BLUETOOTH SERIES

tech talks

UPCOMING SESSIONS

FEB 23RD	ML in Predictive Maintenance and Safety Applications
MAR 23RD	Unboxing: What's New With Bluetooth
APR 20TH	What's New with Bluetooth Mesh 1.1
MAY 18TH	Bluetooth Portfolio: What's Right for Your Application
JUN 15TH	The Latest in HADM With Bluetooth LE

2023 tech talks
WEBINAR SERIES

Bluetooth® Portfolio: What's Right For Your Application

SILICON LABS

Agenda

Why Bluetooth® 5.4?

What's new with Bluetooth® 5.4

Bluetooth® Portfolio

Bluetooth Selector Guide

Code Levels

Summary and Q&A

Bluetooth® 5.4

Petteri Paatsila

Why Bluetooth 5.4?

- **Need for standardized large scale star networks**
  - Capability to host thousands of nodes
  - Encrypted data traffic
  - Ultra-low power consumption
  - Driven by electronic shelf label (ESL) market
- **Enhancements**
  - Optimizing access to secure data
  - Better control for LE Coded PHY for extended advertising

Bluetooth 5.4 – Target Markets & Use Cases

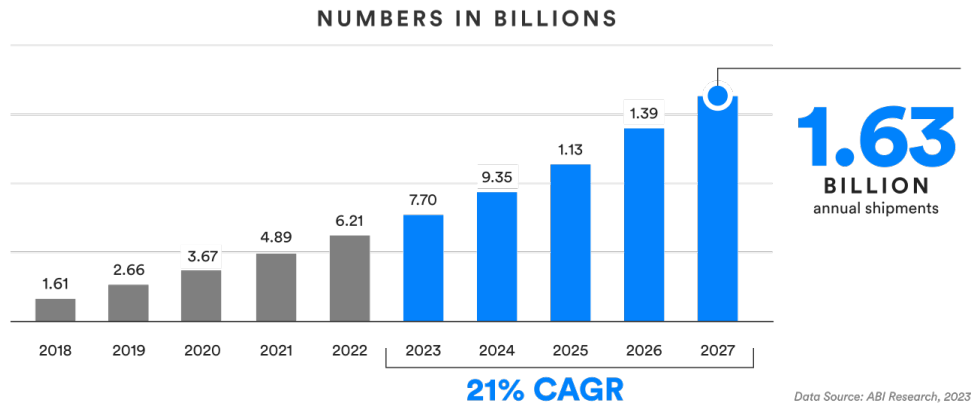
SMART RETAIL

- Electronics Shelf Labels
- Shelf Sensors

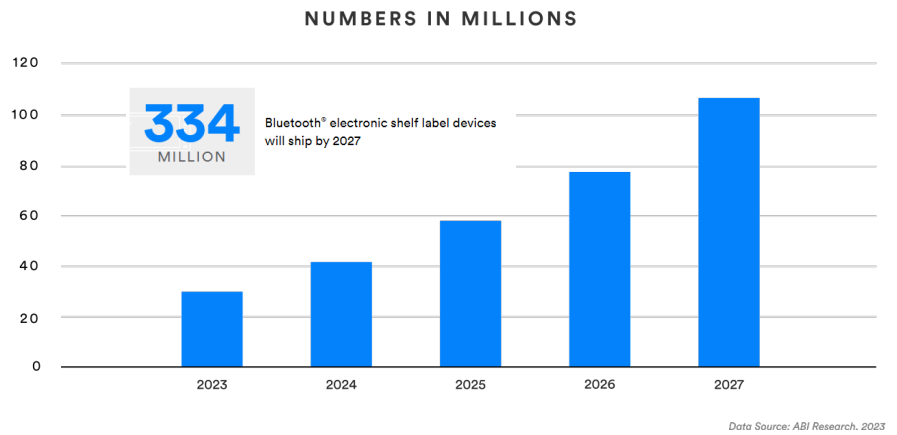
INDUSTRIAL

- Manufacturing & Logistics
- Digital Signage
- Asset monitoring

Annual Bluetooth® Device Networks Device Shipments



Annual Bluetooth® ESL Shipments



Source: https://www.bluetooth.com/2023-market-update/

Bluetooth 5.4 New Features

Periodic Advertising with Responses (PAwR)

Provides energy efficient, large-scale, and bi-directional one-to-many communication topology

Encrypted Advertising Data (EAD)

Feature to the secure broadcasting of data in advertising packets

LE GATT Security Levels Characteristic

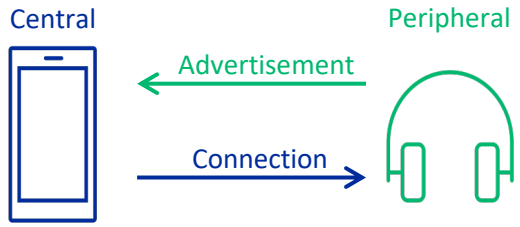
Devices can indicate the security mode and level required for all their GATT functionality to be available

Advertising Coding Selection

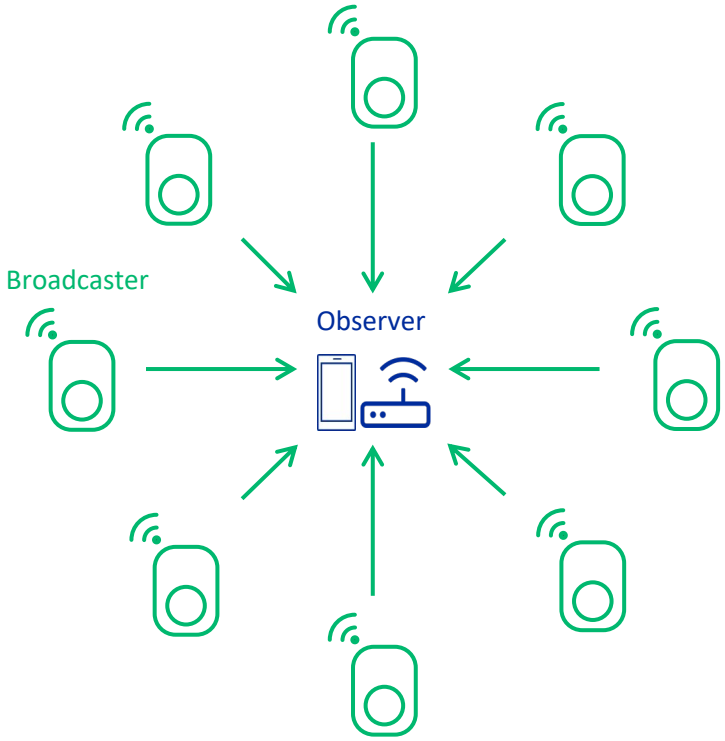
The Host can specify which of two supported long range coding options are used with LE extended advertising

Advertising Modes in Bluetooth 5.4

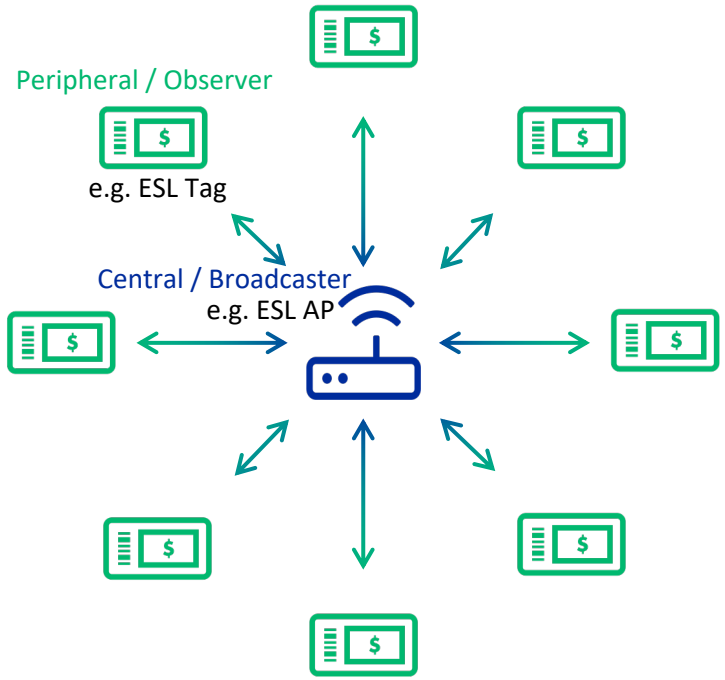
Advertising for Connection
(irregular, unidirectional)



