Install Keil Microcontroller Development Kit Version 5 for Freescale FRDM-KL25Z

This tutorial is intended for the preparation to develop software with Freescale FRDM-KL25Z board using Keil Microcontroller Development Kit (MDK) version 5.11a.

This document covers

- download/installation of Keil MDK v5.11a
- installation of Device Family Pack for Freescale Kinetis KL25Z family
- the PEMicro device driver update
- installation of bootloader and MSD-debugger firmware for FRDM-KL25Z board

Starting version 5 the device support software components are separated from the MDK software and called Device Family Packs. As release v5.11a, many ARM microcontroller Device Family Packs are available. Software development with Device Family Packs is slightly different from software development in MDK v4.

Download MDK v5

1. Browse to www.keil.com. And click on Download.



2. In the next page, click on "Product Downloads."



3. In the next page, click on "MDK-ARM v5"



4. Fill up the form in the page and click "Submit."

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ARM Development Tools C166 Development Tools C51 Development Tools		Fools Tools Tools	MDK-ARM Version 5.11a Complete th	sion 5.11a ne following fo	rm to downlo	ad the Keil software development tools.
C2 De	251 Development abug Adapters	Tools			Er	ter Your Contact Information Below
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5. In the next page, click "MDK511A.EXE" to download the development software kit. The file is over 300 MB and will take a while to download.



6. After downloads are complete, you should see the file in your download folder.



Installation of MDK v5

7. Double click on the icon of **mdk511a.exe** in the download folder. Windows may block the execution and display a warning screen. Click "Run anyway" button.



8. When the Welcome dialog box pops up, click "Next" button.

Setup MDK	-ARM V5.11a	×
Welcome to Keil MDK-ARM Release 6/2014		
		DOIS DY ARM
This SETUP program installs:		
MDK-ARM V5.11a		
This SETUP program may be used to update a prev However, you should make a backup copy before p	vious product installation. proceeding.	
It is recommended that you exit all Windows program	ms before continuing with SETUP.	
Follow the instructions to complete the product insta	allation.	
Keil MDK-ARM Setup		
	<< Back Next >>	Cancel

9. In the next License Agreement dialog box, check "I agree ..." and click "Next" button.



10. In the next Folder Selection dialog box, accept the defaults and click "Next" button.

KEIL Tools by ARN
ers for installation.
Browse
Browse

11. In the next Customer Information dialog box, fill the information and click "Next" button. The installation of MDK and several software packs will start.

Setu	p MDK-ARM V5.11a	
Customer Information Please enter your information.		
Please enter your name, the name of the c	company for whom you work and your E-mail ad	ldress.
First Name:		
Last Name:		
Last Name:		
Last Name: Company Name: E-mail:		
Last Name: Company Name: E-mail: Keil MDK-ARM Setup		

12. Before installing ULINK device drivers, Windows will halt it and asks for confirmation. If you do not use a ULINK debugging device you do not need it. On the other hand, you may install it for future use.



13. When the installation is complete, this dialog box will appear. Click "Finish" button.

Setup M	DK-ARM V5.11a	×
Keil MDK-ARM Setup completed MDK-ARM V5.11a		Is by ARM
MDK-ARM Core Setup has performed all reques	ted operations successfully.	
🔽 Show Release Notes.		
Keil MDK-ARM Setup	++	

