LM63S1 User's Manual

Sequans Communications

Portes de la Défense

15-55, Boulevard Charles de Gaulle

92700 Colombes, France

+33.1.70.72.16.00

+33.1.70.72.16.09 (FAX)

www.sequans.com

contact@sequans.com

Preface

Legal Notices

Copyright© 2015, SEQUANS Communications

Document Revision History

Revision	Date	Product Application
V1.0	April 1, 2015	First edition of the LM63S1 User Manual
V1.1	April, 5, 2015	Adding HW integration guideline, updating FCC Regulation
V1.2	April 21, 2015	updating FCC statement

About this Document

Purpose and Scope

This user manual is intended for engineers who use the LM63S1 module

Who Should Read this User Manual

This document is intended for engineers who want to operate the evaluation kit based on the LM63S1 module, for purposes.

Table of Contents

1 LM63S1 Product Description

1.1 Product Features

The LM63S1 is an mPCIe module supporting LTE bands B4, B13 and B14.

The LM63S1 can be fitted into a mPCIe host connector in (e.g.) a vehicular modems and be connected to a USB port using a mPCIe/to USB connector.

1.2 Software Description

The LM63S1 is a hostless device. All the required software is present in the device's Flash memory:

- LTE stack software
- Hardware configuration parameters
- Application software, including Linux openWrt kernel

2 Installation Procedures

2.1 Prerequisites

2.1.1 Hardware

Sequans' LM63S1 requires a Windows® PC, running Windows 8 or Window7 with an USB 2.0 port. It can also be used with a computer running MAC OS or Linux.

.

2.2 First Installation

2.2.1 Install the Host Software

Without plugging in the device, launch the Windows installer. File name is sqn_setup_3.3.3.0-msi-xxxxx-host-only.exe.   It automatically installs the Sequans' LM63S1 drivers on the PC.

Follow the procedure:

1. Launch the installer and confirm its execution. Click Yes button to start the installation process.

2. Click the Next> button.

3. Select the installation directory. The default directory can be changed by clicking the Browse... button. Click Next when the appropriate directory is selected.

4. Verify the installation directory and click Install if no change is required. You can update the installation directory by clicking the Back button at this stage.

5. Check the box to trust Sequans software and proceed with the installation process.

6. Click Finish to complete the installation process.

2.2.2 Install the DM Tool Software

This is an optional step. Please refer to DM tool' user manual.

2.3 LM63S1 Board Connection

After the installation of the Host Software is completed, you can plug the device in an USB port. Three drivers should be installed:

- One composite driver,
- One serial over USB driver (`SqnAcm`) to control the device using AT commands
- One Ethernet over USB driver (`SqnUsb`) to transport the data traffic between the device and the PC

1. Plug the LM63S1 on an USB port of your PC.

2. Wait for the automatic driver installation. It takes some time (a few dozens of seconds) before the evaluation kit is properly identified on the USB interface.

3. When the process is completed, the PC indicates that the device is ready to use.

You can launch a PuTTY Windows and use AT commands. Sequans LTE UE products implement the standard 3GPP 27.007 AT commands.

2.4 Connection to Serial Port

Using a terminal emulator application (e.g PuTTY on Windows®), open the installed serial port @ 115200 bauds, 8 data bits, 1 stop bit, no parity and no flow control.   Next figure illustrates a PuTTY configuration.

