Bluetooth Module

QCC5181

Product Specification

Harman International Industries, Incorporated

APROVED	MANAGER	CHECKED	FILLED

Customer.

S.MANAGER	MANAGER	CHECKED	CHIEF	FILLED

Revision control

Revision	Date	Check by	Author	Remarks
V1.0	2023.7.21		Echo.Lu	Initial
VP1.0	2023.11.29		Shuwei.hu	Add Harman information, transmission power, and nameplate information

Contents

1 Overview

QCC5181 Bluetooth module is an intelligent wireless audio data dual-mode transmission product independently developed by the company, which is high-end and efficient stereo wireless transmission scheme, the module adopts QCC5181 series chips to provide the module with high quality sound quality and compatibility better performance.

The QCC5181 Bluetooth module adopts the drive free mode. Customers only need to connect the module to the application product, and it can be fast realize the wireless transmission of music and enjoy the fun of wireless music.

2 Features

- Main Chipset : QCC5181
- Qualified to Bluetooth v5.4 specification
- Dual 240 MHz Qualcomm® Kalimba™ audio DSPs
- 32/80 MHz Developer Processor for applications
- Firmware Processor for system
- Flexible QSPI flash programmable platform
- High-performance 24‑bit stereo audio interface
- Digital and analog microphone interfaces
- Flexible LED controller and LED pins with PWM support
- Serial interfaces: UART, Bit Serializer (I²C/SPI), USB 2.0
- Advanced audio algorithms
- Active Noise Cancellation: Hybrid, Feedforward, and Feedback modes, using Digitalor Analog Mics, enabled using license keys available from Qualcomm®
- Qualcomm® aptX™ and aptX HD Audio
- aptX Adaptive, enabled using license key
- Qualcomm® cVc™ Noise Cancellation Technology, enabled using license key
- Integrated PMU: Dual SMPS for system/digital circuits,Integrated Li-ion battery charger
- 99-ball 4.930 mm x 3.936 mm x 0.57 mm, 0.4 mm pitch WLCSP
- Integrated dual switch-mode regulators, linear regulators, and battery charger
- Green (RoHS compliant and no antinomy or halogenated flame retardants)
- Size 34.1mm x 18.7mm x 3.0mm

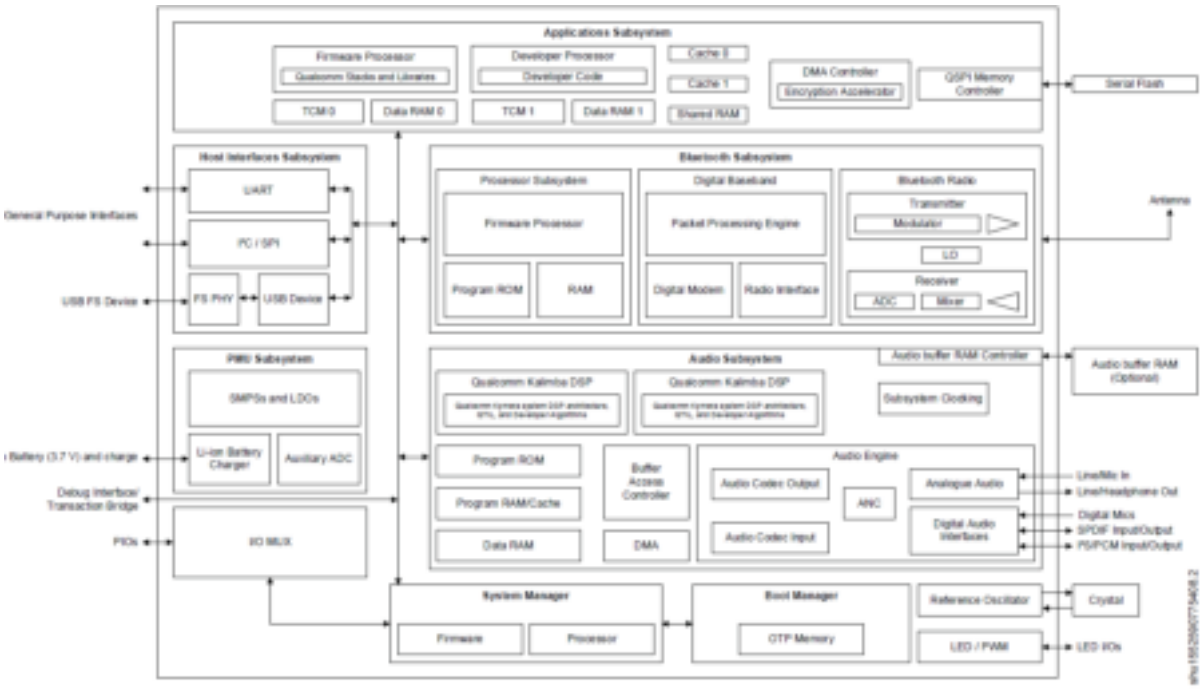
3 Applications

- Stereo Wireless Headsets.
- Wired stereo headsets and headphones.
- Portable stereo speakers.
- Analog and USB Mulitmedia Dongle.
- Home Audio System.
- Qualcomm TrueWireless™ stereo earbuds

