



HY-40R201PC Bluetooth BLE 5.0 Module Specifications

(40 pin)

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Version : V1.0

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The *Bluetooth* trademark is owned by the Bluetooth SIG Inc., USA

1. Description

HY-40R201PC Bluetooth low energy single mode module is a single mode device targeted for low power sensors and accessories.

HY-40R201PC offers all Bluetooth low energy features: radio, stack, profiles and application space for customer applications. The module also provides flexible hardware interfaces to connect sensors.

HY-40R201PC can be powered directly with a standard 3V coin cell batteries or pair of AAA batteries. in lowest power shutdown mode it consumes only 0.15uA and will wake up in few microseconds.

HY-40R201PC transmission distance of 100 meter .(At face to face, free space, 1.2 Meter high from Ground for testing).

Bluetooth IC : TTC2640R2 6*6*0.9mm 48 pin IC,Used TI CC2640R2 chip

2. Application:

Heart rate sensors

Pedometers

Watches

Blood pressure and glucose meters

Weight scales

Key fobs

Households sensors and collector devices

Security tags

Wireless keys (keyless go)

Proximity sensors

HID keyboards and mice

Indoor GPS broadcasting devices

Smart home living device control & message transceiver.

Smart office device control & message transceiver.

Smart industrial device control and message transceiver.

3. Key Features:

Bluetooth v.4.2/v.5.0 single mode compliant

Supports master,slave and master/slave modes

Integrated Bluetooth low energy stack

GAP, GATT, L2CAP, SMP Bluetooth low energy profiles

Pre-certified RF regulations for BQB BLE 5.0 (DID:D037649, QDID 102453) , CE ETSI RED (AGC01629170901E0), FCC (ID: 2ADXE-HY-40R201PC), IC(Canada)(ID: 23267-HY40R201PC) ; and can Compliance for other worldwide RF Regulations.

Transmit power :+5 dBm typical

Receiver sensitivity: -97dBm typical

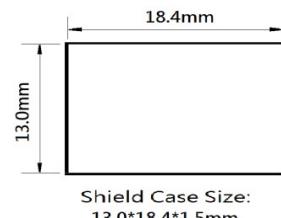
Ultra low current consumption :Shutdown. No clocks running, no retention: 150 nA(Typical)

Programmable ARM Cortex-M3 processor for embedding full applications

4. Product model Number: Hardware Model Description

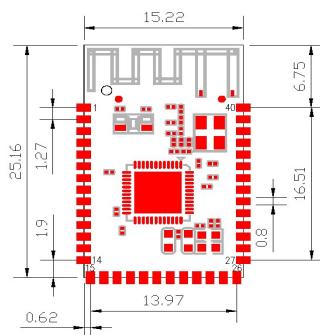
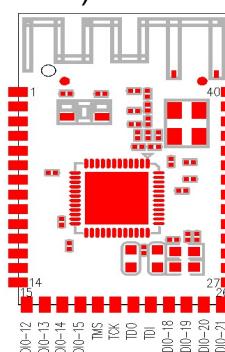
| | Product Mode Item | PCB NO. | Description |
|---|-------------------|-------------|-------------|
| 1 | WMD40R201xx6PC | HY-40R201PC | PCB Antenna |

5. FCC ID & IC ID & CE & BQB print format on the shield case:



Shield Case Size:
13.0*18.4*1.5mm

6. PCBA dimension size and picture HY-40R201PC / WMD40R201xx6PC(PCB F Antenna)



7. Application Note:

7-1. Attention to the electrostatic protection, prevent the soldering iron and the equipment grounding bad; And the workbench, working environment, packaging materials and from the human body Touch with static electricity, etc., destroy IC and software to be flied; Manual welding module solder iron temperature, should pay attention to avoid the PCB copper stripping off; Soldering iron strictly Grounding requirements, eliminating solder iron leak voltage and **avoid supply power Vcc switch instant turn on/ turn off state**, generate high voltage, May be let the module to damaged;

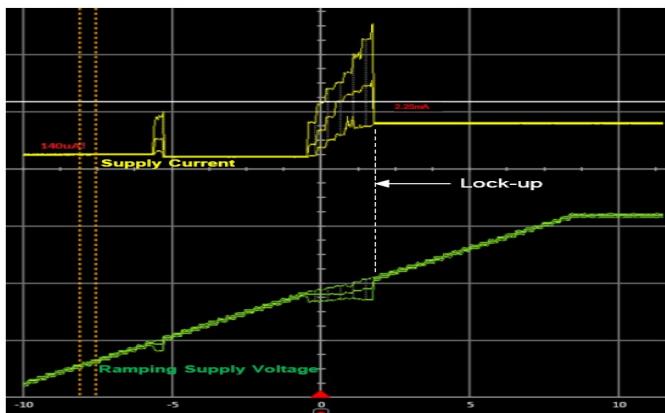
7-2. Attention to avoid the overall motherboard power supply circuit of bad welding connected to short circuit or open circuit, causing the Bluetooth chip, abnormal voltage, The software will fly and problems of IC was damaged.

