DC Shield TLE9562-3QX

About this document

Scope and purpose

This user manual describes the BLDC shield with the TLE9562-3QX. This document provides detailed information on the board's content, layout and use. It should be used in conjunction with the TLE9562-3QX datasheet, which contains full technical details on the device specification and operation.

Intended audience

This document is intended for users who develop applications with the TLE956x family.

Table of contents

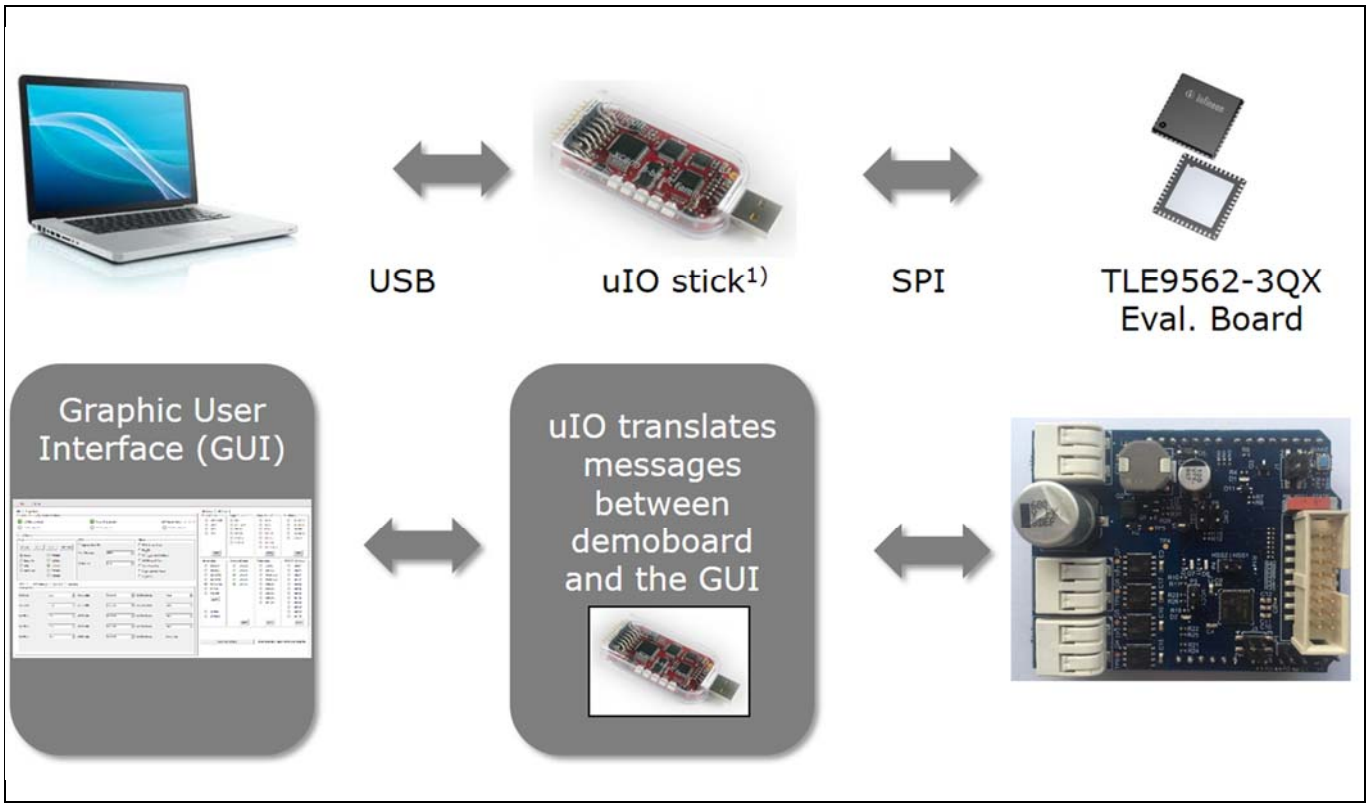
1 Introduction

2 The TLE9652-3QX evalutaion board is intended to provide a simple and easy-to-use tool for getting familiar with the device features and for first application tests. The evaluation board consists of a uIO-stick,
a TLE9652-3QX board.

3 The uIO-stick is the interface between the PC and the application board such as the TLE9562-3QX. The TLE9562-3QX SPI communication is emulated by the uIO-stick, which is controlled by the PC software.

4 The board of the TLE9562-3QX has a connector for the uIO-stick, connectors for the power supply, three connector for the motor output. And an active reverse battery protection with IPZ40N4S5L-2R8.

Figure 1 TLE9562-3QX evaluation Board concept



[1)] The uIO stick must be ordered separately – SP001215532
Details about the uIO stick can be found hear: www.hitex.com/uIO

2 Hardware description

2.1 Hardware

The TLE9562-3QX evaluation board is designed to be compatible with the uIO-stick. The uIO-stick plugs into the TLE9562-3QX main board via a 16-pin header, and allows an easy interface to the microcontroller via USB for SPI communication.

