BLDC Shield TLE9563-3QX

About this document

Scope and purpose

This user manual describes the BLDC shield with the TLE9563-3QX. This document provides detailed information on the board's content, layout and use. It should be used in conjunction with the TLE9563-3QX 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

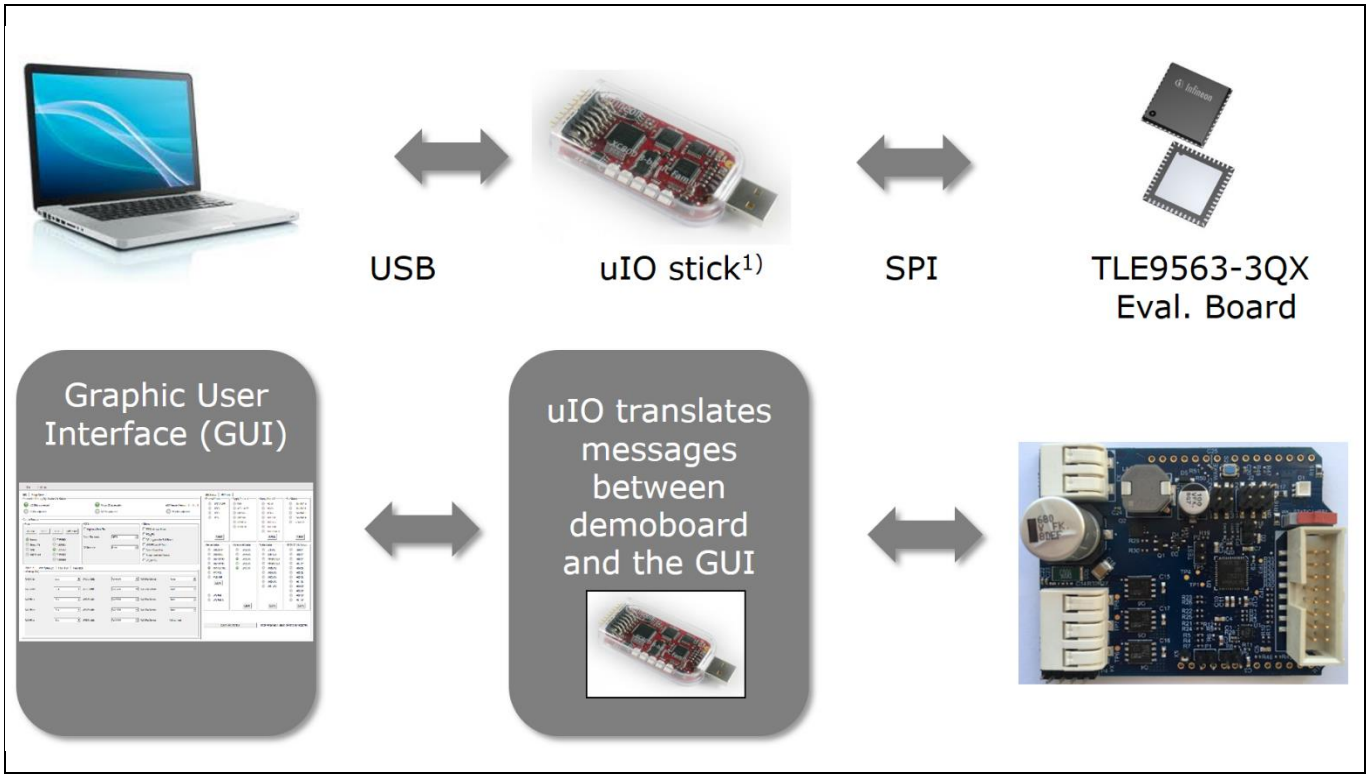
The TLE9653-3QX evaluation board is intended to provide a simple and easy-to-use tool for getting familiar with the device features and for first application tests.

The evaluation board can be used wither with a uIO-stick, or with an Arduino Uno.

The uIO-stick is the interface between the PC and the application board such as the TLE9563-3QX.
The TLE9563-3QX SPI communication is emulated by the uIO-stick, which is controlled by the PC software.

The board of the TLE9563-3QX 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 TLE9563-3QX Eval. 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 TLE9563-3QX evaluation board is designed to be compatible with the uIO-stick. The uIO-stick plugs into the TLE9563-3QX main board via a 16-pin header, and allows an easy interface to the microcontroller via USB for SPI communication.