7-3. When programming firm ware , the VDDS supply voltage must in DC 2.4~3.3V, To avoid programming has not completely, and abnormal status occur.

7-4. Avoid supply voltage in (BOD Brown - Out Dectect) fall within the scope of electrical detection threshold (1.76 V ~ 1.78 V) occurred many times, (diagram below off electric Lock - up area) firmware may be locked.

Cause the Boot Code startup Code suspended, unable to connect to the JTAG protocol,; In case of this state is available use Reset pin action under 1.0 V, to remove this phenomenon; The rechargeable batteries at charge-discharg status; In the application at the same time, to ensure the voltage setting of the protection system; And pay attention to the supply of power caused by the internal resistance and line impedance voltage drop; And make sure that

The equipment operating voltage from 1.8 V to 3.8 V, and ensure that the voltage slope faster than 0.5 V/ms (through BOD threshold).

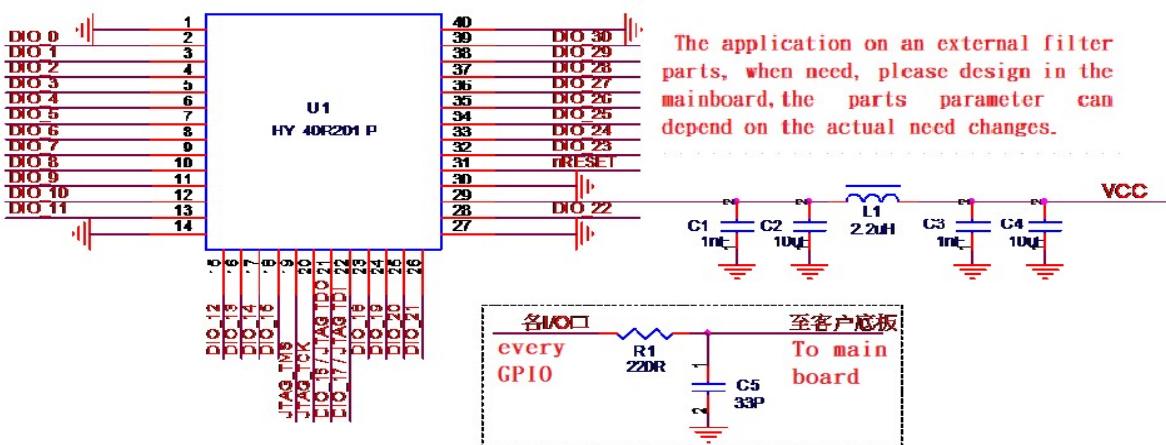


7-5. Use the module in the production and the transport process, please insure module's component protection, prevent the precision parts on the module Damaged (welding furnace exit and assembly, testing, delivery process, suggest using collision buffer material, not collide with each other)

7-6. The module is humidity sensitive components (MSD level 3), if used in SMT reflow soldering operations, please strictly follow the IPC/JEDECJ - STD – 020 regulation, completes the drying dehumidifying , and for this module has second processing work after placed in the functional test environment, the humidity of the chip is no guarantee that in a certain ratio, the honored guest please understand;(The attention note show in below Fig.)



