

Quick start guide

27 Jan 2026

public

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Introduction



Compact 3-phase motor drive system solution

Designed for **Hall sensor** motor control

Spin your motor with easy-to-use GUI for tuning of motor

The hardware board and motor control software provides:

- Hall sensor based trapezoidal control
- Hall learning for identifying PWM pattern
- Over-current protection
- Speed controlled using GUI

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System overview

Components

- **XCM1402 Microcontroller**
  - Includes J-Link debug interface by Segger
  - Feature 32 KB flash, 16 KB RAM
  - Industrial control, POSIF, CCU8, CCU4
- **Smart gate driver 6EDL7141**
- **OptiMOS™ 7 ISCH57N04NM7VSC**
  - OptiMOS™ 7 motor-drive optimized MOSFET
  - 0.57 mΩ $R_{DS(on)-max}$
  - Duel-side cooling

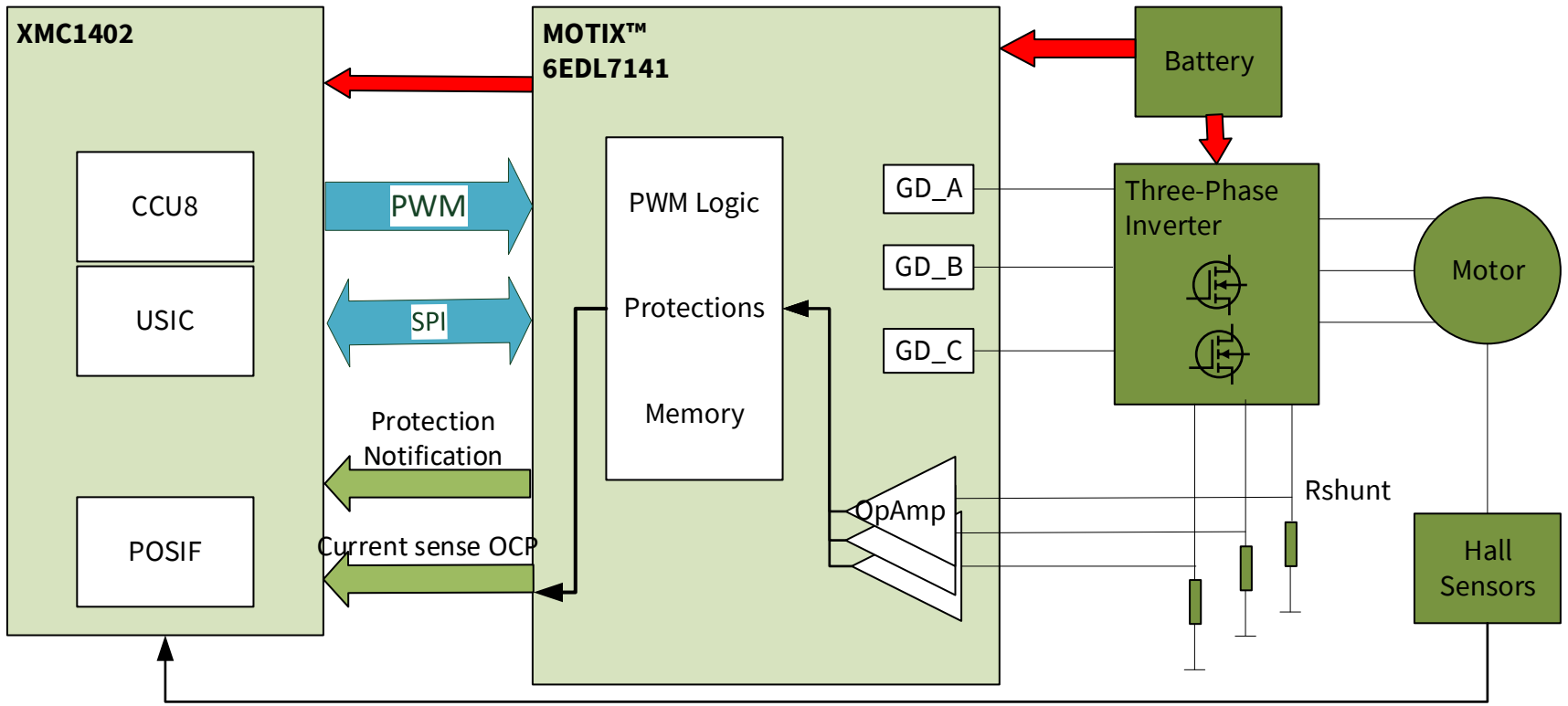
Software package

- ModusToolbox™ MotorSuite
- ModusToolbox™ Software

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System overview

Block diagram description:



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Hardware overview

- **Kit name**
  - REF_18VDC_MTRC
- **Kit description**
  - REF_18VDC_MTRC board
  - USB cable
  - KIT_XMC_LINK_SEGGER_V1 – Isolated Debug Probe
- **Order number**
  - SP006273876
- **Input voltage/output power**
  - 18 V DC (nominal) / 820 W (peak)

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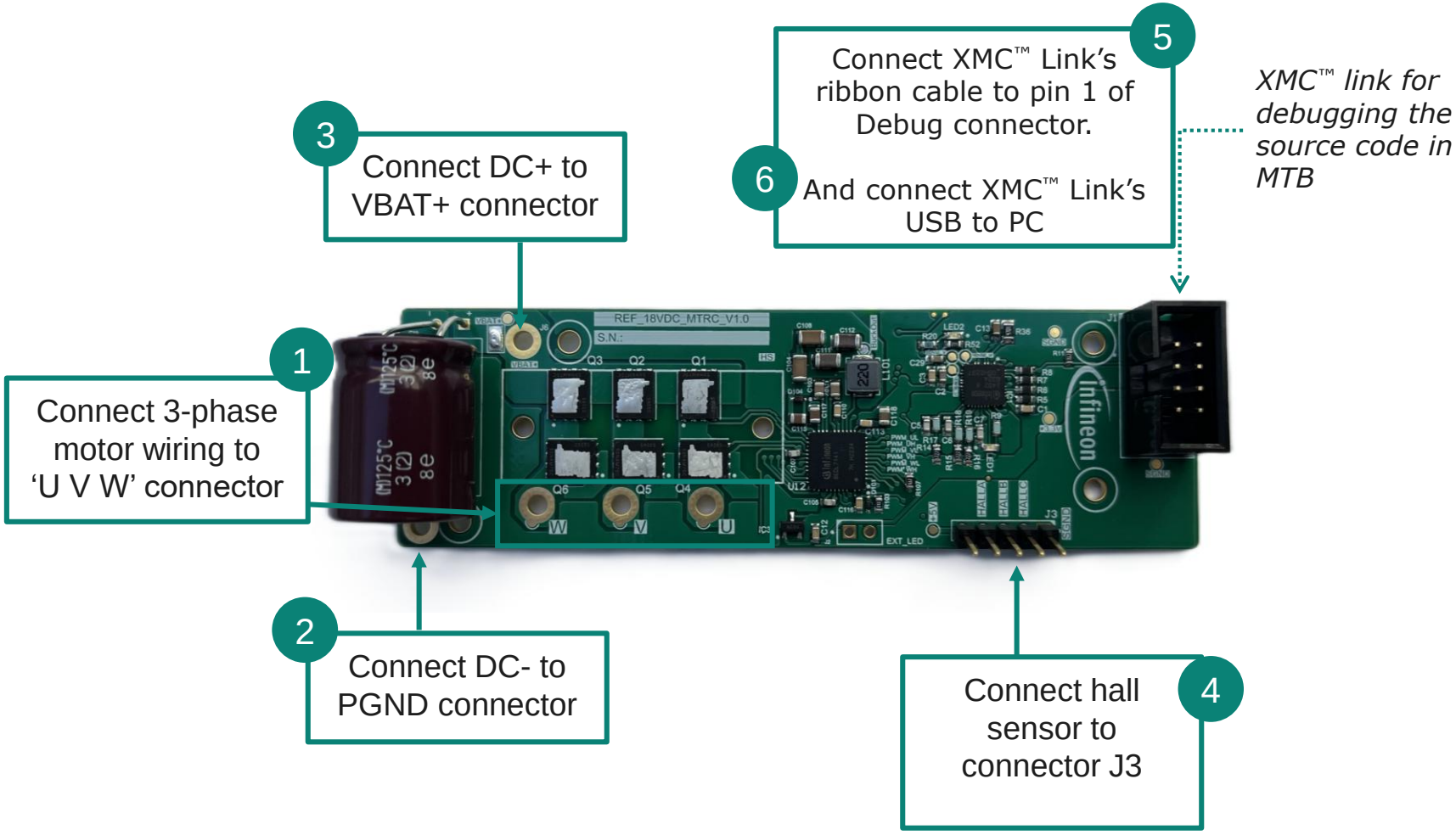
Hardware overview

