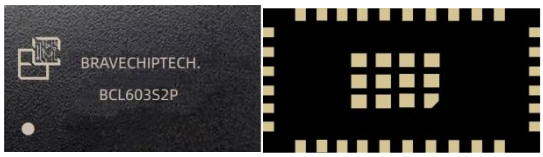
BCL603S2P Smart Ring Chiplet Datasheet



Features

- Integrates more than 20 devices such as NRF52840, LDO, PMIC, crystal oscillator, resistance,capacitance, etc
- Operating voltage: 1.7V~5.5V
- provides up to 19 GPIO ports, which can be configured as 2-channel I²C, 4-channel SPI, 8-channel 12bit ADC, supporting PPG, NTC, IMU, ECG, NFC, LED and other peripherals and sensors
- Built-in NFC supports touch-and-click pairing
- supports BLE 5.2, embedded Bluetooth Low Energy stack, and GATT services
- embedded smart ring firmware, support ChipletRing App connection use
- ARM Cortex-M4 32-bit provides a floating-point computing core, a CPU frequency of up to 64MHz, and a CPU power consumption of 52uA/MHz
- 256KB SRAM, of which the Bluetooth protocol stack occupies 20KB, supports the operation of various algorithms such as heart rate, blood oxygen, blood pressure, sleep, step counting, and 3DoF
- 1MB Flash. Historical data can be retained for more than 7 days. Dual-backup OTA upgrade is supported
- Transmit power: -20 DBM ~ +8dBm
- High receiving sensitivity: -96dBm
- TX RX Peak current < 4.8mA(0dBm)
- Ring resting current < 0.6μA
- The ring broadcast status current <80uA at 1s interval
- Ring heart rate oximetry current <1.6mA
- Ring battery life can be more than 7 days
- Operating temperature range: -40℃~80℃

Application

- Smart Health ring
- XR space interactive controller
- Wearable devices
- Anti-loss device
- Data transparent module
- Miniaturized Bluetooth device

Number	Package Type	Type
BCL603S2P	LGA34（4×6.8mm）	Tape/Reel

Description

BCL602S2P is a high-performance, ultra-low power dedicated chip for smart ring Chiplet, using 4mm width LGA package, smart ring can adopt two-layer FPC design, reduce BOM number by 30%, ensure PCBA bending yield of more than 95%,

provide smart ring dedicated communication protocol and algorithm library. Support secondary development and custom protocol development.

