

# Course Software Installation

ECE 3436 – Microprocessor Systems

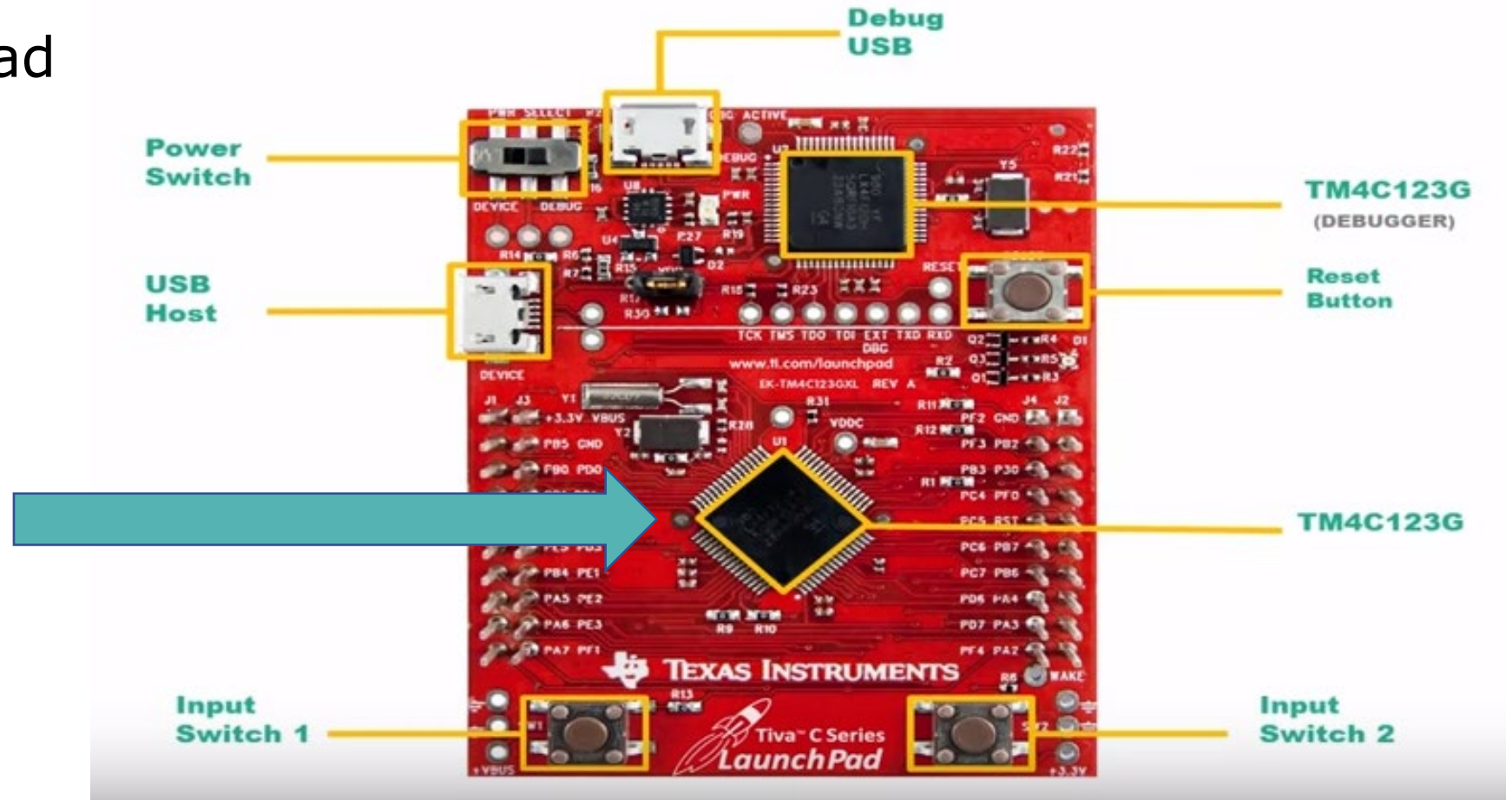
Dr. Diana de la Rosa-Pohl

*\* Some software has been provided by Dr. John Valvano and his team in the Department of Electrical and Computer Engineering at The University of Texas at Austin.*





# The Hardware

- The TI LaunchPad

Tiva® C Series MCU  
TM4C123GH6PM



# Development Tools for Tiva C Series MCUs

				
<b>Eval Kit License</b>	30-day full function. Upgradeable	32KB code size limited. Upgradeable	32KB code size limited. Upgradeable	Full function. Onboard emulation limited
<b>Compiler</b>	GNU C/C++	IAR C/C++	RealView C/C++	TI C/C++
<b>Debugger / IDE</b>	gdb / Eclipse	C-SPY / Embedded Workbench	µVision	CCS/Eclipse-based suite
<b>Full Upgrade</b>	99 USD personal edition / 2800 USD full support	2700 USD	MDK-Basic (256 KB) = €2000 (2895 USD)	445 USD
<b>JTAG Debugger</b>		J-Link, 299 USD	U-Link, 199 USD	XDS100, 79 USD

## Step 1: Download & Install Keil MDK V5

- download the free version of Keil MDK V5
  - MDK = microcontroller development kit
  - <https://www.keil.com/demo/eval/arm.htm>

# Download Keil

- Enter your information
- The device you are using is the **TM4C123**
- You must accept the privacy policy.

# armKEIL

[Home](#)[Products](#)[Download](#)[Events](#)[Support](#)[Videos](#)

Search Keil...[+](#)[Go](#)

## Product Information

Software & Hardware Products

- Arm Development Tools
- C166 Development Tools
- C51 Development Tools
- C251 Development Tools
- Debug Adapters
- Evaluation Boards

Product Brochures

Newsletters

## Device Database®

Device List

## Compliance Testing

ISO/ANSI Compliance

Validation and Verification

## Distributors

Overview

[Home](#) / [Product Downloads](#)

## MDK-ARM

MDK-ARM Version 5.37  
Version 5.37

Complete the following form to download the Keil software development tools.

### Enter Your Contact Information Below

First Name:

Diana

Last Name:

de la Rosa-Pohl

E-mail:

ddelarosa2@uh.edu

Company:

University of Houston

Job Title:

Instructional Associate Professor

Country/Region:

United States

State/Province:

Texas

Phone:

☐ Send me e-mail when there is a new update.

**NOTICE:**  
If you select this check box, you **will** receive an e-mail message from Keil whenever a new update is available. If you don't wish to receive an e-mail notification, don't check this box.

Which device are you using?  
(eg, STM32)

TM4C123

Arm will process your information in accordance with the Evaluation section of our [Privacy Policy](#).

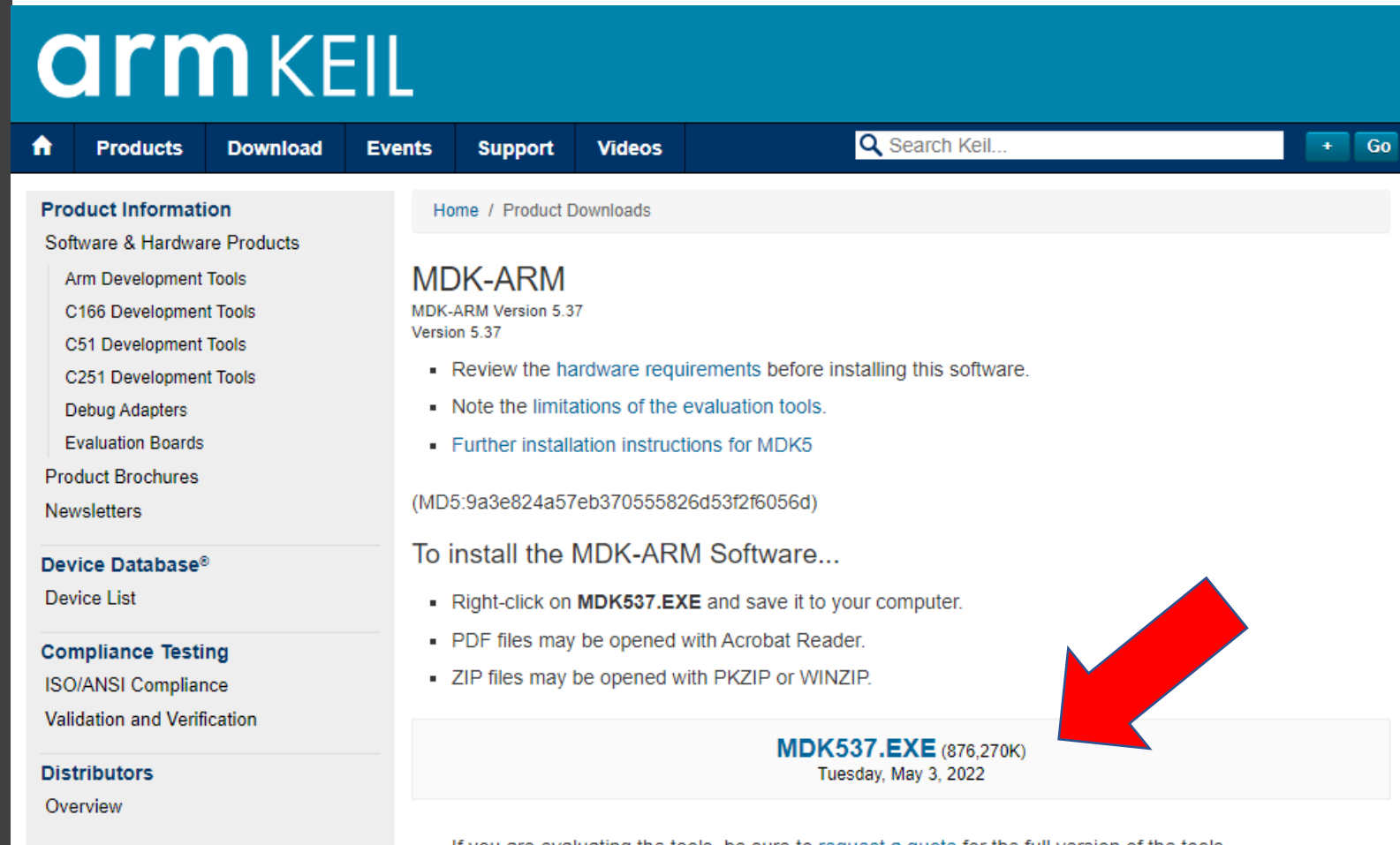
☐ Please keep me updated on products, services and other relevant offerings from Arm. You can change your mind and unsubscribe at any time.

Submit

Reset

# Download Keil

- The installation file is ~900 MB



The screenshot shows the ARM KEIL website's 'Product Downloads' section for MDK-ARM. The left sidebar contains navigation links for Product Information, Device Database, Compliance Testing, and Distributors. The main content area displays the MDK-ARM Version 5.37 download page, including a list of instructions for installation and a download link for MDK537.EXE (876,270K) dated Tuesday, May 3, 2022. A large red arrow points to the download link.

## arm KEIL

Home / Product Downloads

### MDK-ARM

MDK-ARM Version 5.37  
Version 5.37

- Review the [hardware requirements](#) before installing this software.
- Note the [limitations of the evaluation tools](#).
- [Further installation instructions for MDK5](#)

(MD5:9a3e824a57eb370555826d53f2f6056d)

#### To install the MDK-ARM Software...

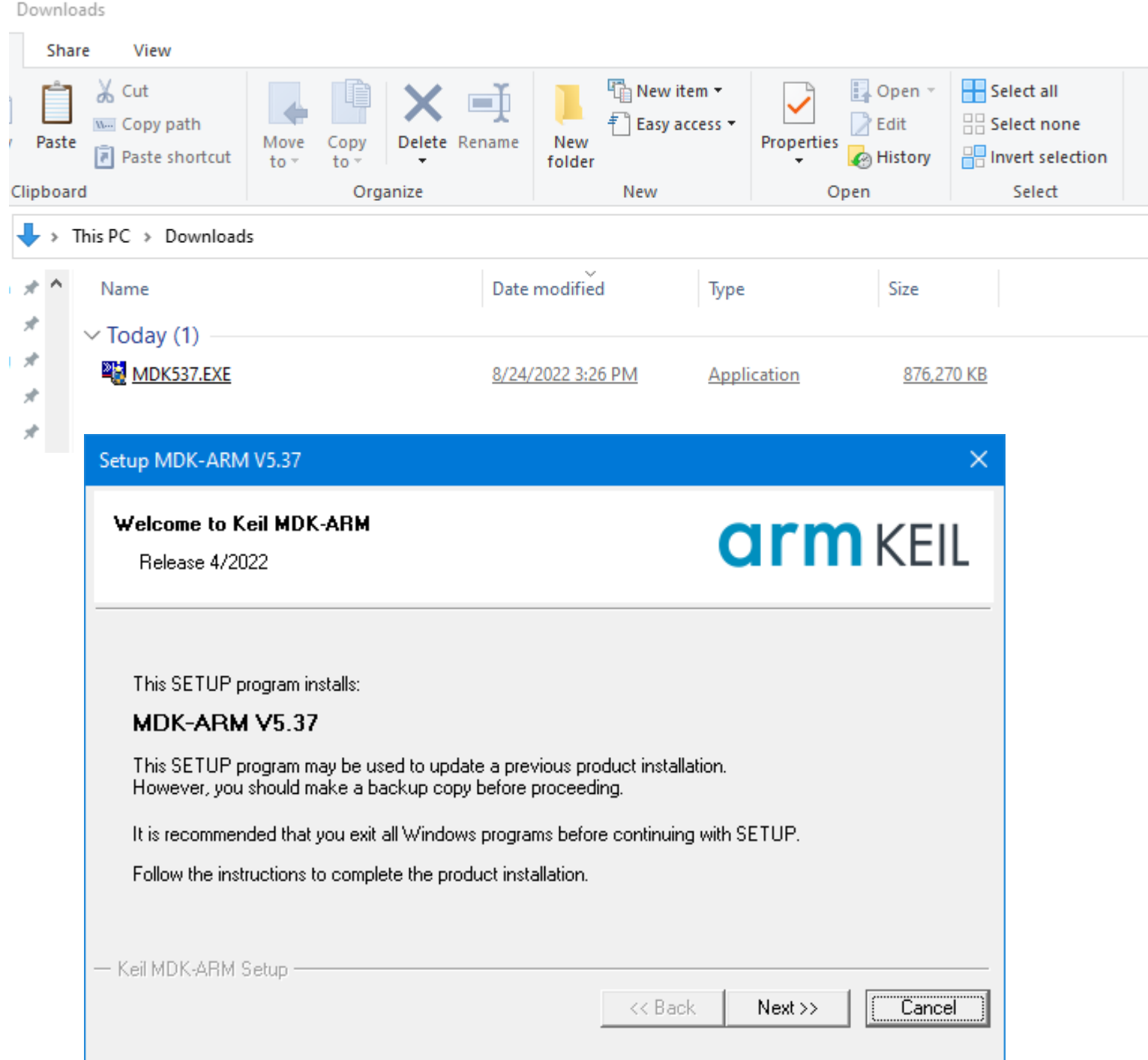
- Right-click on **MDK537.EXE** and save it to your computer.
- PDF files may be opened with Acrobat Reader.
- ZIP files may be opened with PKZIP or WINZIP.

**MDK537.EXE** (876,270K)  
Tuesday, May 3, 2022

- If you are evaluating the tools, be sure to [request a quote](#) for the full version of the tools.

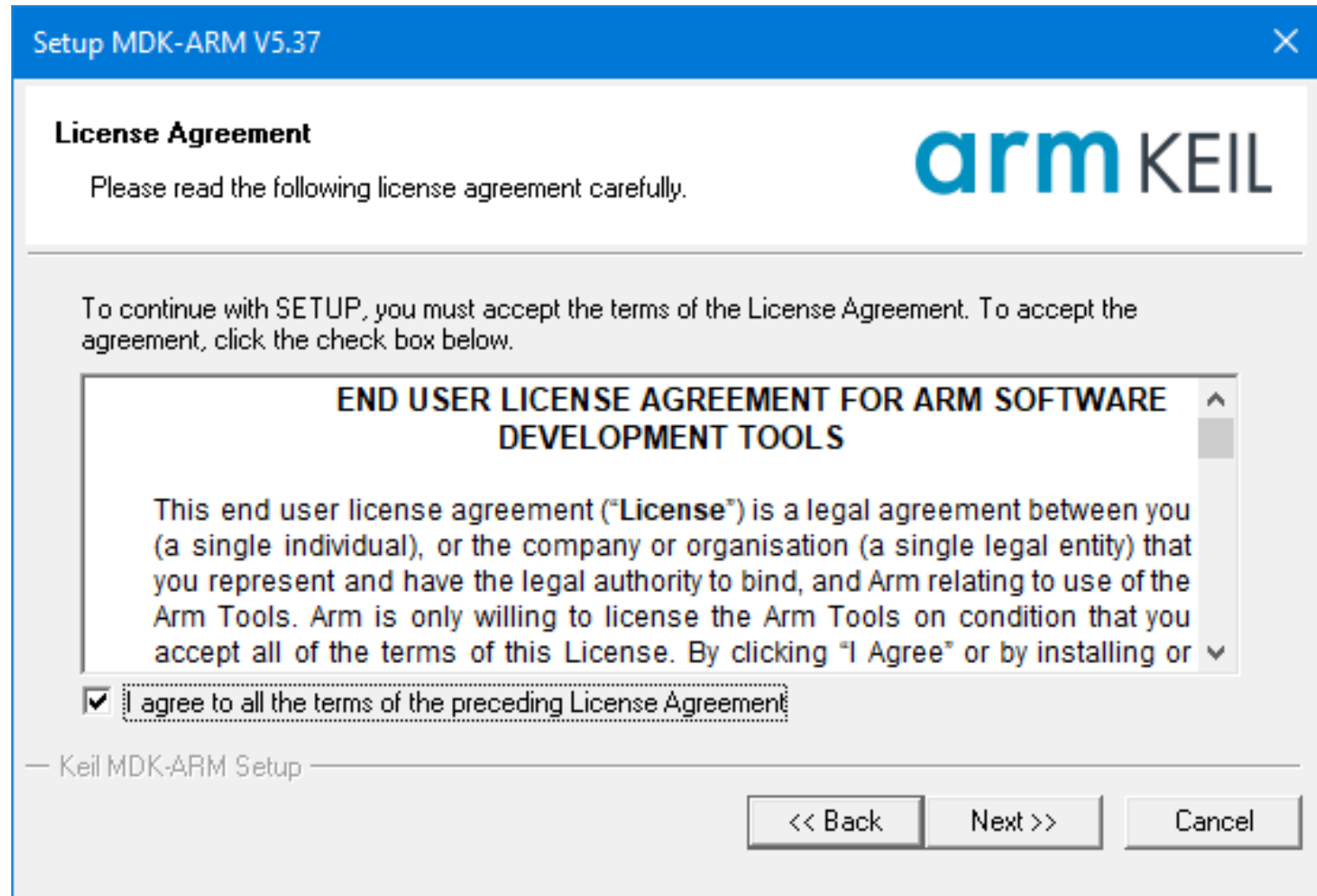
# Install Keil

- run the MDK537.exe file



# Install Keil

- agree to the license agreement





# Install Keil

- Choose where you want to install Keil

Setup MDK-ARM V5.37

**Folder Selection**

Select the folder where SETUP will install files.

Press 'Next' to install MDK-ARM to these folders. Press 'Browse' to select different folders for installation.

Destination Folders

Core: C:\Keil\_v5

Pack: C:\Keil\_v5\Arm\Packs

— Keil MDK-ARM Setup —

<< Back    Next >>    Cancel

# Install Keil

- Enter YOUR information

Setup MDK-ARM V5.37

**Customer Information**

Please enter your information.

arm KEIL

Please enter your name, the name of the company for whom you work, and your E-mail address.

