Demonstrating DDR-less EtherCAT® Slave on AMIC110

User's Guide:
http://processors.wiki.ti.com/index.php/PRU_ICSS_EtherCAT

TI Reference Design:
http://www.ti.com/tool/TIDEP-0105

DDR-less EtherCAT® Slave on AMIC110 Reference Design

TIDesigns

(ACTIVE) TIDEP-0105

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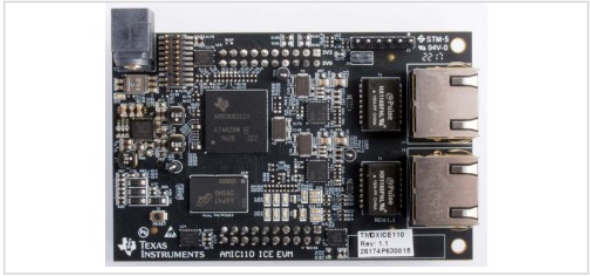
Key Document

- EtherCAT DDR-less Reference Design (PDF 519 KB)
  26 Feb 2018 438 views

» View All Technical Documents (6)



TIDEP-0105 DDR-less EtherCAT® Slave on AMIC110 Reference Design Board Image

Description

EtherCAT® (Ethernet for Control Automation Technology) continuously grows to establish itself as a dominant, industrial, Ethernet network. The DDR-less EtherCAT reference design serves as a reference design for a completely new and low-cost, DDR-less, EtherCAT slave implementation on the AMIC110, a multiprotocol industrial communications system on a chip (SoC). This reference design showcases the ability to run a full EtherCAT slave stack entirely on the internal memory of the SoC. Significant system bill of materials (BOM) and board savings are achieved with this reference design by eliminating an external ASIC and DDR. Additionally, applications such as connected industrial drives and communications modules can significantly benefit from the faster speeds that are achieved by eliminating external memory transfers for EtherCAT.

Features

- Entire EtherCAT slave stack is hosted on internal memory
- Passes EtherCAT Slave Conformance Testing Tool (CTT) from EtherCAT Technology Group (ETG)
- Eight Fieldbus Memory Management Units (FMMUs) and Sync Managers (SMs) supported by PRU-ICSS firmware
- Enhanced link-loss detection for loop control
- Helps improve system performance with removal of latencies associated with external memory accesses

View available purchase options for designs kits, evaluation modules and/or the bill of materials.

$195.00(USD)

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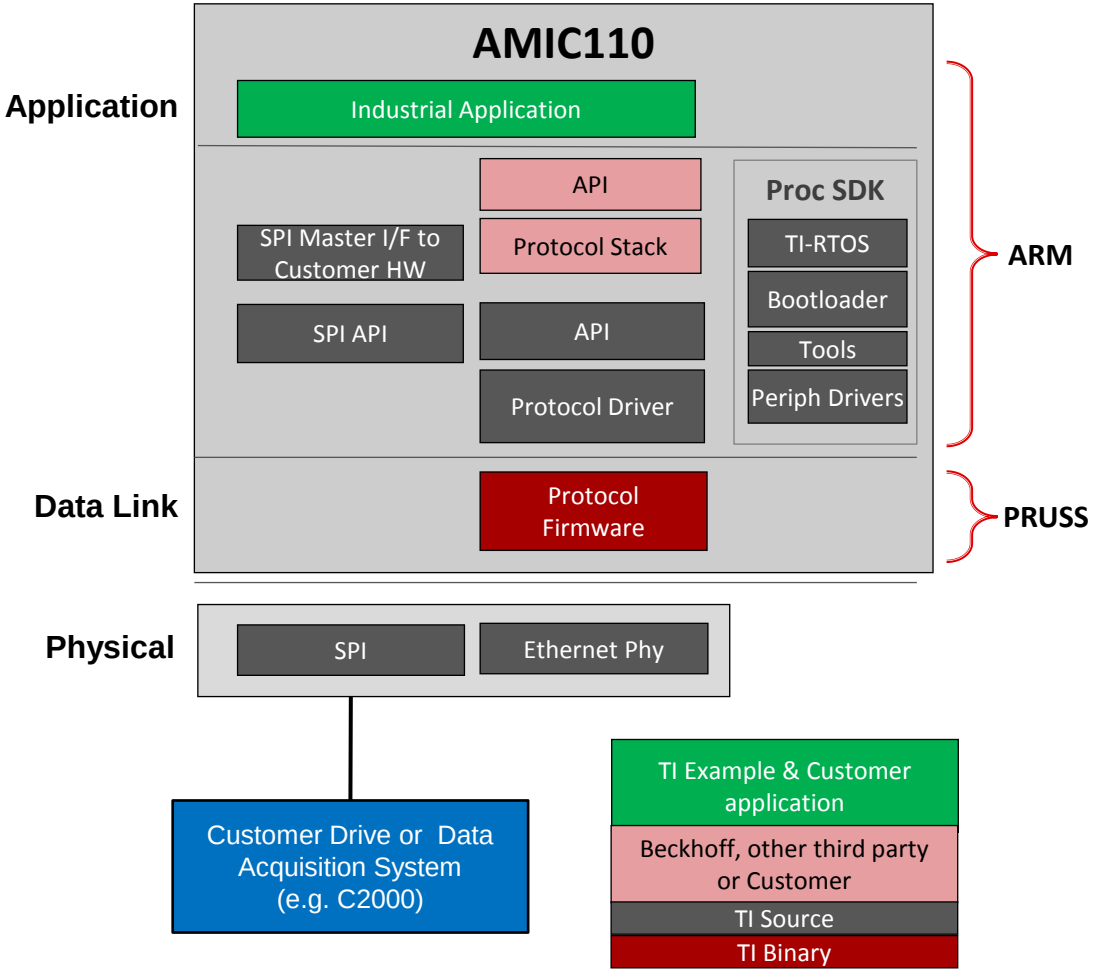
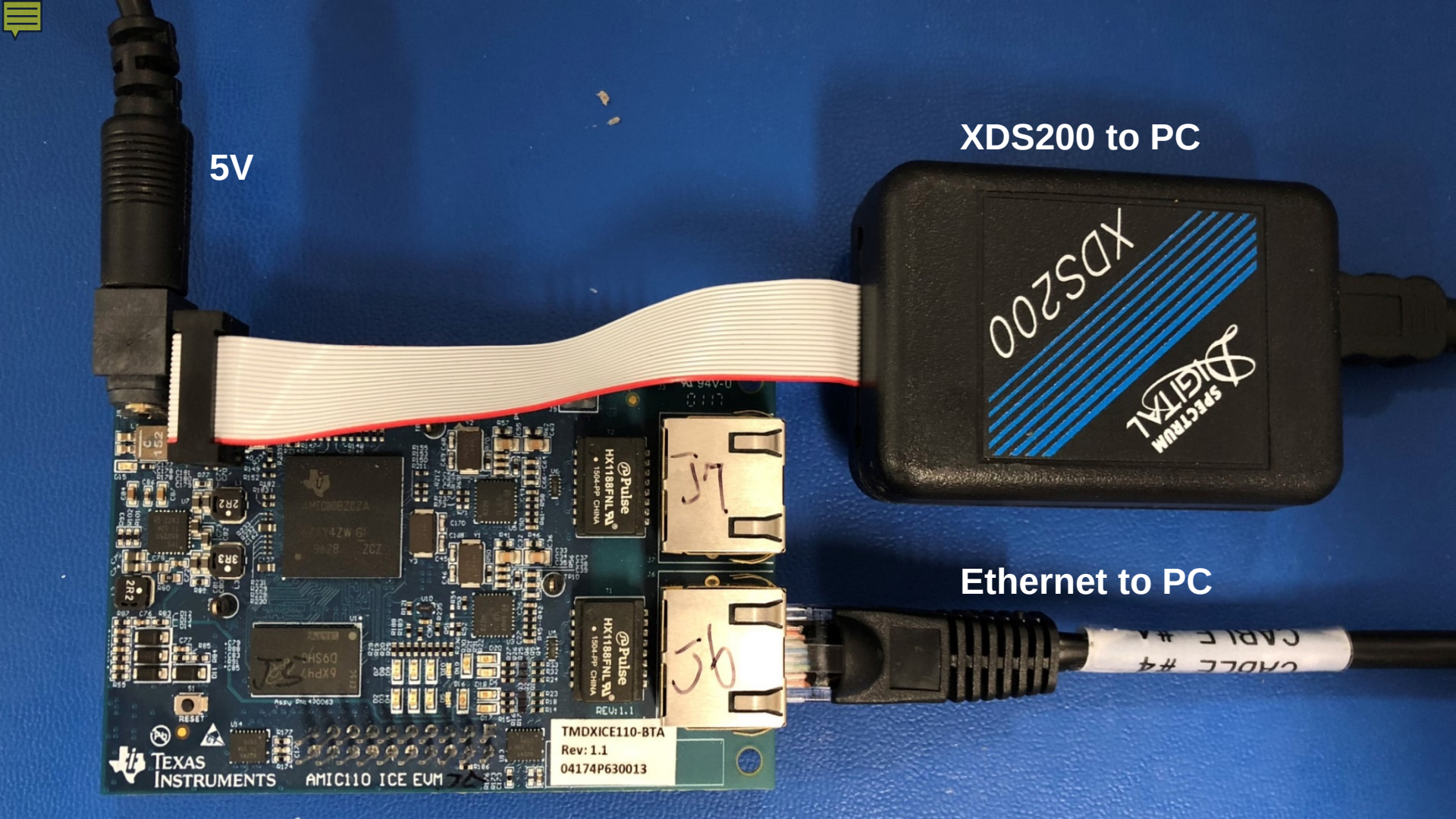
System overview



