



PRODUCT DATASHEET

Notecard Datasheet

NOTE-NBGLWX

An affordable, embeddable module for cellular, satellite, and WiFi connectivity.

Blues Notecard® Datasheet: NOTE-NBGLWX

An affordable, embeddable module for cellular, satellite, and WiFi connectivity.

Notecard for Skylo is an affordable all-in-one solution that includes satellite uplink and downlink data with the cost of the device, in partnership with [Skylo](#). Notecard for Skylo offers a JSON-based programming interface consistent with Notecard.

Notecard for Skylo is offered in a single SKU, with LTE-M, NB-IoT, and GPRS global cellular coverage, without requiring a second module in a new or existing design.

Functional Description

Notecard is an embeddable device-to-cloud data pump designed to remove the complexity and friction inherent in traditional IoT solutions. The Notecard family includes models supporting secure cellular, WiFi, LoRa, or satellite connectivity, enabling rapid development and iteration at a predictable, low cost. With as little as two lines of code on your host MCU, and no external libraries or dependencies, any Notecard model can securely move data from device to cloud.

Specifically, the Notecard NOTE-NBGLWX is:

- A drop-in embeddable data storage and transport module for [cellular IoT](#) products, pumping JSON-formatted or binary data ("Notes") bi-directionally between device and cloud:
 - JSON from/to MCU application using I2C, Serial, or USB.
 - JSON to/from your cloud app using HTTPS or MQTT.
 - JSON is auto-tagged with date/time and cell tower location. GPS location tagging is also available, but the GPS module is off by default and requires explicit activation.
- A removable and field-upgradable system-on-a-module (SOM).
- A cellular device without the monthly fees.

The NOTE-NBGLWX also has:

- A WiFi module for additional connectivity and location triangulation.
- Satellite (NTN) connectivity through its cellular modem for fallback, with no monthly fees.

Features

- **Low-power.** Designed to operate on battery power, be "always-on", maintain time & location, while drawing minimal current when idle.
- **MCU-agnostic.** Will support any MCU or single-board computer as your app processor - even low-memory, 8-bit microcontrollers.
- **Hassle-free.** The integrated, embedded MFF2 SIM features both North American and Global coverage options. No SIM or carrier subscription is required. Includes 10-years of global cellular service with 500MB of data (more data options available upon request).
- **Connected.** Provides connectivity without the hassle of dealing with SSIDs, passwords, access points, gateways, carriers, or SIMs.
- **Secure.** Integrated STSAFE Secure Element with hardware crypto, true hardware random number generator, and a factory-installed ECC P-384 certificate provisioned at chip manufacture. *Note that the certificate is no longer valid after November 16, 2047.*
- **Simple.** Uses a JSON command interface over I2C, UART, or USB. Allows you to connect your 3.3V or 1.8V MCU, while eliminating complex AT commands and state to manage.
- **Power-conscious.** Integrated GPS with LIS2DTW accelerometer, for power-optimized location/motion awareness. Not to mention a mostly-offline data sync mode for low power, and always-online mode for low latency.
- **Encrypted.** Secures transactions without any provisioning challenges, using encrypted "off the internet" communication.
- **Efficient.** Battery-powered cellular without the complexity of managing modems, connections, queues, or storage.
- **Integrated.** Utilizes an extremely thin cloud infrastructure that directly routes your data to where it belongs: AWS, Azure, GCP, or your own cloud.
- **Built for data.** Data routing and simple "no code/low code" visual data stream analysis through Notehub.io (SaaS), or host and integrate Notehub functionality into your own app (OSS).

Package Configuration

NOTE-NBGLWX – Notecard, Narrowband, Global, 500MB + WiFi + Satellite

- Product Name: Notecard for Skylo
- Modem: Quectel BG95-S5
- Data Networks: LTE-M, NB-IoT, GPRS, Skylo
- WiFi Module: Silicon Labs WFM200S WiFi Transceiver Module
- Radio: 2.4 GHz 802.11b/g/n
- General Region: See [Cellular Service](#) and [Satellite Service](#) below
- Data included: 500MB (cellular), 10KB (Skylo)

[View in Store](#) 

Modem Datasheet

To best determine the supported bands and radio access technologies, RATs, refer to the modem datasheet.

- [Quectel BG95-S5](#) 

