



ZigBee-Ready RF Transceiver Module (IEEE 802.15.4) CTL3585

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ZigBee- Ready RF Transceiver Module CTL3585

Revision

Rev.	Date (DD-MM-YYYY)	History
1	21-1-2015	First Released

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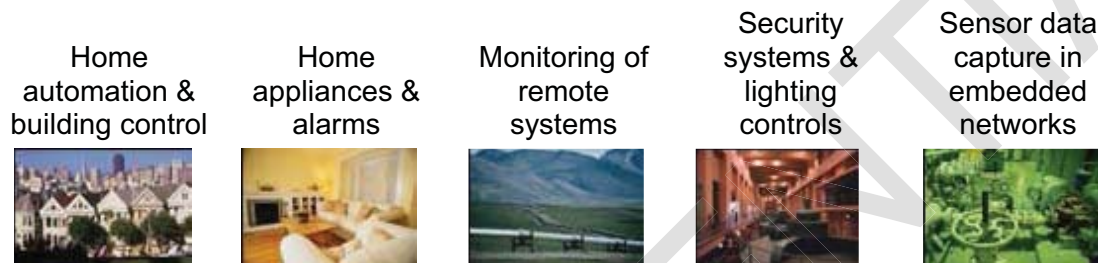
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1. General Description

The CTL3585 are compact surface mounted High Power Wireless RF Transceiver Module specially designed for Ember ZigBee™ protocol stack for wireless networks, EmberZNet, based on IEEE 802.15.4 standard in the 2.4GHz world-wide ISM band. The size of CTL3514 is 19.2 x 16 x 2.8 mm and the size of CTL3585 is 23.5x16 x2.8mm.It integrated a 2.4GHz, IEEE 802.15.4-2003 compliant transceiver with a 32-bit network processor (ARM Cortex-M3 Processor) to run EmberZNet. It contains embedded FLASH and integrated RAM for program and data storage. It utilizes the non-intrusive SIF module for powerful software debugging and programming of the network processor.

2. Applications



3. Features

- Complete ZigBee-ready module with integrated PCB antenna
- Integrated IEEE 802.15.4 PHY and MAC layer
- Non-intrusive debug interface (SIF)
- SPI interface for communication and controlled by the Host using the EmberZNet Serial Protocol (EZSP)
- Internal RC oscillator for timer
- High performance direct sequence spread spectrum (DSSS) RF transceiver
- 16 channels in the 2.4 GHz ISM band
- On-chip regulator for 2.1-3.6V operation.
- Three deep low power modes
- 32-bit ARM® Cortex™-M3 processor
- 192KB FLASH ROM and 12KB RAM(EM357 internal)
- +20dBm Max. transmission power
- -100dBm sensitivity
- Small footprint: 23.5x16x2.8mm
- Extremely low Deep Sleep Current.

4. Absolute Maximum Ratings

Parameter	Test Conditions	Min.	Max.	Unit
Regulator input voltage (VDD_PADS)		-0.3	+3.6	V
Voltage on any GPIO (PA[7:0], PB[7:0], PC[7:0]), SWCLK, nRESET, VREG_OUT		-0.3	VDD_PADS +0.3	V
Voltage on any GPIO pin (PA4, PA5, PB5, PB6, PB7, PC1), when used as an input to the general purpose ADC with the low voltage range selected		-0.3	2.0	V
Voltage on OSCA, OSCB, NC		-0.3	VDD_PADSA +0.3	V
Storage temperature		-40	+85	°C

5. Recommended Operating Conditions

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Regulator input voltage (VDD_PADS)		2.1		3.6	V
Operating temperature range		-40		+85	°C
Moisture Sensitivity Level(MSL)		MSL3			

6. Electrical Specifications

T=25°C, VCC = 3.0V, Fo =2450MHz, if nothing else stated.