Demonstration process overview

http://processors.wiki.ti.com/index.php/pru_icss_ethercat

Set up hardware

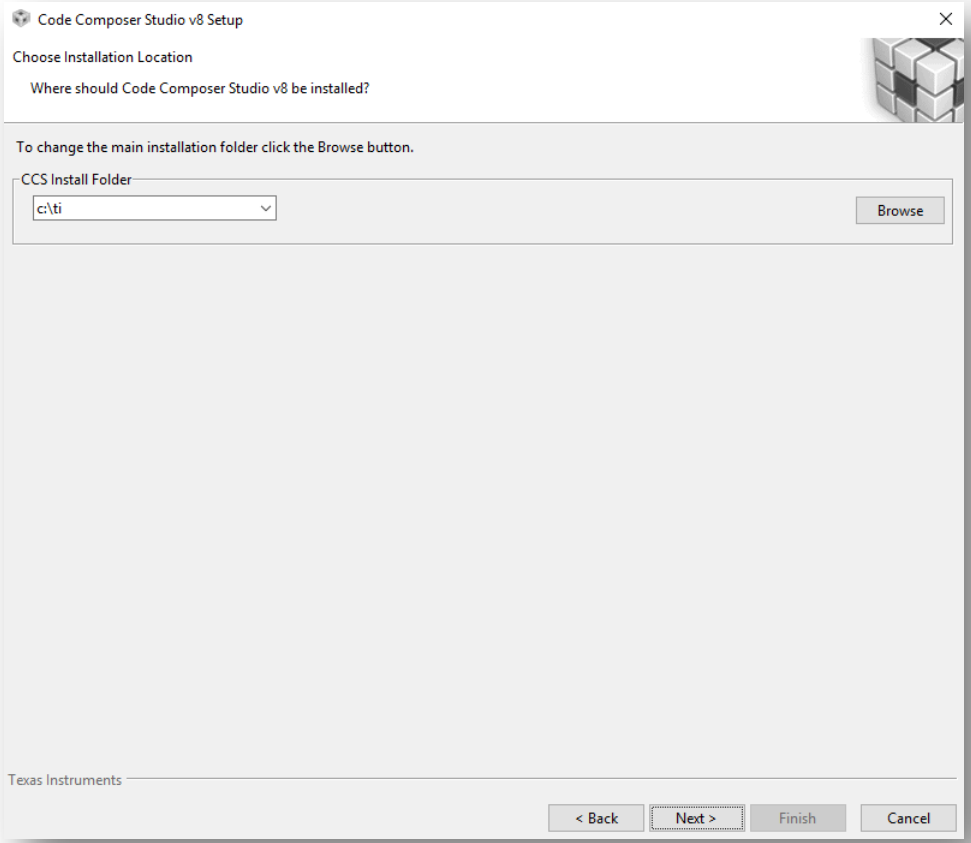

5V
XDS200 to PC
Ethernet to PC
XDS200
SPECTRUM DIGITAL
J9
J6
TMDXICE110-BTA
Rev: 1.1
04174P630013
TEXAS INSTRUMENTS
AMIC110 ICE EVM

