NCV78XXX LED Driver / Platform Evaluation Board User's Manual

NCV78XXXGEVK

Introduction

The evaluation board allows in an easy way to demonstrate features of NCV78xxx device family – LED Drivers for Automotive Front Lighting. Based on one common platform, 2 sizes of boards are available: half size LED Driver EVK intended for single product evaluation and full size LED Platform EVK allowing evaluation of multichannel system. User friendly GUI SW detects all boards automatically and allows to access and control any register or external I/O pin of the devices.

The provided motherboard gives a lot of flexibility during your development process. Easy access to several signals makes debugging very easy and gives you the possibility to connect the evaluation kit with your own application which reduces the development time.

Evaluation of the complete NCV78xxx family is made very easy by means of the separate daughter boards.

Evaluation Board Features

- Wide Range of Supply Voltage: 6 to 30 V
- Daughter Board Auto−detection
- Easy Access via Test Points to I/O Signals
- Single Side PCB Assembly
- User Friendly GUI SW
- Rapid Development Support
- Reference PCB Layout

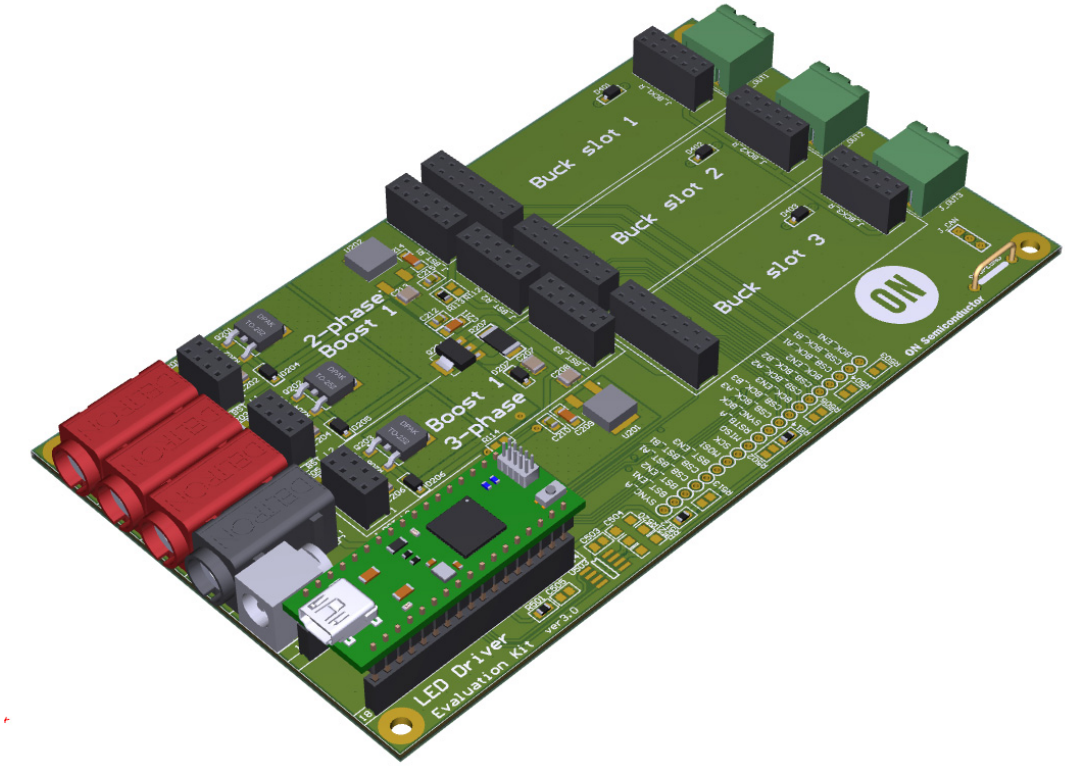

Figure 1. Evaluation Board

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Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Unit
Supply Voltage (V_{BAT})	−0.3 to 60	V
Output LED Current	3	A
Junction Temperature	−40 to 175	°C
Ambient Temperature	−40 to 105	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 2. RECOMMENDED BOARD OPERATING CONDITIONS

Parameter	Value	Unit
Supply Voltage (V_{BAT})	6 to 40	V
Output LED Current	3	A
Ambient Temperature	−40 to 105	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Table 3. INTERFACE FUNCTION DESCRIPTION

Connector Name	Connector Type	Description / Function
J_PWR	DC POWER JACK 2.5MM	Input supply connector, DC 6 – 40 V
J_VBAT1(2,3,4,5,6)	BANANA RED 4MM	Input supply connector, positive, 6 – 40 V
J_GND	BANANA BLACK 4MM	Input supply connector, GND
J_OUT1(2,3,4,5,6)	2 pins / 5.08 mm / Header Terminal Block	LED output
J_ONMCU_	2 pcs 1 x 17 pins / 2.54 mm / Socket Header	Connector for ONMCU_DIL microcontroller board
J_BST_L1(2,3,4,5,6)	2 x 4 pins / 2.54 mm / Dual Socket Header	Connector for NCV78XXX Booster Daughterboard
J_BST_R1(2,3,4,5,6)	2 x 6 pins / 2.54 mm / Dual Socket Header	Connector for NCV78XXX Booster Daughterboard
J_BCK1(2,3,4,5,6)_L	2 x 8 pins / 2.54 mm / Dual Socket Header	Connector for NCV78XXX Buck Daughterboard
J_BCK1(2,3,4,5,6)_R	2 x 6 pins / 2.54 mm / Dual Socket Header	Connector for NCV78XXX Buck Daughterboard
J_CAN	3 pins / 3.5 mm / Header Terminal Block	UART over CAN PHY output
SCOPEGND	Wire Bridge	Ground wire, global ground.
Test points	TEST POINT TH 1MM	Easy access to all signals

Getting Started

The evaluation board can be supplied through a standard 5.5 x 2.5 mm power jack DC connector, but preferred way is to connect current limited laboratory power supply through standard 4 mm bananas.

