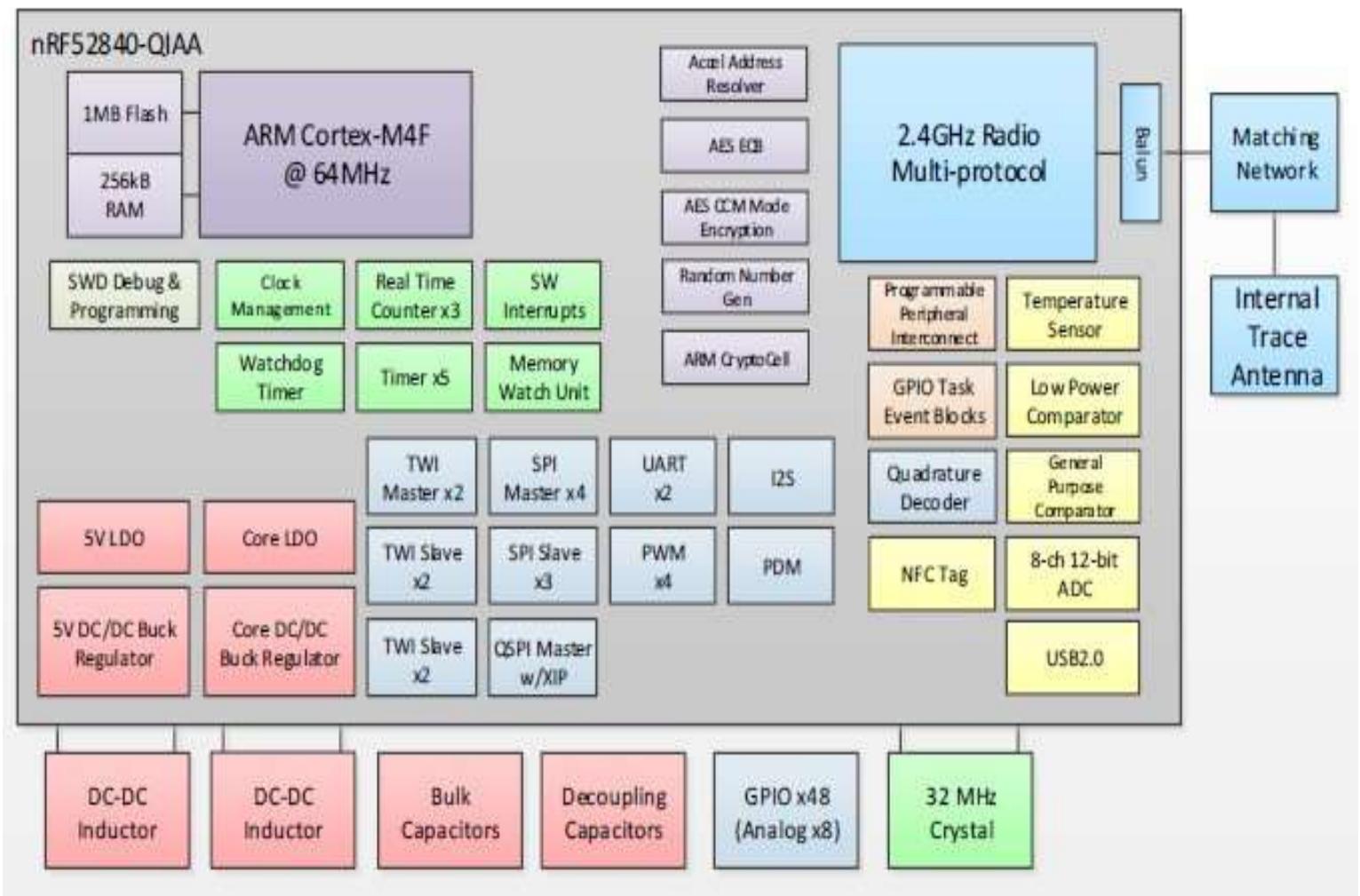# BLE-0101 Module Datasheet

Version 1.0

1. Description

The RYSE BLE0101 is an advanced, highly flexible, ultra-low power multiprotocol System on Module (SoM) that enables Bluetooth 5 low energy and IEEE 802.15.4 (Thread and Zigbee) connectivity for portable, and extremely low power embedded systems. With an Arm® Cortex®-M4 with FPU processor, integrated 2.4G Hz transceiver, and an integrated antenna, the BLE0101 provides a complete RF solution allowing faster time to market with reduced development costs. Providing full use of the Nordic Semiconductor nRF52840's capabilities and peripherals, the BLE0101 can power the most demanding applications, all while simplifying designs and reducing BOM costs. The BLE0101 is an ideal solution for designs that require Bluetooth 5 features or 802.15.4 based networking for Thread and Zigbee. Increased integration with built in USB and 5.5 V compatible DC/DC supply reduces design complexity and BOM cost, while expanding possible applications. BLE0101 designs are footprint compatible with the BMD-300/301/330/360, providing low-cost flexibility for tiered product lineups.

2. Key features

- Based on the Nordic Semiconductor nRF52840 SoC
- Bluetooth 5 PHYs: LE 1M, LE 2M, and LE Coded (long range)
- Bluetooth 5 features: Advertising Extensions, Channel Selection Algorithm #2
- Bluetooth mesh
- IEEE 802.15.4 with Thread and Zigbee support
- Complete RF solution with an integrated PCB antenna
- Integrated DC-DC converter
- No external components required