Infineon parts utilized on REF_18VDC_MTRC board:	
Infineon Parts	Order Number
XMC1402 Microcontroller	XMC1402-Q040X0032
Smart gate driver	6EDL7141
OptiMOS™ 7 Power-Transistor 40 V	ISCH57N04NM7VSC

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Hardware overview

To properly setup the board, follow these steps:



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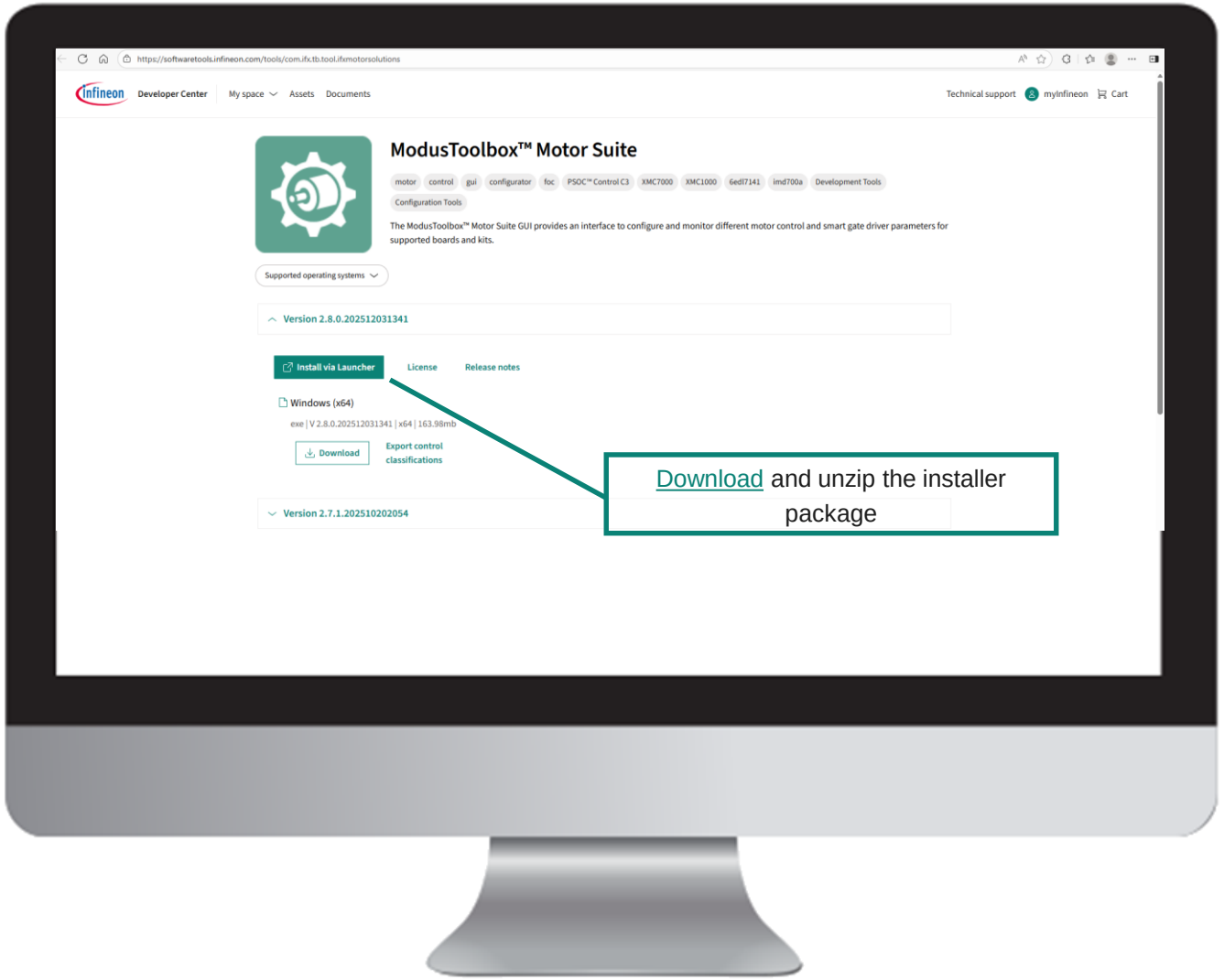
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ModusToolbox™ Software



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ModusToolbox™ Motor Suite



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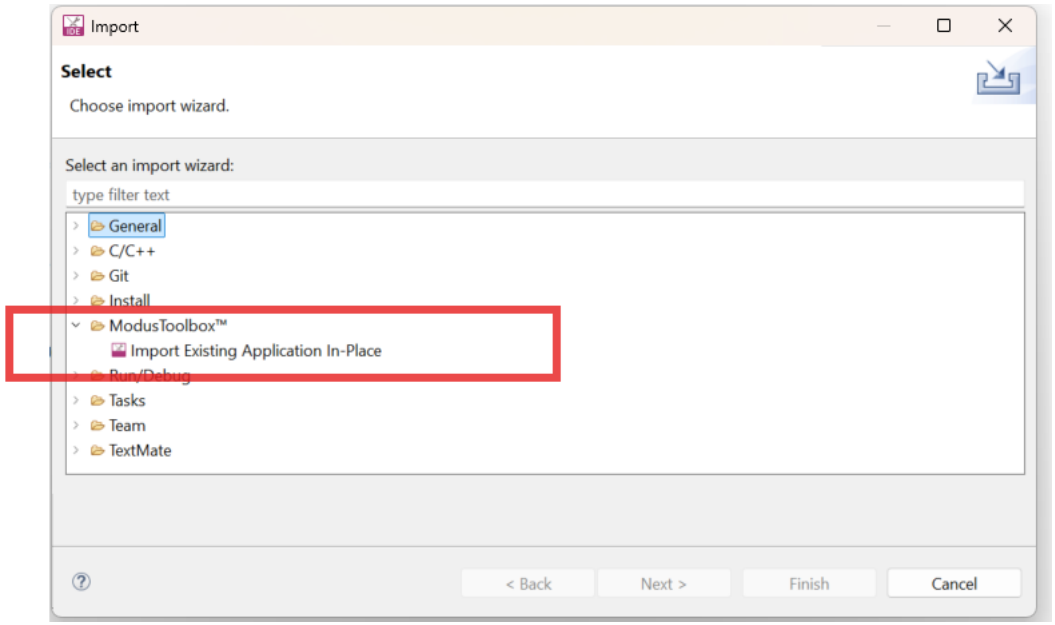
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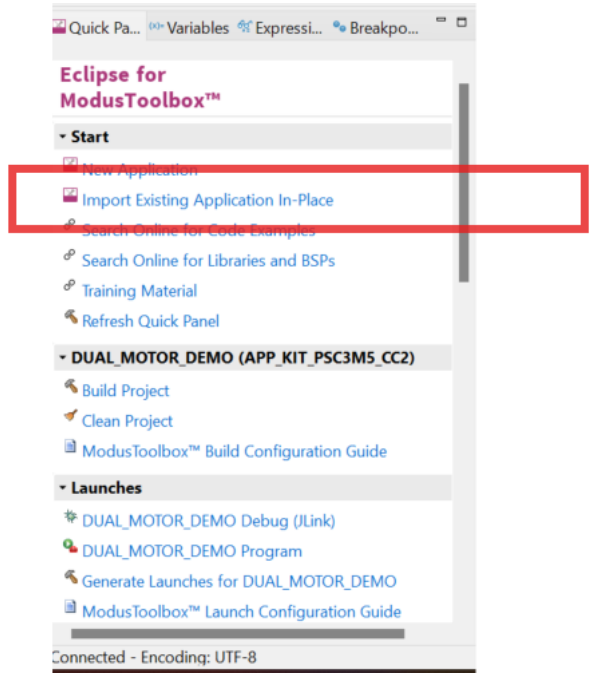
Import source project

- Click on File → Import to import project folder into IDE
- Choose the project source path accordingly