Battery voltage should be connected first, followed by connection of USB mini cable.

Individual battery inputs can be shorted together on board by means of zero ohm resistors R101, R106, R111 (and R126, R116, R121 for full size board).

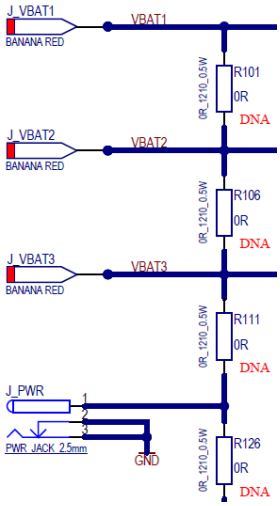


Figure 2. Battery Input Connection

At each individual battery input the reverse battery protection circuitry is placed.

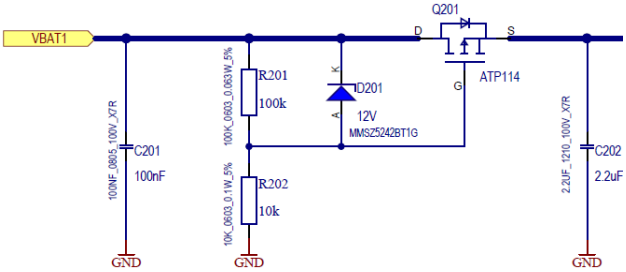


Figure 3. Reverse Battery Protection

After reverse battery protection, at each battery input, there is a diode bringing the voltage to the section with linear regulators creating 12 V, 5 V and 3.3 V supply branches. In case of need (e.g. efficiency measurements) some of diodes D204, D205, D206 (D202, D204, D206, D208, D210, D212 for full size board) can be unsoldered and the connection interrupted by this way. Please note that connecting higher voltage (> 40 V) on battery inputs can cause excessive power loss on linear regulators.

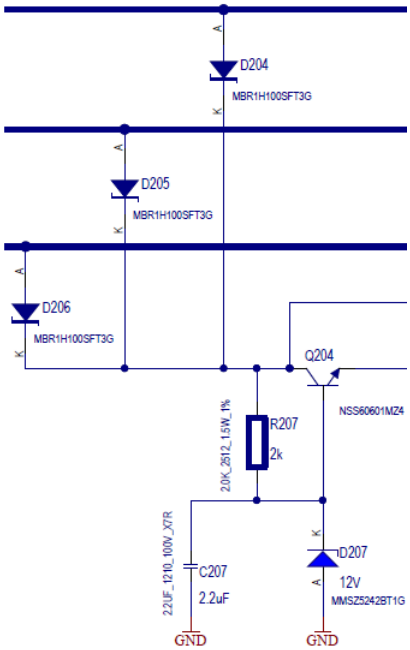


Figure 4. Connection from Battery Inputs to Regulators

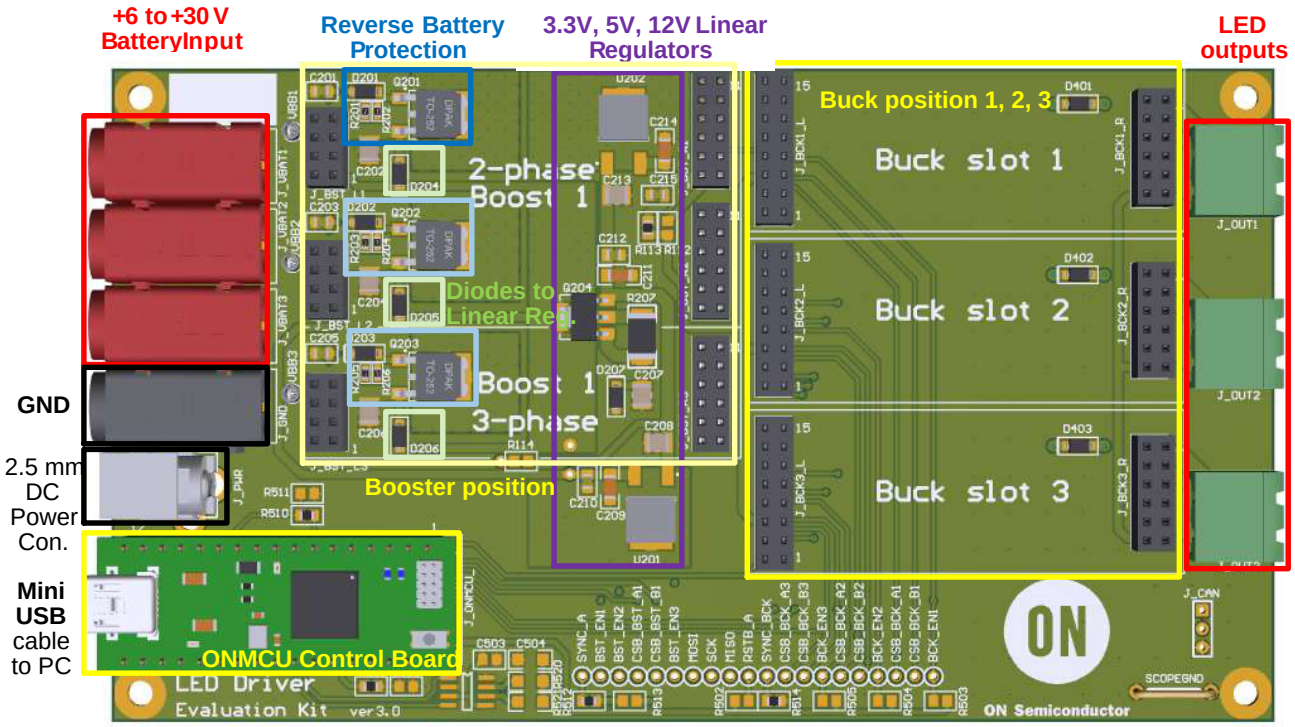
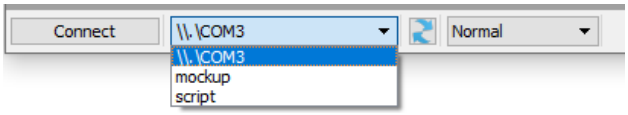