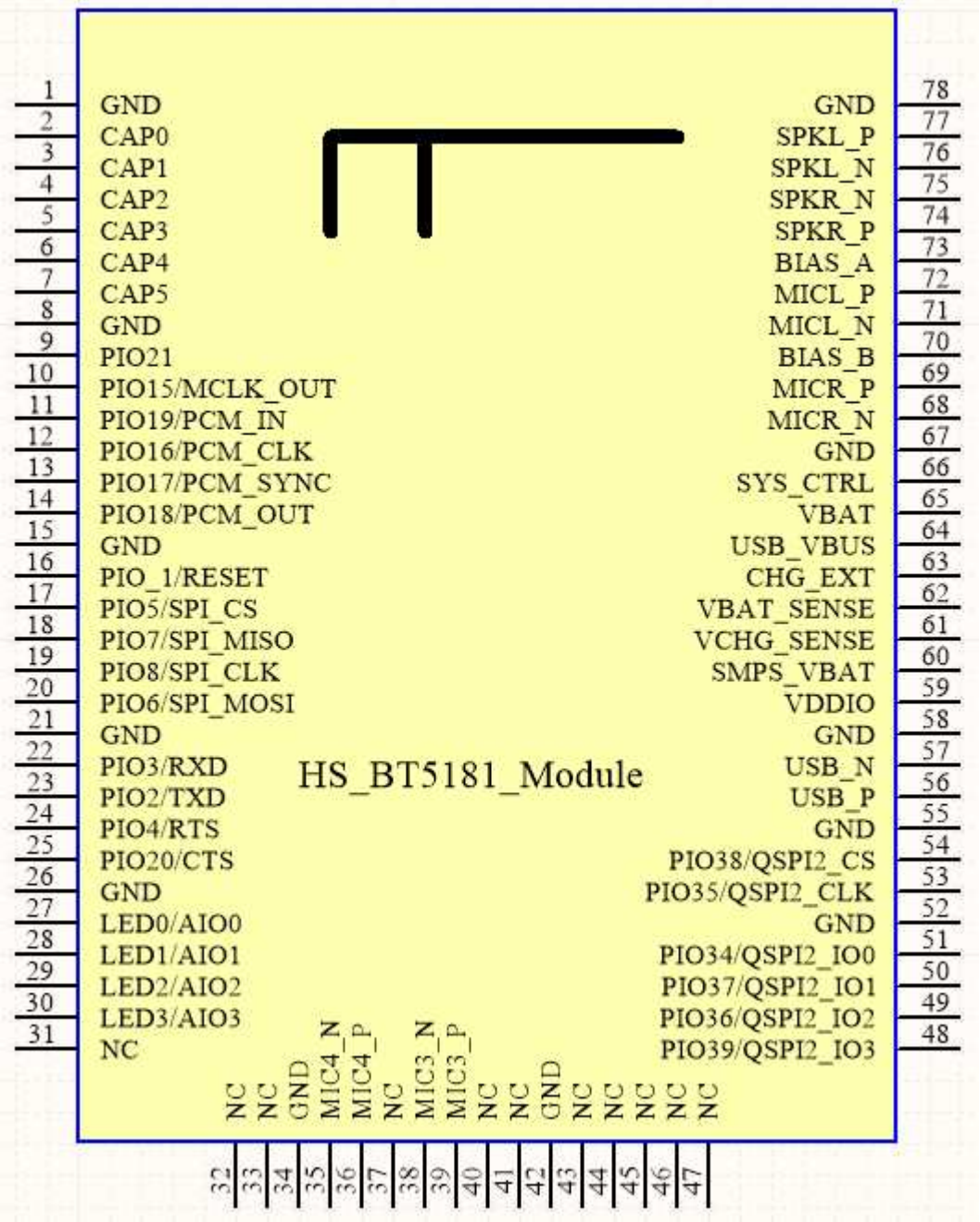
4 Specifications

Model	QCC5181
Bluetooth specifications	Qualified to Bluetooth v5.4 specification
Modulation mode	π / 4 DQPSK, 8DPSK
Supply voltage	3.3-5.0V
Support Bluetooth protocol	A2DP V1.3.1, AVRCP v1.6, HFP V1.7, HSP v1.2 SPP v1.2，DID v1.3，HOGP v1.0，PXP v1.0.1 FMP v1.0，BAS v1.0
Working current	≤ 20mA
Standby current	< 500uA
Temperature range	- 40 ° C to + 85 ° C
Charger operating temperature range	- 10 ° C to + 85 ° C
Wireless transmission range	more than 10m
Transmission power	support class 1
Sensitivity	Typ -96 DBM at 0.1% BER
Frequency range	2.402GHz-2.480GHz
External interface	PIO, SPI, AIO, UART, USB, I2S, MIC,I2C, PCM, SPK (L / R)
Support system	Android, IOS and windows
Audio decoding output	APTX(QCC5181)
Audio SNR	≥88dB
Distortion	≤ 0.1%
Module size	36mm x 18.5mm x3.8mm