One-way “Beaconing”
(regular, unidirectional)



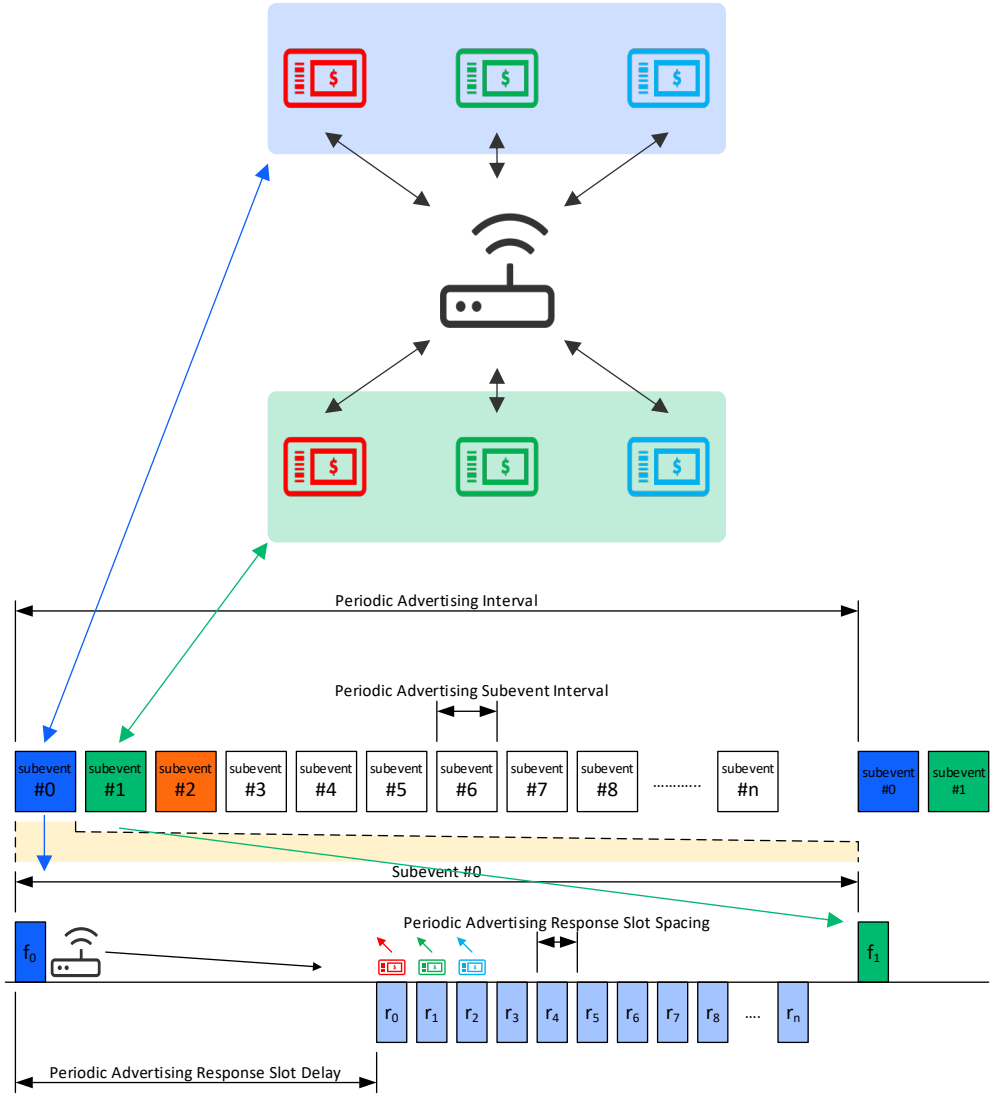
Periodic Advertising with Responses
(regular, bidirectional)



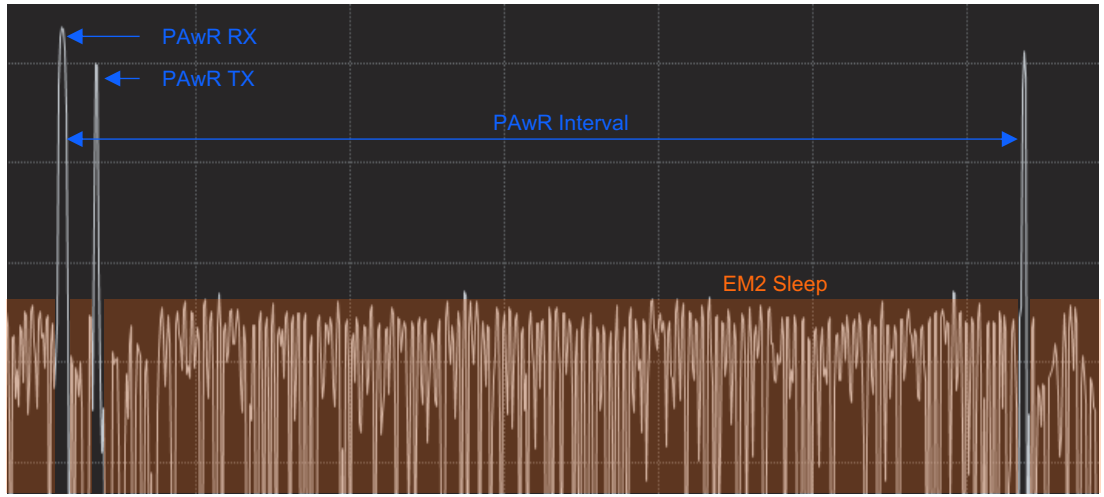
New mode enabling “Synchronized” mode network. Used by BT ESL.

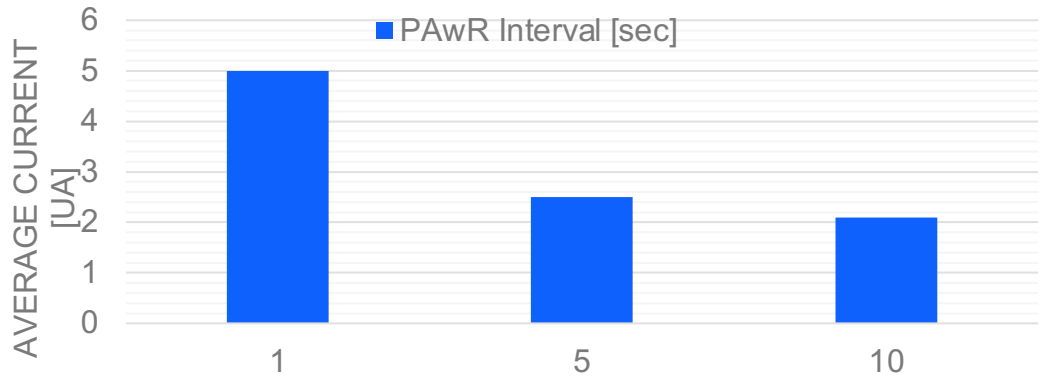
Periodic Advertisement with Responses (PAwR) Explained

- **PAwR train setup**
  - Sets timing parameters
  - Configure number of Subevents and Response Slots
- **Subevents**
  - Each Peripheral (ESL) belongs to one Subevent
  - Maximum 128 Subevents (ESL Group)
  - 255 unique ESLs in one ESL Group
  - Total max 32,640 Peripherals in the network
- **Inside a Subevent**
  - All Peripherals in one Subevent receive the Central Device transmission (downlink)
    - Keeps up the synchronization to the PAwR train
    - Transmits downlink payload data
  - Each Peripheral has its own Response Slot to reply (uplink)



Example of PAwR Current Consumption



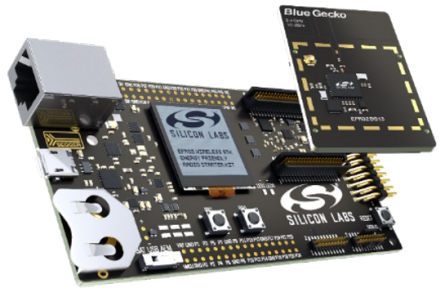


- **Peripheral device use case**
  - Receives Central Device downlink transmission at given Subevent time slot
  - Responses uplink at given Response Slot
  - Remains in sleep mode rest of time

- **Measurement condition**
  - MG22 Radio Board
  - Vinput 3.0V, DC/DC in use
  - SoC Current only
  - TX 0dBm
  - LFXO accuracy 50ppm

A Complete Solution for Bluetooth 5.4 Development

Early Access available on request. Public GSDK release taking place in June.