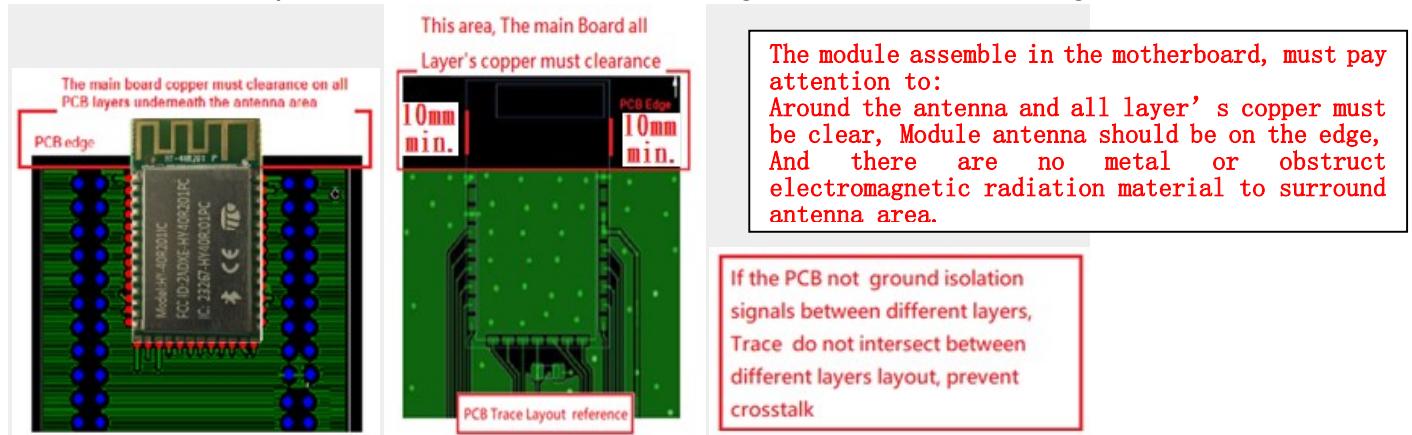
7-7. The diagram (show in below Fig.) of the module application on external filter parts, when need, please design in the mainboard, the parts parameter can depend on the actual need to changes. And pay attention to the increase and decrease ramping of supply voltage fast than 0.5v/ms;



7-8. Assembly recommendation (1): Underneath the module antenna and RF circuit on the main board PCB copper need to clearance, and place close to the main board edge, as show in below Fig.

The antenna can't be near around metal parts and prevent material existence of electromagnetic radiation , Can affect the manipulation of the distance.

7-9. Assembly recommendation (2): Signal trace and power supply trace, don't cross layout, as show in below Fig. To avoid crosstalk, affect the receiving sensitivity. Assembly recommendation 1: Underneath the module antenna and RF circuit on the main board PCB copper need to clearance, and place close to the main board edge, as show in below Fig.



8. Pinout and GPIO function Description

| Pin No. | Name | Type | Function Description |
|---------|--------|-------------|--|
| 1 | GND | Power GND | Ground |
| 2 | DIO_0 | Digital I/O | GPIO, Sensor Controller (I:4mA max) |
| 3 | DIO_1 | Digital I/O | GPIO, Sensor Controller (I:4mA max) |
| 4 | DIO_2 | Digital I/O | UART RX; GPIO, Sensor Controller (I:4mA max) |
| 5 | DIO_3 | Digital I/O | UART TX; GPIO, Sensor Controller (I:4mA max) |
| 6 | DIO_4 | Digital I/O | WAKE UP; Don't floating GPIO, Sensor Controller (I:4mA max) |
| 7 | DIO_5 | Digital I/O | GPIO, Sensor Controller, high-drive capability (8mA max). |
| 8 | DIO_6 | Digital I/O | GPIO, Sensor Controller, high-drive capability (8mA max). |
| 9 | DIO_7 | Digital I/O | GPIO, Sensor Controller, high-drive capability (8mA max). |
| 10 | DIO_8 | Digital I/O | GPIO (I: 4mA max) |
| 11 | DIO_9 | Digital I/O | GPIO (I: 4mA max) |
| 12 | DIO_10 | Digital I/O | GPIO (I: 4mA max) |
| 13 | DIO_11 | Digital I/O | GPIO (I: 4mA max) |
| 14 | GND | Power GND | Ground |

