



BLE Beacon TRX Module

BM7161-00-1

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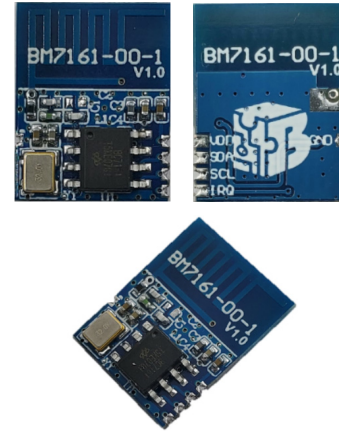
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Table of Contents

Features	3
General Description	3
Applications	3
Block Diagram	3
Pin Assignment	4
Pin Description	4
Technical Specifications	4
Absolute Maximum Ratings	4
D.C. Electrical Characteristics.....	5
RF Electrical Characteristics	5
Functional Description	6
Interface	7
I ² C Communication Format	7
Application Circuits	8
I ² C Mode	8
Layout Description	8
PCB Footprint.....	8
Layout Guidelines	8
Layout	8
Dimensions	9
Reference Information	9
Modification History.....	9
Buy Online.....	9

Features

- Operating voltage range: 2.0V~3.6V
- Frequency range: 2402/2426/2480MHz
- Modulation mode: GFSK
- Data rate: 1Mbps
- Standby current: 0.35 μ A(Typ.) @ 3.3V, Deep Sleep mode
- Operating current:
 - ♦ 19.5mA(Typ.) @ 3.3V, 5dBm TX mode
 - ♦ 11.5mA(Typ.) @ 3.3V, -5dBm TX mode
- Interface: 7-pin stamp hole
- Size: 15.5mm(L) \times 12.0mm(W) \times 2.4mm(H)



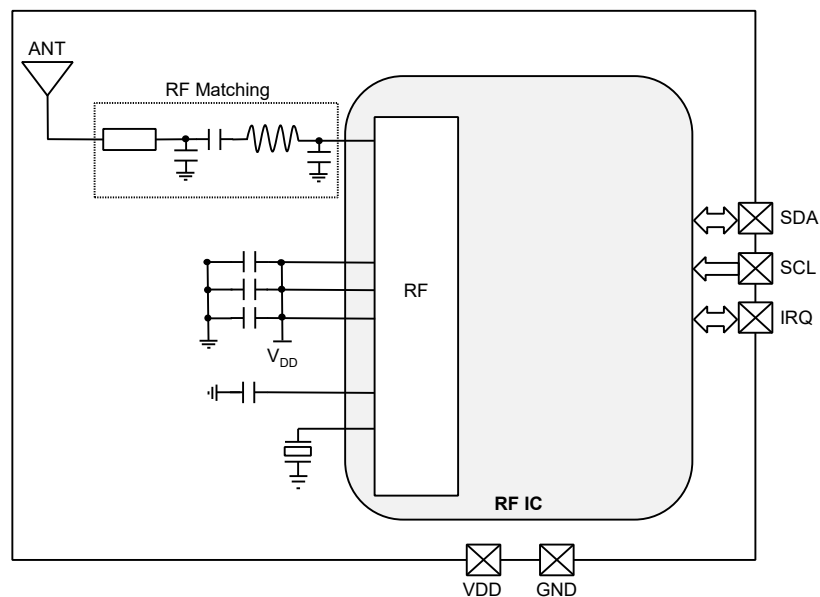
General Description

The BM7161-00-1 is an affordable 2.4GHz BLE Beacon transceiver designed based on the BC7161 device, which uses the I²C communication method. This module can implement a complete Beacon device. The output power level can be programmed from -10dBm to +5dBm for various applications.

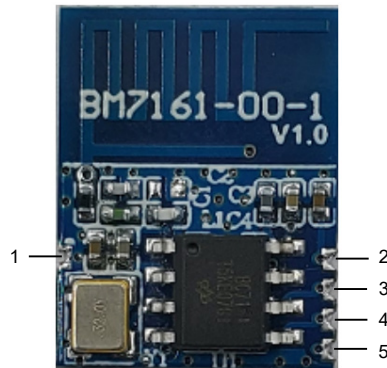
Applications

- Wireless ceiling lights
- Wireless remote controllers
- Wall mounted fans
- Weight scales

Block Diagram



Pin Assignment



Pin Description

Pin	Function	Type	Description
1	GND	PWR	Negative power supply, ground
2	VDD	PWR	Positive power supply
3	SDA	I/O	I ² C data line
4	SCL	I	I ² C clock line
5	IRQ	I/O	Multi-function pin

Note: PWR: Power; I: Digital input; I/O: Digital input/output.