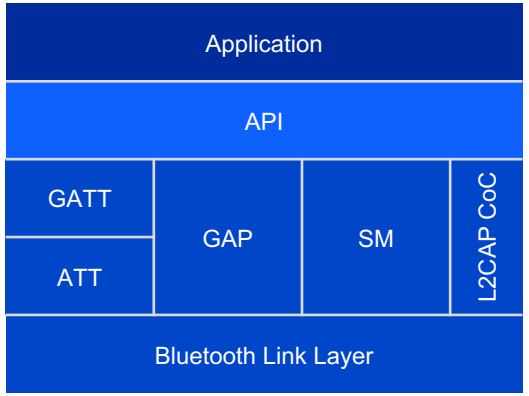


SOC, MODULES, DEV KITS

Multiple physical interfaces to support advanced development and debugging

UART, Ethernet, USB

LCD, LED, buttons



STACK SOFTWARE

In-house developed stack

Bluetooth 5.4

Support for PAwR, EAD, PAST, CoC, BT ESL Service and Profile

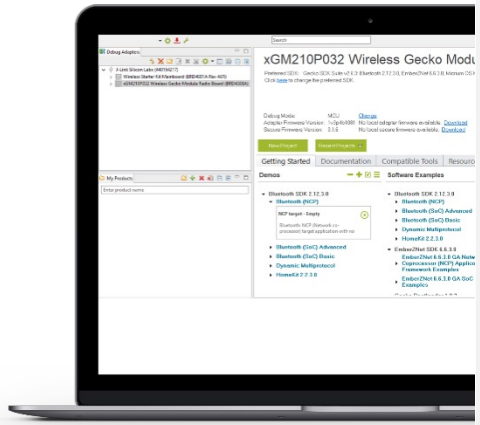
All security features supported

ESL ACCESS POINT DEMO

Python based ESL AP

ESL Library (GATT, OTS & NCP Events)

EFR32 radio with NCP



DEVELOPMENT TOOLS

Simplicity Studio

BT 5.4 NCP and SoC

BT ESL Example

Energy Profiler

SILICON LABS

Bluetooth® Portfolio

Aashish Chaddha

The Portfolio of SoCs and Modules

Increasing Features

BG22 SoC

BGM220S SiP & PCB Modules

Industry-leading energy efficient SoC

- Lowest power Bluetooth LE
- Direction Finding
- Bluetooth mesh LPNs
- SoC, PCB Module and SIP
- Balance of features, size, power, cost
- Support in SoC mode BT 5.4 stack and ESL application

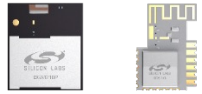
Q2 2023

BG27 SoC

Most Battery Versatile SoC for Connected Health, Smart Home, Portable Products

- Supports button cells
- DCDC Buck and Boost
- Coulomb counting
- Small form factor WLCSP
- Wake-up pin (BOOST_EN)
- Support in SoC mode BT 5.4 stack and ESL application
- Bluetooth mesh Relay, Proxy, LPNs

BG21 SoC

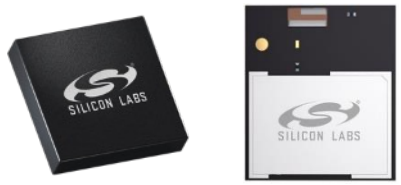


BGM210L & PCB Module

Optimized for LED lighting, Gateway/Hub, and Bluetooth mesh applications

- Highest output power in Industry
- Line-powered devices
- Secure Vault High, PSA L3
- Bluetooth mesh
- Bluetooth 5.4 gateway devices

BG24 SoC



BGM240S SiP & PCB Modules

Feature rich device with Highest integration

- Largest Flash/RAM
- High I/O pin count
- AI/ML hardware accelerator
- High sensing ADC
- Secure Vault High, PSA L3
- Bluetooth mesh
- Bluetooth 5.4 gateway devices
- SoC mode for micro gateways

Increasing Flash/RAM

BG22 and BGM220: Lowest Power for Battery Powered End Devices

SoCs and Modules

BG22 SoC

BGM220S SiP Module

BGM220P PCB Module

SoC Device Specifications

High Sensitivity 2.4 GHz Radio
- -98.9 dBm RX @ BLE 1 Mbps

Efficient ARM® Cortex®-M33
- Up to 76.8 MHz
- 512kB Flash, 32kB RAM

Low Power
- 27 µA/MHz
- 4.1 mA TX @ 0 dBm
- 3.6 mA RX (BLE 1 Mbps)
- 1.4 µA EM2
- 0.17 µA EM4

Multiple protocol support
- Bluetooth (1M/2M/LR)
- Bluetooth mesh LPN
- Direction Finding
- Proprietary 2.4 GHz

SoCs and Modules
- 5x5 QFN40
- 4x4 QFN32
- 4x4 TQFN32
- 6x6 SiP Module
- 12.9x15.0 PCB Module

Differentiated Features

- **Lowest Power RF**
  - Increases battery life
- **RFSense with OOK mode**
  - Ultra low power receive mode
- **PLFRCO**
  - Eliminates need for 32 KHz xtal
- **16-bit ADC**
  - Up to 14-bit ENOB for better analog sensing

Segments and Applications

Smart Cities
- Livestock Management

Industrial
- Access Control
- Human Machine Interface
- Predictive Maintenance
- Asset Tracking

Commercial / Building
- Electronic Shelf Labels
- Clinical Medical
- Point of Sale
- Loss Prevention
- Indoor Real Time Location Services

Smart Home
- Appliances
- Locks
- Switches
- Sensors
- HVAC

Connected Health
- Portable Medical
- Smart Hospitals
- Smart Wearables

BG27: Most Battery Versatile Series-2 SoC

SoCs and Modules

BG27 SoC

SoC Device Specifications

High Performance 2.4 GHz Radio
- Up to +8 dBm TX
- -98.9 dBm RX @ BLE 1 Mbps
- -106.7 dBm RX @ BLE 125 kbps

MCU Core
- ARM Cortex®-M33 (76.8 MHz with FPU & DSP)

Memory
- Up to 64kB RAM
- Up to 768kB Flash

Ultra Low Power
- 4.1 mA TX @ 0 dBm
- 3.6 mA RX (BLE 1 Mbps)
- 1.6 µA EM2
- 0.18 µA EM4

Multiple protocol support
- Bluetooth (1M/2M/LR)
- Bluetooth mesh
- Proprietary 2.4 GHz

Package
- 2.3x2.6 WLCSP (19 GPIO) +85ºC
- 5x5 QFN40 (26 GPIO) +125ºC
- 4x4 QFN32 (18 GPIO) +125ºC

Differentiated Features

Extremely small form-factor
- 2.3 x 2.6 WLCSP package

Flexible battery support
- DCDC Buck/Boost
- Supports 0.8 to 1.7 volts
- Supports 1.8 to 3.8 volts

Enhanced security
- Secure Vault™ Mid
- Tamper detect
- Secure Key Management w/PUF