Software setup

- Code Composer Studio (CCS): http://processors.wiki.ti.com/index.php/Download_CCS
  - Version 8.0.0.00016
- Processor SDK RTOS for AM335x: http://www.ti.com/tool/PROCESSOR-SDK-AM335X
  - Version 5.0
- PRU-ICSS EtherCAT Slave software: http://www.ti.com/tool/PRU-ICSS-INDUSTRIAL-SW
  - Verson 1.00.06
- EtherCAT Slave Stack Code (SSC): https://www.ethercat.org/
  - Version 5.12
- TwinCAT 3: https://www.beckhoff.com/english.asp?download/tc3-downloads.htm
  - Version 3.1
- Windows Patch Utility: https://sourceforge.net/projects/gnuwin32/files/patch/2.5.9-7/
- Text file format converter: https://sourceforge.net/projects/dos2unix/

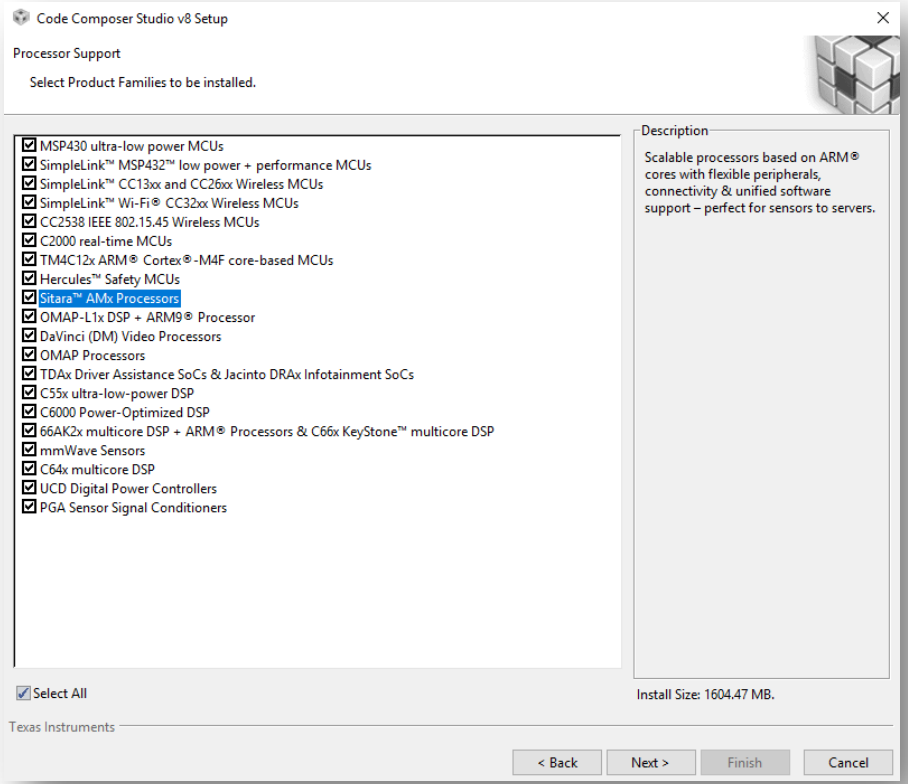
Install software

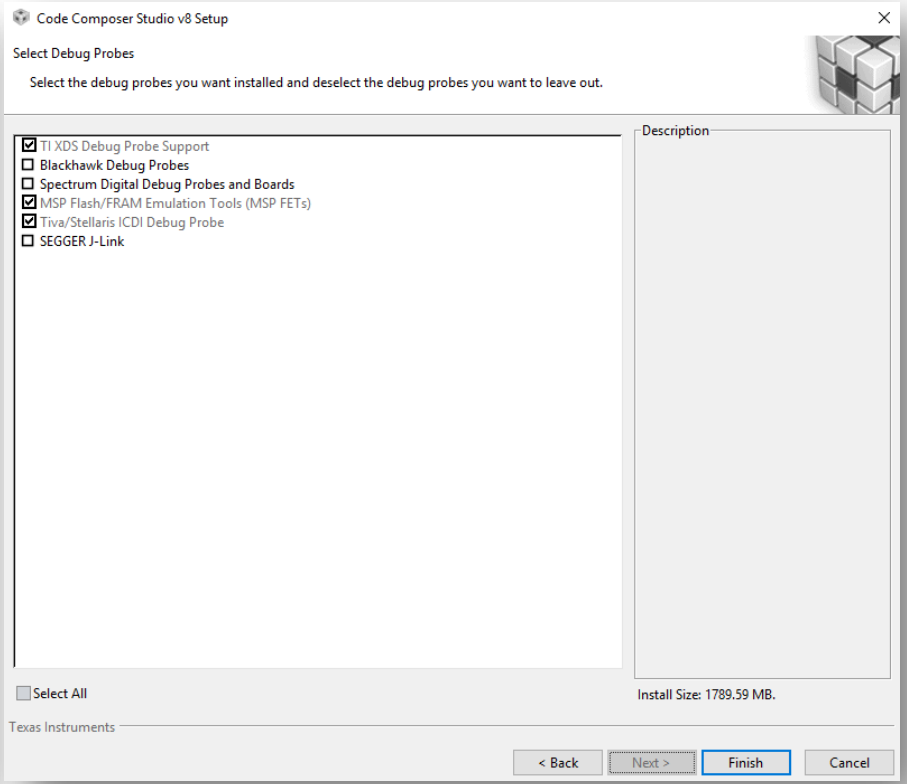
Install CCS



http://processors.wiki.ti.com/index.php/Download_CCS

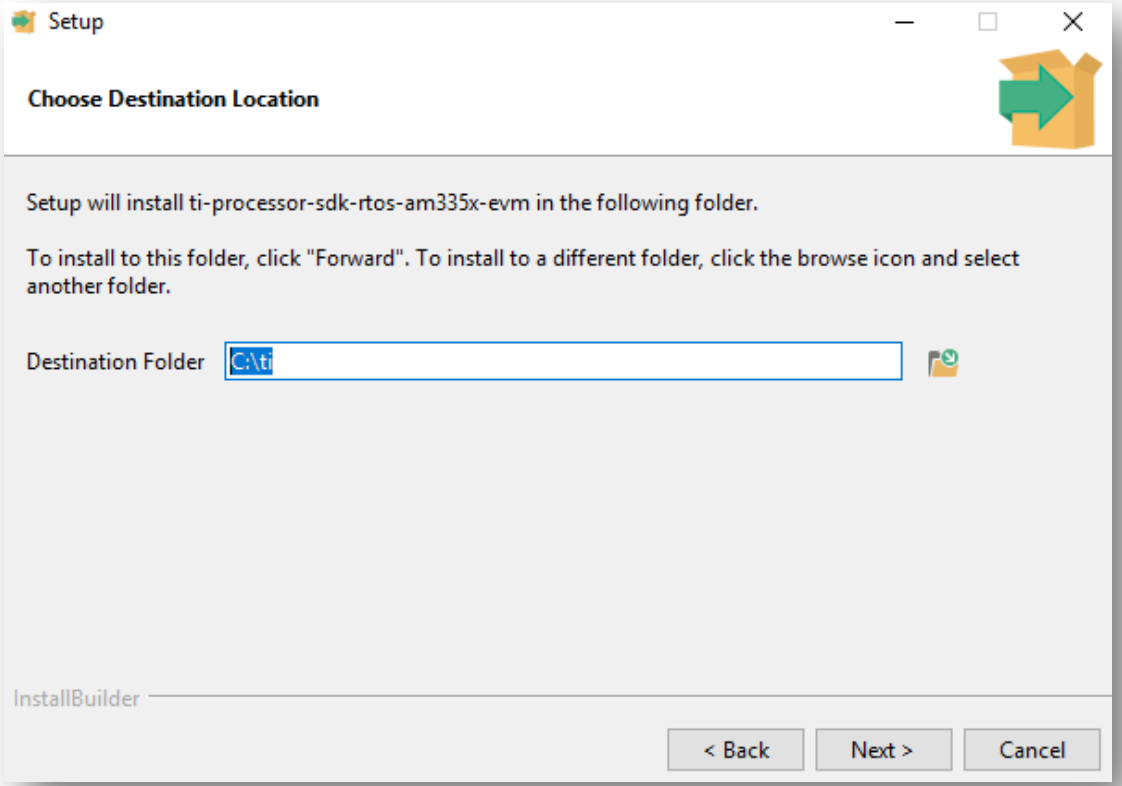
Install CCS





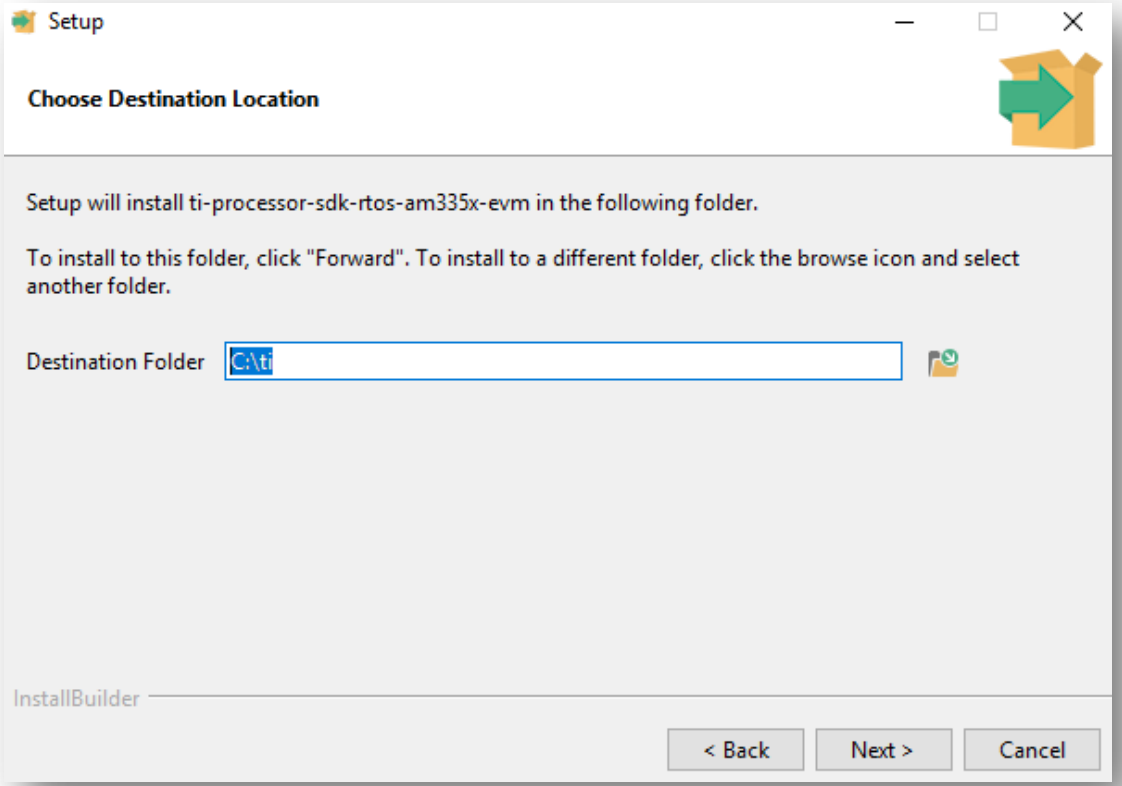
http://processors.wiki.ti.com/index.php/Download_CCS

