



LPWAN SERIES

**Presentation  
Will Begin  
Shortly**

tech **t**alks **UPCOMING SESSIONS**

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FEB 16<sup>TH</sup> | Amazon Sidewalk: Using Battery-Powered Sensors

MAR 16<sup>TH</sup> | Getting Started with Amazon Sidewalk

APR 13<sup>TH</sup> | Introducing FG25 for Wi-SUN FAN 1.1

MAY 11<sup>TH</sup> | Optimizing FG23 for Battery Life & Performance

JUN 8<sup>TH</sup> | Designing Long Range Devices with Amazon Sidewalk

We will begin in:

**0:00**



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2023



WEBINAR SERIES

# Welcome

**Designing Long Range Devices with  
Amazon Sidewalk**

Chad Steider  
Lucie Labadie



**LPWAN SERIES**

JUST ANNOUNCED

# New FG28 SoC



amazon sidewalk



# Why FG28?



- **Dual-Band (Sub-GHz + 2.4 GHz) Support with Series 2 Performance**
  - Increased processor performance over FG1x devices including AI/ML hardware accelerator
- **Multi-Protocol Support**
  - Support for static and dynamic multi-protocol use cases for select Sub-GHz and Sub-GHz + Bluetooth scenarios
- **Broader Ecosystem Support for Low-power Devices**
  - Full support for Wi-SUN LFN low power nodes
  - Support for both Bluetooth LE and FSK PHYs for Amazon Sidewalk
- **Up to 49 GPIOs for Better System Integration**
  - Eliminate system complexity by incorporating more into FG28
- **Migration Path from Earlier FG Devices**
  - Footprint compatible path from FG12 (QFN68) and FG23 (QFN48)

# FG28 Target Applications



**Smart Meters**



**Home Automation and Security**



**Access Control**



**Public Infrastructure**



**Agriculture**



**Asset Tracking and Logistics**

# FG28: Dual-Band SoC for the Next Generation of IoT



**Dual-Band**  
**Multi-protocol**  
**More GPIOs**  
**Secure**

## DEVICE SPECIFICATIONS

### High Performance Dual-Band Radio

- Up to +20 dBm Sub-GHz
- -125.8 dBm RX @ 915 MHz 4.8 kbps O-QPSK
- Up to +10 dBm 2.4 GHz
- -94.2 dBm @ BLE 1 Mbps

### Efficient ARM® Cortex®-M33

- Up to 78 MHz
- Up to 1024kB Flash, 256kB RAM

### Low Power

- 82.8 mA TX Current (915 MHz, +20 dBm)
- 26.2 mA Tx Current (915 MHz, +14 dBm)
- 4.6 mA RX (915 MHz 4.8 kbps O-QPSK)
- 22.5 mA TX Current (2.4 GHz +10 dBm)
- 5.2 mA RX (BLE 1 Mbps)
- Active Current: 33 µA/MHz @39 MHz
- 1.3 µA EM2 (16 kB Retained)

### Protocol Support

- Wi-SUN
- Amazon Sidewalk
- WM-BUS
- Proprietary
- Bluetooth LE
- Silicon Labs Connect

### Package Options

- 6x6 QFN48 (31 GPIO), 8x8 QFN68 (49 GPIO)

## DIFFERENTIATED FEATURES

### Dual-Band

- Supports Sub-GHz + 2.4 GHz Bluetooth LE

### Secure Vault™ Mid and High

- Allows for migration path as security needs change
- **+20 dBm output power**
- Eliminates the need for an external power amplifier

### 16-bit ADC

- Up to 14-bit ENOB for better analog resolution

### AI/ML Hardware Accelerator

- Reduces current consumption for AI/ML at the edge

### Preamble Sense

- Ultra low power receive mode

### Sub-GHz Antenna Diversity

- 6-8 dBm better link budget (Sub-GHz only)

### Segment LCD

- 4x40 segment LCD

### High GPIO count

- Supports up to 49 GPIO

# FG28 Protocol Support



Protocol	FG28	
Amazon Sidewalk (Bluetooth LE + FSK)	✓	
Wi-SUN	✓	
WM-Bus	✓	
CONNECT	✓	
Proprietary	✓	
Bluetooth LE	✓	
Static Multi-Protocol	Amazon Sidewalk + Bluetooth LE	✓ (23Q4 Alpha)
	Proprietary + Bluetooth LE	✓
Dynamic Multi-Protocol	Proprietary + Bluetooth LE	✓

- Static Multi-Protocol
  - Device operates on only one network but can be switched between the supported protocols
- Dynamic Multi-Protocol
  - Device can operate on multiple networks at the same time by switching the active protocol at pre-specified intervals



