National Semiconductor

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LMX9838DONGLE Hardware User Guide

1.0 Scope

National Semiconductor LMX9838 Bluetooth™ serial dongle reference design kit is a plug and play serial adapter for serial cable replacement applications and more. It is able to support more profiles than just the Serial Port Profile (including audio support with external codec boards). By using the enclosed Simply Blue Commander software, it allows user to develop their own SW applications easily given the built in interpreter for HEX commands. SBSmart is a higher level application tool that provides buttons with the built in commands to easily set up or demonstrate different profile support using the Simply Blue SPP package.

2.0 General Description

2.1 REFERENCE DESIGN KIT CONTENTS

- LMX9838 Bluetooth serial adapter reference board
- USB Dongle and application software stack
- Null modem cable
- Sedona Lite board (Audio CODEC Board)
- 110V to 240V AC to 5V DC power adapter and pigtail
- CDROM with design documents and Simply Blue software Application tools.

2.2 LMX9838 BLUETOOTH SERIAL ADAPTER REFERENCE BOARD

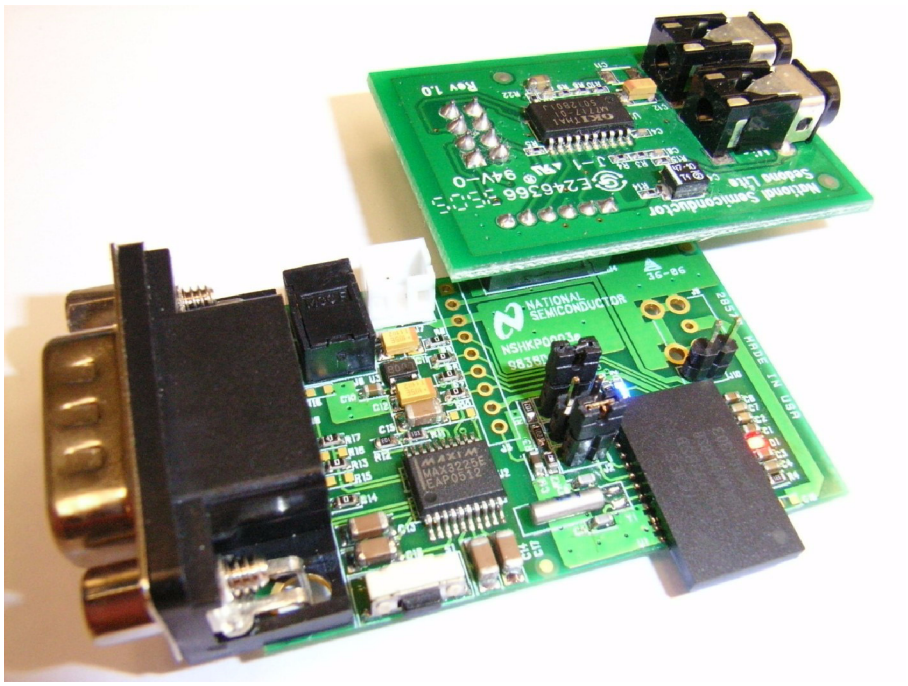

Figure 1. Reference Board and Sedona Lite Board

3.0 Qualification

- FCC certified:
  - FCC ID: ED9LMX9838
- FCC compliance (see Section 13.0): The device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:
  - This device may not cause harmful interference
  - This device must accept any interference received, including interference that may cause undesired operation
- IC certified:
  - IC: 1520A-LMX9838
- Bluetooth SIG QD ID: B012394

4.0 Requirement and Setup

4.1 BASIC REQUIREMENT

- X86 PC with serial port.
- One of the following operating system is required.
  - Windows 2000
  - Windows XP

4.2 APPLICATION SOFTWARE

4.2.1 Simply Blue Commander

Application command oriented tool to generate commands and watch events in the Simply Blue Command interface window. Reference the Simply Blue Commander User Guide document for details.

4.2.2 SBSmart

Easy to use Windows based tool to demonstrate additional profile support of the Simply Blue functionality. Reference the SBSmart User Guide for additional details.

4.2.3 Patch Programming

LMX9838 allows for patch programming for firmware update if necessary. Reference the LMX9838 SW User Guide document for details. This can also be done with the Simply Blue Commander and SBSmart tools.

