



BL-M8735QT2

802.11n 150Mbps WLAN+BLE v5.1

Camera Module Specification

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(Top View)



(Bottom View)

Module Name: BL-M8735QT2	
Module Type: 802.11b/g/n 150Mbps WLAN + BLE v5.1 Camera Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
0.1	Initial release	2023-06-27	Fnz
1.0	Official release	2023-07-26	Fnz

1. Introduction

1.1 General description

BL-M8735QT2 is a highly integrated low power IP camera module ,it contains Micro Controller unit, Memory unit, Security unit, Power management unit, Video unit, Audio unit, Wireless communication unit, and other functional units. The module also provides rich functional interfaces such as analog audio, MIPI video, USB 2.0 host or device, SD card , and a set of GPIOs that are configurable as digital peripherals, ADC inputs, and PWM outputs. With so many advantages, BL-M8735QT2 is ideal for multi-function, small size and cost-effective high-definition IP cameras!

1.2 Features

Video

- Supports MIPI CSI-2 two data lane interface for CMOS sensor
- Supports the resolution of sensor up 5Mega Pixels(4:3)/4Mega Pixels(16:9)
- Integrated Image Signal Processor supports multiple and professional image processing functions
- Graphic Processing such as scale up and down for zoom, multiple stream and various outputs formats, advanced motion detection and private mask
- H.264 Baseline , Main and High profiles video encoding with levels 1to4.1(I/P Slice)
- H.265 Main profiles video encoding with levels 1 to 4 .1 (I/P Slice)
- JPEG Baseline video encoding (Snapshot)
- H.264 / H.265 / JPEG Maximum resolution 5M
- Multiple streams real-time H.265/H.264 /JPEG encoding
- Supports 1080p@45 fps / 1080p@30fps+720p@30fps video streams
- CBR / VBR / CVBR / FIXOP / AVBR rate control
- Support 90° / 180° / 270° video Rotation, Crop, ROI/GDR

Audio

- Integrated Audio Codec with 1-way single-ended mode output, and 1-way AMIC or 2-way DMIC input
- Supports silence detection , EQ , and gain control at the ADC path
- ADC input gain and headphone output gain are controlled by software
- MIC input boost gain stages are 0 , 20 , 30 , and 40 db
- Sampling rates 8 , 16 , 32 , 44.1 , 48, 88.2 , and 96 KHz are supported

- Built-in MIC bias generator
- Gain Control in ADC / DAC Path
- Supports Asynchronous Sampling Rate Converter

MCU

- ARM v8M MCU with 500MHz clock and 2.23 DMIPS/MHz
- I-Cache 32KB/D-Cache 32KB
- Supports 768KB ROM
- Supports 512KB RAM
- Supports external (on customer's mainboard) SPI/QPI NOR/NAND flash
- eExecute In Place (XIP) on NOR flash
- Supports MCM embedded 64MB/ DDR2

Wireless communication

- Compatible IEEE 802.11b/g/n, 1T1R WLAN data rate up to 150Mbps
- Compatible Bluetooth Low Energy v5. 1, data rate up to 2Mbps
- Operating Frequency: 2.4~2.4835GHz
- Compatible IEEE 802.11b/g/n 1T1R WLAN PHY rate up to 150Mbps
- Connect to the external antenna through IPEX-4 connector

