

# SPECIFICATION

## PBA RF Module

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Customer	-
Model name	RP-M2470
Part name	<b>WSZGM200C00</b>
Date	<b>2013. 11. 13</b>
REVISION	<b>02</b>
Application	<b>Set Top Box</b>
CUSTOMER-CODE	-

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### 1. Approval Revision Record

NO	REASON	RECORD OF REVISION	Remarks	Revision Page
1	REV00	WSZGM200B00 Approval Releases	2012-03-06	-
2	REV01	FCC ID / IC Number Added - FCC ID : 2ABA2RPM2470 - IC : 11534A-RPM2470	2013-11-11	-
3	REV02	FCC/IC Notice Added	2013-11-13	-

### 2. Scope

This specification is applied to ZigBee / IEEE802.15.4  
 This module has Chip Antenna, 32MHz X-TAL, Single chip MG2470

### 3. Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VDD	Chip core supply voltage	-0.3 to 2.0	V
3V_IN	I/O supply voltage	-0.3 to 3.6	V
TSTG	Storage Temperature	-40 to 85	°C

#### 4. DC Characteristics

Symbol	Parameter	Min	Typ.	Max	Unit
<b>3V_IN</b>	<b>I/O supply voltage(VDDIO)</b>	<b>2.0</b>	<b>3.0</b>	<b>3.6</b>	<b>V</b>
VIH	High level input voltage	2.5	-	3.6	V
VIL	Low level input voltage	0	-	0.4	V
VOH	High level output voltage	2.5	-	3.6	V
VOL	Low level output voltage	-	-	0.4	V
TA	Air temperature	-40	-	85	°C

#### 5. Electrical Specification

(Condition: EVM Board, at 25°C, 3V\_IN=3.0V)

Parameter	Min	Typ.	Max	Unit
Current consumption				
MCU active without RX/TX operation, Peripherals [UART1 & RNG] active	-	4.2	-	mA
TX Mode (MCU active and peripherals[UART1 & RNG] active)  @ max (+9.6dBm) output power @+8dBm output power @+7dBm output power @+6dBm output power @+5dBm output power @+4dBm output power @+3dBm output power @+2dBm output power @+1dBm output power @+0dBm output power	-	43          25	-	mA
RX Mode (MCU active and peripherals[UART1 & RNG] active)	-	25	-	mA

PM1	-	30	-	uA
PM2	-	1.25	2	uA
PM3	-	0.1	1	uA
TX / RX and RX / TX turnaround	-	-	192	us

## 6. RF Specifications

### 6-1. RF Characteristics

Parameter	Min	Typ.	Max	Unit
RF Characteristics				
RF Frequency Range	2405	-	2480	MHz
Maximum Input Level (PER=1%) @250kbps	-	-1	-	dBm
Received RF Bandwidth	-	2	-	MHz
Channel Bandwidth	-	5	-	MHz
Receiver Sensitivity (PER≤1%, Packet length of 22-byte) @1000kbps @500kbps @250kbps @125kbps @62.5kbps @31.25kbps	-	-93 -94 -99 -100 -103 -105	-	dBm
Adjacent Channel Rejection +5MHz -5MHz	-	30 30	-	dB
Alternate Channel Rejection +10MHz -10MHz	-	50 50	-	dB
Co-Channel Rejection	-	-5.9	-	dB

Blocking / Desensitization +5MHZ / -5MHZ +10MHZ / -10MHZ +20MHZ / -20MHZ +30MHZ / -30MHZ +50MHZ / -50MHZ	-	-53/-52 -48/-46 -44/-40 -43/-38 -41/-37	-	dBm
<b>TX output power</b> * -7dBm±2dB@2480MHz	<b>6</b>	<b>8</b>	<b>9.6</b>	<b>dBm</b>
Transmit chip rate	-	2	-	Mcps
Spurious Emission(30Hz~1GHz)	-	-60	-	dBm
Spurious Emission(1GHz~12.75GHz)	-	-45	-	dBm
Spurious Emission(5.15GHz~5.3GHz)	-	-70	-	dBm
2 <sup>nd</sup> Harmonics	-	-45	-	dBm
3 <sup>rd</sup> Harmonics	-	-55	-	dBm
Frequency Error Tolerance	-	-	±200	KHz
Error Vector Magnitude(EVM)	-	8.5	-	%
Frequency Synthesizer				
Phase Noise (Unmodulated carrier) @±100KHz offset @±1MHz offset @±2MHz offset @±3MHz offset @±5MHz offset	-	-79.9 -104.2 -110.0 -113.8 -115.6	-	dBc/Hz
PLL Lock Time	-	-	192	usec
32MHz Crystal Oscillator				
Crystal Frequency	-	32	-	MHz
Crystal Frequency Accuracy Requirement	-40	-	+40	ppm
Data rate	-	250	-	kbps