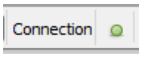
Figure 5. NCV78XXX LED Driver Evaluation Board Picture

Using of GUI SW

After connection of the battery supply and mini USB cable to the evaluation board, the button in status bar should be used to relist all active virtual COM ports. From the list the COM port where evaluation board is connected should be selected. In case there is no real hardware available, the “Mockup” simulation mode can be selected to run the GUI SW.



After clicking “Connect” button, the successful connection status should be indicated in status bar:



After scanning of all positions is finished, list of plugged daughter boards will appear in menu “Application” and also will be graphically displayed on the main screen. This is possible thanks to the EEPROM memory assembled on each daughter board and bearing all necessary information.

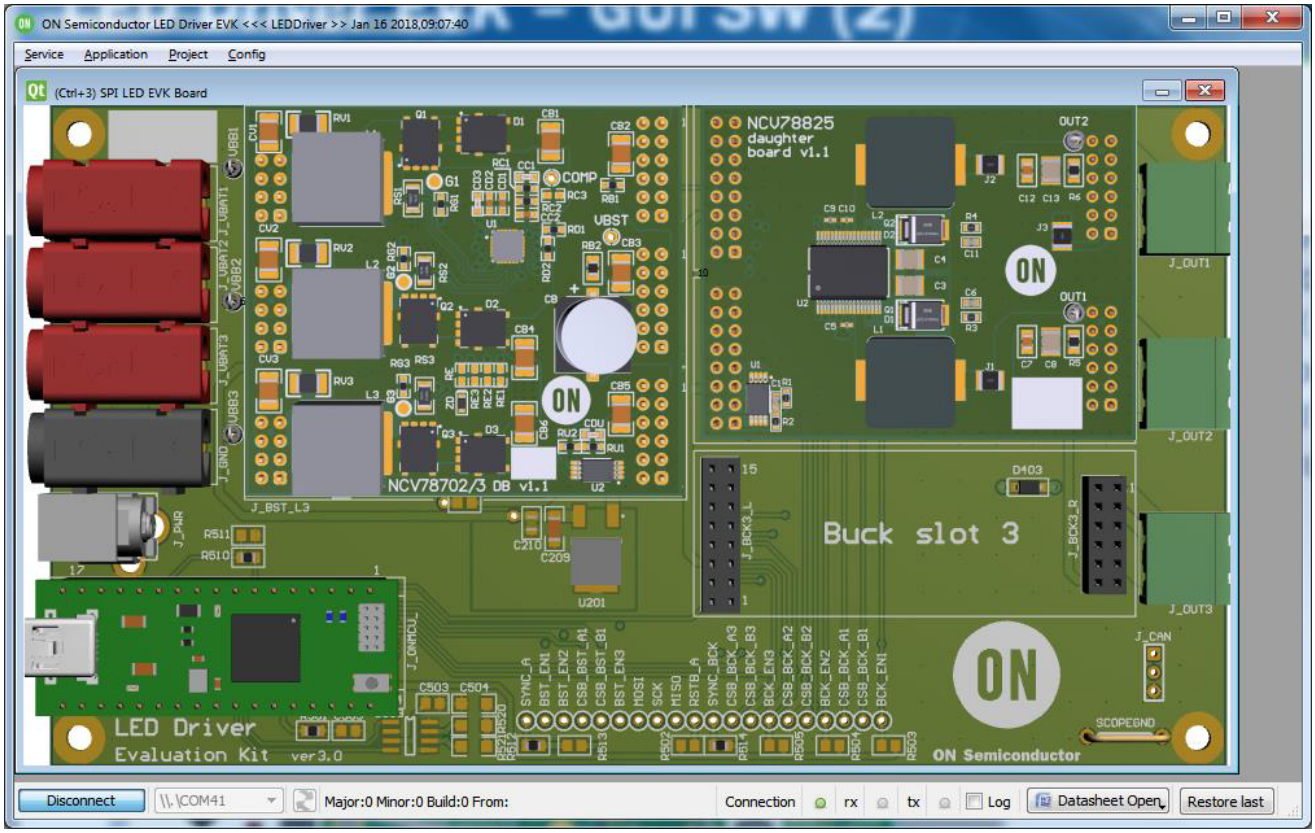
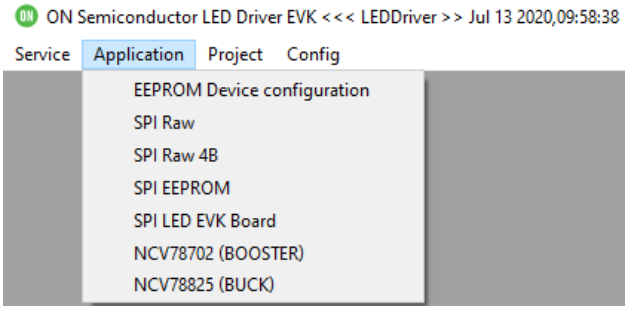
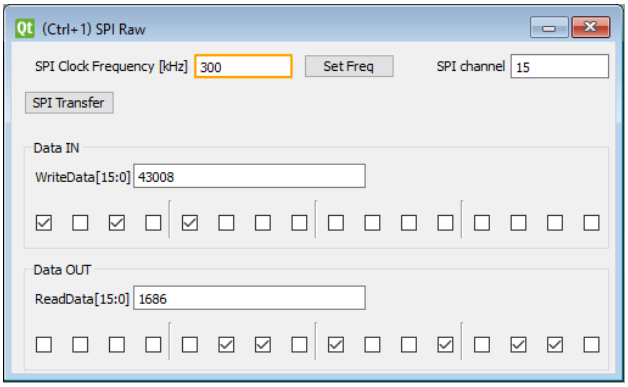