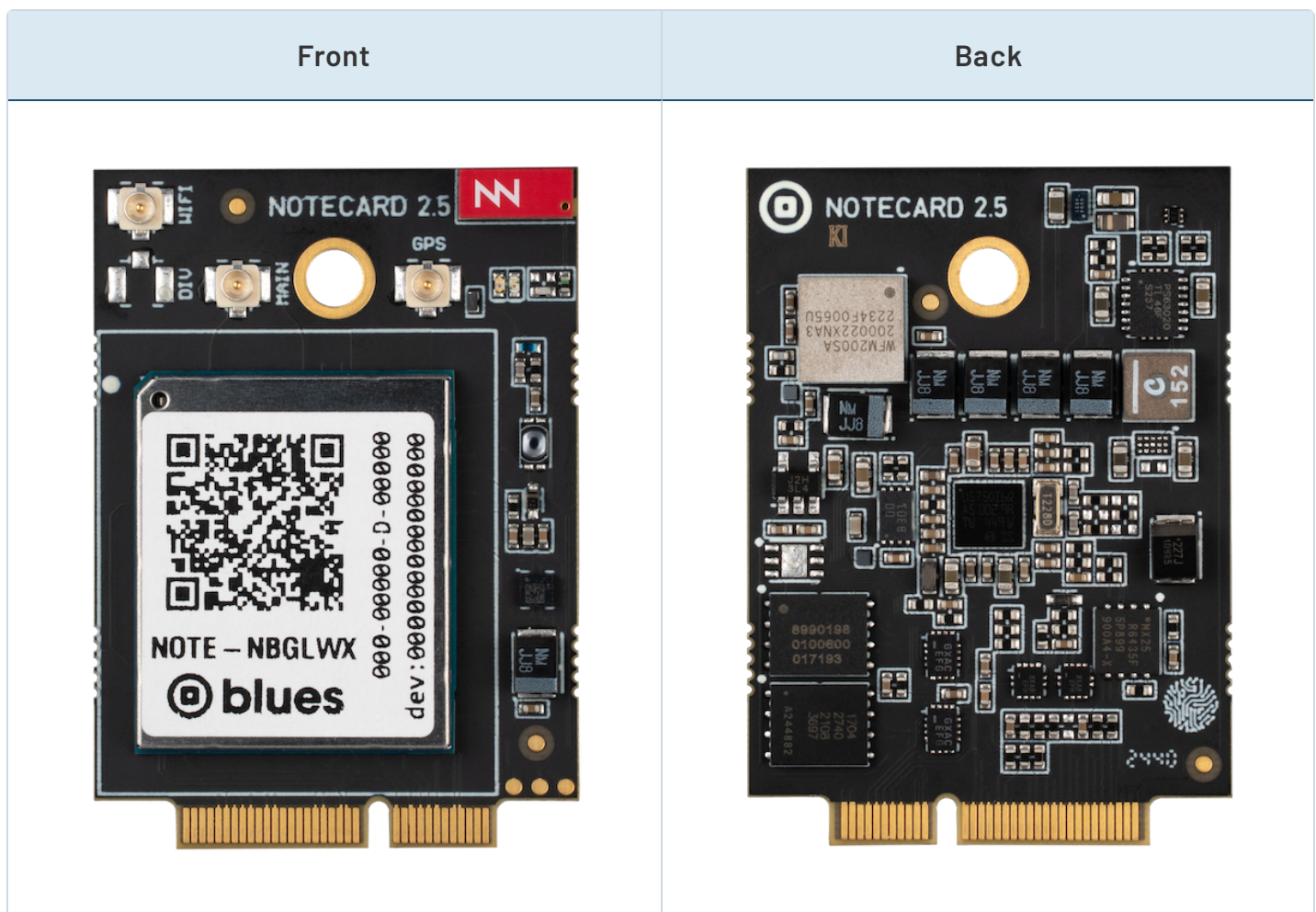
Block Diagram

Notecard for Skylo is packaged using a compact removable form factor, 30mm x 42mm.

Open hardware schematics for both the Notecard and Notecarrier boards [are available on GitHub](#)[🔗], making it a straightforward task to embed the Notecard into a broad variety of host device designs.

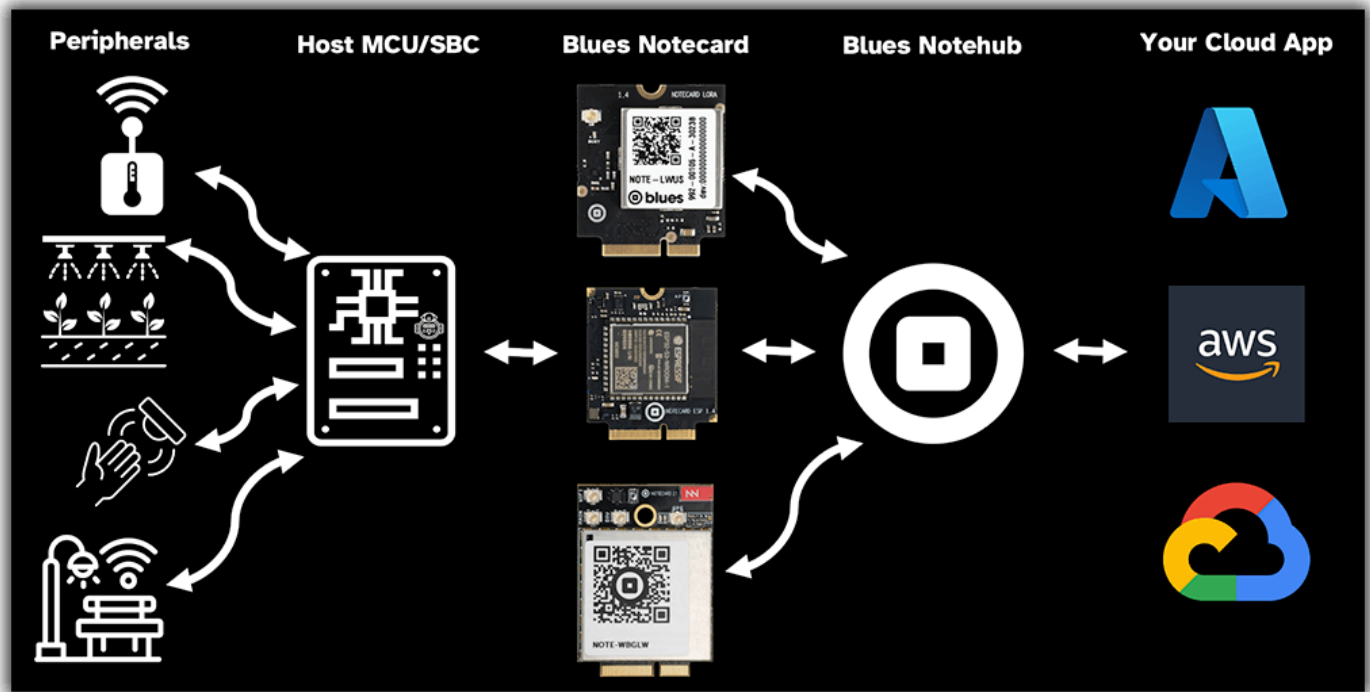
The Notecard has an embedded MFF2 SIM that enables its included cellular service coverage, with an integrated external SIM switch for applications that require such a capability.