| | | | |
|----|---------------|---------------|---|
| 15 | DIO_12 | Digital I/O | GPIO (I: 4mA max) |
| 16 | DIO_13 | Digital I/O | GPIO (I: 4mA max) |
| 17 | DIO_14 | Digital I/O | GPIO (I: 4mA max) |
| 18 | DIO_15 | Digital I/O | GPIO (I: 4mA max) |
| 19 | JTAG TMSC | Digital I/O | JTAG TMSC; high-drive capability |
| 20 | JTAG TCKC | Digital I/O | JTAG TCKC |
| 21 | DIO_16 TDO | Digital I/O | GPIO,JTAG_TDO; high-drive capability(8mA max). |
| 22 | DIO_17 TDI | Digital I/O | GPIO,JTAG_TDI; high-drive capability(8mA max). |
| 23 | DIO_18 | Digital I/O | GPIO (I: 4mA max) |
| 24 | DIO_19 | Digital I/O | GPIO (I: 4mA max) |
| 25 | DIO_20 | Digital I/O | GPIO (I: 4mA max) |
| 26 | DIO_21 | Digital I/O | GPIO (I: 4mA max) |
| 27 | GND | Power GND | Ground |
| 28 | DIO_22 | Digital I/O | GPIO (I: 4mA max) |
| 29 | VDD | Power Supply | +1.8V to +3.8V (Recommended 2.7~3.3V) |
| 30 | GND | Power GND | Ground |
| 31 | RESET | Digital input | Reset, active-low. Module have pull up. |
| 32 | DIO_23 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 33 | DIO_24 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 34 | DIO_25 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 35 | DIO_26 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 36 | DIO_27 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 37 | DIO_28 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 38 | DIO_29 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 39 | DIO_30 | Digital I/O | GPIO, Sensor Controller, Analog(I: 4mA max) |
| 40 | GND | Power GND | Ground |

9. Electrical Characteristics

(Test condition: With $T_a = 25^{\circ}\text{C}$, $VDD = 3.0\text{V}$ with internal DC-DC converter,
standardmeasure:1Mbps GFSKmodulation ,FRF = 2440MHz Bluetooth Low energy mode.)

9-1.Radio performance & current consumption

(Test condition:With $T_a = 25^{\circ}\text{C}$, $VDD = 3.0\text{V}$, with internal DC-DC converter,
standardmeasure:1Mbps GFSKmodulation ,FRF = 2440MHz Bluetooth Low energy mode.)

➤ Modulation Mode: GFSK

- Frequency range: 2402~2480MHZ (2.4GHz ISM band)
- Transmit power setting Range: -21 ~ +5 dBm typical (differential mode o/p point characteristics ; programmable by software)
- Receiver sensitivity: -97dBm typical(differential mode o/p point characteristics)
- Pre-certified RF regurations for BQB BLE 4.2/5.0, CE ETSI RED, FCC, IC (Canada), (FCC and IC only for PCB antenna with shield case model);
Another can Compliance for worldwide RF Regulations.
- Ultra low current consumption
 - Transmit : 6.1mA(typical) (O/P Power setting :0dBm)
 - Transmit : 9.1mA(typical) (O/P Power setting :5dBm)
 - Receive(high gain setting): 6.1 mA(typical)
 - Idle. Supply Systems and RAM powered:550uA(Typical)
 - Standby. With Cache, RTC, CPU, RAM and partial register retention. XOSC_LF: 3.0 uA(Typical)
 - Shutdown. No clocks running, no retention: 150 nA(Typical)

9-2. Absolute Maximum Ratings

Note: These are absolute maximum ratings beyond which the module can be permanently damaged, these are not Maximum operating conditions, the maximum recommended operating conditions are in the table 6.

| Rating | Min | Max | Unit |
|-------------------------|---------|----------|------|
| VDDS | -0.3 | 3.9 | V |
| Other Terminal Voltages | VSS-0.3 | VDDS+0.3 | V |
| Storage Temperature | -40 | +85 | °C |

9-3. ESD Ratings

| V _{ESD} Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDECJS001 Charged device model (CDM), per JESD22-C101 | All pins | Value | Unit |
|--|---|------------|-------|------|
| | | RF pins | ±750 | V |
| | | Non-RFpins | ±750 | |

9-4. Recommended Operating Conditions

Supply voltage noise should be less than 10mVpp. Excessive noise at the supply voltage will reduce the RF performance.

| Rating | Min | Max | Unit |
|------------------------------|-----|-----|------|
| VDD (when BlueTooth Active) | 1.9 | 3.8 | V |
| VDD(when flash programming) | 2.4 | 3.3 | V |
| Operating Temperature Range | -40 | +85 | °C |

Note: (1).VDD power supply recommended voltage : 2.7~3.3V

(2).When programming firm ware , the VDD supply voltage must in DC 2.4~3.3V,

To avoid programming has not completely, or abnormal status occur..

(3).For smaller coin cell batteries, with high worst-case end-of-life equivalent source resistance, a 22- μ F VDDS input capacitor must be used to ensure compliance with this slew rate(6-6 timing req.).

