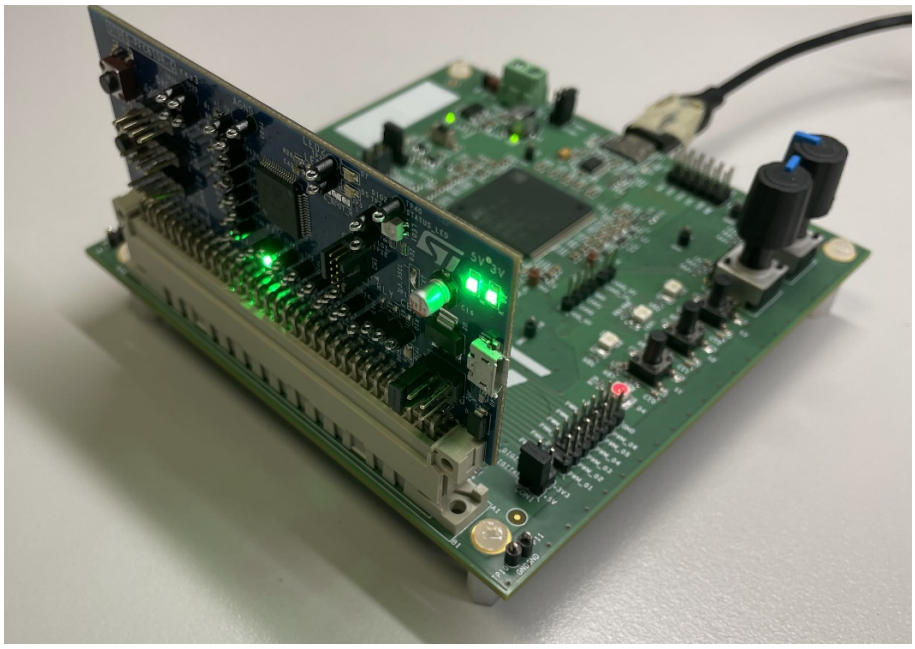
Getting started with the STEVAL-HILE1G4K1 HIL cost effective emulation tool for digital power converters based on STM32G474 and STELLAR E1 MCUs

Introduction

The control board implements control algorithms exploiting the capabilities the of STM32G474RE MCU, ensuring seamless integration with the emulator for accurate real-time system validation.

Figure 1. STEVAL-HILE1G4K1 evaluation kit



*Notice: For dedicated assistance, submit a request through our online support portal at **www.st.com/support**.*

1 Acronyms and abbreviations

Acronym	Description
3L-TT	Three-level T-type converter
ADC	Analog-to-digital converter
AFE	Active front end
B6	Three-phase two-level bridge converter
COM	Communication (serial) port
CPU	Central processing unit
CRC	Cyclic redundancy check
CSV	Comma-separated values
DAB	Dual active bridge
DAC	Digital-to-analog converter
FTDI	Future technology devices international (USB–UART bridge vendor)
FW	Firmware
GUI	Graphical user interface
HIL	Hardware-in-the-loop, an emulation platform that allows real-time simulation
HW	Hardware
MCU	Microcontroller unit
MBD	Model-based design
PFC	Power factor correction
PWM	Pulse width modulation
TLM	Telemetry
VSI	Voltage source inverter

2 References

- StellarStudio.
- StellarLINK.
- STM32CubeIDE.
- STLINK-V3MINIE.
- eDesignSuite.

3 Safety instructions

This board is intended for use by skilled technical personnel who are suitably qualified and familiar with the installation, use, and maintenance of electronic systems. The same personnel must be aware of and must apply national accident prevention rules. The electrical installation shall be completed in accordance with the appropriate requirements (for example, cross-sectional areas of conductors, fusing, and GND connections).

Important: *Avoid exposing the kit to moisture or extreme temperatures.*

Important: *Disconnect power before making hardware changes.*

Warning: *Use appropriate protective gear when handling electrical components.*

Warning: *Handle boards by the edges to avoid static discharge.*

Caution: *Store components in anti-static bags when not in use.*

3.1 Maintenance

Regular maintenance procedures

Perform routine checks and cleaning to ensure optimal performance.

Firmware updates

Keep the system updated with the latest firmware releases for improved functionality.

Storage and handling

When not in use, store the kit in a dry, temperature-controlled environment.

4 Setup and installation

4.1 Unboxing and inspection

Upon receiving the kit, verify that all components are present and undamaged. The HIL board is the Stellar E1-based emulator STEVAL-HILE1V1 (Figure 2), and the control board is the STM32G474-based STEVAL-G474V1CB (Figure 3).

Important: The STEVAL-HILE1V1 board and the STEVAL-G474V1CB board are not available for separate sale.

4.2 Hardware assembly

Plug the STM32 control board on the HIL board exploiting the 64-pin connector, as shown in Figure 1. Connect the HIL to the computer exploiting a USB Type-C® cable.

4.3 Software installation

Install the following:

- StellarStudio or your preferred IDE for programming the Stellar E1 microcontroller on the HIL board.
- STLINK-V3MINIE and STM32CubeIDE or your preferred IDE for programming the STM32G4 on the control board.
- DPOWER-HIL GUI for monitoring and modifying parameters of the HIL board.
- Install USB drivers from the FTDI website for GUI communication with the HIL board via USB.

4.4 Setting up the simulation environment

Note: The following description is based on the 3L-TT topology. Similar procedure and behavior is expected for the other supported topologies.

Step 1. Connect the HIL board (STEVAL-HILE1V1) to the control board (STEVAL-G474V1CB) and flash both of them, making sure the HIL application LED is blinking fast and the power LEDs of the control board are turned on. Ensure you download the correct .elf binary for the selected topology from eDesignSuite.

Step 2. Program the HIL board using StellarStudio, OpenOCD, or your preferred StellarE IDE. You also need a flasher/debugger like StellarLINK to be connected to the board with the proper flat cable.

Step 3. Download the STM32 firmware from eDesignSuite, compile it using STM32CubeIDE or your preferred IDE, and program the microcontroller. You also need a flasher/debugger like STLINK-V3MINIE to be connected to the board with the proper flat cable.

Step 4. Run the DPOWER-HIL GUI downloaded from eDesignSuite, click the “Load setup” button and choose the provided .dphs configuration file, then click “Start”.

Step 5. Reset the control board.

Step 6. Press the S1 button on the HIL board and check that the LED application (LED1 on the HIL board) is now blinking at 1 Hz. Then, check that the input voltage on phase A - Va - on the GUI becomes a sinusoidal waveform between ± 325 V.

Step 7. Check that the LED1 of the STM32 control board turns to orange, then red, and finally to green.

Step 8. Check that the relay status LEDs next to S1 and S2 on the HIL board are OFF and then turn them ON one by one (grid and inrush relays).

Step 9. Turn the two potentiometers to the minimum setting; press S3 on the HIL board to connect the load and check that the relay status LED next to S3 turns on.

Step 10. Turn the potentiometer Pot1 (the one close to the buttons) to the half range; check the DC power on the GUI and move the potentiometer to get the full load condition.

Step 11. Check that the input current on phase A - Ia - is sinusoidal in the DPOWER-HIL GUI plot.

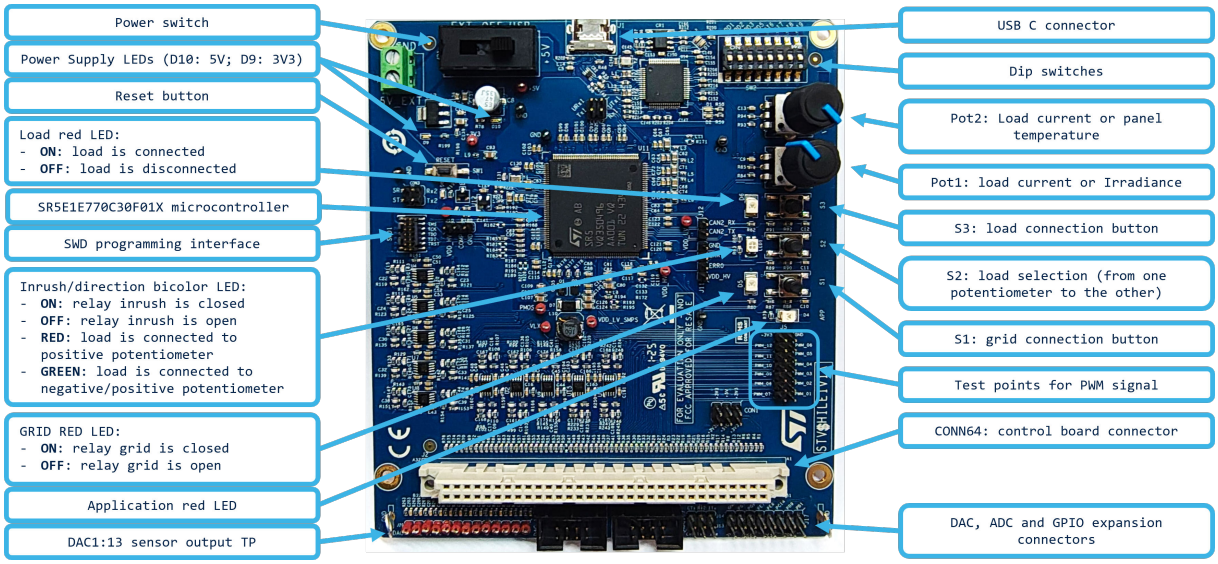
Step 12. Turn the potentiometer Pot1 to zero and click the S2 button so that the corresponding LED turns green and increases the potentiometer Pot2 to get full load condition.

5 Getting started - system overview

5.1 Emulator - HIL board description

The HIL board is a cost-effective power system emulator designed to accelerate software development and validation for power converter applications. This emulator replicates the entire power conversion chain, including the AC or DC source, converter power stage and load, providing an accurate virtual representation of real-world power systems. It also features advanced fault injection capabilities, enabling engineers to simulate a wide range of abnormal and fault conditions to thoroughly evaluate system robustness and fault tolerance. With this setup, engineers can safely develop, test, and fine-tune control algorithms and firmware without risking damage to physical hardware.

Figure 2. HIL board



5.2 Key features

- Model-based power plant emulation
- High simulation accuracy for AFE 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
  - Grid and relay status monitoring
  - Grid and load activation and setting
- GUI for real time monitoring and efficient debugging

5.3 STM32 control board description

The STM32 control board executes control algorithms using powerful Arm Cortex®-M4 core for efficient processing. It integrates advanced ADC performance and a high-resolution timer (HRTIM) with 184 ps precision, providing versatile control through 12 PWM outputs.

Figure 3. STM32 control board

5.4 Integration and compatibility

The kit supports a range of power converter topologies, such as 3-Level T-type (3L-TT), Vienna rectifier, and full-bridge B6 configurations with planned updates to further extend its capabilities. Additionally, we are advancing full model-based design (MBD) support, allowing customers to develop custom models in MATLAB® Simulink and seamlessly generate code that directly integrate with our GUI.

6 HIL platform integration in eDesignSuite and workflow

The HIL platform is a key component of the eDesignSuite convergence, enabling seamless integration of digital power development and real-time simulation.