Figure 6. Graphical Representation of Plugged Daughter Boards

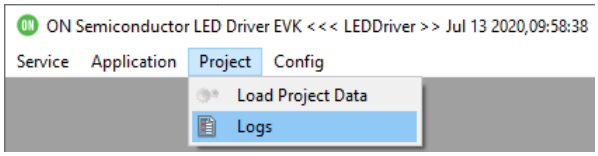


Window allowing to access all SPI registers and control all external signals of each individual device can be then open by clicking on graphical representation of daughter board or from menu “Application”.

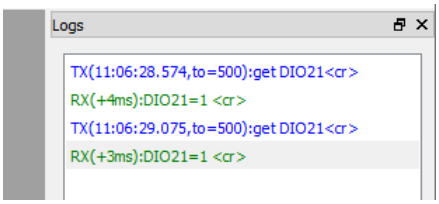
There is a possibility to use low level access where each individual bit in SPI frame can be controlled via “SPI Raw” (16 bits frames) or “SPI Raw 4B” (32 bits frames) panel. This allows to create non−standard frames for testing purposes (e.g. with corrupted parity).



For debugging purposes, logging of the communication between GUI SW and Evaluation board can be useful. This can be enabled in menu “Project” by item “Logs”:

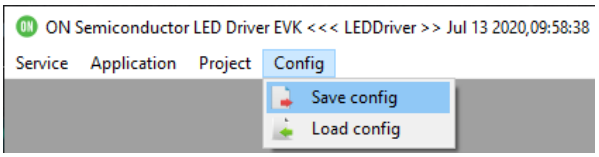


On the right side of the application area, the dedicated “Logs” window should appear:

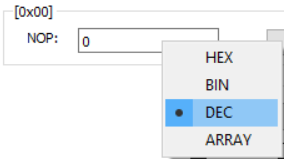


Logging of the ongoing commands can be then started/stopped by clicking check box “Log”:

Current state of the GUI SW including all control elements can be saved and restored in the “Config” menu.



Please note that format of the number in any text box can be changed by clicking the right mouse button.



Scripting Support

GUI SW framework allows to access and control all GUI elements from Python scripts. This can help with evaluation of the device significantly by automatizing many steps. For more details about Python scripting look for dedicated document.

NCV78xxx Device Control and Register Access

From detected daughter boards, select intended one in menu “Application” or by clicking on its graphical representation and appropriate “NCV78xxx Device Control and Register Access” window will open. Window consists from several parts, on the left side the section for control of external pins is available and on the right side, either high level application control is available or all internal SPI registers can be accessed via “Control registers”, “Status registers” or “Trimming constants” tabs.

