Smart Power Switches - Motherboard description

User guide

About this document

Scope and purpose

This user guide provides a comprehensive overview of the motherboard, its schematic, and a detailed description of its features. Engineers can use the document to assess the behavior of the component under different operating conditions, interface it with other hardware, and verify its suitability for a particular application.

Intended audience

This user guide is intended for engineers and potential customers who want to evaluate Infineon's Smart Power Switches for their target application.

Evaluation Board

This board is to be used during the design-in process for evaluating and measuring characteristic curves, and for checking datasheet specifications.

Warnings

***Note**: printed circuit board (PCB) and auxiliary circuits are not optimized for final customer designs.*

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Safety precautions

Safety precautions

***Note**:* *Please note the following warnings regarding the hazards associated with development systems.*

Table 1 Safety precautions

	**Warning:** *The DC link potential of this board is up to 1000 V or more. When measuring voltage waveforms by oscilloscope, high voltage differential probes must be used. Failure to do so may result in personal injury or death.*
	**Warning:** *The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *The evaluation or reference board is connected to the grid input during testing. Hence, high-voltage differential probes must be used when measuring voltage waveforms by oscilloscope. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires, or perform maintenance work. Wait five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.*
	**Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	**Caution:** *Only personnel familiar with the drive, power electronics and associated machinery should plan, install, commission and subsequently service the system. Failure to comply may result in personal injury and/or equipment damage.*
	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*
	**Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.*
	**Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.*

Table of contents

1 The board at a glance

The smart power switches (SPS) evaluation kit consists of a *motherboard (MB)* and a *daughterboard (DB)*. The figure below shows one DB plugged onto the MB. Depending on the device's features, the DB provides additional functionalities. For more information, refer to the documentation on the DB for the relevant product family.

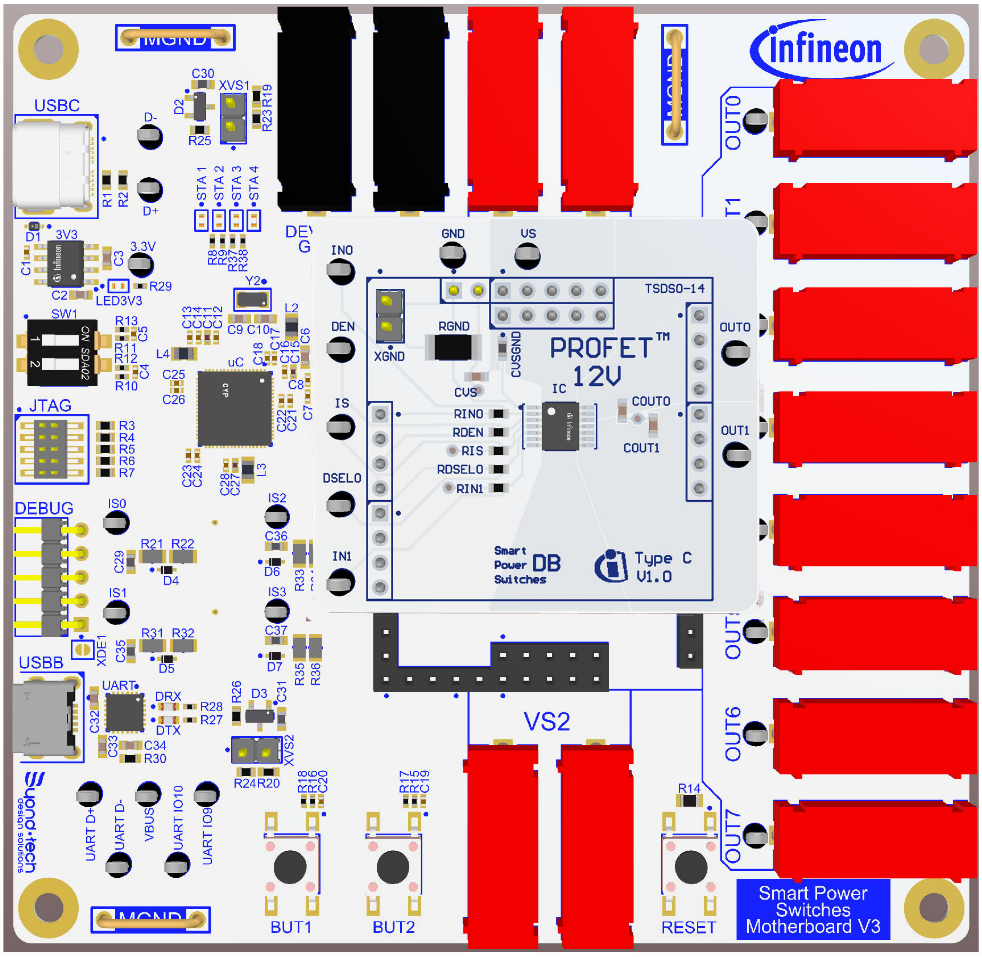

Figure 1 SPS evaluation kit

The MB is designed to handle devices of the following product families:

- PROFET™ + 12V
- PROFET™ + 24V
- PROFET™ + 48V
- PROFET™ +2 12V
- PROFET™ Wire Guard 12V
- Power PROFET™ + 12/24/48V
- SPOC™ +2

The equipment is suitable for evaluating resistive, capacitive, and inductive loads, as well as for driving devices with an *serial peripheral interface (SPI)* interface.