The flow begins by generating the STM32 control firmware and HIL firmware from the eDesignSuite - digital power workbench environment. For the selected power converter topology, either 3-Level T-type, Vienna rectifier or three-phase full bridge (B6), the design wizard includes the HIL section, enabling the download of HIL platform components and reflecting the hardware and firmware customizations made by the user during the design process.

These are deployed in the STM32 control board and in the HIL board.

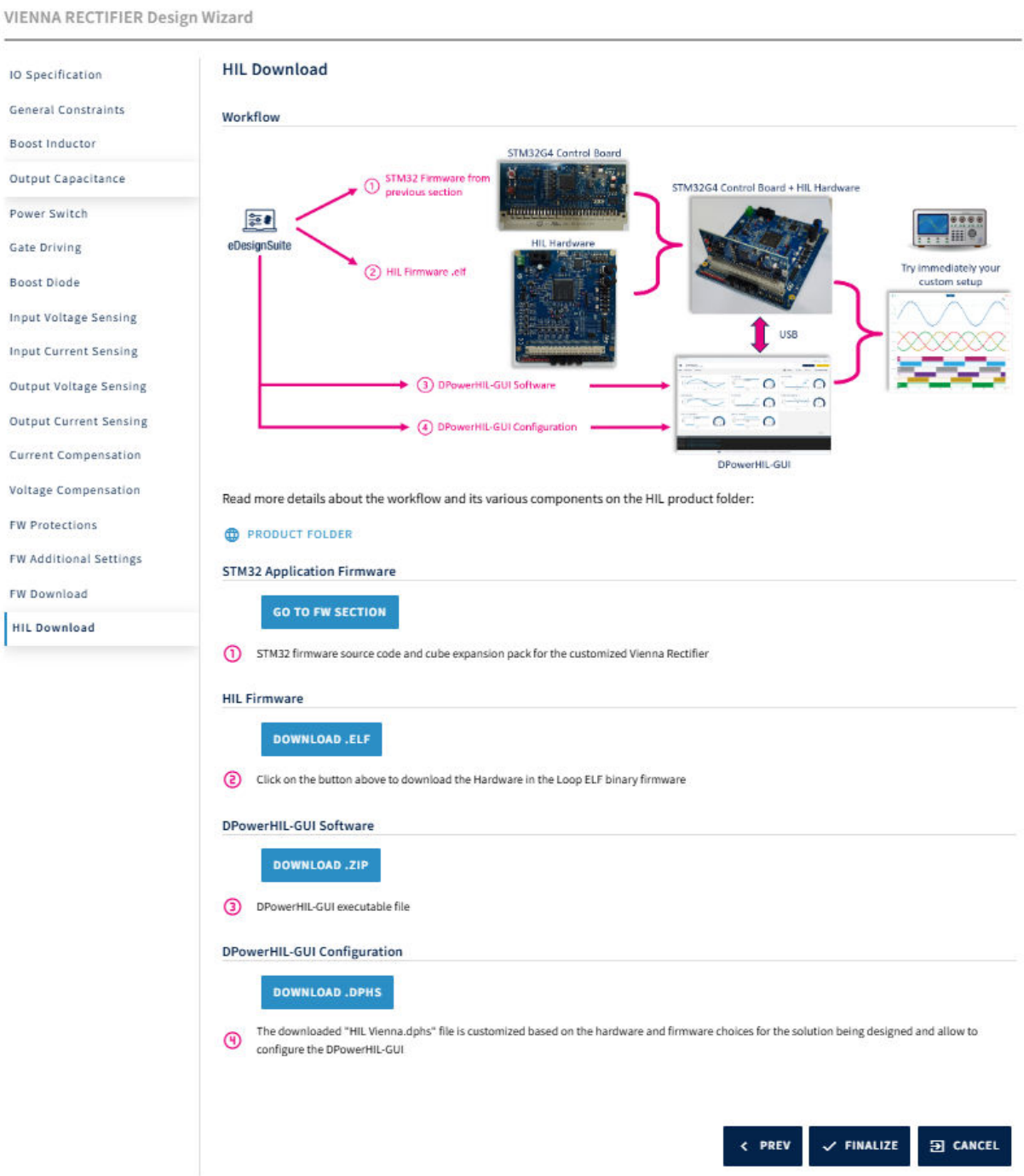
Parallel to the firmware deployment, the GUI software and GUI configuration files are downloadable from eDesignSuite.

This graphical interface provides real-time visualization, control, configuration of the HIL simulation environment, and testing of the power converter.

This integrated setup streamlines hardware verification, firmware predevelopment, and customer system validation.

For deeper explanation on how to use the D-Power Vienna expansion package in eDesignSuite and STM32Cube software tools, please refer to UM3101.

Figure 4. **HIL workflow in eDesignSuite**



7 Graphical user interface (GUI)

The DPOWER-HIL GUI application runs on Windows systems. The current version is v.2.0.0.

This application allows the user to:

- Customize key aspects of the solution that the HIL converter simulator simulates.
- Monitor and influence the behavior of the HIL board.
- Provide an optional data log for offline analysis and troubleshooting of parameter values.

The following sections describe each feature in detail.

7.1 Prerequisites

To use the app, the following hardware is required:

1. HIL board (STEVAL-HILE1V1): emulates the power conversion system.
   – StellarLINK: in-circuit debugger/programmer for Stellar MCUs, used to flash the HIL board firmware (.elf file).
2. STM32 control board (STEVAL-G474V1CB):
   – ST-LINK: in-circuit debugger/programmer for the STM32 MCUs, used to flash the control board firmware (generated by STM32CubeMX from two input files: the .ioc file and the converter expansion pack).

In order to use each converter, the following are required:

- HIL firmware: dependent on the selected topology.
- STM32 application firmware: dependent on the selected topology.
- GUI configuration file (.dphs): enables the GUI to configure itself properly and customize the HIL firmware to align with the hardware and firmware choices for the solution being designed.

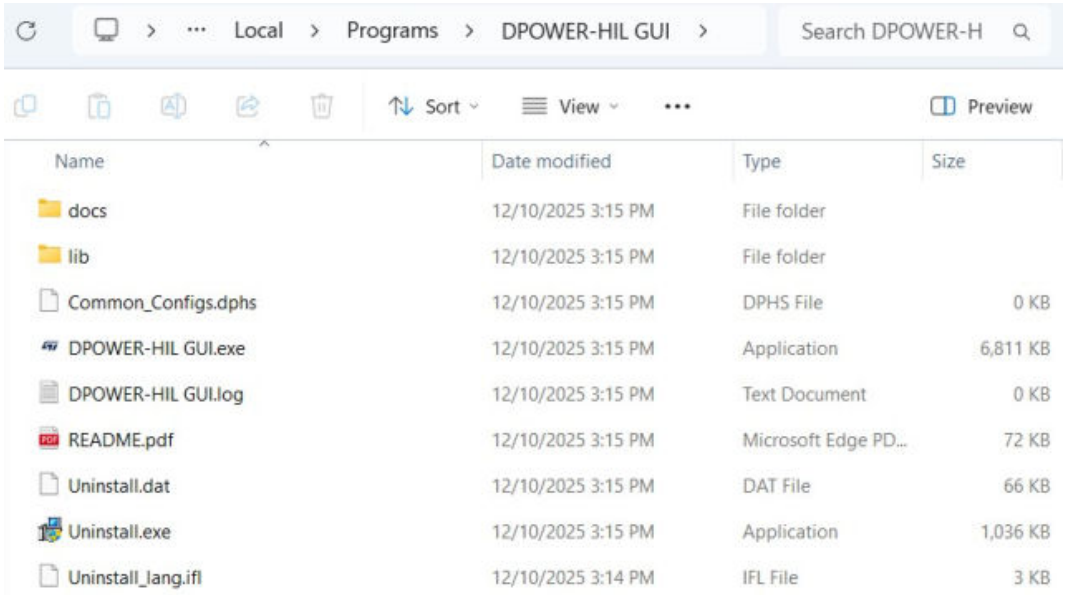
All these components, along with the GUI itself, can be retrieved from the eDesignSuite in the “HIL download” section of the specific converter solution, by accessing the customization wizard (see Figure 4).

To start using the GUI, the HIL and STM32 firmware must be flashed.

7.2 How to use the GUI

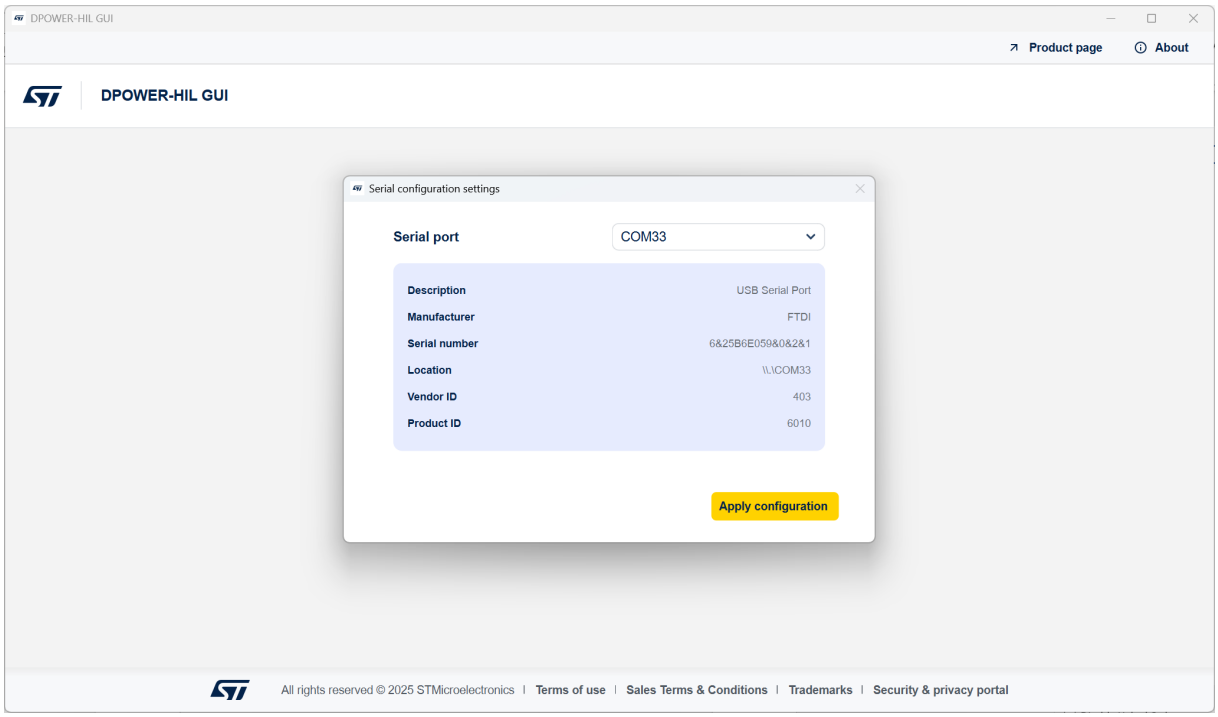
After downloading the GUI app, it is necessary to install it. Once the wizard finishes, the installation folder appears, as shown in the following figure.

Figure 5. GUI installation folder



To launch the application, double-click the DPOWER-HIL GUI and the main window appears.

