PRODUCT DATASHEET

Swan Datasheet

Swan v1.7

Swan is a low-cost embeddable STM32L4+-based microcontroller board designed to accelerate the development and deployment of battery-powered IoT solutions.

Last Revised February 2, 2023

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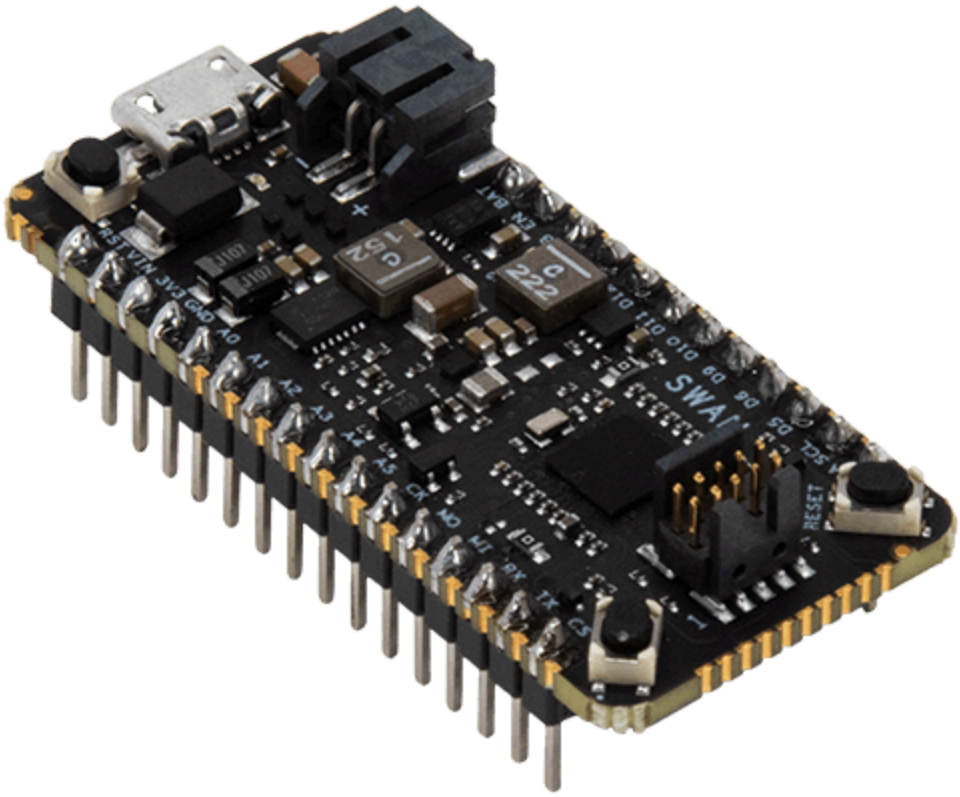


It is especially useful for applications requiring large memory or a high degree of I/O expandability at an affordable cost, such as edge-based inferencing and remote monitoring. Acting in this role, Swan is designed to be the ideal companion to Blues's Notecard.

Functional Description

The Swan is a Feather-compatible MCU based on the STM32 from STMicroelectronics. The device was built after Blues worked directly with a customer to implement a complex industrial modernization solution based around the Notecard. It is designed to operate as a device that developers can get started with quickly as a Feather for a POC or Prototype. Once developers are ready to move into a Pilot,

or the complexity of the solution demands it, the Swan can leverage an additional 36 pins from the STM32 MCU through a set of castellated edges on the main PCB to utilize additional GPIOs or buses like I2C, UART, SPI, and CAN.

Features

- Features of the ST STM32L4R5ZIY6 microcontroller
    - 120MHz Clock speed
    - 2MB Flash, 2 banks read-while-write, proprietary code readout protection
    - 640KB of SRAM including 64KB with hardware parity check
    - Ultra-low-power with FlexPowerControl
    - 16x timers
    - 20x communication interfaces
    - 14-channel DMA controller
    - Rich analog peripherals (independent supply)
    - True random number generator
- Compliant with the Adafruit Feather Specification
    - includes a Micro-USB port for easy power and serial connectivity
    - includes a PMIC accessible via a JST PH connector, allowing you to either power the board via a LiPo battery and/or recharge the battery via USB.
- Access to 36 additional STM32 pins (beyond the Feather pins) via 0.05" castellated edge headers
- `USER_BTN` programmable button
- `LED_BUILTIN` programmable LED (red)
- JTAG (SWD capable) debug jack
- BOOT and RESET buttons

