Circuit Design on a Budget

Class 1: Introduction to EDA and Our Tools

February 25, 2019

Charles J. Lord, PE
President, Consultant, Trainer
Blue Ridge Advanced Design and Automation

Presented by:

DesignNews

Blue Ridge Advanced Design and Automation
Asheville, North Carolina

CEC CONTINUING EDUCATION CENTER

Digi-Key ELECTRONICS

This Week's Agenda

2/25 Introduction to EDA and Our Tools

2/26 Starting at the Beginning

2/27 Creating Our Schematic

2/28 Creating Our PCB Layout

3/1 Our Finished Board

This Week's Agenda

2/25 Introduction to EDA and Our Tools

2/26 Starting at the Beginning

2/27 Creating Our Schematic

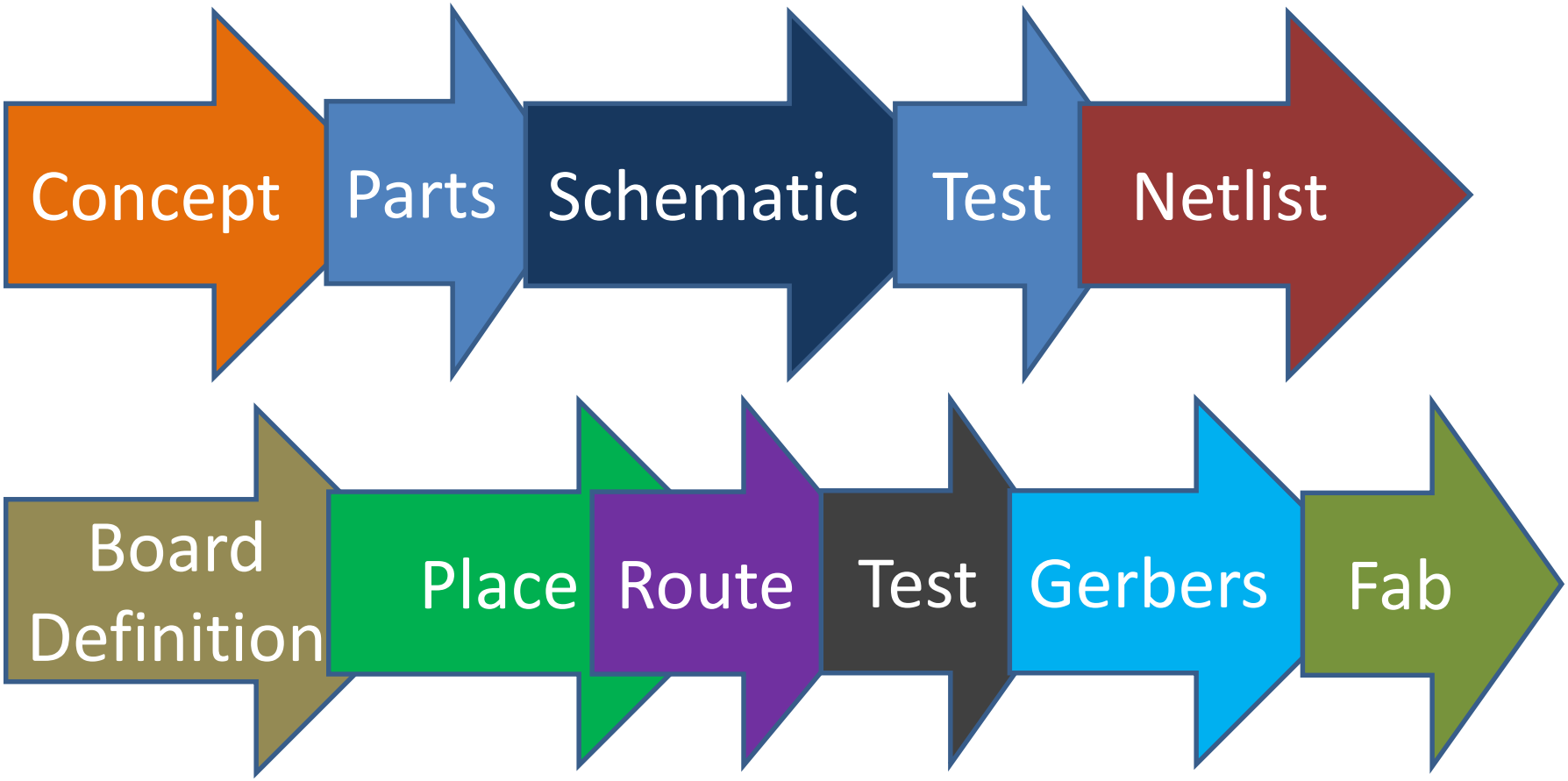
2/28 Creating Our PCB Layout

3/1 Our Finished Board

Idea to PCB

- Electronic Design Automation (EDA) tools make quick work of the creation of hardware
- A big jump from the days of pencil on vellum schematics and taped artwork!
- Now include extra tools like simulation, 3-D modelling, design rule checking, supplier links

The Basic Process

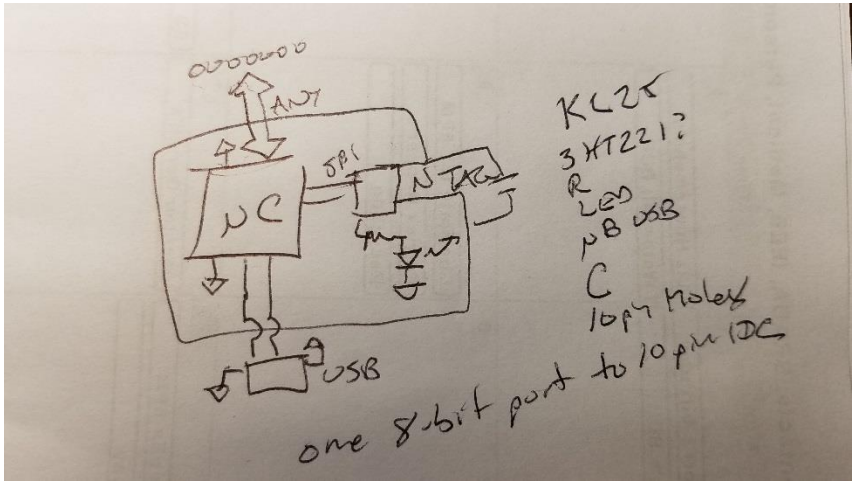


Question 1: What kind of testing might we do on the schematic?

Concept

- ‘sketch on napkin’
- Examples from mfrs
- Breadboarding
- The Next Version Of…

- Typically defines most parts, some concept of layout (fit)