Install Processor SDK



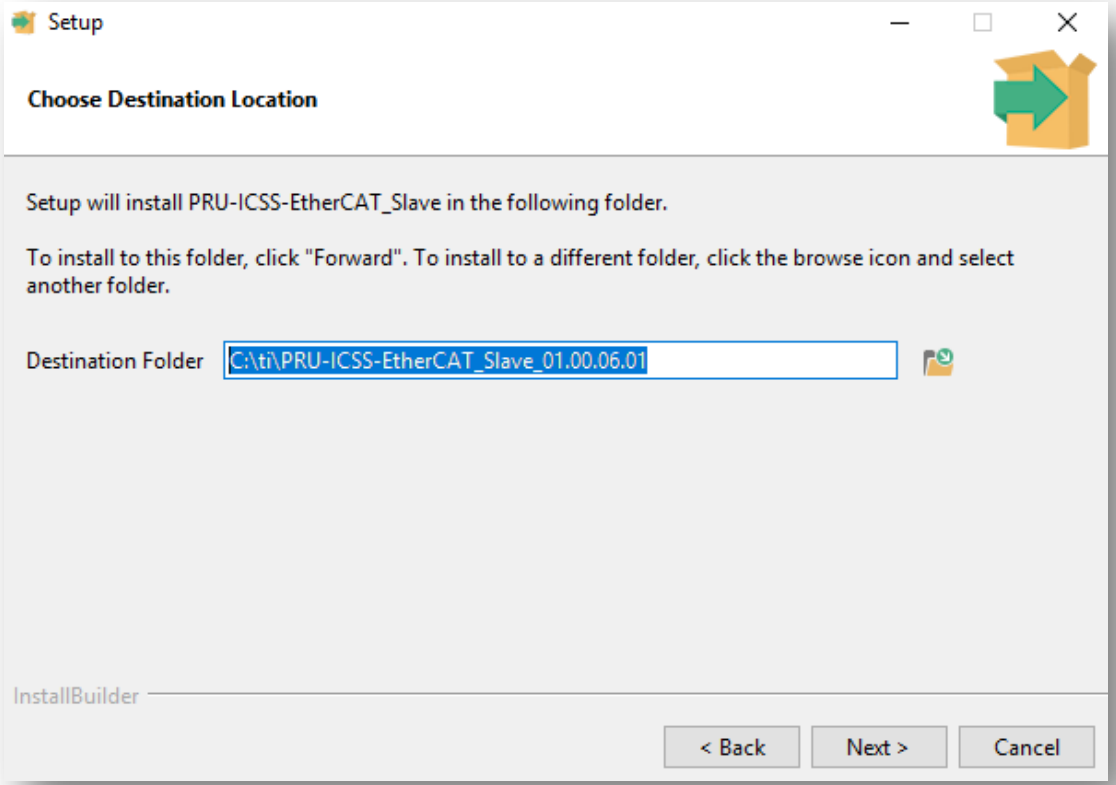
http://www.ti.com/tool/PROCESSOR-SDK-AM335X

Install Processor SDK



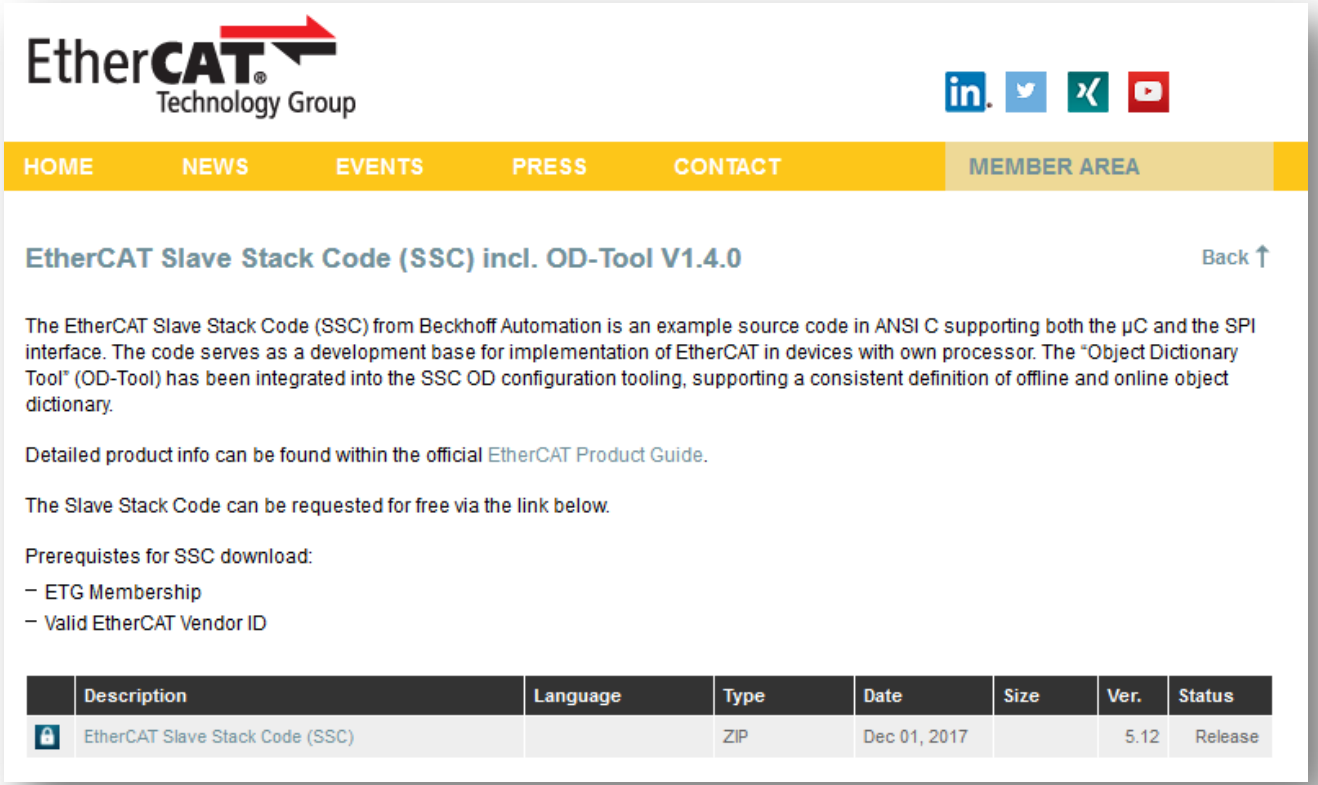
http://processors.wiki.ti.com/index.php/PRU_ICSS_EtherCAT

