FOXCONN® Network System Group

WLAN and Bluetooth combo module

T77H134

< REV.05>

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0. Revision History

Date	Change Note	REV Note
Nov. 11, 2008	Rev.01	0
Dec. 19, 2008	Rev.02	Update dimension of module
Apr. 28, 2009	Rev.03	Change the pin-define
Oct. 13.2009	Rev.04	Change the height of shielding
Oct. 27.2009	Rev.05	Change the mechanical spec of shielding

1. Introduction

Project Name: Mini-Module (802.11b/g + BT Module) based on Marvell IC 88W8688 with TFBGA package.

This documentation describes the Engineering requirements specification of the WLAN (802.11b/g) +Bluetooth 2.1 EDR Mini-Module. It is a confidential document of FOXCONN.

1.1 Scope

The Wireless MARVELL 88W8688BFL Mini-Module is designed to support 802.11g data rate of 54, 48, 36, 24, 18, 12, 9, 6Mbps, and as well as 802.11b data rate of 11, 5.5, 2, 1Mbps for WLAN operation. In addition, this module is Bluetooth 2.1+Enhanced Data Rate (EDR) compliant which provide 1, 2 and 3Mbps data rate.

1.2 Function

- **Compatible with IEEE 802.11b/g standard and Bluetoothv2.1+EDR standard**
- **Ultra low-power dissipation**
- **Support external power down mode**
- **Support Marvell Wi-Fi/Bluetooth coexistence**
- **Support the IEEE 802.11i security standard through implementation of the Advanced Encryption Standard (AES)/ Counter Mode CBC-Mac Protocol (CCMP) and WEP security mechanisms. Also supports Internet Protocol Security (IPSce) with DES/3DES/AES encryption and MD5/SHA-1 authentication.**
- **Host interface supports for SDIO/ G-SPI, PCM/I2S Codec interface for multimedia application**
- **Host interface supports for SDIO/ G-SPI, PCM/I2S Codec interface for multimedia application**

1.3 Environmental

Ambient Temperature (operation) = -10 to +75 Degrees Celsius.
Product storage temperature = -40 to +85 Degrees Celsius.

2 Product Specification

2.1 Hardware Specification

2.1.1 WLAN

Wireless LAN Standards	**IEEE 802.11g standard and IEEE 802.11b**
Operating Frequency	**2.412~2.484GHz**
Channel Numbers	**11 channels for United States** and Taiwan. **13 channels for Europe Countries** **14 channels for Japan**
WLAN Data Rate	**802.11g: 54Mbps with fall back of 48, 36, 24, 18, 12, 9, 6Mbps.** **802.11b: 11Mbps with fall back rates of 5.5, 2, and 1Mbps**
Modulation Schemes	**802.11g:** **64QAM (54Mbps, 48Mbps), 16QAM (36Mbps, 24Mbps), QPSK (18Mbps, 12Mbps), BPSK (9Mbps, 6Mbps)** **802.11b:** **CCK (11 Mbps, 5.5Mbps), DQPSK (2 Mbps), DBPSK (1 Mbps)**
Transmitter Output Power	11b : 22 dBm 11g : 25 dBm
EVM	**802.11b @11Mbps_14dBm (8%dB@peak)** **802.11g @54Mbps_14dBm (-26dB@average)**
Receiver Sensitivity	**Typical –72dBm for 54Mbps @ 10% PER** **Typical –74dBm for 48Mbps @ 10% PER** **Typical –81dBm for 36Mbps @ 10% PER** **Typical –83dBm for 24Mbps @ 10% PER** **Typical –86dBm for 18Mbps @ 10% PER** **Typical –88dBm for 12Mbps @ 10% PER** **Typical –88dBm for 9Mbps @ 10% PER** **Typical –88dBm for 6Mbps @ 10% PER** **Typical –88dBm for 11Mbps @ 8% PER** **Typical –90dBm for 5.5Mbps @ 8% PER** **Typical –92dBm for 2Mbps @ 8% PER** **Typical –93dBm for 1Mbps @ 8% PER**
Media Access Protocol	**CSMA/CA with ACK**

2.1.2 Bluetooth

Radio Technology	**FHSS**
Operating Frequency	**2402 ~ 2480MHz ISM band**
Channel Numbers	**79 channels with 1MHz BW**
Transmitter Output Power	**-4dBm**
Receiver Sensitivity	**-80dBm @ GFSK 0.1% BER, 1Mbps**
Maximum Receiver Signal	**-20dBm**

3. Product Requirements

3.1 Hardware Requirements

Form factor	**LGA**
Host Interface	**SDIO**
PCB	**6-layer FR4**
Antenna port:	**One BT RF port and One Wi-Fi RF port**

3.2 Hardware Architecture

The module design is based on the MARVELL 88W8688BFL single chip which implements IEEE802.11b/g and Bluetooth 2.1+EDR.