Figure 6. Main window



Each time the app is launched, two files are updated:

- DPOWER-HIL GUI.log: primarily used for troubleshooting software issues.
- Common_Configs.dphs: primarily used to access customization settings, such as the last selected serial port and the last configuration file used.

Regular users should not interact directly with these files.

You can find a link to the product page at the top and additional links at the bottom. Additionally, clicking the “About” link opens the “About” page.

7.2.1 Serial configuration

Initially, it is necessary to establish a serial connection with the HIL board. To do this, simply select the “Serial port” from the dropdown menu. For each selected port, details such as description, manufacturer, serial number, location, vendor, and product identifiers are displayed. Once selected, click “Apply configuration” to proceed. The last confirmed selection is saved in the “Common_Configs.dphs” file and proposed the next time the application is opened.

If unsure about which port to select, open Windows Device Manager, expand the Ports section, and examine all available ports. Physically disconnect and reconnect the HIL board’s USB connector to identify the correct port.

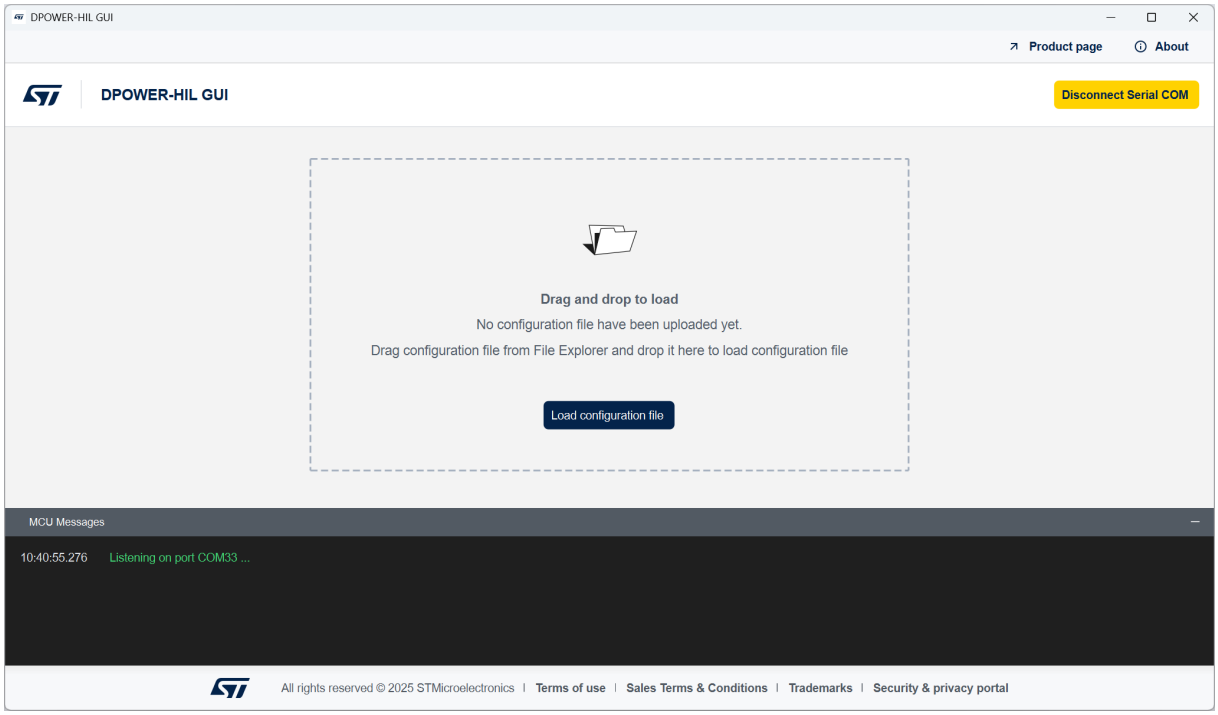
Note: If the port is not detected correctly, ensure that the proper FTDI drivers are installed.

7.2.2 GUI configuration

To customize the GUI, two elements are required:

1. Information from the HIL board: this includes primarily which parameters to supervise (read and/or write), but also control information like versioning, retransmissions, CRC, etc.
2. Configuration file (.dphs): this file is downloaded from eDesignSuite and contains indications on:
   - Versioning.
   - Graphical parameter aspects; for example, the arrangement on various window tabs and, for numerical data types, the ability to define widgets, value ranges, bias, and gain.
   - HIL board firmware customization: this involves setting parameter values according to selections made in eDesignSuite.

Figure 7. Main window after serial configuration

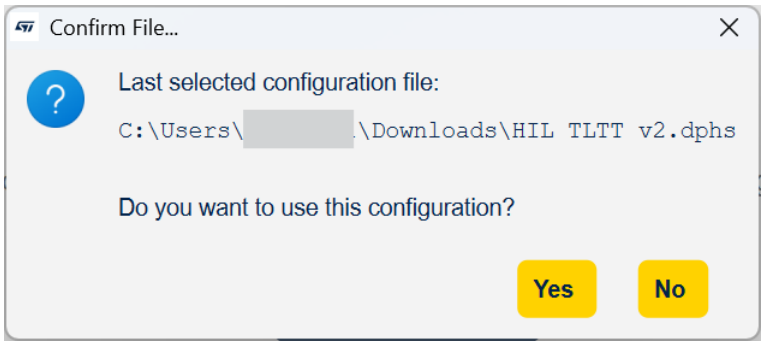


The main window updates its appearance (see Figure 7), prompting for the configuration file selection.

This can be done in three ways:

- Drag and drop the file into the dotted area.
- Select the file by browsing through the file system.
- Reuse the previously selected one, if any.

Figure 8. Configuration file selection



At this point, the configuration file is analyzed and its information, combined with the data provided by the HIL board, defines the GUI configuration. More importantly, it customizes the HIL firmware to align with the specific solution being designed.

The MCU messages box displays messages sent by the MCU and helps you understand what's happening behind the scenes. You can adjust its size by dragging the top border and minimize or restore it by clicking the corresponding icon.

It's possible to return to the previous screen to establish a new serial connection by clicking on "Disconnect serial COM".

7.2.3 Versioning

A versioning control system is implemented to detect and signal any compatibility issues. More specifically, the following aspects are investigated:

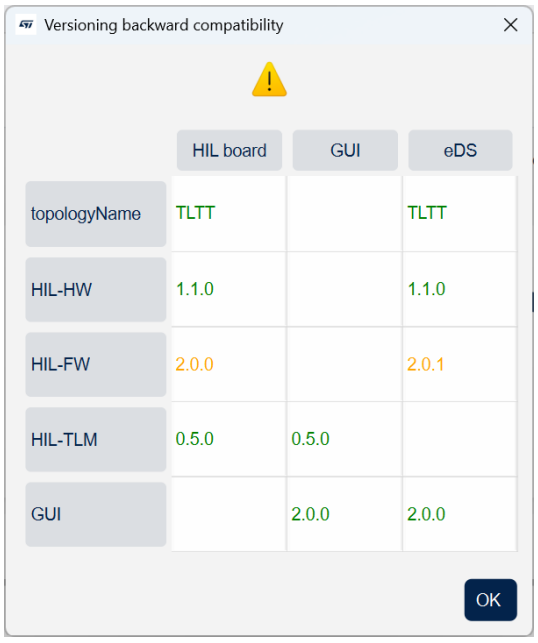
- “topologyName”: it identifies any mismatch between the converter topology simulated by the HIL board and the one referred to by the configuration file (.dphs), such as TLTT, Vienna, or B6.
- “HIL-HW”: it detects a mismatch in the hardware version of the HIL board compared to the configuration file.
- “HIL-FW”: it detects a mismatch in the firmware version of the HIL board compared to the configuration file.
- “HIL-TLM”: it assesses whether the GUI and the telemetry firmware module embedded in the HIL board are functionally aligned.
- “GUI”: it assesses through the configuration file whether the GUI and eDesignSuite are aligned from a graphical/functional perspective.

Notice: If everything is aligned, no versioning information is shown.

The system relies on semantic versioning 2.0.0, signaling the user about any discrepancies and distinguishing between:

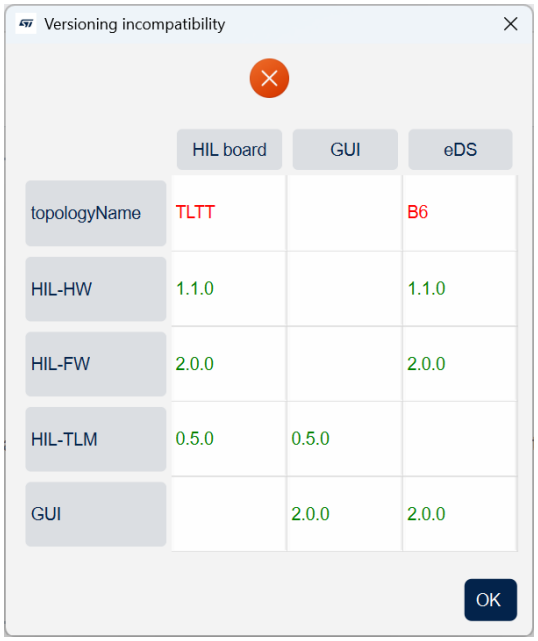
- Backward compatibility: it does not halt the execution of the app, but warns the user that some of the latest features may not be available or updated, and thus not fully exploited.
  The following figure shows an example where the firmware version of the HIL board is outdated compared to the version available when the configuration file was released.

Figure 9. Backward compatibility



- Incompatibility: it prevents the execution of the app and requires the user to fix the problems by updating one or more components.
  Figure 10 shows an example where the HIL board is emulating a TLTT topology, while the configuration file pertains to a B6 topology. This indicates an error either in the firmware flashed on the HIL board or in the configuration file download, requiring adjustments to one of the two parts.