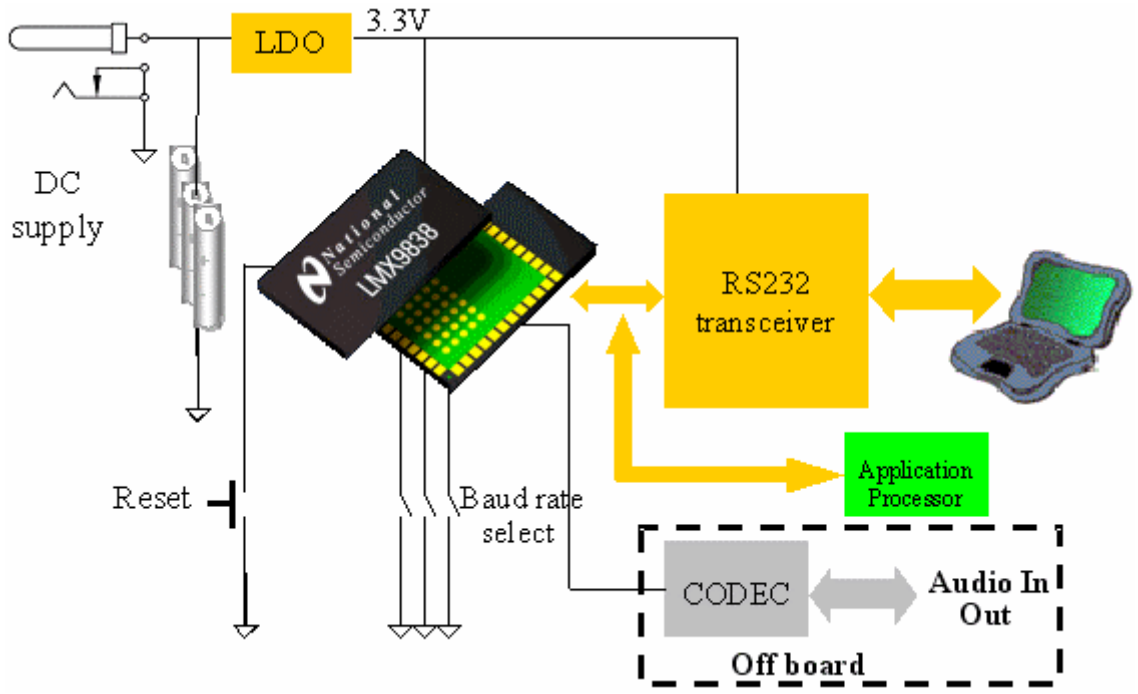

Figure 2. System Block Diagram

5.0 Functional Description

5.1 POWER SUPPLY

- DC Power Jack (6V max)
- Battery Holder (6V max)

5.2 MAIN SYSTEM

- Reset button for manual Reset
- Jumper option for Baud rate selection

5.3 UART INTERFACE

DB9 connector for RS232 standard PC interface using On-board level shifter IC for handling LMX9838 module's 3.3V UART interface.

5.4 ADVANCE AUDIO INTERFACE

- Support Audio applications
- PCM codec interface (support linear and A-law)
- PCM Master or Slave operation (SW configurable)
- Direct connection to Sedona Lite Board (A-law only)

6.0 Design Consideration

6.1 POWER MANAGEMENT

- 3.3V output single LDO is used to provide power for RS232 interface chip and Digital portion of the LMX9838.

7.0 Layout Consideration

The LMX9838 reference design is split into 2 sections, one section is RS232 transceiver circuit for PC connection, another section is LMX9838 main circuit for Host processor. (Figure 3)

7.1 PCB REQUIREMENT

- 2 layers PCB required
- 1 mm overall thickness

7.2 LAYERS CLASSIFICATION

- Top layer is the components and main signals layer
- Bottom layer is interface signals and ground plane
- RF circuit requirement
- Large ground plane with ground via's is must for good RF performance

8.0 AUDIO CODEC Board

Sedona Lite Board contains an audio codec and two phone jacks. This board can be used in conjuction with LMX9838DONGLE to realize the audio (SCO) transmission and reception capabilities. (See Table 9)

9.0 Board components and Pin Assignments

A summary of the configuration and selection jumpers is provided in the tables that follow. Reference both the schematic and PCB layout (included on the CD in the kit)

Table 1 Major Components List

Device	Description
U1	National LMX9838 Serial Port Module - Reference the device datasheet.
U3	National LP3985 Low-Dropout Voltage Regulator
U2	Maxim MAX3225 1 Mbps High Speed UART Driver

