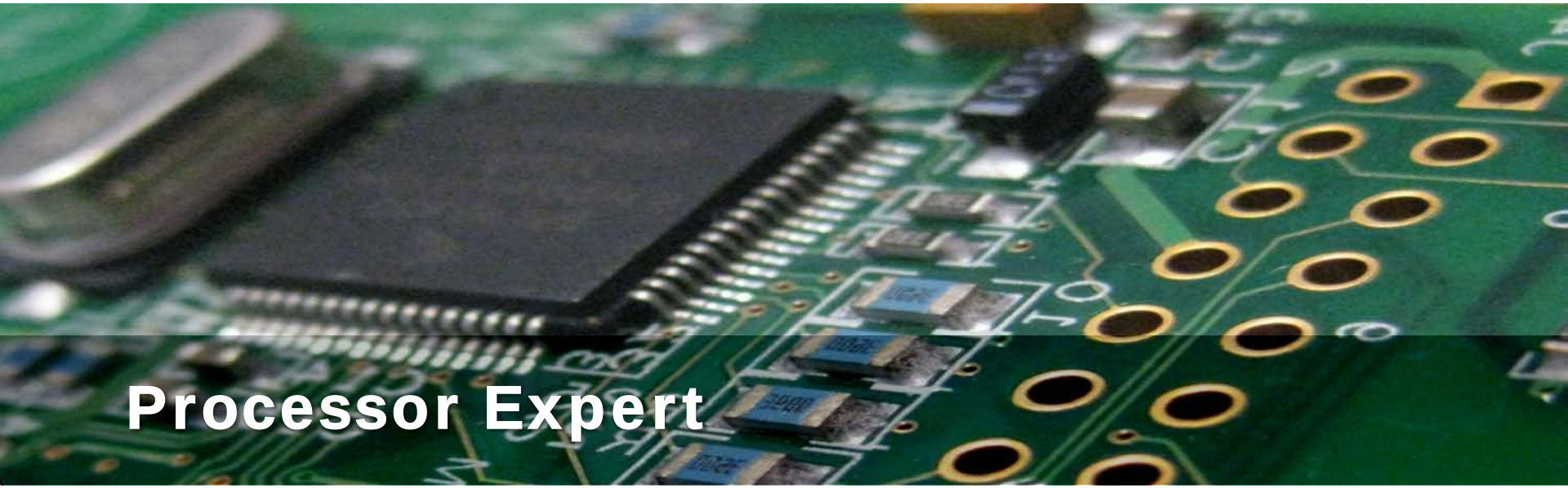
Lucerne University of
Applied Sciences and Arts
HOCHSCHULE
LUZERN
Technik & Architektur



Processor Expert

“We just have received these hardware kits. Have a look at them and see how you can use them to build up that demonstrator.”

Prof. Erich Styger
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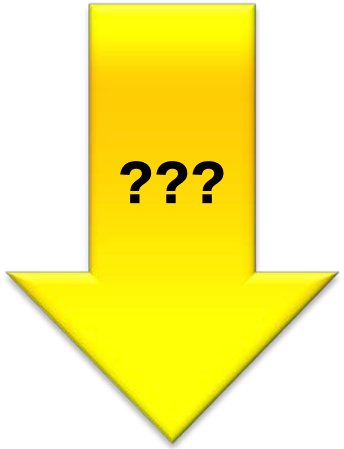
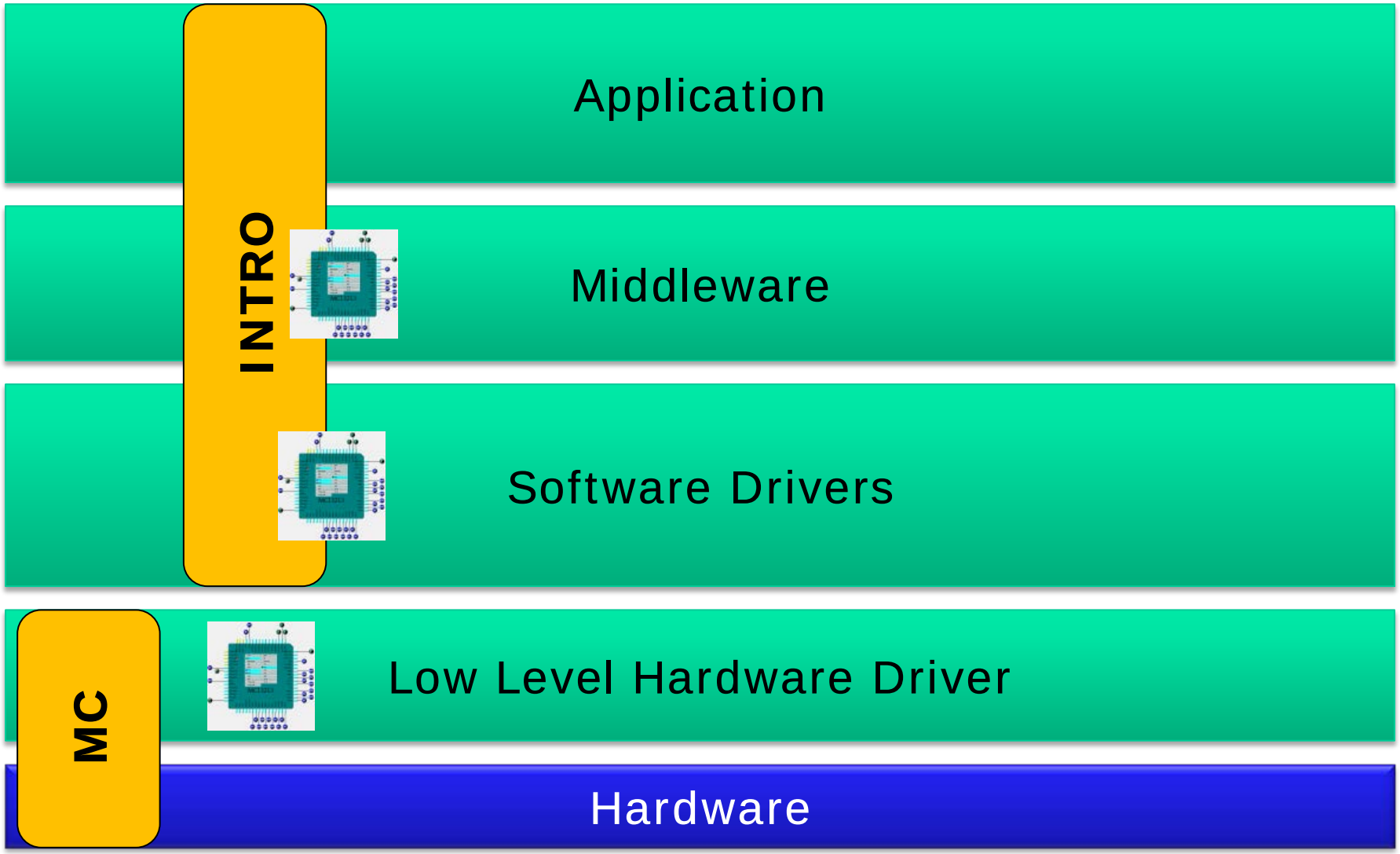
Learning Goals

