

Lyra P - Bluetooth Module

Bluetooth 5.3
Model: 453-00147

FCC ID: 2BHVY-AMB1

The Lyra P is a module designed and built to meet the performance, security, and reliability requirements of battery powered IoT products running on Bluetooth networks.

Based on the Silicon Labs EFR32BG22 SoC, the Lyra P enables Bluetooth® Low Energy connectivity while delivering best-in-class RF range and performance, future-proof capability for feature and OTA firmware updates, enhanced security features, and low energy consumption.

Lyra P modules are a full solution that comes with fully upgradeable, robust software stacks, and world-wide regulatory certifications.

The Lyra P is intended for a broad range of applications, including:

- Asset Tags and Beacons
- Sports, Fitness, and Wellness devices
- Portable Medical
- Connected Home
- Industrial and Building Automation
- Bluetooth mesh Low Power Node

KEY FEATURES

- Bluetooth 5.3
- Bluetooth mesh Low Power Node
- Built-in antenna
- Up to 8 dBm TX power
- -98.9 dBm BLE RX sensitivity at 1 Mbps
- 32-bit ARM Cortex-M33 core at up to 76.8MHz
- 512/32 kB of Flash/RAM memory
- Optimal selection of MCU peripherals
- Up to 25 GPIO pins
- 12.9 mm x 15.0 mm

Table 1: Module Specifications

Operating Frequency

- 2400-2483.5 MHz

Power Consumption

- 32 Milliamps Nominal

Supported Protocols

- Bluetooth Low Energy (Bluetooth 5.3)
 - Direction finding
 - 1M, 2M, and LE Coded PHYs
- Bluetooth Mesh Low Power Node

Wireless System-on-Chip

- 2.4 GHz radio
- TX power up to +8 dBm
- High-performance 32-bit ARM Cortex-M33[®] with DSP instruction and floating-point unit for efficient signal processing
- 512 kB flash program memory
- 32 kB RAM data memory
- Embedded Trace Macrocell (ETM) for advanced debugging

High-Receiver Performance

- -106.7 dBm sensitivity (0.1% BER) at 125 kbps GFSK
- -102.5 dBm sensitivity (0.1% BER) at 500 kbps GFSK
- -98.9 dBm sensitivity (0.1% BER) at 1 Mbps GFSK
- -96.2 dBm sensitivity (0.1% BER) at 2 Mbps GFSK

Low-Energy Consumption

- 4.3 mA RX current at 1 Mbps GFSK
- 4.8 mA TX current at 0 dBm output power
- 10.6 mA TX current at 8 dBm output power
- 26 μ A/MHz in Active Mode (EM0)
- 1.40 μ A EM2 DeepSleep current (RTCC running from LFXO, Full RAM retention)

Regulatory Certifications

- FCC

Security Features

- Secure Boot with Root of Trust and Secure Loader (RTSL)
- Hardware Cryptographic Acceleration for AES128/256, SHA-1, SHA-2 (up to 256-bit), ECC (up to 256-bit), ECDSA, and ECDH
- True Random Number Generator (TRNG) compliant with NIST SP800-90 and AIS-31
- ARM[®] TrustZone[®]
- Secure Debug with lock/unlock

Output Power

- +8 dBm nominal

Operating Temperature

-40 to +105°C

Wide Operating Range

- 1.8 to 3.8 V

Dimensions

- 12.9 mm x 15.0 mm x 2.2 mm

Wide Selection of MCU Peripherals

- Analog to Digital Converter (ADC)
 - 12-bit @ 1 Msps
 - 16-bit @ 76.9 ksps
- Up to 25 General Purpose I/O pins with output state retention and asynchronous interrupts
- 8 Channel DMA Controller
- 12 Channel Peripheral Reflex System (PRS)
- 4 × 16-bit Timer/Counter with 3 Compare/Capture/PWM channels
- 1 × 32-bit Timer/Counter with 3 Compare/Capture/PWM channels
- 32-bit Real Time Counter
- 24-bit Low Energy Timer for waveform generation
- 1 × Watchdog Timer
- 2 × Universal Synchronous/Asynchronous Receiver/Transmitter (UART/SPI/SmartCard (ISO 7816)/IrDA/I²S)
- 1 × Enhanced Universal Asynchronous Receiver/Transmitter (EUSART)
- 2 × I²C interface with SMBus support
- Digital microphone interface (PDM)
- RFSense with selective OOK mode

Applicable Transmitter Rules:

USA: FCC 15.247
FCC 15 subpart B

Conditions for integration:

USA - FCC

This device complies with Part 15 of the FCC Rules when operating with the embedded antenna. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesirable operation.