Parameter	Condition / Note	Min	Typ.	Max	Unit
RF Operating frequency	Programmable in 5MHz steps, 5 MHz steps for IEEE 802.15.4 compliance	2.405		2.48	GHz
Number of channels	For IEEE 802.15.4 compliance		16		
Channel spacing	For IEEE 802.15.4 compliance		5		MHz
Frequency stability				+/-40	ppm
Transmit power	Programmable from firmware			+20	dBm
Sensitivity	PER = 1% PER, 20byte packet defined by IEEE 802.15.4 Boost mode		-100		dBm
Adjacent channel rejection +/-5 MHz	IEEE 802.15.4 compliance at -82 dBm		35/35		dB
Adjacent channel rejection +/-10 MHz	IEEE 802.15.4 compliance at -82 dBm		40/40		dB

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Parameter		Condition / Note	Min	Typ.	Max	Unit
Supply voltage			2.1		3.6	V
Current consumption, RX mode		Max RX sensitivity (normal mode)		28		mA
		Max RX sensitivity (boost mode)		30		mA
Current consumption, TX mode	CTL3585			190		mA
Deep sleep current	CTL3585			2.8		uA
Flash Memory		FLASH memory in EM3585		512		KB
MCU clock frequency				24		MHz
MCU Low Speed Clock		External crystal or Ext 32.768KHz clock		32.768		KHz

7. Typical application block

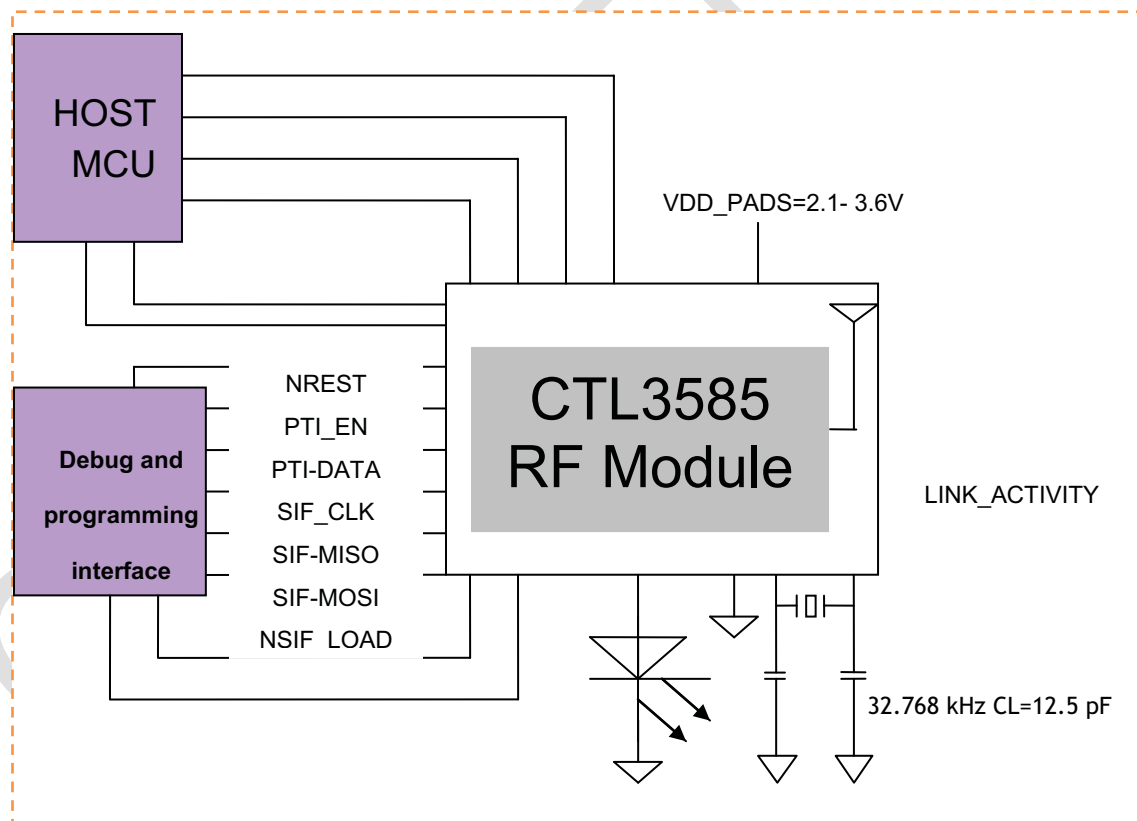
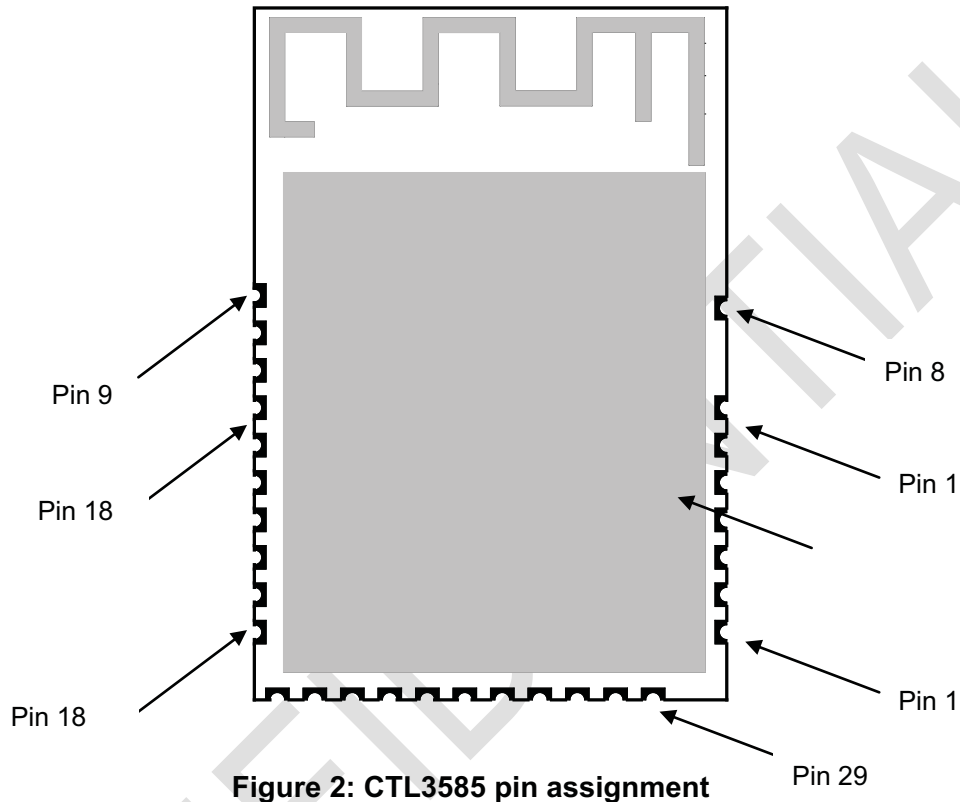