Figure 2 TLE9562-3QX evaluation board

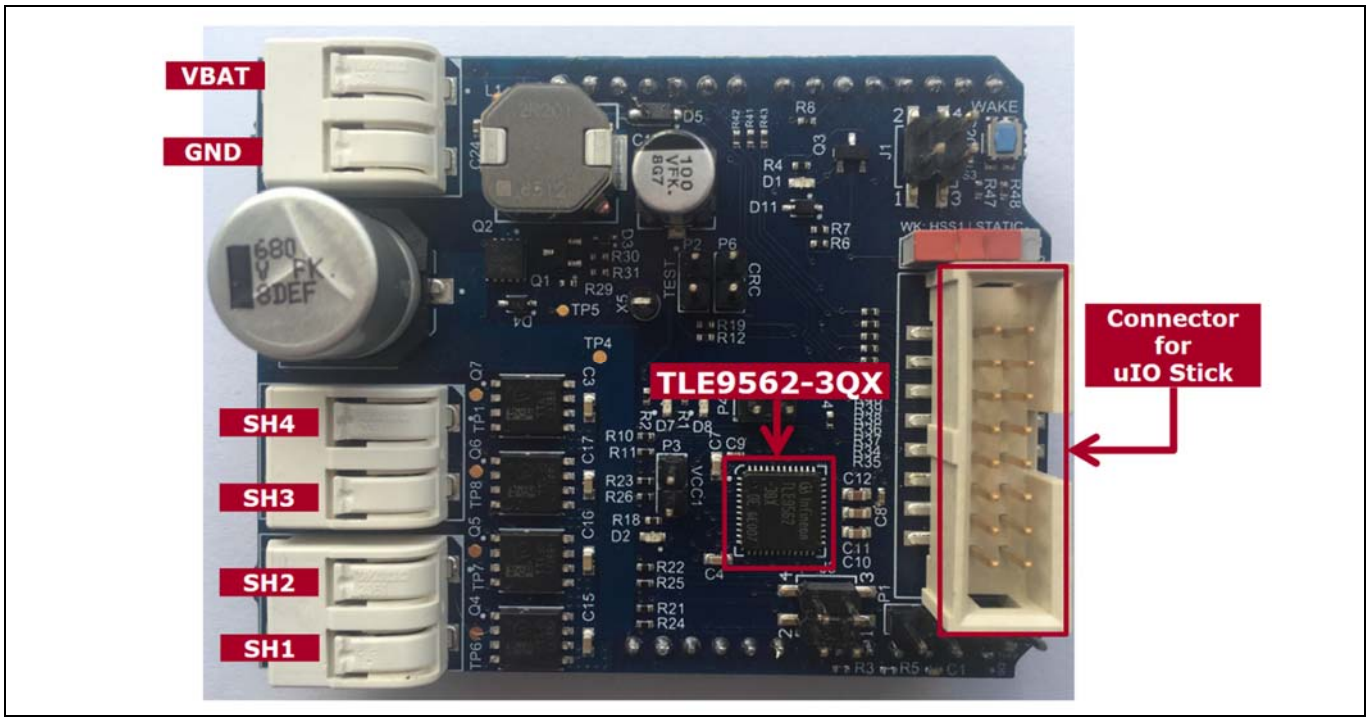


Figure 3 TLE9562-3QX evaluation board

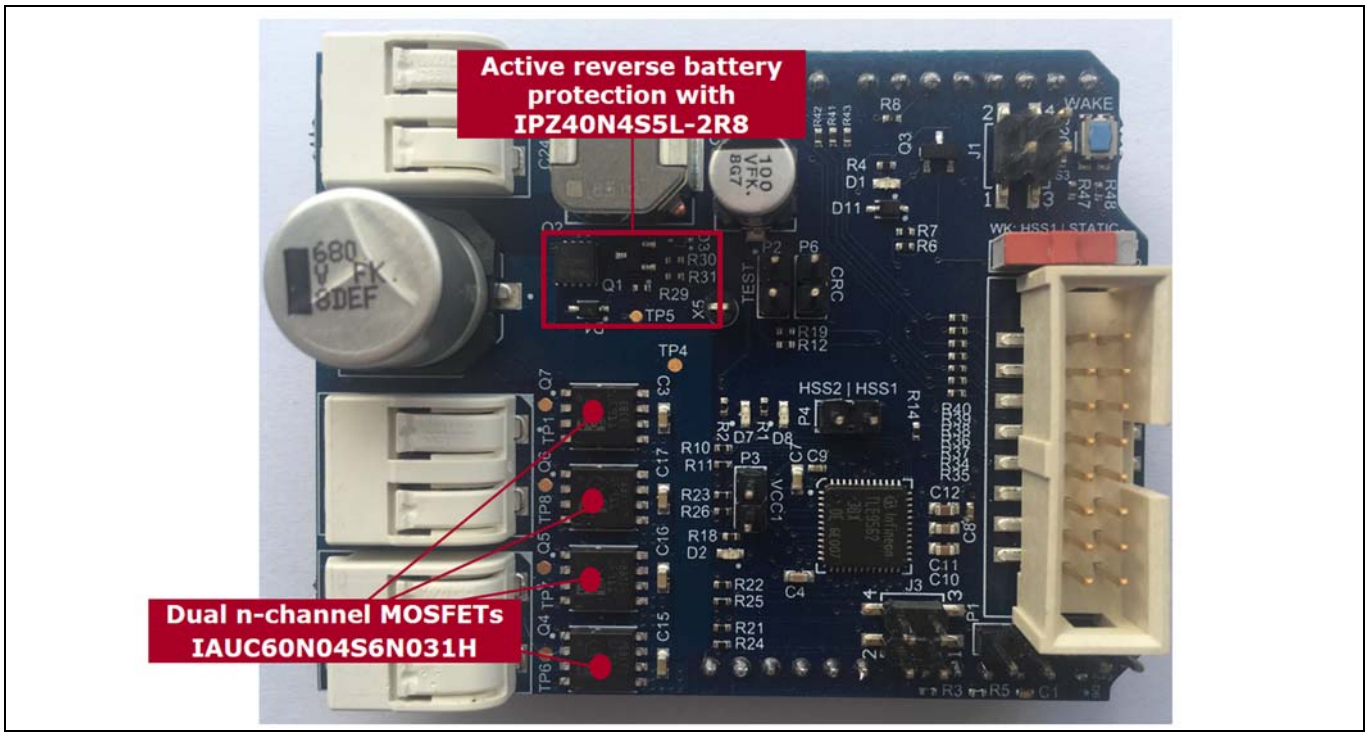


Figure 4 TLE9562-3QX evaluation board: Jumper settings

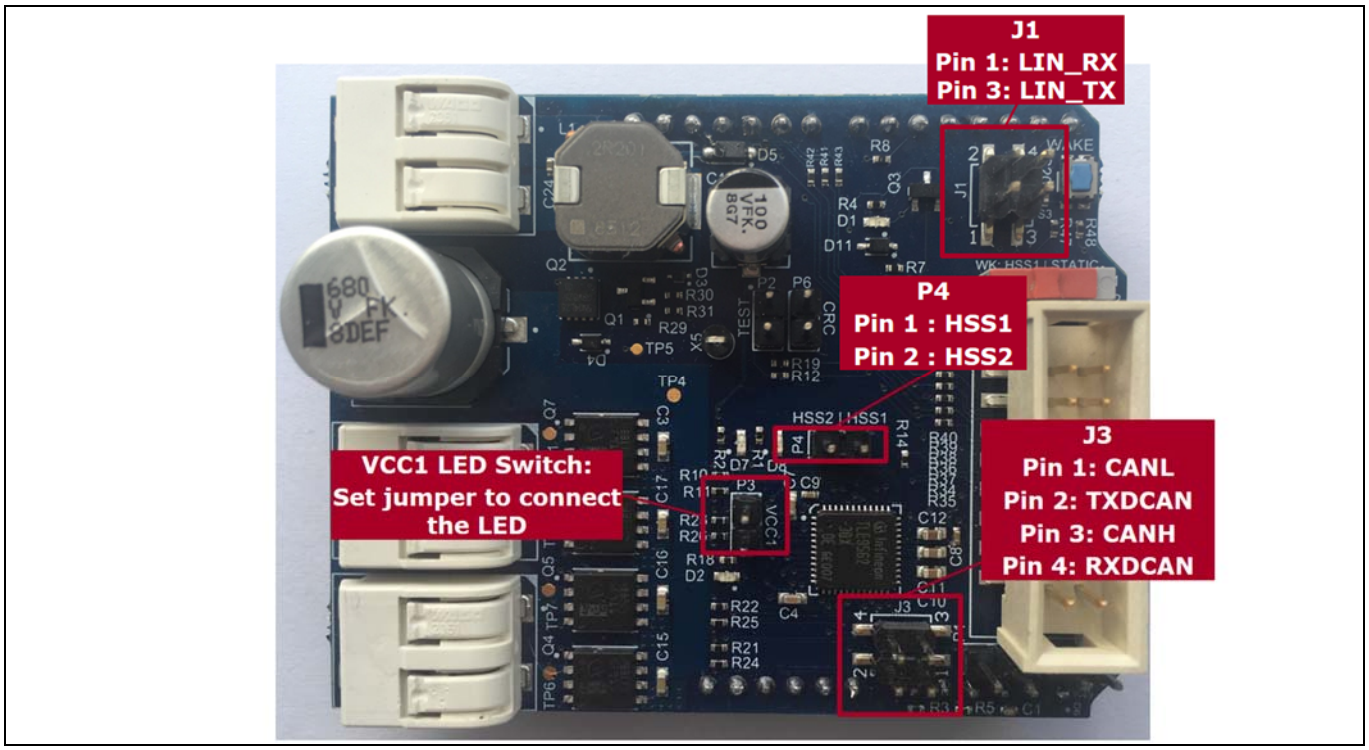
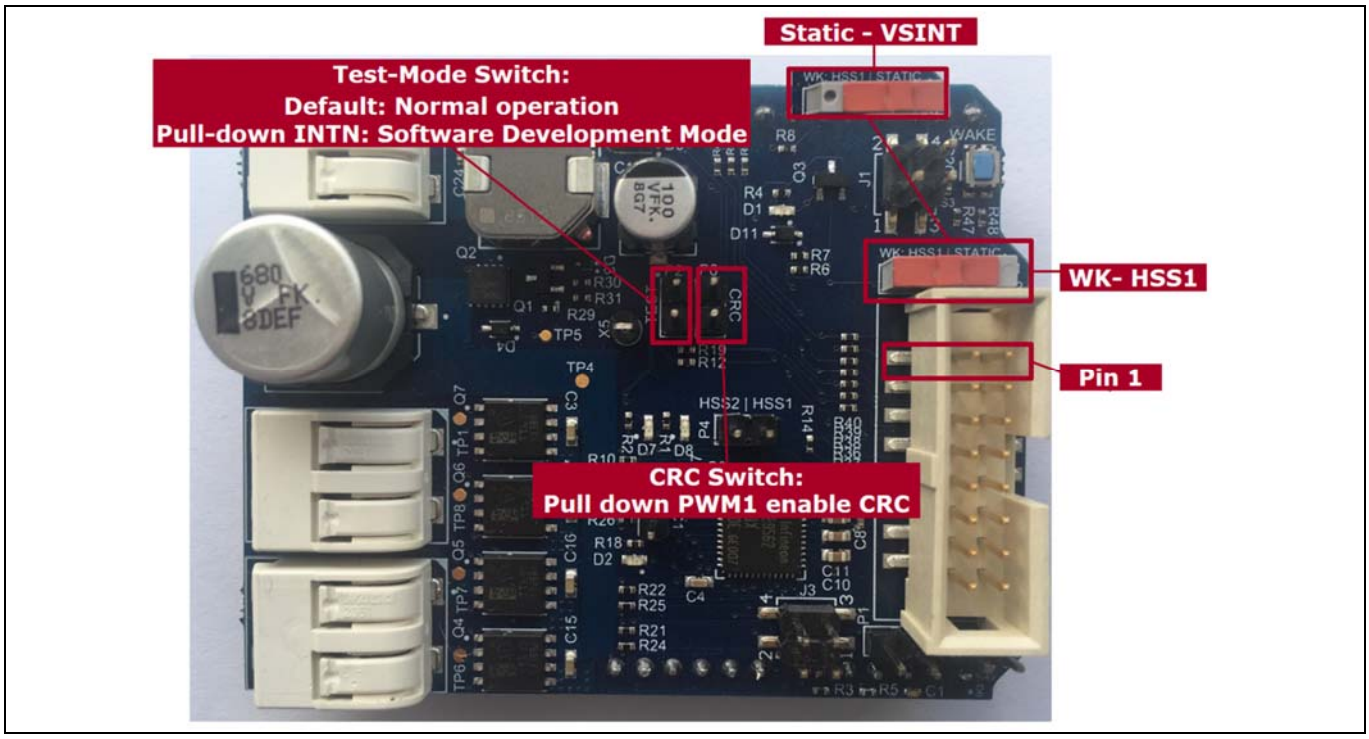


Figure 5 TLE9562-3QX evaluation board: Jumper setttings and switches



- Test-Mode Switch: Software Development Mode is a dedicated SBC configuration especially useful for software development. The Watchdog is enabled in Software Development Mode as default state.

- CRC: The SPI interface includes also 8 Bits used for Cyclic Redundancy Check (CRC) to ensure data integrity on sent or received SPI command.

Figure 6 TLE9562-3QX evaluation board: Arduino connectors 1/2

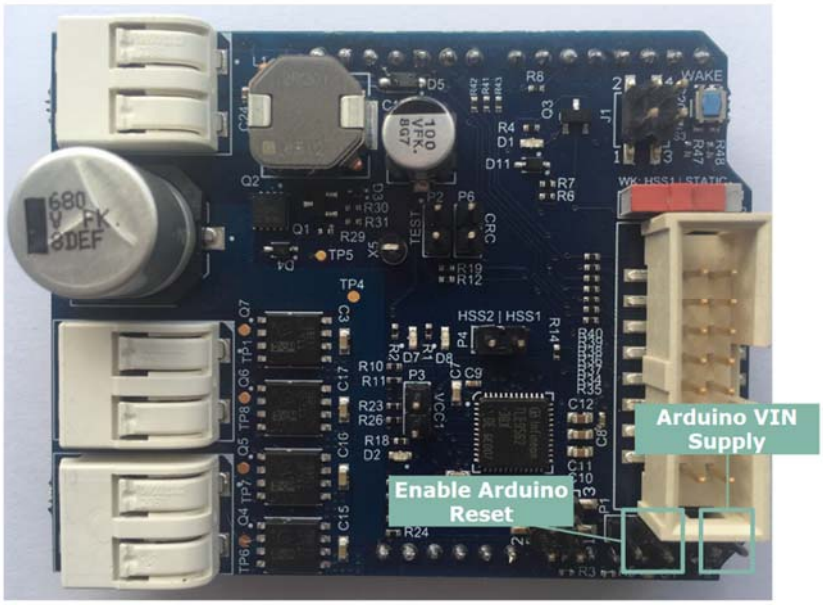
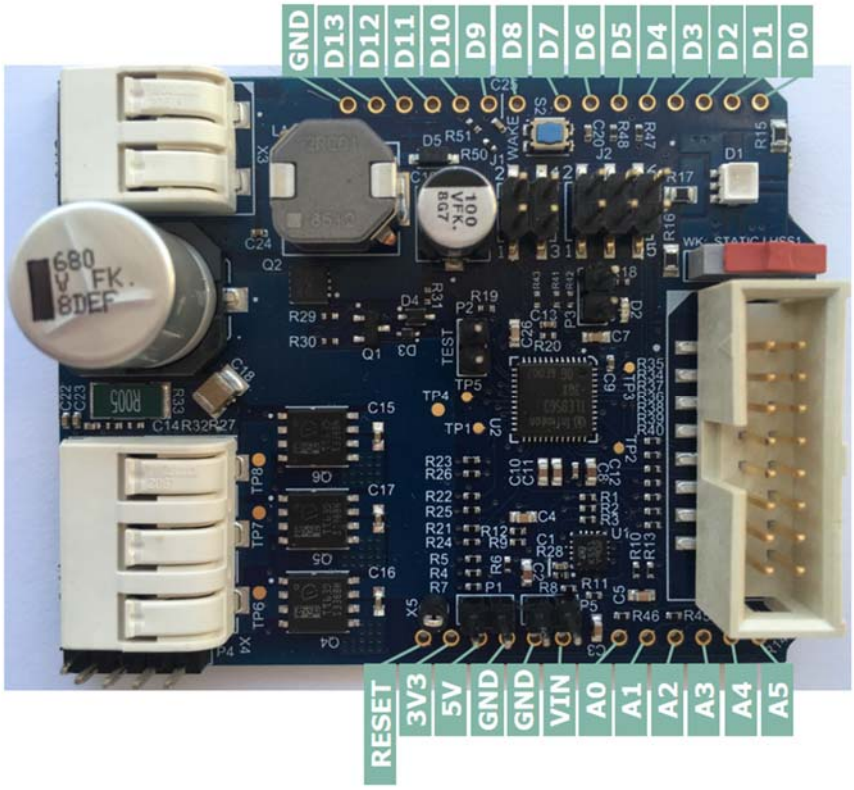


