



RX-357x ZigBee Module

Silicon Lab EM357 based IEEE 802.15.4 / ZigBee Modules

RX-357x (x=0-9)

Date Released: Sep. 16, 2013

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DESCRIPTION

The RX-3573 module is a ZigBee™ network solution that based on Silicon Labs™ EM357 SoC which integrates a 2.4Ghz, IEEE 802.15.4-compliant transceiver with an 32-bit ARM Cortex M3 microprocessor. It contains integrated Flash and RAM memory and peripherals of use to designers of ZigBee-based applications.

The transceiver utilized an efficient architecture in which the integrated receiver channel filtering allows for co-existence with other communication standards in the 2.4Ghz spectrum such as WiFi and Bluetooth. An optional high performance radio mode (boost mode) is software selectable to boost dynamic range by a further 3dBm. The highly integrated antenna, power regulator, and Xtal keep the external component count low. The internal PCB traced antenna and an external U.FL connector port is user selectable¹. This maximum the flexibility for the designer to minimize the cost or maximize the system performance.

The EM357 has 192kB of embedded Flash memory and 12kB of integrated RAM for data and program storage. The EM375 software stack employs an effective wear-leveling algorithm in order to optimize the lifetime of the embedded Flash.

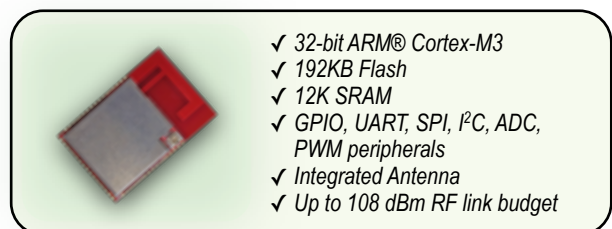
To support user-defined application, a number of peripherals such as GPIO, UART, SPI, TWI(I²C), ADC, and general purpose timers are integrated. Also, an integrated voltage regulator, power-on-reset circuitry, sleep timer, and low-power sleep modes are available. The deep sleep mode draws less than 2uA, allowing products to achieve long battery life. The equipped internal watch-dog timer allows the system to be reactivated once the system go into a dead-lock state. This mechanism makes the system more reliable and available.

FEATURES

- Silicon Labs™ EM357 platform
- 192KB Flash memory
- 12KB SRAM
- 32-bit ARM Cortex M3 microprocessor
- 17 general purpose I/O ports
- DMA-SPI, I2C and UART interfaces
- Integrated 14-bit resolution ADC
- Designed for EmberZNet ZigBee Pro compliant networks
- Miniature footprint: 2cm x 3cm
- Integrated PCB trace antenna and U.FL external antenna connector
- 16 RF channels
- Over indoor 30m and outdoor visual contact 300m of range
- Non-intrusive debug interface (SIF)
- AES 128-bit encryption
- Low power consumption
- Constant RF out power over 2.1~3.6 V voltage range
- FCC and NCC under certification
- RoHS compliant

APPLICATIONS

- Home automation and control
- Building automation and control
- Smart energy monitoring and control
- Tele-healthcare
- General ZigBee wireless sensor networking



ORDERING INFORMATION

Order Model	Description	MOQ
RX-3571	On-board PCB traced antenna	500
RX-3572	U.FL connector for external antenna	500
RX-3573	User selectable PCB traced antenna and U.FL external antenna connector	50

¹ Only RX-3573 supports user selectable antenna.