Figure 1: Example of application circuit

8. Pin Assignment



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9. Pin Description

Pin#	CTL3585	Direction	Description
1	PB0	I/O	Digital I/O
	VREF	Analog O	ADC reference output
	VREF	Analog I	ADC reference input
	IRQA	I	External interrupt source A
	TRACECLK	O	Synchronous CPU trace clock
	TIM1CLK	I	Timer 1 external clock input
	TIM2MSK	I	Timer 2 external clock mask input
2	NC	NC	NC
3	PC0	I/O High current	Digital I/O Either Enable with GPIO_DBGCFG[5]
	JRST	I	JTAG reset input from debugger
	IRQD	I	Default external interrupt source D
	TRACEDATA1	O	Synchronous CPU trace data bit 1
4	PB7	I/O High current	Digital I/O
	ADC2	Analog	ADC input 2
	IRQC	I	Default external interrupt source C
	TIM1C2	O	Timer 1 channel 2 output
	TIM1C2	I	Timer 1 channel 2 input
5	PB6	I/O High current	Digital I/O
	ADC1	Analog	ADC input 1
	IRQB	I	External interrupt source B
	TIM1C1	O	Timer 1 channel 1 output
	TIM1C1	I	Timer 1 channel 1 input

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Pin#	CTL3585	Direction	Description
6	PB5	I/O	Digital I/O
	ADC0	Analog	ADC input 0
	TIM2CLK	I	Timer 2 external clock input
	TIM1CLK	I	Timer 1 external clock mask input
7	GND		
8	GND		
9	NC	NC	NC
10	nRESET	I	Active low chip reset(internal pull-up)
11	PC6	I/O	Digital I/O
	OSC32B	I/O	32.768KHz crystal oscillator.
	NTX_ACTIVE	O	Inverted TX_ACTIVE signal
12	PC7	I/O	Digital I/O
	OSC32A	I/O	32.768KHz crystal oscillator.
	OSC32_EXT	I	Digital 32.768KHz clock input source
13	VDD_PADS	Power	Pads supply(2.1-3.6V)
14	PA7	I/O High current	Digital I/O Disable REG_EN with GPIO_DBGCFG [4]
	TIM1C4	O	Timer 1 channel 4 output
	TIM1C4	I	Timer 1 channel 4 input
	REG_EN	O	External regulator open drain output
15	PB3	I/O	Digital I/O
	TIM2C3	O	Timer 2 channel 3 output
	TIM2C3	I	Timer 2 channel 3 input
	SC1nCTS	I	UART CTS handshake of Serial Controller 1
	SC1SCLK	O	SPI master clock of serial Controller 1
	SC1SCLK	I	SPI slave clock of serial Controller 1