The Notecard can interface with the host MCU at either 1.8v or 3.3v levels.



Typical Application

As shown below, Notecard is not an application processor and hosts no customer application code. It can be used as a data pump peripheral that is focused on bidirectional, asynchronous, secure data staging and transfer of [JSON Notes](#).



Key Features

- **Tracking**

Notes transferred by the Notecard can be tagged with time and location. Location is obtained using a GPS receiver, and time is available from both the cellular network and GPS. To optimize energy use in devices when not in motion, the Notecard has a MEMS-based, LIS2DTW accelerometer that determines when use of the GPS is not required.

- **Security**

Modern services require that the cloud and the device perform bidirectional authentication so that neither can be spoofed. For many applications it's important that over-the-air and over-the-wire data is encrypted. For this reason, the Notecard integrates an STSAFE Secure Element which contains symmetric keys manufactured into the chip. Neither the manufacturer of the Notecard

nor the manufacturer of the customer's product has any need to handle or manage secure key material. The keys generated by STMicroelectronics for the Notecard use ECC with the NIST P-384 curve, and the signature algorithm is ECDSA-with-SHA384.

- **Low Power Consumption**

The Notecard has sophisticated power control and makes heavy use of variable clock speeds. This enables the Notecard to have a low idle current consumption, while still supporting active UART and I2C communication.

Power Information

The Notecard's main supply voltage (`VMODEM_P`) is used for the cellular modem and associated circuitry. The Notecard has on-board regulators designed for direct connection to a battery, so any voltage in the range of 2.5V to 5.5V may be provided.

The Notecard typically sits in an idle mode waiting for a request from the host MCU, however the Notecard current draw increases to the ~250mA range when the modem is active. Furthermore, when in a region requiring the use of GSM, it can spike to up to nearly 2A for a few milliseconds. The modem also draws 10's of mA when the GPS is receiving or the CPU is performing session encryption. As such, it's recommended that `VMODEM_P` be directly connected to a battery or other supply that is capable of such brief spikes. It is also recommended that PCB traces for `VMODEM_P` and `GND` be designed to handle such current.

The Notecard's logic voltage (`VIO_P`) is provided by the Notecarrier or host system for digital communication; it will be either 1.8V or 3.3V. Although the Notecard typically draws very little current, this supply should be designed with a 150mA budget allocated to the Notecard.

Pin Name	Direction	Pin Numbers	Usage
GND	--	3,5,6,11,18,33,39,45,51,57,71,73	Ground
VIO_P	IN	2,4	1.8V or 3.3V @ 150mA
VUSB	IN	13	USB Serial proxy for "line power", with respect to dynamic line voltage detection
VMODEM_P	IN	70,72,74	2.5V to 5.5V, capable of sustained 750mA draw

Note

In order to take advantage of various Notecard features pertaining to "dynamic line voltage detection" (both now and in the future), or establish a USB Serial connection to the Notecard, you must connect the `VUSB` power pin and support the USB power design aspects of the Notecard.

Features include:

- Continuous mode behavior with the `usb` flag.
- Triangulate mode behavior with the `usb` flag.
- Monitor mode behavior.

Reset and Loss of Power

Warning

A power-loss event occurs whenever the Notecard loses power on `VIO_P` or `VMODEM_P`, or the Notecard's `NRST` pin is pulled low.

The modems used on all cellular Notecard variants are designed by their manufacturers to use best efforts to maintain integrity when recovering from a power-loss event. That said, there is a small chance that recovery will be impossible and the modem will be rendered permanently unusable.

Upon recovering from any power-loss event, the Notecard initiates a procedure to ensure filesystem integrity. The Notecard also conducts a procedure upon first connection to Notehub after power loss to ensure consistency between Notecard's file system and Notehub's replica copy of those files. This verification procedure is done to protect and ensure the integrity of your product, and you should expect additional use of network bandwidth when these rare events occur.

It is the responsibility of every product designer to ensure that designs utilizing Notecard provide constant power to `VMODEM_P` and `VIO_P`, at the cost of as little as 8 μ A, so as to ensure that power-loss events do not occur as a matter of course from the perspective of the Notecard.

If repeated power failures are expected and unavoidable in a product's use, designs must incorporate a small battery or lithium ion capacitor to provide backup power, and the Notecard firmware should be configured to enter a quiescent state when operating on its backup supply.

Frequent power-loss events will result in the voiding of the Notecard warranty. In addition, since repeated Notecard resets can be indistinguishable from "denial of service" attacks on the Notehub, Blues also reserves the right to deny access to devices that exhibit such behavior.

Antenna Requirements

If an application utilizes GPS location, a GPS antenna is also required. The Notecard design allows the option of a passive or active GPS antenna, and can supply a 3.3V - 4.0V bias voltage to power an active antenna's LNA. If an active antenna requires a different voltage, the board designer can inject whatever voltage they require into the antenna's coax by feeding it to the `VACT_GPS_IN` pin.