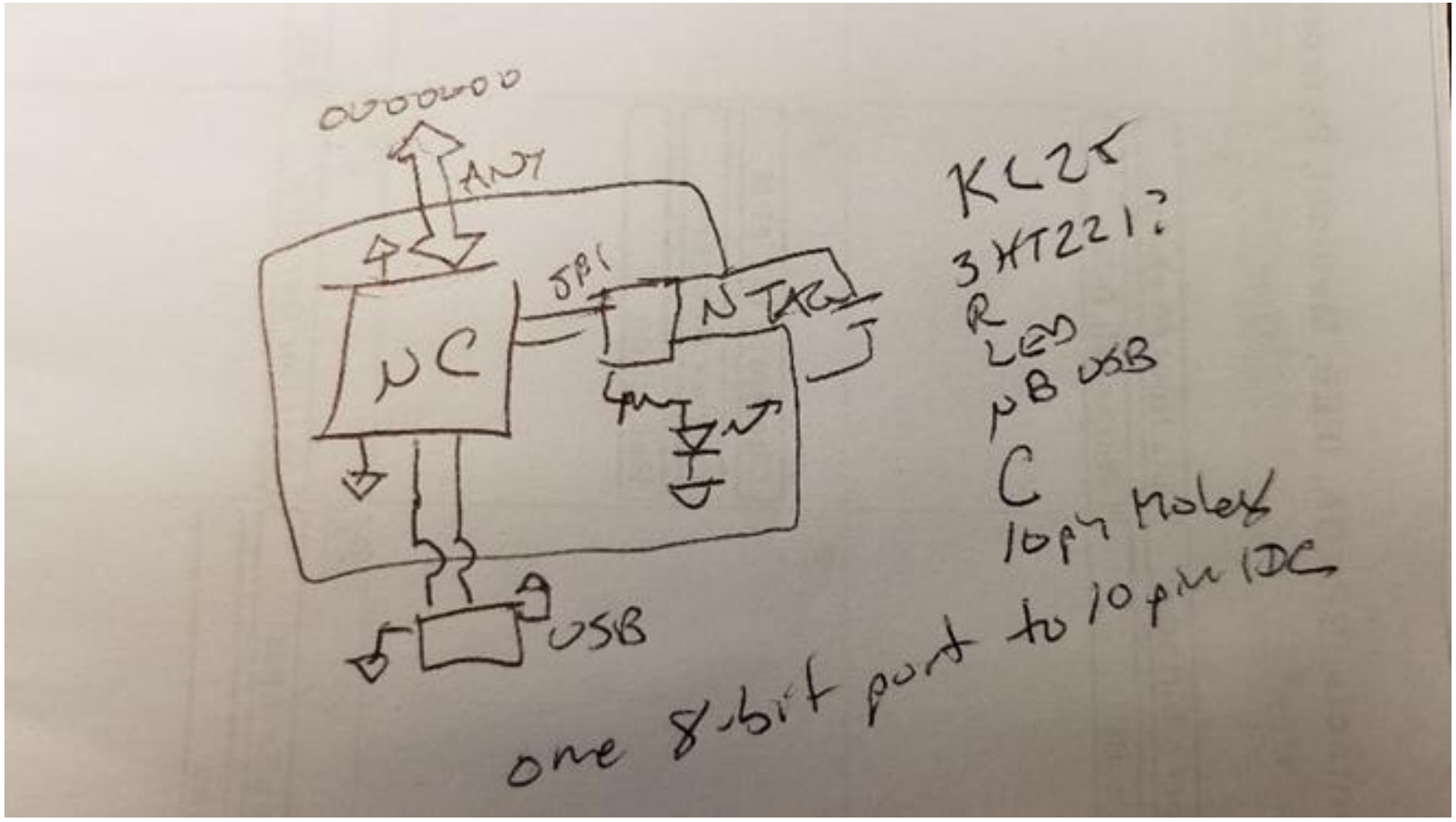
Our Project

- We are going to design an NFC (Near Field Communication) tag device that can be read via USB. When it is not attached to USB, it is self-powered via the NFC field and is “off” otherwise.
- It will also feature an RGB LED to signal NFC detection and successful read via USB

Known components

- Board must fit in a Serpac H659VPC black case
- We prototyped with a NXP FRDM KL-25 board and a NTAG kit that used the NT3H2211 NTAG IC, communicating with the KL25Z (ARM Cortex M0+) processor via SPI – we will use those chips (as available).
- We will need a loop antenna for the NFC with a 4pf parallel capacitor
- Customer has also spec'ed a 10-pin expansion connector 0.1" spacing (one 8-bit GPIO plus power)

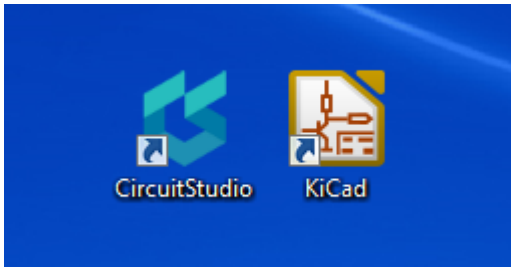
Customer's Drawing



Parts

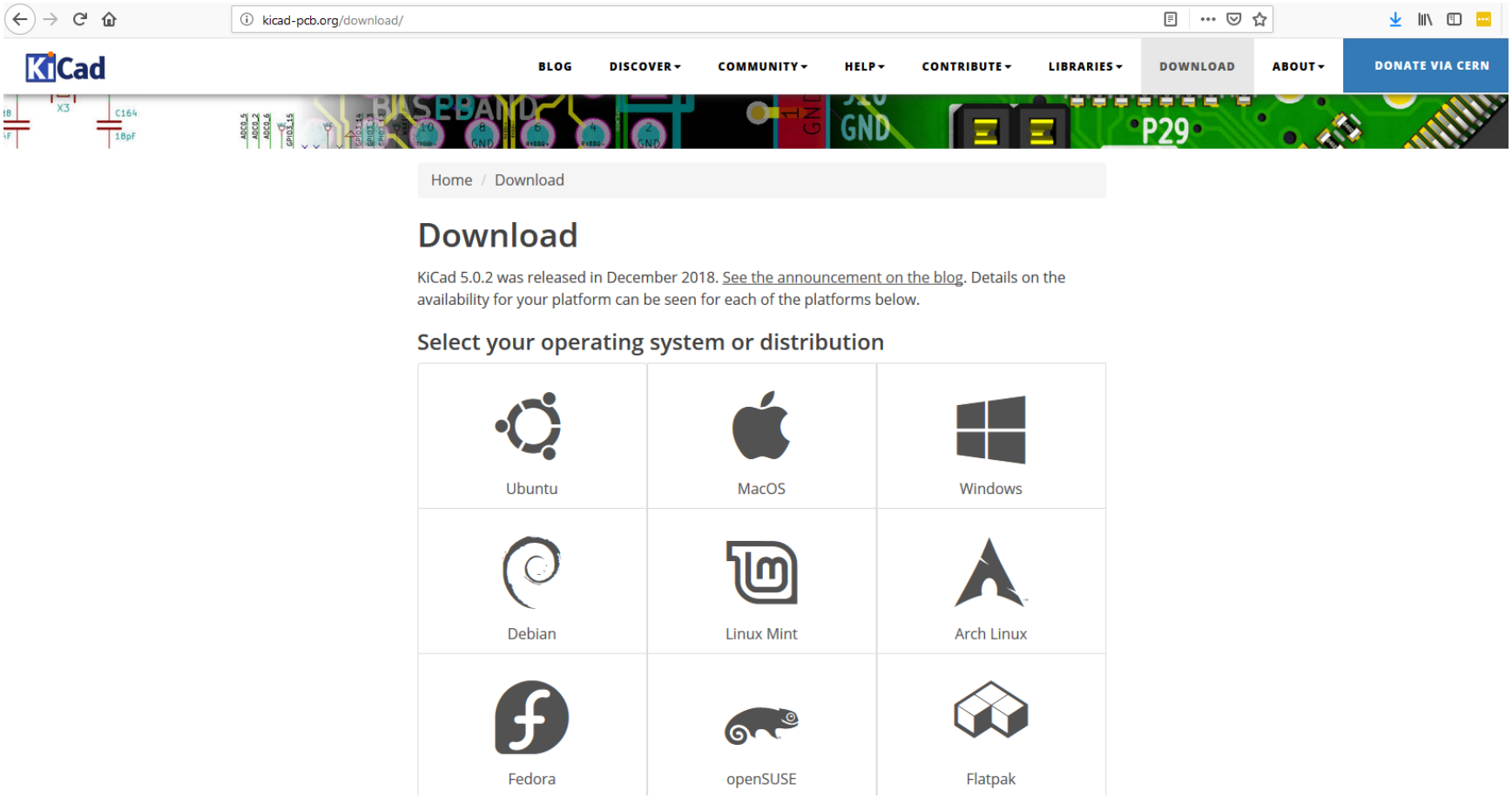
- Who has stock? *IS* the part stocked?
- What packages do you need and are they available?
- I recommend ordering sample quantities of any new parts (particularly ICs)
- We will do this tomorrow!
- Time to install some tools!

