



**HY-40R204 BLE 5.0 Module Specifications**

**(16 pin)**

25 Oct. 2017

Version : V2.0

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## 1. Description

HY-40R204 Bluetooth low energy single mode module is a single mode device targeted for low power sensors and accessories.

HY-40R204 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-40R204 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-40R204 transmission distance of 100 meter . (Face to Face, Free space, at 1.2 Meter high from Ground for testing).

Bluetooth IC : TTC2640R2 4\*4\*0.9mm 32pin IC,Used TI CC2640R2 die chip

### 1-1.APPLICATIONS:

- 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

### 1-2.KEY FEATURES:

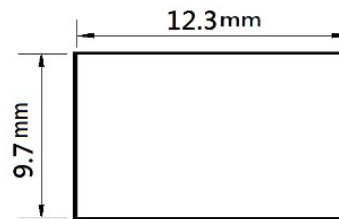
- Bluetooth v.5.0 single mode compliant
- Supports master,slaveand master/slave modes
- Integrated Bluetooth low energy stack
- GAP, GATT, L2CAP, SMP Bluetooth low energy profiles
- Pre-certified RF regurations for BQB BLE 5.0, CE ETSI RED, FCC, IC(Canada), (FCC and IC certified only for HY-40R204PC PCB antenna with shield case model);  
Another can Compliance for 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

## 2. Product model Number: Hardware Model Description

### 2-1. (4 kinds Antenna type for choice) ,(Option: with shield case or no shield case)

	Product Mode Item	PCB NO.	Description
1	WMD40R204SR6P0	HY-40R204P	PCB Helix Antenna
2	WMD40R204SR6I0	HY-40R204I	IPEX Connector for External Antenna
3	WMD40R204SR6W0	HY-40R204W	Metal Wire Antenna
4	WMD40R204SR6C0	HY-40R204C	Ceramic Antenna
6	WMD40R204SR6PC	HY-40R204PC	PCB Helix Antenna with shield case
5	WMD40R204SR6IC	HY-40R204IC	IPEX Connector for External Antenna with shield case
7	WMD40R204SR6WC	HY-40R204WC	Metal Wire Antenna with shield case
8	WMD40R204SR6CC	HY-40R204CC	CeramicAntenna with shield case

