

Product Specification

Model Name: AVMD7540-SWA5
(AV7540 +16dBm module with U.FL connector)

Revision: 1.0

Issue Date: 2010/10/26



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Revision History

Edition #	Reason for revision	Issue date	Author
0.1	Initial Revision	2010/05/07	cjo
1.0	Add FCC certification wording on p.3	2010/10/26	Amy

1. General Description

The AVMD7540-SWA5 module is a complete radio module solution containing all the necessary HW and FW to provide a system-integration ready, multichannel wireless HD audio solution.

The module is comprised of a AV7540 IC combined with RF front-end circuits (RF PA + balun + filter + RF switch), flash memory, crystal, and passive components. It is FCC certified and ready for operation with U.FL connectors. The module provides a convenient set of digital I/O interfaces for digital audio through an I2S port, host MCU control through an SPI or I2C interface and optional GPIO for various control and indicator functions.

The module is a card edge style using the 36 pin PCIe card edge connection method to save space and cost in connecting to the main board.

FCC & IC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the exemption from the routine evaluation limits in section 2.5 of RSS 102.

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters from user and bystanders.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102

2. Features

✓ **Complete, Integrated Wireless Module**

- AV7540 IC
- RF front-end
- Flash memory

✓ **High Performance Audio and RF solution**

- 16 bit, 48kHz to 24 bit, 96kHz digital audio
- 120dB SNR Digital Audio Path
- Fixed Low Latency solution
- +16dBm transmit RF output power
- -82dBm receive RF sensitivity
- Support for 30m/100m range NLOS/LOS

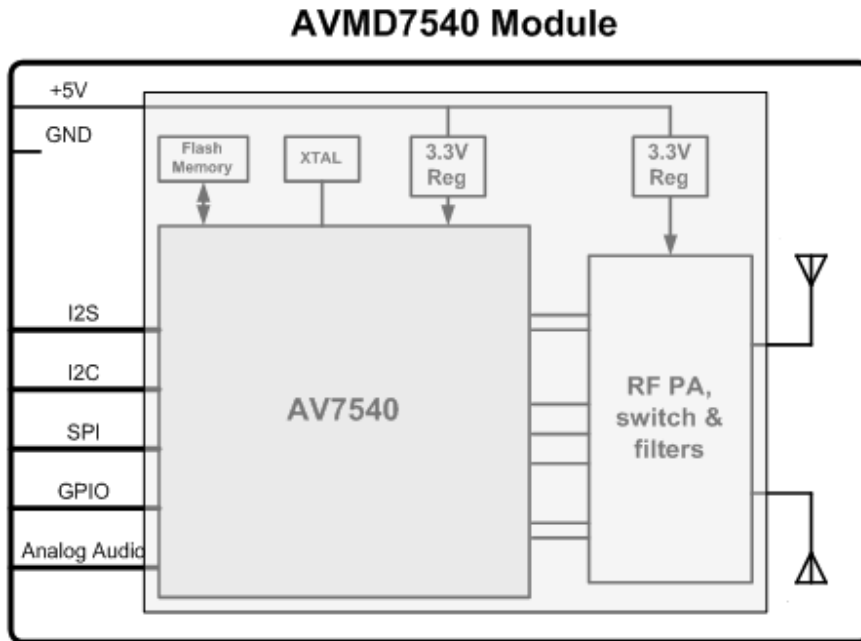
✓ **Digital interfaces and Audio**

- 8 channel digital audio I/O (4 I2S ports)
 - Configurable as input or output
- Stereo audio DAC output
- 4-wire SPI slave interface or 2-wire I2C-compatible communication with the host MCU

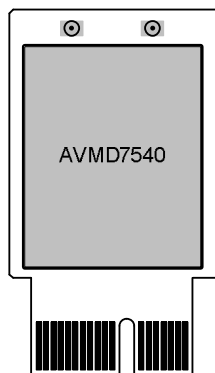
✓ **Package and connections**

- Compact size
- 36 pin (2x18) PCIe card edge connector
- diversity antenna capability

