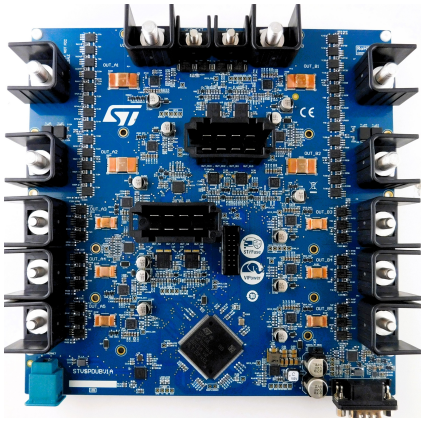
STEVAL-PDUBV1

Data brief

26-channel power distribution ECU based on SPC58NG84E7 Chorus 6M MCU and STi^{2}Fuse devices



Product summary	
26-channel power distribution ECU based on SPC58NG84E7 Chorus 6M MCU and STi^{2}Fuse devices	STEVAL-PDUBV1
Firmware for STEVAL-PDUBV1 control and configuration	STSW-PDUB-UDS
Smart Octa P-channel for ultra-low current consumption automotive systems	L99SP08TR
High-side switch controller with STi2Fuse protection for 12 V, 24 V and 48 V automotive applications	VNF1248FTR
Automotive Power Management IC with LIN and CAN-FD	SPSB0815-TR
32-bit Power Architecture MCU for	SPC58NG84E7QEH0X

Features

- MCU controllable power distribution unit (PDU) dedicated to 12 V board net
- Thanks to the software running on the MCU, the STEVAL-PDUBV1 can be operated in assembly, parking, and normal driving modes
- e-fuse protected high-side drivers:
  - A pair of 2-channel VNF9D1M5Q, featuring 27 A per channel
  - A pair of 2-channel VNF9D5SF, featuring 13 A per channel
  - One 4-channel VNF9Q20SF, featuring 5 A per channel
- VNF1248F high-side switch controllers with intelligent e-fuse protection for 12 V
- Two separate power output rails (rail A and rail B) that can be used independently, with different current carrying capabilities: rail A from 5 to 200 A, rail B from 10 to 200 A
- Low-current (5 and 10 A) power connector per rail
- Preburned firmware, whose flash memory image from the product folder page of STSW-PDUB-UDS
- UART interface to be used for the interaction via a graphical user interface (GUI) to be provided with one of the future releases of the board firmware
- 100BASE-TX Ethernet connector
- L99SP08 companion chip for advanced standby performance by switching off main STi^{2}Fuse channels and delegating the remaining standby supply to the companion p-channels with 400 mA capability each
- 5 MCU SPI ports for communication with STi^{2}Fuse, with companion chip and PMICs
- Onboard ASIL-D SPC58NG84E7, chorus 6M, triple-core microcontroller
- For improved standby performance, the MCU can be switched off during PDU parking mode condition thanks to the wake-up features of the on board SPSB081 PMIC featuring wake-up on CAN bus activity physical layer
- Compact size: 200 x 200 mm

Description

Modern automotive power distribution in EVs features a section dedicated to the high-voltage power distribution, normally connecting the main battery voltage to: the traction motor, the OBC, the heater, the e-compressor, and the main DC-DC converter.

A section for the low-voltage power distribution that takes care of delivering the power from the output of the main DC-DC to the various car loads through the wire harness, is also available.

In a traditional low-voltage board-net topology, when replacing the “e-fuse box” inside the vehicle, the power distribution is composed of a main primary board connected via a power rail switch board (PRS) directly with the output of the high-voltage DC-DC.

This is the case with our STEVAL-PDUBV1. Based on this architecture, our system consists of a primary distribution unit (PDU) featuring several channels for the different points of load in the car.

Product summary	
Automotive General Purpose Applications - Chorus family	
2-channel high-side driver with STi²Fuse protection for automotive power distribution applications	VNF9D1M5QTR
2-channel high-side driver with STi²Fuse protection for automotive power distribution applications	VNF9D5SFTR
PMIC with buck and precise voltage reference for MCU applications	SPSA068-TR
4-channel high-side driver with STi²Fuse protection for automotive power distribution applications	VNF9Q20SFTR
Applications	Smart power distribution

The STEVAL-PDUBV1 serves as an automotive-intended primary power distribution unit, positioned closer to the loads, thereby reducing the total wire length within the zone control unit, with a maximum operating voltage of 28 V, featuring the latest STi^{2}Fuse generation of e-fuses and p-channel companion chips for parking mode and low quiescent current applications.

All the devices on the board are automotive grade including the connectors and the discrete parts.

The board features two independent power rails with separate inputs. Each rail consists of 13 output channels with different current carrying capabilities, from 5 up to 200 A, leveraging STi^{2}Fuse devices and ST F8 MOSFET technology.

Designed as an all-in-one unit to optimize space, the board protects primary circuits (such as preheating, electric steering, and body computers) and distributes DC-DC output power sourced from the main battery, and / or the auxiliary battery, and / or the engine, and / or the regenerative braking.

To replace the physical e-fuses, the PDU channels have been protected with high-side drivers integrating smart e-fuses with a current threshold configurable via SPI to block the channel current drain at a given certain level.

This generation of regenerable, configurable, and precise smart e-fuses replace standard discrete e-fuses. A key feature is STi^{2}Fuse protection (ST proprietary I^{2}t functionality), an intelligent circuit breaking mechanism designed to protect PCB traces, connectors, and wire harnesses from overheating, without impacting load transients such as inrush currents and capacitance charging.

The I^{2}t curve parameters can be individually configured for each channel. The dissipated power is limited to a safe level, up to the point of thermal shutdown intervention.

The device enters a fail-safe mode in case of communication loss with the microcontroller, reset of digital memory, or watchdog monitoring time-out event. In fail-safe mode, the output can be directly controlled by dedicated, assignable direct inputs.

To meet the highest automotive safety standards, all e-fuse devices include a periodic watchdog operating within a defined time window.

The board also features the powerful ASIL-D SPC58NG84E7 chorus MCU, with 6 MB flash memory able to host large applications and configuration parameters.

The available communication interfaces are a CAN-FD channel, a 100 BASE-TX automotive Ethernet channel, and a UART communication port to be used with an external UART-to-USB converter.

The MCU power management in the STEVAL-PDUBV1 is managed by three different devices: two PMICs (SPSB081 and SPSA068) and an LDO (LDL40).

The board has a dedicated supply capacity for external 3.3 V loads. The whole system runs at 3.3 V.

The board comes with basic operating firmware (STSW-PDUB-UDS) implementing a CAN message responder coupled with ISO14229 (UDS) standard used for diagnostic purposes.

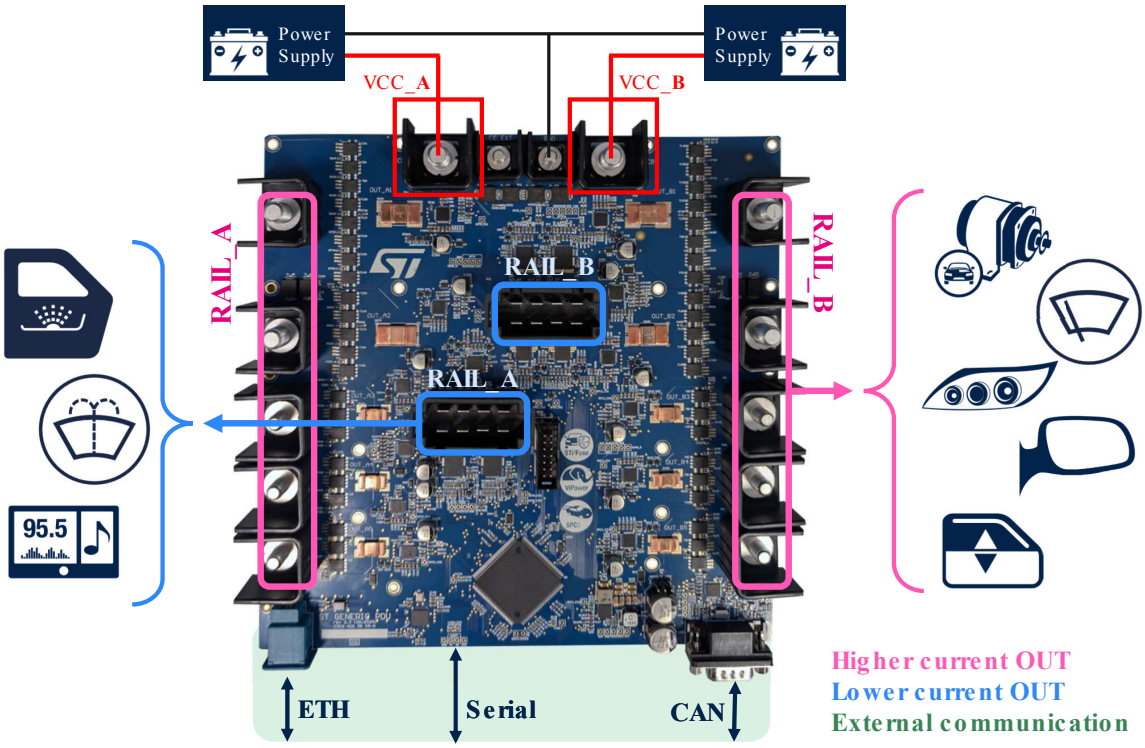
The software is preburned on the STEVAL-PDUBV1 board, and the same flash memory image can be downloaded from ST web page.

