

Description

The Arduino Due is a groundbreaking microcontroller board featuring the Atmel SAM3X8E ARM Cortex-M3 CPU, making it the first Arduino board built around a 32-bit ARM core microcontroller. With its 54 digital input/output pins, 12 analog inputs, 4 UARTs, USB OTG capability, and 84 MHz clock, the Due offers enhanced performance and versatility for a wide range of projects. Compatible with all Arduino shields designed for operation at 3.3V and compliant with the 1.0 Arduino pinout standard, the Due is a powerful tool for both beginners and experienced makers alike.

Warning: Unlike most Arduino boards, the Arduino Due board runs at 3.3V. The maximum voltage that the I/O pins can tolerate is 3.3V. Applying voltages higher than 3.3V to any I/O pin could damage the board.

Target Areas

Embedded Systems Development, Robotics, 3D Printing & CNC Machines, Prototyping

Features

- **Atmel SAM3X8E ARM Cortex-M3** Microcontroller
 - Core
 - 32-bit ARM Cortex-M3
 - Clock speed: 84 MHz
- **Memory**
 - **SAM3X**
 - Flash: 512 KB
 - SRAM: 96 KB (divided into two banks: 64 KB and 32 KB)
- **ATmega16U2**
 - Provides a virtual COM port to software on a connected computer.
 - Connected to the SAM3X hardware UART.
- **I/O**
 - Digital I/O pins: 54
 - Serial 0: (RX) and 1 (TX)
 - Serial 1: 19 (RX) and 18 (TX)
 - Serial 2: 17 (RX) and 16 (TX)
 - Serial 3: 15 (RX) and 14 (TX)
 - PWM: Pins 2 to 13
 - SPI: SPI header (ICSP header on other Arduino boards)
 - CAN: CANRX and CANTX
 - "L" LED: 13
 - TWI 1: 20 (SDA) and 21 (SCL)
 - TWI 2: SDA1 and SCL1
 - Analog Inputs: pins from A0 to A11
 - DAC1 and DAC2
 - AREF
 - Reset
- **Communication**
 - UART: 4 (hardware serial ports)
 - TWI (I2C): 2
 - SPI: 1 (SPI header)
 - USB: 2
 - Native USB port (USB OTG capable)
 - Programming port (for uploading sketches and serial communication)



- **USB**
 - **USB Host** Micro Type B
 - Native USB port
 - **USB Peripheral** Micro Type B
 - Programming Port
- **Connectors**
 - JTAG connector
- **Power**
 - Circuit operating voltage: 3.3V
 - Input voltage (VIN).
 - Recommended: 7-12V
 - limits: 6-16V
 - DC Current per I/O Pin: 8 mA

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The Board

1 Application Examples

The Arduino Due combines the performance of the Atmel SAM3X8E microcontroller with the flexibility of the Arduino platform, offering a versatile solution for developers, hobbyists, and professionals alike. With its 32-bit architecture and clock speed of 84 MHz, the Due delivers robust performance for demanding applications.