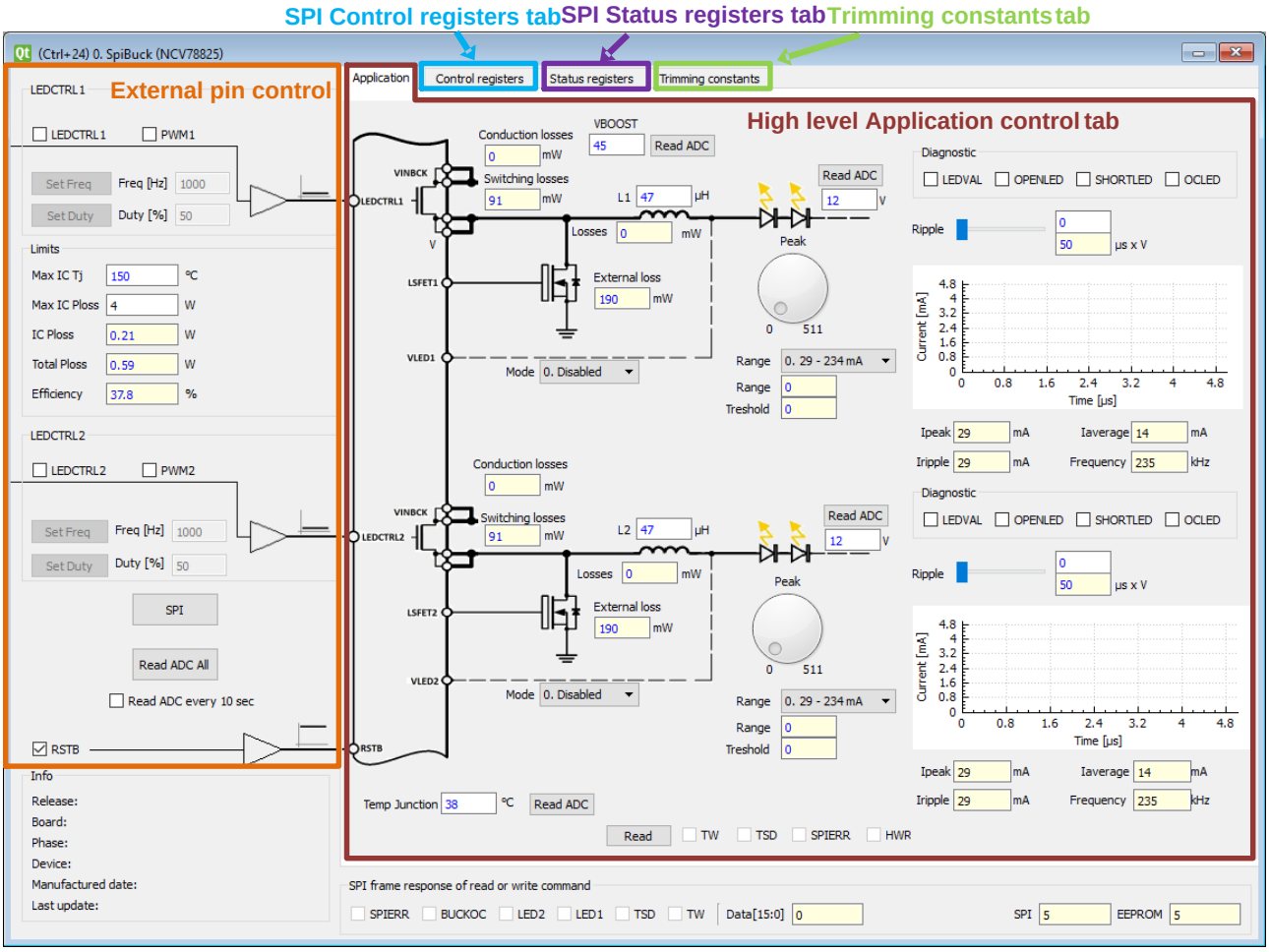
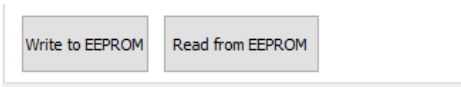
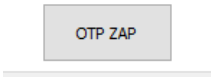


Figure 7. Basic NCV78xxx Control Window

Content of SPI Control registers can be saved into daughter board's EEPROM memory by button "Write to EEPROM" and restored by "Read from EEPROM" on "Control registers" tab.



On NCV78xxx devices which contain internal OTP memory, the button "OTP ZAP" is available on "Control registers" tab. This button allows to perform whole OTP zapping procedure by one click. Write all SPI control registers with required value and then start zapping procedure by clicking the button.



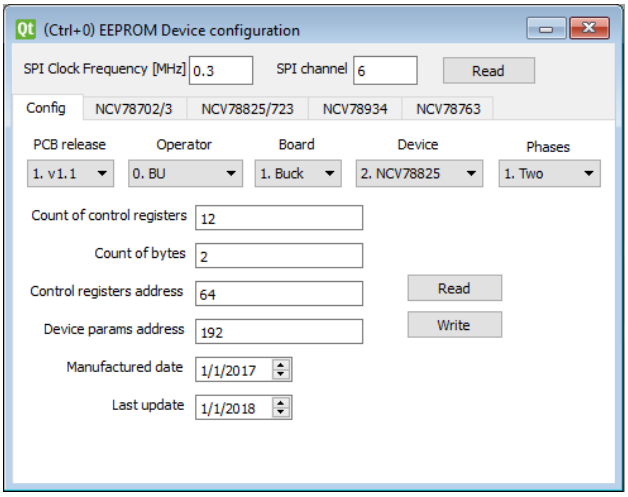
Daughter Board's EEPROM Memory Manipulation