OR

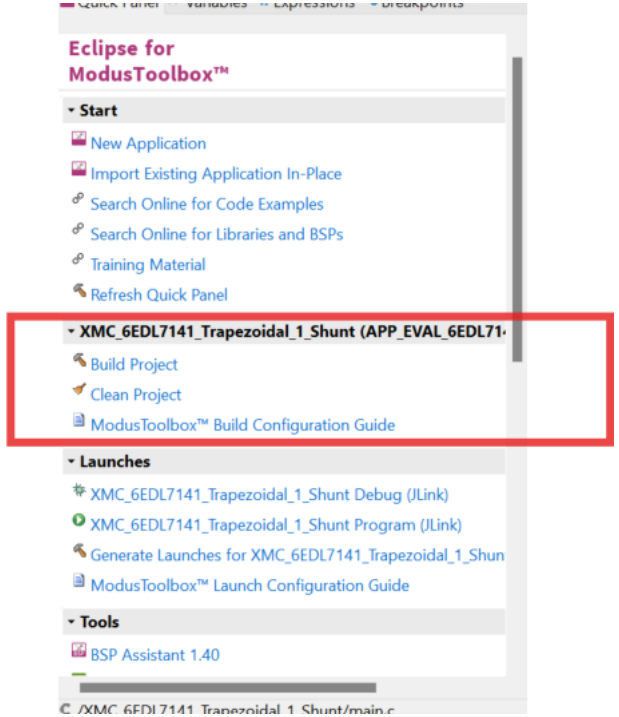
- At the Quick Panel tab near left bottom corner, click on “Import Existing Application In-Place”



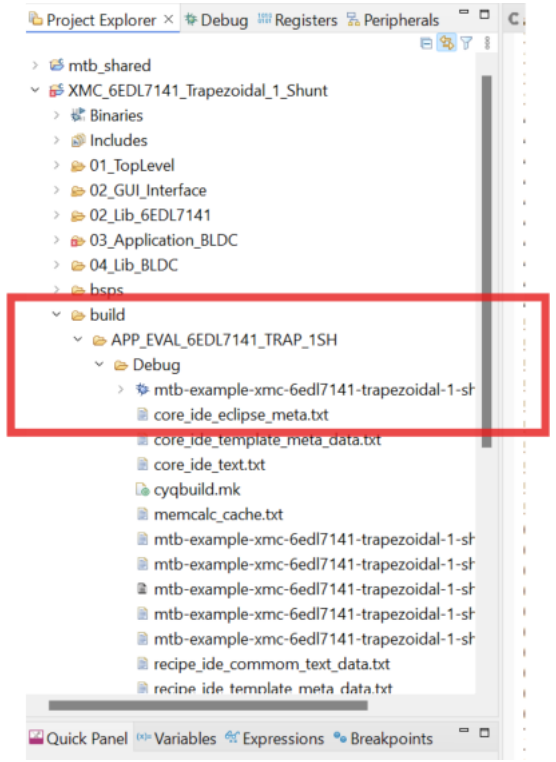


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Build/compile project







- The result of project build is shown in **build folder** as .elf and .hex file

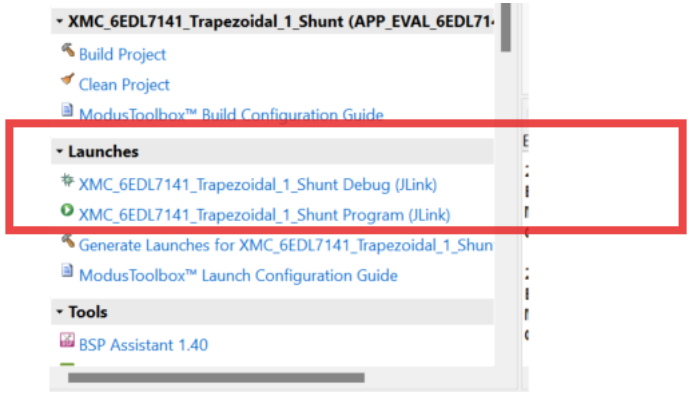
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Load .elf file to MCU

Method 1: Use ModusToolbox™ Motor Suite (Refer to next slide)

Method 2: Using ModusToolbox™ JLink Debug

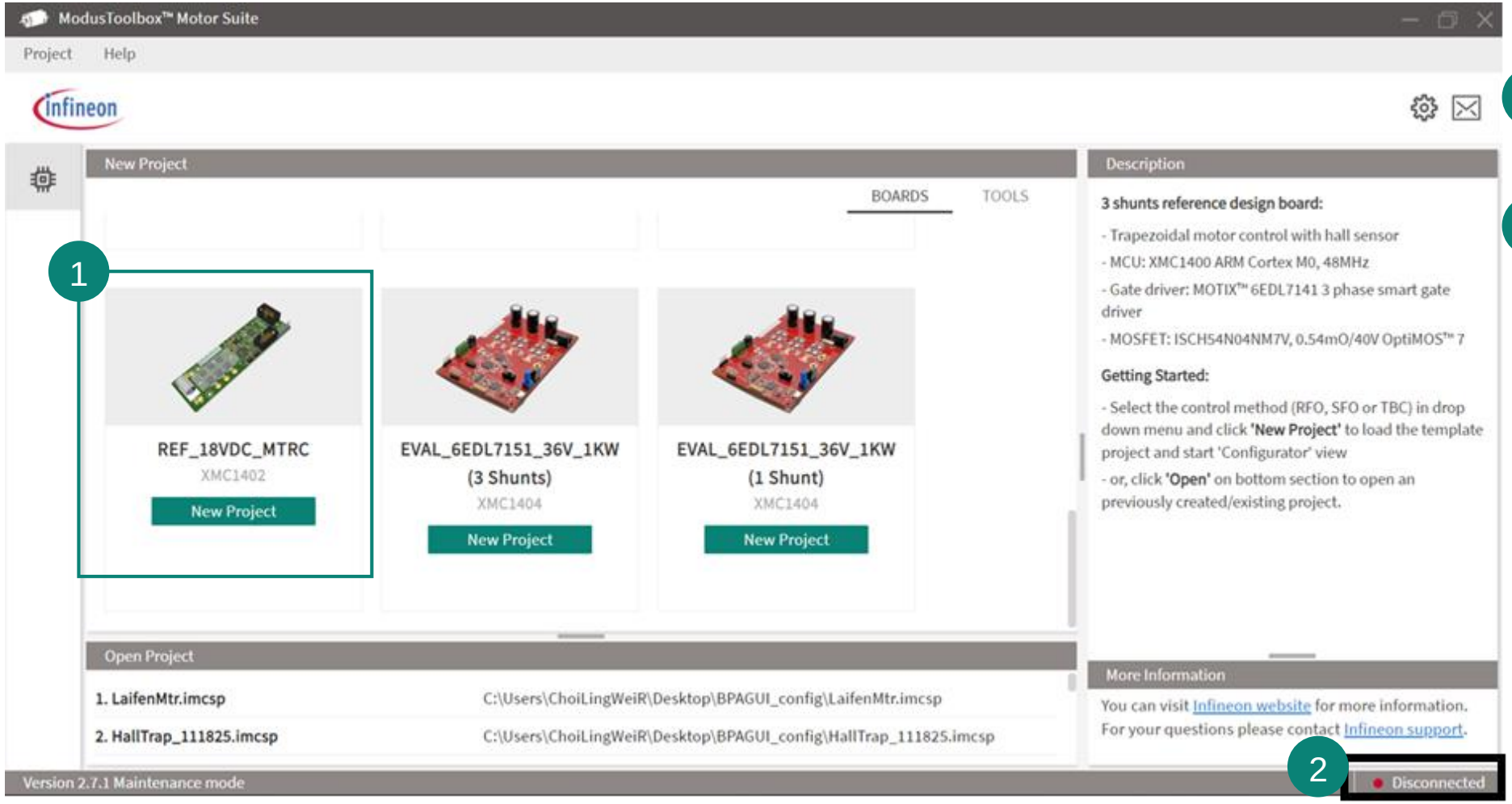
Note: In case don't see the option Debug(JLink), click on ***Generate Launches for XMC_6EDL7141_***...



