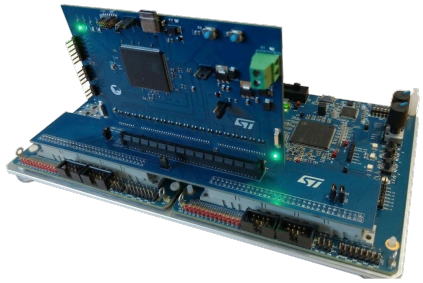
STEVAL-HILE1H7K1

Data brief

HIL - Hardware in the Loop - cost effective emulation tool for digital power converters based on STM32H7P



Product summary	
HIL - Hardware in the Loop - cost effective emulation tool for digital power converters, based on STM32G474 and STELLAR E1 MCUs	STEVAL-HILE1H7K1
Firmware configuration for the STEVAL-HILE1H7K1	STSW-HILE1H7K1
MCU, ARM Cortex-M7 32-bit, 2MB Flash, 320KB SRAM, With Crypto, SMPS	STM32H7P5IIT6Q
SR5 E1 line of Stellar electrification MCUs, 32-bit Arm Cortex-M7 automotive MCU 2x cores	SR5E1E770C30F01X
Applications	Digital power / Battery storage systems for home / Battery storage systems for commercial / Microinverter/Power optimizer

Features

- Model-based power plant emulation
- High simulation accuracy for DC-DC with MPPT and VSI (maximum simulation frequency: 100 kHz)
- Extensive onboard I/Os: 12x PWM inputs, 20x DAC outputs
- Fault injection support
  - AC and DC overvoltage
  - AC and DC overcurrent
- User interface: pushbuttons, LEDs, potentiometers, and DIP switches
  - PV panel max power and V_{OC} setting
  - DC bus activation, sharing and monitoring
  - Grid and relay status monitoring
- GUI for real-time monitoring and efficient debugging
- Programmer for STM32H7P and Stellar E1 included

Description

The STEVAL-HILE1H7K1 is a hardware-in-the-loop (HIL) evaluation kit composed of two emulator boards based on the Stellar E1 MCU and one control board based on the STM32H7P MCU.

The HIL boards provide a real-time emulation environment for digital power conversion systems, enabling validation of control algorithms in a safe low-voltage setup.

The real controller interacts with a virtual power stage under both normal and fault operating conditions, without exposing the actual power hardware to the risks typically associated with high-power testing.

Each HIL board emulates the complete power conversion chain, including the input source, power stage, and load, allowing accurate closed-loop testing of converter control functions.

The two HIL boards are configured to emulate two cascaded converters: a six-channel DC-DC boost converter with photovoltaic (PV) panel emulation and a three-phase T-type inverter stage.

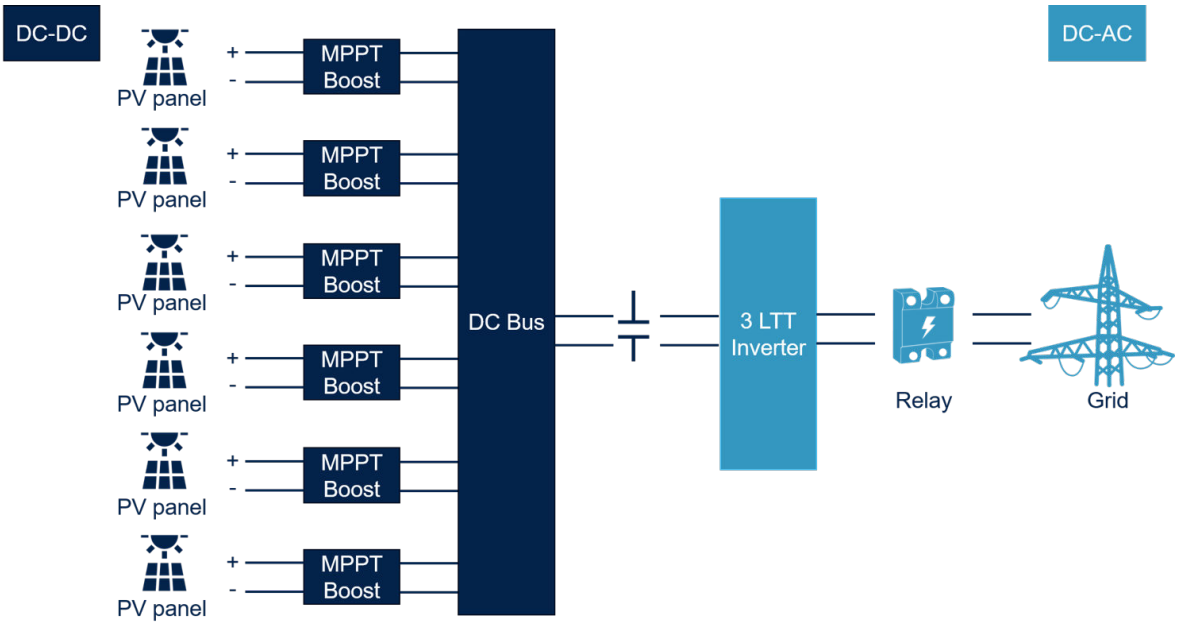
The two converters exchange analog parameters and operate in cascade mode. In this configuration, the DC-DC converter performs maximum power point tracking (MPPT) for the PV panels, while the inverter stage controls the output current and synchronizes with the AC grid.

A dedicated software GUI provides real-time monitoring and analysis of key signals and operating variables. It supports customizable dashboards, signal logging, and interactive control functions, facilitating debugging, performance characterization, and control-loop tuning during development and validation.

By enabling early verification of power converter control strategies in a nondestructive environment, the STEVAL-HILE1H7K1 reduces development time, engineering effort, and test cost.

