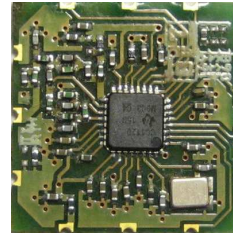# High Performance RF Transceiver Module for Narrowband Systems

Applications

- ✔ Wireless Metering and Wireless Smart Grid (AMR and AMI)
- ✔ IEEE 802.15.4g systems
- ✔ Alarm and security systems, Home and building automation
- ✔ Wireless sensor networks and Active RFID
- ✔ Telemetry Station
- ✔ Private mobile radio

Product Description

The **BITxxxRTH** is a very low cost transceiver module designed for very low power wireless applications.

This module is intended for ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) frequency band at 169, 433 and 868/915 MHz, but can easily be programmed for operation at other frequencies:

BIT169RTH 164 – 192 MHz
BIT433RTH 410 – 480 MHz
BIT868RTH 820 – 960 MHz

The Transceiver module supports various modulation formats (2-FSK, 4-FSK, GFSK, MSK, ASK) and has a configurable data rate up to 200 kbps. The communication range can be increased by enabling a Forward Error Correction option, which is integrated in the module.

BITxxxRTH provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication and wake-on-radio.

The main operating parameters and the 128-byte transmit/receive FIFOs of **BITxxxRTH** can be controlled via an SPI interface. In a typical system, the **BITxxxRTH** will be used together with a microcontroller.

BITxxxRTH has a very small package only 19 x 19 mm ready for SMT assembly.

BITxxxRTH is based on the well-proven CC1120 Product from Texas Instruments.

Key Features

- Small size (19 x 19 mm package, 13 pins).
- Frequency bands:
  BIT169RTH 164 – 192 MHz
  BIT433RTH 410 – 480 Mhz
  BIT868RTH 820 – 960 MHz
- High sensitivity: -127 dbm @ 300 bps with coding gain
- Programmable output power up to + 16 dBm with VDD = 3.6V.
- Low current consumption (3.7 mA in RX Sniff Mode @ 1.2 kbps
- Excellent receiver selectivity and blocking performance.
- Programmable baseband modem.
- Ideal for multi-channel operation.
- Configurable packet handling hardware.
- Suitable for frequency hopping systems due to a fast settling frequency synthesizer.
- Optional Forwad Error Correction with interleaving.
- Separate 128-byte RX and TX data FIFOs
- Efficient SPI interface: All registers can be programmed with one "burst" transfer.
- Digital RSSI output.
- Programmable data rate up to 200 kbps
- **BITxxxRTH** are suited for system compliant with:
  Europe   ETSI EN 300 220
              ETSI EN 54-25
  US   FCC CFR47 Part 15
              FCC CFR47 Part 90, 24 and 101
  Japan   ARIB RCR STD-T30
              ARIB STD-T67
              ARIB STD-T96
- Integrated analog temperature sensor.
- Lead-free "green package.
- OOK/ASK, 2-FSK, 4-FSK GFSK e MSK supported.
- Wake-on-radio functionality for automatic low–power RX polling.
- Flexible support for packet oriented systems: On chip support for sync word detection, address check, flexible packet length and automatic CRC handling.
- Programmable channel filter bandwidth.
- Automatic Frequency Compensation can be used to align the frequency synthesizer to the received centre frequency.
- Many powerful digital features allow a high-performance RF system to be made using an inexpensive microcontroller.
- Optional automatic whitening and dewhitening of data.
- Support for asynchronous transparent receive/transmit mode for backwards compatibility with existing radio communication protocols
- Programmable Carrier Sense indicator
- Programmable Preamble Quality Indicator for detecting preambles and improved protection against

sync word detection in random noise.

o Support for automatic Clear Channel Assessment (CCA) before transmitting (for listen-before-talk systems).

o Support for per-package Link Quality Indication

1. Absolute Maximum Ratings

Under no circumstances must the absolute maximum ratings given in Table 1 be violated. Stress exceeding one or more of the limiting values may cause permanent damage to the device.