- Modular design supports Feather pins or an expansion PCB (to break pins out to 0.1" headers for easier wiring and debugging).
- 10kΩ pull-ups on the `SDA` and `SCL` pins

Warning

The performance of the STM32 microcontroller onboard the Swan may be affected in the presence of extremely bright light including, for example, direct sunlight. Bright light may interfere with the semiconductor's operation by generating unwelcome electrical currents, performance degradation, malfunction, or shutdown.

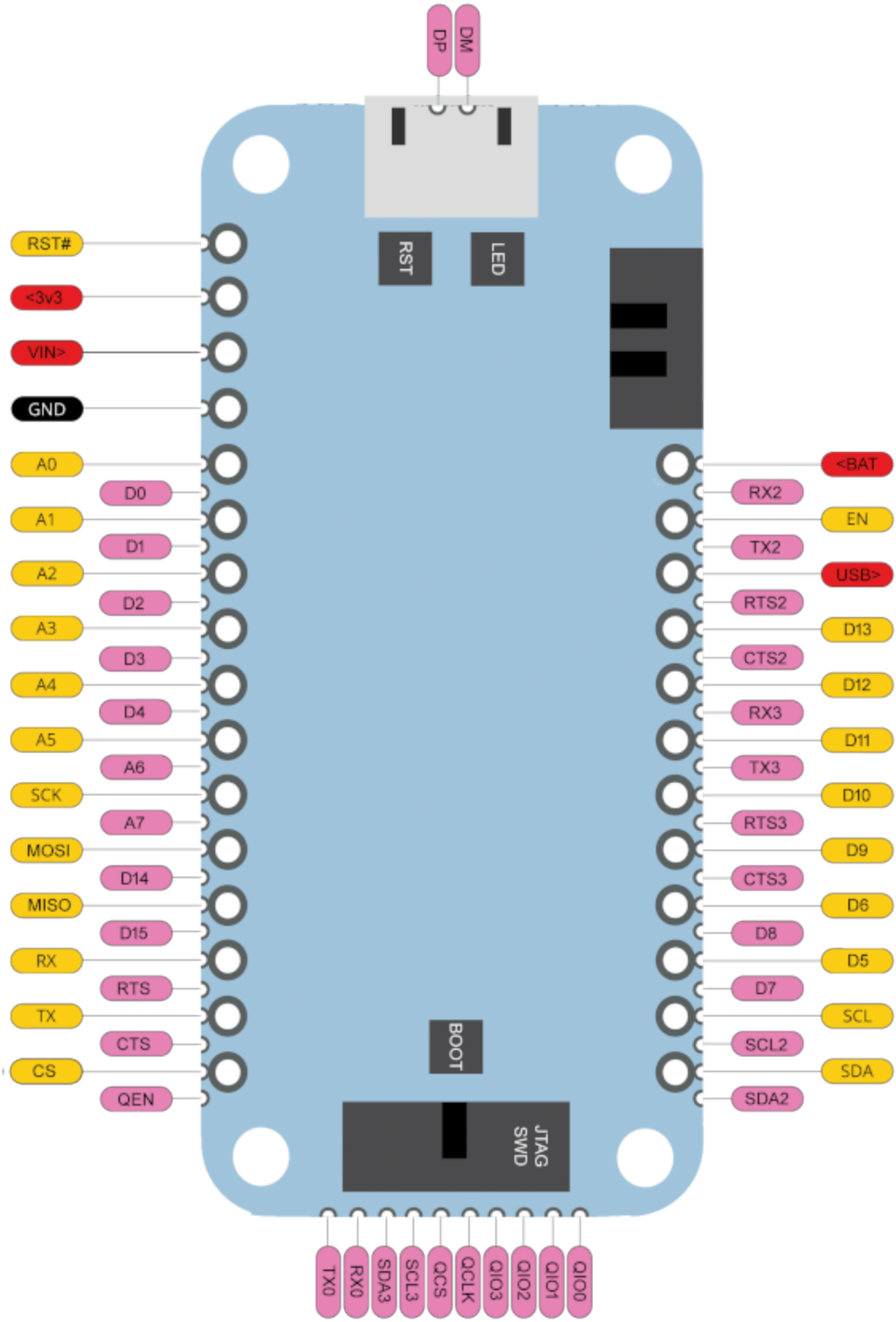
If you anticipate that bright light may shine on your device in its deployed setting, we recommend you mount the device in a shadow, or that you cover the STM32 microcontroller with an opaque tape to reduce light levels that may affect the semiconductor.

