



# Proprietary Flex SDK 3.7.0.0 GA

## Gecko SDK Suite 4.4

### December 13, 2023

The Proprietary Flex SDK is a complete software development suite for proprietary wireless applications. Per its namesake, Flex offers two implementation options.

The first uses Silicon Labs RAIL (Radio Abstraction Interface Layer), an intuitive and easily-customizable radio interface layer designed to support both proprietary and standards-based wireless protocols.

The second uses Silicon Labs Connect, an IEEE 802.15.4-based networking stack designed for customizable broad-based proprietary wireless networking solutions that require low power consumption and operates in either the sub-GHz or 2.4 GHz frequency bands. The solution is targeted towards simple network topologies.

The Flex SDK is supplied with extensive documentation and sample applications. All examples are provided in source code within the Flex SDK sample applications.

These release notes cover SDK version(s):

3.7.0.0 GA released December 13, 2023.



#### RAIL APPS AND LIBRARY KEY FEATURES

- Connect OFDM support for some applications
- EFR32xG28 Proprietary 2.4 GHz 15.4 Standard PHY support
- Added hardware support: MG24 QFN40, EFRBG22-E, EFR32xG28 Explorer Kit

#### CONNECT APPS AND STACK KEY FEATURES

- SUN-FSK and SUN-OFDM support
- Long message reception and transmission

## Compatibility and Use Notices

For information about security updates and notices, see the Security chapter of the Gecko Platform Release notes installed with this SDK or on the TECH DOCS tab on <https://www.silabs.com/developers/flex-sdk-connect-networking-stack>. Silicon Labs also strongly recommends that you subscribe to Security Advisories for up-to-date information. For instructions, or if you are new to the Silicon Labs Flex SDK, see [Using This Release](#).

### Compatible Compilers:

IAR Embedded Workbench for ARM (IAR-EWARM) version 9.40.1

- Using wine to build with the IarBuild.exe command line utility or IAR Embedded Workbench GUI on macOS or Linux could result in incorrect files being used due to collisions in wine's hashing algorithm for generating short file names.
- Customers on macOS or Linux are advised not to build with IAR outside of Simplicity Studio. Customers who do should carefully verify that the correct files are being used.

GCC (The GNU Compiler Collection) version 12.2.1, provided with Simplicity Studio.

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# 1 Connect Applications

This release of the Gecko SDK (GSDK) will be the last with combined support for all EFM and EFR devices, except for patches to this version as needed. Starting in mid-2024 we will introduce separate SDKs:

- The existing Gecko SDK will continue with support for Series 0 and 1 devices.
- A new SDK will cater specifically to Series 2 and 3 devices.

The Gecko SDK will continue to support all Series 0 and 1 devices with no change to the long-term support, maintenance, quality, and responsiveness provided under our software policy.

The new SDK will branch from Gecko SDK and begin to offer new features that help developers take advantage of the advanced capabilities of our Series 2 and 3 products.

This decision aligns with customer feedback, reflecting our commitment to elevate quality, ensure stability, and enhance performance for an exceptional user experience across our software SDKs.

## 1.1 New Items

### Added in release 3.7.0.0

- EFR32xG28 Explorer Kit Support
- EFRBG22-E Support
- MG24 QFN40 Support

## 1.2 Improvements

### Changed in release 3.7.0.0

- Gecko Bootloader is used instead of Legacy HAL

## 1.3 Fixed Issues

### Fixed in release 3.7.0.0

ID #	Description	Workaround
1076409	OTA Bootloader is not working on Series2	

## 1.4 Known Issues in the Current Release

Issues in bold were added since the previous release. If you have missed a release, recent release notes are available on the TECH DOCS tab on <https://www.silabs.com/developers/flex-sdk-connect-networking-stack>.