**6-2. Analog Temperature**

Parameter	Min	Typ	Max	Unit
Analog Temperature				
Output Voltage at -40℃	-	716	-	mV
Output Voltage at 0℃	-	847	-	mV
Output Voltage at 40℃	-	978	-	mV
Output Voltage at 80℃	-	1109	-	mV
Temperature Coefficient	-	3.275	-	mV/℃
※ All measurement results are obtained using the 12 bit ADC				
Analog Temperature				
Input Voltage	0	-	VDD	V
Input Resistance	-	150	-	kΩ
Full-scale signal	-	-	3	V
Effective number of bits(ENOB) Single-ended input, 12bit setting	-	10.8	-	bits
Effective noise and distortion(SINAD) Single-ended input, 12bit setting	-	66.78	-	dB
Current Consumption	-	0.62	-	mA
Internal Reference Voltage	-	1.25	-	V

## 7. Specification on Chip Antenna

### 1.1 Electrical Specifications

No	Item	Spec.	Remark
1	Frequency Range [GHz]	2.4 ~2.485	
2	VSWR	Max 3.0:1	
3	Peak Gain [dBi]	typ. 2.9	
4	Total Avg. Gain [dBi]	typ. -0.5	
5	Efficiency [%]	typ. 90	
6	Polarization	Linear	
7	Impedance [ $\Omega$ ]	Nominal 50	

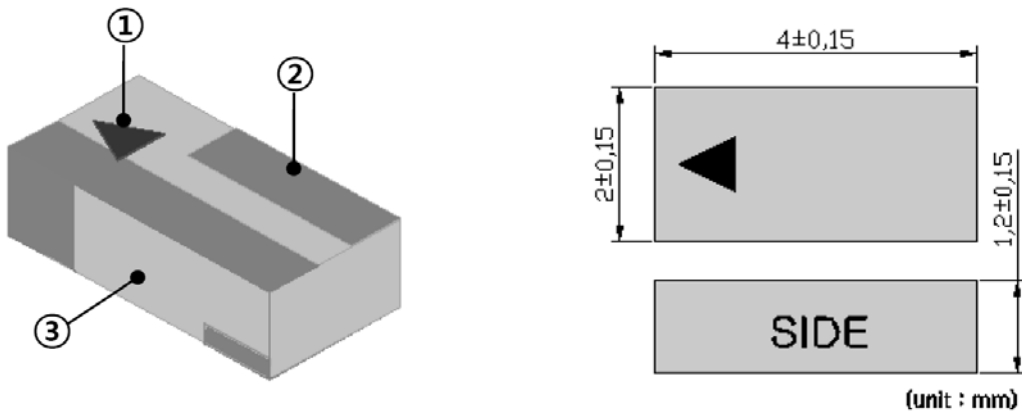
- ✓ The results are measured on the 50x50mm<sup>2</sup> evaluation board(EVB).
- ✓ See Page 6. for more detail gain parameter

### 1.2 Mechanical Specifications

No	Item	Spec.	Remark
1	Dimensions (LxWxH)	4.0x2.0x1.2 mm <sup>3</sup>	
2	Unit Weight	typ. 35 mg	
3	Operating Temperature	-35 ~ +85 °C	

### 1.3 Appearance & Material

No	Item	Function	Material
①	Marking	Feeding Index	Ink
②	Electrode	Radiation Element	Ag
③	Ceramic Body	-	Ceramic