Technical Specifications

Absolute Maximum Ratings

Supply Voltage	$V_{SS}-0.3V \sim V_{SS}+3.6V$
Operating Temperature.....	$-40^{\circ}C \sim 85^{\circ}C$
I/O Ports Voltage	$V_{SS}-0.3V \sim V_{DD}+0.3V$
ESD HBM	2kV
Storage Temperature.....	$-60^{\circ}C \sim 150^{\circ}C$

Note: The module is ESD sensitive. HBM (Human Body Mode) is based on MIL-STD-883.

D.C. Electrical Characteristics

Ta=25°C, V_{DD}=3.3V, GFSK modulation, unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
T _{OP}	Operating Temperature	—	-40	—	85	°C
V _{DD}	Operating Voltage	—	2.0	3.3	3.6	V
Digital I/Os						
V _{IH}	High Level Input Voltage	—	0.7×V _{DD}	—	V _{DD}	V
V _{IL}	Low Level Input Voltage	—	0	—	0.3×V _{DD}	V
V _{OH}	High Level Output Voltage	I _{OH} =-5mA	0.8×V _{DD}	—	V _{DD}	V
V _{OL}	Low Level Output Voltage	I _{OL} =5mA	0	—	0.2×V _{DD}	V
Current Consumption						
I _{DeepSleep}	Deep Sleep Mode Current	—	—	0.35	1.00	μA
I _{Idle}	Idle Mode Current	LIRC on	—	1.6	—	μA
I _{LightSleep}	Light Sleep Mode Current	X'tal on	—	1	—	mA
I _{TX}	TX Mode Current (Low Power Matching)	RF output power=-10dBm	—	10.5	—	mA
		RF output power=-5dBm	—	11.5	—	
		RF output power=0dBm	—	15.5	—	
		RF output power=2dBm	—	17.5	—	
		RF output power=5dBm	—	19.5	—	

RF Electrical Characteristics

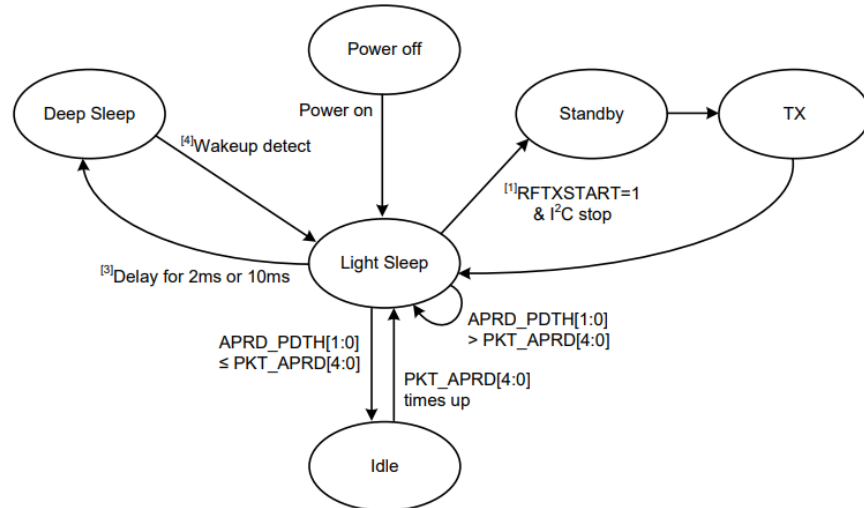
Ta=25°C, V_{DD}=3.3V, GFSK modulation, unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
RF Transmitter Characteristics						
f _{RF}	RF Operating Frequency	CH37	—	2402	—	MHz
		CH38	—	2426	—	
		CH39	—	2480	—	
DR	Data Rate	GFSK @ f _{DEV} =250kHz	—	1	—	Mbps
f _{DEV}	Frequency Deviation	—	—	250	—	kHz
P _{OUT}	RF Transmit Output Power	—	-10	0	5	dBm
	Occupied Bandwidth	—	—	1	—	MHz
SE _{TX}	TX Spurious Emission (P _{OUT} =5dBm)	f<1GHz	—	—	-36	dBm
		47MHz<f<74MHz	—	—	-54	
		87.5MHz<f<108MHz				
		174MHz<f<230MHz				
		470MHz<f<862MHz				
		f>1GHz	—	—	-30	

Functional Description

The BM7161-00-1 is a BLE Beacon TX module, it has five operation modes: Power Off Mode, Deep Sleep Mode, Light Sleep Mode, Standby Mode and TX Mode. An external MCU can set RF parameters, transmit data and wake up the RF chip via the I²C interface.

