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## 1 Introduction

**Easy Core Tech.** introduces the pioneer of the Bluetooth 5.0 modules EM6Q321B which is a high performance, cost effective, low power and compact solution. The Bluetooth module provides a complete 2.4GHz Bluetooth system based on the QCC3021 BGA chipset which is a single chip radio and baseband IC for Bluetooth 2.4GHz systems. This module is fully qualified single-chip dual mode Bluetooth@v5.0 system.

## 2 Key Features

### EM6Q321B(QCC3021) Features

- Qualified to Bluetooth® v5.0 specification
- 120 MHz Qualcomm® Kalimba™ audio DSPs
- 32 MHz Developer Processor for applications
- Firmware Processor for system
- Flexible QSPI flash programmable platform
- Advanced audio algorithms
- High-performance 24-bit stereo audio interface
- Digital and analog microphone interfaces
- SBC, and AAC audio codecs support
- Serial interfaces: UART, Bit Serializer (I<sup>2</sup> C/SPI),USB 2.0
- Integrated PMU: Dual SMPS for system/digital circuits, Integrated Li-ion battery charger

### Application subsystem

- Dual core application subsystem 32 MHz operation
- 32-bit Firmware
  - Processor:
    - Reserved for system use
    - Runs Bluetooth upper stack, profiles, house-keeping code
- 32-bit Developer Processor:Runs developer applications
- Both cores execute code from external flash memory using QSPI clocked at 32 MHz
- On-chip caches per core allow for optimized performance and power consumption

### Bluetooth subsystem

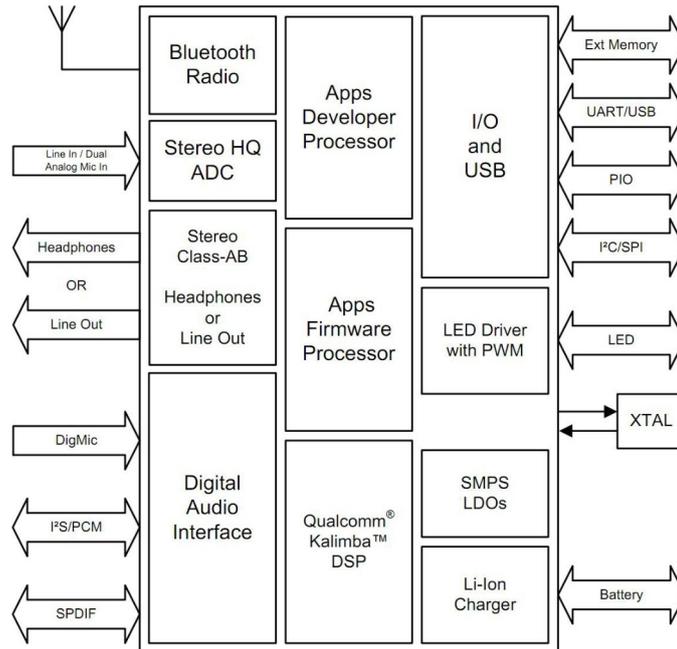
- Qualified to Bluetooth v5.0 specification including 2 Mbps Bluetooth low energy (Production parts)
- Single ended antenna connection with on-chip balun and Tx/Rx switch
- Bluetooth, Bluetooth low energy, and mixed topologies supported
- Class 1 support