Figure 7 TLE9562-3QX evaluation board: Arduino connectors 2/2



2.2 Schematic

Figure 8 Schematic 1/3

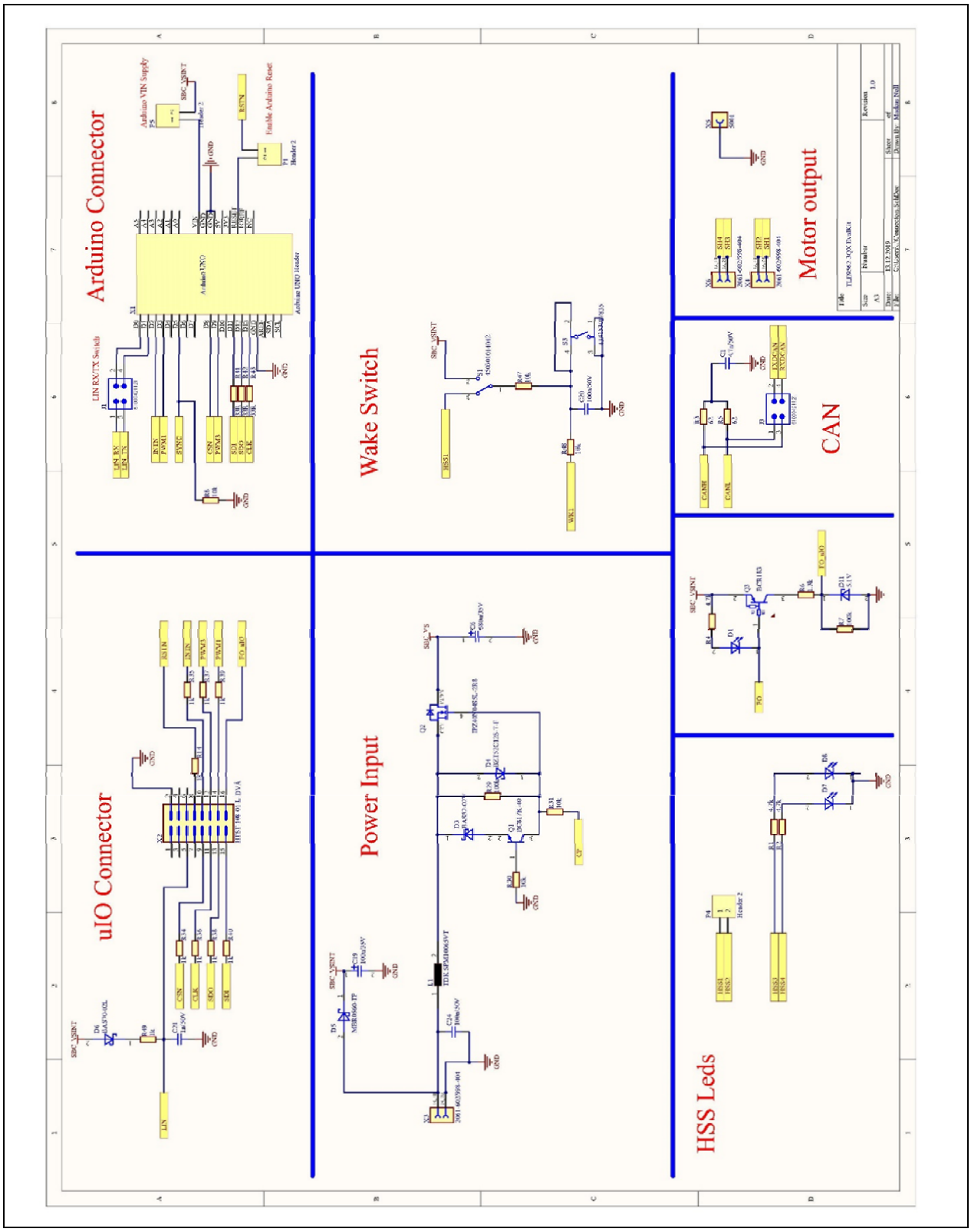


Figure 9 Schematic 2/3

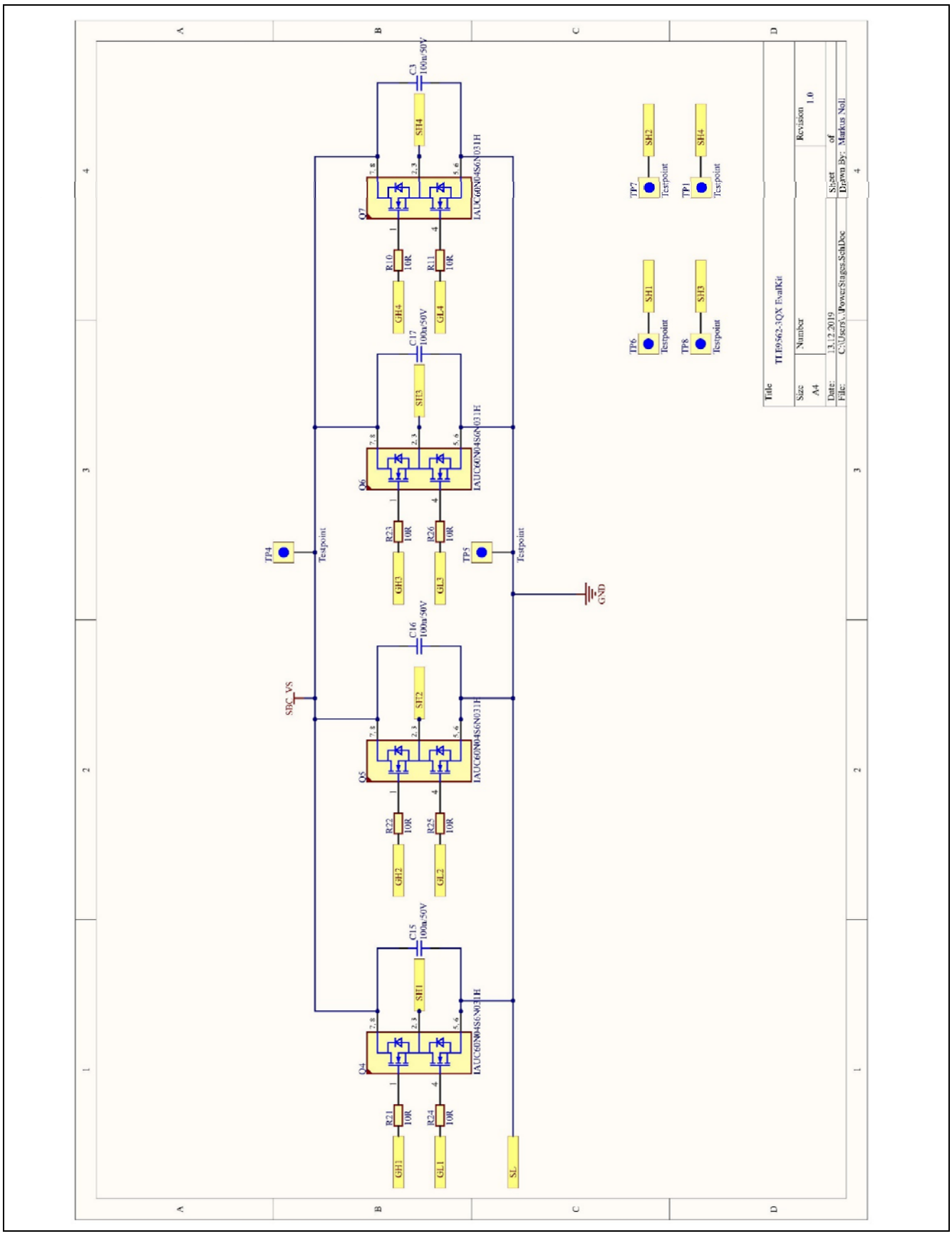
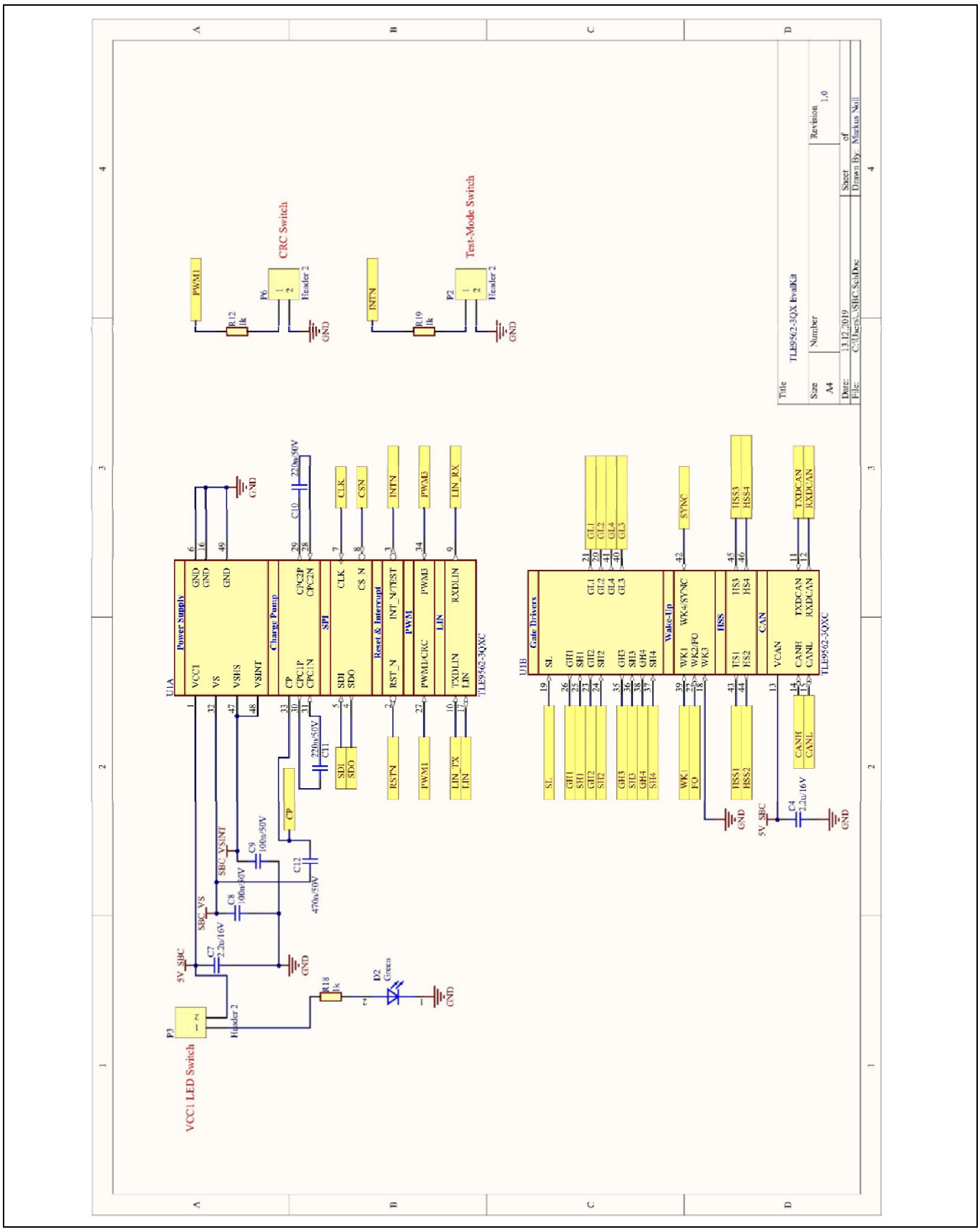