- **Embedded Systems Development:** The Arduino Due can be utilized to create a real-time data acquisition system for monitoring and analyzing environmental parameters in industrial settings. By interfacing sensors such as temperature, humidity, and pressure sensors with the Due's abundant I/O pins, developers can capture real-time data and process it using the Due's powerful microcontroller. The system can then transmit this data wirelessly or via USB to a host computer for analysis, allowing for continuous monitoring and remote management of critical processes.
- **Robotics:** The Arduino Due can serve as the brain of an autonomous mobile robot capable of navigating and interacting with its environment. By integrating sensors such as ultrasonic range finders, gyroscopes, and encoders, developers can equip the robot with perception capabilities to sense its surroundings and detect obstacles. Using the Due's abundant I/O pins and powerful processing capabilities, algorithms for localization, mapping, and path planning can be implemented to enable autonomous navigation. Additionally, actuators such as motors or servos can be controlled by the Due to execute motion commands, allowing the robot to move and manipulate objects in its environment autonomously.
- **3D Printing & CNC Machines:** the Arduino Due can function as a versatile controller for DIY projects. By interfacing stepper motor drivers and endstop switches with the Due's numerous I/O pins, enthusiasts can create their own 3D printers or CNC machines. The Due's high-speed processing capabilities enable precise control of stepper motors for accurate positioning and movement.
- **Prototyping:** The Arduino Due serves as an invaluable tool for quickly iterating and testing new ideas for IoT devices. By leveraging the Due's extensive I/O capabilities and compatibility with various sensors, communication modules, and actuators, developers can rapidly assemble and test prototypes of IoT devices. Whether it's a smart home sensor node, a weather station, or a remote monitoring system, the Arduino Due provides a flexible platform for integrating components, writing firmware, and validating functionality. With the Due's support for Arduino libraries and easy-to-use development environment, prototypers can focus on innovation and experimentation, accelerating the process of bringing ideas to fruition.



2 Accessories

- USB Cable Type A Male to Micro Type B Male (Not included)

3 Related Products

- Arduino Mega Proto Shield Rev3 (A000080)
- Arduino 4 Relays Shield (A000110)
- Arduino Motor Shield Rev3 (A000079)