In the same zip file, we include the DBC file for the CAN messages. Future software extensions might include a complete GUI based on the UART port available on board.

Ethernet communication is available at the hardware level but reserved for future use at software level.

1 System requirements, hardware and software resources

Figure 1. **STEVAL-PDUBV1 application block diagram**



2 Schematic diagrams

Figure 2. **STEVAL-PDUBV1 circuit schematic (1 of 14)**

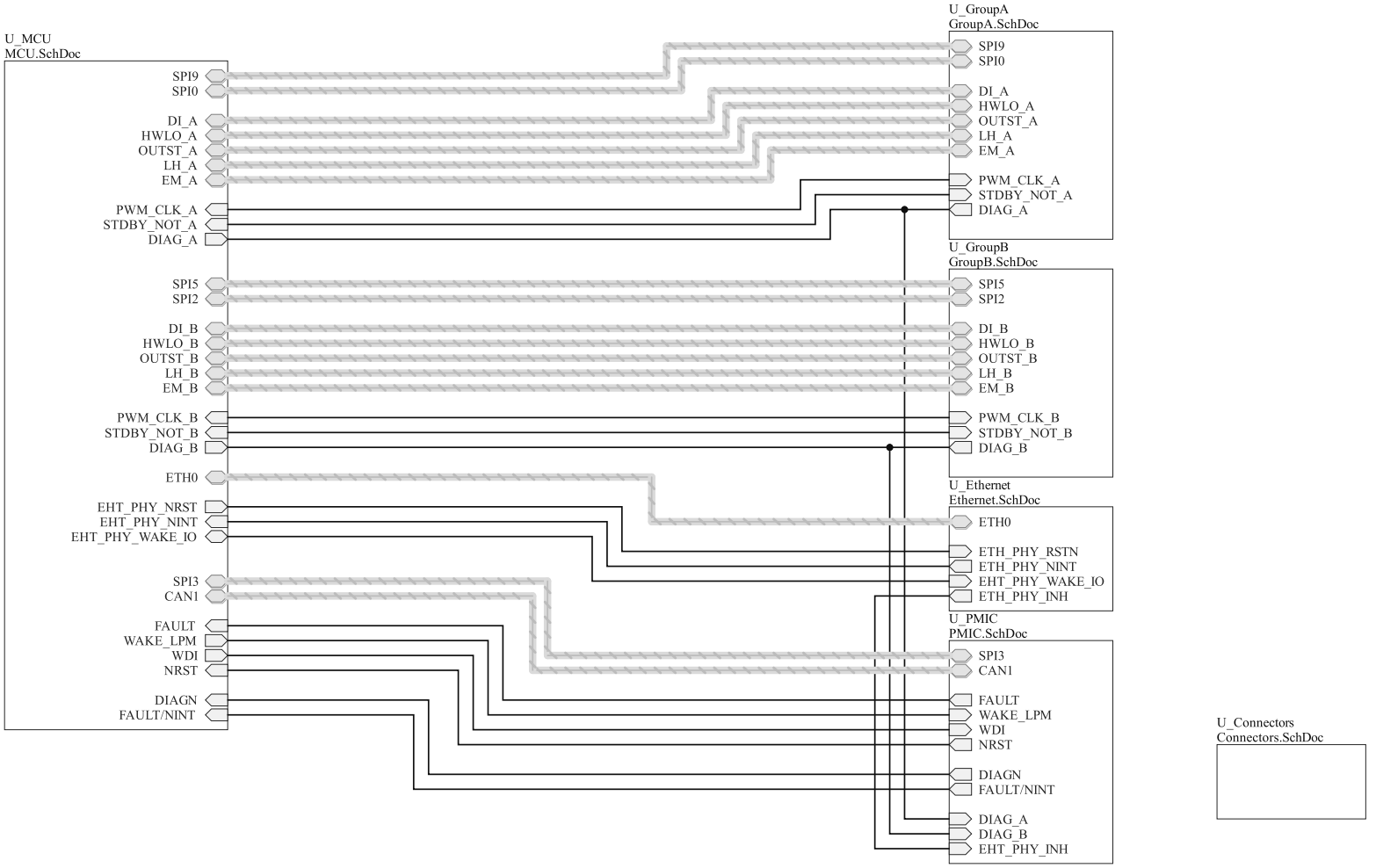


Figure 3. STEVAL-PDUBV1 circuit schematic (2 of 14)