- Arm® Cortex®-M4 with FPU 32-bit processor
- Arm® TrustZone® Cryptocell 310 security
- True random number generator
- Serial Wire Debug (SWD)
- Nordic Semiconductor SoftDevice ready
- 1 MB embedded flash memory
- 256 KB RAM
- 48 General Purpose I/O Pins
- 12-bit/200 KSPS ADC
- One Full-Speed USB (12 Mbps)
- Four SPI Master/Slave (8 Mbps)
- Quad SPI with Execute in Place (XIP)
- PWM 4 blocks x 4-channels each
- General Purpose and Low power comparators
- Temperature sensor
- Two 2-wire Master/Slave (I2C compatible)
- I2S audio interface
- Two UARTs (w/ CTS/RTS and DMA)
- 20-channel CPU independent Programmable Peripheral Interconnect (PPI)
- Quadrature Demodulator (QDEC)
- 5 x 32 bit timer/counters
- 3 x 24 bit Real Timer Counters (RTC)
- NFC-A tag interface for OOB pairing
- Dimensions: 15.0 x 10.2 x 1.9 mm

3. Block Diagram

3.1 Specifications

Bluetooth	
Version	Bluetooth 5 Low Energy, Concurrent Central & Peripheral (S140) Coded PHY (Long Range), 2Mbps & 1Mbps PHY, Advertising Extensions, Improved Coexistence
Security	AES-128
LE connections	Concurrent central, observer, peripheral, and broadcaster roles with up to twenty concurrent connections along with one Observer and one Broadcaster (S140)

IEEE 802.15.4	
Thread Stack	OpenThread, Thread 1.1 certified
Thread Security	Thread Security AES-128, ARM® Cryptocell accelerated
Zigbee Stack	Zigbee 3.0

Radio	
Frequency	2.360GHz to 2.500GHz
Modulations	GFSK at 1 Mbps and 2Mbps, QPSK at 250kbps
Transmit power	+8 dBm maximum
Receiver sensitivity	-96 dBm (BLE mode)
Antenna	Integrated (-1dBi max gain)