3. Block Diagram



3. Module Outline



4. Pin Configuration and Definition

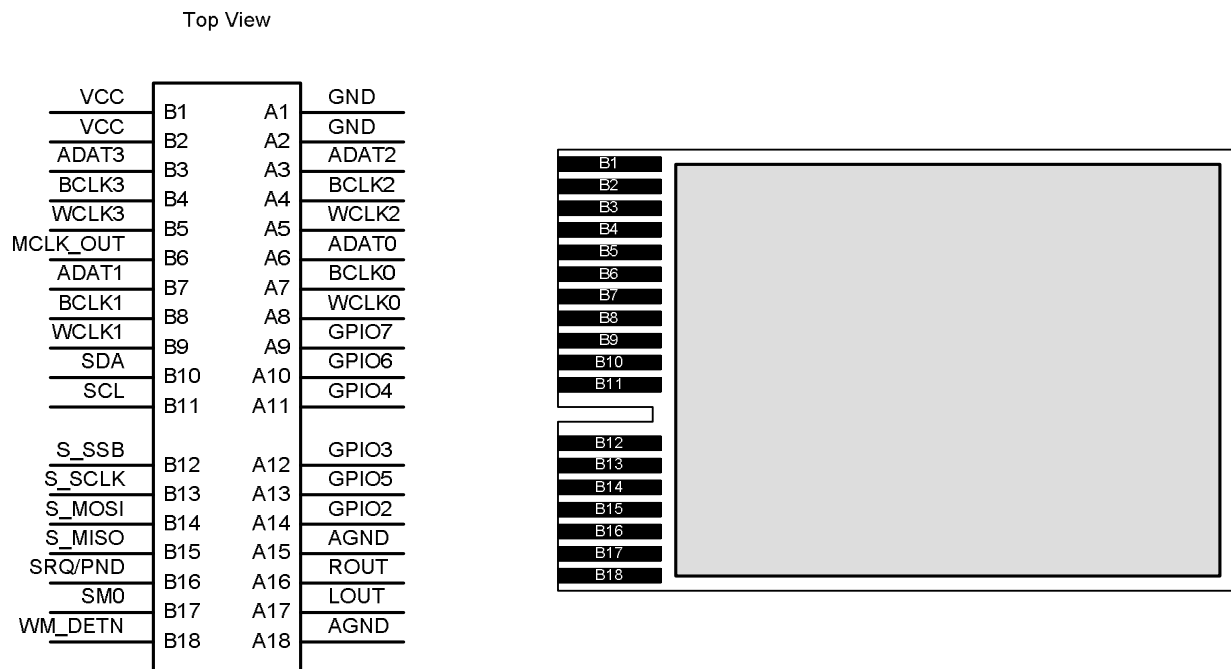


Figure 1-1 – AVMD7540-SWA5 module pin configuration

Table 錯誤! 所指定的樣式的文字不存在文件中。 -1 AVMD7540-SWA5 pin description

#	Pin Name	Pin Type	Description
A1	GND	Analog	Module ground
A2	GND	Analog	Module ground
A3	WCLK2	Digital I/O	I2S Word clock, AV75xx physical I2S I/O # 2 – input/output
A4	BCLK2	Digital I/O	I2S Bit clock, AV75xx physical I2S I/O # 2 – input/output
A5	ADAT2	Digital I/O	I2S audio data, AV75xx physical I2S I/O #2 – input/output
A6	WCLK0	Digital I/O	I2S Word clock, AV75xx physical I2S I/O # 0 – input/output
A7	BCLK0	Digital I/O	I2S Bit clock, AV75xx physical I2S I/O # 0 – input/output
A8	ADAT0	Digital I/O	I2S audio data, AV75xx physical I2S I/O # 0 – input/output
A9	SPI/TWI_SEL	Digital I/O	SPI / TWI interface selection (SPI = 0, TWI = 1)
A1 0	GPIO6	Digital I/O	GPIO #6
A1 1	GPIO4	Digital I/O	GPIO #4
A1 2	GPIO3	Digital I/O	GPIO #3
A1 3	GPIO5	Digital I/O	GPIO #5
A1 4	reserved	Digital I/O	reserved
A1 5	AGND	Analog	Audio ground
A1 6	ROUT	Analog	Audio DAC right channel output
A1 7	LOUT	Analog	Audio DAC left channel output
A1 8	AGND	Analog	Audio ground
B1	VCC	Analog	+5V supply voltage input
B2	VCC	Analog	+5V supply voltage input
B3	ADAT3	Digital I/O	I2S audio data, AV75xx physical I2S I/O # 3 – input/output
B4	BCLK3	Digital I/O	I2S Bit clock, AV75xx physical I2S I/O # 3 – input/output
B5	WCLK3	Digital I/O	I2S Word clock, AV75xx physical I2S I/O # 3 – input/output
B6	MCLK_OUT	Digital Output	MCLK for I2S audio data
B7	ADAT1	Digital I/O	I2S audio data, AV75xx physical I2S I/O # 1 – input/output
B8	BCLK1	Digital I/O	I2S Bit clock, AV75xx physical I2S I/O # 1 – input/output
B9	WCLK1	Digital I/O	I2S Word clock, AV75xx physical I2S I/O # 1 – input/output
B1 0	SDA	Digital I/O	I2C compatible serial data I/O
B1 1	SCL	Digital I/O	I2C compatible serial clock I/O
B1 2	S_SSB	Digital I/O	SPI Slave – slave select (active low)
B1 3	S_SCLK	Digital I/O	SPI Slave – serial clock