Package Configuration

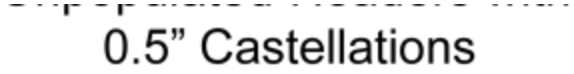
The Swan can be used as a Feather-compatible board with soldered male headers, as a part of the Blues Notecard Feather dev kit, or as a headerless PCB with base carrier board for accessing 55 IO pins on the core STM32L4R5 MCU.

Swan Embedded

The Swan comes from the factory with no headers and a castellated edge, which allows it to be embedded directly in almost any project.

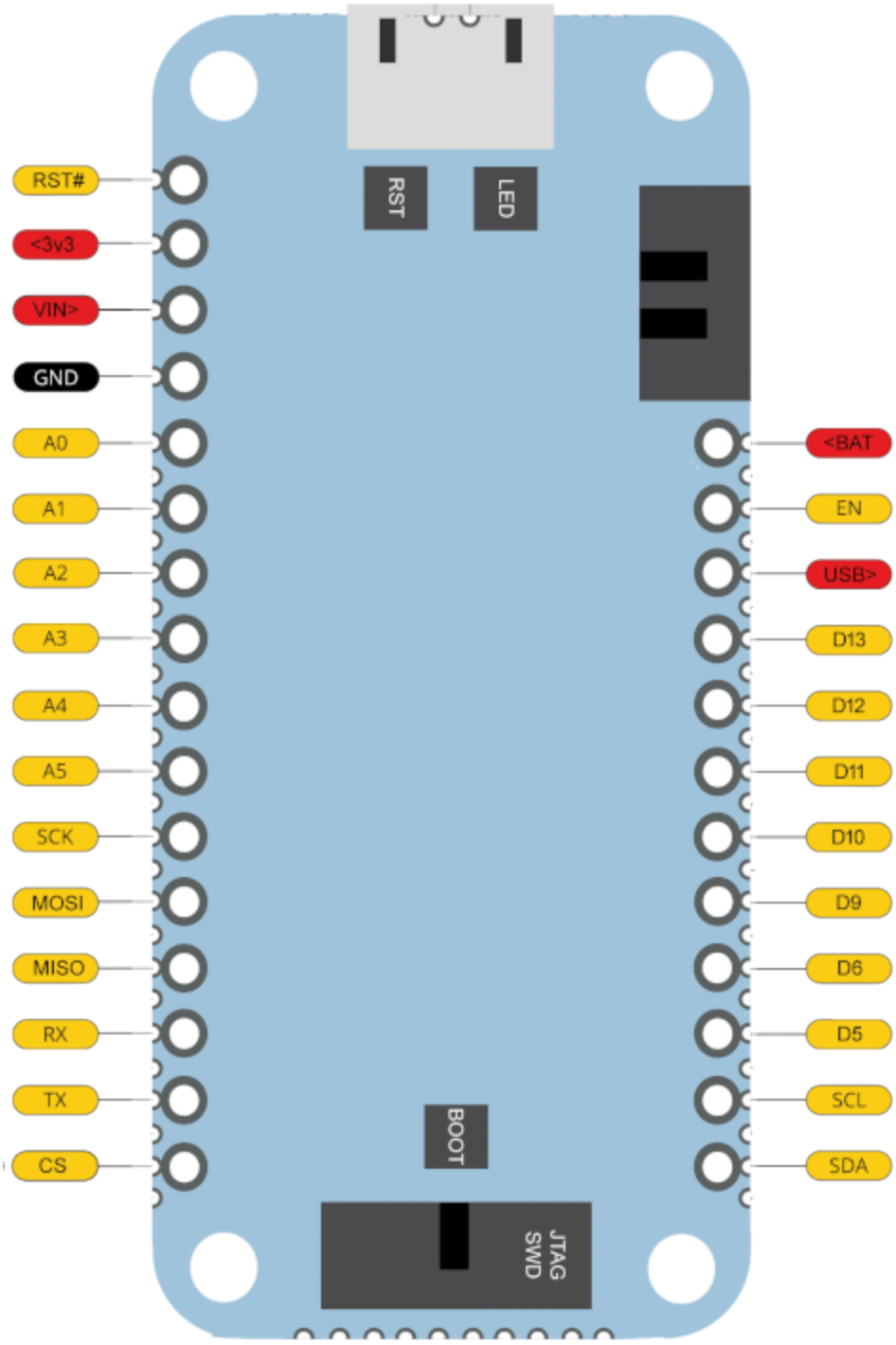


Unpopulated Headers with



Feather-compatible Swan

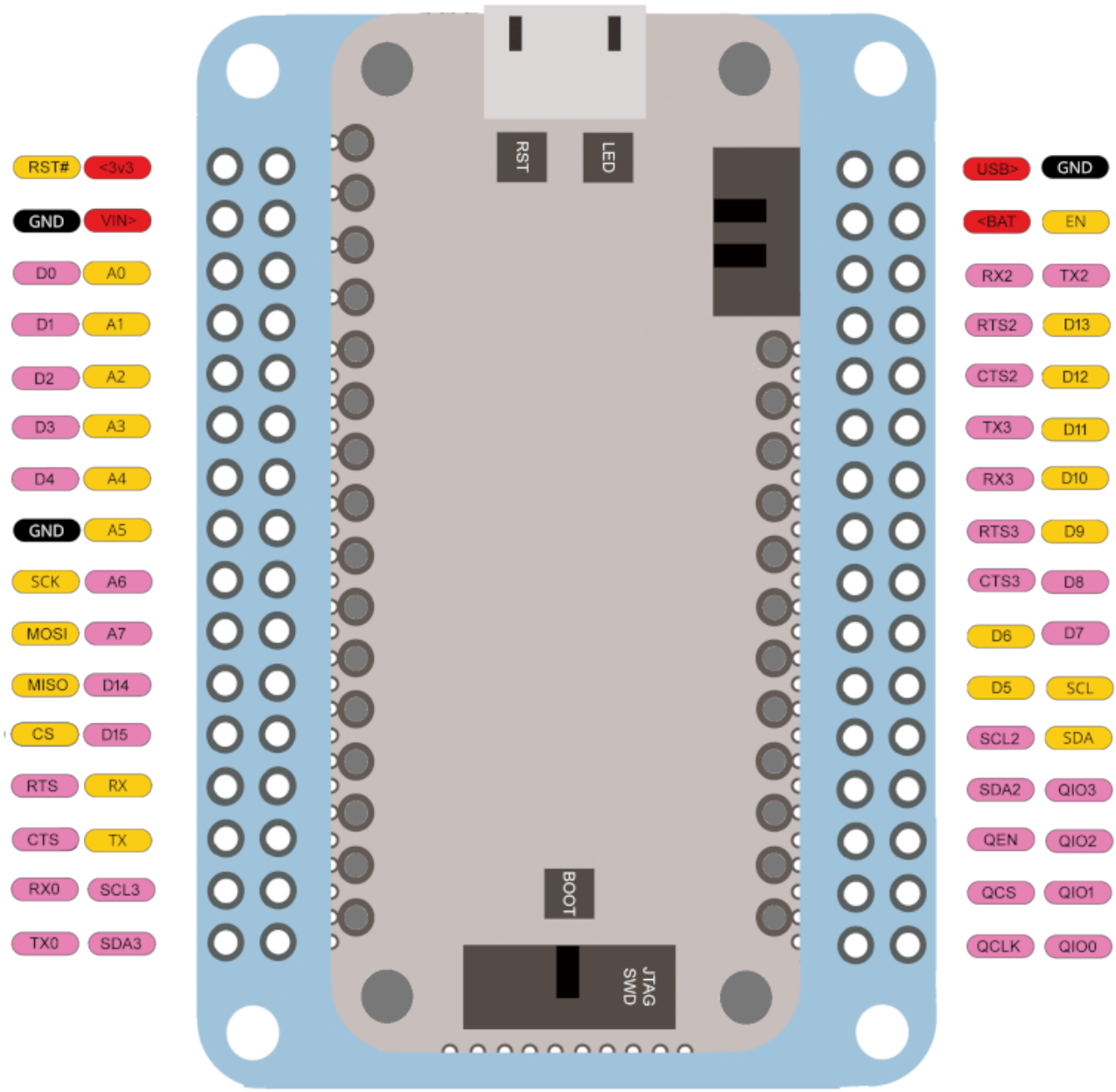
Use the included male Feather header pins to use the Swan as a Feather-compatible device.