Figure 2 TLE9563-3QX evaluation board: Overview

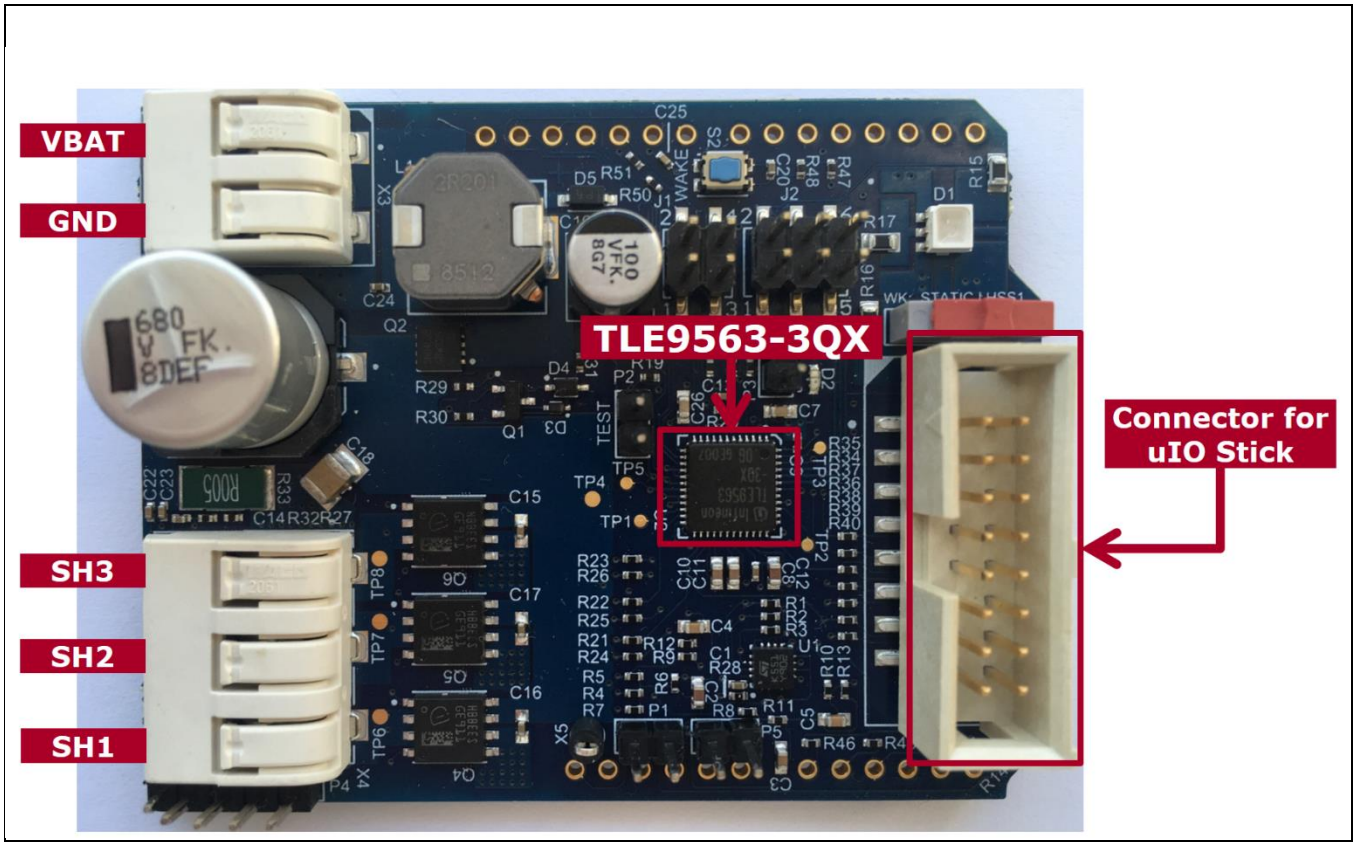


Figure 3 TLE9563-3QX evaluation board

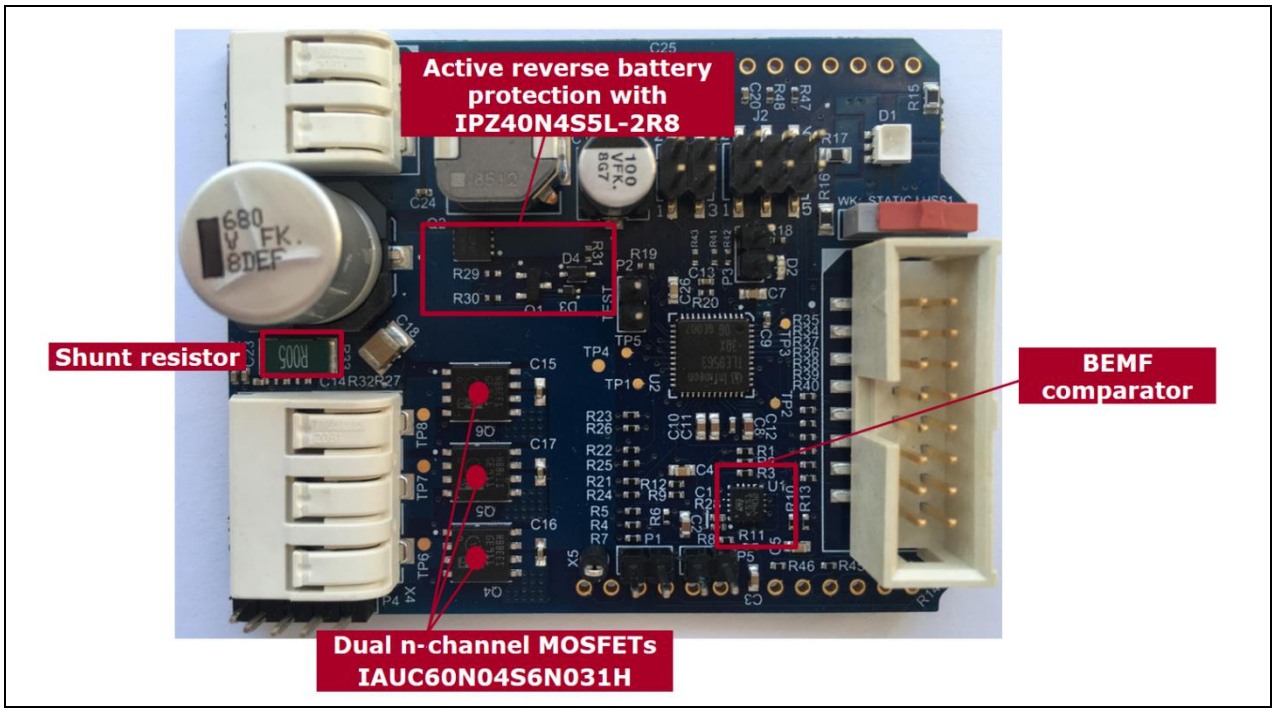


Figure 4 TLE9563-3QX evaluation board

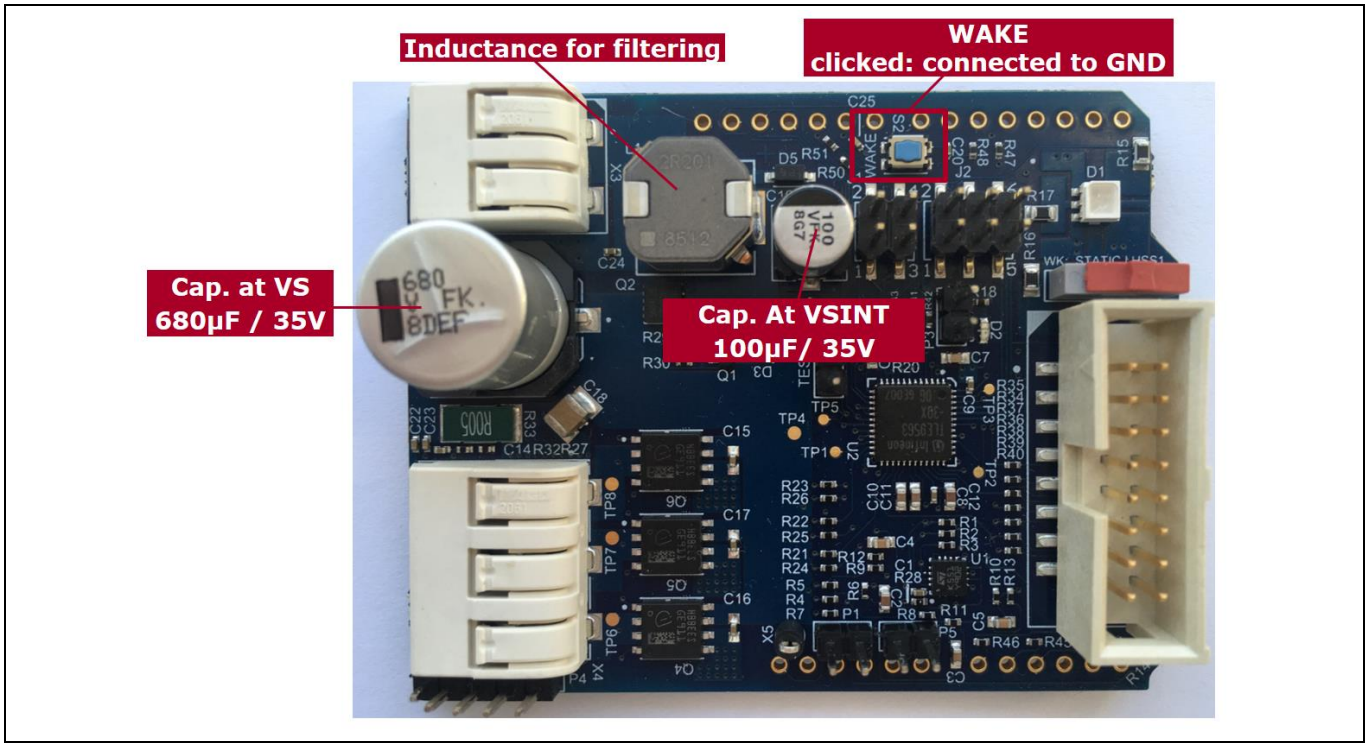
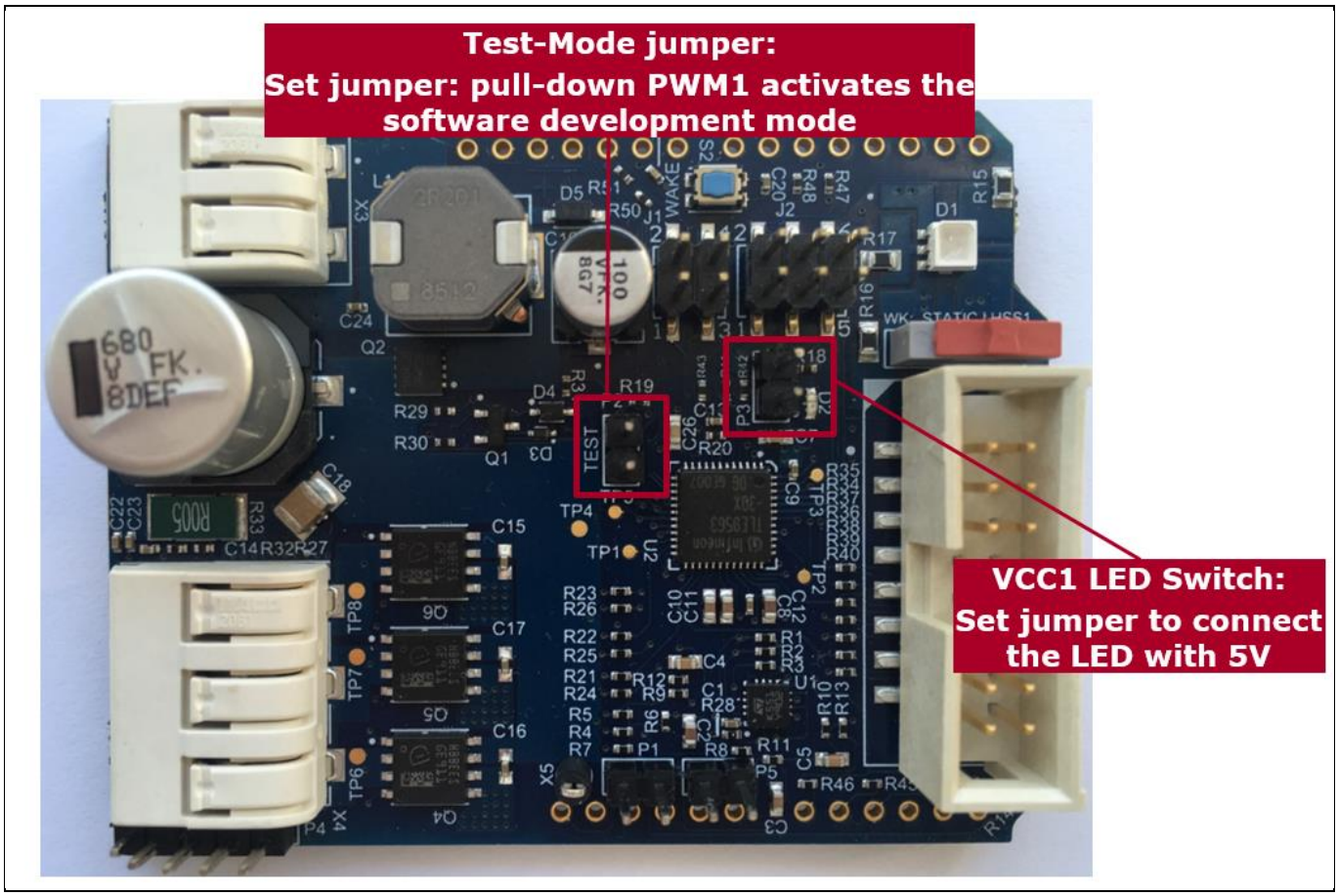


Figure 5 TLE9563-3QX evaluation board: Jumper settings 1/3



- Test-Mode jumper: Software Development Mode is a dedicated SBC configuration especially useful for software development. When the jumper is set, the watchdog is disabled.

Attention: ***The uIO stick does not refresh the watchdog. Therefore, for a correct operation with the uIO stick, the Jumper for Test Mode must be placed in order to enable the software development mode and to deactivate the watchdog***