Our Tool Sets



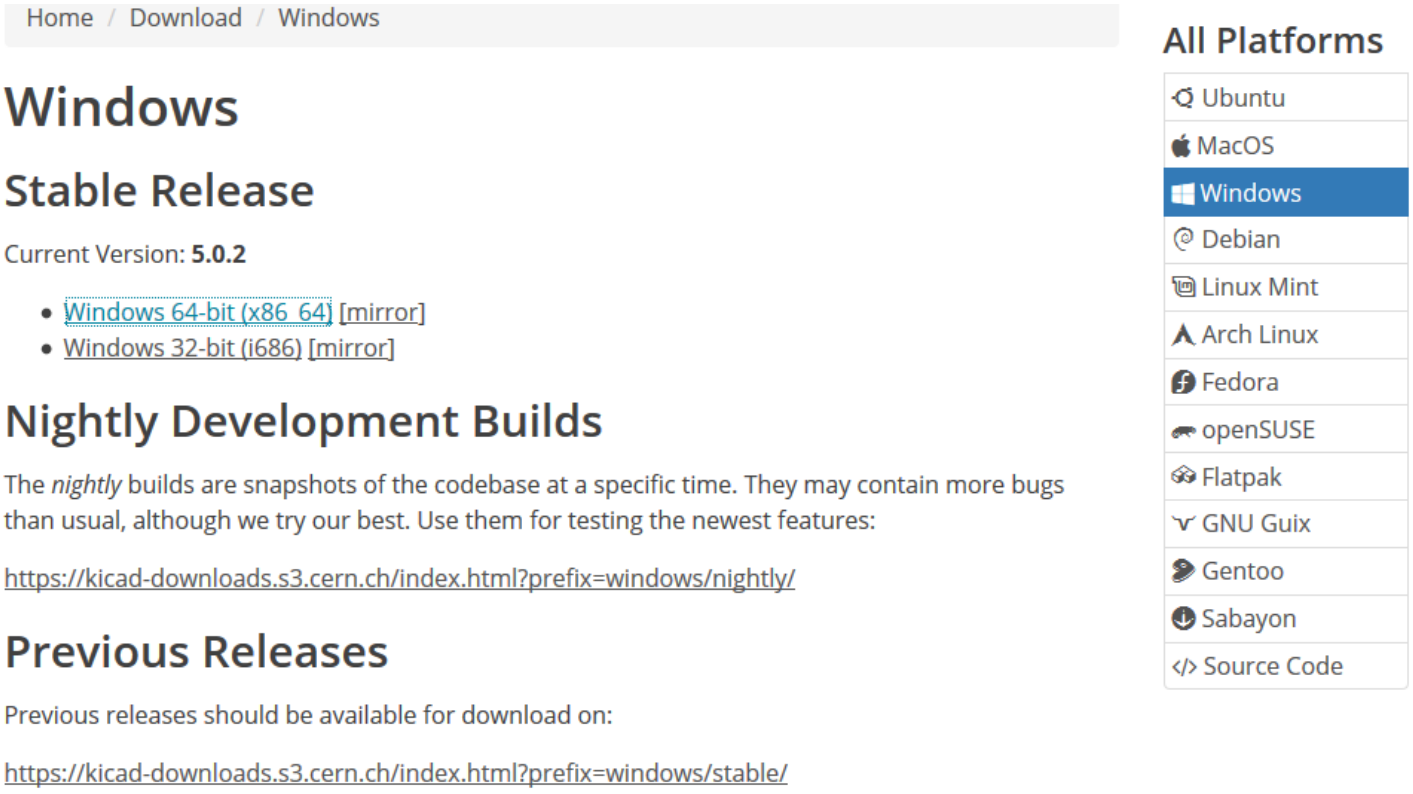
- This class is intended to show the basic process of designing and making a PCB using two representative EDA programs
- It is not intended to be a head-to-head comparison – after all, one is open source and free and the other is a 'low-end' commercial program
- But we will look at some tradeoffs between the two.

http://kicad-pcb.org/



Question 2: Any experience with KiCad?

Many platforms supported



Home / Download / Windows

Windows

Stable Release

Current Version: **5.0.2**

- Windows 64-bit (x86_64) [mirror]
- Windows 32-bit (i686) [mirror]

Nightly Development Builds

The *nightly* builds are snapshots of the codebase at a specific time. They may contain more bugs than usual, although we try our best. Use them for testing the newest features:

https://kicad-downloads.s3.cern.ch/index.html?prefix=windows/nightly/

Previous Releases

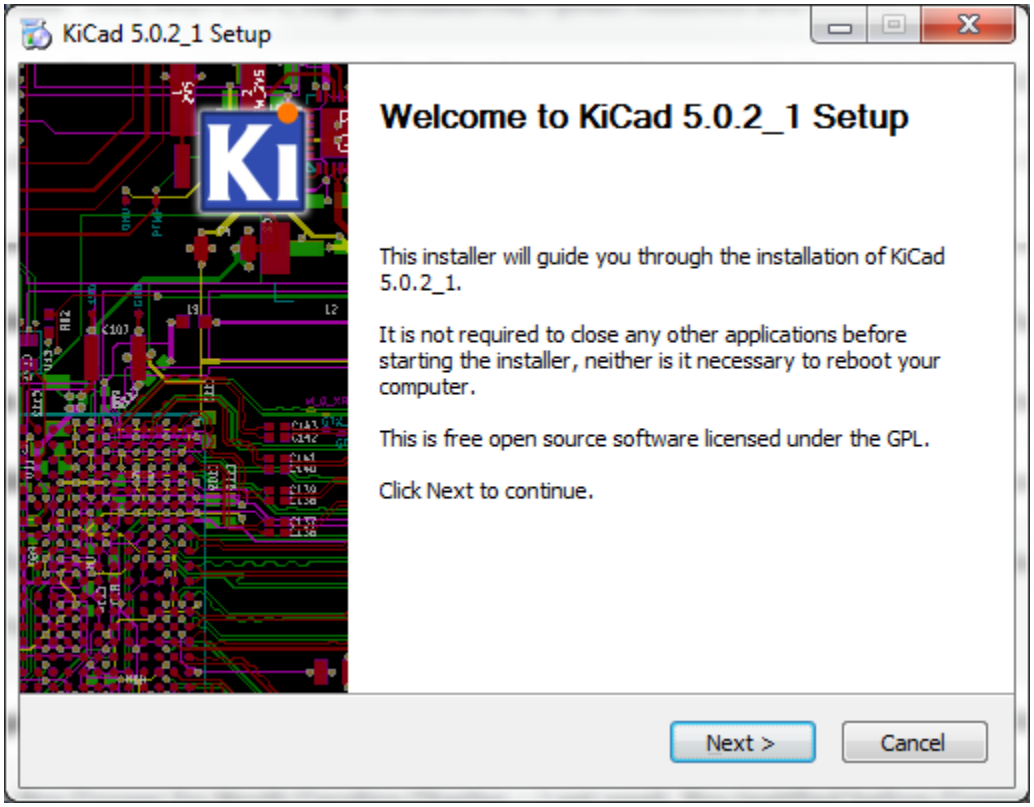
Previous releases should be available for download on:

https://kicad-downloads.s3.cern.ch/index.html?prefix=windows/stable/

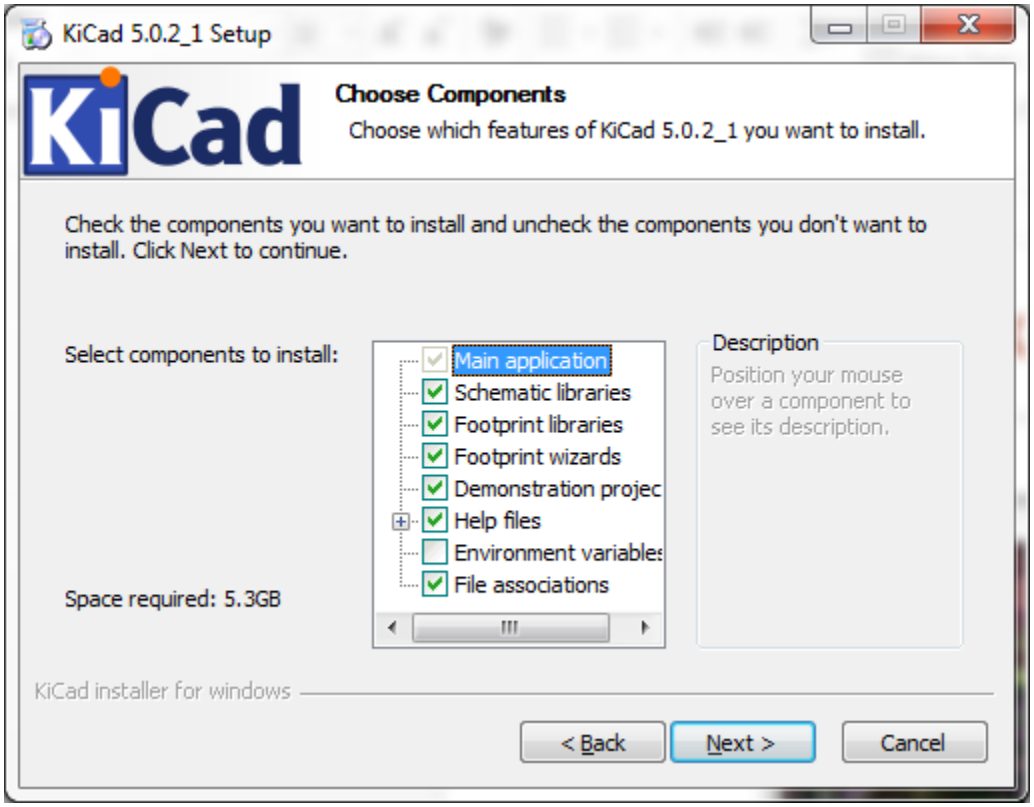
All Platforms

- Ubuntu
- MacOS
- Windows
- Debian
- Linux Mint
- Arch Linux
- Fedora
- openSUSE
- Flatpak
- GNU Guix
- Gentoo
- Sabayon
- Source Code