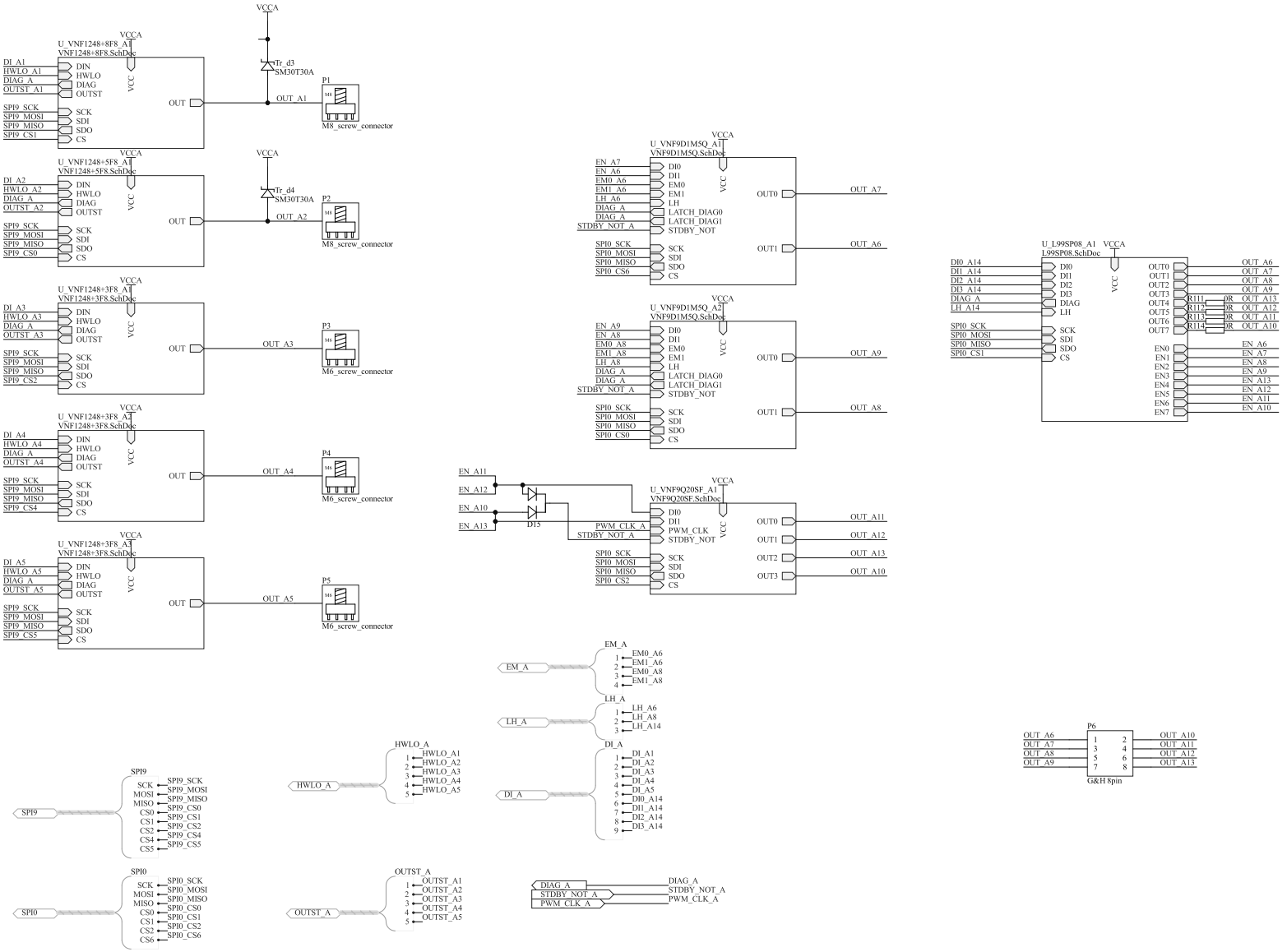
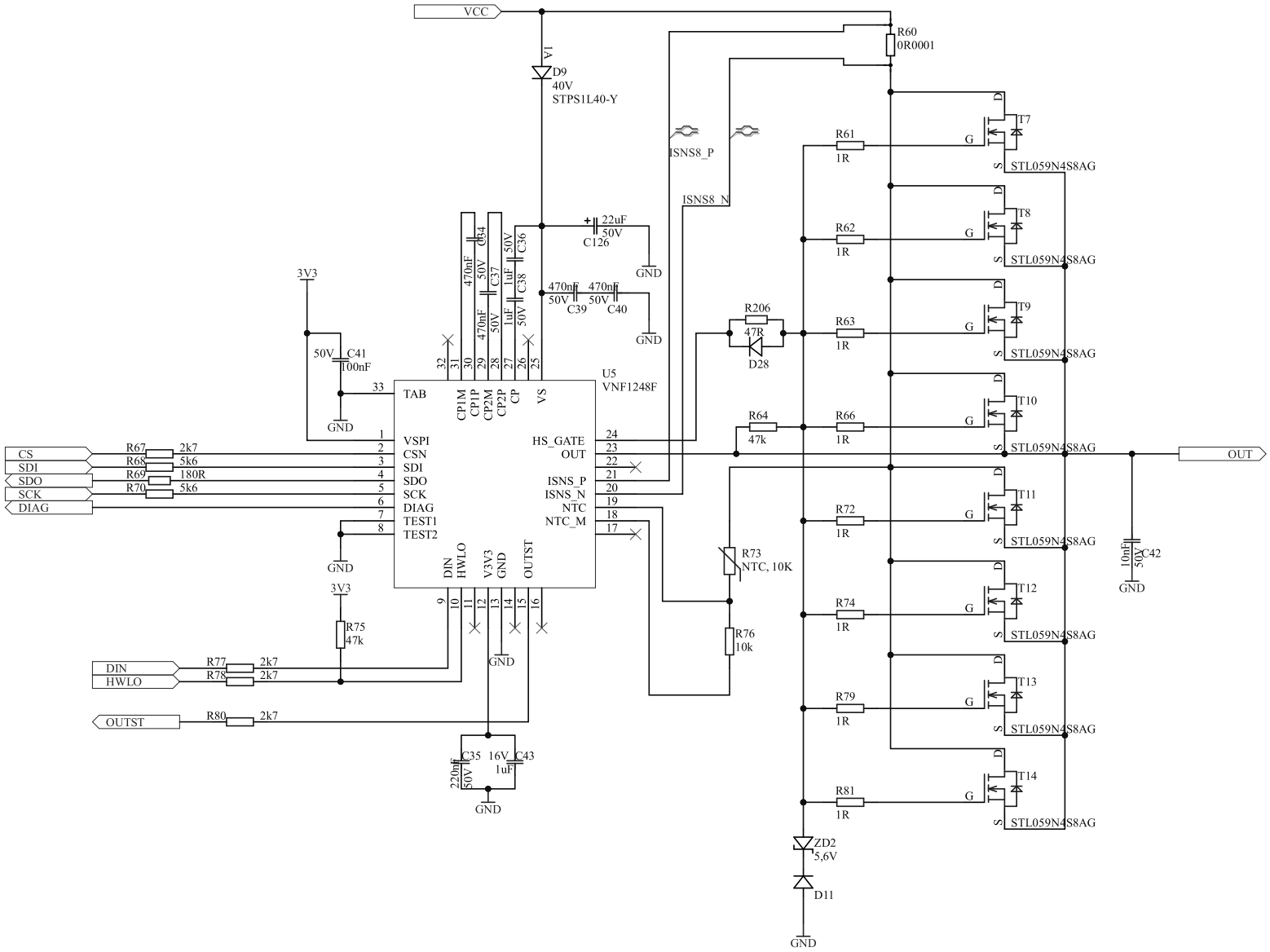


Figure 4. **STEVAL-PDUBV1 circuit schematic (3 of 14)**



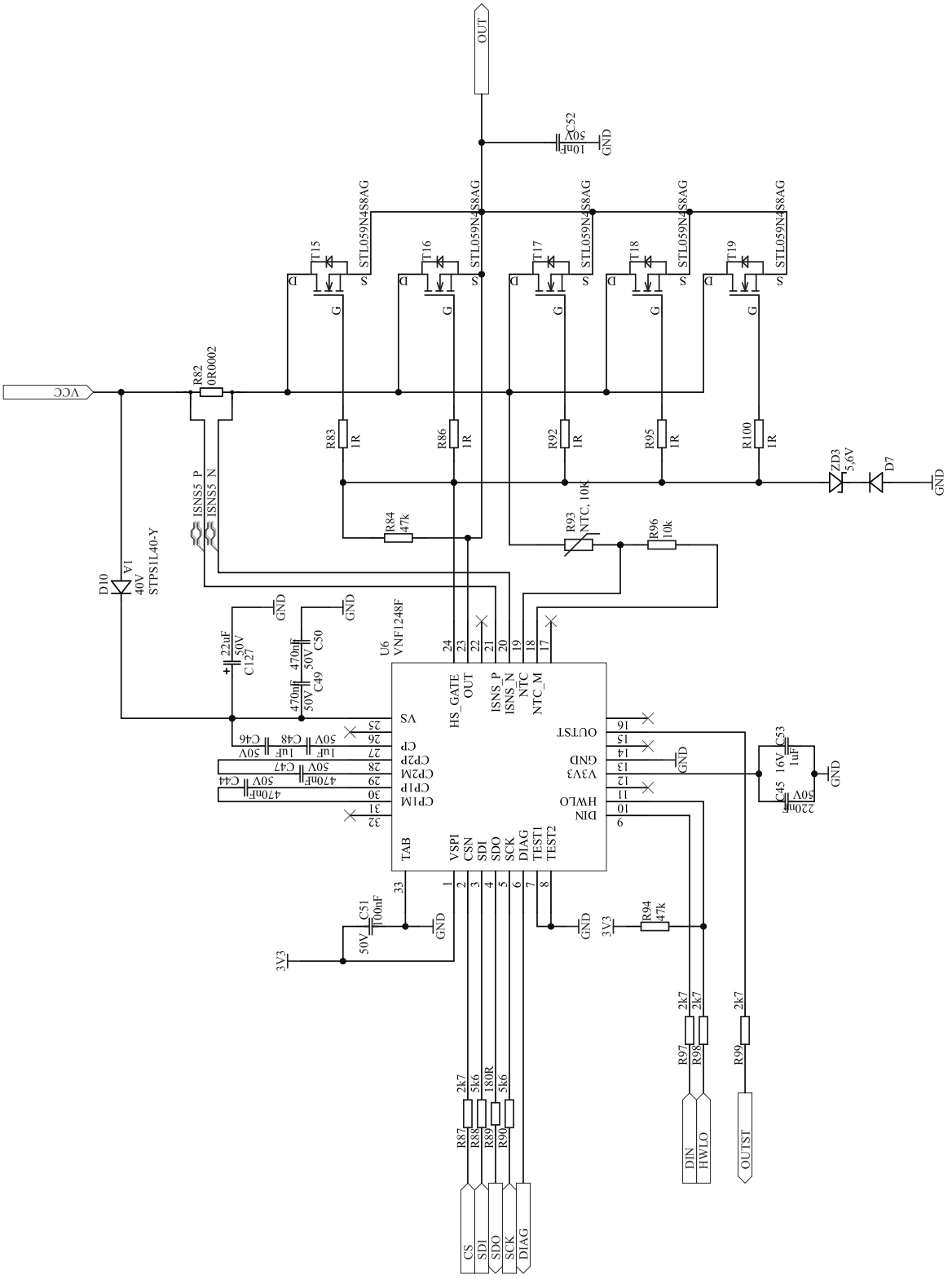


Figure 5. STEVAL-PDUBV1 circuit schematic (4 of 14)