First Name:

Last Name:

Company Name:

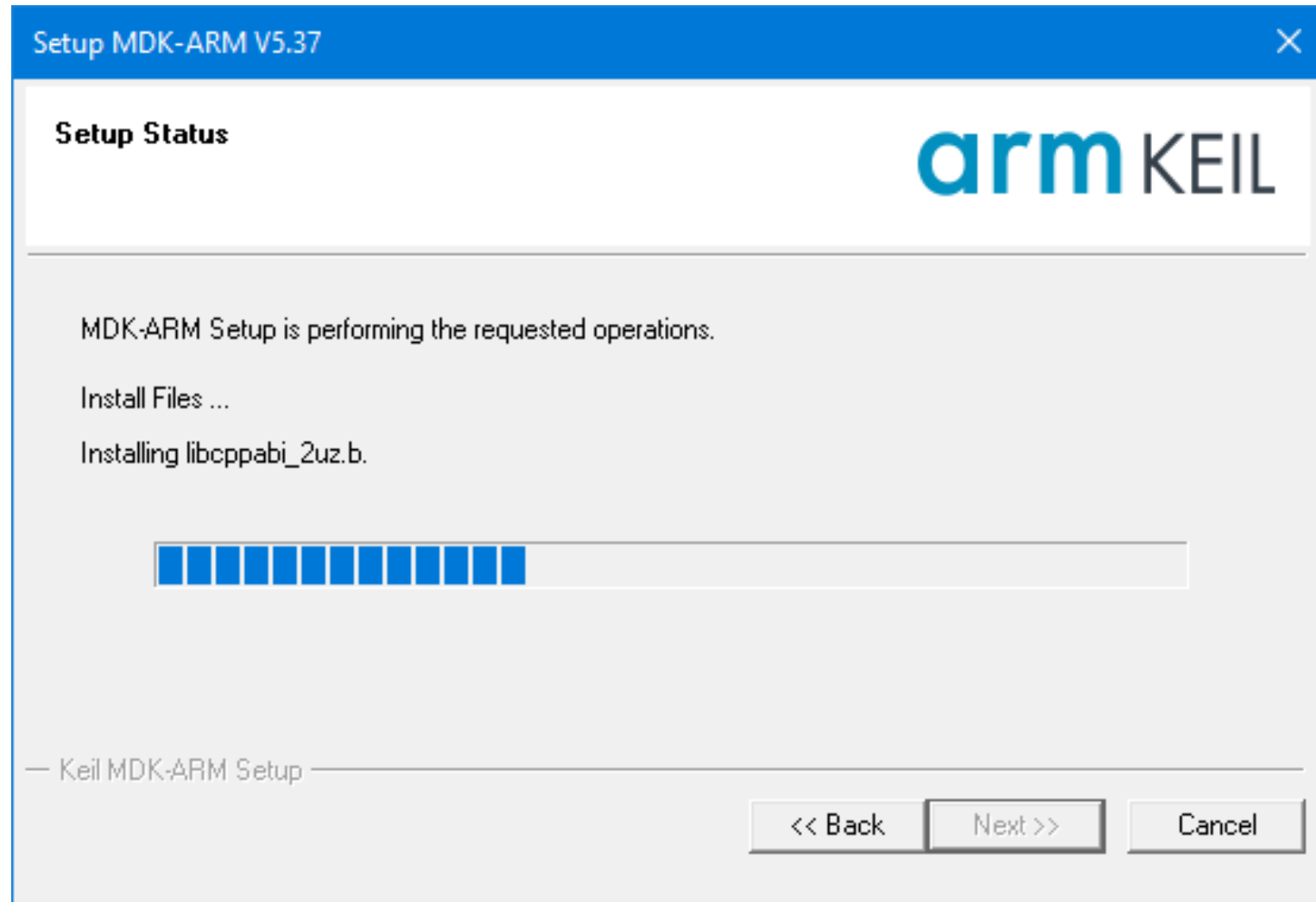
E-mail:

— Keil MDK-ARM Setup —

<< Back   Next >>   Cancel

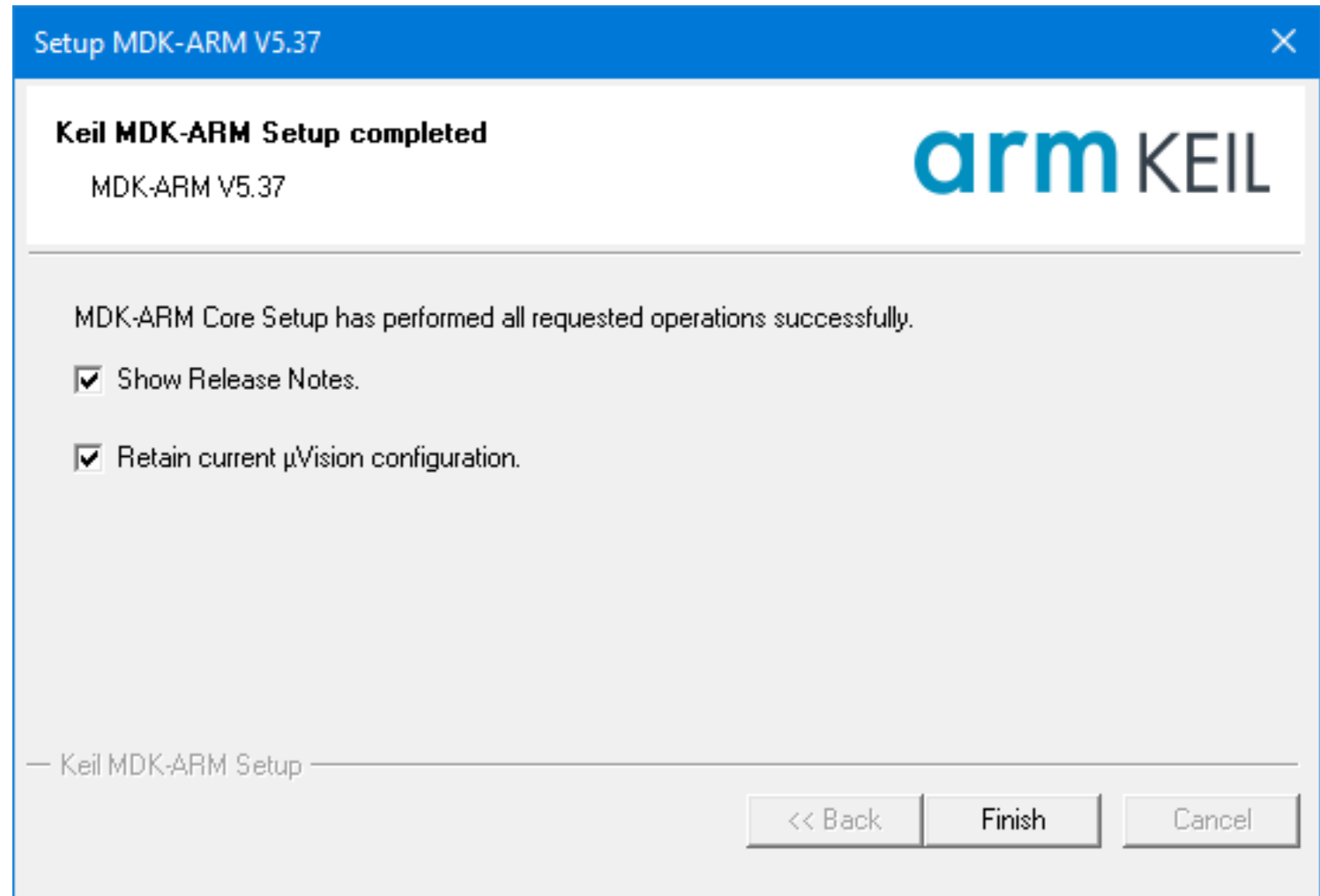
## Install Keil

- click Next and wait for all of the files to be installed
- this process will take a few minutes



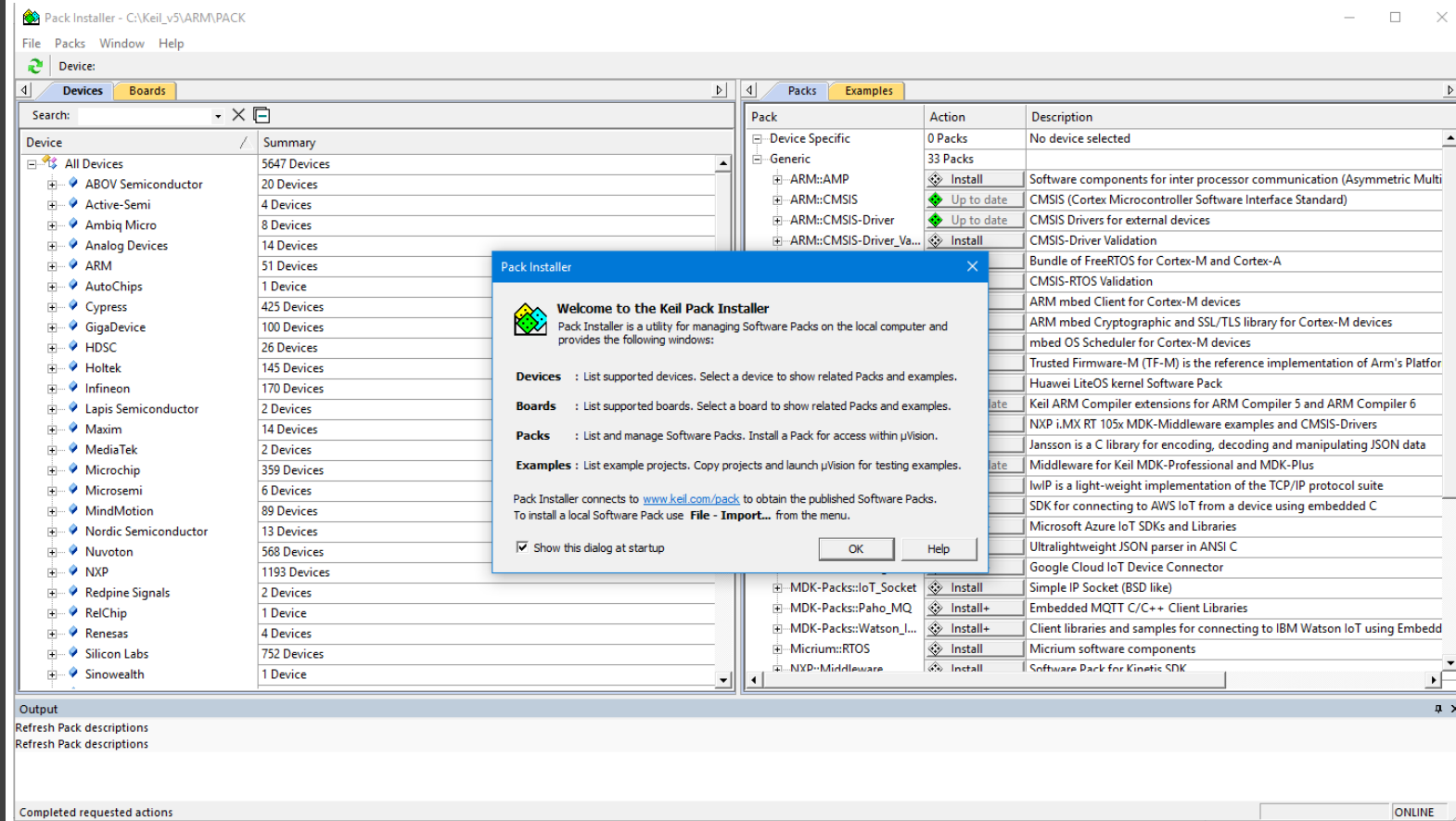
# Install Keil uVision

- Click “Finish”