- Problem: No time to deal with the very low level

- Processor Expert
  - Properties
  - Methods
  - Events
- Importing Packages
- Bit I/O, LED Component

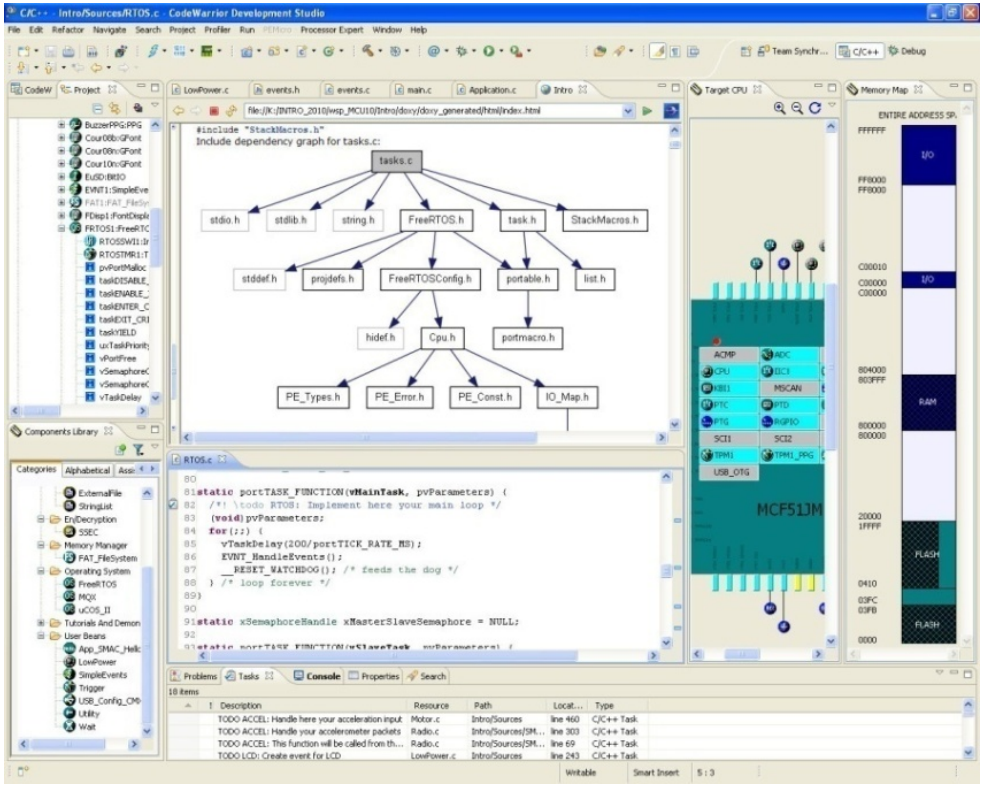


What to build on…



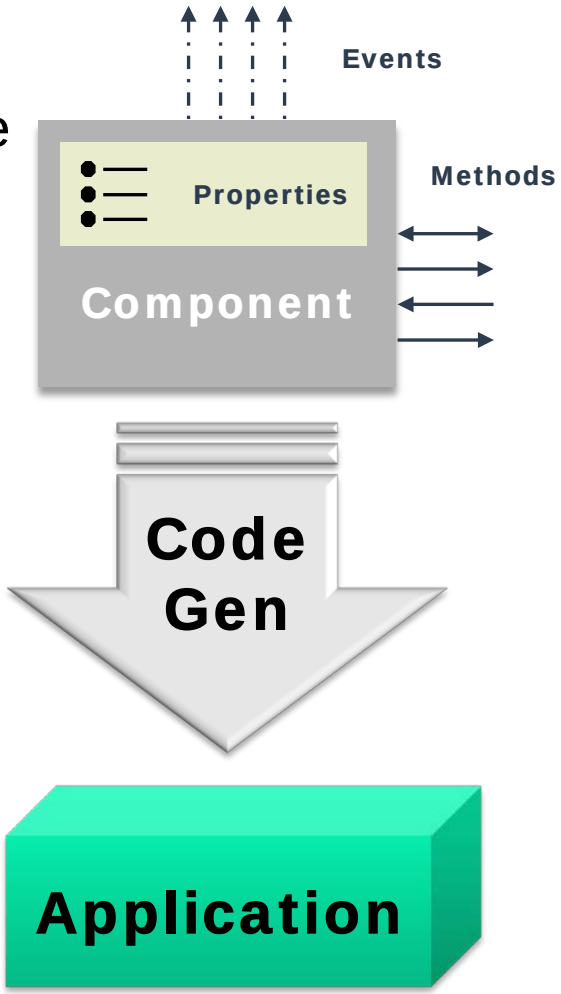
Eclipse with Processor Expert

- Rapid Application Generation Tool
- Embedded Software Components
- Source Code Driver
  - Properties
  - Methods
  - Events
  - Inheritance