ID #	Description	Workaround
652925	EFR32XG21 is not supported for "Flex (Connect) - SoC Light Example DMP" and "Flex (Connect) - SoC Switch Example"	
1139850	DMP instabilities with XG27	

## 1.5 Deprecated Items

### Deprecated in release 3.7.0.0

None

## 1.6 Removed Items

### Removed in release 3.7.0.0

None

## 2 Connect Stack

### 2.1 New Items

#### Added in release 3.7.0.0

- Added support of SUN-FSK and SUN-OFDM. Enable the transmission and reception of packets carrying up to 2033 bytes of payload. `EmberMessageLength` was extended to allow the message length to be coded on 16 bits. Most of the packet's buffer are allocated dynamically except the radio RX fifo that is static and has to be extended to be able to contain at least one maximum length packet. It is the application responsibility to do so by implementing `RAILCb_SetupRxFifo()` and calling `RAIL_SetRxFifo()`. Depending on the application configuration, RTOS task stack sizes, minimum heap size and CPC packet maximum length may also need to be increased.
- Added new API `emberOfdmSetMcs()` and `emberOfdmGetMcs()` that set and get the OFDM modulation and coding scheme (MCS).
- Updated the hardware abstraction layer.

### 2.2 Improvements

#### Changed in release 3.7.0.0

None

### 2.3 Fixed Issues

#### Fixed in release 3.7.0.0

None

### 2.4 Known Issues in the Current Release

Issues in bold were added since the previous release. If you have missed a release, recent release notes are available on the TECH DOCS tab on <https://www.silabs.com/developers/gecko-software-development-kit>.

ID #	Description	Workaround
	When running the RAIL Multiprotocol Library (used for example when running DMP Connect+BLE), IR Calibration is not performed because of a known issue in the RAIL Multiprotocol Library. As result, there is an RX sensitivity loss in the order of 3 or 4 dBm.	
501561	In the Legacy HAL component, the PA configuration is hard-coded regardless of the user or board settings.	Until this is changed to properly pull from the configuration header, the file <code>ember-phy.c</code> in the user's project will need to be modified by hand to reflect the desired PA mode, voltage, and ramp time.
711804	Connecting multiple devices simultaneously may fail with a timeout error.	
1223893	Connect Profile's SUN-FSK cannot be used with Connect stack.	Wi-SUN SUN-FSK radio profile can be used instead. In the sample application, the radio restriction files (in <code>config/rail</code> ) must be deleted in order to unlock the selection of Wi-SUN profile configurations.

### 2.5 Deprecated Items

#### Deprecated in release 3.7.0.0

None

## 2.6 Removed Items

### Removed in release 3.7.0.0

None

### 3 RAIL Applications

This release of the Gecko SDK (GSDK) will be the last with combined support for all EFM and EFR devices, except for patches to this version as needed. Starting in mid-2024 we will introduce separate SDKs:

- The existing Gecko SDK will continue with support for Series 0 and 1 devices.
- A new SDK will cater specifically to Series 2 and 3 devices.

The Gecko SDK will continue to support all Series 0 and 1 devices with no change to the long-term support, maintenance, quality, and responsiveness provided under our software policy.

The new SDK will branch from Gecko SDK and begin to offer new features that help developers take advantage of the advanced capabilities of our Series 2 and 3 products.

This decision aligns with customer feedback, reflecting our commitment to elevate quality, ensure stability, and enhance performance for an exceptional user experience across our software SDKs.