** In order to verify if firmware is successfully loaded and run, LED1 should blink to indicate control loop is running.

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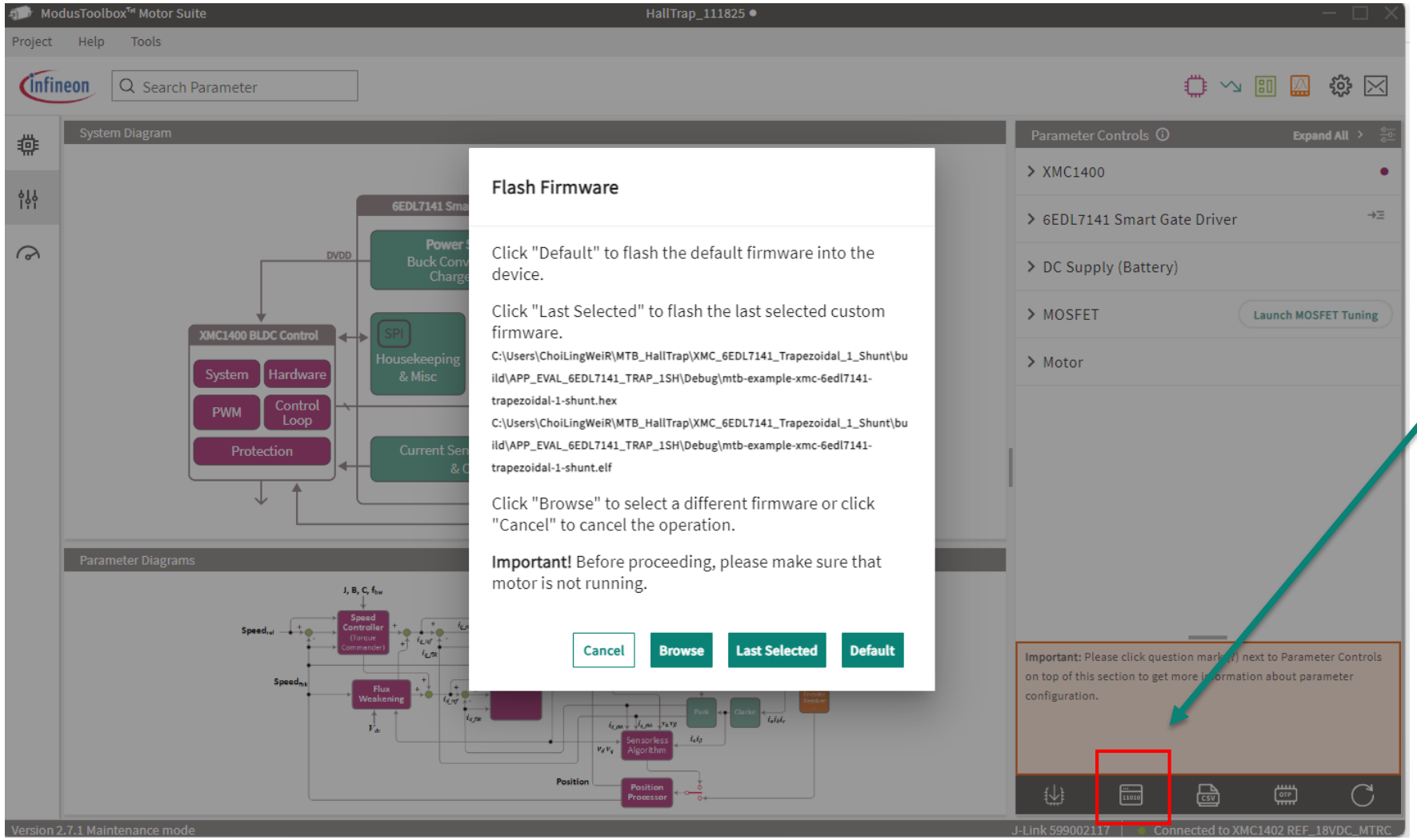
ModusToolbox™ Motor Suite



1. Click on the New Project under REF_18VDC_MTRC
2. Plug in the usb debugger and choose the device id to connect
   - **If** it is not automatically connected

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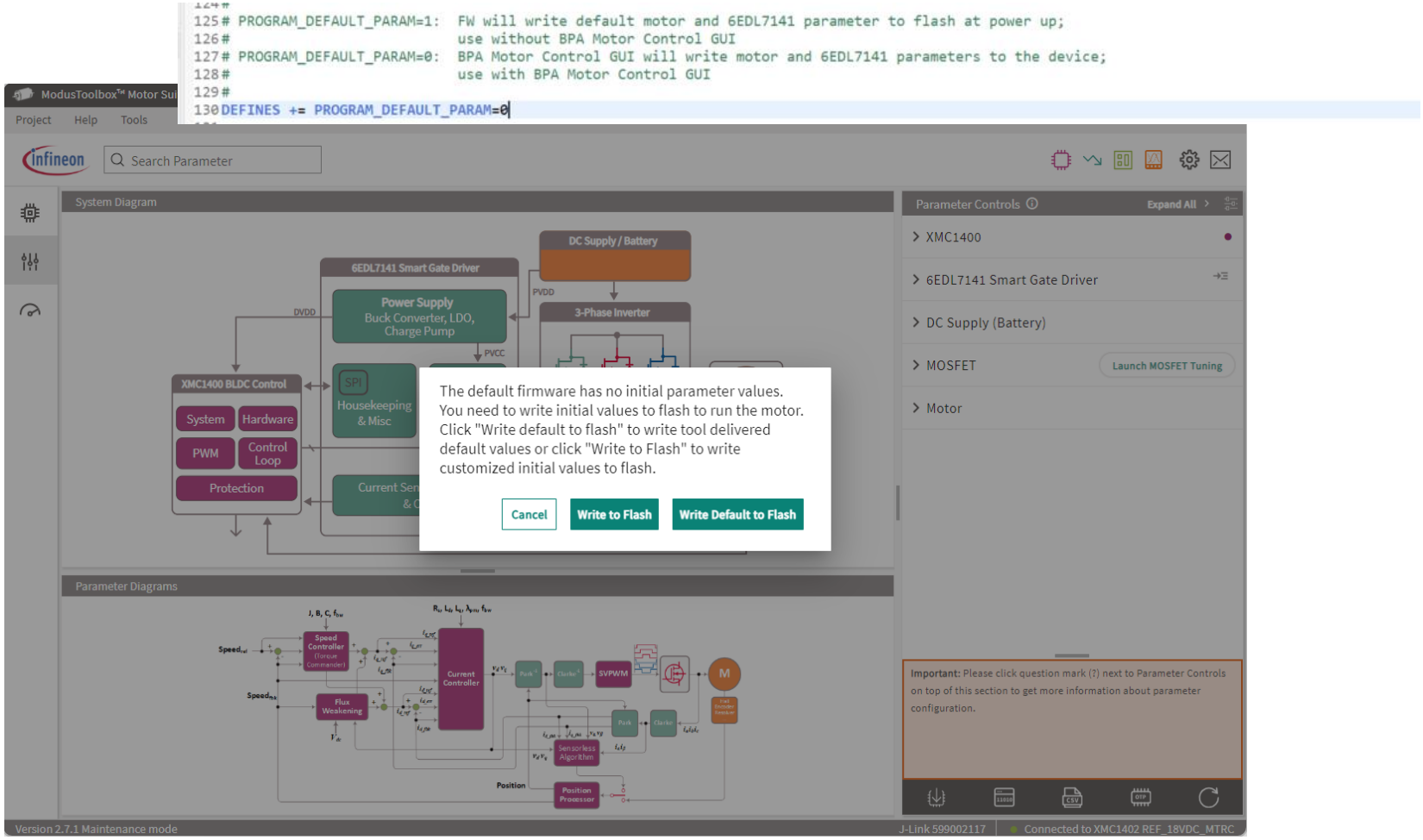
Flash firmware



- Click on the symbol in red box
- This bring up Flash Firmware window,
- Browse to file location which contain .elf and .hex files built
- If the location of the files are same as your last attempt to flash firmware, choose “Last Selected”

