MCU Presentation Will Begin Shortly

We will begin in: 4:00

2023 tech talks
UPCOMING SESSIONS

NEW

DEC 5TH EFM and EFR: A Common MCU Platform for IoT Development

MORE SESSIONS TO COME NEXT YEAR

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Welcome

EFM and EFR: A Common MCU Platform for IoT Development

Rich Lysaght, Sr FAE – Central Region
Chad Steider, Sr. Product Marketing Manager
Silicon Labs MCU Portfolio

- **EFM8**
  - Low cost, highly integrated 8-bit MCUs
  - Comprehensive Support with free IDE, Compiler, and hundreds of code examples

- **EFM32**
  - Stand alone MCU offering based on Wireless SoC Platform
  - Code compatible with Wireless SoCs

- **EFR32**
  - Complete Wireless SoC offering for Sub-GHz and 2.4 GHz needs
  - Multi-core architecture for most efficient designs
# EFM8 BB5x Family

## EFM8 BB5X FEATURES

- **Easy to use, flexible 8-bit family**
  - Simplicity Studio tool integration aligns with both 8-bit and 32-bit families
  - Fully featured Kiel 8-bit compiler allows for optimized code development

- **High performance 8051 Core**
  - Optimized for large number of single cycle instructions to improve efficiency
  - 4 Interrupt levels for faster response

- **Wide Operating Voltages (1.8 – 5.5V)**
  - Allows for use in Lithium powered devices

- **Advanced peripherals for LED and BLDC Control**
  - 16-bit 6ch PWM
  - Separate clock for LED Control

- **Low Power Modes for Battery Applications**
  - Optimized energy modes for best system performance

- **Various package options optimized for size or IO needs**
  - 2x2 QFN12, 2.5x2.5 QFN16, 3x3 QFN20, and 5x5 QFN32
  - SOIC16, TSSOP20 and TSSOP29

## APPLICATIONS

- BLDC Control
- LED Lighting
- Personal Hygiene Products
- Sensors
- Keypads
- Toys
**EFM32 Series 2**

- **Seamlessly transition from connected to non-connected products**
  - Platform compatibility allows for easy transition from EFM32 to EFR32 products
  - Allows for easy creation of good, better, best approach

- **Common Security and AI/ML Subsystems**
  - Enables developers to maintain security scheme for non-connected products
  - Enables re-use of complex and costly AI/ML algorithms

- **Flexible portfolio of devices**
  - Options optimized for power, analog performance, and AI/ML

- **Cost optimized platform**
  - Lower cost than similarly featured Series 1 MCUs

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**TARGET APPLICATIONS – PG22**

- Sensors
- Portable Medical
- Personal Hygiene Products
- Remotes
- Keypads / Switches

**TARGET APPLICATIONS – PG23**

- Smart Metering
- Portable Medical
- Personal Hygiene Products
- Sensors
- Building Automation

**TARGET APPLICATIONS – PG28**

- Smart Lighting
- Garage Door Opener
- Building Automation
- Asset Tracking
- Electronic Shelf Labels
- Smart City
EFM32 Portfolio Value Proposition

**PG22**
- Optimized for low power
- Small package options for space constrained applications
- Firmware and footprint compatible with xG22 SoCs for simple platform approach

**PG23**
- Secure Vault™ Mid and High options for consistent security architecture
- High performance analog for sensing applications
- Firmware and footprint compatible to xG23 Sub-GHz SoCs

**PG28**
- AI/ML accelerator for faster, lower power inferencing at the edge
- Larger memory and more GPIOs for better system integration
- Secure Vault™ Mid and High options for consistent security architecture
- Firmware compatible with xG28 sub-GHz and dual band SoCs
EFM and EFR: Multi-core Solutions for IoT Development

- Multi-core architecture gives design flexibility and optimization across EFM and EFR platforms
  - Dedicated application, radio\(^1\), and security\(^2\) cores share system burden for better resource utilization
- Common development platform for connected and non-connected products
  - Simplicity Studio gives developers a common development platform for entire product portfolio
- Common Security and AI/ML subsystems
  - Allows for design consistency independent of connectivity needs
- Footprint and firmware compatibility between EFM and EFR families
  - Simplified SKU management and code base development lowers development cost and complexity

<table>
<thead>
<tr>
<th>Secure Vault API</th>
<th>Wireless Stacks</th>
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<tr>
<td>Security Subsystem (Cortex M0+ - Dedicated Core)</td>
<td>RAIL</td>
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<tr>
<td>Cortex M33 - Application Core</td>
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<tr>
<th>BG</th>
<th>MG</th>
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1- EFR32 devices only  2- Secure Vault Hardware Secure Element (HSE) Only

EFR Device Families

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Peripherals for Low Power Optimized