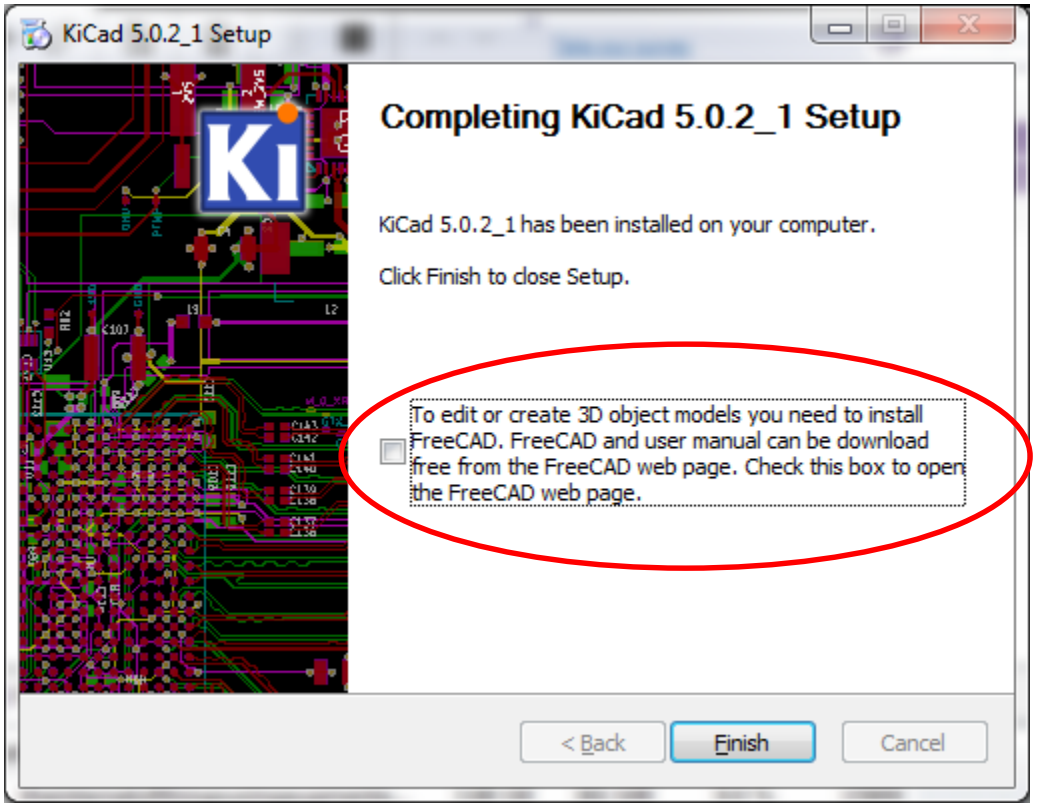
Note – well behaved



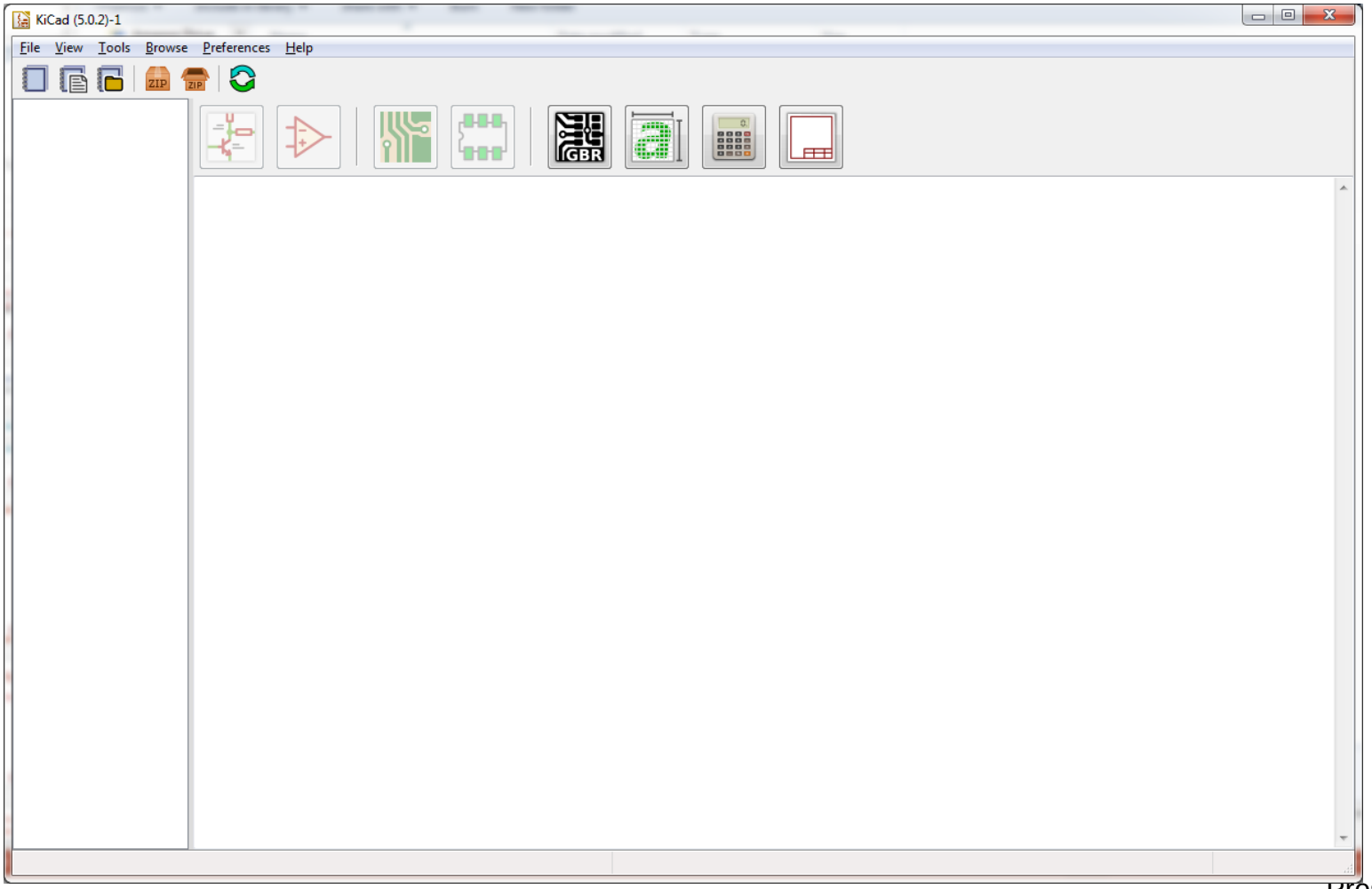
Defaults


KiCad 5.0.2_1 Setup
KiCad
Choose Components
Choose which features of KiCad 5.0.2_1 you want to install.
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select components to install:
Main application
Schematic libraries
Footprint libraries
Footprint wizards
Demonstration projec
Help files
Environment variables
File associations
Description
Position your mouse over a component to see its description.
Space required: 5.3GB
KiCad installer for windows
< Back
Next >
Cancel