| Parameter	Min	Max	Units	Condition
Supply voltage	-0.3	3.9	V	All supply pins must have the same voltage
Voltage on any digital pin	-0.3	VDD+0.3, max 3.9	V	
Input RF level		+10	dBm	
Storage temperature range	-40	85	℃	
ESD		2000	V	According to JEDEC STD 22, method A114, Human Body Model (HBM)
ESD		500	V	According to JEDEC STD 22, C101C, Charged Device Model (CDM)

Table 1: Absolute Maximum Ratings

2. Operating Conditions

The operating conditions for BITxxRT are listed Table 2 in below.

Parameter	Min	Max	Units	Condition
Operating temperature	-30	85	℃	
Operating supply voltage	2.0	3.6	V	All supply pins must have the same voltage

Table 2: Operating Conditions

3. Pin-Out
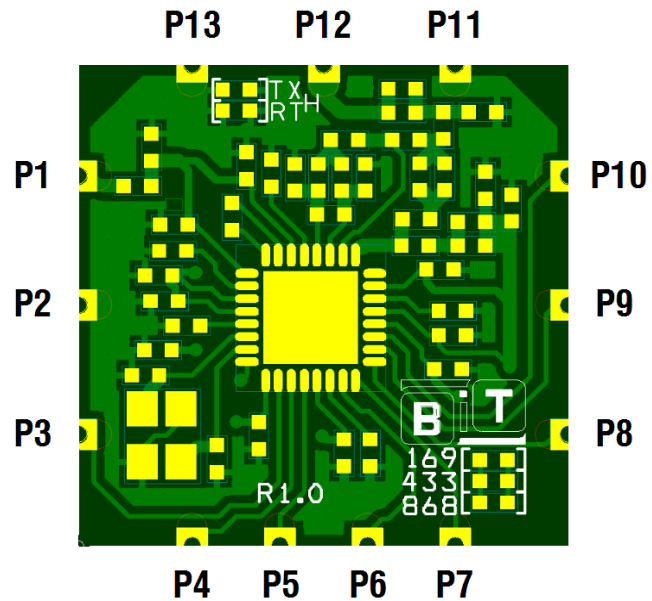
| Pin #	Pin Name	Pin Type	Description
P1	VDD	Power	2.0V – 3.6V analog power supply connection
P2	GND	Ground	Ground Connection
P3	$\overline{\text{RST}}$	Digital Input	Asynchronous, active-low digital reset
P4	GPIO3	Digital Input/Output	General purpose I/O
P5	GPIO2	Digital Input/Output	General purpose I/O
P6	SI	Digital Input	Serial configuration interface, data input
P7	SCLK	Digital Input	Serial configuration interface, clock input
P8	SO GPIO1	Digital Input/Output	Serial configuration interface, data output General purpose I/O
P9	GPIO0	Digital Input/Output	General purpose I/O
P10	$\overline{\text{CS}}$	Digital Input	Serial configuration interface, chip select
P11	AGND	Antenna Ground	Ground connection for Antenna
P12	RF	RF I/O	RF input/output to Antenna
P13	AGND	Antenna Ground	Ground connection for Antenna