9-5.GPIO DC Characteristics

| Parameter | Test Condition | Typical | Unit |
|-----------------------|-----------------------------------|---------|------|
| GPIO VOH at 8-mA load | IOCURR = 2, high-drive GPIOs only | 2.68 | V |
| GPIO VOL at 8-mA load | IOCURR = 2, high-drive GPIOs only | 0.33 | V |
| GPIO VOH at 4-mA load | IOCURR = 1 | 2.72 | V |
| GPIO VOL at 4-mA load | IOCURR = 1 | 0.28 | V |

9-6. Timing Requirements

| Description | MIN | NO M | MAX | UNIT |
|--|--|------|-----|-------|
| Rising supply-voltage slew rate | 0 | | 100 | mV/uS |
| Falling supply-voltage slew rate | 0 | | 20 | mV/uS |
| Falling supply-voltage slew rate, with low-power flash settings(1) | | | 3 | mV/uS |
| Positive temperature gradient in standby(2) | No limitation for negative temperature gradient, or outside standby mode | | 5 | °C/s |
| CONTROL INPUT AC CHARACTERISTICS(3) | | | | |
| RESET_N low duration | 1 | | | uS |

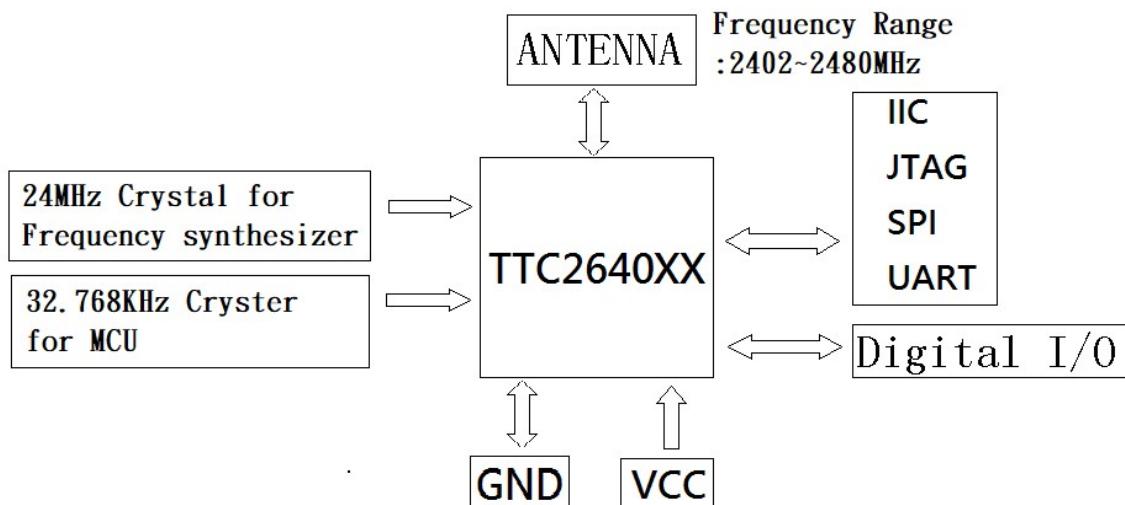
(1) For smaller coin cell batteries, with high worst-case end-of-life equivalent source resistance, a 22- μ F VDDS input capacitor must be used to ensure compliance with this slew rate.
(2) Applications using RCOSC_LF as sleep timer must also consider the drift in frequency caused by a change in temperature .

9-7. Switching Characteristics

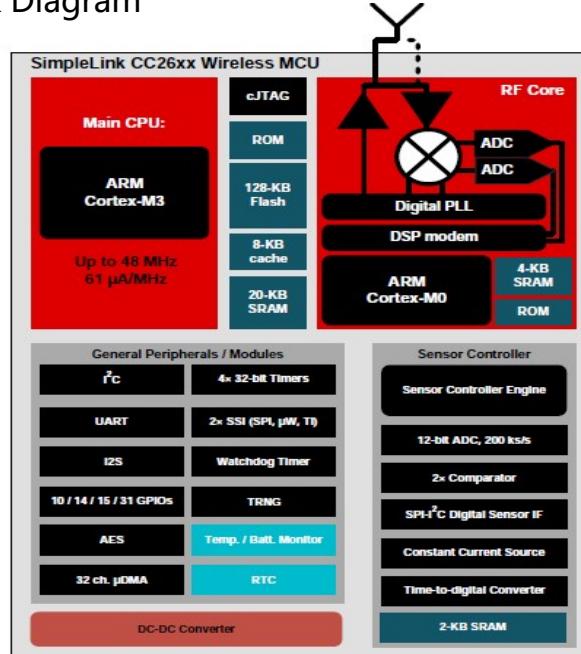
Measured with $T_c = 25^\circ\text{C}$, $\text{VDDS} = 3.0 \text{ V}$, unless otherwise noted.