Installation of KL25Z Device Family Pack

14. After MDK v5 is installed, it will automatically prompt the user to install the Device Family Packs.

Packs Examples	0	<u>Þ</u>	4 Devices	Boards	4
Pack	Action	Description	Search:		• ×
E ARM::CMSIS	Up to date	CMSIS (Cortex Microcontroller Softwar	Device	/	Summary
Infineon::XMC1000_DFP	Install	Infineon XMC1000 Series Device Suppo	🕀 👻 Analog	Devices	10 Devices
Infineon::XMC4000_DFP	Install	Infineon XMC4000 Series Device Suppo	🗄 🔗 ARM		10 Devices
Keil::ARMCortex_DFP	Offline	ARM Cortex-M Profile Device Support	🗄 🔗 Atmel		122 Devices
Keil::CM4xx_DFP	🔅 Install	Analog Devices ARM Cortex-M4 CM4x	🕀 🕂 🕈 🗄 🕀 🕀 🗄 🕀	Micro	238 Devices
Keil::EFM32GGxxx_DFP	🔅 Install	Energy Micro EFM32 Giant Gecko Serie	🗄 🍳 Freesca	ale	172 Devices
Keil::EFM32Gxxx_DFP	🔅 Install	Energy Micro EFM32 Gecko Series Devi	庄 🔗 Infined	n	81 Devices
Keil::EFM32LGxxx_DFP	🔅 Install	Energy Micro EFM32 Leopard Gecko Se	🛨 🔗 Maxim	E.	4 Devices
Keil::EFM32TGxxx_DFP	🔅 Install	Energy Micro EFM32 Tiny Gecko Series	主 🔗 Ni		Dack Installer
Keil::EFM32WGxxx_DFP	🔅 Install	Energy Micro EFM32 Wonder Gecko Se		T doc instantor	
Keil::EFM32ZGxxx_DFP	Install	Energy Micro EFM32 Zero Gecko Series			we to the Kail Dack Installer
Keil::FM0plus_DFP	Install	Spansion FM0+ Series Device Support		Pack In	one to the Kell Pack Installer
Keil::FM3Basic_DFP	🔅 Install	Spansion FM3 Basic Series Device Supp	🛨 🔗 Sp	provide	es the following windows:
Keil::FM3HighPerformanc	Install	Spansion FM3 High Performance Serie	. ⊕ 🔗 ST		
Keil::FM3LowPower_DFP	🔅 Install	Spansion FM3 Low Power Series Device	🛨 🔗 Te	Packs : Li	st and manage Software Packs. Install a Pack for access within μ Vision.
Keil::FM3UltraLowLeak_DFP	🔅 Install	Spansion FM3 Ultra Low Leak Series De	+ 🗸 To	Evample	st example projects. Conv projects and launch UVision for testing examples
Keil::FM4_DFP	🔅 Install	Spansion FM4 Series Device Support		Enample ()	or example projector copy projecto and barrer prision for cesting examples
Keil::Kinetis_K10_DFP	🔅 Install	Freescale Kinetis K10 Series Device Sup		Devices : Li	st supported devices. Select a device to show related Packs and examples
Keil::Kinetis_K20_DFP	🕸 Install	Freescale Kinetis K20 Series Device Supp		Boards : Li	st supported boards. Select a board to show related Packs and examples.
	Install	Freescale Kinetis K30 Series Device Supj 🗸			
Keil::Kinetis_K30_DFP					

- 15. After reading the descriptions, click "OK" button in the smaller dialog box to close it. It will take few minutes to download and populate the most current packs information and verify whether there are any updates available.
- 16. To install a Device Family Pack, you need to select one of the devices or boards on the right panel of the Pack Installer. The required pack(s) to support your device/board selection will appear on the left panel. For example, if you plan to use Freescale FRDM-KL25Z board, drill down the Device list to Freescale->KLxx Series->KL2x. The required and optional packs appear on the left panel Packs tab.

		Pack I	nstaller		>
Eile <u>P</u> acks <u>W</u> indow <u>H</u> elp					
Device: Freescale - KL2x	τ.				
1 Packs Examples		<u> </u>	4 Devices Boards		
Pack	Action	Description	Search:	• ×	
ARM::CMSIS	🚸 Update	CMSIS (Cortex Microcontroller Software In	Device	/ Summary	
Keil::Kinetis_KLxx_DFP	Install	Freescale Kinetis KLxx Series Device Suppo	+ Analog Devices	10 Devices	
	🚸 Up to date	Keil MDK-ARM Professional Middleware fo	E ARM	10 Devices	
lwIP::lwIP	Install	IwIP is a light-weight implementation of tl	+ 🖌 Atmel	122 Devices	
wolfSSL::CyaSSL	🚸 Install	Light weight SSL/TLS and Crypt Library for	🛨 🌳 Energy Micro	238 Devices	
		92 92	E 🖌 Freescale	172 Devices	
			🗄 🔧 K10 Series	20 Devices	
			🕀 🏤 😵 K20 Series	33 Devices	
			🗄 🔧 K30 Series	6 Devices	
			🗄 🔧 K40 Series	6 Devices	
			🗄 😤 K50 Series	11 Devices	
			🕀 쓚 K60 Series	18 Devices	
			🛨 🔧 K70 Series	4 Devices	
			🕀 쓚 KEAxx Series	6 Devices	
			🕀 🏤 KExx Series	11 Devices	
			🖃 쓚 KLxx Series	37 Devices	
			🕀 🔧 KL0x	12 Devices	
			🕀 🔧 KL1x	9 Devices	
			E 😤 KL2x	7 Devices	
1			🕀 🔧 KL3x	4 Devices	
		•	🕂 🕂 🔂 KL4x	5 Devices	

17. A yellow diamond in Action column (such as ARM::CMSIS) indicates the pack is installed but an update is available. A green diamond (Keil::MDK::Middleware) indicates the pack is current. A grey diamond (Keil::kinetis_KLxx_DFP) shows that the device pack is available for download. The light-weight IP and light-weight SSL are optional. Click on the Update button for CMSIS and Install button for KLxx_DFP to download and install these packs. The packs are downloaded from Keil website and built locally. It takes several minutes depending on the computer and Internet speed. When the pack installations are complete, the diamond in the button will turn green.

