National Semiconductor

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LMX9820A
Simply Blue Serial Adapter Reference Board Designer Guide

1.0 Scope

National Semiconductor LMX9820A Bluetooth™ serial adapter reference board is plug and play serial adapter for cable replacement. It was able to support more profiles than Serial Port Profile (including audio support with external codec board). By using Simply Blue Commander software, it allows user to develop their own applications easily.

2.0 General Description

2.1 REFERENCE DESIGN KIT CONTENTS

- LMX9820A Bluetooth serial adapter reference board
- Null modem cable
- Sedona Lite board (CODEC)
- 110V to 240V AC to 5V DC power adapter (with DC plug adapter cable)
- CDROM with documents and SimplyBlue Commander software

2.2 LMX9820A BLUETOOTH SERIAL ADAPTER REFERENCE BOARD WITH CHIP ANTENNA ON BOARD

Figure 1. Reference Board and Sedona Lite Board

3.0 Requirement and Setup

3.1 BASIC REQUIREMENT

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

3.2 APPLICATION SOFTWARE

3.2.1 SimplyBlue Commander

- Command oriented tool to generate commands and watch events on the Simply Blue Command interface. Reference the Simply Blue Commander User Guide document for details.

3.2.2 SBSmart

- Easy to use Windows based tool to demonstrate SB functionality. Reference the SBSmart User Guide for additional details.

3.2.3 CRISP in system programmer (ISP)

- Windows tool to update the on-chip firmware over the command interface. Reference the CRISP User Guide document for details.