## 8. Pin Description

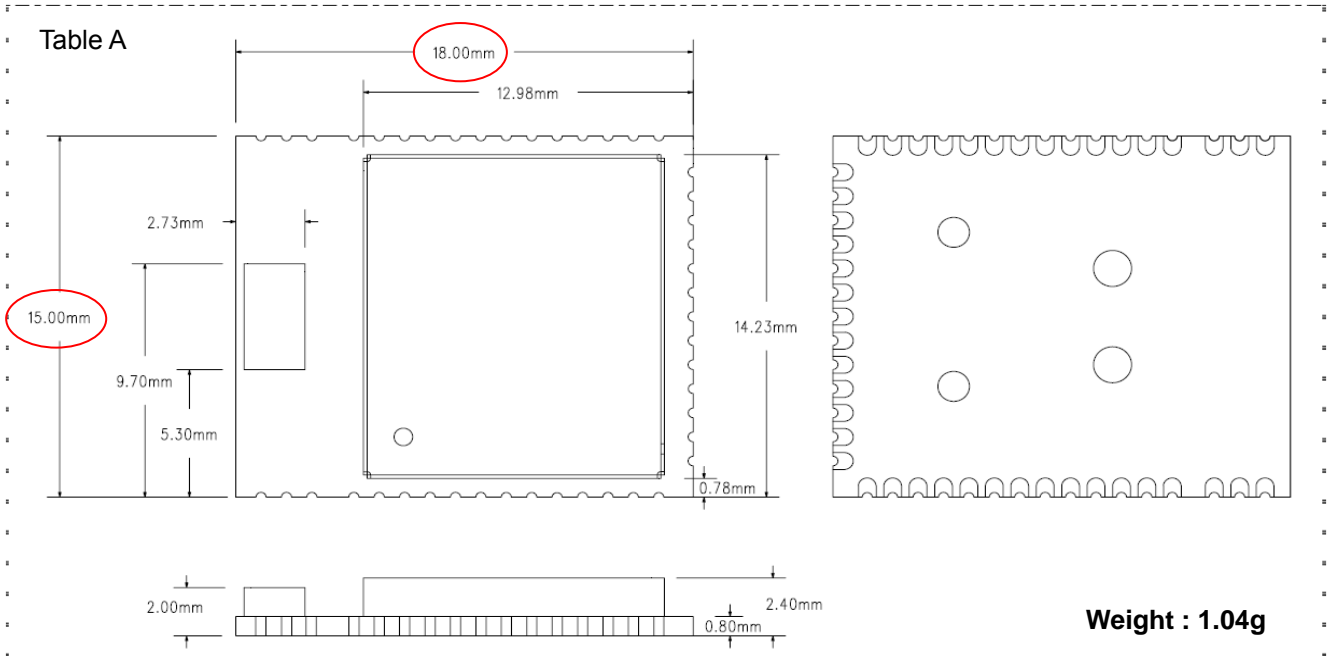
Terminal	NAME	Inter face	I/O	Description
1	ACH0	Analog	I/O	Sensor ADC input
2	ACH1	Analog	I/O	Sensor ADC input
3	ACH2	Analog	I/O	Sensor ADC input
4	ACH3	Analog	I/O	Sensor ADC input
5	NC	-	-	-
6	AGND	Ground	-	RF Ground
7	AGND	Ground	-	RF Ground
8	AGND	Ground	-	RF Ground
9	MS2	Digital	I	Mode select
10	NC	-	-	-
11	RESETB	Digital	I	Reset (Active Low)
12	3V_IN	Power	I	3V Power supply
13	DGND	Ground	-	Ground for digital core and I/O
14	P1[7]	Digital	O	Port P1.7GPO/P0AND/TRSW/Fold/Clock/BIST Fail Indicator
15	P1[6]	Digital	B	Port P1.6/TRSWB
16	NC	-	-	-
17	P1[4]	Digital	B	Port P1.4 /QUADZB/Sleep Timer OSC Buffer Input.
18	P1[3]	Digital	B	Port P1.3/QUADZA/Sleep Timer OSC Buffer Output/RTCLKOUT
19	NC	-	-	-
20	P1[1]	Digital	B	Port P1.1/TXD1
21	P1[0]	Digital	B	Port P1.0/RXD1
22	P3[7]	Digital	B	Port P3.7/12mA Drive capability /PWM3/CTS1/SPICSN(slave only)
23	P3[6]	Digital	B	Port P3.6/12 mA Drive capability /PWM2/RTS1/SPICLK