Figure 6. STEVAL-PDUBV1 circuit schematic (5 of 14)

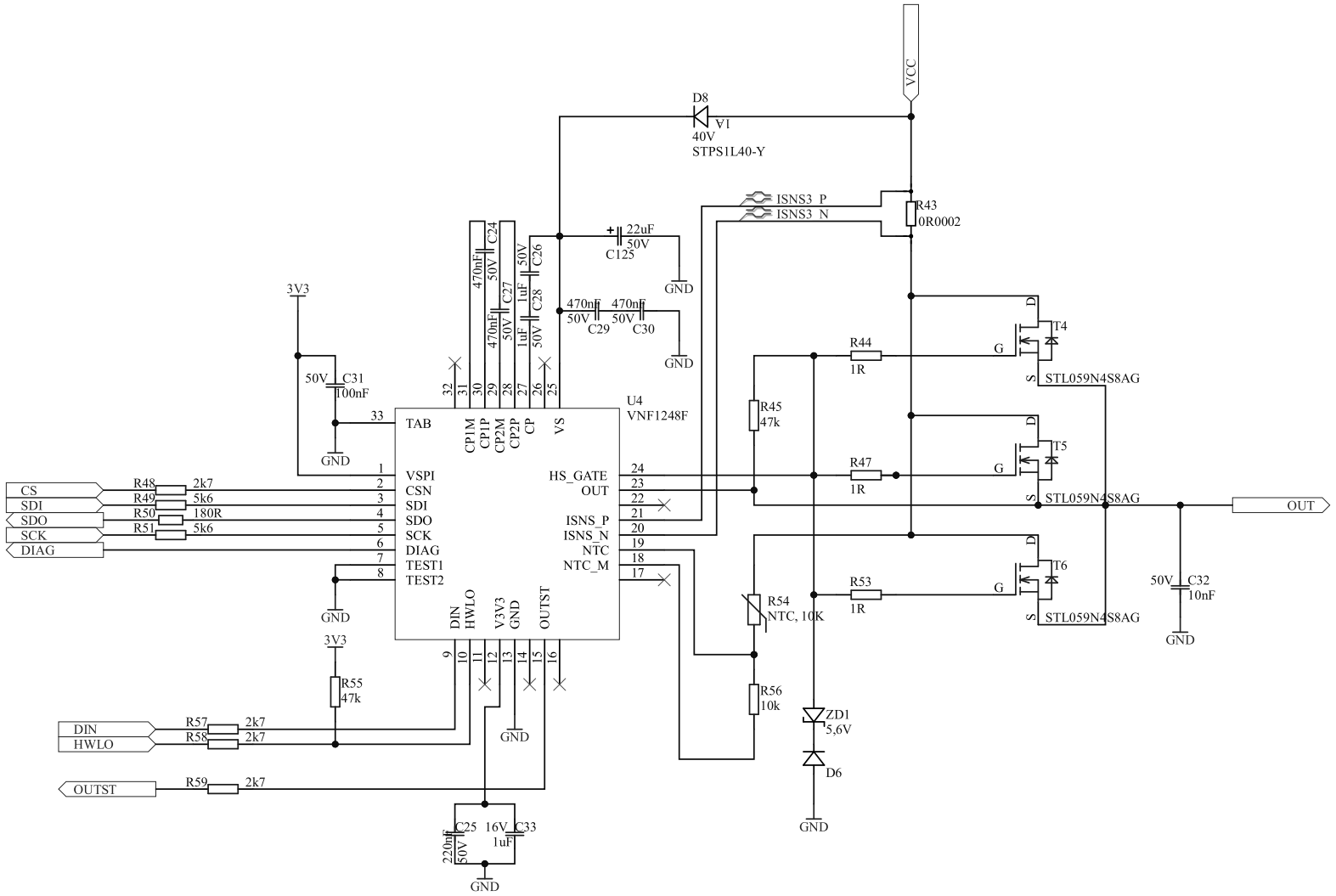


Figure 7. **STEVAL-PDUBV1 circuit schematic (6 of 14)**

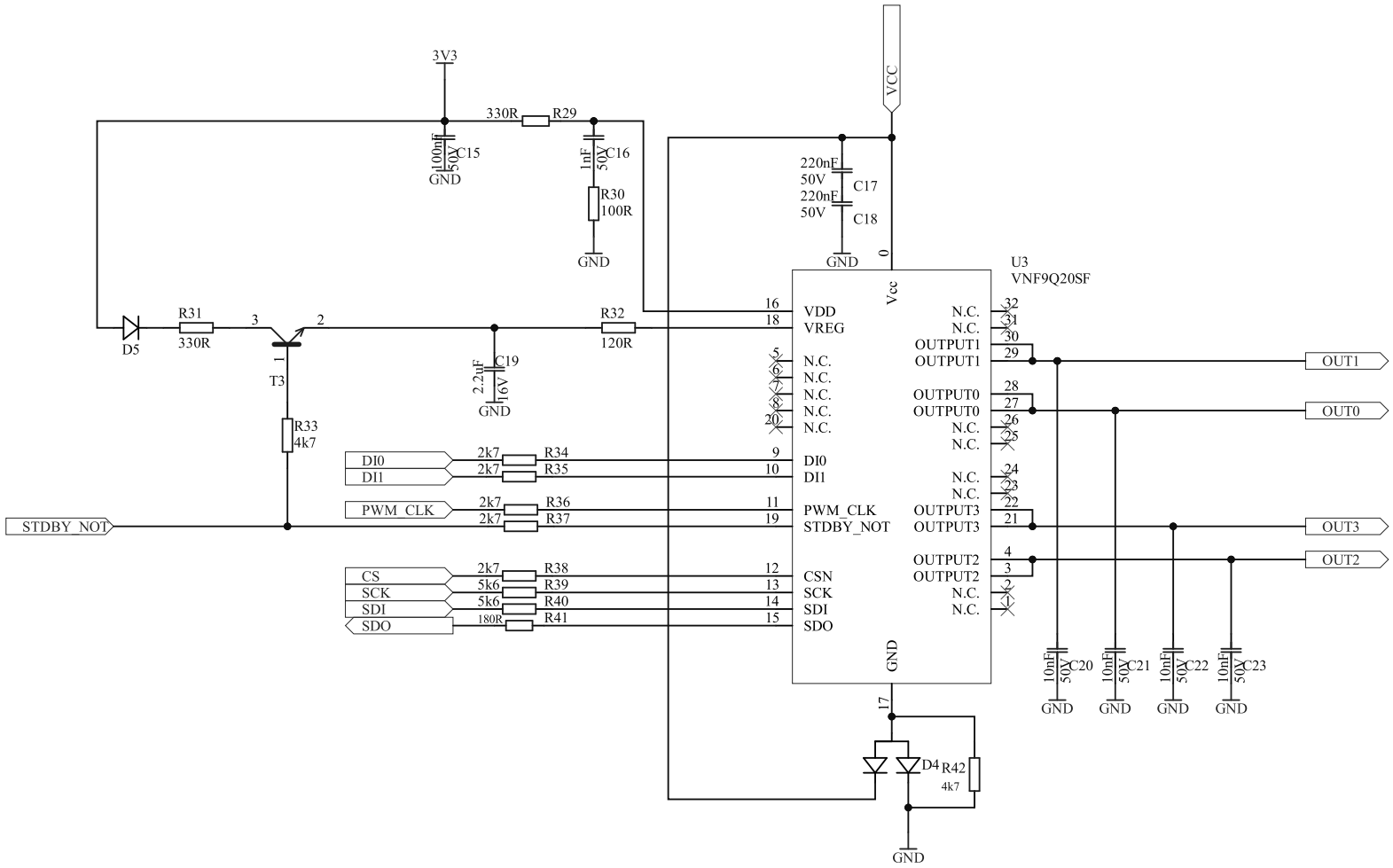


Figure 8. **STEVAL-PDUBV1 circuit schematic (7 of 14)**