Rating

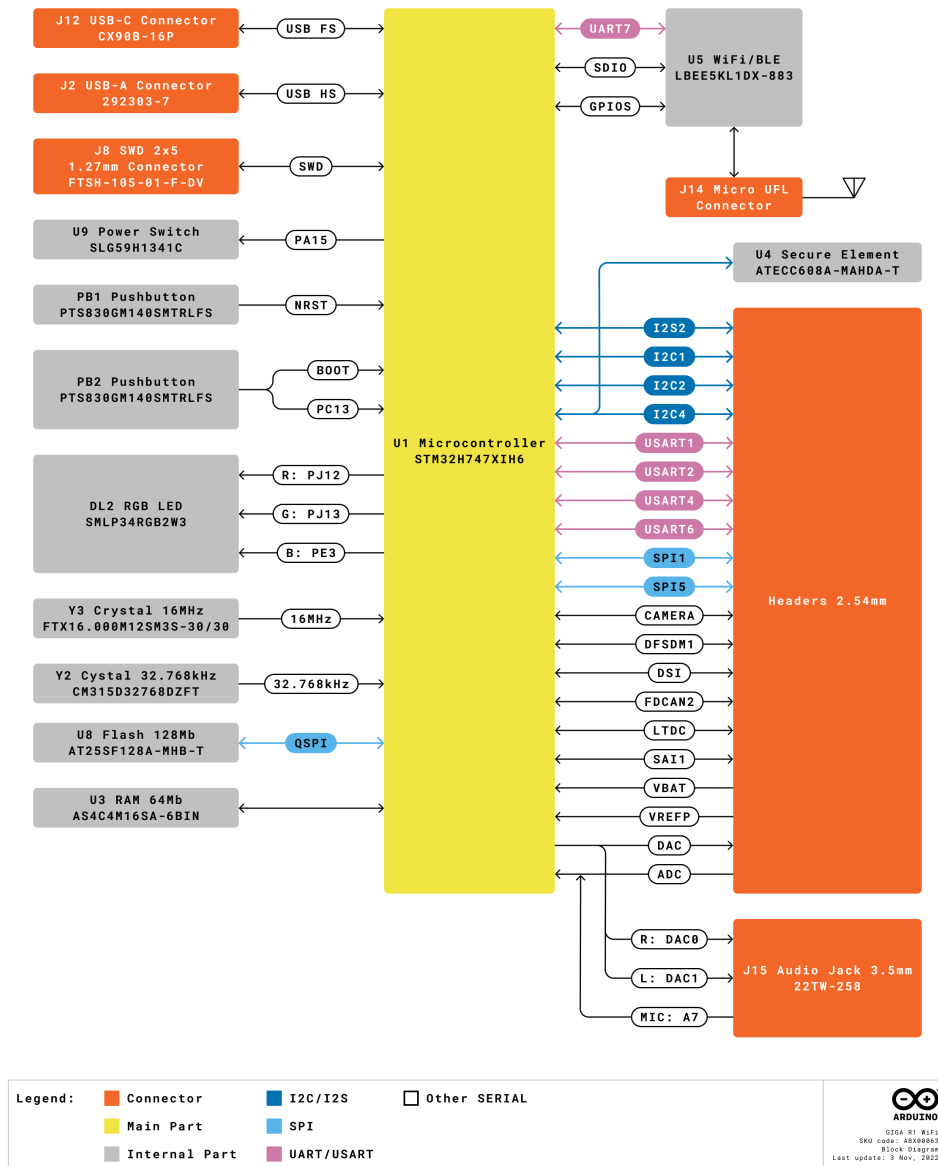
4 Recommended Operating Conditions

Symbol	Description	Min	Typ	Max	Unit
V_{IN}	Input voltage from VIN pad	6	7.0	16	V
V_{USB}	Input voltage from USB connector	4.8	5.0	5.5	V
V_{DD}	Input high-level voltage	$0.7 \cdot V_{DD}$		V_{DD}	V
V_{IL}	Input low-level voltage	0		$0.3 \cdot V_{DD}$	V
T_{OP}	Operating Temperature	-40	25	85	°C

Note: V_{DD} controls the logic level and is connected to the 3.3V power rail. V_{AREF} is for the analog logic.

