

SECURE, POWERFUL WIRELESS ENGINE FOR YOUR IOT DESIGN



Building on Laird's expertise with Nordic from the BL600 and BL652 series comes the most powerful yet - the BL654 series! It provides OEMs with the maximum design flexibility and performance. A complete multi-protocol embedded wireless offering with exceptional processing capability, all at a micro power budget.

Powered by **Nordic's nRF52840** silicon, the small form factor BL654 modules, DVKs and USB Dongle 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 the **Nordic SDK**, a simple, intuitive **AT Command Set**, as well as Laird's own **smartBASIC** environment.

The BL654 series brings out all nRF52840 hardware features and capabilities including **USB access**, up to **5.5V** supply considerations, and **802.15.4 (Thread)** implementation. 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**
- **802.15.4** functionality (Thread & ZigBee via Nordic SDK)
- **Widest range of configurable interfaces:** UART, I2C, SPI, ADC, GPIO, PWM, I2C, USB, and NFC
- Industrial Temp Rating (-40° to +85° C)
- **Ultra-Small footprint** (15mm x 10mm x 2.2mm)
- BLE Peripheral/Central roles with DTM embedded
- **2Mbps & LE Long Range:** Support for 2Mbps, 1Mbps, & 125kps coded
- **Hostless operation** – Internal MCU reduces BOM
- **Powerful Core** Cortex-M4F (1Mbit Flash, 256k 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 *smartBASIC*, simple AT Command Set or utilize Nordic SDK directly.
- **USB Dongle option:** Packaged USB Adapter – bring full Bluetooth v5 connectivity to ANY device with a virtual COM port capability

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 the Nordic SDK directly – design your way



EXTREMELY EFFICIENT POWER MANAGEMENT

Customize to balance throughput with power usage, enabled by ultra-low power sleep mode.



GLOBAL APPROVALS – MAKE YOURSELF AT HOME

Carries several modular FCC, IC, CE, RCM, MIC 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

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION	
Wireless Specification	Bluetooth®	v5 – Single-Mode (Peripheral and Central Roles)	
	Thread®	802.15.4 stack provided via Nordic SDK	
	Frequency	2.402 - 2.480 GHz	
	Transmit Power	+ 8 dBm (maximum). Configurable down to -40 dBm	
	Receive Sensitivity		-95 dBm (typical @ BLE 1 Mbps)
			-92 dBm (typical @ BLE 2 Mbps)
			-103 dBm (typical @ BLE 125 kbps)
		Link Budget	103 dB (@ BLE 1 Mbps), 111 db (@ BLE 125kbps)
	Antenna Options	PCB Trace antenna or IPEX MHF4 RF Connector	
	Raw Data Rates (Air)	1 Mbps, 2 Mbps, 125kbps	
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	48 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 BLE Features	Bluetooth Low Energy	<ul style="list-style-type: none"> ▪ 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	<i>smartBASIC</i>	On-board BASIC programming language	
	AT Command Set	Simple AT 'Hayes style' command protocol	
	Nordic SDK	Software / Support available from Nordic directly	
FW upgrade		Via UART or JTAG	
Supply Voltage		1.7V – 5.5V	
Power Consumption	Current	Max Peak Radio Current (@ +8dBm TX) – 14.1mA (DCDC at 3V)	
		Max Peak Radio Current (@ 0dBm TX) – 4.9mA (DCDC at 3V)	
		Standby Doze – 3.1µA	
	Deep Sleep –0.4µA (external signal wake up)		
Physical	Dimensions	15mm x 10mm x 2.2mm (Modules)	
		18.39 mm x 50.74 mm x 11mm (USB Adapter)	
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	
Regulator	Approvals	FCC / IC / CE / MIC / RCM - All BL654 Series	

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

PART #	DESCRIPTION
451-00001	Bluetooth v5 + 802.15.4 + NFC Module – Integrated Antenna (Tape / Reel)
451-00002	Bluetooth v5 + 802.15.4 + NFC Module – IPEX MHF4 Antenna Connector (Tape / Reel)
451-00001C	Bluetooth v5 + 802.15.4 + NFC Module – Integrated Antenna (Cut Tape)
451-00002C	Bluetooth v5 + 802.15.4 + NFC Module – IPEX MHF4 Antenna Connector (Cut Tape)
451-00003	Intelligent USB Bluetooth v5 Adapter
455-00001	Development Board for Bluetooth v5 + 802.15.4 + NFC Module – Integrated Antenna
455-00002	Development Board for Bluetooth v5 + 802.15.4 + NFC Module – IPEX MHF4 Antenna Connector