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Initial parameter values

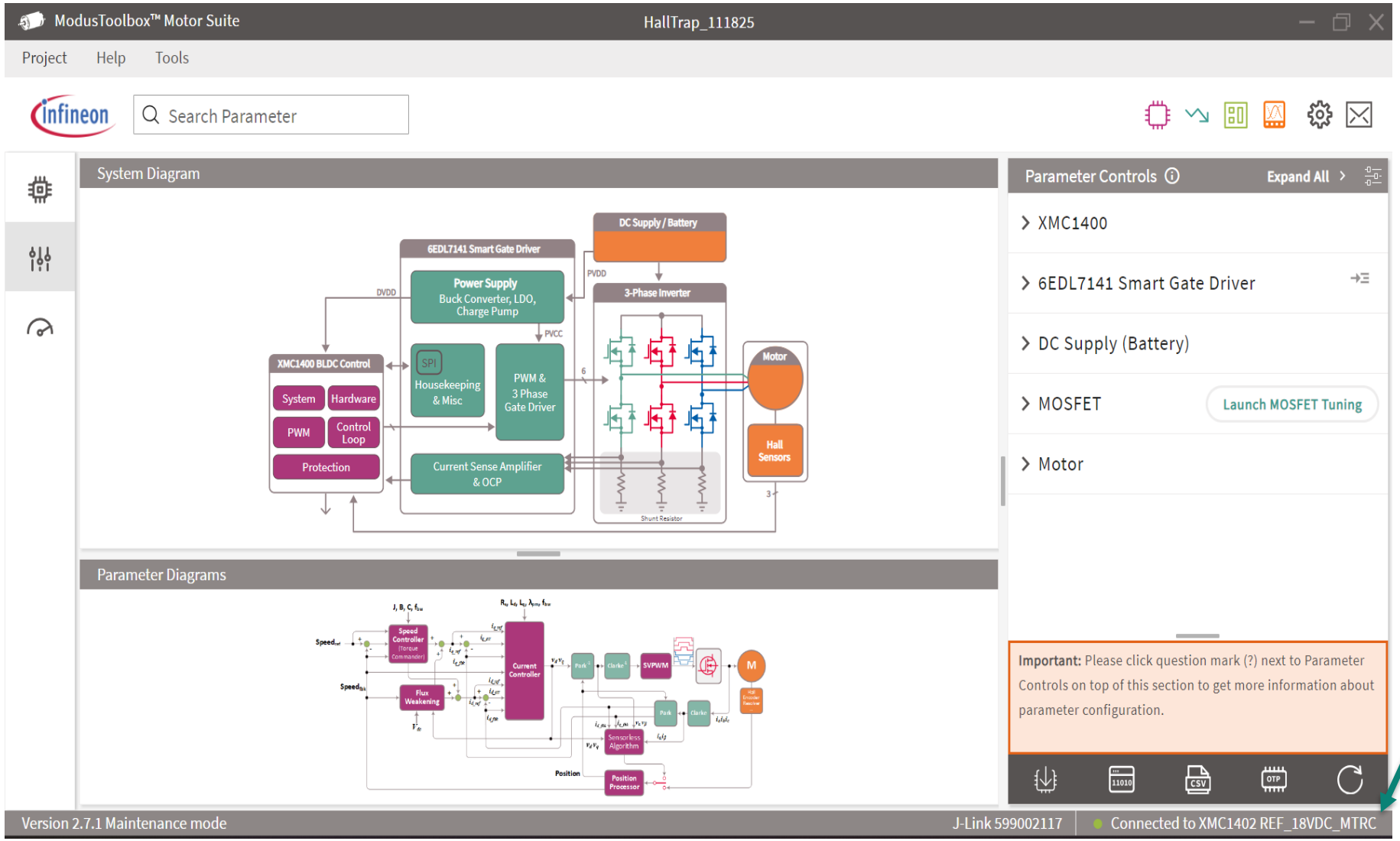


- If using Motor Suite GUI for settings initial parameters, set the **PROGRAM_DEFAULT_PARAM** to 0 in Makefile, and rebuilt firmware.
- Click on Write to Flash to write the parameter value configured in Motor Suite GUI to target device

- In case user prefer to write default initial parameter values set in firmware, set the **PROGRAM_DEFAULT_PARAM** to 1 in Makefile, and rebuilt firmware.
- Click Cancel to avoid GUI parameter value overwrite the default initial values set in firmware

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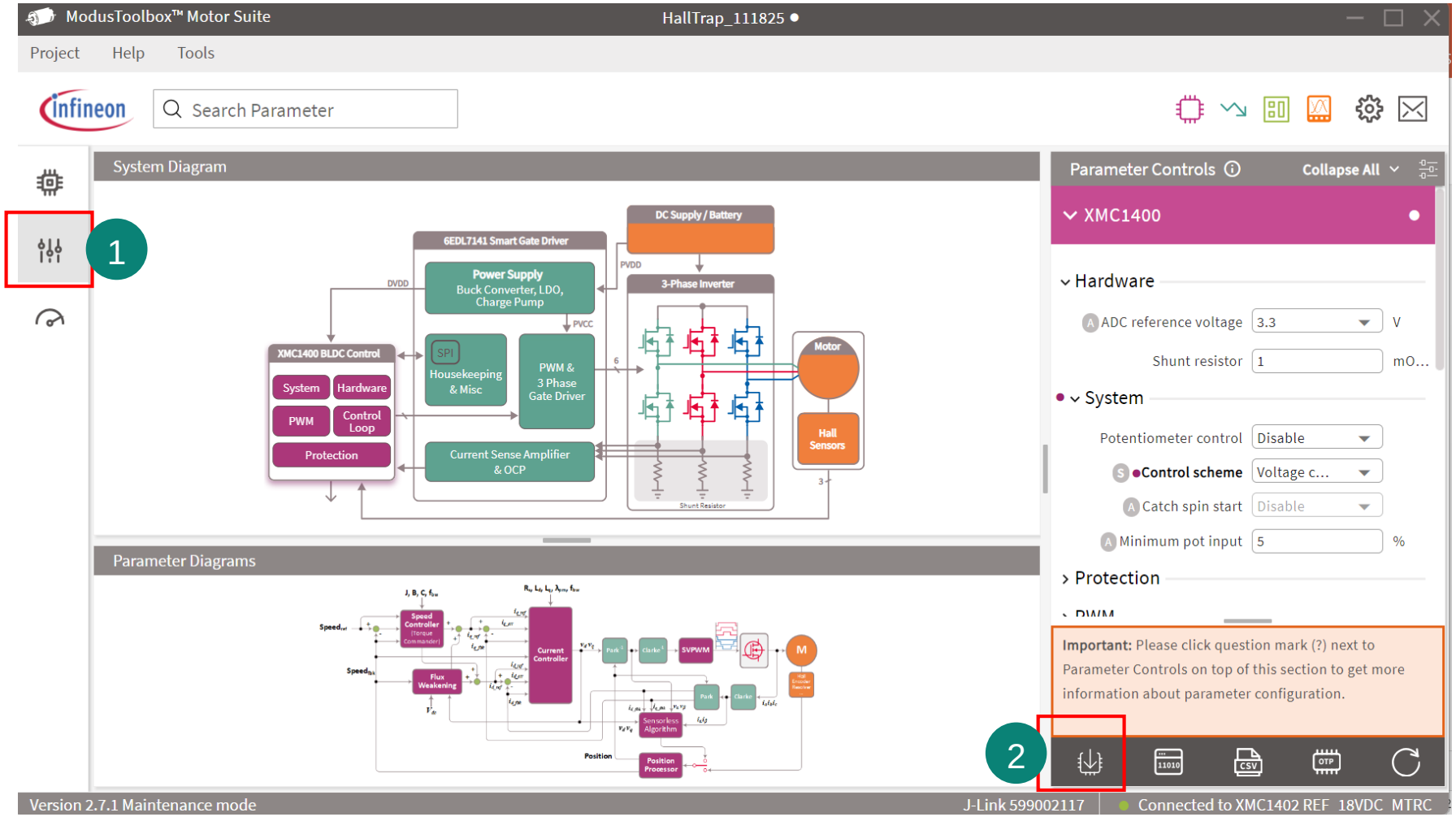
Cont. flash firmware



- After finished flashing firmware,
- The GUI reflects the connected target device's name