Terminal	NAME	Inter face	I/O	Description
24	P3[5]	Digital	B	Port P3.5/T1/CTS0/QUADYB/SPIDO
25	P3[4]	Digital	B	Port P3.4/T0/RTS0/QUADYA/SPIDI
26	P3[3]	Digital	B	Port P3.3/INT1(active low)
27	P3[2]	Digital	B	Port P3.2/INT0(active low)
28	P3[1]	Digital	B	Port P3.1/TXD0/QUADXB
29	P3[0]	Digital	B	Port P3.0/RXD0/QUADXA
30	DGND	Ground	-	Ground for digital core and I/O
31	NC	-	-	-
32	P0[7]	Digital	B	Port P0.7/I2STX_MCLK
33	P0[6]	Digital	B	Port P0.6/I2STX_BCLK
34	P0[5]	Digital	B	Port P0.5/I2STX_LRCK
35	P0[4]	Digital	B	Port P0.4/I2STX_DO
36	P0[3]	Digital	B	Port P0.3/I2SRX_MCLK
37	P0[2]	Digital	B	Port P0.2/I2SRX_BCLK
38	P0[1]	Digital	B	Port P0.1/I2SRX_LRCK
39	P0[0]	Digital	B	Port P0.0/I2SRX_DI
40,41,42	AGND	Ground	-	RF Ground
43,44,45	AGND	Ground	-	RF Ground
46,49	AGND	Ground	-	RF Ground
47,48	DGND	Ground	-	Ground for digital core and I/O