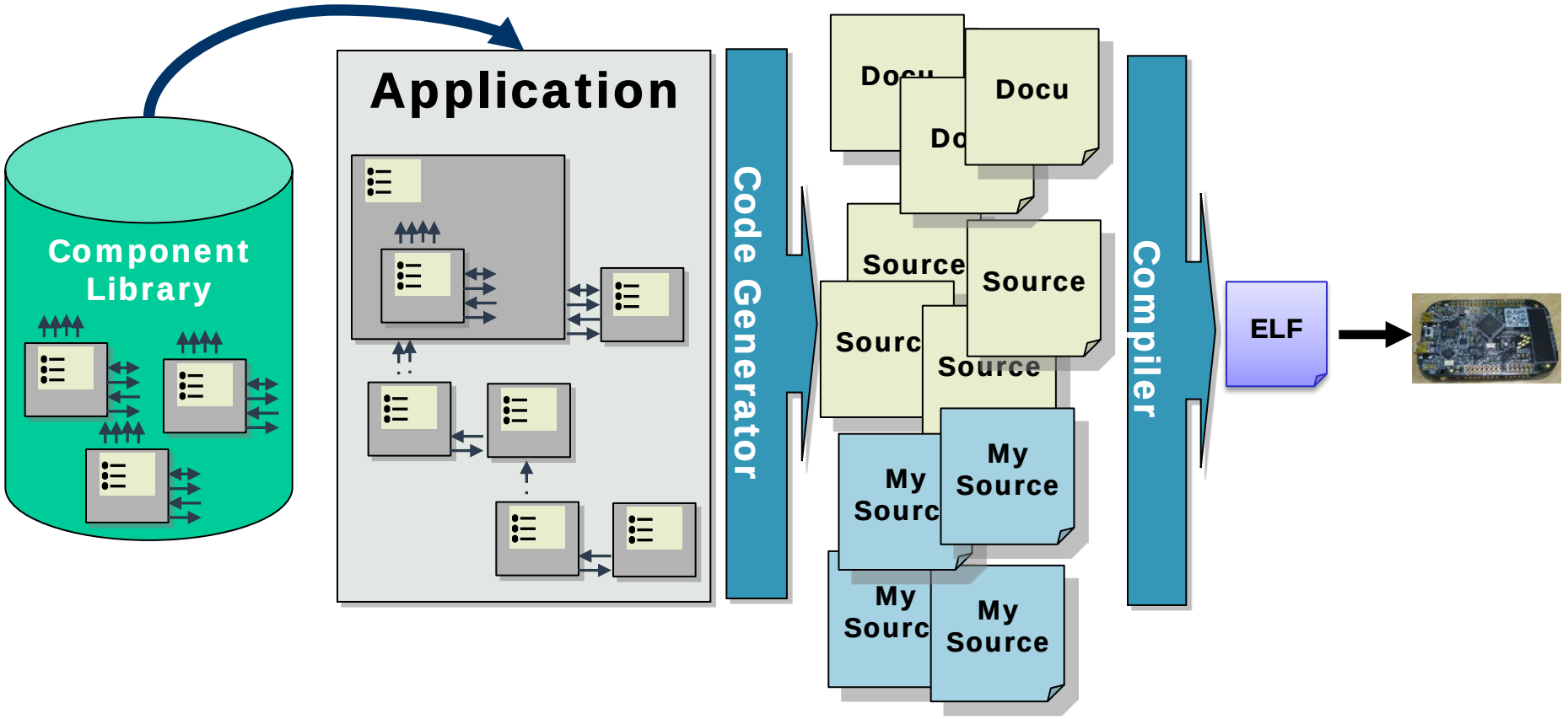


Embedded Components

- Component
  - Building block of an application
  - Implemented in a C like scripting language
  - Functionality separated into small objects
  - Components have interface (similar way classes have in object-oriented programming)
    - **Methods**
      - Procedures that can be executed
      - Function calls
    - **Events**
      - Indication of state changing
      - Usually implementation of ISRs
    - **Properties**
      - Modify/Customize object behavior
      - Set during design-time

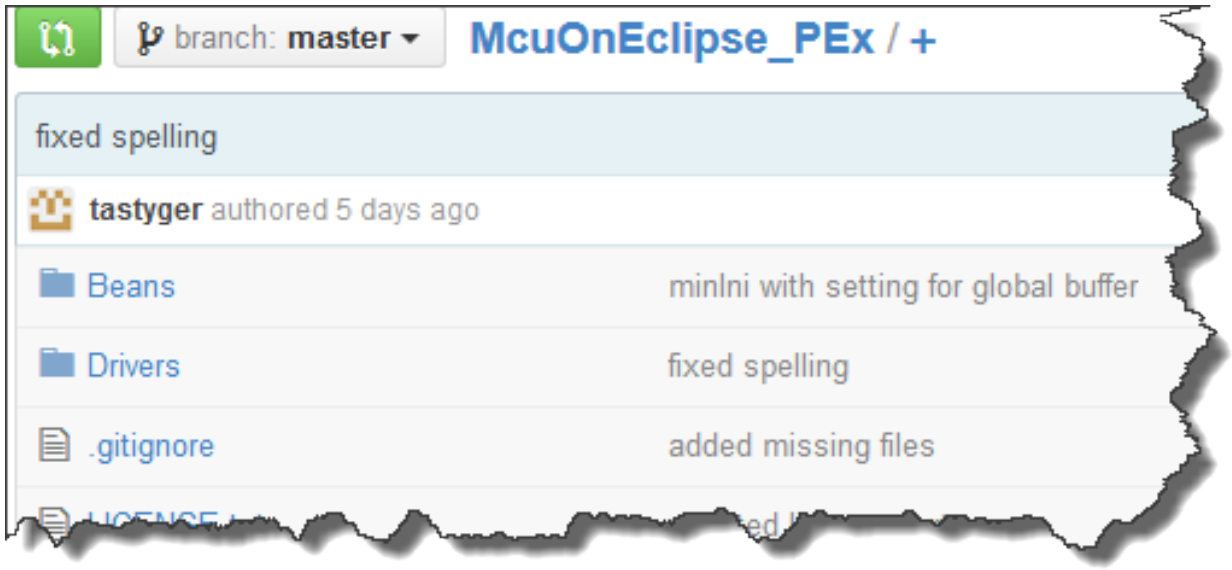


Component Model Development Flow



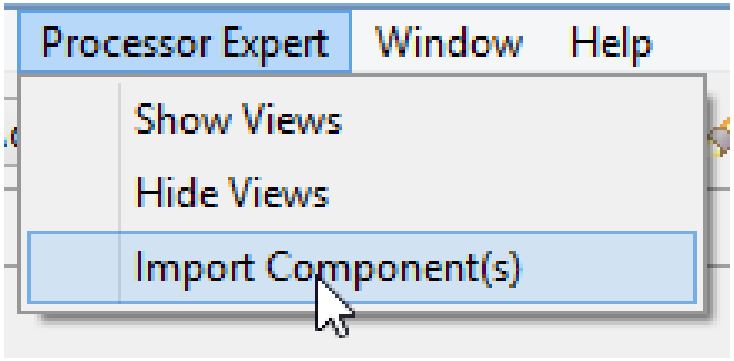
Public GitHub Repository

- Git Repository:
  https://github.com/ErichStyger/McuOnEclipse_PEx
  - Open source/public components
- http://mcuoneclipse.com/2014/11/16/mcuoneclipse-component-sources-in-dedicated-github-repository/



