RockBLOCK 9603

Developer guide

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ROCK SEVEN
LOCATION COMMUNICATION

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Introduction

Thanks for choosing RockBLOCK! This developer guide refers to RockBLOCK 9603.

What is RockBLOCK?

RockBLOCK makes it easy to use Iridium Short-Burst Data services with your project. The PCB assembly hosts an Iridium 9603N transceiver, simplifies it's power requirements, and provides a UART interface to your project. Finally, RF considerations are taken care of by RockBLOCK's built-in patch antenna, or SMA connector for an external antenna.

About Short Burst Data

SBD is a bandwidth-limited messaging system, capable of transmitting packets of up to 340 bytes, and receiving packets of 270 bytes. With a good view of the sky, it is possible to send/receive approximately once every 40 seconds.

It is suitable for applications which need to regularly send or receive small amounts of information - typically these would include tracking, telemetry, system control and monitoring applications.

It is not suitable if very low latency is required, or if the data to be transmitted is larger than a few thousand bytes. Sending images, or GRIB files, is usually not sensible.

About Iridium

"The Iridium constellation of 66 cross-linked Low Earth Orbit (LEO) satellites, plus several in-orbit spares, means truly global coverage and real mobility everywhere.

The network is considered a meshed constellation of interconnected, cross-linked satellites so that each satellite "talks" with the other nearby satellites in adjacent orbits.

Unique to Iridium, this architecture provides inherent advantages in performance and reliability over other mobile satellite services providers."

(from www.iridium.com)

Importantly, Iridium operates in the microwave L-band, which means that successful data transmission relies on having an unobstructed line-of-sight view of a satellite. Satellites travel quite quickly - from horizon to horizon in under 10 minutes - so with sensible application design, it is possible to transmit data, even with a heavily obstructed view of the sky.

The Iridium website (www.iridium.com) has more information.

Rock Seven has been an Iridium Partner since 2008.

Getting Help

If you need any help at all, either with your RockBLOCK device, or with any of our associated web services, please just drop us an email.

support@rock7.com

Functional Description

Power supply

RockBLOCK includes a super capacitor as an internal energy store to satisfy the burst current requirements of a transit cycle. This is charged from a 5V external power supply, or a Lithium Ion cell (3.7V). These inputs are current-limited to 450mA.

UART

Serial communications is provided by a full UART interface at 3.3v. This can be operated in 3-wire mode (Rx / Tx / GND) with no detriment to functionality or performance. Signals are available on a Molex PicoBlade 1.25mm header.

Antenna

RockBLOCK is supplied with both a 25mm square ceramic patch antenna, and an SMA jack for attaching a suitable external antenna. There is a UFL-UFL RF cable connecting the 9603N module to *either* the patch antenna *or* the SMA jack.

USB Compatible

Rock 7 can supply an FTDI TTL-232R-3V3 cable, terminated with the Molex PicoBlade connector for direct connection to RockBLOCK . This provides a virtual com port on a USB host.

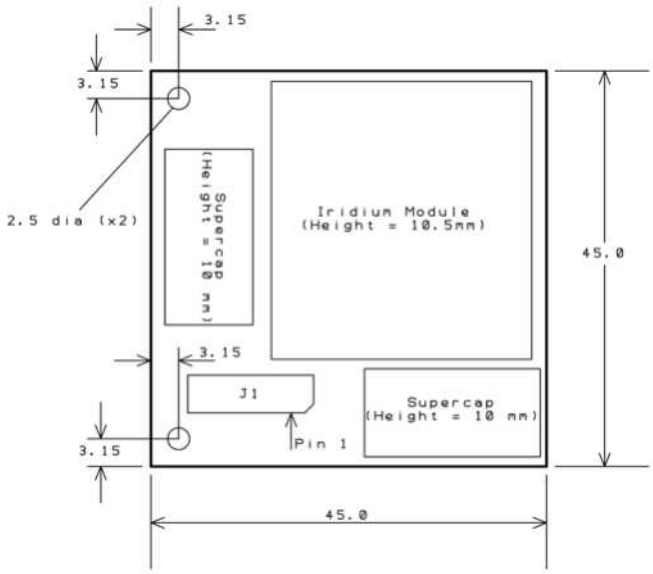
Product Photographs



Physical Specification

Dimensions

Maximum dimensions	
Length	45.0 mm
Width	45.0 mm
Height	15.5 mm



**Note that the diagram and dimensions do not include the SMA connector*

Electrical Specification

How RockBLOCK manages power

When connected to a 5V power supply, the RockBLOCK limits current consumption to 450mA.

On initial connection to a power supply, the on-board charge store must charge. At 450mA, this can take up to 20 seconds to reach full charge.

The Iridium 9603N modem will not be 'switched on' until the accumulated charge reaches a level at which it will be able to successfully transmit. When charging at 450mA, this is typically around 10 seconds after initial power-up.