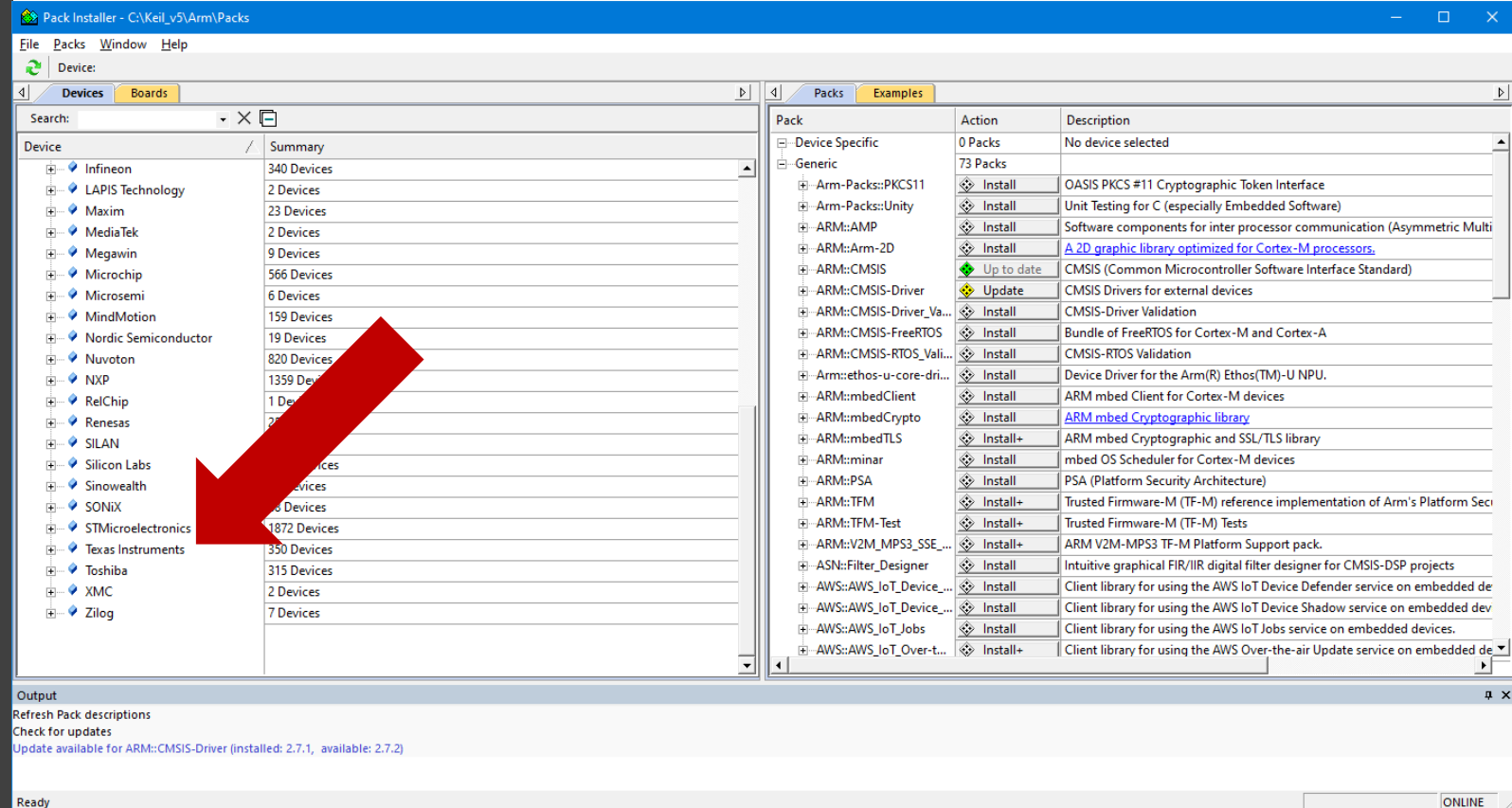
# Install Keil

- Click OK



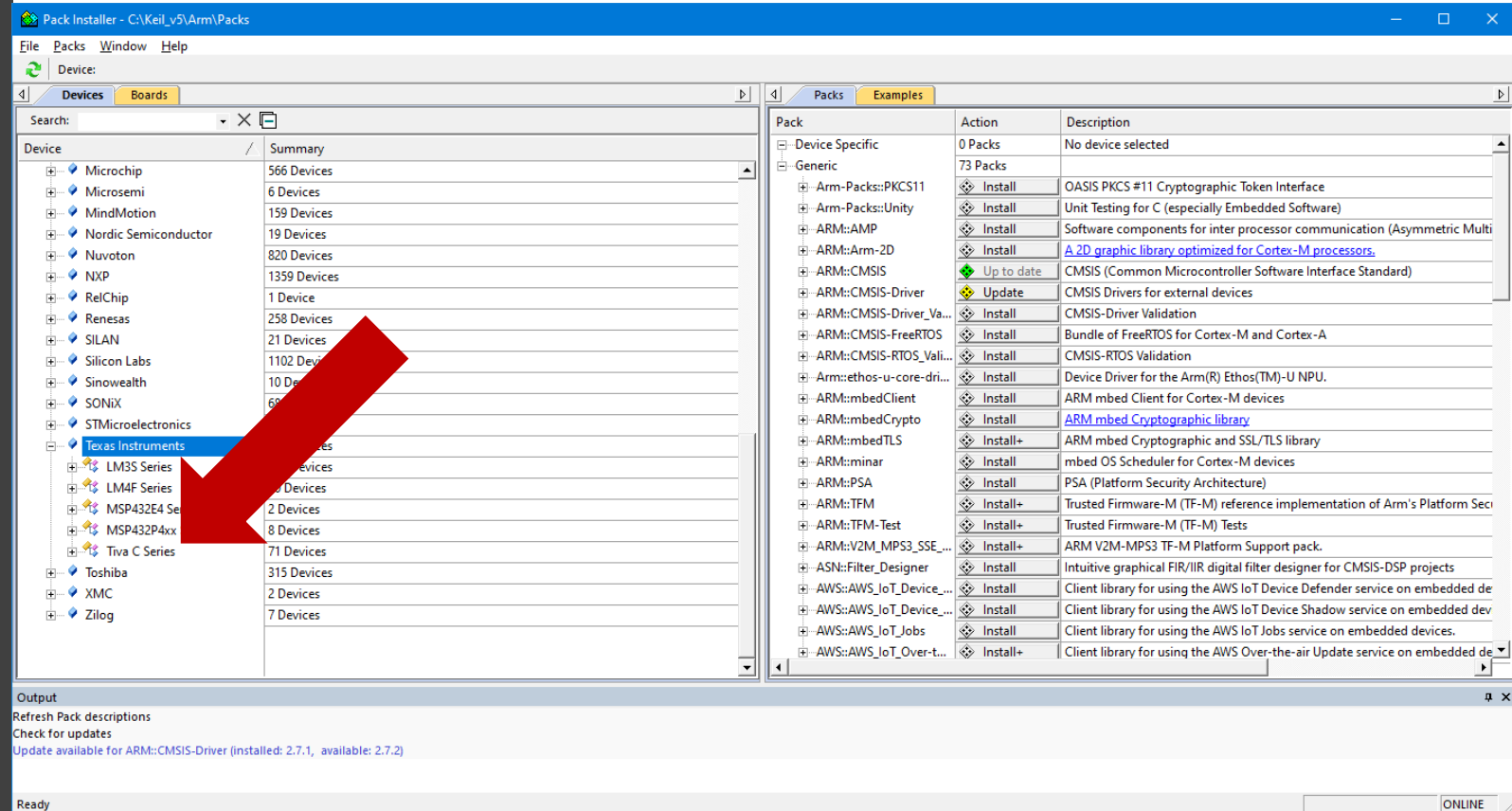
# Install Keil

- Expand the **Texas Instruments** options



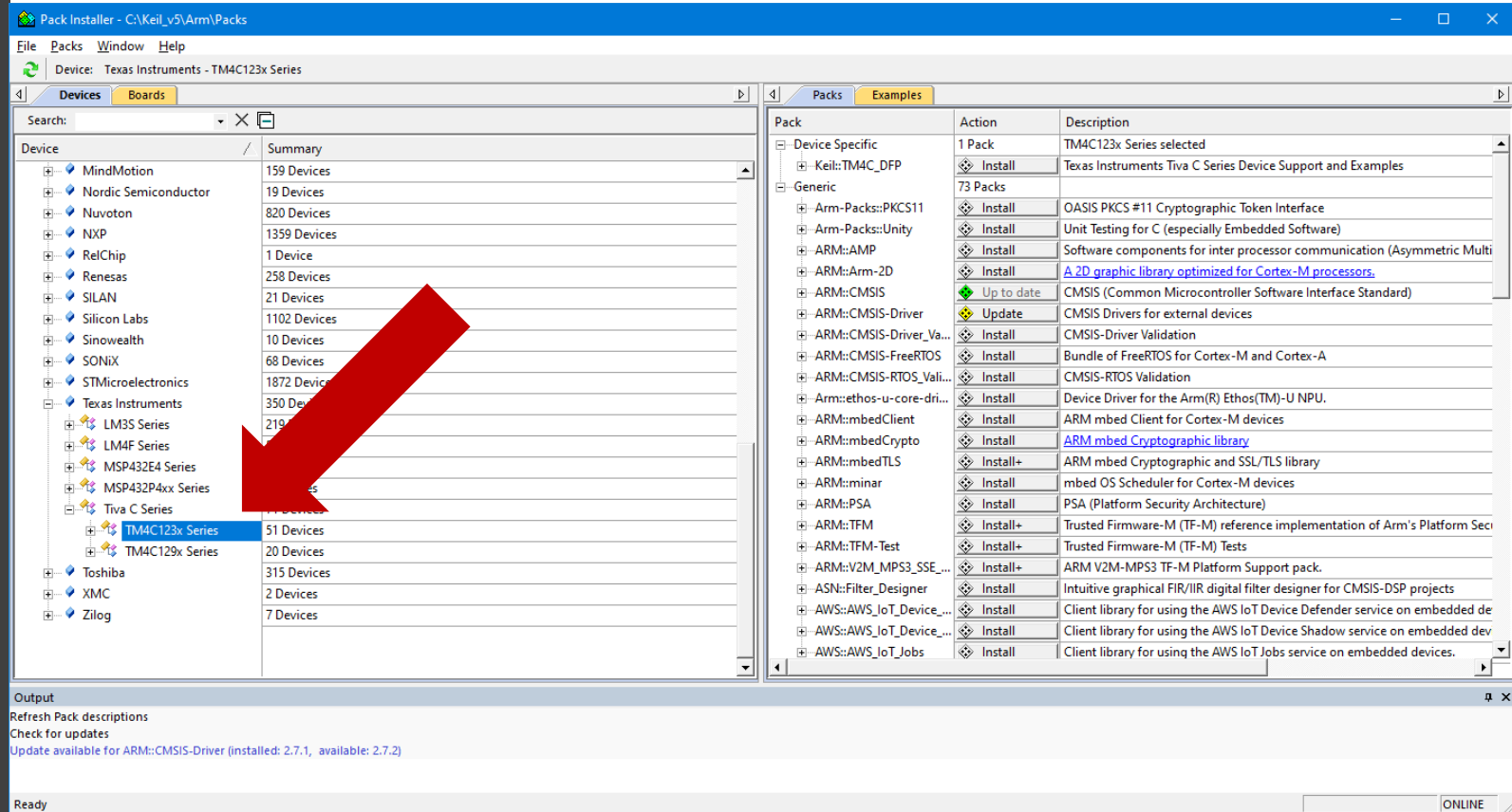
# Install Keil

- Expand the **Tiva C Series** options



# Install Keil

- Expand the **TM4C123** options

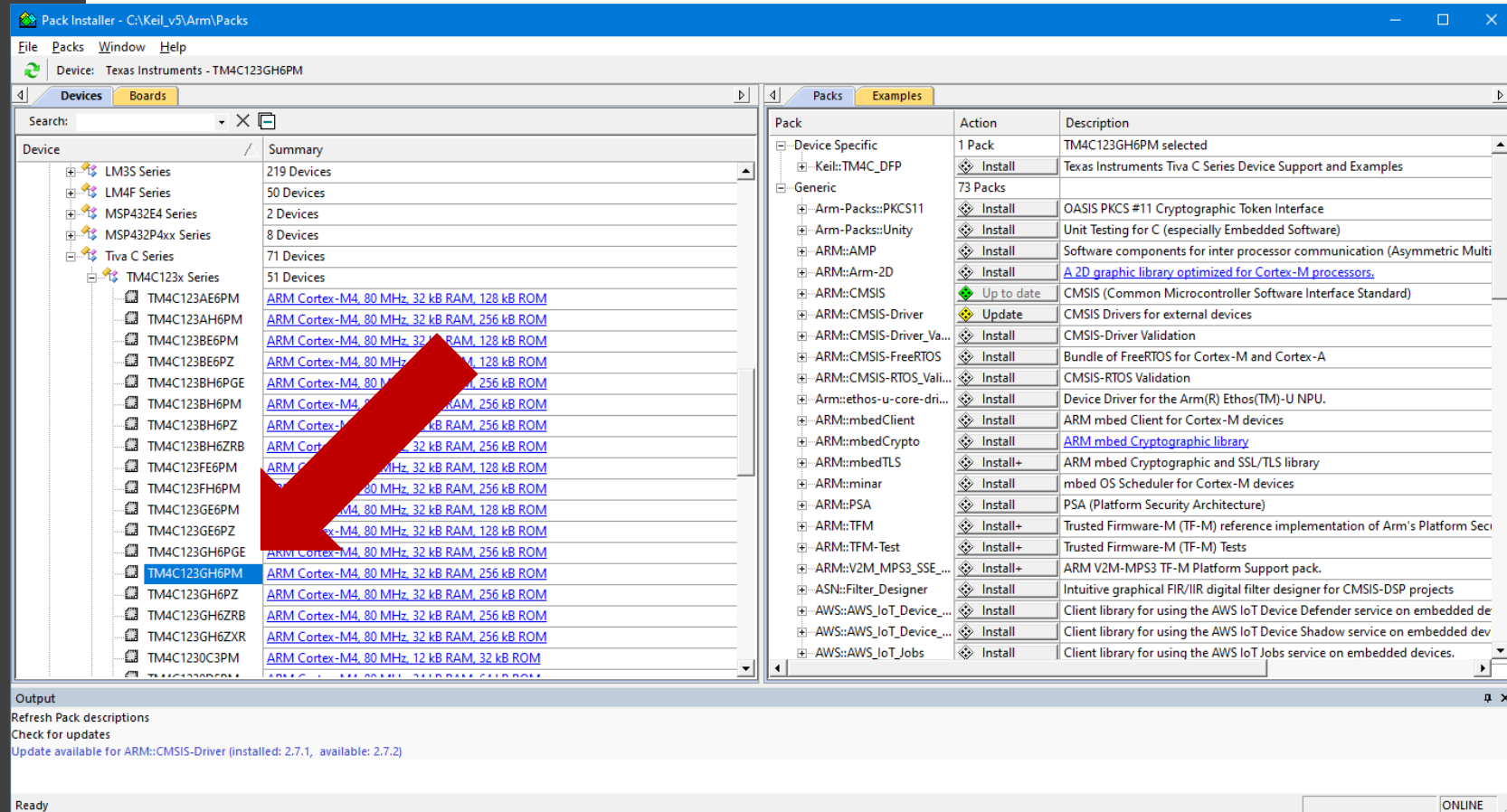




# Install Keil

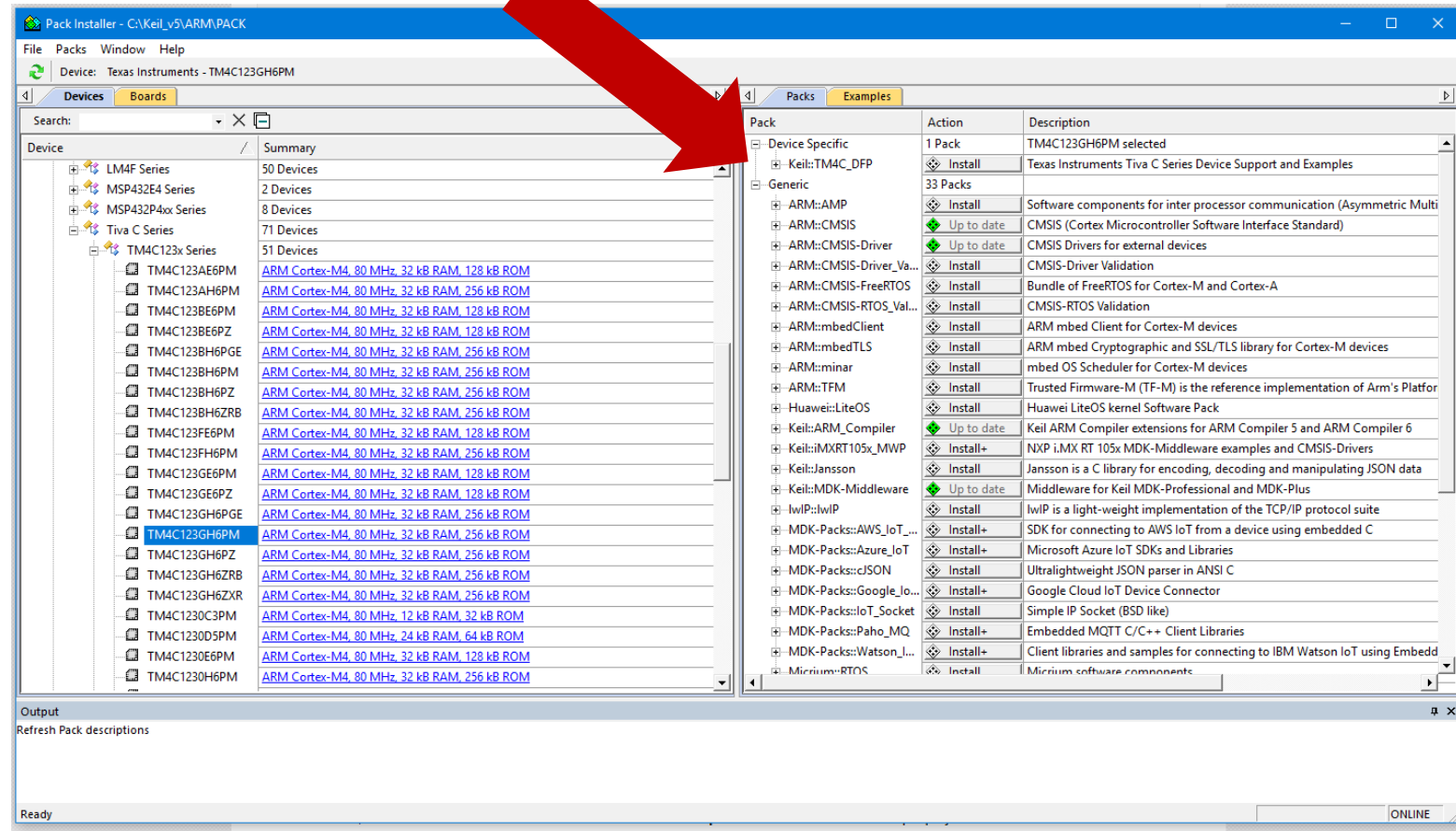
- Select the target device
  - **TM4C123GH6PM**
- Wait until the download finishes.

This takes a while!



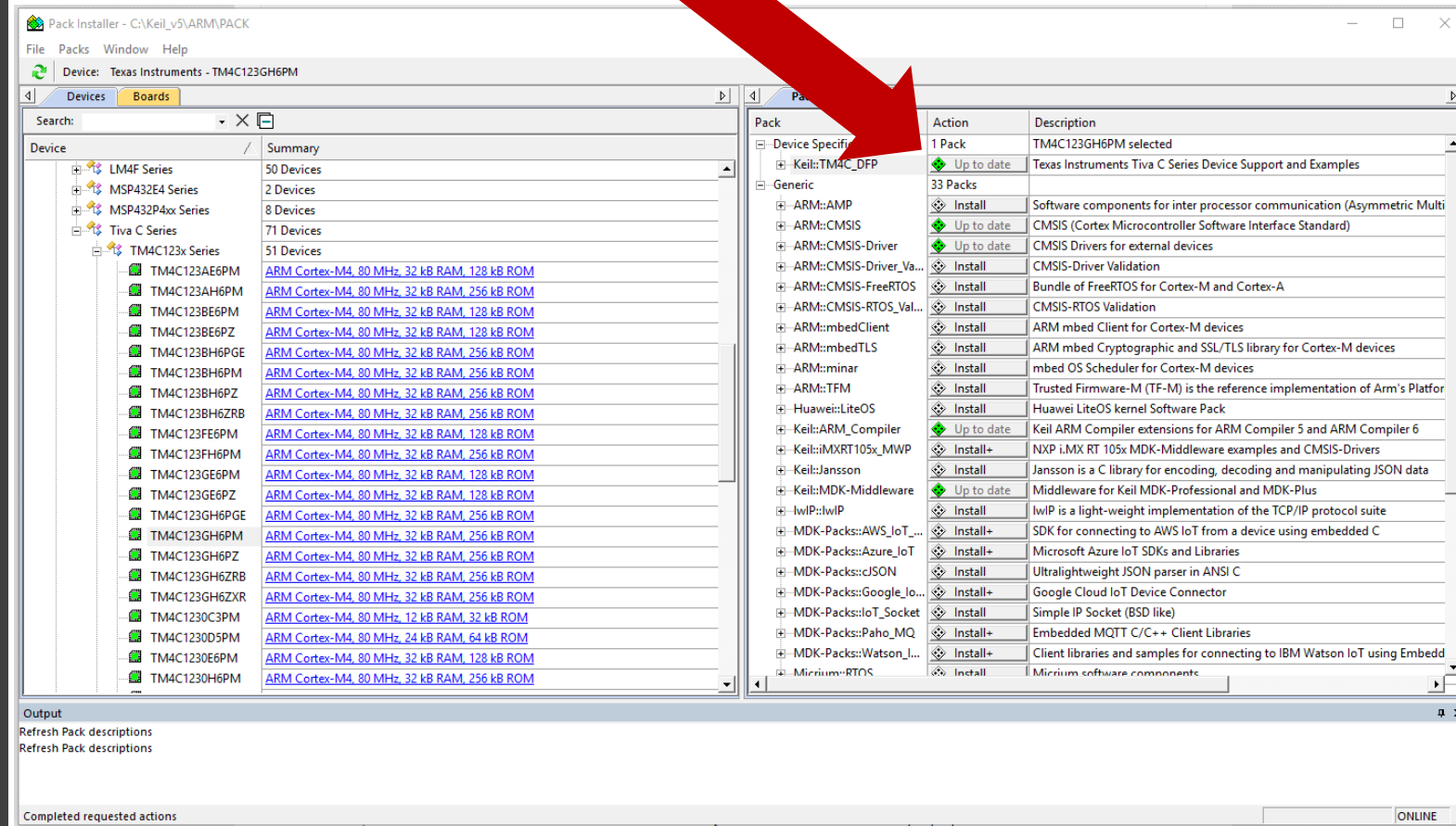
# Install Keil

- Install the Device Specific pack
  - **Keil::TM4C\_DFP**
- wait until the install completes (see the bar at the bottom)



# Install Keil

- wait until the install completes (see the bar at the bottom)
- You should see “Up to date” as in the image to the right
- You can now close this application



# µVision User's Guide

<https://developer.arm.com/documentation/101407/latest>

- Refer to the uVision User's Guide for more information.

The screenshot displays the ARM Developer website interface. At the top, the 'armDeveloper' logo is on the left, and navigation links for 'IP Explorer', 'Documentation', 'Downloads', 'Community', and 'Support' are on the right. Below the header, a breadcrumb trail reads 'Home / Documentation / Tools and Software / Keil Products / Keil MDK'. The main title 'µVision User's Guide' is prominently displayed. Underneath the title, there is a version selector set to 'Version: v5.37', a 'Subscribe' button, and a search bar labeled 'Search within this document'. A left-hand sidebar contains a 'DOCUMENT TABLE OF CONTENTS' with a list of sections: 'Back to search', 'All Keil MDK Documentation', 'µVision User's Guide' (highlighted), 'About uVision', 'User Interface', 'Creating Applications', 'Debugging', 'Debug Commands', 'Debug Functions', 'Simulation', 'Flash Programming', and 'Dialogs'. The main content area on the right features the title 'µVision User's Guide Version 5.37' and the subtitle 'About this book'. It includes a paragraph stating that the guide describes the µVision® IDE & Debugger and lists the chapters. A 'Next Section →' link with five star icons is located in the top right corner of the content area.

armDeveloper

IP Explorer Documentation Downloads Community Support

Developing on Arm Architecture and Processors Tools and Software

Home / Documentation / Tools and Software / Keil Products / Keil MDK

## µVision User's Guide

Version: v5.37 Subscribe Search within this document

DOCUMENT TABLE OF CONTENTS

- < Back to search
- < All Keil MDK Documentation
- µVision User's Guide
- > About uVision
- > User Interface
- > Creating Applications
- > Debugging
- > Debug Commands
- > Debug Functions
- > Simulation
- > Flash Programming
- > Dialogs

### µVision User's Guide

#### Version 5.37

#### About this book

This User's Guide describes the µVision® IDE & Debugger. It contains the chapters:

- **About µVision** describes main features, the folder structure, development cycle, how to request assistance, and contains a link to the release notes.
- **User Interface** describes the IDE interface with an extended section about using the Editor.
- **Creating Applications** describes the creation of projects using Software Components, shows features to edit and compile source files, fix errors and warnings, and generate executable code. This chapter includes a section with advanced techniques such as invoking external tools, creating a custom Device Database, or including library modules.
- **Debugging** describes the µVision debugger, the debugging windows and dialogs, and expressions that can be used in debugging commands. The chapter includes a section with advanced debugging techniques for accessing peripherals.
- **Debug Commands** describes debug and trace commands that can be entered in the **Command** window.

Next Section → ☆☆☆☆

If you do not have your LaunchPad you can skip to Step 3 for now and come back to Step 2 later.

## Step 2: Download & Install the TI LaunchPad drivers

- download the LaunchPad drivers
  - [http://www.ti.com/tool/stellaris\\_icdi\\_drivers](http://www.ti.com/tool/stellaris_icdi_drivers)

# Download Stellaris ICDI Drivers

- Click on the **Download** button for the current drivers
- As of 8/24/22, the filename is
  - **spmc016a.zip**

The screenshot shows the Texas Instruments website for Stellaris ICDI Drivers. The page has a red header with the TI logo and navigation links. The main content area is titled 'STELLARIS\_ICDI\_DRIVERS' and 'Stellaris® ICDI Drivers'. Below this is a navigation bar with tabs: Overview, Downloads, Technical documentation, Related design resources, and Support & training. The 'Downloads' tab is active. The 'Overview' section contains text about the ICDI interface. The 'Downloads' section features a table with one entry: 'SW-ICDI-DRIVERS — Stellaris® ICDI Drivers - Current'. A yellow arrow points to the 'Download' button for this entry.

TEXAS INSTRUMENTS

Search

Login / Register English Ship to USD

Products Applications Design resources Quality & reliability Support & training About TI

Home / Design resources

## STELLARIS\_ICDI\_DRIVERS

Stellaris® ICDI Drivers


Downloads

Overview Downloads Technical documentation Related design resources Support & training

### Overview

Tiva™ C Series evaluation and reference design kits provide an integrated In-Circuit Debug Interface (ICDI) which allows programming and debugging of the onboard C Series microcontroller. The ICDI can be used with the [LM Flash Programmer](#) as well as any of the Tiva-supported toolchains such as Texas Instruments' [Code Composer Studio](#). Only JTAG is supported. To use the ICDI, follow the instructions in the Quick Start document (literature number [SPMU287](#)) on this page to install the appropriate drivers on the host computer.

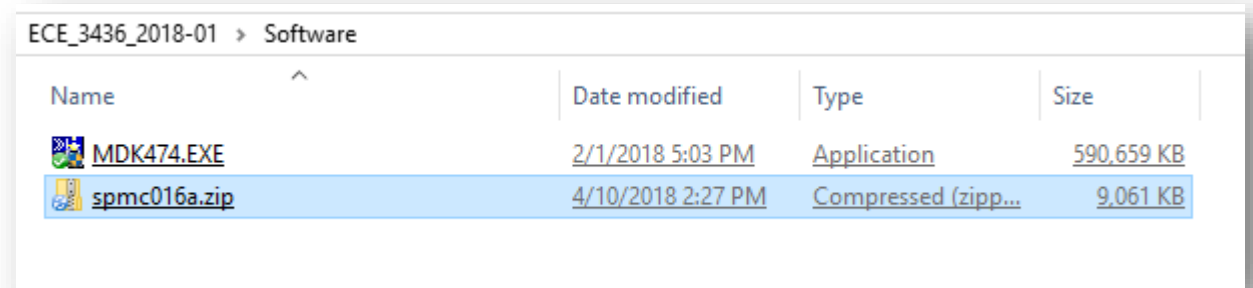
### Downloads

DRIVER OR LIBRARY	
	<p>SW-ICDI-DRIVERS — Stellaris® ICDI Drivers - Current</p> <p><a href="#">Supported products &amp; hardware</a></p>



Download

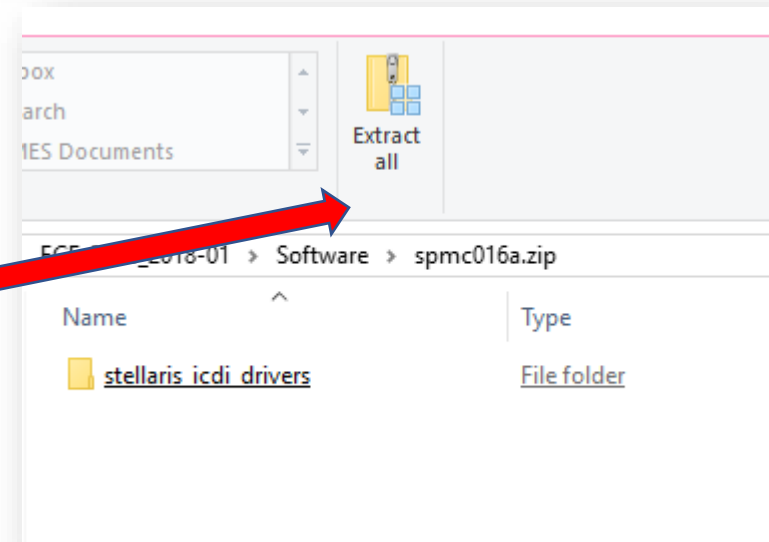
# Download Stellaris ICDI Drivers

- save the zip file to your course software folder (remember where you put this!)
- click on the zip folder
- extract all files
- optional: delete the **zip** folder and just leave the extracted folder











ECE\_3436\_2018-01 > Software

Name	Date modified	Type	Size
 MDK474.EXE	2/1/2018 5:03 PM	Application	590,659 KB
 sPMC016a.zip	4/10/2018 2:27 PM	Compressed (zipp...	9,061 KB



## Download Stellaris ICDI Drivers

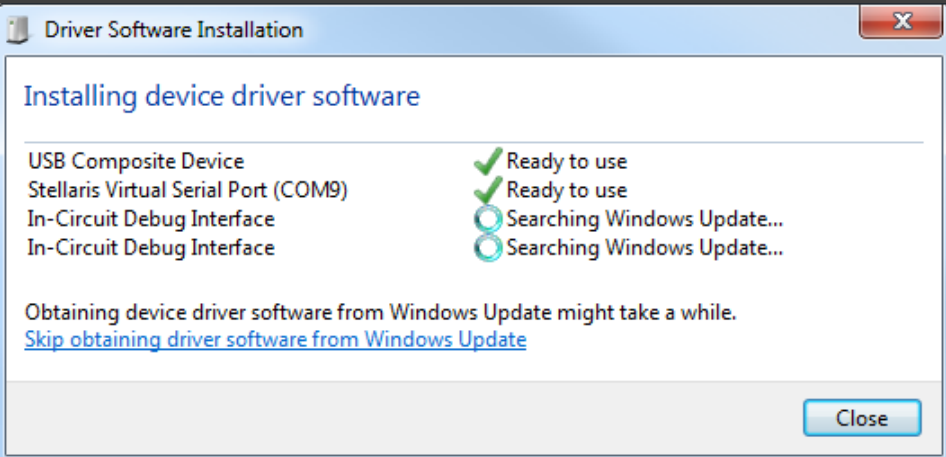
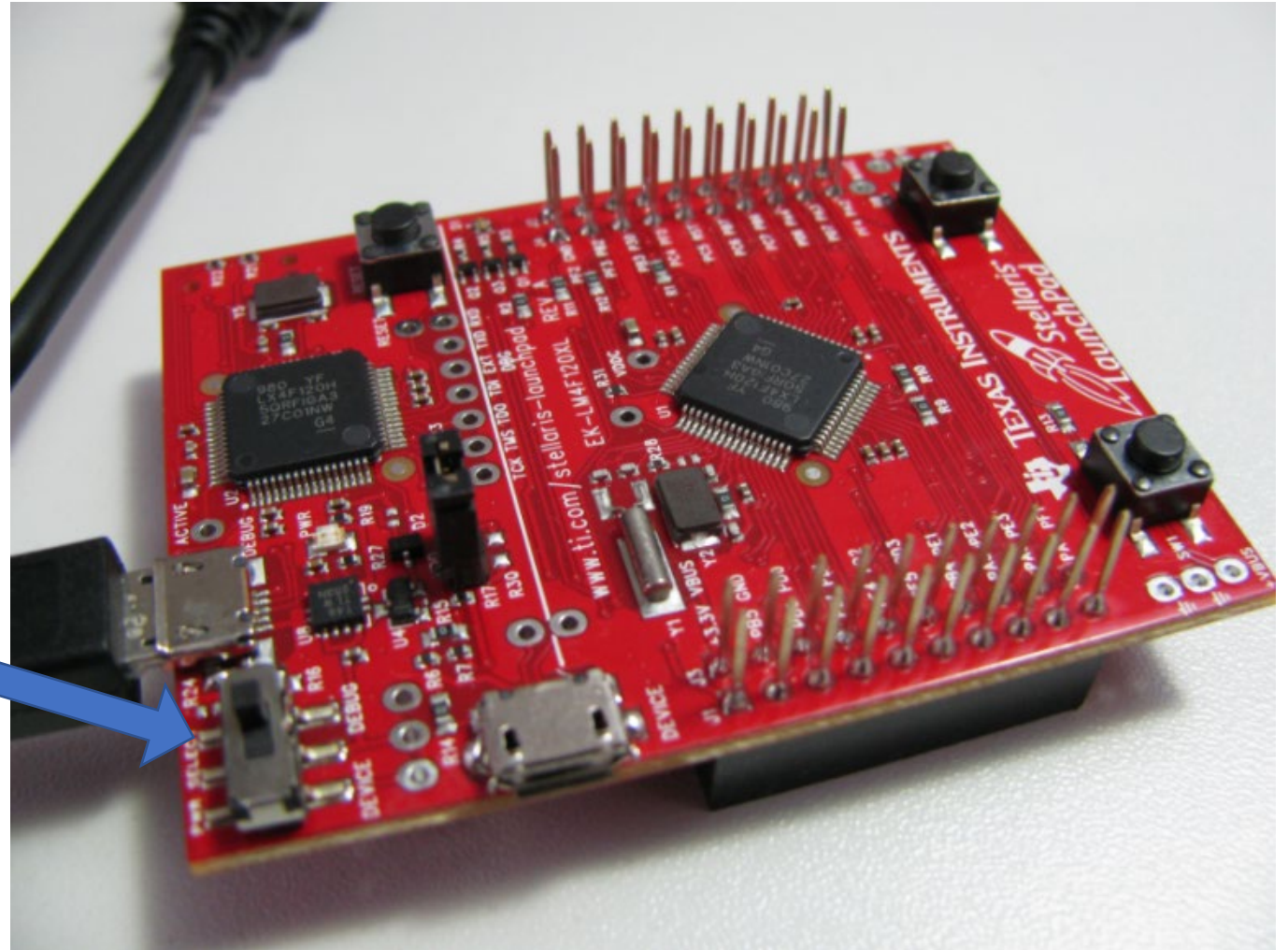
- Your driver folder should look like what you see on the right.