Battery management
- Coulomb counter

Wake-up pin (BOOST_EN)
- allows the device to be off (<20 nA) for long-term storage
- Up to 10 years of shelf storage

RFSense with OOK mode
- Ultra low power receive mode

Segments and Applications

Smart Home
- Appliances
- Door Locks
- Sensors
- Switches
- HVAC
- LED Lighting

Medical and Health and Fitness
- Portable Medical
- Clinical Medical
- Wearables

Industrial & Commercial
- Access Control
- HMI
- HVAC
- Smart Buildings
- Asset Tracking
- Indoor RTLS
- Point of Sale
- Commercial Lighting
- Predictive Maintenance

BG21 and BGM210: Optimized for LED lighting and Gateway/Hub Devices

SoCs and Modules

BG21 SoC

BGM210P PCB Module

SoC Device Specifications

High Performance 2.4 GHz Radio
- Up to +20 dBm TX
- -97.5 dBm RX @ BLE 1 Mbps
- -104.5 dBm RX @ 802.15.4

Efficient ARM® Cortex®-M33
- Up to 80 MHz
- 1024kB Flash, 96kB RAM

Low Power
- 50.9 µA/MHz
- 9.3 mA TX @ 0 dBm
- 8.8 mA RX (BLE 1 Mbps)
- 4.5 µA EM2 sleep

Multiple protocol support
- Bluetooth (1M/2M/LR)
- Bluetooth mesh
- Proprietary 2.4 GHz

SoCs and Modules
- 4x4 QFN32
- 12.9 x 15.0 PCB Module
- 15.5 x 22.5 Lighting Module

Differentiated Features

+20 dBm output power
- Eliminates the need for an external power amplify

Secure Vault High
- Protects data, IP and device
- PSA L3 Certified

Co-existence
- Improves RF performance in crowded 2.4 GHz environments

Low BOM count
- Reduces cost and complexity

Segments and Applications

Smart Home
- Appliances
- Locks
- LED Lighting
- Switches
- Gateways, Hubs and Panel
- HVAC

Industrial
- Circuit Breakers
- HVAC

Commercial
- Commercial Lighting
- Access Points

BG24 and BGM240: Ideal for Battery Powered IoT Mesh Devices

SoCs and Modules

BG24 SoC

BGM240S SiP Module

BGM240P PCB Module

SoC Device Specifications

High Performance Radio
- Up to +19.5 dBm TX
- -97.6 dBm RX @ BLE 1 Mbps

Efficient ARM® Cortex®-M33
- 78 MHz
- 1536kB Flash, 256kB RAM

Low Power
- 33.4 µA/MHz
- 5.0 mA TX @ 0 dBm
- 4.4 mA RX (BLE 1 Mbps)
- 1.3 µA EM2 sleep

Multiple protocol support
- Bluetooth (1M/2M/LR)
- Bluetooth mesh
- Proprietary 2.4 GHz

SoCs and Modules
- 5x5 QFN40
- 6x6 QFN48
- 7x7 SiP Module
- 12.9x15.0 PCB Module

Differentiated Features

Upto +19.5 dBm output power
- Eliminates need for external power amplify

AI/ML accelerator
- Accelerates inferencing while reducing power consumption

Secure Vault High
- Protects data, IP and device
- PSA L3 Certified

20-bit ADC
- 16-bit ENOB for advance sensing

Improved Coexistence
- Ideal for gateways and hubs

PLFRCO
- Eliminates need for 32 KHz xtal

Segments and Applications

Smart Home
- HVAC
- Locks
- LED Lighting
- Switches
- Sensors
- Gateways, Hubs and Panels

Connected Health
- Portable Medical

Industrial and Smart Buildings
- Access Control
- HVAC
- Predictive Maintenance
- Asset Tracking

Smart Cities
- EV Charging

Commercial
- Lighting
- Access Points
- Clinical Medical
- Indoor Real Time Location Services

Bluetooth Development Hardware Options

	Explorer Kit	Dev Kit	Pro Kit
Debug Speed	1.6MHz	1.6MHz	8MHz
Debug USB	Full Speed	Full Speed	High Speed
Packet Trace Interface (PTI)	✓	✓	✓ 2x
Breakout Pads	✓	✓	✓
Pushbutton s & User LEDs	✓	✓	✓
Virtual COM	✓	✓	✓
Coin cell battery holder	–	✓	✓
On-board Sensors	–	✓	✓
Battery Pack Connector	–	✓	✓
Radio Board Connectors	–	–	✓
EXP Connector	–	–	✓
Display	–	–	✓
Debug OUT	–	–	EFM8/32, EFR32, EZR32
Debug Ethernet	–	–	100 Mbit/s
Energy Monitor (AEM)	–	–	✓
3rd Party Hardware addons	✓	–	–

✓ Supported ✓ Optional or not mounted – Not Supported

Explorer Kit	Dev Kit	Pro Kit
▪ Lowest price point	▪ Single device development board	▪ Modular development platform
▪ On-board debugger and signal breakouts	▪ On-board debugger and signal breakouts	▪ Advanced development use cases
▪ Minimal on-board features	▪ On-board sensors	▪ Energy profiling and external device debug
▪ 3rd part hardware support	▪ Impressive out-of-the-box demos	▪ Ethernet for large network test
		▪ Designed to maximize reuse of EFR32 devices

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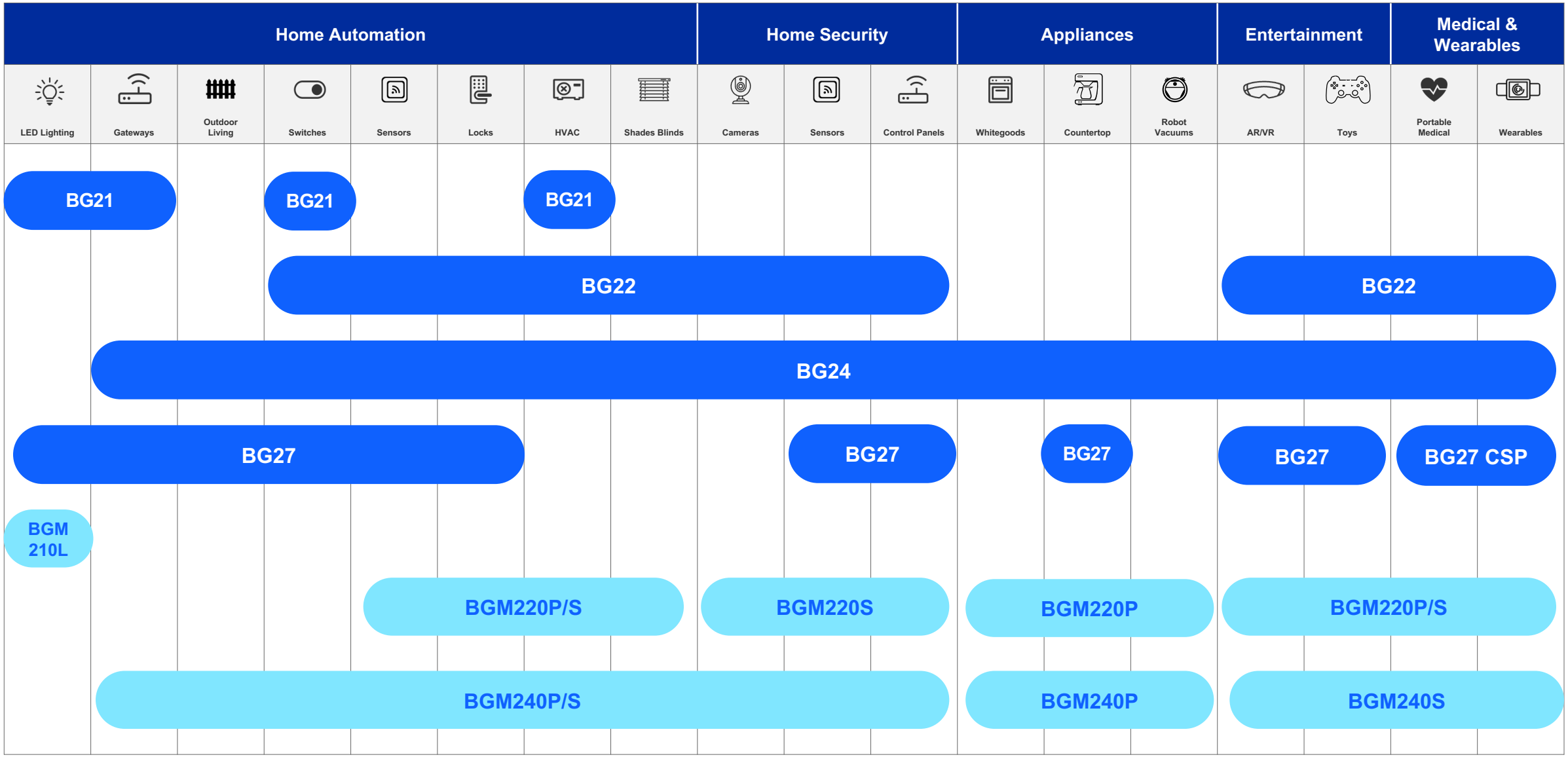
Home & Life - Bluetooth Selector Guide