Figure 6 TLE9563-3QX evaluation board: Jumper settings 2/3

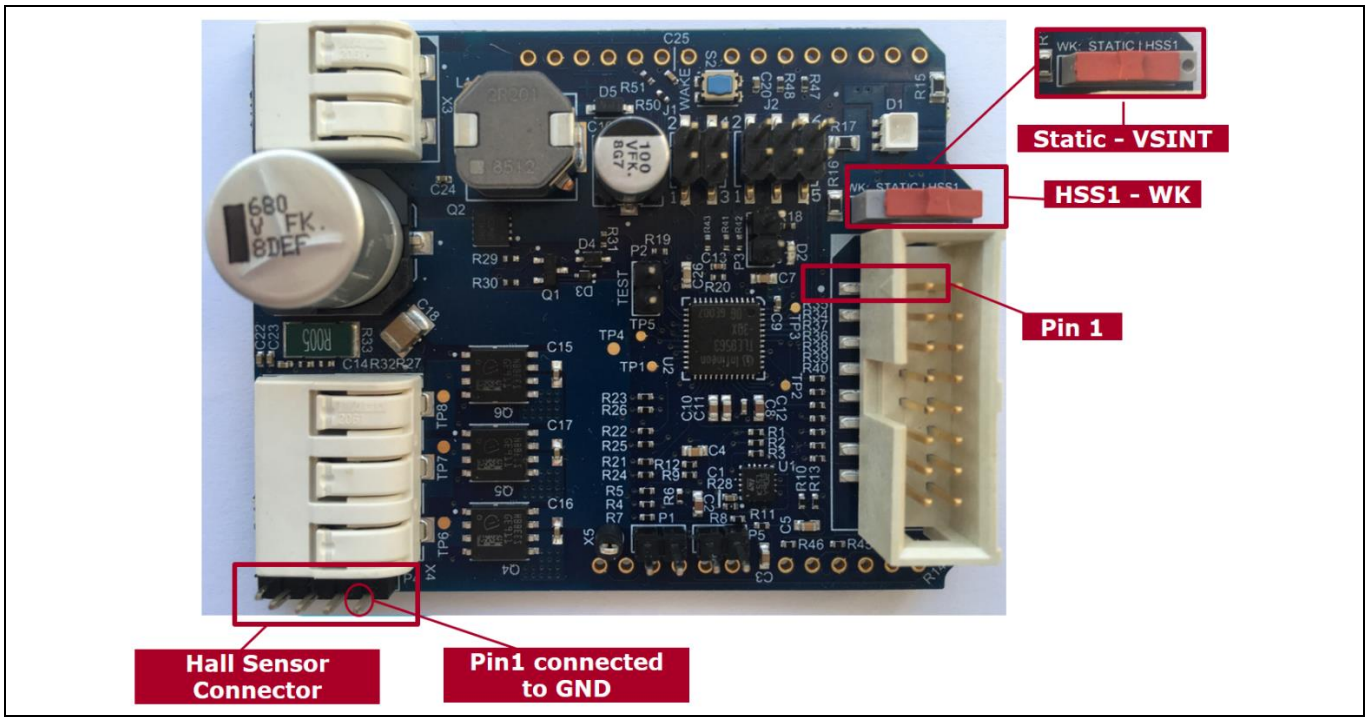


Figure 7 TLE9563-3QX evaluation board

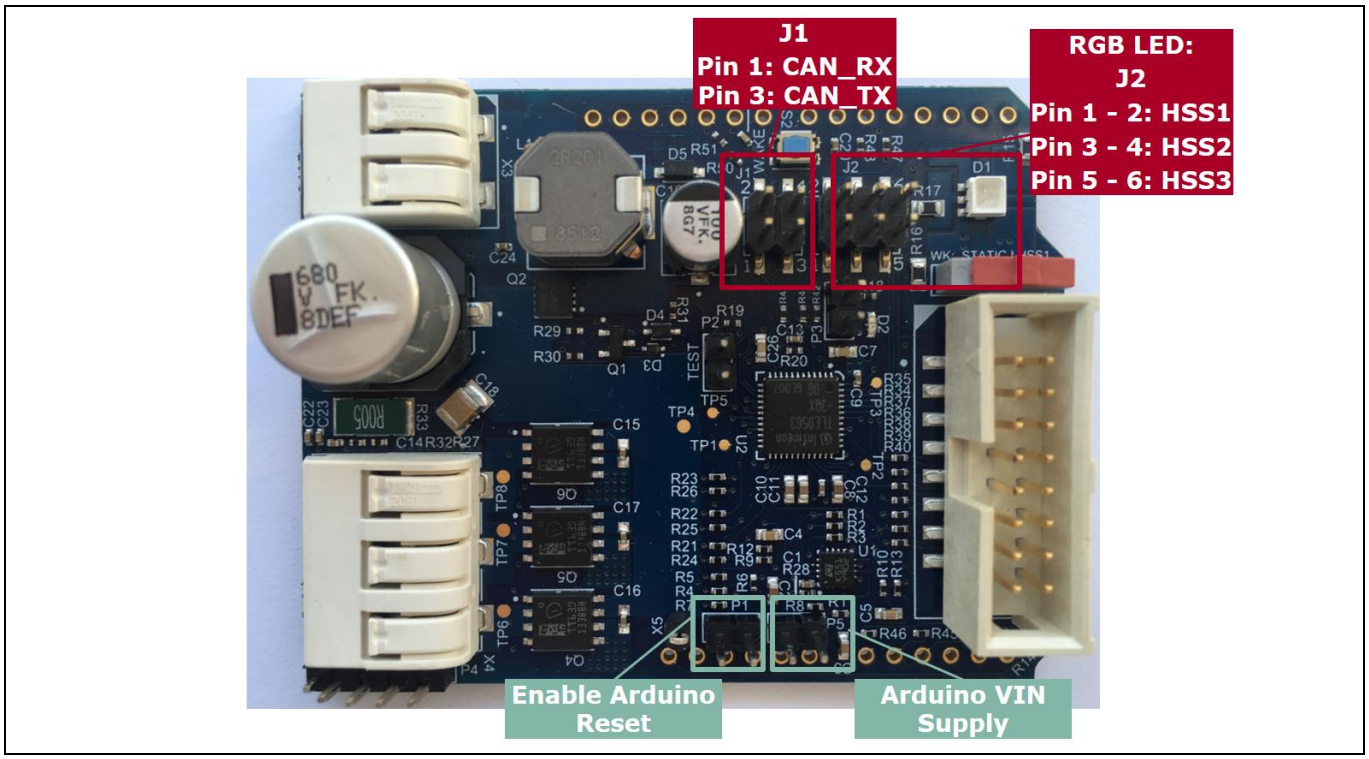
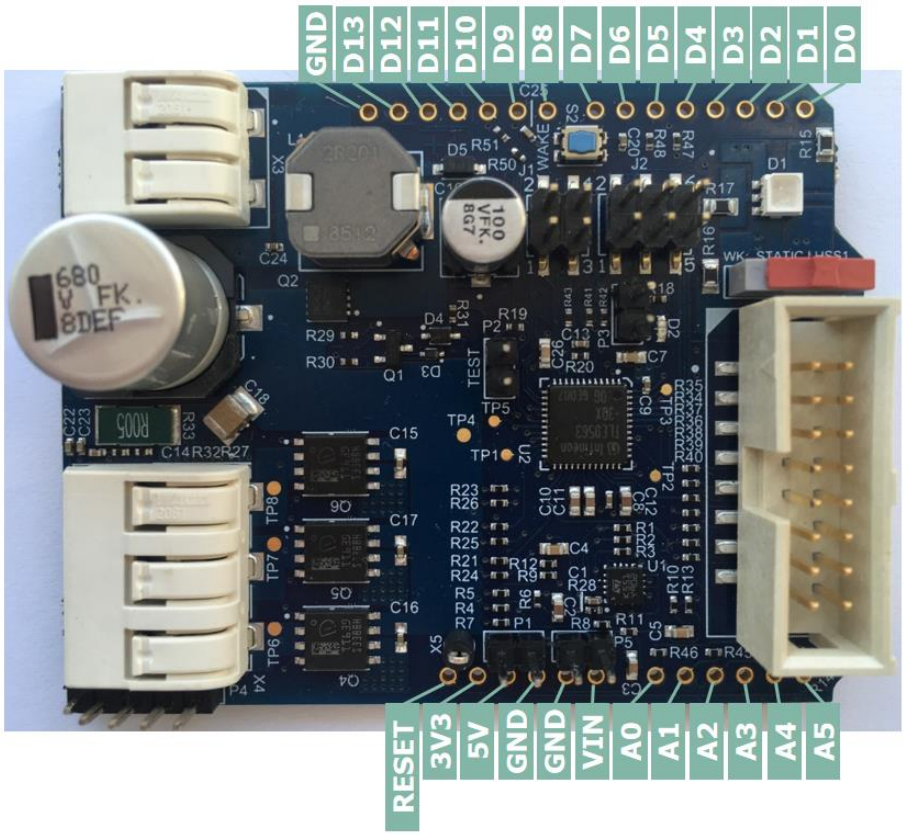


