U S E R ' S   M A N U A L

C2104001

BCM 43224 WiFi Card

Contents

HON HAI PRECISION IND. CO., LTD.

Section One: Introduction

1. Introduction
Project Name: 802.11a/b/g/n (2x2) card based on IC BCM43224 with BGA package.

The typical use model for this embedded device is to allow the client device to be connected to an 802.11a/b/g/n 2x2 wireless network with infrastructure mode or to serve as an ad-hoc (peer-to-peer) data path.

1.1 Scope
The Wireless BCM43224 is an available 11n solution in the 2.4/5GHz band, compatible with the IEEE 802.11a/b/g/n. The 802.11 a/g 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 MCS8~MCS15 for HT20 which PHY data rate up to 150Mbps; also provide MCS8~MCS15 for HT40 with data rate up to 300Mbps.

1.2 Function
- **RoHS and Green Compliant.**

- **802.11a/b/g/n 2x2 based on BCM43224.**

- **PCI-E Half Mini Supported.**

- **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 20 MHz (+/- 10ppm).**

- **JTAG connector will be provided for FA and debug.**

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2 Product Specification

2.1 Hardware Specification

Wireless LAN Standards	**IEEE 802.11 a/b/g/n**
Operating Frequency	**2400~2483.5MHz, 5150~5250MHz, 5725~5850MHz**
WLAN Data Rate	**802.11a/g: 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: MCS8~MCS15
Transmitter Output Power	**Typical 10.0dBm(AV) for 11a**
	Typical 15.5dBm(AV) for 11b
	Typical 15.5dBm(AV) for 11g
	Typical 14.5dBm(AV) for HT20
	Typical 13.5dBm(AV) for HT40
Receiver Sensitivity	**Typical –65dBm for MCS15 (HT40) @ 10% PER**
	Typical –67dBm for MCS14 (HT40) @ 10% PER
	Typical –68dBm for MCS13 (HT40) @ 10% PER
	Typical –71dBm for MCS12 (HT40) @ 10% PER
	Typical –73dBm for MCS11 (HT40) @ 10% PER
	Typical –76dBm for MCS10 (HT40) @ 10% PER
	Typical –79dBm for MCS9 (HT40) @ 10% PER
	Typical –82dBm for MCS8 (HT40) @ 10% PER
	Typical –70dBm for MCS15 (HT20) @ 10% PER
	Typical –72dBm for MCS14 (HT20) @ 10% PER
	Typical –73dBm for MCS13 (HT20) @ 10% PER
	Typical –76dBm for MCS12 (HT20) @ 10% PER
	Typical –79dBm for MCS11 (HT20) @ 10% PER
	Typical –82dBm for MCS10 (HT20) @ 10% PER
	Typical –83dBm for MCS9 (HT20) @ 10% PER
	Typical –85dBm for MCS8 (HT20) @ 10% PER
	Typical –74dBm for 54Mbps @ 10% PER
	Typical –76dBm for 48Mbps @ 10% PER
	Typical –86dBm for 18Mbps @ 10% PER
	Typical –89dBm for 6Mbps @ 10% PER
	Typical –89dBm for 11Mbps @ 8% PER
	Typical –94dBm for 1Mbps @ 8% PER

3. Product Requirements

3.1 Hardware Requirements

Host Interface   PCI-E
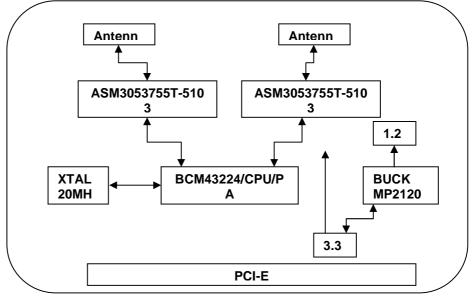
3.2 Hardware Architecture

This specification describes an embedded 802.11a/b/g/n WiFi interface PCA 'module' for embedded device products. The module has two antennae. This module is powered from the host (3.3V) and interfaces to the host with PCIE-half signals. No switches, indicators or related user interface signals are provided on this module. An on-board 20 MHz XTAL is included.

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┌─────────────────────────────────────────────────────────────┐
│   ┌─────────┐                          ┌─────────┐          │
│   │ Antenn  │                          │ Antenn  │          │
│   └────┬────┘                          └────┬────┘          │
│        ↕                                    ↕               │
│ ┌──────────────────┐            ┌──────────────────┐  ┌─────┐│
│ │ ASM3053755T-5103 │            │ ASM3053755T-5103 │  │ 1.2 ││
│ └────────┬─────────┘            └────────┬─────────┘  └─────┘│
│          ↕                               ↕              ↑    │
│ ┌──────┐   ┌──────────────┐           ┌──────────────┐      │
│ │ XTAL │ ↔ │ BCM43224/    │           │    BUCK      │      │
│ │ 20MH │   │ CPU/PA       │           │   MP2120     │      │
│ └──────┘   └──────────────┘           └──────────────┘      │
│                              ┌─────┐        ↕               │
│                              │ 3.3 │────────              │
│                              └─────┘                        │
│        ┌────────────────────────────────────────┐          │
│        │                 PCI-E                   │          │
│        └────────────────────────────────────────┘          │
└─────────────────────────────────────────────────────────────┘
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I/O PIN DEFINE

PIN	SIGNAL NAME	I/O	NOTES
2	3.3V		Power supply
3	WPS status		LED indicated
4	GND		Ground
9	GND		Ground
10	WPS status		LED indicated
11	REF CLK-		Differential PCI-E Clock negative
13	REF CLK+		Differential PCI-E Clock Positive
15	GND		Ground
18	GND		Ground
21	GND		Ground
22	PCIE-Reset		Reset to the device from Host
23	PERn0		Differential PCI-E data receive negative
25	PERp0		Differential PCI-E data receive positive
26	GND		
27	GND		
29	GND		
31	PETn0		Differential PCI-E data transmit negative
33	PETp0		Differential PCI-E data transmit positive
34	GND		
35	GND		
40	GND		
44	WLAN Activity		LED indicated
50	GND		
52	3.3V		Power supply
54	GND		

others	Reserved		

4 FCC Notice

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.

Operations in the 5.15-5.25GHz band are restricted to indoor usage only

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:XCNC2104001".

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.