However, the board is not designed for *electromagnetic compatibility (EMC)* characterization, including ISO pulses, nor optimized for thermal performance characterization. For this, use the Infineon Smart Power Switches Configuration Wizard (Config. Wizard) from the Infineon Developer Center.

2 Schematic

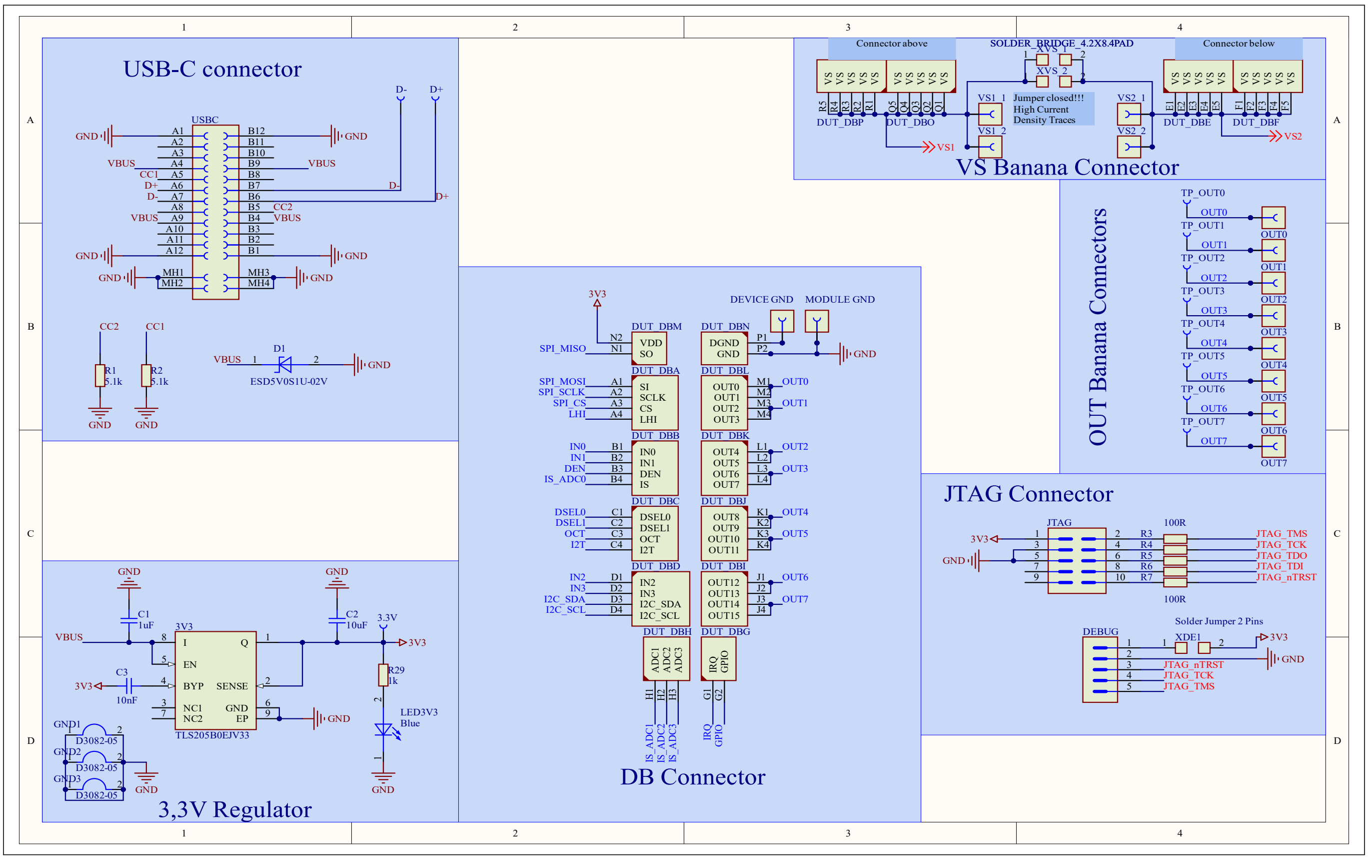

Figure 2 Schematic sheet 1

2 Schematic

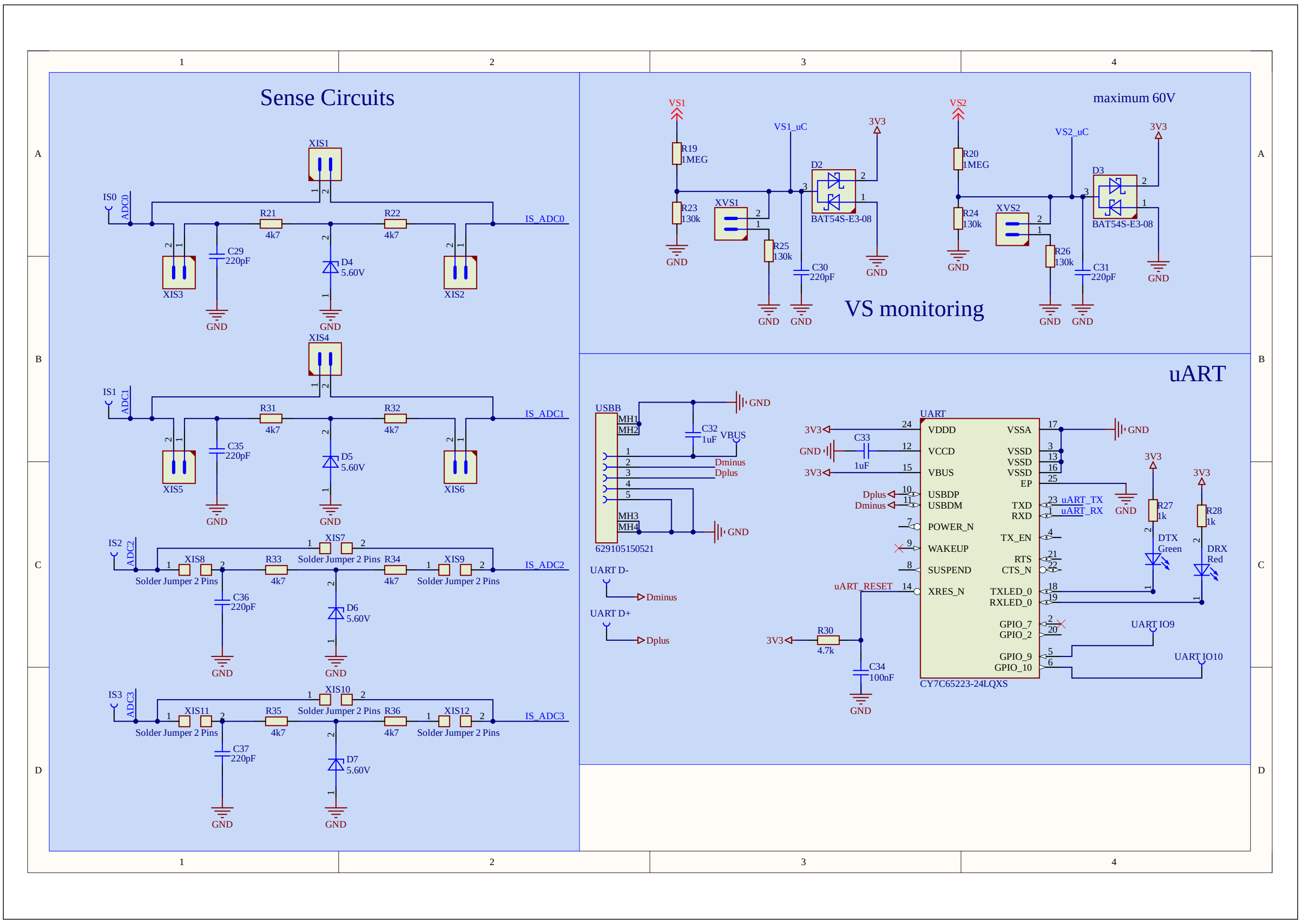

Figure 3 **Schematic sheet 2**

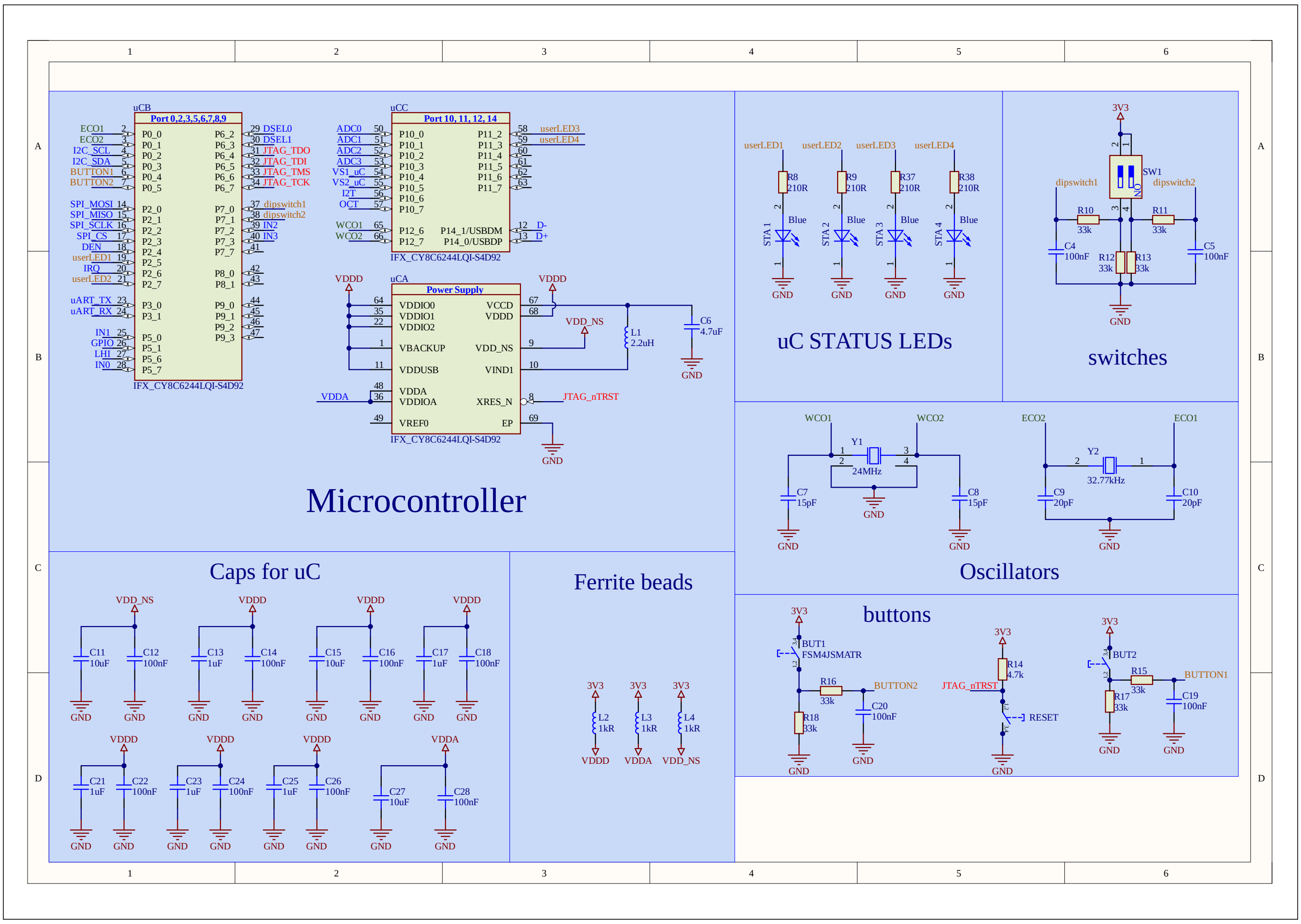

Figure 4 **Schematic sheet 3**

3 Getting started

The following additional equipment is required:

- USB-C cable between the *MB* and the computer
- A voltage source for the supply voltage V_S
- Banana cables for connecting
  - Supply voltage V_S and *ground (GND)* to the MB
  - Target load to the output OUT

Initial steps

1. Close the jumper on the *DB* XGND (refer to Ground design)
2. Connect the USB-C cable with the MB and the computer
3. Start the Configuration Wizard from the Infineon Developer Center

4 System and functional description

4.1 OUT connector

Based on the number of channels and the targeted load current of the device, it is necessary to use various OUT banana connectors. For more information, refer to the documentation on the *DB* for the relevant product family.

4.2 Ground design

There are two options for setting up the *GND* with the evaluation kit. Depending on the requirement, you can use either "MODULE GND" or "DEVICE GND" as the ground reference. Both are indicated by black banana sockets on the *MB*. The ground resistor specific to the product is placed on the *DB*.

