AN12396 EdgeLockTM SE050 Quick start guide with FRDM-K64F Rev. 2.1 — 17 December 2019 Application note 534421

Document information

Information	Content
Keywords	EdgeLock SE050, EdgeLock SE050 Plug & Trust middleware, FRDM-K64F
Abstract	This document explains how to get started with EdgeLock SE050 Plug & Trust middleware using the OM-SE050ARD and FRDM-K64F MCU boards. It provides detailed instructions to run projects imported either from the FRDM- K64F SDK or the CMake-based build system included in the EdgeLock SE050 Plug & Trust middleware.



Revision history

Revision his	story	
Revision number	Date	Description
1.0	2019-06-08	First document release
1.1	2019-06-20	Update of board figures
2.0	2019-11-25	Major update to incorporate details to import projects from FRDM-K64F SDK and CMake- based build system.
2.1	2019-12-17	Corrected OM-SE050ARD J14 jumper setting.

1 How to use this document

The EdgeLock SE050 Plug & Trust middleware includes a set of project examples that demonstrate the use of EdgeLock SE050 in the latest IoT security use cases. These project examples can be either:

- Imported from the MCUXpresso SDKs made available for FRDM-K64F MCU board.
- Imported from the CMake-based build system included in the EdgeLock SE050 Plug & Trust middleware package

This document provides detailed instructions to run EdgeLock SE050 project examples imported either from the FRDM-K64F SDK or the CMake-based build system. However, the FRDM-K64F SDK is recommended as it fastest way to import and run EdgeLock SE050 project examples. The CMake-based option is provided for developers familiar with it or willing to run exactly the same project example on PC/Windows/Linux and embedded targets. The main body of this document should be used in this sequence:

- 1. Order board samples. <u>Section 2</u> contains the ordering details of the boards required in this document
- 2. Setup your boards. <u>Section 3</u> describes how to setup the OM-SE050ARD and FRDM-K64F boards.
- Run project examples. Go to <u>Section 4</u> for instructions to import projects from the FRDM-K64F MCUXpresso SDK or alternatively, go to <u>Section 5</u> for instructions to import projects from the CMake-based build system.

Supplementary material has been provided in the appendices.

2 Hardware required

This guide provides detailed instructions to run the EdgeLock SE050 Plug & Trust middleware project examples using the hardware described below. However, you could use other MCU boards supported by EdgeLock SE050 Plug & Trust middleware for this purpose as well.

1. OM-SE050ARD development kit:

Table 1. OM-SE050ARD development kit details

Part number	12NC	Content	Picture
OM-SE050ARD	935383282598	EdgeLock SE050 development board	

2. FRDM-K64F board:

Table 2. FRDM-K64F details

Part number	12NC	Content	Picture
FRDM-64F	935326293598	Freedom development platform for Kinetis K64, K63 and K24 MCUs	

3 Boards setup

This section explains how to prepare the OM-SE050ARD and FRDM-K64F boards to run the EdgeLock SE050 Plug & Trust middleware project examples. This consists of:

- 1. Update FRDM-K64F with DAPLlink firmware
- 2. Hardware setup for FRDM-K64F
- 3. <u>OM-SE050ARD and FRDM-K64F board connection</u>.

3.1 Update FRDM-K64F board with DAPLink firmware

Arm Mbed DAPLink is an open-source software project that enables programming and debugging application software running on Arm Cortex CPUs. DAPLink runs an open-source bootloader and enables developers with drag-and-drop programming, a serial port and CMSIS-DAP based debugging.

Note: To debug MCUXpresso project examples, we need to flash FRDM-K64F with DAPLink firmware. If your FRDM-K64F board already includes DAPLink firmware, you can skip these steps.

To flash DAPLink firmware, follow these steps:

- 1. Go to NXP OpenSDA site
- Scroll down and select FRDM-K64F board from the *Download OpenSDA bootlader* and application drop down list as indicated in <u>Figure 1</u>:

Jump To Download – OpenSDA Bootloader and Application Overview & Features Comparison Table of Different OpenSDA Versions	The OpenSDA hardware consists of a circuit featuring a Kinetis [®] K2x microcontroller with an integrated USB controller. On the software side, it implements a mass storage device bootloader which offers a quick and easy way to load OpenSDA applications such as flash programmers, run-control debug interfaces, serial to USB converters, and more More *
	OpenSDA Block Diagram
	OpenSDA Serial and Debug Adapter FRDM-KL482 FRDM-KL462 FRDM-KL482 FRDM-KL282 FRDM-KL282 FRDM-KL282 FRDM-KL27Z FRDM-KL27Z FRDM-KL25Z FRDM-KL25Z FRDM-KL05Z FRDM-KL02Z
	Serial Terminal Application FRDM-KE15Z FRDM-KE06Z FRDM-KE04Z FRDM-KE04Z FRDM-K60F FRDM-K66F FRDM-K64F FRDM-K28F
	Download - OpenSDA Bootloader and Application RDM-K22F FRDM-K20D50M
	To update your board with OpenSDA applications Choose your board to start •
Figure 1. DAPLin	nk firmware update - select board

3. Download the latest DAPLink firmware version as shown in Figure 2:

EdgeLock[™] SE050 Quick start guide with FRDM-K64F



4. Start the board's bootloader mode. To do so, (1) keep reset button pressed while (2) connecting the USB cable to the SDA USB port and release it after 1s (Figure 3):



5. Drag and drop or copy and paste the binary file into the BOOTLOADER drive from your computer file explorer as shown in <u>Figure 4</u>. The FRDM-K64F will automatically un-mount after the drag and drop operation.

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item		regacy_0x3000.bin				

- 6. Un-plug and re-plug the USB cable from the SDA USB port *without* keeping reset button pressed.
- Check the category Ports (COM & LTP) from your computer Device Manager to ensure that new devices have been properly detected and their driver correctly installed by your computer OS.



3.2 OM-SE050ARD jumper configuration

The OM-SE050ARD board has jumpers that allow you to interface the EdgeLock SE050 $\rm I^2C$ interface via the Arduino header. Configure the jumper settings as shown in Figure 6 to enable this option.

EdgeLockTM SE050 Quick start guide with FRDM-K64F





For more information about the OM-SE050ARD jumper settings, refer to AN12395 OM-SE050ARD hardware overview.