### 3 Applications

- Wired/wireless speakers

### 4 Block Diagram



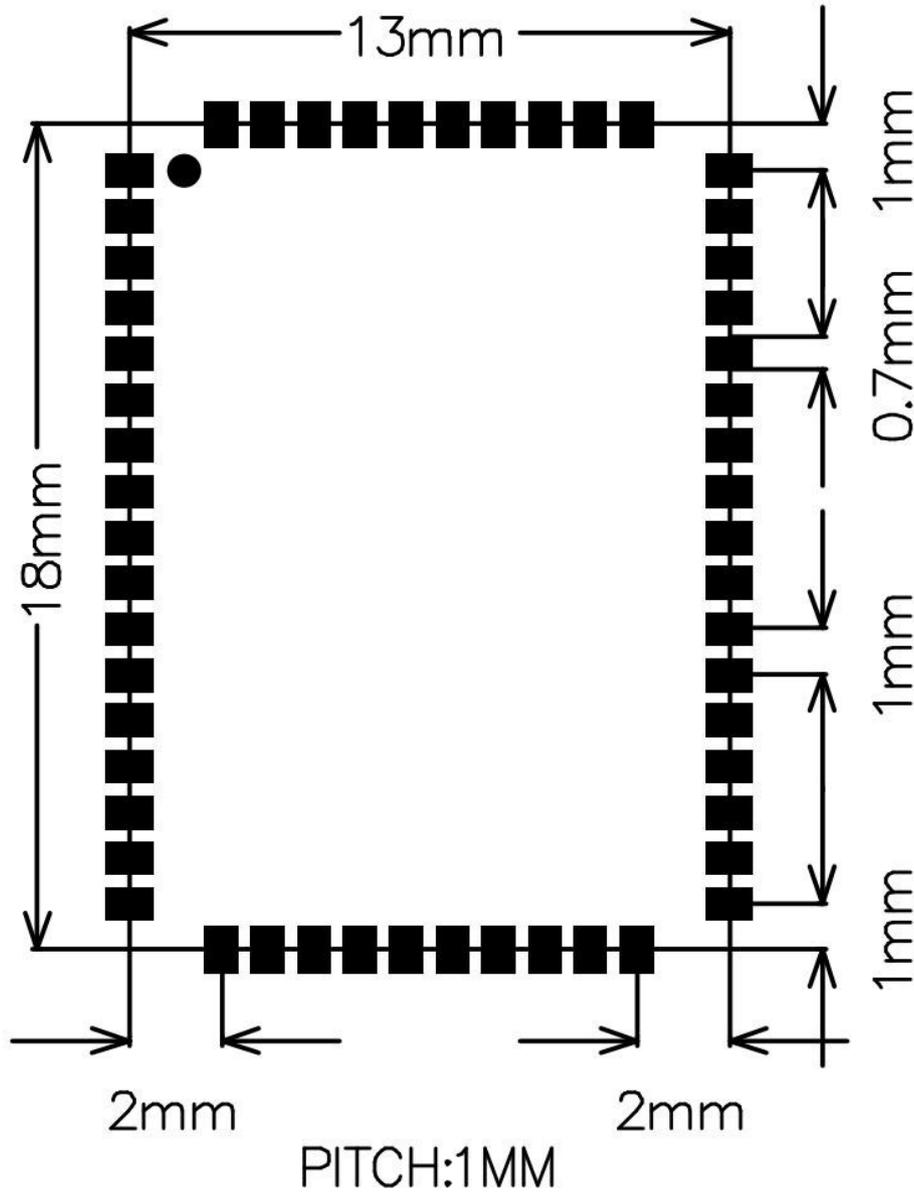
### 5 General specifications

<b>Model Name</b>	<b>EM6Q321B</b>
<b>Product Description</b>	<b>Bluetooth 5.0 Class2 Module</b>
Bluetooth Standard	Bluetooth 5.0
Chipset	QCC3021 QFN
Dimension	13mm x 18mm x 2.4mm
<b>Operating Conditions</b>	
Voltage	2.8~4.2V
Temperature	-10~+70℃
Storage Temperature	-40~+85℃
<b>Electrical Specifications</b>	
Frequency Range	2402~2480MHz
Maximum RF Transmit Power	9dBm
$\pi$ /4 DQPSK Receive Sensitivity	-91dBm
8DPSK Receive Sensitivity	-81dBm