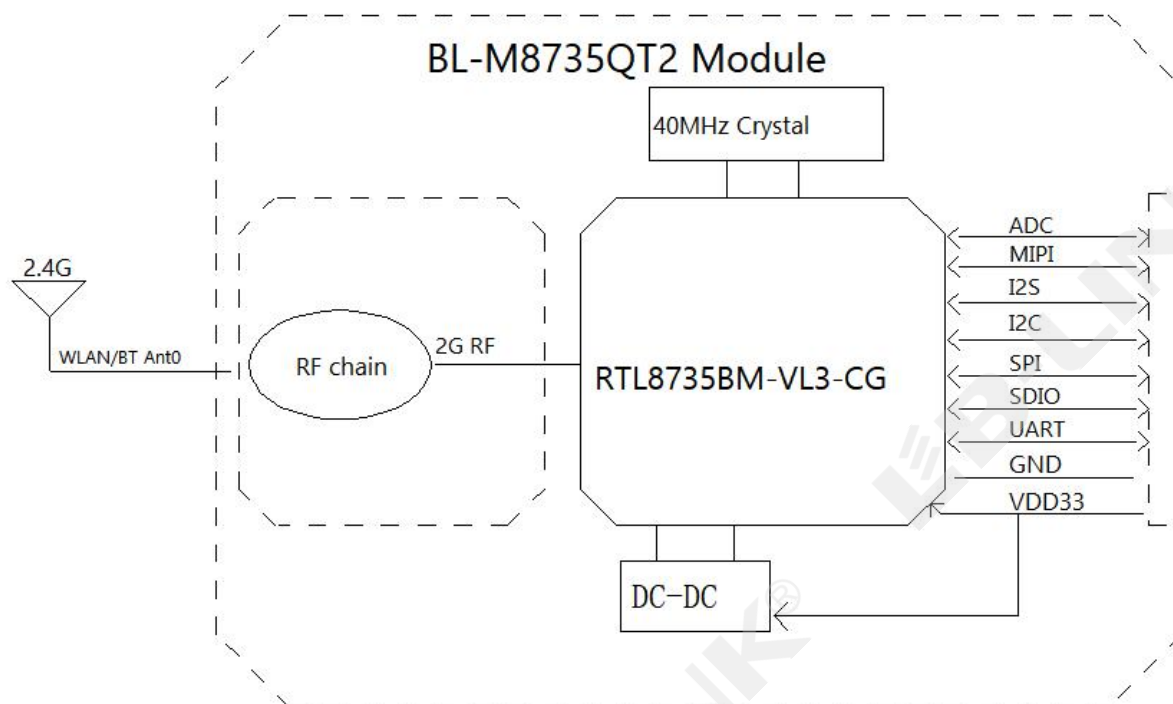
High speed interface

- USB 2.0 host HS/FS or USB 2.0 device HS/FS selectable
- SD version 1.0~3.0 Host Controller, supports 4-bit SDR12/SDR25/SDR50/DDR50 mode up to 100MHz

Peripheral interfaces

- Supports 2 UART interfaces, max baud rate 4MHz
- Supports I2S or PCM selectable interfaces
- Supports maximum 2 x I2C ports either master or slave mode
- Supports maximum 2 SPI interfaces with master or slave mode
- Supports MAX 6 ADC with 12-bit mode and 62.5KHz sample rate

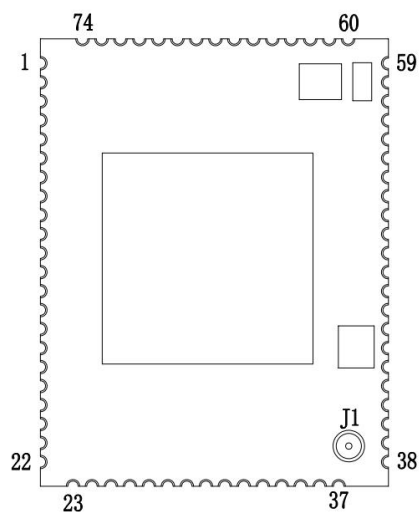
1.3 Block Diagram



1.4 General Specifications

Module Name	BL-M8715QT2, camera Module
Chipset	RTL8735BM-VL3-CG
WLAN Standards	IEEE802.11b/g/n
BT Specification	Bluetooth BLE v5.1
Antenna	Connect to external antenna through IPEX-4 connector
Dimension	16.5*21.2*2.3mm (L*W*H) ±0.15mm
Power Supply	DC 3.3V±0.2V @ 500 mA (Max)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



(Top view)

2.1 Pin Definition

No	Pin Name	Type	I/O Level	Description
J1	ANT0	RF		IPEX-4 connector for 2.4G /BT RF to ANT0
1	FLASH_D0	I/O	3.3V	NOR/NAND Flash DAT0 signal Multiplexed with GPIOC_2
2	FLASH_D2	I/O	3.3V	NOR/NAND Flash DAT2 signal Multiplexed with GPIOC_3
3	FLASH_CS	I/O	3.3V	NOR/NAND Flash CS signal Multiplexed with GPIOC_5
4	FLASH_D3	I/O	3.3V	NOR/NAND Flash DAT3 signal Multiplexed with GPIOC_1
5	FLASH_D1	I/O	3.3V	NOR/NAND Flash DAT1 signal Multiplexed with GPIOC_4
6	FLASH_CLK	I/O	3.3V	NOR/NAND Flash CLK signal Multiplexed with GPIOC_0
7	SD_D0	P	3.3V/1.8V	SD Data 0 Multiplexed with GPIOC_2
8	SD_CMD	I/O	3.3V/1.8V	SD Command Multiplexed with GPIOC_3
9	SD_D3	I/O	3.3V/1.8V	SD Data 3 Multiplexed with GPIOC_5