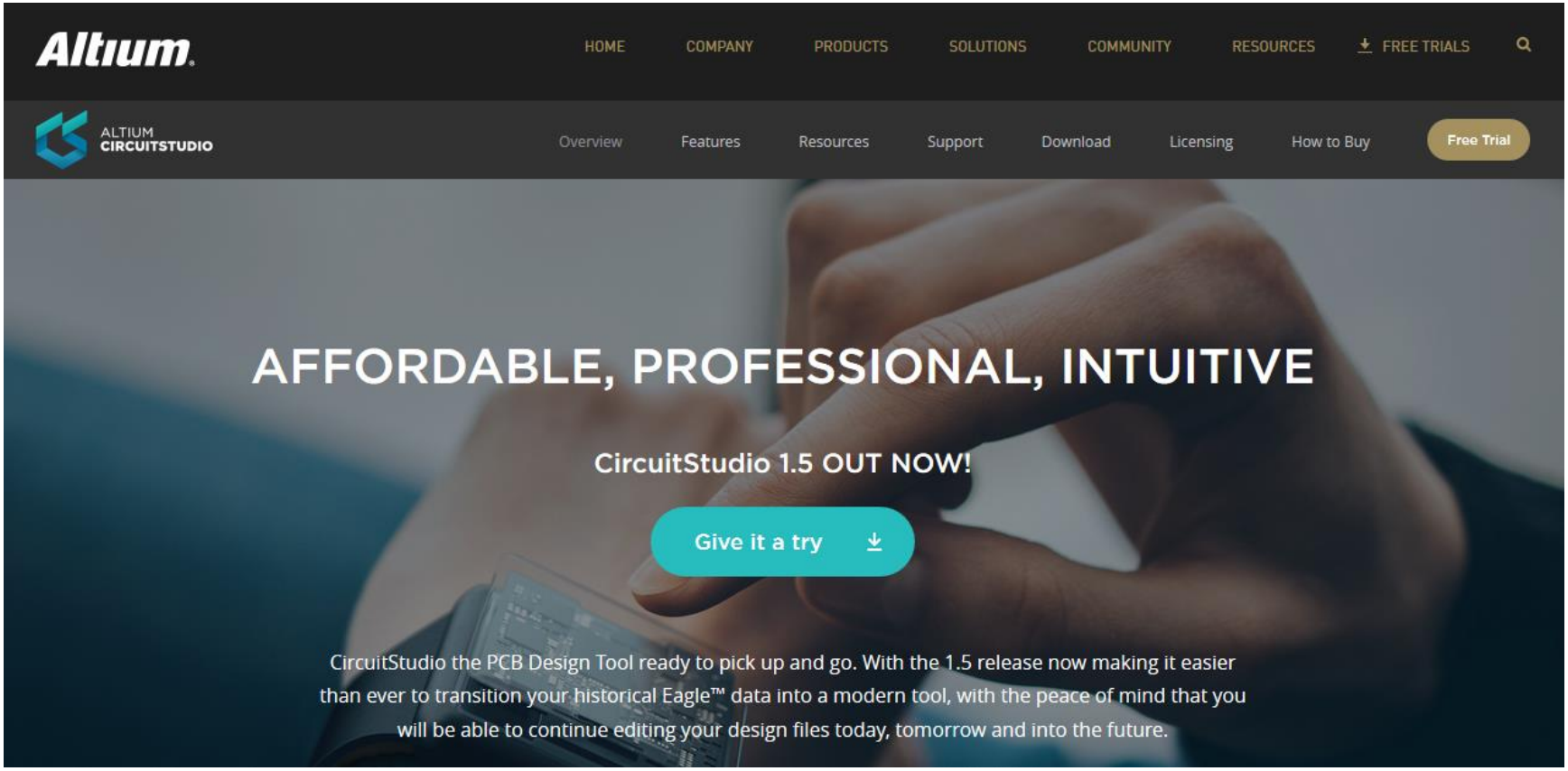
We will do this later!



Works?



https://www.altium.com/circuitstudio/



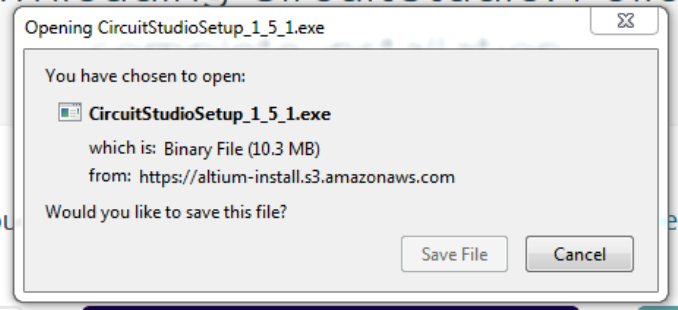
Question 3: Any experience with Altium, CircuitStudio, or CircuitMaker?

ALTIUM CIRCUITSTUDIO

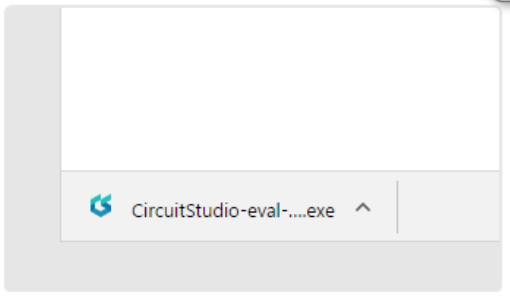
Overview Features Resources Support Download Licensing How to Buy

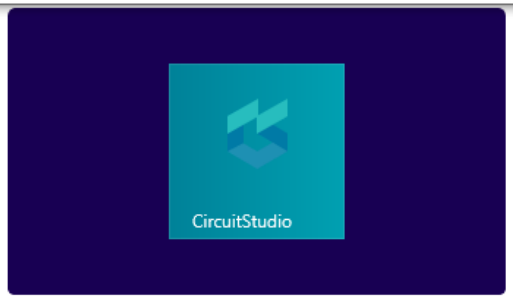
Switch to CircuitStudio today for only $495 Learn More >

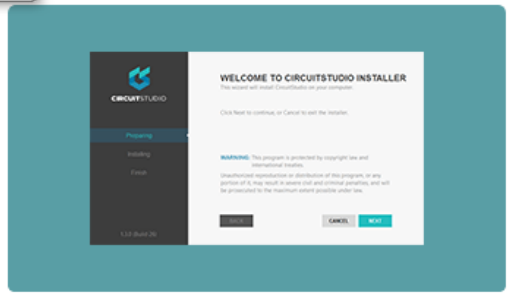
Thank you for downloading CircuitStudio! Follow these steps to



If you ere.







1. Open the Installer

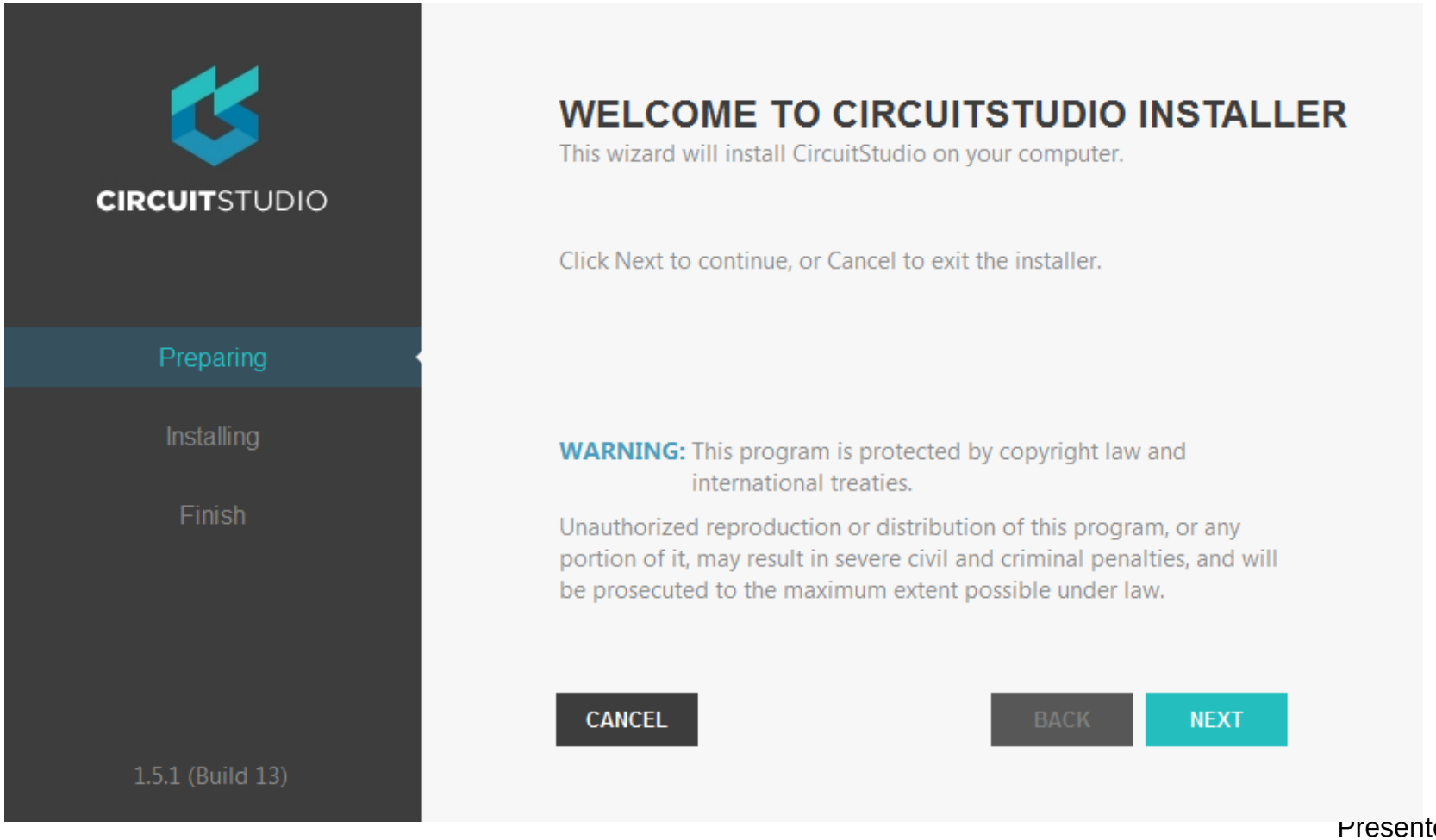
Click the CircuitStudio installer file on your downloads bar.