Active GPS

If you choose to connect an Active GPS antenna to the Notecard GPS u.fl connector, you are required to provide your antenna's DC bias voltage to the center conductor of the coax antenna via `VACT_GPS_IN`. For your convenience and the Notecard supplies a 3.3V - 4.0V power supply at `VACT_GPS_OUT` whenever it activates its GPS, so `VACT_GPS_OUT` can be connected directly to `VACT_GPS_IN`. `VACT_GPS_OUT` must not be used for any other purpose than powering an active antenna Low-Noise Amplifier.

Pin Name	Direction	Pin Number	Usage
VACT_GPS_IN	IN	22	Active GPS antenna DC bias voltage
VACT_GPS_OUT	OUT	20	+3.3V - 4.0V from Notecard when GPS is operating

Notecard for Skylo includes three u.FL connectors for use with external antennas.

1. The `MAIN` u.FL connector must be attached to the included Skylo-certified LTE-capable antenna that supports S-Band / L-Band frequencies on B23, B255, B256 bands.
2. The `GPS` u.FL connector must be attached to a GPS/GNSS antenna. Both passive and active GPS antennas are supported (see [Active GPS](#) above).
3. The `WIFI` u.FL connector may optionally be attached to an external antenna that supports the 2.4 GHz frequency band. Notecard for Skylo also includes an onboard antenna for the WiFi function.

The `MAIN` and `GPS` antennas must be placed outdoors and oriented towards the sky.

Warning

Notecard for Skylo is certified on Skylo's network exclusively with the antenna provided with the device. If you replace or modify the antenna, Skylo classifies the device as uncertified and may block it.

Should you wish to pursue Skylo certification with a different antenna, you'll need to work with your test house to produce a report that demonstrates that the combination of device + antenna does not exceed an EIRP of 30dBm. This delta test lab report demonstrates that the transmission power of the device does not exceed regulatory limits and can be done by any lab that is authorized to do CTIA/OTA testing. If you don't have a test house that can perform this test, [Blues can recommend one](#).

Regardless of antenna choice, we strongly advise comprehensive field testing in the final enclosure and deployment environment to ensure reliable connectivity.

Cellular Service

A 10-year data plan with 500MB of cellular data is embedded in the Notecard, with more available for applications requiring it. No other actions related to cellular activation or deactivation are required. There are no "know your customer" restrictions, so the Notecard can be embedded in a product without knowing the ultimate end-customer. Placement of a product can be permanent. Although the coverage area may change from time to time because of local technical and regulatory restrictions.

Covered Countries

To approximately forecast the Notecard's compatibility with a country, you can research the networks available (for example on [Wikipedia](#)) and cross-reference with the [modem datasheet](#).

Warning

This list of covered countries does not imply any widespread deployment or national coverage. Carrier agreements change over time. This list is for planning purposes only - we have not independently verified coverage.

If your experience differs please [let us know](#) so we can keep this list updated.

Covered Countries			
Afghanistan	Aland Islands	Albania	Anguilla
Antigua and Barbuda	Argentina	Armenia	Aruba
Australia	Austria	Azerbaijan	Bahamas
Bangladesh	Belarus	Belgium	Belize
Bermuda	Bolivia	Bosnia and Herzegovina	Bulgaria

Covered Countries			
Burkina Faso	Cambodia	Cameroon	Canada
Cayman Islands	Chad	Chile	Colombia
Costa Rica	Croatia	Cyprus	Czech Republic
Denmark	Dominica	Dominican Republic	Dutch Antilles
Ecuador	El Salvador	Estonia	Ethiopia
Faroe Islands	Fiji	Finland	France
Gabon	Georgia	Germany	Ghana
Gibraltar	Greece	Greenland	Grenada
Guam	Guatemala	Guernsey	Haiti
Honduras	Hong Kong	Hungary	Iceland
Indonesia	Ireland	Isle Of Man	Israel
Italy	Jamaica	Japan	Jersey
Jordan	Kazakhstan	Kenya	Kyrgyzstan
Lao	Latvia	Lesotho	Liechtenstein
Lithuania	Luxembourg	Macao	Macedonia
Malawi	Malaysia	Mali	Malta
Martinique	Mayotte	Mexico	Moldova

Covered Countries			
Mongolia	Montenegro	Montserrat	Morocco
Mozambique	Nepal	Netherlands	New Zealand
Nicaragua	Niger	Norway	Panama
Paraguay	Peru	Poland	Portugal
Puerto Rico	Romania	Rwanda	Saint Barthelemy
Saint Kitts and Nevis	Saint Lucia	Saint Martin	Seychelles
Sierra Leone	Singapore	Slovakia	Slovenia
South Africa	Spain	Sri Lanka	Suriname
Sweden	Switzerland	Taiwan	Tajikistan
Tanzania	Thailand	Trinidad and Tobago	Turks and Caicos Islands
Uganda	Ukraine	United Kingdom	United States
Uruguay	Virgin Islands (British)	Zambia	Zimbabwe

Countries Not Included*			
Algeria	French Guiana	Mauritania	Saudi Arabia
American Samoa	French Polynesia (Tahiti)	Mauritius	Senegal