| Parameter | Test Condition | Min | Typical | Max | Unit |
|-------------------------------|----------------|------|---------|-----|------|
| Wakeup and Timing | | | | | |
| Idle \rightarrow Active | | 14 | | | μs |
| Standby \rightarrow Active | | 151 | | | μs |
| Shutdown \rightarrow Active | | 1015 | | | μs |

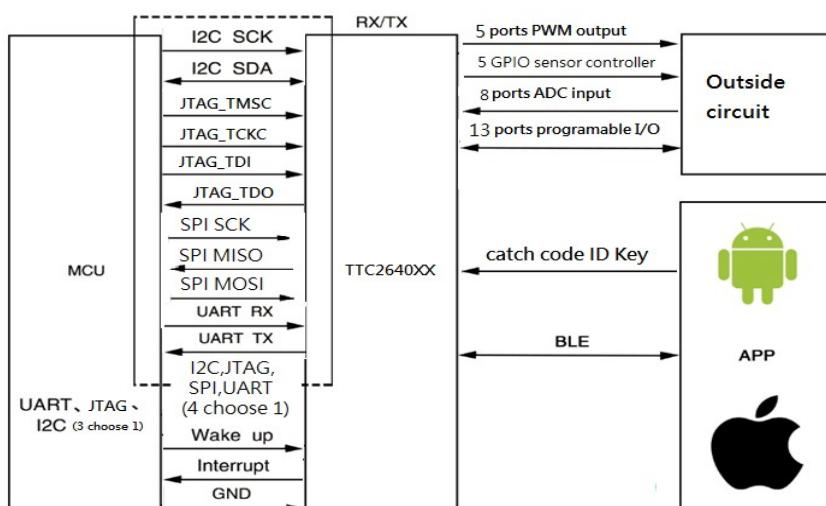
10. Block Diagram



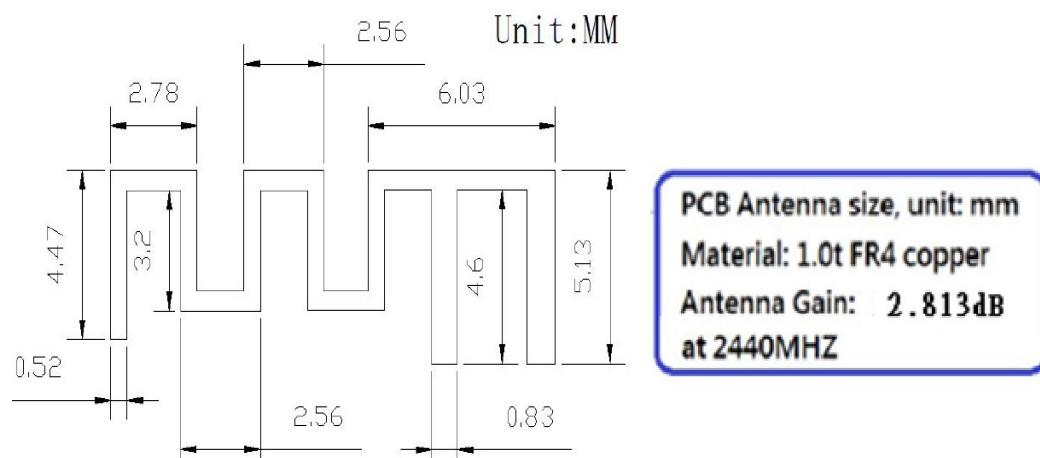
11. Functional Block Diagram

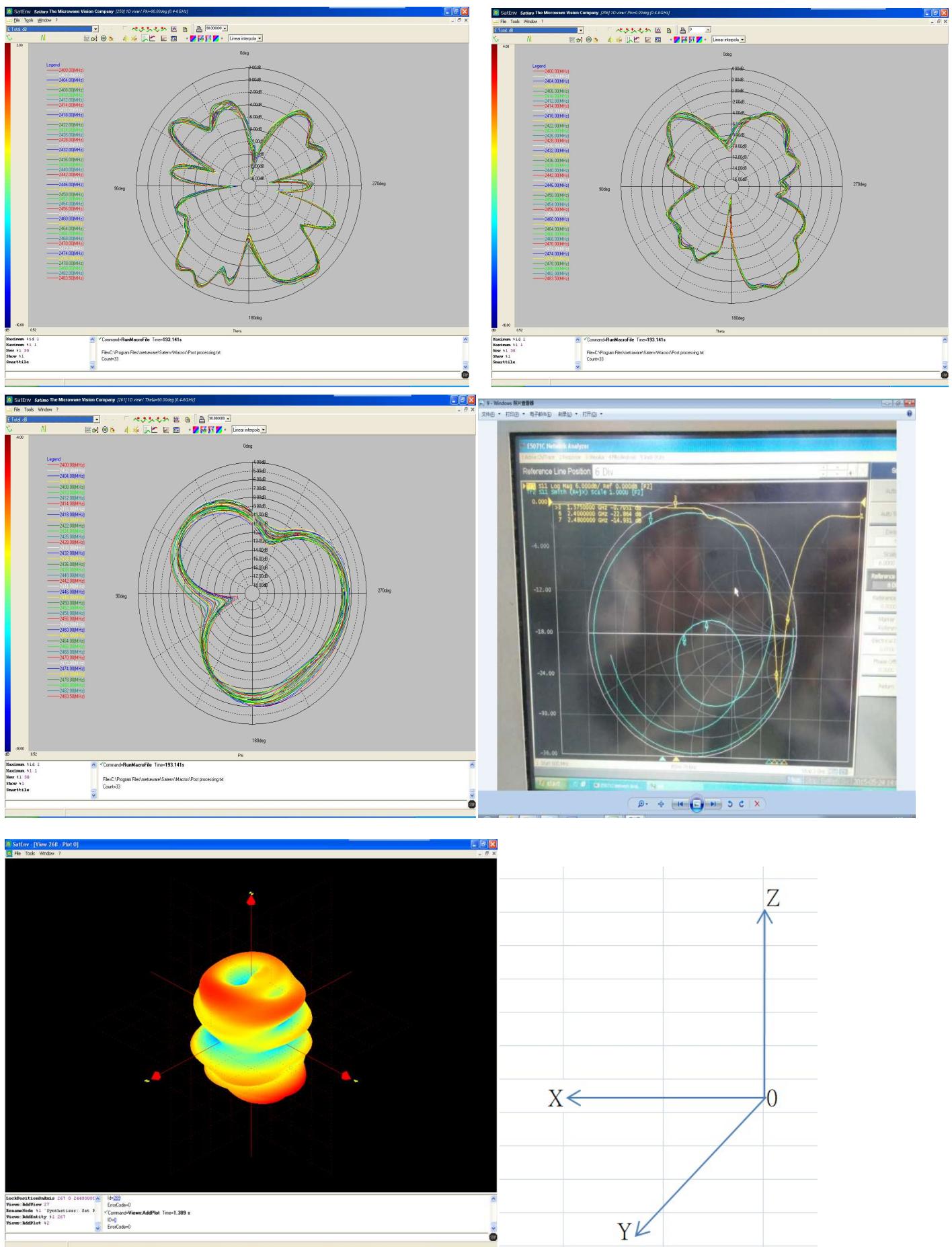


12. Working mode schematic :



13. Antenna size, gain and test data information : (Antenna gain: 2.813dBi at 2440MHz)

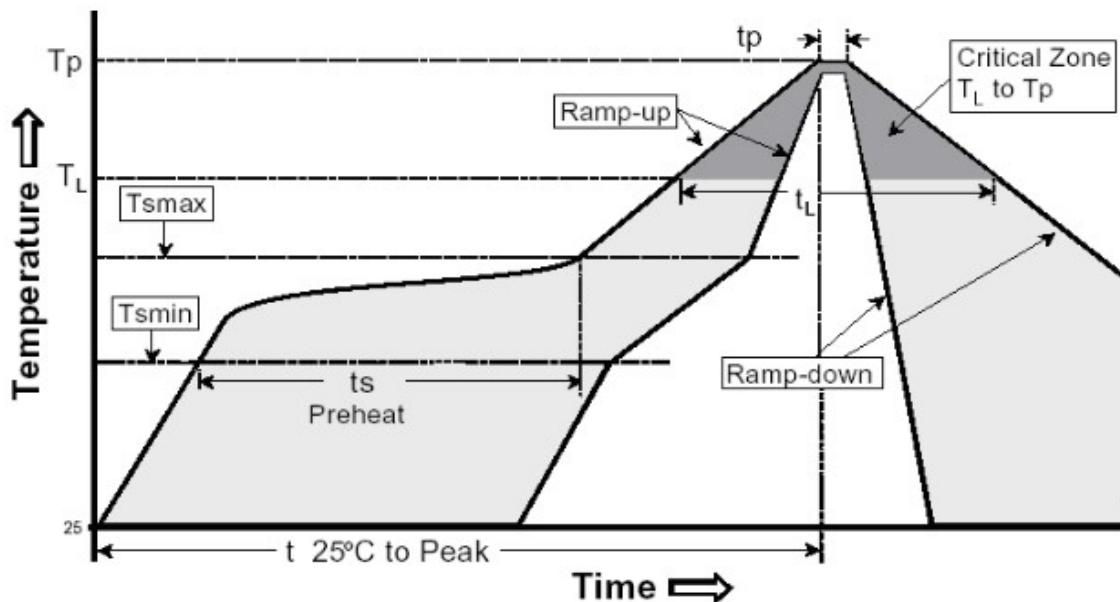




14. Recommend Reflow Profile(Leadless solder cream: Sn 96.5%, Ag 3%, Cu 0.5%)

| Profile Feature | Pb-Free Assembly | |
|--|----------------------------------|----------------|
| | Large Body | Small Body |
| Average ramp-up rate(T_L to T_P) | 3°C/second max | |
| Preheat-Temperature Min (T_{Smin}) -Temperature Max (T_{Smax}) -Time (min to max)(t_s) | 150°C 200°C 60-180 seconds | |
| T_{Smax} to T_L -Ramp-up Rate | 3°C/second max | |
| Time maintained above-Temperature (T_L) -Time (t_L) | 217°C | 60-150 seconds |
| Peak Temperature (T_P) | 245 +0/-5°C | 250 +0/-5°C |
| Time within 5°C of actualPeakTemperature (t_p) | 10-30 seconds | 20-40 seconds |
| Ramp-down Rate | 6°C/second max | |
| Time 25°C to PeakTemperature | 8 minutes max | |

Reflow Curve Classification



15. HY-40R201PC/WMD40R201SR6PC Module FCC / Industry Canada Statement

(to be placed on End Products) Federal Communications Commission (FCC) Statement
FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated" has to be labeled with an auxiliary label stating the FCC ID of the RF Module, such as "Contains FCC ID:

2ADXEHY-40R201PC

"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."

"Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

the Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

- 1) The radio elements have the radio frequency circuitry shielded.
- 2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.
- 3) The module contains power supply regulation on the module.
- 4) The module contains a permanently attached antenna.
- 5) The module demonstrates compliance in a stand-alone configuration.
- 6) The module is labeled with its permanently affixed FCC ID label.
- 7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.
- 8) The module complies with RF exposure requirements.

NOTE: 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 or more 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

Industry Canada (IC) Statement

This device complies with Industry Canada licence-exempt RSS standard(s).

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.

Canada, avis d'Industry Canada (IC)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

16. Contact Us:

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Address: Room 602, B Block of Longjing Jingu Hi-tech Pioneer Park, Longzhu 4th Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China..



**Integration instructions for host product manufacturers according to KDB 996369 D03 OEM
Manual v01**

2.2 List of applicable FCC rules

FCC Part 15.247

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

not applicable

2.5 Trace antenna designs

It is "not applicable" as trace antenna which is not used on the module.

2.6 RF exposure considerations

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This compliance to FCC radiation exposure limits for an uncontrolled environment, and minimum of 50mm separation between antenna and body.

The host product manufacturer would provide the above information to end users in their end-product manuals.

2.7 Antennas

Integral Antenna; 3.42dBi; 2.402 GHz~2.480GHz

2.8 Label and compliance information

The end product must carry a physical label or shall use e-labeling followed KDB784748D01 and KDB 784748 stating "Contains Transmitter Module FCC ID: 2ADXEHY-40R201PC".

2.9 Information on test modes and additional testing requirements.

Information on test modes:

The host manufacturer can use software for access to the test modes. Connected to the device through the serial port of the host product and control the module. If it does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

The following provides guidance to host product when installing this module on how they may verify the end product:

- A. If the modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the

host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits(e.g., where a different antenna may be causing additional emissions).

- B. The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.
- C. If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.