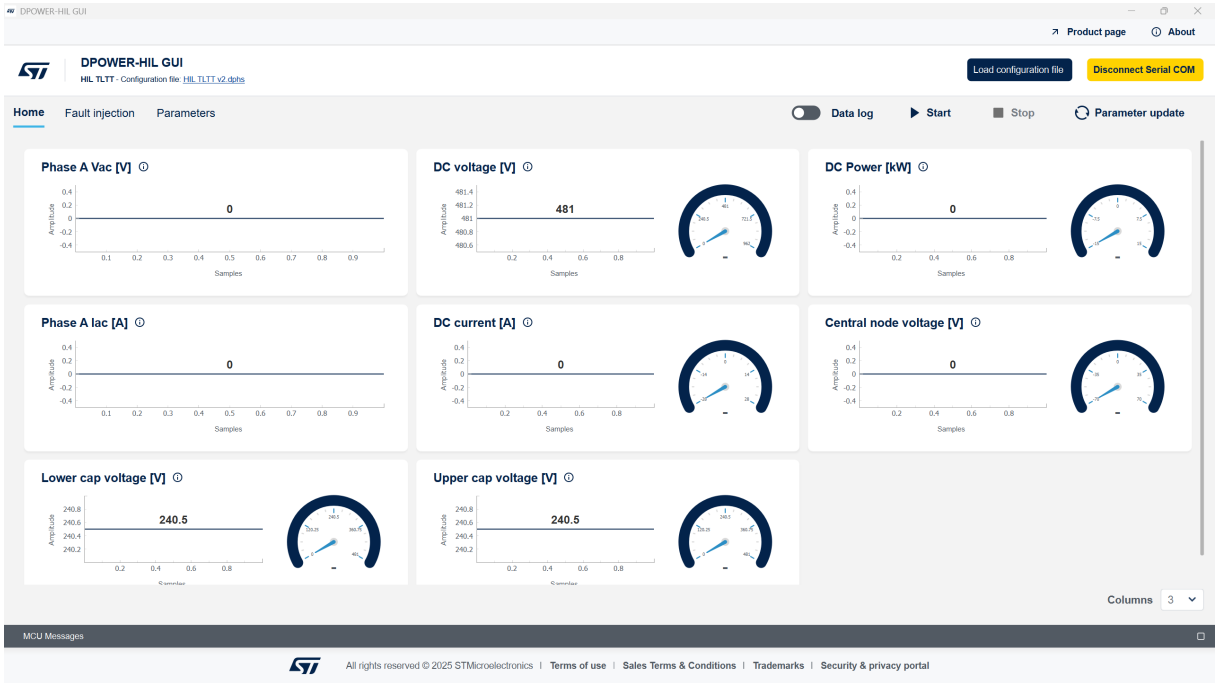
Figure 10. Incompatibility



7.3 Main window description

After the configuration data has been correctly collected, the main window is automatically updated, displaying a layout similar to the following.

Figure 11. Main window after configuration

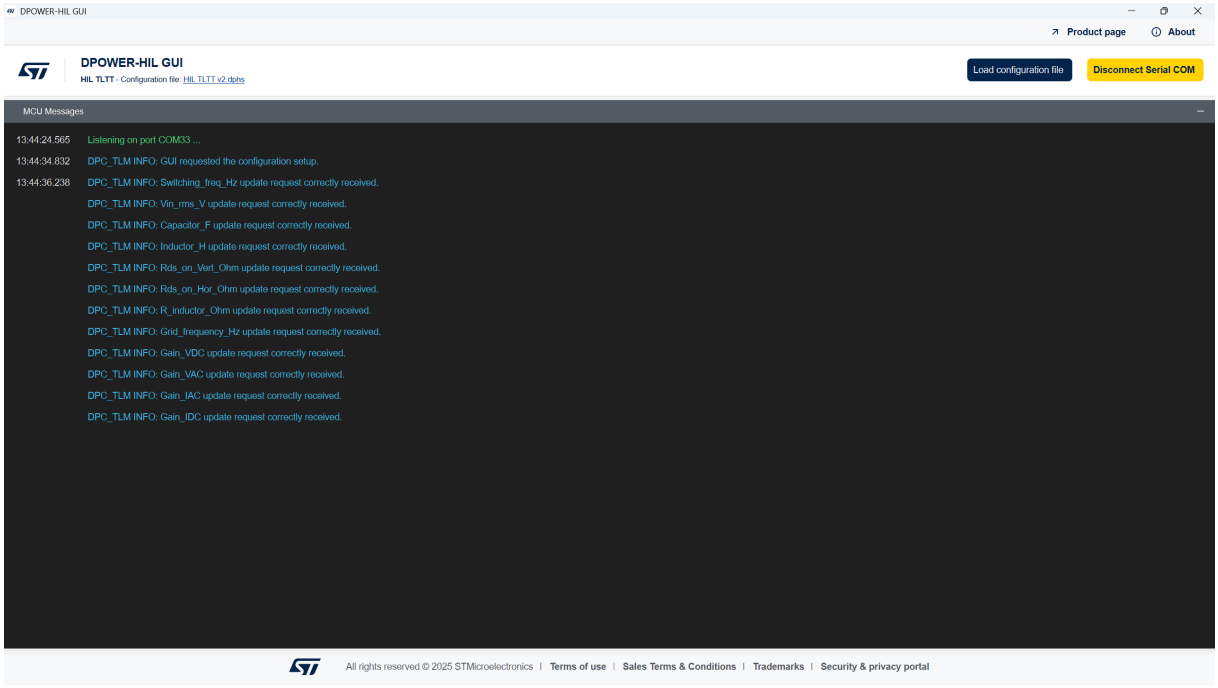


On the upper left side, the configuration name is displayed along with the configuration file used (which provides a direct link to its folder).

Directly below that, tabs are displayed, serving as logical containers for the parameters managed by the GUI. Each parameter has its own data type and an associated graphical representation.

Moreover, based on the topology and selections made in eDesignSuite, a subset of parameters is automatically updated, as illustrated in Figure 12, customizing the HIL board firmware. They are displayed in the Parameters tab (see Figure 17).

Figure 12. Automatic parameter values update



At this point, “Start” must be clicked to begin the acquisition of parameter values.

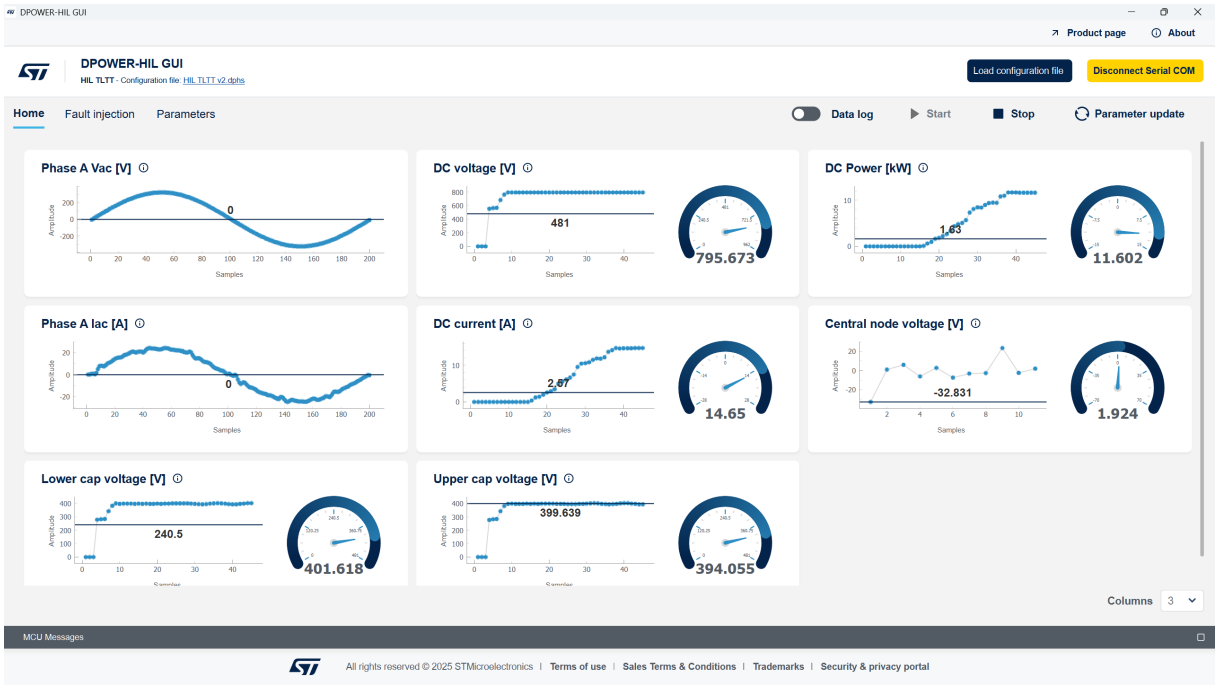
Some of them are transmitted as a batch of values without a periodic requirement, overriding themselves each time, while others are treated as scalars.

The refresh rate of these values depends on the specific parameter dynamics.

A snapshot of a running TLTT in PFC mode is shown in Figure 13.

To increase robustness to noise, parameters on the HIL board side may be sampled multiple times. Upon reception, if a majority is not reached for any parameter value, the one with the highest cardinality is shown in yellow.

Figure 13. **3L-TT converter in PFC mode**



To pause the sampling, click the “Stop” button. You can then resume the acquisition or load a new configuration.

Each parameter can have an optional description to better explain its purpose. It is shown when hovering the mouse over the “i” symbol next to the parameter name.

7.3.1 Widget

Each parameter belongs to one of the following categories:

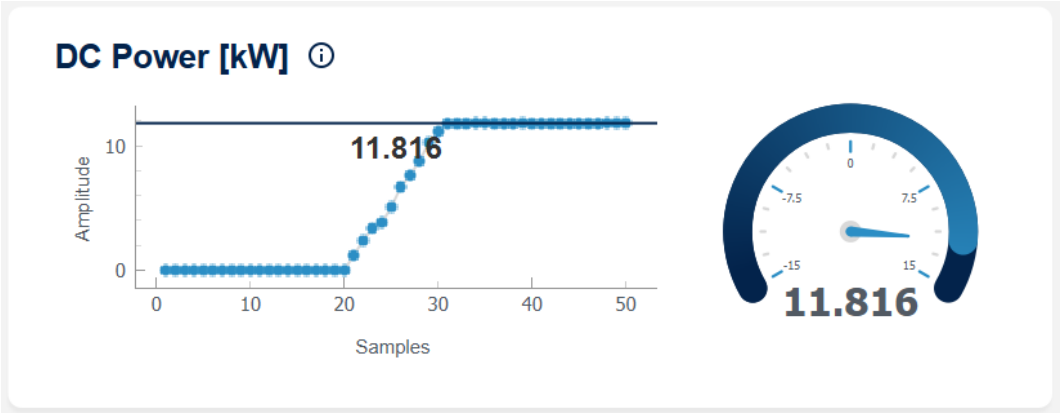
Numerical

A numerical data type can be a signed/unsigned integer or a floating-point number (single or double precision). It can be represented with a combination of one or more of the following widgets:

- Gauge.
- Plotter.
- Basic (just the number).

An example is shown in Figure 14, where the plotter is on the left and the gauge on the right.

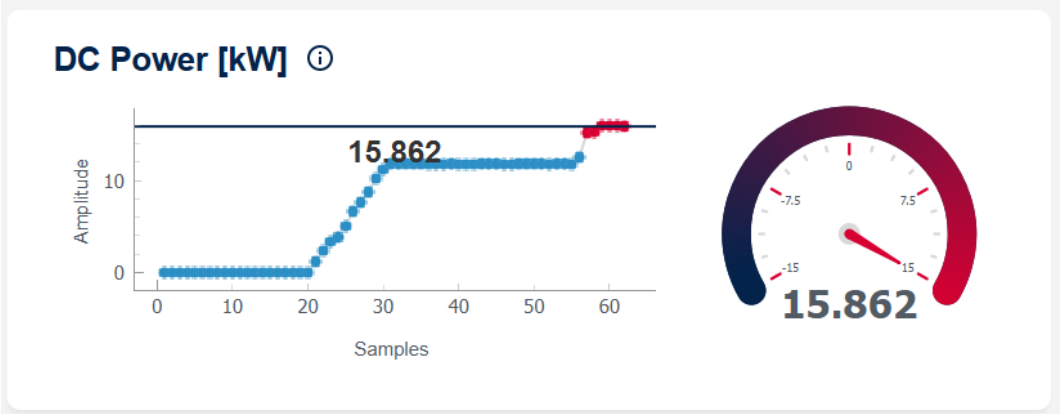
Figure 14. **Numerical widgets**



A basic form of processing is applied to the numeric data sampled from the HIL board: each value sampled from the HIL board has a bias (offset) and a gain (scaling factor) applied before being displayed.