Table3: Pin-Out

4. Typical Application
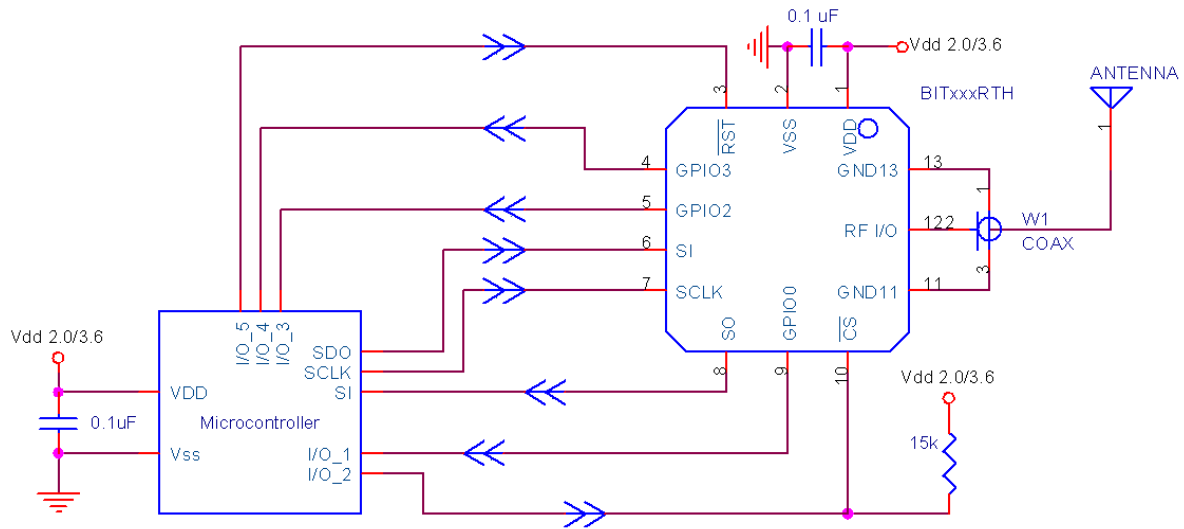
5. Development Tools

5.1. Technical Documents:
Data sheet CC1120 available for download from http://www.ti.com/product/cc1120

5.2. Configuration Software
BITxxxRTH can be configured using the SmartRF® Studio software, available for download from http://www.ti.com/tool/smartrftm-studio. The SmartRF® Studio software is highly recommended for obtaining optimum register settings, and for evaluating performance and functionality. A screenshot of the SmartRF® Studio user interface for CC1120 is shown in following figure
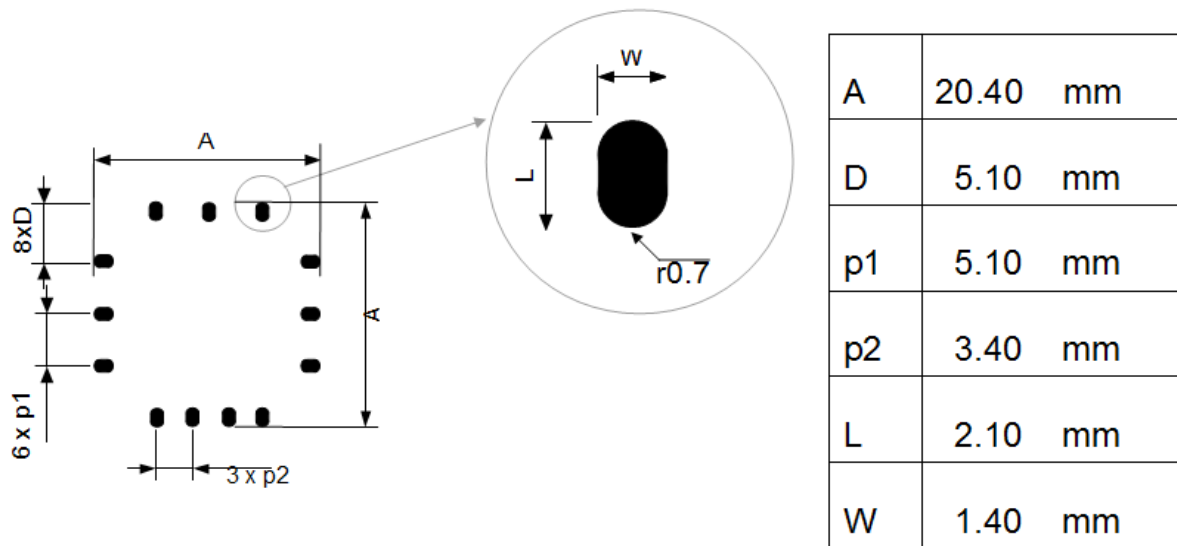
6. Package Description