3.3 OM-SE050ARD and FRDM-K64F board connection

The OM-SE050ARD and FRDM-K64F boards can be directly connected using the Arduino connectors of both boards. The OM-SE050ARD comes with male connectors while the FRDM-K64F board comes with female headers.

Mount the OM-SE050ARD board on top of the FRDM-K64F as shown in Figure 7:



Double check that the two boards are connected as shown in Figure 8:

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Note: Refer to Figure 6 for OM-SE050ARD jumper configuration.

4 Import project examples from FRDM-K64F SDK

This section explains how to run the EdgeLock SE050 projects importing them from the FRDM-K64F SDK.

4.1 Prerequisites

The following steps are required to run a project imported from the MCUXpresso SDK:

- 1. MCUXpresso IDE. Check Section 6 for detailed installation instructions
- 2. TeraTerm (or an equivalent serial application). You can download and run TeraTerm installer from this <u>link</u>.

4.2 Download FRDM-K64F SDK

The project examples for the EdgeLock SE050 are included as part of the FRDM-K64F SDK. First, download the FRDM-K64F SDK, publicly available from the <u>NXP website</u>.

4.3 Install FRDM-K64F SDK

After downloading the FRDM-K64F SDK, we need to install it into our MCUXpresso workspace. To install the SDK, (1) drag and drop the FRDM-K64F SDK zip file in the *Installed SDKs* section in the bottom part of the MCUXpresso IDE and (2) click *OK* as shown in Figure 9:

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If the SDK is successfully imported, you should see it listed in the *Installed SDK* window as shown in <u>Figure 10</u>:

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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4.4 Import project example in MCUXpresso

After importing the FRDM-K64F SDK in our MCUXpresso workspace, follow these instructions to import a project:

1. Click *Import SDK examples* from file system in the MCUXpresso IDE quick start panel as shown in Figure 11

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 The SDK import wizard will be opened. You should see a figure of an FRDM-K64F board with an SE050 orange label. Select the board and click *Next* button as shown in <u>Figure 12</u>:

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3. Under the se_hostlib_examples drop down list, you have the list of supported project examples for the FRDM-K64F. Select the number of examples you would like to import in your MCUXpresso workspace and click *Finish* button as shown in <u>Figure 13</u>. In this case, we select the se_hostlib_se05x_minimal project as an example. The same process can be done with the rest of them.

AN12396 Application note

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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4. The projects you selected should now be visible in your MCUXpresso workspace as shown Figure 14:

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Figure 14. Imported projects in MCUXpresso workspace

AN12396
Application note

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

4.5 Build, run and debug project example

After importing project examples in our MCUXpresso workspace, follow these instructions to build, run and debug a project:

1. Attach a USB cable from the computer to the K64F OpenSDA debug USB connector as shown in Figure 15.



- 2. Launch and setup TeraTerm application as shown in Figure 16:
 - a. Click *Serial* option and select from the drop down list the COM port number assigned to your FRDM-K64F board
 - b. Go to Setup > Serial Port and configure the terminal to 115200 baud rate, 8 data bits, no parity and 1 stop bit and click OK.



 Go to the MCUXpresso Quickstart Panel and click *Build* button as shown in <u>Figure 17</u>. Wait a few seconds and check that the build process has finished successfully in the MCUXpresso console window.

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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4. Go to the MCUXpresso Quickstart Panel and click *Debug* button as shown in <u>Figure 18</u>. If there is more than one probe attached, you have to the select CMSIS-DAP debug probe from the list. Wait a few seconds until the project executes

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5. When it executes, it will automatically stop in a breakpoint. Click on Resume to allow the software to continue its execution as shown in Figure 19.

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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		(Kfiiffidi)

6. Once the program execution begins, logs are printed on the terminal application indicating the execution status. For the se05x_minimal project example, the logs should indicate the available memory in EdgeLock SE050 (in this case, 592) as can be seen in Figure 20

File Edit Setup Co	ntrol Window Help PlugAndTrust_v02.08.02_2	0190511	^
SSS:INFO	atr (Len=35) 00 A0 00 00	03 96 04 03	
50 34 20 41 sss:WARN sss:WARN App:INFO	01 00 00 00 54 50 4F Communication channel is <u>1919Not</u> recommended for pr them=592	00 64 00 00 Plain. roduction use.?!?	
			~

7. The same operation can be repeated with any of the other EdgeLock SE050 Plug & Trust middleware project examples.

5 Import project examples from CMake-based build system

This section explains how to run EdgeLock SE050 projects using the CMake-based build system.

5.1 Prerequisites

The following tools are required to run project imported from the MCUXpresso SDK:

- 1. MCUXpresso IDE. Check <u>Section 6</u> for detailed installation instructions.
- 2. CMake. Check <u>Section 7</u> for detailed installation instructions.
- 3. Python 3.7.x 32 bit version. Check <u>Section 8</u> for detailed installation instructions.
- 4. TeraTerm (or an equivalent serial application). You can download and run TeraTerm installer from this <u>link</u>.

5.2 Download EdgeLock SE050 Plug & Trust middleware

Follow these steps to download the EdgeLock SE050 Plug & Trust middleware in your local machine:

- 1. Download EdgeLock SE050 Plug & Trust middleware from the NXP website.
- 2. Create a folder called **se050_middleware** in C: directory as shown in Figure 21:



 Unzip the EdgeLock SE050 Plug & Trust middleware inside the se050_middleware folder. After unzipping, you will see a folder called simw-top created. The contents of the simw-top directory should look as shown in Figure 22:

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

	Name	Date modified	Туре	Size
📌 Quick access	akm	13-Nov-19 10:52 A	File folder	
MobileKnowledge	binaries	13-Nov-19 10:51 A	File folder	
This PC	demos	13-Nov-19 10:52 A	File folder	
	doc	13-Nov-19 10:51 A	File folder	
JD Objects	ext	13-Nov-19 10:53 A	File folder	
Desktop	hostlib	13-Nov-19 10:51 A	File folder	
Documents	projects	13-Nov-19 10:52 A	File folder	
👆 Downloads	pycli	13-Nov-19 10:51 A	File folder	
Music	scripts	13-Nov-19 10:51 A	File folder	
Pictures	sss	13-Nov-19 10:51 A	File folder	
Videor	tools	13-Nov-19 10:53 A	File folder	
	Android.mk	13-Nov-19 10:50 A	Makefile	7 KI
US (C:)	🗊 CleanSpec.mk	13-Nov-19 10:50 A	Makefile	2 KE
USB Drive (D:)	CMakeLists.txt	13-Nov-19 10:50 A	Text Document	3 KI
USB Drive (D:)	EULA.pdf	13-Nov-19 10:50 A	Adobe Acrobat D	134 K
<u> </u>	README.First.txt	13-Nov-19 10:50 A	Text Document	1 KE
Network	A Third Party License.pdf	13-Nov-19 10:50 A	Adobe Acrobat D	202 K
	version info.txt	13-Nov-19 10:50 A	Text Document	1 KE

Figure 22. Unzip se050 middleware

Note: It is recommended to keep *se050_middleware* with the <u>shortest</u> path possible and <u>without spaces</u> in it. This avoids some issues that could appear when building the middleware if the path contains spaces.