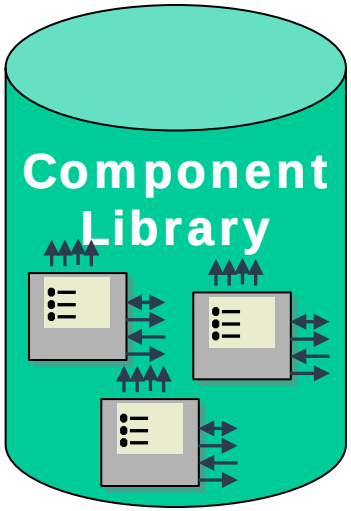
Importing Components

- As *.PEupd file(s)
- https://sourceforge.net/projects/mcuoneclipse/files/PEx%20Components/
- Packages (special archive files)
- Import the *.PEupd files



Component Library

- Add to project
  - Double Click
  - Context menu
  - Drag&Drop



Components Library

Alphabetical | Categories | Processors | Board Configurations

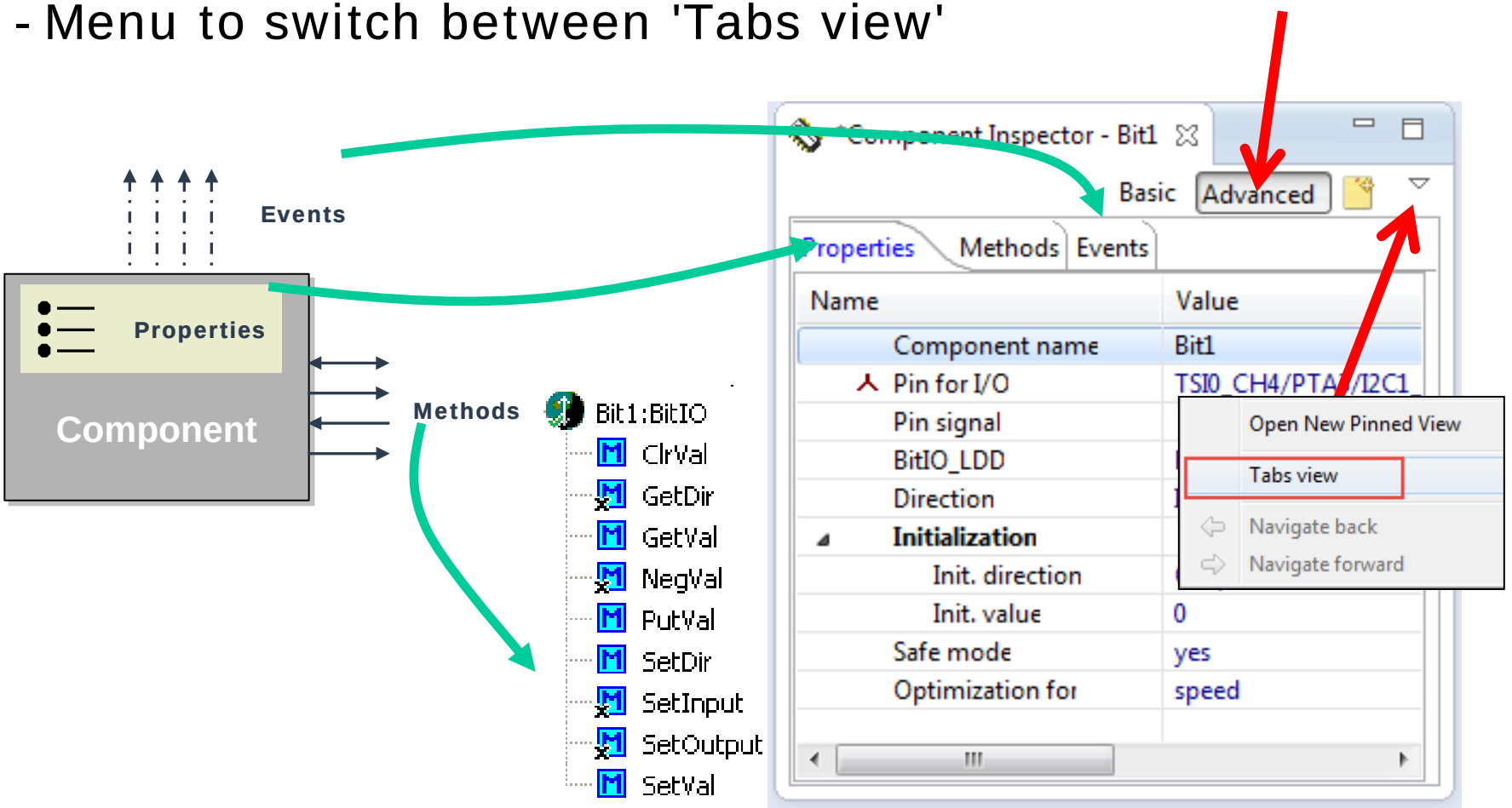
All repositories | All

Component	Component Repository	Description
24AA_EEPROM	Legacy User Components	Microchip 24AA Serial EEPROM
74HC164	Legacy User Components	74HC164 Shift Register
74HC595	Legacy User Components	Driver for the 74HC595 Shift Regis
ADC	Kinetis	A/D Converter - Legacy High Leve
ADC_LDD	Kinetis	A/D Converter - Logical Device Dr
AnalogComp_LDD	Kinetis	Analog Comparator - Logical Dev
App_SMAC_Hello	Legacy User Components	Simple SMAC 'Hello' Application
ASRC_LDD	Kinetis	Asynchronous Sample Rate Conv
AsynchroSerial	Kinetis	Asynchronous Serial Communica
AT25HP512	Legacy User Components	Driver for SPI EEPROM AT25HP51
Bareboard	Kinetis	Bareboard RTOS Adapter - RTOS
BasicProperties	Kinetis	This component is example of ba
BitIO	Kinetis	General 1-bit Input/Output - Lega
BitIO_LDD	Kinetis	General 1-bit Input/Output - Logi
BitIO_to_PCA9554	Legacy User Components	Bit-IO to a PCA I/O-Expander bit
BitsIO	Kinetis	General Multi-Bits Input/Output (
BitsIO_LDD	Kinetis	General Multi-Bits Input/Output (
Bluetooth_EGBT	Legacy User Components	Driver for Bluetooth Modules (like
BootLoaderDisk	Legacy User Components	Bootloader Disk
BootLoaderUSB	Legacy User Components	Bootloader USB Port
ByteIO	Kinetis	General Byte Input/Output (8 bits)