5 Block Diagram



6 Pin view


1 GND
2 CAP0
3 CAP1
4 CAP2
5 CAP3
6 CAP4
7 CAP5
8 GND
9 PIO21
10 PIO15/MCLK_OUT
11 PIO19/PCM_IN
12 PIO16/PCM_CLK
13 PIO17/PCM_SYNC
14 PIO18/PCM_OUT
15 GND
16 PIO_1/RESET
17 PIO5/SPI_CS
18 PIO7/SPI_MISO
19 PIO8/SPI_CLK
20 PIO6/SPI_MOSI
21 GND
22 PIO3/RXD
23 PIO2/TXD
24 PIO4/RTS
25 PIO20/CTS
26 GND
27 LED0/AIO0
28 LED1/AIO1
29 LED2/AIO2
30 LED3/AIO3
31 NC
78 GND
77 SPKL_P
76 SPKL_N
75 SPKR_N
74 SPKR_P
73 BIAS_A
72 MICL_P
71 MICL_N
70 BIAS_B
69 MICR_P
68 MICR_N
67 GND
66 SYS_CTRL
65 VBAT
64 USB_VBUS
63 CHG_EXT
62 VBAT_SENSE
61 VCHG_SENSE
60 SMPS_VBAT
59 VDDIO
58 GND
57 USB_N
56 USB_P
55 GND
54 PIO38/QSPI2_CS
53 PIO35/QSPI2_CLK
52 GND
51 PIO34/QSPI2_IO0
50 PIO37/QSPI2_IO1
49 PIO36/QSPI2_IO2
48 PIO39/QSPI2_IO3
HS_BT5181_Module
32 NC
33 NC
34 GND
35 MIC4_N
36 MIC4_P
37 NC
38 MIC3_N
39 MIC3_P
40 NC
41 NC
42 GND
43 NC
44 NC
45 NC
46 NC
47 NC

7 Pin Assignment

Terminal	Pin Name	Pin Type	Description
1.	GND	GND	Common Ground
2.	CAP 0	NC	NC
3.	CAP 1	NC	NC
4.	CAP 2	NC	NC
5.	CAP 3	NC	NC
6.	CAP 4	NC	NC
7.	CAP 5	NC	NC
8.	GND	GND	Common Ground
9.	PIO_21	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 21. Alternative function: ■ PCM_DOUT[2]
10.	PIO_15	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 15. Alternative function: ■ MCLK_OUT
11.	PIO19/PCM_IN	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 19. Alternative function: ■ PCM_DIN[0]
12.	PIO16/PCM_CLK	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 16. Alternative function: ■ PCM_CLK
13.	PIO17/PCM_SYNC	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 17. Alternative function: ■ PCM_SYNC
14.	PIO18/PCM_OUT	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 18. Alternative function: ■ PCM_DOUT[0]
15.	GND	GND	Common Ground
16.	PIO1/RST#	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
17.	PIO5/SPI_CS	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 5. Alternative function: ■ TBR_MISO[1]
18.	PIO7/SPI_MISO	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 7. Alternative function: ■ TBR_MISO[0]

19.	PIO8/SPI_CLK	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 8. Alternative function: ■ TBR_CLK
20.	PIO6/SPI_MOSI	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 6. Alternative function: ■ TBR_MOSI[0]
21.	GND	GND	Common Ground
22.	PIO3/RXD	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 3. Alternative function: ■ TBR_MISO[2]
23.	PIO2/TXD	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 2. Alternative function: ■ TBR_MISO[3]
24.	PIO4/RTS	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 4. Alternative function: ■ TBR_MOSI[1]
25.	PIO20/CTS	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 20. Alternative function: ■ PCM_DOUT[1]
26.	GND	GND	Common Ground
27.	LED0/AIO0	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
28.	LED1/AIO1	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
29.	LED2/AIO2	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
30.	LED3/AIO3	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
31.	NC	NC	NC
32.	NC	NC	NC
33.	NC	NC	NC
34.	GND	GND	Common Ground
35.	MIC4_N	Analog	Microphone differential 4 input, negative. Alternative function: ■ Differential audio line input 4, negative
36.	MIC4_P	Analog	Microphone differential 4 input, positive. Alternative function: ■ Differential audio line input 4, positive
37.	NC	NC	NC
38.	MIC3_N	Analog	Microphone differential 3 input,