### 2-2: FCC ID & ( IC ID/ wait defind) Print Format on the Shield Case :(HY-40R204PC model only)



Shield Case Size:  
 9.7\*12.3\*1.5mm

Word Type: Calibri

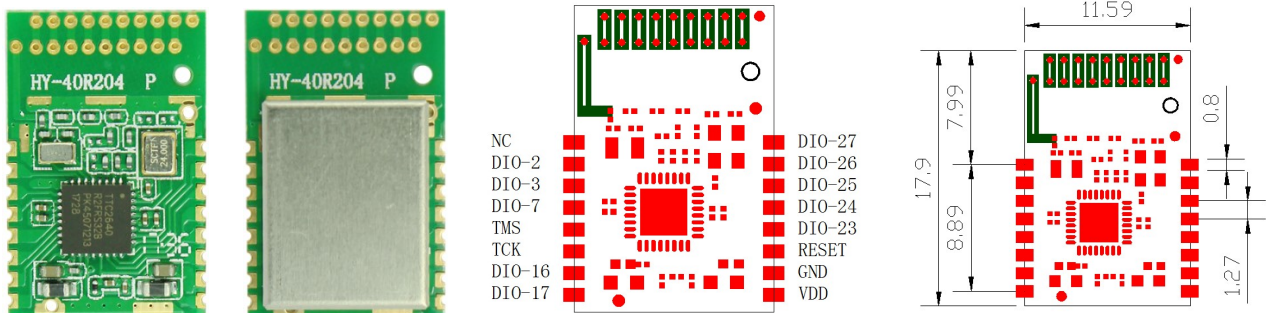
Direction: Horizon

## 3. PCBA dimension size and picture

### 3-1: HY-40R204P / WMD40R204SR6P0( PCB Helix Antenna)

### &HY-40R204PC / WMD40R204SR6PC (PCB Helix Antenna, with shield case);

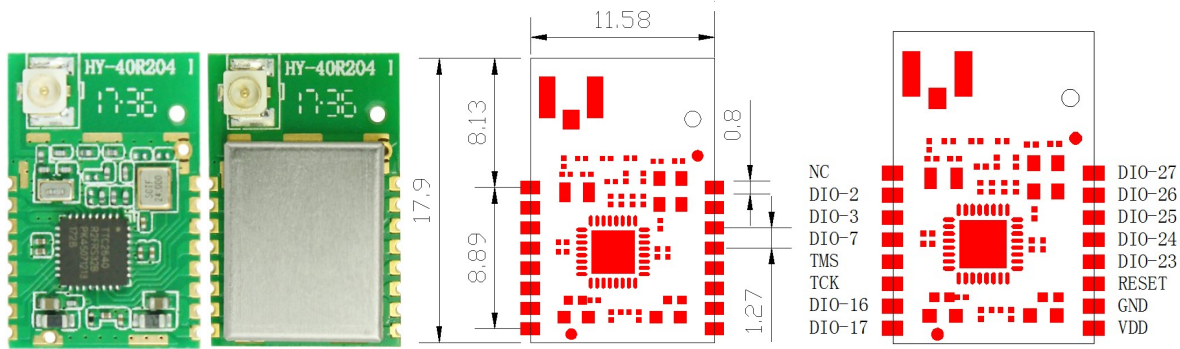
(PCBA dimension size : 17.9\*11.59\*2.0/2.6 mm).



**3-2:HY-40R204I / WMD40R204SR6I0(IPEX RF connector terminal)**

**&HY-40R204IC / WMD40R204SR6IC (IPEX RF connector with shield case )**

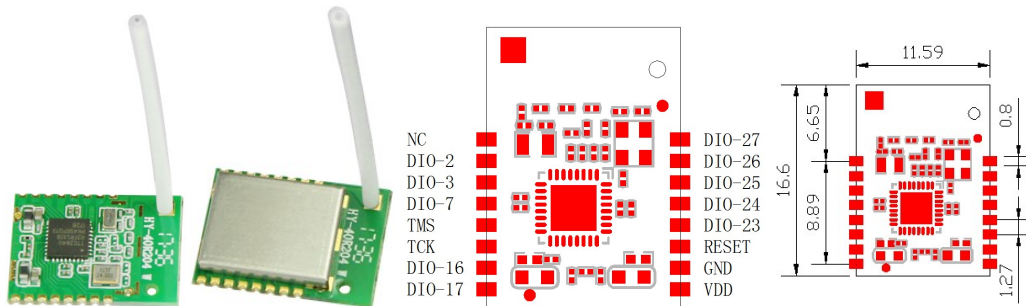
(PCBA dimension size : 17.9\*11.58\*2.6 mm).



**3-3: HY-40R204W / WMD40R204SR6W0( Metal WireAntenna)(1/4 λ half wave dipole)\_**

**&HY-40R204WC / WMD40R204SR6WC ( Metal Wire Antenna, with shield case) ;**

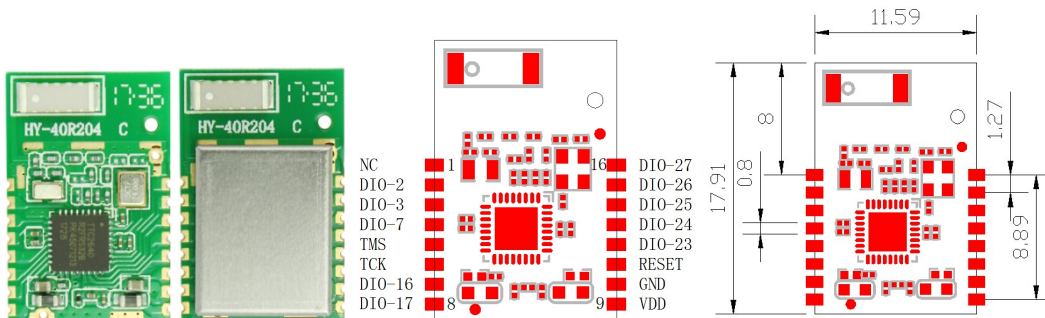
(PCBA dimension size : 16.6\*11.59\*2.0/2.6 mm).