Once charged, the average idle current (with the Iridium 9603N 'awake') will be around 40mA @5V. In this mode, network 'ring-alerts' will be received.

It is possible to enter a low-power 'sleep' mode, by switching off the Iridium 9603N. This is done using the sleep pin on the direct header. In this mode, RockBLOCK will only require about 20uA. The internal charge will be maintained, so it will be possible to transmit almost immediately on wake-up.

Input Current

	Sleep	Idle	Charging (max)
5V power supply	20 uA	40 mA	450 mA

Input Voltage

	Minimum	Absolute Maximum
Using super capacitor (current limited to 450mA)	4.5 V	5.4 V
Power from Li-Ion cell	2.6* V	5.4 V

**Note that when powering from a Li-Ion cell, the source must be able to supply a burst of 7.5W for 10ms.*

Communications Interfaces

Your application will be communicating directly with the Iridium 9603N module within RockBLOCK.

Comprehensive documentation of this module is available in the *Iridium 9603N SBD Transceiver Product Developers Guide* which can be downloaded from the Rock Seven website

The data serial interface is an RS-232 9-wire interface at 3.3V digital signal levels (LVTTL) over which the 9603N and FA transfer commands, responses, and SBD message data. With respect to this interface, the 9603N behaves as a DCE (Data Communication Equipment), and the FA behaves as a DTE (Data Terminal Equipment).

If RS-232 voltage levels are needed, the FA must include an LVTTL/RS-232 level-shifter.

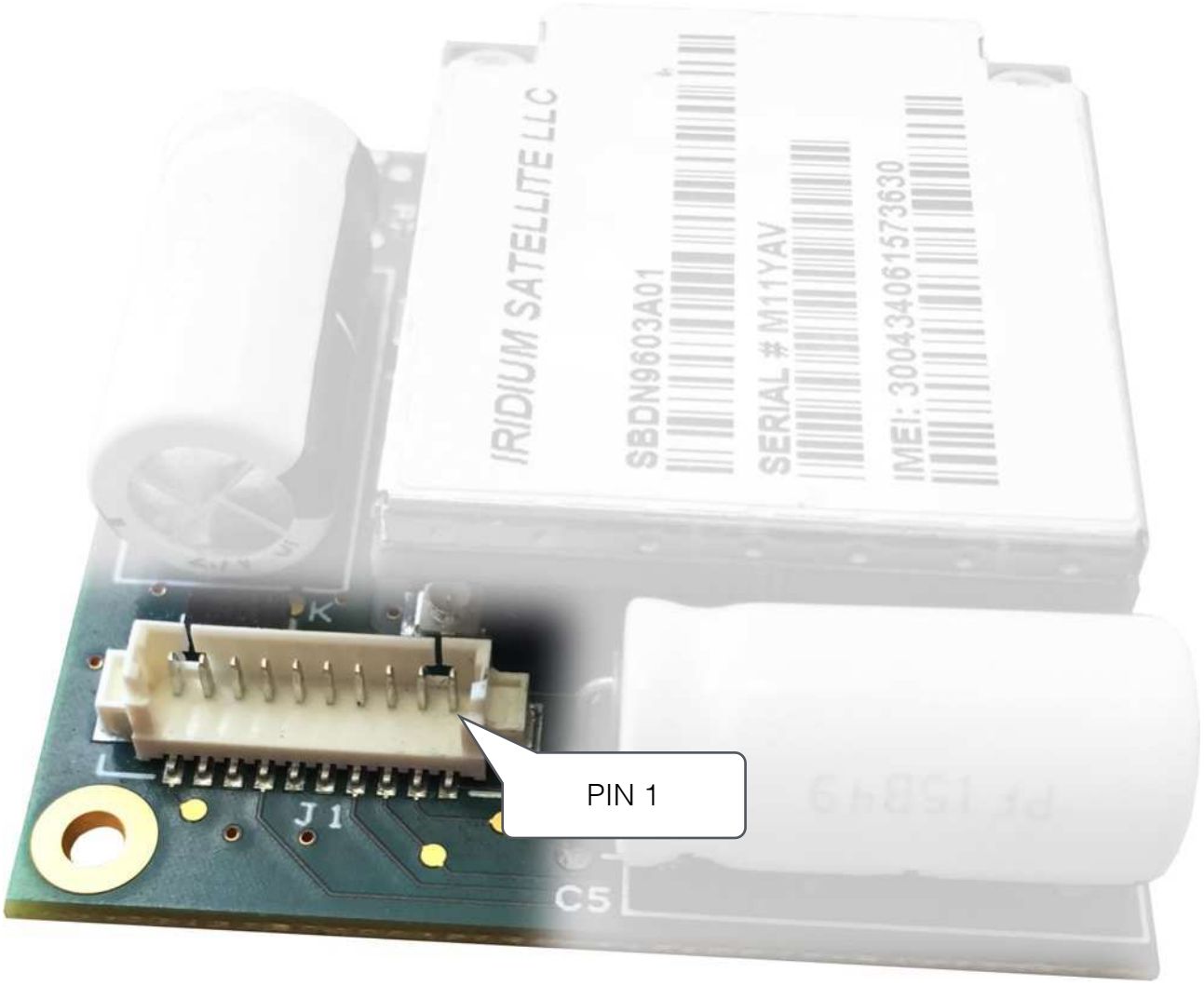
The baud rate can be set via the AT+IPR command. The default rate is 19200 bps.