			negative. Alternative function: ■ Differential audio line input 3, negative
39	MIC3_P	Analog	Microphone differential 3 input, positive. Alternative function: ■ Differential audio line input 3, positive
40	NC	NC	NC
41	NC	NC	NC
42	GND	GND	Common Ground
43	NC	NC	NC
44	NC	NC	NC
45	NC	NC	NC
46	NC	NC	NC
47	NC	NC	NC
48	PIO39/QSPI2_IO3	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 39. Alternative function: ■ QSPI2_IO[3]
49	PIO36/QSPI2_IO2	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 36. Alternative function: ■ QSPI2_IO[2]
50	PIO37/QSPI2_IO1	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 37. Alternative function: ■ QSPI2_IO[1]
51	PIO34/QSPI2_IO0	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 34. Alternative function: ■ QSPI2_IO[0]
52	GND	GND	Common Ground
53	PIO35/QSPI2_CLK	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 35. Alternative function: ■ QSPI2_CLK
54	PIO38/QSPI2_CS	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 38. Alternative function: ■ QSPI2_CS
55	GND	GND	Common Ground
56	USB_P	Digital	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
57	USB_N	Digital	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
58	GND	GND	Common Ground

59	VDDIO	Supply	Supply to VDD_PADS
60	SMPS_VBAT	Supply	Supply to SMPS power switch from battery.
61	VCHG_SEN	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 SMPS_VCHG.
62	VBAT_SEN	Analog	Battery voltage sense input.
63	CHG_EXT	Analog	External charger transistor current control. Connect to base of external charger transistor as per application schematic.
64	USB_VBUS	Supply	Supply to SMPS power switch from charger input.
65	VBAT	Supply	Supply to SMPS power switch from battery.
66	SYS_CTRL	Digital input	Typically connected to an ON/OFF push button. If power is present from the battery and/or charger, and software has placed the device in the OFF or DORMANT state, a button press boots the device. Also usable as a digital input in normal operation. No pull. Additional function: ■ PIO[0] input only
67	GND	GND	Common Ground
68	MIC2_N	Analog	Microphone differential 2 input, negative. Alternative function: ■ Differential audio line input right, negative
69	MIC2_P	Analog	Microphone differential 2 input, positive. Alternative function: ■ Differential audio line input right, positive
70	BIAS_B	NC	NC
71	MIC1_N	Analog	Microphone differential 1 input, negative. Alternative function:

			■ Differential audio line input left, negative
72	MIC1_P	Analog	Microphone differential 1 input, positive. Alternative function: ■ Differential audio line input left, positive
73	BIAS_A	Analog	Mic bias output.
74	SPKR_P	Analog	Headphone/speaker differential right output, positive. Alternative function: ■ Differential right line output, positive
75	SPKR_N	Analog	Headphone/speaker differential right output, negative. Alternative function: ■Differential right line output, negative
76	SPKL_N	Analog	Headphone/speaker differential left output, negative. Alternative function: ■ Differential left line output, negative
77	SPKL_P	Analog	Headphone/speaker differential left output, positive. Alternative function: ■ Differential left line output, positive
78	GND	GND	Common Ground

8 Interfaces

8.1 USB Interface

QCC5181 WLCSP has a USB interface, device port and charger detection.

8.1.1 USB interface

QCC5181 WLCSP has a USB device interface: An upstream port, for connection to a host Phone/PC or battery charging adaptor.

For details on software support for USB features, see ADK documentation.

8.1.2 USB device port

The device port is a USB2.0 Full Speed (12 Mb/s) port. Typically QCC5181 WLCSP enumerates as a compound device with a hub. The enabled audio source / sink / HID / mass storage device appears behind that hub.

The DP 1.5 k pull-up is integrated in QCC5181 WLCSP. No series resistors are required on the USB data lines.

QCC5181 WLCSP contains integrated ESD protection on the data lines to IEC 61000-4-2 (device level). In normal applications, no external ESD protection is required.

Extra ESD protection is not required on VCHG (VBUS) because QCC5181 WLCSP meets the USB certification requirements of a minimum of 1uF, and a maximum of 10 μF being present on VCHG (VBUS).

The VCHG input of QCC5181 WLCSP is tolerant of a constant 6.5 V and transients up to 7.0 V. Use an external clamping protection device if extra overvoltage protection is required.

8.1.3 USB charger detection

QCC5181 WLCSP supports charger detection to the USB BC 1.2specification. It provides Data Contact Detection (DCD) using an internal current source, and provides:

- Detection of Standard Downstream Ports (SDP)
- Charging Downstream Ports (CDP)

■ Dedicated Downstream Ports (DCP)

The 10-bit auxiliary ADC reads the voltage on the USB data lines. This enables detection of proprietary chargers that bias the voltage on the USB data lines. For USB Type-C® connectors, use the LED pins to detect the voltage on the USB Configuration Channel (CC) line pins (CC1 and CC2) to detect the charge current capabilities of the upstream device.

8.2 PIO

QCC5181 WLCSP has the following digital input/output (I/O) pads:

■ 21 PIO pads:

□ Including 1 x Reset (active low) pad: PIO[1]

■ 6 x pads for the Applications subsystem QSPI interface

■ 6 x pads intended for LED operation: LED[5:0]

■ 1 x power-on signaling: SYS_CTRL, available for use as an input after boot.