**3-4: HY-40R204C / WMD40R204SR6C0( CeramicAntenna)**

**&HY-40R204CC / WMD40R204SR6CC (Ceramic Antenna, with shield case) ;**

(PCBA dimension size : 17.91\*11.59\*2.0/2.6 mm).



**4.Application Note:**

**4-1.**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 be fly; Manual welding module solder iron temperature, should pay attention to avoid the PCB copper stripping off; Soldering iron strictly Grounding requirements, eliminating iron power failure module;

**4-2.**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.

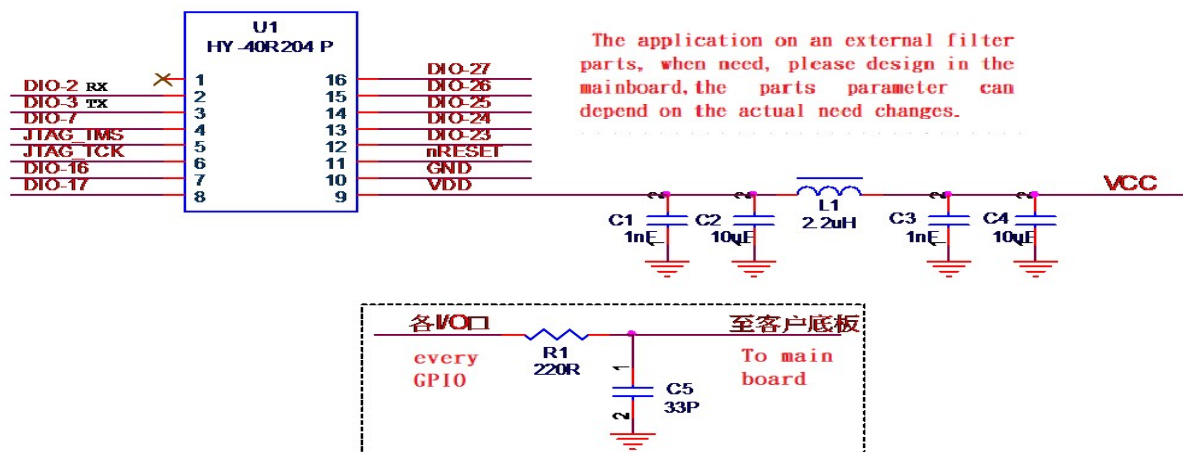
**4-3.**When programming firm ware , the VDDs supply voltage must in DC 2.4~3.3V, To avoid programming has not completely, and abnormal status occur..