Figure 8 TLE9563-3QX evaluation board: Arduino connectors



2.2 Schematic

Figure 9 Schematics 1/4

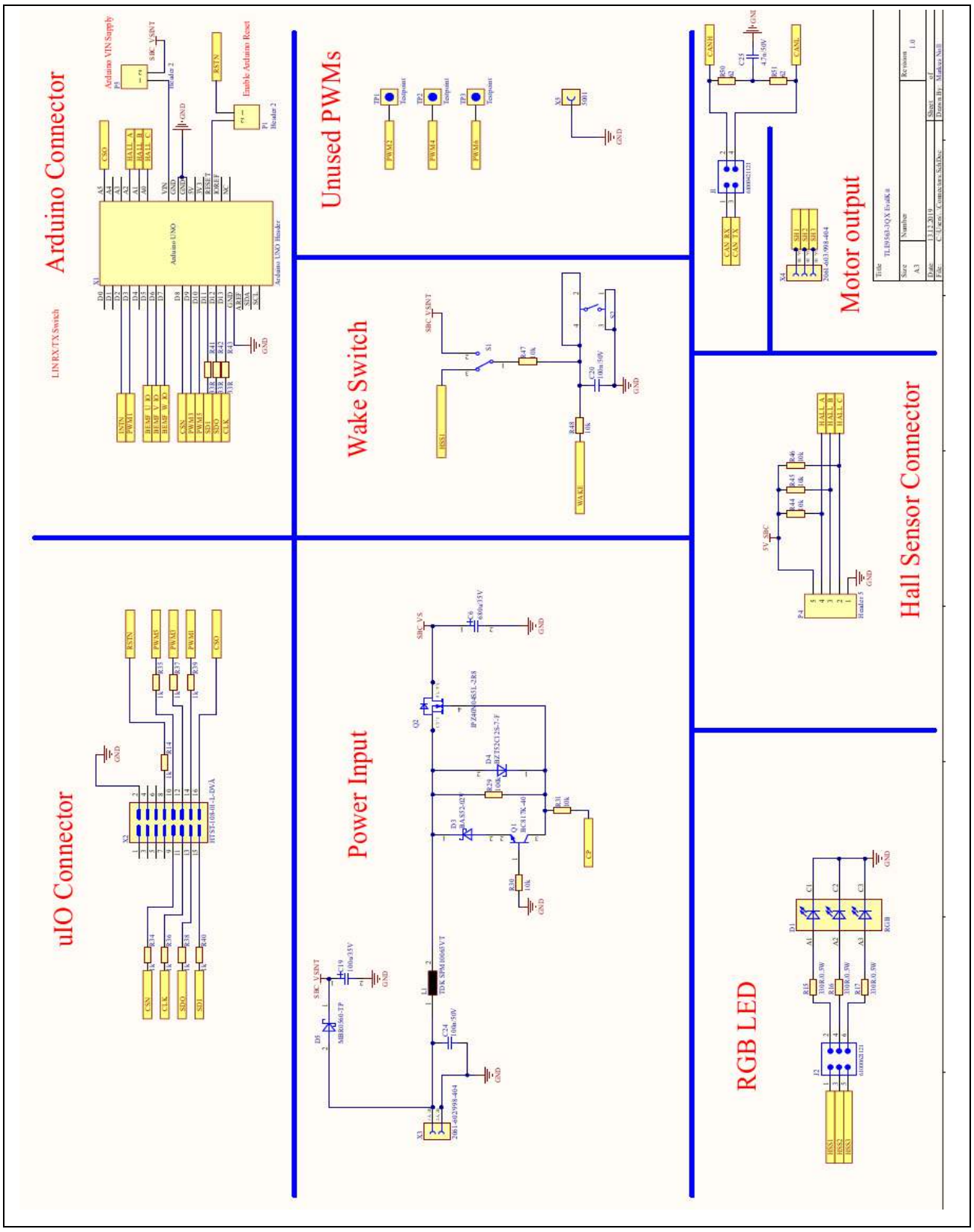


Figure 10 Schematics 2/4

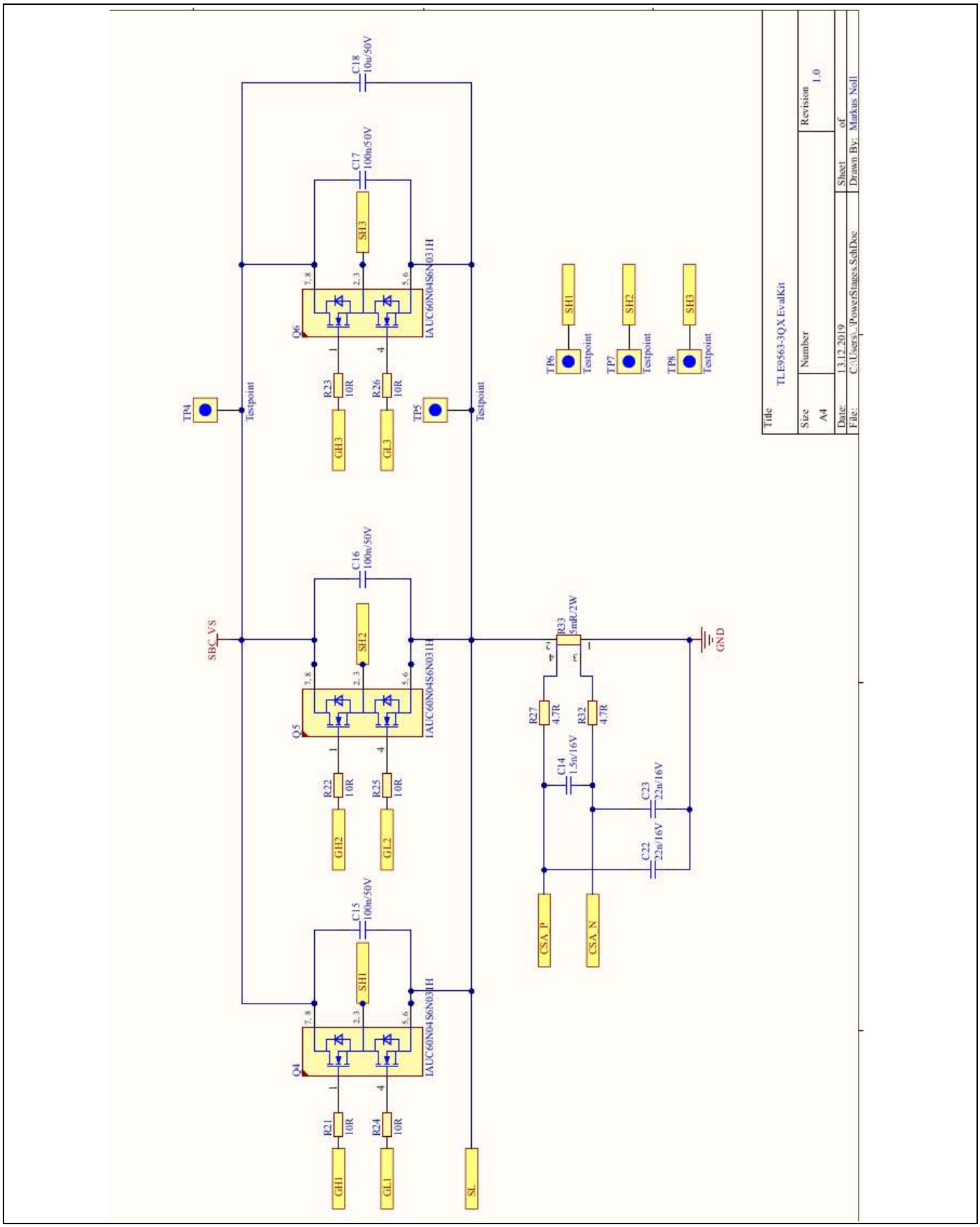


Figure 11 Schematics 3/4

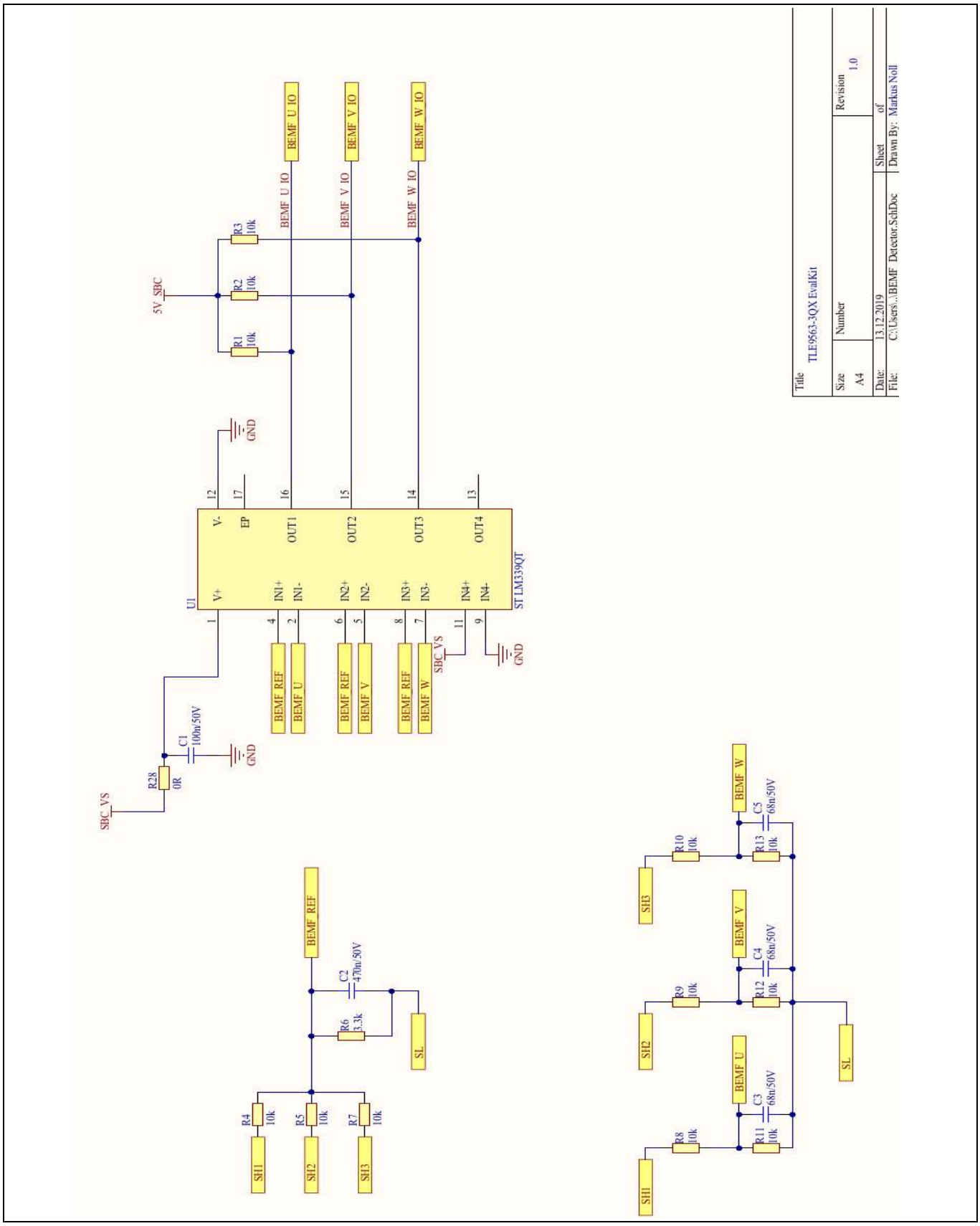
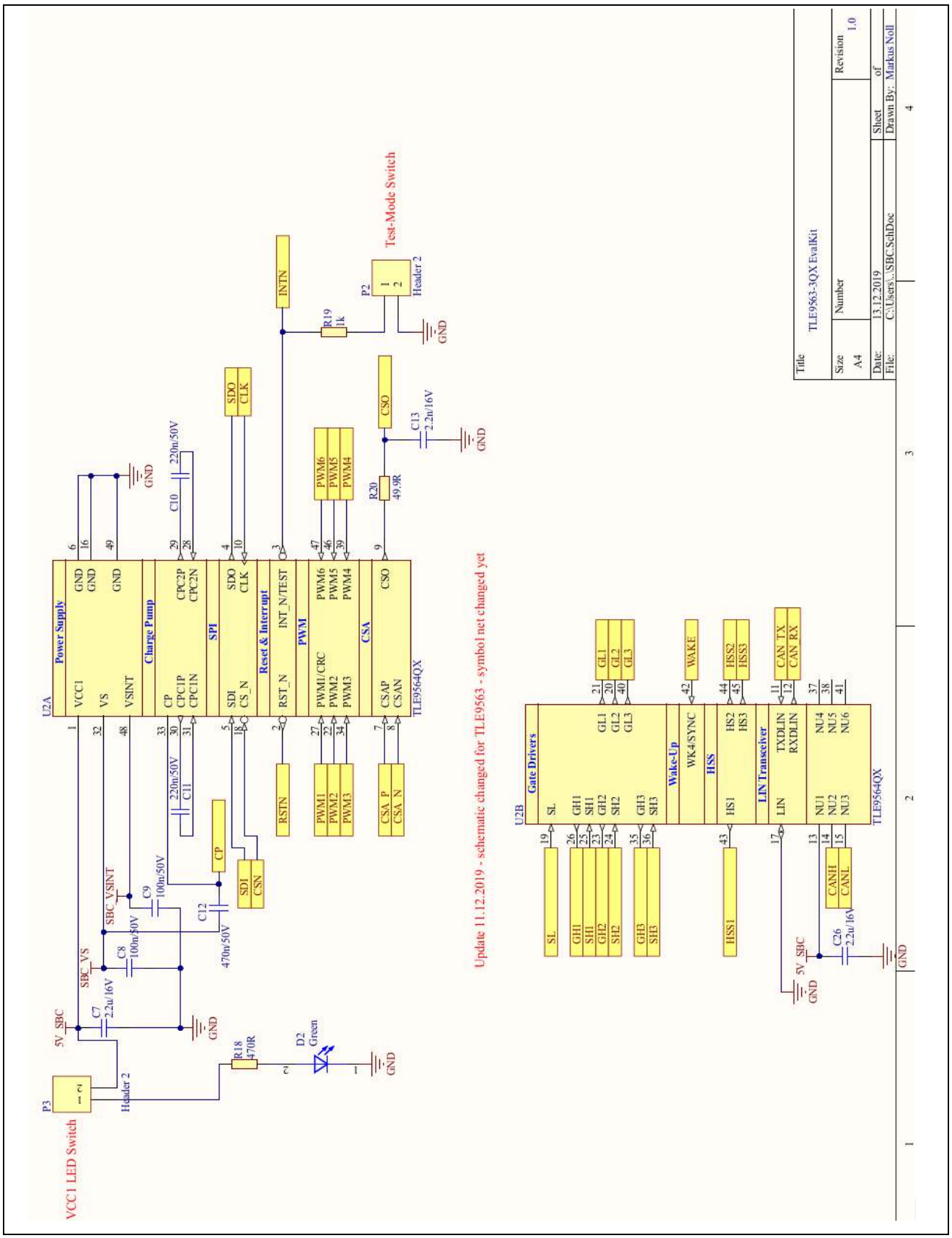