#	Pin Name	Pin Type	Description
B1 4	S_MOSI	Digital I/O	SPI Slave – master out slave in
B1 5	S_MISO	Digital I/O	SPI Slave – master in slave out
B1 6	SRQ/PND	Digital Output	Notification signal to host (pending notification)
B1 7	SM0	Digital Input	Serial Mux control (for flash programming) and module reset (active low)
B1 8	WM_DET_N	Digital output	Wireless module detect (low signal to indicate module is inserted in product)

5. Electrical Specifications

5.1. Absolute Maximum Ratings

The Absolute Maximum Rating (AMR) corresponds to the maximum value that can be applied without leading to instantaneous or very short-term unrecoverable hard failure (destructive breakdown). Absolute Maximum Ratings are stress ratings only. Permanent damage to the device may be caused by continuously operating at or beyond these limits. Device functional operating limits and guaranteed performance specifications are given under Electrical Characteristics at the test conditions specified.

Table 6-1 6-2 AVMD7540-SWA5 Absolute Maximum Ratings

CONDITION	MIN	MAX	Units
Supply (relative to GND)			
+5V	-0.3	6.0	V
Input Voltage Range – Digital Inputs	-0.3	3.6V	V
Short circuit to GND (any pin)	---	continuous	
Storage Temperature	-40	+100	°C
Lead Temperature (10s)	--	+225	°C
ESD Voltage Rating – Human Body Model test		2000	V

5.2. DC Electrical Characteristics

Operating Conditions: +5V_IN = 5.0V ±10%, T_A=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-2 6-3 AVMD7540-SWA5 DC Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input supply voltage	Driven by an external regulator	4.5		5.5	V
Supply Current – (Note 1)	RESET			10	mA
	RX mode: 1 stereo output I2S		100		mA
CMOS I/O Logic Levels – 3.3V I/O					
Input Voltage Logic Low, V _{IL}	Internal regulator = 3.3V			0.6	V
Input Voltage Logic High, V _{IH}	Internal regulator = 3.3V	2.0			V
Output Voltage Logic Low, V _{OL}	Internal regulator = 3.3V; I _{LOAD} =1mA			0.4	V
Output Voltage Logic High, V _{OH}	Internal regulator = 3.3V; I _{LOAD} =1mA	2.9			V

Note 1: The operating states are defined as:

RESET = AVMD7540-SWA5 is held in reset by holding SM0 low

RX mode: AVMD7540-SWA5 is operating in a link as a client node receiving 1 stereo channel of 16bit, 48kHz audio.

5.3. Electrical Characteristics – RF Receiver

Operating Conditions: +5V_IN = 5.0V ±10%, T_A=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-3 -4 AVMD7540-SWA5 Electrical Characteristics – RF Receiver

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
RF Channel Frequency Range		2412		2462	MHz
Sensitivity (Note 1)	T _A =25°C		-80		dBm
Max Input Signal (Note 1)			-5		dBm
Spurious RF outputs	2400-2483.5 MHz			-47	dBm
	<2400 MHz			-60	dBm
	>2483.5 MHz			-60	dBm
LO leakage				-47	dBm

Note 1: Sensitivity and max signal level are defined as the onset of 1% BLER Block Error Rate.

