ROCKBLOCK

Developer guide

Version 1.2 - 9th May 2013

ROCK SEVEN
LOCATION TECHNOLOGY

Table of Contents

Introduction 3

What is RockBLOCK? 3

About Iridium 3

Getting Help 3

High-Level Schematic Diagram 4

Physical Specification 5

Dimensions 5

Connectors 5

Mounting Holes 6

Electrical Specification 7

How RockBLOCK manages power 7

Input Current 8

Input Current measurements 8

Input Voltage 12

Communications Interfaces 12

USB Interface 12

Direct Header Interface 13

RockBLOCK Gateway Commands 14

Flush the MT queue 14

Introduction

Thanks for choosing RockBLOCK!

What is RockBLOCK?

RockBLOCK makes it easy to use Iridium Short-Burst Data services with your project. The 'Naked' PCB assembly hosts an Iridium 9602 transceiver, simplifies it's power requirements, and provides either a USB or UART interface to your project. Finally, RF considerations are taken care of by RockBLOCK's built-in patch antenna.

A 'Rugged' version of the device is also available.

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@rock7mobile.com

High-Level Schematic Diagram

Physical Specification

Dimensions

Maximum dimensions (see photographs)	
Length	78.6 mm
Width	51.5 mm
Height	19.0 mm

Connectors

The USB connector is a standard Mini-B type connector.

The alternative, direct header mates with Molex part number 51021-1000.

Mounting Holes

Electrical Specification

How RockBLOCK manages power

When connected to a 5V USB host, the RockBLOCK limits current consumption to 90mA. It will never exceed this value.

On initial connection to a power supply, the on-board charge store must charge. At 90mA, this can take up to 180 seconds to reach full charge.

The Iridium 9602 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 90mA, this is typically around 120 seconds after initial power-up.

Once charged, the idle current (with the Iridium 9602 'awake') will be around 60mA. In this mode, network 'ring-alerts' will be received.

It is possible to enter a low-power 'sleep' mode, by switching off the Iridium 9602. 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.

A successful transmission (typical when RockBLOCK has an unobstructed view of the sky), will deplete the charge storage and will take approximately 10 seconds to return to full charge. An unsuccessful transmission typically consumes much more power, and could take up to 20 seconds to return to full charge. A 'full' charge is sufficient for about 8 'failed' transmissions in quick succession.

It is not recommended to attempt to transmit in quick succession without a 'pause' to allow the stored charge to recover. The length of the pause will depend on the application, and the ratio of successful/failed attempts.

If RockBLOCK is powered by the direct header, the input current is instead limited to 470mA. In this mode, it is not usually necessary to pause between transmission attempts.

Input Current

	Sleep	Idle	Charging (max)
5V USB	14 mA	73 mA	90 mA
5V Direct header *See detailed measurements below!*	0.2 mA	50 mA	470 mA

Input Current measurements

Example 1: Using the direct header, with an unlimited 5V power supply, and the Iridium SLEEP signal held LOW (9602 asleep), the current is measured across a 1-ohm resistor (1mA = 1mV deflection).

As shown in the above plot, the input current climbs to the internal current limit (approximately 470mA) over the first 15 seconds. Roughly 21 seconds after applying power, the input current starts to fall. After 50 seconds the input current is below 50mA, and it continues to fall over the next few minutes. After 15 minutes, the input current has fallen to 200uA.

Example 2: As above, but this time the Iridium SLEEP signal is held HIGH. This means that the Iridium 9602 module will switch on as soon as there is sufficient charge stored. The RockBLOCK has zero visibility of the sky. No commands are issued to the 9602, but it is evident that the module performs some regular background activity.

The Iridium 9602 can be seen switching on about 25 seconds after power is applied.

Example 3: Continuing from example 2, above, we leave the RockBLOCK for 15 minutes and then take another plot of input current. The RockBLOCK has zero visibility of the sky. Note that the scale on this plot is now 50s per division, and the voltage axis has also changed range.

It can be seen that the Iridium 9602 is performing some regular task every 130 seconds. Average current is around 50mA. This behaviour does vary as the view of the sky changes.

Example 4: We write 50 bytes to the transmit buffer, and then initiate an SBD session every 30 seconds. With zero view of the sky (100% failure) the input current plot looks like this:

When placed in a location with about 50% visibility of the sky, the average input power requirements are lower. The following plot shows an average of 78mA over 8 minutes.

Input Voltage

	Minimum	Maximum
USB	4.75 V	5.25 V
5V Direct header	4.00 V*	5.10 V

**Note that supplying less than 5V will reduce the total capacity of the internal charge storage. It will also reduce the efficiency of the circuit.*

Communications Interfaces

Regardless of which interface you choose, your application will be communicating directly with the Iridium 9602 module within RockBLOCK.

Comprehensive documentation of this module is available in the *Iridium 9602 SBD Transceiver Product Developers Guide* which can be downloaded from the RockBLOCK website

USB Interface

RockBLOCK's USB interface is provided by an FTDI FT231X (Full Speed USB to Full Handshake UART) bridge. Full details on this interface, including device drivers for most platforms, are available here:

http://www.ftdichip.com/Products/ICs/FT231X.html

By default, the Iridium 9602 operates at 19200 baud. Flow control is not used when in command mode. RTS/CTS flow control is used when in data mode.

The following signals are connected to the FT231X CBUS pins.

Signal	Port
Network Available	CBUS0
Ring Indicator	CBUS1
On/Off	CBUS2

Access to the CBUS pins is not available if using Virtual Com Port (VCP) drivers. Consult the FTDI website for more information. These signals may be useful for some applications, but are not required in order to use RockBLOCK.

Direct Header Interface

The direct header interface is designed for direct integration with non-USB hosts. Rock Seven can supply a break-out cable if required.

Pin	Label	Description
1	-	Do not connect
2	5V	5V Power supply
3	TX	Iridium 9602 TX
4	RX	Iridium 9602 RX
5	CTS	Iridium 9602 CTS
6	RTS	Iridium 9602 RTS
7	SLEEP	Iridium 9602 On/Off control
8	RING	Ring Indicator
9	NET	Network Available
10	GND	Ground

Please review the notes in the *Iridium 9602 SBD Transceiver Product Developers Guide* if you intend to communicate using a 3-wire serial interface.

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+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
```