Revision record：

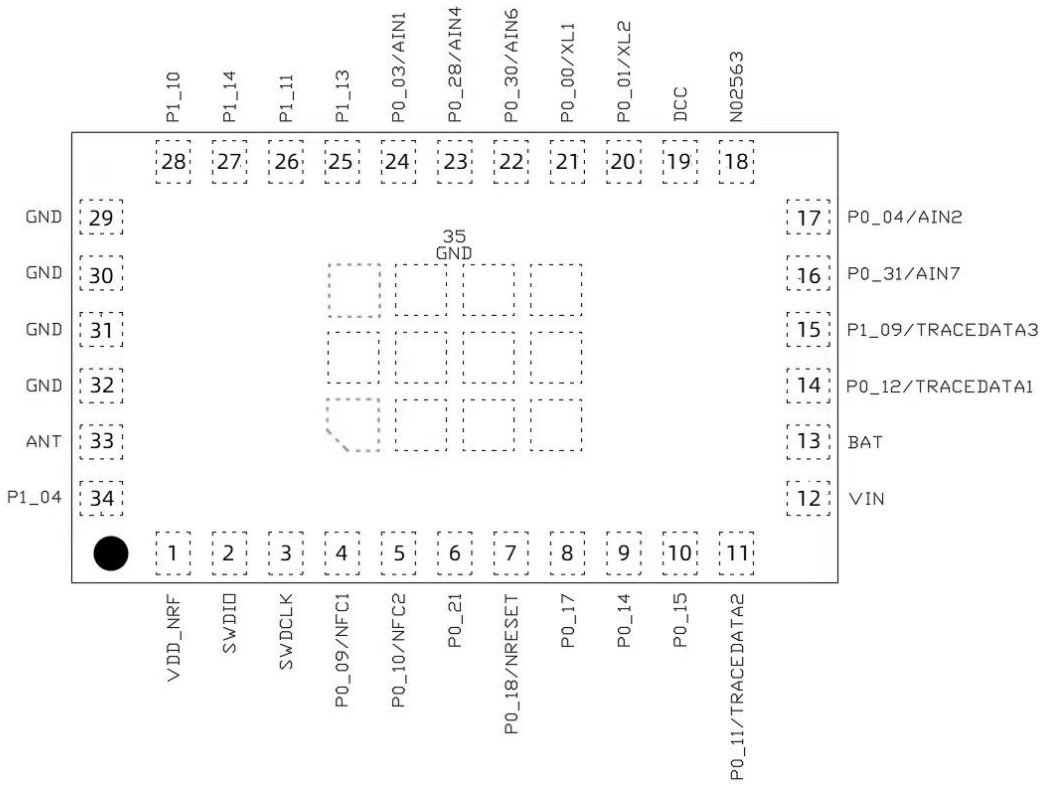
Version	Name	Date	Description
V1.0	Jingjing Wang	2023.05.22	Original version
V1.1	Jingjing Wang	2024.07.24	Pin description
V1.2	Lizhen Zou	2024.09.14	Update typical circuit
V1.3	Danlei Wang	2025.04.27	Update the chip diagram, Pinout Diagram, pin definition, and typical circuit diagram

Catalogue

1、 Introduction

BCL603S2P uses Chiplet technology to integrate NRF52840, LDO, PMIC, crystal oscillator, and critical resistance and capacitance, designed for smart ring applications to greatly reduce product size, improve production yield, and simplify clock and RF design.

