RELIABLE BLUETOOTH CONNECTIVITY FOR IOT – JUST A FRACTION OF THE SIZE

Laird Connectivity's latest range of Nordic nRF52833 based modules specifically targets OEMs where space is constrained in their designs. Yet still the **miniaturized BL653μ series** enables Industrial OEMs to robustly implement **longer range** Bluetooth Low Energy (LE) applications in the **harshest operating environments**. This series of secure, low power microcontroller modules with multi wireless capabilities is the future of wireless Internet of Things (IoT) connectivity.

Powered by **Nordic's nRF52833 WLCSP** silicon, the small form factor BL653μ modules provide for a secure, robust Bluetooth LE and **Cortex - M4F** CPU for any OEM's product design. The BL653μ 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 BL653μ series brings out key nRF52833 hardware features and capabilities including **USB access,** up to **+8 dBm** transmit power, up to **5.5V** supply considerations, and **NFC tag** implementation. Complete regulatory certifications enable faster time to market and reduced development risk completes Laird Connectivity's simplification of your next small form factor Bluetooth design.

- **Ultra-small footprint**
  - Integrated Antenna (6.3 mm x 8.6 mm x 1.6 mm)
  - Trace Pad Option   (6.3 mm x 5.6 mm x 1.6 mm)
- **Bluetooth v5.1** Bluetooth Low Energy (LE) plus **NFC**
- **802.15.4** radio (non-certified) –ZigBee / Thread via nRF Connect SDK or Thread via Zephyr
- **Widest range of configurable interfaces**: UART, I2C, I2S, SPI, ADC, GPIO, PWM, FREQ, USB, PDM, and NFC
- **Extended** Industrial **Temperature Rating** (-40° to +105 °C)
- Bluetooth Low Energy - Peripheral/Central roles supported
- 2 Mbps and **LE Long Range:** Support for 2 Mbps, 1 Mbps, & 125 Kbps coded PHY
- Bluetooth 5.1 - Direction finding – **AoA and AoD**
- **Hostless operation** – Internal MCU reduces BOM
- **Powerful Core** Cortex-M4F (512 kB Flash, 128 k RAM)
- Built on years of experience with Nordic (BL600, BL652 & BL654 Series)
- **Application design choice:** Leverage Laird Connectivity's *smart*BASIC, simple AT command set, Zephyr RTOS or utilize Nordic SDK directly
- **Nordic nRF52833** – 3.175 x 3.175 mm WLCSP with 32 GPIOs utilized.

FEATURES AT A GLANCE

TINY FOOTPRINT YET STILL HIGH PERFORMANCE
Nearly 24% reduction in overall module footprint compared to standard BL653 series.

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, ISED, EU, UKCA, RCM, MIC, AS/NZS, and Bluetooth SIG approvals.

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

NORDIC SEMICONDUCTOR   Zephyr™

APPLICATION AREAS

Professional Lighting

Direction Finding / AoA / AoD

Secure Medical Peripherals

Industrial IoT Sensors

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION	
Wireless Specification	Bluetooth®	v5.1	
	802.15.4	Thread and Zigbee support via Nordic nRF Connect SDK, Thread via Zephyr	
	Frequency	2.402 - 2.480 GHz	
	Transmit Power	+ 8 dBm (maximum). Configurable down to -40 dBm	
	Receive Sensitivity	-96 dBm (typical @ Bluetooth LE 1 Mpbs)	
		-103 dBm (typical @ Bluetooth LE 125 Kbps)	
	Link Budget	103 dB (@Bluetooth LE I Mbps), 111 dB (@Bluetooth LE 125 Kbps)	
	Antenna Options	Integrated chip antenna or RF 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	USB 2.0 full speed device	
	Other	32 multifunction GPIO's that can provide:	
		2 UART (4 GPIO pins each)	1 I2S (5 GPIO pins)
		8 ADC channels (1 pin each)	2 GPIO pins for 32.768 kHz crystal
		2 I2C (2 GPIO pins each)	2 GPIO pins for NFC
		Up to 4 SPI Master / 3 SPI slave with easyDMA	PWM output on 16 pins
		(4 GPIO pins including CS each)	FREQ output on 16 pins
		2 PDM (2 GPIO pins each)	
Key Bluetooth LE Features	Bluetooth Low Energy	GATT client & GATT server – Any adopted/custom services	LE advertising extensions
			LE secure connections
		Central/Peripheral roles	Data packet length extensions
		Up to 8 Bluetooth LE connections (smartBASIC)	LE privacy v1.2
			LE ping
		Bluetooth LE Mesh – nRFConnect SDK / Zephyr	vSP – Virtual Serial Port
			DTM Firmware (Test Modes) – Built In
		CODED PHY	
		2M PHY	
Programmability Options	smartBASIC	On-board BASIC event driven programming language	
	AT Command Set	Simple AT Hayes-style command protocol	
	Nordic nRFConnect 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 (SWD)	
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	6.3 mm x 8.6 mm x 1.6 mm (integrated antenna)	
		6.3 mm x 5.6 mm x 1.6 mm (trace pad variant)	
Environmental	Temp Range	-40°C to +105°C	
Miscellaneous	Lead Free	Lead-free and RoHS-compliant	
	Development Kit	None available – utilize larger BL653 DVK – part # 453-00039-K1 or 453-00041-K1	
Development Tools	Utilities	UwTerminalX and UWFlashX (Multi-platform), Nordic nRFConnect (Android/iOS applications)	
Qualifications	Bluetooth®	Complete Declaration ID	
Regulatory	Approvals	FCC/ISED/EU/UKCA/MIC/ASNZS/RCM - All BL653μ Series	

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

PART #	DESCRIPTION
453-00059R	BL653μ - Micro Bluetooth Low Energy module (Nordic nRF52833) – Integrated antenna (Tape/Reel)
453-00060R	BL653μ - Micro Bluetooth Low Energy module (Nordic nRF52833) – Trace pin (Tape/Reel)
453-00059C	BL653μ - Micro Bluetooth Low Energy module (Nordic nRF52833) – Integrated antenna (Cut Tape)
453-00060C	BL653μ - Micro Bluetooth Low Energy module (Nordic nRF52833) – Trace pin (Cut Tape)