Install PRU-ICSS EtherCAT slave



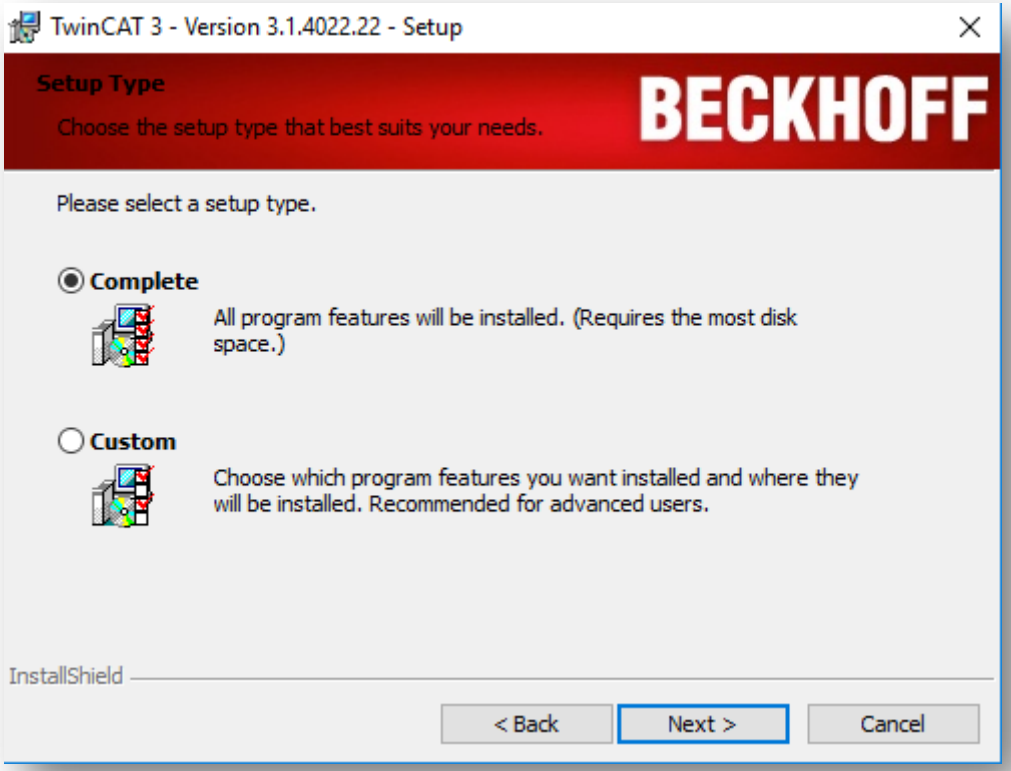
http://www.ti.com/tool/PRU-ICSS-INDUSTRIAL-SW

Install EtherCAT slave stack code



https://www.ethercat.org/

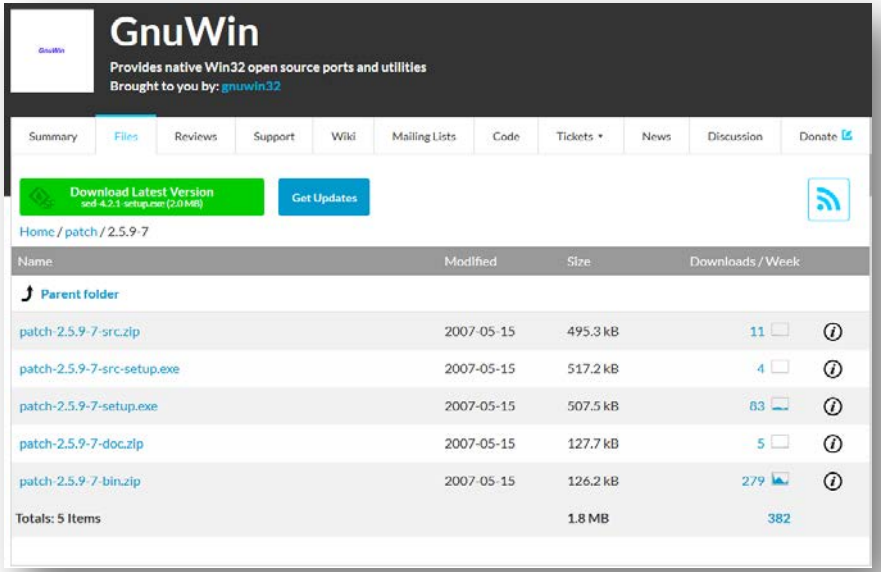
Install Beckhoff TwinCAT 3



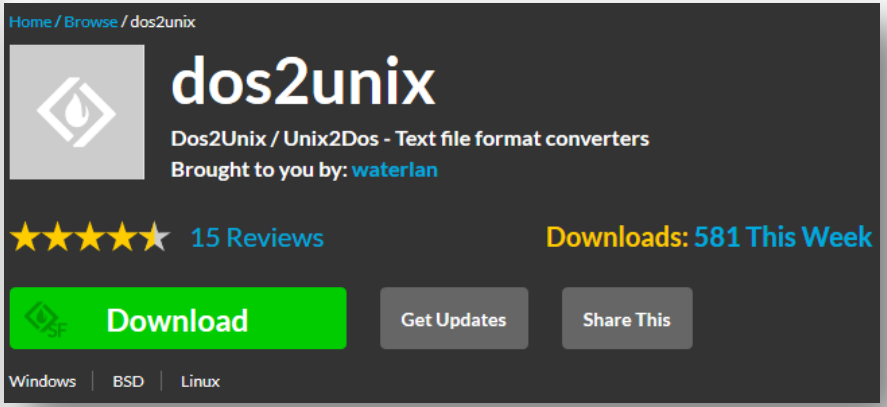
https://www.beckhoff.com/english.asp?download/tc3-downloads.htm