8.2.1 PIO pad allocation

The following QCC5181 WLCSP functions have specific pad allocations:

■ QSPI (Applications subsystem)

■ QSPI interface for optional support of external Audio buffer RAM

■ LED pads

■ Transaction bridge

■ Audio I^2S/PCM

NOTE: Any PIO is usable for:

■ Digital microphones

■ SPDIF

■ UART

- Bit Serializer (I^2C/SPI)
- LED PWM controllers

8.3 Standard I/O

The standard digital I/O pins (PIO) on QCC5181 WLCSP are split into separate pad domains. Each VDD_PADS domain can be separately powered, from 1.7 V to 3.6 V.

NOTE: When PIOs in a supply domain are used for a high-speed interface, decoupling the respective VDD_PADS pin with a 100 nF decoupling capacitor may be beneficial. The VDD_PADS of a particular pin should be powered before voltages are applied to any PIO powered by that domain, otherwise back powering can occur through the electrostatic discharge (ESD) protection in the pad.

PIO are programmed to have a pull-up or pull down with two strengths (weak and strong). Program PIO with a sticky function where they are strongly pulled to their current input state. PIO have a reset pull state. After reset, pulls are reconfigurable using software.

PIO also have a programmable drive strength capability of 2, 4, 8, or 12 mA. All subsystems can read all PIO. Use software to assign PIO write access to particular subsystem control. To make PIO inputs available use Schmitt triggers.

8.4 Pad multiplexing

A QCC5181 WLCSP pad function is chosen at runtime from multiple potential functions, using multiplexing.

In the input direction, signals driven into the chip, all PIOs are distributed to each subsystem and visible on the PIO status bus. The subsystem selects I/Os of interest for a particular application.

In the output direction, the System Manager has overall control of PIO

allocation and control. When a PIO is allocated to a particular subsystem, the output is connected from the subsystem to the pad. There are no registers between the subsystem and the pad.

The LED pins and some other peripheral I/O states are read as virtual PIOs, see Table 8-1.

Function	PIO
SYS_CTRL	PIO[0]
LED[5:0]	PIO[79:74]

Table 8-1

8.5 RESET# reset pin

The QCC5181 WLCSP digital reset pin (RESET#) is an active low reset signal. PIO[1] defaults to RESET# on boot.

When the pin is active low, on-chip glitch filtering avoids unintended resets by filtering out spurious noise. The RESET# pin has a fixed strong pull-up to VDD_PADS_1, and can be left unconnected. The input is asynchronous,

and is pulse extended within QCC5181 WLCSP to ensure a full reset.

QCC5181 WLCSP contains internal Reset Protection functionality to automatically keep the power rails enabled and enable the system to restart after unintended reset (such as a severe ESD event). Assertion of RESET# beyond the

Reset Protection timeout (typically greater than~1.8 s) causes the device to power down if VCHG is not present and SYS_CTRL is low. QCC5181 WLCSP then requires a SYS_CTRL assertion or VCHG attach to restart.

NOTE: QCC5181 WLCSP is always powered if VCHG is present. It does not power down if RESET# is asserted while VCHG remains present.

QTIL recommends that QCC5181 WLCSP is powered down using software-control rather than external assertion of RESET#.

Holding RESET# low continuously is not the lowest QCC5181 WLCSP power state, because pull downs are enabled on VCHG and VDD_BYP in this state.

RESET# is guaranteed to work if held low for 120 μs.

After boot, PIO[1] is configurable as a digital PIO.

8.6 SYS_CTRL pin

SYS_CTRL is an input pin that acts as a power-on signal for the internal regulators. Use it as an input (virtual PIO[0]-available using software) or as a multifunction button.

From the OFF state, SYS_CTRL must be asserted for >20 ms to start power up.

SYS_CTRL is VBAT tolerant (4.8 V max), and typically connected using a button to VBAT. SYS_CTRL has no internal pull resistor, and requires an external pull-down if left undriven.

Use software to logically disconnect SYS_CTRL from the power on signal for internal regulators. For example, when booted, software takes control of the

8.7 LED

QCC5181 WLCSP has LED pads and controllers.

8.7.1 LED pads

Table 8-2 lists QCC5181 WLCSP LED pad operating modes.

Table 8-2 QCC5181 WLCSP LED pad operating modes

Mode name	Description
LED Driver	This mode drives LEDs. The pad operates as an open-drain pad, which tolerates voltages up to 7.0 V. The cathode of the LED can connect to the QCC5151 WLCSP LED pad. Each pad is rated to sink current of up to 50 mA.
Digital / Button Input	This mode is for slow input signals, typically buttons. It is not for fast switching digital inputs like SPI. For these types of inputs, use the standard PIOs. In this mode, an internal weak pull-down is enabled. Typically this mode is for active high button signals to ensure that the input returns to 0 when the button is released. The pads are 7.0 V tolerant and the logic 1 threshold is typically 1 V. In digital input mode, the logic inputs are read by the software as virtual PIO[79:74].
Analog Input	In this mode, the LED pad is an analog input port. The pad voltage routes to a 10-bit auxiliary ADC.
Disabled	This is the default state for LED pads, where the pad is 7.0 V tolerant and a high impedance with no pull-down.