1 System block diagram

Figure 1. **System block diagram**



2 Schematic diagrams

Figure 2. **Circuit schematic of STEVAL-DPSH7P control board - MCU**

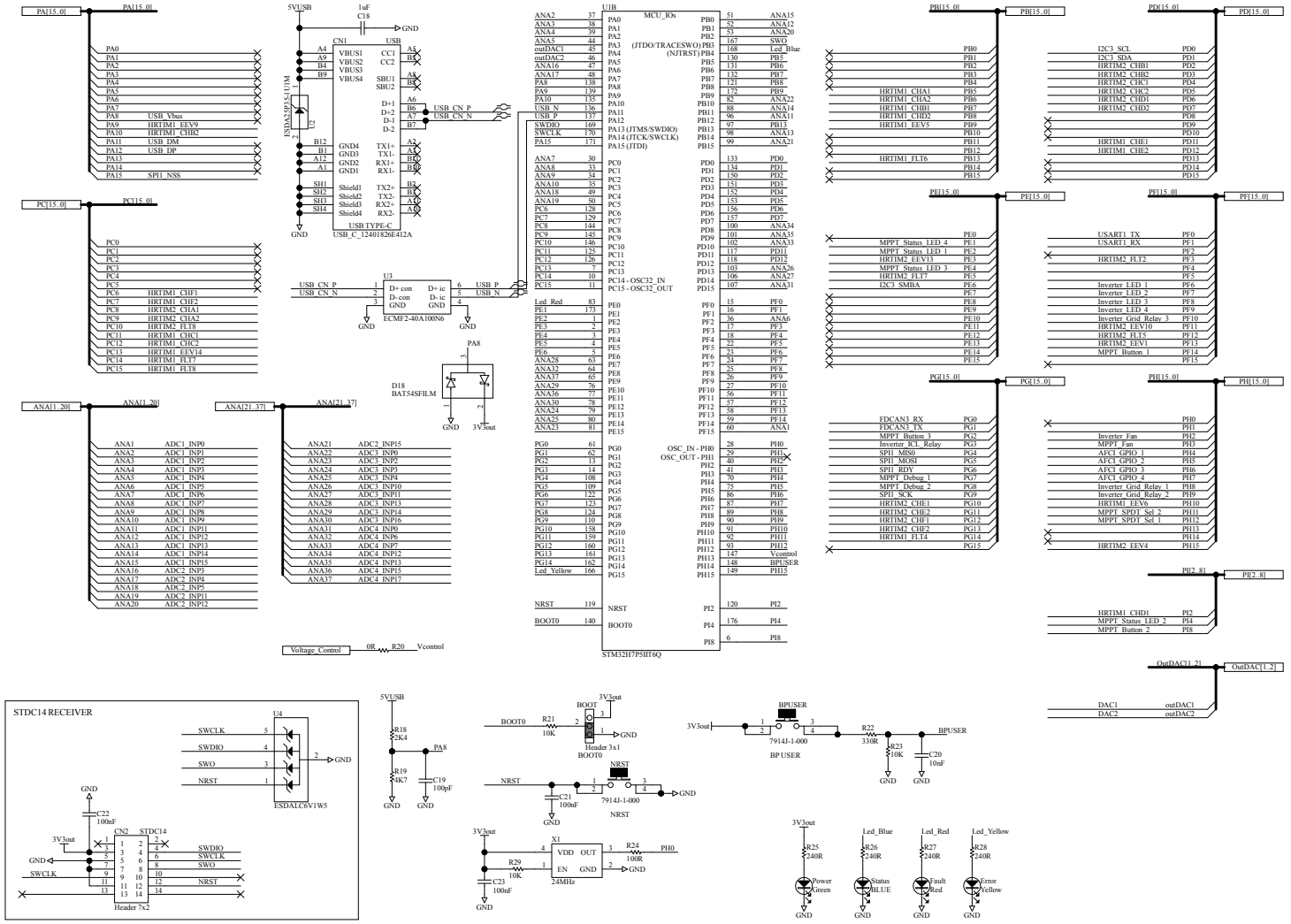


Figure 3. Circuit schematic of