T77H262.00
SDIO WiFi Module
Rev. 1.0

Prepared by	Reviewed by	Approved by
Frey	Ai-ning	Robin

1. Revision History

Date	Change Note	REV Note
2011-05-08	Initial Release	1.0

2. Introduction

Project Name: 802.11 b/g/n wireless card

The T77H262.00 802.11b/g/n module provides wireless modem functionality utilizing direct sequence spread spectrum and OFDM/CCK technology. This module is based on Broadcom BCM4319GKUBG P20 solution which is integrated 2.4GHz IEEE802.11 b/g/n (MAC/baseband/radio), power amplifiers (PA), and power management unit (PMU).

2.1 Scope

The wireless LAN is compliant to IEEE 802.11b and IEEE 802.11g and IEEE 802.11n standard. The data rate of 802.11b is up to 11Mbps and fallback rates of 5.5, 2, 1Mbps. The data rate of 802.11g is up to 54Mbps and fallback rates of 48,36,24,18,12,9, 6Mbps. The data rate of 802.11n HT20 with 800ns GI is up to 65Mbps and fallback rates of 58.5, 52, 39, 26, 19.5, 13, 6.5Mbps; the data rate of 802.11n HT20 with 400ns GI is up to 72.2Mbps and fallback rates of 65, 57.8, 43.3, 28.9, 21.7, 14.4, 7.2Mbps.
The data rate of 802.11n HT40 with 800ns GI is up to 135Mbps and fallback rates of 121.5, 108, 81, 54, 40.5, 27, 13.5Mbps. The data rate of 802.11n HT40 with 400ns GI is up to 150Mbps and fallback rates of 135, 120, 90, 60, 45, 30, 15Mbps.

2.2 Function

- IEEE802.11b/g/n (1X1) based on Broadcom 4319 solution.
- SDIO 2.0 Interface.
- Module is powered by the host with a 3.3V +/- 10% supply.
- Two PCB printed antennas.
- One DPDT switch for antenna diversity.
- RoHS and Green Compliant.

3. Product Specification

3.1 Electrical Characteristics

Parameter		Minimum	Typical	Maximum	Units
Frequency Range		2.4	~	2.5	GHz
Input Supply Voltage	Absolute maximum Voltage	3.0	3.3	3.6	V
Tx Output	CCK	15.5	17	18.5	dBm
	OFDM BPSK	12.5	14	15.5	dBm
	OFDM QPSK	12.5	14	15.5	dBm
	OFDM 16QAM	12.5	14	15.5	dBm
	OFDM 64QAM	12.5	14	15.5	dBm
	MCS0~7	12.5	14	15.5	dBm
Storage Temperature		-20	~	85	℃
Storage Humidity		0	~	90	%
ESD Level	HBM	-	TBD	-	V
	MM	-	TBD	-	V

3.2 WiFi RF Specification

3.2.1 IEEE802.11b Mode

Radio Technology	Direct Sequence Spread Spectrum (DSSS)
Operating Frequency	2412 ~ 2484MHz ISM band
Modulation Schemes	DQPSK, DBPSK and CCK
Channel Numbers	11 channels for United States 13 channels for Europe Countries 14 channels for Japan
Data Rate	1Mbps , 2Mbps, 5.5Mbps and 11Mbps
Media Access Protocol (MAC)	CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
Transmitter Output Power	17.0 dBm+/-1.5dBm for all data rate.
Frequency Accuracy	+/-25ppm
Minimum Receiver Sensitivity Level	Typical –97dBm for 1Mbps @ 8% PER Typical –94dBm for 2Mbps @ 8% PER Typical –91dBm for 5.5Mbps @ 8% PER Typical –88dBm for 11Mbps @ 8% PER
Maximum Receiver Sensitivity Level	Maximum –20dBm
EVM	Typical 18% for 1Mbps @17dBm output power Typical 18% for 2Mbps @17dBm output power Typical 18% for 5.5Mbps @17dBm output power Typical 18% for 11Mbps @17dBm output power

3.2.2 IEEE802.11g Mode

Radio Technology	Orthogonal Frequency Division Multiplexing (OFDM)
Operating Frequency	2412 ~ 2472MHz ISM band
Modulation Schemes	BPSK, QPSK, 16QAM, 64QAM
Channel Numbers	11 channels for United States 13 channels for Europe Countries
Data Rate	6 Mbps,9, 12, 18, 24, 36, 48, and 54Mbps
Media Access Protocol (MAC)	CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
Transmitter Output Power	14.0 dBm+/-1.5dBm for all data rate.
Frequency Accuracy	+/-25ppm
Minimum Receiver Sensitivity Level	Typical –89dBm for 6Mbps @ 10% PER Typical –89dBm for 9Mbps @ 10% PER Typical –88dBm for 12Mbps @ 10% PER Typical –86dBm for 18Mbps @ 10% PER Typical –84dBm for 24Mbps @ 10% PER Typical –80dBm for 36Mbps @ 10% PER Typical –76dBm for 48Mbps @ 10% PER Typical –75dBm for 54Mbps @ 10% PER
Maximum Receiver Sensitivity Level	Maximum –20dBm

EVM	Typical –30dB for 6Mbps @14dBm output power Typical –30dB for 9Mbps @14dBm output power Typical –30dB for 12Mbps @14dBm output power Typical –30dB for 18Mbps @14dBm output power Typical –30dB for 24Mbps @14dBm output power Typical –30dB for 36Mbps @14dBm output power Typical –30dB for 48Mbps @14dBm output power Typical –30dB for 54Mbps @14dBm output power