In the Deep Sleep Mode, the module has a sleep current of less than 1μA and features the internal register data retention.



Note: 1. Once the RFTXSTART control bit is enabled, the I²C will stop and the RF chip will start transmitting data.

2. Deep Sleep mode: X'tal off.

Light Sleep mode: X'tal on, RF frequency synthesizer off.

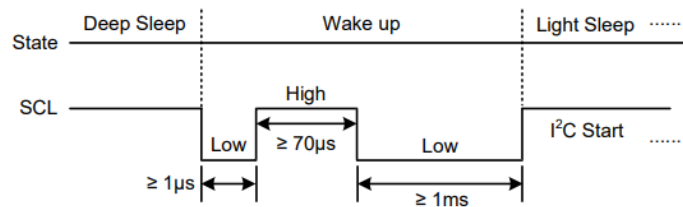
Standby mode: X'tal on, RF frequency synthesizer on, RF PA off.

TX mode: X'tal on, RF frequency synthesizer on, RF PA on.

Idle mode: X'tal off, LIRC on.

3. In the Light Sleep mode, if the SDA and SCL pin states both keep unchanged for 10ms, the device state will change to the Deep Sleep mode. If the SDA or SCL pin state has been toggled and then keeps unchanged, the timer will reset and recount until the 10ms time is up and then enter the Deep Sleep mode.

4. The device will be woken up from the Deep Sleep mode if a falling edge is detected on the SCL pin and the low pulse width should be maintained at least 1ms to return to Light Sleep state. After this, the master MCU can control the device based on the I²C format.



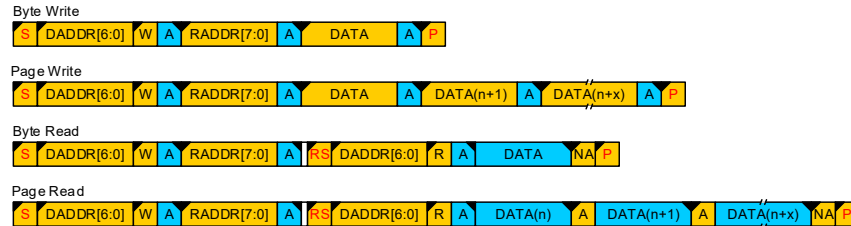
5. Each frame will be sent consecutively until the frame counter (PKT_AUTORS) is finished then enter the Light Sleep mode.

Interface

I²C Communication Format

The BM7161-00-1 includes an I²C communication interface, which is composed of SDA and SCL lines. This module supports the I²C format for byte write, page write, byte read and page read formats. Each data byte length on the SDA line is 8 bits, and the device address of the module is fixed at 0x71. The register address will not automatically increase for the FIFO port (address: 10h) when continuously writing/reading data to/from the FIFO.

It should be noted that the I²C is a non-standard I²C interface, which only supports a single device for connection. Refer to the BC7161 datasheet for details.



Bus Direction: : Host to device; : Device to host

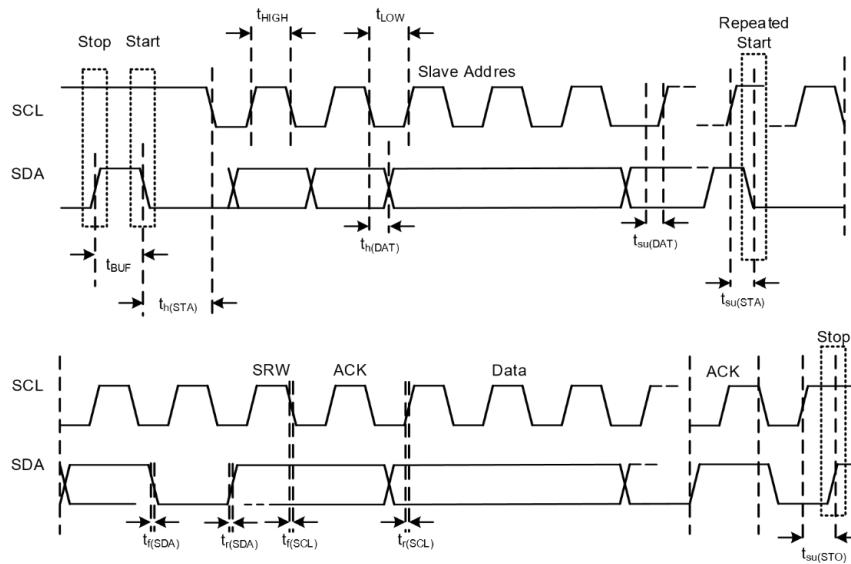
Symbol Definitions: S: Start; RS: Repeated Start; P: Stop