5.3 Build EdgeLock SE050 Plug & Trust middleware project examples

The EdgeLock SE050 Plug & Trust middleware uses CMake for building the project examples into your local machine. To build EdgeLock SE050 Plug & Trust middleware, open a Command Prompt and use the following steps as shown in Figure 23:

- 1. Go to folder with the unzipped SE050 middleware:
 (1) Send >> cd C:\se050 middleware\simw-top\scripts
- 2. Define the environment:
 (2) Send >> env setup.bat
- Generate the EdgeLock SE050 Plug & Trust middleware project examples: (3) Send >> create_cmake_projects.py
 Note: This command may take a few seconds to complete.

EdgeLock[™] SE050 Quick start guide with FRDM-K64F



4. Your project directory should now contain two folders: a (1) simw-top folder and a (2) simw-top build folder as shown in Figure 24:

I Image: sequence of the sequen	w OS (C:) > se050_middleware			
1011	Name	Date modified	Туре	Size
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 A bobileKnowledge This PC J D Objects Desktop 	2 📙 simw-top_build	6/3/2019 5:59 PM	File folder	
Figure 24. SE050 r	niddleware project str	ructure		

5.4 Import PlugAndTrustMW project example in MCUXpresso workspace

After generating the projects in your local machine using the create_cmake_projects.py script, we need to import the *PlugAndTrustMW* project example in our MCUXpresso workspace. Follow these steps to import a project:

1. Go to *File* \rightarrow *Import* using the top bar menu as shown in <u>Figure 25</u>. Note: In this case, do not use the MCUXpresso Quickstart Panel to import project.

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EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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	Print	Ctrl+P	Welcome to MCUXpresso IDE v11.0.0		
	Export Properties	Alt+Enter	Control M dovers, including LPC and Kinetis microcontrollers and LMX RT crossover processors. It offen advanced editing, compling, and debugging labatives with the addition of MCU-specific debugging views, code trace and profiling, multicore debugging, and integrated configuration tools. Documentation		
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	iguro 25	Immont			

2. In the import wizard menu, select import "*Existing Projects into Workspace*" from the *General* folder as shown in Figure 26:

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g Project 😢 🏊 Periphe IIII Registers 🎋 Faults 🗢 🗖	Welcon Select Create new projects from an archive file or directory		0.201905281035/pages/registered.htm
) Qu L 22 104 West SP Quitt 9 ₁₀ Bire (44 Ging ¹⁰ 10	Select an import witard: Type filter test		We want of the total bases We want of the total bases We buse many of the more powerful features, atabate for the field manu: We want of the more powerful features, atabate for the field manu:
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🗞 🏂 Build Clean			
ne			(i) NYP MK64EN1M0cov12 (freimk nimal)

 First, we need to import EdgeLock SE050 Plug & Trust middleware project in MCUXpresso. For that, in the Select root directory option, browse to C: \se050_middleware\simw-top_build or browse the location of your EdgeLock SE050 Plug & Trust middleware directory and click Select folder as shown in Figure 27:

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Application note	

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EdgeLock[™] SE050 Quick start guide with FRDM-K64F

	M Import	X	Select Folder		
oject 🛛	Import Projects Select a directory to search for existing Eclipse projects.		Corganize ▼ New folder	> simw-top_build v ⊘ Search simw-	top_build
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Aiscellaneo Edit projec s selected	(2) < Back	h Cancel	en la	(1) DissAndTouthAV.	ton-erlinte arm

 After selecting C:\se050_middleware\simw-top_build folder, a project called *PlugAndTrustMW* should be visible in the "projects" area. Click *Finish* button to import this project into your worskpace as shown in Figure 28:

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		< >		sover processors. It offers advanced editing, views, code trace and profiling, multicore	
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B Edit project settings	<				>
ms selected		8		DiugAndTrustMW-	top-eclipse arm

- Figure 28. Import EdgeLock SE050 Plug & Trust middleware
- 5. The *PlugAndTrustMW* project should now be imported in your workspace as shown in Figure 29:

EdgeLockTM SE050 Quick start guide with FRDM-K64F



5.5 Import *cmake_projects_frdm64f* project example in MCUXpresso workspace

After importing the *PlugAndTrustMW* project example in MCUXpresso, we need to import the *cmake_projects_frdm64f* project example. Follow these steps:

1. Go to *File* \rightarrow *Import* using the top bar menu as shown in <u>Figure 25</u>. Note: In this case, do not use the MCUXpresso Quickstart Panel to import project.

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- In the import wizard menu, select import "Existing Projects into Workspace" from the General folder as shown in Figure 26:

3. In the Select root directory option, browse to C:\se050_middleware\simw-top \projects or browse the location of your FRDM-K64F projects directory. Choose the cmake_projects_frdm64f project and click Select folder as shown in Figure 32:

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 After selecting C:\se050_middleware\simw-top\projects folder, the cmake_projects_frdm64f project should be visible in the "projects" area. Click Finish button to import this project into your worskpace as shown in Figure 33:

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5. Both The *PlugAndTrustMW* and *cmake_projects_frdm64f* projects should now be imported in your workspace as shown in Figure 34:

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> [Targets]	debugging, and integrated configuration tools.	
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5.6 Run EdgeLock SE050 Plug & Trust middleware test examples

This section explains how to list, edit and execute project examples using the CMake build system. It includes the following sections:

- List the EdgeLock SE050 Plug & Trust middleware test examples.
- Edit EdgeLock SE050 Plug & Trust middleware test example CMake options.
- Execute one EdgeLock SE050 Plug & Trust middleware test example.