### 9. Dimensions & drawing

#### 9-1. Design dimension

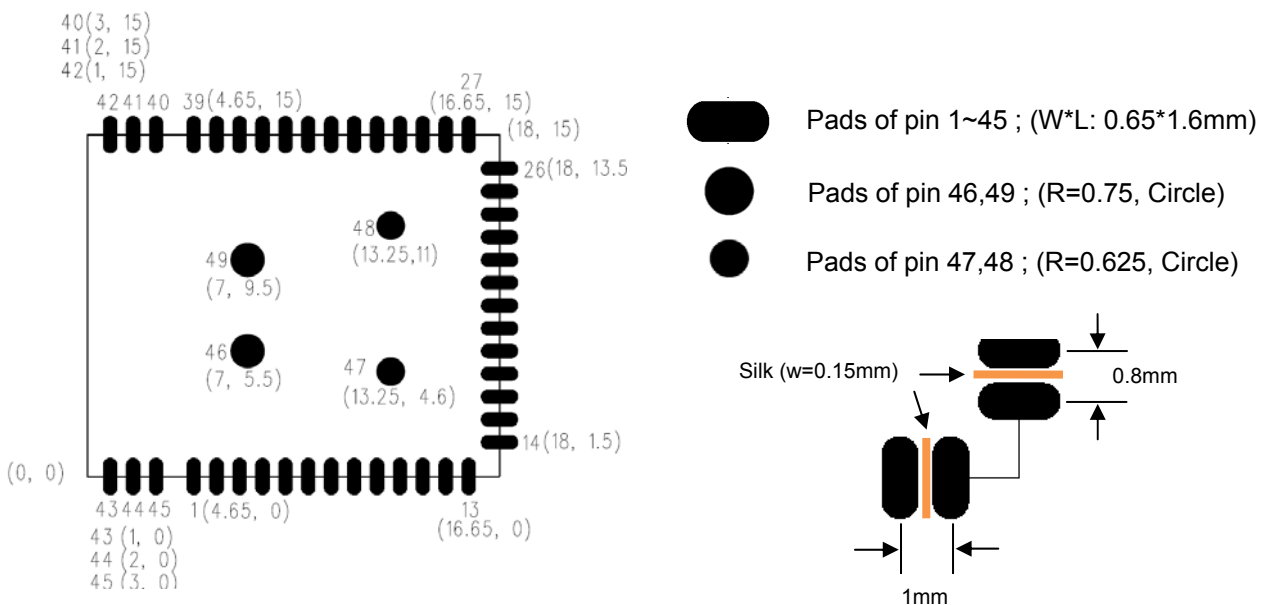


※ Table A: Real dimension specification

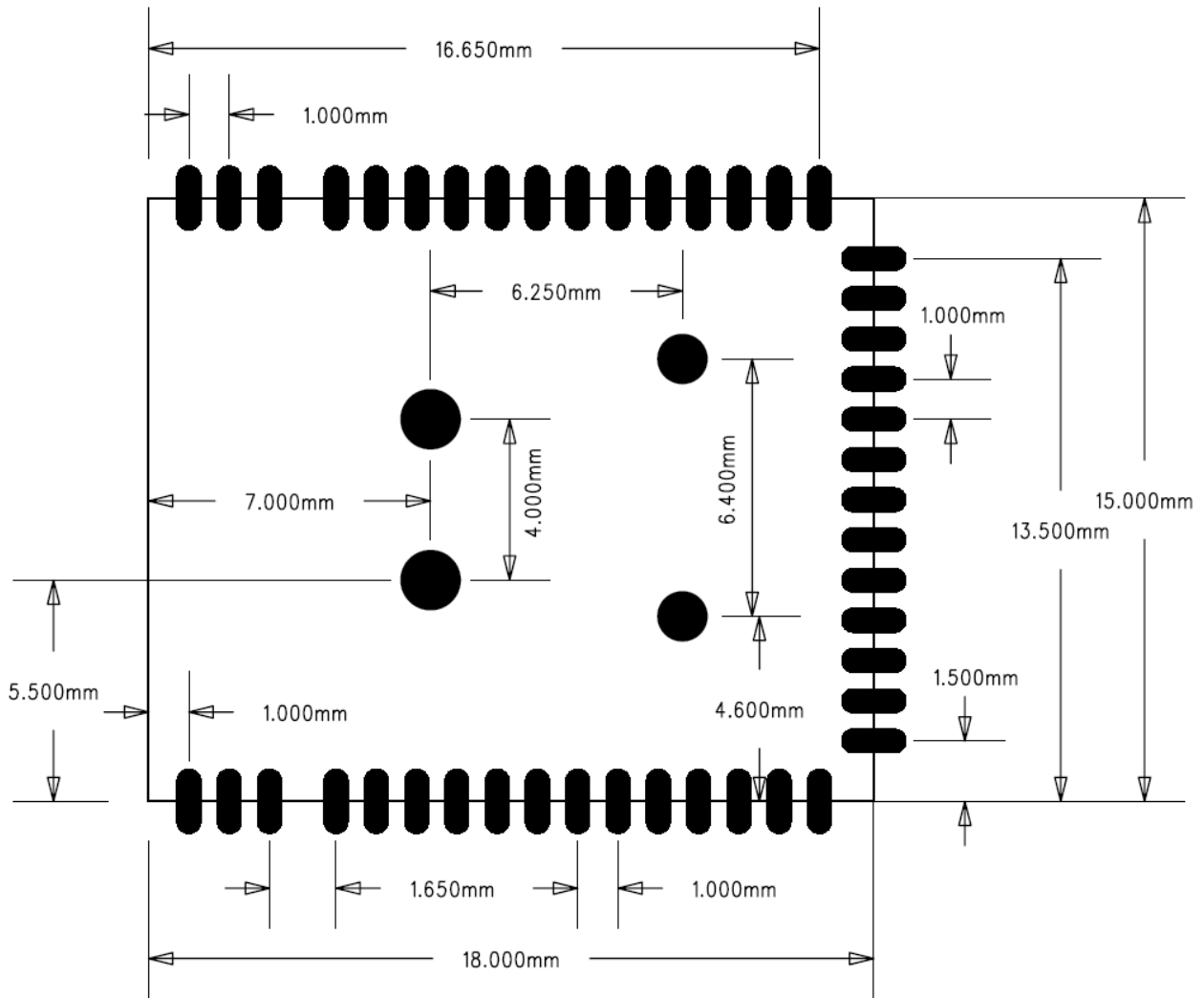
ITEM	Width	Length
Design	15 mm	18 mm
Real dimension value	14.90mm(*)	17.90mm(*)