STEVAL-DPSH7P control board - MCU power

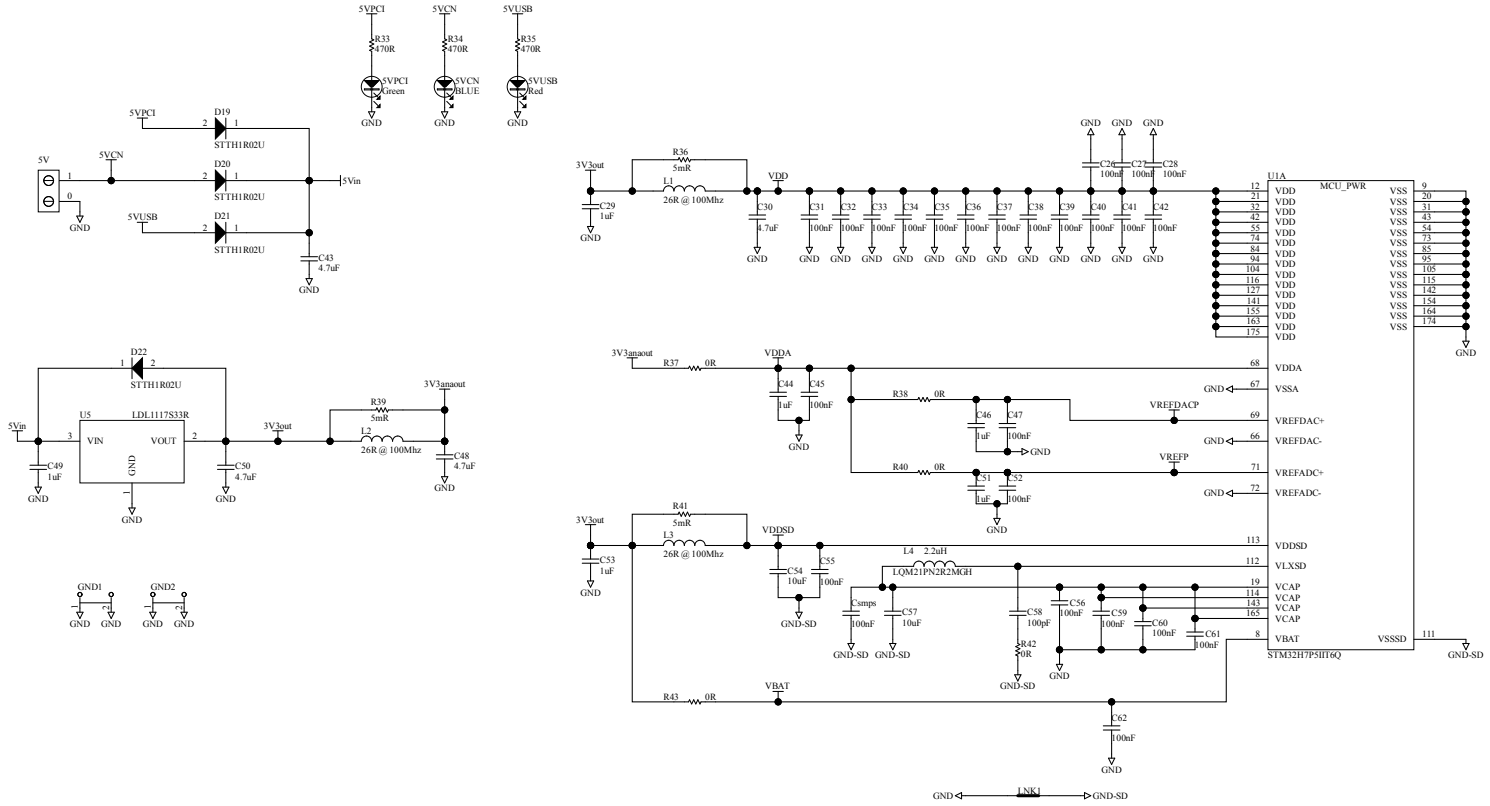


Figure 4. Circuit schematic of STEVAL-DPSH7P control board - PCI connector

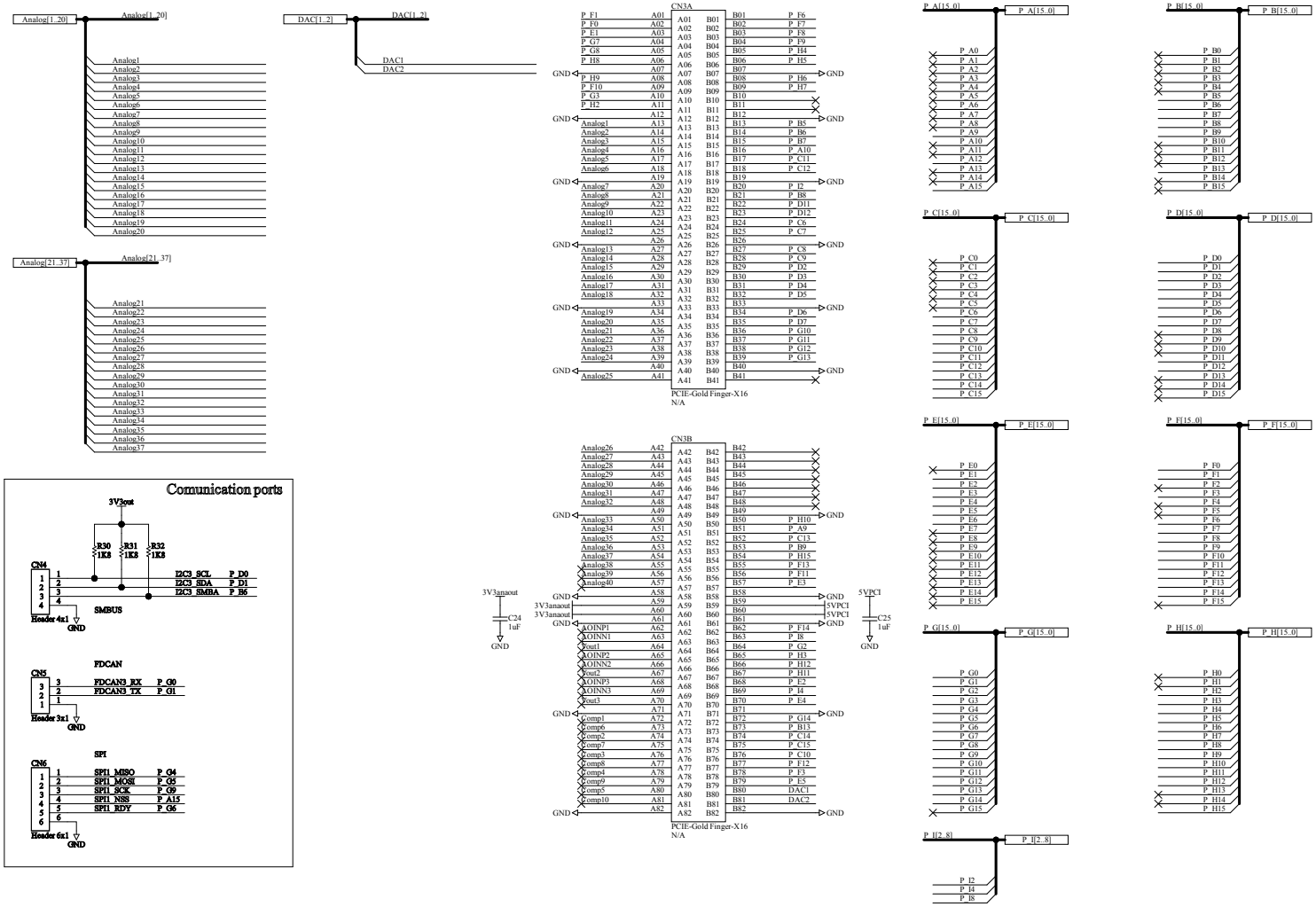


Figure 5. Circuit schematic of