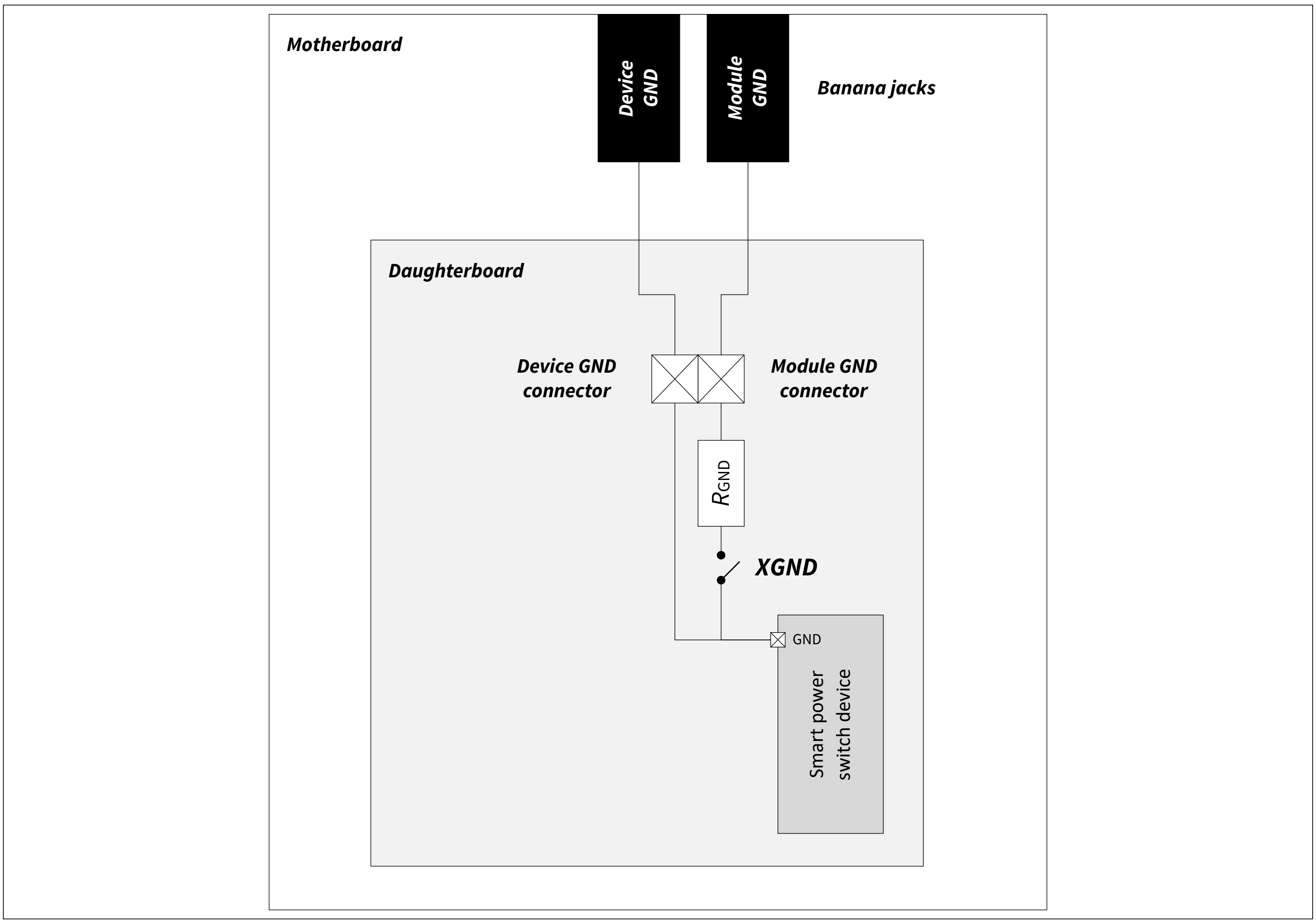

Figure 5 **Ground design: motherboard and daughterboard**

Use with integrated RGND value

It is advisable to use a ground resistor RGND, placed on the DB and aligned with the application information in the datasheet. Consequently, it is recommended to close the jumper XGND on the DB. Subsequently, the banana socket "MODULE GND" is to be used as the ground reference.

Use with individual RGND value

For advanced evaluation, the connector XGND can be left open, and the banana socket "DEVICE GND" is to be used as the ground reference. It is important to note that this setup results in the absence of a ground resistor