#### 3.1 New Items

##### Added in release 3.7.0.0

- EFR32xG28 Explorer Kit Support
- EFRBG22-E Support
- MG24 QFN40 Support

#### 3.2 Improvements

##### Changed in release 3.7.0.0

- EFR32xG28 Proprietary 2.4 GHz 15.4 Standard PHY Support
- Connect OFDM PHY Support for
  - RAIL - SoC Simple TRX
  - RAIL - SoC Range Test

#### 3.3 Fixed Issues

##### Fixed in release 3.7.0.0

ID #	Description

#### 3.4 Known Issues in the Current Release

None

#### 3.5 Deprecated Items

##### Deprecated in release 3.7.0.0

None

#### 3.6 Removed Items

##### Removed in release 3.7.0.0

None

## 4 RAIL Library

### 4.1 New Items

#### Added in release 3.7.0.0

- Added support for a new assert, which will be thrown if the loaded PHY is not supported by the software-defined modem on the EFR32xG25.
- Added new RAIL\_GetAutoAckFifo() API and allow NULL for RAIL\_WriteAutoAckFifo() or RAIL\_IEEE802154\_WriteEnhAck() ackData parameter, which gives applications direct access to the AutoAck FIFO to construct Ack packets in pieces.
- Added support for antenna selection through the applicable RAIL\_RxOptions\_t and RAIL\_TxOptions\_t values when using OFDM on the EFR32xG25.
- Added a new "RAIL Utility, SFM Sequencer Image Selection" component to allow selection of modulations supported by EFR32xG25 software modem (SFM). These changes can save considerable flash space by reducing the set of modulations to just those that are needed.
- Added support for Sidewalk PHYs on the EFR32xG23 and EFR32xG28 chips.
- Added an assert RAIL\_ASSERT\_INVALID\_XTAL\_FREQUENCY on the EFR32xG1x and EFR32xG2x chips, to fire when a radio config that is loaded is incompatible with a device due to the defined crystal frequency of the config not matching with the device's crystal frequency.
- Added the RAIL\_TX\_REPEAT\_OPTION\_START\_TO\_START option to measure the delay between repeated transmits from the start of TX to start of TX instead of the default from end of TX to start of TX.
- Added support for GCC 12.2.1 and IAR 9.40.1 compilers.
- Added support for Fast Channel Switching PHYs on the EFR32xG24.
- Added support for RAIL\_IEEE802154\_SUPPORTS\_G\_MODESWITCH on the EFR32xG28.
- Added support for the IEEE802154 2.4 GHz coherent PHYs via RAIL\_SUPPORTS\_IEEE802154\_BAND\_2P4 on the EFR32xG28.
- Added a new RAIL\_RxOptions\_t option to enable collision detection on the EFR32xG25. Once enabled, when a collision with a strong enough packet is detected, the demod will stop the current packet decoding and try to detect the preamble of the incoming packet.
- Added support of RAILTEST for the MGM240x modules.
- Added support for channel masks during Wi-SUN mode switch in RAILTEST application on the EFR32xG25.
- Added support of 802.15.4 IMM-ACK with OFDM and OQPSK modulations (FCS 4 bytes only) on the EFR32xG25.
- Updated the RAIL Library component to include the "RAIL Utility, Built-in PHYs Across HFXO Frequencies" component automatically to better support different HFXO frequencies on supported parts.

### 4.2 Improvements

#### Changed in release 3.7.0.0

- Updated the default PTI rate to 3200000 bps on the EFR32xG25.
- No longer include rail\_chip\_specific.h and rail\_features.h (anything dependent on em\_device.h) when SLI\_LIBRARY\_BUILD is defined. This will allow the user to build their radio code in a way that depends on RAIL generically but is not chip-specific. When doing this the code cannot depend on things that are inherently chip-specific and are still in those files like RAIL\_RF\_PATHS, RAIL\_NUM\_PA, or any of the compile-time RAIL\_SUPPORTS\_xxx defines. Code will need to call appropriate runtime APIs or split itself between the generic and chip specific portions and build them separately.
- To better support chip-agnostic builds RAIL\_TxPowerMode\_t is now a superset representing all possible PAs across all chips. Any code depending on the number of or consecutive ordering of chip-supported PAs will likely need to be updated.
- To better support chip-agnostic builds RAIL\_CalValues\_t and subordinate RAIL\_IrCalValues\_t have grown to encompass the superset of fields needed on all chips, affecting all chips except EFR32xG25.
- To better support chip-agnostic builds RAIL\_TransitionTime\_t and therefore RAIL\_StateTiming\_t have grown to a superset type, affecting EFR32xG1.