DADDR[6:0]: Device Address, 71h

R/W: Read/Write select; R: Read(1); W: Write(0)

RADDR[7:0]: register address

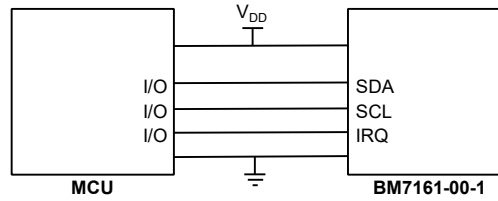
A: ACK(0); NA:NAK(1)



* Products are available from [Best Modules](http://www.bestmodules.com)

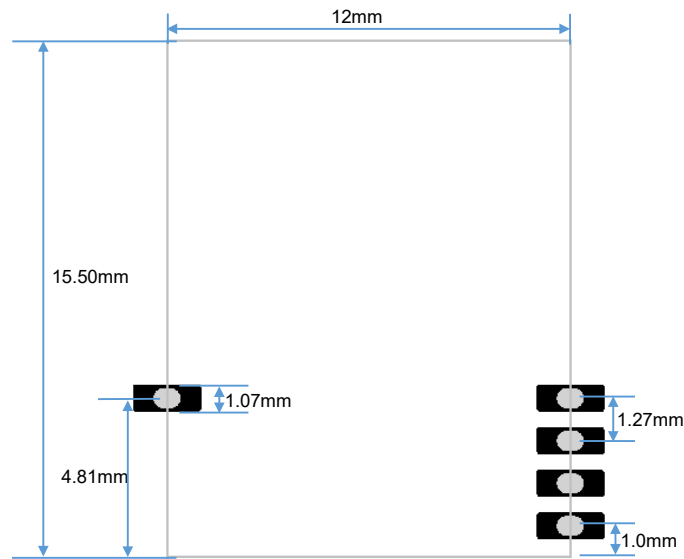
Application Circuits

I²C Mode



Layout Description

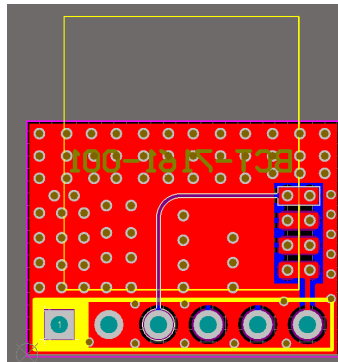
PCB Footprint



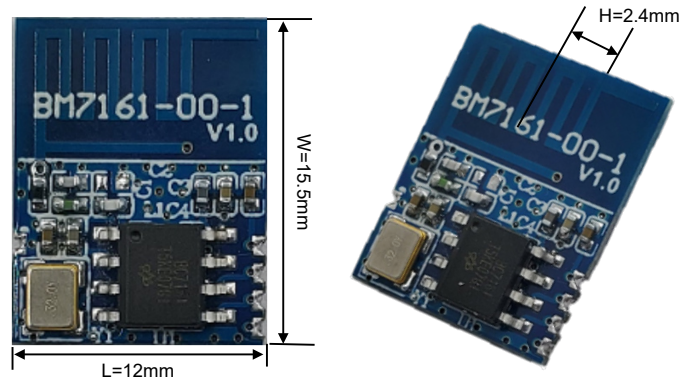
Layout Guidelines

Do not lay a ground plane below the PCB antenna. Lay the end of the PCB antenna towards to the side without a ground plane as much as possible.

Layout



Dimensions



Reference Information

Modification History

Data	Author	Issue	Modification Information
2024.07.22	Zahi	V1.00	First Version

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