STEVAL-DPSH7P control board - Resistors links

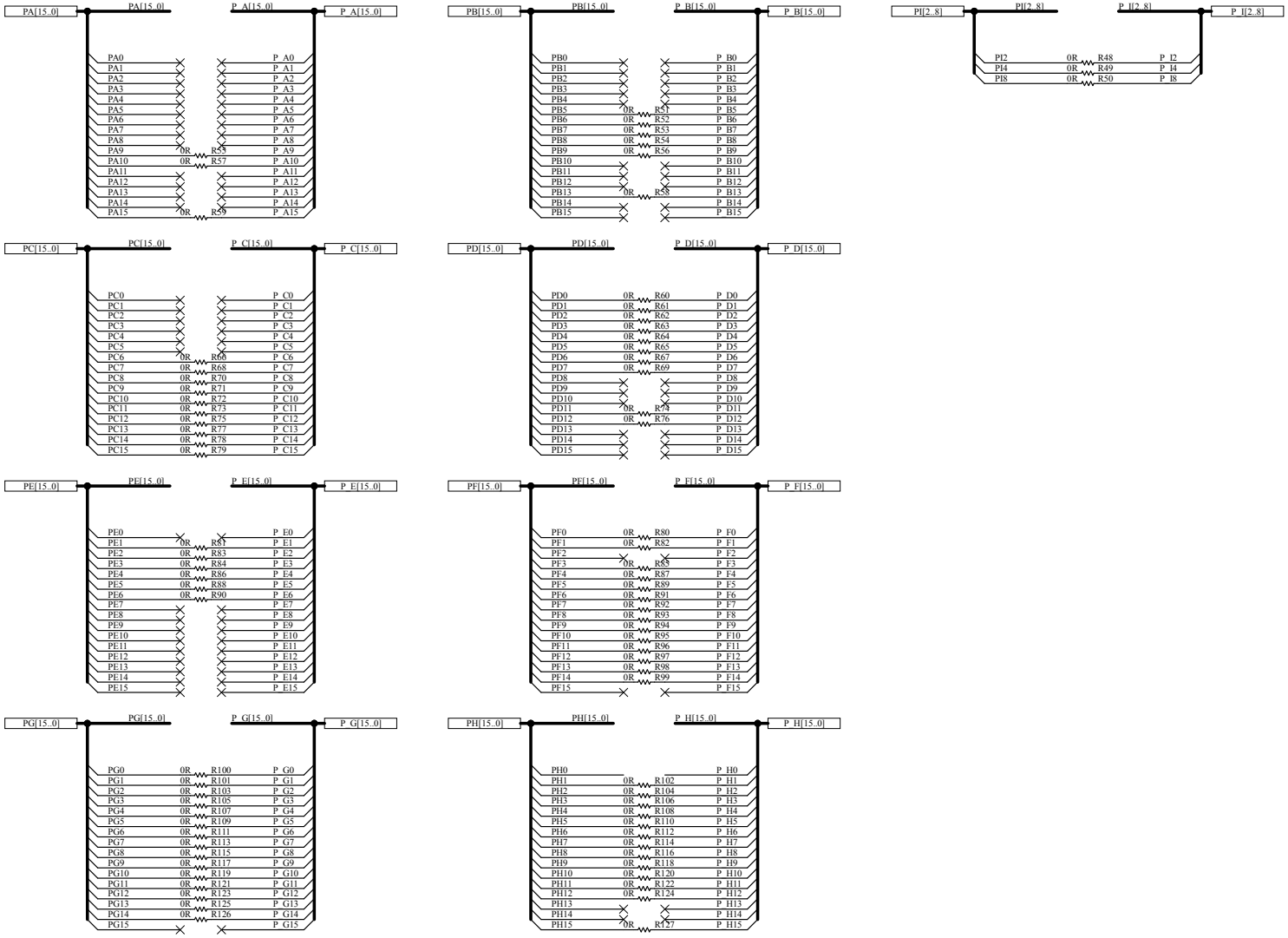


Figure 6. Circuit schematic of STEVAL-DPSH7P control board - ADC Analog 1

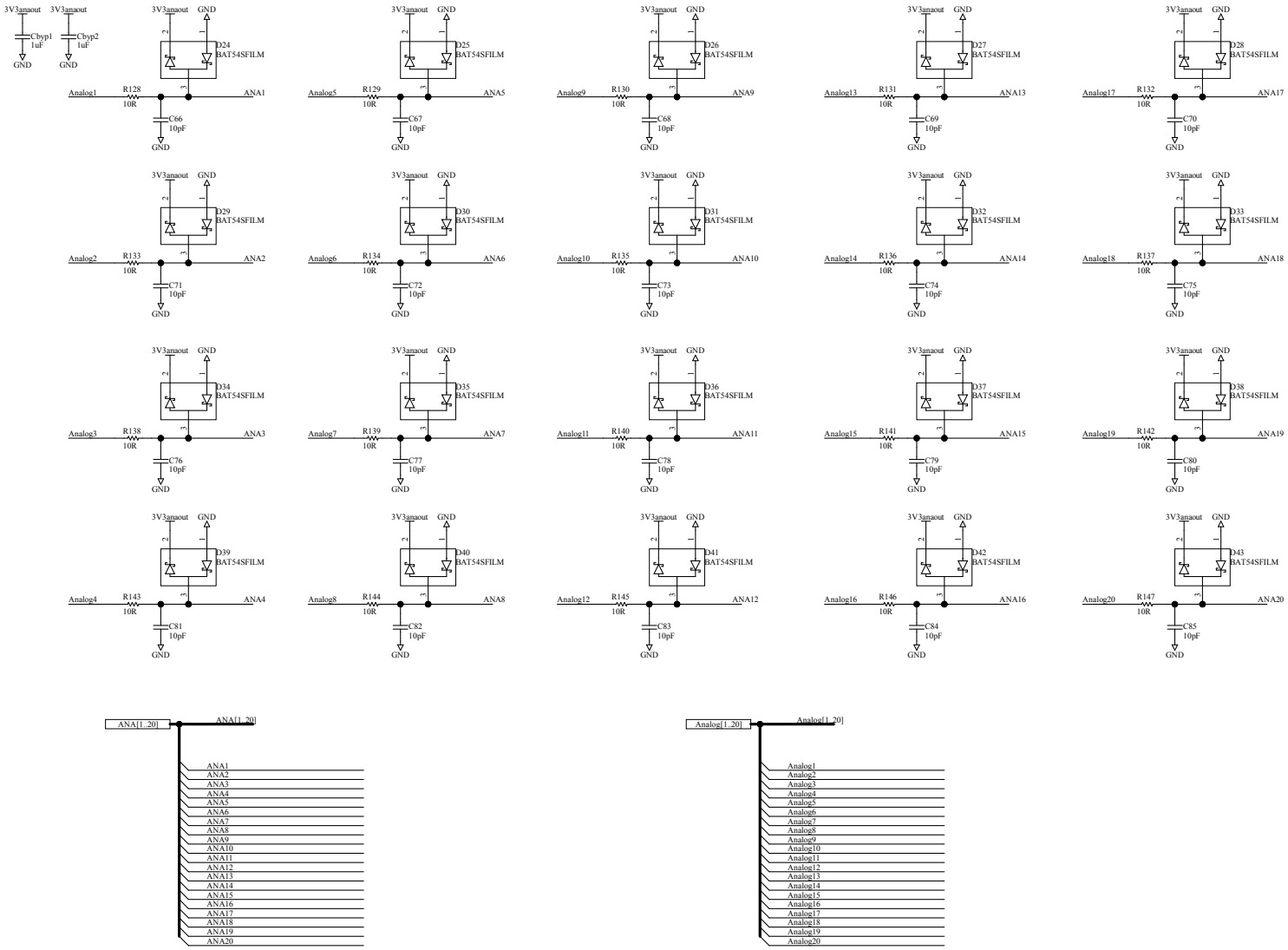