10	SD_D1	I/O	3.3V/1.8V	SD Data 1 Multiplexed with GPIOs_1
11	SD_D2	I/O	3.3V/1.8V	SD Data 2 Multiplexed with GPIOs_6
12	SD_CD	I	3.3V/1.8V	SD Card Detection Multiplexed with GPIOs_4
13	GND	P		Ground connections
14	SD_CLK	O	3.3V/1.8V	SD Bus clock. Multiplexed with GPIOs_0
15	VDIO_SD	PO		Linear regulator output, 3.3 V+5% or 1.8V+5%
16	GND	P		Ground connections
17	MDP0	I	3.3V	MIPI sensor lane0 differential data positive input
18	MDN0	I	3.3V	MIPI sensor lane0 differential data negative input
19	MDP1	I	3.3V	MIPI sensor lane1 differential data positive input
20	MDN1	I	3.3V	MIPI sensor lane1 differential data negative input
21	MCKP	I	3.3V	MIPI sensor differential clock positive input
22	MCKN	I	3.3V	MIPI sensor differential clock negative input
23	GND	P		Ground connections
24	SSOR_PDN	I/O	3.3V	GPIOD_11 SSOR_PDN, used as Sensor Power Down Enable output signal
25	SSOR_SDA	I/O	3.3V	GPIOD_10 SSOR_SDA,I2C:dedicated for COMS Sensor management
26	SSOR_SCL	I/O	3.3V	GPIOD_12 SSOR_SCL,I2C:dedicated for COMS Sensor management
27	SSOR_SYSCLK	I/O	3.3V	GPIOD_13 SSOR_SYSCLK, Clock output signal for Sensor
28	DMIC_CLK	I/O	3.3V	GPIOD_14 DMIC_CLK, Stereo digital microphone interface CLK
29	I2S1_SD_TX0	I/O	3.3V	GPIOD_15 I2S1_SD_TX0, I2S TX Data output signal
30	I2S1_MCK	I/O	3.3V	GPIOD_16 I2S1_MCK, I2S Main Clock output(master) signal
31	I2S1_WS	I/O	3.3V	GPIOD_17 I2S1_WS Word Select output(master) signal
32	DMIC_DATA	I/O	3.3V	GPIOD_18 DMIC_DATA, Stereo digital microphone interface data
33	SSOR_RST	I/O	3.3V	GPIOE_0 SSOR_RST, used as Sensor Reset output signal
34	GND	P		Ground connections

35	RFE_CTRL4	I/O	3.3V	GPIOE_3 RFE_CTRL4
36	RFE_CTRL5	I/O	3.3V	GPIOE_4 RFE_CTRL5
37	I2C2_SDA	I/O	3.3V	GPIOE_6 I2C2_SDA, I2C Serial Data I/O signal
38	GND	P		Ground connections
39	UART1_IN	I/O	3.3V	GPIOF_3 UART1_IN, HS-UART RX Data input signal
40	UART1_OUT	I/O	3.3V	GPIOF_4 UART1_OUT, HS-UART RX Data input signal
41	SPI_1_SCL	I/O	3.3V	GPIOF_6 SPI_1_SCL, Clock output signal
42	GND	P		Ground connections
43	SPI_1_CS0	I/O	3.3V	GPIOF_8 SPI_1_CS0, Select active low output signal
44	SGPIO	I/O	3.3V	GPIOF_9 SGPIO, GPIO_ pin
45	SPI_1_MISO	I/O	3.3V	GPIOF_5 SPI_1_MISO, Data I/O signal / MISO input signal
46	ADC0	I/O	3.3V	GPIOF_0 ADC0, AD converter input channel 0
47	SPI_1_MOSI	I/O	3.3V	GPIOF_7 SPI_1_MOSI, Data I/O signal / MOSI output signal
48	PWM4	I/O	3.3V	GPIOF_10 PWM4, HS-PWM output signal
49	PWM5	I/O	3.3V	GPIOF_11 PWM5, HS-PWM output signal
50	PWM6	I/O	3.3V	GPIOF_12 PWM6, HS-PWM output signal
51	PWM7	I/O	3.3V	GPIOF_13 PWM7, HS-PWM output signal
52	PWM8	I/O	3.3V	GPIOF_14 PWM8, HS-PWM output signal
53	PWM9	I/O	3.3V	GPIOF_15 PWM9, HS-PWM output signal
54	PWM10	I/O	3.3V	GPIOF_16 PWM10, HS-PWM output signal
55	VDD_DDR_EN	I/O	3.3V	GPIOF_17 VDD_DDR_EN, Power enable pin