2、 Pin description

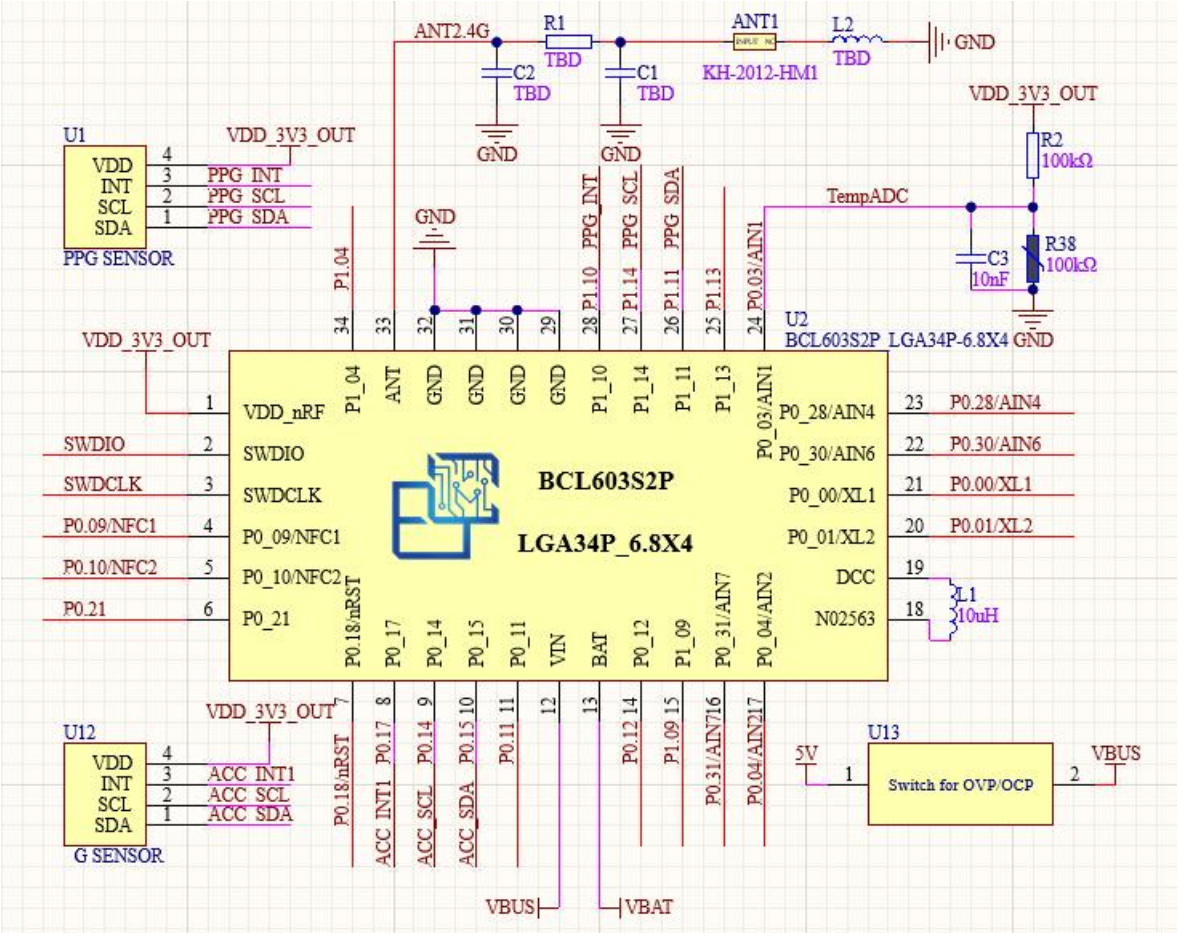


Pin Number	Pin Name	Type	Description
1	VDD_nRF	Power	Digital power, BLE core power supply
2	SWDIO	Debug	Serial wire debug I/O for debug and programming
3	SWDCLK	Debug	Serial wire debug clock input for debug and programming
4	P0_09/NFC1	I/O	General Purpose I/O；NFC antenna connection
5	P0_10/NFC2	I/O	General Purpose I/O；NFC antenna connection
6	P0_21	I/O	General Purpose I/O
7	P0_18/NRESET	I/O	General Purpose I/O

8	P0_17	I/O	General Purpose I/O
9	P0_14	I/O	General Purpose I/O
10	P0_15	I/O	General Purpose I/O
11	P0_11/TRACE DATA2	I/O	General Purpose I/O
12	VIN	Power	Power supply
13	BAT	Power	Battery pin
14	P0_12/TRACE DATA1	I/O	General Purpose I/O
15	P1_09/TRACE DATA3	I/O	General Purpose I/O
16	P0_31/AIN7	Analog input	General Purpose I/O ； Configurable as ADC input
17	P0_04/AIN2	Analog input	General Purpose I/O ； Configurable as ADC input
18	N02563	I/O	External inductance
19	DCC	I/O	External inductance
20	P0_01/XL2	I/O	General Purpose I/O
21	P0_00/XL1	I/O	General Purpose I/O
22	P0_30/AIN6	Analog input	General Purpose I/O ； Configurable as ADC input
23	P0_28/AIN4	Analog input	General Purpose I/O ； Configurable as ADC input
24	P0_03/AIN1	Analog input	General Purpose I/O ； Configurable as ADC input
25	P1_13	I/O	General Purpose I/O
26	P1_11	I/O	General Purpose I/O
27	P1_14	I/O	General Purpose I/O
28	P1_10	I/O	General Purpose I/O
29	GND	Power	Ground
30	GND	Power	Ground
31	GND	Power	Ground
32	GND	Power	Ground
33	ANT	RF	Single-ended radio antenna connection

