

## Bluetooth<sup>®</sup> 5.0 Low Energy Single Mode Class 1 SoC USB Serial Dongle

### nBlue<sup>™</sup> BR-MUSB-LE5.0-S1A (nRF52840)

- **AT HOME. AT WORK. ON THE ROAD. USING BLUETOOTH LOW ENERGY WIRELESS TECHNOLOGY MEANS TOTAL FREEDOM FROM THE CONSTRAINTS AND CLUTTER OF WIRES IN YOUR LIFE.**
- FCC, IC, CE, RoHS, and Bluetooth<sup>®</sup> 5.0 Certified ISM 2.4GHz module supporting Bluetooth<sup>®</sup> 5.0 high speed mode, long range mode and advertising extensions. Can also support Bluetooth Mesh, 802.15.4 for Thread and Zigbee, ANT or proprietary 2.4Ghz.
- Utilizes the Nordic nRF52840 SoC. 64Mhz ARM<sup>®</sup> Cortex<sup>™</sup> M4F 32-bit processor with FPU, 1MB Flash, 256K RAM, built in DC-DC converter and ARM CryptoCell cryptographic accelerator.
- Programmable output power from -40dBm to +8dBm for short to long range applications.
- Over 500 meter line of site distance with integrated antenna. External antenna can be connected to RF\_OUT pad or through optional u.FL connector (requires moving RF path resistor).
- Can be externally controlled via simple ASCII AT commands over UART, USB and Bluetooth, or programmed with custom applications embedded in the module.
- LED status indicators: PIO2 Bluetooth Connection (blue), PIO5 Slave status (green), PIO7 Sleep status (orange) PIO8 AT command received (red).
- USB 2.0 CDC ACM virtual serial port, no custom software driver installation required.  
Included: translucent blue ABS plastic enclosure. 30(L) X 18(W) X 10(H)mm (1.2" X 0.71" X 0.40")



nBlue<sup>™</sup> BR-MUSB-LE5.0-S1A module



## FEATURES

- Peripherals: Full-speed USB 2.0 controller, UART (2 or 4 wire with CTS/RTS, 9600 to 921.6K baud), I2C, I2S, SPI (32MHz), QSPI (32MHz), PWM, PDM, AES, 8 channel 12-Bit ADC, comparator, quadrature decoder, temperature sensor, real time counter, watchdog timer, 46 PIOs. Integrated 32kHz crystal.
- Type 2 Near Field Communication (NFC-A) Tag support. (External antenna required.)
- Very low power consumption: 14.8mA at +8dBm TX, 4.6mA RX, 3.4uA sleep, and 0.4uA shutdown.
- Secure and robust communication link:
  - ✓ FHSS (Frequency Hopping Spread Spectrum)
  - ✓ 24-bit CRC Error correction for guaranteed packet delivery
  - ✓ AES-128 bit encryption using CCM for encryption and authentication of packets.
  - ✓ LE Secure Connections Pairing using the Elliptic-Curve Diffie-Hellman (ECDH) algorithm.
- Free iOS & Android libraries and applications. Supports iBeacon.

## SOFTWARE

- Integrated AT.s command stack for external control via UART or RF, with Bluetooth 5.0 support, BRSP serial profile, battery (BAS) profile and device information (DIS) profile. BRSP allows the user to stream data over LE similar to the way SPP works on Classic Bluetooth devices – now with throughput up to 50kBps.
- Bootloader allows updates to be done Over-the-Air (with no external flash required), over the UART or over USB. Clients should make hardware accommodations for upgrading firmware on custom designs since modules shipped

from the factory in tape and reel cannot be guaranteed to contain the latest AT.s firmware. **Be sure to update the AT.s firmware regularly to ensure compliance.** Firmware updates can be found by going to <http://www.blueradios.com/forum/> in the *Bluetooth 5.0 Low Energy Modules » AT.s Firmware » BR-LE5.0-S1 AT.s Firmware* section.

- Nordic Semiconductor nRF5 SDK available for custom embedded applications. Available embedded *Bluetooth* Profiles include: ANS, Apple ANCS, BAS, BPS, CSCS, CTS, Nordic DFU, DIS, Eddystone ESCS, GLS, HIDS, HRS, HTS, IAS, IPSP, LBS, LLS, Nordic NUS, RSCS, TPS.
- Also available from Nordic Semiconductor: nRF5 SDK for Mesh for *Bluetooth* Mesh development and nRF5 SDK for Thread and Zigbee 802.15.4 development.
- BRSP Service Library for nRF5 SDK (Coming Soon) to add BRSP service support to custom embedded applications.
- Apple iOS and Android libraries, as well as a data terminal example application (nBlueTerm - with source code) provided free of charge. nBlueTerm supports connect, disconnect, pairing and sending data over BRSP.