56	GND	P		Ground connections
57	VDD33	PI		3.3V Main power supply
58	GND	P		Ground connections
59	UART0_OUT	I	3.3V	Shared with GPIOA_2 AD converter input channel 6
60	UART0_IN	I	3.3V	Shared with GPIOA_3 AD converter input channel 7
61	SSOR_PWR_CTRL	I	3.3V	Shared with GPIOA_5 1: Enter into test/debug mode 0: Normal operation mode
62	Au3V3	PI		3.3 V power source for analog blocks
63	AuGND	P		Ground connections
64	AOUT_LP	AO		Speaker output positive signal
65	MICBIAS	PO		Microphone bias output
66	MIC1_P	AI		MIC input positive signal
67	GND	P		Ground connections
68	HSDP	AI/O		Shared with GPIOB_0 High-Speed USB D+ signal
69	HS DM	AI/O		Shared with GPIOB_1 High-Speed USB D- signal
70	SWR_CORE_EN	I	3.3V	Shared with GPIOA_4 1: OTP settings are not loaded 0: OTP settings are loaded(Built in 100K resistor, default low)
71	GND	P		Ground connections
72	VDD09	PI		0.9V power source for analog blocks
73	GND	P		Ground connections
74	VDD_DDR	PI		1.8V power for DDR

P: Power or Ground; I/O: In/Output; I: Input; O :Output; AI/O: Analog In/Output; AI: Analog Input; AO: Analog Output; RF: Analog RF Port or RF Ground;

1. Electrical and Thermal Specifications

1.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	°C
External Antenna VSWR			1.7	2.1	/
Supply Voltage	VDD33	3.1	3.3	3.5	V
	VDD_DDR	1.75	1.8	1.85	V
	VDD09	0.85	0.9	0.95	V

1.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	2.0	--	--	V
VIL	Input Low Voltage	--	--	0.8	V
VOH	Output High Voltage	2.4	--	--	V
VOL	Output Low Voltage	--	--	0.4	V
VT+	Schmitt-trigger High Level	-	--	2.1	V
VT-	Schmitt-trigger Low Level	0.7	--	--	V
IIL	Input-Leakage Current	-10	±1	10	uA
--	Driving for Normal Pins	4	--	16	mA
--	Loading for Normal Pins	--	15	--	pF
--	Pull Resistance for Normal Pins	--	75	--	KΩ

1.3 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VDD33 Current		
	Typ(I _{RMS})	Max(I _{Peak})	Units
2.4G WLAN TCP throughput TX 40Mbps (Linux Drive, BT disable)	284	312	mA
2.4G WLAN TCP throughput RX 40Mbps (Linux Drive, BT disable)	198	250	mA

2.4G 11b 1Mbps TX @ 18dBm (TX RF test)	333	350	mA
2.4G 11b 1Mbps RX (RX RF test)	49	120	mA
2.4G 11b 11Mbps TX @ 18dBm (TX RF test)	331	350	mA
2.4G 11g 6Mbps TX @ 17dBm (TX RF test)	281	300	mA
2.4G 11g 54Mbps TX @ 17dBm (TX RF test)	276	294	mA
2.4G HT20 MCS0 TX@16dBm (TX RF test)	266	290	mA
2.4G HT20 MCS7 TX@16dBm (TX RF test)	264	284	mA
2.4G HT20 MCS7 RX (RX RF test)	49	120	mA
2.4G HT40 MCS0 TX@16dBm (TX RF test)	234	250	mA
2.4G HT40 MCS7 TX@16dBm (TX RF test)	228	248	mA
2.4G HT40 MCS7 RX (RX RF test)	50	120	mA
BT LE_1M TX@8dBm (BT RF test, WLAN disable)	119	170	mA
BT LE_2M TX@8dBm (BT RF test, WLAN disable)	91	170	mA
BT LE_2M RX Active (BT0 RF test, WLAN disable)	43	110	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11b/g/n, CSMA/CA
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Ch1~Ch13 (For 20MHz Channels)
Modulation	802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps;
Frequency Tolerance	≤ ±20ppm
2.4G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)	