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Home & Life - Bluetooth Positioning

Home Automation

LED Lighting

BG21
- Line Powered
- Long Range +20dBm Tx
- High Temp +125ºC
- CA Title 20
- Secure Vault High (Sesip L3 / PSA L3)

BG24
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator

BGM210L
- Line Powered
- High Temp +125ºC
- CA Title 20
- Long Range +12.5dBm Tx
- Antenna and RF Certifications
- Flexible mountability (vertical / horizontal)

Gateways

BG22
- Battery Powered
- High Temp +125ºC
- CA Title 20
- Ultra-Low Power
- Secure Vault Mid

BG27
- Battery Powered
- Battery Life tracking (Coulomb Counter)
- DC-DC Converter
- Ultra-Low Power
- Secure Vault Mid

BGM240P/S
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications
- 7x7mm SIP, 12.9x15mm PCB

Outdoor Living

BGM220P/S
- Battery Powered
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

Switches

BG22
- Battery Powered
- High Temp +125ºC
- CA Title 20
- Ultra-Low Power
- Secure Vault Mid

BG24
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator

BGM220P/S
- Battery Powered
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

Sensors

BG22
- Battery Powered
- High Temp +125ºC
- CA Title 20
- Ultra-Low Power
- Secure Vault Mid

BG24
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator for tiny edge processing

BG27
- Battery Powered Devices
- Battery Life tracking (Coulomb Counter)
- DC-DC Converter
- Ultra-Low Power
- Secure Vault Mid

BGM220S
- Battery Powered
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

BGM240P/S
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications

Locks

BG22
- Battery Powered
- High Temp +125ºC
- CA Title 20
- Ultra-Low Power
- Secure Vault Mid

BG24
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator

BG27
- Battery Powered Devices
- Battery Life tracking (Coulomb Counter)
- DC-DC Converter
- Ultra-Low Power
- Secure Vault Mid

BGM220P
- Battery Powered
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

BGM240P
- Energy Efficient
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications

HVAC

Shades Blinds

Home Security

Cameras

Sensors

Control Panels

Appliances

Whitegoods

Countertop

Robot Vacuums

Entertainment

AR/VR

BG22
- 4.1mA Tx current @0dBm
- Secure Vault Mid
- -98.9dBm Rx Sensitivity
- 4x4 mm

BG24
- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator for tiny edge processing
- -97.6dBm Rx Sensitivity
- 5x5 mm

BG27 CSP
- Ultra small form-factor 2.3x2.6mm
- -98.9dBm Rx Sensitivity
- 4.1mA Tx current @0dBm
- Battery Life Tracking (Coulomb Counter)
- DC-DC Converter
- Wakeup Pin
- Secure Vault Mid

BGM220P/S
- Battery Powered
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

BGM240S
- Battery Powered
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications
- 7x7mm SIP

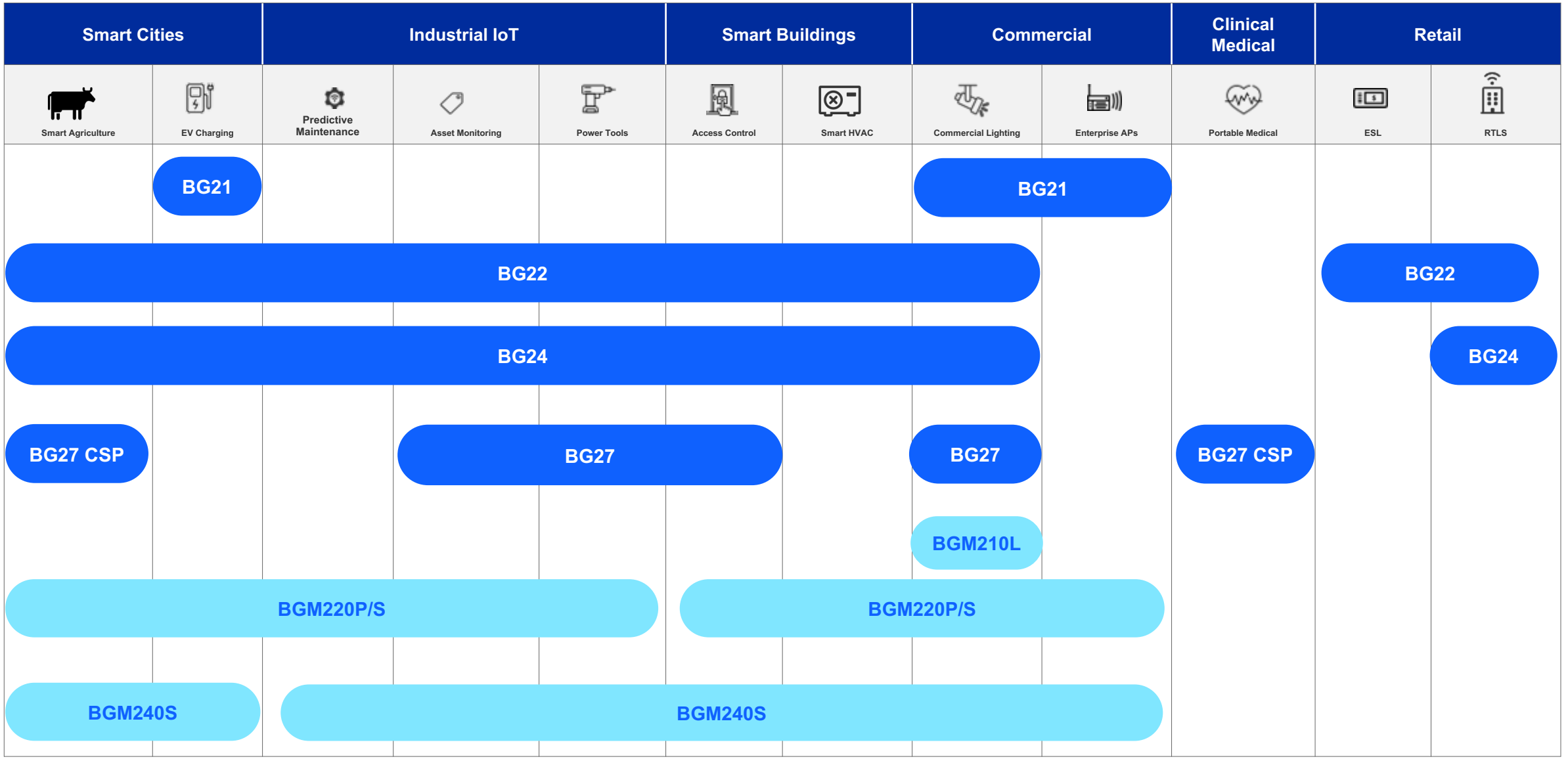
Toys

Medical & Wearables

Portable Medical

Wearables

Industrial & Commercial - Bluetooth Selector Guide



SoCs Modules

SILICON LABS

Industrial & Commercial - Bluetooth Selector Guide

Smart Cities

Smart Agriculture

BG27 CSP

- Ultra small form-factor 2.3x2.6mm
- -98.9dBm Rx Sensitivity
- 4.1mA Tx current @0dBm
- Battery Life Tracking (Coulomb Counter)
- DC-DC Converter
- Wakeup Pin
- Secure Vault Mid