# Battery Powered Sensor Node



## DESIGN CONSIDERATIONS

- Range - TX power, RX sensitivity
- Cost – Highly integrated Wireless SoC
- Battery Life – Long coin cell battery operation
- Environmental conditions
- Security

## HARDWARE SOLUTIONS

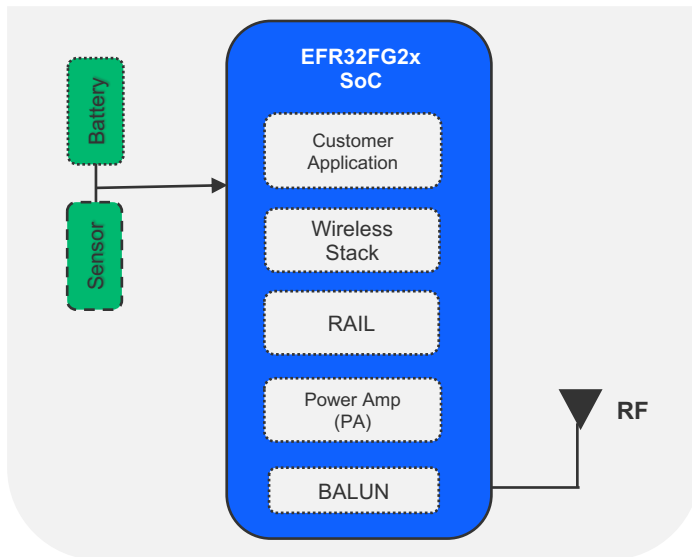
- **FG28**
  - High GPIO count (49)
  - Superior RF performance (Link budget of ~146 dBm)
  - AI/ML accelerator for lower power consumption
  - Low active and standby currents for battery life optimization
  - Dual band support (Sub-G, 2.4G BLE)
  - Increased security with Secure Vault™ Mid and High options

## RECOMMENDED KITS

- **FG28**
  - FG28-PK6025A Pro kit (+20 dBm)
  - xG28-EK2705A Explorer Kit
- **Amazon Sidewalk**
  - KG100S-PK6130A Pro Kit

## SOFTWARE SOLUTIONS

- **Amazon Sidewalk (FG28)**
  - Complete application support with both Amazon and Silicon Labs supplied examples
  - Supported in Simplicity Studio with GSDK
  - Support for both Bluetooth LE and FSK PHYs
- **Power management solutions for low power by**
  - Option to turn off the power to unused RAM blocks
  - Peripheral Reflex System (PRS)
  - Low Energy Sensor Interface (LESENSE)
  - Optimized analog peripherals for low power performance