5.6.1 List the EdgeLock SE050 Plug & Trust middleware test examples

The EdgeLock SE050 Plug & Trust middleware comes with several test examples used to verify atomic EdgeLock SE050 security IC features. To get the list of test examples, follow these steps:

- 1. Select the *cmake project frdmk64f* project example and click on the arrow on the "hammer" icon in the top bar menu of the MCUXpresso.
- 2. Select 3 help (Print help) option. Wait a few seconds until the operation is completed.
- 3. The MCUXpresso console display the list of EdgeLock SE050 Plug & Trust middleware test examples as shown in Figure 35.



Figure 35. EdgeLock SE050 Plug & Trust middleware test examples

5.6.2 Edit EdgeLock SE050 Plug & Trust middleware test example CMake options.

The EdgeLock SE050 Plug & Trust middleware is delivered with the CMake files that include the set of directives and instructions describing the project's source files and targets. In addition, it includes the CMake configuration files used to enable or disable several features, portability and setting flags to generate the build files for your platform and native build environment. To edit the CMake options, follow these steps:

1. Click on the arrow on the "hammer" icon in the top bar menu of the MCUXpresso.

- 2. Select 2 edit_cache (Edit CMake Cache).
- 3. The CMake GUI window will open in your laptop as shown in <u>Figure 36</u>. Using this GUI, you could change the CMake options (if needed). Leave out the **default** preselected options and close the CMake GUI window.

Note: In case you want to change any of the default pre-selected CMake options, you need to click on Configure or Generate buttons before closing the CMake window.



Figure 36. Configure CMake options of EdgeLock SE050 Plug & Trust middleware test examples.

5.6.3 Build and run an EdgeLock SE050 Plug & Trust middleware project example

This section explains how to build and run the EdgeLock SE050 Plug & Trust middleware test example called se05x_minimal. The se05x_minimal project outputs the memory left in EdgeLock SE050 security IC.

Note: The execution of the *se05x_minimal* project is shown as an example. The steps detailed in this section can be replicated to run any other test example included as part of the EdgeLock SE050 Plug & Trust middleware.

To execute the se05x minimal project example, follow these steps:

1. Attach a USB cable from the computer to the K64F OpenSDA debug USB connector as shown in Figure 37.

EdgeLockTM SE050 Quick start guide with FRDM-K64F



 Open TeraTerm. Click Serial option and select from the drop down list the COM port number assigned to your FRDM-K64F. Then go to Setup > Serial Port and configure the terminal to 115200 baud rate, 8 data bits, no parity and 1 stop bit and click OK as shown in Figure 38:



- 3. Select the se05x minimal as the project to be executed. For that, follow the steps shown in Figure 39:
 - a. In the Project Explorer window, go to **Debug** folder and open the **Makefile** file (under cmake_project_frdmk64f).
 - b. The **BUILD_TARGET** contains the name of the project to be executed. Write se05x_minimal in the **BUILD_TARGET** variable
 - c. Click on the arrow on the "hammer" icon in the top bar menu of the MCUXpresso.
 - d. Select **1** Debug (Debug build). Wait a few seconds until the build operation completes.

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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> 🔊 Includes	6BUILD_DIR2=././././S(TOP_NAME) build/\$(TOP_NAME)-eclipse_arm	
> 🗁 amazon-freertos	7 BUILD_TARGET=se05x_minimal	
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		-9
Import project(s) from file system	CDT Build Console [cmake_project_frdmk64f]	
- Duild man and and	[66%] Built target mbedtls	
Build your project	73%] Built target smCom	
C. & Build	[//// built target a/_utils	
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	[97%] Built target ex_common	
🔹 Debug your project 🛛 🔊 🐇 😴 🔛	V [908] LINKING C EXECUTABLE/J./DIN/SED5X_mInImal.axT co55x minimal avf	
COD IN Debug	[100%] Built target se05x minmal	
Terminate Build and Debug		
	14:01:36 Build Finished. 0 errors, 0 warnings. (took 6s.621ms)	
▼ Miscellaneous		>
Miscellaneous Edit project settings	v <	

4. Go to the MCUXpresso Quickstart Panel and click Debug button as shown in Figure 40. If there is more than one probe attached, you have to the select CMSIS-DAP debug probe from the list. Wait a few seconds until the project executes:

- 🛛 🕼 🕲 - 🗞 - 🛗 🥔 🗠 🕒 - 🖳 🔪 🗈	🔲 🖩 💦 🔀 Probes discovered	1				9. • 109 A? • 109 10 11 101 • 10 • 10 4	• 🖒 •
	Connect to target:	MK64FN1M0xxx12				Quick	Access
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C smale assist (idmbf/f cDebug)	🗢 🗘 📕 Available attac	hed probes				.0.201905281035/pages/registered.htm	✓ ►
> O Project Settings							
> 🚱 Binaries	Name	Serial number/ID	Туре	Manu	IDE Debug Mode	Mathematics State (1)	
1 Includes	LS CMSIS-DAP	0240000040214	LinkS	ARM	Non-Stop	A Province Concerns 11	
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HP Rinaries	MCUXpresso IDF	LinkServer (inc. CMSIS-DAP) n	robes			E v11.0.0	
Archiver	DRE Misse areh						
S losludes						ironment for NXP MCUs based on ARM®	
CB [Source directory]	SEGGER J-LINK P	robes				ging views, code trace and profiling, multicore	
(1) [Subprojecte]						,	
Ca [Targetr]	Probe search option	s					
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A Debug	,					ailable from the Help menu:	
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Debug your project 💽 👻 🔛 👻							
The Dahua							
Ne Debug							
A terminate, build and Debug	• <						
make_project_frdmk64f				80		U NXP MK64FN1M0.	xx12 (cmakek64f)

5. When it executes, it will automatically stop in a breakpoint. Click on Resume to allow the software to continue its execution as shown in Figure 41.