TX Rate	Recommended Target TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1~11Mbps	18	+1/-1.5	≤ -10
802.11g@6Mbps	17	+1/-1.5	≤ -10
802.11g@54Mbps	17	+1/-1.5	≤ -25
802.11n@HT20_MCS0	16	+1/-1.5	≤ -10
802.11n@HT20_MCS7	16	+1/-1.5	≤ -28
802.11n@HT40_MCS0	16	+1/-1.5	≤ -10
802.11n@HT40_MCS7	16	+1/-1.5	≤ -28
2.4G Receiver Specifications			
RX Rate	Min Input Level(Typ, dBm)	Max Input Level(Typ, dBm)	PER
802.11b@1Mbps	-95	-10	< 8%
802.11b@11Mbps	-87	-10	< 8%
802.11g@6Mbps	-90	-20	< 10%
802.11g@54Mbps	-74	-20	< 10%
802.11n@HT20_MCS0	-90	-20	< 10%
802.11n@HT20_MCS7	-73	-20	< 10%
802.11n@HT40_MCS0	-89	-20	< 10%
802.11n@HT40_MCS7	-70	-20	< 10%

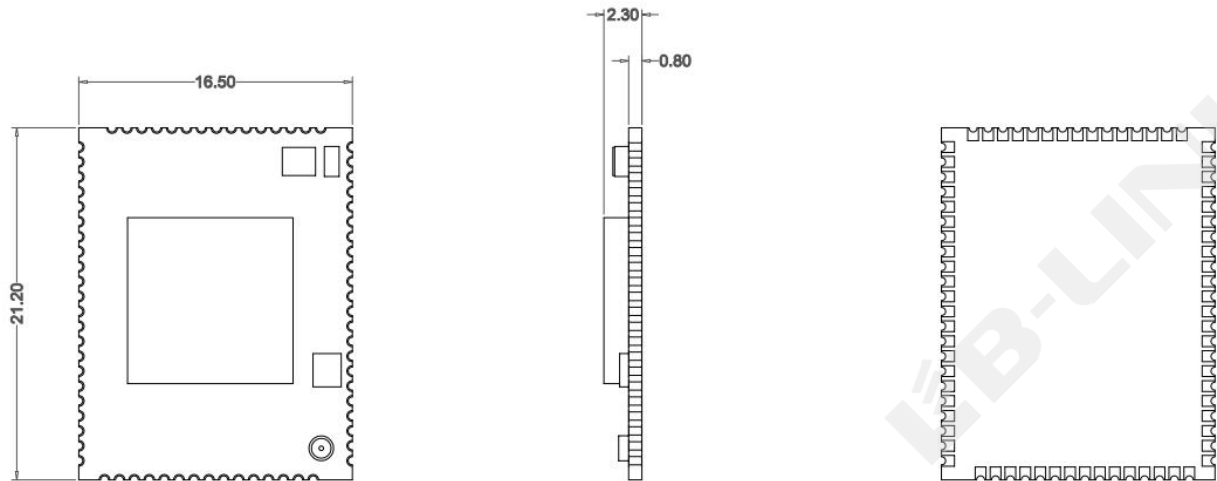
4.2 Bluetooth RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
Bluetooth Specification	Bluetooth Core Specification BLE v5.1		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	Min	Typ	Max
TX Power			

LE_1M/2M	5dBm	8dBm	11dBm	
LE_1M Modulation Characteristics				
Δf1avg	225KHz	249.8KHz	275KHz	
Δf2avg	185KHz	230.3KHz	/	
Δf2max	185KHz	243.6KHz	/	
Δf2avg/Δf1avg	0.8	0.96	/	
LE_2M Modulation Characteristics				
Δf1avg	450KHz	499.6KHz	550KHz	
Δf2avg	370KHz	467.7KHz	/	
Δf2max	370KHz	477.8KHz	/	
Δf2avg/Δf1avg	0.8	1	/	
Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level (Typ)	PER	Input Level (Typ)	PER
LE_1M	-90dBm	≤5%	-5dBm	≤5%
LE_2M	-90dBm	≤5%	-5dBm	≤5%