# Common Platform & Tools



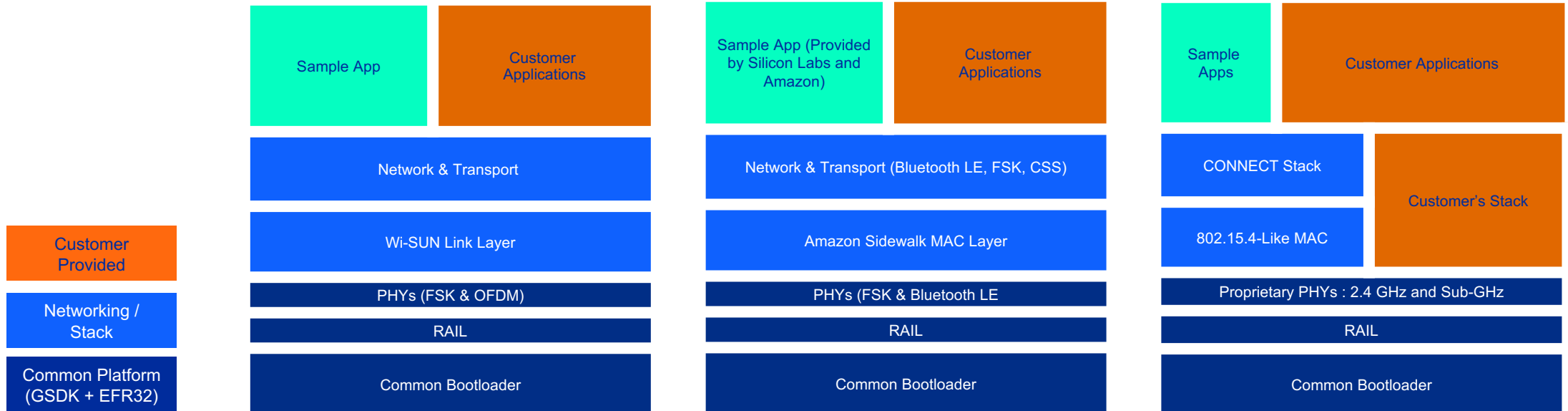
## Wi-SUN SDK



## Amazon Sidewalk SDK

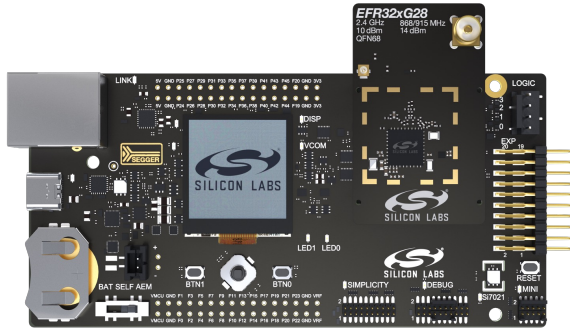


## FLEX SDK



# Getting Started with FG28

## Pro Kit



**FG28-PK6025A (+20 dBm)**  
**FG28-PK6024A (+14 dBm)**

- 1x BRD4002A Wireless Starter Kit Mainboard
- 1x FG28-RB440xB 915MHz Radio Board
- 1x 915 MHz antenna
- 1x Flat Cable
- 1x 2xAA Battery Holder

## Explorer Kit



**xG28-EK2705A**

- 1x BRD2705A Explorer Kit Board
- 1x USB Type C

## Radio Boards



**xG28-RB4400C (+14 dBm)**  
**xG28-RB4401C (+20 dBm)**

- 1x xG28-RB440xC 915MHz Radio Board
- 1x SMA Antenna connector

# 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	✔	✔	✔
Pushbuttons & 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)	-	-	✔
3 <sup>rd</sup> Party Hardware addons	✔	-	-

✔ Supported

✔ Optional or not mounted

- Not Supported



## Explorer Kit

- Lowest price point
- On-board debugger and signal breakouts
- Minimal on-board features
- 3<sup>rd</sup> party hardware support