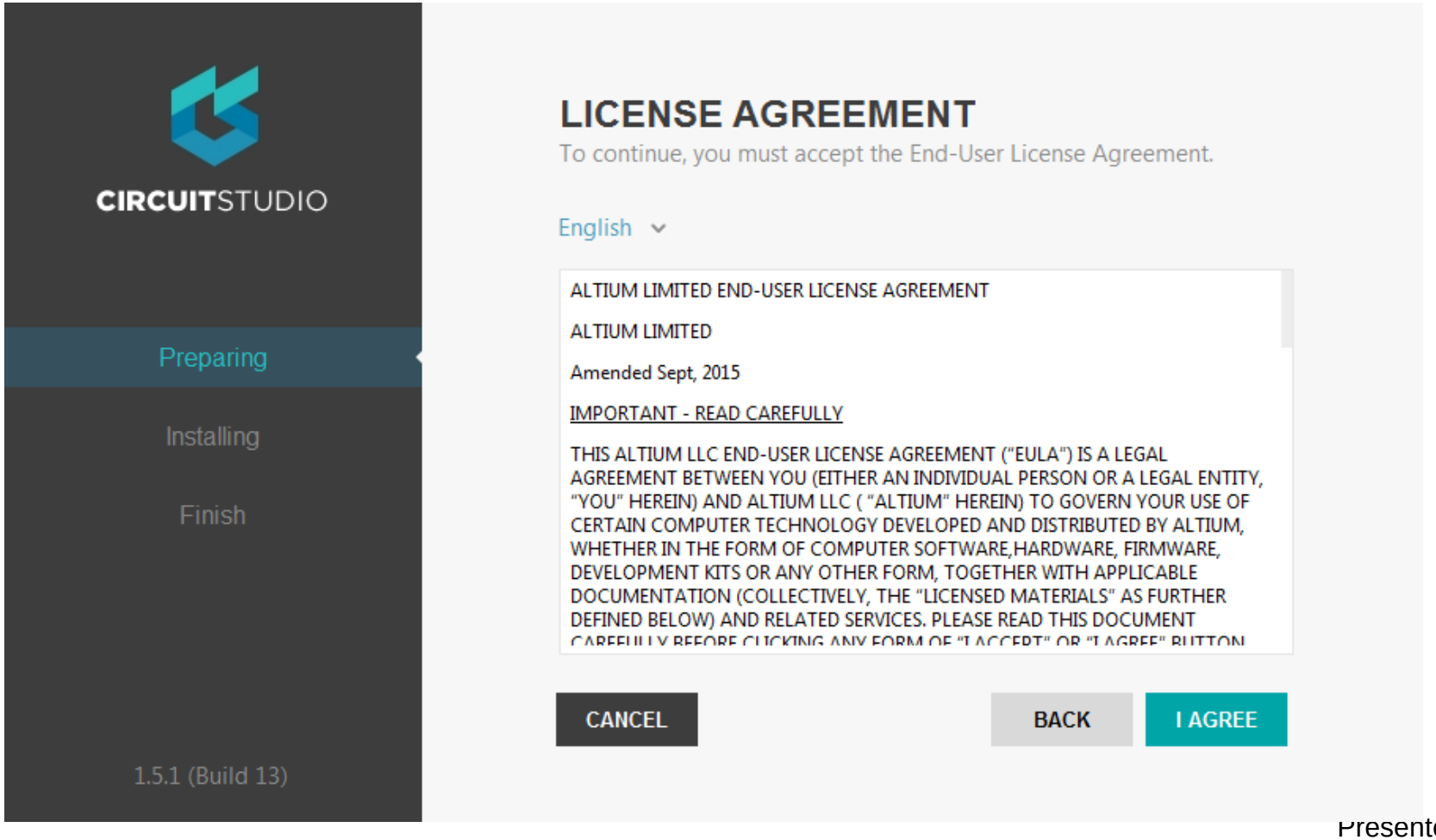
2. Run the Installer

Double-click the CircuitStudio installer application and select Open.

3. Install CircuitStudio

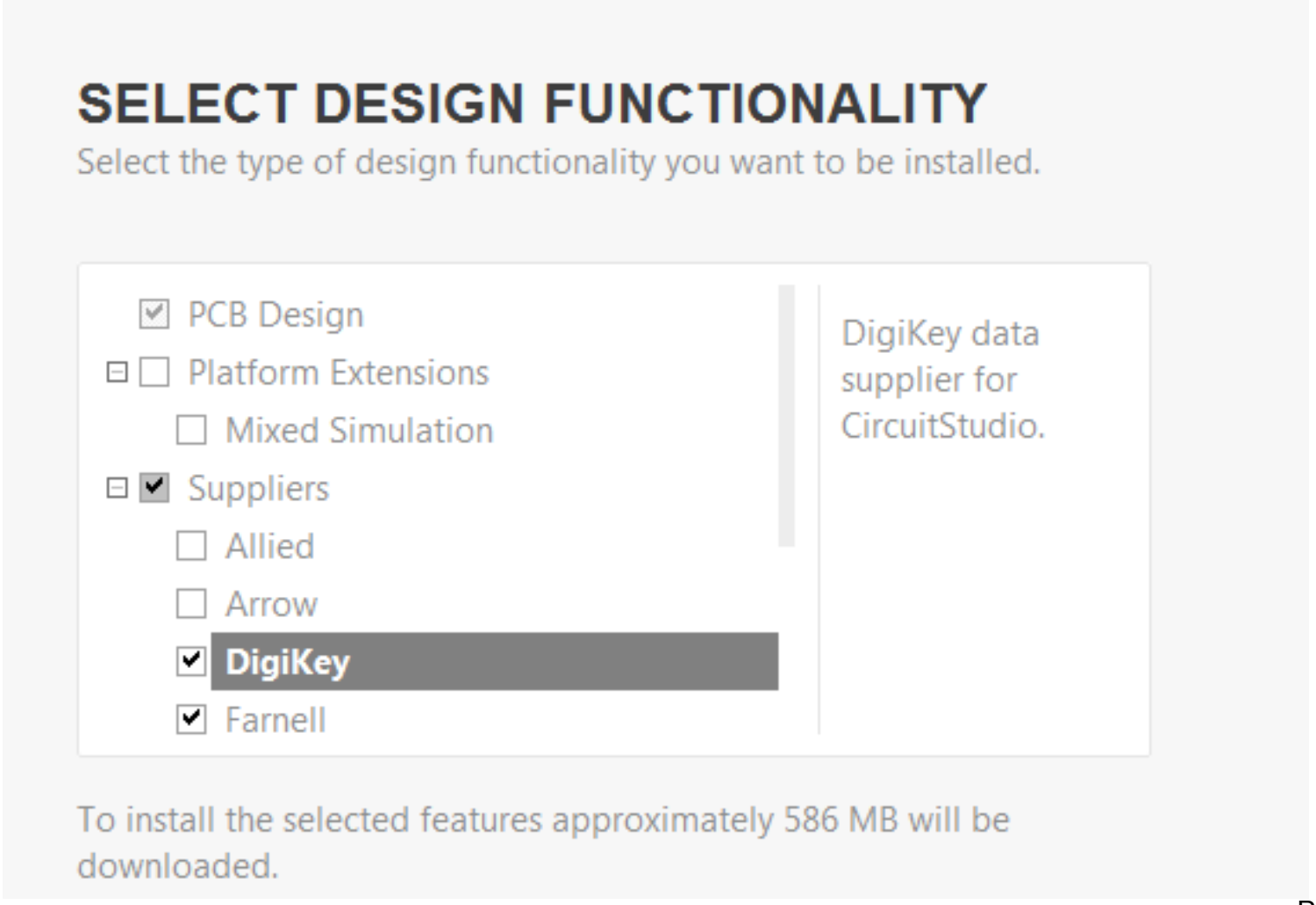
Review our Terms of Service, and then click Install to begin installing.