(\*) : 0.1mm is cut by Dicing blade




#### 9-2. PCB Drawing -1 (Top View)



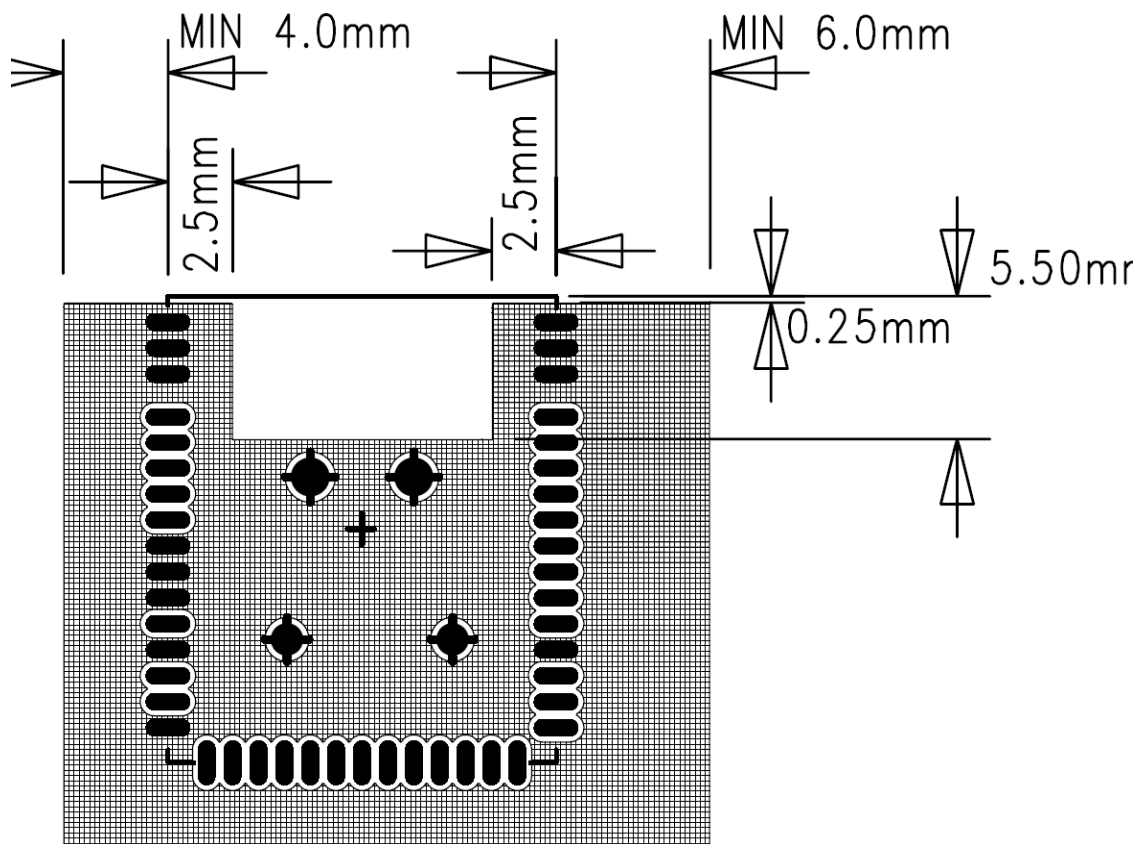
9-3. PCB Drawing -2 (Top View)



9-4. Solder mask opening guide

PAD TYPE	PAD SIZE	MASK open	RESULT
	W: 0.65mm L: 1.60mm	W:0.615mm L:1.76~1.8mm	W: About 95% L: About 110~115%
	R=0.75mm	R=0.35mm	46.7%
	R=0.625mm	R=0.25mm	40%

9-5. Setup guide for an host devices to install the module



## 10. 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.

### **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.

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

### **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 FCC ID: 2ABA2RPM2470 ". 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.

## 11. IC Notice

### IC Statement

This Class B digital apparatus complies with Canadian ICES-003.

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.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

### IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 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 device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

### **IMPORTANT NOTE:**

This module is intended for OEM integrator. The OEM integrator is still responsible for the IC 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 IC RSS-102 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.

LABEL OF THE END PRODUCT: The final end product must be labeled in a visible area with the following "Contains IC : 11534A-RPM2470".