MIPI DSI host & MIPI D-PHY to interface with low-pin count large display
GPU	Chrom-ART graphical hardware Accelerator™

Timers	22x timers and watchdogs
UART	4x ports (2 with flow control)
Ethernet PHY	10 / 100 Mbps (through expansion port only)
SD Card	Interface for SD Card connector (through expansion port only)
Operational Temperature	-40 °C to +85 °C (excl. Wireless module) / -10 °C to +55 °C (incl. Wireless module)
MKR Headers	Use any of the existing industrial MKR shields on it
High-density Connectors	Two 80 pin connectors will expose all of the board's peripherals to other devices
Camera Interface	8-bit, up to 80 MHz
ADC	3× ADCs with 16-bit max. resolution (up to 36 channels, up to 3.6 MSPS)
DAC	2× 12-bit DAC (1 MHz)
USB-C	Host / Device, DisplayPort out, High / Full Speed, Power delivery

## OSH: Schematics

The Portenta H7 is open-source hardware! You can study how the board works using the following files:

[SCHEMATICS IN .PDF](#)

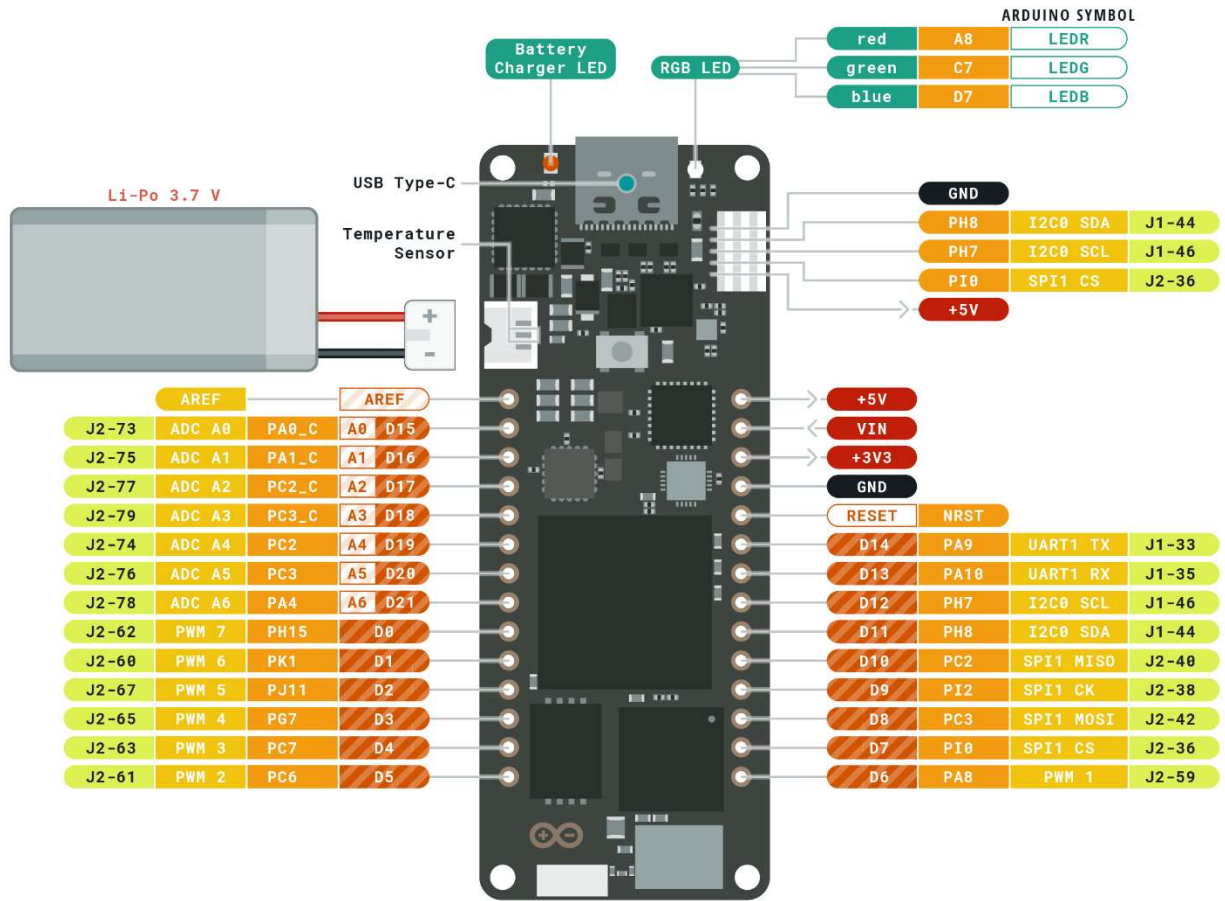
<https://content.arduino.cc/assets/Arduino-PortentaH7-schematic-V1.0.pdf>

## Pinout Diagram

The Portenta H7 follows the Arduino MKR form factor, but enhanced with the Portenta family 80 pin high-density connector. Learn more about the board's pinout by reading the board's pinout documentation.