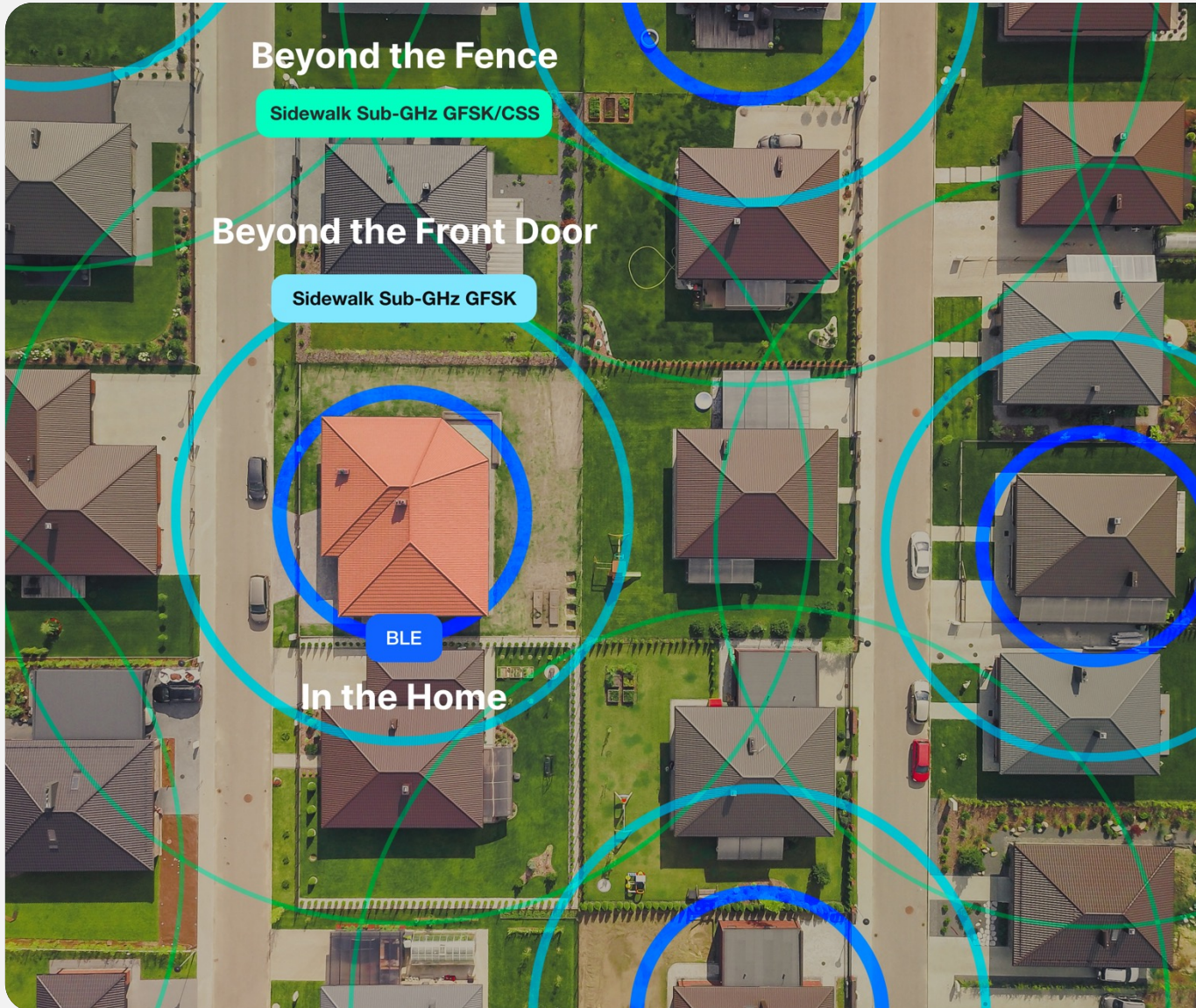
## Dev Kit

- Single device development board
- On-board debugger and signal breakouts
- On-board sensors
- Impressive out-of-the-box demos

## Pro Kit

- Modular development platform
- Advanced development use cases
- Energy profiling and external device debug
- Ethernet for large network test
- Designed to maximize reuse of EFR32 devices

# Sidewalk Enables a Distributed Network Beyond the Front Door

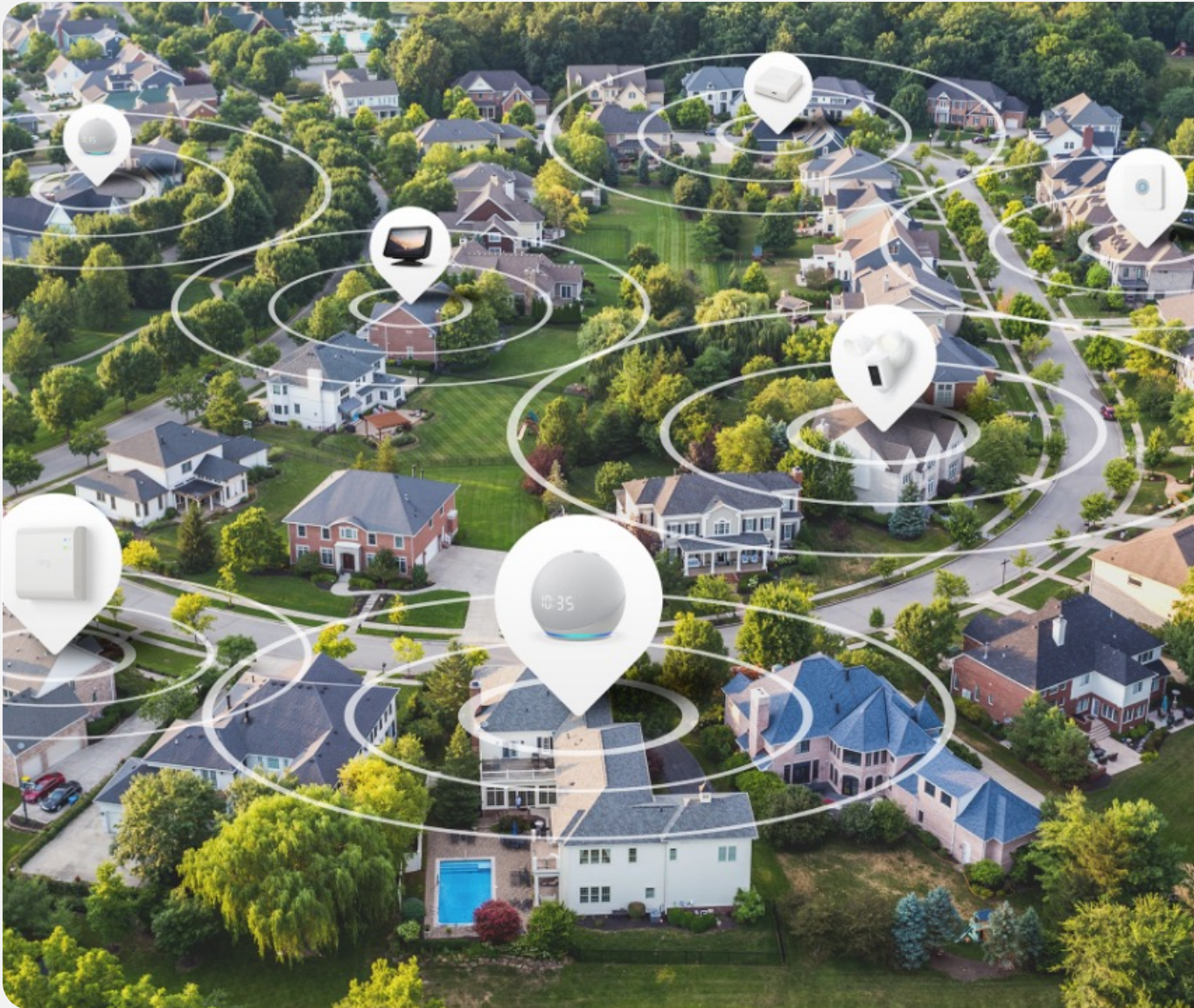


**Amazon Sidewalk is a new ecosystem for creating shared wireless networks connecting IoT devices at homes, and beyond the front door, across the entire neighborhood, and even the city.**