Each numerical parameter also has a well-defined range of admissible values. Values within this range are marked in blue; otherwise, they are marked in red.

Figure 15. Numerical value out of range



While the gauge simply displays a number, the plotter can track the evolution of the data, reporting the number of samples on the x-axis and the signal amplitude on the y-axis.

The plotter widget allows for some useful interactions:

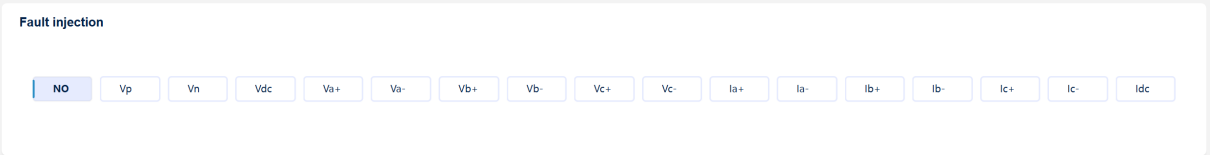
- Moving the mouse along the x-axis displays the value for the specific sample.
- Left-clicking and holding the key while moving the mouse allows you to move the graph inside the widget.
- Right-clicking and holding the key while moving the mouse:
  - Vertically: moving downward contracts the y-axis, while moving upward stretches it.
  - Horizontally: moving to the left contracts the x-axis, while moving to the right stretches it.
- Right-clicking brings up a context menu that allows plot cleaning.
- To make all the data fit in the available space, hover the mouse over the plot area; a symbol “A” appears in the bottom left corner of the plot. Click on it.

The unit of measure for the numerical parameter is indicated next to its name inside square brackets (as illustrated in Figure 14), and is also displayed in the update window.

Enumerative

An enumerative data type consists of a set of named values, where only one can be selected at a time.

Figure 16. Enumerative widget



Tabs

As previously mentioned, a tab is a container for logically related parameters.

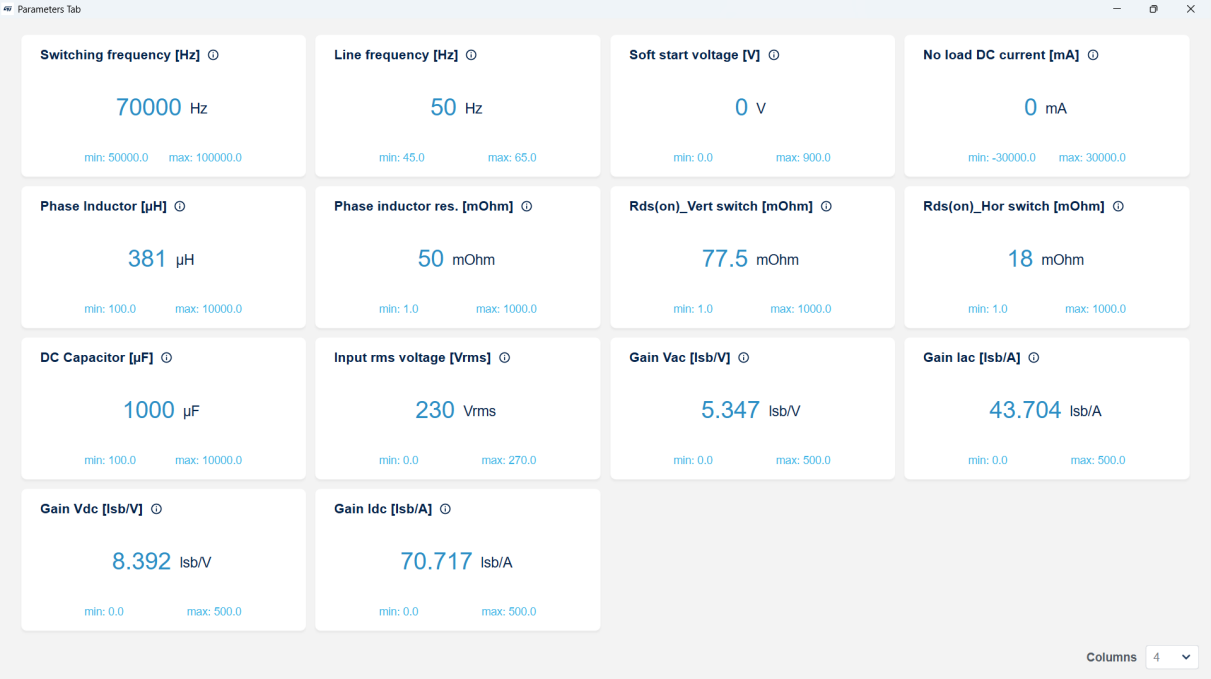
The user can customize the graphical layout in several ways:

- Parameter level:
  - Reorder a parameter box by drag and drop: click on the parameter name, hold the mouse button, drag it to an empty space, and release the button.

- Tab level:
  - Change the number of columns: use the selector in the bottom right corner to adjust the number of columns for each tab.
  - Show in a new window: right-click on the tab and select the corresponding option. To revert this action, simply close the detached tab.

All modifications (except detached tabs) are automatically saved.

Figure 17. Detached tab (parameters)



7.3.2 Updates

It is possible to update the value of one parameter at a time. To open the update section, click on “Parameter update” in the main window.

Not all the parameters shown in tabs are updatable, and not all the updatable parameters are shown in tabs. To determine which of them are eligible for updates, use the drop-down menu next to the Name label. Depending on the parameter type (enumerative, integer or float numeric), a different input method is displayed. Figure 18 illustrates an integer data type, while Figure 19 shows an enumerative data type.

When ready, press “Apply” and the value is sent to the HIL board, which handles the request accordingly.

Figure 18. Update window - integer

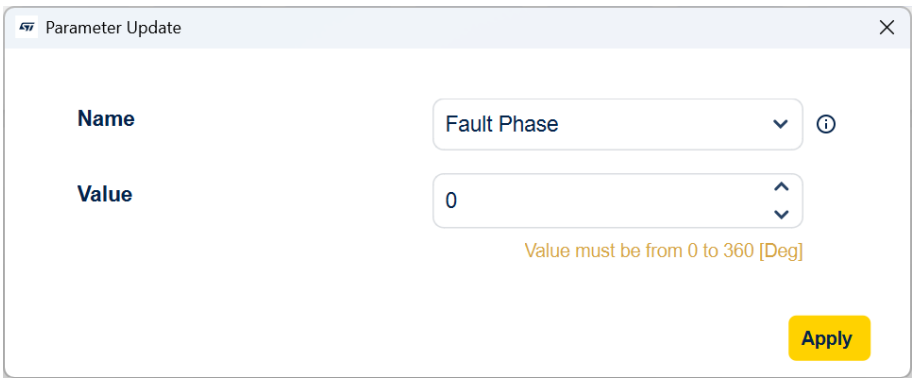
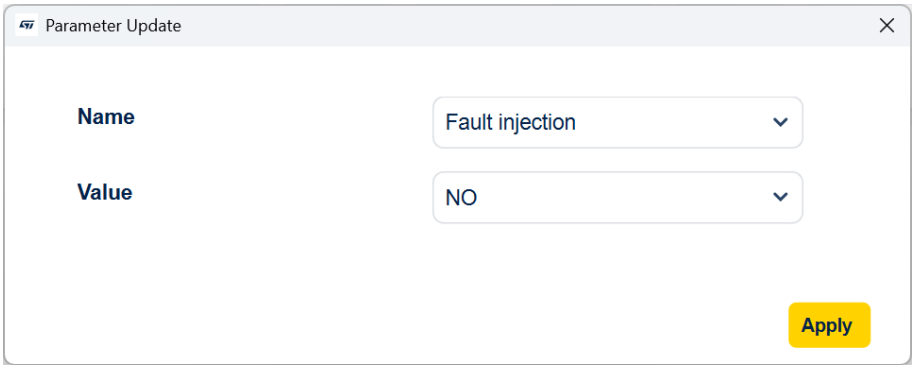


Figure 19. **Update window - enumerative**



7.3.3 Data log

If the data log selector shown in Figure 13 is enabled, all the sampled parameter values are saved in real time to a CSV file, which is then compressed into a gzip (.gz) file. This file has the same filename and is placed in the same folder as the dphs configuration file.

Figure 20 shows an excerpt of the CSV data log file. Each row represents a sampling event. The first column contains the timestamp corresponding to the end of decoding. The subsequent columns report the following for each parameter sampled at that timestamp:

- The value(s) obtained.
- Whether a majority was achieved (useful in case of retransmissions).
- Whether the value is valid (useful for numeric parameters to detect out-of-range conditions).

For numeric arrays, this information is reported in square brackets.

The presence of "N/A" for a parameter indicates that it was not included in the transmission of the sampled values. This could be due to the parameter's dynamics (some parameters have higher dynamics than others) or, in the case of arrays, if they were not yet filled.