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Pin#	CTL3585	Direction	Description
16	PB4	I/O	Digital I/O
	TIM2C4	O	Timer 2 channel 4 output
	TIM2C4	i	Timer 2 channel 4 input
	SC1nRTS	O	UART RTS handshake of serial controller 1
	SC1nSSEL	I	SPI slave select of serial controller 1
17	PA0	I/O	Digital I/O
	TIM2C1	O	Timer 2 channel 1 output
	TIM2C1	I	Timer 2 channel 1 input
	SC2MOSI	O	SPI master data out of serial controller 2
	SC2MOSI	I	SPI slave data in of serial controller 2
18	PA1	I/O	Digital I/O
	TIM2C3	O	Timer 2 channel 3 output
	TIM2C3	I	Timer 2 channel 3 input
	SC2SDA	I/O	TWI data of serial controller 2
	SC2MISO	O	SPI slave data out of serial controller 2
	SC2MISO	I	SPI master data in of serial controller 2
19	PA2	I/O	Digital I/O
	TIM2C4	O	Timer 2 channel 4 output
	TIM2C4	I	Timer 2 channel 4 input
	SC2SCL	I/O	TWI clock of serial controller 2
	SC2SCLK	O	SPI master clock of serial controller 2
	SC2SCLK	I	SPI slave clock of serial controller 2
20	PA3	I/O	Digital I/O
	SC2Nssel	I	SPI slave select of serial controller 2
	TIM2C2	O	Timer 2 channel 2 output
	TIM2C2	I	Timer 2 channel 2 input

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Pin#	CTL3585	Direction	Description
21	PA4	I/O	Digital I/O
	ADC4	Analog	ADC input 4
	PTI_EN	O	Frame signal of packet trace interface
	TRACEDATA2	O	Synchronous CPU trace data bit 2
22	PA5	I/O	Digital I/O
	ADC5	Analog	ADC input 5
	PTI_DATA	O	Data signal of packet trace interface
	NBOOTMODE	I	Embedded serial bootloader activation out of reset
	TRACEDATA3	O	Synchronous CPU trace data bit 3
23	PA6	I/O High current	Digital I/O
	TIM1C3	O	Timer 1 channel 3 output
	TIM1C3	I	Timer 1 channel 3 input
24	PB1	I/O	Digital I/O
	SC1MISO	O	SPI slave data out of serial controller 1
	SC1MOSI	O	SPI master data out of serial controller 1
	SC1SDA	I/O	TWI data of serial controller 1
	SC1TXD	O	UART transmit data of serial controller 1
	TIM2C1	O	Timer 2 channel 1 output
	TIM2C1	I	Timer 2 channel 1 input
25	PB2	I/O	Digital I/O
	SC1MISO	I	SPI master data in of serial controller 1
	SC1MOSI	I	SPI slave data in of serial controller 1
	SC1SCL	I/O	TWI clock of serial controller 1
	SC1RXD	I	UART receive data of serial controller 1
	TIM2C2	O	Timer 2 channel 2 output
	TIM2C2	I	Timer 2 channel 2 input
26	JTCK	I	JTAG clock input from debugger
	SWCLK	I/O	Serial Wire Clock input/output with debugger

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Pin#	CTL3585	Direction	Description
27	PC2	I/O	Digital I/O Enable with GPIO_DBGCFG[5]
	JTDO	O	JTAG data out to debugger
	SWO	O	Serial Wire Output asynchronous trace output to debugger
	TRACEDATA0	O	Synchronous CPU trace data bit3
28	PC3	I/O	Digital I/O Enable with GPIO_DBGCFG[5]
	JTDI	I	JTAG data in from debugger
	TRACECLK	O	Synchronous CPU trace clock
29	PC4	I/O	Digital I/O Either Enable with GPIO_DBGCFG[5]
	JTMS	I	JTAG mode select from debugger
	SWDIO	I/O	Serial Wire bidirectional data to/from debugger