Figure 10 Schematic 3/3



2.3 Layers

Figure 11 Top layer with overlay

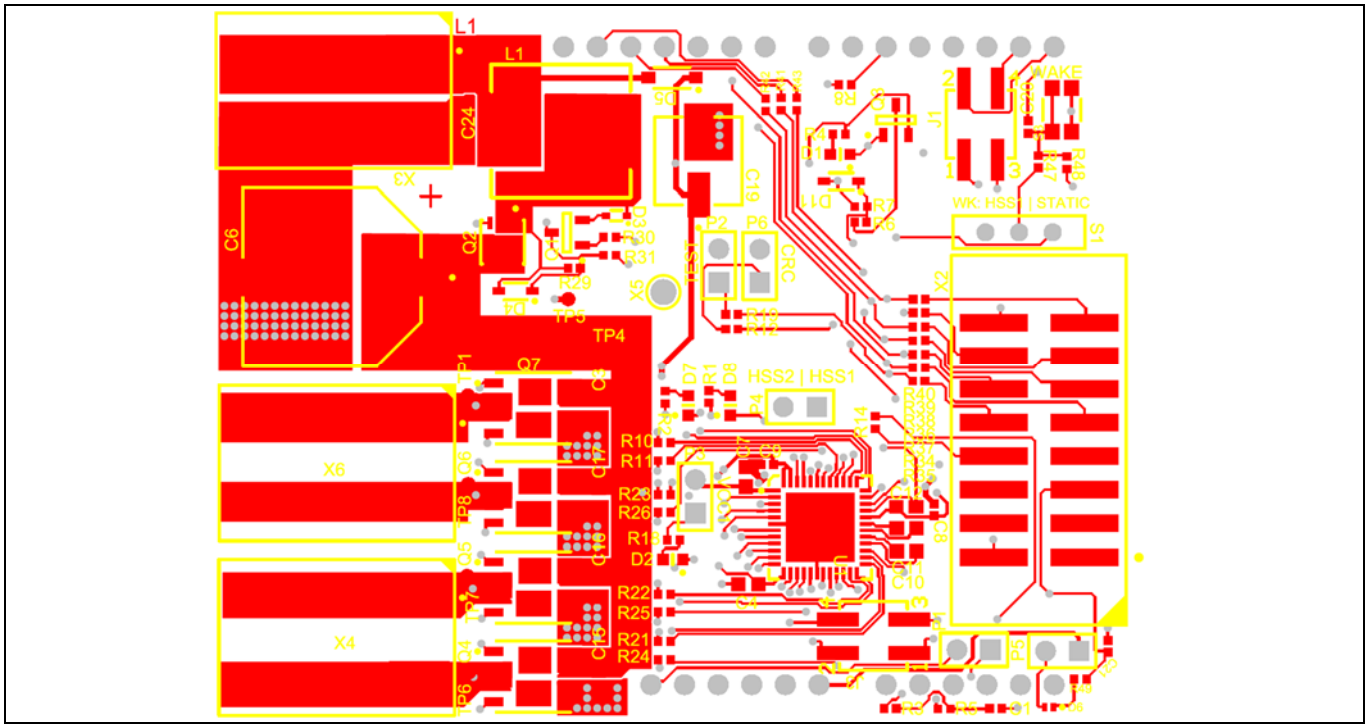


Figure 12 Bottom layer with overlay

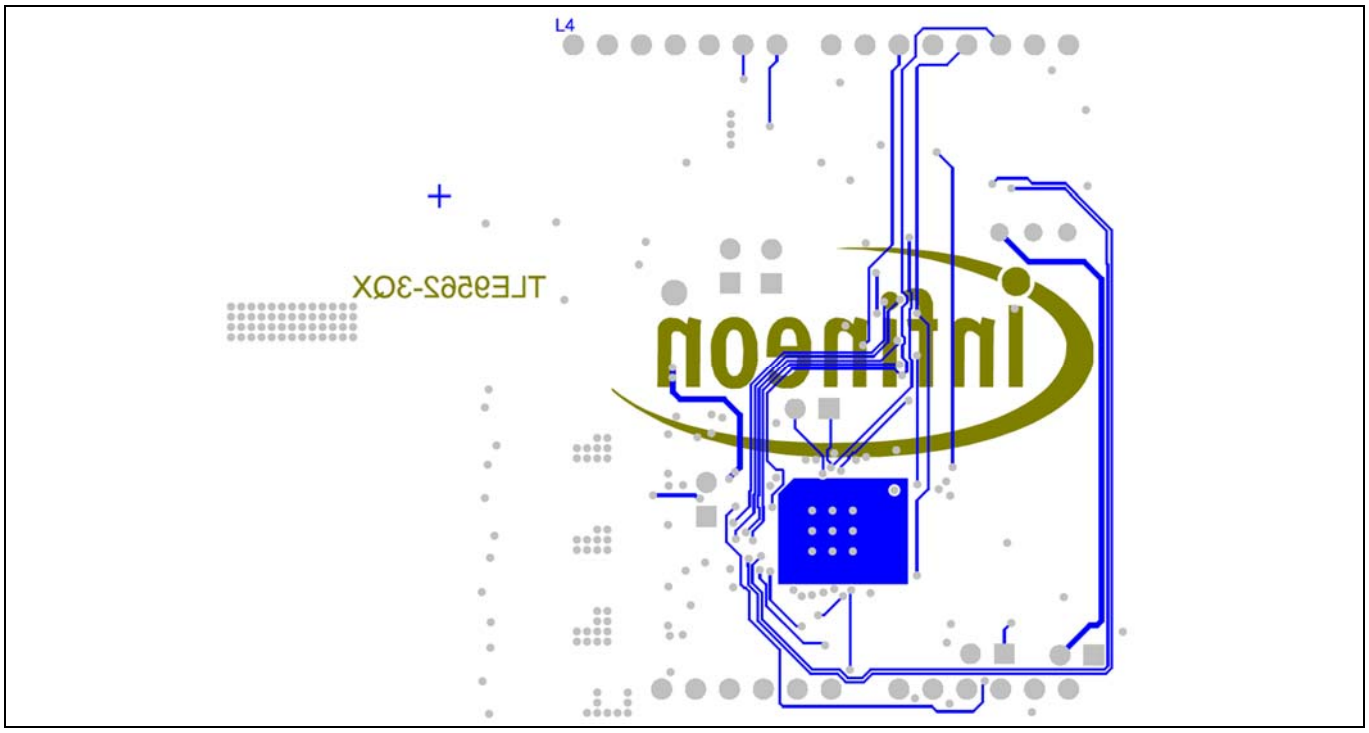
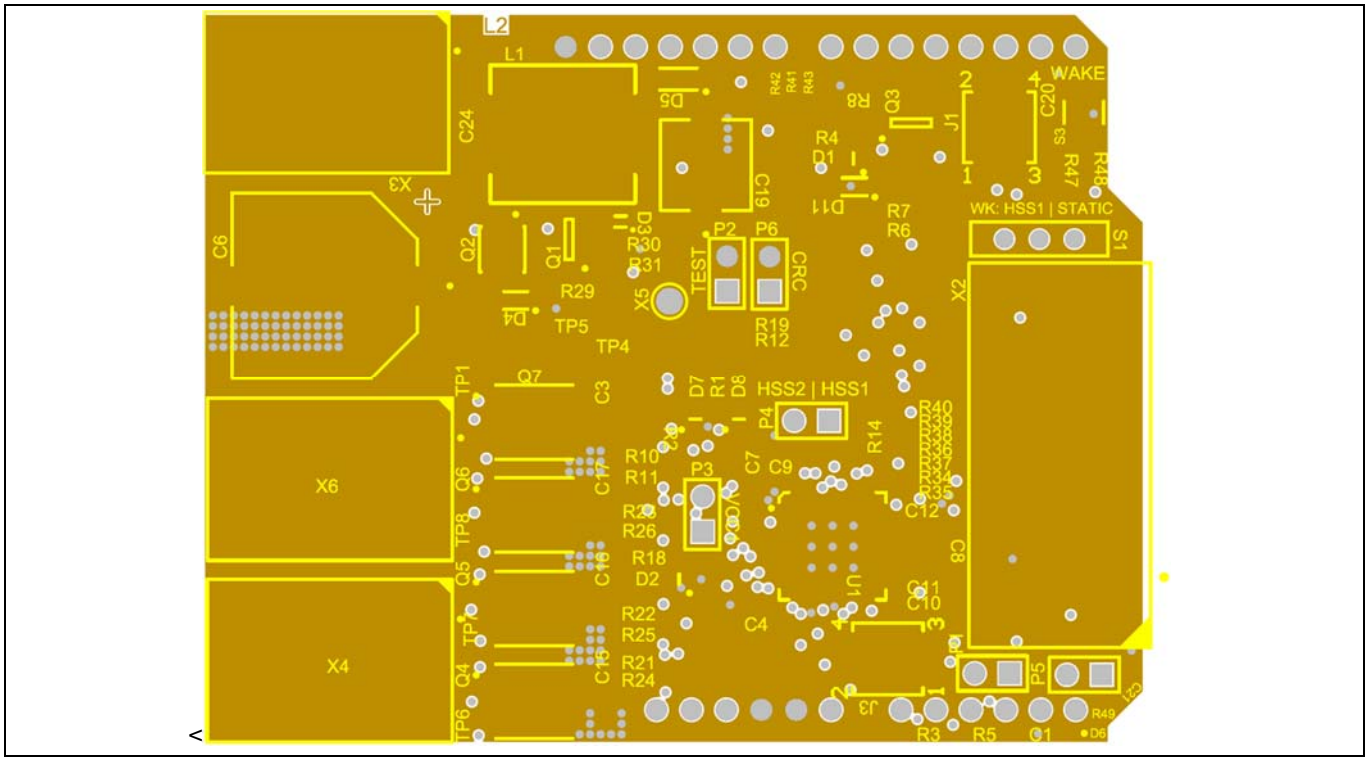