34	P1_04	I/O	General Purpose I/O
35	GND	Power	Chip bottom pad, Ground

3、Typical circuit

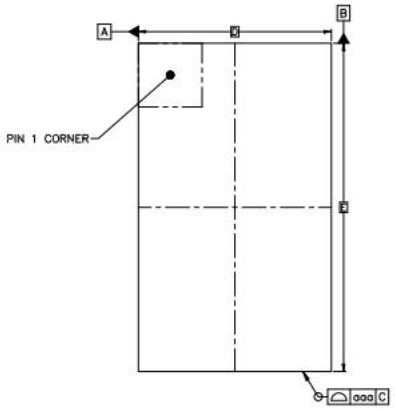


4、 Electrical Characteristics

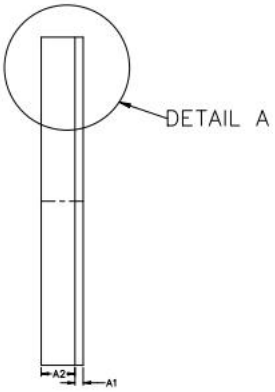
Symbol	Conditions	Min	Value	Max	Unit
Power Supply Voltage VCC	/	1.8	3.3	5.5	V
IO Voltage	/	0	3.3	VCC	V
Operating temperature	/	-40	25	80	℃
Storage temperature	/	-55	/	120	℃
IO input low level	/	0	/	0.4	V
IO input high level	/	0	/	VCC	V

IO output low level	5mA	0	/	0.6	V
IO output high level	5mA	3.3	/	VCC	V
Wireless modulation mode	GFSK				
Frequency range	/	2.402	/	2.480	Ghz
Number of channels	/	/	40	/	/
Air speed	/	1	/	2	Mbps
Rf port impedance	/	/	50	/	Ohm
Transmitting power	/	/	0	+8	Dbm
Emission current	/	/	4.8	/	mA
Receiving current	/	/	4.6	/	mA
Receiving sensitivity	/	/	-95	-96	dbm
Ring resting current	3.7V		0.6		uA
Ring standby current	3.7V	/	80	/	uA
Ring operating current	3.7V	/	1.6	/	mA
Ring using time	/	5	7	9	Day
Ring standby time	/	/	30	/	Day
Operating humidity	/	10%	30%	90%	/
Storage humidity	/	5%	30%	90%	/

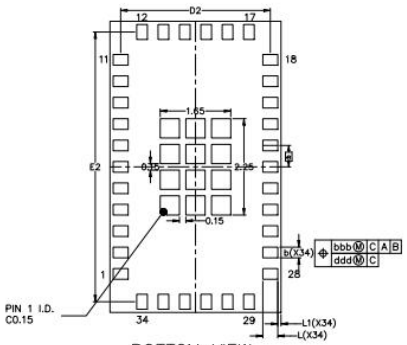
5、 Package Dimensions



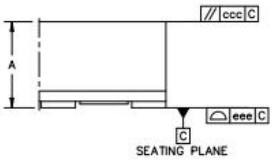
TOP VIEW



SIDE VIEW



BOTTOM VIEW



DETAIL A

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.820	0.870	0.920
MOLD CAP		A2	---	0.700	---
SUBTRATE THICKNESS		A1	0.140	0.170	0.200
LEAD WIDTH		b	0.200	0.250	0.300
BODY SIZE	X	D	3.900	4.000	4.100
	Y	E	6.700	6.800	6.900
LEAD PITCH		e	0.500		
EDGE PAD CENTER TO CENTER		D2	3.500 BSC		
		E2	6.300 BSC		
LEAD LENGTH		L	0.300	0.350	0.400
LEAD TIP TO PKG EDGE		L1	0.000	0.075	0.150
PACKAGE EDGE TOLERANCE		aaa	0.100		
MOLD FLATNESS		ccc	0.100		
COPLANARITY		eee	0.080		
LEAD OFFSET		bbb	0.100		
		ddd	0.080		