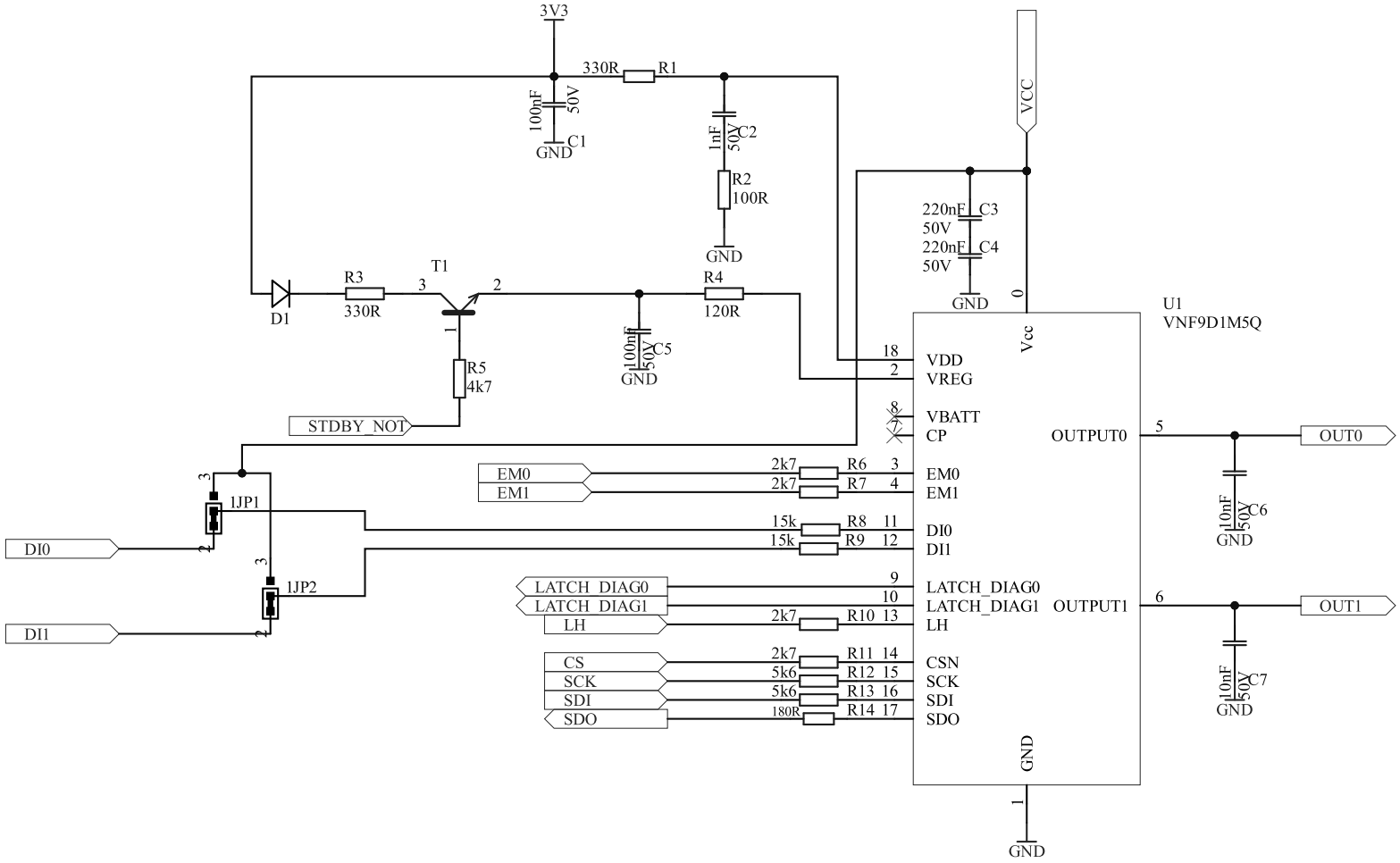


Figure 9. **STEVAL-PDUBV1 circuit schematic (8 of 14)**

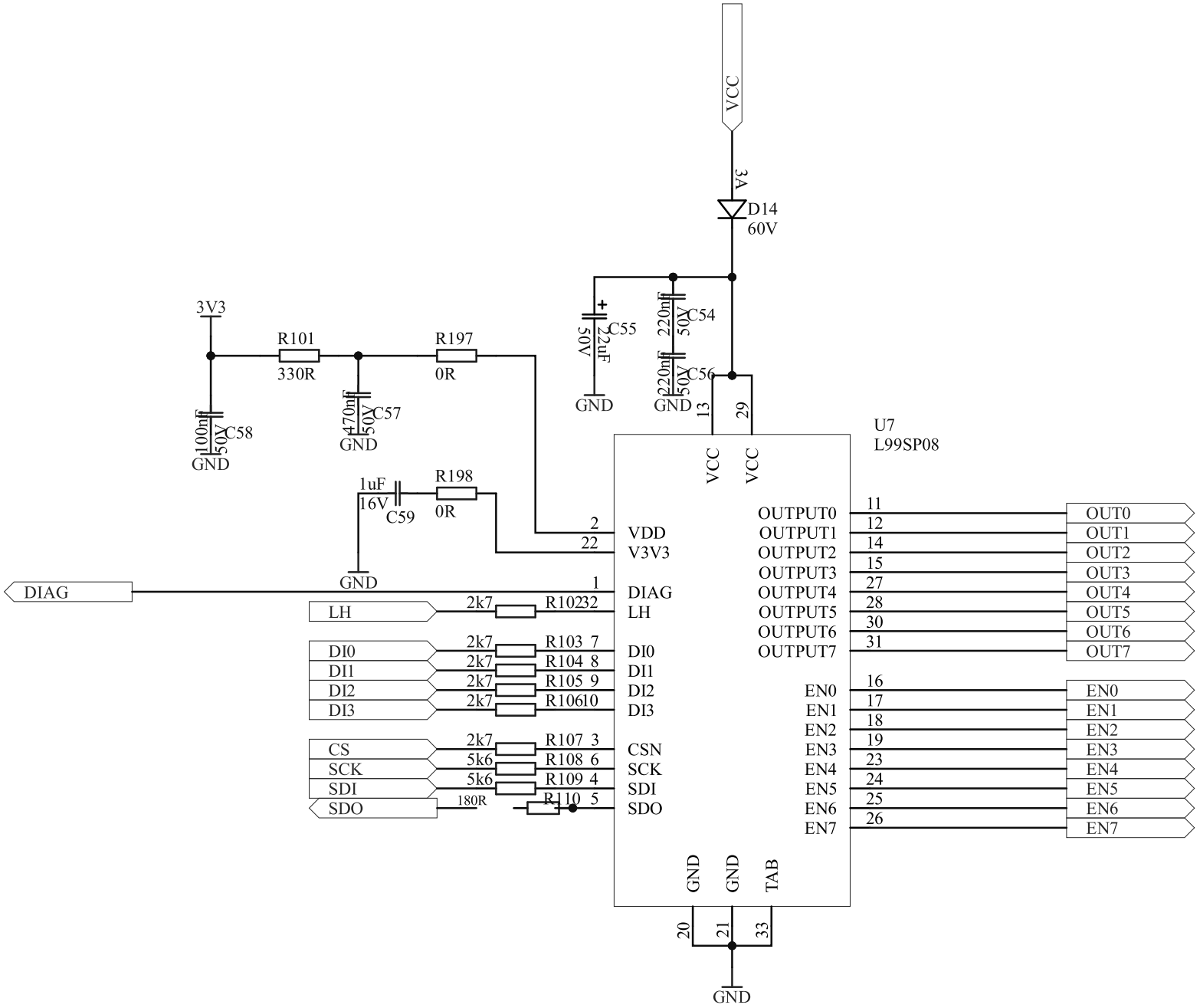


Figure 10. STEVAL-PDUBV1 circuit schematic (9 of 14)