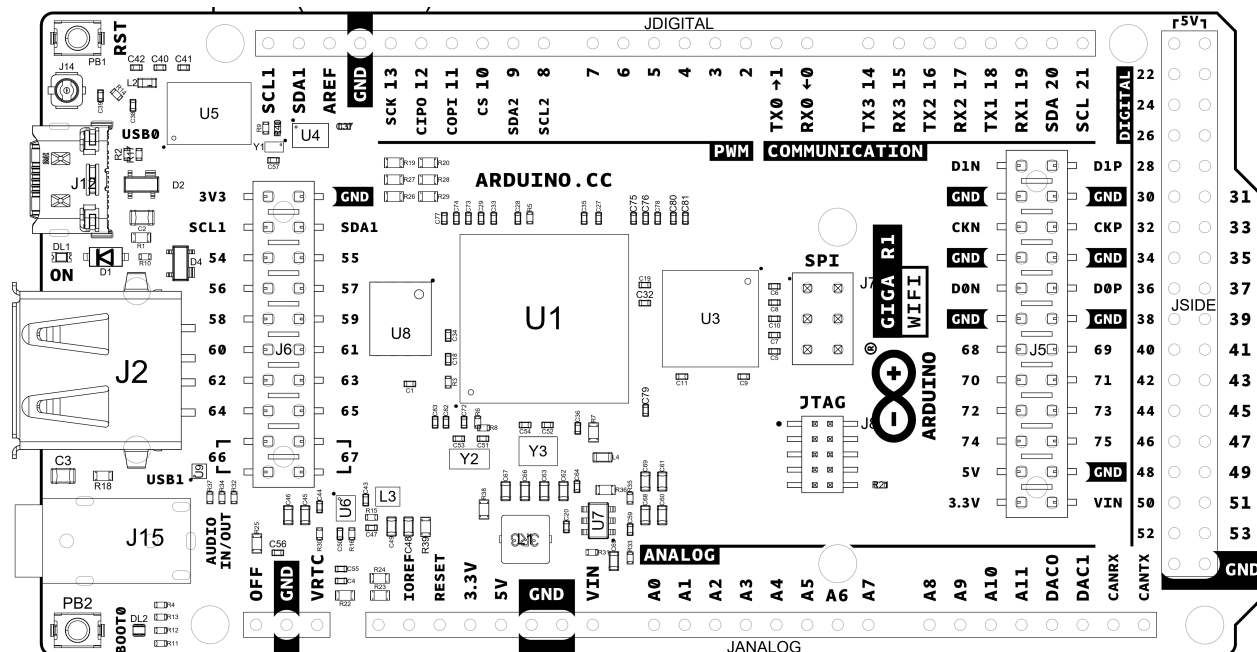
Functional Overview

5 Block Diagram



6 Board Topology

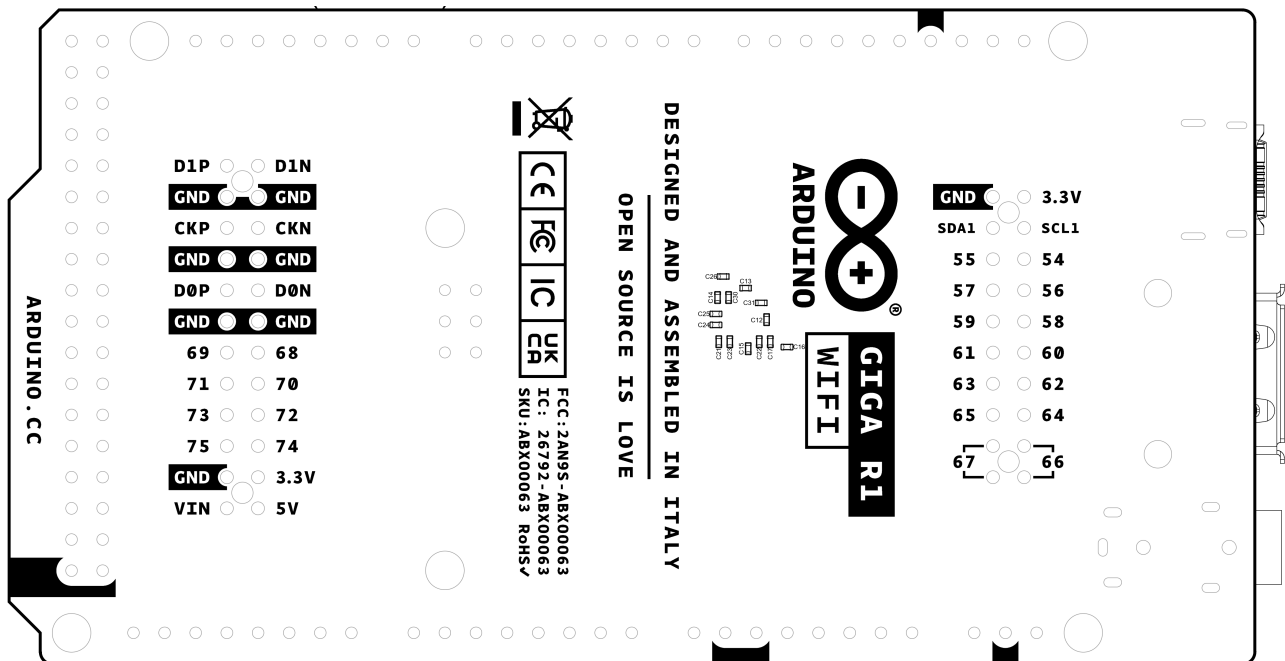
6.1 Front View



Top View of Arduino GIGA R1 WiFi

Ref.	Description	Ref.	Description
U1	STM32H7 Dual Core Microcontroller IC	U8	AT25SF128A-MHB-T 16 MB Flash IC
U3	AS4C4M16SA 8MB SDRAM IC	U4	ATECC608A-MAHDA-T Secure Element IC
U5	LBEE5KL1DX-883 Wi-Fi®/Bluetooth® Module	U6	MP2322GQH Buck Converter 3.3V IC
U7	MP2269GD-Z Buck Converter 5V IC	JANALOG	Analog input/output headers
JDIGITAL	Digital input/output headers	JSIDE	Digital input/output headers
SPI	SPI headers	JTAG	JTAG Headers
J2	USB 2.0 A Host	J15	3.5 mm audio in/out
PB1	RESET Button	PB2	BOOT0 button
J14	Micro UFL connector	J5	Camera
J6	Camera	DL1	Power LED
DL2	RGB SMLP34RGB2W3 Common anode LED	J12	CX90B-16P USB-C® connector

