

## CC264BPA-S\_Bluetooth LE Module

### Features

- Fully compliant to Bluetooth Smart (4.2 Low Energy single mode) specifications
- High efficiency on-module printed PCB RF antenna (CC264BPA-S)
- Very few external BOM-count to create a fully functional application circuit
- Texas Instrument CC26xx SimpleLink™ Wireless MCU
- 48MHz ARM Cortex-M3 MCU core for applications with 128K flash memory for ISP
- 8-KB SRAM for Cache and 20-KB Ultra-Low Leakage SRAM
- Dedicated ARM Cortex-M0 core, 4KB SRAM, and ROM for RF operations
- Dedicated processor and 2KB SRAM for ultra-low power sensor control
- Coin battery-friendly 1.8-3.8V operation
- Ultra Low power consumption, 6.5mA during Active-TX at 0dBm
- Increased modulation index providing possible range of 100m+ in open area
- Continuous Time Comparator and Ultra-Low Power Analog Comparator
- TRNG and AES-128 encryption for data encryption and authentication
- 4 General-Purpose Timer Modules (8 × 16-Bit or 4 × 32-Bit Timer, PWM Each)
- Programmable UART, SPI, I2S, I2C, and GPIO interface
- 12-Bit ADC, 200-ksamples/s, 8-Channel Analog MUX and battery monitor
- Support for 8 Capacitive Sensing Buttons
- Support user-developed applications and custom profile over GATT
- Integrated RF Shield can models available (CC264BPA-S / CC265BPA-S)
- Bluetooth Certification BQB: Available upon request
- FCC Certification: Available for CC264BPA-S
- REACH / RoHS compliant

### Applications

- Internet of Things (IoT) Device
- iBeacon
- Wireless Keyboard and Mouse
- GamePad and Game Controller
- HID applications
- Mobile phone and tablet accessory
- Medical and healthcare monitor
- Sports and Fitness equipment
- Proximity and Lost-prevention Key Fob
- Smart Wearable
- RC and Interactive Toy
- Home/Building Automation
- Machine-to-Machine data transfer
- Remote Sensor Network
- Wireless Alarm and Security
- Automatic Meter Reading (AMR)
- Electronic Shelf Labeling
- Lighting and HAVC control
- Remote Control and Assisted Living

## **General Electrical Specification**

Absolute Maximum Ratings		
Ratings	Min.	Max.
Storage Temperature	-40 °C	+90 °C
Supply Voltage VDD	-0.3 V	3.9 V
Recommended Operating Condition		
Operating Condition	Min.	Max.
Operating Temperature range – (C-grade)	-20 °C	+75 °C
Operating Temperature range – (I-grade) <sup>+</sup>	-40 °C	+85 °C
Supply Voltage VDD, VDDIO	1.8 V	3.8 V

Parameter	Description	Min.	Typ.	Max.	Units
Operating Frequency		2.4GHz			
Carrier frequency		2379 to 2496 MHz, 1 MHz step 40 channels			
Modulation Method	1Mbps	GFSK, 160/250 KHz deviation			
	2Mbps	GFSK, 320/500 KHz deviation			
Air transmission rate				2	Mbps
RF Output Power		-20	-	3.8	dBm
RX Sensitivity	@0.01% BER		-95.5		dBm
Current Consumption – TX	@ +5dBm	-	9.1	-	mA
Current Consumption – TX	@ 0dBm	-	6.2	-	mA
Current Consumption – RX	Standard	-	5.9	-	mA
Current Consumption – Radio Off	Active	1.6	3.4	-	mA
Current Consumption – Idle	LPM1 Mode	-	0.5	-	mA
Current Consumption – Standby	LPM3 Mode, SRAM/CPU retention and RTC running	-	1	-	uA
Current Consumption – Deep Sleep	LPM4/5 Mode	0.5	0.1	-	uA
Current Consumption – Connected	1 sec Connection Interval, 0dBm		9.8		uA

\* Measurements are for CC264BPA

<sup>+</sup> Contact your GT-tronics sales representative for availability

## **Standard Firmwares Available**

- Heart Rate Monitor (HRP)
- Blood Glucose Monitor
- Health Thermometer (HLP)
- Blood Pressure Monitor (BLP)
- DataExchanger (serial data transfer via GATT)
- Smart Lighting Control (GATT)

