Bluetooth® 4.0 Dual Mode Low Energy Class 1 SoC XBee® Foot Print
BlueBridge™ BR-XB-LE4.0-D2A

OUTLINE

- 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.

- Contains BR-LE4.0-D2A module

Wireless data communications 20 pin DIP device 24.38(W) X 27.62(L) X 3.89(H) mm

- Includes integrated ceramic antenna and Vcc filter caps

- Utilizes the TI MSP430F5438A with 256K Flash, 16K RAM and the TI CC2564 baseband.

- Includes integrated software stack, profiles, and AT modem like commands.

- Code space in Texas Instruments MSP430F5438A for client applications (100Kb Flash, 4Kb RAM) Baseband is TI dual mode CC2564

- Supports both Low Energy and Classic 2.1 BR/EDR Bluetooth.

- The BR-LE4.0-D2 dual mode module has the same footprint as the nBlue single mode modules and is pin for pin compatible with the exception of a few extra PIOs.

- Embedded Bluetooth stack protocols and profiles (Master/Slave) included (requires no host MCU stack): SPP, GAP, GATT, SMP, ATT, L2CAP, BAS, BLP, BLS, DIS, FMP, ANP, HIDS, HOGP, HID, HTP, HTS, HRP, HRS, IOP, IAS, LLS, PASP, PXP, SCPP, SCPS, TIP, TPS, and BRSP.

FEATURES

- nBlue serial radio modems can be configured, commanded, and controlled via simple ASCII strings on generic profiles or using “C” library calls with custom applications embedded onto the unit.

- UART hand shaking speeds: 9600bps up to 460.8Kbps. Default is 115200bps

- +300 meters over SPP estimated distance (LOS)

- Software adjustable transmitter power from short to long range applications

- Programmable Input Output (PIO's)

- Operating temperature range: -40°C to ~+85°C

- Secure and robust communication link
  - FHSS (Frequency Hopping Spread Spectrum)
  - 128 bit encryption, and 16 alphanumeric Personal Identification Number (PIN)
  - Error correction schemes for guaranteed packet delivery

- Free iOS & Android libraries and applications. Supports iBeacons
FIRMWARE OPTIONS

1. AT.s Command Set for external control via UART or RF.
2. Stonestreet One Bluetopia stack for custom embedded applications, which requires either the MSP430 IAR Systems Compiler or TI Code Composer Studio.

DIMENSIONS

- BR-XB-LE4.0-D2A (with Ceramic Antenna) 2 dBi TDK ANT8030-2R4-01
- BR-XB-LE4.0-D2U (U.FL)
- BR-XB-LE4.0-D2W (Whip Antenna)

Keep Out Area. DO NOT locate any parts or copper in Keep Out Area on any layer. (Chip Antenna Configuration Only)

Mating Through Hole Connector:
- Digikey P/N: S5751-10-ND
- Manufacturer: Sullins Connector Solutions
- Man. P/N: NPPN101BFCN-RC

Mating Surface Mount Connector:
- Digikey P/N: S5901-10-ND
- Manufacturer: Sullins Connector Solutions
- Man. P/N: NPPN101BFLC-RC

<table>
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<tr>
<th>TERMINALS</th>
<th>1. VCC (2.4-3.6Vdc)</th>
<th>2. DOUT</th>
<th>3. DIN</th>
<th>4. PIO 9</th>
<th>5. RESET</th>
<th>6. PIO 8</th>
<th>7. PIO 0</th>
<th>8. PIO 14</th>
<th>9. PIO 3</th>
<th>10. GND</th>
<th>11. ADC1</th>
</tr>
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</table>
Part is not 5Vdc tolerant.
Reset is active low; pulse 1usec. (min)
INPUTS – Schmitt Trigger
OUTPUTS – Reduced Drive Strength
NOTE: Please refer nBlue User’s guide for more information (D2 PIO Specification Summary 3.4.2)

Power-up Sequence

Power management sleep modes:

Refer to BR-LE4.0-D2A module spec.