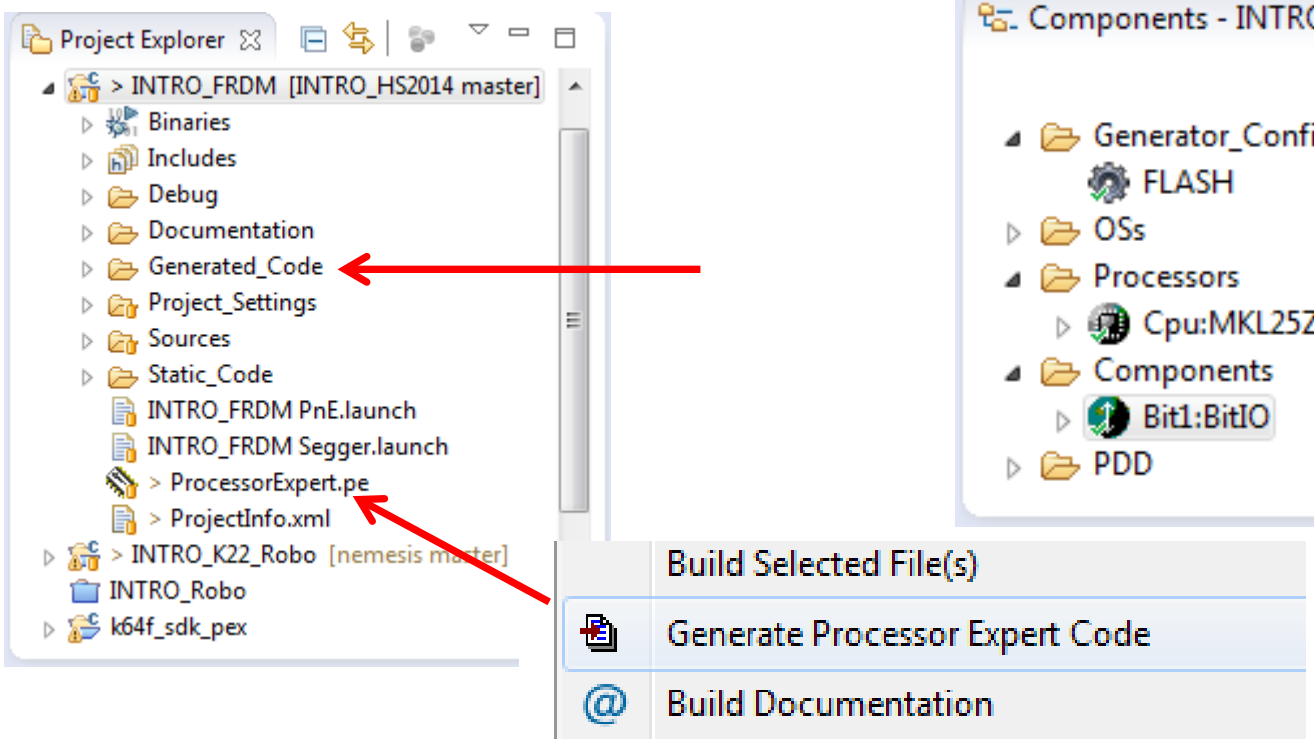
Filtering disabled, active project FRDM-KL25Z_Master

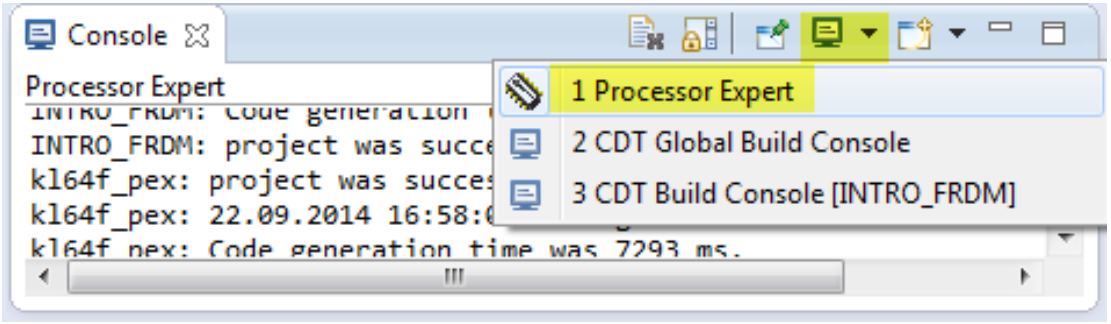
Component Inspector

- Context menu on component to open Inspector
- Menu to switch between 'Tabs view'