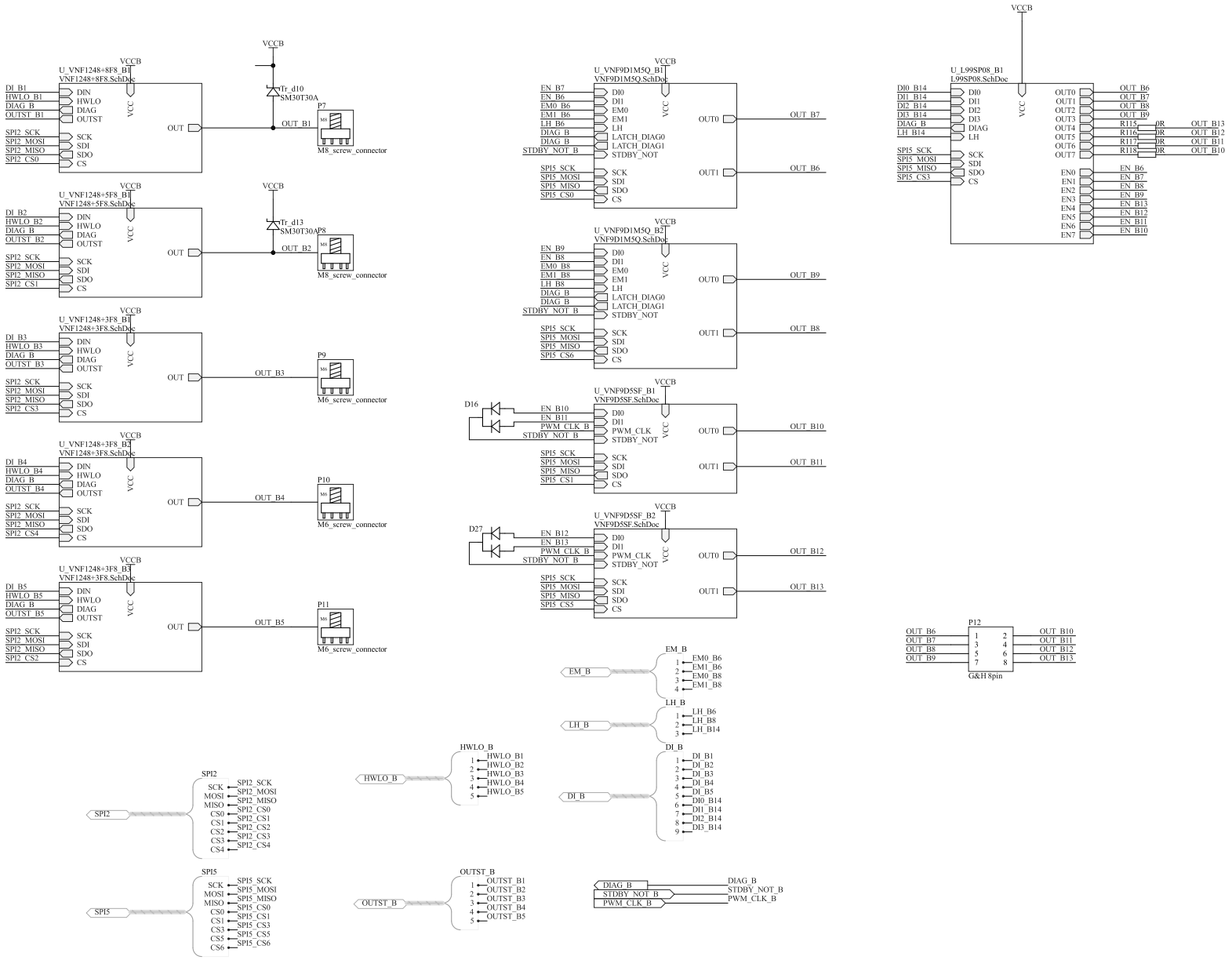


Figure 11. **STEVAL-PDUBV1 circuit schematic (10 of 14)**

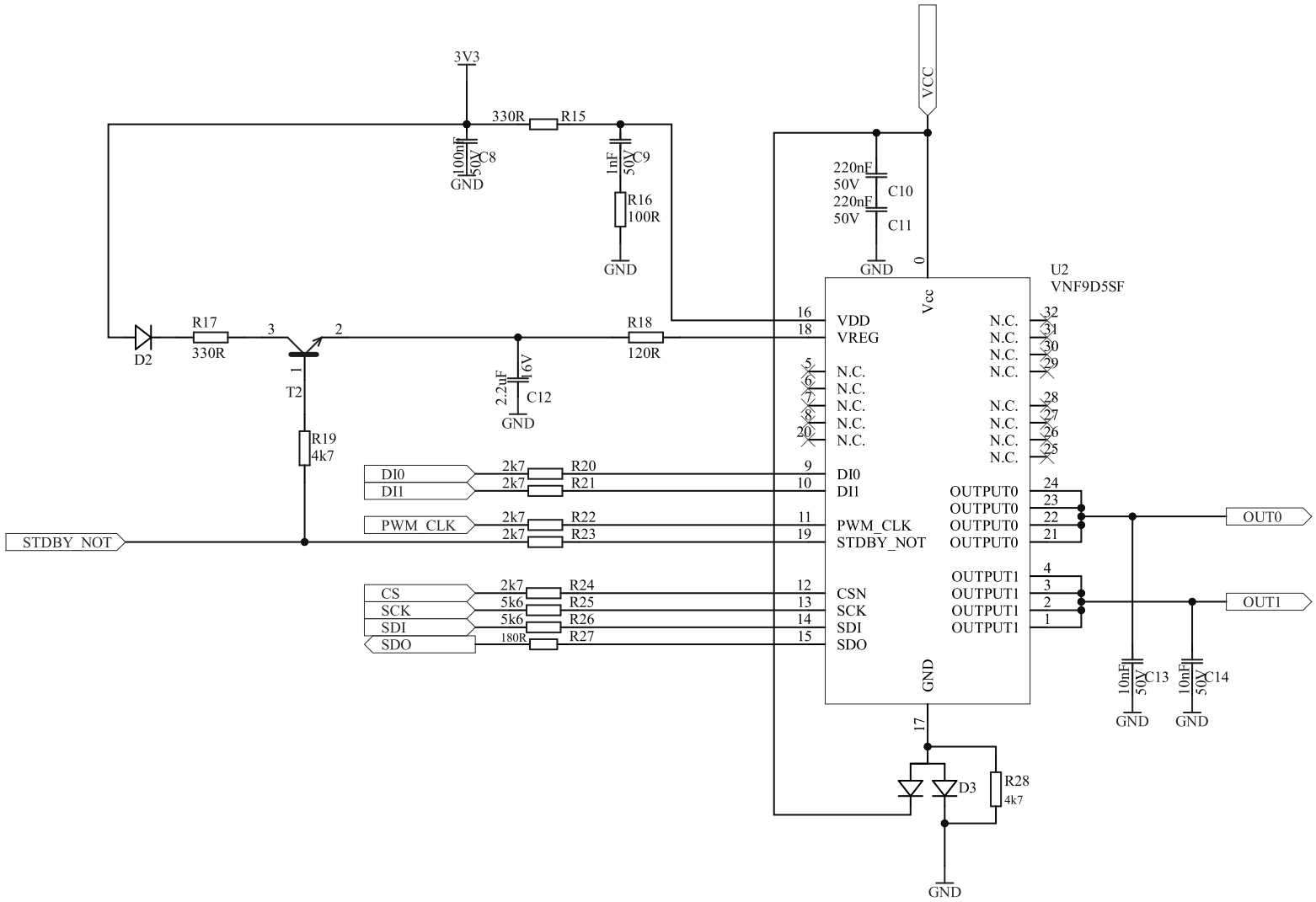


Figure 12. STEVAL-PDUBV1 circuit schematic (11 of 14)