Name	Date modified	Type	Size
 <a href="#">amd64</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">File folder</a>	
 <a href="#">i386</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">File folder</a>	
 <a href="#">boot_usb.cat</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Security Catalog</a>	<a href="#">15 KB</a>
 <a href="#">boot_usb.inf</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Setup Information</a>	<a href="#">5 KB</a>
 <a href="#">stellaris icdi_com.cat</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Security Catalog</a>	<a href="#">9 KB</a>
 <a href="#">stellaris icdi_com.inf</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Setup Information</a>	<a href="#">2 KB</a>
 <a href="#">stellaris icdi_debug.cat</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Security Catalog</a>	<a href="#">17 KB</a>
 <a href="#">stellaris icdi_debug.inf</a>	<a href="#">8/24/2022 3:53 PM</a>	<a href="#">Setup Information</a>	<a href="#">5 KB</a>



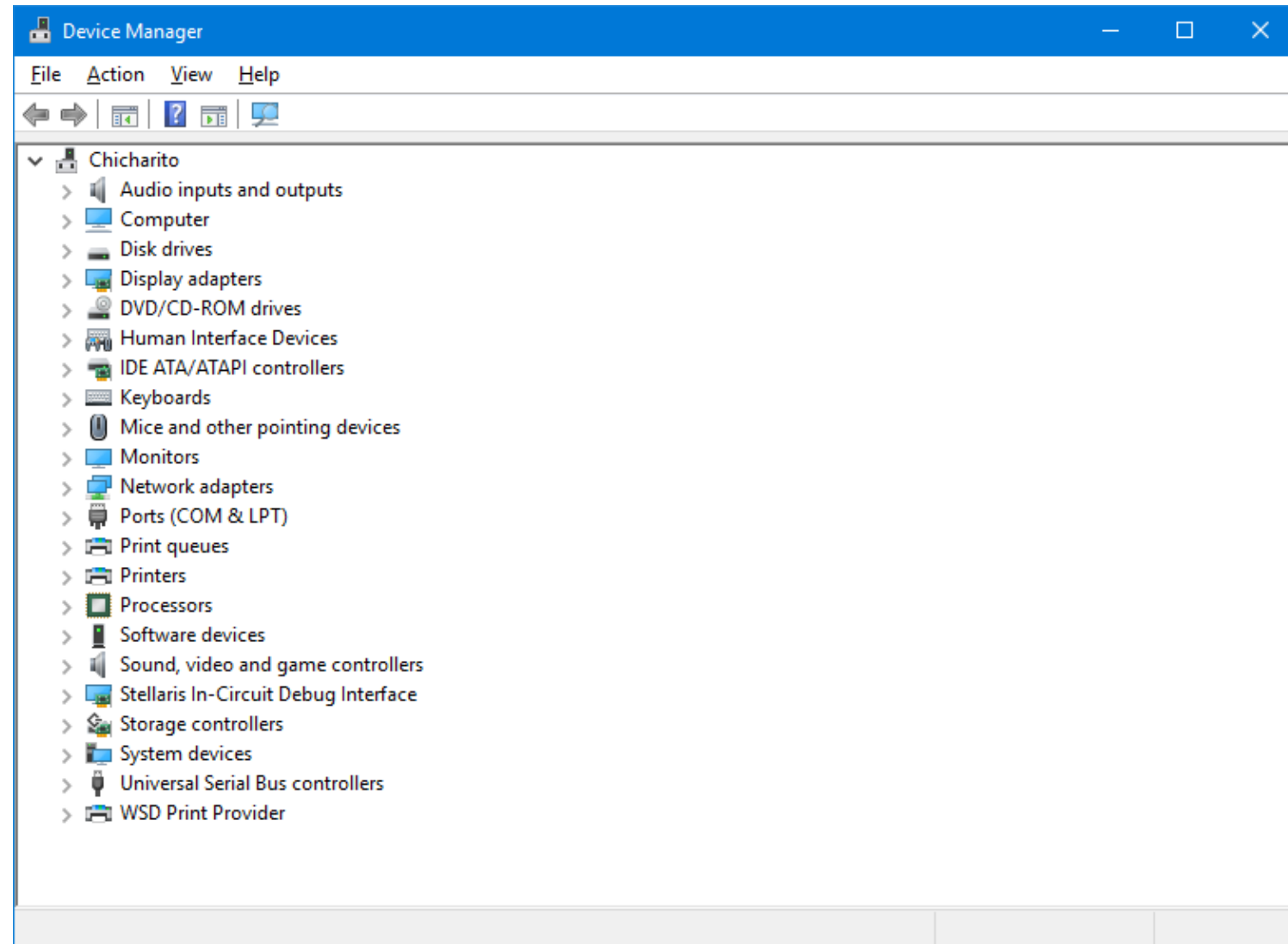
# Install Stellaris ICDI Drivers

- Plug USB cable into the LaunchPad Debug USB port
- Plug other end of USB cable into your computer
- Switch on power on LaunchPad



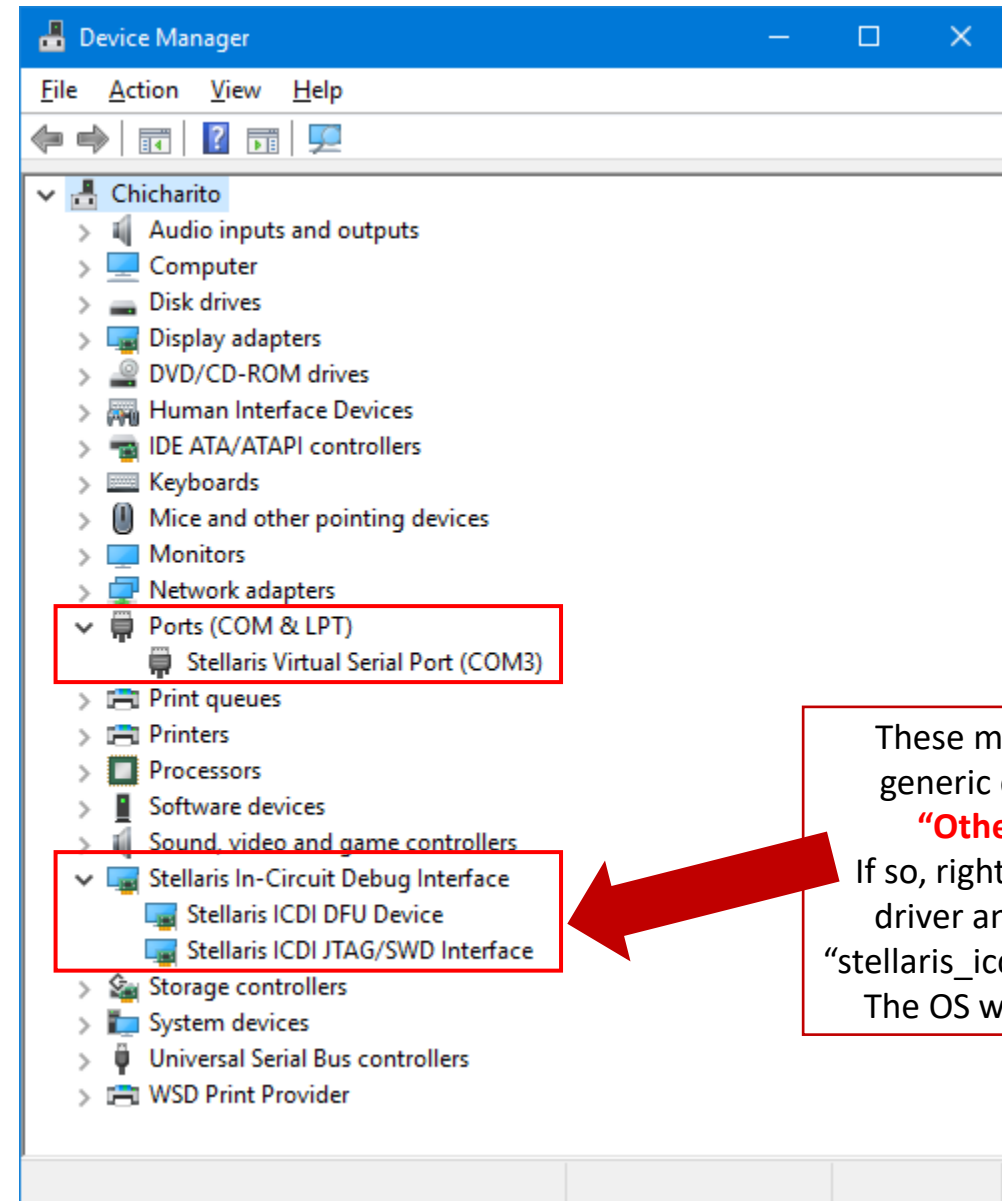
# Install Stellaris ICDI Drivers

- Open your **Device Manager**



# Install Stellaris ICDI Drivers

- expand the Ports tab
- update the drivers  
*(need administrator rights)*
  - right click on “Stellaris ICDI DFU Device”
  - select Update driver
  - browse for drivers on your computer
  - you will need to navigate to the folder where you stored the Stellaris drivers (see later slide)

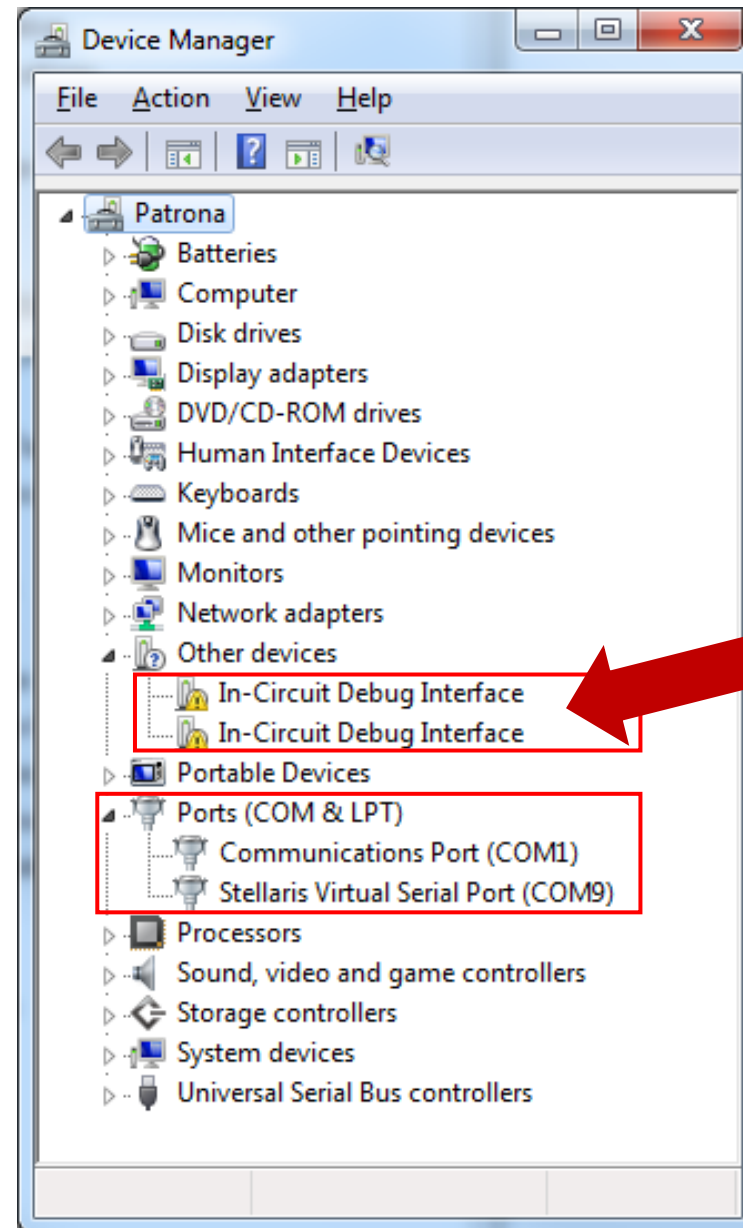


These may be listed as generic devices under **“Other Devices.”** If so, right click to update driver and point to the “stellaris\_icdi\_drivers” folder. The OS will figure it out.

## Install Stellaris ICDI Drivers: “Other Devices” case

- expand the Ports tab
- right click the yellow triangles (indicating missing drivers)
- update the drivers (*need administrator rights*)
  - you will need to navigate to the folder where you stored the Stellaris drivers
- the yellow triangles should disappear (as shown)

## Case when device shows up as “Other Devices”



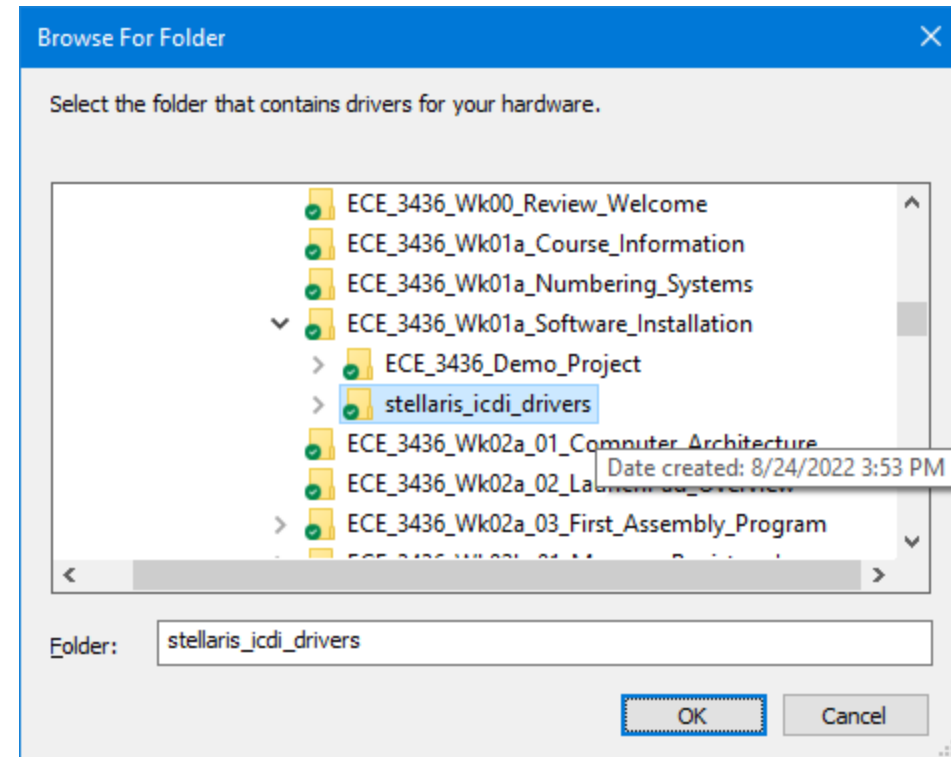
These may be listed as generic devices under “Other Devices.”

If so, right click to update driver and point to the “stellaris\_icdi\_drivers” folder. The OS will figure it out.

You need administrator rights.

## Install Stellaris ICDI Drivers

- select the folder where your drivers are located
- Click OK
- Click Next

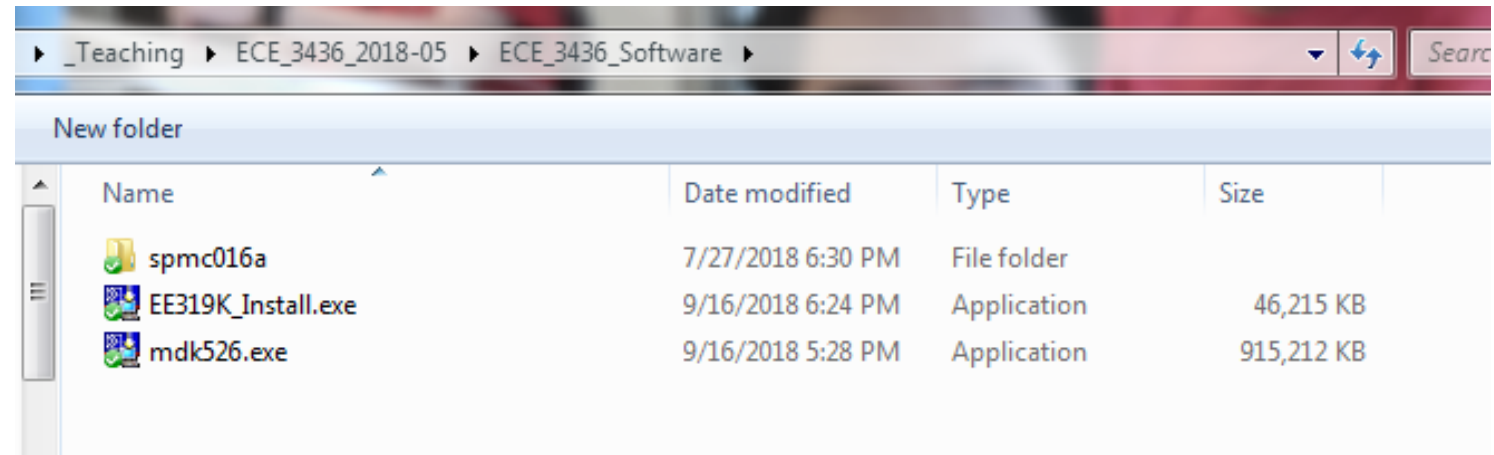


# Step 3: Download & Install the UT EE319K Software

- [http://users.ece.utexas.edu/~valvano/Volume1/EE319K Install.exe](http://users.ece.utexas.edu/~valvano/Volume1/EE319K%20Install.exe)
- If the link does not work, get file from **Teams**

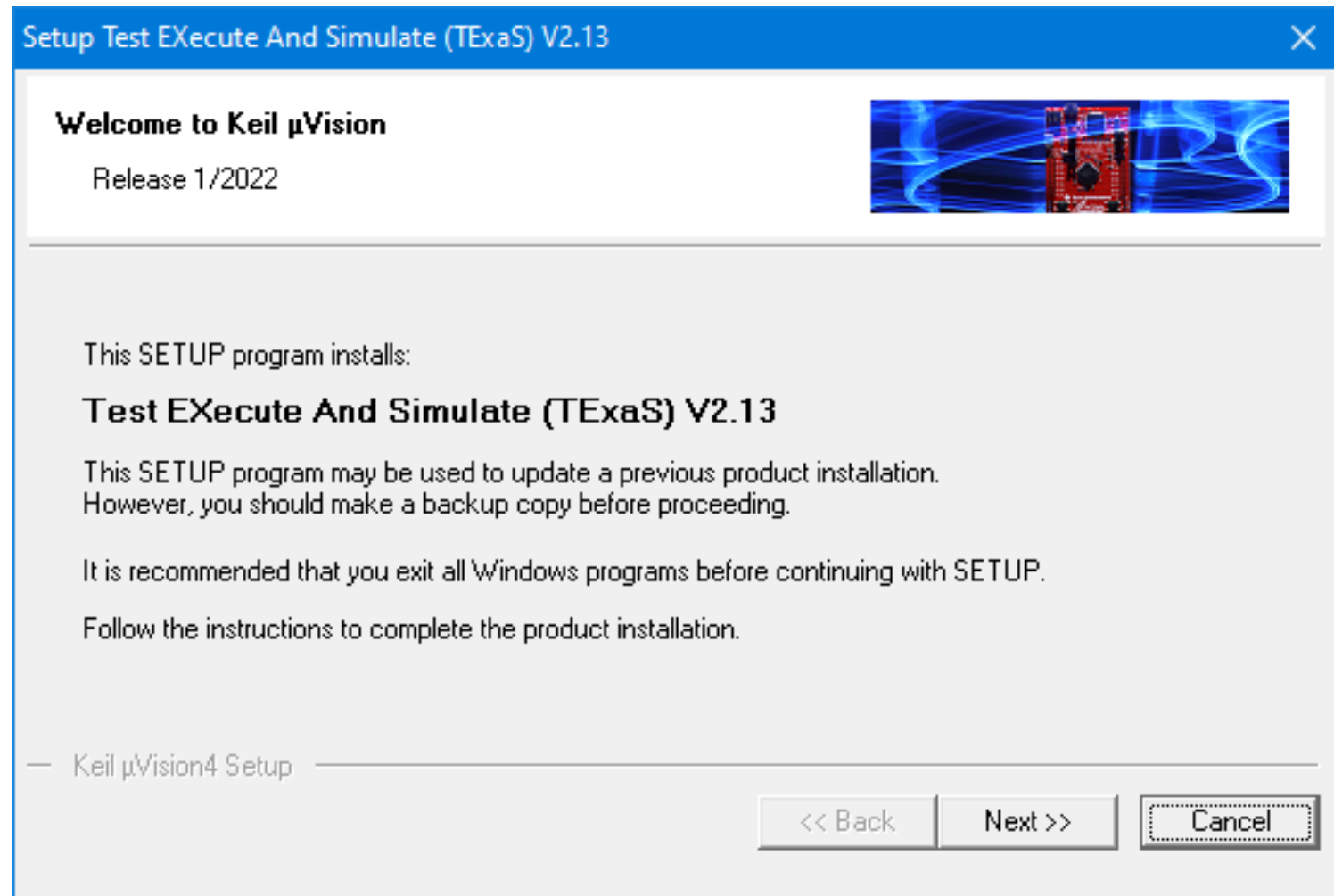
# UT EE319K Software

- save the starter configuration executable with your course software



# UT EE319K Software

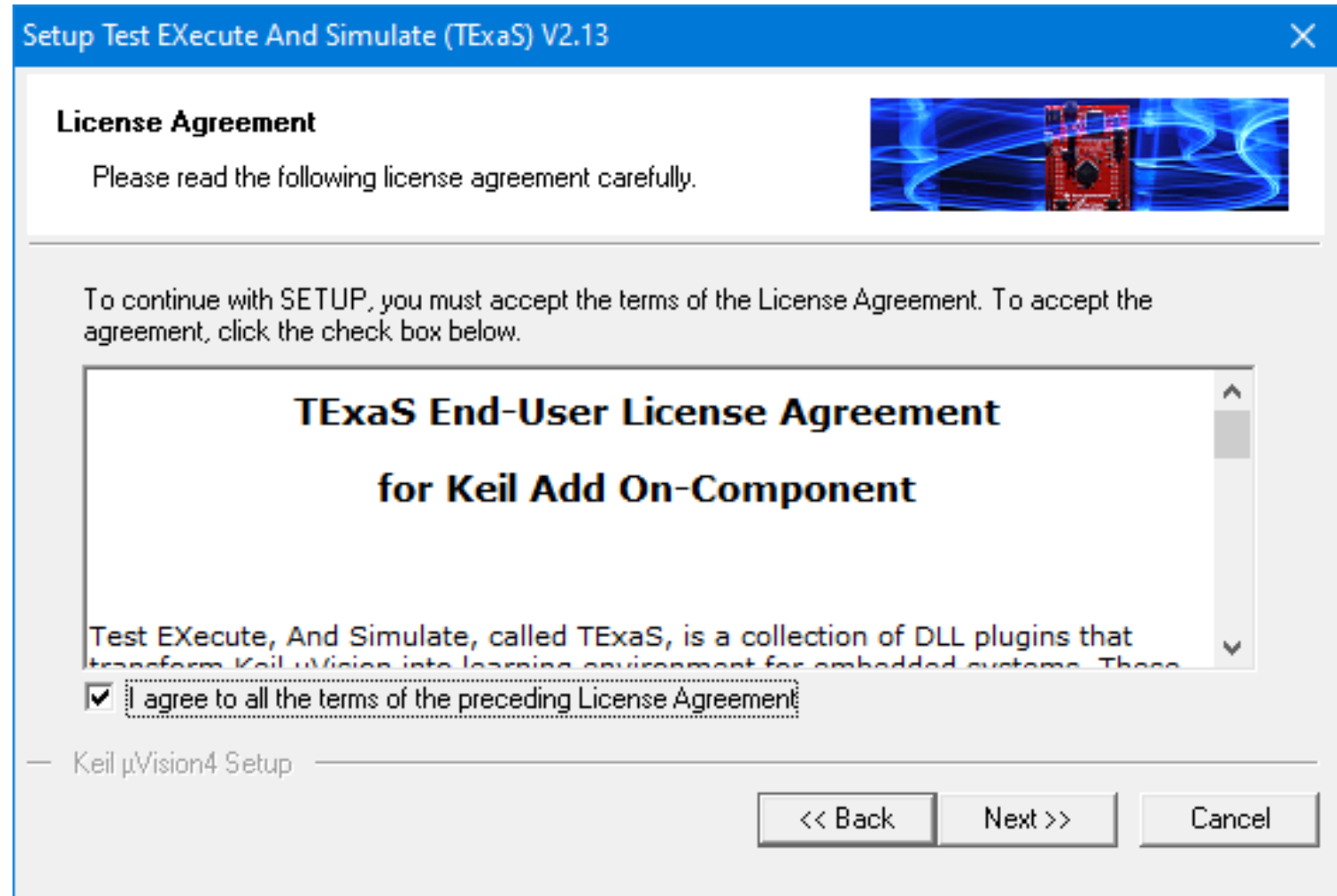
- run the EE319K executable
- be sure it's V2.13
- click Next