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Configurator

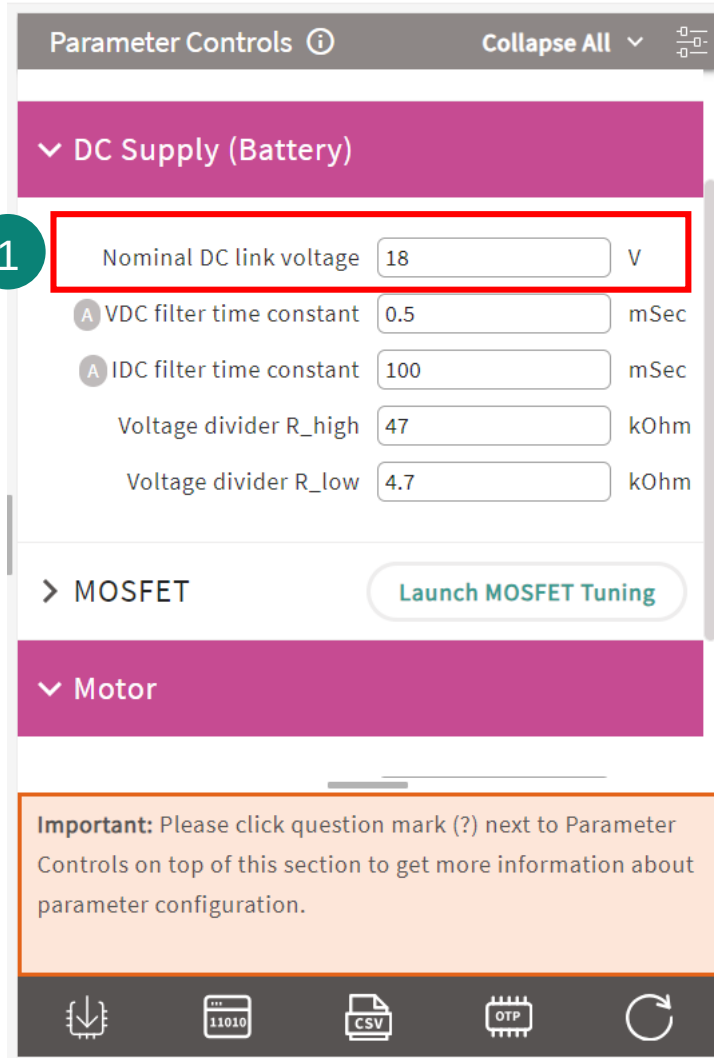


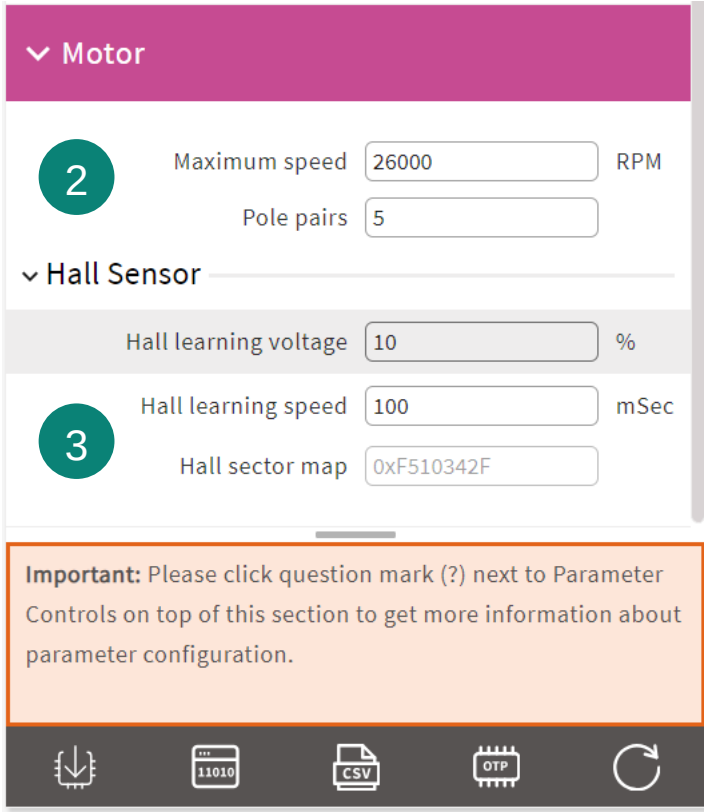
- Assuming **PROGRAM_DEFAULT_PARAM = 0**

1. Configure initial parameter values in Configurator tab
2. Click Write parameters to overwrite parameters in target device

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Configure to run motor first time



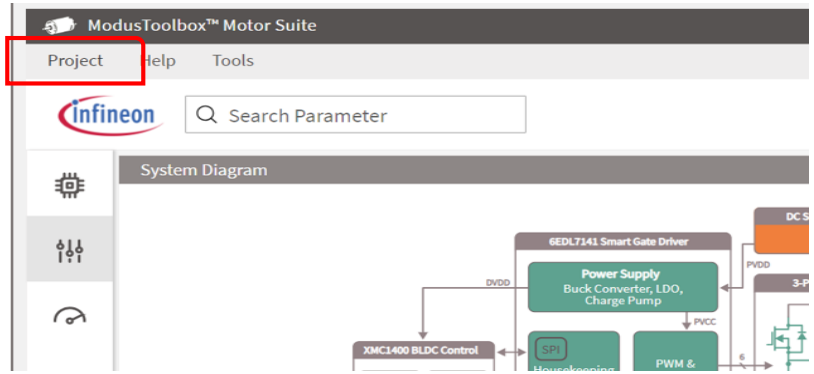


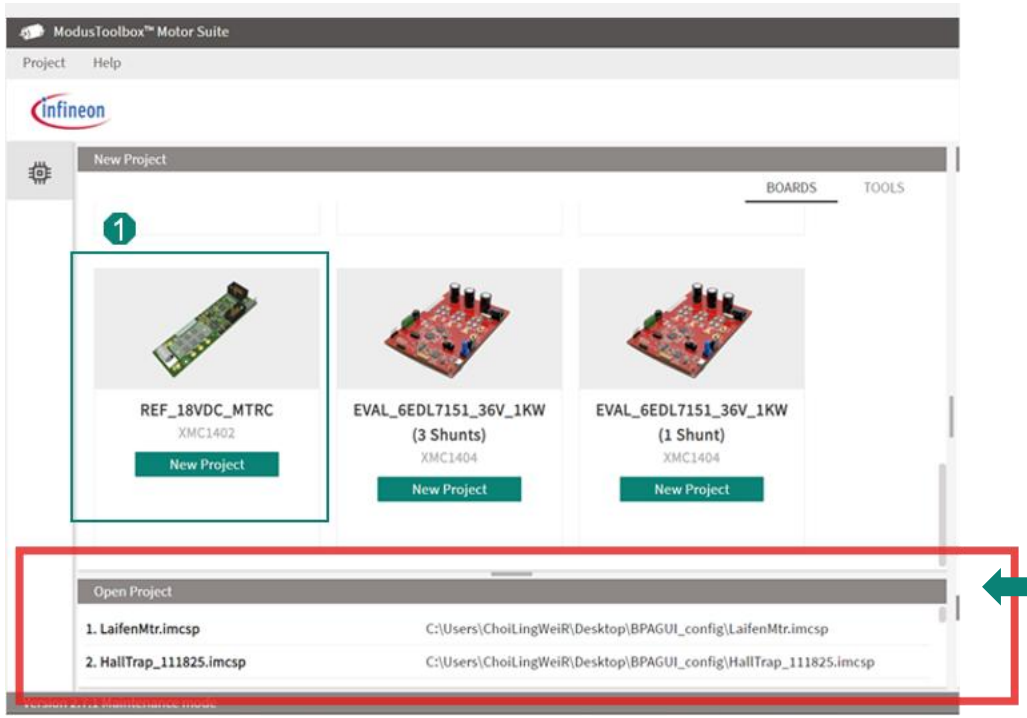
1. Configure the DC link voltage as per your power supply to the board
2. Configure the motor max speed and pole pairs according to the motor used
3. Important step before start the motor, user can run the Hall learning in the test bench tab (next slide)
   The Hall sector map* is **automatically** updated after completed hall learning