6.2 Back View



Back View of Arduino GIGA R1 WiFi

7 Processor

The Arduino Due is powered by the Atmel SAM3X8E ARM Cortex-M3 microcontroller. This 32-bit microcontroller offers a clock speed of 84 MHz, providing ample processing power for a wide range of applications. With 512 KB of flash memory and 96 KB of SRAM, the SAM3X8E enables efficient storage and execution of code, making it suitable for both simple and complex projects. Its rich set of peripherals includes UARTs, SPI, I2C, PWM, ADC, DAC, and more, offering versatile connectivity options for interfacing with sensors, actuators, and other devices.

8 Onboard Memories

The Arduino Due is equipped with two primary onboard memory types. Its flash memory, boasting a capacity of 512 KB, stores the program code, including uploaded sketches, libraries, and bootloader, facilitating the execution of complex programs efficiently. Complementing this, the microcontroller features SRAM divided into two banks, totaling 96 KB (64 KB and 32 KB respectively). This SRAM serves as dynamic memory, storing variables and data during program execution, offering fast access times crucial for effective data handling. Together, these onboard memories empower the Arduino Due to execute tasks, interact with peripherals, and accommodate diverse application requirements seamlessly.

9 USB Connectors

The Arduino Due features two USB connectors: the Native USB port and the Programming port. The Native USB port, positioned on the board, enables direct communication with the host computer, supporting USB host/device functionality and USB OTG capability. It serves essential functions such as uploading sketches, facilitating serial communication, and interfacing with USB peripherals. Conversely, the Programming port, also situated on the board, is dedicated specifically to sketch uploading and serial communication with the Arduino Due. Linked to the ATmega16U2 microcontroller, it functions as a USB-to-serial converter, simplifying the uploading process by enabling recognition of the board as a COM port by the Arduino IDE. Together, these USB ports offer convenient connectivity options for programming, communication, and interaction with external devices.

Legend:

- Connector: J12 USB-C Connector CX90B-16P, J2 USB-A Connector 292303-7, J8 SWD 2x5 1.27mm Connector FTSH-105-01-F-DV
- Main Part: U7 Buck Converter AP63200WU-7, U6 Buck Converter MP2322GQH, U5 WiFi/BLE LBEE5KL1DX-883, U4 Secure Element ATECC608A-MAHDA-T
- Internal Part: U9 Power Switch Reverse Blocking SLG659H1341C, U1 Microcontroller STM32H747XIIH6, U3 RAM 64Mb AS4C4M16SA-6BIN, U8 Flash 128Mb AT25SF128A-MHB-T, DL1 Power LED Green HSMD-C190, DL2 RGB LED SMLP34RGB2W3

Power Flow:

- USB-C Input:** J12 USB-C Connector (CX90B-16P) → VBUS_USB0 → D1 Schottky PME66020AELRX → +5V → U9 Power Switch Reverse Blocking SLG659H1341C (VIN, VOUT) → VBUS_USB1 → J2 USB-A Connector (292303-7)
- Header Input:** Headers 2.54mm (5V, VIN, 3V3, IOREF) → VIN → U7 Buck Converter AP63200WU-7 (VIN MAX 32V, IOUT MAX 1.5A) → +5V → U6 Buck Converter MP2322GQH (VIN MAX 22V, IOUT MAX 1A) → +3V3 → J8 SWD 2x5 1.27mm Connector (FTSH-105-01-F-DV)
- Internal Components:** U1 Microcontroller STM32H747XIIH6, U3 RAM 64Mb AS4C4M16SA-6BIN, U8 Flash 128Mb AT25SF128A-MHB-T, DL1 Power LED Green HSMD-C190, DL2 RGB LED SMLP34RGB2W3