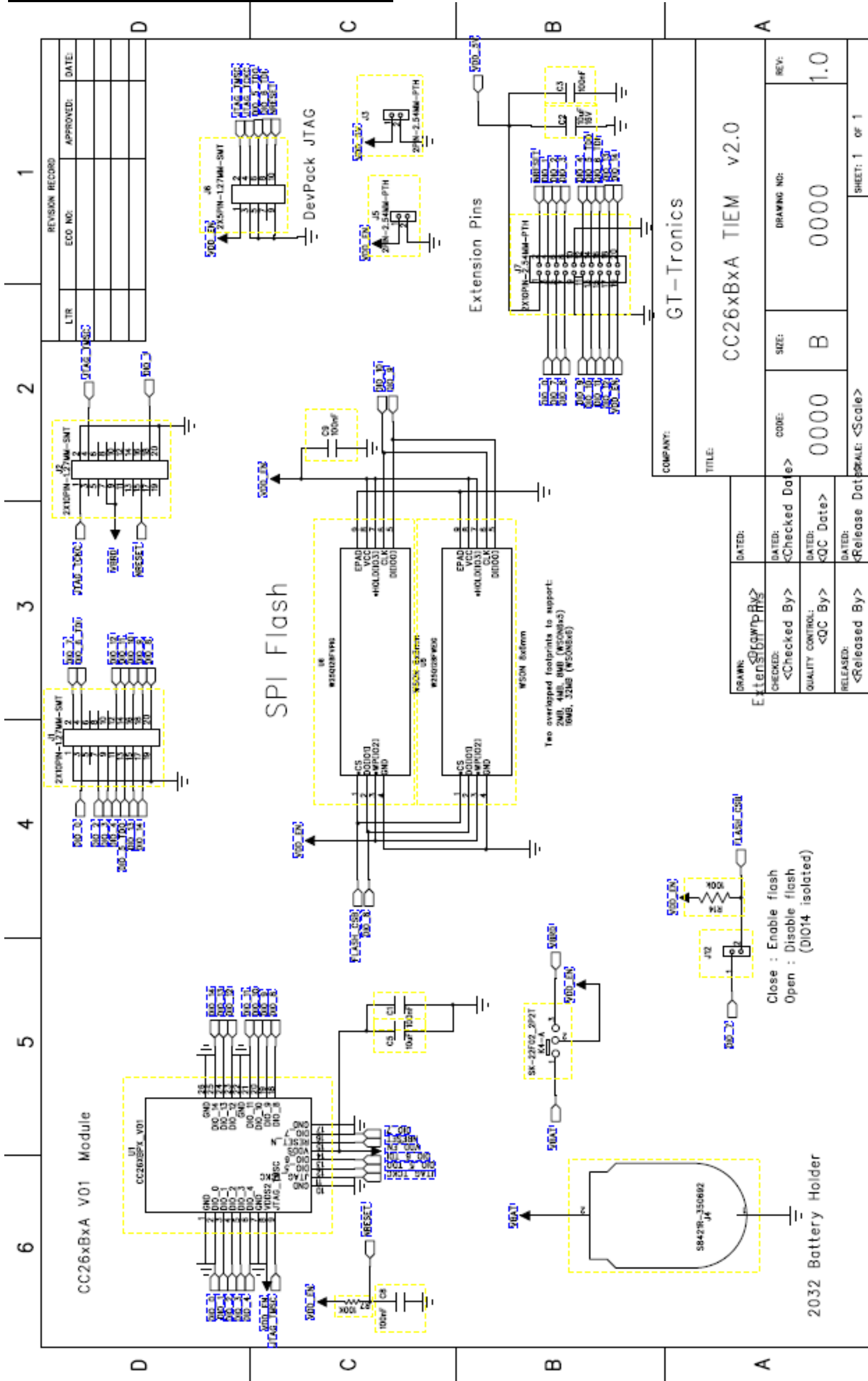
## **Pins Configurations<sup>3</sup>**

PIN	NAME	TYPE	FUNCTION	TYPICAL USAGE <sup>1</sup>
1	GND	Power	Ground	
2	DIO_0	Digital I/O	GPIO with 4mA drive capability	GPIO, Sensor control
3	DIO_1	Digital I/O	GPIO with 4mA drive capability	GPIO, Sensor control
4	DIO_2	Digital I/O	GPIO with 8mA drive capability	GPIO, Sensor control
5	DIO_3	Digital I/O	GPIO with 8mA drive capability	GPIO, Sensor control
6	DIO_4	Digital I/O	GPIO with 8mA drive capability	GPIO, Sensor control
7	GND	Power	Ground	
8	VDD_IO	Power	1.8v to 3.8v GPIO Supply	Connect to VDD
9	JTAG_TMSC	Digital I/O	JTAG TMSC	Debug port data
10	GND	Power	Ground	
11	JTAG_TCKC	Digital I/O	JTAG TCKC	Debut port clock
12	DIO_5	Digital I/O	GPIO with 8mA drive capability	GPIO, JTAG_TDO
13	DIO_6	Digital I/O	GPIO with 8mA drive capability	GPIO, JTAG_TDI
14	VDD	Power	1.8v to 3.8v main power supply	3.3v power input
15	RESET_N	Digital Input	Reset, active-low, no internal pullup	Resistor pull up to VDD
16	DIO_7	Digital/Analog I/O	GPIO with 4mA drive capability, analog	Sensor control, analog
17	GND	Power	Ground	
18	DIO_8	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
19	DIO_9	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
20	DIO_10	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
21	DIO_11	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
22	GND	Power	Ground	
23	DIO_12	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
24	DIO_13	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
25	DIO_14	Digital/Analog I/O	GPIO with 4mA drive capability, analog	GPIO, Sensor control, analog
26	GND	Power	Ground	

Note:

1. Typical usage is firmware dependent. Please check with standard firmware application note or your firmware designer for the actual pin definition.
2. Pin out for CC2640 5x5 RHB IC package.

Reference Application Example



CC264BPA is a high-performance and ultra low-power BLE 4.x data module which uses Texas Instrument's CC2640/CC2650 SoC as the main component. Its integrated PCB antenna further simplifies the system design to provide users with a truly handy design block. All essential I/Os and power lines are wired out to the module pins. All I/O functions are software configurable.