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High
- -97.6dBm Rx Sensitivity
- 5x5 mm

BGM240S

- Battery Powered Devices
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications

BGM220 P/S

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

EV Charging

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator
- -97.6dBm Rx Sensitivity
- 5x5 mm

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG21

- Line Powered
- Long Range +20dBm Tx
- High Temp +125ºC
- CA Title 20
- Secure Vault High (Sesip L3 / PSA L3)

Industrial IoT

Predictive Maintenance

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator
- -97.6dBm Rx Sensitivity
- 5x5 mm

BGM240S

- Battery Powered Devices
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications

BGM220 P/S

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

Asset Monitoring

BG27

- Battery Powered Devices
- Battery Life tracking (Coulomb Counter)
- DC-DC Converter
- Ultra-Low Power
- Secure Vault Mid

Power Tools

Smart Buildings

Access Control

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator
- -97.6dBm Rx Sensitivity
- 5x5 mm

BG27

- Battery Powered Devices
- Battery Life tracking (Coulomb Counter)
- DC-DC Converter
- Ultra-Low Power
- Secure Vault Mid

BGM220 P/S

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid
- Antenna and RF Certifications

BGM240S

- Battery Powered Devices
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- Antenna and RF Certifications

Smart HVAC

Commercial

Commercial Lighting

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator
- -97.6dBm Rx Sensitivity
- 5x5 mm

BG21

- Line Powered
- Long Range +20dBm Tx
- High Temp +125ºC
- CA Title 20
- Secure Vault High (Sesip L3 / PSA L3)

BGM210L

- Line Powered
- High Temp +125ºC
- CA Title 20
- Long Range +12.5dBm Tx
- Antenna and RF Certifications
- Flexible mountability (vertical / horizontal)

Enterprise APs

BG21

- Line Powered Devices
- Long Range +20dBm Tx
- Secure Vault High (Sesip L3 / PSA L3)

Clinical Medical

Portable Medical

BG27 CSP

- Ultra small form-factor 2.3x2.6mm
- -98.9dBm Rx Sensitivity
- 4.1mA Tx current @0dBm
- Battery Life Tracking (Coulomb Counter)
- DC-DC Converter
- Wakeup Pin
- Secure Vault Mid

Retail

ESL

RTLS

BG22

- Battery Powered Devices
- Ultra-Low Power
- Secure Vault Mid

BG24

- 5.0mA Tx current @0dBm
- Long Range – Low Power
- Secure Vault High (Sesip L3 / PSA L3)
- Large Memory
- AI/ML accelerator
- -97.6dBm Rx Sensitivity
- 5x5 mm

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Bluetooth Selector Guide

Bluetooth® SoC and Module Selector Guide

Silicon Labs offers a range of Bluetooth® wireless SoCs and modules to suit virtually every design requirement. To narrow down your selection, take a look at the product summaries below. Consider the design requirements you have in terms of range, security, dual-band capability, and low power credentials.

Another consideration is whether you wish to undertake your own wireless type approvals or benefit from one of our pre-certified Bluetooth® modules.

	Low Power	Range	Sensitivity	Security	Solution Type	Target Applications
 BG21	●○○○○	●●●●●	●●●●○	●●●●●	SoC	Industrial automation, general purpose
 BGM210P	●○○○○	●●●●●	●●●●○	●●●●●	Module w/ antenna and certifications	Mains powered, lighting, long range, switches, dimmers
 BG22	●●●●●	●●●○○	●●●●●	●●●●○	SoC	Battery powered devices, consumer, medical
 BGM220P	●●●●●	●●●●○	●●●●●	●●●●○	Module w/ antenna and certifications	Battery powered devices, consumer, medical
 BGM220S	●●●●●	●●●○○	●●●●●	●●●●○	Module w/ antenna and certifications	Battery powered devices, consumer, medical
 BG24	●●●●○	●●●●●	●●●●○	●●●●●	SoC	Battery Powered devices, consumer and medical

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Bluetooth® SoC Lineup

	 BG21 (Series 2)	 BG22 (Series 2)	 BG24 (Series 2)
Bluetooth features	5.1 and mesh 1.0 (1M, 2M, LE Coded PHYs and AE)	5.2 and Bluetooth mesh LPN (1M, 2M, LE Coded PHYs, AE and Bluetooth direction finding)	Bluetooth Low Energy, Bluetooth mesh
Proprietary 2.4G	2(G)FSK, (G)MSK, OQPSK DSSS	2(G)FSK, (G)MSK, OQPSK DSSS	2(G)FSK, (G)MSK, OQPSK DSSS
TX / RX (1M,GFSK)	+20 dBm / -97.5 dBm	+6 dBm / -98.9 dBm	+19.5 dBm/-97.5 dBm
TX Current (MCU + radio value)	9.3 mA (0 dBm) 33.8 mA (10 dBm)	4.1 mA (0dBm) 8.2 mA (6 dBm)	5.1 mA (0 dBm) 20 mA (10 dBm)
RX Current (1M, GFSK)	8.8 mA	3.6 mA	4.4 mA
CPU / CLock Speed	Cortex M33 (80 MHz)	Cortex M33 (up to 76.8 MHz) Cortex M0+ for radio	Cortex-M33 (up to 78 MHz)
Flash (kB)	Up to 1024	Up to 512	Up to 1536
RAM (kB)	Up to 96	32	Up to 256
Sleep Current (EM2)	4.5 µA (16 kB RAM)	1.2 µA (8 kB RAM) -1.4 µA (32 kB RAM)	1.3 µA EM2 DeepSleep current (16 kB RAM)
Active Current (EM0)	50.9 µA / MHz	27 µA / MHz	32.2 µA/MHz
Security	Secure Vault - Mid Secure Vault - High	Secure Vault - Mid	Secure Vault - Mid Secure Vault - High
Operating Voltage	1.71V to 3.8V	1.71V to 3.8V	1.71 V to 3.8 V
Packages (mm)	4x4 QFN32	4x4 QFN32 4x4 TQFN32 5x5 QFN40	5x5 QFN40 6x6 QFN48

Bluetooth® Module Lineup

	 BGM210P	 BGM210L	 BGM220P	 BGM220S	 BGM240P
Protocols	5.3 and mesh 1.0 (1M, 2M, Coded PHY and AE)	5.3 and mesh 1.0 (1M, 2M, Coded PHY and AE)	5.3 and mesh 1.0 LPN (1M, 2M, Coded PHY, AE and Bluetooth direction finding)	5.3 and mesh 1.0 LPN (1M, 2M, Coded PHY, AE and Bluetooth direction finding)	5.3 and Bluetooth mesh (1M, 2M, LE Coded PHYs, AE and Bluetooth direction finding)
EFR32 SoC	BG21	BG21	BG22	BG22	BG24
Antenna	Built-in or RF pin	Built-in	Built-in	Built-in or RF pin	Built-in or RF pin
Max TX power	+10 / +20 dBm	+12.5 dBm	+8 dBm	+6 dBm	+10/ +20 dBm
Sensitivity (1M)	-97 dBm	-97 dBm	-98 dBm	-98 dBm	-98.5 dBm
Flash (kB)	1024	1024	512	512	1536
RAM (kB)	96	96	32	32	256
GPIO	20	12	24, 25	25	26
Operating Voltage	1.8V - to 3.8V	1.8V – 3.8V	1.8V - to 3.8V	1.8V - to 3.8V	1.8 to 3.8 V
Operating Temp.	–40 to +125°	–40 to +125°	–40 to +105°	–40 to +105°	–40 to +105°
Dimensions W x L x H (mm)	12.9 x 15.0 x 2.2	15.5 x 22.5 x 2.2	12.9 x 15.0 x 2.2	6 x 6 x 1.3	12.9 mm x 15.0 mm
Certifications	BT, CE, FCC, ISED, Japan & S-Korea	BT, CE, FCC, ISED, Japan & S-Korea	BT, CE, FCC, ISED, Japan & S-Korea	BT, CE, FCC, ISED, Japan & S-Korea	CE, UKCA, FCC, ISED, MIC, KC