Figure 12 Schematics 4/4



2.3 Layout

Figure 13 Top layer with overlay

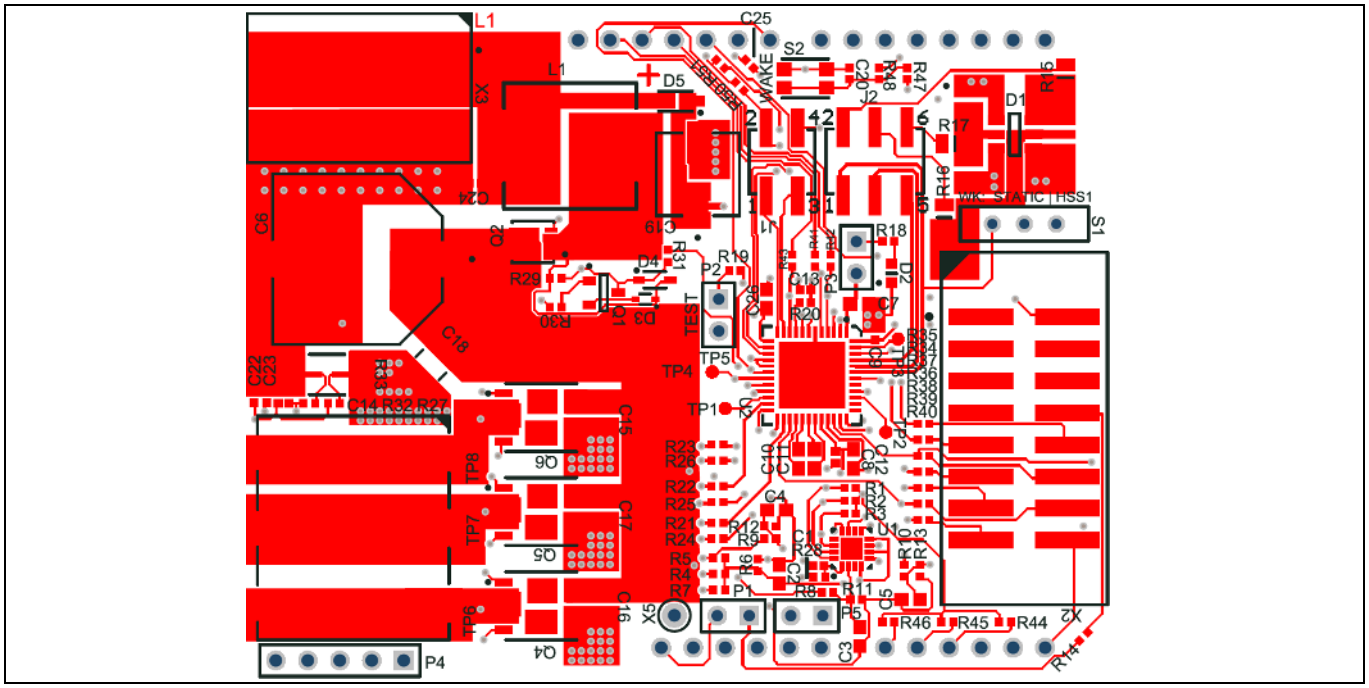


Figure 14 Bottom layer with overlay

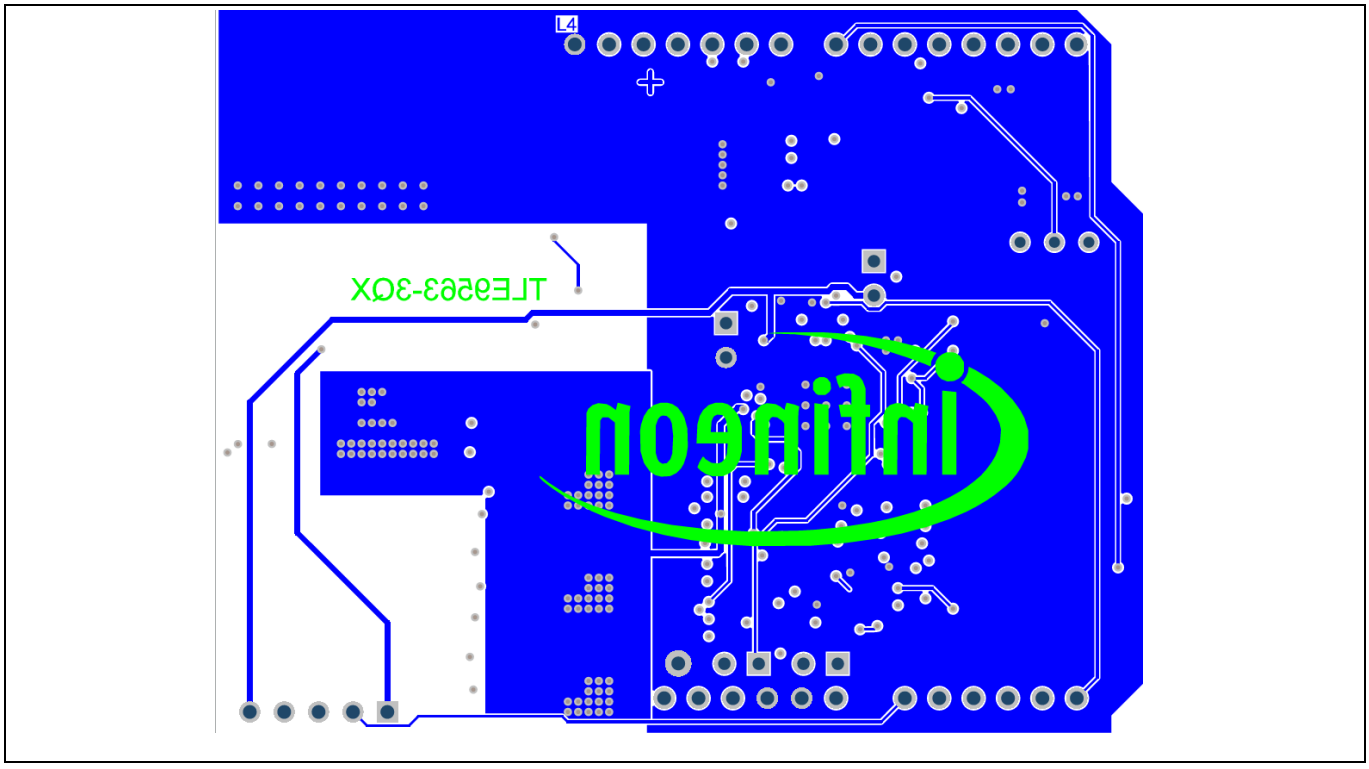
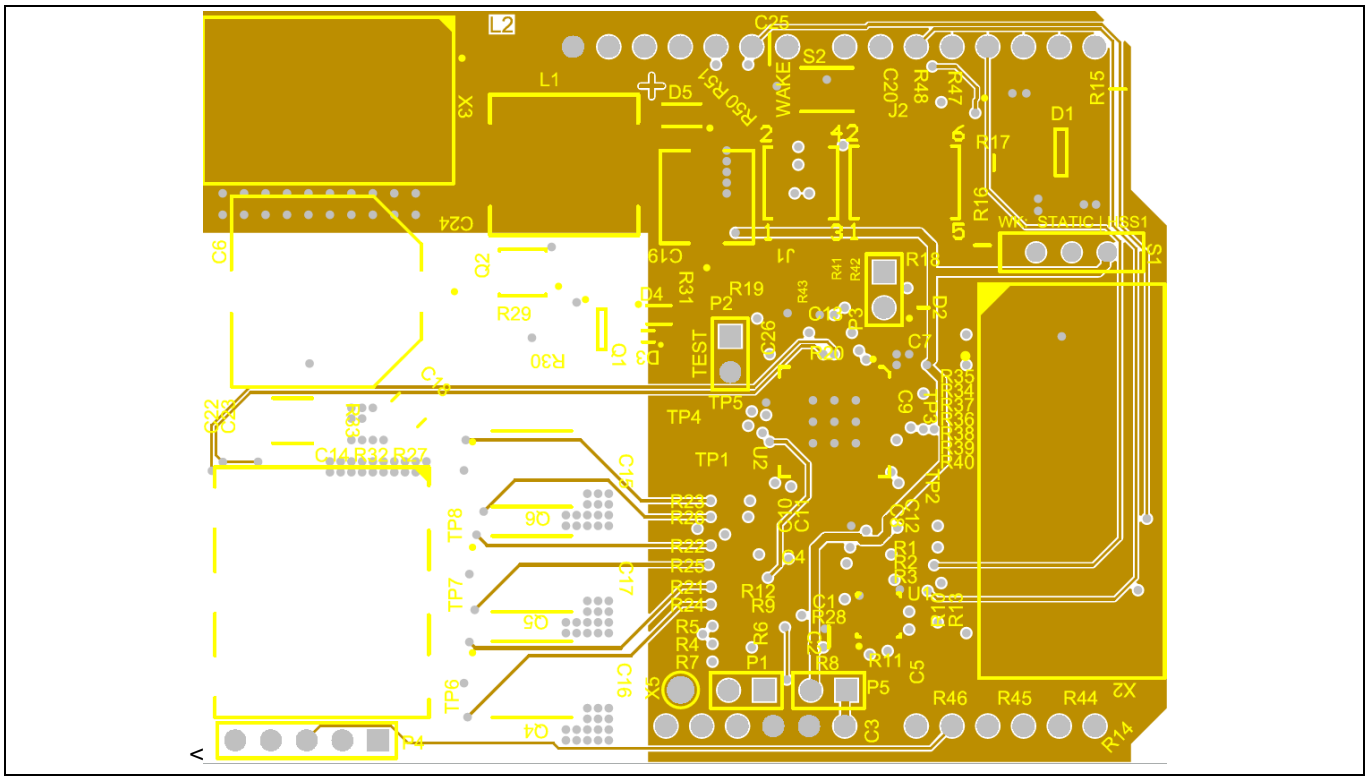


Figure 15 Inner layer - GND



2.4 Bill of Material

Figure 16 Bill of Material

Designator	Value	Manufacturer	Description	Quantity
U2	TLE9563	Infineon Technologies	Motor System IC - BLDC CAN	1
Q2	IPZ40N04S5L-2R8	Infineon Technologies	OptiMOS-5 N-Channel Enhancement Mode Power-Transistor, VDS 40V, ID 40A	1
Q4, Q5, Q6	IAUC60N04S6N031H	Infineon Technologies		3
L1	TDK SPM10065VT	TDK Corporation	1 µH inductor, Isat20 = 27 A	1
U1	LM339QT		Quad comparator	1
D4	BZT52C12S-7-F		Surface Mount Zener Diode	1
D3	BAS52-02V	Infineon Technologies	Silicon Schottky Diode	1
Q1	BC817K-40	Infineon Technologies	NPN Silicon AF Transistor	1
C18	10u/50V		Surface Mount Ceramic Capacitor, Commercial Grade, 10 uF	1
X5	5001		Test Point THT, Black	1
R33	5mR/2W		Shunt resistor 0.005R/2W/1%	1
D5	MBR0560-TP		Schottky Rectifier, 0.5A/60V	1
C13	2.2n/16V		Chip Monolithic Ceramic Capacitor	1
C14	1.5n/16V		Chip Monolithic Ceramic Capacitor	1
C22, C23	22n/16V		Chip Monolithic Ceramic Capacitor	2
C6	680u/35V		Aluminum Electrolytic Capacitors	1
C19	100u/35V		Surface Mount Aluminium Electrolytic Capacitor	1
R28	0R		0R/50V	1
C2, C12	470n/50V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	2
C3, C4, C5	68n/50V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	3
C7, C26	2.2u/16V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	2
C10, C11	220n/50V	TDK Corporation	Multilayer Ceramic Chip Capacitor, Automotive Grade, Soft Termination	2
C25	4.7n/50V	TDK Corporation	Chip Multilayer Ceramic Capacitor for General Purpose	1
C1, C8, C9, C15, C16, C17, C20, C24	100n/50V	TDK Corporation	Chip Multilayer Ceramic Capacitor for General Purpose, Surface Mount Ceramic Capacitor Automotive Grade	8
R1, R2, R3, R4, R5, R7, R8, R9, R10, R11, R12, R13, R30, R31, R44, R45, R46, R47, R48	10k		Standard Thick Film Chip Resistor	19
R6	3.3k		Standard Thick Film Chip Resistor	1
R14, R19, R34, R35, R36, R37, R38, R39, R40	1k		Standard Thick Film Chip Resistor	9
R15, R16, R17	330R/0.5W		Standard Thick Film Chip Resistor	3
R18	470R		Standard Thick Film Chip Resistor	1
R20	49.9R		Standard Thick Film Chip Resistor	1
R21, R22, R23, R24, R25, R26	10R		Standard Thick Film Chip Resistor	6
R27, R32	4.7R		Standard Thick Film Chip Resistor	2
R29	100k		Standard Thick Film Chip Resistor	1
R41, R42, R43	33R		Standard Thick Film Chip Resistor	3
R50, R51	62		Standard Thick Film Chip Resistor	2
S1	450301014042		10x2.5mm THT WS-SLTV	1
S2	434153017835		3.5x2.9mm SMD J-Bend WS-TASV, height 1.7 mm, 350 gf	1