Figure 7. Circuit schematic of STEVAL-DPSH7P control board - ADC Analog 2

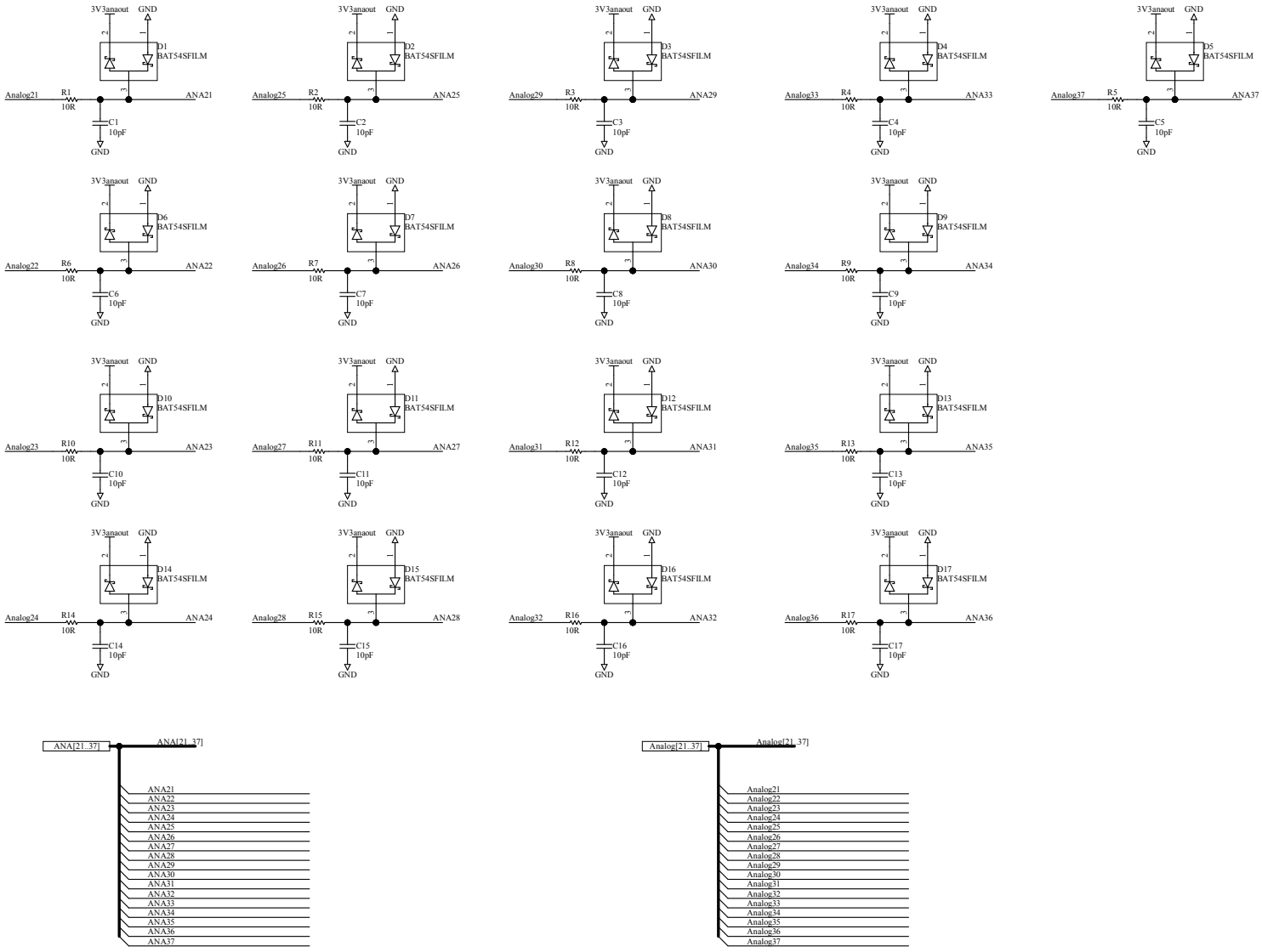


Figure 8. Circuit schematic of STEVAL-DPSH7P control board - DAC Analog

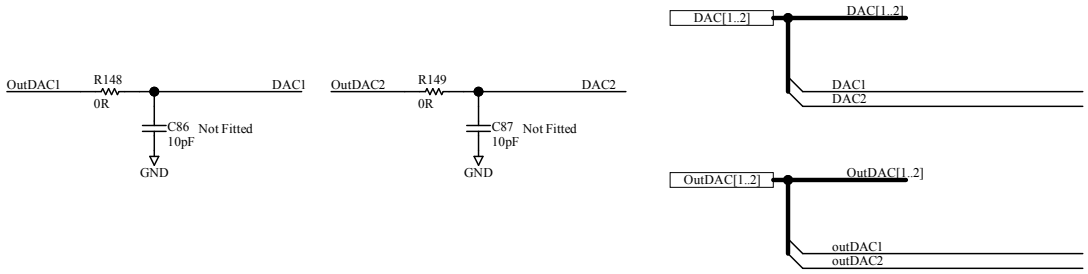