Table 2 Connectors Summary

Connector	Description	Details
J7	Battery Connector 2mm pitch	Maximum input voltage is 6V
J6	DC jack	Same as above
J8	DP9 serial connector (male)	See Table 5
J5	External processor interface	See Table 6
J4	Advance Audio interface	See Table 7

Table 3 Jumper and Test Point Summary

Jumper / Test Point	Description	Details
J1, J2 and J3	Clock & UART setting jumper	See Table 8

Table 4 Switch and LEDs

Switch/LED	Description
S1	Reset button
D1	Operation Status
D2	Data Traffic (TX/RX)

Table 5 J8 DP9 (male) Pin Assignments

Pin #	Signal name	Description
1	NC	No connection
2	RxD	Receive Data (input)
3	TxD	Transmit Data (output)
4	NC	No connection
5	GND	Ground
6	NC	No connection
7	RTS	Ready to send (output)
8	CTS	Clear to send (input)
9	NC	No connection

Table 6 J5 External Processor Interface

Pin #	Signal name	Description
1	POWER_D#	ON/OFF control of LMX9838
2	VCC	LDO output (3.3V)
3	GND	Ground
4	TXD	Transmit Data (output)
5	CTS#	Clear to send (input)
6	RXD	Receive Data (input)
7	RTS#	Ready to send (output)
8	VCC_CORE _IN	1.8V voltage regulator input/output
9	RESET#	Reset (input)

Table 7 J4 Advance Audio Interface

Pin #	Signal name	Description
1	VCC	LDO output (3.3V)
2	SCLK	Advanced Audio Interface Clock
3	STD	Advanced Audio Interface Transmit Data
4	SFS	Advanced Audio Interface Frame Synchronization
5	SRD	Advanced Audio Interface Receive Data
6	GND	Ground

Table 8 UART interface setting

J2	J3	J1	UART baud rate
Short	Short	Short	921600bps
Short	Open	Short	115200bps(default)
Open	Short	Short	9600bps
Open	Open	Short	NVS (Default 9600bps)

Table 9 J4 (Audio CODEC Board)

Pin #	Signal name	Description
1	Vcc	3.3V Input
2	SCLK	PCM Clock
3	STD	PCM Input Data
4	SFS	PCM Frame Synchronization
5	SRD	PCM Output Data
6	GND	Ground

