National Semiconductor

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LMX9820A to LMX9838 Conversion Guide

1.0 LMX9838

The National Semiconductor® LMX9838 Bluetooth® Serial Port module is the next generation of the current LMX9820A. The LMX9838 is a complete self contained design which includes some key changes that must be considered in the system design and implementation. Table 1 on page 1 summarizes differences between LMX9820A and the LMX9838.

Table 1. LMX9820A vs. LMX9838

Specification	LMX9820A	LMX9838	Changes details
Main clock Frequency range	12 MHz Recommended External	13 MHz Internal	The LMX9838 has a fixed internal 13 MHz crystal
Reset Baseband and Reset Radio	Reset Baseband and Reset Radio are tied together and driven externally	A single Reset pin (Pad 2) Reset# is driven externally, and will put both the Radio and Baseband into the Reset state	
Physical	116 Pins FR4 10.1mm x 14.1mm x 2.0mm	70 Pins LGA 10mm x 17mm x 1.85mm	Reference LMX9838 dongle design
Low Power Modes	32.768 kHz Supported in version 6.23 Firmware	32.768 kHz Supported	See Section 2.0 "Optional 32 kHz For LOW Power"
Antenna design	External	Internal chip antenna	
Bluetooth settings memory	Internal Flash	ROM based Internal EEPROM	See LMX9838 datasheet and Software Users Guide
BD address	Organized by National - Included in Flash	Organized by National - Included in EEPROM	
Firmware update	Flash based, using ISP software	ROM based, no upgrade possible, Patch support for partial replacement	Using Patch RAM mechanism See Section 3.0 "Firmware Upgrade And Patch RAM"
Additional features	Normal scan Up to 3 active links	Interlaced scan Up to 7 active links Scatternet supported Audio PCM slave Adaptive Frequency Hoping	
Command set			See Section 4.0 "Command Set" and LMX9838 Software Users Guide

2.0 Optional 32 kHz For LOW Power

On the LMX9838 a second oscillator is provided that is tuned to provide optimum performance and low-power consumption while operating with a 32.768 kHz crystal. By using this 32 kHz the current consumption can be reduced from 2.5 mA to 430 µA in low power mode PM2 (See Table 3 "Power Mode Activity").

An external crystal clock network is required between the 32k+ clock input (pad 27) and the 32k- clock output (pad 28) signals. The oscillator is built in a Pierce configuration and uses two external capacitors. Table 2 provides the oscillator's specifications.

In case the 32 kHz is placed optionally, it is recommended to remove C2 and replace C1 with a zero ohm resistor.

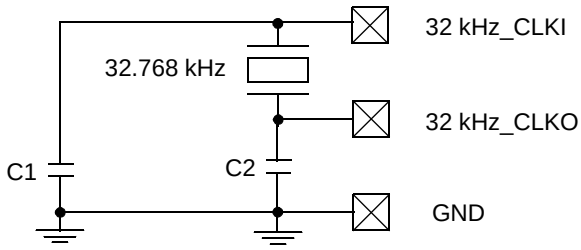

Figure 1 32.768 kHz Oscillator

Table 2. 32.768 kHz Oscillator Specifications

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{DD}	Supply Voltage		1.62	1.8	1.98	V
I_{DDACT}	Supply Current (Active)			2		µA
f	Nominal Output Frequency			32.768		kHz
V_{PPOSC}	Oscillating Amplitude			1.8		V
	Duty Cycle		38	48.3	58	%

Table 3 "Power Mode Activity" sums up the different low power modes available with the LMX9838. Note that using the optional 32 kHz oscillator will improve the current consumption only for the low power mode PM2. For more information on Low Power mode operation on LMX9838 please refer to the LMX9838 datasheet and the Software Users Guide

Table 3. Power Mode Activity

Power Mode	UART activity	Radio activity	Reference Clock
PM0	OFF	OFF	none
PM1	ON	OFF	Main Clock
PM2	OFF	Scanning	Main Clock / 32.768khz
PM3	ON	Scanning	Main Clock
PM4	OFF	SPP Link	Main Clock
PM5	ON	SPP Link	Main Clock

3.0 Firmware Upgrade And Patch RAM

The LMX9838 firmware is included in ROM and therefore can not be updated. To still be able to correct small errors or to do minor modifications to the software, the LMX9838 offers the so called "Patch" mechanism, which basically allows to replace small parts of the ROM code. This patch code is held in RAM and needs to be provided during "Initialization Mode", in which it is either read from EEPROM or pushed by the host.

For more information about the Patch RAM mechanism please refer to the LMX9838 Software User's Guide.

4.0 Command Set

The command set changed slightly from LMX9820A to LMX9838. Some commands specific to the LMX9838 have been added and some have been removed.

4.1 REMOVED COMMANDS AND EVENTS

Below is the list of the commands removed from the LMX9838 command set:

- Store SPP Record
- Store DUN Record
- Store FAX Record
- Store OPP Record
- Store FTP Record
- Store IrMCSync Record

4.2 ADDED COMMANDS

Below is the list of the commands added to the LMX9838 command set:

- Set Clock Frequency
- Get Clock Frequency
- Set PCM Slave Configuration
- Enter Bluetooth Mode
- Set Clock And Baud Rate
- Get Pin response
- Replacing “Firmware upgrade” command to “Write ROM Patch”: Using same opcode. See SimplyBlue Commander User’s Guide for how to use the Write ROM Patch command
- Read Memory
- Write Memory
- Read NVS
- Write NVS
- Set GPIO WPU
- Get GPIO Input State
- Set GPIO Direction
- Set GPIO Output High
- Set GPIO Output Low

4.3 ADDED EVENTS/INDICATORS

Below is the list of the events or indicators added to the LMX9838 command set:

- Pin Request
- Await Initialization

For a detailed list of the functionality of those commands and how to use them, please refer to the LMX9838 Software User’s Guide.

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