## SPECIFICATIONS SUMMARY (Module only)

### Operating Conditions Summary

Item	Specifications
Supply voltage (VDD)	1.7-3.6 V
VDD Supply rise time (0V to 1.7V)	60ms
Supply voltage (VDDH – Optional)	2.5-5.5 V
VDDH Supply rise time (0V to 3V)	1ms
Supply voltage (VBUS - Optional)	4.35-5.5 V
Supply ripple	100 mV Max
Max I/O pin voltage	VDD + .3V, 3.9V Max ( <b>Not 5V Tolerant</b> )
Ambient Temperature Range	-40 – 85 °C

### Sleep Mode Consumption Summary

TA = 25°C, VDD = 3 V, LDO regulator (Data from nRF52840 Product Specification v1.0)

Item	Specifications
Shutdown Mode (No RAM retention, Wake on Reset)	0.4 µA
Sleep Mode (No RAM retention, Wake on any event)	0.97 µA
Sleep Mode (Full RAM retention, Wake on any event)	2.35 µA
Sleep Mode (No RAM retention, Wake on RTC)	1.5 µA
Sleep Mode (No RAM retention, Wake on RTC)	3.16 µA

### CPU Current Consumption Summary

TA = 25°C, VDD = 3 V, DCDC regulator enabled (Data from nRF52840 Product Specification v1.0)

Item	Specifications
CPU executing CoreMark (Running from RAM)	2.8 mA
CPU executing CoreMark (Running from Flash)	3.3 mA

### Radio Current Consumption Summary

TA = 25°C, VDD = 3.3 V, DCDC regulator enabled (Data from nRF52840 Product Specification v1.0)

Item	Specifications
Radio RX Current (1Mbps BLE Mode)	4.6 mA
Radio RX Current (2Mbps BLE Mode)	5.2 mA
Radio TX Current	
8 dBm	14.8 mA
4 dBm	9.6 mA
0 dBm	4.8 mA
-4 dBm	3.3 mA
-8 dBm	3.1 mA
-12 dBm	3.0 mA
-16 dBm	2.8 mA
-20 dBm	2.7 mA
-40 dBm	2.3 mA

### AT.s Current Consumption Summary

TA = 25°C, VDD = 3.3 V, DCDC regulator enabled (Data measured on BR-LE5.0-S1A module running AT.s 5.0.2.0-S1)

Item	Specifications
Shutdown Mode	~0.4 µA
Sleep Mode	~3.4 µA
Sleep Mode, Default Advertising at 100ms Interval, 0dB	~140 µA
Sleep Mode, Default Advertising at 100ms Interval, 8dB	~240 µA
Idle	~625 µA
Default Advertising at 100ms Interval, 0dB	~750 µA
Default Advertising at 100ms Interval, 8dB	~850 µA

### RF Specifications Summary

Item	Specifications
Frequency	2402 – 2480 MHz in 2 MHz steps
Data Rate	2Mbps, 1Mbps, 500kbps, 125kbps
Number of Channels	40: 37 data / 3 advertising (0,12,39)
Receive Sensitivity	-103 (125kbps BLE Mode), -95dBm (1Mbps BLE Mode), -92 (2Mbps BLE Mode)
Output Power	-40 to +8 dBm
Link Budget	Up to 111dB

For complete specifications of the nRF52840 see the nRF52840 Product Specification:

[https://www.nordicsemi.com/DocLib/Content/Product\\_Spec/nRF52840/latest/keyfeatures\\_html5](https://www.nordicsemi.com/DocLib/Content/Product_Spec/nRF52840/latest/keyfeatures_html5)

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## DEBUGGING

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Debugging is done through a two-pin serial wire debug (SWD) interface. A debugger is only needed for programming/debugging a custom application and is not necessary for using the AT.s command set. If a debugger is needed a Segger J-Link can be used, or for a more cost effective option a Nordic PCA10056 nRF52840 development board can be used. The PCA10056 has a J-Link built in and can connect to an external board using its P19 Debug out header.

J-Link: [https://shop-us.segger.com/DebugProbe\\_s/40.htm](https://shop-us.segger.com/DebugProbe_s/40.htm)

PCA10056: <https://www.nordicsemi.com/Software-and-Tools/Development-Kits/nRF52840-DK>

**A debugger is only needed for writing a custom application for a module and not using the AT.s command set, AT.s firmware can be updated without a debugger.**

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## ORDERING INFORMATION

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Pricing and ordering information can be found at:

[http://www.blueradios.com/orderinfo\\_new.htm](http://www.blueradios.com/orderinfo_new.htm)

### PART NUMBER

BR-MUSB-LE5.0-S1A

*Bluetooth Low Energy Single Mode with Antenna*

### STANDARD PACKAGING

Bulk

### DEVELOPMENT KIT (BR-EVAL-LE5.0-S1A)

Development kit available containing everything required to set up a connection quickly and evaluate range and performance of the BR-LE5.0-S1A: [http://www.blueradios.com/hardware\\_EVAL-LE5.0-S1A.htm](http://www.blueradios.com/hardware_EVAL-LE5.0-S1A.htm)

### CUSTOM FIRMWARE

The AT.s command interface can be modified for high volume customers and custom embedded software development is available upon request

### ADDITIONAL DOCUMENTATION

Complete Documentation can be found at: <http://www.blueradios.com/forum>.

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