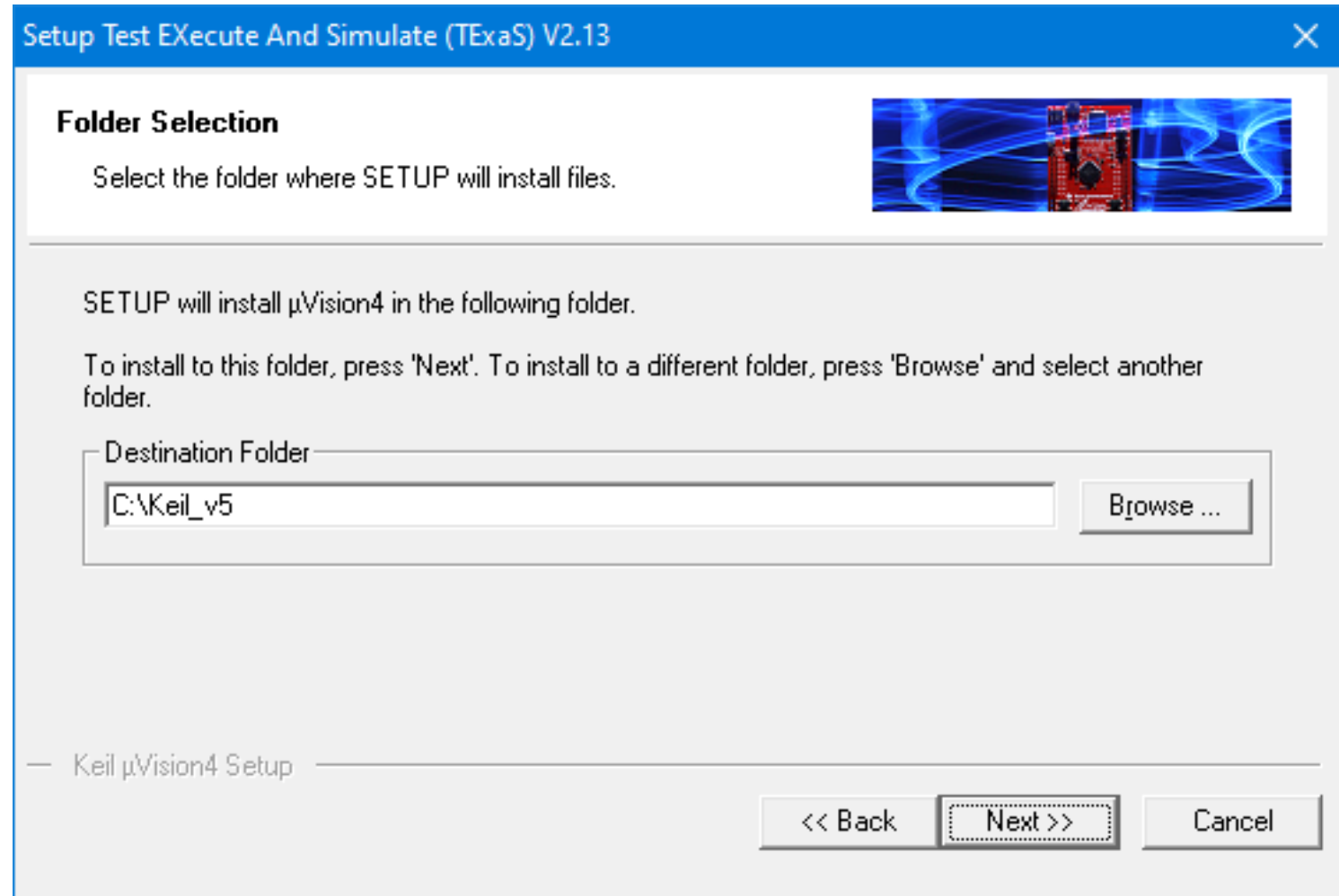
# UT EE319K Software

- read and click if you agree to the license agreement



# UT EE319K Software

- set up in your Keil folder
- click Next




# UT EE319K Software

- enter your information
- click Next

Setup Test EXecute And Simulate (TExaS) V2.13

**Customer Information**

Please enter your information.



Please enter your name, the name of the company for whom you work and your E-mail address.

First Name:

Last Name:

Company Name:

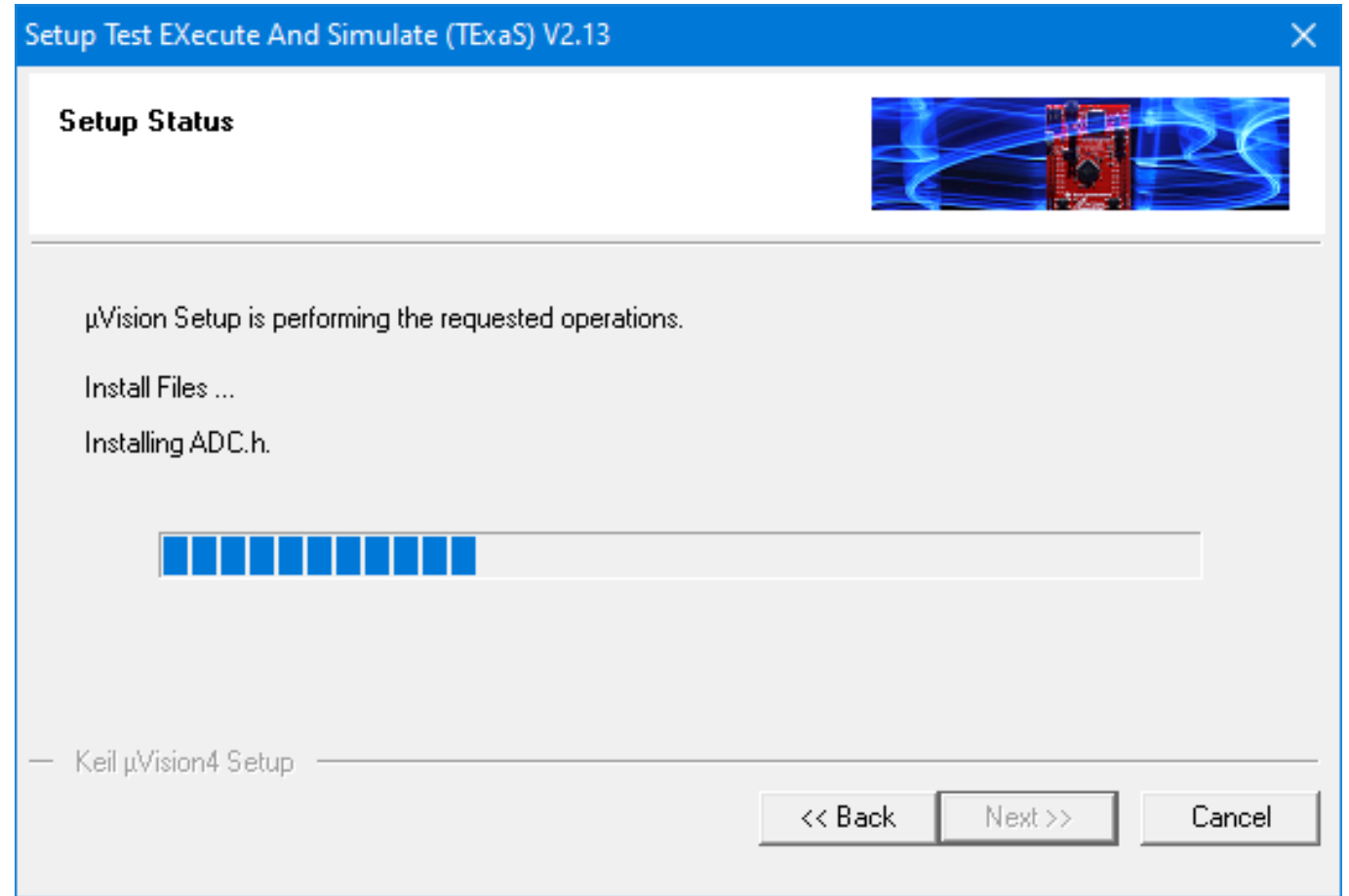
E-mail:

— Keil  $\mu$ Vision4 Setup —

<< Back   Next >>   Cancel

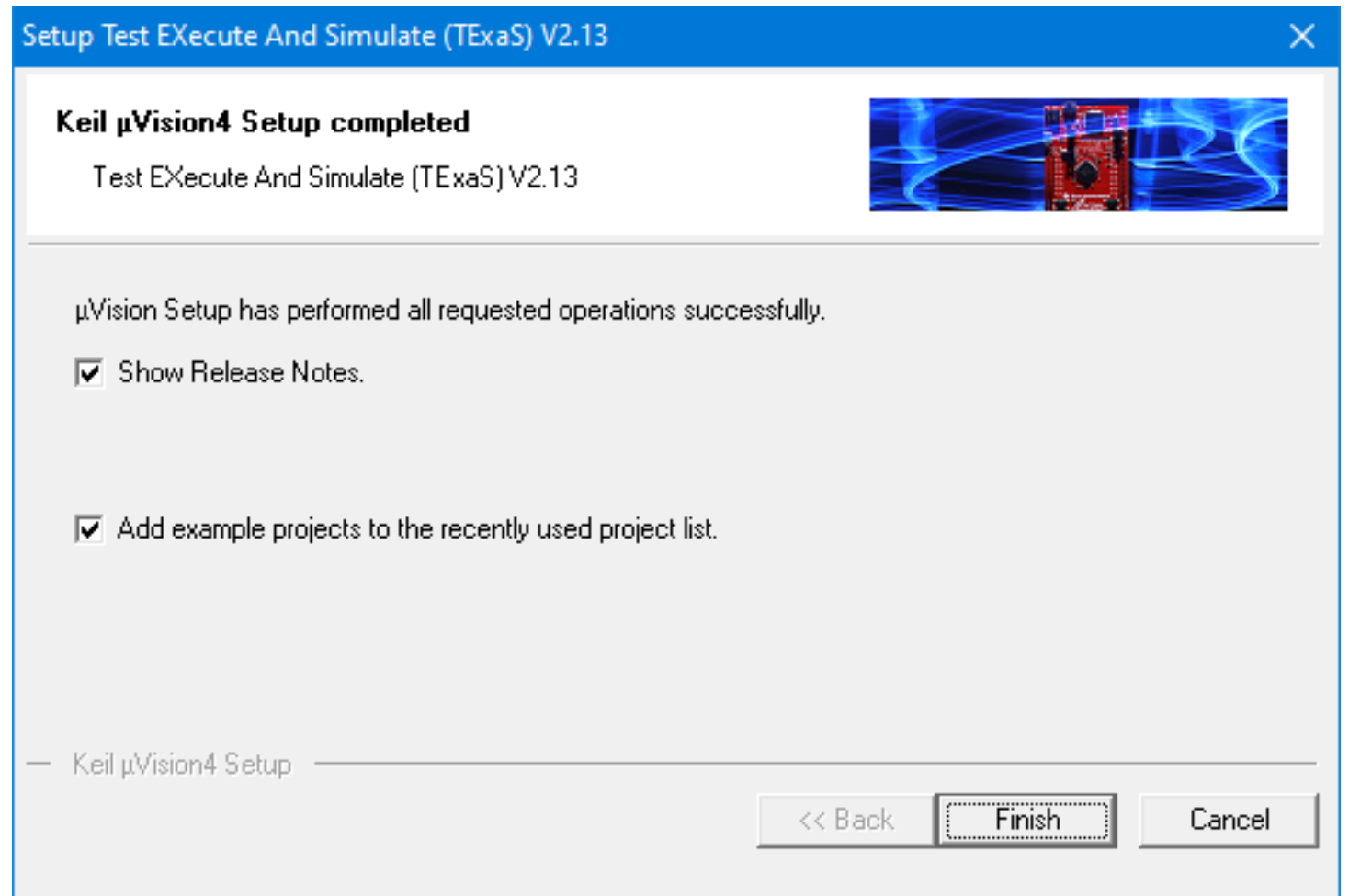
## UT EE319K Software

- wait for files to install



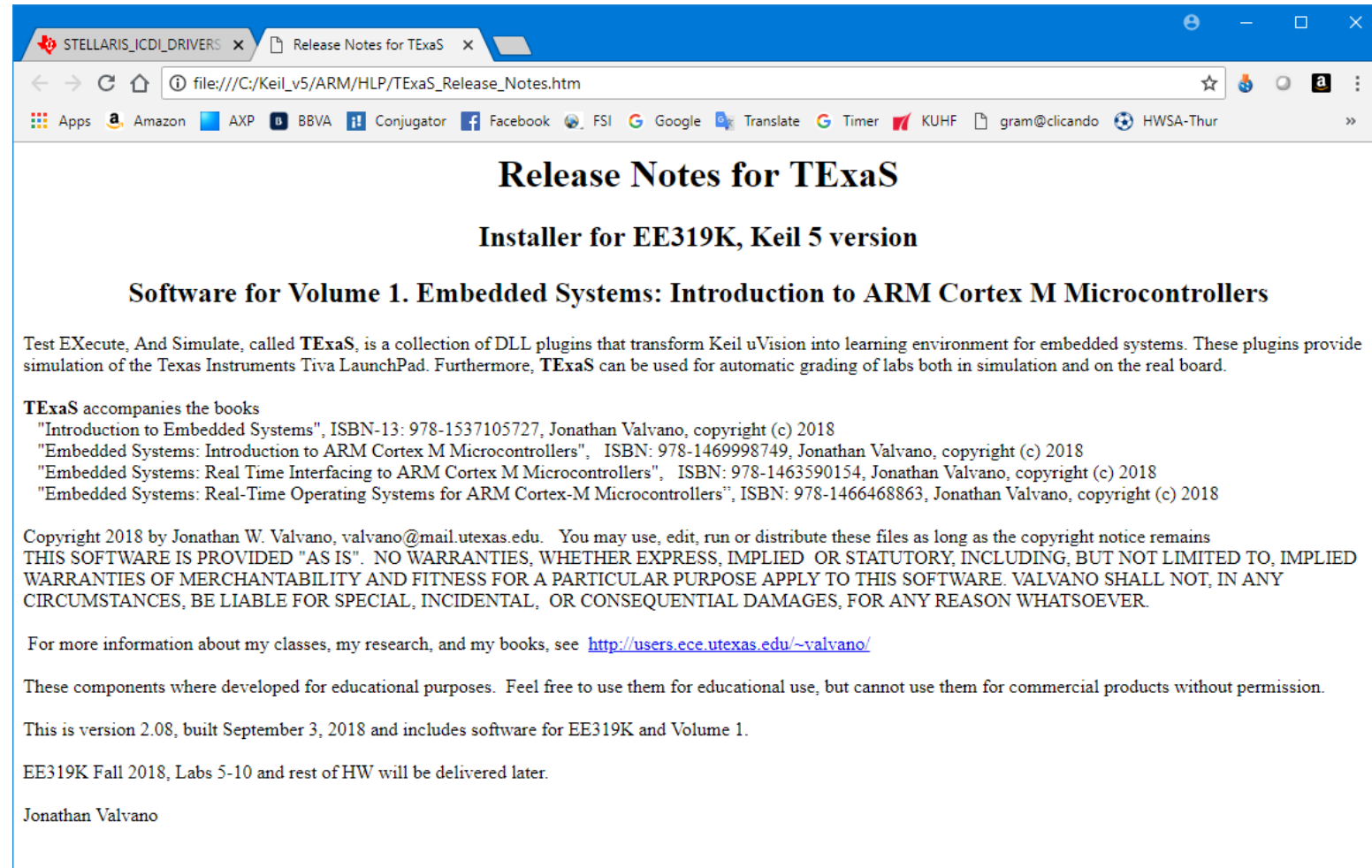
# UT EE319K Software

- the setup should only take a few seconds
- then you should see this dialog box
- leave both boxes checked
- click Finish



# UT EE319K Software

- you will be redirected to the release notes for TExaS



The screenshot shows a web browser window with two tabs: "STELLARIS\_ICDI\_DRIVERS" and "Release Notes for TExaS". The address bar shows the file path "file:///C:/Keil\_v5/ARM/HLP/TExaS\_Release\_Notes.htm". The browser's toolbar includes various icons for apps, Amazon, AXP, BBVA, Conjugator, Facebook, FSI, Google, Translate, Timer, KUHF, gram@clcando, and HWSA-Thur. The main content area displays the following text:

## Release Notes for TExaS

### Installer for EE319K, Keil 5 version

#### Software for Volume 1. Embedded Systems: Introduction to ARM Cortex M Microcontrollers

Test EXecute, And Simulate, called **TExaS**, is a collection of DLL plugins that transform Keil uVision into learning environment for embedded systems. These plugins provide simulation of the Texas Instruments Tiva LaunchPad. Furthermore, **TExaS** can be used for automatic grading of labs both in simulation and on the real board.

**TExaS** accompanies the books

- "Introduction to Embedded Systems", ISBN-13: 978-1537105727, Jonathan Valvano, copyright (c) 2018
- "Embedded Systems: Introduction to ARM Cortex M Microcontrollers", ISBN: 978-1469998749, Jonathan Valvano, copyright (c) 2018
- "Embedded Systems: Real Time Interfacing to ARM Cortex M Microcontrollers", ISBN: 978-1463590154, Jonathan Valvano, copyright (c) 2018
- "Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers", ISBN: 978-1466468863, Jonathan Valvano, copyright (c) 2018

Copyright 2018 by Jonathan W. Valvano, [valvano@mail.utexas.edu](mailto:valvano@mail.utexas.edu). You may use, edit, run or distribute these files as long as the copyright notice remains. THIS SOFTWARE IS PROVIDED "AS IS". NO WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE APPLY TO THIS SOFTWARE. VALVANO SHALL NOT, IN ANY CIRCUMSTANCES, BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, FOR ANY REASON WHATSOEVER.

For more information about my classes, my research, and my books, see <http://users.ece.utexas.edu/~valvano/>

These components were developed for educational purposes. Feel free to use them for educational use, but cannot use them for commercial products without permission.








This is version 2.08, built September 3, 2018 and includes software for EE319K and Volume 1.

EE319K Fall 2018, Labs 5-10 and rest of HW will be delivered later.

Jonathan Valvano

# UT EE319K Software

- your Keil folder should look similar to this now
- Of course, the year(s) will change depending on when you take the course.

Sys (C:) > Keil_v5				
Name	Date modified	Type	Size	
 <a href="#">ARM</a>	<a href="#">8/24/2022 3:35 PM</a>	<a href="#">File folder</a>		
 <a href="#">EE319KwareSpring2021</a>	<a href="#">3/22/2021 10:18 PM</a>	<a href="#">File folder</a>		
 <a href="#">EE319KwareSpring2022</a>	<a href="#">8/24/2022 4:19 PM</a>	<a href="#">File folder</a>		
 <a href="#">license terms</a>	<a href="#">3/22/2021 10:01 PM</a>	<a href="#">File folder</a>		
 <a href="#">UV4</a>	<a href="#">8/24/2022 3:35 PM</a>	<a href="#">File folder</a>		
 <a href="#">TOOLS.INI</a>	<a href="#">8/24/2022 4:19 PM</a>	<a href="#">Configuration sett...</a>	<a href="#">6 KB</a>	
 <a href="#">Uninstall.exe</a>	<a href="#">4/10/2022 12:55 PM</a>	<a href="#">Application</a>	<a href="#">3,228 KB</a>	

## Step 4: Install the uVision Driver Patch





# Software Installation

- Even though you installed the drivers, uVision doesn't show them as an option until you **install a patch.**
- so do that...

<https://www.keil.com/support/docs/4196.htm>

**arm** Developer

Developing on Arm ▾ Architecture and Processors ▾ Tools and Software ▾

Version: 1.0 ▾ Subscribe Search within this document

[Back to search](#)

[All Keil MDK Documentation](#)

UVISION: Stellaris ICDI Debug Adapter Support

**Applies To:** Keil MDK  
**Confidentiality:** Customer Non-confidential

Information in this knowledgebase article applies to:

- MDK v5.29

**QUESTION**

I'm working on the device TI TM4C123GH6PM within MDK μVision. When I try starting the application, I get the following error message:

```
lmick-agdi.dll cannot be loaded
```

How can I resolve this issue?

**ANSWER**

In MDK v5.29 as well as newer versions of MDK the support for the Stellaris ICDI debug adapter is not included. There is an add-on Stellaris ICDI installer that supports MDK v5.29. Just download and install it.

