



MARVELL 88W8786 1X1 11n Card

Engineering Requirements Specification

Project code: SP88W8786-MD0-2C2T00
Solution: Marvell 88W8786
Application: IEEE802.11b/g/n

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0. Revision History

Date	Change Note	REV Note
Jan. 23, 2009	1 st Rev.	0

1. Introduction

Project Name: 11n (1x1) card based on IC Marvell 88W8786 with QFN package.

The typical use model for this embedded device is to allow the host device to be connected to an 802.11b/g/n 1x1 wireless network with infrastructure mode or to serve as an ad-hoc (peer-to-peer) data path.

1.1 Scope

The Wireless MARVELL 88W8786 available 11n solution in the 2.4-GHz band, compatible with the IEEE 802.11b standard, 802.11g standard and 11n standard. The 802.11g data rate provides for 54, 48, 36, 24, 18, 12, 9, 6Mbps, and 802.11b data rate provides for 11, 5.5, 2, 1Mbps. In addition, 11n provide 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps for HT20; And also provide 13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps for HT40.

1.2 Function

- RoHS and Green Compliant.
- 802.11b/g/n 1x1 based on Marvell 88W8786U IC
- USB 2.0 Interface, High and Full Speeds supported.
- Module has antenna diversity switching.
- Module is powered by the host with a 3.3V +/- 10% supply (55mVpp ripple).
- Module's clock source is provided by the on board XTAL Oscillator of 40 MHz (+/- 10ppm).
- Module connected to motherboard with approximately 10cm cable.
- JTAG connector will be provided for FA and debug.
- The USB-8786U PCA module assembly is homologation tested as a MODULAR PCA UNIT.
Unit dependent RF parameters are programmed into each module EEPROM at production test time by the manufacturer.

2 Product Specification

2.1 Hardware Specification

Wireless LAN Standards	IEEE 802.11 b/g/n
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 11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps for HT20 11n: 13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps for HT40
Transmitter Output Power	Typical 24dBm for 11b Typical 25dBm for 11g Typical 25dBm for HT20 Typical 23dBm for HT40
Receiver Sensitivity	Typical -65dBm for 135Mbps @ 10% PER Typical -75dBm for 81Mbps @ 10% PER Typical -80dBm for 40.5Mbps @ 10% PER Typical -85dBm for 13.5Mbps @ 10% PER Typical -71dBm for 65Mbps @ 10% PER Typical -78dBm for 39Mbps @ 10% PER Typical -83dBm for 19.5Mbps @ 10% PER Typical -88dBm for 6.5Mbps @ 10% PER Typical -72dBm for 54Mbps @ 10 Typical -73dBm for 48Mbps @ 10% PER Typical -86dBm for 18Mbps @ 10% PER Typical -89dBm for 6Mbps @ 10% PER Typical -87dBm for 11Mbps @ 8% PER Typical -94dBm for 1Mbps @ 8% PER

3. Product Requirements

3.1 Hardware Requirements

Host Interface	USB 2.0
PCB	4-layer FR4
Antenna port:	Diversity

3.2 Hardware Architecture

This specification describes an embedded 802.11b/g/n WiFi interface PCA 'module' for embedded device products. The module has two on-board antennae. This module is powered from the host (3.3V) and interfaces to the host with USB 2.0 signals. No switches, indicators or related user interface signals are provided on this module. An on-board 40 MHz XTAL is included.

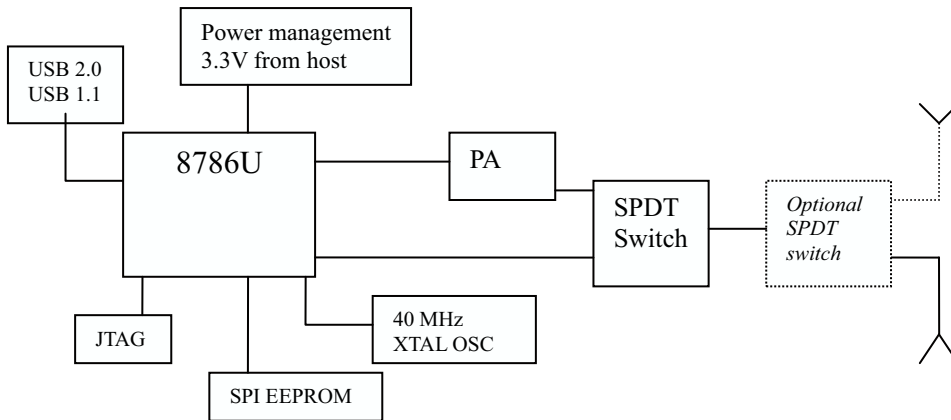


Figure 1 Functional Block Diagram



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.

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,
- 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: BKMFB88W8786".

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.



Industry Canada Statement

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions:

- 1) this device may not cause interference and
- 2) this device must accept any interference, including interference that may cause undesired operation of the device

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC 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.

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,
- 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 IC authorization is no longer considered valid and the IC 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 IC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following: "Contains TX IC : 1052C-SP88W8786".

Manual Information That Must be Included

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 user's manual for OEM Integrators must include the following information in a prominent location "IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements. The antenna must not be co-located or operating in conjunction with any other antenna or transmitter".

Taiwan 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 WiFi ALLIANCE CONFORMANCE

The Module is certified by the Wi-Fi Alliance. The Module and standard PC driver passes the Wi-Fi System Interoperability Test Plan including the following:

- A. IEEE 802.11-2007 Standard for LAN/MAN - Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications; ISBN: 978-0-7381-3572-4
- B. IEEE P802.11N Draft Standard for Information Technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY), ISBN: 0-7381-5568-3
- C. Supported security:
 - 64 bit and 128 bit WEP RC4 encoding
 - WPA and WPA2 personal as required by the Wi-Fi Alliance
 - Module shall support WPA2 and WPA in 802.11bgn modes
 - Key-mapping key.
 - The AES-CCM is implemented in HW
- D. Forward compatible to ratified IEEE Standard 802.11n supporting these optional features:
 - 1x1 PHY modes minimum (transmit 1 spatial stream, receive 1 spatial stream)
 - Future 2.4GHz band 20/40 MHz Coexistence Mechanism
 - HT duplicate mode
 - Short Guard interval
- E. WFA Wireless Protected Access: WPA, WPA2 WPA2-CCMP version 3.1
- F. WFA Wireless Multimedia (WMM) version 1.3.2
- G. WFA Wireless Protected Setup (WPS) version 1.0
- H. WMM Power Save test plan version 1.1.1
- I. USB 2.0 and USB 1.1 Specification compliance.