Table 8-2

NOTE: LED pins might be driven to ground level for up to 300 μs within 50 ms of the chip powering up from off stage.

8.7.2 LED controllers

QCC5181 WLCSP has six PWM-based LED controllers controlled by the Applications subsystem. Use them for driving either the LED pads (through virtual PIOs) or other available PIOs.

An application may configure the LED flash rate and ramp time using a dedicated API.

Once configured, the LED flash and ramp rate are fully hardware controlled within the LED/PWM module. It is possible to synchronize any number of the LED drivers together. Use the flash/ramp rate configuration to generate color change sequences on RGB LEDs.

LED outputs are able to operate in Deep Sleep state, but not in Dormant state.

Table 8-3 lists the LED controller pattern for QCC5181 WLCSP. Each PWM block can make use of the PIOs and LED pads (virtual PIOs).

Table 8-3 LED controller pattern

LED_PWM number	PIO						
LED_PWM[0]	-	PIO[6]	-	PIO[18]	-	PIO[42]	PIO[74]
LED_PWM[1]	PIO[1]	PIO[7]	-	PIO[19]	-	PIO[43]	PIO[75]
LED_PWM[2]	PIO[2]	PIO[8]	-	PIO[20]	-	PIO[44]	PIO[76]
LED_PWM[3]	PIO[3]	-	PIO[15]	PIO[21]	-	PIO[45]	PIO[77]
LED_PWM[4]	PIO[4]	-	PIO[16]	-	PIO[40]	-	PIO[78]
LED_PWM[5]	PIO[5]	-	PIO[17]	-	PIO[41]	-	PIO[79]

Table 8-3

NOTE: The configuration of the PWM controller is the same whether it drives a PIO or LED pad.

If an OEM assigns other functions, not all PIOs may be available for use with the PWM generator.

Table 8-4 shows how each LED_PWM maps to a specific virtual PIO and LED_PAD on QCC5181 WLCSP.

Table 8-4 LED_PWM to PIO to LED_PAD mapping

LED_PWM number	=	PIO number	=	LED_PAD number
LED_PWM[0]	=	PIO[74]	=	LED_PAD[0]
LED_PWM[1]	=	PIO[75]	=	LED_PAD[1]
LED_PWM[2]	=	PIO[76]	=	LED_PAD[2]
LED_PWM[3]	=	PIO[77]	=	LED_PAD[3]
LED_PWM[4]	=	PIO[78]	=	LED_PAD[4]
LED_PWM[5]	=	PIO[79]	=	LED_PAD[5]

Table 8-4

9 Boot Manager

Figure 9-1 shows the Boot Manager.

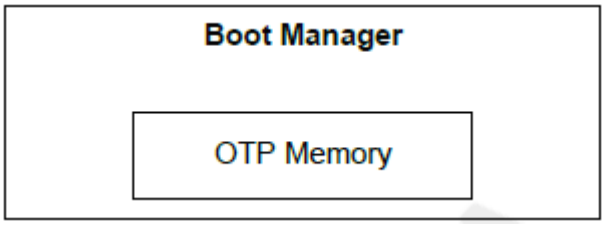


Figure 9-1 Boot Manager

The Boot Manager:

- Performs all low-level housekeeping functions
- Manages chip boot
- Manages the lowest level stages of Deep Sleep and Dormant state entry/exit

10 OTP memory

QCC5181 WLCSP contains one-time programmable memory areas, used to hold a customer programmable security key.

System Manager

Figure 10-1 shows the System Manager.

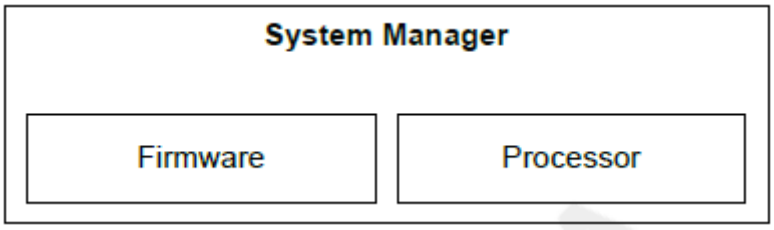


Figure 10-1 System Manager

The System Manager:

■ Executes from ROM

■ Controls the allocation of the resources in the system

■ Coordinates firmware operation using message-passing and interaction with the other subsystems

Chip-level sleep modes are coordinated by the System Manager. Each subsystem indicates to the System Manager that they are asleep. The System Manager can individually disable clocks and/or power to subsystems in turn to minimize device power.

10.1 System timer

The System Manager maintains a 1 MHz system timer, which is distributed to

the subsystems in the hardware using the transaction bus. The system time has 20 ppm, 250 ppm, and 20% modes to optimize current in low-power states.