CIRCUITSTUDIO
Preparing
Installing
Finish
1.5.1 (Build 13)
WELCOME TO CIRCUITSTUDIO INSTALLER
This wizard will install CircuitStudio on your computer.
Click Next to continue, or Cancel to exit the installer.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
CANCEL
BACK
NEXT

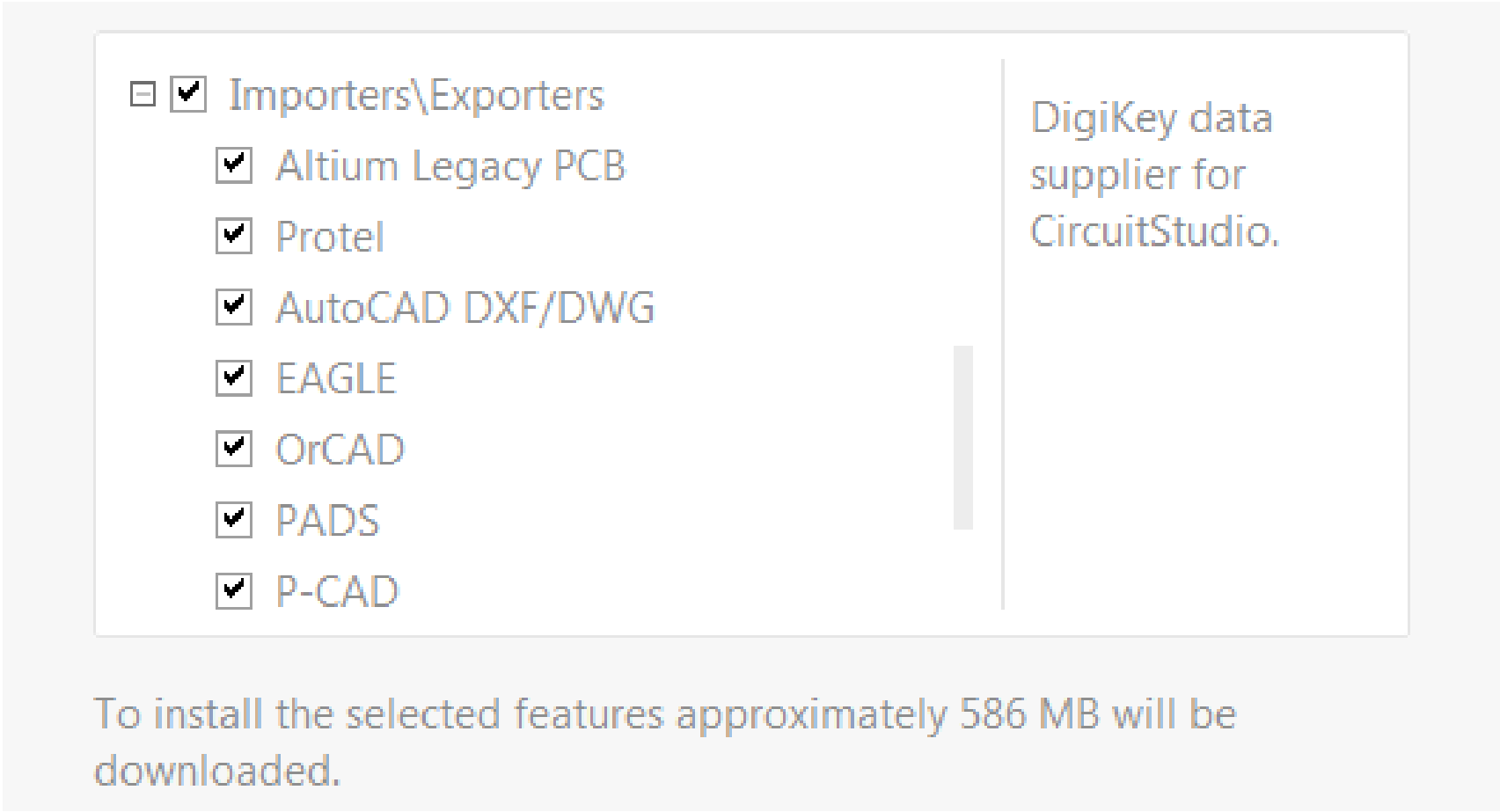

CIRCUITSTUDIO
Preparing
Installing
Finish
1.5.1 (Build 13)
LICENSE AGREEMENT
To continue, you must accept the End-User License Agreement.
English
ALTIUM LIMITED END-USER LICENSE AGREEMENT
ALTIUM LIMITED
Amended Sept, 2015
IMPORTANT - READ CAREFULLY
THIS ALTIUM LLC END-USER LICENSE AGREEMENT ("EULA") IS A LEGAL AGREEMENT BETWEEN YOU (EITHER AN INDIVIDUAL PERSON OR A LEGAL ENTITY, "YOU" HEREIN) AND ALTIUM LLC ("ALTIUM" HEREIN) TO GOVERN YOUR USE OF CERTAIN COMPUTER TECHNOLOGY DEVELOPED AND DISTRIBUTED BY ALTIUM, WHETHER IN THE FORM OF COMPUTER SOFTWARE,HARDWARE, FIRMWARE, DEVELOPMENT KITS OR ANY OTHER FORM, TOGETHER WITH APPLICABLE DOCUMENTATION (COLLECTIVELY, THE "LICENSED MATERIALS" AS FURTHER DEFINED BELOW) AND RELATED SERVICES. PLEASE READ THIS DOCUMENT
CANCEL
BACK
I AGREE