Figure 20. **Data log - CSV file excerpt**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Timestamp	Phase A Vac [V] value	Phase A Vac [V] Majority	Phase A Vac [V] Validity	Phase A Ia	Phase A Ia	Phase A Ia	DC voltage	DC voltage	DC voltage	DC curren	DC curren	DC curren	Central no	Central no	Central no	DC Power	DC Power	DC Power	Upper cap	Upper cap L
2	2025-10-30T15:53:17.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[0.0, 0.0, 0	(True, True	[True, True	0	TRUE	TRUE	0	TRUE	TRUE	0	TRUE	TRUE	0	TRUE	TRUE	0	TRUE
3	2025-10-30T15:53:17.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	0	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	0	TRUE
4	2025-10-30T15:53:18.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	0	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	0	TRUE
5	2025-10-30T15:53:18.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	0	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	0	TRUE
6	2025-10-30T15:53:19.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[0.0, 0.0, 0	(True, True	[True, True	556.546	TRUE	TRUE	0	TRUE	TRUE	-46.99	TRUE	TRUE	0	TRUE	TRUE	278.247	TRUE
7	2025-10-30T15:53:19.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	564.601	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	282.287	TRUE
8	2025-10-30T15:53:20.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	568.803	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	284.385	TRUE
9	2025-10-30T15:53:20.	N/A	N/A	N/A	[0.0, 0.0, 0	(True, True	[True, True	688.367	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	344.156	TRUE
10	2025-10-30T15:53:21.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-0.001, 0.	(True, True	[True, True	765.456	TRUE	TRUE	0	TRUE	TRUE	1.178	TRUE	TRUE	0	TRUE	TRUE	382.71	TRUE
11	2025-10-30T15:53:21.	N/A	N/A	N/A	[-0.001, 0.	(True, True	[True, True	795.991	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	397.661	TRUE
12	2025-10-30T15:53:22.	N/A	N/A	N/A	[0.074, -0.	(True, True	[True, True	795.529	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.099	TRUE
13	2025-10-30T15:53:22.	N/A	N/A	N/A	[-0.046, 0.	(True, True	[True, True	795.835	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	397.372	TRUE
14	2025-10-30T15:53:23.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-0.171, 0.	(True, True	[True, True	795.49	TRUE	TRUE	0	TRUE	TRUE	-3.714	TRUE	TRUE	0	TRUE	TRUE	398.869	TRUE
15	2025-10-30T15:53:23.	N/A	N/A	N/A	[-0.024, 0.	(True, True	[True, True	795.641	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.013	TRUE
16	2025-10-30T15:53:24.	N/A	N/A	N/A	[-0.197, 0.	(True, True	[True, True	795.886	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.197	TRUE
17	2025-10-30T15:53:24.	N/A	N/A	N/A	[-0.031, 0.	(True, True	[True, True	795.39	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	397.758	TRUE
18	2025-10-30T15:53:25.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[0.013, 0.2	(True, True	[True, True	795.675	TRUE	TRUE	0	TRUE	TRUE	7.287	TRUE	TRUE	0	TRUE	TRUE	398.478	TRUE
19	2025-10-30T15:53:25.	N/A	N/A	N/A	[0.016, 0.2	(True, True	[True, True	795.845	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	397.238	TRUE
20	2025-10-30T15:53:26.	N/A	N/A	N/A	[0.053, 0.7	(True, True	[True, True	795.81	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.143	TRUE
21	2025-10-30T15:53:26.	N/A	N/A	N/A	[0.049, 0.3	(True, True	[True, True	795.222	TRUE	TRUE	0	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.377	TRUE
22	2025-10-30T15:53:27.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[0.004, 0.4	(True, True	[True, True	795.423	TRUE	TRUE	0	TRUE	TRUE	-4.738	TRUE	TRUE	0	TRUE	TRUE	397.331	TRUE
23	2025-10-30T15:53:27.	N/A	N/A	N/A	[-0.09, 0.1	(True, True	[True, True	795.575	TRUE	TRUE	0.485	TRUE	TRUE	N/A	N/A	N/A	0	TRUE	TRUE	398.033	TRUE
24	2025-10-30T15:53:28.	N/A	N/A	N/A	[-0.095, 0.	(True, True	[True, True	795.502	TRUE	TRUE	2.599	TRUE	TRUE	N/A	N/A	N/A	1.802	TRUE	TRUE	397.936	TRUE
25	2025-10-30T15:53:28.	N/A	N/A	N/A	[-0.105, 0.	(True, True	[True, True	795.804	TRUE	TRUE	3.207	TRUE	TRUE	N/A	N/A	N/A	2.574	TRUE	TRUE	398.66	TRUE
26	2025-10-30T15:53:29.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-0.692, -0	(True, True	[True, True	795.867	TRUE	TRUE	4.423	TRUE	TRUE	17.12	TRUE	TRUE	3.335	TRUE	TRUE	399.259	TRUE
27	2025-10-30T15:53:29.	N/A	N/A	N/A	[-1.794, -1	(True, True	[True, True	795.4	TRUE	TRUE	5.559	TRUE	TRUE	N/A	N/A	N/A	4.175	TRUE	TRUE	398.802	TRUE
28	2025-10-30T15:53:30.	N/A	N/A	N/A	[-0.203, -0	(True, True	[True, True	795.715	TRUE	TRUE	6.059	TRUE	TRUE	N/A	N/A	N/A	4.807	TRUE	TRUE	398.537	TRUE
29	2025-10-30T15:53:30.	N/A	N/A	N/A	[-1.194, -0	(True, True	[True, True	795.068	TRUE	TRUE	7.217	TRUE	TRUE	N/A	N/A	N/A	5.434	TRUE	TRUE	397.816	TRUE
30	2025-10-30T15:53:31.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-1.522, -0	(True, True	[True, True	795.392	TRUE	TRUE	8.52	TRUE	TRUE	6.62	TRUE	TRUE	6.768	TRUE	TRUE	397.253	TRUE
31	2025-10-30T15:53:31.	N/A	N/A	N/A	[-0.724, -0	(True, True	[True, True	795.424	TRUE	TRUE	9.598	TRUE	TRUE	N/A	N/A	N/A	7.478	TRUE	TRUE	396.314	TRUE
32	2025-10-30T15:53:32.	N/A	N/A	N/A	[-1.232, -1	(True, True	[True, True	795.524	TRUE	TRUE	9.822	TRUE	TRUE	N/A	N/A	N/A	7.698	TRUE	TRUE	395.487	TRUE
33	2025-10-30T15:53:32.	N/A	N/A	N/A	[-0.732, -0	(True, True	[True, True	795.596	TRUE	TRUE	10.221	TRUE	TRUE	N/A	N/A	N/A	7.888	TRUE	TRUE	395.173	TRUE
34	2025-10-30T15:53:33.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-0.382, 0.	(True, True	[True, True	795.372	TRUE	TRUE	10.213	TRUE	TRUE	17.042	TRUE	TRUE	8.143	TRUE	TRUE	398.039	TRUE
35	2025-10-30T15:53:33.	N/A	N/A	N/A	[-0.686, -0	(True, True	[True, True	795.336	TRUE	TRUE	10.894	TRUE	TRUE	N/A	N/A	N/A	8.421	TRUE	TRUE	398.386	TRUE
36	2025-10-30T15:53:34.	N/A	N/A	N/A	[-0.989, -0	(True, True	[True, True	795.572	TRUE	TRUE	11.277	TRUE	TRUE	N/A	N/A	N/A	8.931	TRUE	TRUE	399.587	TRUE
37	2025-10-30T15:53:34.	N/A	N/A	N/A	[-0.741, -0	(True, True	[True, True	795.341	TRUE	TRUE	11.733	TRUE	TRUE	N/A	N/A	N/A	9.244	TRUE	TRUE	401.648	TRUE
38	2025-10-30T15:53:35.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-0.702, -0	(True, True	[True, True	795.691	TRUE	TRUE	12.168	TRUE	TRUE	0.519	TRUE	TRUE	9.649	TRUE	TRUE	402.257	TRUE
39	2025-10-30T15:53:35.	N/A	N/A	N/A	[-1.033, -0	(True, True	[True, True	795.792	TRUE	TRUE	12.211	TRUE	TRUE	N/A	N/A	N/A	9.676	TRUE	TRUE	401.67	TRUE
40	2025-10-30T15:53:36.	N/A	N/A	N/A	[-0.575, 0.	(True, True	[True, True	795.744	TRUE	TRUE	12.146	TRUE	TRUE	N/A	N/A	N/A	9.648	TRUE	TRUE	400.099	TRUE
41	2025-10-30T15:53:36.	N/A	N/A	N/A	[-0.136, 0.	(True, True	[True, True	795.74	TRUE	TRUE	12.175	TRUE	TRUE	N/A	N/A	N/A	9.711	TRUE	TRUE	395.954	TRUE
42	2025-10-30T15:53:37.	[-3.999, 6.089, 16.172,	(True, True, True, True, Tr	[True, True, True, True, T	[-1.147, -0	(True, True	[True, True	795.915	TRUE	TRUE	13.203	TRUE	TRUE	8.427	TRUE	TRUE	10.412	TRUE	TRUE	394.683	TRUE

HIL TLTT v2

8 Troubleshooting

This section provides guidance to resolve common issues encountered during the setup and operation of the STEVAL-HILE1G4K1 evaluation kit. Follow the steps included in the following sections to identify and fix problems related to hardware, firmware, and software integration.

8.1 USB connection issues

Step 1. Check physical connection: ensure that the USB Type-C cable is securely connected between the HIL board and the PC.

Step 2. Verify USB power supply: confirm that the USB port or hub provides sufficient current (typically ≥ 500 mA). Insufficient power can cause communication failures or unstable operation.

Step 3. Inspect USB cable and ports: try using a different USB cable or port to rule out hardware defects.

Step 4. Driver installation: verify that all necessary USB drivers are correctly installed:

- FTDI drivers for USB communication with the HIL board;
- StellarLINK drivers for flashing the Stellar MCU;
- ST-LINK drivers for programming the STM32 control board.

Step 5. Device recognition: use Windows device manager to confirm the device appears under the correct COM port. Reconnect the device to refresh the port list.

Step 6. Power cycling: disconnect and reconnect the USB cable to reset the connection.

8.2 Firmware verification

Step 1. Firmware version compatibility: verify that the HIL board firmware version is compatible with the GUI configuration file (.dphs). Mismatches may cause missing features or prevent the GUI from running; in this case, update either the HIL firmware or regenerate/download the correct configuration file from eDesignSuite.

Step 2. Topology compatibility: ensure that the selected converter topology is consistent across all components:

- HIL board firmware (emulated topology);
- STM32 control board firmware;
- GUI configuration file (.dphs).

Important: Any mismatch (for example, the HIL is running a 3L-TT topology while the STM32 is configured for a B6 topology) must be corrected by reflashing the appropriate firmware and/or selecting the correct configuration file in the GUI.

Step 3. Firmware flashing: ensure that the flashing process completes successfully without errors using StellarStudio for the HIL firmware and STM32CubeIDE or ST-LINK for the control board firmware.

Step 4. Firmware integrity: if an unexpected behavior occurs, reflash the firmware to rule out corruption.

8.3 Hardware configuration

Step 1. Connector seating: ensure that the STM32 control board is firmly plugged into the HIL board via the 64-pin connector.

8.4 PWM signal and frequency

Step 1. PWM frequency matching: check that the PWM frequency configured in the GUI matches the PWM frequency parameter programmed in the firmware.

Step 2. Signal integrity: use an oscilloscope or logic analyzer to verify PWM signals on the relevant pins.

Step 3. PWM outputs: confirm that all STM32 PWM channels are active and outputting signals as expected.

8.5 Power supply considerations

Step 1. USB power limitations: some USB ports, especially on laptops or through unpowered hubs, may not supply adequate current. Use a powered USB hub or connect directly to a high-current USB port.

Step 2. External power supply: if available, use an external power source to power the board to ensure stable operation.

8.6 Software and driver installation

Step 1. Driver verification: confirm that all required drivers are installed and up to date:

- StellarLINK for Stellar MCU programming;
- FTDI drivers for USB communication;
- ST-LINK drivers for STM32 MCU programming.

Step 2. Reinstallation: if communication issues persist, uninstall and reinstall the drivers.

Step 3. Operating system compatibility: ensure that the host PC OS supports the drivers and GUI software version.

8.7 Additional checks

Step 1. LED indicators:

- Application LED on the HIL board: blinks during normal operation.
- STM32 bicolor status LED on the STM32 control board: follows the startup sequence (orange, red, then green).
- Power supply LEDs on both boards: check that all power supply LEDs are ON and stable (not flickering).

Note: If any power LED is OFF, unstable, or dim, verify the USB/external power source, connectors, and jumpers before proceeding with further debugging.

Step 2. GUI feedback: monitor the GUI for error messages or warnings related to version mismatches or communication failures.

