

SECURE, EXTENDED RANGE BLUETOOTH v5.1 FOR YOUR IOT DESIGN



Building on Laird Connectivity's expertise with Nordic from the BL654 series comes the most powerful yet - the BL654PA 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 BL654PA modules and DVKs provide for a secure, robust Bluetooth Low Energy (LE) 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 Connectivity's own **smartBASIC** environment.

The BL654PA 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 Connectivity's simplification of your next Bluetooth design!

- **Bluetooth v5.1** Bluetooth LE plus **NFC**
- **Widest range of configurable interfaces:** UART, I2C, SPI, ADC, GPIO, PWM, FREQ, USB, and NFC
- Industrial Temp Rating (-40° to +85° C)
- **Ultra-Small footprint** (22 mm x 10 mm x 2.2 mm)
- Bluetooth LE Peripheral/Central roles with **DTM embedded**
- **2 Mbps & 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 Bluetooth LE development
- **Application Design Choice:** Leverage Laird Connectivity's *smartBASIC* 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, *smartBASIC* 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 *smartBASIC*. 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, ISED, RCM, Korea, AS/NZS, and Bluetooth SIG approvals.



PERSONAL SUPPORT FROM DESIGN TO MANUFACTURE

Laird Connectivity'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

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION
Wireless Specification	Bluetooth®	v5.1 – 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 @ Bluetooth LE 1 Mbps) -95 dBm (typical @ Bluetooth LE 2 Mbps) -107 dBm (typical @ Bluetooth LE 125 kbps)
	Link Budget	116.5 dB (@ Bluetooth LE 1 Mbps), 121 db (@ Bluetooth LE 125 kbps)
	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 <i>smartBASIC</i> (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: <ul style="list-style-type: none"> ▪ 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 Bluetooth LE Features	Bluetooth Low Energy	<ul style="list-style-type: none"> ▪ GATT Client & GATT Server – Any Adopted / Custom Services ▪ Central / Peripheral Roles. ▪ Up to 20 Bluetooth LE connections ▪ Bluetooth LE 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	<i>smartBASIC</i>	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, ISED, RCM, Korea, AS/NZS

For full specifications on BL654PA 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