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 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 **TLE9563**

3.2 Configuration Wizard for TLE9563-3QX

The first utilization of the uIO stick in combination of the GUI for the TLE9563 requires the programmation of the uIO stick:

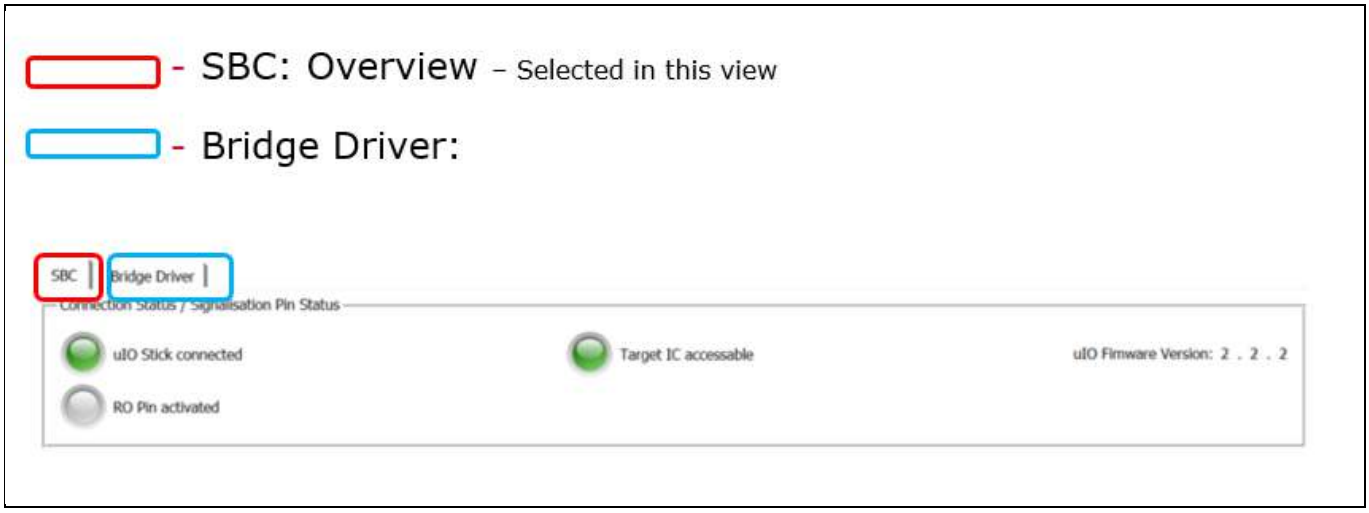
1. Connect the uIO stick to the USB port
2. Menu Extra
3. Update uIO
4. Click Yes (refer Figure 17)