The reference application (TIEM) described in this section provides a typical usage example of the module. It provides a hardware environment for CC264BPA module evaluation as well as facilitates the development of firmware on the module. It is also compatible to TI's SmartRF06 development board, CC2650DK Development Kit, SensorTag Debugger DevPack, and is a near-drop-in replacement to CC2650EMK-5XD Evaluation Module. By plugging in a CR2032 coin cell (not provided in the package) to the TIEM evaluation module, the board can run as a standalone wireless device, providing simple function such as iBeacon. The breakout pins on the E-interface allows further hardware feature extension. Actuator control, temperature and motion sensing, for example. This is a perfect fit for quick prototyping Internet of Things (IoT) hardware demo.

## Board Features

- Featuring TI CC26xx SimpleLink Wireless SoC
- Operate on battery as standalone wireless RF device
- Complete BLE and Zigbee RF solution including built-in antenna
- E-interface break out pins for hardware extension
- Compatible with TI SmartRF06, CC2650DK, and SensorTag Debugger DevPack

## Additional Resources

- See *CC26xBxA Bluetooth Smart and IoT Module DataSheet* for the specifications of the RF module on the CC26xBxA Evaluation Module.
- Check out Texas Instruments' web site (<http://www.ti.com>) for availability of the SmartRF06 evaluation board, and *SmartRF06 Evaluation Board User's Guide* from Texas Instruments for the operation of the SmartRF06 evaluation board.
- Check out Texas Instruments' web site (<http://www.ti.com>) for availability of the SensorTag Debugger DevPack, and *SensorTag DevPack Getting Started* from Texas Instruments for the operation of the SmartRF06 evaluation board.

## Application Notes

- **Using coin cell battery as power source**  
If the TIEM evaluation module is running on CR2032 coin cell battery (i.e.VDD=3V or less), the logic level of all IOs on E-interface will follow this VDD, which is determined by the battery level. If there is any external hardware connected through the E-interface to the CC2640BPA module with logic levels different from this battery level (e.g. connecting USB-UART dongle with 3.3v logic levels), power rail mismatch problem may arise. In this case, it is suggested to supply 3.3v external power to DC power input connection (J3) of TIEM and remove the coin cell battery.