While the 9603N's data serial interface supports the control signalling of a 9-wire interface by default for those host applications which require it, the interface can be configured for 3-wire operation – where only transmit, receive and ground signals are used – with no detriment to functionality or performance.

A very important note about signal directions!

- ★ **TXD** and **RTS** are **INPUTS** TO the RockBLOCK
- ★ **RXD** and **CTS** are **OUTPUTS** FROM the RockBLOCK

PicoBlade 1.25mm Header Interface



Pin	Label	Description
1	RXD	Iridium 9603N RX (*output from RockBLOCK*)
2	CTS	Iridium 9603N CTS (*output from RockBLOCK*)
3	RTS	Iridium 9603N RTS *(input to RockBLOCK)*
4	NetAv	Network available signal
5	RI	Ring Indicator signal
6	TXD	Iridium 9603N TX (*input to RockBLOCK*)
7	OnOff	Sleep control (pull to ground to switch off)
8	5v In	5V Power supply (450mA limit)
9	Li-Ion 3.7v In	3.7V power supply (450mA limit)
10	GND	Ground

RockBLOCK 'Hello World' Example

With your RockBLOCK connected to a suitable power supply, check that your serial communications are established (default 19200, 8N1), by issuing the command:

```
AT\r
```

Which will produce the response:

```
OK\r
```

Now, these commands will transmit your first message:

```
AT&K0\r
```

```
OK\r
```

```
AT+SBDWT=Hello World\r
```

```
OK\r
```

```
AT+SBDIX\r
```

```
+SBDIX: 0, 0, 0, 0, 0, 0\r
```

The SBDIX response tell you that it was transmitted successfully, and that there were no MT messages downloaded during this SBD session.

Please refer to the *Iridium AT Command Reference* for further detail.

Note that RockBLOCK expects commands to be terminated with a **carriage return (\r)** character. This is hex **0x0D.**

Using a **line-feed (\n) 0x0A** character will not work!

RockBLOCK Gateway Commands

In general, the RockBLOCK gateway will simply transfer your MO payload directly to your chosen destination addresses (see Web Services User Guide for configuration details).

There are some specially-formatted payload that will be intercepted by the gateway to request specific functions.

Flush the MT queue

This command causes an MT message to be queued in reply, with a flag set to instruct the Iridium gateway to clear any MT messages queued, but not yet downloaded. This is very useful if you suspect that there may be hundreds of queued messages for your device, but you don't wish to download them all. Note that you are still charged for the queued MT messages, regardless of whether or not you download them.

This behaviour will be triggered if your MO payload is equal to "FLUSH_MT" (Hex: `46 4c 55 53 48 5f 4d 54`).

The resultant MT reply will contain the same payload, indicating that the queue has been flushed. In this example, there were 10 MT messages queued. They were Hello1, Hello2, Hello3... etc.

```
AT&K0             (turns off flow control, as running in 3-wire mode)
OK
AT+SBDIX
+SBDIX: 0, 4, 1, 2, 6, 9
OK
AT+SBDRT
+SBDRT:
Hello1
OK
AT+SBDWT=FLUSH_MT
OK
AT+SBDIX
+SBDIX: 0, 5, 1, 3, 6, 8
OK
AT+SBDRT
+SBDRT:
Hello2
OK
AT+SBDD0
0
OK
AT+SBDIX
+SBDIX: 0, 6, 1, 8, 8, 0
OK
AT+SBDRT
+SBDRT:
FLUSH_MT
OK
```

Sending a message directly to another RockBLOCK

if you have two or more RockBLOCK configured in your account, then it is possible to have an MO message from one delivered directly to another, with the routing configured dynamically at the time of transmission.

The MO message must be formatted with a prefix, which differs depending on whether you are using binary or ASCII mode (SBDWT or SBDWB).

I order to send the message 'Hello' to the RockBLOCK with serial number 1234, using binary mode, then the MO buffer should contain:

```
52 42 00 04 d2 48 65 6c 6c 6f
```

The first two bytes decode as 'RB' and are required as a prefix. The next 24 bits (`00 04 d2`) indicate the serial number of the target RockBLOCK.

To achieve the same result using ASCII mode, the format is slightly different. Your SBDWT command would look like this:

```
AT+SBDWT=RB0001234Hello
```

Note that the serial number is required to be 7 bytes in this mode.

In both cases, the 5 or 9 byte prefix will be removed before the payload 'Hello' is delivered to RockBLOCK 1234.