9 Schematic diagrams

Figure 21. **STEVAL-HILE1V1 - HIL board circuit schematic (1 of 6)**

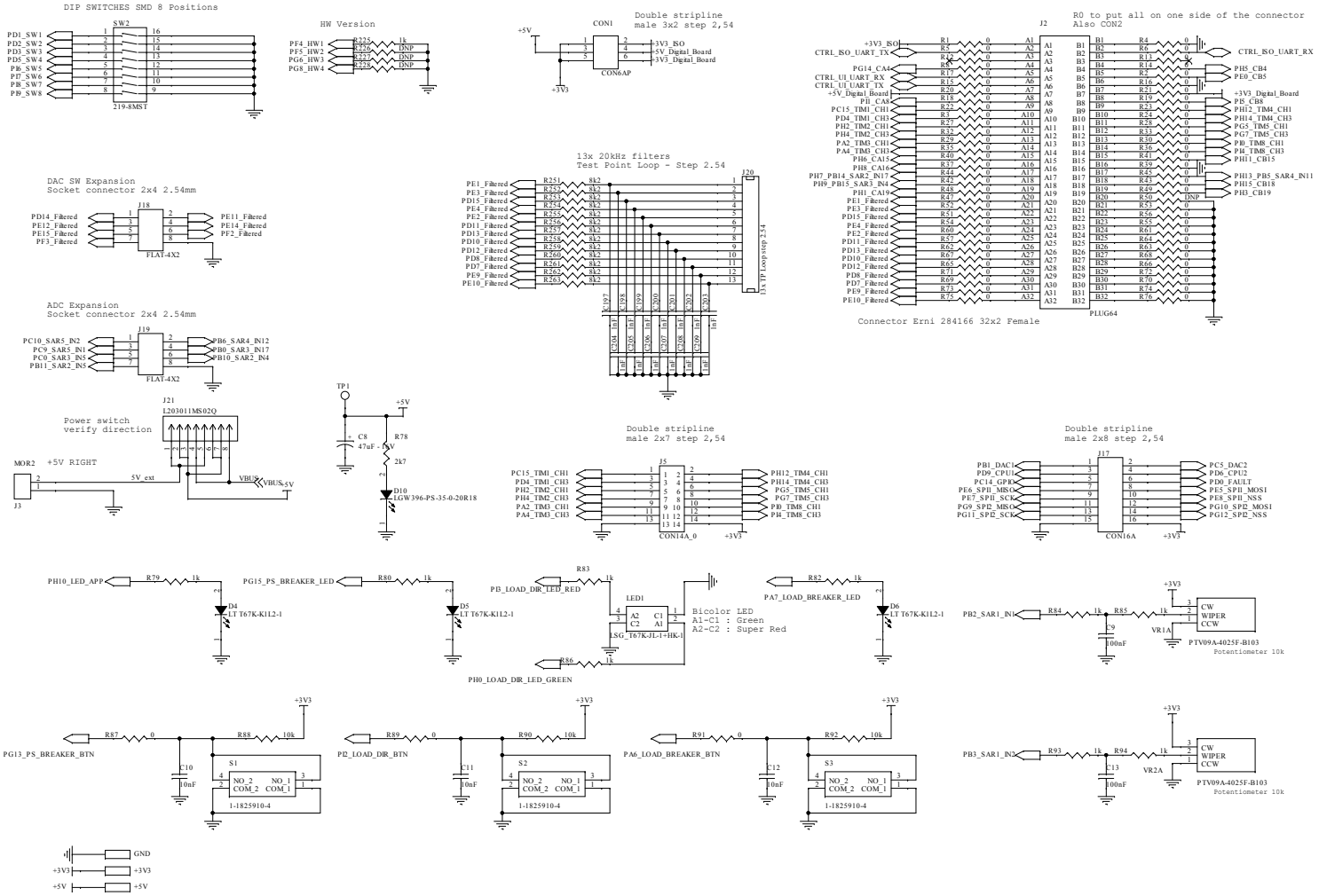


Figure 22. STEVAL-HILE1V1 - HIL board circuit schematic (2 of 6)

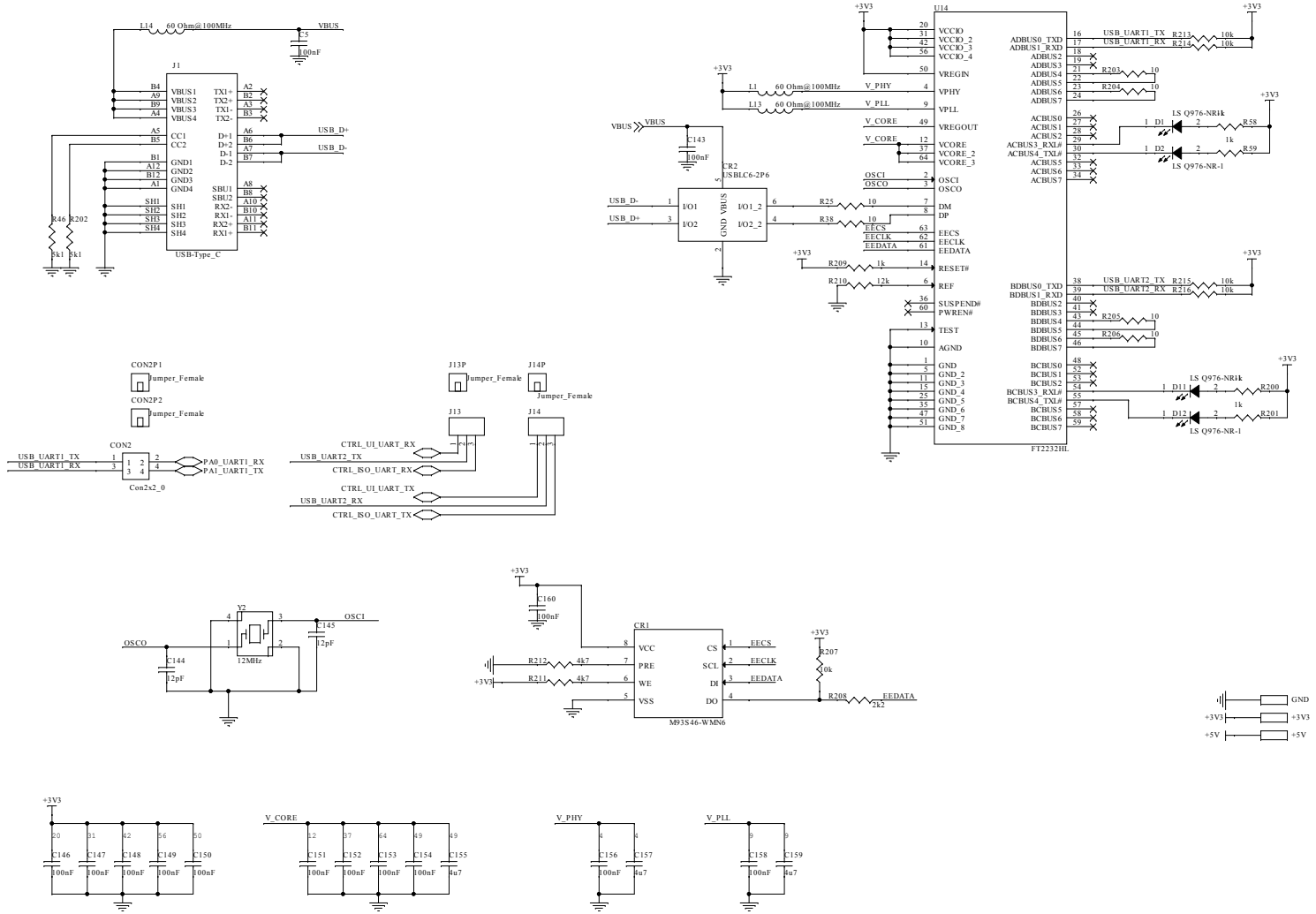


Figure 23. STEVAL-HILE1V1 - HIL board circuit schematic (3 of 6)