Figure 9. Circuit schematic of STEVAL-HILE1V1 emulator board - Interfaces

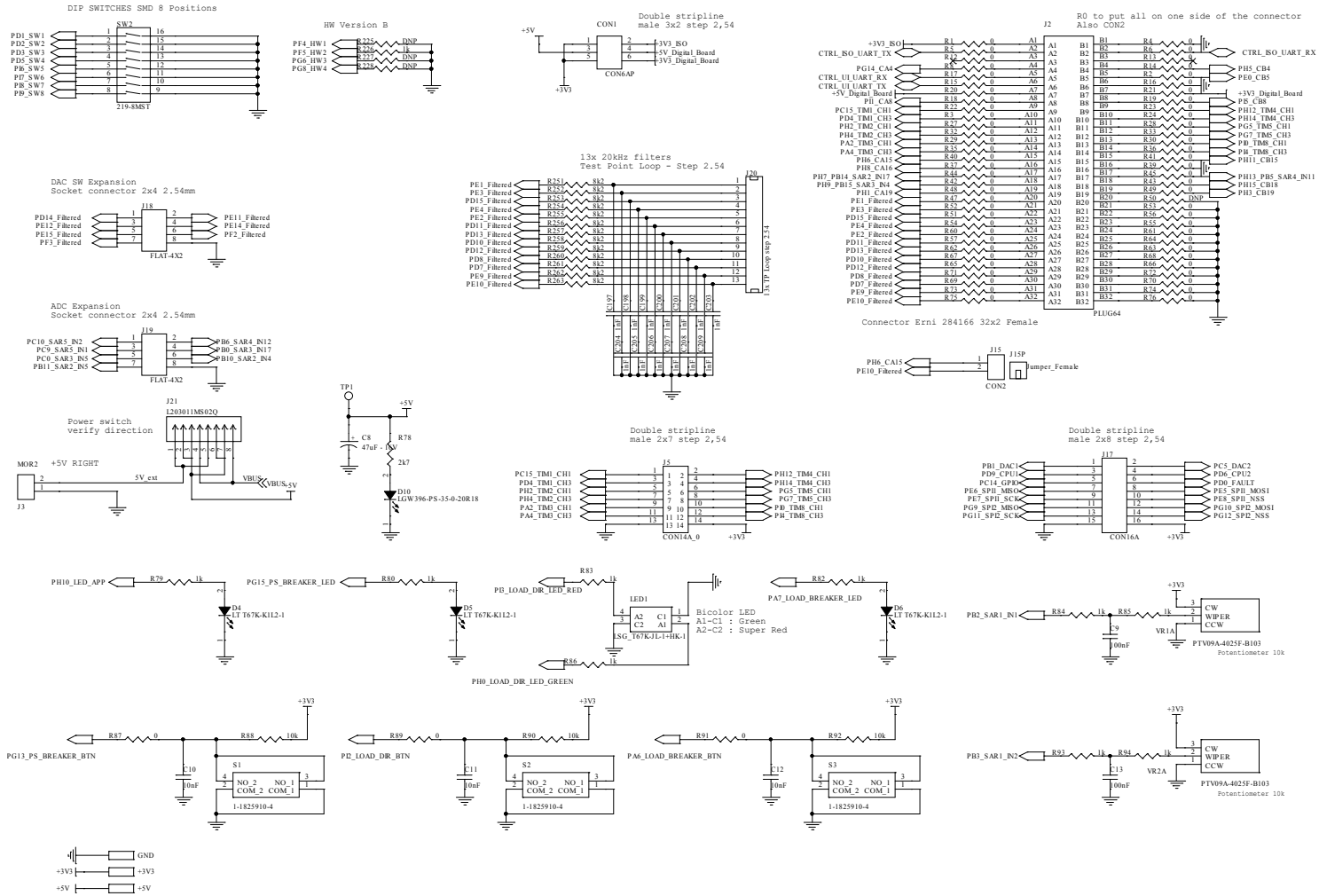


Figure 10. Circuit schematic of STEVAL-HILE1V1 emulator board - USB

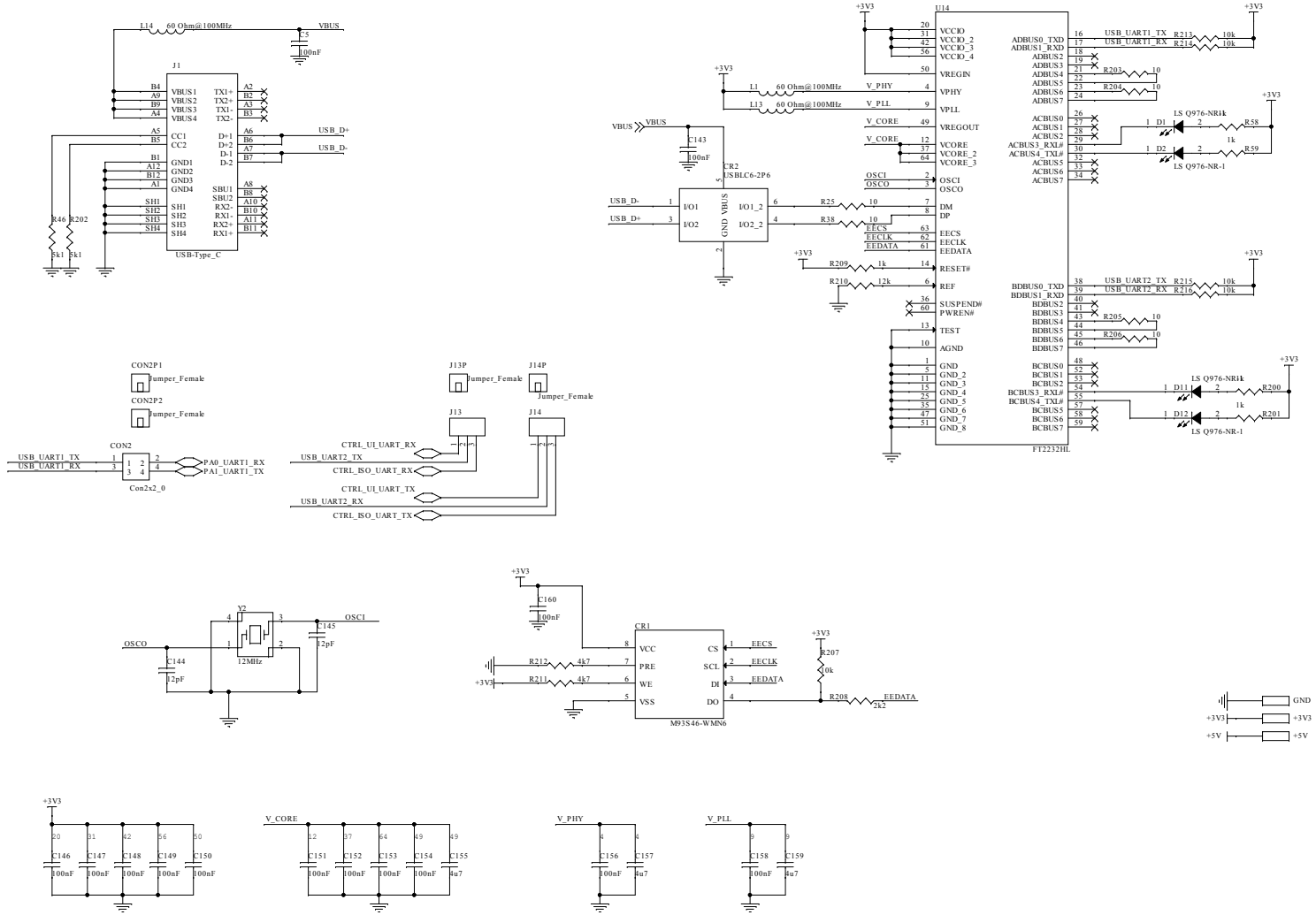