Any changes or modifications not expressly approved by Sense Diagnostics could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.
- This transmitter meets the Mobile requirements at a distance of 0.5 cm and above from the human body, in accordance with the limit(s) exposed in the RF Exposure Analysis.
- This transmitter also meets the Portable requirements at distances equal or above those listed for convenience in Table 2 Minimum Separation Distances for SAR Evaluation.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

Table 2: Minimum separation distances for SAR evaluation exemption

Certification	Lyra P
FCC	Bluetooth LE: 5 mm

OEM Responsibilities to Comply with FCC Regulations

This module has been tested for compliance to FCC / 47 CFR part 15.247

OEM integrators are responsible for testing their end-product for any additional compliance requirements needed with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). Additionally, investigative measurements and spot checking are strongly recommended to verify that the full system compliance is maintained when the module is integrated, in accordance to the *Host Product Testing Guidance* in FCC's KDB 996369 D04 Module Integration Guide V01.

▪ **General Considerations**

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement. However, such requirement is typically applicable to the final host. Thus, the final host will still need to be reassessed for compliance to this portion of rule requirements, if applicable.

▪ **OEM/Host Manufacturer Responsibilities**

OEM / Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter



module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

Separation

- To meet the SAR exemption for portable conditions, the minimum separation distance indicated in [Table 3](#) must be maintained between the human body and the radiator (antenna) at all times.
- This transmitter module is tested in a standalone mobile RF exposure condition, and in case of any co-located radio transmitter being allowed to transmit simultaneously, or in case of portable use at closer distances from the human body than those allowing the exceptions rules to be applied, a separate additional SAR evaluation will be required, ultimately leading to a Class II Permissive Change, or more rarely to a new grant.

Important Note: In the event that these conditions cannot be met, then for the FCC authorization to remain valid the final product must undergo additional testing to evaluate the RF exposure, and a permissive change must be applied. The evaluation (SAR) is in the responsibility of the end-product's manufacturer, as well as the permissive change that can be carried out with the help of the customer's own Telecommunication Certification Body typically acting as the grant holder's agent.

End Product Labeling

Lyra P modules are labeled with their own FCC ID. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

Contains FCC ID: : 2BHVY-AMB1

Approved Antenna Information:

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna

Lyra P modules include a ceramic chip antenna on board with the characteristics detailed in Table 3.

Table 3: Antenna information

Parameter	With Optimal Layout	Note
Efficiency	-1 dB	Antenna efficiency, gain and radiation pattern are highly dependent on the application PCB layout and mechanical design.
Peak gain	1.86 dBi	

Power Supply

The Lyra P requires a single nominal supply level of 3.0 V to operate. All necessary decoupling and filtering components are included in the module.

Testing Requirements:

This modular transmitter is only authorized for the specific rule parts (i.e., FCC transmitter rules) listed above. The host product manufacturer (integrator) is responsible for compliance to any other rules that



apply to the host not covered by the modular transmitter grant of certification. The integrator is responsible for testing the final host product to applicable requirements for the combined product including host and module. For example, US 47 CFR Part 15 Subpart B compliance testing is required with the modular transmitter installed.

The Lyra P BGAPI DTM firmware allows BGAPI-formatted DTM commands (and not industry standard BT SIG DTM commands for BLE) which can be sent using a Silicon Labs tool called Bluetooth NCP commander Standalone (and within that, the RF Regulatory Test panel). This tool sends BGAPI DTM commands for the BLE radio. Contact us for more information on setting up testing of the module.

The integrator is responsible for verifying emissions of this modular transmitter in the host do not exceed applicable requirements. For additional requirements, see FCC KDB 996369 D04 Module Integration Guide.

Link to FCC modular transmitter requirements:

<https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=44637>

Changes to this Module:

There are no changes to be made by third parties.

Labeling Requirements:

Physical labels shall include the following text:

Model: 453-00147

FCC ID: 2BHVY-AMB1

IC: 3147A-LYRAP

User Manual Requirements:

The host product's users manual shall include the following required legal statements:

FCC Required Statements:

When to include:	Statement to include:
Always	<i>Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.</i>
Always	<i>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.</i>
15.109 Class B hosts only.	<i>Note: 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 or more of the following measures:</i>



	—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.
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Legal:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-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.

Note: 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 or more 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.

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