### SMD Module Cross Reference Table

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<th>BR-XX-S1 BLE</th>
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<th>BR-XX-S2 BLE</th>
<th>BR-XX-D2 BT/BLE</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>VCC (3.3V)</td>
<td>3.3V</td>
<td>3.3V</td>
<td>3.3V</td>
<td>3.3V</td>
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<tr>
<td>2.</td>
<td>DOUT UART TX</td>
<td>UART_TX</td>
<td>UART_TX</td>
<td>UART_TX</td>
<td>UART_TX</td>
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<tr>
<td>3.</td>
<td>DIN UART RX</td>
<td>UART_RX</td>
<td>UART_RX</td>
<td>UART_RX</td>
<td>UART_RX</td>
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<tr>
<td>4.</td>
<td>PIO 9 NC</td>
<td>PIO 9</td>
<td>PIO 9</td>
<td>PIO 9</td>
<td>PIO 9</td>
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<td>5.</td>
<td>RESET RESET</td>
<td>RESET</td>
<td>RESET</td>
<td>RESET</td>
<td>RESET</td>
</tr>
<tr>
<td>6.</td>
<td>PIO 8 NC</td>
<td>PIO 8</td>
<td>PIO 8</td>
<td>PIO 8</td>
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<tr>
<td>7.</td>
<td>PIO 0 PIO 0</td>
<td>PIO 0/ADC0</td>
<td>PIO 0/ADC0</td>
<td>PIO 0/ADC0</td>
<td>PIO 0/ADC0</td>
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<tr>
<td>8.</td>
<td>PIO 14 NC</td>
<td>NC</td>
<td>NC</td>
<td>PIO 14</td>
<td>PIO 14</td>
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<tr>
<td>9.</td>
<td>PIO 3 PIO 3</td>
<td>PIO 3</td>
<td>PIO 3</td>
<td>PIO 3</td>
<td>PIO 3</td>
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<tr>
<td>10.</td>
<td>GND GND</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
</tr>
<tr>
<td>11.</td>
<td>ADC1 NC</td>
<td>PIO 1/ADC1</td>
<td>PIO 1/ADC1</td>
<td>PIO 1/ADC1</td>
<td>PIO 1/ADC1</td>
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<tr>
<td>12.</td>
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<td>UART_CTS</td>
<td>UART_CTS</td>
<td>UART_CTS</td>
<td>UART_CTS</td>
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<tr>
<td>13.</td>
<td>SLEEP PIO 5</td>
<td>PIO 5</td>
<td>PIO 5</td>
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<td>14.</td>
<td>VREF PIO 6</td>
<td>PIO 6</td>
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<td>PIO 6</td>
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<td>15.</td>
<td>PIO 2 PIO 2</td>
<td>PIO 2</td>
<td>PIO 2</td>
<td>PIO 2</td>
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<tr>
<td>16.</td>
<td>RTS UART_RTS</td>
<td>UART_RTS</td>
<td>UART_RTS</td>
<td>UART_RTS</td>
<td>UART_RTS</td>
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<tr>
<td>17.</td>
<td>ADC2 SPI MISO</td>
<td>SPI MISO / ADC2</td>
<td>SPI MISO</td>
<td>SPI MISO / ADC2</td>
<td>SPI MISO</td>
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<tr>
<td>18.</td>
<td>ADC3 SPI MOSI</td>
<td>SPI MOSI / ADC3</td>
<td>SPI MOSI</td>
<td>SPI MOSI / ADC3</td>
<td>SPI MOSI</td>
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<tr>
<td>19.</td>
<td>ADC4 SPI CSB</td>
<td>SPI CSB / ADC4</td>
<td>SPI CSB</td>
<td>SPI CSB / ADC4</td>
<td>SPI CSB</td>
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<tr>
<td>20.</td>
<td>ADC5 SPI CLK</td>
<td>SPI CLK / ADC5</td>
<td>SPI CLK</td>
<td>SPI CLK / ADC5</td>
<td>SPI CLK</td>
</tr>
</tbody>
</table>

** NOTE: Please refer to nBlue Module User’s Guide for IO alternative function

### Firmware Options

- AT Command API.
- Libraries to compiler in custom “C” Applications

PIO_4 and PIO_7 have dual modes and when not used for programming inputs.