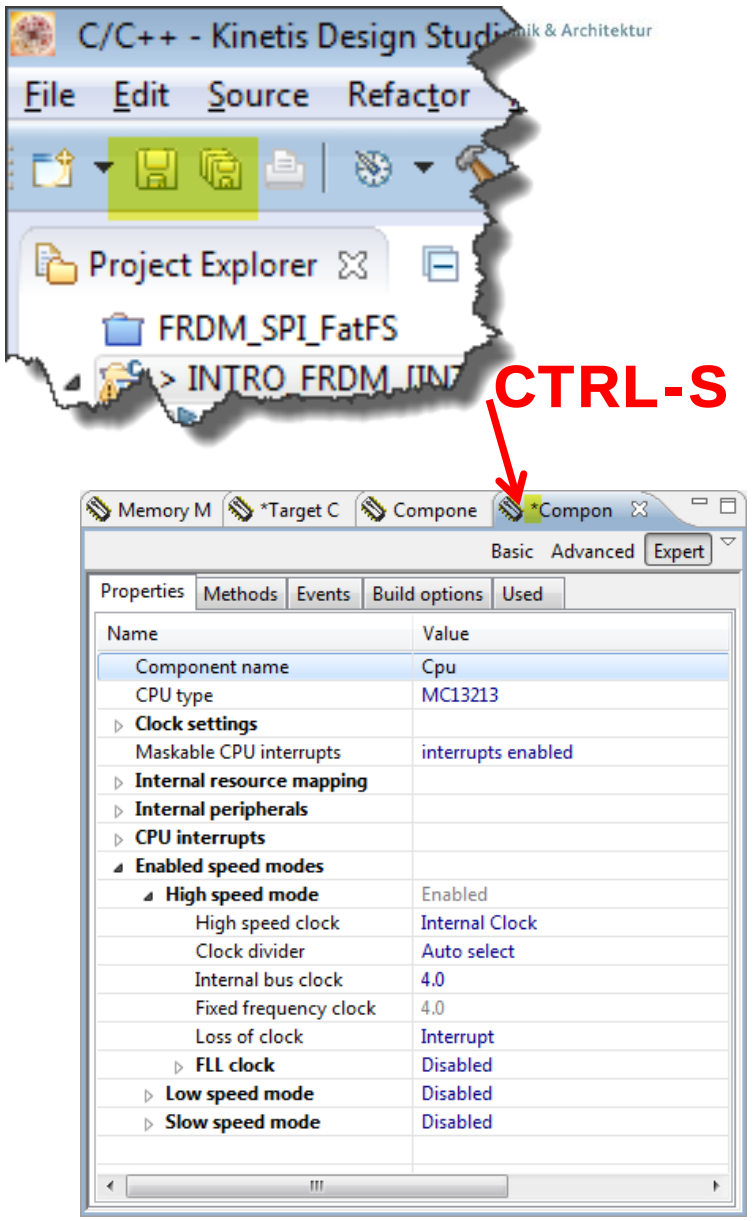
Generating Code





Saving Component Settings

- * indicates settings not saved yet
- CTRL-S/Save all
- XML file: ProcessorExpert.pe
- IMPORTANT VCS NOTE
  - Agree on group change in advance!
  - User A: Commit/Push
  - User B: Closes project, (removes *.pe file), then pulls file
  - Otherwise: merge ☹



BitIO Component

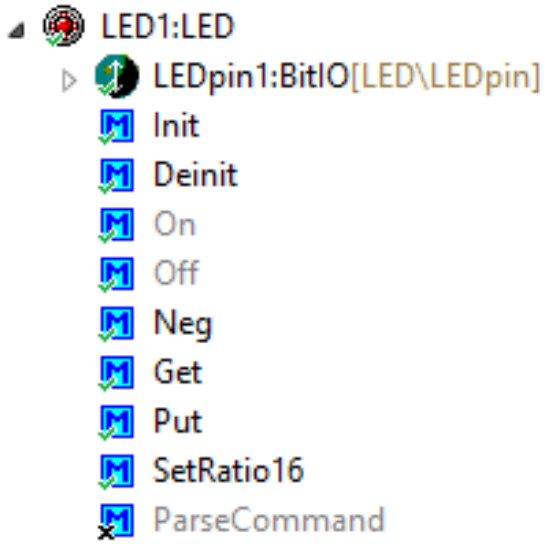
- BitIO:
  - Input
  - Output
  - Input/Output
- Name signals!

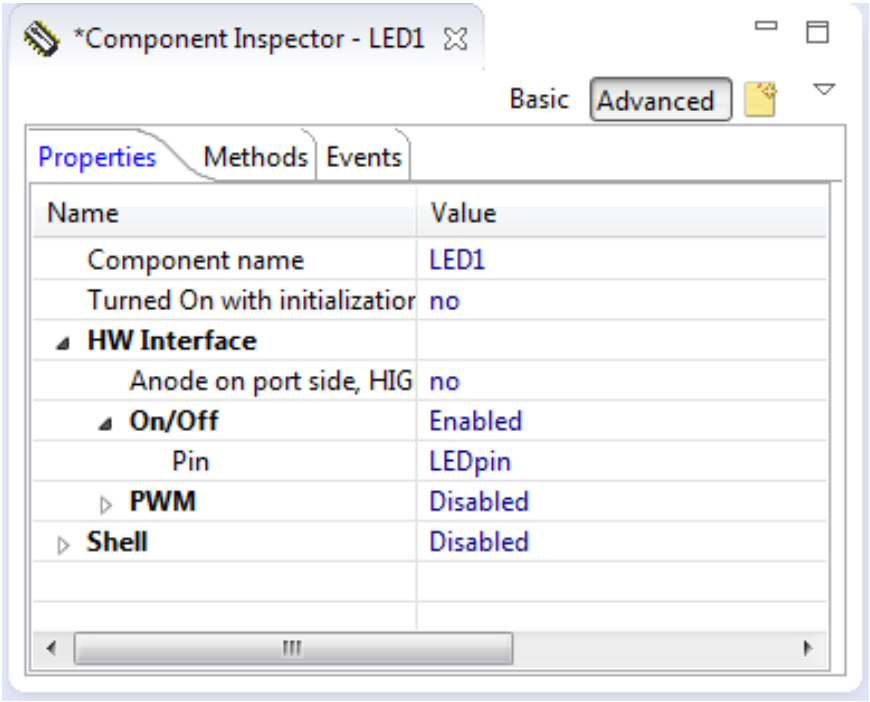
Properties | Methods | Events

Name	Value
Component name	LED1
Pin for I/O	PTD4_TPM2CH1
Pin signal	LED1
Pull resistor	autoselected pull
Open drain	push-pull
Slew rate control for PTD4	no
Direction	Output
Initialization	
Init. direction	Output
Init. value	1
Safe mode	yes
Optimization for	speed

LED Component

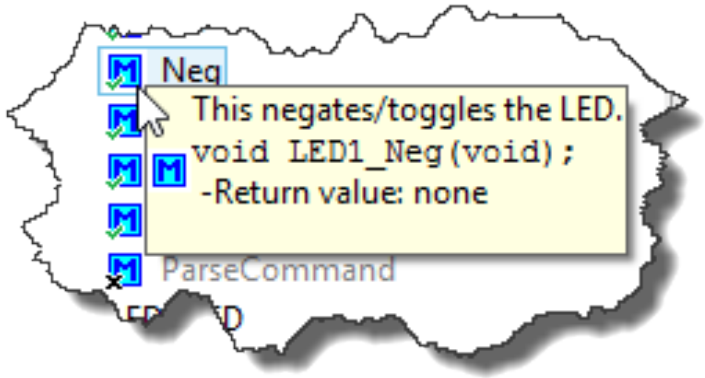
- Inherits BitIO Component
- Implements Cathode/Anode setting
- Additionally
  - PWM
  - Shell/Console

