BM021
Bluetooth Low Energy Module
Datasheet

Version 1.3

Issued date: Jan 31, 2019

TABLE OF CONTENTS

Revision History

Revision	Date	Description
V1.0	2017/09/01	Initial release
V1.1	2018/03/20	Define 0x01/0x0A type Function
V1.2	2018/06/01	Modify 0x01 type pin define
V1.3	2019/01/31	Added Certification information

1. BNC-TECH BLE Module

BM021

1.1 Introduction

BM021 Bluetooth® module is a Telink's 32Bit MCU SoC Bluetooth low energy products for the Bluetooth Smart market. BM021 increases application code and data space for greater application development flexibility. It is slim and light so the designers can have better flexibilities for the product shapes.

The BM021 Bluetooth module compatible with Bluetooth standard and supports BLE specification up to version 4.2.It supports profiles for health and fitness sensors, watches, i-Beacon, It's Also support BLE Mesh protocol for Smart Lighting ,Mesh Gateway ,IoT system leave network topology application . It integrates BLE/15.4 2.4G RF Baseband controller, antenna, etc. And it also provides UART /i2C/SPI interface, programmable I/O,ADC etc.

1.2 Feature

Specification

Module Name	BM021
Chips ID	TLSR8267/8269 F512ET32
Wireless Protocol	BLE version 4.2, Dis profile Only
Transceiver Type	1TX x 1RX
Data Rate	1 Mbps
Operating Frequency	2402MHz~2480MHz
Antenna	External RF Pin(Hole) out
Transmission Range	Depends on designated antenna
RF Output Power	+7 dBm
Power Consumption	TX: 15~22mA / RX: 12mA /Suspend :10uA /Deep Sleep:1.7uA
Interface Port	USB ,5 x PWM ,or 1 x I2C,1 x UART,8x GPIO, total 10 GPIOs for Option Pin define

Processor	Embedded 32 Bit MCU with clock Up to 48Mhz
Memory	Build-in 512KB Program Flash ,16KB SRAM
Security	Hardware AES-128 Encryption
Audio decoder	One Analog/Digital MIC ,One Mono Audio Output
Firmware Upgrade	OTA (Over the Air) or SWS wire Port
Power Supply	DC 1.9V~3.6V
Operating Environment	-40 ~ +85°C(VT to +105°C) , 0~95% RH
Dimensions	16(L) x 14(W) x 2.25(H) mm(PCB 1.0mm)
Environmental standard	RoHS-compliant and 100% lead (Pb)-free.

2. Ordering Information

BM021<u>XXX</u>-<u>X</u> <u>S</u> <u>S</u>

Software Type

Hardware Type:
P = i-PEX RF out Version
E = External RF Pin out Version
Y = i-PEX RF out ,PB7 Version
Z = External RF Out PB7 Version