# ARDUINO PORTENTA H7



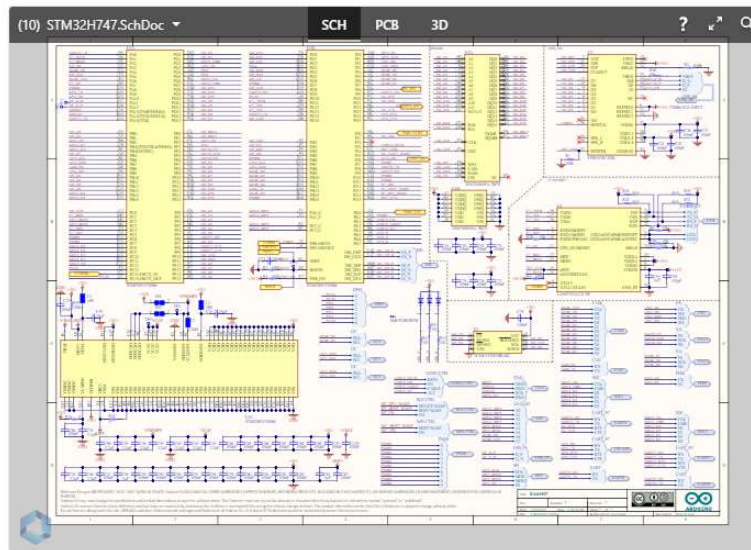
Ground	Internal Pin	Digital Pin	Microcontroller's Port
Power	SWD Pin	Analog Pin	High Density Connector
LED	Other Pin	Default	

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This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Download the full pinout diagram as PDF [here](#).

[https://content.arduino.cc/assets/Pinout-PortentaH7\\_latest.pdf](https://content.arduino.cc/assets/Pinout-PortentaH7_latest.pdf)

## Interactive Board Viewer

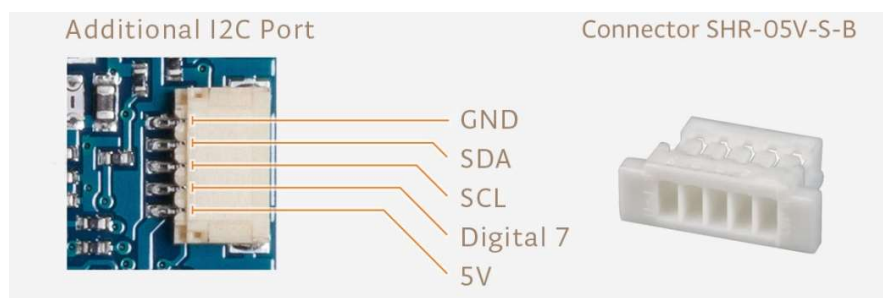


## Additional I2C Port

The Portenta H7 has an additional connector meant as an extension of the I2C bus. It's a small form factor 5-pin connector with 1.0 mm pitch. The mechanical details of the connector can be found in the [connector's datasheet](#).

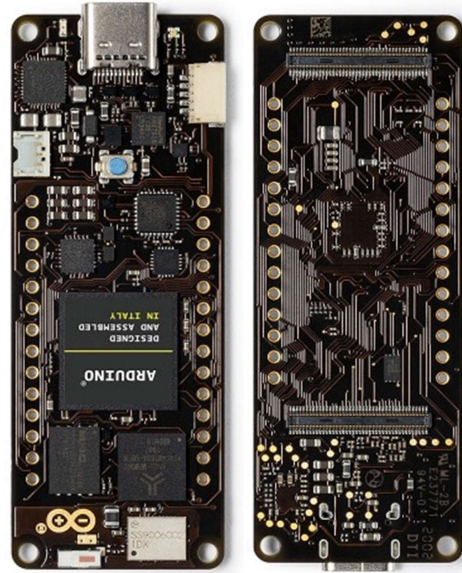
[https://content.arduino.cc/assets/ESLOV\\_connector.pdf](https://content.arduino.cc/assets/ESLOV_connector.pdf)

The I2C port, also referred to as the Eslov self-identification port within Arduino, comes with: SDA, SCL, GND, +5V, and an extra digital pin meant to send an alarm to the otherwise plain I2C devices connected to it. The pinout is shown in the following image:



If you are interested in designing your own modules for Arduino boards with this expansion port, the connector we suggest using is code: SHR-05V-S-B, also in the picture.