Countries Not Included*			
Andorra	French Southern Territories	Micronesia	Serbia
Angola	Gambia	Monaco	South Korea
Bahrain	Guadeloupe	Myanmar	South Sudan
Barbados	Guinea	Namibia	Sudan
Benin	Guinea-Bissau	Nigeria	Swaziland
Bhutan	Guyana	North Korea	Timor-Leste
Botswana	India	Northern Mariana Islands	Togo
Brazil	Iraq	Oman	Tonga
Brunei Darussalam	Ivory Coast	Pakistan	Tunisia
Burundi	Kiribati	Palau	Turkey
Cape Verde	Kosovo	Papua New Guinea	United Arab Emirates
Central African Republic	Kuwait	Philippines	Vanuatu
China	Lebanon	Qatar	Venezuela
Curacao	Liberia	Reunion	Vietnam
Democratic Republic of the Congo	Libya	Russia	Yemen

Countries Not Included*			
Egypt	Madagascar	Samoa	
Equatorial Guinea	Maldives	Sao Tome and Principe	

**These countries are not covered by the embedded MFF2 SIM, and require use of a user-supplied, external SIM*

Satellite Coverage

Satellite coverage for Notecard for Skylo is provided by Skylo. Please consult [Skylo's map](#) for more specific information on country- and region-specific satellite coverage.

Pin Information

Pin Definitions

Pin Name	Pin Description
ALT_DFU_BOOT	Used by Notecard to control the BOOT pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_RESET	Used by Notecard to control the RESET pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_ACTIVE	Driven low by Notecard to indicate to the host that an Outboard DFU is in progress.
ALT_DFU_RX	Input on which Notecard receives data from the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ALT_DFU_TX	Output on which Notecard sends data to the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ATTN_P	Attention pin (requires protection)
AUX_EN_P	Auxiliary serial port enable (requires protection)
AUX_RX_P	Auxiliary UART receive (requires protection)
AUX_TX_P	Auxiliary UART transmit (requires protection)
AUX1	Auxiliary GPIO pin 1
AUX2	Auxiliary GPIO pin 2
AUX3	Auxiliary GPIO pin 3

Pin Name	Pin Description
AUX4	Auxiliary GPIO pin 4
AUX_CHARGING	Charge detection
BOOT	Test/debug pin used to force Notecard into its bootloader
GND	Ground
NC	No connection(must be left open)
NRST	Active-low (not) reset*
RSVD	Reserved for internal use (electrically connected and must be left open)
RX_P	UART receive (requires protection - Notecard has onboard 10K pull-up resistors)
SCL_P	I2C clock (requires protection - Notecard has onboard 10K pull-up resistors)
SDA_P	I2C data (requires protection - Notecard has onboard 10K pull-up resistors)
SIM_CLK	External SIM clock
SIM_IO	External SIM input/output
SIM_NPRESENT	External SIM active-low (not) present
SIM_RST	External SIM reset
SIM_VCC	External SIM positive (common collector) voltage
TX_P	UART transmit (requires protection)
USB_DN	USB data negative

Pin Name	Pin Description
USB_DP	USB data positive
VACT_GPS_IN	Active antenna GPS bias voltage
VACT_GPS_OUT	Active antenna GPS 3.8V from Notecard
VIO_P	I/O Voltage (requires protection)*
VMODEM_P	Voltage modem (requires protection)*
VUSB	USB Active indicator from 3V3 to 5V

* See the [power information](#) section for important product design considerations related to reset and loss of power conditions.

Pin Description

Notecard M.2 Key E, Edge Connector Pinout

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
1	NC		Power	VIO_P	2
3	GND	Power	Power	VIO_P	4
5	GND	Power	Power	GND	6
7	USB_DP	USB Serial	External SIM	SIM_VCC	8
9	USB_DN	USB Serial	External SIM	SIM_RST	10
11	GND	Power	External SIM	SIM_IO	12

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
13	VUSB	USB Serial	External SIM	SIM_CLK	14
15	RSVD		External SIM	SIM_NPRESENT	16
17	RSVD		Power	GND	18
19	RSVD		Active GPS	VACT_GPS_OUT	20
21	NC		Active GPS	VACT_GPS_IN	22
23	RSVD			NC	24
25	NC			NC	26
27	NC			NC	28
29	NC			NC	30
31	NC		Outboard DFU	ALT_DFU_BOOT	32
33	GND	Power	Outboard DFU	ALT_DFU_RESET	34
35	RSVD		Outboard DFU	ALT_DFU_ACTIVE	36
37	RSVD		Auxiliary Ports	AUX_CHARGING	38
39	GND	Power	I2C Serial	SCL_P	40
41	ALT_DFU_RX	Outboard DFU	I2C Serial	SDA_P	42
43	ALT_DFU_TX	Outboard DFU		RSVD	44
45	GND	Power	Auxiliary Ports	AUX1	46

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
47	NC		Auxiliary Ports	AUX2	48
49	NC		Auxiliary Ports	AUX3	50
51	GND	Power	Auxiliary Ports	AUX4	52
53	RSVD		Attention	ATTN_P	54
55	RSVD		Auxiliary Ports	AUX_EN_P	56
57	GND	Power	Auxiliary Ports	AUX_RX_P	58
59	RSVD		Auxiliary Ports	AUX_TX_P	60
61	RSVD		UART Serial	RX_P	62
63	RSVD		UART Serial	TX_P	64
65	BOOT	Bootloader		RSVD	66
67	NRST	Reset		RSVD	68
69	NC		Power	VMODEM_P	70
71	GND	Power	Power	VMODEM_P	72
73	GND	Power	Power	VMODEM_P	74
75	NC				

Link: [Digi-Key part number of the connector](#) - Both Digi-Key and Mouser have pictures for this part number that show a component with a different key, but both have links to datasheet/drawing/CAD models.

Note

All pins whose **Functional Interface** is marked "[Power](#)" must be connected.