I/O PIN ASSIGNMENT

Pin No.	Name	Type	Description
1	GND	GND	Ground
2	NC	NC	No Connection
3	GND	GND	Ground
4	NC	NC	No Connection
5	NC	NC	No Connection
6	NC	NC	No Connection
7	NC	NC	No Connection
8	VCC	PWR	Power Supply Input
9	nRESET	I	Active low chip reset (internal pull-up)
10	PC5 TX_ACTIVE	I/O O	General Purpose Digital I/O Logic-level control for external Rx/Tx switch. The EM35x baseband controls TX_ACTIVE and drives it high when in Tx mode.
11	PC6 OSC32B nTX_ACTIVE	I/O I/O O	General Purpose Digital I/O 32.768KHz crystal oscillator Inverted TX_ACTIVE signal (see PC5)
12	PC7 OSC32A OSC32_EXT	I/O I/O I	General Purpose Digital I/O 32.768KHz crystal oscillator Digital 32.768KHz clock input source
13	PA7 TIM1C4 REG_EN	I/O I/O O	General Purpose Digital I/O Timer 1 channel 4 input/output External regulator open drain output
14	PB3 TIM2C3 SC1nCTS SC1SCLK	I/O I/O I I/O	General Purpose Digital I/O Timer 2 channel 3 input/output UART CTS handshake of Serial Controller 1 SPI master clock of Serial Controller 1
15	GND	GND	Ground
16	GND	GND	Ground
17	PB4 TIM2C4 SC1nRTS SC1nSSEL	I/O I/O O I	General Purpose Digital I/O Timer 2 channel 4 input/output UART RTS handshake of Serial Controller 1 SPI slave select of Serial Controller 1
18	PA0 TIM2C1 SC2MOSI	I/O I/O I/O	General Purpose Digital I/O Timer 2 channel 1 input/output SPI master data out or slave data in of Serial Controller 2
19	PA1 TIM2C3 SC2SDA SC2MISO	I/O I/O I/O I/O	General Purpose Digital I/O Timer 2 channel 3 input/output TWI data of Serial Controller 2 SPI slave data out or master data in of Serial Controller 2
20	PA2 TIM2C4 SC2SCL SC2SCLK	I/O I/O I/O I/O	General Purpose Digital I/O Timer 2 channel 4 input/output TWI clock of Serial Controller 2 SPI slave/master clock of Serial Controller 2
21	PA3 SC2nSSEL TRACECLK TIM2C2	I/O I O I/O	General Purpose Digital I/O SPI slave select of Serial Controller 2 Synchronous CPU trace clock Timer 2 channel 2 input/output
22	PA4 ADC4 PTI_EN TRACEDATA2	I/O A O O	General Purpose Digital I/O ADC input 4 Frame signal of Packet Trace Interface (PTI) Synchronous CPU trace data bit 2

Pin No.	Name	Type	Description
23	PA5 ADC5 PTI_DATA nBOOTMODE TRACEDATA3	I/O A O I O	General Purpose Digital I/O ADC input 5 Data signal of Packet Trace Interface (PTI) Activate FIB monitor instead of main program or bootloader when coming out of reset Synchronous CPU trace data bit 3
24	PA6 TIM1C3	I/O I/O	General Purpose Digital I/O Timer 1 channel 3 input/output
25	PB1 SC1MISO SC1MOSI SC1SDA SC1TXD TIM2C1	I/O O O I/O O I/O	General Purpose Digital I/O SPI slave data out of Serial Controller 1 SPI master data out of Serial Controller 1 TWI data of Serial Controller 1 UART transmit data of Serial Controller 1 Timer 2 channel 1 input/output
26	PB2 SC1MISO SC1MOSI SC1SCL SC1RXD TIM2C2	I/O I I I/O I I/O	General Purpose Digital I/O SPI master data in of Serial Controller 1 SPI slave data in of Serial Controller 1 TWI clock of Serial Controller 1 UART receive dat of Serial Controller 1 Timer 2 channel 2 input/output
27	JTCK SWCLK	I I/O	JTAG clock input from debugger Serial Wire clock input/output with debugger
28	PC2 JTDO SWO	I/O O O	General Purpose Digital I/O JTAG data out to debugger Serial Wire output asynchronous trace output to debugger
29	PC3 JTDI	I/O I	General Purpose Digital I/O JTAG data in from debugger
30	GND	GND	Ground
31	GND	GND	Ground
32	PC4 JTMS SWDIO	I/O I I/O	General Purpose Digital I/O JTAG mode select from debugger Serial Wire bidirectional data to/from debugger
33	PB0 VREF IRQA TRACECLK TIM1CLK TIM2MSK	I/O AIO I O I I	General Purpose Digital I/O ADC reference input/output External interrupt source A Synchronous CPU trace clock Timer 1 external clock input Timer 2 external clock mask input
34	PC1 ADC3 SWO TRACEDATA0	I/O A O O	General Purpose Digital I/O ADC input 3 Serial Wire output asynchronous trace output to debugger Synchronous CPU trace data bit 0
35	PC0 JRST IRQD TRACEDATA1	I/O I I O	General Purpose Digital I/O JTAG reset input from debugger Default external interrupt source D Synchronous CPU
36	PB7 ADC2 IRQC TIM1C2	I/O A I I/O	General Purpose Digital I/O ADC input 2 Default external interrupt source C Timer 1 channel 2 input/output
37	PB6 ADC1 IRQB TIM1C1	I/O A I I/O	General Purpose Digital I/O ADC input 1 External interrupt source B Timer 1 channel 1 input/output
38	VCC	PWR	Power Supply Input