Current Consumption	
TX only @ +8 dBm, 0 dBm @ 3V, DCDC enabled	14.8 mA, 4.8 mA
TX only @ +8 dBm, 0 dBm	32.7 mA, 10.6 mA
RX only @ 1 Mbps @ 3V, DCDC enabled	4.6 mA
RX only @ 1 Mbps	9.9 mA
CPU @ 64MHz from flash, from RAM	6.3 mA, 5.2mA
CPU @ 64MHz from flash, from RAM @ 3V, DCDC enabled	3.3 mA, 2.8mA
System Off, On (Supply on VDD), no RAM retention	0.4 µA, 0.97 µA
System Off, On (Supply on VDD), full 256kB RAM retention	1.86 µA, 2.35µA

Dimensions		
BMD-340	Length	15.0 mm ± 0.3 mm
	Width	10.2 mm ± 0.3 mm
	Height	1.9 mm ± 0.1 mm

Hardware		
Interfaces	SPI Master/Slave x4 Quad SPI x1 UART x2 Two-Wire Master/Slave (I2C) x2 GPIO x48	I2S x1 PWM x12 PDM x1 USB 2.0 x1 Analog input x8
Power supply	VDD: 1.7V to 3.6V, 1.75V required to start DCDC VDDH: 2.5V to 5.5V VBUS: 4.35V to 5.5V (For USB operation)	
Temperature Range	-40°C to +85°C	

Certifications	
USA (FCC)	FCC part 15 modular certification FCC ID: 2AA9B10
Canada (IC)	Industry Canada RSS-210 modular certification IC: 12208A-11
Europe (CE)	EN 60950-1: A2:2013 3.1 (a): Health and Safety of the User EN 301 489-1 V2.1.1 & 3.1 (b): Electromagnetic Compatibility EN 301 489-17 V3.1.1 EN 300 328 V2.1.1 3.2: Effective use of spectrum allocated
Australia / New Zealand (RCM)	AS/NZS 4268:2017, Radio equipment and systems – Short range devices
Bluetooth	BMD-340 RF-PHY Component (Tested) – DID: D040773; QDID: 95452

Export	
BMD-350	ECCN: 5A992.C, Exception 740.17(b)(1) HTS: 8473.30.1180

Nordic Semiconductor nRF52840	
Additional details	nRF52840 Product Specification Software Development Kit