RGND, which provides additional protection. An additional resistor can be placed outside the evaluation kit. Be aware that the module GND must be reconnected to the "MODULE GND" banana socket.

4.3 Sense circuit

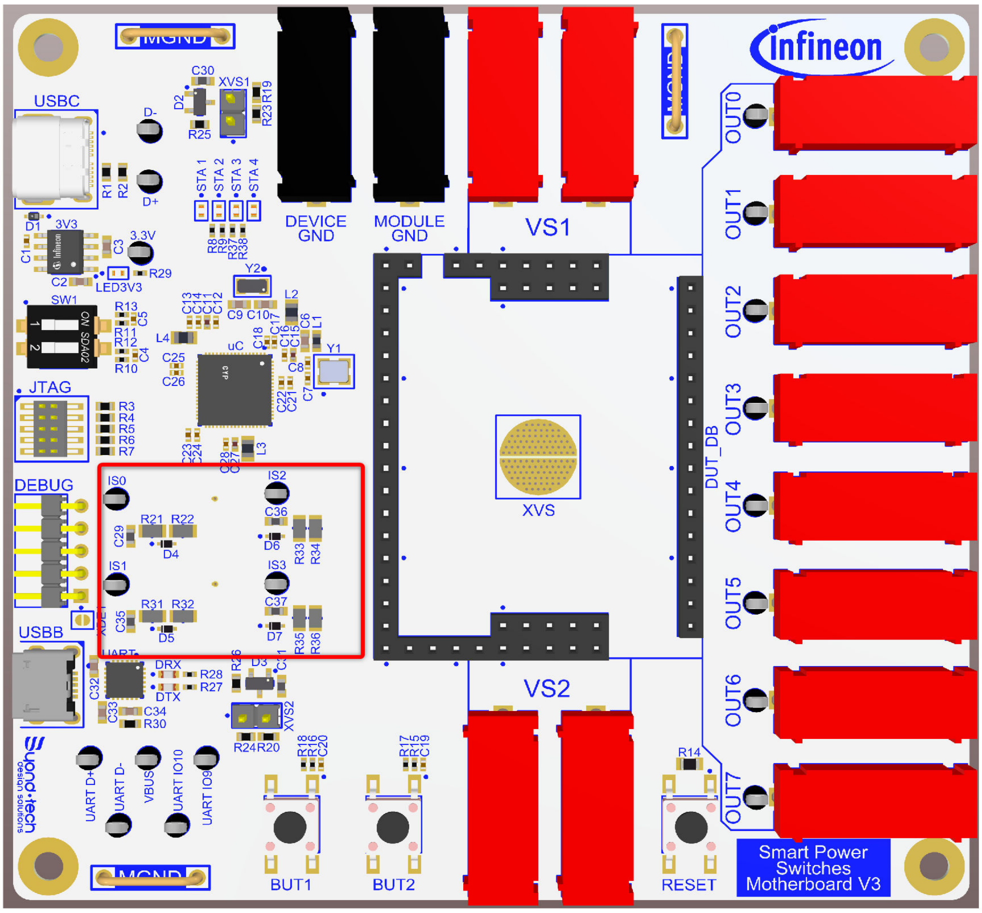

Figure 6 Sense circuit

The sense resistor specific to the device is situated on the respective *DB*. The rest of the sense circuit is situated on the *MB*. The MB offers up to four current sense circuits, depending on the device's sense current output.