Power can either be supplied via the VIN pins, or the 5V of the USB connectors (J2, J12). If power is supplied via VIN, the MP2269GD-Z (U7) buck converter steps the voltage down to 5V. The 5V power rail is then stepped down to 3.3V by the MP2322GQH (U6) buck converter. The logic level of components on the GIGA R1 WiFi is 3.3V.

11 Board Operation

11.1 Getting Started - IDE

To program your Arduino Due, you'll need to install the Arduino Desktop IDE. When connecting the Arduino Due to your computer, utilize a Type-B USB cable. This cable not only facilitates programming but also provides power to the board, as signified by the LED indicator (L).

11.2 Getting Started - Arduino Cloud Editor

All Arduino boards, including this one, work out-of-the-box on the Arduino Cloud Editor, by just installing a simple plugin.

The Arduino Cloud Editor is hosted online, therefore it will always be up-to-date with the latest features and support for all boards. Follow to start coding on the browser and upload your sketches onto your board.

11.3 Online Resources

Now that you have gone through the basics of what you can do with the board you can explore the endless possibilities it provides by checking exciting projects on Arduino Project Hub, the Arduino Library Reference, and the online store; where you will be able to complement your board with sensors, actuators and more.

11.4 Board Recovery

All Arduino boards have a built-in bootloader which allows flashing the board via USB. In case a sketch locks up the processor and the board is not reachable anymore via USB, it is possible to enter bootloader mode by double-tapping the reset button right after the power-up.

Mechanical Information

12 Pinout

12.1 Analog

Pin	Function	Type	Description
1	NC	NC	Not Connected
2	IOREF	IOREF	Reference for digital logic V - connected to 3.3V
3	Reset	Reset	Reset
4	+3V3	Power	+3V3 Power Rail
5	+5V	Power	+5V Power Rail
6	GND	Power	Ground
7	GND	Power	Ground
8	VIN	Power	Voltage Input
9	A0	Analog	Analog input 0 /GPIO
10	A1	Analog	Analog input 1 /GPIO
11	A2	Analog	Analog input 2 /GPIO
12	A3	Analog	Analog input 3 /GPIO
13	A4	Analog	Analog input 4 /GPIO
14	A5	Analog	Analog input 5 /GPIO
15	A6	Analog	Analog input 6 /GPIO
16	A7	Analog	Analog input 7 /GPIO
17	A8	Analog	Analog input 8 /GPIO
18	A9	Analog	Analog input 9 /GPIO
19	A10	Analog	Analog input 10 /GPIO
20	A11	Analog	Analog input 11 /GPIO
21	DAC0	Analog	Digital to Analog Converter 0
22	DAC1	Analog	Digital to Analog Converter 1
23	CANRX	Digital	CAN Bus Receive
24	CANTX	Digital	CAN Bus Transfer



