UPL Connected Wearable Activity Monitor
SAML21 32-bit ARM® Cortex®-M0+ MCU, BTLC1000 BLE Module and ECC508A CryptoAuthentication™ Chip

Summary
High-end wearable activity trackers can take step count, temperature, light and other movement and environment measurements. They are not only being used for fitness applications, but are becoming an essential part of medical device design. Microchip’s Ultra-Low Power (ULP) Connected Wearable Activity Monitor Demonstration Board can be used as the starting point for the design of medical home monitoring, patient tracking and drug delivery compliance devices.

This board is a high-end activity tracker demonstration and development board that not only measures a user’s motion and environment, but it can also be used as a starting point for the design of more advanced activity and biometric measurement devices. These types of devices measure and analyze sleep quality, heart rate, body temperature, blood oxygen, etc. Bluetooth® connectivity allows the demo to communicate with tablets, smartphones or PCs for IoT capability.

Microchip’s ULP Connected Wearable Activity Monitor Demonstration board features the SAML21—a high-performance, 32-bit ARM Cortex-M0+ microcontroller with ultra-low power technology, the BTLC1000 4.1 Bluetooth Low Energy module, the ECC508A CryptoAuthentication chip as well as movement and environmental sensor chips.

SAML21 MCU Features
- Ultra-low power, high-performance 32-bit ARM Cortex-M0+ MCU
- Up to 256 KB of Flash and 40 KB of SRAM
- Up to 48 MHz operating frequency
- Up to 14-channels, 1 Msps 12-bit ADC
- Two 1 MSPS 12-bit DACs
- Three op amps
- Full-speed USB device and embedded host
- 16-channel DMA and 12-channel event system
- AES and true Random Number Generator (RNG)
- 32-bit RTC
- Support for up to 81 touch channels (mutual capacitance)
- 1.62 to 3.63V power supply

BTLC1000 BLE Module Features
- Ultra-low power Bluetooth Low Energy (BLE 4.1) SoC with:
  - Integrated ARM Cortex-M0 MCU
  - Transceiver and modem
  - MAC, PA, TR switch, and power management unit
- Fully qualified Bluetooth 4.1 module offers rapid time to market for connected designs
- On-board Bluetooth Low Energy 4.1 stack
- Simple ASCII command interface over UART
- Certifications: FCC, IC, CE, QDID
- Small form factor and low-power modes
- GAP, GATT, SM, L2CAP and Bluetooth SIG profiles

ECC508A CryptoAuthentication Chip Features
- Crypto element device with secure hardware-based key storage
- Performs high-speed public key algorithms: ECDSA and ECDH
- NIST standard P256 elliptic curve support
- SHA-256 hash algorithm with HMAC option
- Host and client operations
- Two high-endurance monotonic counters
- Guaranteed unique 72-bit serial number
- Internal high-quality FIPS RNG
- Storage for up to 16 keys
- Multiple options for consumption logging and one-time write information
- Intrusion latch for external tamper switch or power-on chip enablement
**Demonstration Highlights**

- Ideal for designs that need medical patient tracking, patient compliance, patient biometric diagnostics, fitness activity tracking, etc.
- Measures proximity, step count, free fall (detection), gyroscopic motion, ambient temperature, pressure (altitude), humidity and light
- Allows for easy development of more advanced activity tracker functions (e.g. distance travelled, calories burned, sleep analysis, etc.)
- Additional biometric measurement capability, such as heart rate, blood oxygen and body temperature can be added to a design using other Microchip reference designs
- BLE module is used to demonstrate smartphone/tablet IoT capability
- Low overall BOM cost due to high level of integration
- Powered from a single 3V lithium coin cell battery

This reference demo helps designers develop a low power, connected activity monitoring board with Bluetooth Low Energy capability for medical and fitness IoT applications.*

**System Diagram**

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