Figure 13 Inner layer - GND



2.4 Bill of Material of the TLE9562-3QX

Figure 14 TLE9562-3QX - Section of Bill of Material (BOM)

Designator	Comment	Manufacturer	Description	Quantity
J1, J3	61000421121		SMT Vertical Pin Header WR-PHD, Pitch 2.54 mm, Dual Row, 4 pins	2
L1	TDK SPM10065VT			1
P1, P2, P3, P4, P5, P6	Header 2		Header, 2-Pin	6
S1	450301014042		WS-SLTV THT Mini Slide Switch, Opposite Side Connection, SPDT	1
S3	434153017835		WS-TASV J-Bend SMT Tact Switch 3.5x2.9mm, height 1.7mm, 350gf	1
TP1, TP4, TP5, TP6, TP7, TP8	Testpoint			6
C3, C15, C16, C17	100n/50V	AVX	Surface Mount Ceramic Capacitor Automotive Grade	4
D4	BZT52C12S-7-F	Diodes Incorporated	Surface Mount Zener Diode	1
D3	BAS52-02V	Infineon Technologies	Silicon Schottky Diode	1
D6	BAS70-02L	Infineon Technologies	Silicon Schottky Diode	1
Q1	BC817K-40	Infineon Technologies	NPN Silicon AF Transistor	1
Q2	IPZ40N04S5L-2R8	Infineon Technologies	OptiMOS-5 N-Channel Enhancement Mode Power-Transistor, VDS 40V, ID 40A	1
Q3	bjt_pnp_1b2e3c_3p_10k	Infineon Technologies	PNP Silicon Digital Transistor	1
Q4, Q5, Q6, Q7	IAUC60N04S6N031H	Infineon Technologies		4
U1	TLE9562-3QXC	Infineon Technologies	Bridge SBC Family, PLGM	1
X5	5001	Keystone Electronics Corp.	Test Point THT, Black	1
D5	MBR0560-TP	Micro Commercial Components	Schottky Rectifier, 0.5A/60V	1
D1, D7, D8	d_led_a	OSRAM Opto Semiconductors	Surface Mount LED, Super Red, 630nm	3
D2	Green	OSRAM Opto Semiconductors	Surface Mount LED, Green, 570nm	1
C6	680u/35V	Panasonic	Aluminum Electrolytic Capacitors	1
C19	100u/35V	Panasonic	Surface Mount Aluminium Electrolytic Capacitor	1
X2	HTST-108-01-L-DVÂ	Samtec	SMT, .025" Shrouded SQ POST IDC Headers , 2.54mm pitch, 16-pin Vertical, Double row	1
C1	4.7n/50V	TDK Corporation	Chip Multilayer Ceramic Capacitor for General Purpose	1
C4, C7	2.2u/16V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	2
C8, C9, C20, C24	100n/50V	TDK Corporation	Chip Multilayer Ceramic Capacitor for General Purpose	4
C10, C11	220n/50V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	2
C12	470n/50V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	1
C21	1n/50V	TDK Corporation	Chip Multilayer Ceramic Capacitor for General Purpose	1
R1, R2, R4	4.7k	Vishay	Standard Thick Film Chip Resistor	3
R3, R5	62	Vishay	Standard Thick Film Chip Resistor	2
R6	1.3k	Vishay	Standard Thick Film Chip Resistor	1
R7, R29	100k	Vishay	Standard Thick Film Chip Resistor	2
R8, R30, R31, R47, R48	10k	Vishay	Standard Thick Film Chip Resistor	5
R10, R11, R21, R22, R23, R24, R25, R26	10R	Vishay	Standard Thick Film Chip Resistor	8
R12, R14, R18, R19, R34, R35, R36, R37,	1k	Vishay	Standard Thick Film Chip Resistor	12
R41, R42, R43	33R	Vishay	Standard Thick Film Chip Resistor	3
D11	5.1V	Vishay General Semiconductor	Small Signal Zener Diode, GDZ-G-Series / 5.1V	1
X3, X4, X6	2061-602/998-404	WAGO	SMD PCB Terminal block with Push-Buttons, with 6mm Pin Spacing, 2-pole	3

3 Start and uIO stick programmation

The uIO stick requires a firmware supporting the GUI (Graphic user interface)

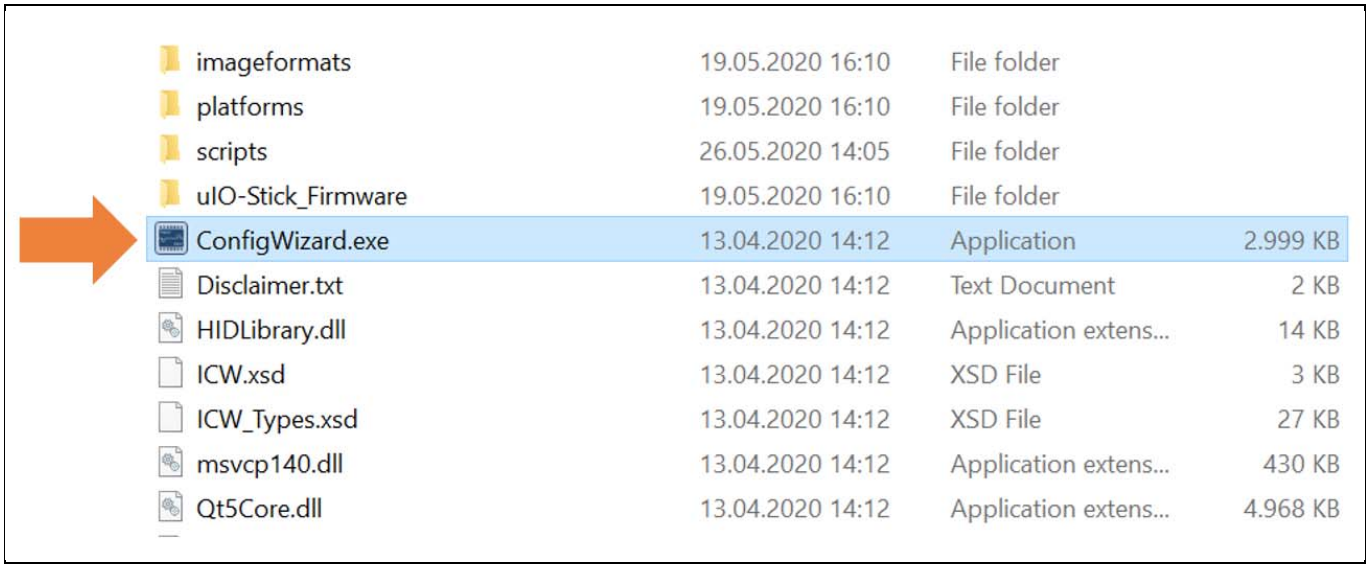
3.1 Download the Graphic User Interface for the uIO stick

The TLE9210x gate driver setting tool can be either downloaded from Infineons's MyICP upon access request or from the Infinon Tool Box (not yet possible by the generation of the user manual).

3.1.1 Download from MyICP

The GUI for the Motor System IC can be downloaded upon request to Motorcontrolsolutions@infineon.com
Once the .zip file is locally extracted, start: **ConfigWizard.exe** (in the application subfolder) and click on the icon for **TLE9562.**

Figure 15 Start of the GUI after download from MyICP



3.1.2 Download from the Infineon Toolbox

The GUI is installed the Infineon Toolbox following the steps below:

1. Go to: **www.infineon.com/toolbox**
2. Follow the instructions provided on the toolbox installation webpage. Also see the "Download Getting Started Infineon Toolbox Guide" link for des additional user information
3. Launch the Infineon Toolbox on your PC:
4. Select **Manage Tools**
5. Search and install the tool: **Config Wizard for Motor System IC**
6. Start the **Config Wizard for Motor System IC**
7. Click on **TLE9562**

3.2 Configuration Wizard for TLE9562-3QX

The first utilization of the uIO stick in combination of the GUI for the TLE9562 requires the programmation of the uIO stick:

1. Connect the uIO stick to the USB port

2. Menu Extra

3. Update uIO

4. Click Yes (refer Figure 16)

Figure 16 Updating the uIO

5. Select uIO.V222.hex and open (the valid version at the creation time of the document)

3.2 Load TLE9562 presettings

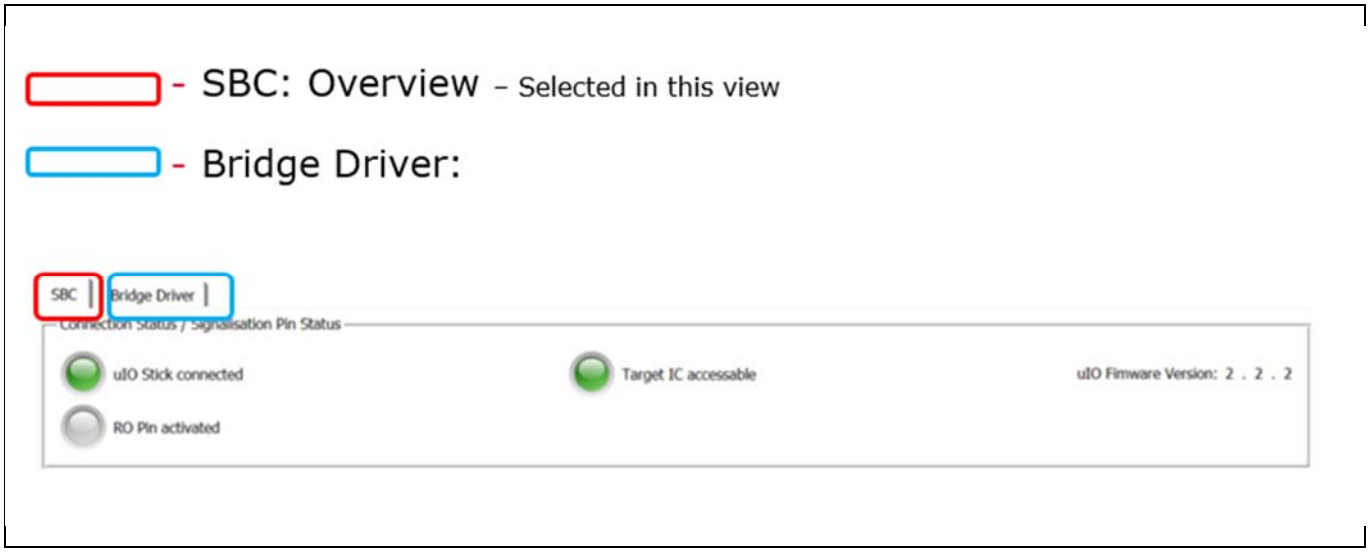
Presettings for the gate driver can be loaded:

File → Load → TLE9562_ConfigWizard_Presettings_2020_06_25_1.icwp

- The charge pump is activated
- The active gate control and the postcharge are activated
- The gate driver currents for the active and freewheeling MOSFETs are pre-configured