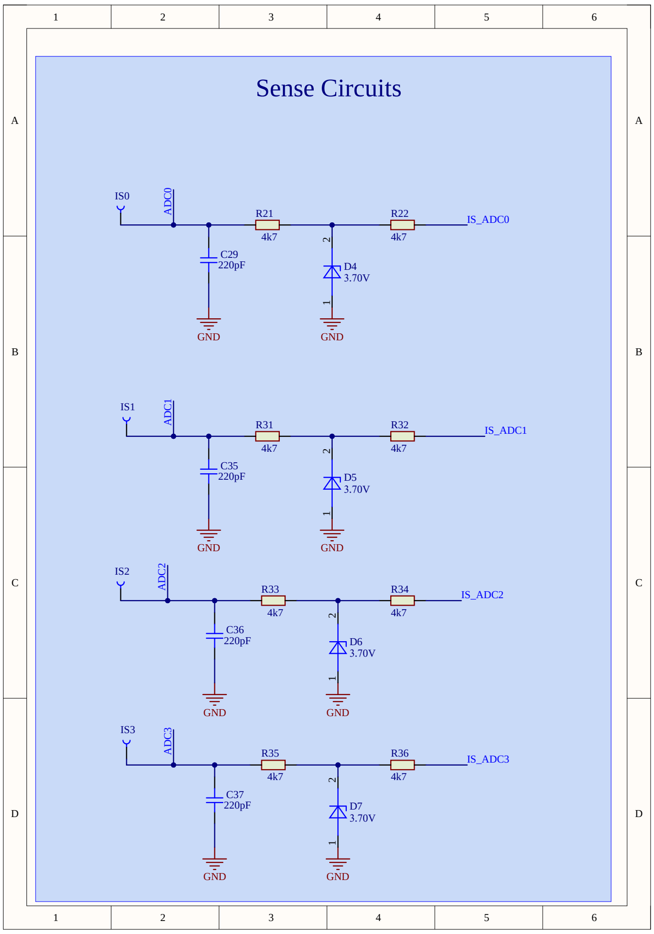

Figure 7 **Sense circuit schematic**

4.4 Buttons

Reset button

When pressed, the reset button interrupts the microcontroller's normal operation, forcing it to restart and initialize with predefined configurations. This functionality is valuable for troubleshooting and restoring the microcontroller to a known state, ensuring the stability and functionality of electronic devices.

BUT1

This button has no clear use at present. This information will be provided at a later stage.

BUT2

This button has no clear use at present. This information will be provided at a later stage.

4.5 Voltage supply monitoring

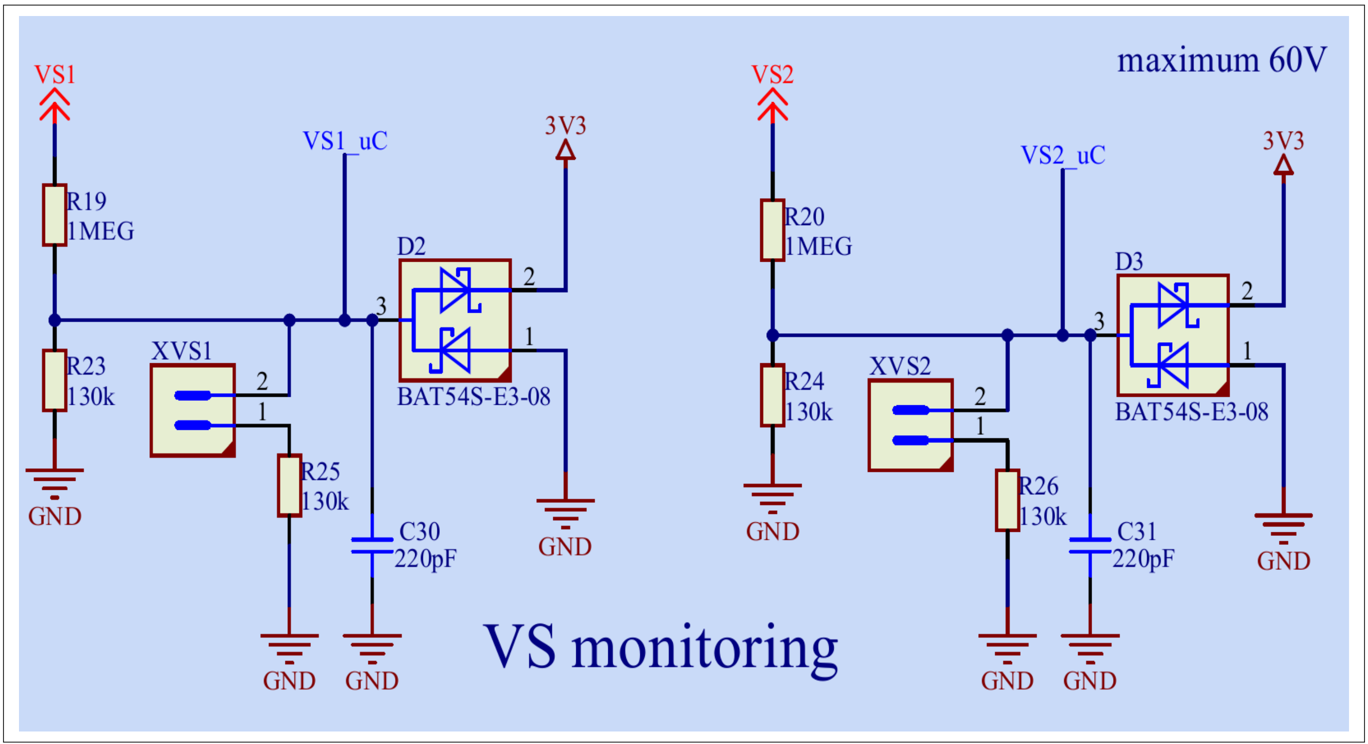

Figure 8 **VS monitoring**

The *MB* can monitor the *supply voltage (VDD)*. When the VDD does not exceed 30 V, and the jumpers XVS1 and XVS2 are to remain open. In applications with higher voltages, both jumpers are to be closed.