## 6 Module Package Information

### 6.1 Pinout Diagram and package dimensions

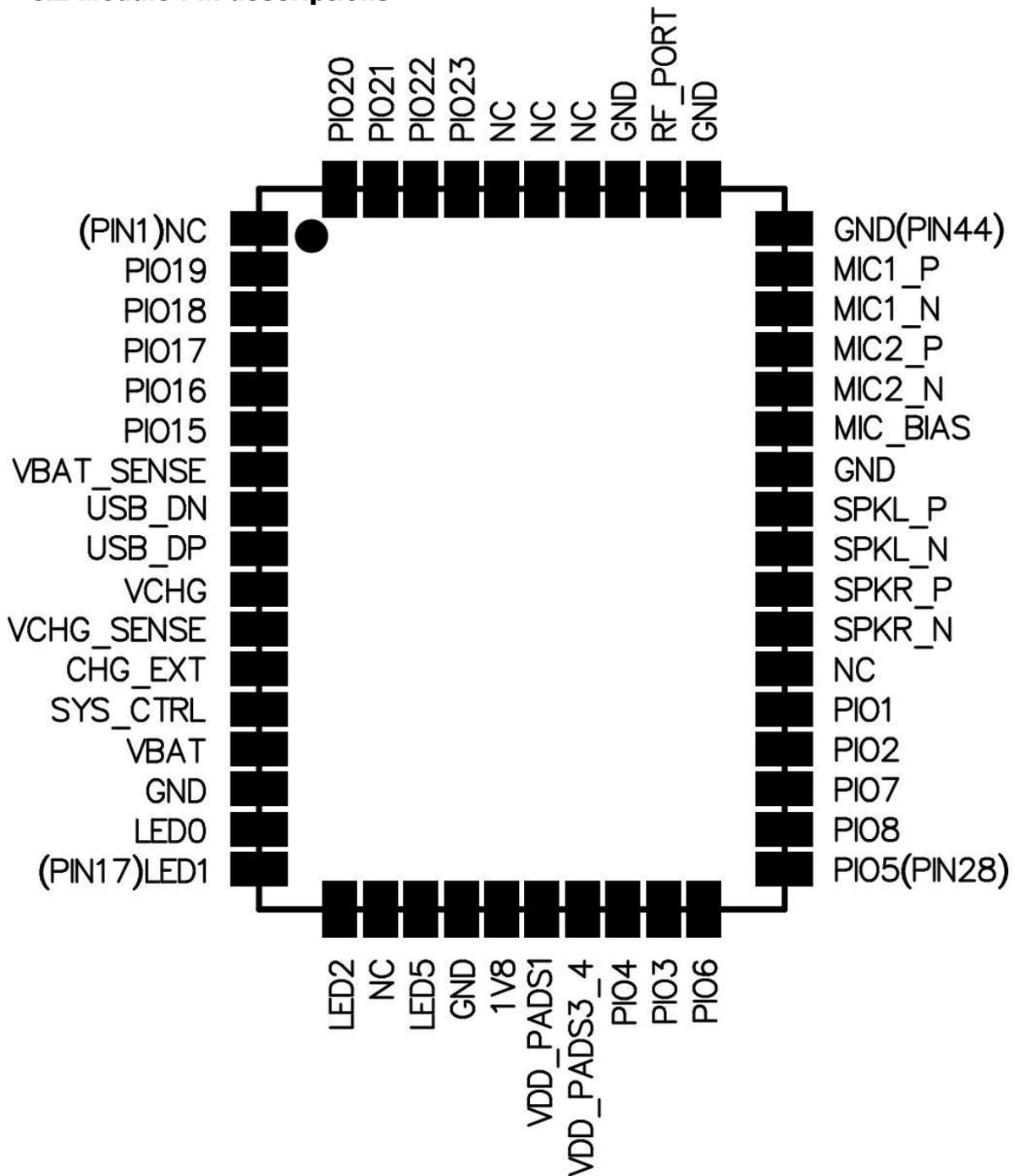


Unit: MM

**Recommended PCB layout footprint**



**6.2 Module Pin descriptions**



Pin#	Pin Name	Pin type	Description
1	NC	NC	NC
2	PIO[19]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 19. Alternative function: PCM_DIN[0]
3	PIO[18]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 18. Alternative function: PCM_DOUT[0]
4	PIO[17]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 17. Alternative function: PCM_SYNC