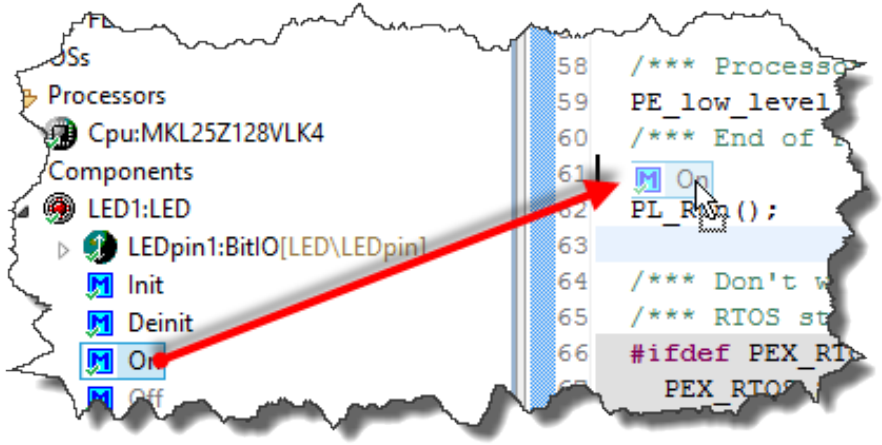


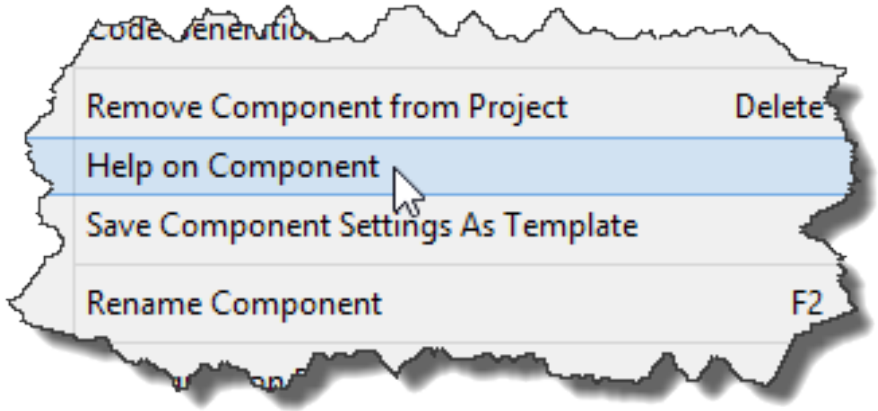


Tips: Using Components

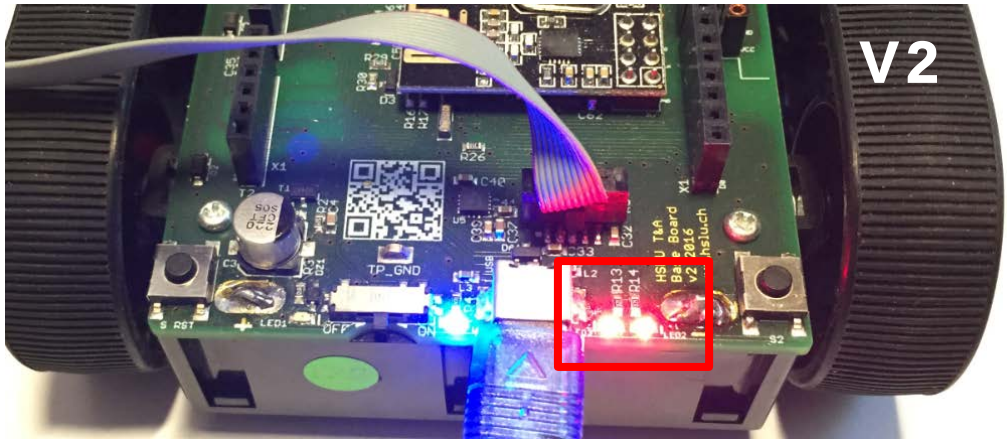
- Tool Tip
- Help on Component context menu
- Drag&Drop of methods