Expand selections

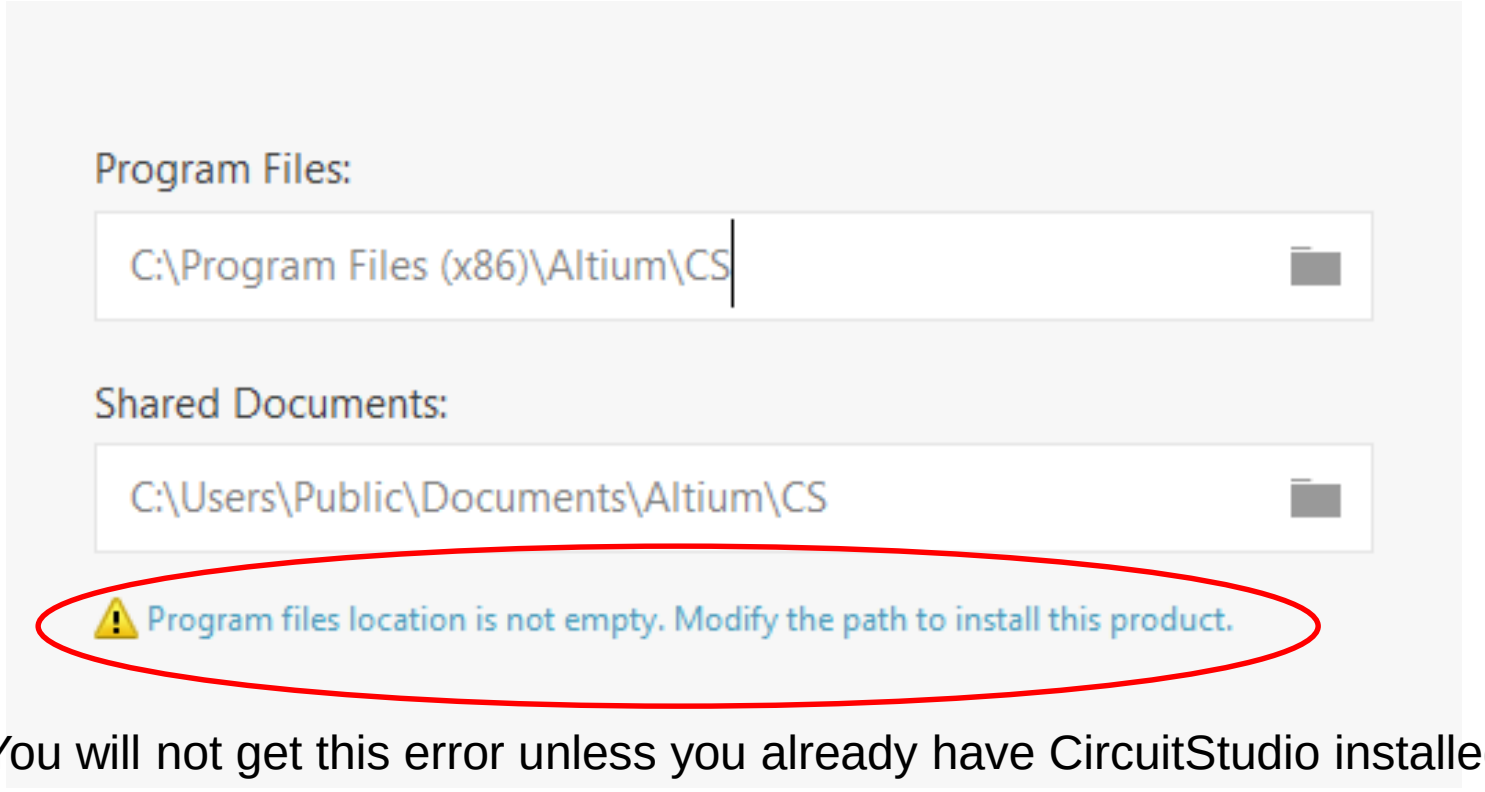
Add Digi-Key!


SELECT DESIGN FUNCTIONALITY
Select the type of design functionality you want to be installed.
PCB Design
Platform Extensions
Mixed Simulation
Suppliers
Allied
Arrow
DigiKey
Farnell
DigiKey data supplier for CircuitStudio.
To install the selected features approximately 586 MB will be downloaded.

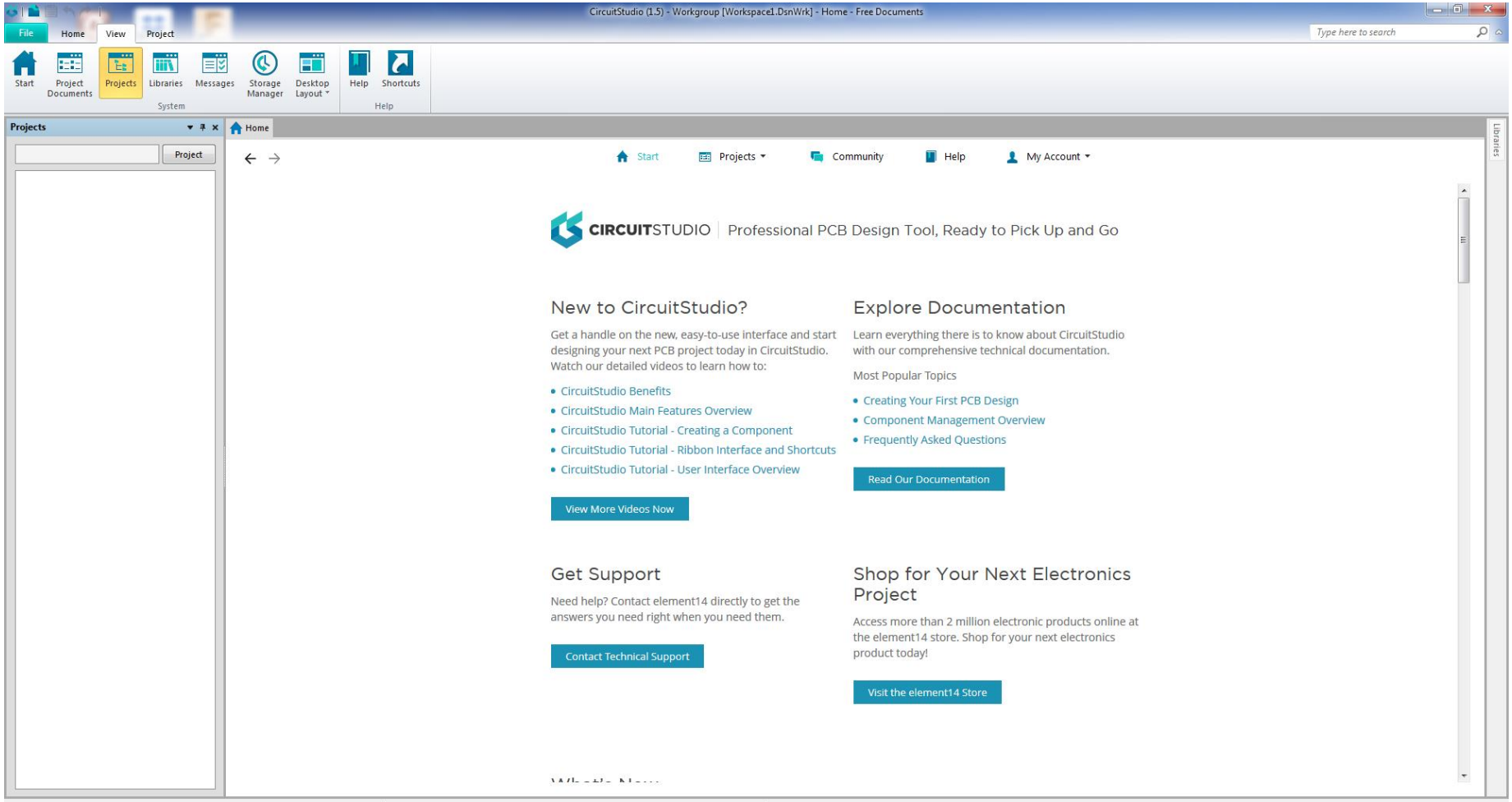
All Importers Are Default



Note Your Document Folder



You will not get this error unless you already have CircuitStudio installed


CircuitStudio (1.5) - Workgroup [Workspace1.DsnWrk] - Home - Free Documents
File
Home
View
Project
Type here to search
Start
Project Documents
Projects
Libraries
Messages
Storage Manager
Desktop Layout
Help
Shortcuts
System
Help
Projects
Project
Home
Start
Projects
Community
Help
My Account
Libraries
CIRCUITSTUDIO | Professional PCB Design Tool, Ready to Pick Up and Go
New to CircuitStudio?
Get a handle on the new, easy-to-use interface and start designing your next PCB project today in CircuitStudio. Watch our detailed videos to learn how to:
CircuitStudio Benefits
CircuitStudio Main Features Overview
CircuitStudio Tutorial - Creating a Component
CircuitStudio Tutorial - Ribbon Interface and Shortcuts
CircuitStudio Tutorial - User Interface Overview
View More Videos Now
Explore Documentation
Learn everything there is to know about CircuitStudio with our comprehensive technical documentation.
Most Popular Topics
Creating Your First PCB Design
Component Management Overview
Frequently Asked Questions
Read Our Documentation
Get Support
Need help? Contact element14 directly to get the answers you need right when you need them.
Contact Technical Support
Shop for Your Next Electronics Project
Access more than 2 million electronic products online at the element14 store. Shop for your next electronics product today!
Visit the element14 Store

This Week's Agenda

2/25 Introduction to EDA and Our Tools

2/26 Starting at the Beginning

2/27 Creating Our Schematic

2/28 Creating Our PCB Layout

3/1 Our Finished Board

Please stick around as I answer your questions!

- Please give me a moment to scroll back through the chat window to find your questions
- I will stay on chat as long as it takes to answer!
- I am available to answer simple questions or to consult (or offer in-house training for your company)
  c.j.lord@ieee.org
  http://www.blueridgetechnc.com
  http://www.linkedin.com/in/charleslord
  Twitter: @charleslord
  https://www.github.com/bradatraining

DesignNews
Blue Ridge Advanced Design and Automation
Asheville, North Carolina
CEC CONTINUING EDUCATION CENTER
Presented by:
Digi-Key ELECTRONICS