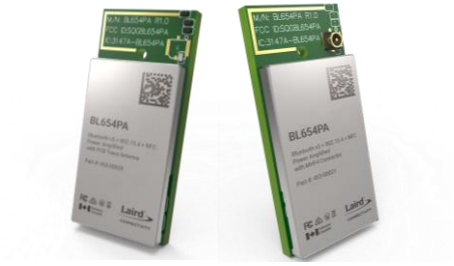
BL654 PA Series

Bluetooth® v5 Modules with Power Amplifier

SECURE, EXTENDED RANGE BLUETOOTH v5 FOR YOUR IOT DESIGN



Building on Laird's expertise with Nordic from the BL654 series comes the most powerful yet - the BL654 PA series! It provides OEMs with the maximum design flexibility and performance. A complete multi-protocol embedded wireless offering with exceptional processing capability, all with extended PA / LNA support for even greater range.

Powered by **Nordic's nRF52840** silicon, the small form factor BL654 PA modules and DVKs provide for a secure, robust BLE and **Cortex -M4F** CPU for any OEM's product design. The BL654 provides you with maximum development flexibility with programming options for a simple, intuitive **AT Command Set**, as well as Laird's own ***smart*BASIC** environment.

The BL654 PA series brings out all nRF52840 hardware features and capabilities including **USB access,** up to **5.5V** supply considerations, and builds in additional TX power capabilities via an **integrated Skyworks PA**. Complete regulatory certifications enable faster time to market and reduced development risk completes Laird's simplification of your next Bluetooth design!

- **Bluetooth v5** Bluetooth Low Energy (BLE) plus **NFC**
- **Widest range of configurable interfaces**: UART, I2C, SPI, ADC, GPIO, PWM, FREQ, USB, and NFC
- Industrial Temp Rating (-40º to +85º C)
- **Ultra-Small footprint** (22 mm x 10 mm x 2.2 mm)
- BLE Peripheral/Central roles with **DTM embedded**
- **2Mbps & LE Long Range:** Support for 2 Mbps, 1 Mbps, & 125 kps coded
- **Hostless operation** – Internal MCU reduces BOM
- **Powerful Core** Cortex-M4F (1 Mbit Flash, 256 k RAM)
- Built on years of experience with Nordic (BL600 & BL652 Series)
- **Fully featured development kit** everything needed to start BLE development
- **Application Design Choice:** Leverage Laird's *smart*BASIC or simple AT Command Set
- **Integrated Power Amplifier:** Up to +18 dBM output power (up to +14 dBm in LE Coded mode – 125 kbps PHY)

FEATURES AT A GLANCE

TRULY HOSTLESS OPERATION FOR AUTOMATED USE CASES

Combine on-module MCU, *smart*BASIC and simultaneous central/peripheral role support for a powerful hostless solution for sensor applications.

SPEED TO MARKET

Easily write event-driven, automated applications, no toolchain required with *smart*BASIC. Or utilize simple AT Command Set – design your way

EXTENDED POWER – INCREASED RANGE

Integrated Skyworks PA enables greater TX power capabilities and range – Bluetooth v5 just got even further!

GLOBAL APPROVALS – MAKE YOURSELF AT HOME

Carries several modular FCC, IC, RCM, Korea and Bluetooth SIG approvals.

PERSONAL SUPPORT FROM DESIGN TO MANUFACTURE

Laird's industry-renowned support is passionate about helping you speed your design to market.

APPLICATION AREAS

- IoT Devices and Sensors
- Beacons and Proximity Applications
- Secure Medical Peripherals
- Industrial Monitoring

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For documentation, software, sample apps and more visit:
http://www.lairdconnect.com/BL654-PA

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION
Wireless Specification	Bluetooth®	v5 – Single-Mode (Peripheral and Central Roles)
	Thread®	802.15.4 stack provided via Nordic SDK only
	Frequency	2.402 - 2.480 GHz
	Transmit Power	+ 18 dBm (maximum). Configurable down to -26 dBm + 14 dBm (maximum). Configurable down to -26 dBm **(LE CODED PHY mode only)**
	Receive Sensitivity	-98.5 dBm (typical @ BLE 1 Mpbs) -95 dBm (typical @ BLE 2 Mbps -107 dBm (typical @ BLE 125 kbps)
	Link Budget	116.5 dB (@ BLE I Mbps), 121 db (@ BLE 125 kpbs)
	Antenna Options	PCB Trace antenna or IPEX MHF4 RF Connector
	Raw Data Rates (Air)	1 Mbps, 2 Mbps, 125 kbps
Host Interface and Peripherals	UART Interface	TX, RX, CTS, RTS. DTR, DSR, DCD, RI possible in *smart*BASIC (GPIO) Default: 115200, N, 8, 1. Configurable from 1200 bps to 1 Mbps
	USB Interface	2 pins - CDC/Audio/HID & Mass storage virtual interfaces
	Other	46 multifunction GPIO's that can provide: ▪ 2 UART (4 GPIO pins each) ▪ 8 ADC channels (1 pin each) ▪ 2 I2C (2 GPIO pins each) ▪ 4 SPI Master (4 GPIO pins including CS each) ▪ 1 QSPI (6 GPIO pins) ▪ 2 PDM (2 GPIO pins each) ▪ 2 I2S (5 GPIO pins) ▪ 2 GPIO pins for 32.768kHz crystal ▪ 2 GPIO pins for NFC ▪ PWM output on 16 pins ▪ FREQ output on 16 pins
Key BLE Features	Bluetooth Low Energy	▪ GATT Client & GATT Server – Any Adopted / Custom Services ▪ Central / Peripheral Roles. ▪ Up to 20 BLE connections ▪ BLE Mesh ▪ CODED PHY ▪ 2M PHY ▪ LE Advertising Extensions ▪ LE Secure Connections ▪ Data Packet Length Extensions ▪ LE Privacy v1.2 ▪ LE Ping ▪ vSP – Virtual Serial Port
Programmability Options	*smart*BASIC	On-board BASIC programming language
	AT Command Set	Simple AT 'Hayes style' command protocol
FW upgrade		Via UART or JTAG
Supply Voltage		3.0V – 5.5V
Power Consumption	Current	Max Peak Radio Current (@ +18 dBm TX) – 102.2 mA (DCDC at 3V)
		Standby Doze – 5.9 µA
		Deep Sleep –2.0 µA (external signal wake up)
Physical	Dimensions	22 mm x 10 mm x 2.2 mm
Environmental	Temp Range	-40°C to +85°C
Miscellaneous	Lead Free	Lead-free and RoHS compliant
	Development Kit	Development board and free software tools
Development Tools	Utilities	UwTerminalX (Multi-platform) Android and iOS applications UART firmware upgrade
Qualifications	Bluetooth®	Complete Declaration ID
Regulatory	Approvals	FCC / IC / RCM / Korea

For full specifications on BL654 PA modules, please see the appropriate datasheet.

ORDERING INFORMATION

PART #	DESCRIPTION
453-00020R	Bluetooth v5 PA Module – Integrated Antenna (Tape / Reel)
453-00021R	Bluetooth v5 PA Module – IPEX MHF4 Antenna Connector (Tape / Reel)
453-00020C	Bluetooth v5 PA Module – Integrated Antenna (Cut Tape)
453-00021C	Bluetooth v5 PA Module – IPEX MHF4 Antenna Connector (Cut Tape)
455-00022	Development Board for Bluetooth v5 PA Module – Integrated Antenna
455-00023	Development Board for Bluetooth v5 PA Module – IPEX MHF4 Antenna Connector

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