Figure 17 Updating the uIO

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

4 Config Wizard - Control tabs

Figure 18 The two main tabs SBC, Bridge Driver



4.1 SBC

Figure 19 Connection Status/ Signaling Pin Status

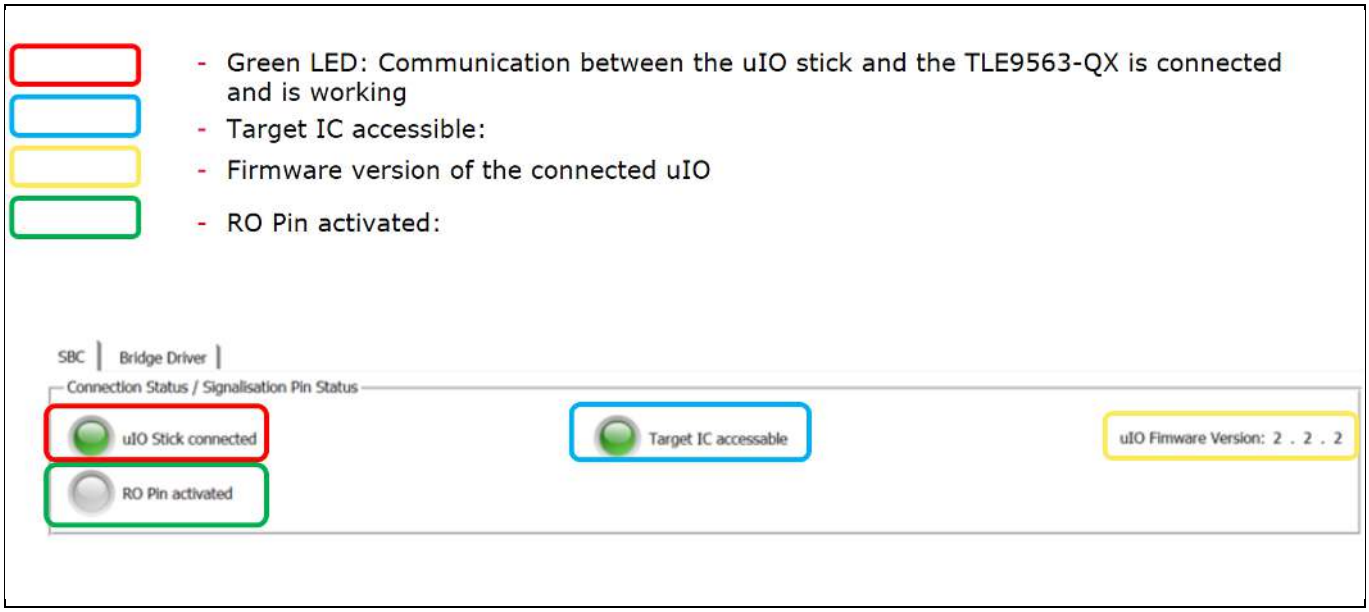


Figure 20 Overview of the SBC tab

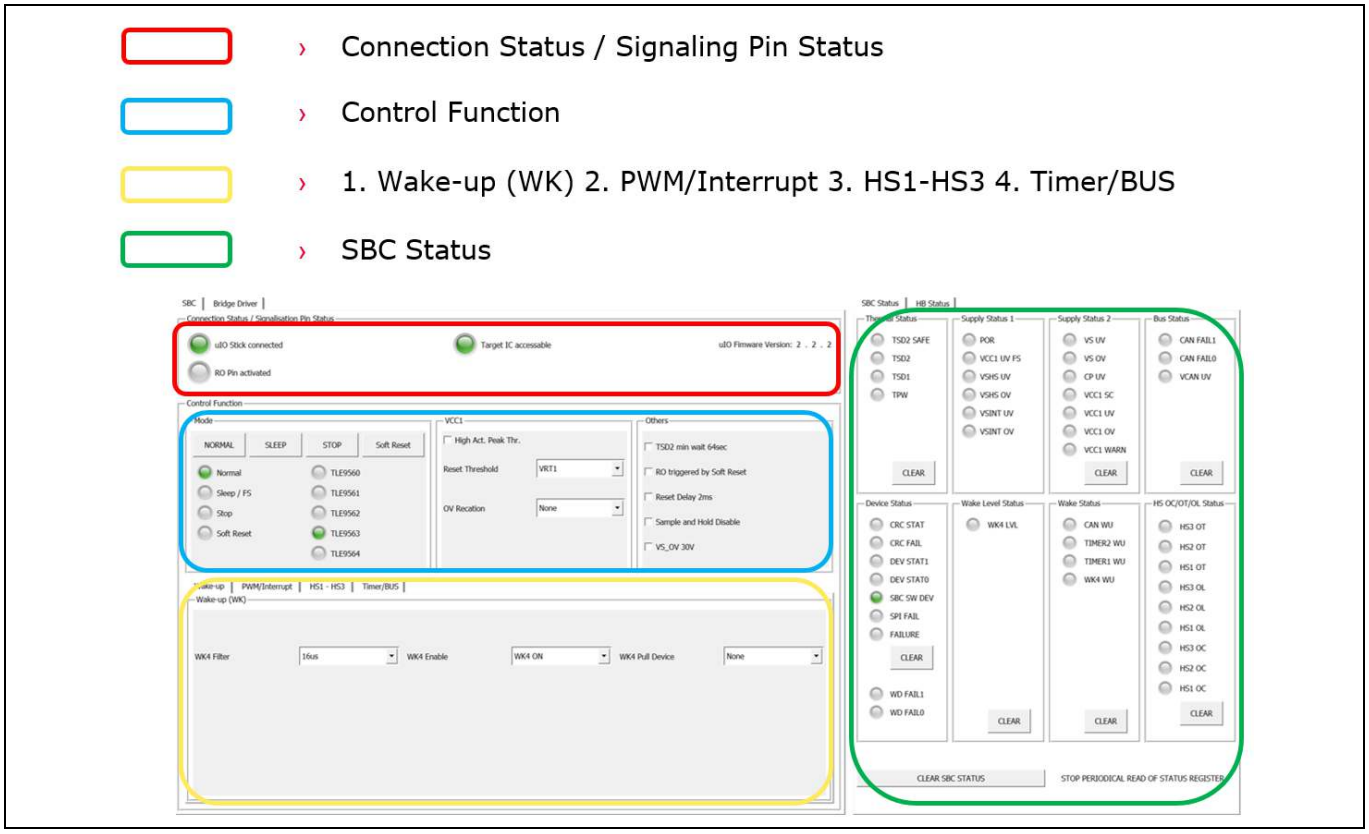


Figure 21 SBC: Control function

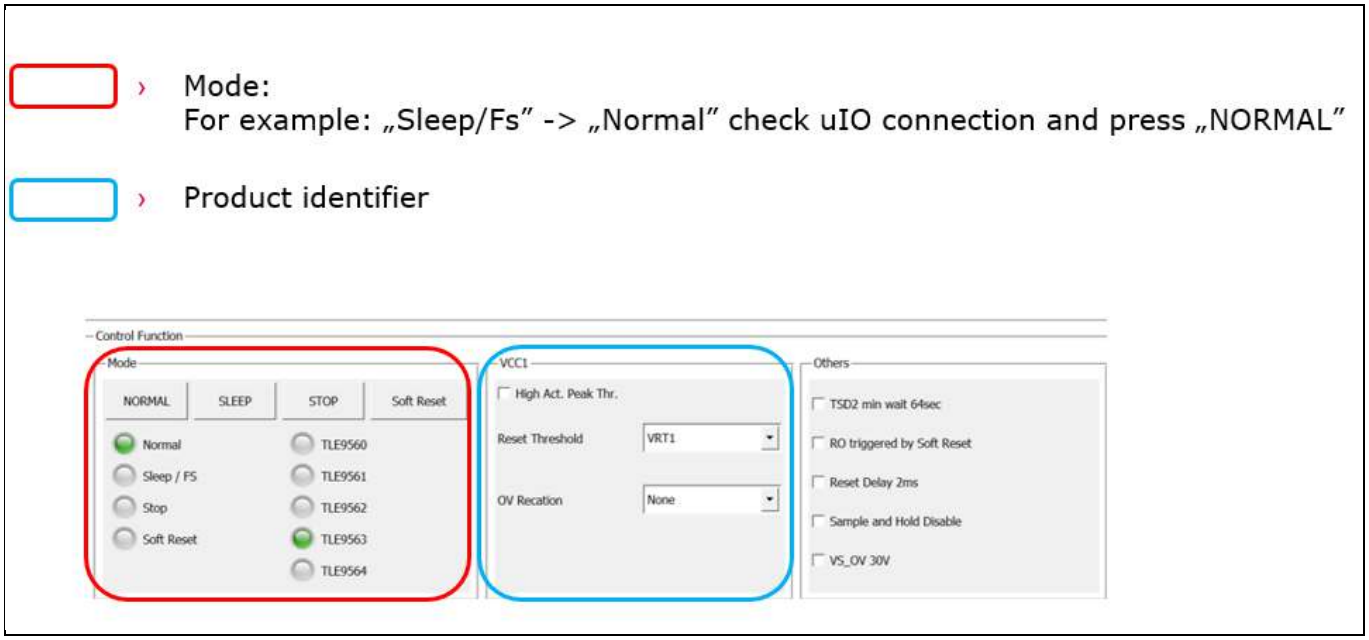


Figure 22 SBC: Wake-up, PWM/Interrupt, HS1 – HS3, Timer /BUS

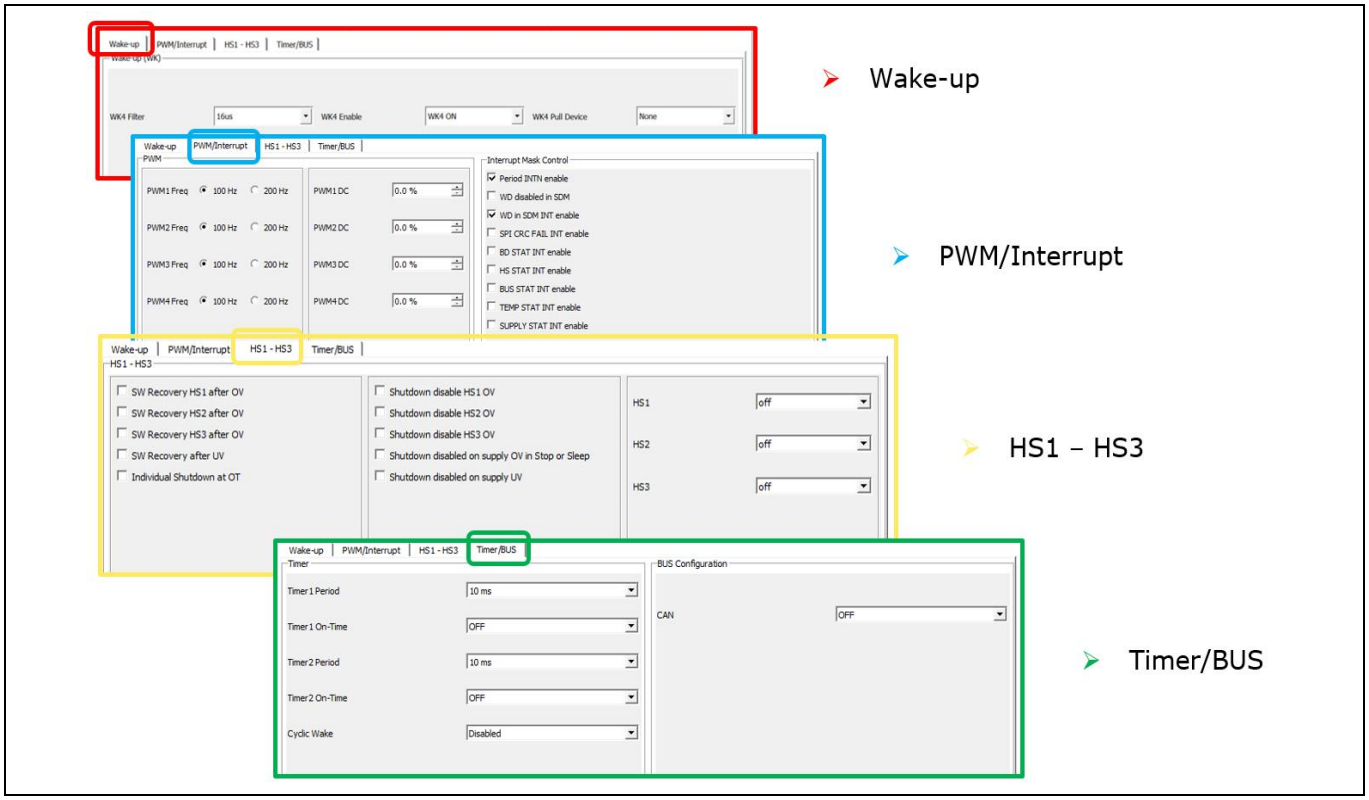


Figure 23 SBC Status

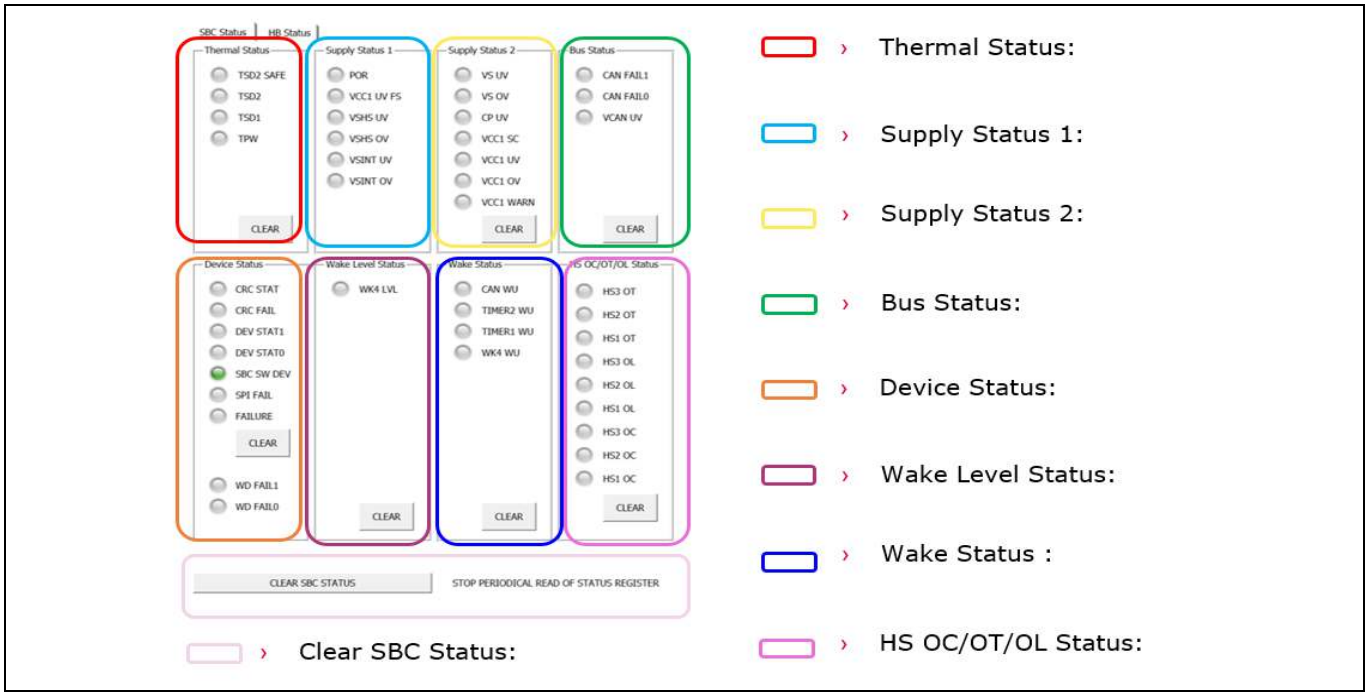
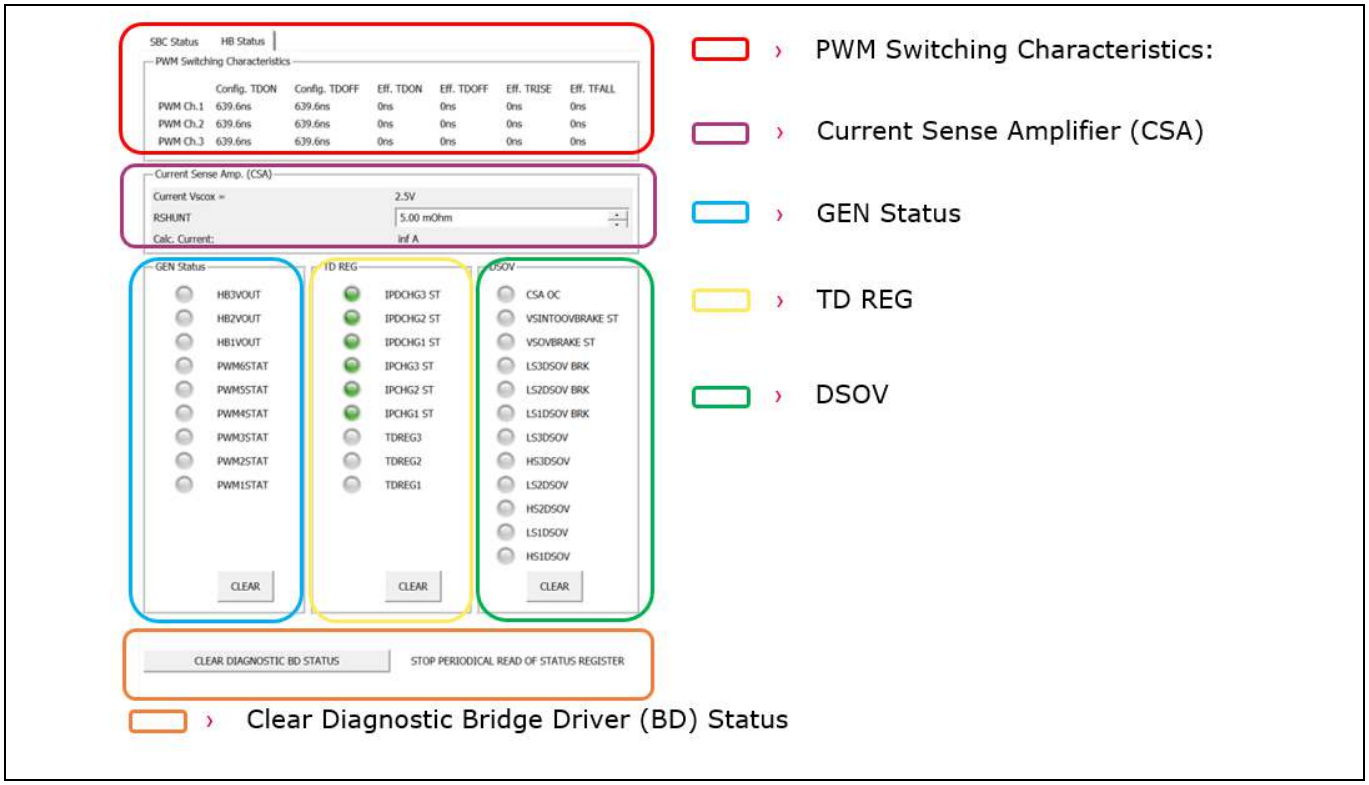