**Caution** – Coin cell battery must be removed before applying 3.3V (max. allowable level) to DC power input (J3) of the TIEM evaluation module.

- **Connection to JTAG debugger**  
CC26xBPA SMD and TIEM evaluation module support both compact JTAG (aka cJTAG) (2 wire) and normal JTAG (4-wire). The JTAG pins on TIEM's J6 and CC26xBPA module are (as specified in the module datasheet):  
TIEM\_Pin\_2, Module\_Pin\_11: JTAG\_TMSC (used by cJTAG and JTAG)  
TIEM\_Pin\_4, Module\_Pin\_13: JTAG\_TCKC (used by cJTAG and JTAG)  
TIEM\_Pin\_6, Module\_Pin\_14: DIO5/JTAG\_TDO (used by JTAG only)  
TIEM\_Pin\_8, Module\_Pin\_15: DIO6/JTAG\_TDI (used by JTAG only)

Although the JTAG core signal pins (2-wire or 4-wire) are mandatory, your JTAG emulator may requires other supporting pins to work probably. Please refer to TI's XDS Target Connection Guide and your XDS100v3 JTAG enumerator manufacturer for the support. TIEM evaluation module's J6 connector is a standard 10-pin ARM cortex header.

In general, in addition to the core signal pins, the following pins may need attention.

1. nRESET (Target Reset) - connect to CC2640's Reset pin (TIEM's J6 pin 10).
2. TDIS (Target Disconnect) - connect to the ground of the target (TIEM's J6 pin 9).
3. TVRef (Target Voltage Reference) - connect to the VDD of the target (TIEM's J6 pin 1).