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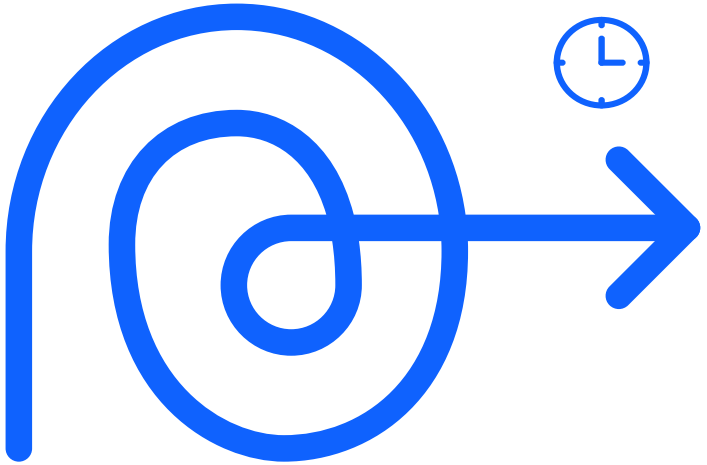
Code Levels

Máté Perjési

The Challenge of IoT Product Creation

IoT HW & SW Offering

The Challenge



The Desired IoT Product

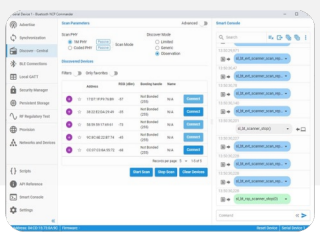
Silicon Labs Code Levels

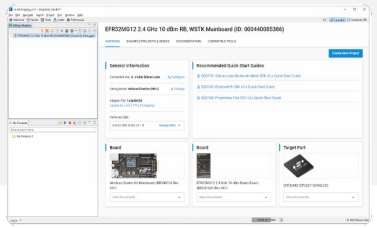
Large variety of customer **expertise levels**:

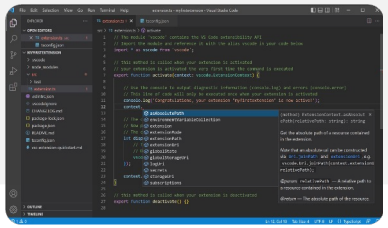
Beginner → Intermediate → Advanced → IoT Expert

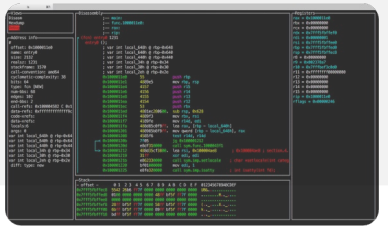
Matching developer flows, the Silicon Labs **Code Levels**:

No-code → Low-code → Custom-code → Pro-code









Typical developer environment and tools:

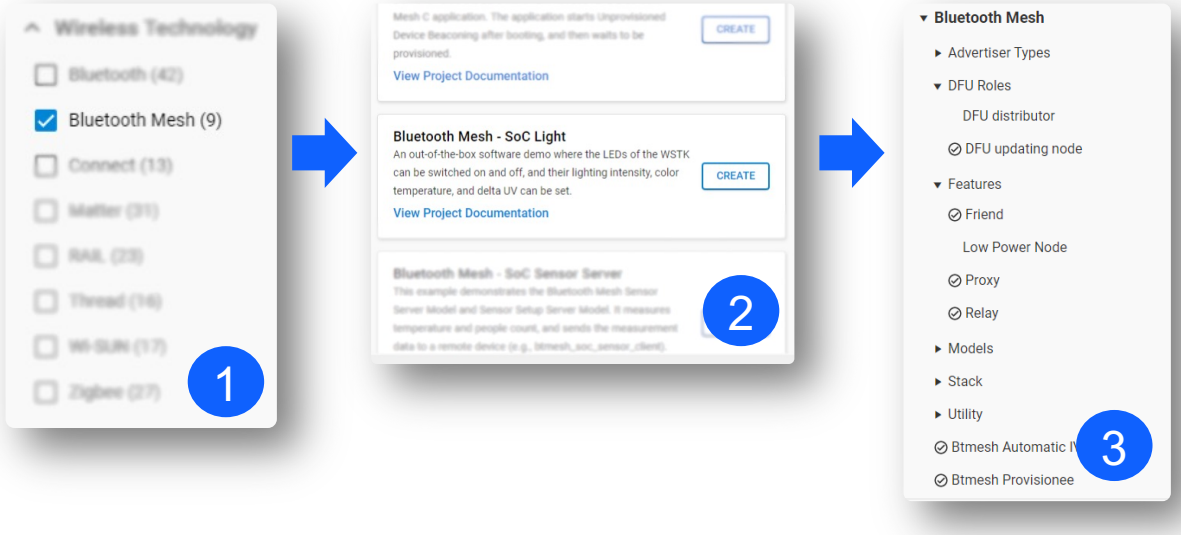
Silabs GUI Tools → Silabs GUI Tools + Silabs IDE → Silabs IDE or Custom IDE → Custom IDE

SLC (Silicon Labs Configurator) as common foundation

No-code DX

No-code | Low-code | Custom-code | Pro-code

- Targeted for **Beginner customers**
- Product creation with **no coding** at all
- For **well-defined use cases**
- Based on **Simplicity Studio**
- Builds on top of **SLC UI** in Simplicity Studio



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Low-code DX

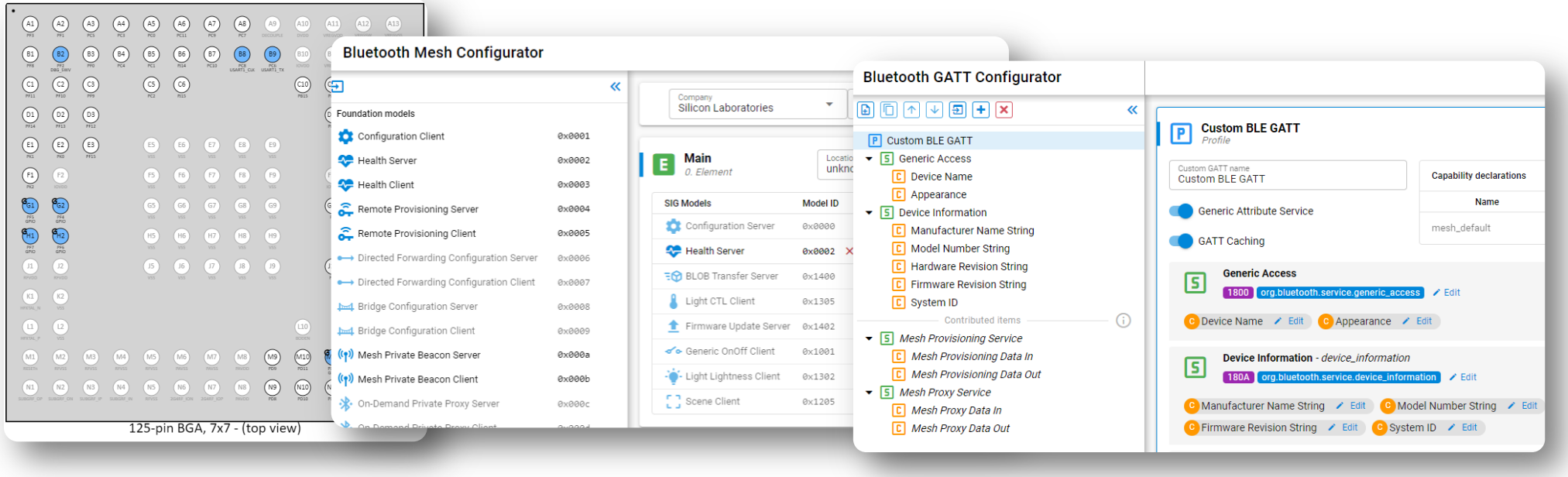
No-code | Low-code | Custom-code | Pro-code