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Application note	Rev. 2.1 — 17 December 2019	
	534421	28 / 44

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

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Project	42 Debug 22	
	a Construction of the second s	
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) S Includer		
> An amazon-freetos	🕘 Welcome 💿 Welcome 💽 (gdb[0].proc[42000].threadGroup[i1].gdb[0].proc[42000].OSthread[1]).thread[🛐 startup_MK64F12.S 🐚 ex_sss_main_inc.h	22
> Ca. Debug	114 ex sss main ksdk bm();	
> 🗛 frdmk64f	115 #endif	
> 🚱 hostlib	116 117 LOG T/DUIGANDTRIKT DROD NAME VED EULL).	
PN7150Nfc		
× 🙀 555	119 #ifdef EX_SSS_BOOT_PCONTEXT	
> 🗁 doc	<pre>120 memset((EX_SSS_BOOT_PCONTEXT), 0, sizeof(*(EX_SSS_BOOT_PCONTEXT)));</pre>	
✓ (2)→ EX	121 #endif	
> 🗁 doc	122 123 status = ex sss boot connectstring(argc, argv, &nortName):	
> 🗁 ecc	124 if (kStatus SSS Success != status) {	
> 🗁 hkdf	<pre>125 LOG_E("ex_sss_boot_connectstring Failed");</pre>	
V 🗁 inc	126 goto cleanup;	
> h ex_sss_auth.h	127 }	
> 🖻 ex_sss_boot.h	129 Wif defined(EX SSS BOOT SKIP SELECT APPLET) 88 \	
> in ex_sss_main_freeRTOS_inc.h	130 (EX_SSS_BOOT_SKIP_SELECT_APPLET == 1)	
> 🖪 ex_sss_main_inc_frdmk64f.h	<pre>Bl31 (PCONTEXT)->se05x open ctx.skip select applet = 1:</pre>	
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	🔳 🗱 🔆 📴 🐼 🖓 🖉 🖓 🔤	🖻 🔻 🗖
New project	 cmake_project_frdmk64f LinkServer Debug [C/C++ (NXP Semiconductors) MCU Application] cmake_project_frdmk64f.axf 	
🖉 🔣 Import SDK example(s)	[MCUXpresso Semihosting Telnet console for 'cmake_project_frdmk64f LinkServer Debug' started on port 59541 @ 127.0.0.1]	
Import project(s) from file system		
Dullation and a st		
Build your project		
💽 🐔 Build		
💭 🧹 Clean		
Debug your project		
o consigned and a set of the set		
💦 🏘 Debug		
သ 🕸 Terminate, Build and Debug	× c	
	🕲 🕚 NXP_MK64FN1MDxxx12 (cma)	kek64f)

6. The project example should now be running into your FRDM-K64F. If it is running successfully, the TeraTerm logs should indicate the available memory in SE050 security IC (in this case, 592) as can be seen in <u>Figure 42</u>.

App:INFO	ntrol Window Help PlugAndTrust_v02.08.02_2	0190511	^
SSSIINFU	atr (Len=35) 00 A0 00 00	03 96 04 03	
50 34 20 41		00 64 00 00	

7. The same operation can be repeated with any of the other EdgeLock SE050 Plug & Trust middleware project examples.

6 Appendix A: Install MCUXpresso IDE

MCUXpresso is a free-of-charge, code size unlimited, easy-to-use IDE for Kinetis and LPC MCUs, and i.MX RT crossover processors. To install it, do the following:

1. Go to <u>MCUXpresso</u> and click the download button as indicated in <u>Figure 43</u>:

MCUXpress	o Integrated Deve	lopment Enviro	onment	(IDE)	Follow 🛛 🛠	
OVERVIEW	DOCUMENTATION	DOCUMENTATION DOWNLOADS DEVE Overview			TRAINING & SUPPORT	
Jump To	Overview					
Supported Devices	The MCUXpress Eclipse-based de	o IDE brings developers an e evelopment environment for N	asy-to-use IXP [®]	 A free-of-charge, of for Kinetis and LP 	code size unlimited, easy-to-use IDE C MCUs, and i.MX RT crossover	
Target Applications	MCUs based on and Kinetis [®] mic	Arm [®] Cortex [®] -M cores, inclu rocontrollers and i MX RT cro	ding LPC issover	processors		
System Requirements	processors. The	MCUXpresso IDE offers adv	anced	 Advanced exiting, comparing and editing with WCO-specific debugging views, code trace, and profiling Integrated configuration tools, including pins, clocks and peripheral tools Industry-standard GNU toolchain with a choice of libraries: optimized C library or the standard GNU Newlib/Nano library with support for semihosting 		
	addition of MCU- and profiling, mu	specific debugging reatures with specific debugging views, co Iticore debugging, and integra	de trace ated			
	configuration too connections sup LPCXpresso, i.M	Is. The MCUXpresso IDE del port Freedom, Tower® system IX RT, and your custom devel	oug n, opment			
	boards with indus commercial debu	boards with industry-leading open-source and commercial debug probes from NXP, P&E Micro [®] , and second be			es and linker files	
					LPC Cortex-M MCUs, as per	
	More -					
	User Guid	de Downk	oad			
Figure 43.	Go to MCUXpres	so website				

2. You will be asked to sign-in with your account at the NXP website. If you do not have an account, click on *Register Now* as shown in <u>Figure 44</u>:

Sign In Email Address or NXP Com Password Sign in Forgot your password Don't have an account?	pany ID Indiana indiana indiana Pendeta indiana	Having trouble? If you are having trouble with registration or login, we're help.	
ABOUT NXP Investors Press, News, Blogs Careers	RESOURCES Mobile Apps Contact Us	Follow US	News 5 NXP Semico Dividend Read Mo
Privacy Terms of Use Terms of Sa	le Feedback		©2006-2019 NXI

3. If you already have an account, you can directly type your (1) email address, (2) password and (3) click sign-in button as shown in <u>Figure 45</u>:

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Sign in or register	Sign In Email Address or NXP C Password 2 3 Sign In Forgot your pass Don't have an account	ompany ID sword? unt? Register Now	Having trouble? If you are having trouble with registration or I help.	ogin, we're here to
	ABOUT NXP Investors Press, News, Blogs Careers	RESOURCES Mobile Apps Contact Us	FOLLOW US	News 5 N NXP Semico Dividend Read Mo
Figure 45.	Privacy Terms of Use Terms of	rf Sale Feedback		©2006-2019 NXF

4. Click on MCUXpresso IDE as shown in Figure 46:

PRODUCTS	APPLICATIONS	SUPPORT	ABOUT	
NXP > Software & Support >	Product Information : MCU	IXpresso IDE		
Software & Support	Product	Informati	on	
Product List				
Product Search Order History	MCUXpresso	IDE		
Recent Product Release	S			
Recent Updates	To register a New P	roduct please click on	the button below	
Licensing	Register			
License Lists				
Offline Activation	Current Previo	DUS		
FAQ	Version Descri	iption		
Download Help	10.3.1 MCUX	presso IDE		Download Log
Table of Contents				
FAQs				
Figure 46	Select MCU	Ynresso		
i igui e 4 0.				