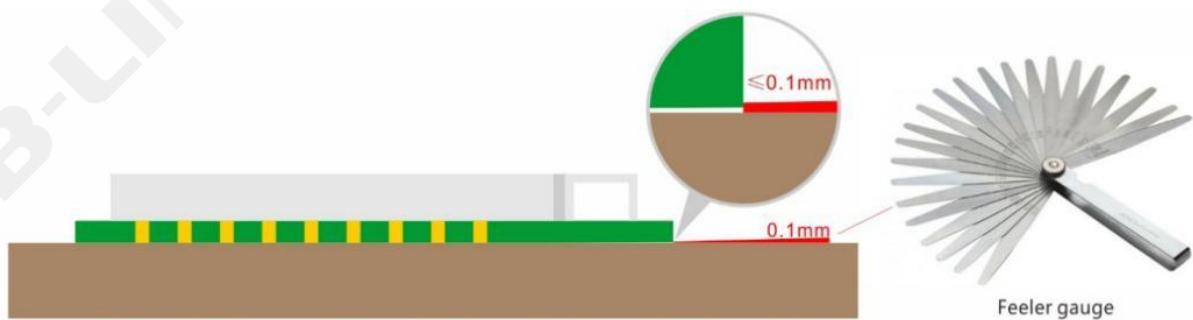
5. Mechanical Specifications

5.1 Module Outline Drawing



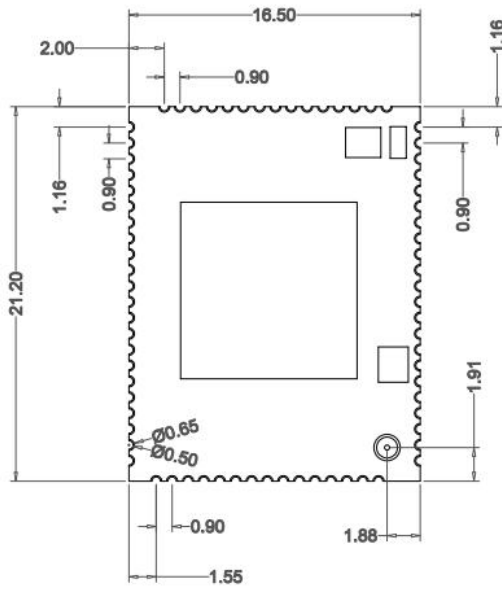
Module dimension: 21.2*16.5*2.3mm (L*W*H; Tolerance: ± 0.15 mm)

IPEX / MHF-4 connector dimension: 2.0*2.0*0.6mm (L*W*H, $\varnothing 1.5$ mm)

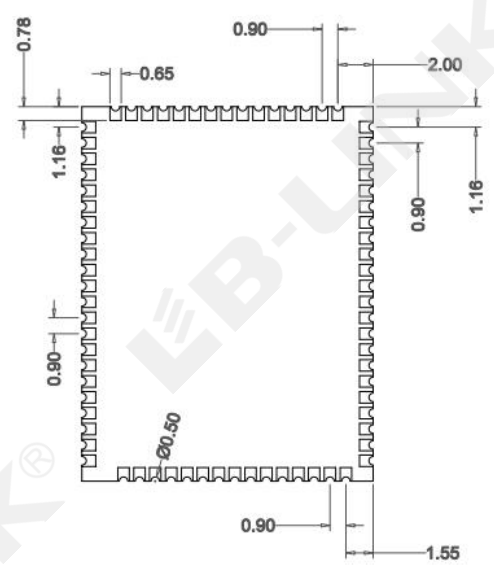


Module Bow and Twist: ≤ 0.1 mm

5.2 Mechanical Dimensions



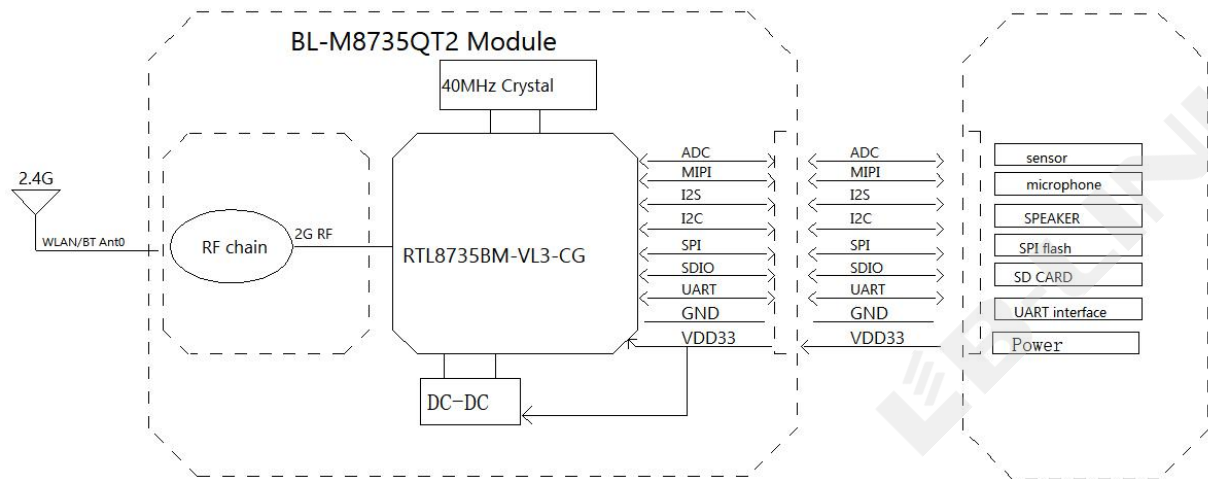
(Top View)