Figure 11. Circuit schematic of STEVAL-HILE1V1 emulator board - MCU

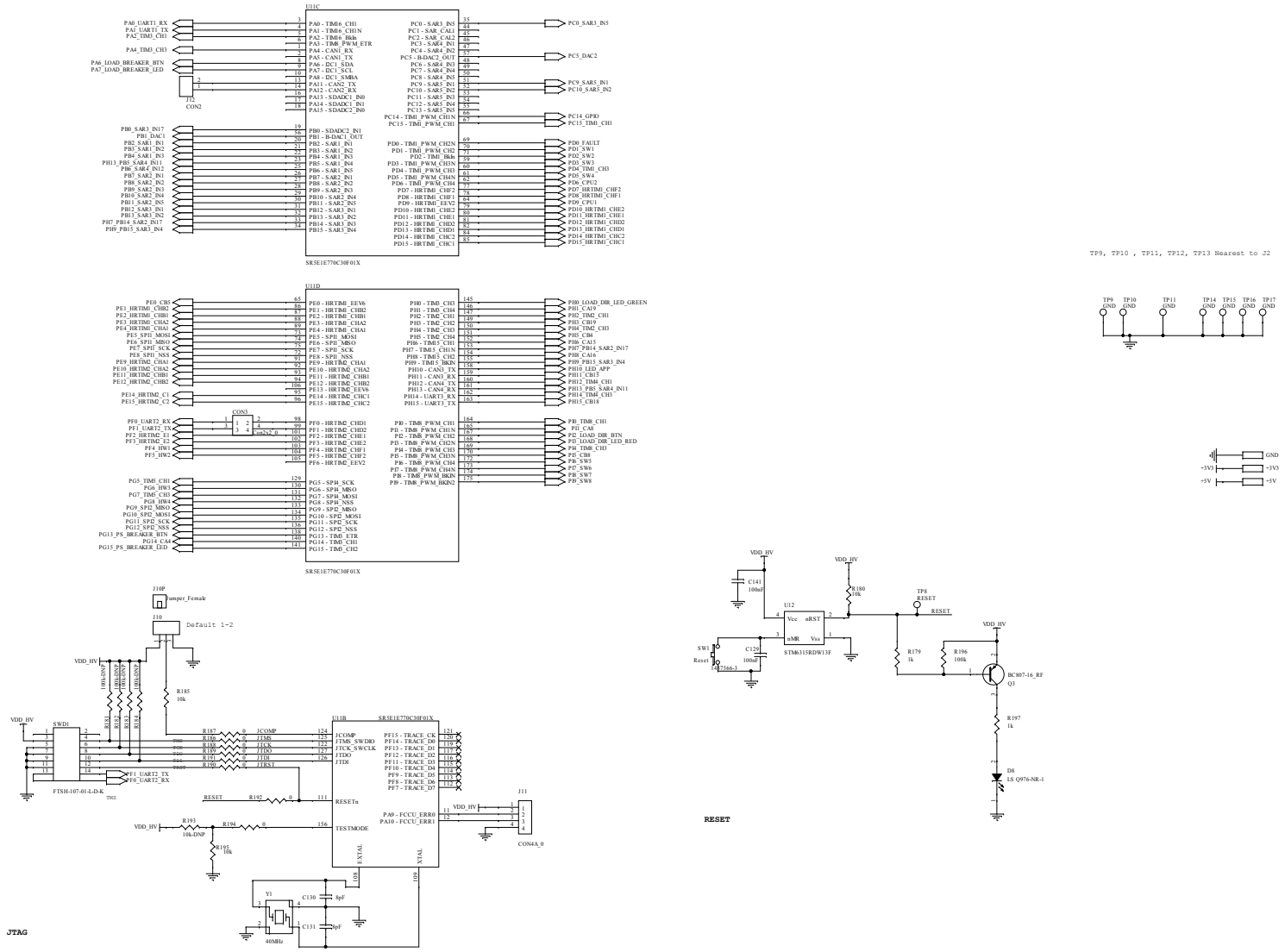


Figure 12. Circuit schematic of STEVAL-HILE1V1 emulator board - DAC 1

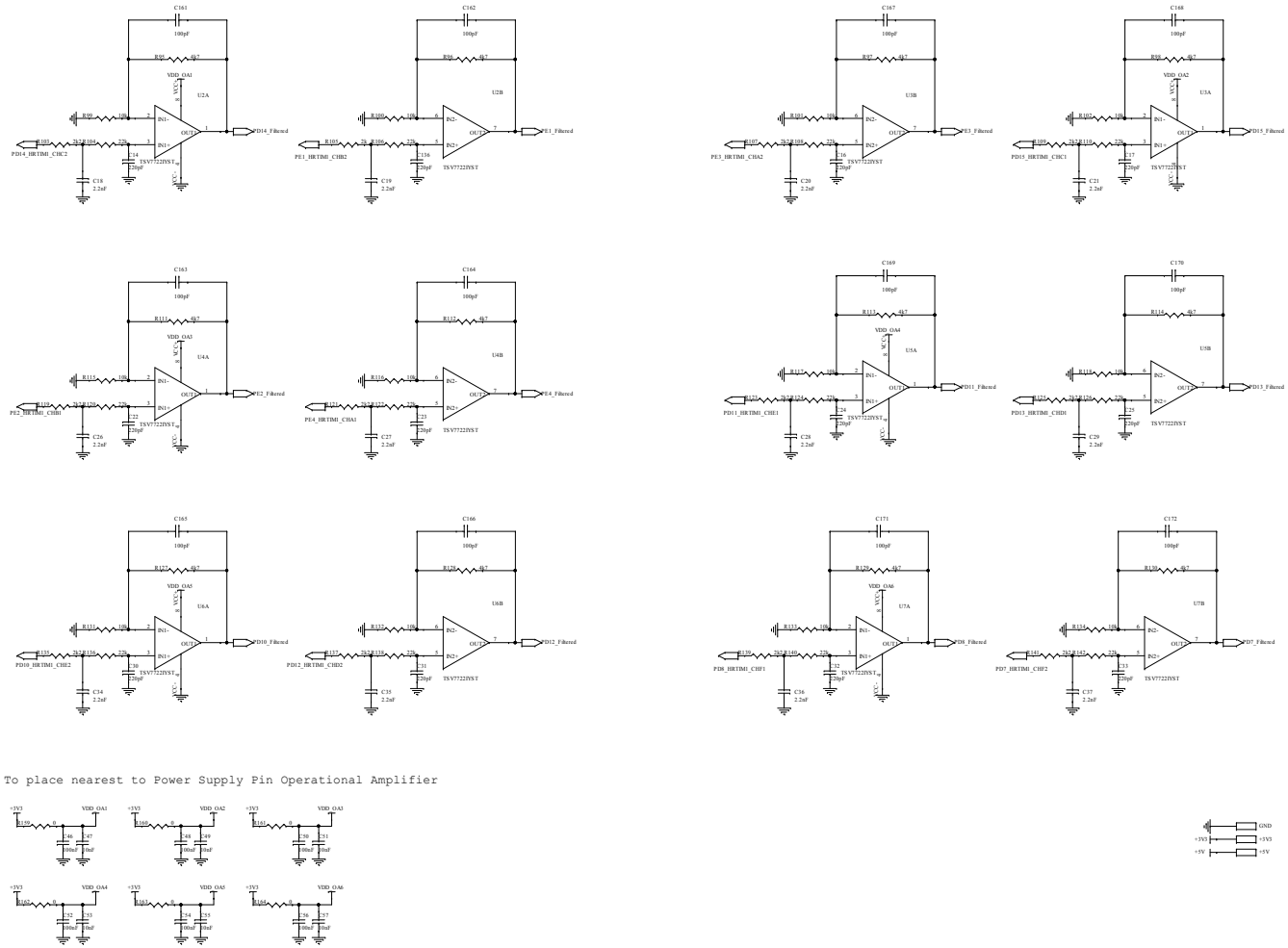
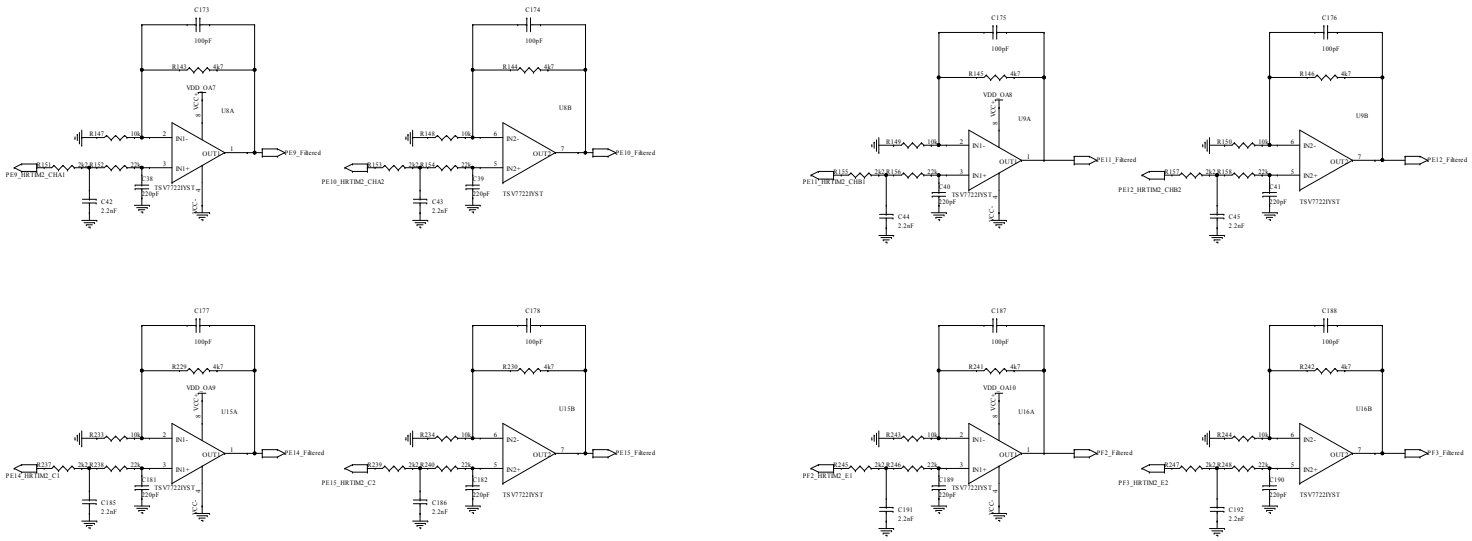