STORE.ARDUINO.CC/PORTENTA-H7

PROGRAM IT WITH HIGH-LEVEL LANGUAGES AND AS WHILE PERFORMING LOW-LATENCY OPERATIONS ON ITS CUSTOMIZABLE HARDWARE.

Connectivity	BLE	WiFi	Ethernet
SDRAM	64KB		
Flash (QSPI)	16MB		
Chip	STM32H743 Dual-Core processor with graphics engine		
Clock	480MHz		
Memory	2MB	1MB	
Interfaces	I2S	I2C	SPi CAN
	PWM	ETH	MIPI DSI
	USB	UART	SAR
Voltages	3V	1.8V	
Pinout	84	10	8
Dimensions	66 x 25 mm		
Highlights	Ceramic Antenna		
	RTOS	WiFi-SECURE	
	RTOSes: Fly	Crypto	
	DisplayPort over USB-C	USA HQ	

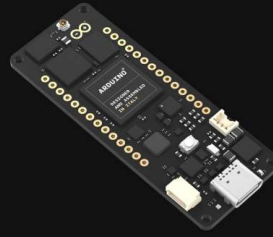


<https://store.arduino.cc/usa/portenta-h7/3-13-20>

## A new board designed for high performance, meet Portenta H7

Program it with high-level languages and AI while performing low-latency operations on its customizable hardware

TINYML PYTHON JAVASCRIPT DISPLAYPORT WIFI BLE



### TWO PARALLEL CORES

## Portenta H7 simultaneously runs high level code along with real time tasks

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Both processors share all the in-chip peripherals and can run:

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The Portenta H7 follows the Arduino MKR form factor, but enhanced with the Portenta family 80 pin high-density connector. [Learn more about the board's pinout by reading the board's pinout documentation.](#)

## Use Portenta when performance is key

- High-end industrial machinery
- Laboratory equipment
- Computer vision
- PLCs
- Industry-ready user interfaces
- Robotics controller
- Mission-critical devices
- Dedicated stationary computer
- High-speed booting computation (ms)

## A new standard for pinouts

The Portenta family adds two 80 pin high density connectors at the bottom of the board. This ensures scalability for a wide range of applications by simply upgrading your Portenta board to the one suiting your needs.

### DUAL CORE

Two processors in one, run parallel tasks

### CUSTOMIZATION

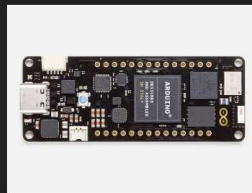
The board is highly customizable in volumes

### DEDICATED COMPUTER

Power your board, connect it to a display, implement UIs

### AI ON THE EDGE

So powerful it can run AI state machines



## Multiple options in one board

By default the **Arduino Portenta H7** comes with:

- STM32H747 dual-core processor with graphics engine
- 8MB SDRAM
- 16MB NOR Flash
- 10/100 Ethernet Phy
- USB HS
- NXP SE050C2 Crypto
- WiFi/BT Module
- Ceramic Antenna
- DisplayPort over USB-C

## Tailor the hardware to your needs

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## PORTENTA H7 TECH SPECS

MAIN PROCESSOR	STM32H747XI dual Cortex®-M7+M4 32bit low power Arm® MCU
SDRAM	8-64 MByte option
QSPI FLASH	2-128 MByte option
ETHERNET	10/100 Phy option
WIRELESS	BT5.0 + WiFi 802.11 b/g/n 65Mbps option
CRYPTO CHIP	ECC608 or SE050C2 (Common Criteria EAL 6+) option
DISPLAY CONNECTOR	MIPI DSI host & MIPI D-PHY to interface with low-pin count large displays
GPU	Chrom-ART graphical hardware Accelerator™
TIMERS	22x timers and watchdogs
UART	4x ports (2 with flow control)
SD CARD	Interface for SD Card connector (through expansion port only)
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ESLOV CONNECTOR	Arduino's open connector standard for self-identifiable hardware
CAMERA INTERFACE	8-bit, up to 80 MHz
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[BACK TO TOP](#) ^

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