Install patch utilities: GnuWin and dos2unix

https://sourceforge.net/projects/gnuwin32/files/patch/2.5.9-7/



https://sourceforge.net/projects/dos2unix/



Generate and build application

Generate and build application

Method 1

Generate EtherCAT source files using a patch file

Method 2

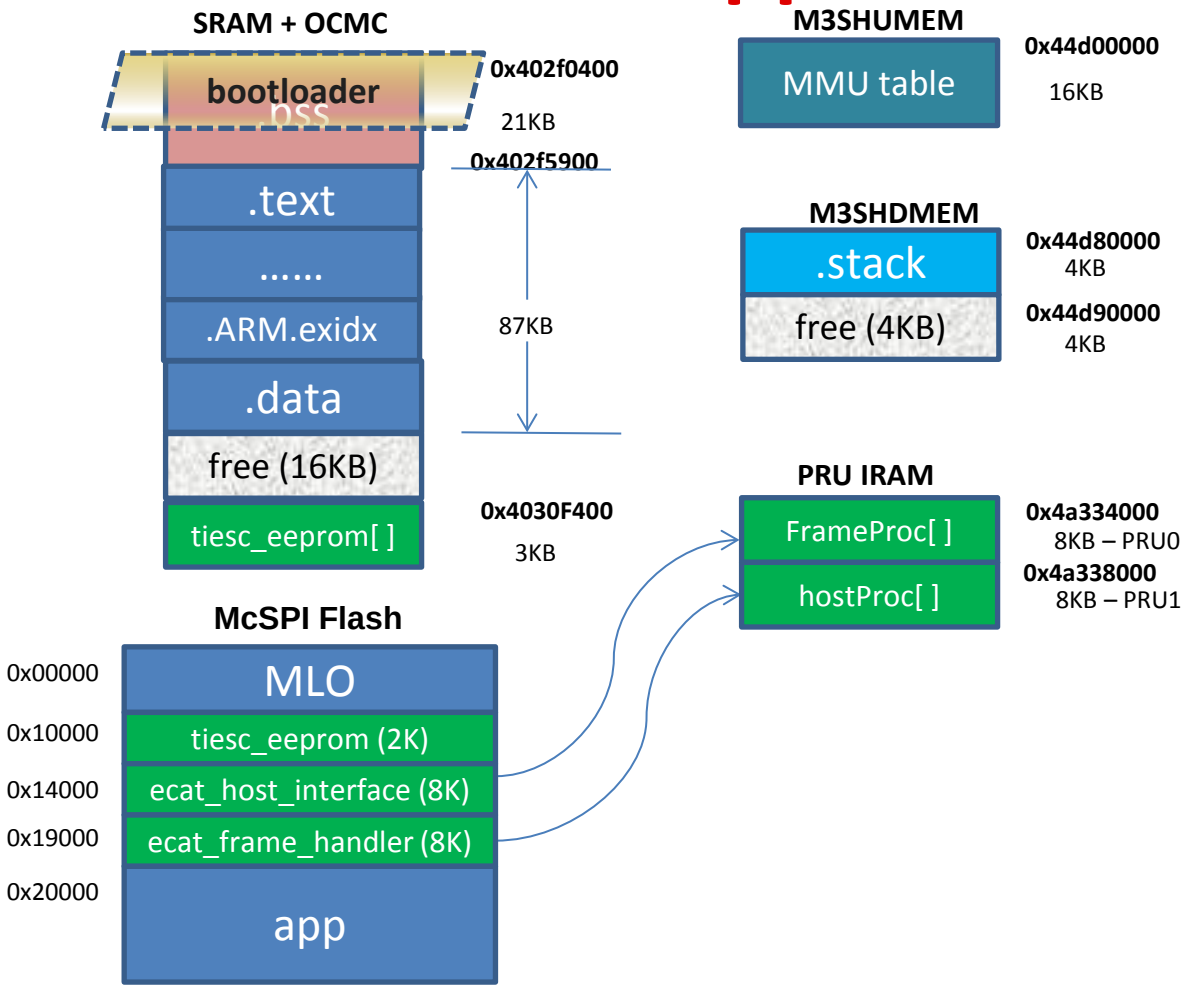
Generate EtherCAT source files using the Beckhoff SSC tool

Generate and build application

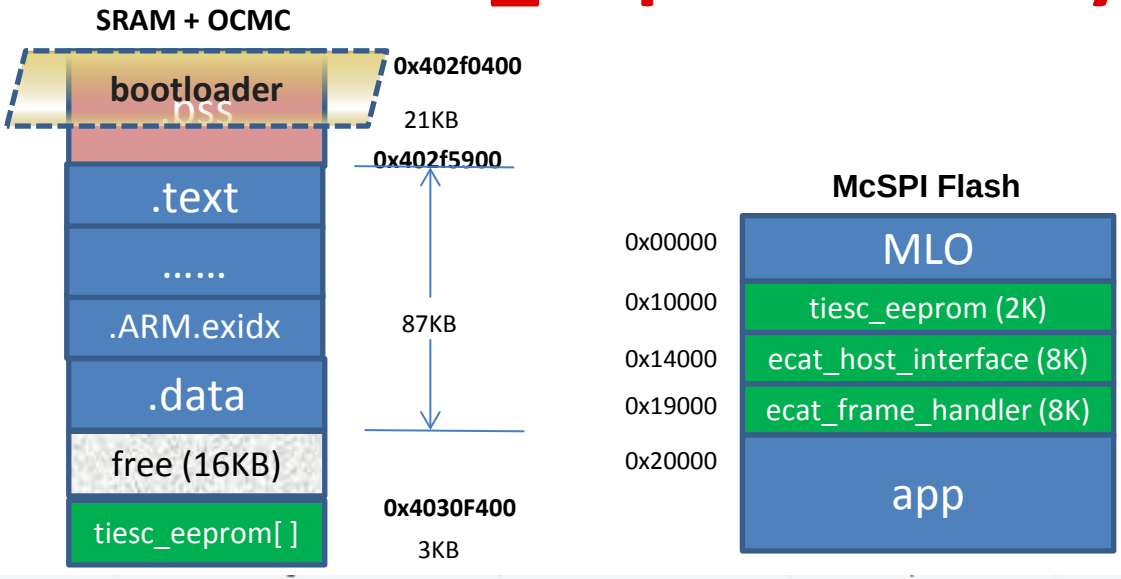
- Video Capture
  1. Generating the EtherCAT source files
     - Option 1: Generating EtherCAT sources using patch file
     - Option 2: Generating EtherCAT sources using Beckoff SSC Tool
  2. Copy source files
  3. CCS Product discovery
  4. Modify projectCreate.bat file
  5. Run projectCreate.bat AM335x arm ethercat_slave_full
  6. Apply thumb mode patch
  7. Rebuild the PDK to generate thumb mode LLD libraries
  8. Open CCS and import the project
  9. Set to release build configuration and build