4.6 Logic supply and LED

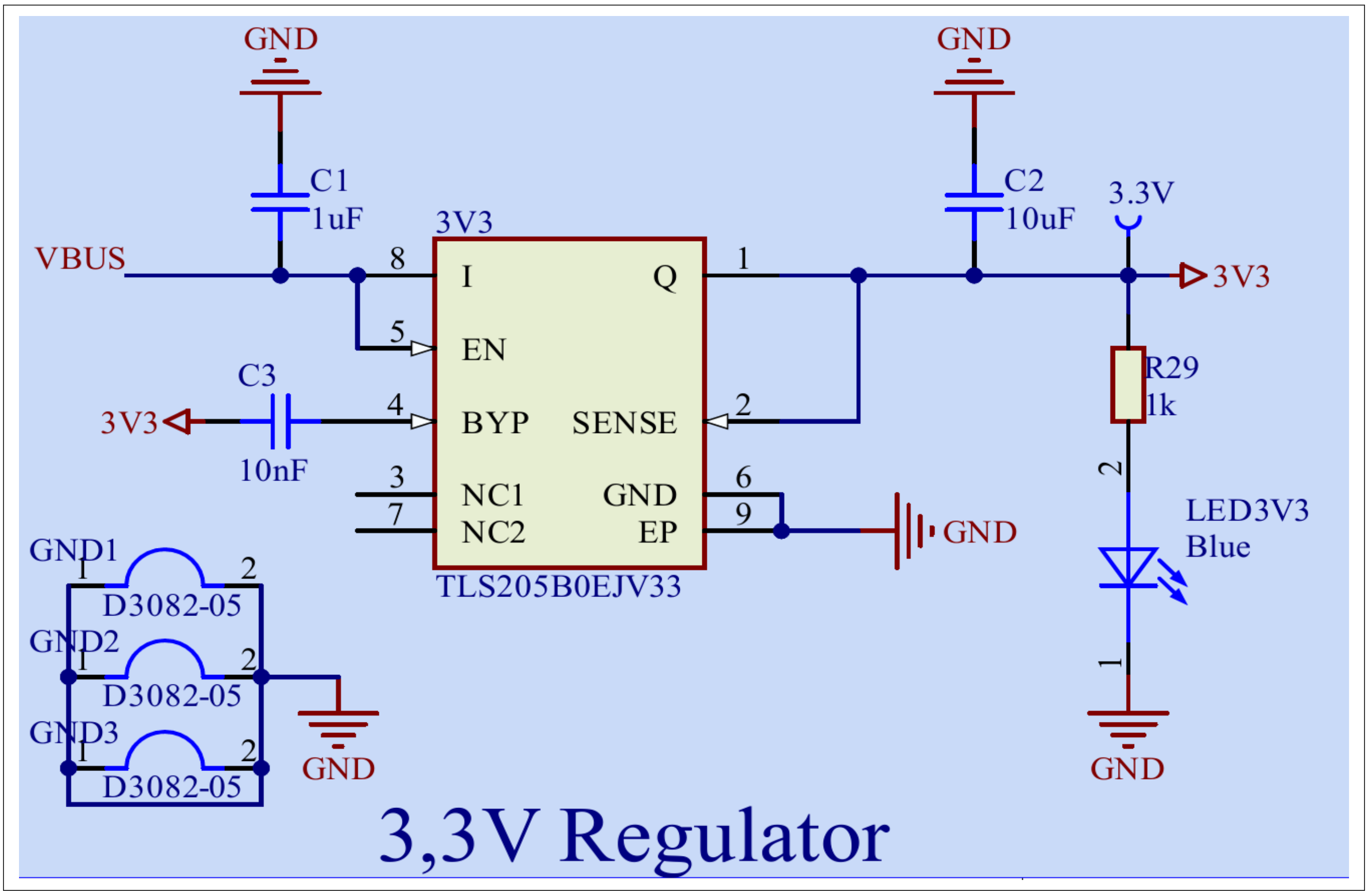

Figure 9 **Voltage regulator**

LED3V3 is illuminated as soon as the USB-C cable is connected between the computer and the *MB*.