4 Config Wizard - Control tabs

Figure 17 The two main tabs SBC, Bridge Driver



4.1 SBC

Figure 18 Connection Status/ Signaling Pin Status

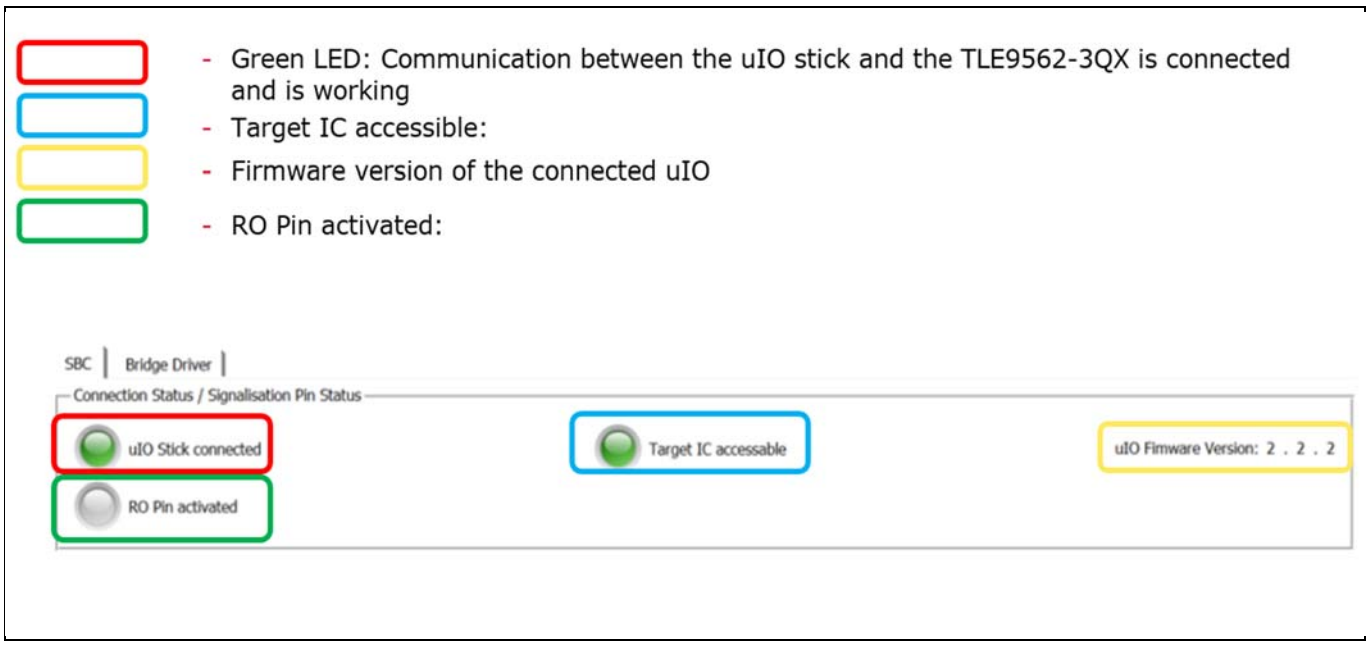


Figure 19 Overview of the SBC tab

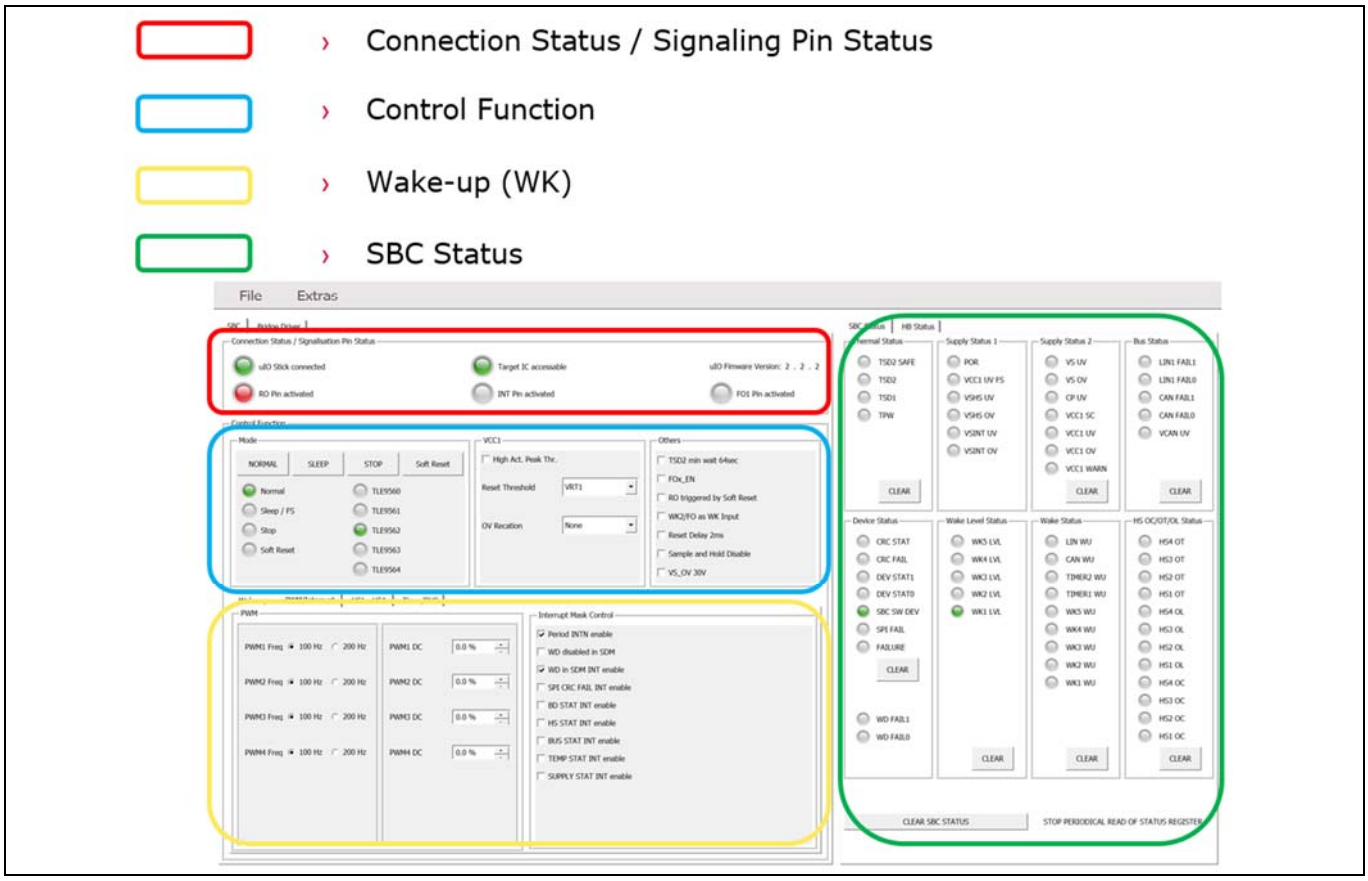


Figure 20 SBC: Control functions

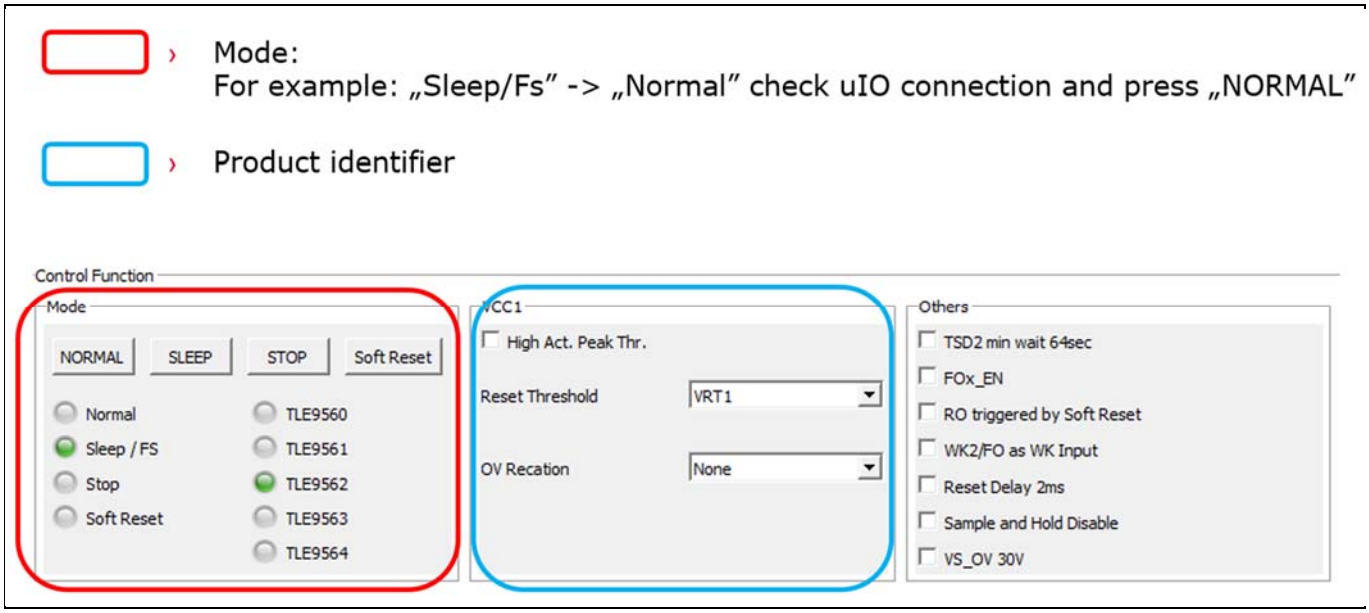


Figure 21 SBC: Wake-up, PWM/Interrupt, HS1 – HS4, Timer /BUS

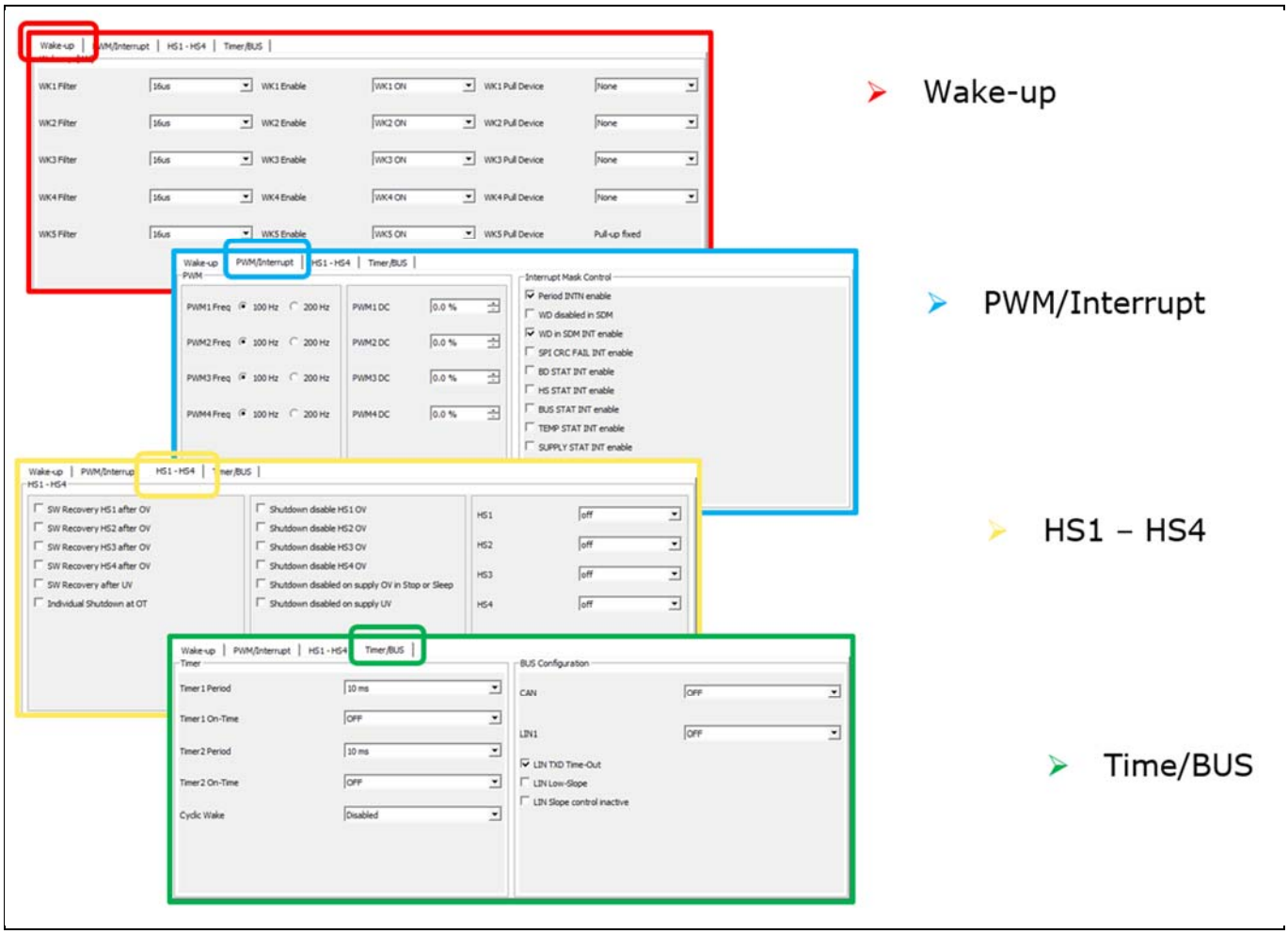


Figure 22 SBC Status

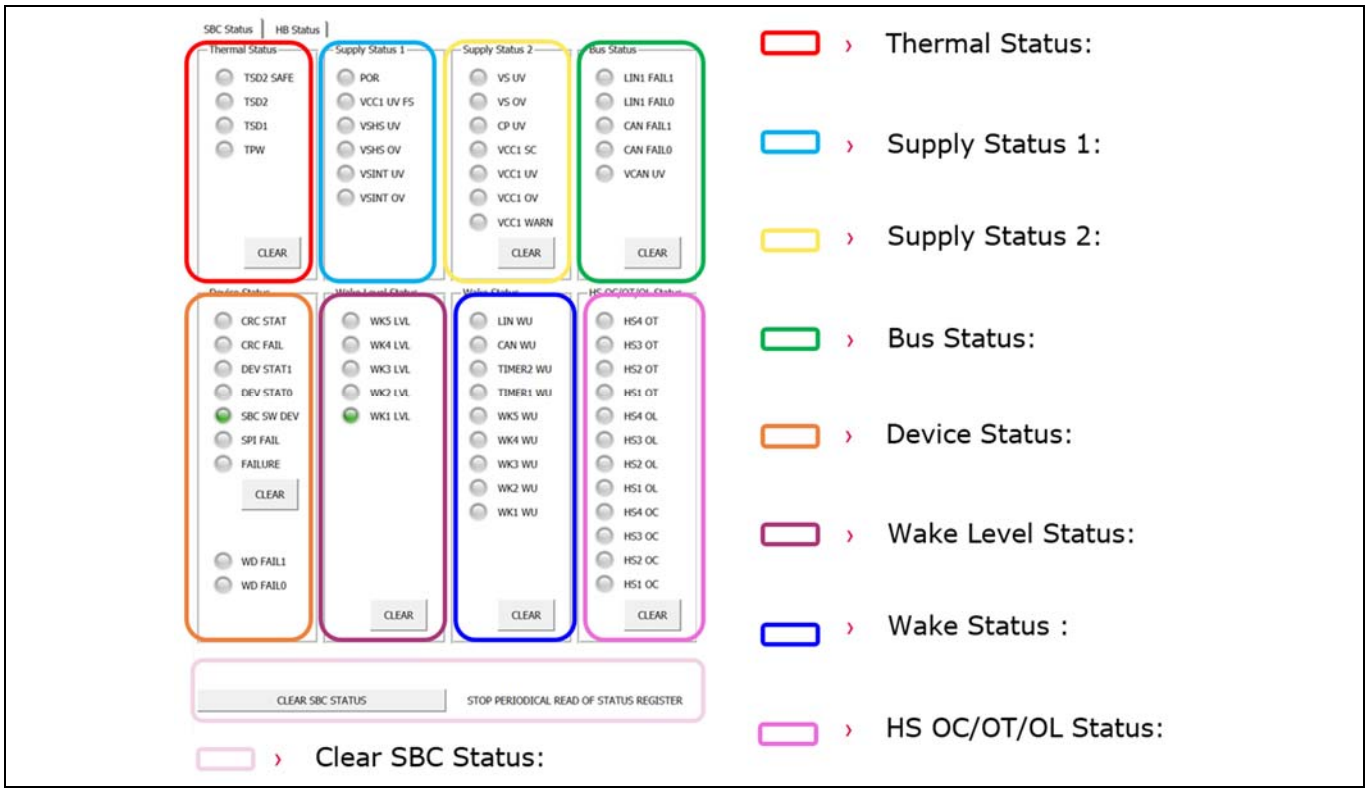
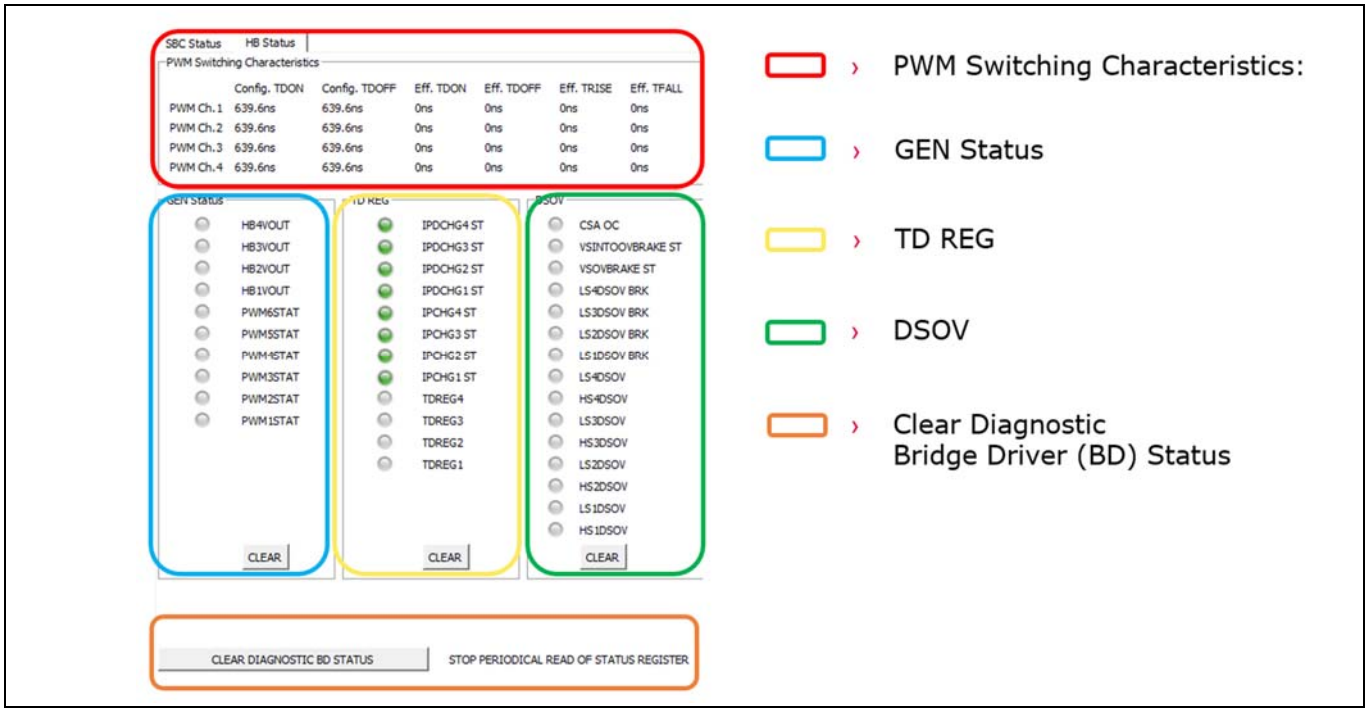


Figure 23 Half-Bridge (HB) Status



4.2 Bridge Driver

Figure 24 Bridge Driver: 1st Tab – General control , VDS Monitoring (Mon.)