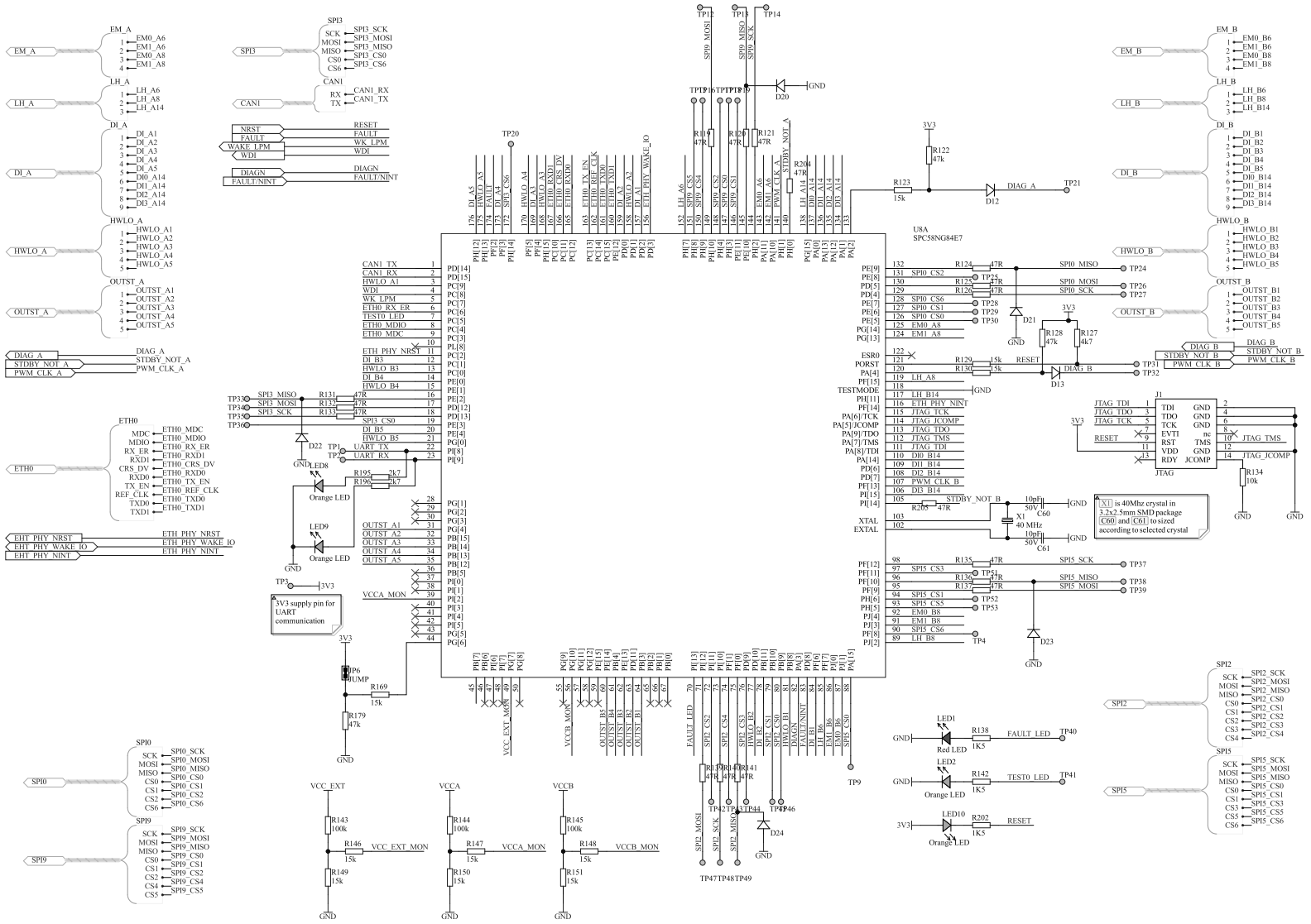


Figure 13. STEVAL-PDUBV1 circuit schematic (12 of 14)

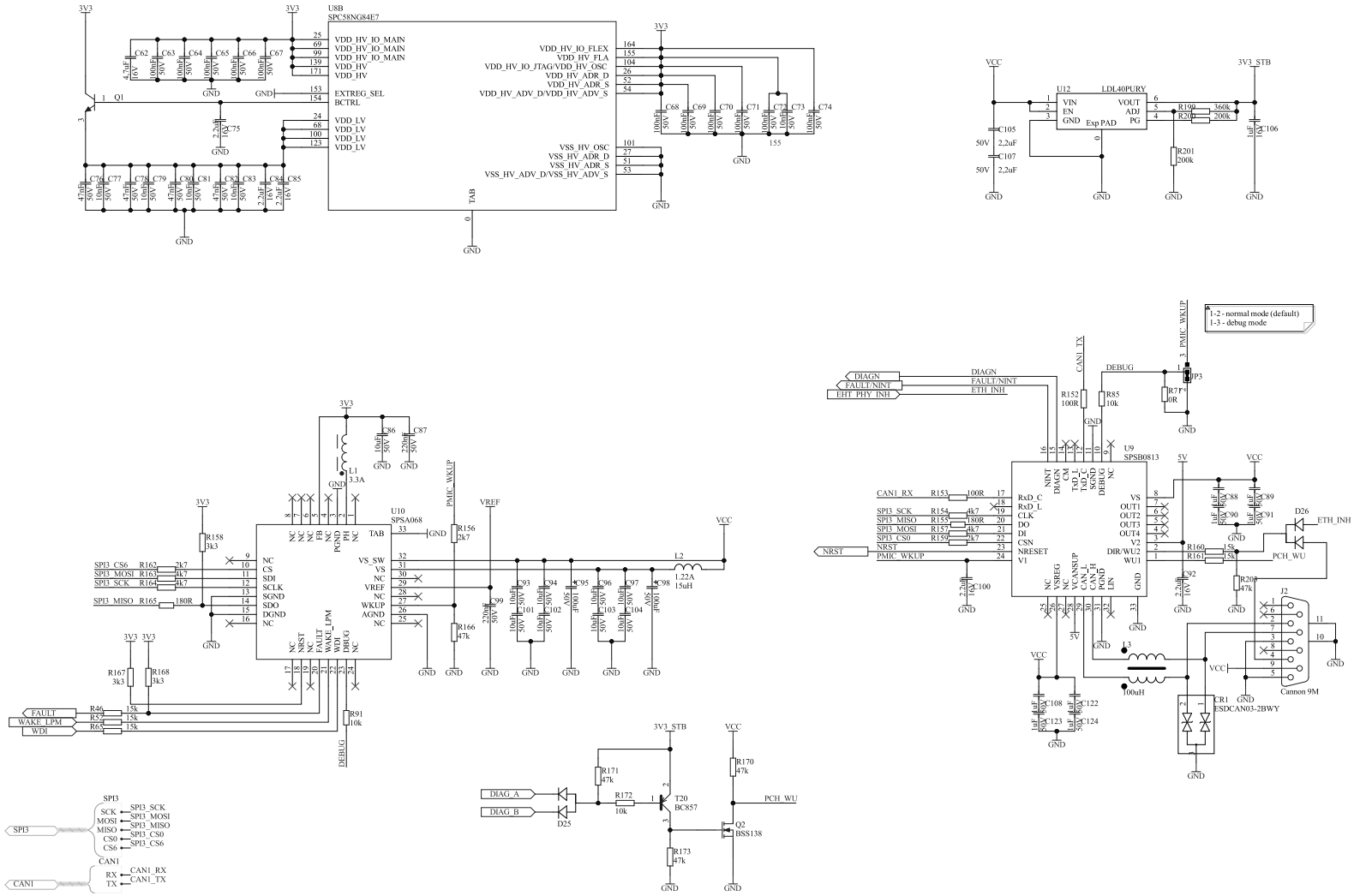


Figure 14. STEVAL-PDUBV1 circuit schematic (13 of 14)

