Laird CONNECTIVITY

LONGER RANGE BLE – ENABLING NEXT GENERATION INDUSTRIAL IOT

Laird Connectivity's new BL653 series enables Industrial OEMs to robustly implement **longer range** BLE applications in the **harshest operating environments**. This series of secure low power, microcontroller modules with multi wireless capabilities is the future of wireless Industrial Internet of Things (IIoT) connectivity.

Powered by **Nordic's nRF52833** silicon, the small form factor BL653 modules and DVKs provide for a secure, robust BLE and **Cortex -M4F** CPU for any OEM's product design. The BL653 provides you with maximum development flexibility with programming options for the **Nordic SDK** or **Zephyr RTOS**, a simple, intuitive **AT command set**, as well as Laird Connectivity's own *smart*BASIC environment.

The BL653 series brings out all nRF52833 hardware features and capabilities including **USB access,** up to **+8 dBm** transmit power up to **5.5V** supply considerations, and **NFC tag (type 2 / 4)** 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 (BLE) plus **NFC**
- **Bluetooth v5.2**- capable
- **802.15.4** radio (non-certified – Thread & ZigBee via Nordic SDK or Thread via Zephyr)
- **Widest range of configurable interfaces**: UART, I2C, SPI, ADC, GPIO, PWM, FREQ, USB, PDM, and NFC
- **Extended** Industrial **Temperature Rating** (-40° to +105 °C)
- **Ultra-small footprint** (15 mm x 10 mm x 2.2 mm)
- BLE Peripheral/Central roles supported
- 2 Mbps and **LE Long Range:** Support for 2 Mbps, 1 Mbps, & 125 kps coded
- Bluetooth 5.1 - Direction finding – **AoA and AoD**
- **Hostless operation** – Internal MCU reduces BOM
- **Powerful Core** Cortex-M4F (512kB Flash, 128 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, Zephyr RTOS or utilize Nordic SDK directly
- **Nordic nRF52833** – 7x7 QFN with 42 GPIOs utilized.
- Mechanically same form factor as **BL654 Series**

FEATURES AT A GLANCE

NEXT GENERATION OF DIRECTION FINDING
Includes radio capable of Bluetooth v5.1 Direction Finding with AoA and AoD

SOFTWARE FLEXIBILITY AND SPEED TO MARKET
Simple AT Command set or easily write event-driven, automated applications, no toolchain required with s*mart*BASIC. Alternatively utilize either Zephyr RTOS or the Nordic SDK directly – develop application SW your way

TRUE INDUSTRIAL OPERATING RANGE
Designed and certified to the highest industrial temperature range of -40 ºC to +105 ºC for every component utilised.

GLOBAL APPROVALS – MAKE YOURSELF AT HOME
Carries several modular FCC, IC, CE, RCM, MIC and Bluetooth SIG approvals.

PERSONAL SUPPORT FROM DESIGN TO MANUFACTURE
Our industry-renowned support is passionate about helping you speed your design to market.

APPLICATION AREAS

Professional Lighting

Direction Finding / AoA / AoD

Secure Medical Peripherals

Industrial IoT Sensors

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For documentation, software, sample apps and more visit:
http://www.lairdconnect.com/BL653-ble-thread-nfc-modules

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION
Wireless Specification	Bluetooth®	v5.1
	802.15.4	Thread and Zigbee support 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 Mpbs) -103 dBm (typical @ BLE 125 kbps)
	Link Budget	103 dB (@ BLE I Mbps), 111 db (@ BLE 125 kpbs)
	Antenna Options	PCB trace antenna or trace pin for external antennas
	Raw Data Rates (Air)	1 Mbps, 2 Mbps, 125 kbps
Host Interface and Peripherals	UART Interface	TX, RX, CTS, RTS. DTR, DSR, DCD, RI (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	42 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) ▪ 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 8 BLE connections (*smart*BASIC) ▪ 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 ▪ Isochronous streams for audio (BT v5.2)
Programmability Options	*smart*BASIC	On-board BASIC event driven programming language
	AT Command Set	Simple AT Hayes-style command protocol
	Nordic SDK	Software/Support available from Nordic directly https://devzone.nordicsemi.com/
	Zephyr RTOS	Software/Support available from https://www.zephyrproject.org/
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 – 2.6 µA
		Deep Sleep –0.6 µA (external signal wake-up)
Physical	Dimensions	15 mm x 10 mm x 2.2 mm (modules)
Environmental	Temp Range	-40°C to +105°C
Miscellaneous	Lead Free	Lead-free and RoHS-compliant
	Development Kit	Development board and free software tools
Development Tools	Utilities	UwTerminalX (Multi-platform) Nordic nRFConnect - Android and iOS applications UART firmware upgrade
Qualifications	Bluetooth®	Complete Declaration ID
Regulatory	Approvals	FCC/IC/CE/MIC/RCM - All BL653 Series

For full specifications on BL653 modules, please see the appropriate datasheet.

PART #	DESCRIPTION
453-00039R	BLE module (Nordic nRF52833) – Integrated antenna (Tape/Reel)
453-00041R	BLE module (Nordic nRF52833) – Trace pin (Tape/Reel)
453-00039C	BLE module (Nordic nRF52833) – Integrated antenna (Cut Tape)
453-00041C	BLE module (Nordic nRF52833) – Trace pin (Cut Tape)
453-00039-K1	Development kit for Bluetooth + 802.15.4 + NFC module – Integrated antenna
453-00041-K1	Development kit for Bluetooth + 802.15.4 + NFC module – Trace pin (external antenna)