N7E = TLSR8267 Topr -40~85°C Versions
N7V = TLSR8267 Topr -40~105°C Versions
N9E = TLSR8269 Topr -40~85°C Versions
N9V = TLSR8269 Topr -40~105°C Versions
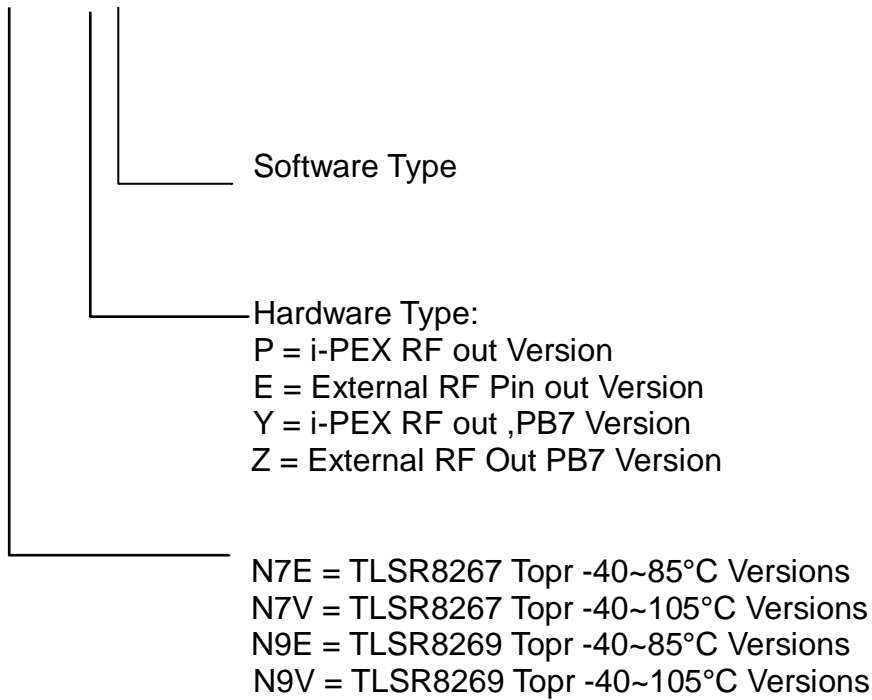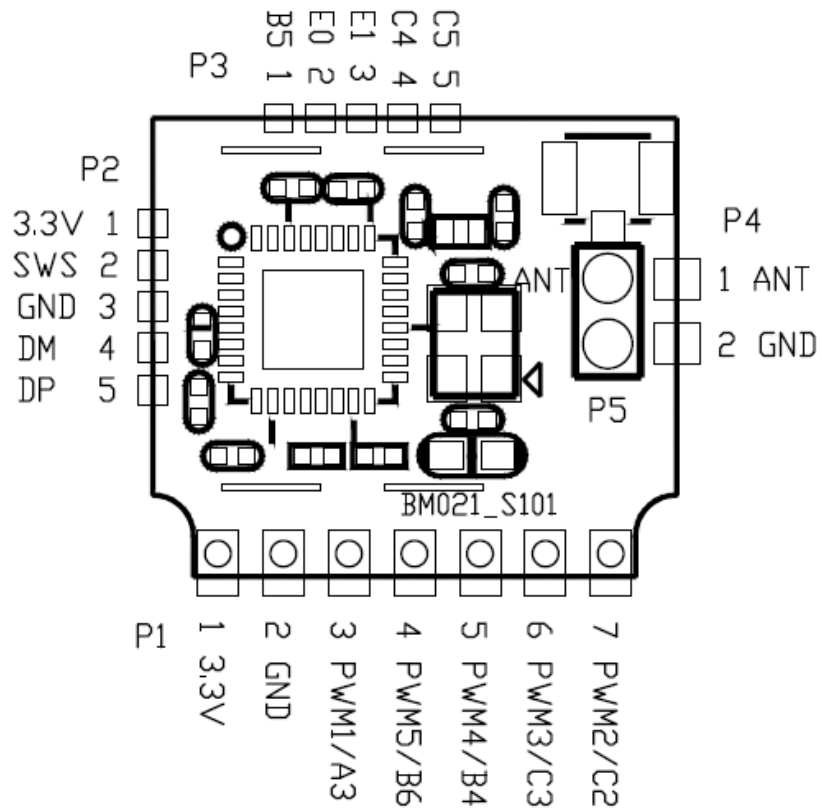
3. Pin Configurations

3.1 Pin Assignments

BM021 Pin -Out

3.2 Pin Description

P1 Pin Define

Pin No	Pin name	Type	Description
1	3.3V	Power	Power Source
2	GND	GND	Ground
3	PWM1/A3 or B7	I/O	PWM1,GPIO_PA3(PB7), I2C_SCK(by soft)
4	PWM5/B6	I/O	PWM5,GPIO_PB6, I2C_SDA(by soft)
5	PWM4/B4	I/O	PWM4,GPIO_PB4
6	PWM3/C3	I/O	PWM3,GPIO_PC3,UART_RX
7	PWM2/C2	I/O	PWM2,GPIO_PC2,UART_TX