All pins named `NC` have no connection on the Notecard and must be left open.

All pins named `RSVD` are reserved for internal use. These pins are electrically connected on the Notecard and **MUST** be left open. Furthermore, any pin not used in a design **MUST** also be left open.

`BOOT` (pin 65) is a test/debug pin, not a functional interface. It is not required for normal operation and should be left open, but routing it to a test point on your carrier board makes it possible to recover a Notecard whose firmware update was interrupted. See [Bootloader](#) for details.

Those pins ending with `_P` may be optionally protected from anomalous external conditions on some Notecarrier designs, depending upon use-case specific requirements.

Technical Details

Host Microcontroller API

Notecard supports a rich, simple API whose syntax is standard JSON. The developer can communicate requests to Notecard, generally by using little more than `printf` functions available in most programming languages.

Serial Communication

JSON requests and responses (the Notecard's Application Programming Interface "API") may be sent over any of the following interfaces:

- USB Serial Interface
- UART Serial Interface
- I2C Interface

Note

If NOT using a [Notecard firmware library](#), you may unintentionally send requests to the Notecard so fast that you overflow the 1500 byte buffer used to receive data (whether it be I2C, Serial, or UART). The solution is to pause 250 ms after every 250 bytes sent and ensure the total size of each [NDJSON](#) object sent is no more than 8KB.

API Reference

For API usage, names, and parameters, please refer to the [Notecard API Reference](#).

USB Serial Interface

The USB Serial Interface appears to the host as a USB 2.0 Full Speed CDC device. You can access it from Linux, Windows, or macOS without a device driver using terminal emulation software. Newline-delimited JSON requests may be sent directly as UTF-8 text over this port, or you may use the open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
USB_DN	I/O	9	USB D- data signal
USB_DP	I/O	7	USB D+ data signal
VUSB	IN	13	+5V from USB
GND	I/O	11	Ground from USB

UART Serial Interface

The UART Serial Interface operates at `VIO_P` at a fixed baud rate of 9600 using eight data bits, no parity bit, and one stop bit. Newline-delimited JSON requests may be sent directly as UTF-8 text over this port, or you may use the open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
RX_P	IN	62	Receive data signal
TX_P	OUT	64	Transmit data signal

I2C Interface

The Notecard acts as an I2C secondary device operating at `VIO_P`, and it implements a simple [Serial-over-I2C protocol](#). You can access it from an embedded host using open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
SCL_P	IN	40	I2C clock
SDA_P	I/O	42	I2C data

Host Microcontroller Hardware Interface

Attention Interrupt

Using software, you can optionally configure Notecard to use the `ATTN` output pin to:

- Inform the host MCU of certain asynchronous events (such as incoming data availability, or Notecard motion) in an interrupt-driven manner rather than just polling.
- Place the host MCU into a power-off sleep state and wake it back up again.

Pin Name	Direction	Pin Number	Usage
ATTN_P	OUT	54	Attention pin

Note

This pin operates at `VIO_P`. If it is unused it can be left disconnected.

Auxiliary Ports

An optional Auxiliary UART Serial Interface is available on the `AUX_RX_P` and `AUX_TX_P` pins. This interface is inactive unless enabled by raising the `AUX_EN_P` pin since this UART consumes extra power when in use. It operates at `VIO_P` at a fixed baud rate of 115200 using eight data bits, no parity bit, and one stop bit. If this interface is unused, the three pins can be left disconnected.

The AUX1-4 pins operate at `VIO_P` and can be configured in software to operate in several optional modes such as GPS Tracking Mode, GPIO Mode, and Internet Button Mode. If these pins are unused, they can be left disconnected.

Pin Name	Direction	Pin Number	Usage
AUX_EN_P	IN	56	Enables serial port on <code>AUX_RX_P</code> and <code>AUX_TX_P</code>
AUX_RX_P	IN	58	RX data for serial port enabled by <code>AUX_EN_P</code>

Pin Name	Direction	Pin Number	Usage
AUX_TX_P	OUT	60	TX data for serial port enabled by <code>AUX_EN_P</code>
AUX1	I/O	46	General Purpose I/O
AUX2	I/O	48	General Purpose I/O
AUX3	I/O	50	General Purpose I/O
AUX4	I/O	52	General Purpose I/O
AUX_CHARGING	I/O	38	Alt. attention pin or charge detection

Note

The auxiliary serial port is normally disabled because it consumes up to 100µA of power when enabled.

Outboard DFU Interface

As an alternative to using the Auxiliary Ports for Outboard DFU, there are also dedicated pins on certain Notecards. For more information on using this interface, check the [detailed documentation](#)

Pin Name	Direction	Pin Number	Usage
ALT_DFU_BOOT	OUT	32	Used by Notecard to control the BOOT pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_RESET	OUT	34	Used by Notecard to control the RESET pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.

Pin Name	Direction	Pin Number	Usage
ALT_DFU_ACTIVE	OUT	36	Driven low by Notecard to indicate to the host that an Outboard DFU is in progress.
ALT_DFU_RX	IN	41	Input on which Notecard receives data from the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ALT_DFU_TX	OUT	43	Output on which Notecard sends data to the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.

External SIM

Notecard contains an integrated, embedded MFF2 SIM but may also be configured to use an external 1.8V Micro-SIM via this interface. This interface is powered by the Notecard. Note that use of an external SIM card also requires that the Notecard be re-configured in software with the APN, access technology, and bands appropriate for the SIM's carrier.

Note

Notecard for Skylo contains two embedded MFF2 SIMs: one for cellular service and one for the Skylo satellite (NTN) service.