4.0 Functional Description

4.1 SYSTEM BLOCK DIAGRAM

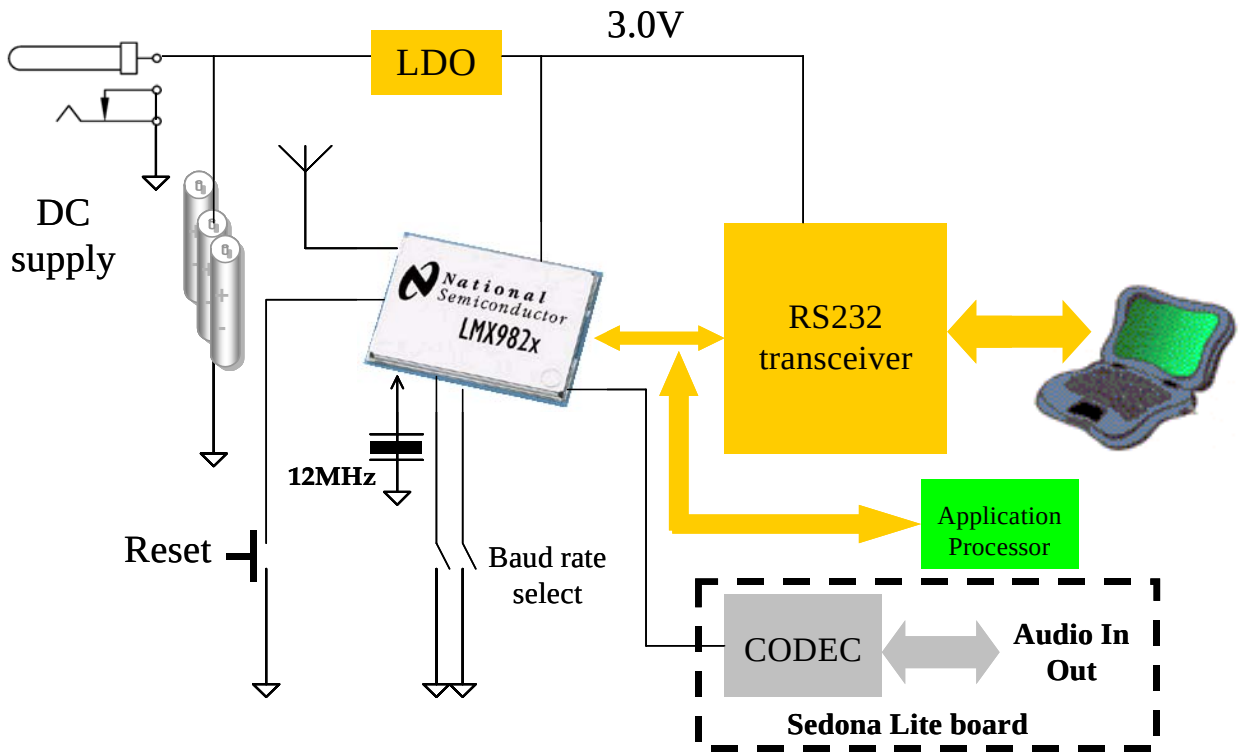

Figure 2. System Block Diagram

4.2 POWER SUPPLY

- DC jack (6V max)
- Battery holder (6V max)

4.3 MAIN SYSTEM

- Crystal - 12MHz
- Reset button for manual reset
- Jumper option for Baud rate select
- Jumper option for ISP (In System Programming)

4.4 UART INTERFACE (H4)

- RS232 (with interface chip mounted)
- 3.0V UART interface (without interface chip)

4.5 AAI INTERFACE (ADVANCE AUDIO INTERFACE)

- Support Audio applications
- PCM codec interface (support linear and A-law)
- Direct connection to Sedona Lite Board (A-law only)

4.6 ANTENNA

- Chip Antenna on board matched with RFinout of LMX9820A (50 ohm typ)
- Optional SMA connector for external antenna or direct cable measurement

5.0 Design Consideration

5.1 CARRIER FREQUENCY OFFSET

- It will be highly depend on the stability of main crystal (12MHz) and it was necessary to fulfill the Bluetooth specification
- It was recommended to be less than +/-20ppm over the operating temperature.

5.2 POWER MANAGEMENT

- 3.0V output single LDO is used to provide power for LMX9820A and RS232 interface chip

5.3 ANTENNA DESIGN

- Chip Antenna is selected due to good price performance rating
- Matching circuit is necessary and RFinout of LMX9820A is 50 ohm typical.
- Bandwidth of Antenna should be more than 100MHz (2.45GHz center frequency and VSWR<2)