Mesh Lighting Application Table

Pin	Application	LED Lighting								Switch/Sensor	
	Product type	Single	CW/WW	RGB	RGBW	RGB/WW_CW	CW_WW ADJ	I2C/W	UART	Switch	Sensor
	Type Code	01	02	03	04	05	06	07	08	09	0A
1	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V
2	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
3	PWM1/A3/B7	Lum	WW	R	R	R	SCK	SCK		OFF LED	SCK
4	PWM5/B6		CW	G	G	G	SDA	SDA			SDA
5	PWM4/B4	On/Off DI_Lo Act		B	B	B	CW Mode			DI	DO Hi Act
6	PWM3/C3				W	WW			URX	On LED	Reset Hi Act
7	PWM2/C2	On/Off Rly hi Act				CW			UTX	On/Off Relay	DI Hi=error

P2 Pin Define

Pin No	Pin name	Type	Description
1	3.3V	Power	Power Source
2	SWS	I/O	GPIO_PB0,PWM2,Single Wire Slave
3	GND	GND	Ground
4	DM	I/O	GPIO_PE2,USB Date Minus
5	DP	I/O	GPIO_PE3,USB Date Positive

P3 Pin Define

Pin No	Pin name	Type	Description
1	B5	I/O	GPIO_PB5

2	E0	I/O	GPIO_PE0,PWM0
3	E1	I/O	GPIO_PE1,PWM1
4	C4	I/O	GPIO_PC4,PWM4,UART_RTS
5	C5	I/O	GPIO_PC5,PWM5,UART_CTS

P4 Pin Define

Pin No	Pin name	Type	Description
1	ANT	Analog	External RF Pin out (For BM021-Exx)
2	GND	GND	Ground

4. Outline Drawing

4.1 Board Dimensions (Unit: mm)
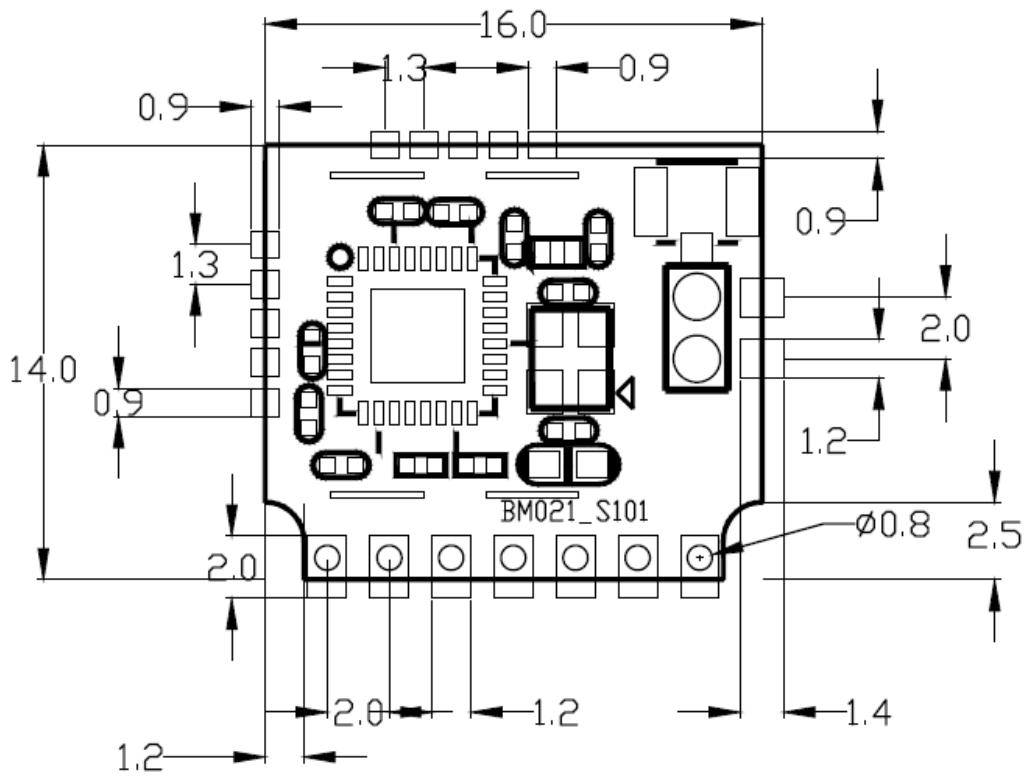
Note:
　＊The P1 Slot All of Pin have 0.8mm hole design, It can use 1x7 2.0 pith pin header
　　parts to connection host board