Silicon Labs can accelerate the development of Amazon Sidewalk devices by making it possible for manufacturers to focus more of their resources on innovation and less on testing and integration. We have in-depth expertise in the underlying wireless protocols utilized by Amazon Sidewalk including Bluetooth® and sub-GHz protocols.

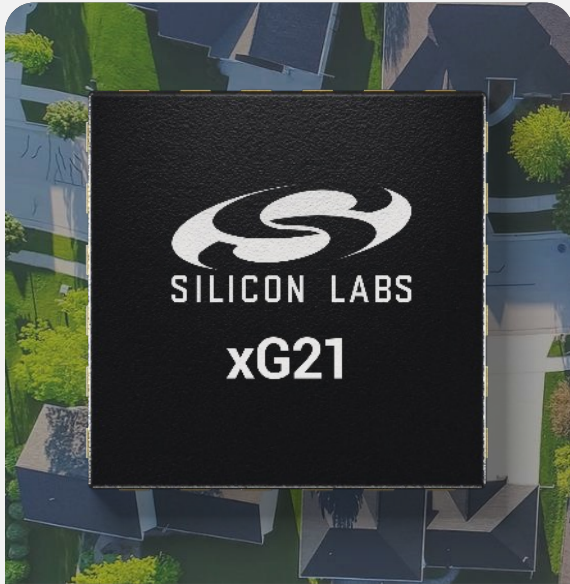
- Complements existing IoT protocols
- Allows device makers to connect securely without the need for dedicated gateways

# Amazon Sidewalk Delivers Significant Value



- Range extension
- Frustration free setup / automatic connection
- Remove need for proprietary gateway
- Reliable connectivity where otherwise isn't present today
- Free alternative to transport data to the cloud
- Transcend home ownership while device remains connected

# Silicon Labs' Amazon Sidewalk Portfolio



## EFR32BG21

2.4GHz Bluetooth LE Radio + MCU

Secure Vault-High

Line Powered Devices

Ref. design for FSK/CSS with SX126x

Up to 1024 kB Flash

Up to 96 kB RAM

## EFR32BG24

2.4GHz Bluetooth LE Radio + MCU

Secure Vault-High

AI/ML Capability

Ref. design for FSK/CSS with SX126x

Up to 1536 kB Flash

Up to 256 kB RAM

## EFR32FG28

2.4GHz and Sub-GHz Radios + MCU

Secure Vault – High

AI/ML Capability

Up to 1024kB Flash

Up to 256 kB RAM

Support for FSK + Bluetooth LE (Alpha 23Q2)