** Please refer to Application Note,* **AN_2110_PL88_2111_120446**

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Save user configuration



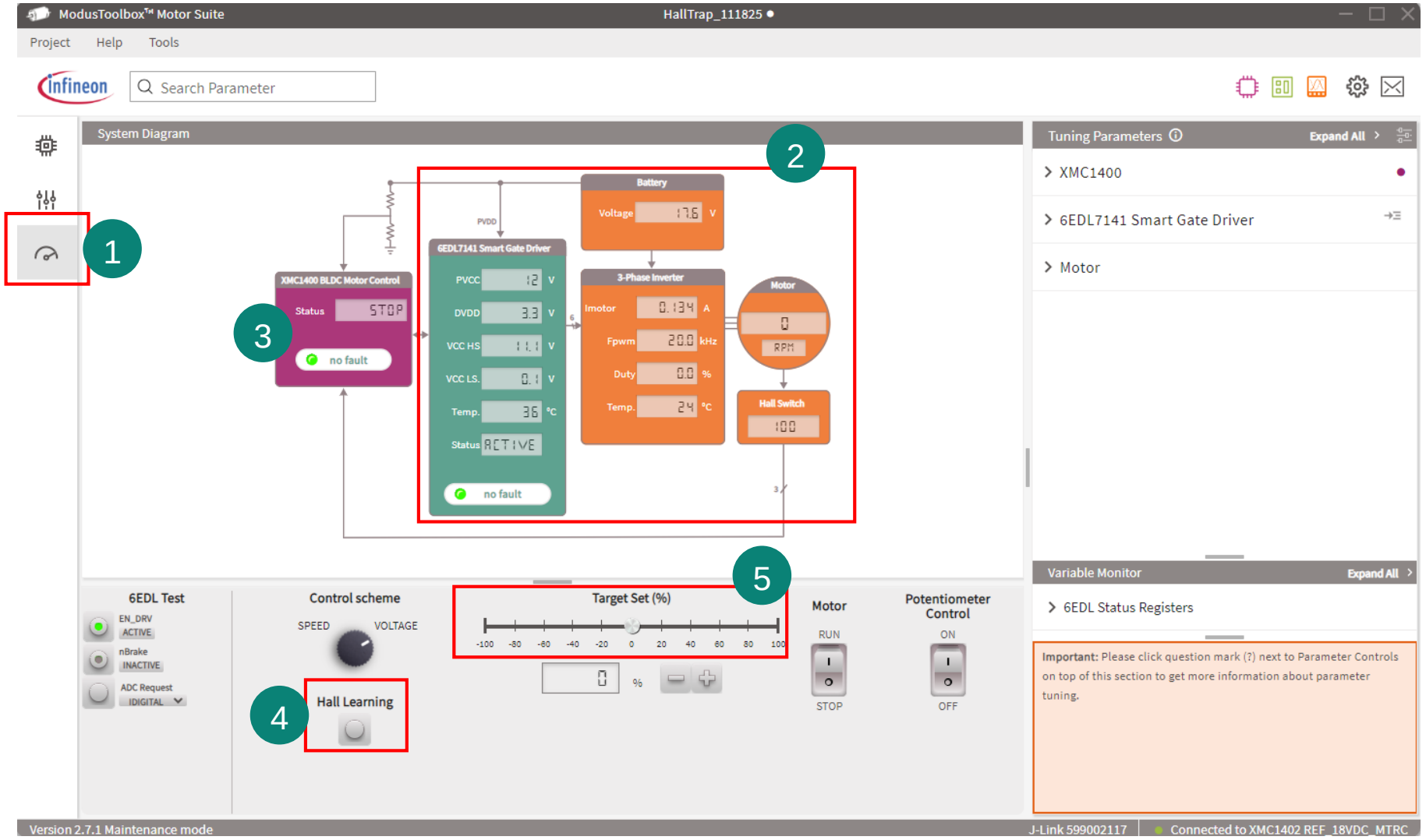


- Specific set of user configuration made in Configurator tab can be saved for next run of the same motor
- By click on Project → save project
- The project saved is in .imcsp file

- This saved project avoid user from re-configuring all the parameters again
- When open Motor Suite GUI, user can select the saved project on the open project panel

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Test bench



1. Choose the Test Bench tab for control/run motor
2. Indicators show real time parameters value
3. There is fault indicator in case software/hardware fault happen
4. Click on Hall learning to identify the hall sector map for a particular motor
5. Move slider to run motor

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Use firmware default initial parameters

- Assuming **PROGRAM_DEFAULT_PARAM = 1,** user have to configure the initial parameter value in firmware, build and use it on target device
- After flashing the firmware, **DO NOT** write parameters to flash

Example option: Motor parameters

- In user_input_config.h file, user can change motor maximum speed/no load speed and motor pole pairs.
- All parameters available in MotorvSuite GUI are available in user_input_config.h file

```
/*****************************
 * Motor group
 *****************************/
#define MOTOR_NO_LOAD_SPEED                     (26000U)            /* Motor maximum speed */
#define MOTOR_POLE_PAIRS                        (5U)               /* Motor pole pairs (number of poles/2) */
```

Other configurations in user_input_config.h

Control scheme: voltage control, speed control

PWM modulation type: PWM high side 120-degree, PWM low-side 120-degree, and PWM high-side 60-degree

For further technical details, please refer to Application Note, **AN_2110_PL88_2111_120446**

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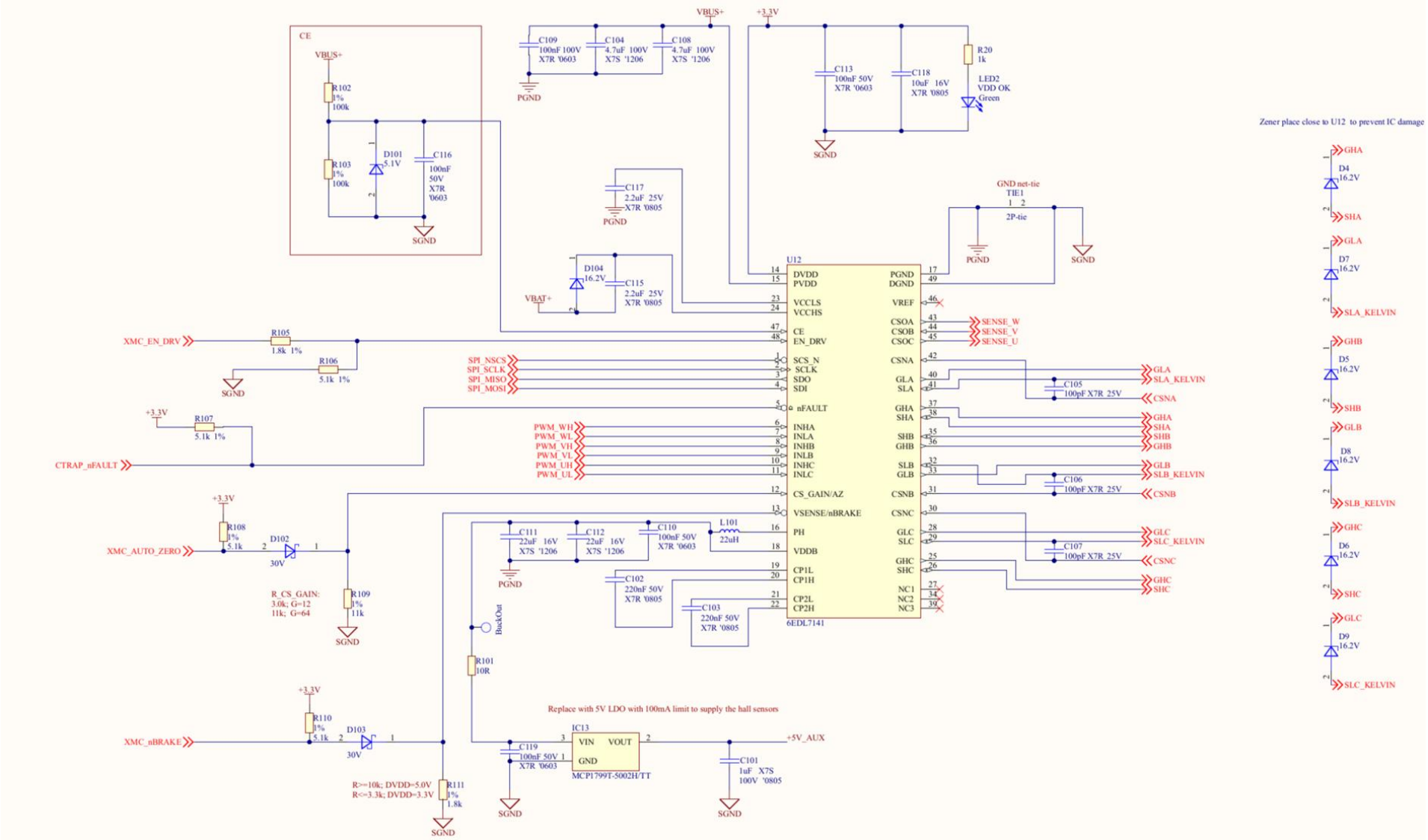
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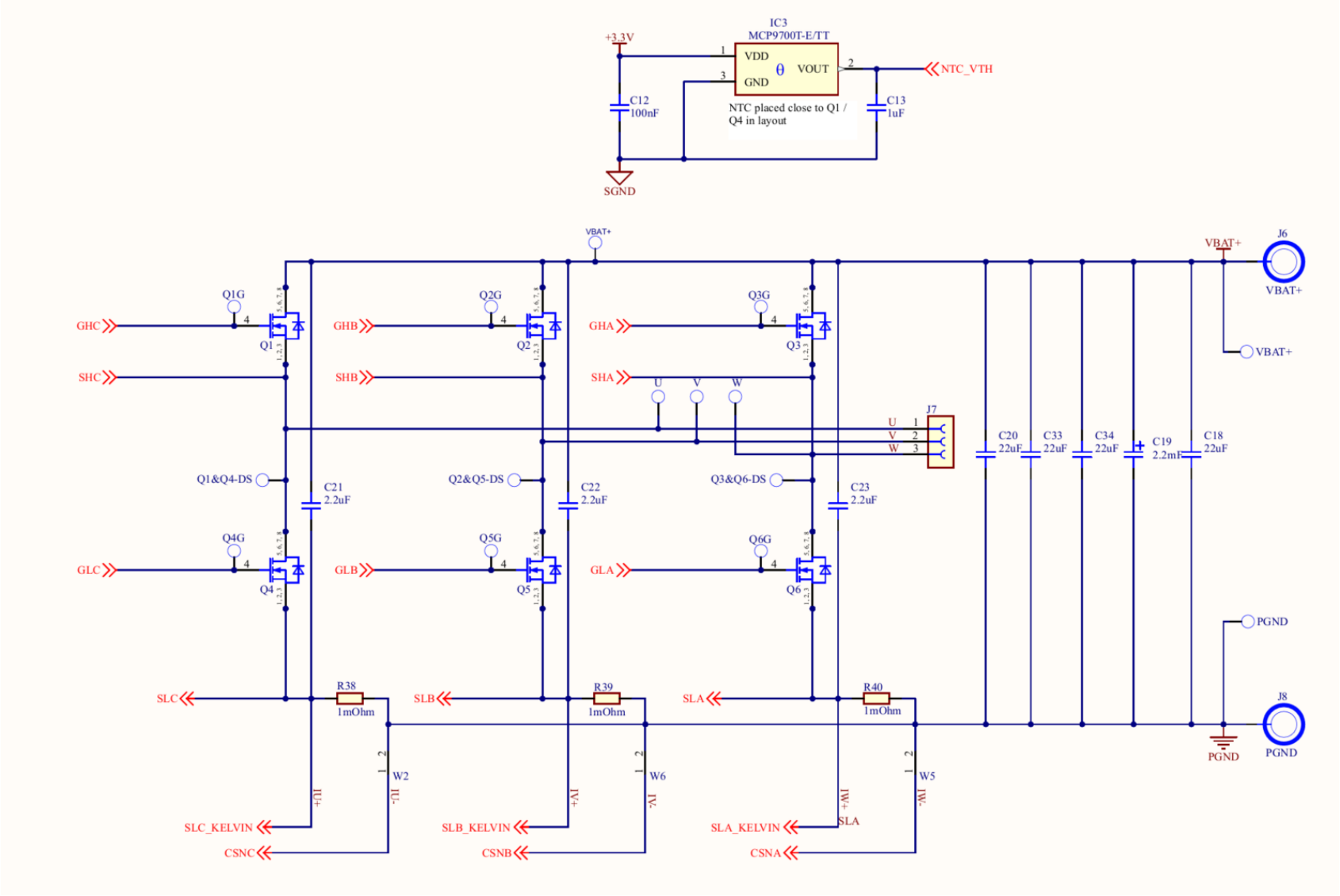
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Schematic of REF_18VDC_MTRC board – gate driver stage