5. Electrical Characteristics

Absolute Maximum Ratings :

Symbol	Parameters	Maximum rating	Unit
VDD	Power Supply Voltage	-0.3 to 3.9	V
Tstr	Storage Temperature	-65 to +150	°C
Tsld	Soldering Temperature	260	°C
VESD	ESD protection (HBM)	2000	V

Operating Conditions

	Min.	Typ.	Max.	Unit
Supply Voltage VDD	1.9	3.3	3.6	V
I/O Supply Voltage		3.3+/-10%		V
Temperature Range (ET Versions)	-40	-	85	°C
Temperature Range (VT Versions)	-40	-	105	°C

DC Electrical Characteristics

	Min.	Max.	Unit
V_{IL} Input Voltage Low	VSS	0.3VDD	V
V_{IH} Input Voltage High	0.7VDD	VDD	V
V_{OL} Output Voltage Low, (IO is 4~16mA)	VSS	0.3	V
V_{OH} Output Voltage High, (IO is 4~16mA)	VDD	VDD-0.3	V

USB Electrical Characteristics

	Min.	Max.	Unit
USB Output Signal Cross-over Voltage Vcrs	1.7	2.0	V

Current Consumption

(VDD = 3.3V, TA = 25°C, unless otherwise specified)

	Min.	Avg.	Max.	Unit
TX Current (Continuous Tx 0dbm)		15		mA
RX Current (Continuous Rx Reception)		12		mA
Suspend Mode Current		10~12		uA
Deep Sleep Mode Current		1.7		uA

6. Soldering

6.1 Recommended Temperature Reflow Profile
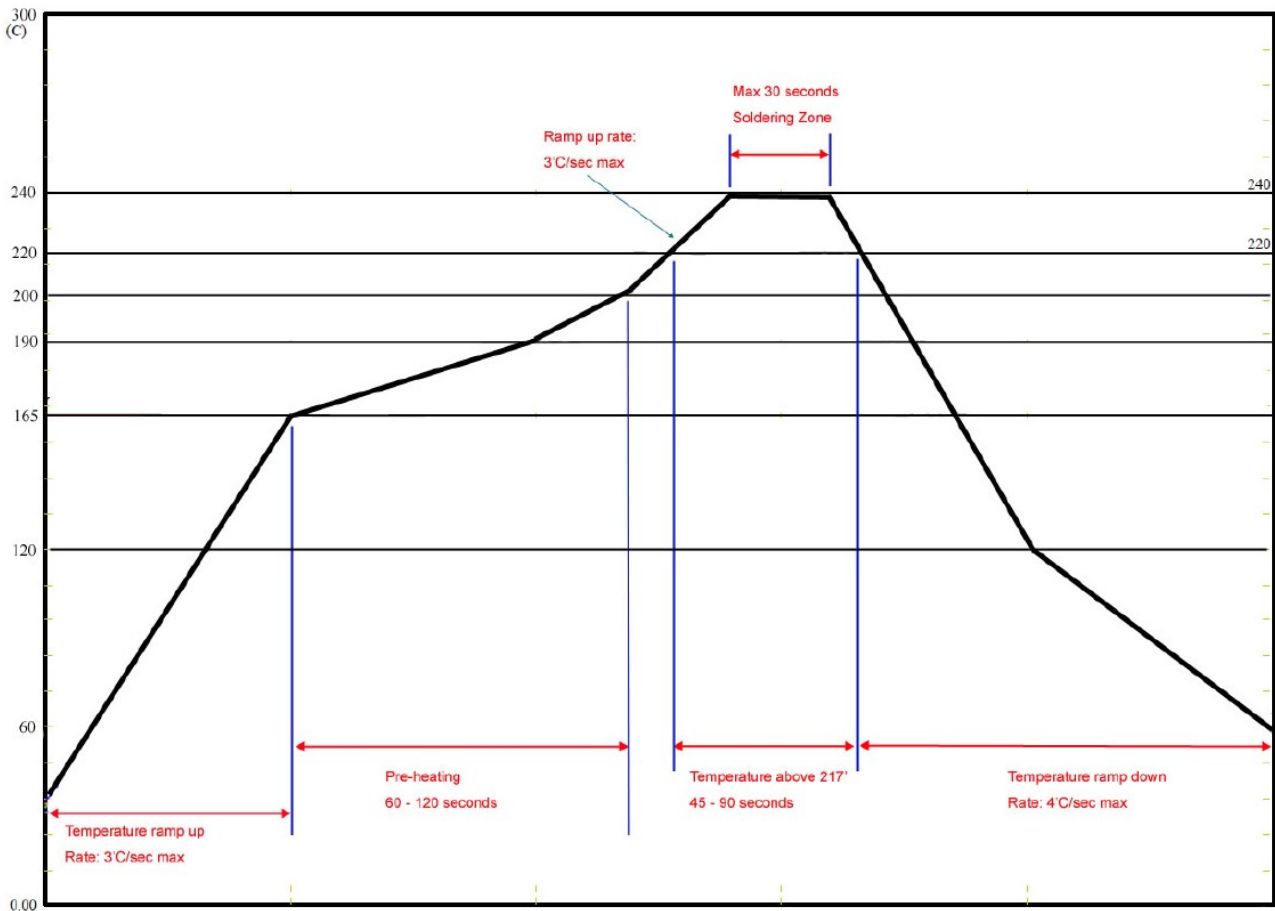
Manual Soldering Conditions: 360'C, 5 seconds, 3 times max