12.2 Digital

Pin	Function	Type	Description
1	D21/SCL1	Digital	GPIO 21/I2C 1 Clock
2	D20/SDA1	Digital	GPIO 20/I2C 1 Dataline
3	AREF	Digital	Analog Reference Voltage
4	GND	Power	Ground
5	D13/SCK	Digital	GPIO 13/SPI Clock (PWM~)
6	D12/CIPO	Digital	GPIO 12/SPI Controller In Peripheral Out (PWM~)
7	D11/COPI	Digital	GPIO 11/SPI Controller Out Peripheral In (PWM~)
8	D10/CS	Digital	GPIO 10/SPI Chip Select (PWM~)
9	D9/SDA2	Digital	GPIO 9/I2C 2 Dataline (PWM~)
10	D8/SCL2	Digital	GPIO 8/I2C 2 Clockline (PWM~)
11	D7	Digital	GPIO 7 (PWM~)
12	D6	Digital	GPIO 6 (PWM~)
13	D5	Digital	GPIO 5 (PWM~)
14	D4	Digital	GPIO 4 (PWM~)
15	D3	Digital	GPIO 3 (PWM~)
16	D2	Digital	GPIO 2 (PWM~)
17	D1/TX0	Digital	GPIO 1 / Serial 0 Transmitter
18	D0/TX0	Digital	GPIO 0 / Serial 0 Receiver
19	D14/TX3	Digital	GPIO 14 / Serial 3 Transmitter
20	D15/RX3	Digital	GPIO 15 / Serial 3 Receiver
21	D16/TX2	Digital	GPIO 16 / Serial 2 Transmitter
22	D17/RX2	Digital	GPIO 17 / Serial 2 Receiver
23	D18/TX1	Digital	GPIO 18 / Serial 1 Transmitter
24	D19/RX1	Digital	GPIO 19 / Serial 1 Receiver
25	D20/SDA	Digital	GPIO 20 / I2C 0 Dataline
26	D21/SCL	Digital	GPIO 21 / I2C 0 Clock

12.3 SPI

Pin	Function	Type	Description
1	CIPO	Internal	Controller In Peripheral Out
2	+5V	Internal	Power Supply of 5V
3	SCK	Internal	Serial Clock
4	COPI	Internal	Controller Out Peripheral In
5	RESET	Internal	Reset
6	GND	Internal	Ground