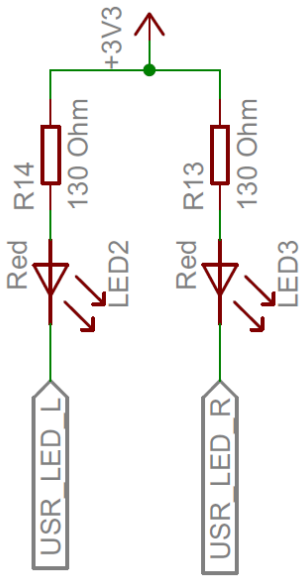


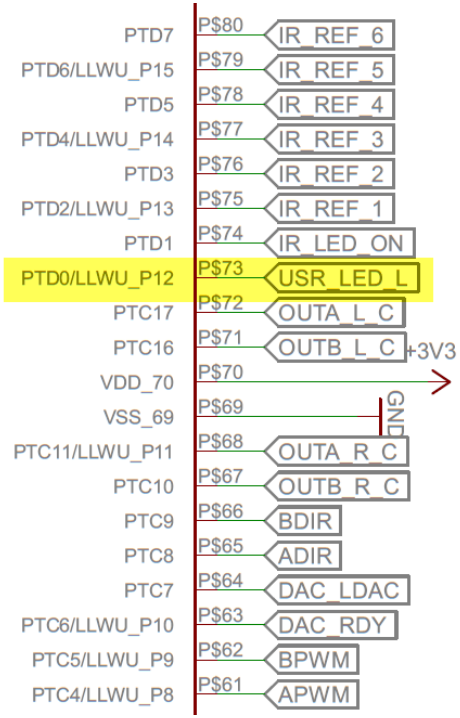


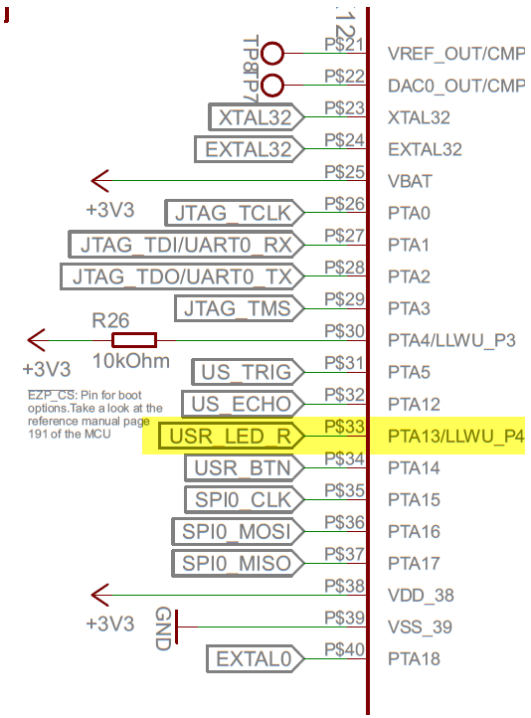


Robot LED

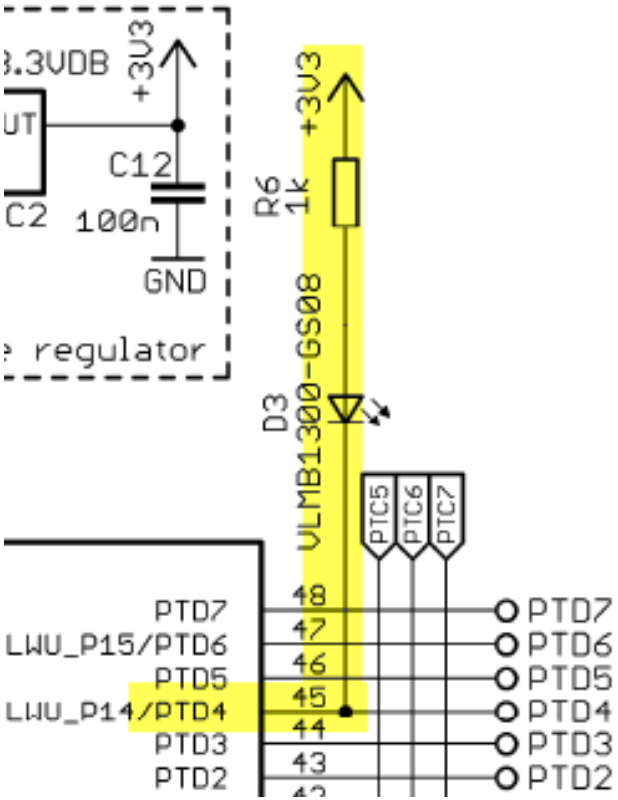

V2

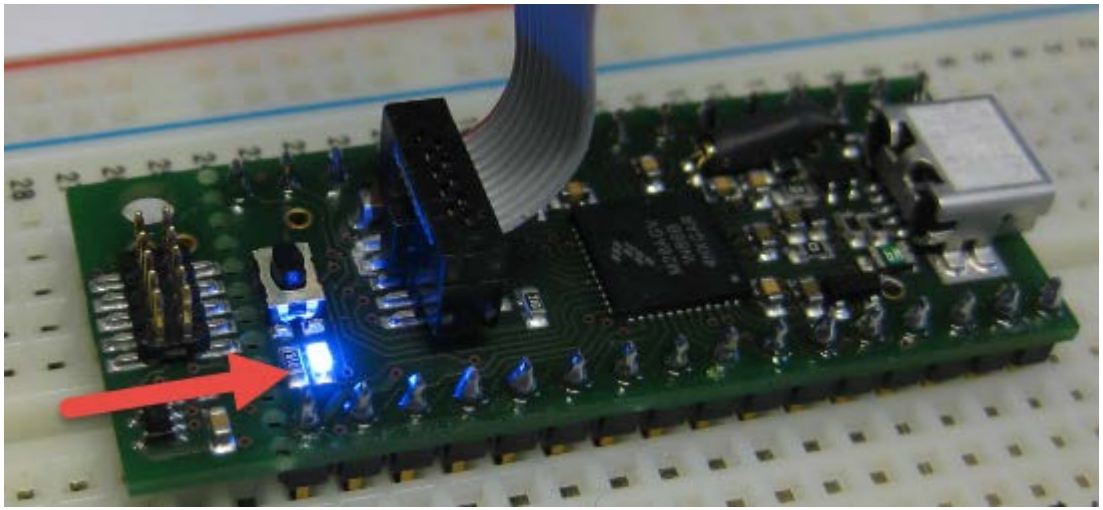

+3V3
R14
130 Ohm
R13
130 Ohm
Red
LED2
Red
LED3
USR_LED_L
USR_LED_R


PTD7 P$80 IR_REF_6
PTD6/LLWU_P15 P$79 IR_REF_5
PTD5 P$78 IR_REF_4
PTD4/LLWU_P14 P$77 IR_REF_3
PTD3 P$76 IR_REF_2
PTD2/LLWU_P13 P$75 IR_REF_1
PTD1 P$74 IR_LED_ON
PTD0/LLWU_P12 P$73 USR_LED_L
PTC17 P$72 OUTA_L_C
PTC16 P$71 OUTB_L_C
VDD_70 P$70 +3V3
VSS_69 P$69 GND
PTC11/LLWU_P11 P$68 OUTA_R_C
PTC10 P$67 OUTB_R_C
PTC9 P$66 BDIR
PTC8 P$65 ADIR
PTC7 P$64 DAC_LDAC
PTC6/LLWU_P10 P$63 DAC_RDY
PTC5/LLWU_P9 P$62 BPWM
PTC4/LLWU_P8 P$61 APWM


P$21 VREF_OUT/CMP
P$22 DAC0_OUT/CMP
XTAL32 P$23 XTAL32
EXTAL32 P$24 EXTAL32
P$25 VBAT
+3V3 JTAG_TCLK P$26 PTA0
JTAG_TDI/UART0_RX P$27 PTA1
JTAG_TDO/UART0_TX P$28 PTA2
JTAG_TMS P$29 PTA3
R26 P$30 PTA4/LLWU_P3
+3V3 10kOhm US_TRIG P$31 PTA5
EZP_CS: Pin for boot options.Take a look at the reference manual page 191 of the MCU
US_ECHO P$32 PTA12
USR_LED_R P$33 PTA13/LLWU_P4
USR_BTN P$34 PTA14
SPI0_CLK P$35 PTA15
SPI0_MOSI P$36 PTA16
SPI0_MISO P$37 PTA17
P$38 VDD_38
+3V3 GND P$39 VSS_39
EXTAL0 P$40 PTA18

tinyK20 LED: Remote

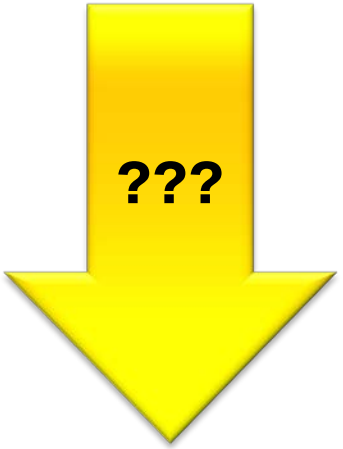




Summary

- *Problem: No time to deal with the very low level*

- Processor Expert
  - Properties
  - Methods
  - Events
- Bit I/O, LED
- Adding components
- Be careful with PEx Files and VCS



Lab: Processor Expert

- Import Processor Expert Components from SourceForge
- Explore user interface
- Addint BitIO component
  - Robot: PTD0, PTA13
  - Remote/tinyK20: PTD4
- Practice sharing PE project settings