Bottom View

A	19.00	mm
D	4.40	mm
p1	5.10	mm
p2	3.40	mm
L	1.30	mm
W	1.20	mm
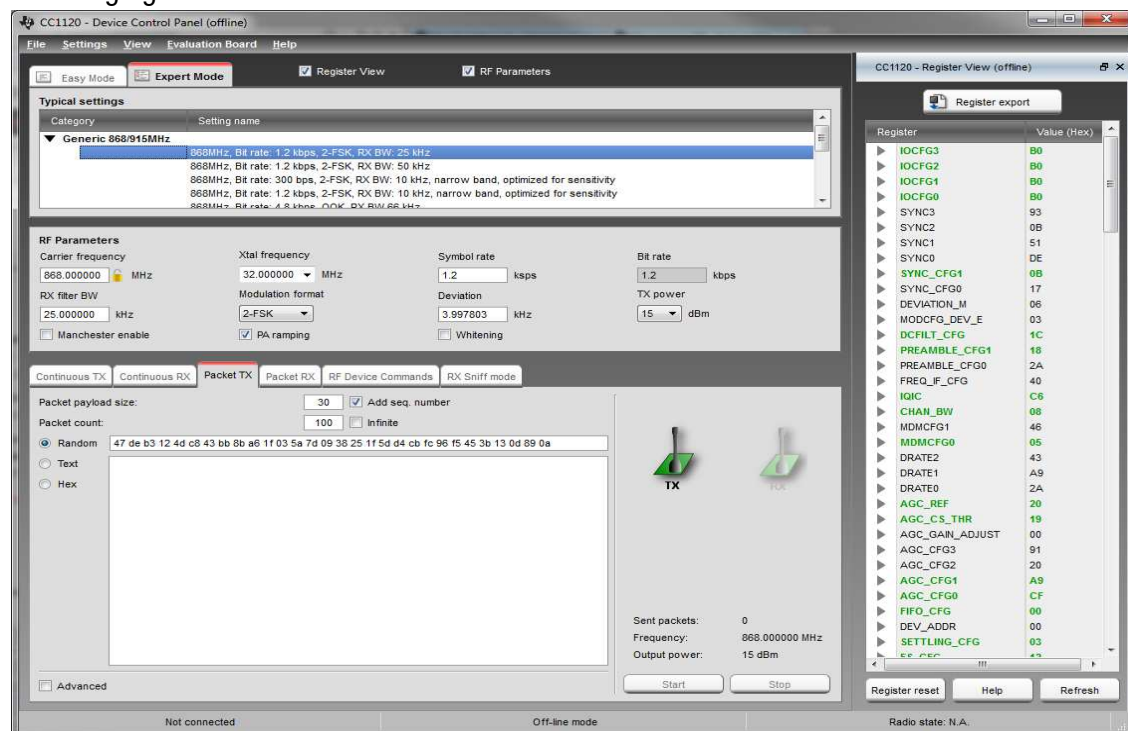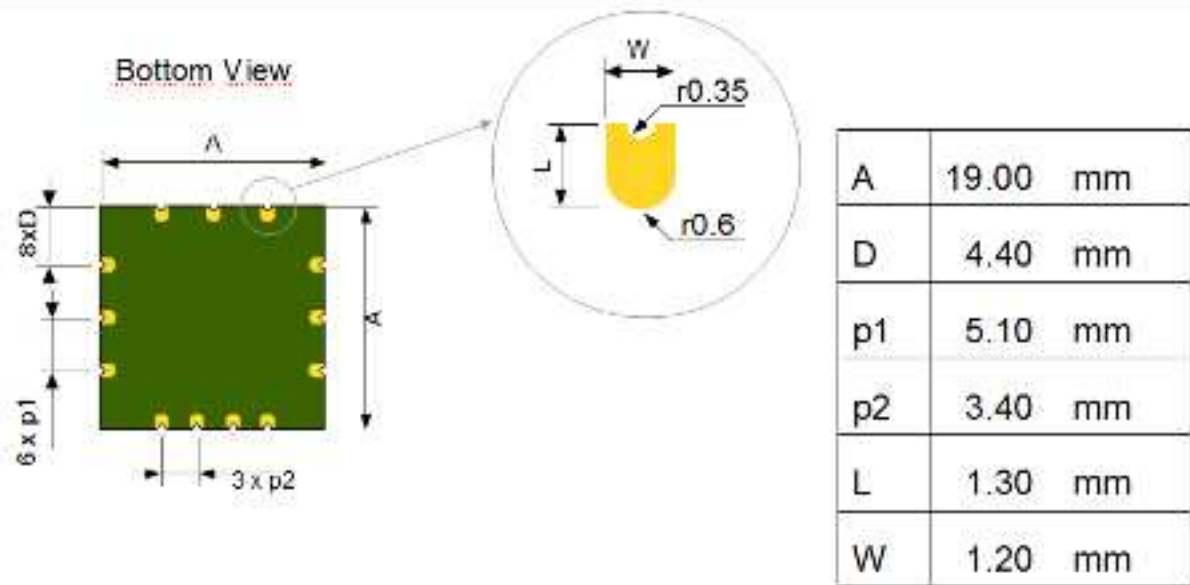
7. Recommended Footprint