10. Block Diagram

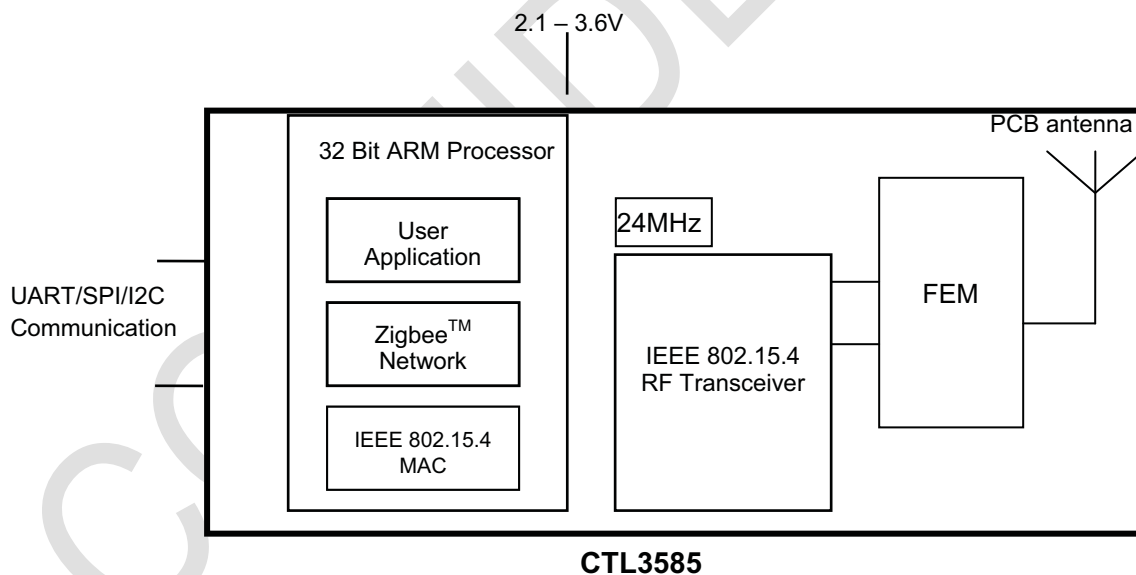


Figure 3: Block Diagram

11. RF Frequency Detail

The following table shows the RF channels as defined by the IEEE 802.15.4 standard.

RF channel	Frequency
11	2405MHz
12	2410MHz
13	2415MHz
14	2420MHz
15	2425MHz
16	2430MHz
17	2435MHz
18	2440MHz
19	2445MHz
20	2450MHz
21	2455MHz
22	2460MHz
23	2465MHz
24	2470MHz
25	2475MHz
26	2480MHz

The use of RF frequencies and maximum allowed RF power should according to different national regulations. The CTL3585 are complying with the applicable regulations for the world wide 2.4GHz ISM band.

12. PCB Layout Recommendations

Please reference Mechanical Dimensions shown in next section for PCB layout.

The area underneath the module should be covered with solder mask in order to prevent short circuit on the test pads on the back side of the module. A solid ground plane under the module is preferred.

As the module integrated with onboard PCB trace antenna, the mounting position of the module will have great impact on the RF performance. There should not be any trace, ground plane or metal part underneath or nearby the area of the onboard PCB trace antenna. The figure below shows an example how the module positioned on the mother PCB.