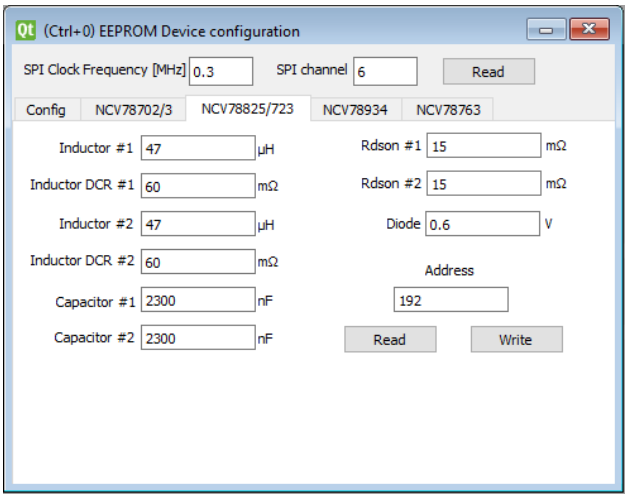
Each daughter board contains EEPROM memory which bears all necessary information:

- identification of plugged daughter board for its auto−detection in GUI SW,
- version of the board, manufacturing date, location,
- parameters of assembled components (used for calculations on high level Application control tab),
- content of SPI control registers can be stored here from "Control registers" tab

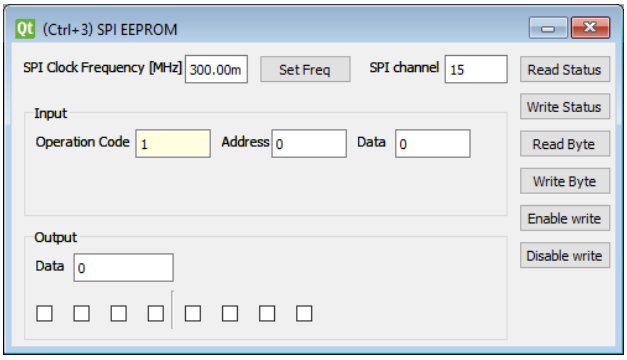
Window "EEPROM Device configuration" serves for manipulation with EEPROM memory. Identify on which SPI channel the EEPROM memory is located and manually enter the number into "SPI channel" text box and click Read button. Memory content should be read out and all related information should appear. On dedicated tab with device

specific information, values of assembled components become available and can be modified and written into EEPROM memory by Write button.





For low level access to EEPROM memory dedicated “SPI EEPROM” window is available.



SPI channel number can be simply identified with help of the following picture and schematic of the specific daughter board. As daughter board usually occupies more slots, it needs to be checked which channel is used for NCV78xxx device and which for on board EEPROM memory.

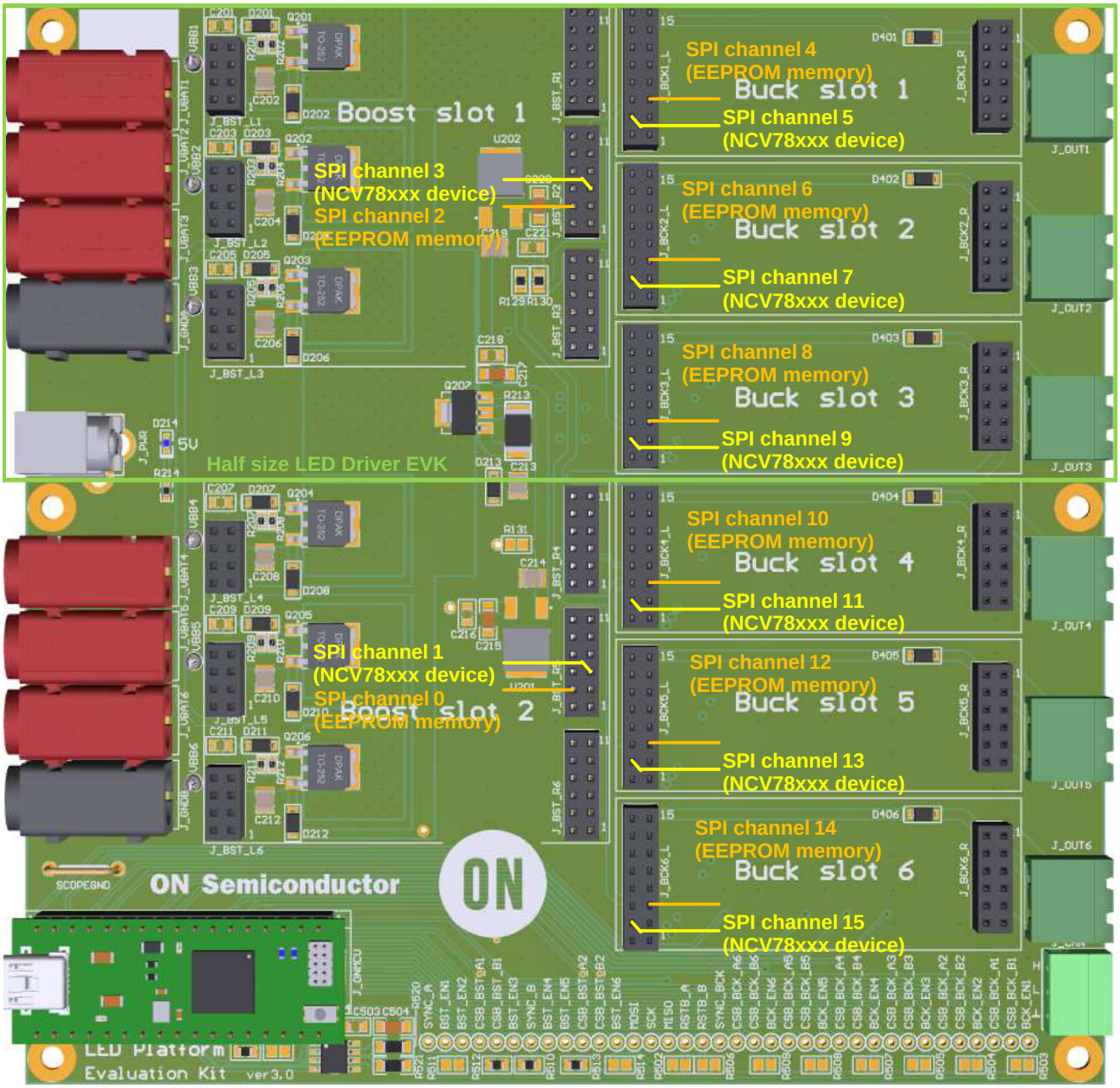
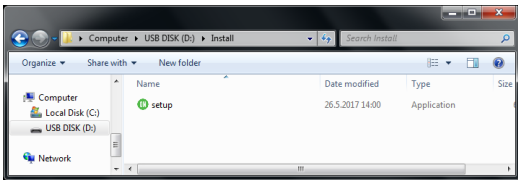