- To better support chip-agnostic builds RAIL\_FIFO\_ALIGNMENT is now universally 32-bit, affecting EFR32xG1x and EFR32xG21, but is still only enforced on chips actually requiring that alignment.
- Updated the default power curves for the 10dBm High Power PA on EFR32xG24.

### 4.3 Fixed Issues

#### Fixed in release 3.7.0.0

ID #	Description
1079816	Fixed a race condition on the EFR32xG22 and later during RX channel hopping or duty-cycling where frame detection occurring close to when a hop should happen could leave the radio stuck in reception but not receiving anything, with the only remedy being to idle the radio.
1088439	Fixed an issue which would cause the incorrect antenna to be reported for a received packet on the EFR32xG25 when using OFDM and antenna diversity.
1153679	Fixed an issue in "RAIL Utility, Coexistence" component on the EFR32xG24 where a GRANT signal pulse less than 100us might result in the radio not being properly placed in hold off after GRANT is deasserted.
1156980	Fixed an issue with channel hopping on the EFR32xG22 and later where use of RAIL_RX_CHANNEL_HOPPING_OPTION_RSSI_THRESHOLD can prevent the timed RX channel hopping modes including RX duty-cycling from timing out properly.
1175684	Fixed an issue with the RAIL_IDLE form of RAIL_Idle() and RAIL_STOP_MODE_PENDING form RAIL_StopTx() during the LBT/CSMA phase of a transmit which could previously hang. Pending LBT/CSMA and scheduled transmits are now stopped or idled with RAIL_EVENT_TX_BLOCKED triggered, except for idle mode RAIL_IDLE_FORCE_SHUTDOWN_CLEAR_FLAGS.
1183040	Updated all PHYs built into RAIL on Series 2 platforms using the latest radio calculator to reduce observed high reference spurs.
1184982	Fixed an issue with RAIL_StartAverageRssi() that could cause execution to hang in interrupt context just before raising RAIL_EVENT_RSSI_AVERAGE_DONE. This was primarily an issue on the EFR32xG21 platform. Note that it is possible, though unlikely, that RAIL_GetAverageRssi() might still return RAIL_RSSI_INVALID after the average RSSI period has finished.
1184982	Fixed an issue with RAIL_StartAverageRssi() that caused it to mistakenly idle the radio in the newly-activated protocol if a dynamic protocol switch occurred during the averaging operation of the suspended protocol.
1188083	Fixed an issue where RAIL_Idle() could hang waiting for the radio to idle when using IEEE 802.15.4 fast RX channel switching.
1190187	Fixed an issue where idling the radio before a Scheduled Receive window ends could cause a subsequent packet that should be silently filtered and rolled back to instead be received with RAIL_RX_PACKET_READY_CRC_ERROR.
1201506	Fixed an issue in multiprotocol applications where the wrong sync word would be used if two protocols used the same radio configuration and only one of those protocols set a custom sync word with RAIL_ConfigSyncWords() API.

### 4.4 Known Issues in the Current Release

Issues in bold were added since the previous release.

ID #	Description	Workaround
	Using direct mode (or IQ) functionality on EFR32xG23 requires a specifically set radio configuration that is not yet supported by the radio configurator. For these requirements, reach out to technical support who could provide that configuration based on your specification	
641705	Infinite receive operations where the frame's fixed length is set to 0 are not working correctly on the EFR32xG23 series chips.	