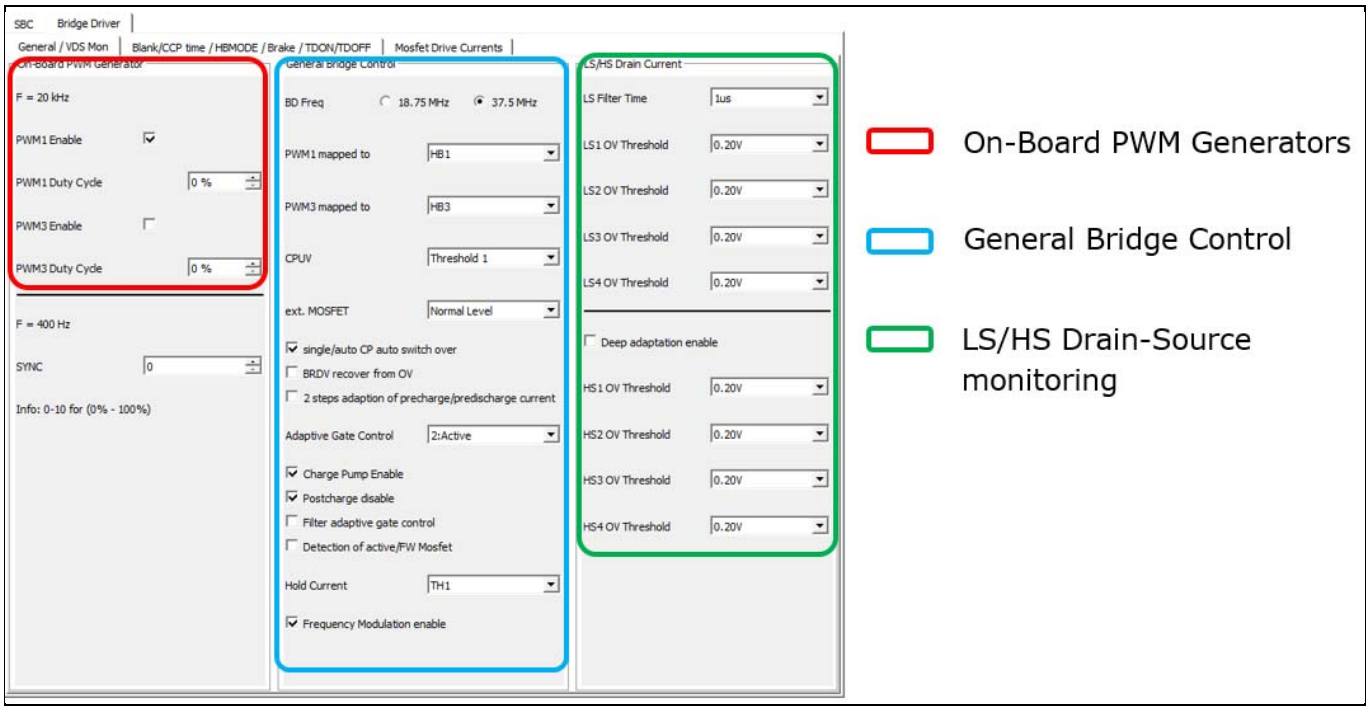


Figure 25 Bridge Driver: 2nd Tab – Blank/ CCp time, HBMODE, Brake, TDON/ TDOFF Timing

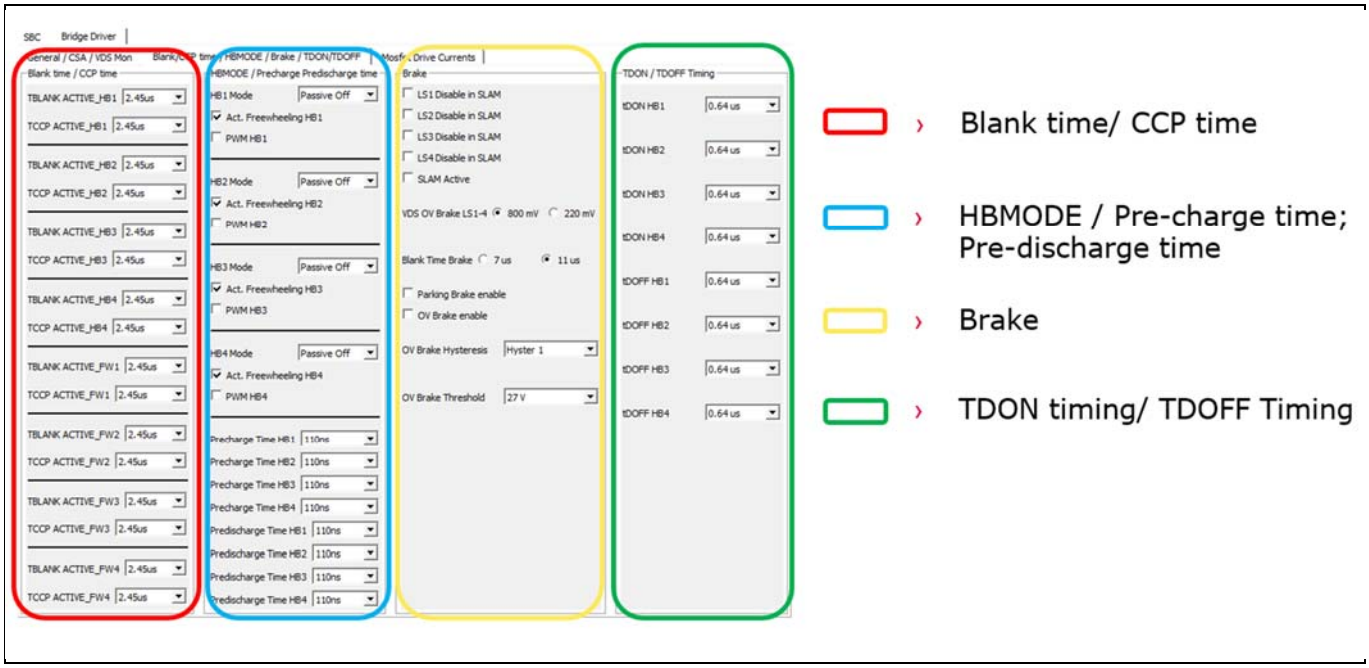
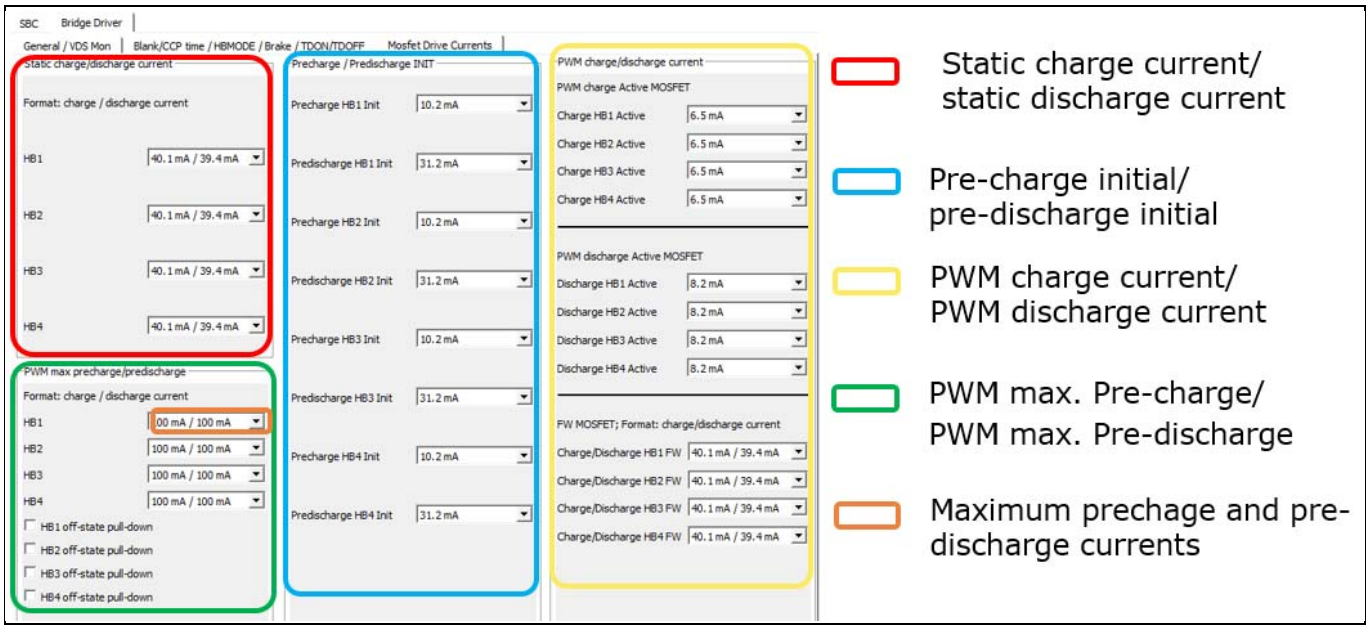


Figure 26 Bridge Driver: 3rd Tab – MOSFET Drive Currents



5 Revision history

Document version	Date of release	Description of changes
V 1.0	2020-07-16	Initial version

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