**Note:** Keep metallic components, connectors, copper traces, internal layers, and ground planes away from the ceramic chip antenna area in 3D space!
AT-Style Commands Reference (BlueRadios AT.s Command Set)

In LE, GAP defines four specific roles: Broadcaster, Observer, Peripheral, and Central. A device may support multiple LE GAP roles provided that the underlying Controller supports those roles or role combinations. However, only one LE GAP role may be supported at a given time. Each role specifies the requirements for the underlying Controller. This allows for Controllers to be optimized for specific use cases.

The Broadcaster role is optimized for transmitter only applications. Devices supporting the broadcaster role use advertising to broadcast data. The broadcaster role does not support connections. The Observer role is optimized for receiver only applications. Devices supporting the observer role are the complementary device for a broadcaster and receives broadcast data contained in advertisements. The observer role does not support connections. The Peripheral role is optimized for devices that support a single connection and are less complex than central devices. Devices supporting the peripheral role only require Controllers that support the Controller’s slave role. The Central role supports multiple connections and is the initiator for all connections with devices in the peripheral role. Devices supporting the central role require a Controller that supports the Controller’s master role and generally supports more complex functions compared to the other LE GAP roles.

DEBUGGING

SBWTCK (TEST) and SBWTDIO (Reset) allow the module to be connected to a TI MSP-FET430UIF for debugging and programming via SPY-Bi Wire. See the MSP-FET430UIF User’s Guide for more information http://www.ti.com/lit/ug/slau278j/slau278j.pdf.

An nBlue Interface Board (IB) is also available and allows the user to debug, program, update firmware and have UART communications with any of the nBlue modules through a single or double row 10 pin header. See the nBlue Module User’s Guide for more information.

A MSP-FET430UIF is only needed for writing a custom application for a module and not using the AT.s command set.
ORDERING INFORMATION

Pricing and ordering information can be found at:
http://www.blueradios.com/orderinfo_new.htm

**BR-XB-LE4.0-D2#**

BR = BlueRadios  
XB = XBee® 20 pin footprint  
LE = Low Energy  
4.0 = Bluetooth LE version  
D = Dual Mode BT2.1/BLE  
2 = Version  

# = A (Antenna), built to order, not a stock item  
# = U (U.FL RF Connector), built to order, not a stock item  
# = W (Whip Antenna), built to order, not a stock item

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tr>
<td>1) BR-XB-LE4.0-D2A</td>
<td>Bluetooth Low Energy v4.0 Single Mode with Ceramic Antenna</td>
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<tr>
<td>2) BR-XB-LE4.0-D2U</td>
<td>Bluetooth Low Energy v4.0 Single Mode with U.FL RF Connector</td>
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<tr>
<td>3) BR-XB-LE4.0-D2W</td>
<td>Bluetooth Low Energy v4.0 Single Mode Whip Antenna</td>
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</table>

Optional Evaluation Test Board  
Part number: BR-XB-TSB

Bluetooth Low Energy, part of Bluetooth Ver. 4.0, specifies two types of implementation: single mode and dual mode. Single mode chips implement the low energy specification and consume just a fraction of the power of classic Bluetooth, allowing the short-range wireless standard to extend to coin cell battery applications for the first time. Dual mode chips combine low energy with the power of classic Bluetooth and are likely to become a de facto feature in almost all new Bluetooth enabled cellular phones and computers.
Note: Single mode Bluetooth 4.0 Low Energy is not backwards compatible with previous Bluetooth standards. Dual mode Bluetooth 4.0 Low Energy is backwards compatible but is not practical for low power devices but targeted to gateway products.

DEVELOPMENT KIT (BR-EVAL-LE4.0-D2A)
Development kit available containing everything required to set up a connection quickly and evaluate range and performance of the BR-LE4.0-D2A: http://www.blueradios.com/hardware_EVAL-LE4.0-D2.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 OEM documentation can be found at: http://www.blueradios.com/forum. Requires proof of purchase.