3.2.3 IEEE802.11n (HT20) Mode

Radio Technology	Orthogonal Frequency Division Multiplexing (OFDM)
Operating Frequency	2412 ~ 2472MHz ISM band
Modulation Schemes	BPSK, QPSK, 16QAM, 64QAM
Channel Numbers	11 channels for United States 13 channels for Europe Countries
Data Rate	800ns GI: 6.5Mbps, 13, 19.5, 26, 39, 52, 58.5 and 65Mbps 400ns GI:7.2Mbps, 14.4, 21.7, 28.9, 43.3, 57.8, 65.0 and 72.2Mbps
Media Access Protocol (MAC)	CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
Transmitter Output Power	14.0 dBm+/-1.5dBm for all data rate
Frequency Accuracy	+/-25ppm
Minimum Receiver Sensitivity Level	Typical –89dBm for 6.5Mbps @ 10% PER Typical –87dBm for 13Mbps @ 10% PER Typical –85dBm for 19.5Mbps @ 10% PER Typical –80dBm for 26Mbps @ 10% PER Typical –79dBm for 39Mbps @ 10% PER Typical –75dBm for 52Mbps @ 10% PER Typical –73dBm for 58.5Mbps @ 10% PER Typical –71dBm for 65Mbps @ 10% PER
Maximum Receiver Sensitivity Level	Maximum –20dBm
EVM	Typical –31dB for MCS0 @14dBm output power Typical –31dB for MCS1 @14dBm output power Typical –31dB for MCS2 @14dBm output power Typical –31dB for MCS3 @14dBm output power Typical –31dB for MCS4 @14dBm output power Typical –31dB for MCS5 @14dBm output power Typical –31dB for MCS6 @14dBm output power Typical –31dB for MCS7 @14dBm output power

IEEE802.11n (HT40) Mode

Radio Technology	Orthogonal Frequency Division Multiplexing (OFDM)
Operating Frequency	2422 ~ 2462MHz ISM band
Modulation Schemes	BPSK, QPSK, 16QAM, 64QAM
Channel Numbers	9 channels for all countries

Data Rate	800ns GI: 13.5 Mbps, 27, 40.5, 54, 81, 108, 121.5 and 135Mbps 400ns GI: 15Mbps, 30, 45, 60, 90, 120, 135 and 150Mbps
Media Access Protocol (MAC)	CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
Transmitter Output Power	14.0 dBm+/-2dBm for all data rate
Frequency Accuracy	+/-25ppm
Minimum Receiver Sensitivity Level	Typical –83dBm for 13.5Mbps @ 10% PER Typical –82dBm for 27Mbps @ 10% PER Typical –81dBm for 40.5Mbps @ 10% PER Typical –80dBm for 54Mbps @ 10% PER Typical –72dBm for 81Mbps @ 10% PER Typical –71dBm for 108Mbps @ 10% PER Typical –69dBm for 121.5Mbps @ 10% PER Typical –67dBm for 135Mbps @ 10% PER
Maximum Receiver Sensitivity Level	Minimum –7dBm @ 10% PER
EVM	Typical –30dB for MCS0 @14dBm output power Typical –30dB for MCS1 @14dBm output power Typical –30dB for MCS2 @14dBm output power Typical –30dB for MCS3 @14dBm output power Typical –30dB for MCS4 @14dBm output power Typical –30dB for MCS5 @14dBm output power Typical –30dB for MCS6 @14dBm output power Typical –30dB for MCS7 @14dBm output power

Remark: The minimum sensitivity level is measured in FOXCONN RD Lab in shielding room. We will back off about 3dB as manufacture test due to bad background noise and interference in our production line.

4. Product Requirements and Characteristic

4.1 Hardware Characteristic

Form factor	44.5x40(mm^2) module with 1x11 pin connector
Host Interface	SDIO 2.0
PCB	4-layer single side
Antenna &RF connector	Two printed Antenna, with one for diversity.

4.2 Hardware Architecture

The T77H262.00 802.11b/g/n module is based on Broadcom BCM4319 solution which is with integrated 2.4GHz IEEE802.11 b/g/n (MAC/baseband/radio), power amplifiers (PA), and power management unit

(PMU).This module is powered from the host (3.3V) and interfaces to the host with SDIO 2.0 and with two printed antennas for diversity and one on-board 26MHz XTAL.

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.

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.

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.

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.

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

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: MCLT77H262”.

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.

Canadian Regulatory Wireless Notice

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 harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Ce dispositif est conforme à la norme CNR-210 d’Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

IMPORTANT NOTE:

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.

NOTE IMPORTANTE: (Pour l’utilisation de dispositifs mobiles)
Déclaration d’exposition aux radiations:
Cet équipement est conforme aux limites d’exposition aux rayonnements IC établies pour un

environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

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 Canada, 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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne,
3) Pour tous les produits vendus au Canada, OEM doit limiter les fréquences de fonctionnement CH1 à CH11 pour bandes de fréquences 2.4G grâce aux outils de microprogrammation fournis. OEM ne doit pas fournir d'outil ou d'informations à l'utilisateur final en ce qui concerne le changement de réglementation de domaine.

Tant que les 3 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

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 Canada 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 Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre

émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

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 IC: 2878D-T77H262".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 2878D-T77H262".