5	PIO[16]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 16. Alternative function: PCM_CLK
6	PIO[15]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 15. Alternative function: MCLK_OUT
7	VBAT_SENSE	Analog	Battery voltage sense input.
8	USB_DN	Digital	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
9	USB_DP	Digital	USB Full Speed device D+ I/O. IEC-61000-4-2 (device level) ESD Protection
10	VCHG	Supply	Charger input to Bypass regulator.
11	VCHG_SENSE	Analog	Charger input sense pin after external mode sense-resistor. High impedance.  NOTE If using internal charger or no charger, connect VCHG_SENSE direct to VCHG.
12	CHG_EXT	Analog	External charger transistor current control. Connect to base of external charger transistor as per application schematic.
13	SYS_CTRL	Digital input	Typically connected to an ON/OFF push button. Boots device in response to a button press when power is still present from battery and/or charger but software has placed the device in the OFF or DORMANT state. Additionally useable as a digital input in normal operation. No pull. Additional function: PIO[0] input only
14	VBAT	Supply	Battery voltage input.
15	GND	Ground	Ground
16	AIO[0]/LED[0]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
17	AIO[1]/LED[1]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
18	AIO[2]/LED[2]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
19	NC	NC	NC
20	AIO[5]/LED[5]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
21	GND	Ground	Ground
22	1V8	Supply	1.8V voltage output.
23	VDD_PADS1	Supply	1.8 V/3.3 V PIO supply.
24	VDD_PADS3_4	Supply	1.8 V/3.3 V PIO supply.
25	PIO[4]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 4. Alternative function: TBR_MOSI[1]
26	PIO[3]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 3. Alternative function: TBR_MISO[2]
27	PIO[6]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 6. Alternative function: TBR_MOSI[0]



28	PIO[5]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 5. Alternative function: TBR_MISO[1]
29	PIO[8]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 8. Alternative function: TBR_CLK
30	PIO[7]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 7. Alternative function: TBR_MISO[0]
31	PIO[2]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 2. Alternative function: TBR_MISO[3]
32	PIO[1]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Automatically defaults to RESET# mode when the device is unpowered, or in off modes. Reconfigurable as a PIO after boot. Alternative function: Programmable I/O line 1
33	NC	NC	NC
34	AUDIO_HPR_N/ SPKR_N	Analog	Headphone/speaker differential right output, negative. Alternative function: Differential right line output, negative
35	AUDIO_HPR_P/ SPKR_P	Analog	Headphone/speaker differential right output, positive. Alternative function: Differential right line output, positive
36	AUDIO_HPL_N/ SPKL_N	Analog	Headphone/speaker differential left output, negative. Alternative function: Differential left line output, negative
37	AUDIO_HPL_P/ SPKL_P	Analog	Headphone/speaker differential left output, positive. Alternative function: Differential left line output, positive
38	GND	Ground	Ground
39	AUDIO_MIC_BIAS	Analog	Mic bias output.
40	AUDIO_MIC2_N/ LINEIN_R_N	Analog	Microphone differential 2 input, negative. Alternative function: Differential audio line input right, negative
41	AUDIO_MIC2_P/ LINEIN_R_P	Analog	Microphone differential 2 input, positive. Alternative function: Differential audio line input right, positive
42	AUDIO_MIC1_N/ LINEIN_L_N	Analog	Microphone differential 1 input, negative. Alternative function: Differential audio line input left, negative
43	AUDIO_MIC1_P/ LINEIN_L_P	Analog	Microphone differential 1 input, positive. Alternative function: Differential audio line input left, positive
44	GND	Ground	Ground
45	GND	Ground	Ground
46	BT_RF	RF	Bluetooth transmit/receive.
47	GND	Ground	Ground
48	NC	NC	NC



49	NC	NC	NC
50	NC	NC	NC
51	PIO[23]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 23.
52	PIO[22]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 22.
53	PIO[21]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 21. Alternative function: PCM_DOUT[2]
54	PIO[20]	Digital: Bidirectional with programmable strength internal pull- up/pull-down	Programmable I/O line 20. Alternative function: PCM_DOUT[1]