ID #	Description	Workaround
732659	On EFR32xG23: Wi-SUN FSK mode 1a exhibits a PER floor with frequency offsets around $\pm 8$ to 10 KHz Wi-SUN FSK mode 1b exhibits a PER floor with frequency offsets around $\pm 18$ to 20 KHz	

#### 4.5 Deprecated Items

None

#### 4.6 Removed Items

None

## 5 Using This Release

This release contains the following:

- Radio Abstraction Interface Layer (RAIL) stack library
- Connect Stack Library
- RAIL and Connect Sample Applications
- RAIL and Connect Components and Application Framework

This SDK depends on Gecko Platform. The Gecko Platform code provides functionality that supports protocol plugins and APIs in the form of drivers and other lower layer features that interact directly with Silicon Labs chips and modules. Gecko Platform components include EMLIB, EMDRV, RAIL Library, NVM3, and mbedTLS. Gecko Platform release notes are available through Simplicity Studio's Documentation tab.

For more information about the Flex SDK v3.x see [UG103.13: RAIL Fundamentals](#) and [UG103.12: Silicon Labs Connect Fundamentals](#). If you are a first time user, see [QSG168: Proprietary Flex SDK v3.x Quick Start Guide](#).

### 5.1 Installation and Use

The Proprietary Flex SDK is provided as part of the Gecko SDK (GSDK), the suite of Silicon Labs SDKs. To quickly get started with the GSDK, install [Simplicity Studio 5](#), which will set up your development environment and walk you through GSDK installation. Simplicity Studio 5 includes everything needed for IoT product development with Silicon Labs devices, including a resource and project launcher, software configuration tools, full IDE with GNU toolchain, and analysis tools. Installation instructions are provided in the online [Simplicity Studio 5 User's Guide](#).

Alternatively, Gecko SDK may be installed manually by downloading or cloning the latest from GitHub. See [https://github.com/SiliconLabs/gecko\\_sdk](https://github.com/SiliconLabs/gecko_sdk) for more information.

Simplicity Studio installs the GSDK by default in:

- (Windows): C:\Users\\SimplicityStudio\SDKs\gecko\_sdk
- (MacOS): /Users/<NAME>/SimplicityStudio/SDKs/gecko\_sdk

Documentation specific to the SDK version is installed with the SDK. Additional information can often be found in the [knowledge base articles \(KBAs\)](#). API references and other information about this and earlier releases is available on <https://docs.silabs.com/>.

### 5.2 Security Information

#### Secure Vault Integration

When deployed to Secure Vault High devices, sensitive keys are protected using the Secure Vault Key Management functionality. The following table shows the protected keys and their storage protection characteristics.

Wrapped Key	Exportable / Non-Exportable	Notes
Thread Master Key	Exportable	Must be exportable to form the TLVs
PSKc	Exportable	Must be exportable to form the TLVs
Key Encryption Key	Exportable	Must be exportable to form the TLVs
MLE Key	Non-Exportable	
Temporary MLE Key	Non-Exportable	
MAC Previous Key	Non-Exportable	
MAC Current Key	Non-Exportable	
MAC Next Key	Non-Exportable	

Wrapped keys that are marked as “Non-Exportable” can be used but cannot be viewed or shared at runtime.

Wrapped keys that are marked as “Exportable” can be used or shared at runtime but remain encrypted while stored in flash.

For more information on Secure Vault Key Management functionality, see [AN1271: Secure Key Storage](#).

## Security Advisories

To subscribe to Security Advisories, log in to the Silicon Labs customer portal, then select **Account Home**. Click **HOME** to go to the portal home page and then click the **Manage Notifications** tile. Make sure that 'Software/Security Advisory Notices & Product Change Notices (PCNs)' is checked, and that you are subscribed at minimum for your platform and protocol. Click **Save** to save any changes.

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<input type="checkbox"/> CDR and PHY	

## 5.3 Support

Development Kit customers are eligible for training and technical support. Use the [Silicon Labs Flex web page](#) to obtain information about all Silicon Labs Thread products and services, and to sign up for product support.

You can contact Silicon Laboratories support at <http://www.silabs.com/support>.

# Simplicity Studio

One-click access to MCU and wireless tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!



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