Maximum number of reflow cycles: 2
Opposite side reflow is prohibited due to the module's weight. (i.e. you must not place the module on the
bottom / underside of your PCB and reflow).

6.2 Hand Soldering

Hand soldering is possible. When using a soldering iron, follow IPC recommendations

(reference document IPC-7711).

6.3 Rework

The module can be unsoldered from the host board. Use of a hot air rework tool should be programmable and the solder joint and module should not exceed the maximum peak reflow temperature of 250°C.

If temperature ramps exceed the reflow temperature profile, module and component damage may occur due to thermal shock. Avoid overheating. Never attempt a rework on the module itself, (e.g. replacing individual components).

6.4 Cleaning

In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process. Use of "No Clean" soldering paste is strongly recommended, as it does not require cleaning after the soldering process.

7. Application Notes

7.1 Flash Use

The BM021 Module has been calibrated by RF before leaving the factory , That has various ID and parameter information of the BM021 module need to be retained, Please don't use the "EraseF" button to erase the All Flash of the BM021 module

7.2 Mounting

BM021 has two sets of soldering pads, which allow it to be mounted both in horizontal and vertical position. In some application, such as LED drivers, there are large components which could affect the antenna performance greatly if the module is mounted at the bottom of the device horizontally on the main PCB. Also, horizontally mounted module has much larger footprint compared to vertically mounted module.

For such cases the module can be mounted in vertical position, either by soldering it to a 1x7 2.0 mm pitch 1-row pin header, or by soldering the module directly into a routed slot on the main PCB.

When mounted in horizontal position there will have to be two keep-out areas; one for the antenna area and one for the unused pads used for vertical assembly.

8. Compliance information

Compliance Information		
Radio	USA	FCC Part 15 Subpart C
	FCC ID (BM021):	2AMD3-BT021
	Bluetooth (BQB)	Bluetooth Product Listing
	Declaration ID (DID)	D042707
	https://launchstudio.bluetooth.com/ListingDetails/73996	
Environmental	RoHS	RoHS compilant
	REACH	REACH compilant

8.1 Federal Communications Commission (FCC) Statement

Compliance 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.

Warning

Any Changes or modifications not expressly approved by BLTC Network Corp could void the user's authority to operate the equipment.

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to
Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interfer-ence in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following meas- ures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

It is the host manufacturer's responsibility to ensure continued compliance with FCC requirements once the module has been installed in to the host product.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

1)   The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2)   The transmitter module may not be co-located with any other transmitter or antenna.

As long as **2** conditions above are met, further <u>transmitter</u> test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions <u>can not be met</u> (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID <u>can not</u> be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2AMD3-BT021". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.