- Targeted for **Intermediate customers**
- Product creation with **minimal coding**
- For **well-defined use cases**
- Based on **Simplicity Studio**
- Builds on top of **SLC UI + UI Tools**

```
/***************************************************************************//**
 * Bluetooth Mesh stack event handler.
 * This overrides the dummy weak implementation.
 *
 * @param[in] evt Pointer to incoming event from the Bluetooth Mesh stack.
 ******************************************************************************/
void sl_btmesh_on_event(sl_btmesh_msg_t *evt)
{
  switch (SL_BT_MSG_ID(evt->header)) {

    default:
      break;
  }
```

Simplicity Studio 5



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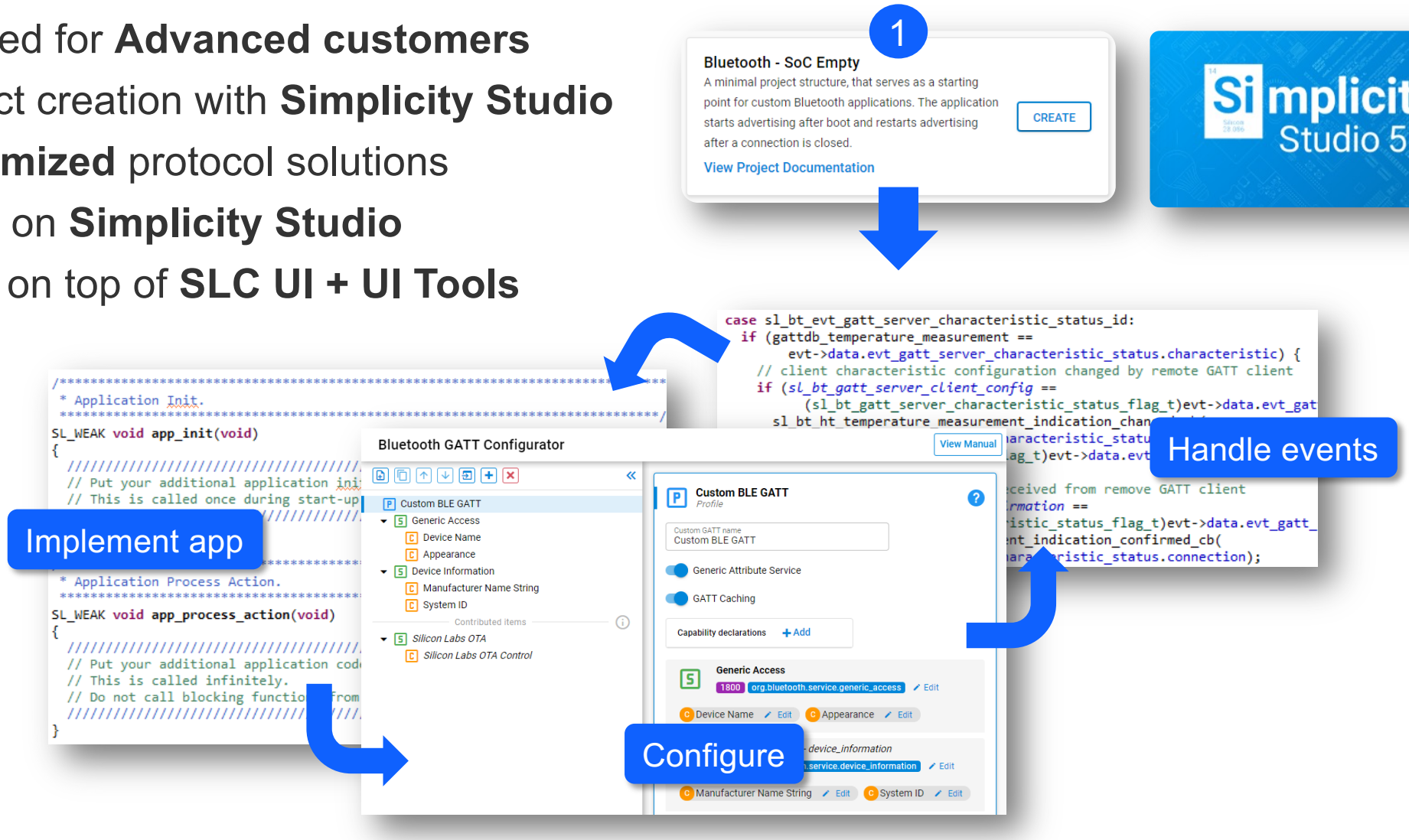
Custom-code DX

No-code | Low-code | Custom-code | Pro-code

- Targeted for **Advanced customers**
- Product creation with **Simplicity Studio**
- **Customized** protocol solutions
- Based on **Simplicity Studio**
- Builds on top of **SLC UI + UI Tools**



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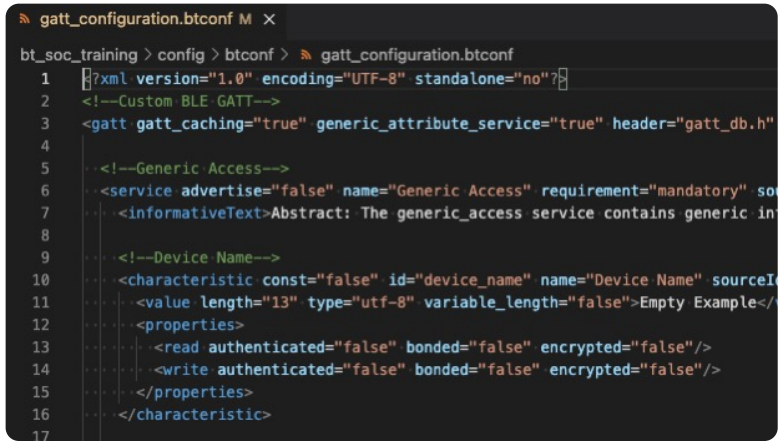
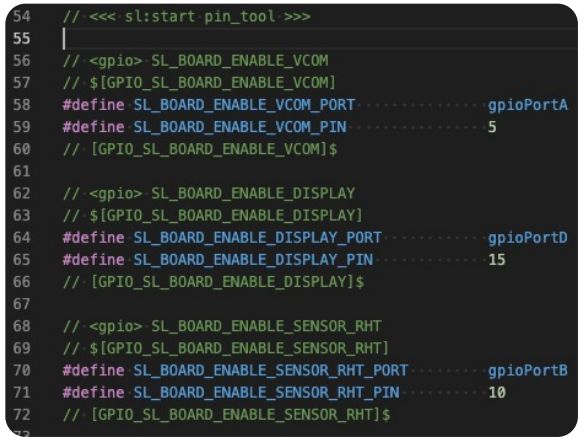
Pro-code DX

No-code | Low-code | Custom-code | Pro-code

- Targeted for **IoT experts**
- Product creation with **customer's preferred IDE**
- **Customized** protocol solutions
- Builds on top of **SLC-CLI + UI Tools**
- Flexibility through **Makefile** and **VS Code** project generation
- **Control** over the development environment and flow





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BLUETOOTH SERIES

tech talks UPCOMING SESSIONS

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MAR 23RD	Unboxing: What's New With Bluetooth
APR 20TH	What's New with Bluetooth Mesh 1.1
MAY 18TH	Bluetooth Portfolio: What's Right for Your Application
JUN 15TH	The Latest in HADM With Bluetooth LE

2023 tech talks
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Thank You

Watch ON DEMAND