SECURE, POWERFUL WIRELESS ENGINE FOR YOUR IOT DESIGN

Building on Laird Connectivity'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 Bluetooth LE 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 Connectivity's own *smart*BASIC 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 Connectivity's simplification of your next Bluetooth design!

- **Bluetooth v5.1** Bluetooth Low Energy (LE) plus **NFC**
- **802.15.4** functionality (Thread and ZigBee via Nordic SDK)
- **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** (15 mm x 10 mm x 2.2 mm)
- BLE 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 and BL652 Series)
- **Fully featured development kit** everything needed to start BLE development
- **Application Design Choice:** Leverage Laird Connectivity's *smart*BASIC, 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, *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 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, ISED, EU, UKCA, RCM, MIC, 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
	Frequency	2.402 - 2.480 GHz
	Transmit Power	+ 8 dBm (maximum). Configurable down to -40 dBm
	Receive Sensitivity	-95 dBm (typical @ Bluetooth LE 1 Mpbs)
		-92 dBm (typical @ Bluetooth LE 2 Mbps
		-103 dBm (typical @ Bluetooth LE 125 kbps)
	Link Budget	103 dB (@ BLE I Mbps), 111 db (@ BLE 125kpbs)
	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 and mass storage virtual interfaces
	Other	48 multifunction GPIO's that can provide:

Other – 48 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 32.768 kHz 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 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

CATEGORY	FEATURE	SPECIFICATION
Programmability Options	*smart*BASIC	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 (@ +8 dBm TX) – 14.1 mA (DCDC at 3V)
		Max Peak Radio Current (@ 0 dBm TX) – 4.9 mA (DCDC at 3V)
		Standby Doze – 3.1µA
		Deep Sleep –0.4µA (external signal wake up)
Physical	Dimensions	15 mm x 10 mm x 2.2 mm (modules)
		18.39 mm x 50.74 mm x 11 mm (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/ISED/EU/UKCA/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