4.7 Status LED

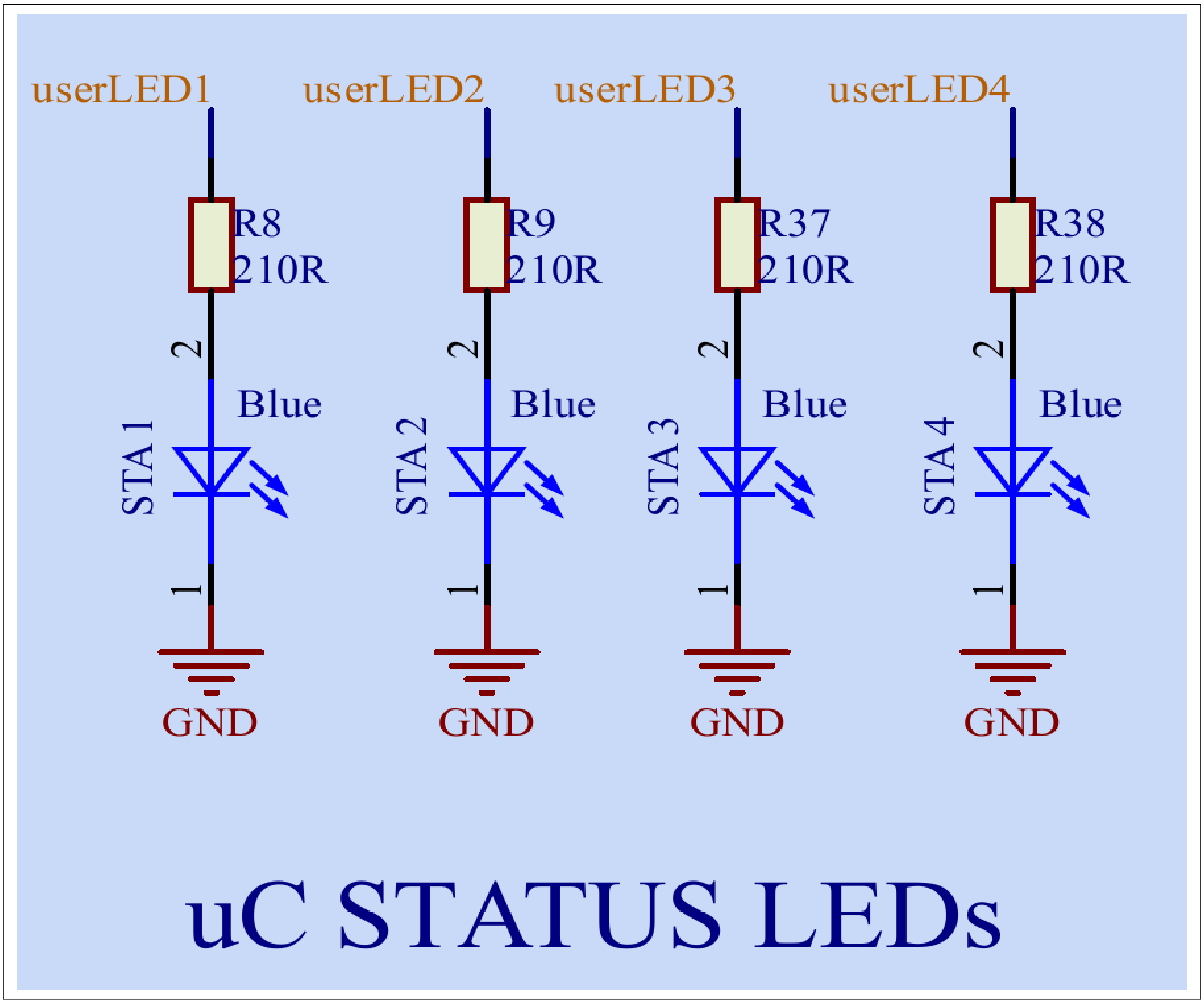

Figure 10 **Status LED**

STA1: The *light-emitting diode (LED)* is illuminated during *universal serial bus (USB)* communication.

STA2: To be updated

STA3: To be updated

STA4: The LED flashes every second as an indicator that the software is running.

4.8 Microcontroller

The communication between the Config Wizard and the smart power switch is facilitated by the 32-bit PSOC™ Arm® Cortex® microcontroller from the PSOC 62 family with part number: CY8C6244LQI-S4D92. Additionally, the CY8C6144LQI-S4F12 can also be used, due to its high pin-to-pin compatibility.

Glossary

DB

daughterboard (DB)
An expansion circuit card connected to a motherboard.

EMC

electromagnetic compatibility (EMC)
The ability of electrical equipment and systems to function acceptably in their electromagnetic environment, by limiting the unintentional generation, propagation and reception of electromagnetic energy which may cause unwanted effects such as electromagnetic interference (EMI) or even physical damage in operational equipment.

GND

ground (GND)

LED

light-emitting diode (LED)

A semiconductor circuit that emits light when activated.

MB

motherboard (MB)
The main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals.

PCB

printed circuit board (PCB)

A board that mechanically supports and electrically connects electronic components using conductive tracks, pads, and other features etched from copper sheets laminated onto a non-conductive substrate.

SPI

serial peripheral interface (SPI)

A synchronous serial communication interface specification used for inter-chip communication, primarily in embedded systems.

USB

universal serial bus (USB)

An industry standard that defines cables, connectors, and communication protocols used in a bus for connection, communication, and power supply between computers and electronic devices.

VDD

supply voltage (VDD)

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2025-10-23	• About this document updated • The board at a glance updated • Figure 3 and Figure 4 added • Getting started updated • System and functional description restructured and updated • Glossary added
Rev. 0.10	2025-02-04	• Preliminary version of user guide available

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Email: erratum@infineon.com

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