Figure 8. SPI Channels Locations on LED Platform/Driver EVK

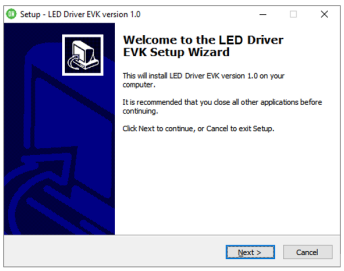
Installation of GUI SW

1. Run “setup.exe” installer:



2. Follow instructions and click Next button until finish:

a)



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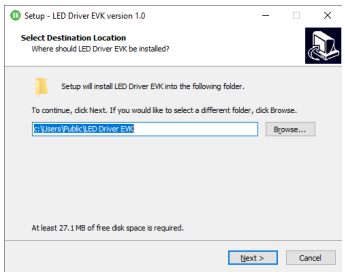

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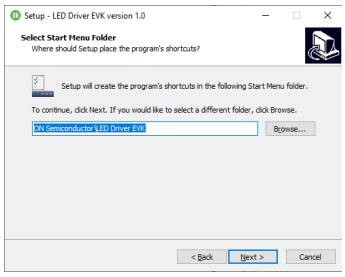

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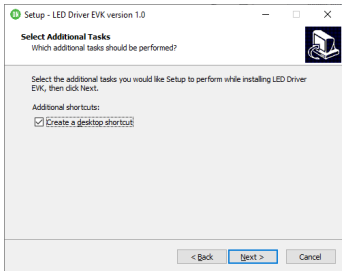
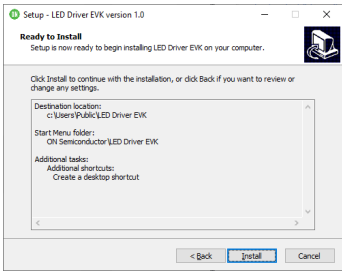


e)



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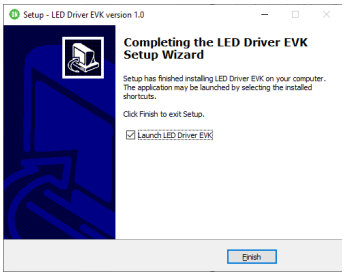
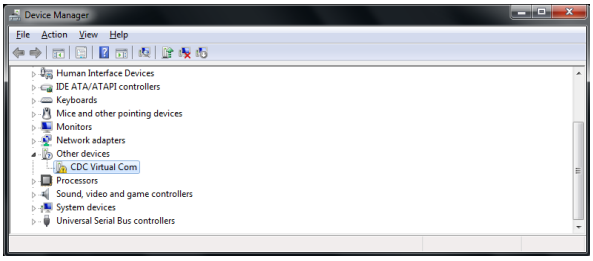
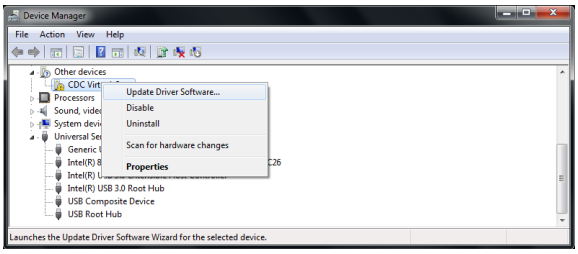


3. Connect USB mini cable to PC
   In case the USB drivers for GUI SW are not yet present on PC, the following procedure should be used:

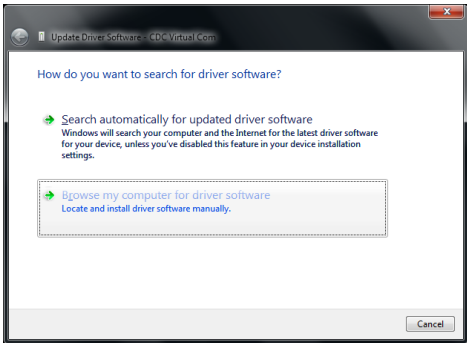
4. Open Device Manager (Press Win+R and type ***devmgmt.msc***)