5.4. Electrical Characteristics – RF Transmitter

Operating Conditions: +5V_IN = 5.0V ±10%, T_A=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-5 -5 AVMD7540-SWA5 Electrical Characteristics – RF Transmitter

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
RF Performance					
RF Channel Frequency Range		2412		2462	MHz
Output Power	T _A =25°C, OFDM signal, 16MHz channel BW		+16		dBm
Harmonics (Note 1)	2 nd harmonic			-45	dBm
	3 rd harmonic			-45	dBm
Conducted RF Spurious signals	800-1000MHz			-45	dBm
	2000-2390MHz			-45	dBm
	2483.5- 3000MHz; RBW=1MHz			-45	dBm
	3000-4000MHz ; RBW=1MHz 4.0-26.5GHz; RBW=1MHz				
Radiated Spurious RF signals	30-88MHz,			34	dBuV/ m
	88-216MHz			37	dBuV/ m
	216-960MHz			40	dBuV/ m
	>960MHz			48	dBuV/ m
LO leakage	Relative to power in a 100kHz BW **, after DC offset correction			-20	dBc

Note 1: Measured at TX output power = +16dBm

Note 1: Measured at TX output power = +16dBm

5.5. Electrical Characteristics – RF Channel Frequency

Operating Conditions: +5V_IN = 5.0V ±10%, T_A=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-5 -6 AVMD7540-SWA5 Electrical Characteristics – RF Transmitter

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
RF Performance					
Channel Frequency	AM2G system channel 1		2412		MHz
	AM2G system channel 2		2438		MHz
	AM2G system channel 3		2462		MHz

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Error	16MHz crystal			+/- 20	ppm

5.6. Electrical Characteristics – End-to-end Audio Characteristics

Operating Conditions: +5V_IN = 5.0V ±10%, TA=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-6 -7 AVMD7540-SWA5 Electrical Characteristics – End-to-end Audio Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
End-to-end SNR	I2S in to I2S out, no interference;				
	16bit / 48kHz mode	96			dB
	24bit / 48kHz mode	120			dB
	16bit / 96kHz mode	97			dB
Latency	24bit / 96kHz mode	120			dB
	48kHz, interleaving level = 0			11	ms
	48kHz, interleaving level = 1			15	ms
Bandwidth	48kHz, interleaving level = 2			19	ms
	+/-0.5dB flatness, 48Khz modes	20		20k	Hz
	+/-0.5dB flatness, 96Khz modes	20		40k	Hz

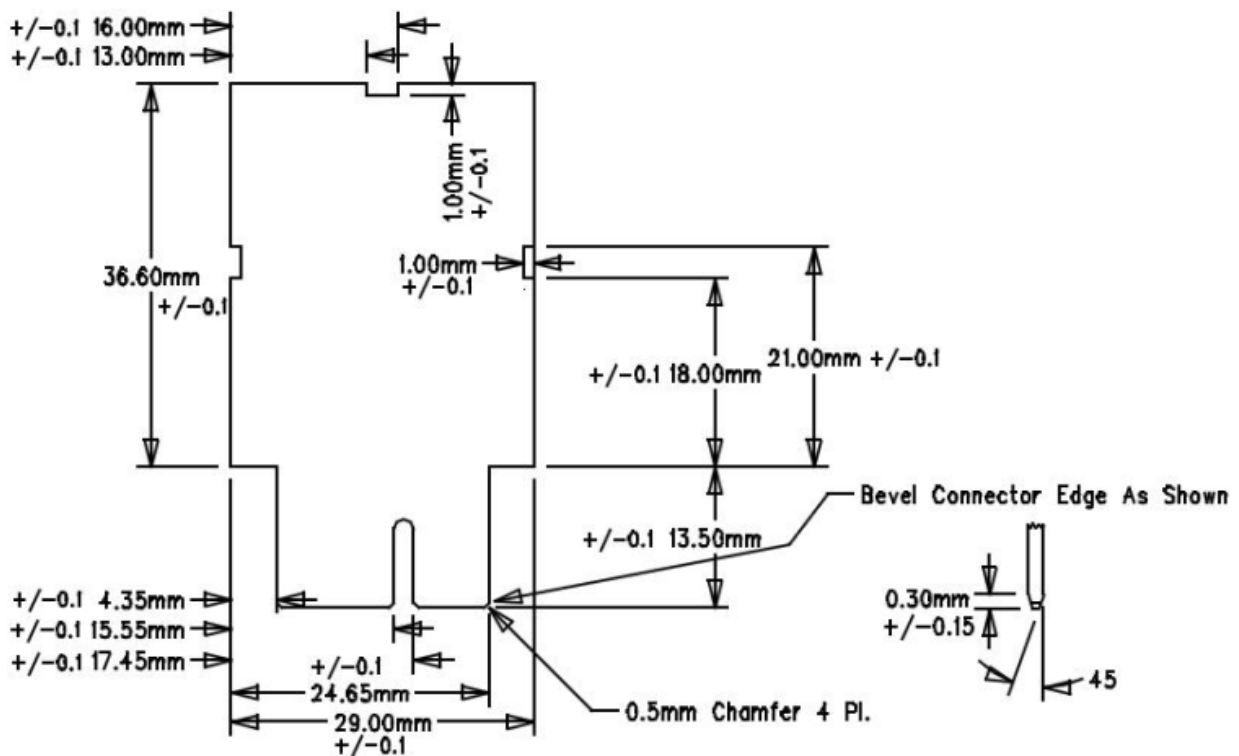
5.7. Electrical Characteristics – MCLK Characteristics