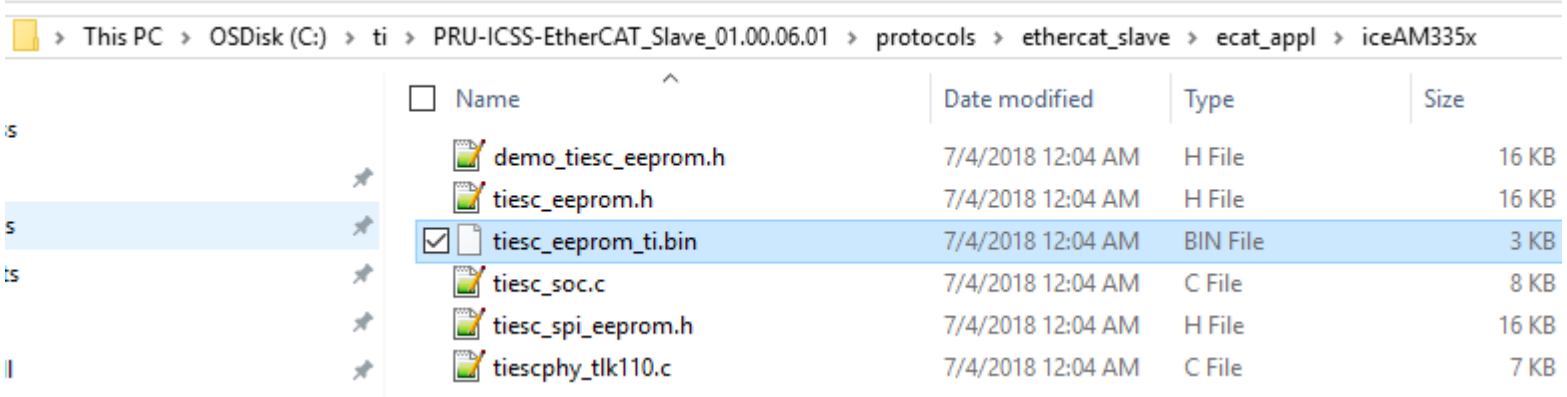
Load and run application

Load and run application



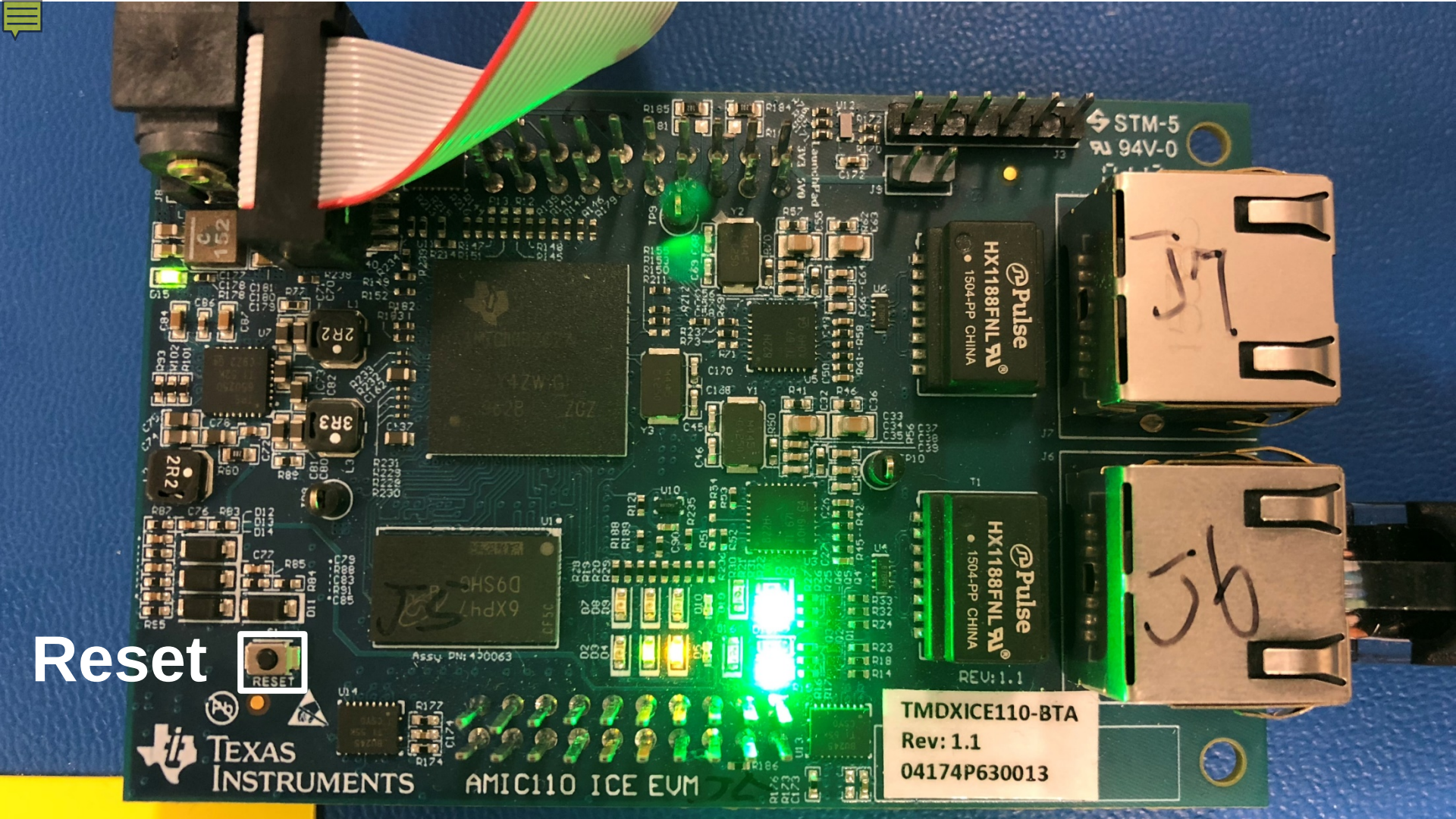
Pre-built tiesc_eeprom binary





Load and run application

- Video
  1. Create the eeprom binary
  2. Create target configuration
  3. Launch target config and connect to A8 core
  4. Load the spi flash writer
     - Go through flashing the 5 binaries


Reset
RESET
TEXAS INSTRUMENTS
AMIC110 ICE EVM
TMDXICE110-BTA
Rev: 1.1
04174P630013
REV:1.1
Pulse
HX1188FNL
1504-PP CHINA
STM-5
94V-0
J7
J6

Validate application results

Validate application results

Video:

- Copying ESI files to TwinCAT
- Creating a TwinCAT project
- Installing Ethernet Drivers
- Scanning for devices
- Checking device state
- Changing LED status

For more information

- DDR-less EtherCAT Slave on AMIC110 Reference Design: http://www.ti.com/tool/TIDEP-0105
- AMIC11x Device Product Overview: http://www.ti.com/processors/sitara/industrial-ethernet/amic11x/overview.html
- EVM Tool Folder: http://www.ti.com/tool/tmdxice110
- Processor SDK RTOS for AM335x: http://www.ti.com/tool/PROCESSOR-SDK-AM335X
- PRU-ICSS EtherCAT Slave software: http://www.ti.com/tool/PRU-ICSS-INDUSTRIAL-SW
- EtherCAT User Guide: http://processors.wiki.ti.com/index.php/PRU_ICSS_EtherCAT
- For questions about this training, refer to the E2E Community Forums for Sitara at http://e2e.ti.com/support/arm/sitara_arm/