Figure 13. Circuit schematic of STEVAL-HILE1V1 emulator board - DAC 2



To place nearest to Power Supply Pin Operational Amplifier

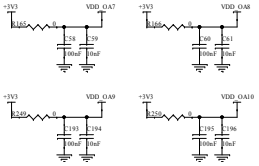


Figure 14. Circuit schematic of STEVAL-HILE1V1 emulator board - Power

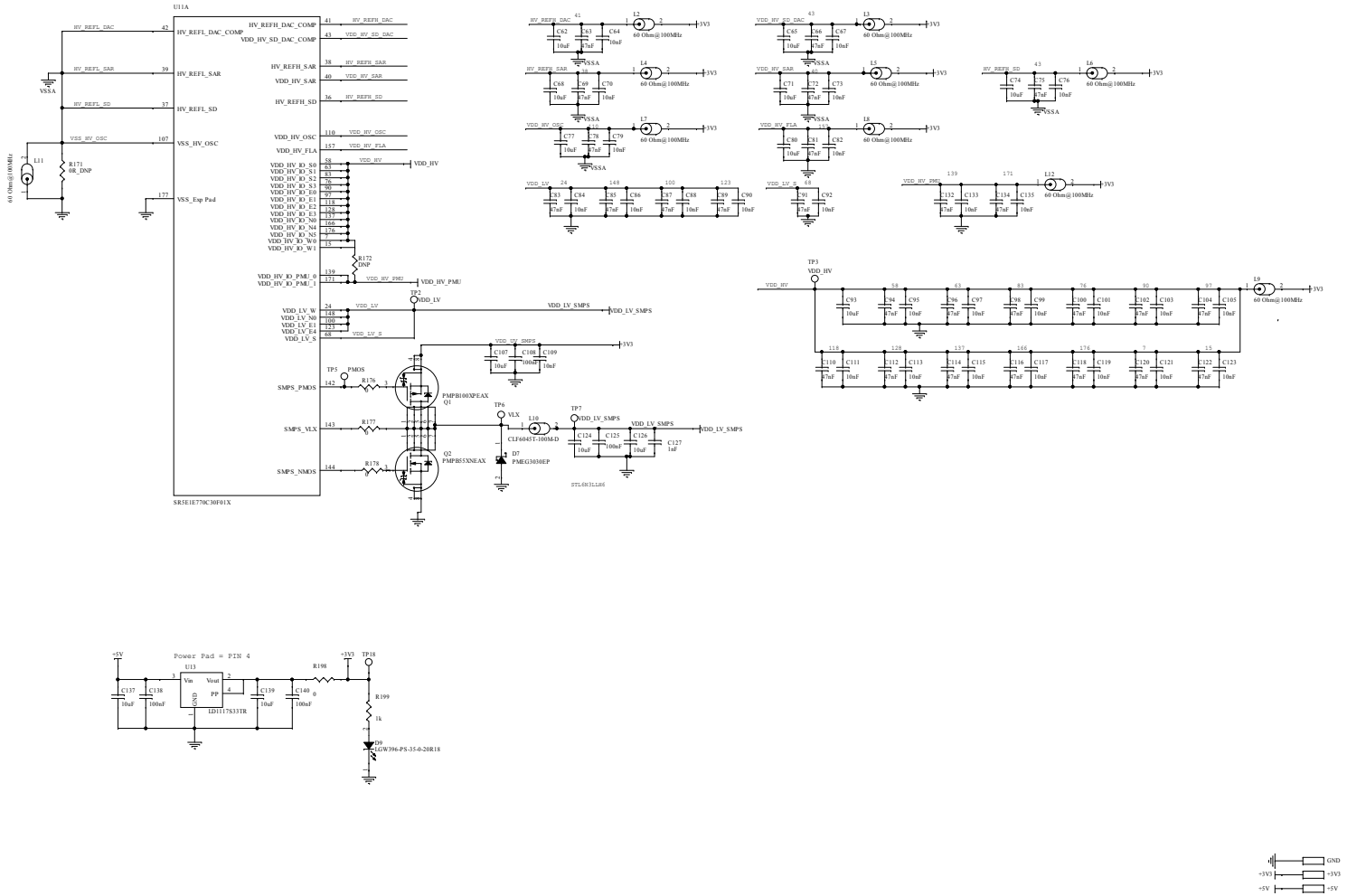
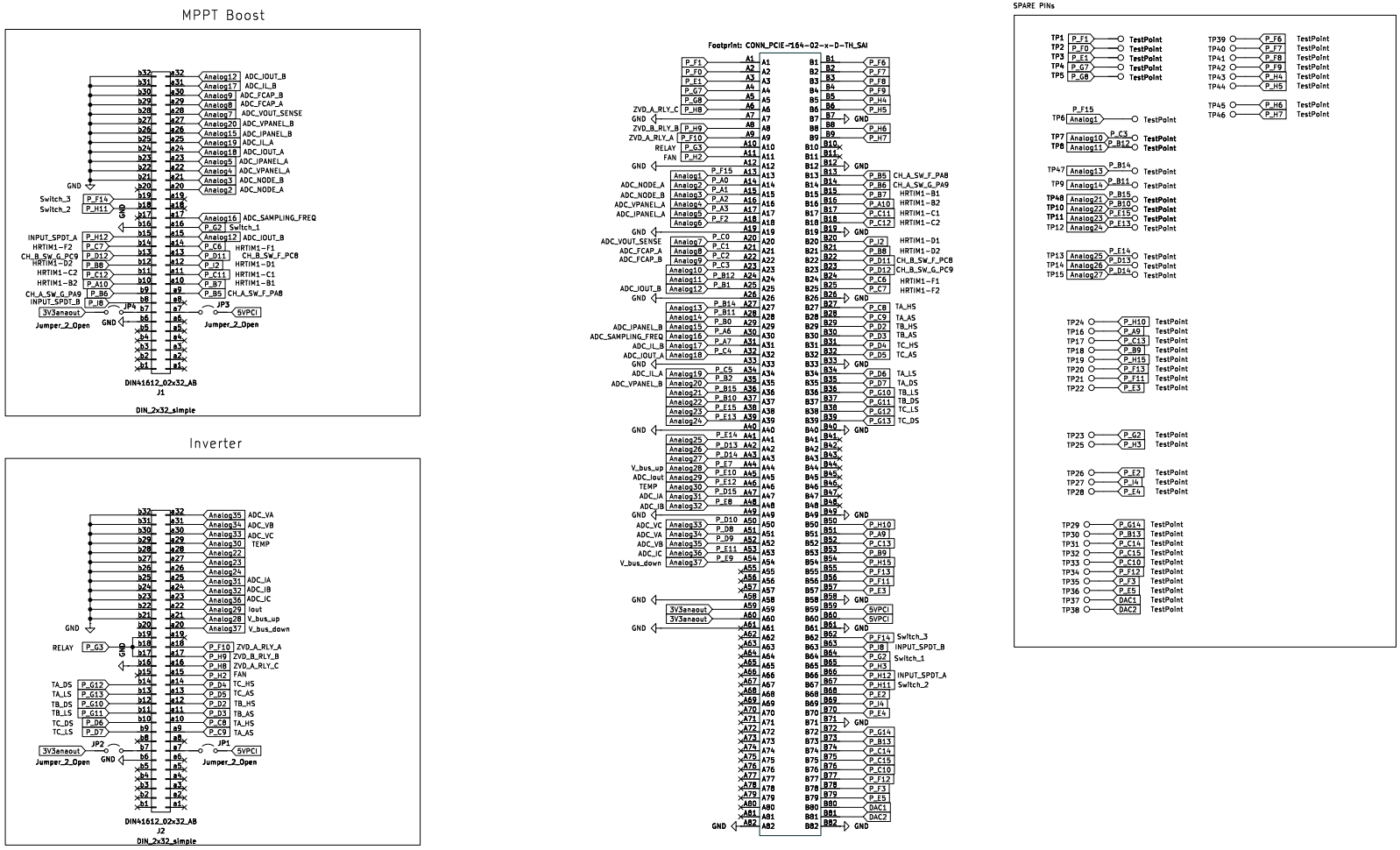


Figure 15. Circuit schematic of STEVAL-HILE1H7AD adapter board



3 Kit versions

Table 1. STEVAL-HILE1H7K1 versions

PCB version	Schematic diagrams	Bill of materials
STV$HILE1H7K1A (1)	STV$HILE1H7K1A schematic diagrams	STV$HILE1H7K1A bill of materials

1. *This code identifies the STEVAL-HILE1H7K1 evaluation kit first version. It is printed on the board PCB. The kit consists of a main board STEVAL-HILE1V1 whose version is identified by the code STV$HILE1V1A and a control board STEVAL-DPSH7P whose version is identified by the code STEVAL$DPSH7P.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
26-Oct-2026	1	Initial release.

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