Operating Conditions: +5V_IN = 5.0V ±10%, TA=0°C to +50 °C; RF Chan. Freq. = 2412MHz to 2462MHz. All specifications are referenced to the AVMD7540-SWA5 edge connector pins and RF connectors, unless otherwise specified. Typical specifications at 5.0V and 25 °C.

Table 6-7 ccccccccccccccccccccccccccccccccccccc-8 AVMD7540-SWA5 Electrical Characteristics – MCLK Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MCLK frequency	“24MHz” mode (256MHz divide by 10.5)		24.38		MHz
	“12MHz” mode (256MHz divide by 21)		12.19		MHz
MCLK output duty cycle		40		60	%

6. Mechanical Dimension

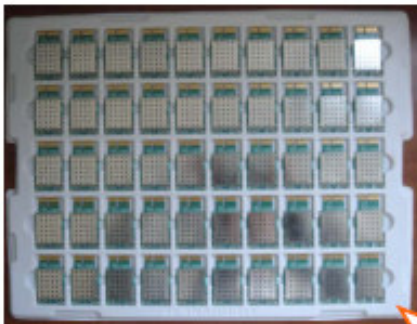


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Model No.:	SWA1	LAYOUT	
PCB NAME:	48SWA1010GA	DATE	2010/03/05
Title:	SWA1 PCB DRAWING	RD VER	0
Gerber Name:		SHEET	0F

7. Package Information

50pcs / Tray-Plate

40 Tray-Plate / Carton -> 2000pcs / Carton

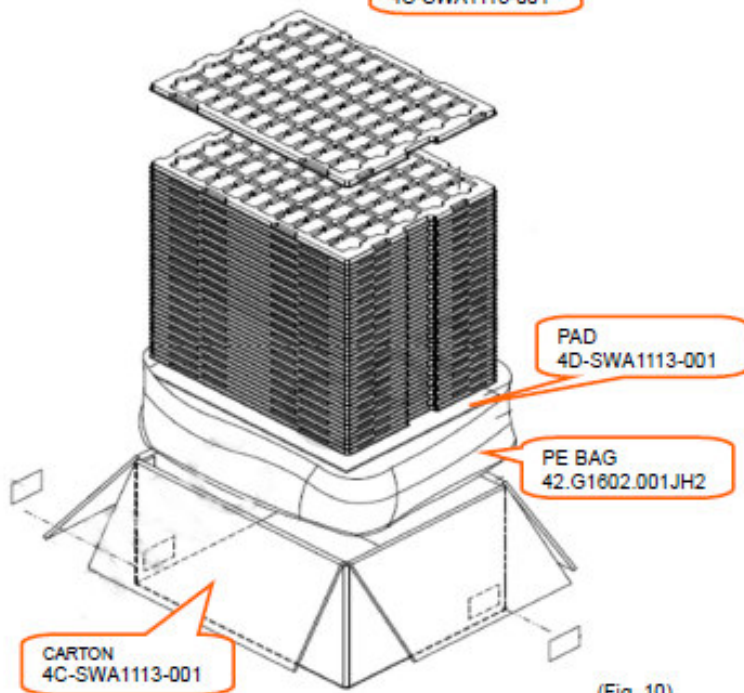


(Fig. 8)



(Fig. 9)

TRAY
4S-SWA1113-001



(Fig. 10)

FCC Statement

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.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

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.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: NKR-SWA5". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.