Note: Find the COM serial port used by the Evaluation Kit with the Windows® Devices settings, when the installation is complete. Select the SQN31X0 device in the Windows devices list, and right-click to read its properties. The COM port number assigned to Sequans CDC/ACM USB interface can be found on the Hardware tab as illustrated on next figures
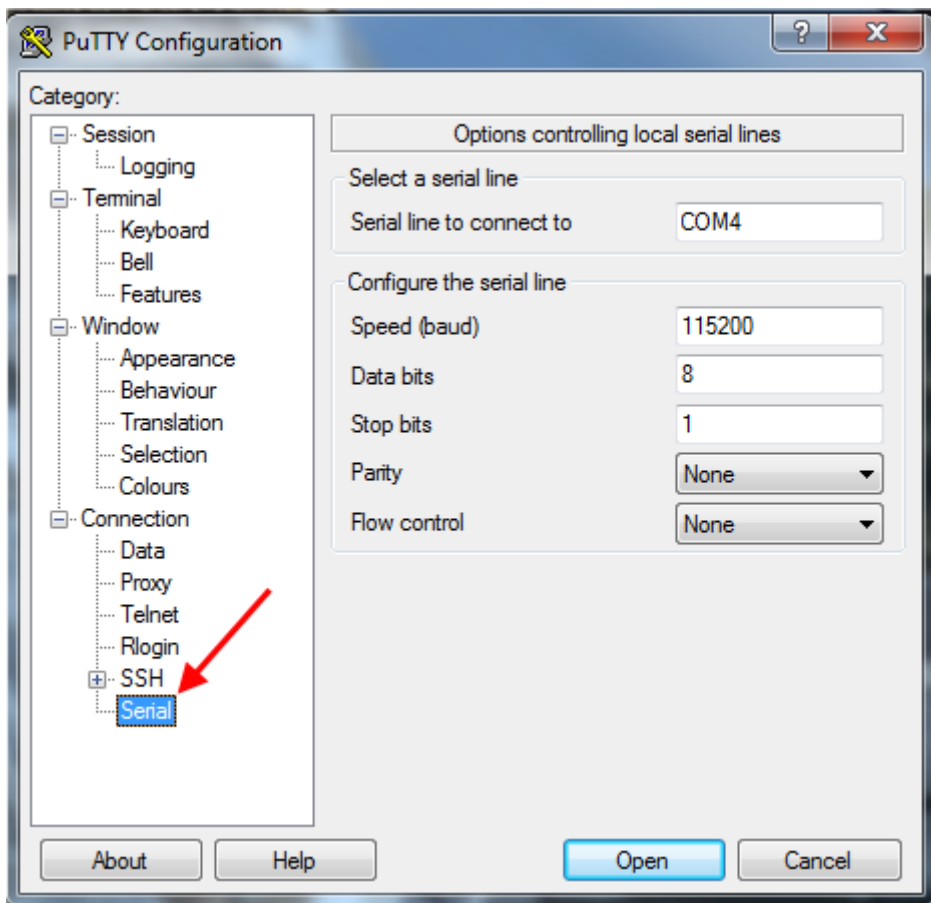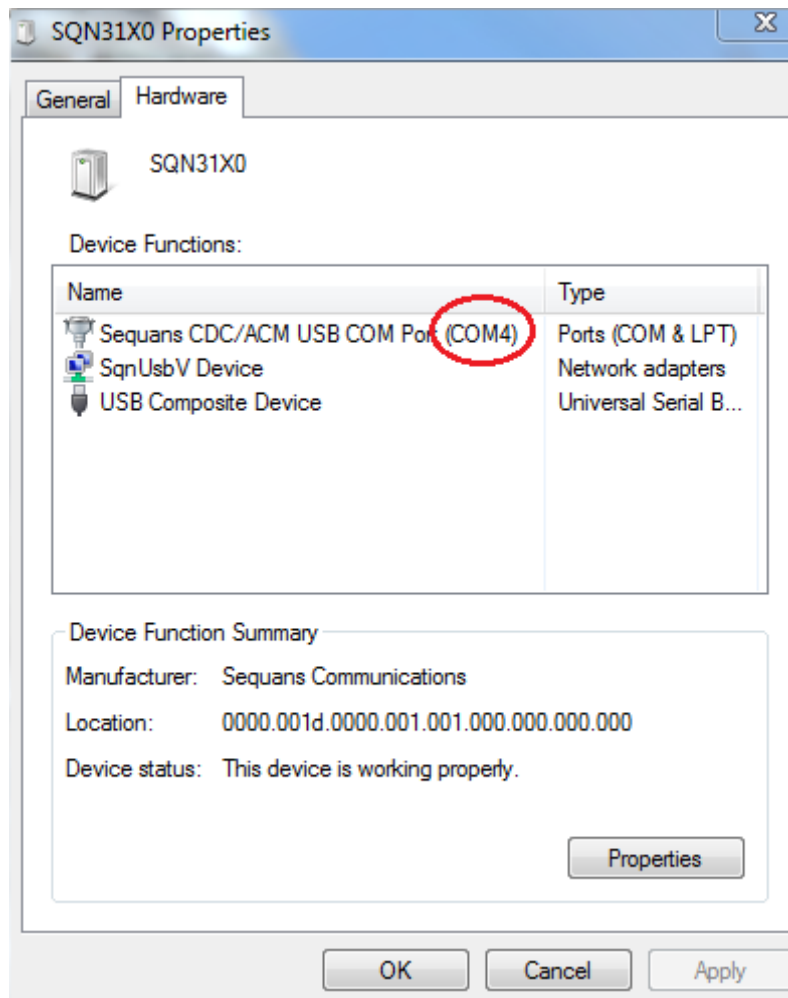
Note: Ping the interface IP address to confirm that the installation is operational.
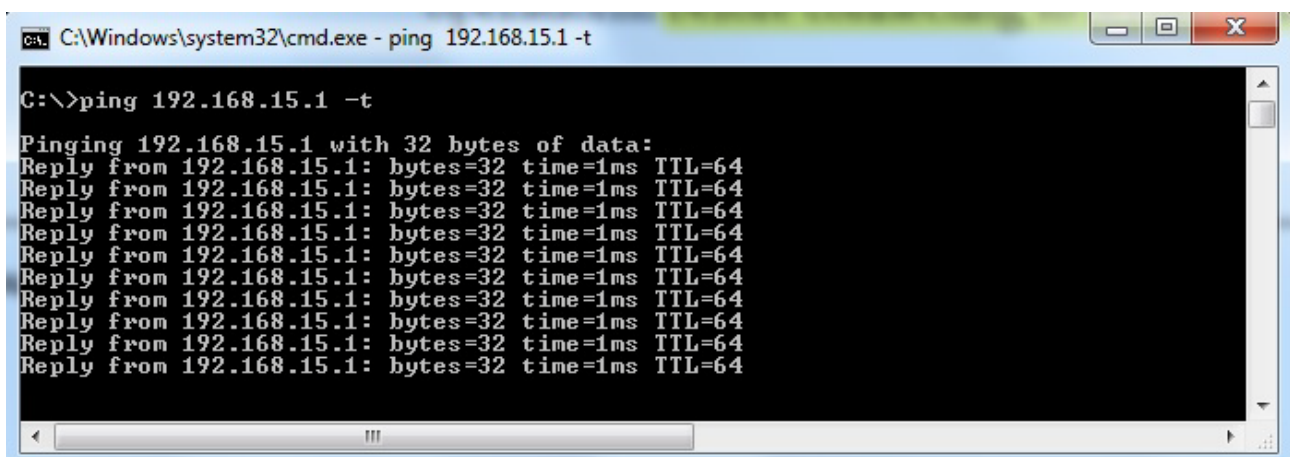
2.5 Software Uninstallation