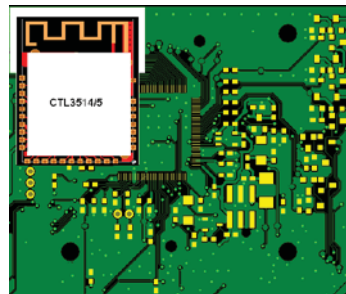


Figure 4: A recommended placement of the module on a main PCB

13. Mechanical Dimensions

Figure 5: Mechanical Dimensions of CTL3585

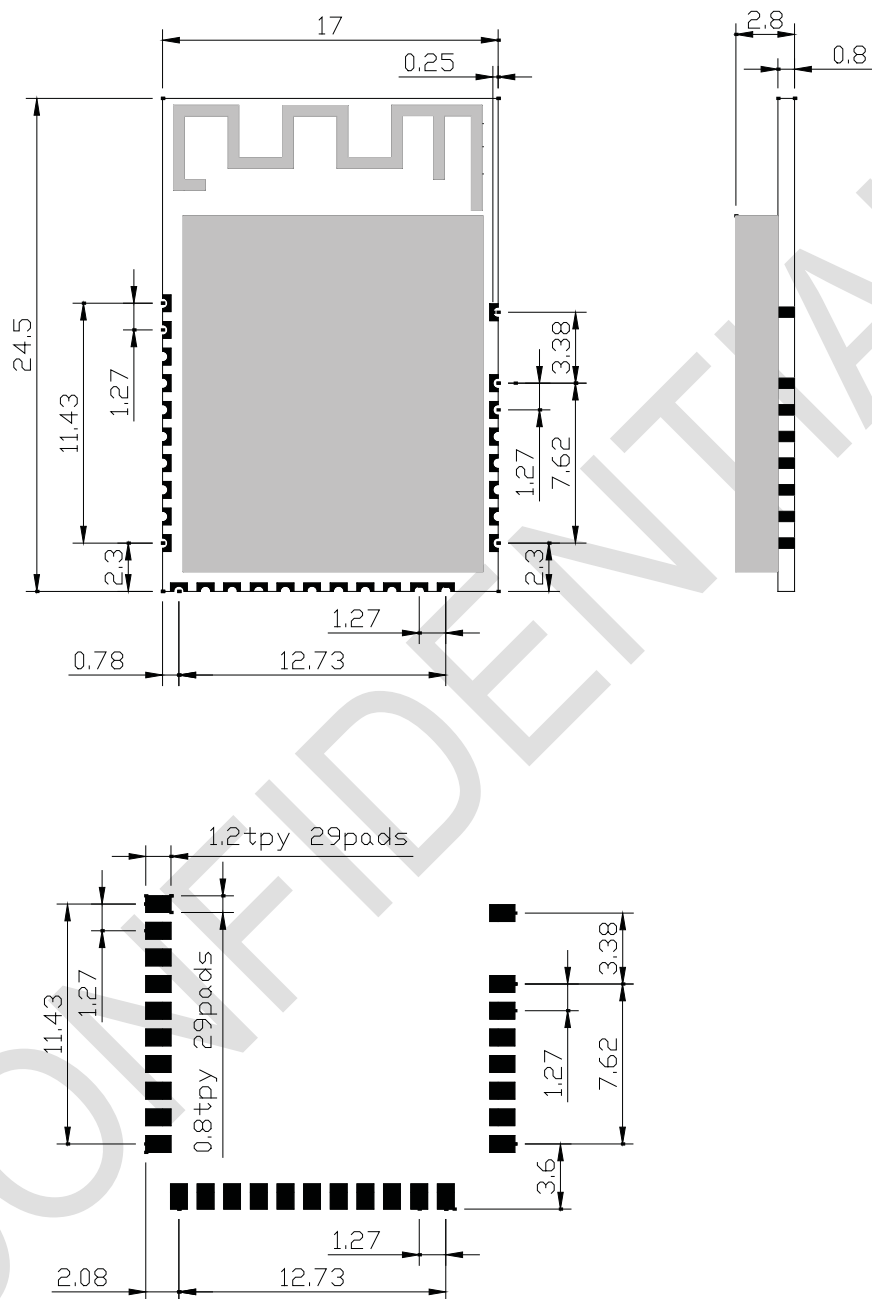


Figure 5: Mechanical Dimensions of CTL3585

For further details on the SoC transceiver (Ember EM351), please consult the data sheet at <http://www.ember.com>



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The Company provides technologies and products that save energy and make people's lives more productive and comfortable.

Regulatory Information

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 not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2AAUQ-CTL35XXA Or Contains FCC ID: 2AAUQ-CTL35XXA "

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. 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.

(2) This device must accept any interference received, including interference that may cause undesired operation.

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product



IC Statement:

This device complies with Industry Canada's licence-exempt RSSs. 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.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :

- (1) Ce dispositif ne peut causer d'interférences ; et
- (2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

IC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body. Cette modulaire doit être installé et utilisé à une distance minimum de 20 cm entre le radiateur et le corps de l'utilisateur.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 1700A-CTL35XXA"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

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