Pin Name	Direction	Pin Number	Usage
SIM_CLK	OUT	14	Clock
SIM_IO	I/O	12	Data

Pin Name	Direction	Pin Number	Usage
SIM_NPRESENT	IN	16	Active-low input indicating presence of SIM card, else must be <code>NC</code> . Required if an external SIM is used, and is supported by the mechanical switch in SIM card slot hardware.
SIM_RST	OUT	10	Reset
SIM_VCC	OUT	8	+1.8V supply for external Micro-SIM

SoftAP Button

NOTE-NBGLWX includes an onboard **AP** push button used to activate SoftAP (software enabled access point) mode for WiFi configuration. Press and hold the button for at least one full second, then release, to start SoftAP mode. For more information, see [Connecting to a WiFi Access Point](#). SoftAP mode can also be activated programmatically with a `card.wifi` request.

Reset

Use of this pin is optional. If the host system has a global reset line, caution should be used when connecting this pin to the host system's reset because the Notecard may independently pull the line low in software. Restrictions on this pin are:

- If this pin is not used, it must remain not connected (`NC`).
- The pin is active-low. It must be held low for at least 350nS for a clean reset.
- This pin must never be pulled-up. A pull-up would interfere with the Notecard's own internal watchdog timer and thus will prevent reliable operations.
- Some Notecarriers may invert this signal to be active-high.

Pin Name	Direction	Pin Number	Usage
NRST	I/O	67	Active-low reset

Bootloader

BOOT (pin 65) is a test/debug pin that forces Notecard into its bootloader instead of running its firmware. Its primary use is recovering a Notecard whose firmware update was interrupted, leaving it unable to boot normally. This pin plays no part in normal operation and use of it is optional.

To enter the bootloader, hold **BOOT** at **VIO_P** while resetting the Notecard, then release **NRST** (pin 67) before releasing **BOOT**. Notecard will stay in its bootloader, ready to accept firmware over the [USB serial interface](#).

Restrictions on this pin are:

- If this pin is not used, it must remain not connected (**NC**).
- Never apply a voltage above **VIO_P** to this pin.
- Never hold this pin **HIGH** in normal operation, or Notecard will enter its bootloader on every reset rather than running its firmware.

Pin Name	Direction	Pin Number	Usage
BOOT	IN	65	Force Notecard into its bootloader on reset

Tip

For the step-by-step procedure on using a Notecarrier to recover a Notecard, see [Recovering a Bricked Notecard](#).

Network Communication Behavior

The Notecard includes a built-in connection to Notehub.io (specifically **a.notefile.net:8086**) and communicates over SSL. Outbound connections speak directly with the Notehub session load balancer (or "Discovery Service") for provisioning and device authentication. By default, the TLS connection is unidirectional, but can operate bi-directionally, if needed. The keys and certificates for each device are provisioned by STMicrosystems inside the STSAFE secure element present on every Notecard. Once the Discovery Service has provisioned or authenticated a device, it issues a "ticket" and a Handler IP address that the Notecard can use to make subsequent requests.

The Notecard can also connect to the Handler to do a constrained set of remote procedure calls related to synchronization. If the Notecard determines that the data queued for transmission to or from the Handler should be encrypted, it opens a session to the Handler on port 8086. Otherwise, an unencrypted socket is opened on port 8081.

The over-the-wire data transmitted on both sockets is highly byte-optimized, which is why raw SSL and TCP sockets are used, and not unoptimized HTTP/HTTPS transactions.

Specifications

General Characteristics

Description	Value
Dimensions	30mm x 42mm
Weight	8 grams

GPS/GNSS Characteristics

Description	Value
Manufacturer-reported typical GNSS position accuracy	2.5m

Note

GPS/GNSS accuracy information is reported by the modem manufacturer. Blues does not independently measure or guarantee this figure. Accuracy in a deployment depends on the choice of GPS antenna, the view of the sky, and the surrounding environment.

Electrical Characteristics

Absolute Maximum Ratings

Description	Minimum	Maximum	Unit
Storage temperature	-40	90	°C
Ambient operating temperature	-35	75	°C

DC Characteristics

Description	Minimum	Typical	Maximum	Unit
VIO Supply Voltage	1.8		3.3	V
VMODEM Supply Voltage	2.5		5.5	V
VIO Operating Current			150	mA
VMODEM Operating Current		250	2000	mA

Ordering Information

[Blues Shop](#) 

Certifications

CE

[CE certification](#) indicates that a product complies with the essential requirements of relevant European health, safety, and environmental protection legislation. It is a mandatory conformity mark for products sold within the European Economic Area (EEA).

European Union (CE RED)

This Notecard is CE-marked for the EU/EEA in accordance with the [Radio Equipment Directive \(RED\) 2014/53/EU](#), as documented in an EU Declaration of Conformity (DoC). Compliance with RED is demonstrated through conformance to applicable harmonized standards covering radio performance, EMC, safety, and cybersecurity.

Warning

EN 18031-1:2024 is the harmonized standard defining cybersecurity requirements for network protection. The conformity assessment was performed via manufacturer self-declaration supported by third-party testing.

This compliance assumes Notecard data is routed off-internet via the Blues-provided secure network path using the embedded SIM and Blues Notehub. Customers must not enable configurations that bypass that path. Specifically: do not use a secondary SIM for alternate cellular connectivity and do not enable WiFi transport for data traffic (WiFi may be used for [WiFi Triangulation](#) only).