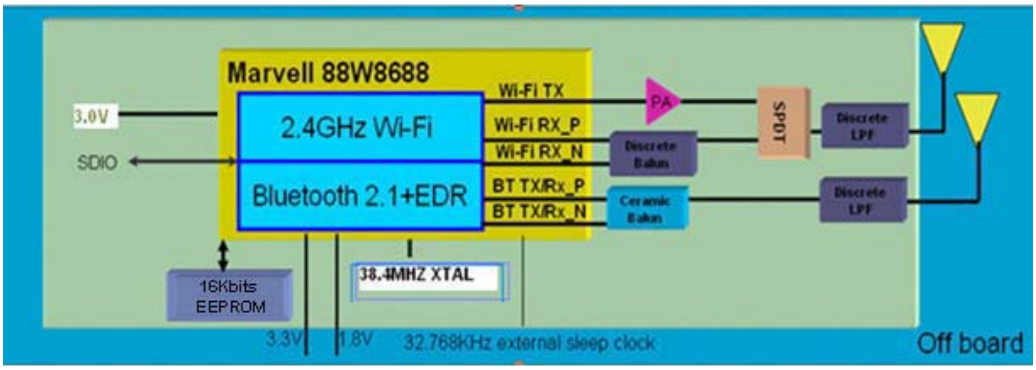

Figure 1 Functional Block Diagram

MARVELL 88W8688BFL is a highly integrated, low-cost, low-power IEEE802.11 b/g MAC /Baseband / RF WLAN and Bluetooth Baseband/RF. The mini Module apply to WLAN /Bluetooth cellular handsets ,WLAN/Bluetooth headsets, portable audio/video devices and accessories , gaming platforms, and WLAN/Bluetooth enabled digital still cameras and printers.

The single chip MARVELL 88W8688BFL interfaces directly with both the RF and digital signals. It transmits and receivers RF signals at 2.4GHz to and from the antenna and digital signals to and from the host interface. A power management (PMU) is placed in the off Board to provide power for all components in the module and also can save precious board space.

Federal Communication Commission Interference Statement

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 of the following measures:

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

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.

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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter, except tested built-in WLAN-BT collocation.

IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.

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

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

2) The transmitter module may not be co-located with any other transmitter or antenna, except tested built-in WLAN-BT collocation.

3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 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 (for example, digital device emissions, PC peripheral requirements, etc.).

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.

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:MCLT77H134”.

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.

3.4.2 Pin definition

NCC 警語：

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本模組於取得認證後將依規定於模組本體標示審合格籤，並要求平台上標示「本產品內含射頻模組：ID編號」

3.5 Software Requirements

The software includes firmware, driver and configuration utility for Wireless WLAN 802.11 b/g + Bluetooth Module based on Marvell 88w8688BFL chip.

3.5.1 Software setup

The software components required for operations will be packed into one installation program, thus user and customer can setup and upgrade software simply by running the setup program (ex. Setup.exe) without any obstacles.

3.5.2 Operating System Support

All software components, including the installer will work on Microsoft Windows XP SP2. Driver for some common Linux systems is also supported, such as Fedora 8. Other Operate Systems (such as Microsoft Windows Vista RTM) will be supported if required by customer.

3.5.3 Software Functions

For WLAN part, the WLAN configuration utility will include the Link Statistics Software, thus customers can evaluate various PHY performance parameters independent of system performance. This utility can also be used to change various WLAN parameters, such as SSID, Band, channel, Data rate, etc. The firmware and driver will fully compliance to the 802.11 published PHY and MAC specifications. It can support the following functions:

- **Scan for Wireless Networks**
- **Connect to a Wireless Network**
- **Change Profiles**
- **Support security standards such as, WEP, WPA, WPA2, WPA-PSK, and WPA2-PSK.**
- **Support ASPM**
- **Support Marvell Bluetooth coexistence**

For Bluetooth part, a fully working Configuration Utility is supplied. It is:

- **Fully compliant with Bluetooth 2.1 +EDR(Enhanced Data Rate) specifications up to HCI (Host Controller Interface) layer**
- **Support all standard operations: Inquiry scan, page scan, paring, authentication, link key, and encryption**
- **Support many approved features of Bluetooth 2.1 release (Link Supervision Timeout, Encryption Pause/Resume, Extended Inquiry Response, Sniff Sub Rating)**
- **Support all Bluetooth low power operation modes. (ie, hold, sniff, and park with configurable intervals).**
- **Support sleep and standby modes for ultra low-power operation.**