**4-4.** 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)

**4-5.** The module for the humidity sensitive components, 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.)

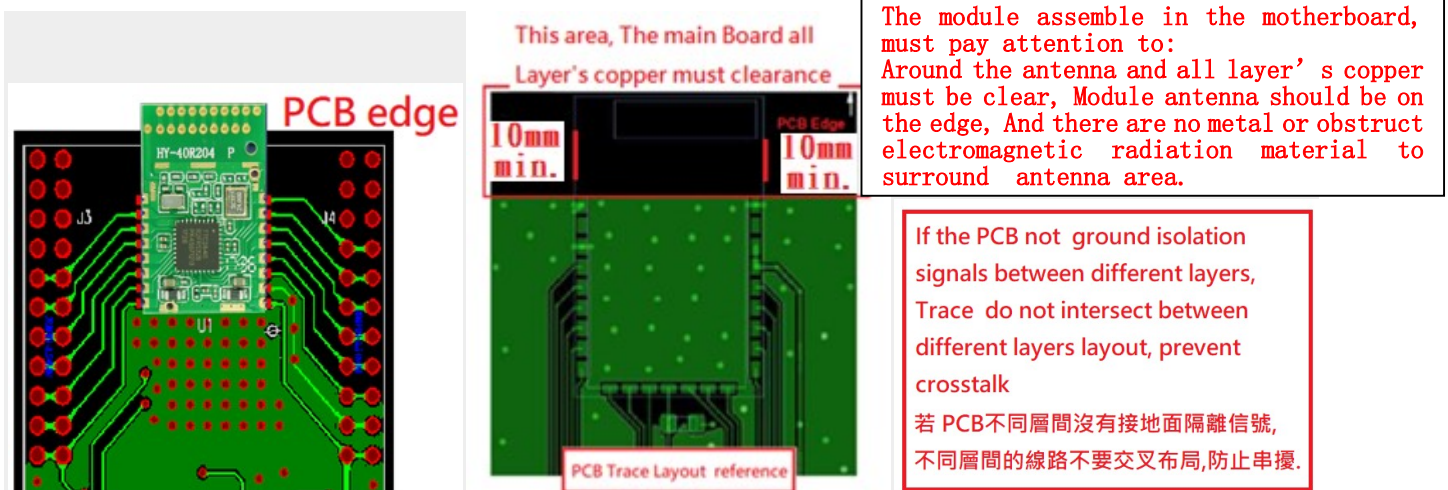


**4-6.** The diagram (show in below Fig.) of the module application on external filter parts, when need, please design in the mainboard, the parts parameter can depend on the actual need to changes.



4-7. 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.

4-8. 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.



## 5. Pinout and GPIO function Description

Pin No.	Name	Type	Function Description
1	NC	NC	Not connect
2	DIO_2	Digital I/O	UART RX; GPIO, Sensor Controller (I:4mA max),
3	DIO_3	Digital I/O	UART TX; GPIO, Sensor Controller (I:4mA max)
4	DIO_7	Digital I/O	Wake Up , Don't floating. GPIO, Sensor Controller. high-drive capability (8mA max).
5	JTAG TMS	Digital I/O	JTAG TMS; high-drive capability
6	JTAG TCK	Digital I/O	JTAG TCK
7	DIO_16 TDO	Digital I/O	GPIO, JTAG_TDO, high-drive capability(8mA max).
8	DIO_17 TDI	Digital I/O	GPIO, JTAG_TDI. high-drive capability(8mA max).
9	VDD	Power Supply	+1.8V to +3.8V (Recommended 2.7~3.3V)



10	GND	Power GND	Ground
11	RESET_N	Digital input	Reset, active-low. Module have pull up.
12	DIO_23	Digital I/O	GPIO, Sensor Controller, Analog(I: 4mA max)
13	DIO_24	Digital I/O	GPIO, Sensor Controller, Analog(I: 4mA max)
14	DIO_25	Digital I/O	GPIO, Sensor Controller, Analog(I: 4mA max)
15	DIO_26	Digital I/O	GPIO, Sensor Controller, Analog(I: 4mA max)
16	DIO_27	Digital I/O	GPIO, Sensor Controller, Analog(I: 4mA max)

## 6. Electrical Characteristics

(Test condition: With Ta = 25 °C, VDD =3.0V with internal DC-DC converter, standardmeasure:1Mbps GFSKmodulation ,FRF = 2440MHz Bluetooth Low energy mode.)

### 6-1.Radio performance & current consumption

(Test condition:With Ta = 25 °C, VDD =3.0V, 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 HY-40R204PC 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)

### 6-2. 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	4.1	V
Other Terminal Voltages	VSS-0.3	VDDS+0.3	V
Storage Temperature	-40	+85	°C

### 6-3. ESD Ratings

			Value	Unit
V <sub>ESD</sub> Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDECJS001	All pins	±2500	V
	Charged device model (CDM), per JESD22-C101	RF pins	±750	
		Non-RFpins	±750	

### 6-4. 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)	1.8	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-μF VDDS input capacitor must be used to ensure compliance with this slew rate(6-6 timing req.).