Use Windows' uninstaller service.

3 General Procedures

3.1 Connect the LM63S1

For the first installation of the LM63S1 on the PC, please follow the procedure described in Section 2. There is no other specific operation required for the later connections. Plug the LM63S1 on a USB port of your PC and wait for the "Device ready" Windows message display. The LM63S1 is then ready.

3.2 Connection to Serial Port

Open a PuTTY terminal and use regular AT commands to control the LTE modem

3.3 Disconnect the LM63S1

Use Windows standard `Eject device` procedure before physically disconnect the LM63S1.

3.4 Programming Instructions

See Applications Software Development Guide.

4. HW integration guidelines

RF connections

When attaching antennas to the module:

*Note: To **disconnect** the antenna, make sure you use the specific RF connector to prevent damage to the module or coaxial cable assembly.*

- •Use the specific RF connector to attach antennas to the module's connection points.
- •Match coaxial connections between the module and the antenna to 50 Ohm.
- •Minimize RF cable losses to the antenna; the recommended maximum cable loss for antenna cabling is 0.5 dB.
- •To ensure best thermal performance, if possible use the mounting holes to attach (ground) the device to the main PCB ground or a metal chassis.

Note: If the antenna connection is shorted or open, the modem will not sustain permanent damage.

Shielding

The module is fully shielded to protect against EMI and must not be removed.

Antenna and cabling

When selecting the antenna and cable, it is critical to RF performance to match antenna gain and cable loss.

Choosing the correct antenna and cabling

When matching antennas and cabling:

- •The antenna (and associated circuitry) should have a nominal impedance of 50 Ohms with a return loss of better than 10 dB across each frequency band of operation.
- •The system gain value affects both radiated power *and* regulatory (FCC, IC, etc.) test results.

Designing custom antennas

Consider the following points when designing custom antennas

- •A skilled RF engineer should do the development to ensure that the RF performance is maintained.

Determining the antenna's location

When deciding where to put the antennas:

•Antenna location may affect RF performance. Although the module is shielded to prevent interference in most applications, the placement of the antenna is still very important — if the host device is insufficiently shielded, high levels of broadband or spurious noise can degrade the module's performance.

•Connecting cables between the module and the antenna must have 50 Ohms impedance. If the impedance of the module is mismatched, RF performance is reduced significantly.

•Antenna cables should be routed, if possible, away from noise sources (switching power supplies, LCD assemblies, etc.). If the cables are near the noise sources, the noise may be coupled into the RF cable and into the antenna.

Ground connection

When connecting the module to system ground:

•Prevent noise leakage by establishing a very good ground connection to the module through the host connector.

•Connect to system ground using the two mounting holes at the top of the module.

•Minimize ground noise leakage into the RF. Depending on the host board design, noise could *potentially* be coupled to the module from the host board. This is mainly an issue for host designs that have signals traveling along the length of the module, or circuitry operating at both ends of the module interconnects.

5 FCC Regulations

This module is designed to meet, and upon commercial release, will meet the requirements of the following regulatory bodies and regulations, where applicable:

   o Federal Communications Commission (FCC) of the United States
   o The Certification and Engineering Bureau of Industry Canada (IC)

Upon commercial release, the following industry approvals will have been obtained, where applicable:

   o PTCRB for B14

Additional certifications may be obtained upon customer request — contact your Sequans Communications account representative for details. Additional testing and certification may be required for the end product with an embedded LM63S1 modem and are the responsibility of the OEM. Sequans Communications offers professional services-based assistance to OEMs with the testing and certification process, if required.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE: FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

The LM63S1 may transmit simultaneously with other collocated radio transmitters within a host device, provided the following conditions are met:

1. Each collocated radio transmitter has been certified by FCC/IC for mobile application

2. At least 20 cm separation distance between the antennas of the collocated transmitters and the user's body must be maintained at all times

For mobile and fixed operating configurations the antenna gain, including cable loss, the device, module LM63S1 must not exceed the following gain values per bands
- for B13 - 777-787 MHz ,   6 dBi gain
- for B14 - 788-798 MHz ,   6 dBi gain
- for B4 - 1710-1755 MHz,   6 dBi gain

The device (module LM63S1) can be co-located with WiFi device that transmit 17dBm with maximum peak gain of 10dBi antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: **2AAGMLM63S1**".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Federal Communication Commission Interference Statement

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, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- o Reorient or relocate the receiving antenna.
- o Increase the separation between the equipment and receiver.
- o Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- o Consult the dealer or an experienced radio/TV technician for help.