5. Accept software terms and conditions as shown in Figure 47:

AN12396

EdgeLock[™] SE050 Quick start guide with FRDM-K64F



6. Select your MCUXpresso product version and click on the corresponding *File Name* to start the download as shown in <u>Figure 48</u>:

Software & Support	Desiderat	Danumlaar			
Product List	Product	Download	2		
Product Search	MCUXpresso I	DE			
Order History Recent Product Releases Recent Lindates	Files License K	eys Notes			O Download Help
Licensing	Show All Files				4 Files
License Lists	File Description	on	File Size	File Name	\$
Offline Activation	H MCUXpresso	v10.3.1 - Linux	753.4 ME	L mcuxpressoide-10.3.1_2233.x86_64.deb.bin	
EAO	H MCUXpresso	v10.3.1 - Mac	720.8 ME	MCUXpressoIDE_10.3.1_2233.pkg	
Download Help	MCUXpresso	v10.3.1 - Windows	675.8 ME	MCUXpressolDE_10.3.1_2233.exe	
Table of Contents	H Readme MCU	JXpresso 10.3.1	53.7 KE	Readme MCUXpresso 10.3.1.pdf	
FAQs	Deverland Calented	Ciles.			

 Double click on the installer file and follow the setup wizard until MCUXpresso installation is completed. Please, make sure you allow the installation of the additional drivers required by MCUXpresso during the installation process as shown in <u>Figure 49</u>, <u>Figure 50</u>, <u>Figure 51</u> and <u>Figure 52</u>:

AN12396

EdgeLock[™] SE050 Quick start guide with FRDM-K64F







AN12396 Application note

AN12396

EdgeLock[™] SE050 Quick start guide with FRDM-K64F



7 Appendix B: Install CMake

CMake is an open-source, cross-platform family of tools that helps you build C/C++ projects on multiple platforms using a compiler-independent method. It has minimal dependencies, requiring only a C++ compiler on its own build system. SE050 middleware leverages on CMake to generate native makefiles and workspaces that can be used in the compiler environment of your choice. To install CMake:

- 1. Go to CMake downloads page: https://cmake.org/download/
- 2. Scroll down and select your binary distribution. For this guide, the binary distribution is Windows as shown in Figure 53:

▲ CMake	About ~ Resource	s v	Developer Resources 🗸	Download	Q
Release Candidate (3.14.0-rcd) The release was packaged with CPack which is included as part of the release. The .sh fill follow the directions. The OS-machine.tar.gz files are gziped tar files of the install tree. This file distributions can be untared in any directory. They are prefixed by the version of CM Linux.x86, 64. This prefix can be removed as long as the share, bin, man and doc directo unpack them with zip or tar and follow the instructions in Readme.txt at the top of the si	s are self extracting gzij ie OS-machine.tar.Z files ike. For example, the Lir ies are moved relative t urce tree. See also the G	oed ta s are c nux-x8 o each CMake	r files. To install a .sh file, run ompressed tar files of the ins 16_64 tar file is all under the o 1 other. To build the source d 2.1.4 Release Notes. Source	it with /bin/sh itall tree. The ta directory cmake listributions, distributions:	and r -
Platform	Files				
Unix/Linux Source (has \n line feeds)	cmake-3.14	4.0-rc4	l.tar.gz		
	cmake-3.14	4.0-rc4	l.tar.Z		
Windows Source (has \r\n line feeds)	cmake-3.14	4.0-rc4	I.zip		
Binary distributions:					
Platform			Files		
Windows win64-x64 Installer: Installer tool has changed. Uninstall CMake 3.4 or I	ower first!		cmake-3.14.0-rc4-win64-x64.	msi	
Windows win64-x64 ZIP			cmake-3.14.0-rc4-win64-x64.	zip	
Windows win32-x86 Installer: Installer tool has changed. Uninstall CMake 3.4 or I	ower first!		cmake-3.14.0-rc4-win32-x86.	msi	
Windows win32-x86 ZIP			cmake-3.14.0-rc4-win32-x86.	zip	
Mac OS X 10.7 or later			cmake-3.14.0-rc4-Darwin-x86	_64.dmg	
			cmake-3.14.0-rc4-Darwin-x86	_64.tar.gz	
Linux x86_64			cmake-3.14.0-rc4-Linux-x86_(54.sh	
			cmake-3.14.0-rc4-Linux-x86_6	64.tar.gz	
auro 52 Download CMaka					

3. Double click on the downloaded installer file. Windows Defender SmartScreen might pop-up the wizard shown in Figure 54:

EdgeLockTM SE050 Quick start guide with FRDM-K64F

	Windows protected your PC	×	
	Windows Defender SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk. <u>More info</u>		
	Don't rui	n	

4. If this is your case: Click (1) on *More info* and then (2) click on *Run anyway* as shown in <u>Figure 55</u>:

Windows protected your PC	Windows protected your PC
Windows Defender SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk. <u>More info</u>	Windows Defender SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk. App: cmake-3.14.0-rc4-win64-x64.msi Publisher: Unknown publisher
Don't run	2 Run anyway Don't run

 The CMake installation wizard will open. Click (1) *Next* and (2) accept the End-User License Agreement as shown in <u>Figure 56</u>:

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 As part of the CMake setup, (1) Add Cmake to the system PATH for all users and (2) click Next as shown in Figure 57:

Install Options	alling CMake 2 14 0	
By default CMake does f	not add its directory to the system PATH.	
O Do not add CMake to	o the system PATH	
Add CMake to the sy	stem PATH for all users	
Add CMake to the sy	stem PATH for the current user	
Create CMake Desktop	Icon	
	2 Next	Cancel

 Select a destination folder, (1) click *Next* and then (2) click *Install* as shown in <u>Figure 58</u>:

AN12396

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

Ready to install CMake
Click Install to begin the installation. Click Back to review or change any of your installation settings, Click Cancel to exit the wizard.
2 Sinstall Cancel

8. Wait a few seconds until the installation is completed and click *Finish* as shown in <u>Figure 59</u>:

	CMake Setup	
		Completed the CMake Setup Wizard
		Click the Finish button to exit the Setup Wizard.
Consel		Finish Cancel
		Chake Setup

8 Appendix C: Install Python 3.7.x 32-bit version

Use these screenshots to install Python 3.7.x in your Windows machine:

1. Go to <u>https://www.python.org/downloads</u> and download **Python v.3.7.x 32 bit version**. Make sure you download Python v3.7.x 32 bit version.