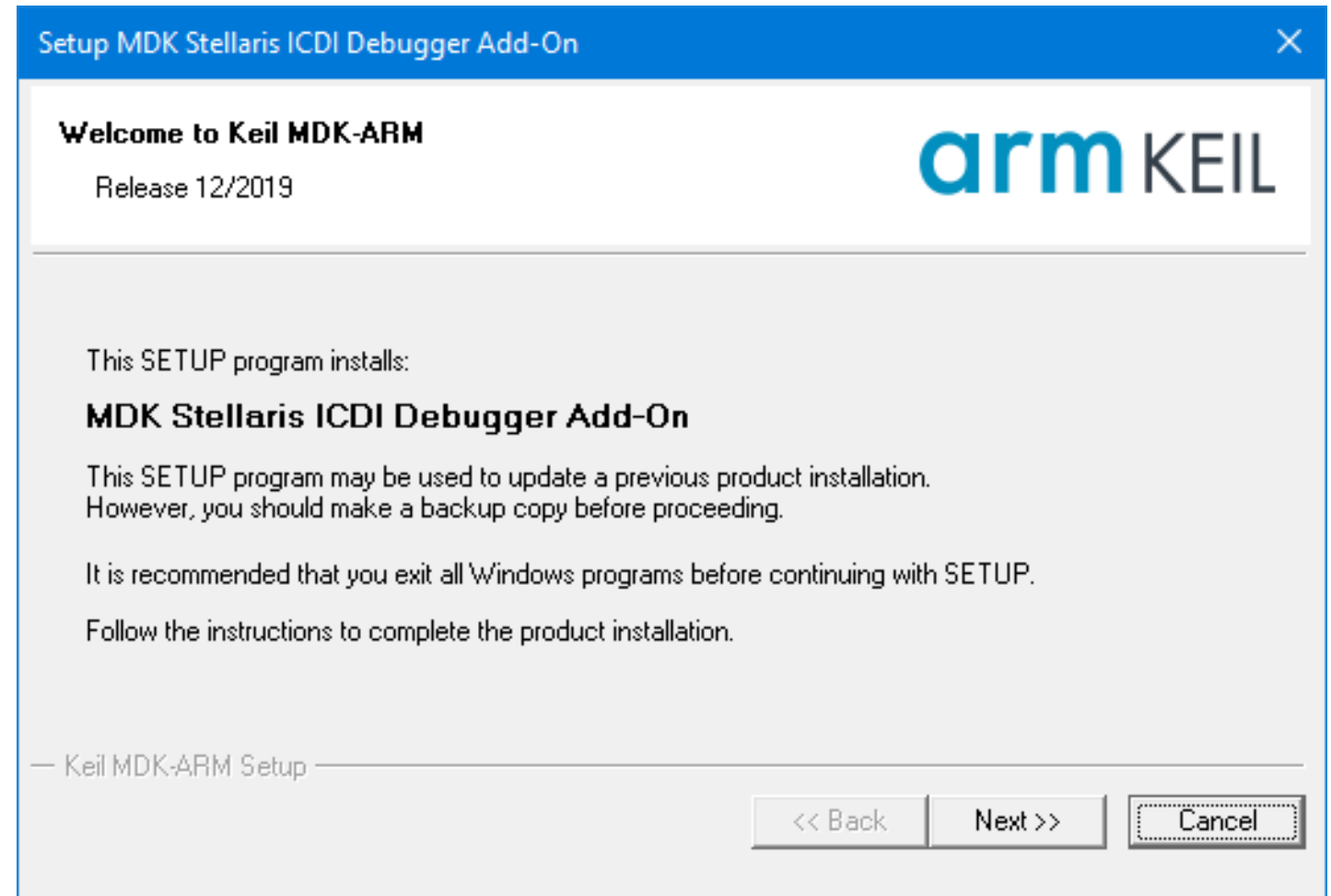
**Attachments**

- [MDK\\_Stellaris\\_ICDI\\_AddOn.exe](#)

# Software Installation

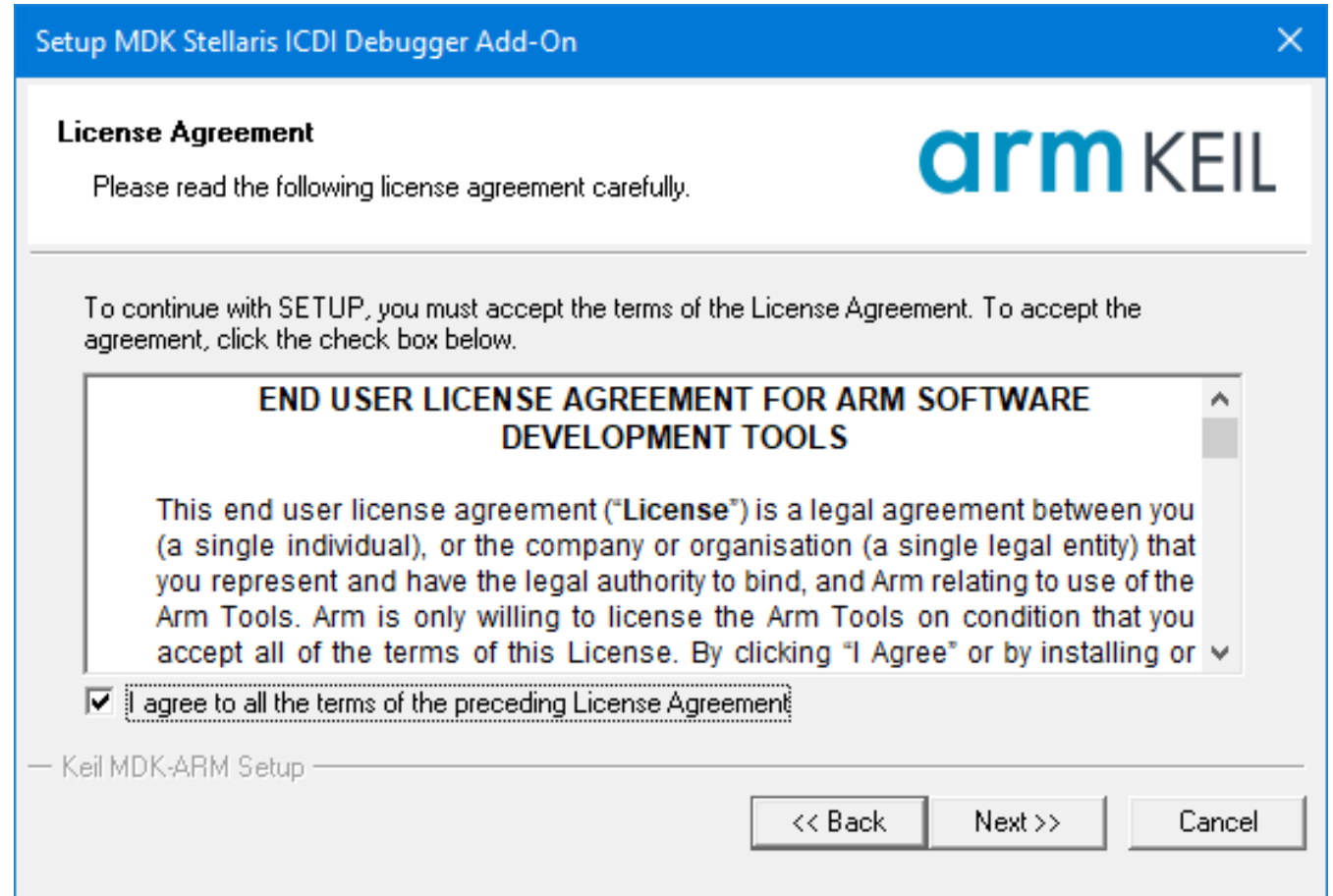
- click Next

<https://www.keil.com/support/docs/4196.htm>



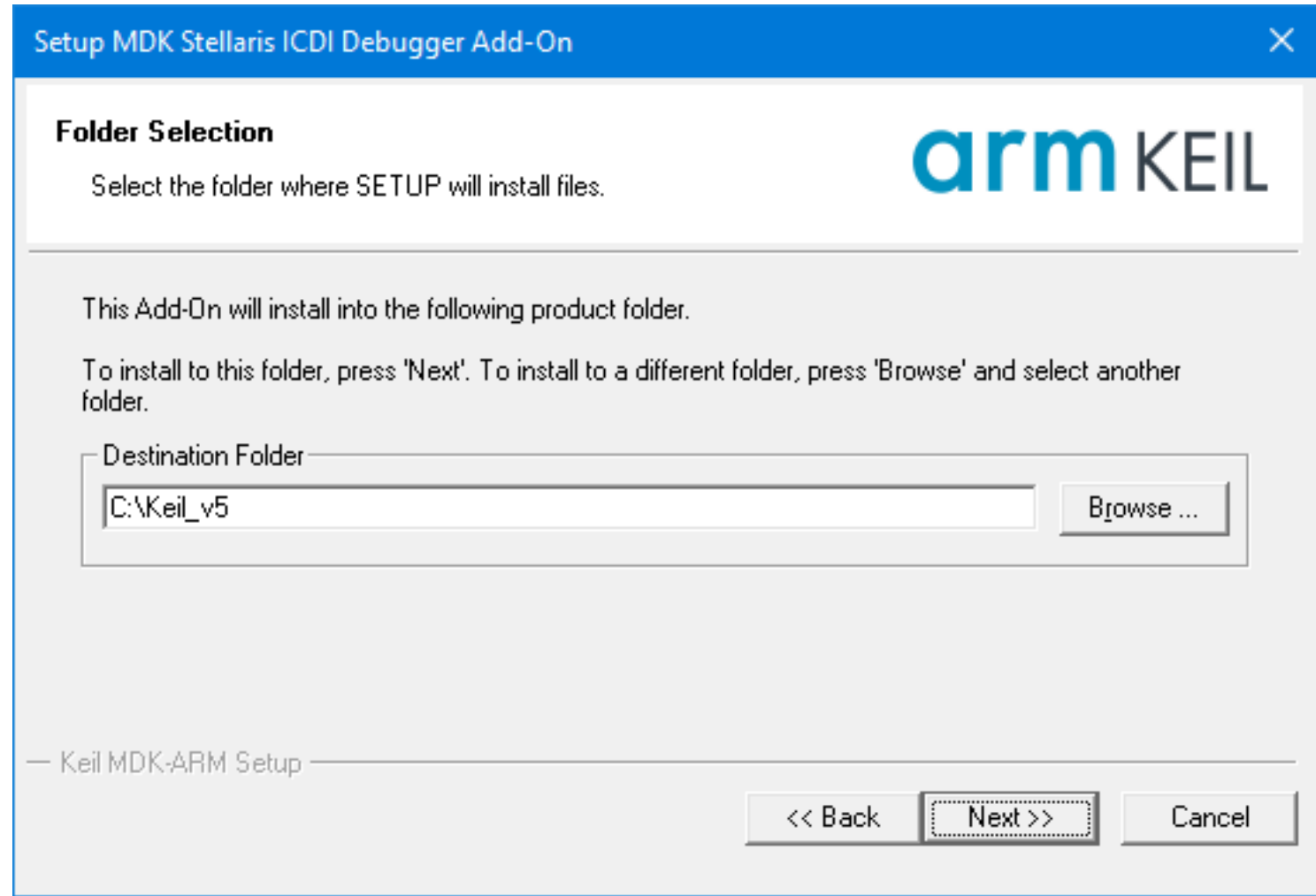
# Software Installation

- agree and click Next



## Software Installation

- agree and click Next



# Software Installation

- enter YOUR information

Setup MDK Stellaris ICDI Debugger Add-On

**Customer Information**

Please enter your information.

Please enter your name, the name of the company for whom you work and your E-mail address.

First Name:

Last Name:

Company Name:

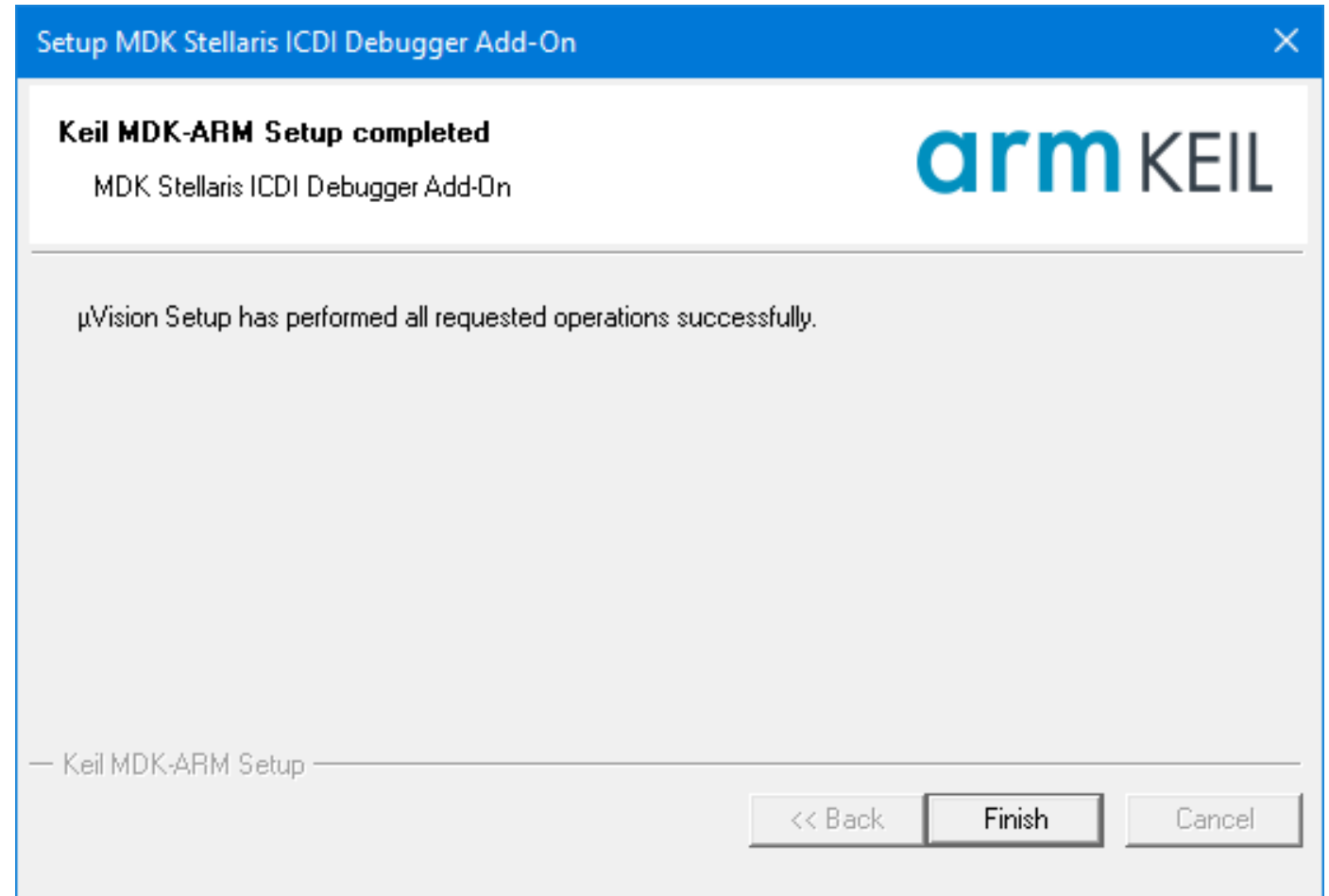
E-mail:

— Keil MDK-ARM Setup —


<< Back   Next >>   Cancel

# Software Installation

- click Finish













## Step 5: Test Your Software in Simulator



## Software Simulator Test

- open the **Lab0** project file in uVision
- the project file always ends in **.uvprojx**

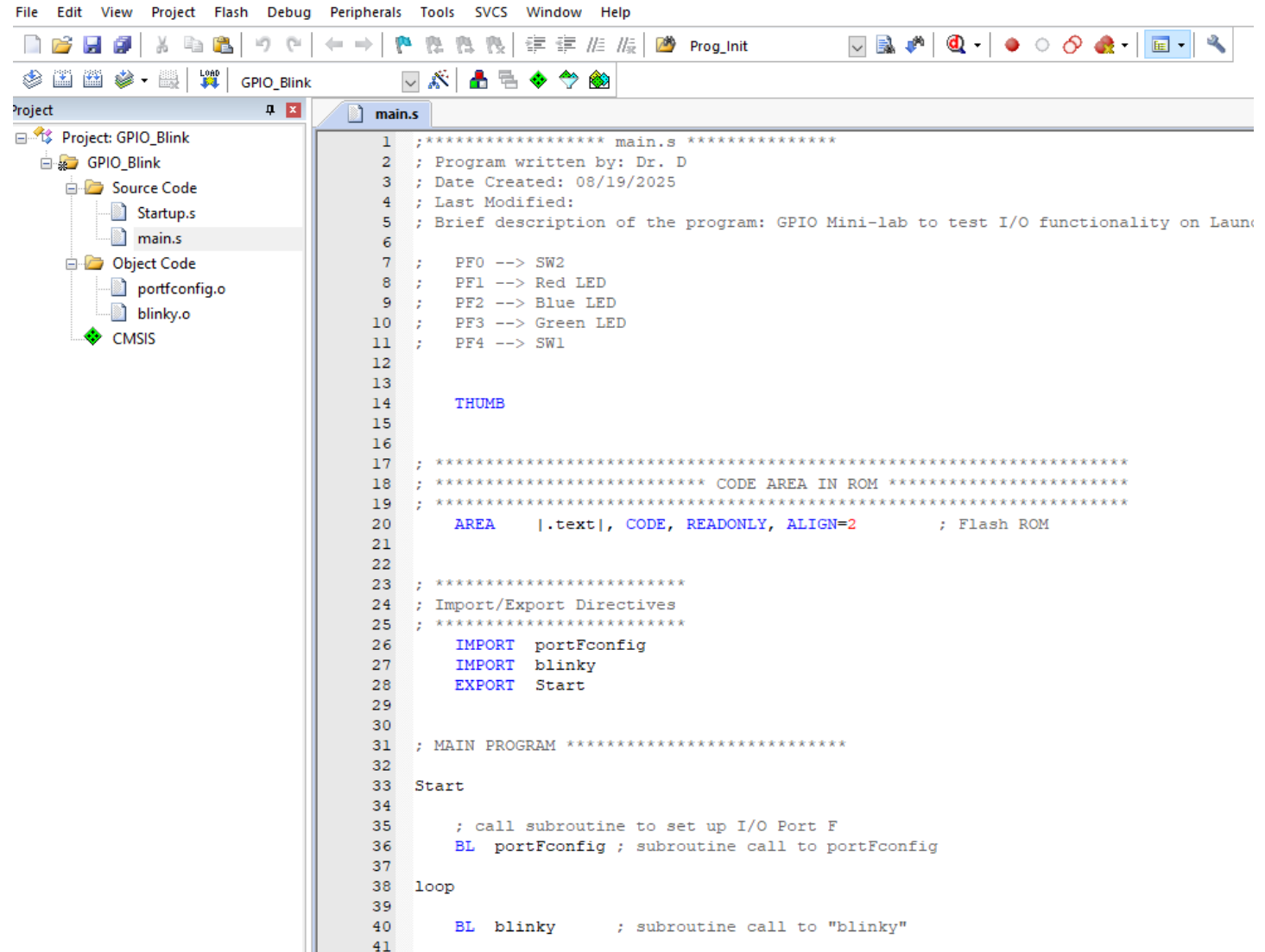
: > \_Teaching > ECE\_3436\_Microprocessor\_Systems >

Name	Status
 <u>blink.c</u>	
 <u>GPIO Blink.uvprojx</u>	
 <u>main.c</u>	
 <u>portconfig.c</u>	
 <u>Startup.c</u>	



# Software Simulator Test

- if the **main.s** file is not showing, double-click on the filename



```
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Prog_Init
GPIO_Blink
Project
Project: GPIO_Blink
  GPIO_Blink
    Source Code
      Startup.s
      main.s
    Object Code
      portconfig.o
      blinky.o
    CMSIS
main.s
1 ; ***** main.s *****
2 ; Program written by: Dr. D
3 ; Date Created: 08/19/2025
4 ; Last Modified:
5 ; Brief description of the program: GPIO Mini-lab to test I/O functionality on Laun
6
7 ; PF0 --> SW2
8 ; PF1 --> Red LED
9 ; PF2 --> Blue LED
10 ; PF3 --> Green LED
11 ; PF4 --> SW1
12
13
14 THUMB
15
16
17 ; *****
18 ; ***** CODE AREA IN ROM *****
19 ; *****
20 AREA |.text|, CODE, READONLY, ALIGN=2 ; Flash ROM
21
22
23 ; *****
24 ; Import/Export Directives
25 ; *****
26 IMPORT portFconfig
27 IMPORT blinky
28 EXPORT Start
29
30
31 ; MAIN PROGRAM *****
32
33 Start
34
35 ; call subroutine to set up I/O Port F
36 BL portFconfig ; subroutine call to portFconfig
37
38 loop
39
40 BL blinky ; subroutine call to "blinky"
41
```

# Software Simulator Test

- **rebuild** (assemble) the entire project by clicking on the icon with 2 down arrows