Certification	Date
EU Declaration of Conformity for EN 18031-1:2024	February 2026

FCC

[FCC certification](#) indicates that a product complies with the regulations set forth by the Federal Communications Commission (FCC) in the United States. This certification ensures that electronic devices do not emit electromagnetic interference that could disrupt other electronic devices and communication systems.

FCC IDs: XMR202406BG95S5, QOQWFM200

Certification	Date
47 CFR Part 15, Subpart B	December 2025

ISED

[ISED/ISED certification](#) is issued by Innovation, Science and Economic Development Canada (ISED), formerly known as Industry Canada (IC). This certification ensures that electronic devices comply with Canadian regulations regarding radio frequency (RF) emissions and electromagnetic interference (EMI).

IC IDs: 10224A-02406BG95S5, 5123A-WFM200

Certification	Date
ICES-003 Issue 7	December 2025

PTCRB

[PTCRB certification](#) is a certification process for mobile and cellular devices that ensures they meet the necessary standards and specifications for operation on North American cellular networks. PTCRB (PCS Type Certification Review Board) was established by North American cellular operators to define test specifications and methods to ensure device interoperability.

[Download the NOTE-NBGLWX PTCRB Certificate of Compliance](#)

Skylo



Notecard for Skylo is [Skylo Certified](#)[🔗]. Notecard for Skylo has cleared Skylo's Non-Terrestrial Network (NTN) Certification Program, validating full compliance with 3GPP Release-17 NB-IoT-over-NTN and Skylo's own "Standards Plus" enhancements. This firmware-level approval guarantees seamless, resource-efficient hand-off to Skylo satellites the moment terrestrial coverage drops, so Notecard for Skylo keeps sending data as long as it can see the sky.

Certification	Date
Notecard for Skylo Certificate of Compliance	April 2026

Board Errata

- On some Notecard Cell+WiFi and Notecard for Skylo devices, over-tightening the mounting screw can lead to a component failure, effectively disabling WiFi. If WiFi is not functional on your Notecard, please reach out to support@blues.com  for a replacement.
- On units shipped where all large black capacitors indicate JJ8 , the idle current of the Notecard may measure slightly higher than the expected current draw indicated above.

Terms and Conditions

Visit [Blues Hardware Terms & Conditions](#)

Security and Vulnerability Scanning

As a part of our regular audit and scanning process, Blues Inc. performs full vulnerability scanning every six months. Any identified vulnerabilities will be analyzed, reported, and patched in a timely fashion, where appropriate.

Revision History

Author	Date	Summary
Ray Ozzie	2019-2020	Document drafted
John Wiedey	2020	Various improvements
Sean Taylor	2020	Various improvements
Zachary J. Fields	11 SEP 2020	Updated information and translated to markdown
Brandon Satrom	13 APR 2021	Updated Country list based on carrier audit
Carlton Henderson	12 JUL 2021	Update coverage information
Carlton Henderson	12 JUL 2021	Fix block diagram photo
Brandon Satrom	11 NOV 2021	Added Certification Dates
Brandon Satrom	07 JAN 2022	Added RoHS Certification Dates
Brandon Satrom	15 FEB 2022	Add WiFi Notecard Datasheet
Rob Lauer	25 AUG 2022	Added updated certification data
Rob Lauer	27 OCT 2022	Update country coverage information

Author	Date	Summary
Rob Lauer	13 JAN 2023	Added RF performance information
Rob Lauer	2 FEB 2023	Warning re: STM32 light sensitivity
Kimball Johnson	21 SEP 2023	Updated for new Cell+WiFi, LoRa, and WiFi Notecards
Rob Lauer	23 OCT 2023	Update and clarify power consumption values
Rob Lauer	31 JAN 2024	Update Notecard for LoRa datasheet details
Rob Lauer	16 APR 2024	Updated for new Cellular (black PCB) Notecards, MB Cellular Notecards, and Notecard XP
Rob Lauer	6 JUN 2024	Added cell band support for Cellular Notecards
Rob Lauer	23 JUL 2024	Update pin definitions
TJ VanToll	24 SEP 2024	Adding Notecard for LoRa v2.1 information
Rob Lauer	01 NOV 2024	Adding Notecard for LoRa v2.1 castellated pin info
Rob Lauer	06 NOV 2024	Added errata for Notecard Cell+WiFi
Brandon Satrom	06 DEC 2024	Expanded reset and loss of power guidance

Author	Date	Summary
Rob Lauer	20 DEC 2024	Added PTCRB certifications for WBNAN, NBNAN, NBGLN
Rob Lauer	5 MAR 2025	Update AUX5 to AUX_CHARGING
Rob Lauer	22 MAY 2025	Fix labelling of NC pins
Rob Lauer	13 JUN 2025	Update certifications
Rob Lauer	21 JUL 2025	Update certifications for WBNAN, NBNAN, NBGLN
Rob Lauer	28 JUL 2025	Update certifications for all Notecard SKUs
Rob Lauer	17 NOV 2025	Add FCC and IC IDs for all Notecard Cellular SKUs
TJ VanToll	21 JAN 2026	Added Notecard for Skylo
Rob Lauer	23 JUL 2026	Accuracy review vs. hardware design files
Rob Lauer	03 AUG 2026	Document the BOOT pin (65) on all Notecard SKUs
TJ VanToll	14 AUG 2026	Adding new Telit SKUs WBEXWT & WBNAWT
Rob Lauer	18 AUG 2026	Expand countries not included

Author	Date	Summary
Rob Lauer	18 AUG 2026	Added manufacturer-reported GNSS accuracy figures

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