4. Pin-Out Information
4.1. PinOut Diagram(Top view)
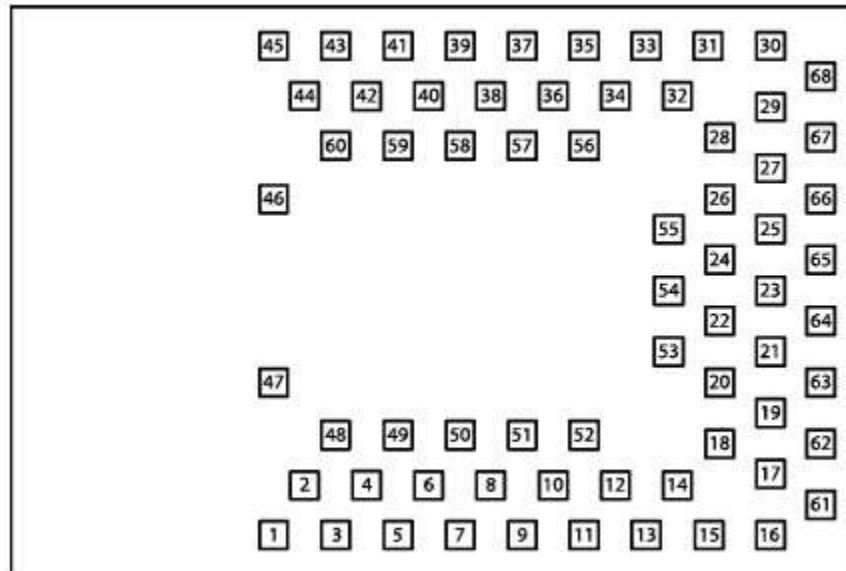
4.2 Pin Definations

Pin	Name	Direction	Description
6	P0.25	In/Out	GPIO
7	P0.26	In/Out	GPIO
8	P0.27	In/Out	GPIO
9	P0.28	In/Out	GPIO/AIN4[2]
10	P0.29	In/Out	GPIO/AIN5[2]
11	P0.30	In/Out	GPIO/AIN6[2]
12	P0.31	In/Out	GPIO/AIN7[2]
13	P0.00	In/Out	GPIO/XTAL1 (32.768kHz)
14	P0.01	In/Out	GPIO/XTAL2 (32.768kHz)
15	P0.02	In/Out	GPIO/AIN0[2]
19	P0.03	In/Out	GPIO/AIN1[2]
20	P0.04	In/Out	GPIO/AIN2
21	P0.05	In/Out	GPIO/AIN3
22	P0.06	In/Out	GPIO
23	P0.07	In/Out	GPIO/TRACECLK
24	P0.08	In/Out	GPIO
25	P0.09	In/Out	GPIO/NFC1[2]
26	P0.10	In/Out	GPIO/NFC2[2]
27	P0.11	In/Out	GPIO/TRACEDATA[2]
28	P0.12	In/Out	GPIO/TRACEDATA[1]
31	P0.13	In/Out	GPIO
32	P0.14	In/Out	GPIO
33	P0.15	In/Out	GPIO
34	P0.16	In/Out	GPIO

Pin	Name	Direction	Description
35	P0.17	In/Out	GPIO
36	P0.21	In/Out	GPIO
37	P0.19	In/Out	GPIO
38	P0.20	In/Out	GPIO
39	P0.18	In/Out	GPIO/$\overline{\text{RESET}}$
40	P0.22	In/Out	GPIO
41	P0.23	In/Out	GPIO
42	P0.24	In/Out	GPIO
43	SWCLK	In	SWD Clock
44	SWDIO	In/Out	SWD IO
48	P1.05	In/Out	GPIO[2]
49	P1.06	In/Out	GPIO[2]
50	P1.07	In/Out	GPIO[2]
51	P1.08	In/Out	GPIO
52	P1.09	In/Out	GPIO/TRACEDATA[3]
53	P1.10	In/Out	GPIO[2]
54	P1.11	In/Out	GPIO[2]
56	P1.00	In/Out	GPIO/TRACEDATA[0]/SWO
57	P1.01	In/Out	GPIO[2]
58	P1.02	In/Out	GPIO[2]
59	P1.03	In/Out	GPIO[2]
60	P1.04	In/Out	GPIO[2]
61	P1.12	In/Out	GPIO[2]
62	P1.13	In/Out	GPIO[2]
63	P1.14	In/Out	GPIO[2]
64	P1.15	In/Out	GPIO[2]
67	USB-D-	In/Out	USB Data -
68	USB-D+	In/Out	USB Data +
66	VBUS	Power	USB PHY supply: 4.35V to 5.5V in Connect to USB Host device 5V supply
17	VCC1	Power In/Out	LV Mode: 1.7V to 3.6V in HV Mode: 1.8V to 3.3V supply out3
65	VCCH1	Power	LV Mode: Connect to VCC HV Mode: 2.5V to 5.5V in
1, 2, 3, 4, 5, 16, 18, 29, 30, 45, 46, 47, 55	GND	Power	Electrical Ground

Note 1: An internal 4.7µF bulk capacitor is included on the module. However, it is good design practice to add additional bulk capacitance as required for your application, i.e. those with heavy GPIO usage and/or current draw.

Note 2: These pins are in close proximity to the nRF52 radio power supply and antenna pins. Radio performance parameters, such as sensitivity, may be affected by high frequency digital I/O with large sink/source current on these pins. Nordic recommends using only low frequency, low-drive functions when possible.

Note 3: In HV mode, VCC acts as a regulated supply that can power other external devices. The voltage output of VCC can be configured in software but is limited to no more than VCCH-0.3V. In System Off mode VCC can supply no more than 1mA.

5. Mechanical Drawing and Specifications

RF KEEPOUT

PAD DIMENSIONS: 0.50 X 0.50 mm