5. Update Driver of not correctly installed device “CDC Virtual Com” by Right button click and select “Update Driver Software”



6. Select “Browse my computer…” then “Let me pick from a list...”
   a)



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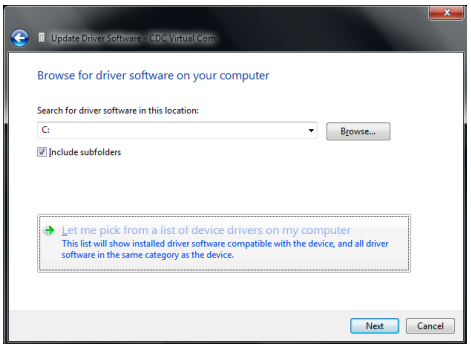
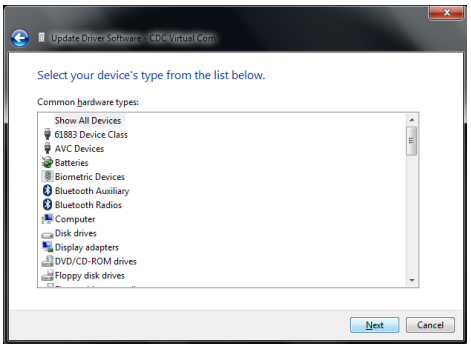


7. Click on “Next” then click on “Have Disk…”
   a)



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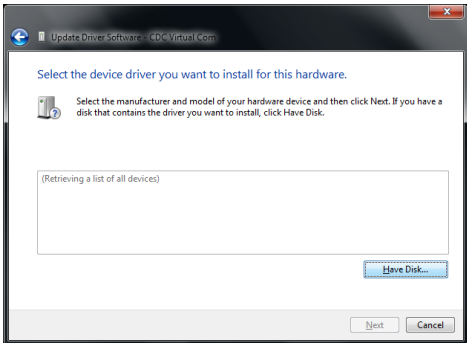
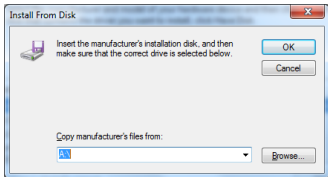


8. Click on “Browse” and select path to driver − default location is “C:\Users\Public\LED Driver EVK\driver” if not changed during GUI SW installation
   a)



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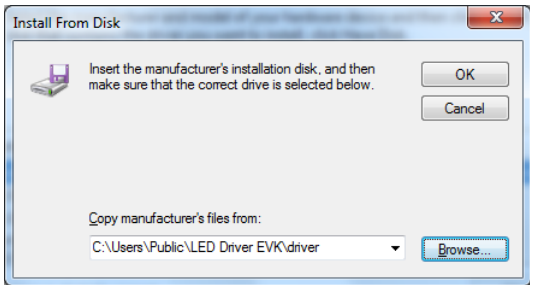

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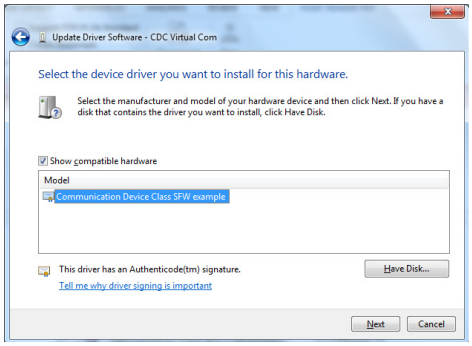

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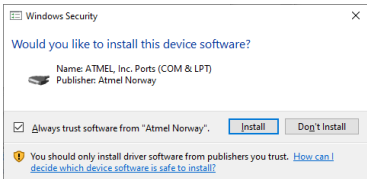
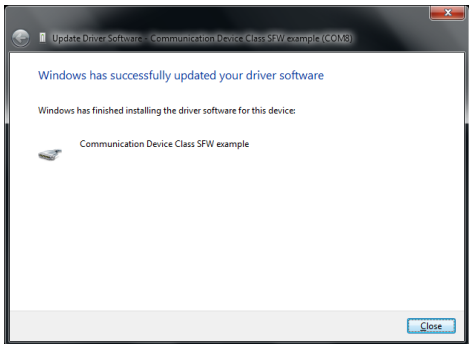
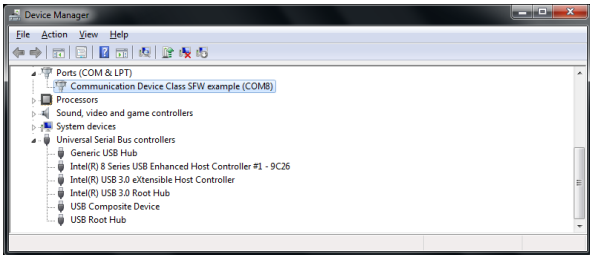


9. Finish USB Driver update by click on “Close”



10. Verify COM port device “Communication Device Class SFW example”



Evaluation Board Schematic and Layout

For Evaluation Board Schematics and Layouts please refer to documents placed on specific Evaluation board webpages.

References

[1] ON Semiconductor, NCV78763−D: Power Ballast and Dual LED Driver for Automotive Front Lighting 2nd Generation, rev.8, February 2019

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