### 6-5.GPIODC 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

### 6-6. Timing Requirements

Description	MIN	NO M	MA X	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

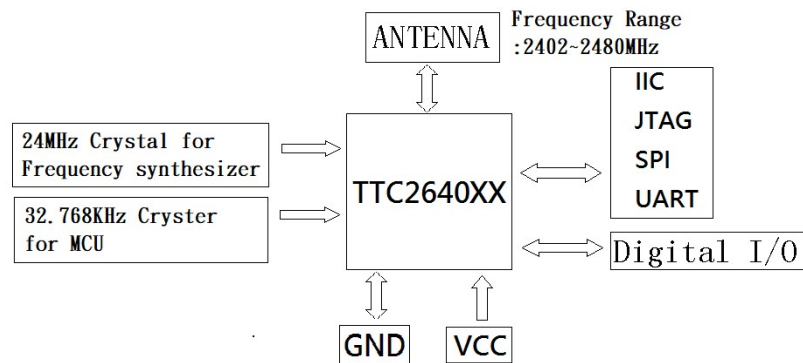
- (1) For smaller coin cell batteries, with high worst-case end-of-life equivalent source resistance, a 22- $\mu$ F VDD5 input capacitor must be used to ensure compliance with this slew rate.
- (2) Applications using RCOSC\_LF as sleep timer must also consider the drift in frequency caused by a change in temperature .

## 6-7. Switching Characteristics

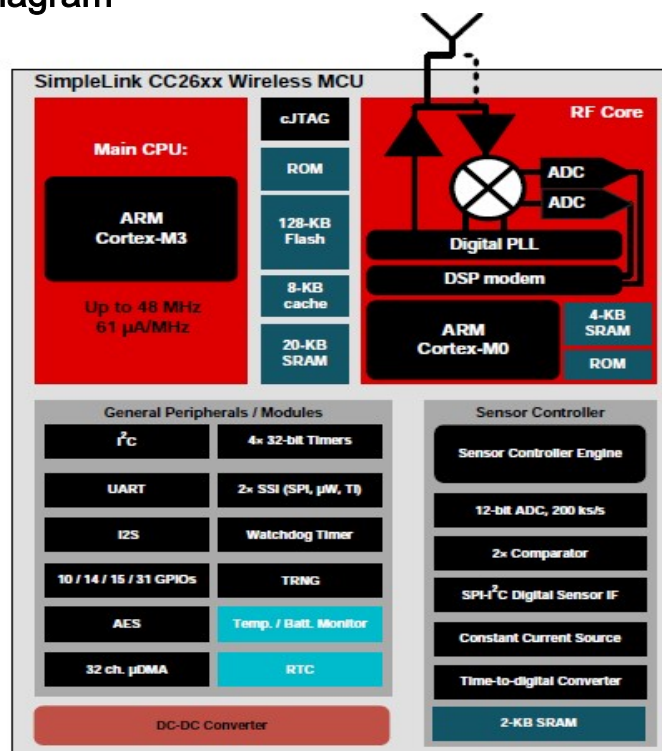
Measured with Tc = 25°C, VDD5 = 3.0 V, unless otherwise noted.

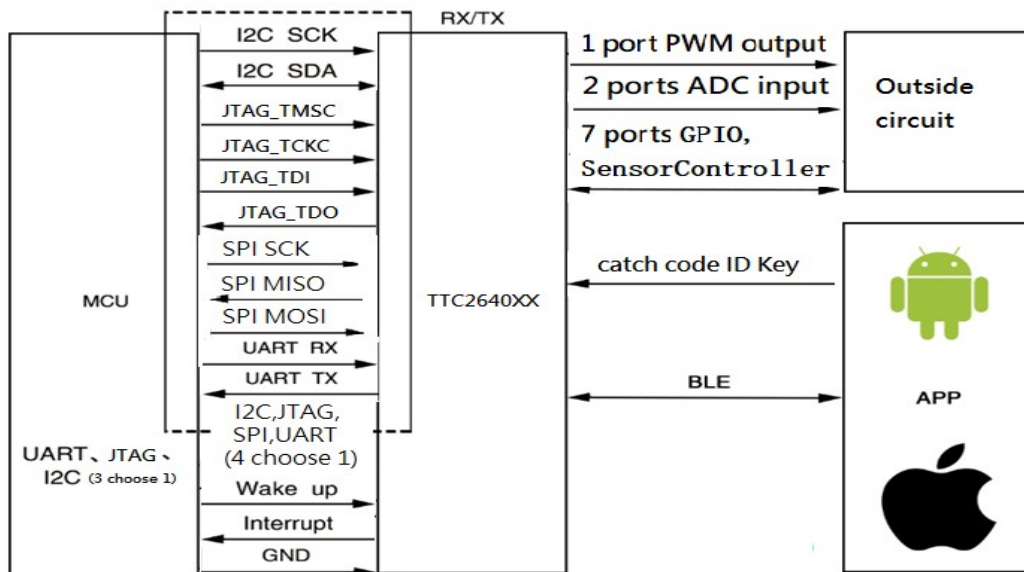
Parameter	Test Condition	Min	Typical	Max	Unit
<b>Wakeup and Timing</b>					
Idle →Active			14		$\mu$ s
Standby →Active			151		$\mu$ s
Shutdown →Active			1015		$\mu$ s