- Autonomous peripherals and subsystems
  - Free up CPU resources and allow for higher sleep duty-cycles
- Peripherals optimized for low power operation
  - Most peripherals available in sleep states to enable best system performance
- Peripheral Reflex System lowers MCU burden without compromising performance
  - Peripherals can trigger actions from other subsystems without application core intervention
Application Optimized for Best Fit

- **Autonomous peripherals and subsystems**
  - Free up CPU resources and allow for higher sleep duty-cycles

- **Peripherals optimized for low power operation**
  - Most peripherals available in sleep states to enable best system performance

- **Peripheral Reflex System lowers MCU burden without compromising performance**
  - Peripherals can trigger actions from other subsystems without application core intervention

- **Broad 8-bit MCU portfolio to meet simple application needs**
  - Flexible, cost optimized platform for systems that don’t need 32-bit overhead
  - Hundreds of ready-made software examples to simplify development

### Peripheral Description

<table>
<thead>
<tr>
<th>Peripheral</th>
<th>Description</th>
<th>Energy Mode (Lowest Avail)</th>
<th>PRS Mode (Prod / Cons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVP</td>
<td>AI/ML H/W Accelerator</td>
<td>EM1</td>
<td>Producer</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display Driver</td>
<td>EM3</td>
<td>Producer</td>
</tr>
<tr>
<td>USART</td>
<td>UART/SPI/Smartcard (ISO 7816)/IrDA/I2S</td>
<td>EM1</td>
<td>Producer/Consumer</td>
</tr>
<tr>
<td>GPIO</td>
<td>General Purpose I/O</td>
<td>EM4</td>
<td>Producer</td>
</tr>
<tr>
<td>EUSART</td>
<td>UART/SPI/IrDA</td>
<td>EM3</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>TIMER</td>
<td>16/32 Timer/Counter</td>
<td>EM1</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>LETIMER</td>
<td>24 Bit Timer</td>
<td>EM3</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>LDMA</td>
<td>Linked Direct Memory Access</td>
<td>EM3</td>
<td>Consumer</td>
</tr>
<tr>
<td>ACMP</td>
<td>Analog Comparator</td>
<td>EM3</td>
<td>Producer</td>
</tr>
<tr>
<td>IADC</td>
<td>Incremental successive approx. ADC</td>
<td>EM3</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>VDAC</td>
<td>Voltage DAC</td>
<td>EM3</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>LESENSE</td>
<td>Low energy sensor Interface</td>
<td>EM3</td>
<td>Producer / Consumer</td>
</tr>
<tr>
<td>KEYSCAN</td>
<td>Keypad scanner</td>
<td>EM3</td>
<td>Producer</td>
</tr>
</tbody>
</table>
Common Development Platform

- EFM32 and EFR32 give simplified development platform for connected and non-connected products
  - PG variants of major wireless SoC families give package and code compatibility most of EFR32 portfolio
- Common tools simplify development process
  - Simplicity Studio gives developers a common development platform for entire Silicon Labs portfolio
- Advanced debug and development tools for quicker system integration
  - Tools like Network Analyzer, Energy Profiler, and GUI based configurators help with adoption and troubleshooting
Platformed AI/ML and Security Approach

- **EFM32 and EFR32 maintain consistent security and AI/ML subsystems**
  - Allow developers to maintain security and AI/ML consistency for connected and non-connected products

- **Lowers overall development burden**
  - Can maintain a single code base for multiple product SKUs

- **Provides migration path as security needs evolve with Secure Vault subsystem**
  - Mid and High options in both EFM and EFR allow provide drop-in migration path as security needs evolve
AI/ML Hardware Accelerator Key Features

- **Matrix processor accelerates ML inferencing**
  - Multi-dimensional array operations
  - Handles real and complex data
  - Offloads MCU
- **Up to 8x faster inferencing over Cortex-M**
  - Lower latency
- **Up to 6x lower power for inferencing**
  - Longer battery life
- **MVP Math Library**
  - Can be used for non-ML applications

Sensors
- Acceleration, Temperature, Current/Voltage

Microphones
- Analog or Digital

Camera
- Low resolution imaging

Event Detection

AI/ML Hardware Accelerator enables efficient Edge ML inferencing
**Silicon Labs Tools 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
Software and Tool Support

**ML Expert**
- Python scripts and tutorials
  - *Machine Learning Toolkit*
  - [siliconlabs.github.io/mltk](https://siliconlabs.github.io/mltk)

**ML Explorer**
- GUI Developer Tools
  - [EDGE IMPULSE](https://edgeimpulse.com)
  - [SensiML](https://sensiml.com)

**Solution Libraries**
- Wake Word / Voice Command
  - [sensory.com](https://sensory.com)
- Anomaly Detection
  - [micro.ai](https://micro.ai)

**System Integrators**
- KLIAKA TECH
- TAITAD
- Bellintegrator

*Cortex M & MVP*

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*Machine Learning Toolkit is an open-source, self-serve, community supported reference example*
ML Demo
Live Q&A
Thank You

Watch ON DEMAND silabs.com/training