Pin No.	Name	Type	Description
39	PB5 ADC0 TIM2CLK TIM1MSK	I/O A I I	General Purpose Digital I/O ADC input 0 Timer 2 external clock input Timer 1 external clock mask input
40	ANT_SEL	I	Antenna select input (GND: internal antenna, VCC: external antenna)
41	NC	NC	No Connection
42	NC	NC	No Connection
43	GND	GND	Ground
44	NC	NC	No Connection
45	GND	GND	Ground

Type Definition

PWR: Power Input

I: Digital Input

A: Analog Input

GND: Ground

O: Digital Output

AIO: Analog Input/Output

ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATING

Parameter	Min.	Typ.	Max.	Unit
Power supply voltage	-0.3	-	3.6	V
Voltage on any digital pin	-0.3	-	VCC + 0.3 Max 3.6	V
Operation temperature range	-40	-	+85	°C
Storage temperature range	-40	-	125	°C

Note: Exceeding the maximum ratings may cause permanent damage to the module or devices.

RECOMMENDED OPERATING CONDITION

Parameter	Min.	Typ.	Max.	Unit
Power supply voltage	2.1	-	3.6	V
Ambient temperature range	-40	25	+85	°C

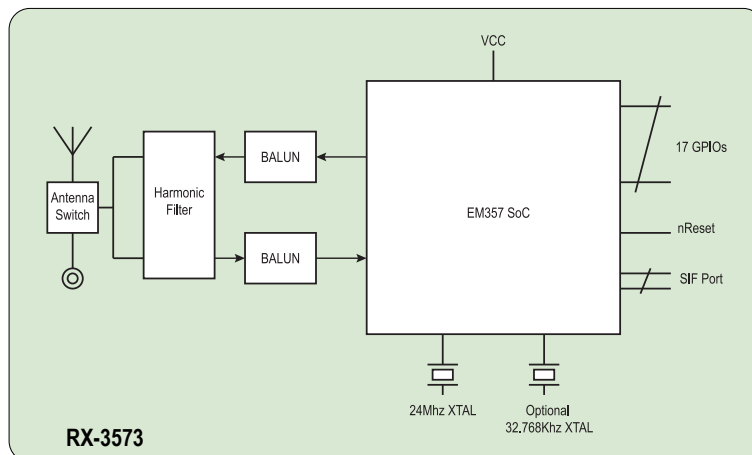
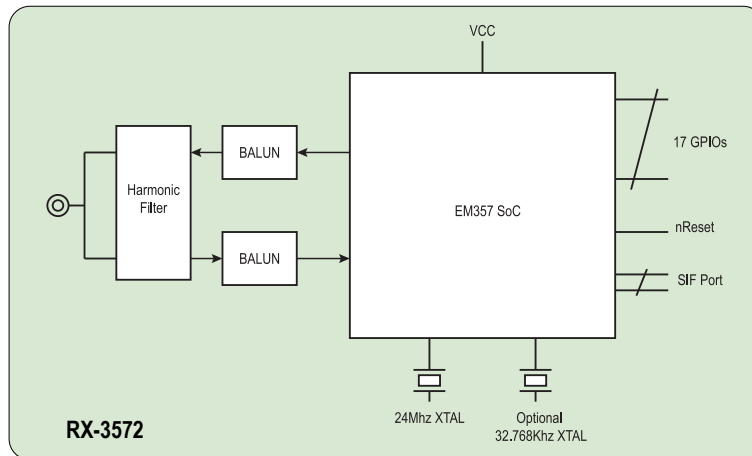
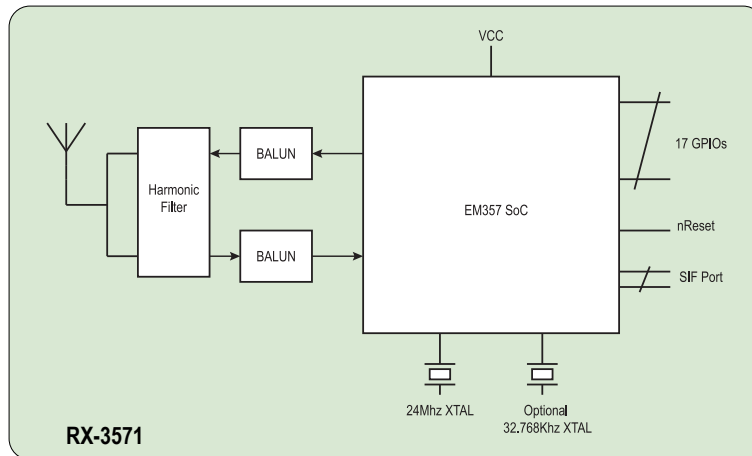
DC CHARACTERISTICS (@ 25 °C, VCC = 3.0V)

