Block description

for the

0dBm Motorola Bluetooth™ Mini PCI

BTMPC100

1 Table of Contents

2 Revision History

Revision	Date	Author	Changes
1.0	03-05-01	EMN	Born

3 General

This document contains block description for the 0dBm Motorola Bluetooth Mini PCI.
On the last page, there is a block diagram of the whole unit.

4 Block Description

4.1 Radio Description

This section is a description of the 0dBm Motorola Bluetooth™ generation 1 radio block diagram.

4.1.1 LMX3162 transceiver IC

The main block of the radio is the National Semiconductor LMX3162 radio transceiver, which in fact is an up banded DECT transceiver.

The LMX3162 radio transceiver consists of a phase locked loop (PLL), transmit and receive functions. The 1,3GHz PLL is shared between transmit and receive sections.
The transmitter part of the LMX3162 includes a frequency doubler and it employs direct VCO modulation.
The receiver part consists of a 2,5GHz low noise converting mixer, an intermediate frequency amplifier, a high gain limiting amplifier and a frequency discriminator.
The receiver section has a simple heterodyne receiver, i.e. single conversion architecture and the received signal is demodulated using a quadrature discriminator. The transceiver IC has on-chip regulators in order to allow supply ranges from 3.0VDC to 5.5VDC.

The frequency reference to the transceiver IC is a divide by 4 version of the onboard 16MHz main clock. The main clock is fed to the Base Band controller (LMX5001), and internal divided by 4 and then fed as the PLL_OSC (4MHz reference) signal to the transceiver IC.

4.1.2 Gaussian filter

The Gaussian filter is a passive filter, which in addition to the filter contains a resistive divider in order to obtain and control the amplitude, such that frequency deviation within the Bluetooth™ specification is achieved.
The Gaussian filter is modulated from the base band controller and the output of the Gaussian filter is fed into the VCO.

4.1.3 VCO

A transmit RF signal is generated by very simple frequency modulation of the VCO. The VCO is seen external to the transceiver IC at the block diagram. The VCO is a none band-switching VCO, which in transmit mode, varies in the frequency range of 1201-1240 MHz dependent of the hopping scheme. It is done in open loop operation.

4.1.4 Bitslicer

The bitslicer consists of a 5.order low pass filter, and a comparator. The 5. order filter will along with the 110.0MHz SAW filter secure that the Bluetooth™ ACI receiver requirements are fulfilled.
The bitslicer uses a fast and a slow time constant in order to have carrier track on only 4 preamble bit's, and at the same time detect long sequences of 0's and 1's in the packet payload. These time constant's are changed from the Base Band controller. The hard coded detected bits are transferred to base band controller as RX_DATA.

4.1.5 Tx chain

The Tx chain gets its input signals from the Radio Transceiver, which delivers an output level of app. –7dBm nominal. This signal is now amplified in an amplifier, which will allow approx. 1 dBm TX power at the antenna connector, according to the power class 2 requirements. The PA supply switches the PA on/off and ramps TX power to avoid sideband noise.
At the output of PA the signal is slightly "band-pass" filtered before passing through the Rx/Tx switch.

4.1.6 Rx chain

After having passed the TX/RX switch the signal enters the LNA, which is build around the BFP420 from Infineon, which can achieve 13dB gain and 2dB noise figure.

4.1.7 Rx/Tx switch

The Rx/Tx switch is simply switching the antennas between Rx- and Tx-chain.

4.1.8 Diversity switch

The signal enters the diversity switch before it is fed to one of the antenna connectors. The construction uses antenna diversity and the decision upon which antenna to use is performed by the receiver by selecting, using a well defined algorithm, the polarization with the currently highest power content. The two antenna connectors connects to antennas, which should covers the entire Bluetooth™ band, i.e. from 2402-2480 MHz.

4.2 Bluetooth™ Base Band

The base band circuit consists of a single chip solution.
The main feature of this chip is to establish the communication between the DSP and the Radio. This means that the base band controller uses two different sets of very different interfaces.

The interface with the DSP is a general synchronous serial data communication using a DSP Sport. Through the serial connection with the base band controller, the DSP controls the Bluetooth™ settings and transmit/receive data from the Bluetooth™ Radio connection.

The interface with the Radio consists of a serial connection, which provides communication with the radio chip. There are several special connections regarding the Bluetooth™ Radio.
The base band controller is configured by the DSP. This means that the DSP makes a setup of the base band controller. In other cases the DSP tells the Base Band chip whether to transmit or receive data from the Bluetooth™ Radio or in general the Bluetooth™ neighborhood and thereby other Bluetooth™ devices.
When transmitting or receiving data the base band converts the DSP data into Bluetooth™ packages and vice versa, as defined in the Bluetooth™ standard.

4.3 DSP / PCI interface

The DSP, Digianswer-type AD21BT102, has interfaces to 3 surrounding segments:

- The EEPROM memory through a 2 wire serial interface.
- The DSP's PC interface is the Mini PCI connector.
- The Base Band chip using a SPORT. The Base Band functionality is described in chapter 4.2.

The EEPROM is programmed under production test and contains information about the module such as IEEE-number and country code.

The communication through the Mini PCI connector is containing both Bluetooth™ data and DSP program overlays, while there is no non-volatile program memory on the Mini PCI board.

The DSP contains a PROM with specific information about the chip and a boot code used at system reset.

4.4 Power Supply

4.4.1 General

The power supplies uses 3.3V from the Mini PCI connector.

4.4.2 DSP supply

The DSP is supplied by the 3.3V.

4.4.3 Base Band supply

The Base Band is supplied by a 3.0V supply, generated from 3.3V by a very low dropout regulator.

4.4.4 VCO supply

The VCO is supplied by a 2.7V supply, generated from 3.3V by a low dropout regulator.
Base Band disables this supply to save power when the VCO is not in use.

4.4.5 Radio supply

The main Radio supply is based on the 3.3V voltage, which is slightly filtered to avoid interference.

4.4.6 PA supply

The PA supply is driven directly from the filtered 3.3V voltage via a switch.
Base Band disables this supply to save power when the Radio is not in TX-mode.
This switch is also used for cutting the RF power, controlled by pin 13 on the Mini PCI-connector.

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