Figure 24 Half-Bridge (HB) Status



4.2 Bridge Driver

Figure 25 Bridge Driver: 1st Tab – General, CSA, VDS Monitoring (Mon)

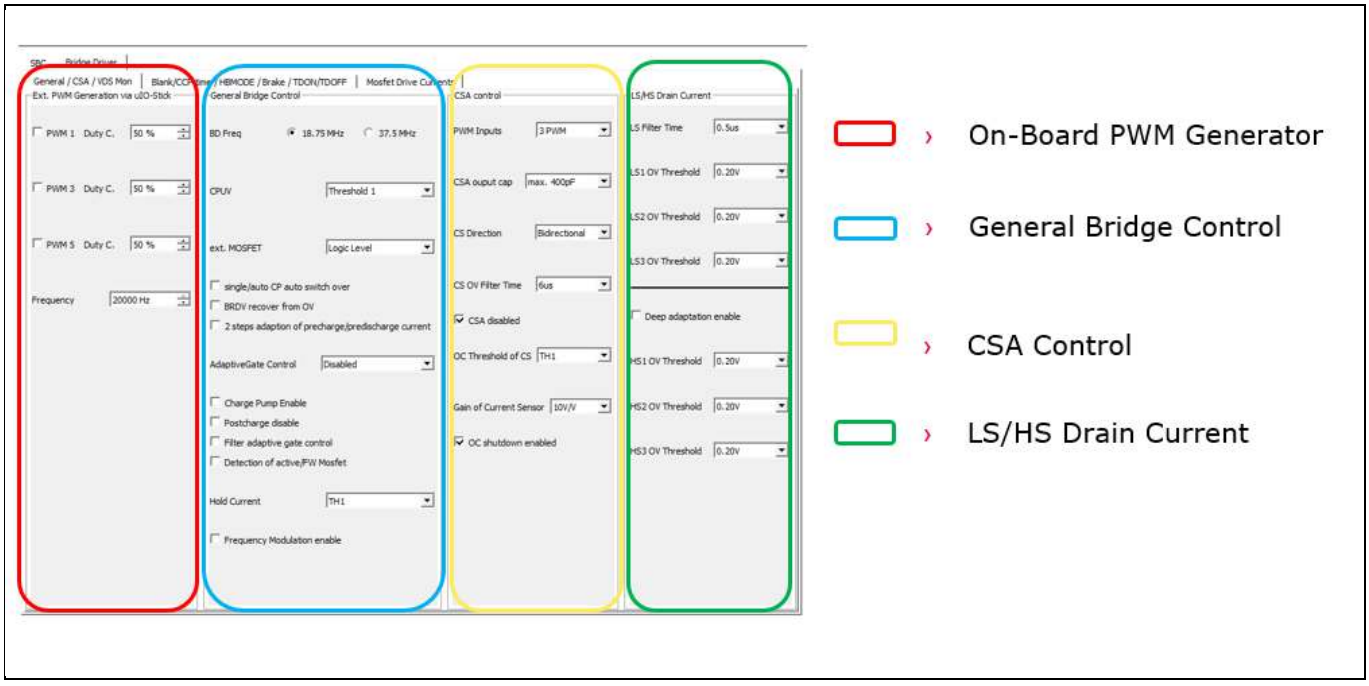


Figure 26 Bridge Driver: 2nd Tab – Blank/ CCP time, HBMODE, Brake, TDON/ TDOFF Timing

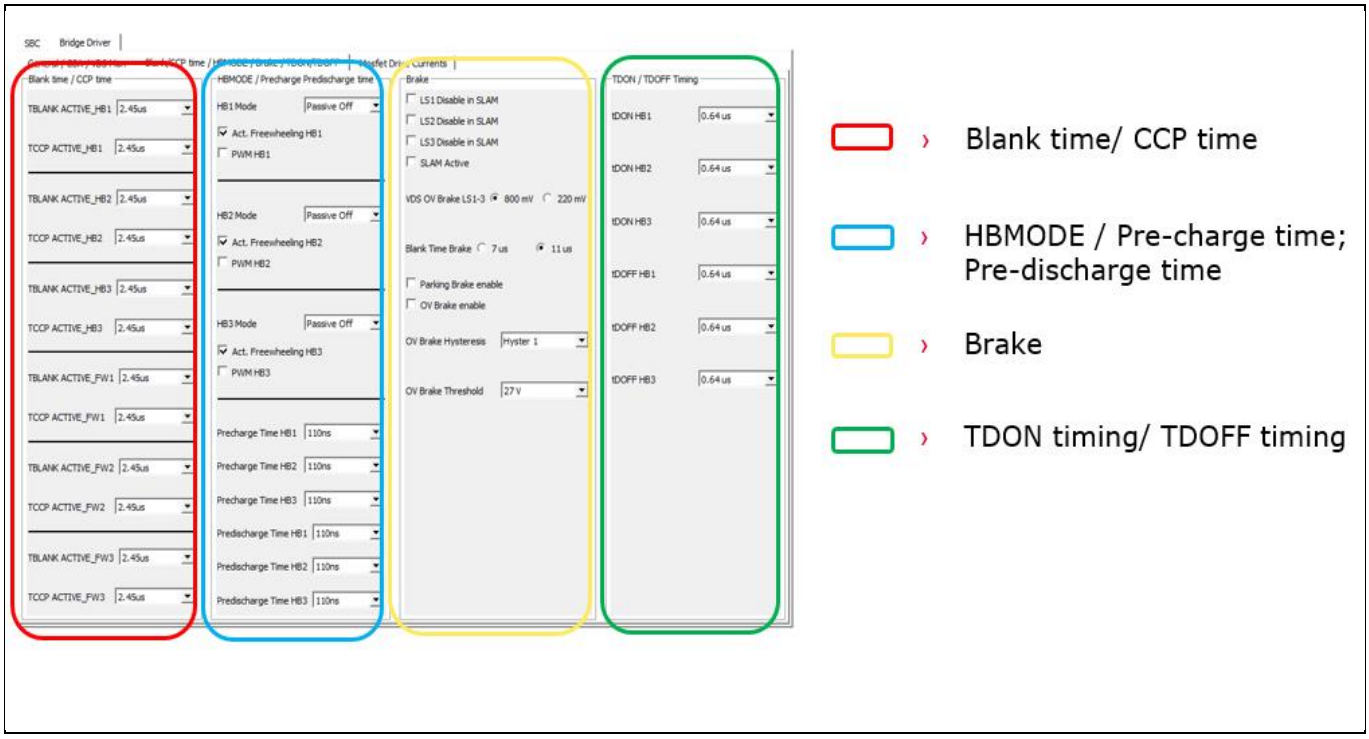
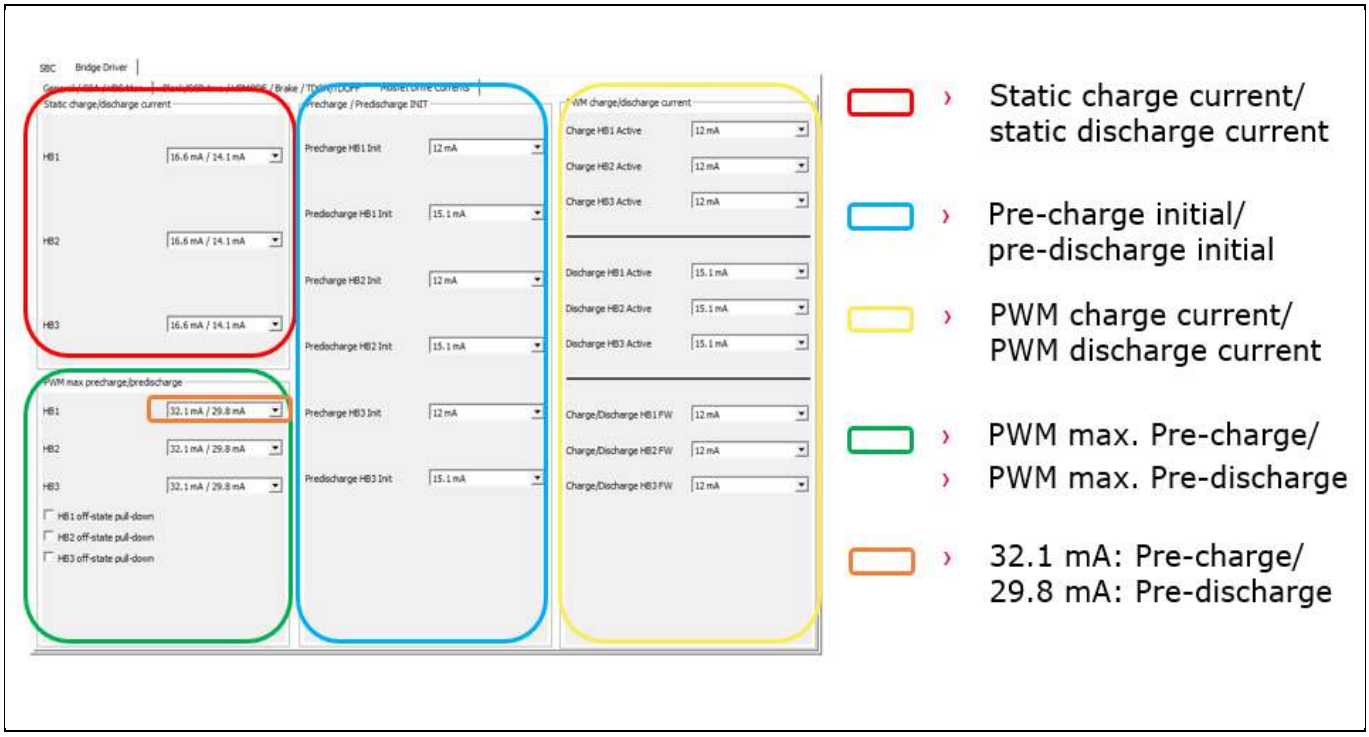


Figure 27 Bridge Driver: 3rd Tab – MOSFET Drive Currents



Revision history

Document version	Date of release	Description of changes
V 1.0	2020-06-23	Initial version

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2020-06-23

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about this document?

Email: erratum@infineon.com

Document reference
AppNote Number

IMPORTANT NOTICE

The information contained in this application note is given as a hint for the implementation of the product only and shall in no event be regarded as a description or warranty of a certain functionality, condition or quality of the product. Before implementation of the product, the recipient of this application note must verify any function and other technical information given herein in the real application. Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind (including without limitation warranties of non-infringement of intellectual property rights of any third party) with respect to any and all information given in this application note.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (**www.infineon.com**).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.