## 7. Block Diagram



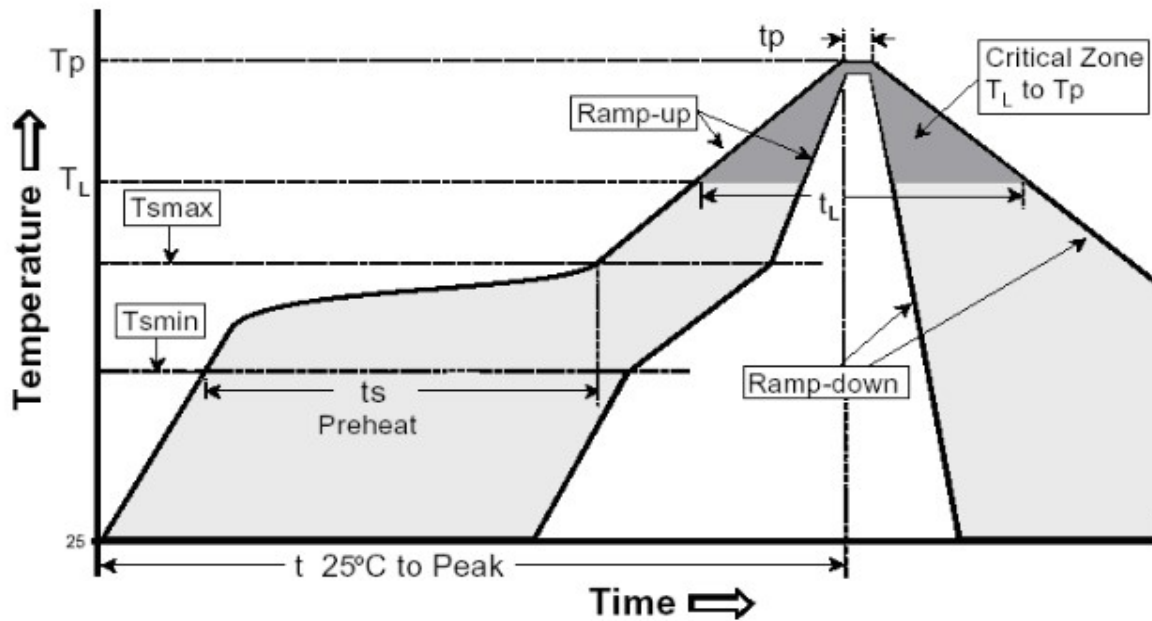
## 8. Functional Block Diagram



**9. Working mode schematic :**

**10. 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 ( $T_{s_{min}}$ )	150°C	
-Temperature Max ( $T_{s_{max}}$ )	200°C	
-Time (min to max)( $t_s$ )	60-180 seconds	
$T_{s_{max}}$ to $T_L$ -Ramp-up Rate	3°C/second max	
Time maintained above-Temperature ( $T_L$ )	217°C	
-Time ( $t_L$ )	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



**11.HY-40R204PC/WMD40R204SR6PC 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: 2ADXE-HY-40R204PC**

"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.

## 12. Contact Us

**ShenZhenShengRun Technology Co.,Ltd.**

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