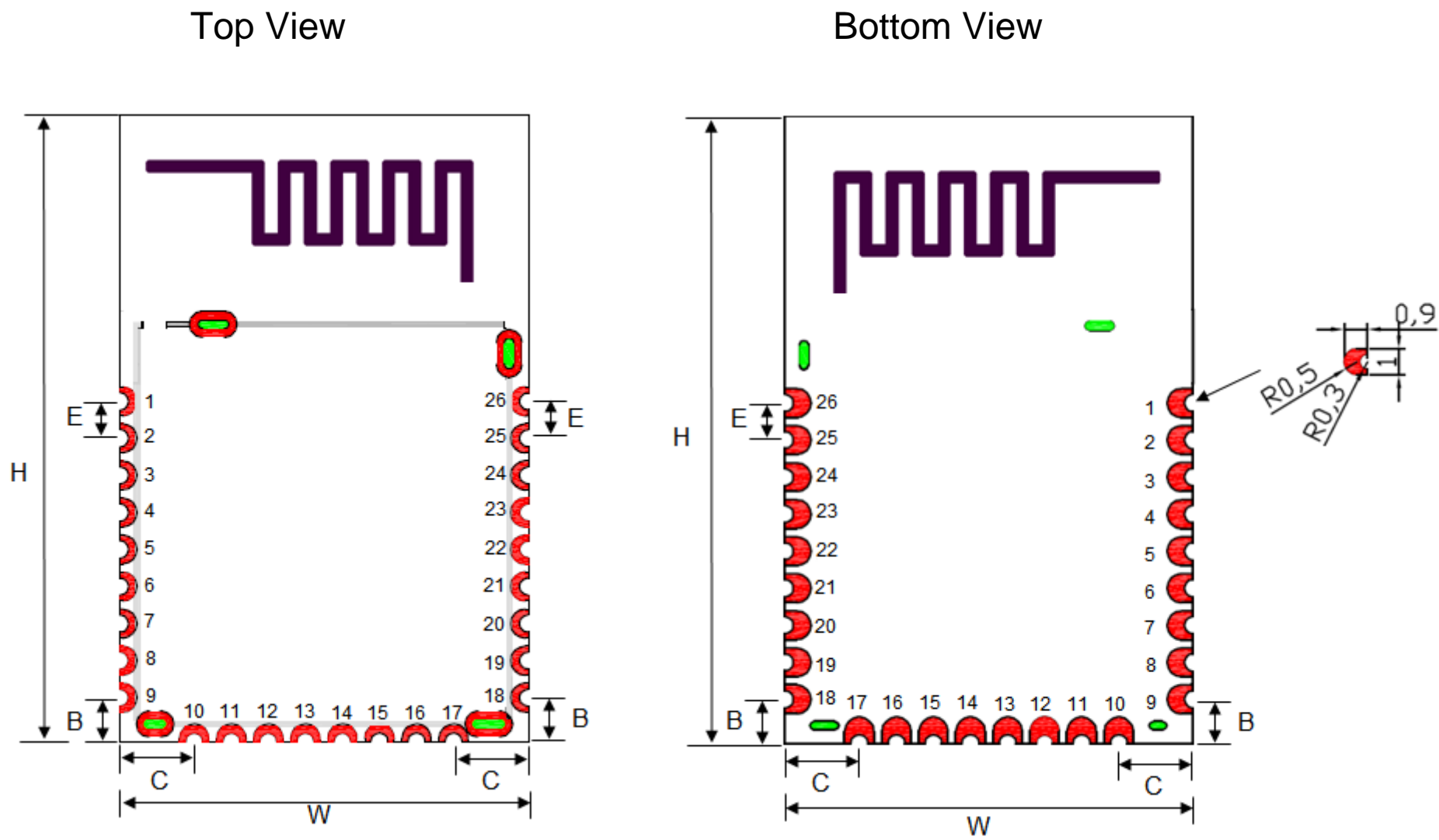
- Accessing **on board SPI Flash**

TIEM comes with 8MByte SPI flash on board which allows user to develop application that needs storage. SPI signals CSB, MISO, MOSI and SCK are assigned to DIO7, DIO8, DIO9 and DIO10 respectively. If storage is not needed, the jumper J12 can be removed to reclaim all 4 I/Os for other purposes.