		Pack I	nstaller		- 🗆 🗙
<u>File Packs Window H</u> elp					
Device: Freescale - KL2x					
Packs Examples		4	Devices Boards		4
Pack	Action	Description	Search:	• ×	
	🚸 Up to date	CMSIS (Cortex Microcontroller Software In	Device /	Summary	
	🚸 Up to date	Freescale Kinetis KLxx Series Device Suppo	🕀 🔗 Analog Devices	10 Devices	•
	🔶 Up to date	Keil MDK-ARM Professional Middleware fo	ARM	10 Devices	
lwIP::lwIP	🔅 Install	IwIP is a light-weight implementation of tl	🗈 🔗 Atmel	122 Devices	
wolfSSL::CyaSSL	🔅 Install	Light weight SSL/TLS and Crypt Library for	🗄 🔗 Energy Micro	238 Devices	
			Freescale	172 Devices	
			📗 🗄 🔧 K10 Series	20 Devices	

18. Now you have the Device Support Pack installed, you are ready to start a new software project.

Install PEMicro Kinetis Driver Update

For MDK v5.10 or higher, it is necessary to install the driver updates for PEMicro OpenSDA on the FRDM board. The driver updates are available at <u>http://www.keil.com/download/docs/408.asp</u> as Freescale Kinetis OSJTAG Drivers V1.20.

19. Open the webpage with the URL above and click on "FSLKINETISDRIVERSV120.EXE".



20. Double click the icon of the file downloaded and the Welcome dialog box will open.



21. Check the license agreement and click Next button.

Tools by	™ ARM
ise Agreement. To accept the	
SOFTWARE DEVELOPMENT	
") IS A LEGAL AGREEMENT SINGLE LEGAL ENTITY) AND VARE ACCOMPANYING THIS IE SOFTWARE TO YOU ON RMS IN THIS LICENCE. BY	Г) 3 4 (-
<back next="">> 0</back>	Cancel
	Se Agreement. To accept the SOFTWARE DEVELOPMENT ") IS A LEGAL AGREEMENT SINGLE LEGAL ENTITY) AND VARE ACCOMPANYING THIS IE SOFTWARE TO YOU ON RMS IN THIS LICENCE. BY (Back Next>> (

22. In the next dialog box, choose the same destination folder as you did in step 10.

Setup Target Connection for Kinetis Tower Boards (P&E: V1.)	20)
Folder Selection Select the folder where SETUP will install files.	
This Add-On will install into the following product folder. To install to this folder, press 'Next'. To install to a different fold folder. Destination Folder.	er, press 'Browse' and select another
C:Keil_v5	Browse
— Keil MDK-ARM Setup —	<< Back Next>> Cancel

23. Fill the Customer Information and click Next button. The "Target Connection for Kinetis Tower Boards" will be installed.

Customer Information		
Please enter your information.		Tools by AR
Please enter your name, the name o	of the company for whom you work and you	E-mail address.
First Name:		
Last Name:		
Last Name:		
Last Name: Company Name: E-mail:		

24. After the Target Connection for Kinetis Tower Boards installation is complete, click Finish button to proceed with the installation of the P&E OSJTAG driver.

Setup Target Connection for Kinetis Tower Boards (P&E: V1.20)	
Keil MDK-ARM Setup completed Target Connection for Kinetis Tower Boards (P&E: V1.20)	
µVision Setup has performed all requested operations successfully. ↓ Launch Driver Installation: "P&E OSJTAG V1.20" ↓ Show Release Notes.	
— Keil MDK-ARM Setup	E Finish Cancel

25. Click "I Agree" button to proceed.

P&E Device Driv	vers Setup	
	License Agreement	
lioro	Please review the license terms before installing P&E Device Drivers.	
Press Page Down	to see the rest of the agreement.	
Software Licen	se	*
This software a Copyright law software in vio prosecuted.	and accompanying documentation are protected by United States and also by International Treaty provisions. Any use of this lation of copyright law or the terms of this agreement will be	E
All the softwar Systems, Inc. (e in this envelope is copyrighted by P&E Microcomputer Copyright notices have been included in the software.	÷
If you accept the agreement to ins	terms of the agreement, dick I Agree to continue. You must accept the tall P&E Device Drivers.	
E Microcomputer :	Systems, Inc.	
	I <u>Ag</u> ree Canc	el