0.1” Feather Headers

Swan Carrier

The Swan Carrier board is designed to breakout the connections along the castellated edge of the Swan board. Once the Swan has been soldered directly to the carrier board, then additional dual row headers can be soldered



Swan Carrier Board with Swan Castellations Soldered-Down
Dual 16-pin RPI-like “Double Headers”

Pin Information

The following tables contain pin definition mappings between the Swan and Carrier pins to the STM32L4R5 core MCU.

Swan Feather to STM32 Mapping

Pin #	Pin Name		Pin #	Pin Name
RST	RST#			----
	3V3			----
	VIN			----
	GND			----
PA3	A0			BAT
PA1	A1		**PE4**	EN
PC3	A2		**PC6**	USB
PC1	A3		**PA5**	D13
PC4	A4		**PA6**	D12
PC5	A5		**PA7**	D11
PD1	SCK		**PA4**	D10
PB15	MOSI		**PD15**	D9
PB14	MISO		**PE9**	D6

Pin #	Pin Name		Pin #	Pin Name
PA10	RX		**PE11**	D5
PA9	TX		**PB6**	SCL
PD0	CS		**PB7**	SDA
PC13	USER_BTN		**PE2**	LED_BUILTIN

Swan Carrier Board to STM32 Mapping

Pin #	Pin Name		Pin #	Pin Name		Pin #	Pin Name		Pin #	Pin Name
RST	RST#			3V3		**PC6**	VUSB			GND
	GND			VIN			VBAT		**PE4**	EN
PD9	D0		**PA3**	A0		**PD6**	RX2		**PA2**	TX2
PD8	D1		**PA1**	A1		**PD4**	RTS2		**PA5**	D13
PF15	D2		**PC3**	A2		**PD3**	CTS2		**PA6**	D12
PE13	D3		**PC1**	A3		**PB10**	TX3		**PA7**	D11
PE3	D4		**PC4**	A4		**PB11**	RX3		**PA4**	D10
	GND		**PC5**	A5		**PD2**	RTS3		**PD15**	D9
PD1	SCK		**PB1**	A6		**PB13**	CTS3		**PF12**	D8
PB15	MOSI		**PC2**	A7		**PE9**	D6		**PF13**	D7

Pin #	Pin Name		Pin #	Pin Name		Pin #	Pin Name		Pin #	Pin Name
PB14	MISO		**PB9**	D14		**PE11**	D5		**PB6**	SCL
PD0	CS		**PE1**	D15		**PF1**	SCL2		**PB7**	SDA
PG12	RTS		**PA10**	RX		**PF0**	SDA2		**PE15**	QIO3
PB4	CTS		**PA9**	TX		**PD5**	QEN		**PE14**	QIO2
PG8	RX0		**PC0**	SCL3		**PC11**	QCS		**PB0**	QIO1
PG7	TX0		**PC9**	SDA3		**PE10**	QCLK		**PE12**	QIO0

Pin Description Table

Pin Name	Pin Description	Voltage Tolerance
A0	I/O - GPIO, PWM, ADC	3.6V
A1	I/O - GPIO, PWM, ADC	5V
A2	I/O - GPIO, ADC	5V
A3	I/O - GPIO, ADC	5V
A4	I/O - GPIO, ADC	5V
A5	I/O - GPIO, ADC	5V
A6	I/O - GPIO, PWM, ADC	5V
A7	I/O - GPIO, ADC	5V

Pin Name	Pin Description	Voltage Tolerance
D0	I/O - GPIO	5V
D1	I/O - GPIO	5V
D2	I/O - GPIO	5V
D3	I/O - GPIO, PWM	5V
D4	I/O - GPIO, PWM	5V
D5	I/O - GPIO, PWM	5V
D6	I/O - GPIO, PWM	5V
D7	I/O - GPIO	5V
D8	I/O - GPIO	5V
D9	I/O - GPIO, PWM	5V
D10	I/O - GPIO, ADC, DAC1	3.6V
D11	I/O - GPIO, PWM, ADC	5V
D12	I/O - GPIO, PWM, ADC	5V
D13	I/O - GPIO, PWM, ADC, DAC2	3.6V
D14	I/O - GPIO, PWM	5V
D15	I/O - GPIO, PWM (*)	5V
SCL	I^2C #1 - Serial Clock	5V