Module Outline

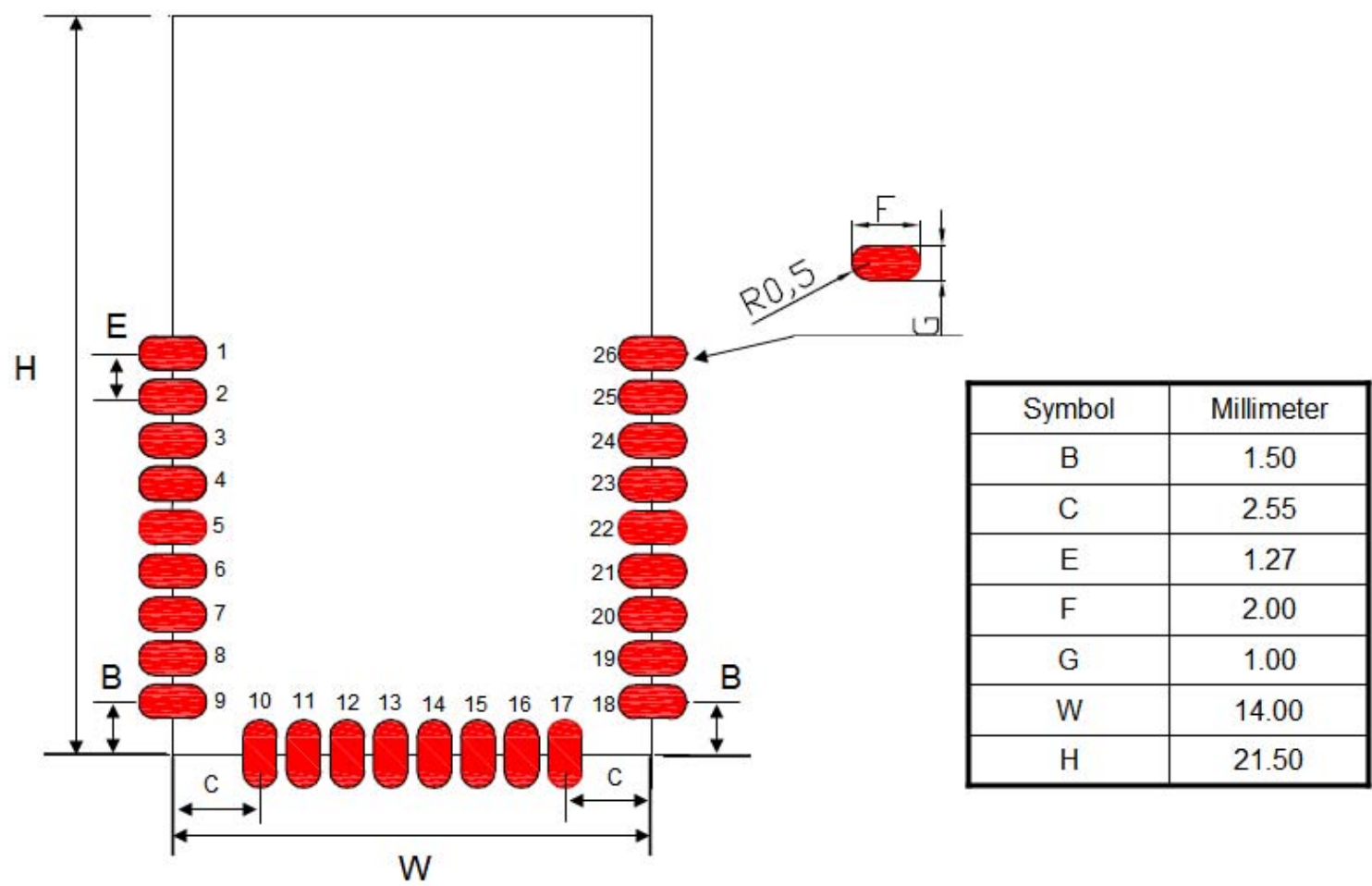
CC264BPA-S Module Outline



Symbol	Dimension (mm)
B	1.50
C	2.55
E	1.27 (pitch applies to all pins)
W	14.00
H	21.50

Recommended PCB Land Patterns

CC264BPA-S Recommended Land Pattern (Top View)





- **Module Reflow Installation**

For RoHS/Pb-free applications, Sn96.5/Ag3.0/Cu0.5 solder is recommended.

Profile Feature	Recommended Parameters
Ramp-up rate before liquidous	< 2°C / second
Preheat	150-200°C 60-90 seconds
Maximum time at liquidous	40 – 80 seconds
Maximum peak temperature	230° - 240°C (below 250°C)
Ramp-down rate	< 6°C / second



### **Host Information**

This module was defined to be used for specific host only. The designated host for this module was:  
Company: GT-tronics HK Ltd.  
Address: B210, Tonic Industrial Center, 19 Lam Hing Street, Kowloon Bay, Hong Kong  
Host Model Name: TIEM  
Host brand name: N/A

### **FCC RF Exposure Requirement**

1. At least 5mm separation distance between the antenna and the user's body must be maintained at all times. And must not transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi transmitter product procedures.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the antenna gain is -0.3dBi.
3. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

### **Please be noticed following information and instructions should be placed in the end-user's operating manual**

The Module has been granted as full modular approval for mobile applications. This Module must be installed in the designated host as specified in this manual.

1. Separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.
2. The Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
3. A label must be affixed to the outside of the end product into which the module is incorporated, with a statement similar to the following: contains FCC ID:B4OCC264BPA-S.
4. The module shall be in non-detachable construction protection into the finished products, so that the end-user has to destroy the module while remove or install it.
5. A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labeled . The OEM manual must provide clear instructions explaining to the OEM the labeling requirements, options and OEM user manual instructions that are required.  
For a host using this FCC certified modular with a standard fixed label, if (1) the module's FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

6. Host product is required to comply with all applicable FCC equipment authorizations regulations, requirements and equipment functions not associated with the transmitter module portion. Compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15B). To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. If a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depends on the details of how the module is integrated with the host, we suggest the host device to recertify part 15B to ensure complete compliance with FCC requirement: Part 2 Subpart J Equipment Authorization Procedures , KDB784748 D01 v07, and KDB 997198 about importation of radio frequency devices into the United States.



### **FCC Certification Requirement:**

The end product with an embedded Module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15.

**Note: If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.**

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 made to this equipment not expressly approved by GT-tronics HK Ltd. may void the FCC authorization to operate this equipment.