## 7 Electrical Characteristics

### 7.1 Absolute Maximum Ratings

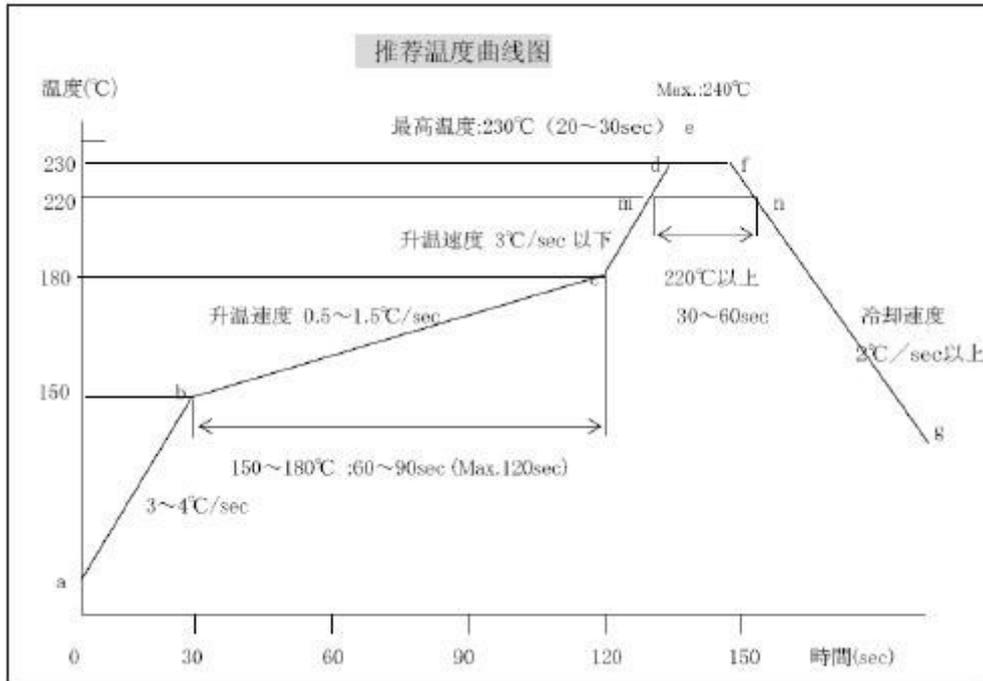
Rating	Minimum	Maximum
Storage temperature	-40°C	+85°C

### 7.2 Recommended Operating Conditions

Operating Condition	Minimum	Maximum
Operating temperature range	-10°C	+70°C
Supply voltage: VBAT	+2.8V	+4.2V



### 8 Recommended reflow temperature profile





**CAUTION**  
This bag contains  
MOISTURE-SENSITIVE DEVICES

LEVEL

3

If Blank, see adjacent  
bar code label

1. Calculated shelf life in sealed bag: 12 months at < 40 °C and < 90% relative humidity (RH)
2. Peak package body temperature: 260 °C  
If Blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
  - a) Mounted within: 168 hours of factory  
If Blank, see adjacent bar code label

conditions ≤ 30 °C / 60 %

  - b) stored at < 10%RH
4. Devices require bake, before mounting, if :
  - a) Humidity Indicator Card is > 10 % when read at 23 ± 5 °C
  - b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hours at 125 ± 5 °C  
Note: If device containers cannot be subjected to high temperature or shorter bake times are desired,  
reference IPC /JEDEC J-STQ-033 for bake procedure

Bag Seal Date: \_\_\_\_\_  
If Blank, see adjacent bar code label

Note Level and body temperature defined by IPC /JEDEC J-STQ-020

**The module Must go through 125°C baking for at least 9 hours before SMT AND IR reflow process!**



## Record of Changes

Data	Revision	Description
2019-11-25	V1.0	Original publication of this document.
2020-04-23	V1.1	Fix PIN definition.
2020-06-29	V1.2	Update product model.

## IMPORTANT NOTICE

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