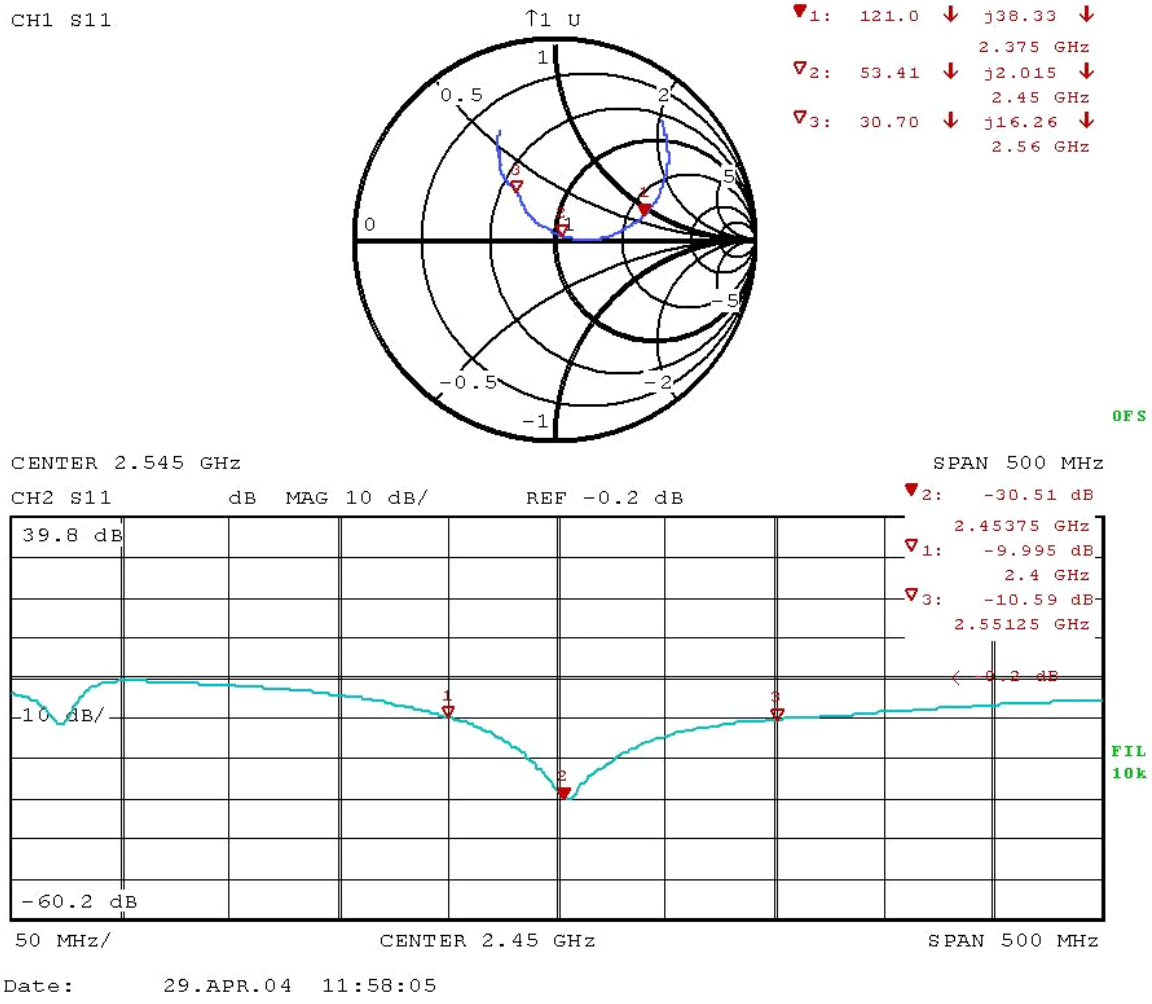

Figure 3.

6.0 Layout Consideration

- It can divided into 2 sections, ONE section is RS232 interface and the other ONE is LMX9820A serial adapter main circuit.

6.1 PCB REQUIREMENT

- 4 layers PCB required

- 1 mm overall thickness

6.2 LAYERS CLASSIFICATION

- Top layer is components layer and main signals
- 2nd layer is ground plane
- 3rd layer is power plane
- Bottom layer is interface signals and ground plane

6.3 RF CIRCUIT REQUIREMENT

- Large ground plane with via is must for good RF performance
- 50 ohm transmission line is used for matching between RFinout and Antenna
- Pi-network is designed for different type of Antenna matching
- Keep the maximum distance between main crystal and Antenna to avoid coupling of TDD signals from Antenna

7.0 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 LMX9820A Serial Port Module - Reference the device datasheet.
U2	Maxim MAX3225 1 Mbps High Speed UART Driver
U3	National LP3986 Low-Dropout Voltage Regulator
X1	12 MHz Crystal - Reference the crystal device datasheet and the LMX9820A datasheet for details.

Table 2 Connectors Summary

Connector	Description	Details
BAT1	Battery Connector 2mm pitch	Maximum input voltage is 6V
DC1	DC jack	Same as above
J1	DP9 serial connector (male)	See Table 7
J2	External processor interface	See Table 8
J3	Advance Audio interface	See Table 9

Table 3 Jumper and Test Point Summary

Jumper/ Test Point	Description	Details
SMA	RF connector	Optional
P1	BBCLK	Test point for 12MHz clock
R18	Mode setting jumper	See Table 8
R15 and R16	UART setting jumper	See Table 9

Table 4 Switch and LEDs

Switch/LED	Description
SW3	Reset button
LED1	Operation Status
LED2	Data Traffic (TX/RX)

Table 5 J1 DP9 (male) Pin Assignments

Pin #	Signal name	Description
1	NC	No connection
2	RxD	Receive Data (input)
3	TxD	NCTransmit 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 J2 External processor interface

Pin #	Signal name	Description
1	LDO_CTL	ON/OFF control of LDO (input)
2	3V6	Power Supply, typical 3.6V (input)
3	GND	Ground
4	UART_TX	Transmit Data (output)
5	UART_CTS	Clear to send (input)
6	UART_RX	Receive Data (input)
7	UART_RTS	Ready to send (output)
8	HOST_WU	Host Wake Up (output)
9	RESET	Reset (input)