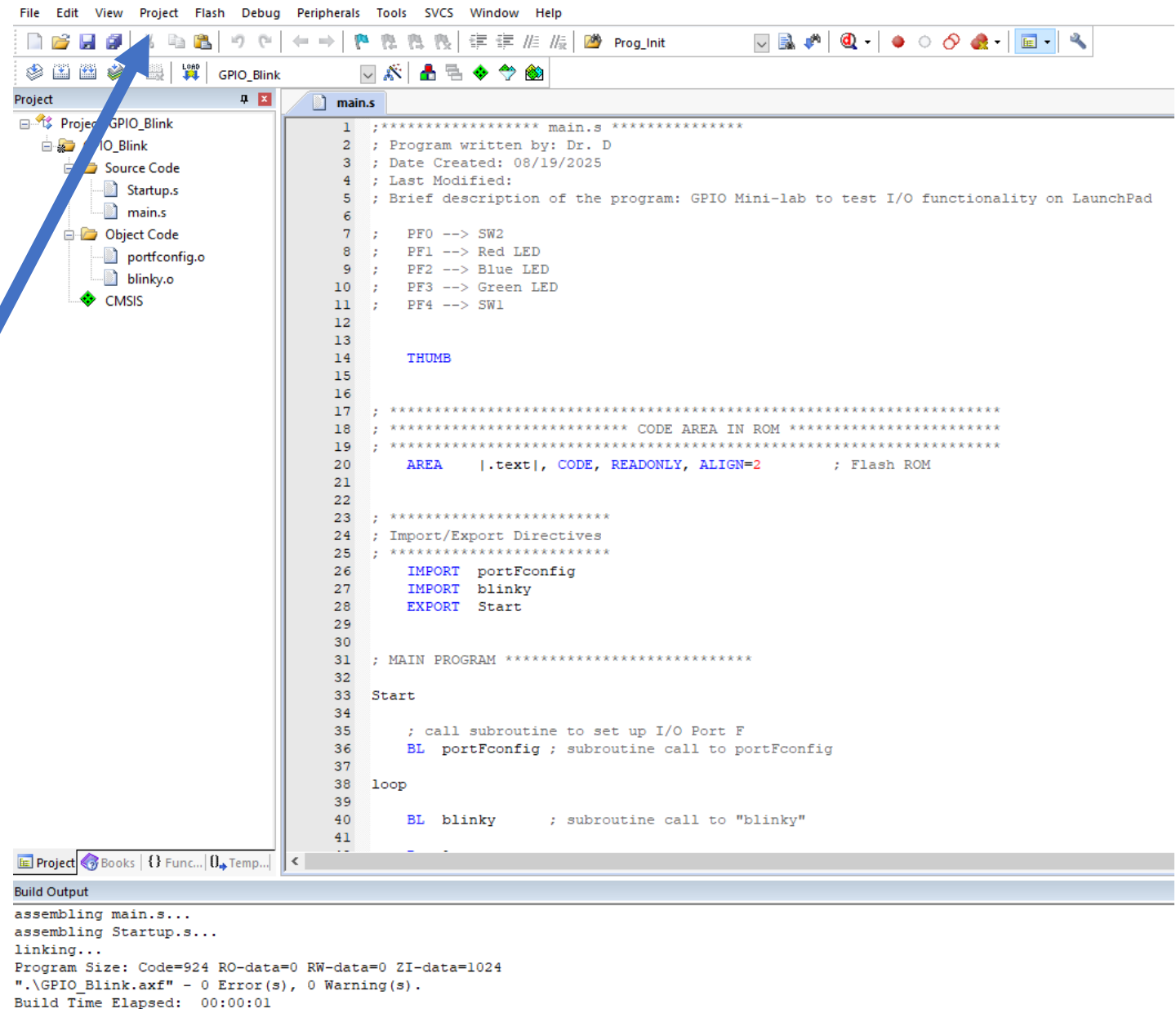


- you should see a Build Output message like that shown to the right

```
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
GPIO_Blink
Project: GPIO_Blink
  GPIO_Blink
    Source Code
      Startup.s
      main.s
    Object Code
      portfconfig.o
      blinky.o
      CMSIS
main.s
1 ;***** main.s *****
2 ; Program written by: Dr. D
3 ; Date Created: 08/19/2025
4 ; Last Modified:
5 ; Brief description of the program: GPIO Mini-lab to test I/O functionality on LaunchPad
6
7 ; PF0 --> SW2
8 ; PF1 --> Red LED
9 ; PF2 --> Blue LED
10 ; PF3 --> Green LED
11 ; PF4 --> SW1
12
13
14 THUMB
15
16
17 ; *****
18 ; ***** CODE AREA IN ROM *****
19 ; *****
20 AREA |.text|, CODE, READONLY, ALIGN=2 ; Flash ROM
21
22
23 ; *****
24 ; Import/Export Directives
25 ; *****
26 IMPORT portFconfig
27 IMPORT blinky
28 EXPORT Start
29
30
31 ; MAIN PROGRAM *****
32
33 Start
34
35 ; call subroutine to set up I/O Port F
36 BL portFconfig ; subroutine call to portFconfig
37
38 loop
39
40 BL blinky ; subroutine call to "blinky"
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204
2205
2206
2207
2208
2209
2210
2211
2212
2213
2214
2215
2216
2217
2218
2219
2220
2221
2222
2223
2224
2225
2226
2227
2228
2229
2230
2231
2232
2233
2234
2235
2236
2237
2238
2239
2240
2241
2242
2243
2244
2245
2246
2247
2248
2249
2250
2251
2252
2253
2254
2255
2256
2257
2258
2259
2260
2261
2262
2263
2264
2265
2266
2267
2268
2269
2270
2271
2272
2273
2274
2275
2276
2277
2278
2279
2280
2281
2282
2283
2284
2285
2286
2287
2288
2289
2290
2291
2292
2293
2294
2295
2296
2297
2298
2299
2300
2301
2302
2303
2304
2305
2306
2307
2308
2309
2310
2311
2312
2313
2314
2315
2316
2317
2318
2319
2320
2321
2322
2323
2324
2325
2326
2327
2328
2329
2330
2331
2332
2333
2334
2335
2336
2337
2338
2339
2340
2341
2342
2343
2344
2345
2346
2347
2348
2349
2350
2351
2352
2353
2354
2355
2356
2357
2358
2359
2360
2361
2362
2363
2364
2365
2366
2367
2368
2369
2370
2371
2372
2373
2374
2375
2376
2377
2378
2379
2380
2381
2382
2383
2384
2385
2386
2387
2388
2389
2390
2391
2392
2393
2394
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
2406
2407
2408
2409
2410
2411
2412
2413
2414
2415
2416
2417
2418
2419
2420
2421
2422
2423
2424
2425
2426
2427
2428
2429
2430
2431
2432
2433
2434
2435
2436
2437
2438
2439
2440
2441
2442
2443
2444
2445
2446
2447
2448
2449
2450
2451
2452
2453
2454
2455
2456
2457
2458
2459
2460
2461
2462
2463
2464
2465
2466
2467
2468
2469
2470
2471
2472
2473
2474
2475
2476
2477
2478
2479
2480
2481
2482
2483
2484
2485
2486
2487
2488
2489
2490
2491
2492
2493
2494
2495
2496
2497
2498
2499
2500
2501
2502
2503
2504
2505
2506
2507
2508
2509
2510
2511
2512
2513
2514
2515
2516
2517
2518
2519
2520
2521
2522
2523
2524
2525
2526
2527
2528
2529
2530
2531
2532
2533
2534
2535
2536
2537
2538
2539
2540
2541
2542
2543
2544
2545
2546
2547
2548
2549
2550
2551
2552
2553
2554
2555
2556
2557
2558
2559
2560
2561
2562
2563
2564
2565
2566
2567
2568
2569
2570
2571
257
```

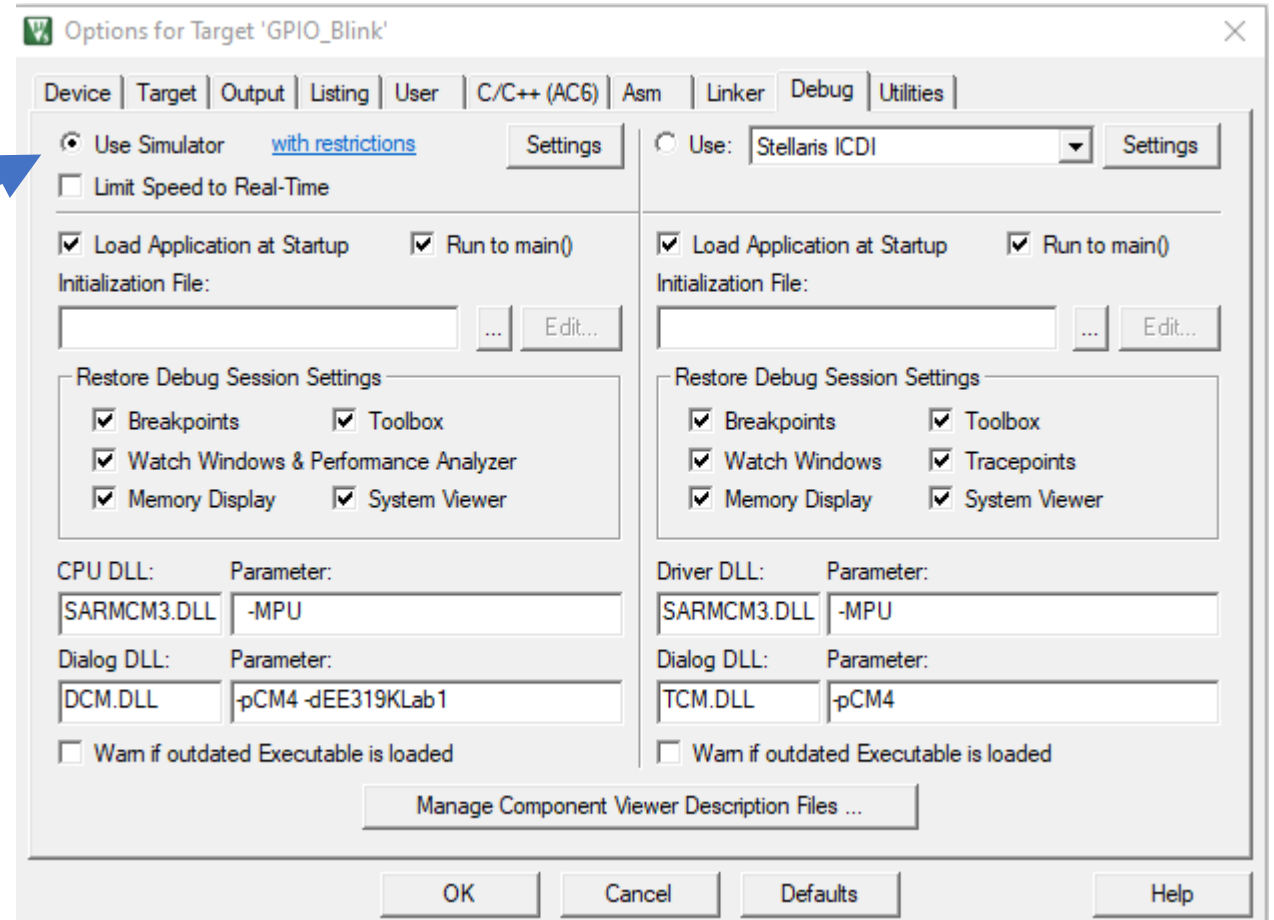
# Software Simulator Test

- make sure that you are in simulator mode
- goto the **Project** menu
- select **Options for Target 'GPIO\_Blink'**



# Software Simulator Test

- make sure that “Use Simulator” is selected in the Debug tab



# Software Simulator Demo

- begin a  
**debugging**  
session



- this starts  
the  
**simulator**

File Edit View Project Flash Debug Peripherals Tools SVCS Window Help

GPIO\_Blink

Project

- Project: GPIO\_Blink
  - GPIO\_Blink
    - Source Code
      - Startup.s
      - main.s
    - Object Code
      - portFconfig.o
      - blinky.o
    - CMSIS

main.s

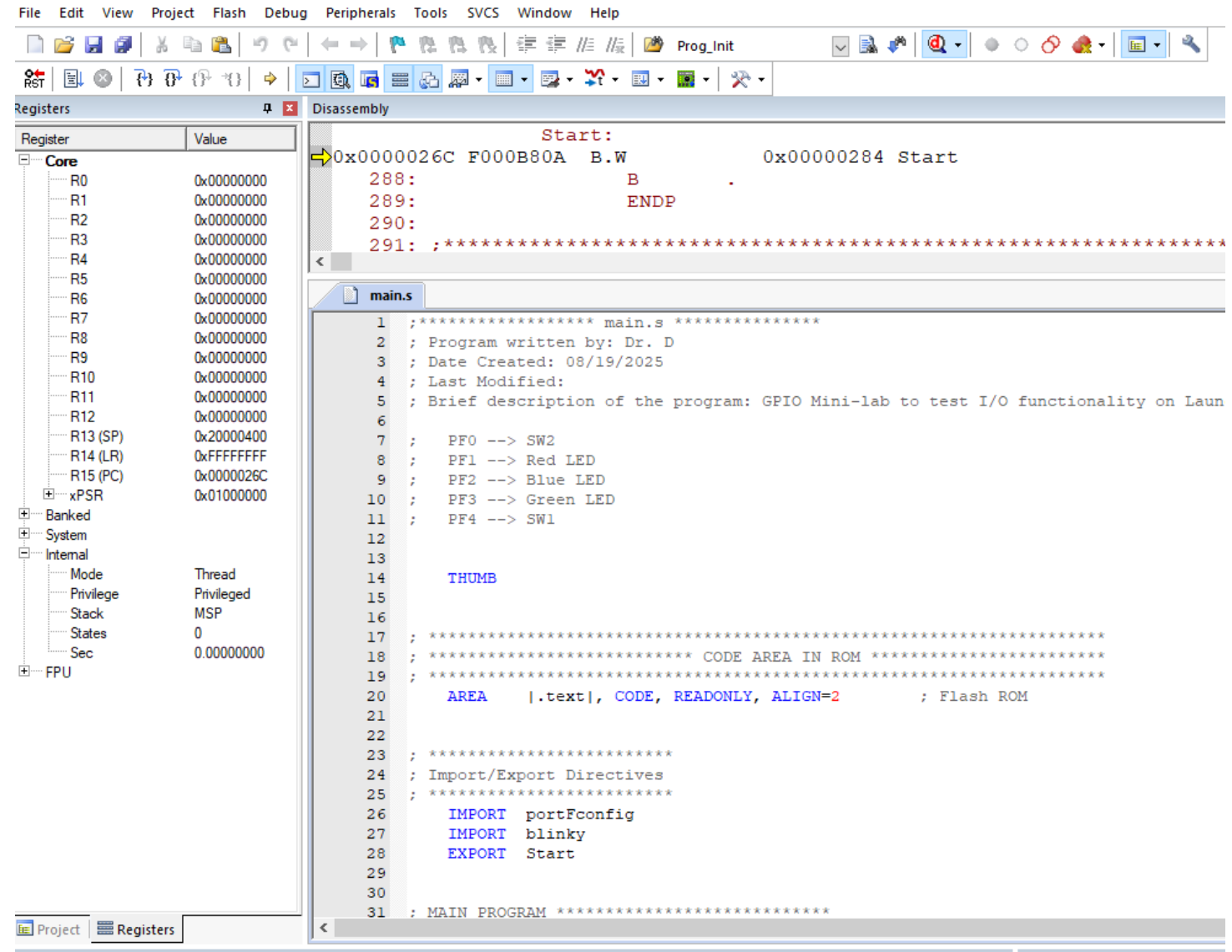
```
1 ;***** main.s *****
2 ; Program written by: Dave
3 ; Date Created: 08/17/2025
4 ; Last Modified:
5 ; Brief Description of the program: GPIO Mini-lab to test I/O functionality on LaunchPad
6
7 ; PF0 --> SW2
8 ; PF1 --> Red LED
9 ; PF2 --> Blue LED
10 ; PF3 --> Green LED
11 ; PF4 --> SW1
12
13
14 THUMB
15
16
17 ; *****
18 ; ***** CODE AREA IN ROM *****
19 ; *****
20 AREA |.text|, CODE, READONLY, ALIGN=2 ; Flash ROM
21
22
23 ; *****
24 ; Import/Export Directives
25 ; *****
26 IMPORT portFconfig
27 IMPORT blinky
28 EXPORT Start
29
30
31 ; MAIN PROGRAM *****
32
33 Start
34
35 ; call subroutine to set up I/O Port F
36 BL portFconfig ; subroutine call to portFconfig
37
38 loop
39
40 BL blinky ; subroutine call to "blinky"
41
42
```

Build Output

```
assembling main.s...
assembling Startup.s...
linking...
Program Size: Code=924 RO-data=0 RW-data=0 ZI-data=1024
".\GPIO_Blink.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:01
```

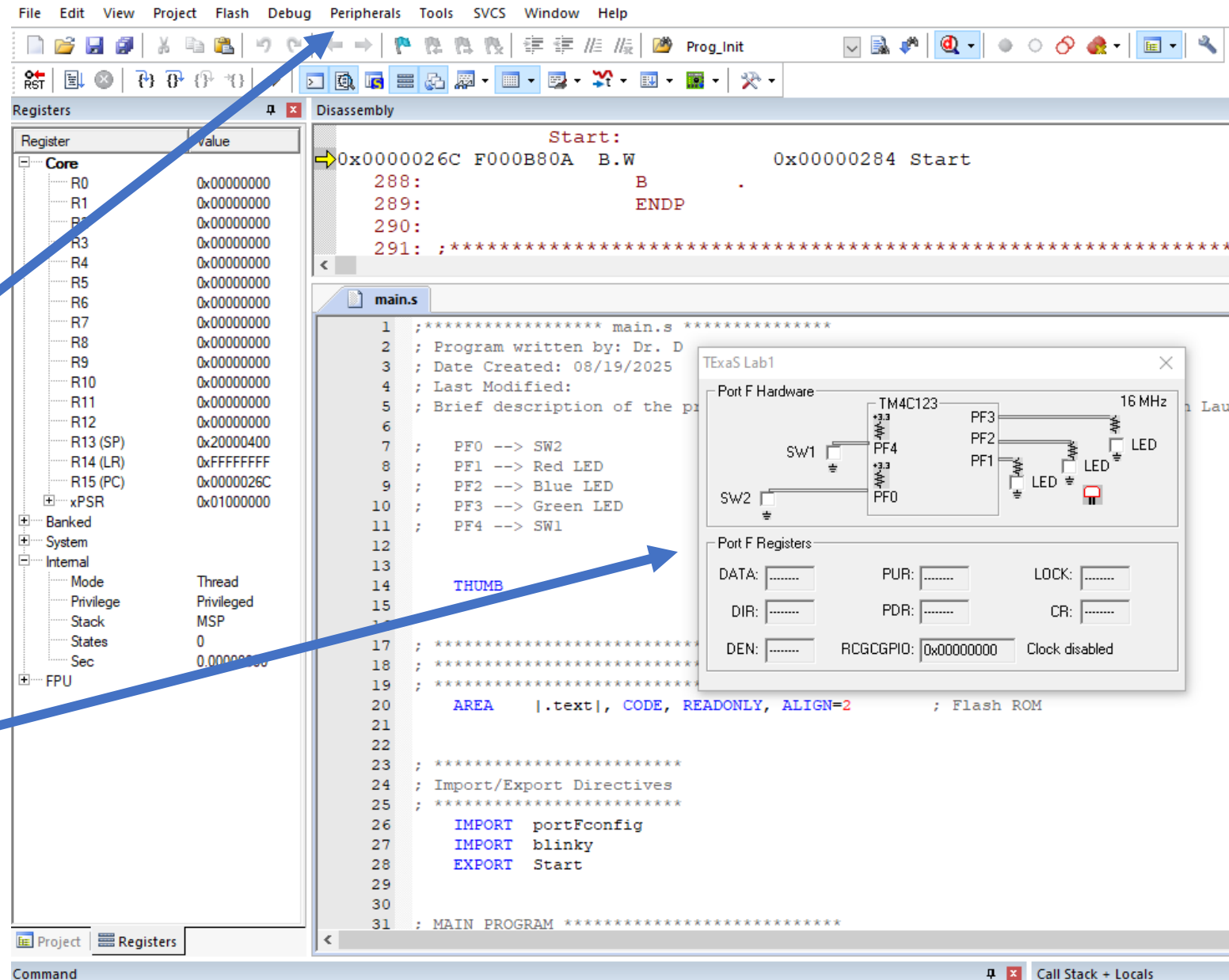
# Software Simulator Demo

- now you  
are in  
simulation  
mode



# Software Simulator Demo

- goto Peripherals menu and select "TEaS Port F"
- this opens the graphical simulator for Port F
  - this is what the UT software was for



# Software Simulator Demo

- verify that you have selected “**Periodic Window Update**” in the View menu
- you won't see anything happening if you don't

The screenshot displays a software simulator interface with the following components:

- Registers Window:** A table showing the state of various registers. The 'Core' registers (R0-R15) are all set to 0x00000000, except for R15 (PC) which is 0x0000026C. Other registers like xPSR, Banked, System, Internal, Mode, Privilege, Stack, States, Sec, and FPU are also listed.
- Disassembly Window:** Shows the assembly code being executed. The current instruction is at address 0x0000026C, which is a B.W (Branch with Link) instruction. The disassembly shows a jump to 0x00000284.
- Source Code Window (main.s):** Displays the C source code for the program. It includes comments about the program's author (Dr. D), date (08/19/2025), and a brief description. The code defines pin mappings for Port F (PF0-PF4) to SW2, Red LED, Blue LED, Green LED, and SW1. It also includes a section for the Flash ROM.
- Port F Hardware Window:** A schematic diagram showing the internal structure of Port F. It includes a 16 MHz clock source, a 4k pull-up resistor, and a 4k pull-down resistor. The pins are connected to SW1, SW2, and four LEDs (Red, Blue, Green, and a fourth unlabeled LED).
- Port F Registers Window:** A table showing the current values of the Port F registers. The DATA register is 0x00000000, and the RCGCGPIO register is 0x00000000. The LOCK and CR registers are also shown.

A blue arrow points from the 'View' menu in the top toolbar to the 'Periodic Window Update' option in the View menu.



# Software Simulator Demo

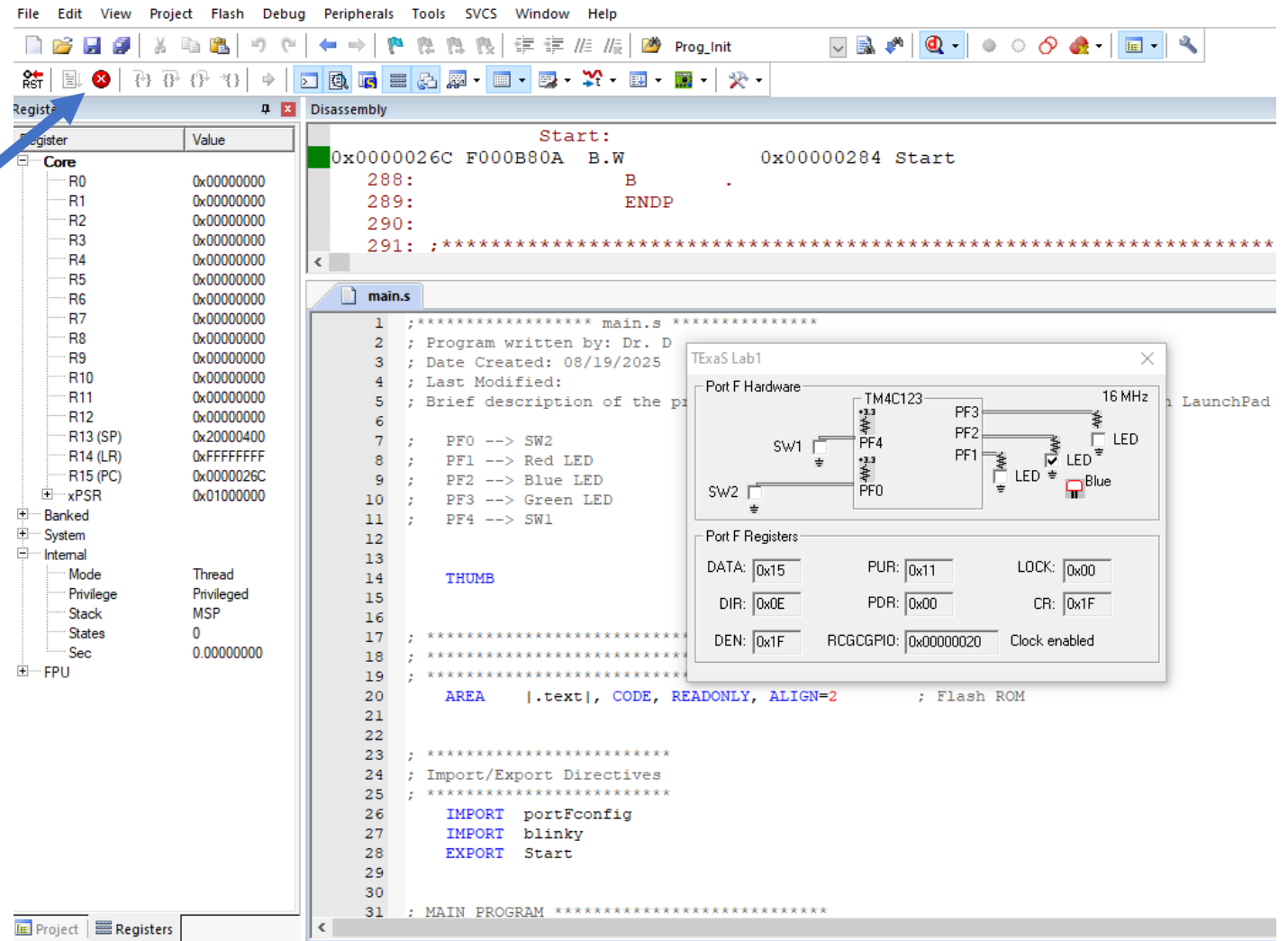
- click the **run** icon or use the **F5** key
- you should see each of the LEDs (red, blue, green) cycle and repeat

The screenshot displays the Texas Instruments Code Composer Studio (CCS) software simulator interface. The interface is divided into several panes:

- Registers:** A table showing the state of the processor registers. The registers are listed on the left, and their values are shown on the right. The registers include R0 through R15, xPSR, Banked, System, Internal, and FPU.
- Disassembly:** A window showing the assembly code being executed. The code starts with 'Start: 0x0000026C F000B80A B.W 0x00000284 Start'. The disassembly shows the instructions being executed, including '288: B', '289: ENDP', '290:', and '291: ;\*\*\*\*\*'.
- main.s:** A window showing the source code for the program. The code includes comments and directives, such as '\*\*\*\*\* main.s \*\*\*\*\*', 'Program written by: Dr. D', 'Date Created: 08/19/2025', 'Last Modified:', 'Brief description of the program:', 'PF0 --> SW2', 'PF1 --> Red LED', 'PF2 --> Blue LED', 'PF3 --> Green LED', 'PF4 --> SW1', 'THUMB', 'AREA |.text|, CODE, READONLY, ALIGN=2 ; Flash ROM', 'Import/Export Directives', 'IMPORT portFconfig', 'IMPORT blinky', 'EXPORT Start', and 'MAIN PROGRAM \*\*\*\*\*'.
- Port F Hardware:** A window showing a schematic diagram of the port hardware. The diagram includes a TM4C123 microcontroller, a 16 MHz clock, and three LEDs (Red, Blue, Green) connected to the port. The 'Port F Registers' section shows the current values of the registers: DATA: 0x15, PUR: 0x11, LOCK: 0x00, DIR: 0x0E, PDR: 0x00, CR: 0x1F, DEN: 0x1F, RCGCGPIO: 0x00000020, and Clock enabled.

# Software Simulator Demo

- hit **stop** icon and then the debug icon again to get out of simulation mode



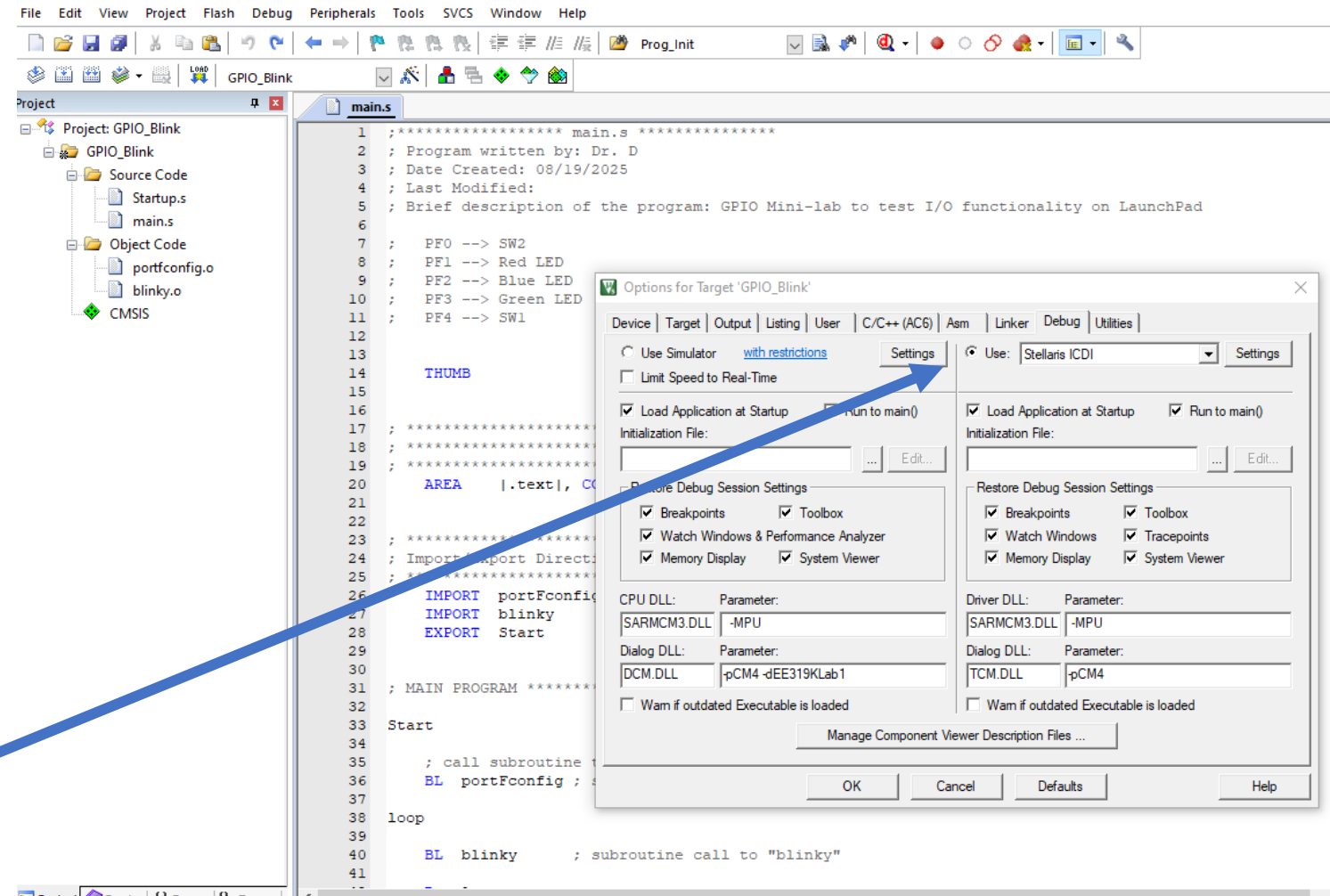
## Step 6: Test Your Hardware



# Hardware Demo

- to test your hardware, switch from simulation mode to the hardware mode
- first, bring up the “Options for Target” dialog box from the Project menu
- then select “Use Stellaris ICDI”

You cannot do this step until you have properly installed the Stellaris drivers! (and the patch)

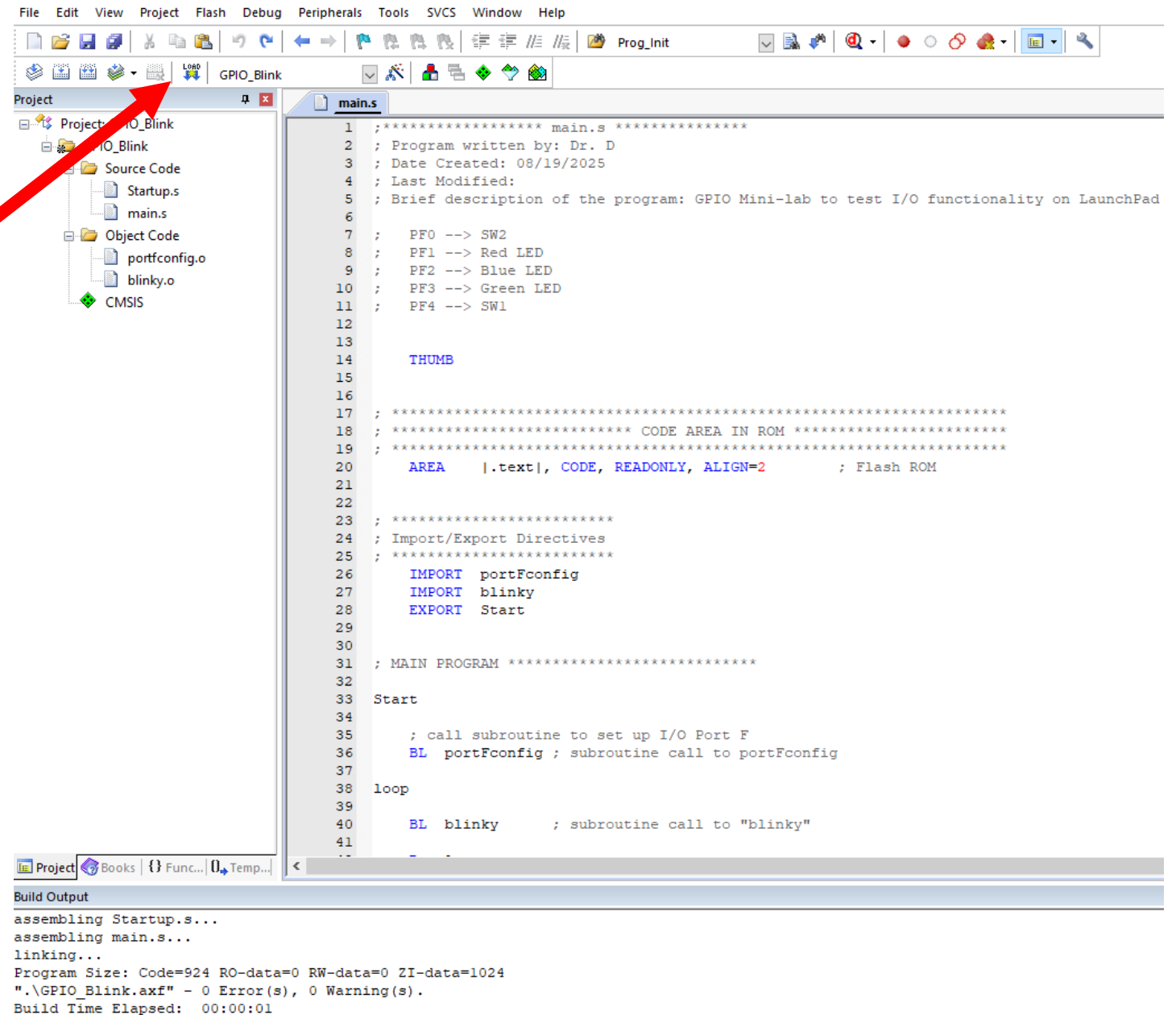


# Hardware Demo

- **LOAD** your ASSEMBLED program to LaunchPad



- of course, your LaunchPad must be plugged in and powered on



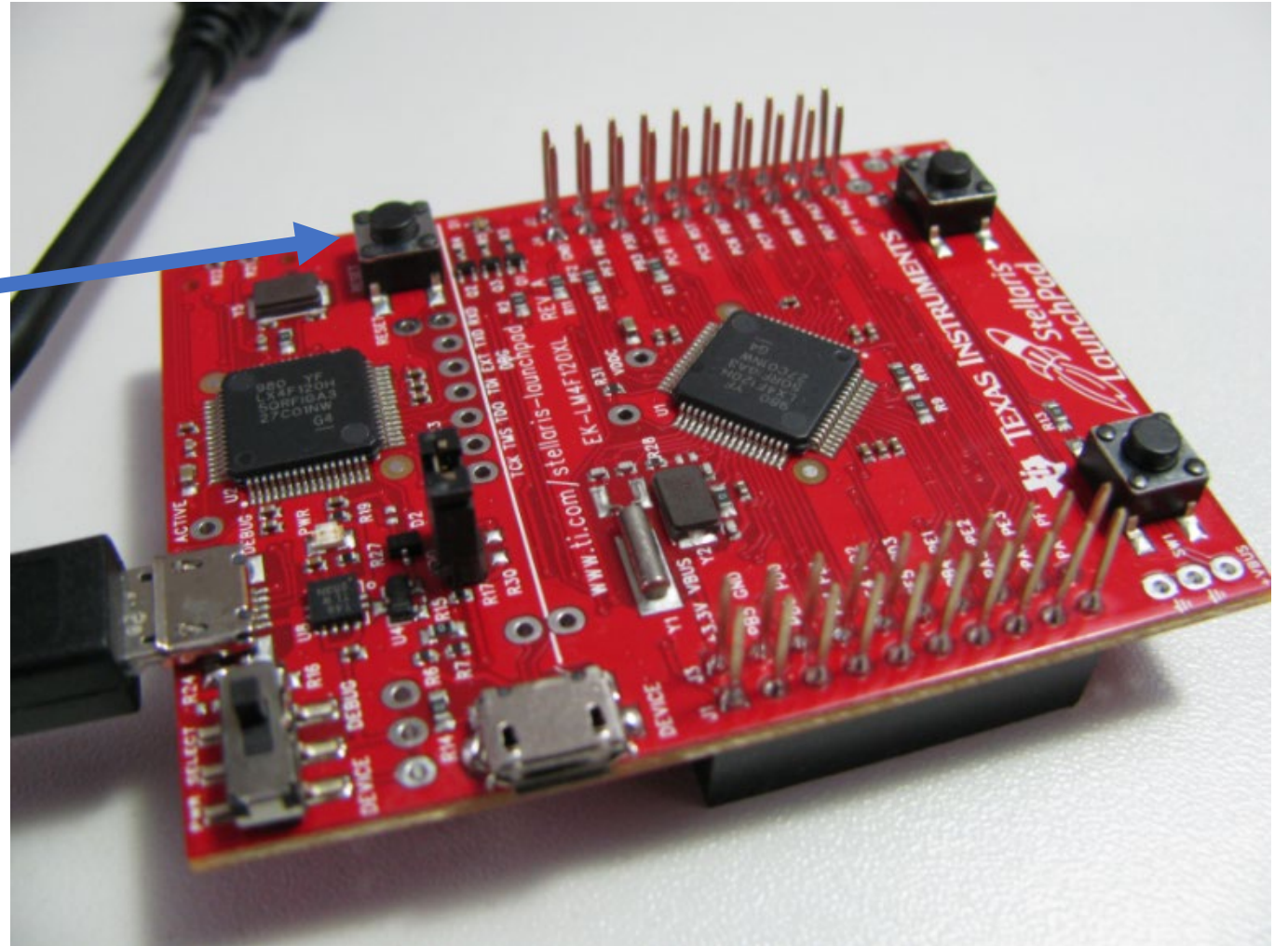
## Hardware Demo

- You should see a message telling you that your program was successfully downloaded to the LaunchPad.

```
Connecting: Mode=JTAG, Speed=1000000Hz  
Erase Done.  
Programming Done.  
Verify OK.  
Flash Load finished at 17:23:37
```

## Hardware Demo

- hit the **reset** button on the LaunchPad
- Now sit back and enjoy!



# Keil uVision Resources





# Keil User's Guide

- <https://developer.arm.com/documentation/101407/latest/>

The screenshot displays the ARM Developer website interface. At the top, the 'arm Developer' logo is visible. Navigation links include 'Developing on Arm', 'Architecture and Processors', and 'Tools and Software'. A breadcrumb trail shows 'Home / Documentation / Tools and Software / Keil Products / Keil MDK'. The main heading is 'µVision User's Guide'. Below this, there's a version selector set to 'v5.37', a 'Subscribe' button, and a search bar. A 'DOCUMENT TABLE OF CONTENTS' sidebar on the left lists sections like 'Back to search', 'All Keil MDK Documentation', 'µVision User's Guide', 'About uVision', 'User Interface', 'Creating Applications', 'Debugging', 'Debug Commands', 'Debug Functions', 'Simulation', and 'Flash Programming'. The main content area on the right features the title 'µVision User's Guide Version 5.37' and a section 'About this book' which states: 'This User's Guide describes the µVision® IDE & Debugger'. It includes a bulleted list: 'About µVision' (describes main features), 'User Interface' (describes the IDE interface), 'Creating Applications' (describes the creation of applications and code), and 'Debugging' (describes the µVision debugger and advanced debugging techniques).

arm Developer

Developing on Arm ▾ Architecture and Processors ▾ Tools and Software ▾

Home / Documentation / Tools and Software / Keil Products / Keil MDK

## µVision User's Guide

Version: v5.37 ▾ Subscribe Search within this document

### DOCUMENT TABLE OF CONTENTS

- < Back to search
- < All Keil MDK Documentation
- µVision User's Guide
  - > About uVision
  - > User Interface
  - > Creating Applications
  - > Debugging
  - > Debug Commands
  - > Debug Functions
  - > Simulation
  - > Flash Programming

## µVision User's Guide

### Version 5.37

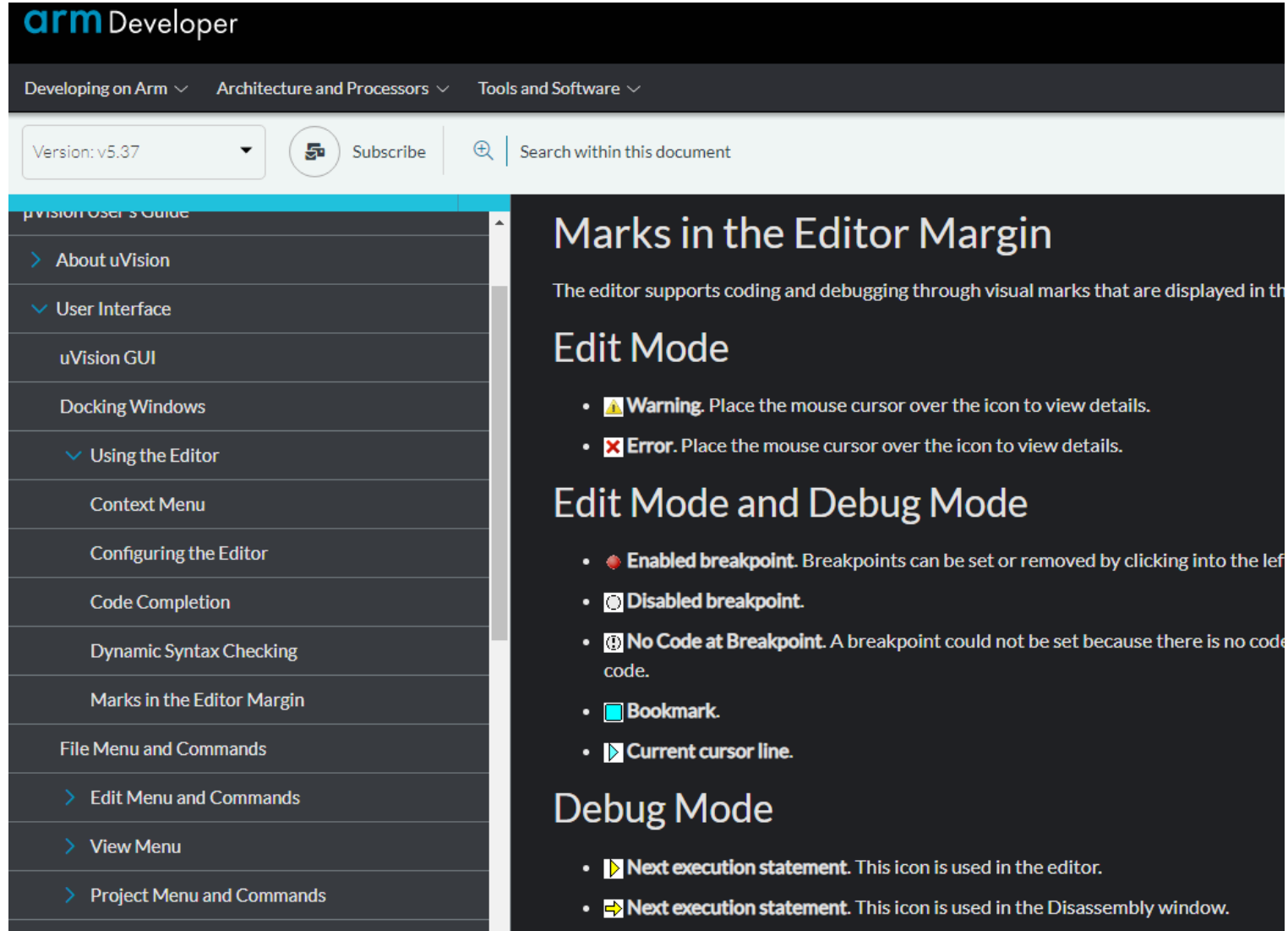
### About this book

This User's Guide describes the µVision® IDE & Debugger.

- **About µVision** describes main features, the folder structure, and the project files.
- **User Interface** describes the IDE interface with its components and settings.
- **Creating Applications** describes the creation of applications and code. This chapter includes a section with advanced techniques for creating code.
- **Debugging** describes the µVision debugger, the advanced debugging techniques for accessing the target hardware, and the use of the debugger.

# Keil Editor Marks



- <https://developer.arm.com/documentation/101407/0537/Using-the-Editor/Marks-in-the-Editor-Margin>



The screenshot shows the ARM Developer website interface. The top navigation bar includes 'arm Developer', 'Developing on Arm', 'Architecture and Processors', and 'Tools and Software'. Below this is a search bar and a 'Subscribe' button. The left sidebar contains a table of contents with 'Marks in the Editor Margin' highlighted. The main content area is titled 'Marks in the Editor Margin' and explains that the editor supports coding and debugging through visual marks. It is divided into 'Edit Mode' and 'Debug Mode' sections, each with a list of icons and their functions.

**arm Developer**



Developing on Arm ▾ Architecture and Processors ▾ Tools and Software ▾

Version: v5.37 ▾  Subscribe  Search within this document






**Marks in the Editor Margin**

The editor supports coding and debugging through visual marks that are displayed in the editor margin.



### Edit Mode

-  **Warning.** Place the mouse cursor over the icon to view details.
-  **Error.** Place the mouse cursor over the icon to view details.

### Edit Mode and Debug Mode

-  **Enabled breakpoint.** Breakpoints can be set or removed by clicking into the left margin.
-  **Disabled breakpoint.**
-  **No Code at Breakpoint.** A breakpoint could not be set because there is no code at this location.
-  **Bookmark.**
-  **Current cursor line.**

### Debug Mode

-  **Next execution statement.** This icon is used in the editor.
-  **Next execution statement.** This icon is used in the Disassembly window.