11 Charging system

11.1 Li-ion charger overview and configurations

The QCC5181 WLCSP integrated Li-ion charger is designed to support single Li-ion cells with a wide range of cell capacities and variable VFLOAT voltages. It has two circuit configurations with different charge current capabilities:

■ Internal configuration: Supports charge rates of 2 mA to 200 mA with no additional external components

required.

■ External configuration: Supports fast charge rates of 200 mA to 1800 mA with the addition of one PNP pass

device and external resistor. Lower trickle and pre-charge charge currents are still available in external configuration.

Operating configuration is set in firmware using

CHARGER_ENABLE_HIGH_CURRENT_EXTERNAL_MODE.

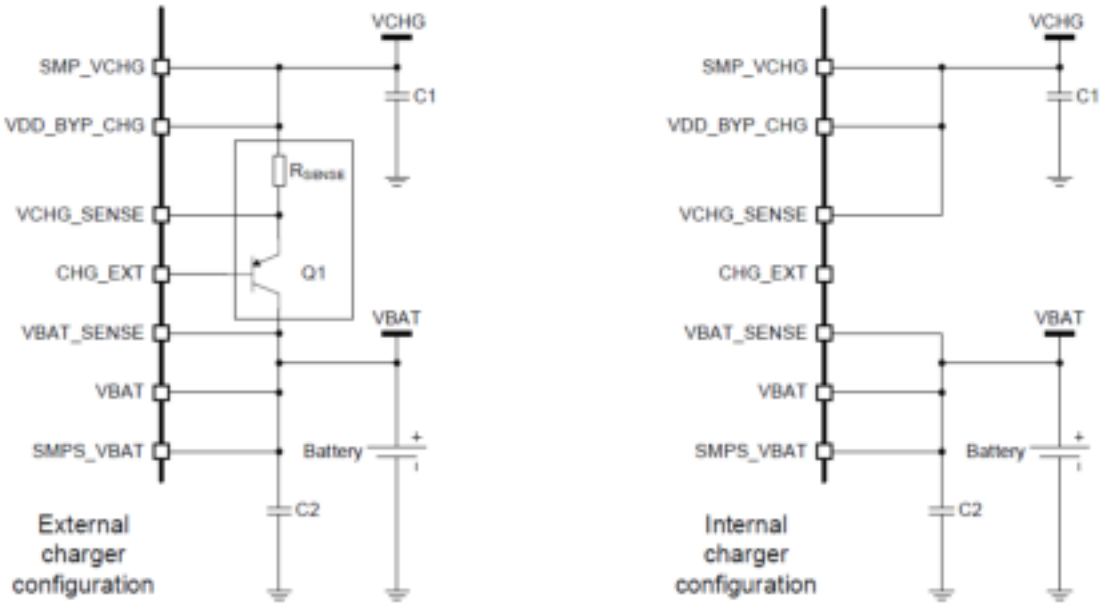


Figure 11-1 Internal and external Li-ion charger configurations

11.2 Charger connections

Internal configuration connections

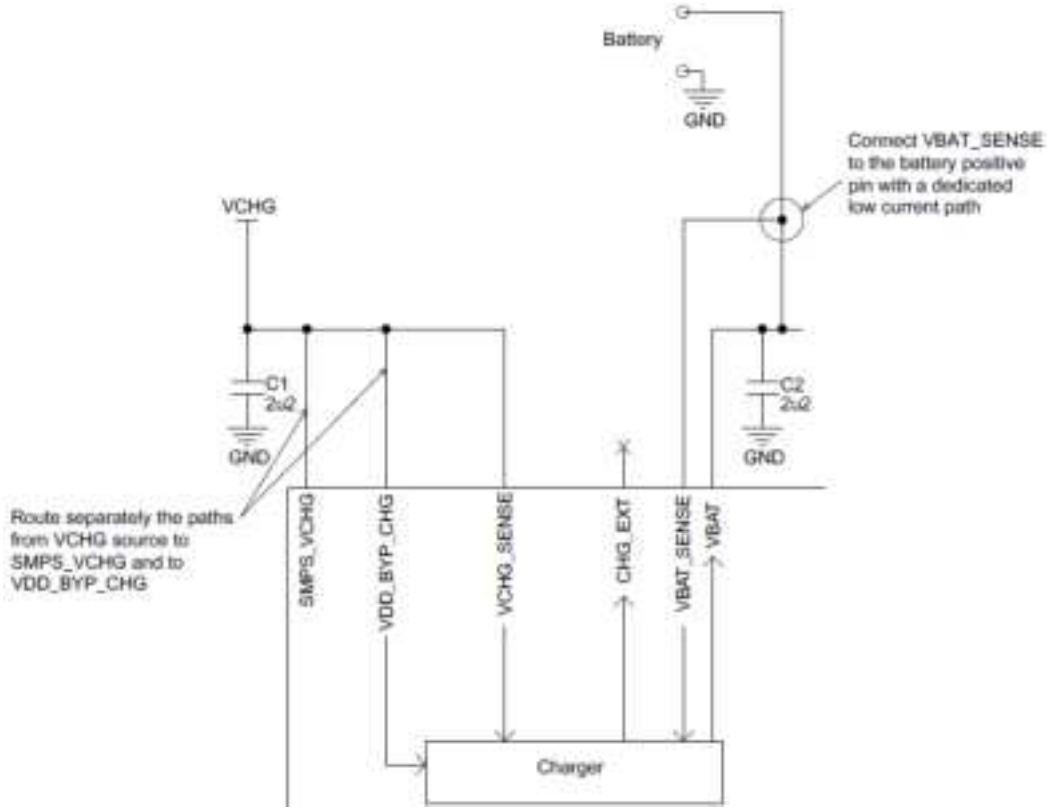


Figure 11-2 Schematic of internal charger configuration

Figure 11-2 shows that in internal configuration, connect the VCHG_SENSE pin to VCHG and leave CHG_EXT unconnected. The charge current passes through QCC5181 WLCSP internally in all charging phases.

Charge current enters through the VCHG pin, which should be locally decoupled with a 2.2 μF ceramic capacitor.

The charger output current exits via the VBAT pin to the battery.

The VBAT_SENSE pin is used to sense the voltage on the battery and must be routed as a Kelvin connection (separately) to the battery connector to avoid IR drop in the battery PCB traces from affecting the charge process, which can lead to early termination.

11.3 Transmission power

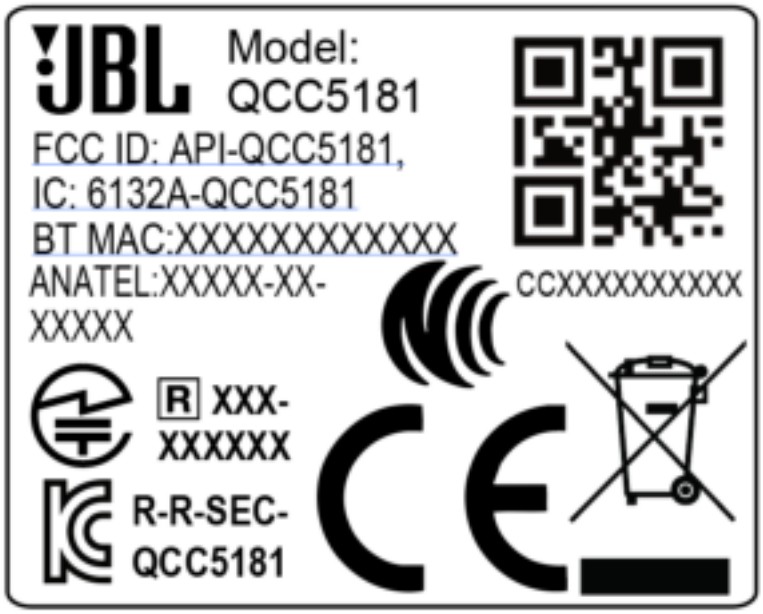
As shown in the following figure，The maximum transmission power is 20dBm

Maximum RF transmit power		13.5	15.0	≤20	dBm

11.4 Nameplate style

As shown in the following figure

20mm



16mm

12 FCC ISED Statement

FCC

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations

4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 Subpart B requirements if needed.

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to Harman International Industries, Incorporated that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID:”. The FCC ID can be used only when all FCC compliance requirements are met.

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
(2) The transmitter module may not be co-located with any other transmitter or antenna.