A	20.40	mm
D	5.10	mm
p1	5.10	mm
p2	3.40	mm
L	2.10	mm
W	1.40	mm

The area underneath the module should be covered with solder resist in order to prevent short circuiting the vias on the back side of the module. A solid ground plane is preferred.

8. Packaging Information

Orderable device	Status	Package Type	Pins	Package Qty	Eco Plan	MSL Peak Temp
BIT169RTH	ACTIVE	MLF	13	84	Green (RoHS & no Sb/Br)	Level-2-260C-1 YEAR
BIT433RTH	ACTIVE	MLF	13	84	Green (RoHS & no Sb/Br)	Level-2-260C-1 YEAR
BIT868RTH	ACTIVE	MLF	13	84	Green (RoHS & no Sb/Br)	Level-2-260C-1 YEAR

9. Top Side Mark Information

Orderable device	Mounted Resistor
BIT169RTH Transceiver 169MHz	R2 & R3
BIT433RTH Transceiver 433MHz	R2 & R4
BIT868RTH Transceiver 868MHz	R2 & R5
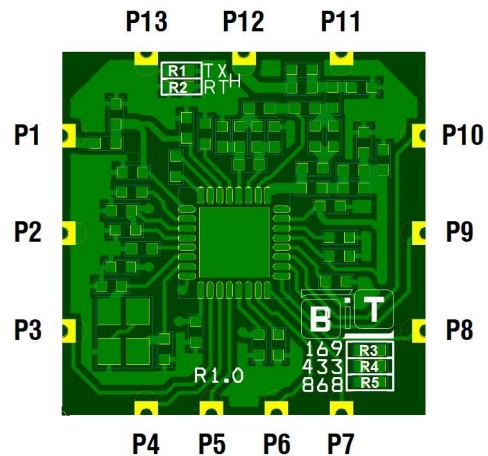
10. General Information

10.1.   Disclaimer

B.I.T. srl believes the information contained herein is correct and accurate at the time of this printing. However, B.I.T. srl reserves the right to make changes to this product without notice. B.I.T. srl does not assume any responsibility for the use of the described product; neither does it convey any license under its patent rights, or the rights of others. The latest updates are available at the BIT website or by contacting BIT directly.

As far as possible, major changes of product specifications and functionality, will be stated in product specific Errata Notes published at the BIT website. Customers are encouraged to sign up to the Developers Newsletter for the most recent updates on products and support tools.

Compliance with regulations is dependent on complete system performance. It is the customer's responsibility to ensure that the system complies with regulations.

10.2.   Life Support Policy

This BIT product is not designed for use in life support appliances, devices, or other systems where malfunction can reasonably be expected to result in significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. B.I.T. srl customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify B.I.T. srl for any damages resulting from any improper use or sale.

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