About	Downloads Do	cumentation Community Su	iccess Stories News Events		
Python 3.7.5					
Release Date: Oct. 15, 2019					
Note Python 3.8 is now the latest feature relea until mid 2023	se series of Python 3. Ge	t the latest release of 3.8.x here. We plan to con	tinue to provide <i>bugfix releases</i> for 3.7.x until m	id 2020 and secu	irity fixes
h uthan 3.7 E is the fifth and most recent	maintonanco roloaco of	Duthon 2.7. The Duthon 2.7 series contains manual	now features and entimizations		
-ython 3.1.5 is the firth and most recent	maintenance release of	Python 3.7. The Python 3.7 series contains many	new reatures and optimizations.		
mong the major new features in Python	2 7 are:				
	5.7 dre.				
Files	S.F die.				
Files	Operating System	Description	MD5 Sum	File Size	GPG
Files Version Gzipped source tarball	Operating System Source release	Description	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa	File Size 23126230	GPG SIG
Files Version Gzipped source tarball XZ compressed source tarball	Operating System Source release Source release	Description	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2	File Size 23126230 17236432	GPG SIG SIG
Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer	Operating System Source release Source release Mac OS X	Description (Deprecated) for Mac OS X 10.6 and later	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4	File Size 23126230 17236432 35020778	GPG SIG SIG SIG
Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit installer	Operating System Source release Source release Mac OS X Mac OS X	Description (Deprecated) for Mac OS X 10.6 and later for macOS 10.9 and later	MD5 Sum 1cd071178ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359	File Size 23126230 17236432 35020778 28198752	GPG SIG SIG SIG SIG
Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit finstaller Windows help file	Operating System Source release Source release Mac OS X Windows	Description (Deprecated) for Mac OS X 10.6 and later for macOS 10.9 and later	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608ccfa250f8baa11a69bbfcb842c0e0	File Size 23126230 17236432 35020778 28198752 8141193	GPG SIG SIG SIG SIG SIG
Files Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit installer Windows help file Windows x86-64 embeddable zip file	Operating System Source release Source release Mac OS X Windows Windows	Description [Deprecated] for Mac OS X 10.6 and later for macOS 10.9 and later for AMD64/EM64T/x64	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608ccfa250f8baa11a69bbfcb842c0e0 436b0f803d2a0b393590030b1cd59853	File Size 23126230 17236432 35020778 28198752 8141193 7500597	GPG SIG SIG SIG SIG SIG SIG
Files Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit installer Windows x86-64 embeddable zip file Windows x86-64 executable installer	Operating System Source release Source release Mac OS X Windows Windows Windows	Description Deprecated) for Mac OS X 10.6 and later for macOS 10.9 and later for AMD64/EM64T/x64 for AMD64/EM64T/x64	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608ccfa250f8baa11a69bbfcb842c0e0 436b0f803d2a0b393590030b1cd59853 697f7a884e80ccaa9dff3a77e979b0f8	File Size 23126230 17236432 35020778 28198752 8141193 7500597 26777448	GPG SIG SIG SIG SIG SIG SIG
Files Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit installer Windows x86-64 embeddable zip file Windows x86-64 embeddable zip file Windows x86-64 embeddable zip file	Operating System Source release Source release Mac OS X Windows Windows Windows Windows Windows Windows	Description Deprecated) for Mac OS X 10.6 and later for macOS 10.9 and later for AMD64/EM64T/x64 for AMD64/EM64T/x64 for AMD64/EM64T/x64	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87e2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608cafa250f8baa11a69bbfcb842c0e0 436b0f803d2a0b393590030b1cd59853 697f7a884e80ccaa9dff3a77e979b0f8 b8b6e5ce8c27c20bfd28f13e6ddf8a2f	File Size 23126230 17236432 35020778 28198752 8141193 7500597 26777448 1363032	GPG SIG SIG SIG SIG SIG SIG SIG
Files Version Gzipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit installer Windows x86-64 embeddable zip file Windows x86-64 embeddable zip file Windows x86-64 web-based installer Windows x86-64 web-based installer	Operating System Source release Source release Mac OS X Mac OS X Windows Windows Windows Windows Windows Windows Windows Windows Windows	Description Descri	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092c79a87c2 cd503606638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608cafa250f8baa11a69bbfcb842c0e0 436b0f803d2a0b393590303b1cd59853 6977r3884e80ccaabd13a7re97bbf8 b8be6sce8c27c20bfd2811366ddf8a2f 72687rd1a15a7dc68f6a4fa489e4cd1	File Size 23126230 17236432 35020778 28198752 8141193 7500597 26777448 1363032 6745126	6P6 516 516 516 516 516 516 516 516 516
Files Version G2ipped source tarball XZ compressed source tarball macOS 64-bit/32-bit installer macOS 64-bit/32-bit installer Windows keip file Windows x86-64 executable installer Windows x86-64 web-based installer Windows x86-64 web-based installer	Operating System Source release Source release Mac OS X Windows Windows	Description (Deprecated) for Mac OS X 10.6 and later for macOS 10.9 and later for AMD64/EM64T/x64 for AMD64/EM64T/x64	MD5 Sum 1cd071f78ff6d9c7524c95303a3057aa 08ed8030b1183107c48f2092e79a87c2 cd50306638c8e6948a591a9229446e4 20d9540e88c6aaba1d2bc1ad5d069359 608cafa250f8baa11a69bbfcb842c0e0 436b0f803d2a0b393590030b1cd59853 697f7a884e80ccaa9dff3a7Te979b0f8 b8b6e5ce8c27c20bfd28f1366df8a2f 726877fd1a1f5a7cd68f6a4f48964cd1 cfe9a828af6111d5951b74093d70ee89	File Size 23126230 17236432 35020778 8198752 8141193 7500597 2677448 136302 6745126 25766192	GPG SIG SIG SIG SIG SIG SIG SIG SIG SIG

2. Double click on the downloaded installer file. Select the "Install launcher for all users" and "Add Python 3.7 to Path" options and click Install Now as indicated in Figure 61:

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3. Wait a few seconds until the installation is completed as indicated in Figure 62