Pin Name	Pin Description	Voltage Tolerance
SDA	I²C #1 - Serial Data	5V
SCL2	I²C #2 - Serial Clock	5V
SDA2	I²C #2 - Serial Data	5V
SCL3	I²C #3 - Serial Clock	5V
SDA3	I²C #3 - Serial Data	5V
3V3	Power - Constant 3.3V Supply	-
EN	Power - Chip Enable	5V
GND	Power - Ground	-
RST	Power - Reset	-
VBAT	Power - Battery Voltage Supply	-
VIN	Power - Input Voltage	-
VUSB	Power - USB Voltage Supply	-
RX0	Serial #0 - Receive	5V
TX0	Serial #0 - Transmit	5V
CTS	Serial #1 - Clear to Send	5V
RTS	Serial #1 - Request to Send	5V
RX	Serial #1 - Receive	5V

Pin Name	Pin Description	Voltage Tolerance
TX	Serial #1 - Transmit	5V
CTS2	Serial #2 - Clear to Send	5V
RTS2	Serial #2 - Request to Send	5V
RX2	Serial #2 - Receive	5V
TX2	Serial #2 - Transmit	5V
CTS3	Serial #3 - Clear to Send	5V
RTS3	Serial #3 - Request to Send	5V
RX3	Serial #3 - Receive	5V
TX3	Serial #3 - Transmit	5V
CS	SPI - Chip Select	5V
MISO	SPI - Main In Secondary Out	5V
MOSI	SPI - Main Out Secondary In	5V
SCK	SPI - Serial Clock	5V
QCLK	Quad SPI - Serial Clock	5V
QCS	Quad SPI - Chip Select	5V
QEN	Quad SPI - Enable	5V
QIO0	Quad SPI - Bit 0	5V

Pin Name	Pin Description	Voltage Tolerance
QIO1	Quad SPI - Bit 1	3.6V
QIO2	Quad SPI - Bit 2	5V
QIO3	Quad SPI - Bit 3	5V
ENABLE_3V3	Enable External `3V3` Regulator	-
LED_BUILTIN	Built-in LED	-
USER_BTN	User Button	-

NOTE: *All digital I/O pins are interrupt capable.*

(*) Not supported on CircuitPython, since it relies on Timer 17, with 16 being the maximum supported.

Note

Swan's A0-A5 pins use different STM32 GPIO ports than the D-series pins. In particular, A4 and A5 map to **PC4** and **PC5** (not PA4/PA5). The two DAC outputs are on **D10** (PA4, DAC1) and **D13** (PA5, DAC2). When using Arduino, reference A0-A5 by their pin names (e.g. `A4`, `A5`) and not by the underlying STM32 port names to ensure correct pin resolution.

Specifications

Electrical Characteristics

DC Characteristics

Description	Minimum	Maximum	Unit
`VIN` Supply Voltage	2.5	5.5	V
`VBAT` Supply Voltage	2.5	5.5	V
`VUSB` Supply Voltage	2.5	5.5	V
Supply Current	0.5	2.0	A
`3V3` Output @ 5V	1.07	2.09	A

Absolute Maximum Ratings

Description	Minimum	Maximum	Unit
Storage temperature	-35	70	°C

Ordering Information

- Please visit the Swan product page for ordering information.

Design Files

Open source hardware designs for the Swan and all Blues hardware are maintained in the note-hardware GitHub repository.

Board Errata

Terms and Conditions

Visit Blues Hardware Terms & Conditions.

Revision History

Author	Date	Summary
Zachary J. Fields	28 JUL 2021	Document drafted
Brandon Satrom	29 SEP 2021	Final Edits for publication
Zachary J. Fields	20 OCT 2022	Swan v3.0 Updates
Rob Lauer	2 FEB 2023	Warning re: STM32 light sensitivity

Contact Information

For other questions about the Swan, visit the Blues Forum.

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