## QUECTEL KG100S

Bluetooth LE/FSK/CSS PCB Module

Fastest Integration Path

Includes BG21 + SX126x

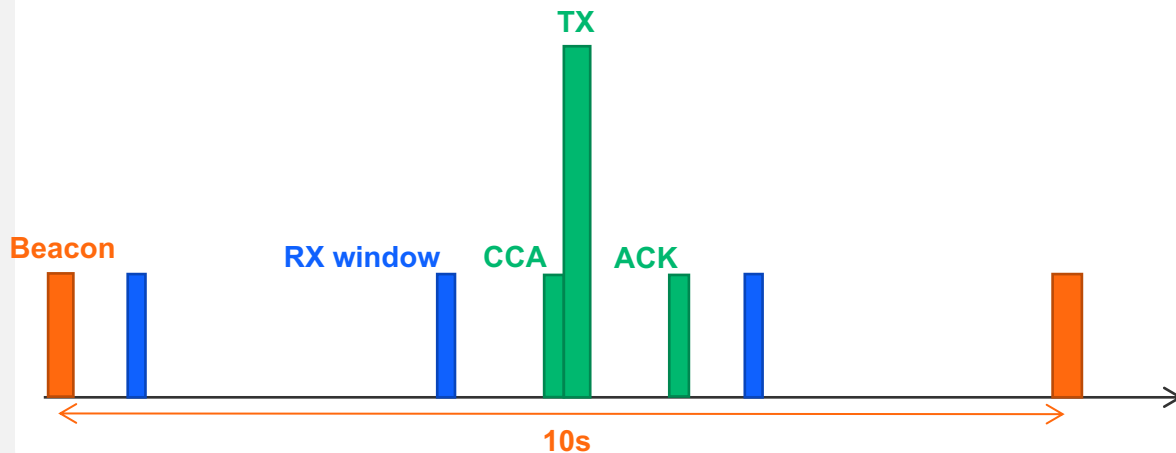
Flash 1024 kB

RAM 96 kB

# Sub-GHz Protocols Deep Dive

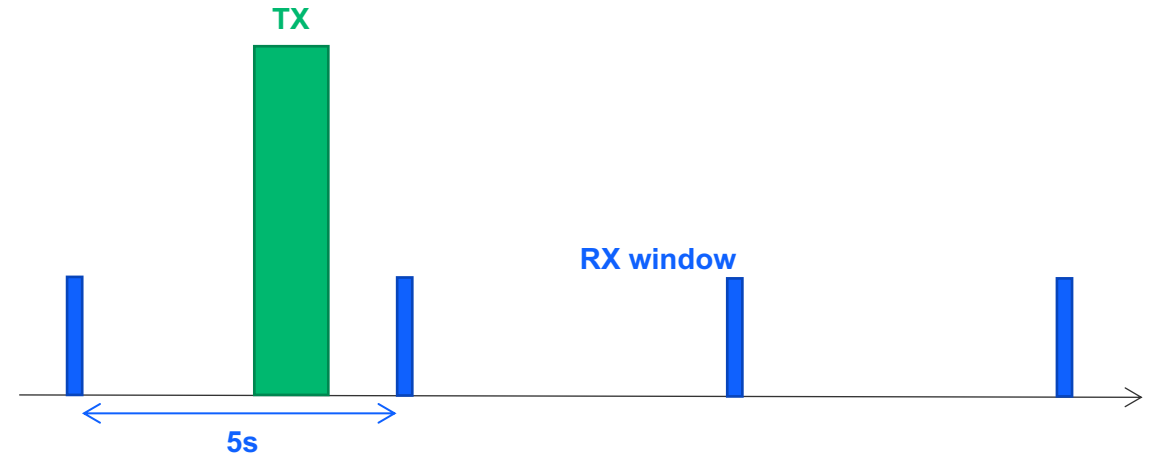
## FSK (900 MHZ)

- Synchronous protocol: always connected to GW
- Connected through beacons every 10 seconds
- Listening windows and transmission opportunities in between beacons
- Different power profiles available
  - Power profile 1: Configuration chosen by gateway
  - Power profile 2: Configuration chosen by endpoint

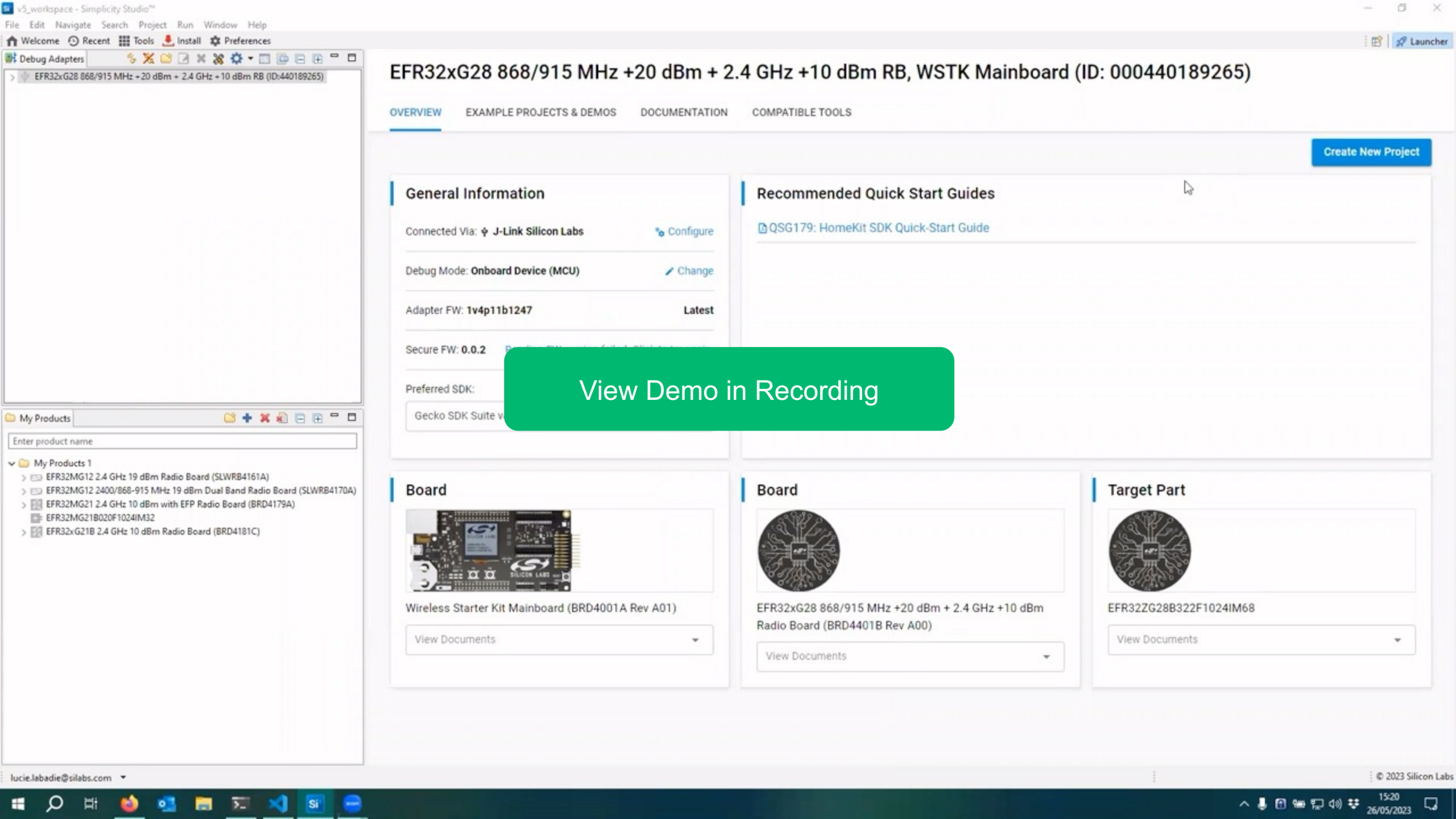


## CSS (900 MHZ)

- Asynchronous protocol: connects when needed
- Periodic listening windows (every 5 seconds)
- Transmissions when needed
- Different power profiles available
  - Power profile A: RX windows depend on TX
  - Power profile B: periodic RX







# EFR32xG28 868/915 MHz +20 dBm + 2.4 GHz +10 dBm RB, WSTK Mainboard (ID: 000440189265)

[OVERVIEW](#) [EXAMPLE PROJECTS & DEMOS](#) [DOCUMENTATION](#) [COMPATIBLE TOOLS](#)

Create New Project

## General Information

Connected Via: **J-Link Silicon Labs** [Configure](#)

Debug Mode: **Onboard Device (MCU)** [Change](#)

Adapter FW: **1v4p11b1247** **Latest**

Secure FW: **0.0.2**

Preferred SDK:

Gecko SDK Suite v

View Demo in Recording

## Recommended Quick Start Guides

[QSG179: HomeKit SDK Quick-Start Guide](#)

- My Products
- Enter product name
- My Products 1
    - EFR32MG12 2.4 GHz 19 dBm Radio Board (SLWRB4161A)
    - EFR32MG12 2400/868-915 MHz 19 dBm Dual Band Radio Board (SLWRB4170A)
    - EFR32MG21 2.4 GHz 10 dBm with EFP Radio Board (BRD4179A)
    - EFR32MG21B020F1024IM32
    - EFR32xG21B 2.4 GHz 10 dBm Radio Board (BRD4181C)

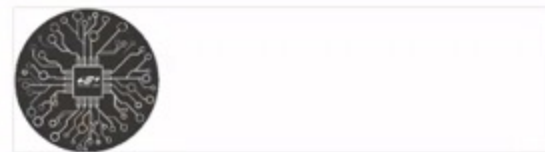
## Board



Wireless Starter Kit Mainboard (BRD4001A Rev A01)

[View Documents](#)

## Board



EFR32xG28 868/915 MHz +20 dBm + 2.4 GHz +10 dBm Radio Board (BRD4401B Rev A00)

[View Documents](#)

## Target Part



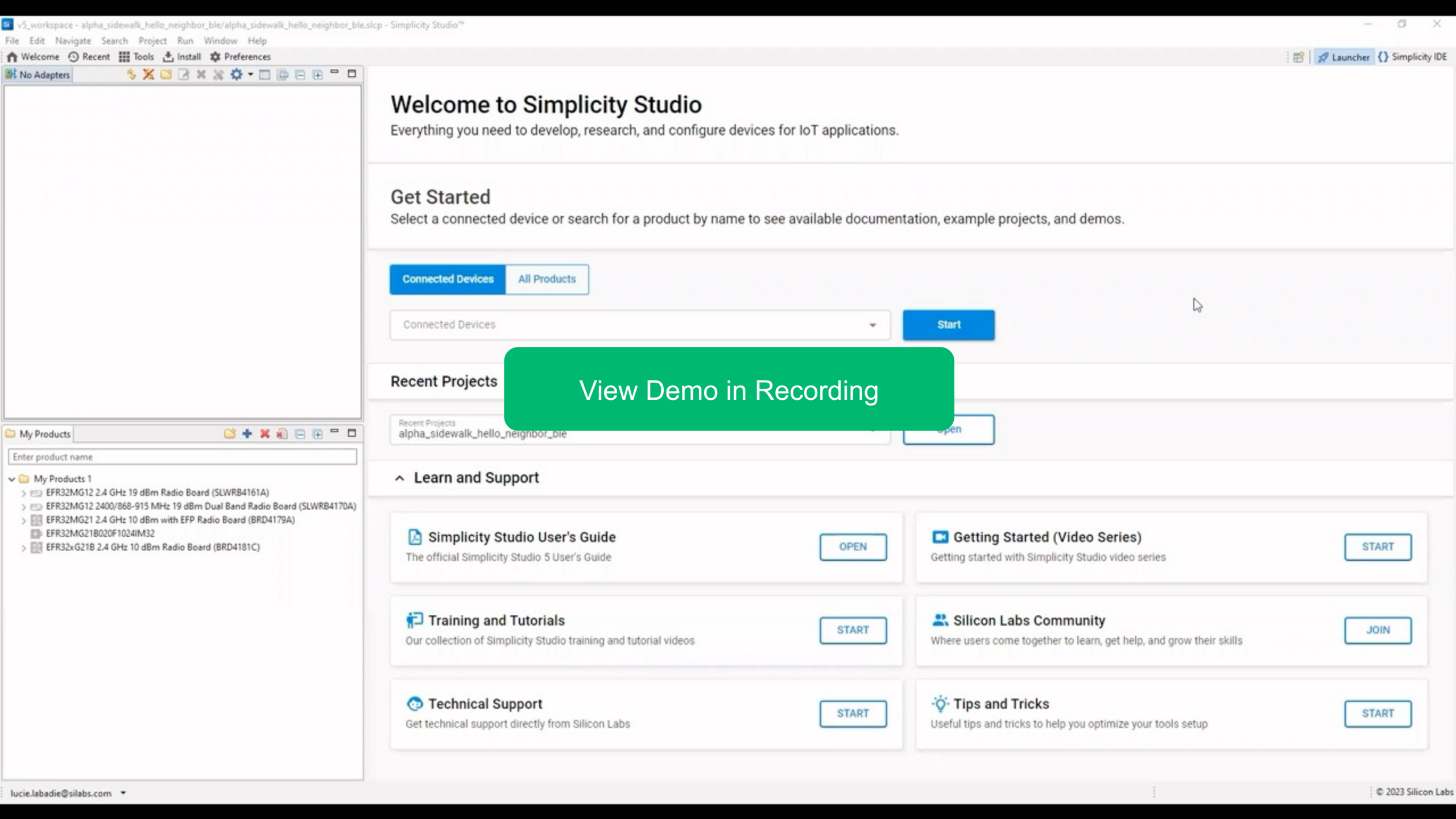
EFR322G28B322F1024IM68

[View Documents](#)

# Q&A



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# Welcome to Simplicity Studio

Everything you need to develop, research, and configure devices for IoT applications.

## Get Started

Select a connected device or search for a product by name to see available documentation, example projects, and demos.

- Connected Devices
- All Products

Connected Devices Start

View Demo in Recording

## Recent Projects

Recent Projects  
alpha\_sidewalk\_hello\_neighbor\_ble Open

## Learn and Support

<p> <b>Simplicity Studio User's Guide</b> The official Simplicity Studio 5 User's Guide</p> <p><span>OPEN</span></p>	<p> <b>Getting Started (Video Series)</b> Getting started with Simplicity Studio video series</p> <p><span>START</span></p>
<p> <b>Training and Tutorials</b> Our collection of Simplicity Studio training and tutorial videos</p> <p><span>START</span></p>	<p> <b>Silicon Labs Community</b> Where users come together to learn, get help, and grow their skills</p> <p><span>JOIN</span></p>
<p> <b>Technical Support</b> Get technical support directly from Silicon Labs</p> <p><span>START</span></p>	<p> <b>Tips and Tricks</b> Useful tips and tricks to help you optimize your tools setup</p> <p><span>START</span></p>

# Q&A



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# That's a wrap!

Watch all sessions on-demand and keep an eye out for future series.

tech **t**alks

AVAILABLE ON-DEMAND

- 
- FEB 16<sup>TH</sup> | Amazon Sidewalk: Using Battery-Powered Sensors
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  - MAY 11<sup>TH</sup> | Optimizing FG23 for Battery Life & Performance
  - JUN 8<sup>TH</sup> | Designing Long Range Devices with Amazon Sidewalk

# W/

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August 22 – 23, 2023