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot 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.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed below. Only the Dipole antenna (RP-SMA) is used for the certification, the PCB antenna is not applicable.

Antenna Type	Manufacturer	Model No.	Antenna Gain (dBi)
Dipole Antenna	Hansong(NanJing)Technology Ltd	RC1WFI0886A	1.24

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.

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.
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 interference 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 measures:

- 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.

Caution: Any changes or modifications not expressly approved by Harman International Industries, Incorporated for compliance could void the user's authority to operate this equipment.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This module has been tested and found to comply with FCC Part 15C requirements for Modular Approval.
The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

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 transmitter 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.

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

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC/IC établies pour un environnement non contrôlé.Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1)This device may not cause interference.(2)This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :(1)L'appareil ne doit pas produire de brouillage; (2)L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ICES

The host product shall be properly labelled to identify the modules within the host product. The ISED certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the ISED certification number for the module, preceded by the word "contains" or similar wording expressing the same meaning, as follows: Contains IC:

Le produit hôte doit être correctement étiqueté pour identifier les modules qui le composent.L'étiquette de certification ise d'un module doit être clairement visible à tout moment lorsqu'il est installé dans le produit hôte;Dans le cas contraire, le produit hôte doit être étiqueté de manière à afficher le numéro de certification ise du module, précédé du mot "contient" ou d'une formulation similaire exprimant le même sens, comme suit: contient IC: