# solidThinking Embed Installation Instructions for Texas Instruments Microcontrollers

Ric Kolk Altair Engineering rkolk@altair.com





#### **Overview:**

solidThinking Embed (sTE), formerly known as VisSim Embedded, is a block diagram application for model based development of embedded systems.

The sTE CodeGen feature allows you to easily generate efficient fixed and floating point C code for any block diagram and execute it on a microcontroller.

These Installation Instructions explain how to install and configure sTE to work with three Texas Instrument microcontroller families;

- C2000
- MSP430
- TM4C12x ARM Cortex-M4F

The generated C code may be executed either from RAM or FLASH, both configurations are explained.





#### **Installation Requirements:**

Before proceeding with the installation please confirm the following:

- 1. You have Internet connectivity.
- 2. Your PC operating system is WIN XP or newer.
- 3. You have at least 1.5GB free disk space.
- 4. Any existing copies of the Texas Instruments Code Composer Studio (CCS) are removed from your PC.
- 5. A Texas Instrument F28069M LaunchPad experimenter board connected via supplied USB to your PC if you want to test your installations.



Installation of the sTE software for Texas Instruments microcontrollers is a three step process that MUST be executed in the following order. NOTE: Step 3 is not required unless you want to execute programs from FLASH.

Step 1: Install Texas Instruments Code Composer Studio (CCS) Includes the Texas Instruments compiler to translate C Code produced by sTE CodeGen to machine code that will execute on Texas Instruments Microcontrollers.

Step 2: Install sTE

Step 3: Install Texas Instruments UniFlash

A standalone application used to program on-chip flash memory on Texas Instruments Microcontrollers



#### **Step 1: CCS Installation (1/11):**

1a. Navigate to the following link:

http://processors.wiki.ti.com/index.php/Download\_CCS#Code\_Composer\_Studio\_Version\_7\_Downloads

1b. Under Release 7.1.0, select the most recent "Build #", then select "Windows" from the "Off-line Installers".

#### Code Composer Studio Version 7 Downloads

There are two types of installers:

- . Web installers allow you to download only the software components that you require.
- Off-line installers will download a large compressed file (about 800MB) so you may then uncompress it then select what you require to install.

Release	Build #	Date	Download	Notes
7.1.0	7.1.0.00016	Mar 17, 2017	Web Installers: Windows & Linux & MacOS & Off-line Installers: Windows >>MD5 & Linux & MD5 & MacOS & MD5 & Manifest &	<ul> <li>New/Notable In This Release (7.1.0.00016):</li> <li>Release notes i?</li> <li>Additional bugfixes for SDK discovery</li> <li>Certain files and directories in c:\ti or \$HOME/ti/ caused the SDK discovery process to terminate. As a consequence CCS would not be aware of the SDKs and the user would get errors during example program imports.</li> <li>Resource Explorer enhancements</li> <li>5X performance improvement when navigating Resource Explorer tree or filter content for specific board/device</li> <li>Enhanced Resource Explorer to clearly identify when newer version of packages are available in the cloud</li> <li>Resolve issue where multiple Software folders are sometime shown in Resource Explorer</li> <li>Resolved issue with Resource Explorer offline/download SimpleLink Academy first when requesting to offline/download SimpleLink SDK</li> <li>NewNotable in CCS 7.1.0:</li> <li>SimpleLink MCU SDK support usability enhancements</li> <li>EnergyTrace HDR for CC13/CC26xx devices.</li> <li>ROV2 – Next Gen Real Time Object Viewer for visibility into SimpleLink SDK stacks</li> </ul>





#### Step 1: CCS Installation (2/11):

After the download completes navigate into the "CCS7.1.0.00016\_win32" folder;

CCS7.1.0	.00016_win32.zip 🕨		👻 🍫 Search	CCS7.1.0.00016_wi 🔎
Organize 🔻 Extract all files				:= • 🔟 🔞
★ Favorites	Name	Туре	Compressed size	Password Size
Desktop	\mu CCS7.1.0.00016_win32	File folder		
Downloads				
Magic Briercase     E				
🚡 Google Drive				
ᇘ Libraries				
Documents				
J Music				
Videos				
	•			Þ
1 item				





#### Step 1: CCS Installation (3/11):

#### Unzip the installation files by clicking "ccs\_setup\_7.1.0.00016.exe"

Ric > Downloads > CC57.1.0.0	0016 win32.zip ► CCS7.1.0.00016 w	in32 🕨	▼ ↓	CS7.1.0.00016 y	x vi Q
Organize   Extract all files				₩ .	0
☆ Favorites	Name	Туре	Compressed size	Password	Size
Nesktop	🌗 baserepo	File folder			
Downloads	퉬 binary	File folder			
🐌 Magic Briefcase 🗏	퉬 featurerepo	File folder			
🗐 Recent Places	퉬 features	File folder			
🕌 Google Drive	👜 artifacts.jar	Executable Jar File	1 KB	No	
	💷 ccs_setup_7.1.0.00016.exe	Application	14,548 KB	No	
🥽 Libraries	📧 content.jar	Executable Jar File	3 KB	No	
Documents	README_FIRST.txt	Text Document	1 KB	No	
🎝 Music	📄 timestamp.txt	Text Document	1 KB	No	
Pictures					
📑 Videos	4				
9 items					





## **Step 1: CCS Installation (4/11):**

#### Select "Extract all"

					×
C V V Ric V Downloads V	CCS7.1.0.00016_win32.zip  CCS7.1.0.00016_	_win32 🕨	✓ <sup>4</sup> → Search C	CS7.1.0.00016_wi	9
Organize 🔻 Extract all files				≣ - □ (	2
☆ Favorites ■ Desktop 0 Jownloads	Compressed (zipped) Folders	Type	Compressed size	Password Siz	je
<ul> <li>Magic Briefcase</li> <li>Recent Places</li> <li>Google Drive</li> <li>Libraries</li> <li>Documents</li> <li>Music</li> <li>Pictures</li> <li>Videos</li> </ul>	This application may depend of files in this folder. For the application to run prop- that you first extract all files. Extract all Run	en other compressed enty, it is recommended	1 KB 14,548 KB 3 KB 1 KB 1 KB	No No No No	4
9 items					





#### Step 1: CCS Installation (5/11):

Extraction folder (default is recommended):

O ⊂ ↓ Ric ► Dow	nloads + CCS7.1.0.00016_win32.zip + CCS7.1.0.00016_win32 +	🔻 🍫 Search	CCS7.1.0.00016_wi 🔎
Organize 🔻 Extract all fil	ar	X	:=
Favorites	🕞 🊺 Extract Compressed (Zipped) Folders	ssed size	Password Size
Magic Briefcase	Select a Destination and Extract Files Files will be extracted to this folder: Colliger 2020 Deweland CCS21.0.00016.wijn22 Provide		
Libraries	Show extracted files when complete	14,548 Ki 3 Ki	3 No 3 No 3 No
<ul> <li>Documents</li> <li>Music</li> <li>Pictures</li> <li>Videos</li> </ul>		1 KI 1 KI	3 No 3 No
9 items			Þ
	Extract Ca	ancel	





#### Step 1: CCS Installation (6/11):

Navigate to and execute "ccs\_setup\_7.1.0.00016.exe" to begin the installation, agree to the license:







#### Step 1: CCS Installation (7/11):

Select the installation folder (default is recommended):







#### Step 1: CCS Installation (8/11):

Select the Product Families (sTE supports the three product families checked):







#### Step 1: CCS Installation (9/11):

Select the Debug Probes (default probes are shown in grey, select additional probes if they are being used):







## Step 1: CCS Installation (10/11):

#### Installing Files:







## **Step 1: CCS Installation (11/11):**

CCS Installation is completed successfully!







#### **Step 2: solidThinking Embed Installation (1/14):**

2a. Navigate to the following link:

http://www.solidthinking.com/embed\_land.html

- 2b. Click on "Request a Trial", fill out the request form and submit it, and a link to your trial license will be emailed to you.
- 2c. Once you receive the email, click the link to get your trial license file and then click on the Embed Installer Package link.





### **Step 2: solidThinking Embed Installation (2/14):**

Any existing versions of sTE must be closed;





#### **Step 2: solidThinking Embed Installation (3/14):**

We have already installed CCS which contains the C compiler for MSP430 and C2000;





#### **Step 2: solidThinking Embed Installation (4/14):**

Select the Embedded Targets you intend to use (check additional selections if needed):







### **Step 2: solidThinking Embed Installation (5/14):**

Select the communication modules you expect to use:





### **Step 2: solidThinking Embed Installation (6/14):**

Select the installation folder location:







## Step 2: solidThinking Embed Installation (7/14):

Accept the license agreement:





### **Step 2: solidThinking Embed Installation (8/14):**

Backup previous installation files is optional:





### **Step 2: solidThinking Embed Installation (9/14):**

Select Start Menu Name (default is recommended):





## **Step 2: solidThinking Embed Installation (10/14):**

Click "Next" to begin the installation:







#### **Step 2: solidThinking Embed Installation (11/14):**

If Microsoft Visual C++ is installed, the DLL Block Wizard will be installed:





### **Step 2: solidThinking Embed Installation (12/14):**

Installing sTE files;







## **Step 2: solidThinking Embed Installation (13/14):**

A desktop icon is recommended:







## **Step 2: solidThinking Embed Installation (14/14):**

sTE installation is completed successfully!







#### Test the sTE + CCS Installation (1/4):

The following procedure may be used to check that CCS operates correctly with solidThinking Embed.

- 1. Connect the Texas Instruments F28069M Launchpad to your computer using the USB cord (supplied)
- 2. Launch solidThinking Embed
- 3. Under "Embedded/Examples/Piccolo/Blink"; Open the file "blinkLaunchPad-28069"

🤪 solidThinking Embed 2017.1 Build 8 - (Diagram2)							
🤯 File Edit View System Analyze Blocks State Charts Motion Diagrams 🗄	mbedded Tools Window Help						
	CortexM3	- +					
	Delfino	⇒±					
	Examples	•	Concerto	+			
	F280x	+	cortexM3	+			
	F281X	•	Delfino	•			
	Generic MCU	•	Digital Motor Control	+			
	MSP430	+	Digital Power Systems	+			
	Piccolo	+	F280x	+			
	TI 32-bit Digital Motor Control Blocks	+	F281x	+			
	TI MotorWare	+	MSP430	+			
			Piccolo	•	ADC	•	
			Simulation	•	ball28035		
			testSimObj	•	Blink	•	blinkF28027
					CAN	•	blinkF28035
					Capture	•	blinkF28055
					chip temp on F28069		blinkF28069
					chip temp on F28069-d		blinkF28075
					FFT	•	blinkF2808
					fixed-point	•	blinkF28377
					JTAG Hotlink	- +	blinkF28377S
					LaunchPad		blinkLaunchPad-28069
					PWM	•	blinkLaunchpad28027
					SPI	•	
					VRefOutF2805x		
				_		-	1



#### Test the sTE + CCS Installation (2/4):

This model will blink the red LED (GPIO34) at the frequency, (Hz), specified in the "squareWave" block;

#### Blink LED

This diagram sends a 1 hz square wave to the LED(s) on the controlCARD/STICK. (You can change the frequency by right clicking on the square wave) Be certain the ControlCARD/STICK is plugged in to your computer

		-
squareWave Properties		
Time Delay(sec):	0	
Frequency :		
Label:		
ОК	Cancel	Help

▶ not ▶ F28068-GPI034 right click to set channel, choose whether it is analog or digital, or seek help. GPIO is configured for F28069/F28035/28027 controICARD/controISTICK



Right-click above block to select JTAG (use TI XDS100 for TI controlCARD) change target or seek help

> Launchpad pin out

#### COMPILING

To generate the C Code to for the controlCARD you need to compile and download to RAM. 1) Select Tools | Codegen... 2) Click "Compile" 3) Click "Download" 4) Click "Download" again

#### INTERACTIVE MODE

If you click the green triangle "Go" button in the tool bar above Embed runs the diagram instead of compiling. If certain IO blocks GPIO, ADC, PWM, quadrature encoder) are present in the diagram, Embed downloads a precompiled .out file to the target that interactively communicates with the PC. While this lets you communicate with on-chip peripherals, all blocks are running on the PC.



31

solidThinking

#### Test the sTE + CCS Installation (3/4):

4. Under "Tools"; select "Code Gen...". The "Code Generation Properties" window will display the following default settings;





32

solidThinking

#### Test the sTE + CCS Installation (4/4):

6. The C code has been compiled. Click "Download" on the "Code Generation Properties" window, the click "Download" on the "Download to F280X" window to load the ".out" file into RAM and commence microcontroller execution.

Code Generation	Properties
Result File:	blinkLaunchPad-28069.c
Result Dir:	C:\sTEmbed2017\cg
Target:	F280X 🔹
Subtarget (set in	target F28069
Optimization Leve	el: 0   Check for Performance Issues
Use selected	compound edge pins for data exchange (enables embedded debug)
🗸 Embed Maps i	n Code 📃 Add Stack Check Code
Call from Fore	eign RTOS/User App 🕢 On-Chip RAM Only
Include Block	Nesting as Comment Target FLASH
Stack size:	512 Heap size: 1024
Periodic Function	Name: cgMain
Quit	Code Gen View Compile Download





#### **Step 3: UniFlash Installation (1/14):**

3a. Navigate to the following link:

http://processors.wiki.ti.com/index.php/CCS\_UniFlash\_v3.4.1\_Release\_Notes

3b. Under "Installation Instructions", select CCS UniFlash v3.4.1 for Windows "Off-line version" (Note: You will be temporarily directed to the Texas Instruments website to complete a free registration before the download begins).

NOTE: solidThinking Embed has been tested with UniFlash versions 3.x, you are requested to only use these versions for FLASH downloads. Added UCD Digital Power Controllers Flash Programming support

- Bug Fixes for CC3200
- . Bug fix for programming >1MB files.
- Fix for Image Creation
- . Bug fix for file listing
- . Other bug fixes (UI, C2000 Serial, etc.)

#### System Requirements

CPU - supports SSE2 instruction set (ie; Intel Pentium 4 or newer; AMD Opteron/Athlon 64 or newer)

Disk Space - 600MB (2GB recommended)

Memory - 1G8 (2G8 recommended)

OS - Windows XP/7/8, Linux Distribution based on CCS requirements here

#### Installation Instructions

Download the CCS UniFlash v3 4.1 build at the following location:

Windows Version	Offline version # (29	1 MB)	Voto version @ (21 MB)
Linux Version	Offline version # (22	7 MB)	Web version # (8 MB)

· Note: Internet access required during installation for Web version

#### List of Supported Devices

#### C2000 10 32-bit Real-time Control MCUs

Device Series	Part #	Device List
	TMS320F280x	
	THEFT	



#### **Step 3: UniFlash Installation (2/14):**

After the download completes navigate into the "Uniflash\_3.4.1.00012\_win32" folder;

	sh_3.4.1.00012_win32.zip ►			
Organize 🔻 Extract all files				
☆ Favorites	Name	Туре	Compressed size	Pa
E Desktop Downloads Magic Briefcase Recent Places Coogle Drive	🕌 Uniflash_3.4.1.00012_win32	File folder		
<ul> <li>□ Libraries</li> <li>□ Documents</li> <li>□ Music</li> <li>□ Pictures</li> <li>□ Videos</li> <li>○ Homegroup</li> </ul>				





#### **Step 3: UniFlash Installation (3/14):**

Execute "uniflash\_setup\_3.4.1.00012.exe" to extract all installation files.

⊖	3.4.1.00012_win32.zip → Uniflash_3.4.1.0001	2_win32 ►		
Organize 🔻 Extract all files				
☆ Favorites	Name	Туре	Compressed size	Pas
🧮 Desktop	퉬 bin	File folder		
🐌 Downloads	퉬 repo	File folder		
🌗 Magic Briefcase	💷 uniflash_setup_3.4.1.00012.exe	Application	21,959 KB	No
Recent Places				
🐌 Google Drive				
Libraries Documents Music Pictures Videos				
🤣 Homegroup				
👰 Computer				





#### **Step 3: UniFlash Installation (4/14):**

#### Select "Extract all"







#### **Step 3: UniFlash Installation (5/14):**

Extraction folder (default is recommended):







#### **Step 3: UniFlash Installation (6/14):**

#### Extract







### **Step 3: UniFlash Installation (7/14):**

Navigate back and execute "uniflash\_setup\_3.4.1.00012.exe"







### **Step 3: UniFlash Installation (8/14):**

Agree to the license:







#### **Step 3: UniFlash Installation (9/14):**

Select the installation folder (default is recommended):







#### **Step 3: UniFlash Installation (10/14):**

Select the Product Families (sTE supports the three product families checked):







## **Step 3: UniFlash Installation (11/14):**

Optional: if you are using debug probes







### **Step 3: UniFlash Installation (12/14):**

Ready to Install







#### **Step 3: UniFlash Installation (13/14):**

Installing Files







### **Step 3: UniFlash Installation (14/14):**

UniFlash installation is completed successfully!







## Test the UniFlash Installation with sTE and CCS (1/10):

The following procedure may be used to check that UniFlash operates correctly with solidThinking Embed and Code Composer Studio

- 1. Connect the Texas Instruments F28069M Launchpad to your computer using the USB cord (supplied)
- 2. Launch solidThinking Embed
- 3. Under "Embedded/Examples/Piccolo/Blink"; Open the file "blinkLaunchPad-F28069"

😝 solidThinking Embed 2017.1 Build 8 - [Diagram2]							
💱 File Edit View System Analyze Blocks State Charts Motion Diagrams	Embedded Tools Window Help						
	CortexM3	- +					
	Delfino	- + <u>i</u>					
	Examples	•	Concerto	+			
	F280x	•	cortexM3	+			
	F281X	+	Delfino	+			
	Generic MCU	•	Digital Motor Control	+			
	MSP430	•	Digital Power Systems	+			
	Piccolo	•	F280x	+			
	TI 32-bit Digital Motor Control Blocks	•	F281x	+			
	TI MotorWare	•	MSP430	→⊥			
			Piccolo	•	ADC	•	
			Simulation	•	ball28035		
			testSimObj	•	Blink	•	blinkF28027
		-			CAN	•	blinkF28035
					Capture	•	blinkF28055
					chip temp on F28069		blinkF28069
					chip temp on F28069-d		blinkF28075
					FFT	•	blinkF2808
					fixed-point	•	blinkF28377
					JTAG Hotlink	•	blinkF28377S
					LaunchPad		blinkLaunchPad-28069
					PWM	•	blinkLaunchpad28027
					SPI	•	
					VRefOutF2805x		
				_			





#### Test the UniFlash Installation with sTE and CCS (2/10):

4. Under "Tools"; select "Code Gen...". The "Code Generation Properties" window will display the following default settings;



C:\sTEmbed2017\cg>lnk2000 --display\_error\_number --diag\_suppress=16008 -c -x -q -mblinkLaunchPad-28069.map\_blinkLaunchPad-28069.obj -- lib\stCcal\_Type0\_U1\_fpu 32.lib -l lib\stCo\_TI\_Build\_U6b\_fpu\_lib\_-1\_lib\si\_F280xsr.lib -heap\_024 -stack 512 -o blinkLaunchPad-28069.out lib\F28069flnk.cmd

C:\sTEmbed2017\cg>if not [] == [1] pause Press any key to continue . . . \_



....

#### Test the UniFlash Installation with sTE and CCS (3/10):

Now we will launch UniFlash and setup a "New Target Configuration" for the F28069 LaunchPad;







#### Test the UniFlash Installation with sTE and CCS (4/10):

By default, sTE uses the "Texas Instruments XDS100v2 USB Debug Probe" and the Board is the F28069;

🐝 CCS UniFlash			_ • • ×
File <u>W</u> indow <u>I</u>	<u>H</u> elp		
Type your filter t	text here	Quick Start Guide:           New Target Configuration : To start a session, you will need a target configuration which specifies your connection can create a new target configuration following the link.           Open Target Configuration : Or, you can also open an existing target configuration to start a session.	n and target device. You
	🥳 New Configuration	pera Dera	tion, and carry out flash
	Target Setup Connection: Board or Device:	Texas Instruments XDS100v2 USB Debug Probe	
Console 🔀			
No consoles to di	splay at this time.		





## Test the UniFlash Installation with sTE and CCS (5/10):

Save your configuration for future use;







#### Test the UniFlash Installation with sTE and CCS (6/10):

Load the sTE generated ".out" file to the target using "Program/Load Program"







#### Test the UniFlash Installation with sTE and CCS (7/10):

sTE creates the ".out" file in the "sTEmbed2017/cg" folder;

🐝 Open						×
Comput	er → OS (C:) → sTEmbed2017 → cg →			🔻 🍫 Search cg		٩
Organize 👻 New fold	ler				•== -	0
📃 Desktop 🖍	Name	Date modified	Туре	Size		
Downloads	🕌 Blink	3/27/2017 10:27 AM	File folder			
Recent Places	鷆 Calc	3/27/2017 10:27 AM	File folder			
Google Drive	\mu can	3/27/2017 10:27 AM	File folder			
Coogle Drive	鷆 doc	3/27/2017 10:27 AM	File folder			
tibrarian	퉬 Examples	3/14/2017 3:20 PM	File folder			
De sum ente	INCLUDE	3/27/2017 10:27 AM	File folder			
Documents	퉬 lib	3/27/2017 10:27 AM	File folder			
IViusic     Distance	퉬 SPI	3/27/2017 10:27 AM	File folder			
Pictures	鷆 tmp	3/27/2017 11:53 AM	File folder			
T videos	퉬 Uart	3/27/2017 10:27 AM	File folder			
🤣 Homegroup	퉬 Web Server	3/27/2017 10:27 AM	File folder			
	blinkLaunchPad-28069.out	3/27/2017 12:22 PM	OUT File	173 KB		
· Commuter	BlinkLED.out	3/15/2017 8:45 PM	OUT File	134 KB		
	PR_C28_v2.out	2/1/2017 10:34 AM	OUT File	365 KB		
DVD RW/ Drives (D	RxStateChart_withUARTRxblocks.out	2/9/2017 2:07 PM	OUT File	184 KB		
File <u>r</u>	ame: blinkLaunchPad-28069.out			▼ *.out		-
				Open	Cance	



### Test the UniFlash Installation with sTE and CCS (8/10):

Open the file to write it to flash;







## Test the UniFlash Installation with sTE and CCS (9/10):

Flash load was successful;

Type your filter text here	TMS320F28069 Flash Settings < TMS320F28069 - Texas Instruments XDS100v2 USB Debug Probe/C28xx >
TMS320F28069 - Texas Instruments XDS1	- Clock Configuration
TMS320F28069 Flash Settings	
Programs	OSCCLK (MHz): 10
	CLKINDIV: 2
	PLLCR Value: 18
	Flash Program Setting:
	erase, Program, Verify
	Program, Verify
	Coad RAM Only
	⑦ Verify Only
	Erase Sector Selection
	Sector A: (0x3F4000 - 0x3F7FFF)
	Sector B: (0x3F0000 - 0x3F3FFF)
	Sector C: (0x3EC000 - 0x3EFFFF)
	Sector D: (0x3E8000 - 0x3EBFFF)
	Sector E: (0x3E4000 - 0x3E7FFF)
	Sector F: (0x3E0000 - 0x3E3FFF)
۰ III >	Sector G: (0x3DC000 - 0x3DFFFF)
Console X	
Jniflash Debug Console	
[20:33:01] Operation Launching session	ion returned.
[20:33:01] Loaded target configurat	ion from: C:\Users\Ric\AppData\Local\TEXASI~1\CCS\ti\4\0\/temptargetconfiguration.ccxml
[20:33:01] Settings purged. [20:34:00] Begin Writing flach memo	ry operation
[20:34:00] Degin writing Flush memo	bed2017\eg\blinklaunchPad-28069.out
[20:34:26] Operation Writing flash	memory returned.



#### Test the UniFlash Installation with sTE and CCS (10/10):

Powercycle the target by disconnecting and reconnecting the JTAG connection.

Observe the LED behavior.





#### **Thank You:**

For more information and training videos like this, please visit;

www.solidthinking.com/embed





© 2016 solidThinking, Inc. Proprietary and Confidential. All rights reserved. An Altair Company

### Thank You