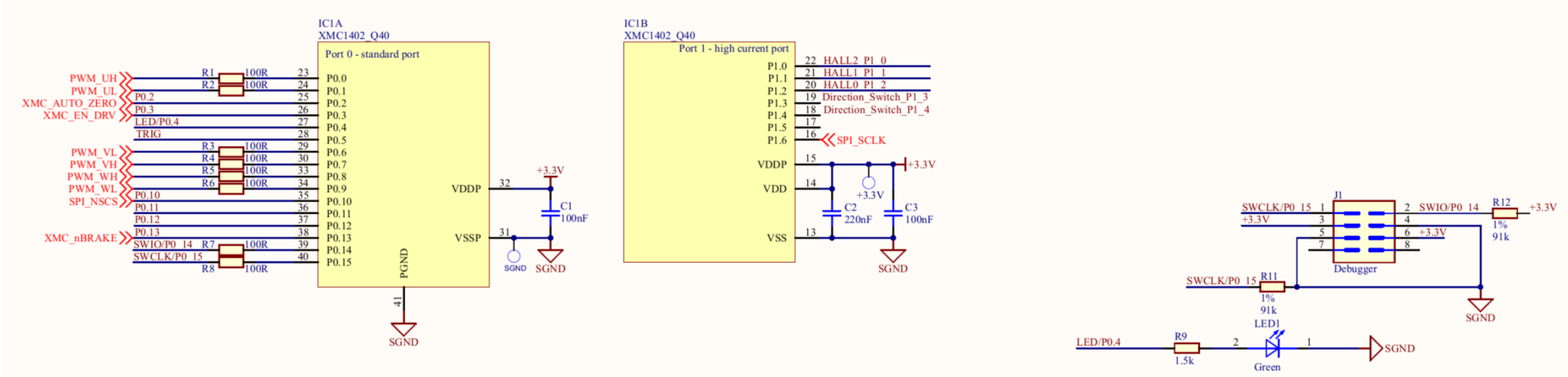
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Schematic of REF_18VDC_MTRC board – power stage



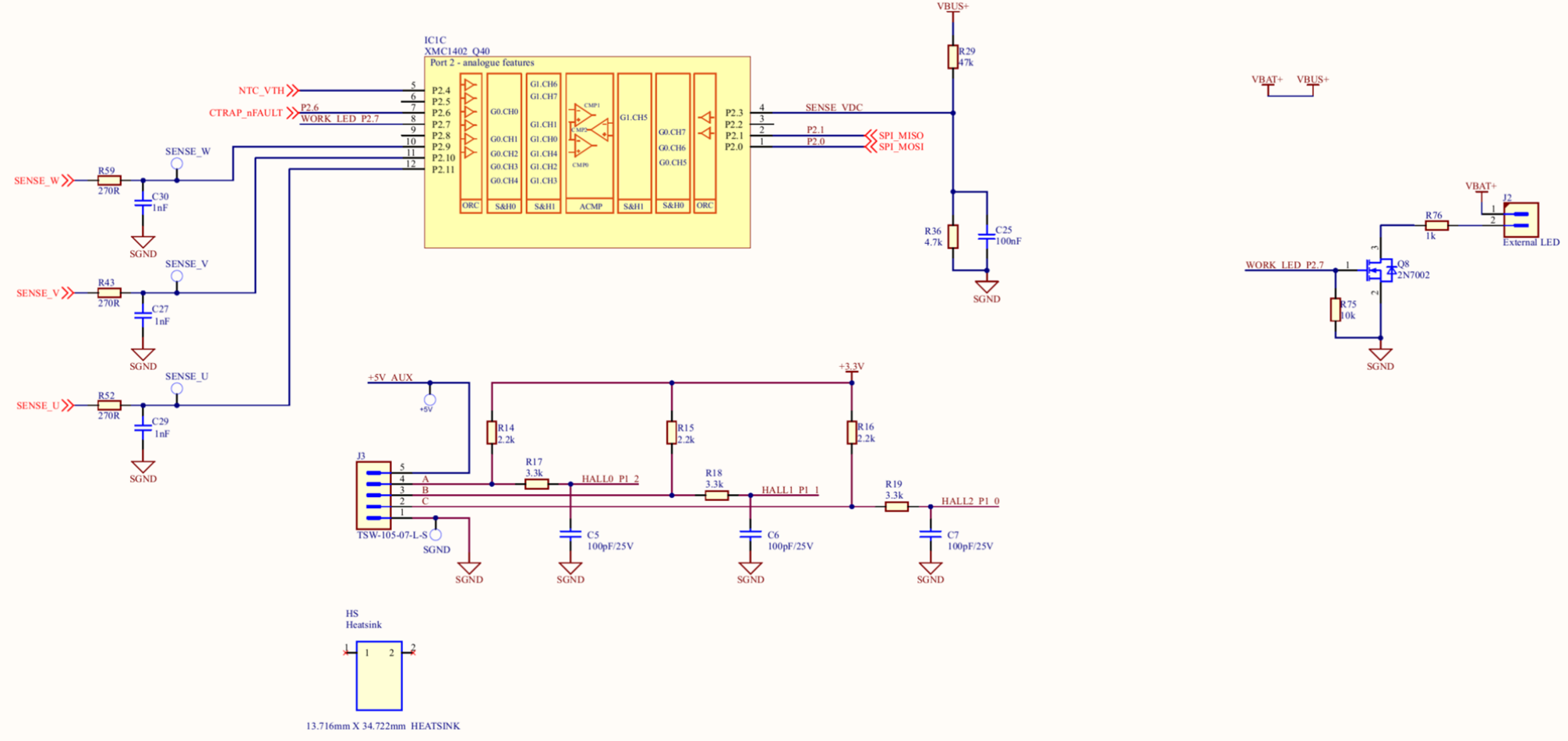
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Schematic of REF_18VDC_MTRC board – control stage, part 1



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Schematic of REF_18VDC_MTRC board – control stage, part 2



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