Python 3.7.5 (32-bit) Setup		- 🗆 ×	Python 3.7.5 (32-bit) Setup	- 🗆 X
	Setup Progress			Setup was successful
	Installing:			Special thanks to Mark Hammond, without whose years of freely shared Windows expertise, Python for Windows would still be Python for DOS.
	Python 3.7.5 Standard Library (32-bit)			New to Python? Start with the online tutorial and
				documentation.
-				See what's new in this release.
			and a second second	S Disable path length limit
				Changes your machine configuration to allow programs, including Python, to bypass the 260 character "MAX_PATH" limitation.
bython			python	
windows		Cancel	windows	Close

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EdgeLock[™] SE050 Quick start guide with FRDM-K64F

Tables

	Tab. 1.	OM-SE050ARD development kit details4	Tab. 2.	FRDM-K64F details4
--	---------	--------------------------------------	---------	--------------------

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

Figures

Fig. 1.	DAPLink firmware update - select board5
Fig. 2.	DAPLink firmware update - select board6
Fig. 3.	Enter bootloader mode6
Fig. 4.	Enter bootloader mode7
Fig. 5.	Enter bootloader mode7
Fig. 6.	Jumper configuration for FRDM-K64F8
Fig. 7.	Arduino connectors of OM-SE050ARD and
-	FRDM-K64F boards8
Fig. 8.	OM-SE050ARD mounted in FRDM-K64F
	board9
Fig. 9.	Import FRDM-K64F board SDK into
	MCUXpresso environment
Fig. 10.	Imported FRDM-K64F SDK11
Fig. 11.	Import projects from SDK11
Fig. 12.	SDK import wizard12
Fig. 13.	Select projects to import
Fig. 14.	Imported projects in MCUXpresso
	workspace13
Fig. 15.	Connect boards to the laptop14
Fig. 16.	TeraTerm setup14
Fig. 17.	Build projects in MCUXpresso workspace15
Fig. 18.	Debug projects in MCUXpresso workspace 15
Fig. 19.	Run projects in MCUXpresso workspace 16
Fig. 20.	TeraTerm logs - se05x_minimal project
	example16
Fig. 21.	Create se050_middleware folder 17
Fig. 22.	Unzip se050 middleware18
Fig. 23.	Generate EdgeLock SE050 Plug & Trust
	middleware project examples19
Fig. 24.	SE050 middleware project structure 19
Fig. 25.	Import a project wizard20
Fig. 26.	Import a project wizard (II)20
Fig. 27.	Select EdgeLock SE050 Plug & Trust
	middleware build folder 21
Fig. 28.	Import EdgeLock SE050 Plug & Trust
	middleware21
Fig. 29.	EdgeLock SE050 Plug & Trust middleware
	imported in workspace22

Fig. 30.	Import a project wizard	22
Fig. 31.	Import a project wizard (II)	23
Fig. 32.	Select FRDM-K64F projects folder	23
Fig. 33.	Import FRDM-K64F in workspace	24
Fig. 34.	FRDM-K64F imported in workspace	24
Fig. 35.	EdgeLock SE050 Plug & Trust middleware	
	test examples	25
Fig. 36.	Configure CMake options of EdgeLock	
	SE050 Plug & Trust middleware test	
	examples	26
Fig. 37.	Connect boards to the laptop	27
Fig. 38.	Configure TeraTerm	27
Fig. 39.	Debug EdgeLock SE050 Plug & Trust	
	middleware se05x_minimal project example .	28
Fig. 40.	Debug se05x_minimal project example	28
Fig. 41.	Resume se05x_minimal project example	29
Fig. 42.	TeraTerm logs - se05x_minimal project	
	example	29
Fig. 43.	Go to MCUXpresso website	30
Fig. 44.	Register your NXP account	30
Fig. 45.	Sign-in in NXP website	31
Fig. 46.	Select MCUXpresso	31
Fig. 47.	Accept software terms and conditions	32
Fig. 48.	Download MCUXpresso	32
Fig. 49.	Install MCUXpresso required drivers I	33
Fig. 50.	Install MCUXpresso required drivers II	33
Fig. 51.	Install MCUXpresso required drivers III	33
Fig. 52.	Install MCUXpresso required drivers IV	34
Fig. 53.	Download CMake	35
Fig. 54.	Execute CMake installer	36
Fig. 55.	Run the CMake installer (II)	36
Fig. 56.	CMake installation wizard	37
Fig. 57.	Add CMake path	37
Fig. 58.	Install CMake	38
Fig. 59.	Complete CMake installation	38
Fig. 60.	Download Python 3.7.x 32 bit version	39
Fig. 61.	Install Python 3.5.x 32 bit for Windows	40
Fig. 62.	Python 3.5.x 32 bit installation completed	40

AN12396

EdgeLock[™] SE050 Quick start guide with FRDM-K64F

Contents

1	How to use this document	3
2	Hardware required	4
3	Boards setup	5
3.1	Update FRDM-K64F board with DAPLink firmware	5
3.2	OM-SE050ARD jumper configuration	7
3.3	OM-SE050ARD and FRDM-K64F board	8
4	Import project examples from FRDM-K64F	0
•	SDK	10
4.1	Prereguisites	10
4.2	Download FRDM-K64F SDK	10
4.3	Install FRDM-K64F SDK	10
4.4	Import project example in MCUXpresso	11
4.5	Build, run and debug project example	14
5	Import project examples from CMake-	
	based build system	17
5.1	Prerequisites	17
5.2	Download EdgeLock SE050 Plug & Trust	
	middleware	17
5.3	Build EdgeLock SE050 Plug & Trust	
	middleware project examples	18
5.4	Import PlugAndTrustMW project example in	
	MCUXpresso workspace	19
5.5	Import cmake projects frdm64f project	-
	example in MCUXpresso workspace	22
5.6	Run EdgeLock SE050 Plug & Trust	
	middleware test examples	25
5.6.1	List the EdgeLock SE050 Plug & Trust	
	middleware test examples	25
5.6.2	Edit EdgeLock SE050 Plug & Trust	
	middleware test example CMake options	25
5.6.3	Build and run an Edgel ock SE050 Plug &	
0.0.0	Trust middleware project example	26
6	Appendix A: Install MCUXpresso IDE	30
7	Appendix B: Install CMake	
8	Appendix C: Install Python 3.7 x 32-bit	
	version	39
9	Legal information	41

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