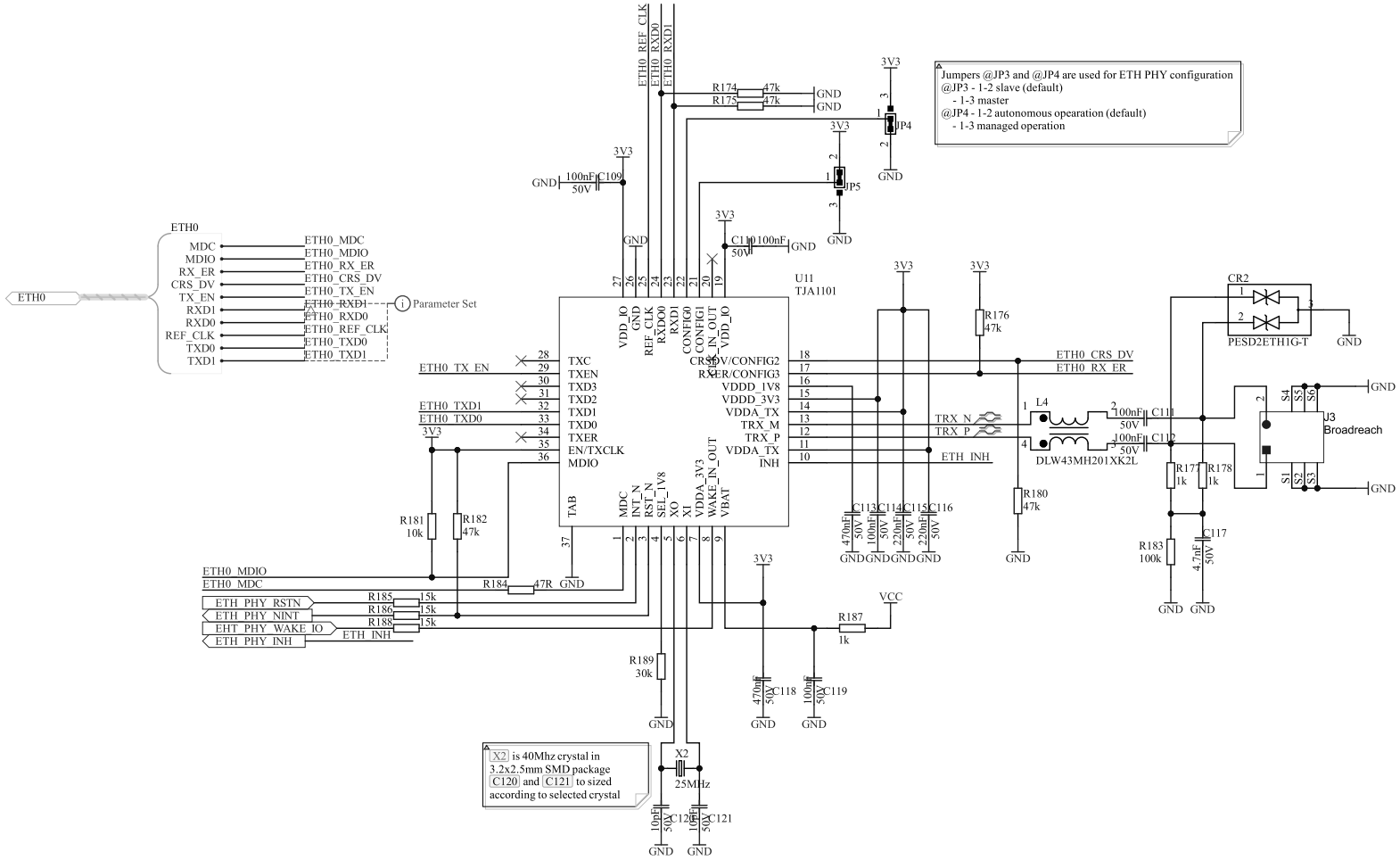
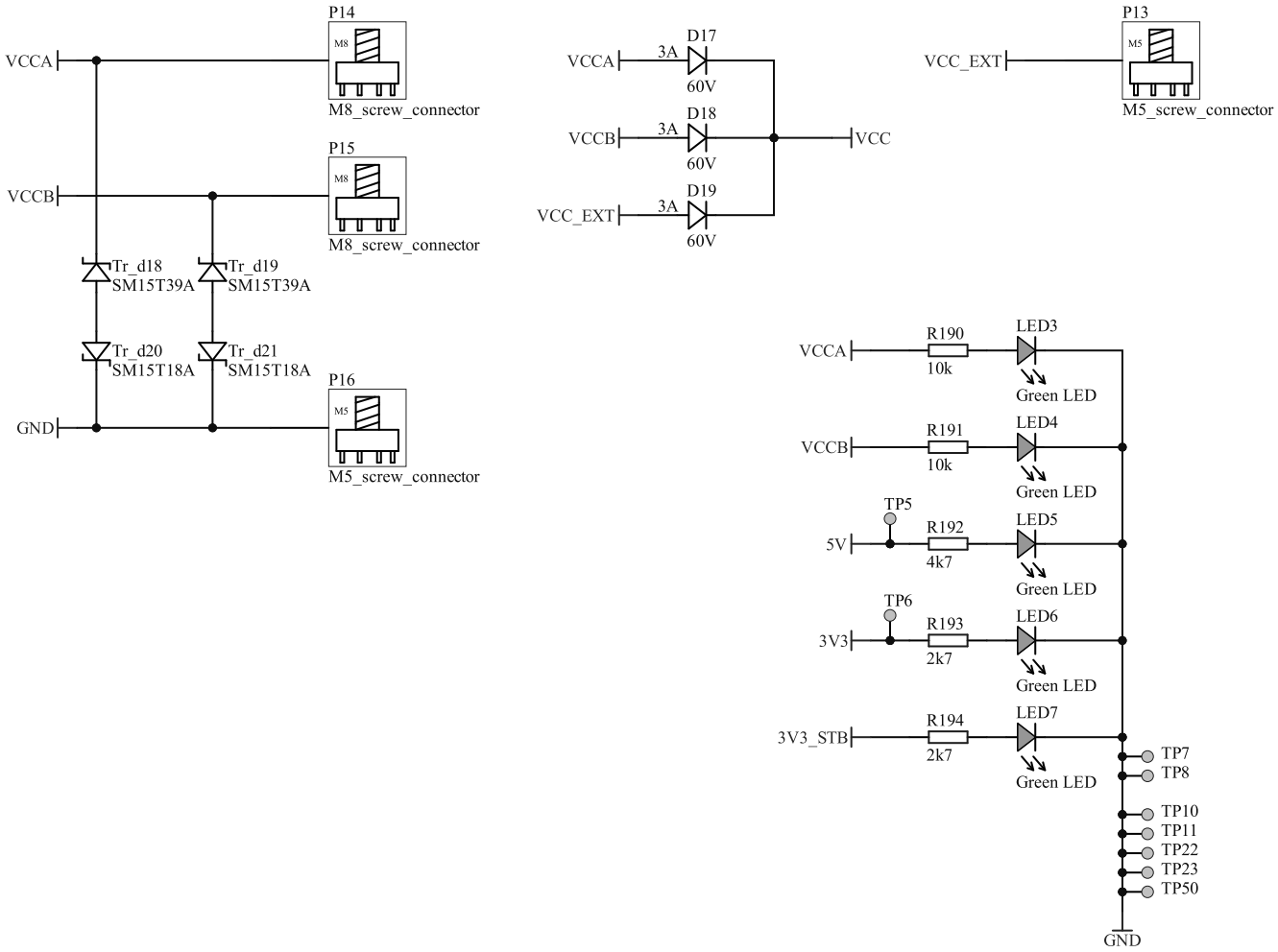


Figure 15. STEVAL-PDUBV1 circuit schematic (14 of 14)



3 Board versions

Table 1. STEVAL-PDUBV1 versions

Finished good	Schematic diagrams	Bill of materials
STV$PDUBV1A (1)	STV$PDUBV1A schematic diagrams	STV$PDUBV1A bill of materials

1. *This code identifies the STEVAL-PDUBV1 evaluation board first version.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
24-Mar-2026	1	Initial release.

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