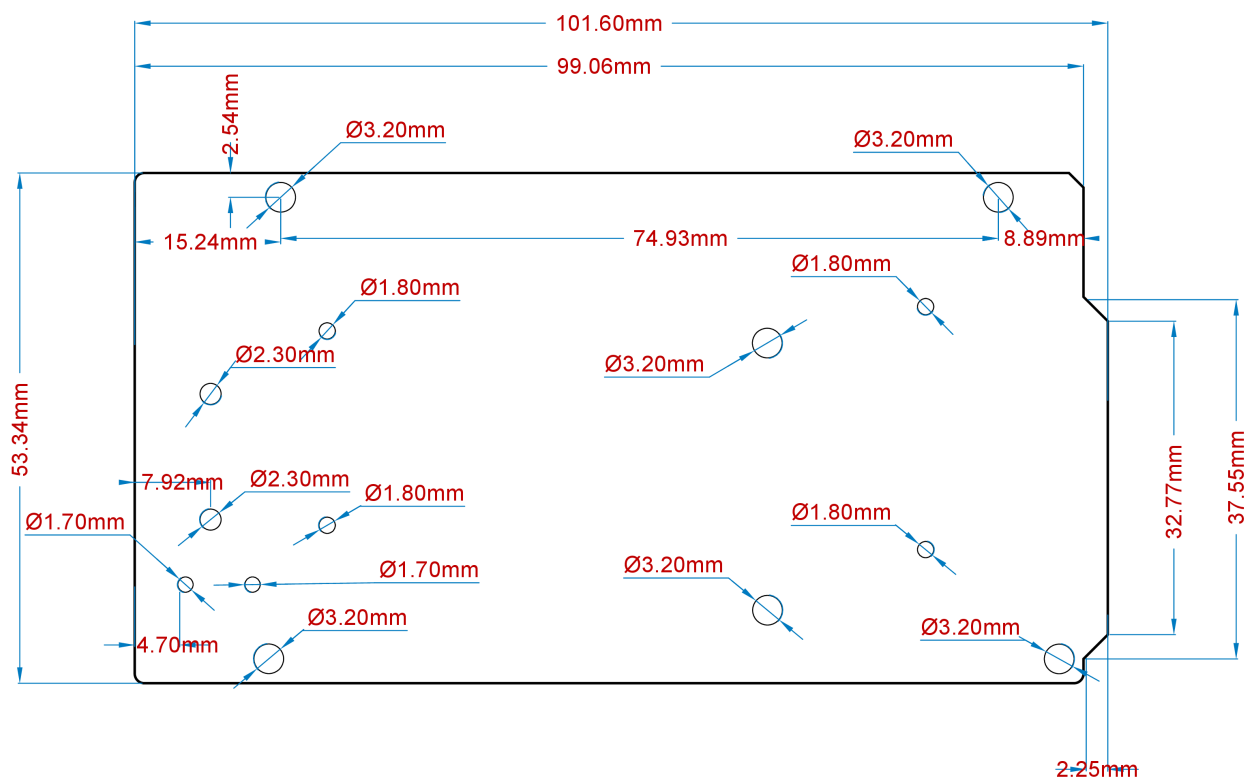
12.4 Digital Pins D22 - D53 LHS

Pin	Function	Type	Description
1	+5V	Power	+5V Power Rail
2	D22	Digital	GPIO 22
3	D24	Digital	GPIO 24
4	D26	Digital	GPIO 26
5	D28	Digital	GPIO 28
6	D30	Digital	GPIO 30
7	D32	Digital	GPIO 32
8	D34	Digital	GPIO 34
9	D36	Digital	GPIO 36
10	D38	Digital	GPIO 38
11	D40	Digital	GPIO 40
12	D42	Digital	GPIO 42
13	D44	Digital	GPIO 44
14	D46	Digital	GPIO 46
15	D48	Digital	GPIO 48
16	D50	Digital	GPIO 50
17	D52	Digital	GPIO 52
18	GND	Power	Ground

12.5 Digital Pins D22 - D53 RHS

Pin	Function	Type	Description
1	+5V	Power	+5V Power Rail
2	D23	Digital	GPIO 23
3	D25	Digital	GPIO 25
4	D27	Digital	GPIO 27
5	D29	Digital	GPIO 29
6	D31	Digital	GPIO 31
7	D33	Digital	GPIO 33
8	D35	Digital	GPIO 35
9	D37	Digital	GPIO 37
10	D39	Digital	GPIO 39
11	D41	Digital	GPIO 41
12	D43	Digital	GPIO 43
13	D45	Digital	GPIO 45
14	D47	Digital	GPIO 47
15	D49	Digital	GPIO 49
16	D51	Digital	GPIO 51
17	D53	Digital	GPIO 53
18	GND	Power	Ground

13 Mounting Holes And Board Outline



Mechanical View of Arduino GIGA R1 WiFi

Certifications

14 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

15 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum Limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl) phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions : No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (<https://echa.europa.eu/web/guest/candidate-list-table>), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

16 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations with regards to laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder, or as a component in metal alloys. As part of our reasonable due diligence Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

17 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference
- (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.
3. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator & your body.

English: User manuals for licence-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC SAR Warning:

English This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.



French: Lors de l'installation et de l'exploitation de ce dispositif, la distance entre le radiateur et le corps est d'au moins 20 cm.

Important: The operating temperature of the EUT can't exceed 85°C and shouldn't be lower than -40°C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 201453/EU. This product is allowed to be used in all EU member states.

Frequency bands	Maximum output power (ERP)
2.4 GHz, 40 channels	TBD

18 Company Information

Company name	Arduino SRL
Company Address	Via Andrea Appiani, 25 - 20900 MONZA (Italy)

19 Reference Documentation

Ref	Link
Arduino IDE (Desktop)	https://www.arduino.cc/en/Main/Software
Arduino Cloud Editor	https://create.arduino.cc/editor
Arduino Cloud Editor - Getting Started	https://docs.arduino.cc/arduino-cloud/guides/editor/
Arduino Project Hub	https://create.arduino.cc/projecthub?by=part&part_id=11332&sort=trending
Library Reference	https://github.com/arduino-libraries/
Online Store	https://store.arduino.cc/

20 Change Log

Date	Changes
24/05/2024	Release