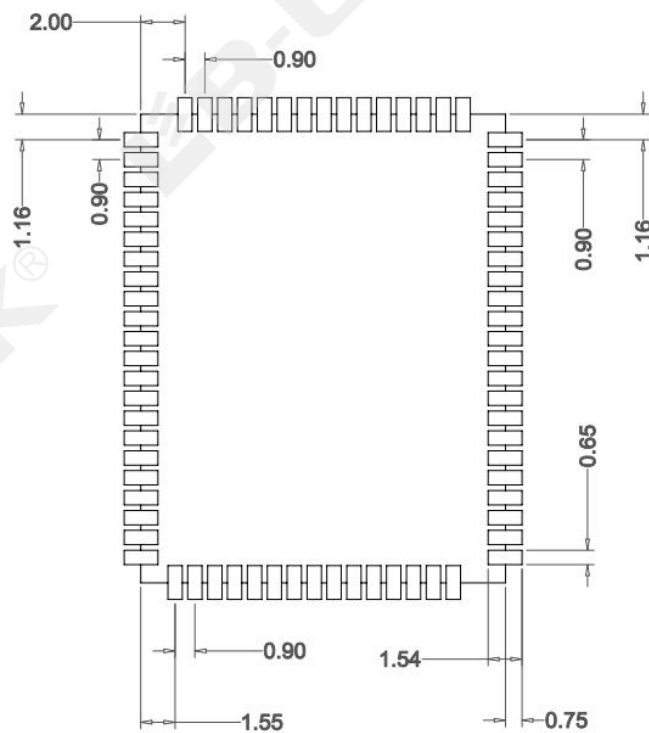
(Bottom View)