Parameter	Min.	Typ.	Max.	Unit
Current consumption at TX mode	23.5		43.5	mA
Current consumption at RX mode (boost mode)	-	28.5	-	mA
Current consumption at RX mode (normal mode)	-	26.5	-	mA
Current consumption at deep sleep mode	-	1	-	μA
Input current for logic 0	-	-	-0.5	μA
Input current for logic 1	-	-	0.5	μA
Input voltage for logic 0	0	-	20% VCC	V
Input voltage for logic 1	80% VCC	-	VCC	V
Output voltage for logic 0	0	-	18% VCC	V
Output voltage for logic 1	82% VCC	-	VCC	V
Input pull-up resistor value	24	29	34	KΩ
Input pull-down resistor value	24	29	34	KΩ
Output source current (standard current pad)	-	-	4	mA
Output sink current (standard current pad)	-	-	4	mA
Output source current (high current pad: PA6, PA7, PB6, PB7, PC0)	-	-	8	mA
Output sink current (high current pad: PA6, PA7, PB6, PB7, PC0)	-	-	8	mA

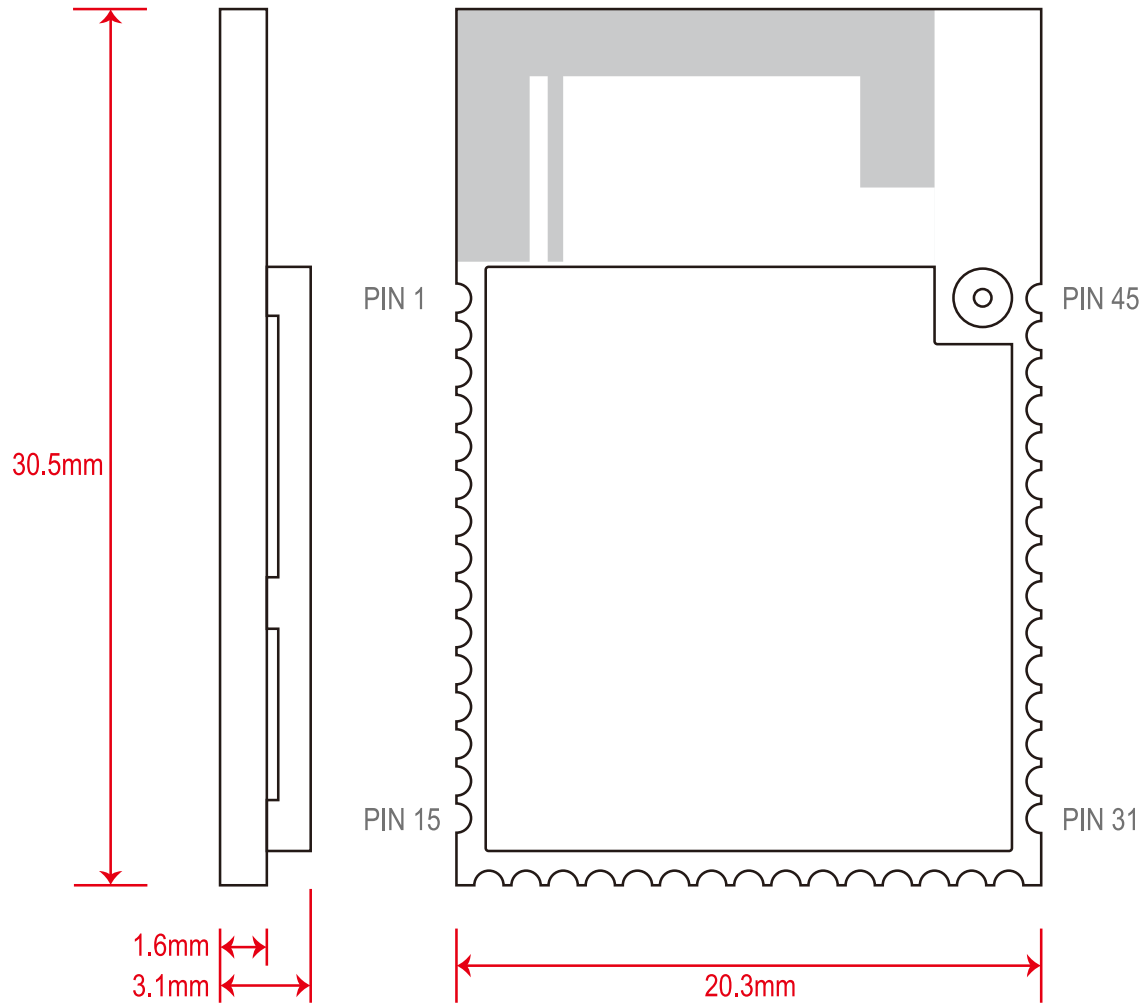
RF CHARACTERISTICS (@ 25 °C, VCC = 3.0V)