26. Accept the default Destination Folder and click Install button.

P&E Device Drive	ers Setup		
	Choose Inst	all Location	
	Choose the	folder in which to install P&E	Device Drivers.
Setup will install P& Browse and select	E Device Drivers in the another folder. Click In:	following folder. To install in stall to start the installation.	a different folder, dick
Destination Fold	er Drivers		Browse
Space required: 14 Space available: 6	4.8MB .4GB		
P&E Microcomputer 5	vstems, Inc. ————	< Back In	stall Cancel

27. When installation is complete, click Close button.

P&E Device Drive	rs Setup	
	Installation Complete Setup was completed successfully.	
Completed		
Show <u>d</u> etails		
P&E Microcomputer Sy	vstems, Inc	ose Cancel

Install Bootloader and OpenSDA Firmware

The FRDM-KL25Z board should be preloaded with the firmware of MSD (mass storage device), bootloader, and OpenSDA (Open-standard Serial and Debug Adapter). You may skip this section unless the OpenSDA is not loaded or you need to upgrade the firmware for Windows 8.1.

Connect a USB cable from the SDA connector to the PC.



With the MSD firmware, the board should show up as a USB disk drive. If OpenSDA firmware is installed, the label of the drive will appear as "FRDM-KL25Z" as shown in the figure below. If OpenSDA firmware is not installed, the label of the drive will appear as "BOOTLOADER".

» 🔀 📜 🔻	Drive Tools		FRDM-KL25Z	(E:)		_ □	x
File Home Share Viev	Manage						~
Copy Paste Copy path	Move Copy to * Org	Delete Rename	New item • New folder New	Propertie	Gpen - Edit S History Open	Select all Select none Invert selection Select	ı
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Videos							
🤩 TI10664900J (C:)							
I FRDM-KL25Z (E:)							
6 items	v						

In either case, with the PC connected to Internet, double click on the file SDA_INFO.HTM. It will connect to P&E Micro OpenSDA Support webpage. The webpage displays the current versions of the firmware on the board. You need bootloader version 1.11 or higher to work with Windows 8.1.



- 28. If your FRDM-KL25Z board already has the version of Bootloader and OpenSDA firmware for your PC, you may the rest of this section.
- 29. To do the upgrades for bootloader and OpenSDA firmware, click on Firmware Apps link under "OpenSDA Firmware (MSD & Debug)" to download the files.
- 30. The Bootloader version 1.09 does not work with Windows 8.1. In order to upgrade the Bootloader firmware, you need to use a Windows 8 or Windows 7 PC to perform the rest of the procedure in this section.
- 31. Unzip the downloaded file then extract "MSD-DEBUG-FRDM-KL25Z_Pemicro_v114.SDA" and "BOOTUPDATEAPP_Pemicro_v111.SDA". Depends on the updates, you may receive newer versions of the files. The latter is inside the "OpenSDA_Bootloader_Update_App_v111_2013_12_11.zip" file. Again, the version number and the date may be newer.
- 32. To upgrade the bootloader, unplug the USB cable from the board. Hold the Reset switch while plugging the USB cable back to the board. Wait until Windows recognizes the board and sounds the three tone chime, release the Reset switch. You should see a drive named "BOOTLOADER".



- _ _ × BOOTLOADER (E:) </ ^ **@**E e Share F V H New item 🝷 Open -🔡 Select all X 41 N- Copy path Easy access • Edit 🛛 🖁 Select none Properties History Copy Delete Rename New Copy Paste Move 🚺 Paste shortcut to folder Select Clipboard Organize New Open (→ ↑ → This PC → BOOTLOADER (E:) v C Search BOOTLOADER (E:) P Date modified Size Name Type 💐 This PC FSL_WEB.HTM 8/8/2012 9:58 PM Chrome HTML Do... 1 KB) Desktop LASTSTAT.TXT 8/8/2012 9:58 PM TXT File 1 KB Documents SDA_INFO.HTM 8/8/2012 9:58 PM Chrome HTML Do... 2 KB bownloads TOOLS.HTM Chrome HTML Do... 8/8/2012 9:58 PM 1 KB Music BOOTUPDATEAPP_Pemicro_... 7/2/2014 12:43 PM SDA File 79 KB Pictures PreadyDLNA: WNDR4000 Videos 🄩 TI10664900J (C:) SOOTLOADER (E:) V K > 5 items 1 item selected 78.8 KB
- 33. Drag and drop the file "BOOTUPDATEAPP_Pemicro_v111.SDA" into the BOOTLOADER drive.