Table 7 J3 Advance Audio Interface

Pin #	Signal name	Description
1	3VB	LDO output (3.0V)
2	AAI_SCLK	Advanced Audio Interface Clock
3	AAI_STD	Advanced Audio Interface Transmit Data
4	AAI_SFS	Advanced Audio Interface Frame Synchronization
5	AAI_SRD	Advanced Audio Interface Receive Data
6	GND	Ground

Table 8 Mode setting

R18	Mode setting
open	RUN mode
short	In System Programming mode

Table 9 UART interface setting

R15	R16	UART baud rate
Open	Open	921600bps
Short	Open	115200bps
Open	Short	9600bps
Short	Short	NVS (9600bps by default)

Table 10 J1 (Sedona Lite Board)

Pin #	Signal name	Description
1	Vcc	3.0V Input
2	SCLK	PCM Clock
3	STD	PCM Input Data
4	SFS	PCM Frame Synchronization
5	SRD	PCM Output Data
6	GND	Ground

Table 11 J2 (Sedona Lite Board)

Pin #	Signal name	Description
1	SCLK	PCM Clock
2	GND	Ground
3	SFS	PCM Frame Synchronization
4	Vcc	3.0V Input
5	STD	PCM Input Data
6	NC	No Connection
7	SRD	PCM Output Data
8	GND	Ground

Table 12 Audio connection

P17	For PC Microphone
P15	For PC Headphone

Figure 4. Sedona Lite Board

8.0 Bill of materials (Reference Board)

Item Name	Description	Vendor	Part Number
X1*	TEW, TAS-4025A,12.000MHz	TEW	20-A0578 or 20-A0060
ANT*	Chip Antenna	MuRata	ANCW12G45SAA110TT1
C1*	Capacitor 10p 0603 COG 50V	MuRata	GRM39COG100J50
C3	Capacitor 100n 0603 X7R 16V	MuRata	GRM39X7R104K16
C4,C6,C18,	Capacitor 100p 0603 COG 50V	MuRata	GRM39COG101J50
C5,C7,C17	Capacitor 10n 0603 X7R 50V	MuRata	GRM39X7R103K50
C2*	Capacitor 12p 0603 COG 50V	MuRata	GRM39COG120J50
C15,C19	TANT CAP 1uF 6.3V SIZE A	MuRata	GRM39Y5V105Z10
C11,C20,C21, C23,C24	Capacitor 1uF 1206 X7R 25V	MuRata	GRM42-6X7R105K25
C9	Chip Inductor 3N9 0603	MuRata	LQG18HN3N9S00
L1*	Chip Inductor 2N2 0603	MuRata	LQG18HN2N2S00
BAT1	Battery holder (2mm pitch)	Any	
SW3	TACK SWITCH TS-1135HS	RAINBOW	
DC1	DC POWER JACK	Morning string limited	DC-015
LED2	Red Color LED 0603 Size	Any	
LED1	Blue Color LED 0603 Size	Any	
J1	DB9 (male) serial connector	Any	
J3	2mm Header (6 poles)	Any	
U1	Bluetooth Wireless PAN Module	National Semiconductor	LMX9820ASM
U2	High Speed RS232 Transceivers	Maxim	MAX3225ECAP
U3	Resistor 0603 Size, 10R	National Semiconductor	LP3985IM5-3.0
R1	Resistor 0603 Size, 100R	Any	
R7, R25	Resistor 0603 Size,1K	Any	
R3, R4	Resistor 0603 Size,100K	Any	
R19,R20,R21, R22,R8,R24	Low Dropout CMOS Voltage Regulator	Any	
R9,R10,R11	Resistor 0603 Size,0R	Any	
R8*	2mm header	Any	
R15*, R16*	2mm header (with jumper)	Any	

9.0 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

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

10.0 References

LMX9820A Bluetooth Serial Port Module data sheet

LMX9820A Bluetooth Serial Port Module - Software Users Guide

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