Parameter	Min.	Typ.	Max.	Unit
Frequency range	2400	-	2500	Mhz
Channels	11	-	26	-
TX output power	-55	-	+8	dBm
Sensitivity (1% PER, boost mode)	-	-102	-96	dBm
Sensitivity (1% PER, normal mode)	-	-100	-94	dBm

BLOCK DIAGRAMS

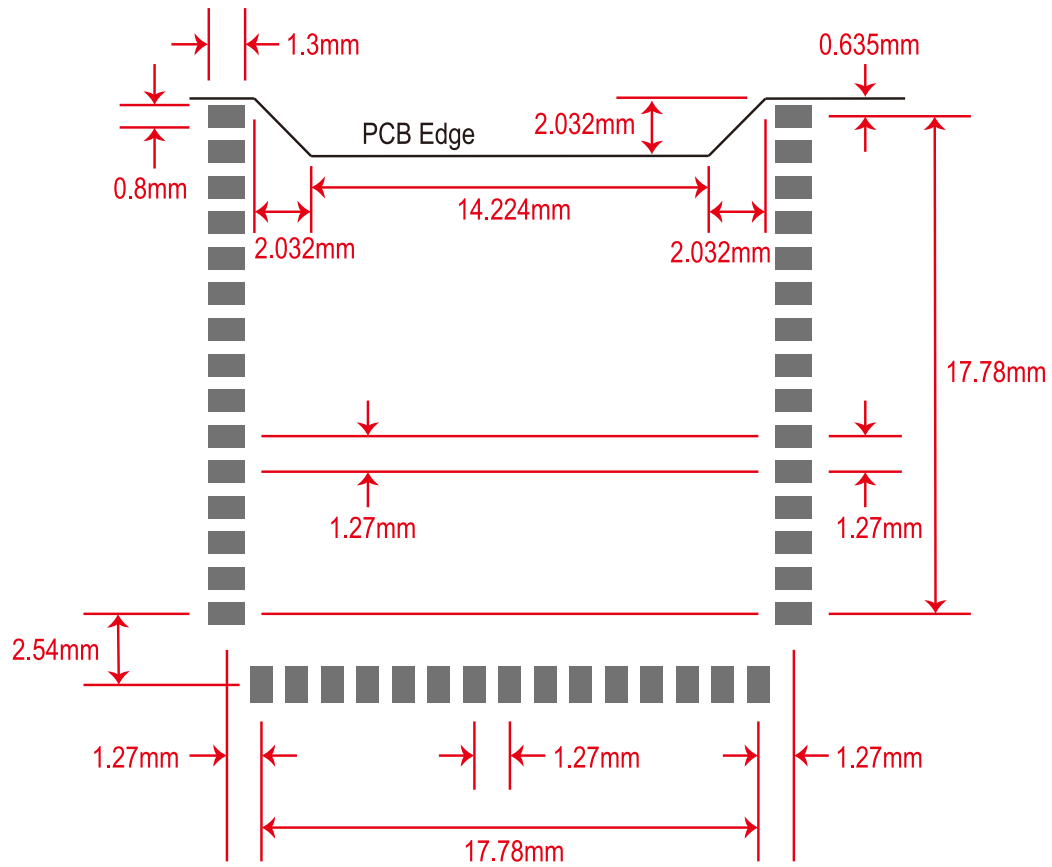


MODULE DIMENSION

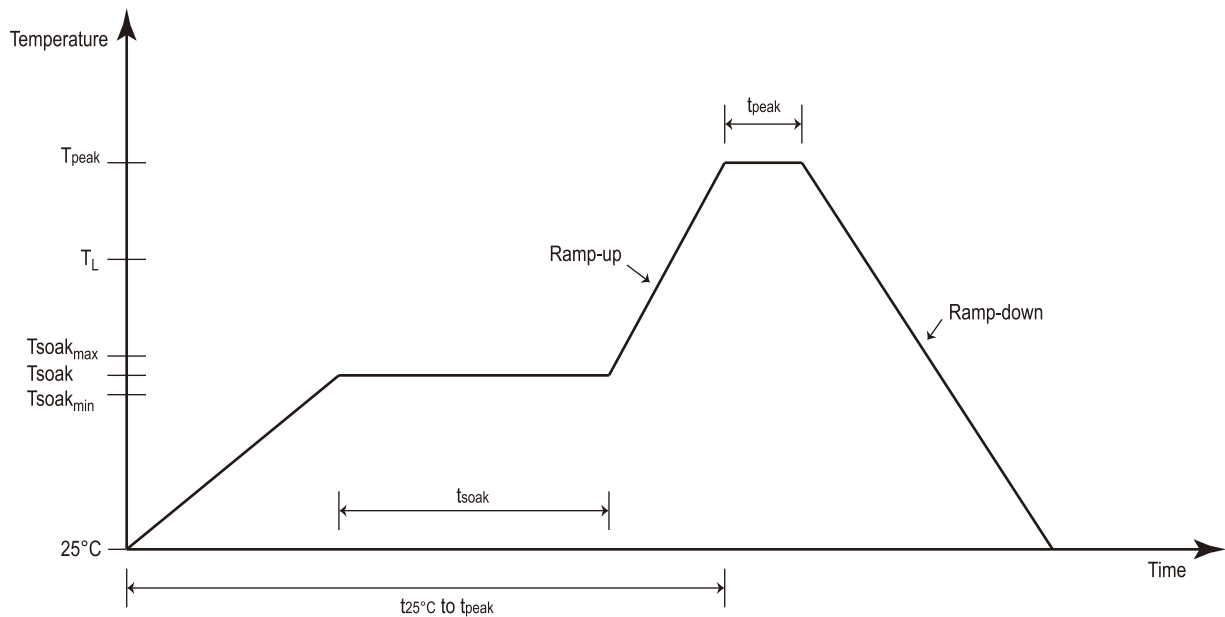


Note: All dimensions are +/- 0.2mm unless otherwise specified.

PCB FOOTPRINT



REFLOW PROFILE



Recommended Reflow Profile for Pb-Free Solder

Parameter	Value
Average Ramp Up Rate (from Tsoak _{max} to Tpeak)	3 °C /sec max.
Minimum Soak Temperature (Tsoak _{min})	150°C
Maximum Soak Temperature (Tsoak _{max})	200°C
Soak Time (tsoak)	60 ~ 120 sec.
Liquidus Temperature (T _L)	217°C
Time above T _L	60 ~ 150 sec.
Tpeak	250 °C
Time within 5°C of Tpeak	20 ~ 30 sec.
Ramp Down Rate	6°C /sec max.
Time from 25°C of Tpeak	8 min max.

Product Approvals

The RX-357x ZigBee modules have been designed to meet all national regulations for world-wide use. The following certification have been obtained:

FCC Approval

The RX-357x with integrated antenna have been tested to comply with FCC CFR Part 15 (USA). The modules meet the requirements for modular transmitter approvals as detailed in the FCC public notice DA 00-1407 "PART 15 UNLICENSED MODULAR TRANSMITTER APPROVAL".

FCC statement:

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 ID: YUDRX357X

When integrating the RX-357x ZigBee module into a product it must be ensured that the FCC labeling requirements are met. This includes a clearly visible label on the outside of the finished product specifying the RX-357x FCC identifier (FCC ID: YUDRX357X). This exterior label can use wording such as "**Contains Transmitter Module FCC ID: YUDRX357X**" or "**Contains FCC ID: YUDRX357X**" although any similar wording that expresses the same meaning may be used.

NCC Approval

NCC 警語：本產品已取得國家通訊傳播委員會低功率射頻認證。依國家通信傳播委員會低功率電波輻射性電機管理辦法之規定，應包含下列警語與 NCC 符號及認證編號：

第十二條：經形式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條：低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規 定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本產品內涵射頻模組：



References

- EM35x Datasheet, Silicon Labs (www.silabs.com)
- IEEE Standard 802.15.4 - 2003 Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANS)
- Datasheet U.FL-Series 2004.2 Hirose Ultra Small Surface Mount Coaxial Connectors - Low Profile 1.9mm or 2.4mm Mated Height
- ZigBee Specifications (www.zigbee.org)

Contact Information

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