34. Unplug the USB cable from the FRDM board and plug the cable back without holding the Reset switch. Windows should recognize the board and open it as a disk drive again as BOOTLOADER. This time drag and drop the file "MSD-DEBUG-FRDM-KL25Z_Pemicro_v114.SDA" into the BOOTLOADER drive.

	BOOTLO	ADER (E:)			_ □	×
F Home Share View		📜 🖑 New item 🔹		🌖 Open 🗸	Select all	^ €
Copy Paste Paste shortcut	Copy Delete Rename	New folder	Properties •	Edit	Select none	on
Clipboard	Organize	New	C	pen	Select	
\bigcirc \bigcirc \uparrow \uparrow \checkmark \blacktriangleright This PC \blacktriangleright BC	Dotloader (E:)		~ C	Search BOO) otloader (e:)	2
^	Name	Date modifi	ed	Туре	Size	
K This PC	FSL_WEB.HTM	8/8/2012 9:5	8 PM	Chrome HT	ML Do	1 KB
Desktop	Martin LASTSTAT.TXT	8/8/2012 9:5	8 PM	TXT File		1 KB
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Downloads	TOOLS.HTM	8/8/2012 9:5	8 PM	Chrome HT	ML Do	1 KB
Music Distures	MSD-DEBUG-FRDM-K	L25Z_P 7/2/2014 12	:41 PM	SDA File		196 KB
ReadyDLNA: WNDR4000						
🖢 Videos						
🤩 TI10664900J (C:)						
- BOOTLOADER (E:)						
Y	<					>
5 items 1 item selected 195 KB						

35. Unplug the USB cable from the FRDM board and plug the cable back without holding the Reset switch again. This time the board should appear as a drive with label "FRDM-KL25Z".

a 🚺 🖣 🗸	Drive Tools	FRDM-KL252	<u>′</u> (E:)		_ □	x
File Home Share View	w Manage					^ (
Copy Paste Copy path	Move Copy to * Organize	ename New folder	Propertie	Goven +	Select all	on
(→ ↑ → This PC	► FRDM-KL25Z (E:)		~ C	Search FRE	0M-KL25Z (E:)	P
	^ Name	Date modi	fied	Туре	Size	
Inis PC	FSL_WEB.HTM	1 8/8/2012 9	:58 PM	Chrome HT	ML Do	1 KB
Desktop	LASTSTAT.TX	T 8/8/2012 9	:58 PM	TXT File		1 KB
Documents	SDA_INFO.HT	M 8/8/2012 9	:58 PM	Chrome HT	ML Do	2 KB
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🥪 FRDM-KL25Z (E:)						
6 items	¥ <					> ====

36. Double click the "SDA_INFO.HTM" file to open the OpenSDA Support webpage at P&E Micro. You should see both the Bootloader and the Application versions are updated.

* 🟦 🗋 www.pemicro.com/opensda/index.cfm	
🥳 <u>Cart</u> 🚢 <u>New Account</u> 🙆 <u>Login</u> Google ^m Custom Search	Search
D ▲ Home About us Products Support	Forums News Sales Information
OpenSDA Support	Kinetis® L-based Freescale™ Freedom Development Board
P&E provides the latest drivers, applications, and firmware updates	
tor reescale's OpenSDA debug programming interface.	
Your Hardware Information	
Board Name is: FRDM-KL25Z MicroBoot Kernel Version is: 1.05	
Bootloader Version is: 1.11 Installed Application: PEMicro FRDM-KL25Z Mass Storage/Debug	
	FRDM-KL25Z
App Application Version is: 1.14	
App Application Version is: 1.14 DUID is: 74823937-473181BB-3735C80C-B678E678 EUID is: 64E30036-684B876118366417.048168D6	
App Application Version is: 1.14 DUID is: 74823937473181BB-3735C80C-B678E678 EUID is: 6AE3D036-A84B8751-1836AA17-948168D6 TUID is: 74823938-473281DF-3734B81B-B78AE678	
App Application Version is: 1.14 DUID is: 74823937-473181BB-3735C80C-B678E678 EUID is: 6AE3D036-A84B8751-1836AA17-948168D6 TUID is: 74823938-473281DF-3734B81B-B78AE678 TOA is: 866BE505-9C723B7F-41E6B687-81163C8D TOA2 is: 866BE505-704F295C-CDE430D7-EEB0BD1E	NEW! GDB Server for Kinetis® devices

37. You have completed the firmware upgrades.