Table 10 Audio Connection

P17	For PC Microphone
P15	For PC Headphone

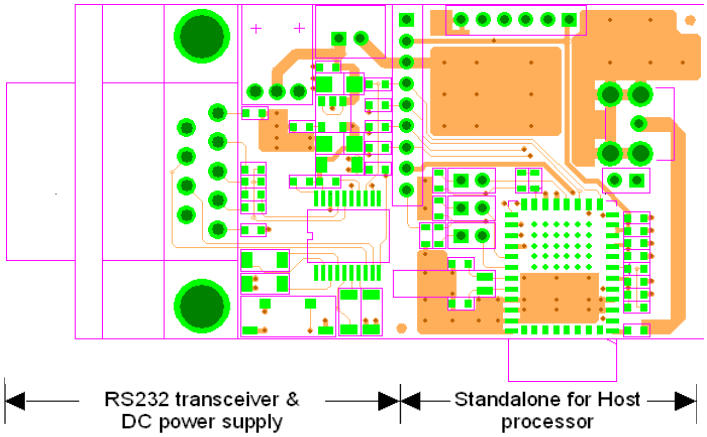

Figure 3. Top view of Reference board

10.0 Bill of materials (Reference Board)

Item Name	Description	Vendor	Part Number
C5,C6	Capacitor 22p 0603 C0G 50V	MuRata	GRM39C0G220J50
C1,C3,C8, C10	Capacitor 100n 0603 Y5V 50V	MuRata	GRM39Y5V104Z50
C2,C4,C7	Capacitor 2u2F 0603 Y5V 10V	MuRata	GRM39Y5V225Z10
C9	Capacitor 100p 0603 C0G 50V	MuRata	GRM39C0G101J50
C11,C12	TANT CAP 1uF 16V SIZE A	Any	
C13,C14,C15, C16,C17	Capacitor 1uF 1206 X7R 25V	MuRata	GRM42-6X7R105K25
C19	Capacitor 1uF 0603 Y5V 10V	MuRata	GRM39Y5V105Z10
J7	Battery holder (2mm pitch)	Any	
S1	TACK SWITCH TS-1135HS	RAINBOW	
Y1	Tuning fork crystal 32.768KHz	Any	
J6	DC POWER JACK	Morning star limited	DC-015
D1	Red Color LED 0603 Size	Any	
D2	Blue Color LED 0603 Size	Any	
J8	DB9 (male) serial connector	Any	
J4	2mm Socket (6 poles)	Any	
U1	Bluetooth SPP Micro Module	National Semiconductor	LMX9838SM
U3	Low Dropout Regulator	National Semiconductor	LP3985IM5X-3.3
U2	High Speed RS232 Transceivers	Maxim	MAX3225EEAP+
R1,R2,R3	Resistor 0603 Size, 1K	Any	
R11,R12	Resistor 0603 Size, 10K	Any	
R6,R7,R8,R9, R13,R14,R17	Resistor 0603 Size, 0R	Any	
R4,R5	Resistor 0603 Size, 330R	Any	
J3,J10	2mm header	Any	
J1,J2	2mm header (with jumper)	Any	

11.0 Bill of Materials (Sedona Lite Board)

Item Name	Description	Vendor	Part Number
C3,C4,C5,C6	Capacitor 100nF	Any	Ceramic cap
C6	Capacitor 1uF	Any	Ceramic cap
C12	TANT CAP 10uF, 10V	Any	
C40	TANT CAP 47uF, 6.3V	Any	
C11	Not mount		
J1	2mm socket (6 poles)	Any	
J2	2.54mm socket (2 x 4 poles)	Any	
P15	Socket for speaker (mono)	Morning Star	MSJ-1537
P17	Socket for microphone (mono)	Morning Star	MSJ-1537
R10	Resistor 0402 Size, 10R	Any	
R13,R14	Resistor 0402 Size, 1K	Any	
R5,R22	Resistor 0402 Size, 4.7K	Any	

Item Name	Description	Vendor	Part Number
R3	Resistor 0402 Size, 10K	Any	
R4,R8,R9	Resistor 0402 Size, 47K	Any	
U2	Single Rail Codec	OKI	MSM7717-01MS-K

12.0 References

- LMX9838 Bluetooth Serial Port Module data sheet
- LMX9838 Bluetooth Serial Port Module - Software Users Guide
- SBSmart user guide

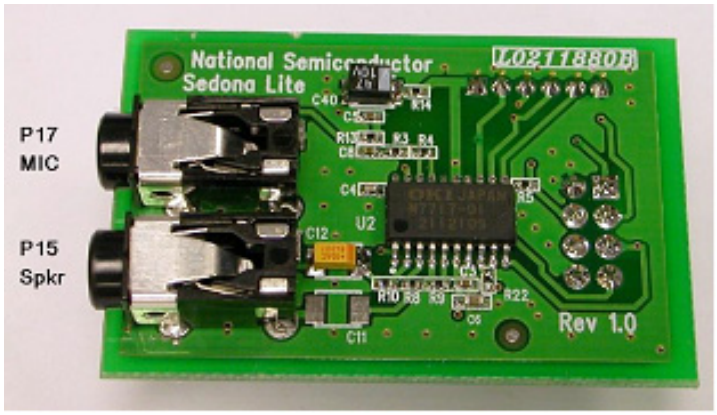

Figure 4. Sedona Board

13.0 Appendix: FCC instructions

13.1 SAFETY INFORMATION FOR RF EXPOSURE

13.1.1 FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

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

1. The antenna must be installed such that 20cm is maintained between the antenna and users;

and

2. The transmitter module may not be co-located with any other transmitter or antenna.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

13.1.2 End Product Labeling

This transmitter module is authorized only for use in devices 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 visible area with the following:

"Contains TX FCC ID: ED9LMX9838"

13.1.3 End Product Manual Information

The user manual for end users must include the following information in a prominent location:

"IMPORTANT NOTE:

To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

13.2 RADIO FREQUENCY INTERFERENCE STATEMENT

13.2.1 INFORMATION TO THE USER

NOTE : 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:

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

Changes or modification not expressly approved by the party responsible for Compliance could void the user's authority to operate the equipment. Connecting of peripherals requires the use of grounded shielded signal cables.

13.2.2 FCC Compliance Information

This device complies with Part 15 of 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.

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