6. Application Information

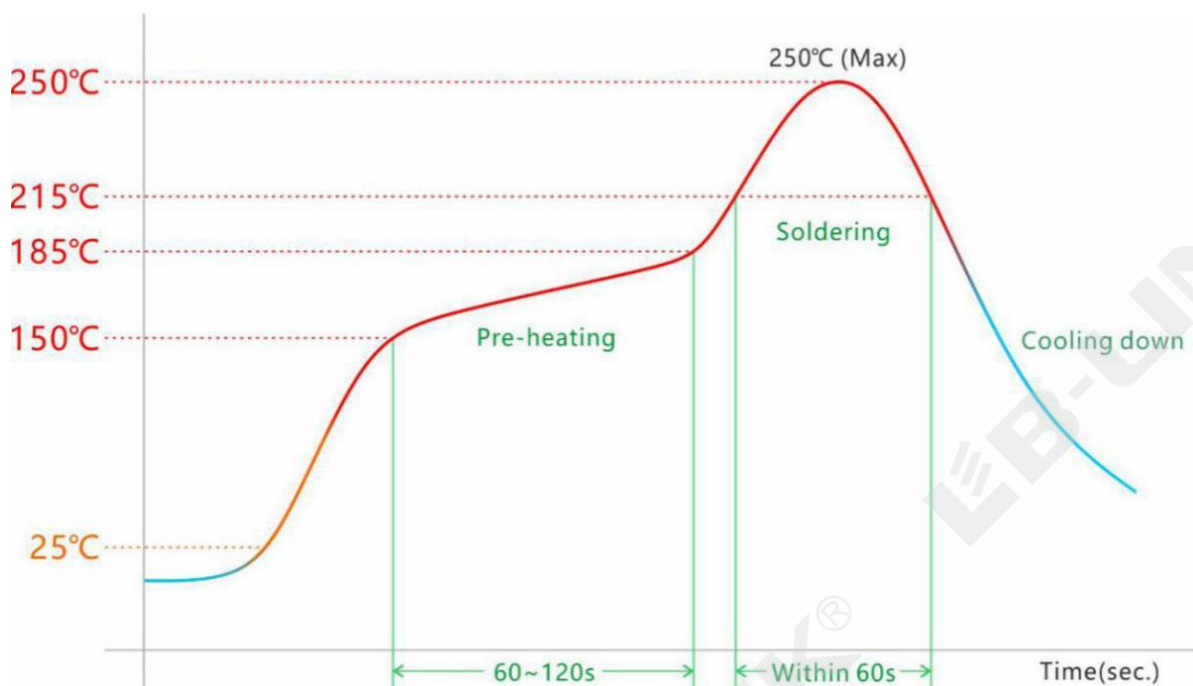
6.1 Typical Application Circuit



6.2 Recommend PCB Layout Footprint



6.3 Reflow Soldering Standard Conditions



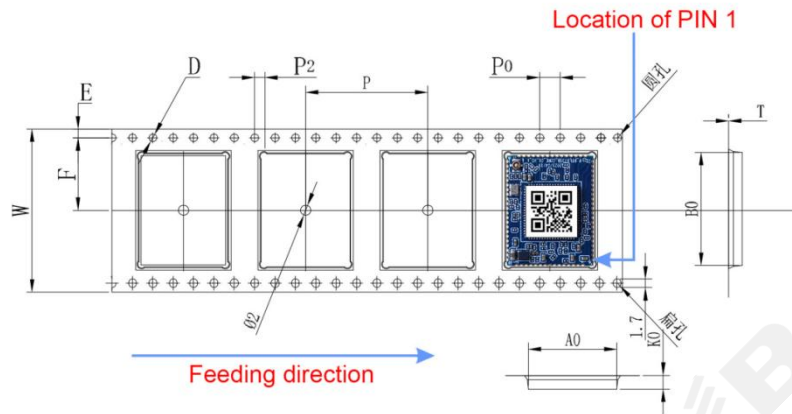
Please use the reflow within 2 times.
Set up the highest temperature within 250°C.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8735BM-VL3-CG	Realtek Semiconductor Corp.	
2	PCB	BL-M8735QT2	ShenZhen Tie Fa Technology Limited	
			MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
3	Crystal	40MHz-2016	LUCKI CM ELECTRONICS CO.,LTD	
			SHENZHEN KAIYUEXIANG ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	A ₀	B ₀	K ₀	E	F	P	P ₀	P ₂	D	T
DIM	32.00±0.3	17.00±0.1	21.75±0.1	2.80±0.1	1.75±0.1	14.2±0.1	24.00±0.1	4.00±0.1	2.00±0.1	Ø1.5±0.1	0.30±0.05



Package specification:

1. 900 modules per roll and 4,500 modules per box.
2. Outer box size: 37.5*36*29cm.
3. The diameter of the blue environment-friendly rubber plate is 13 inches, with a total thickness of 36mm (with a width of 32mm carrying belt).
4. Put 1 package of dry agent (20g) and 1 humidity card in each anti-static vacuum bag.
5. Each carton is packed with 5 boxes.

8.2 Coding Rules

芯片贴纸二维码编码规则（以BLDW200WC14A00001为例）

代码	代码含义	编码规则
BL	工厂代码	固定不变
DW200	产品代码	固定不变
W	客户代码	一个字母，每次订单以业务提供为准
C14	生产年、周	实际生产时间“年份”，例如：2020年用编码A表示，2021年用编码B，2022年用编码C，2023年用编码D，以此类推； 月份按照周期分类，如：4月4日至4月10日为第13周，用编码13，4月11日至4月17日为第14周，用编码14.....以此类推
A	生产日期	实际生产时间“日期”，例如：01日用编码1表示，02日用编码2表示..... 10日用编码A，11日用编码B，12日用编码C.....以此类推
00001	序列号	流水编号：5位数字，从数字00001到99999依次递增

8.3 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C,

Storage humidity: 10% to 95 (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5°C to +40°C,

Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.

The Module shall be stored without opening the packing.

After the packing opened, the Module shall be used within 72hours.

When the color of the humidity indicator in the packing changed,

The Module shall be baked before soldering.

Baking condition: 60°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 2KV(HBM ,Maximum rating)

The Module is a static-sensitive electronic device.

Do not operate or store near strong electrostatic fields.

Take proper ESD precautions!



ESD CAUTION