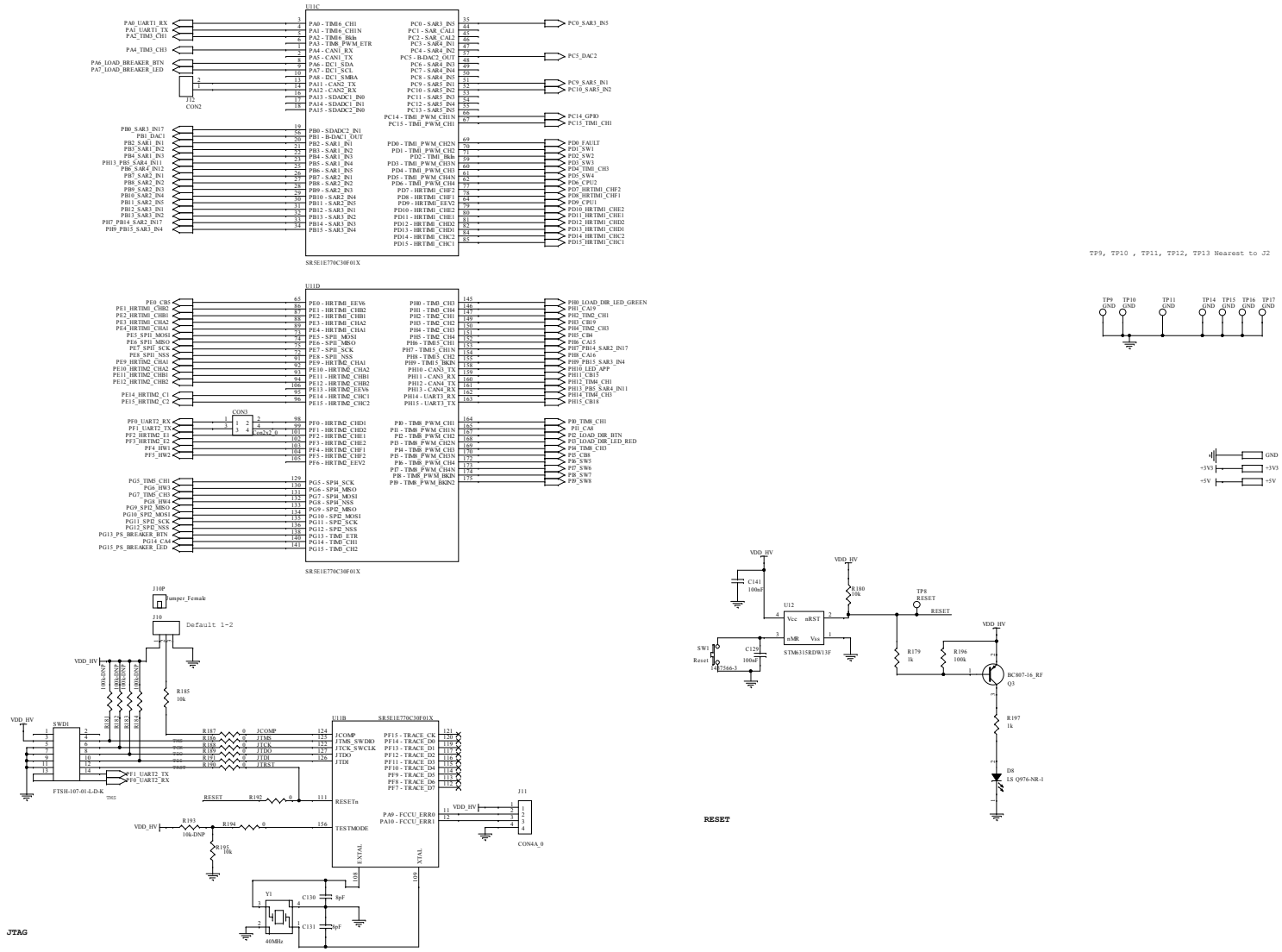
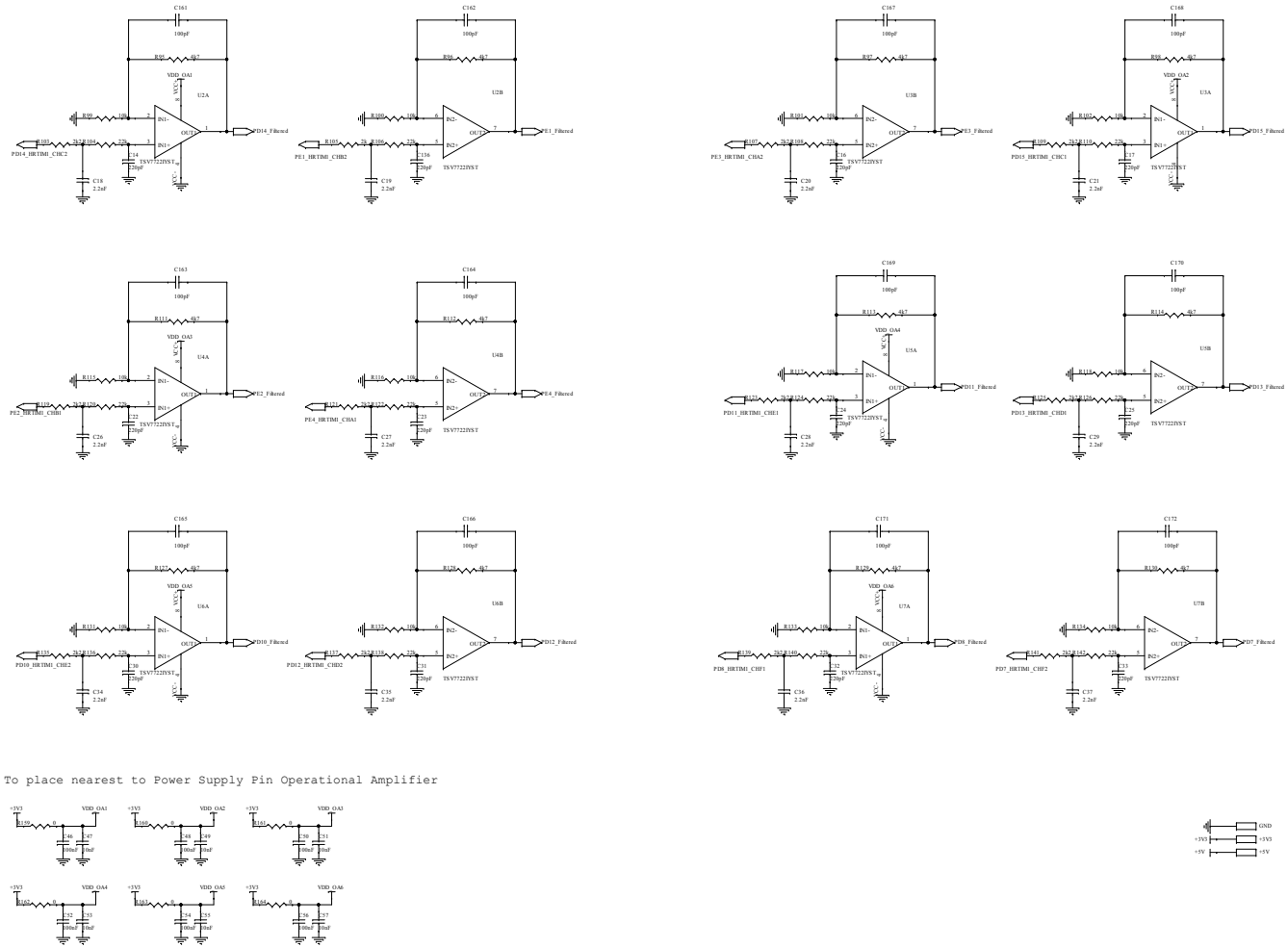
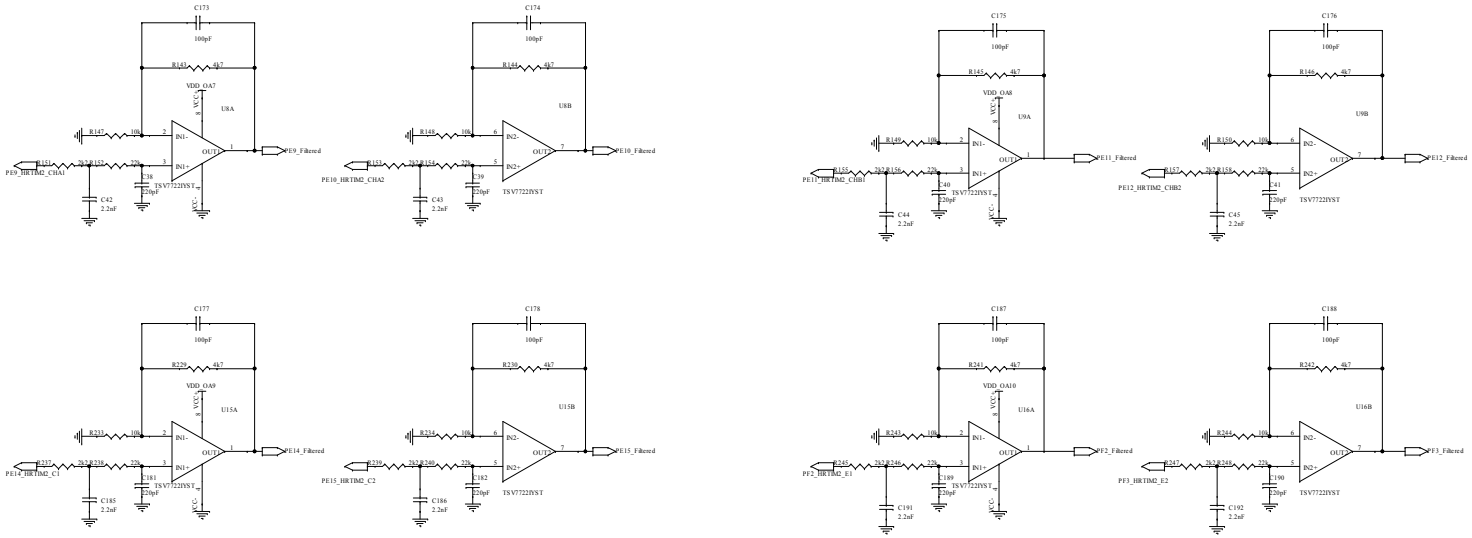


Figure 24. STEVAL-HILE1V1 - HIL board circuit schematic (4 of 6)

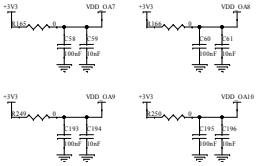


To place nearest to Power Supply Pin Operational Amplifier

Figure 25. STEVAL-HILE1V1 - HIL board circuit schematic (5 of 6)



To place nearest to Power Supply Pin Operational Amplifier



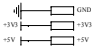


Figure 26. STEVAL-HILE1V1 - HIL board circuit schematic (6 of 6)

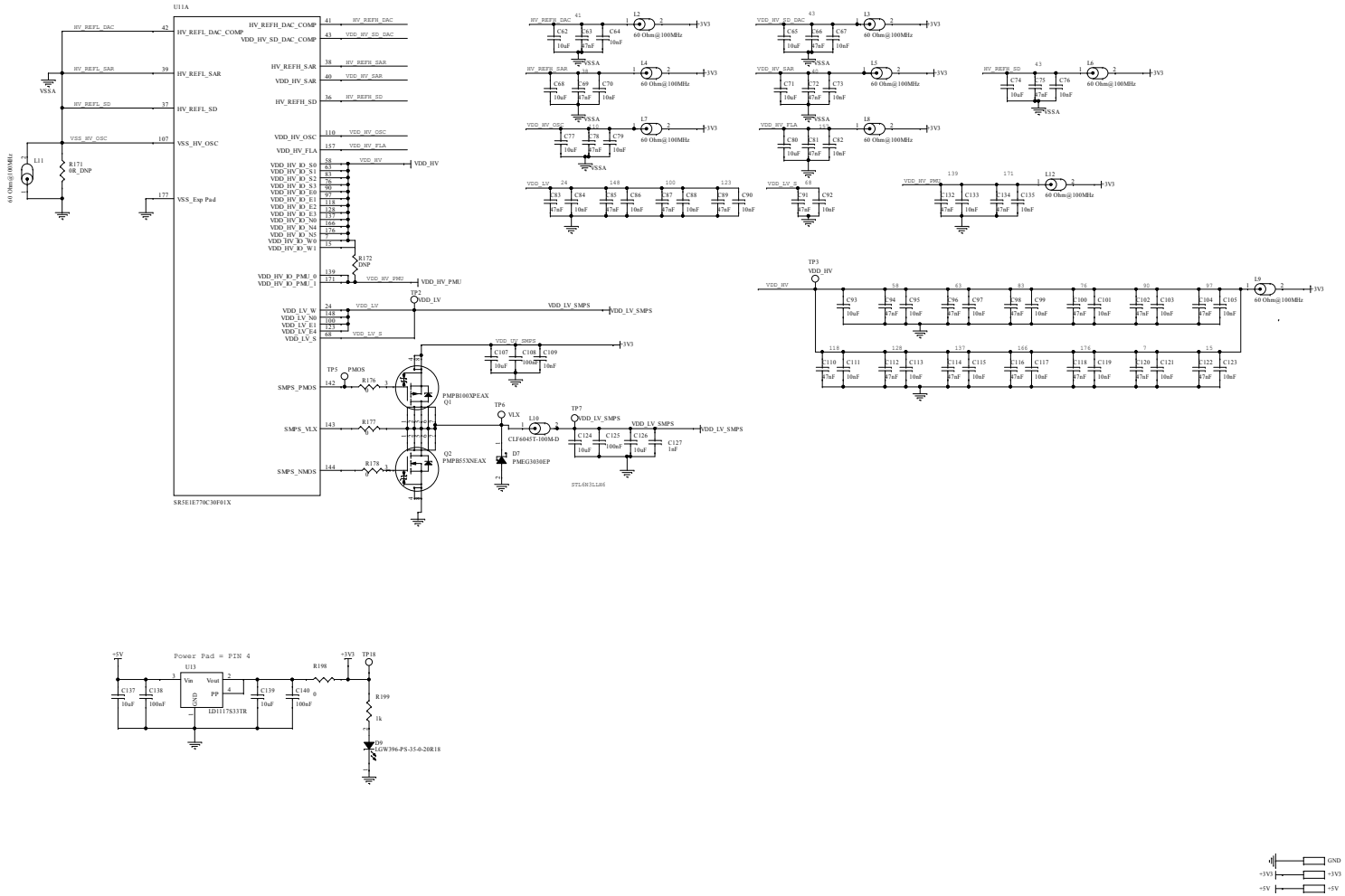
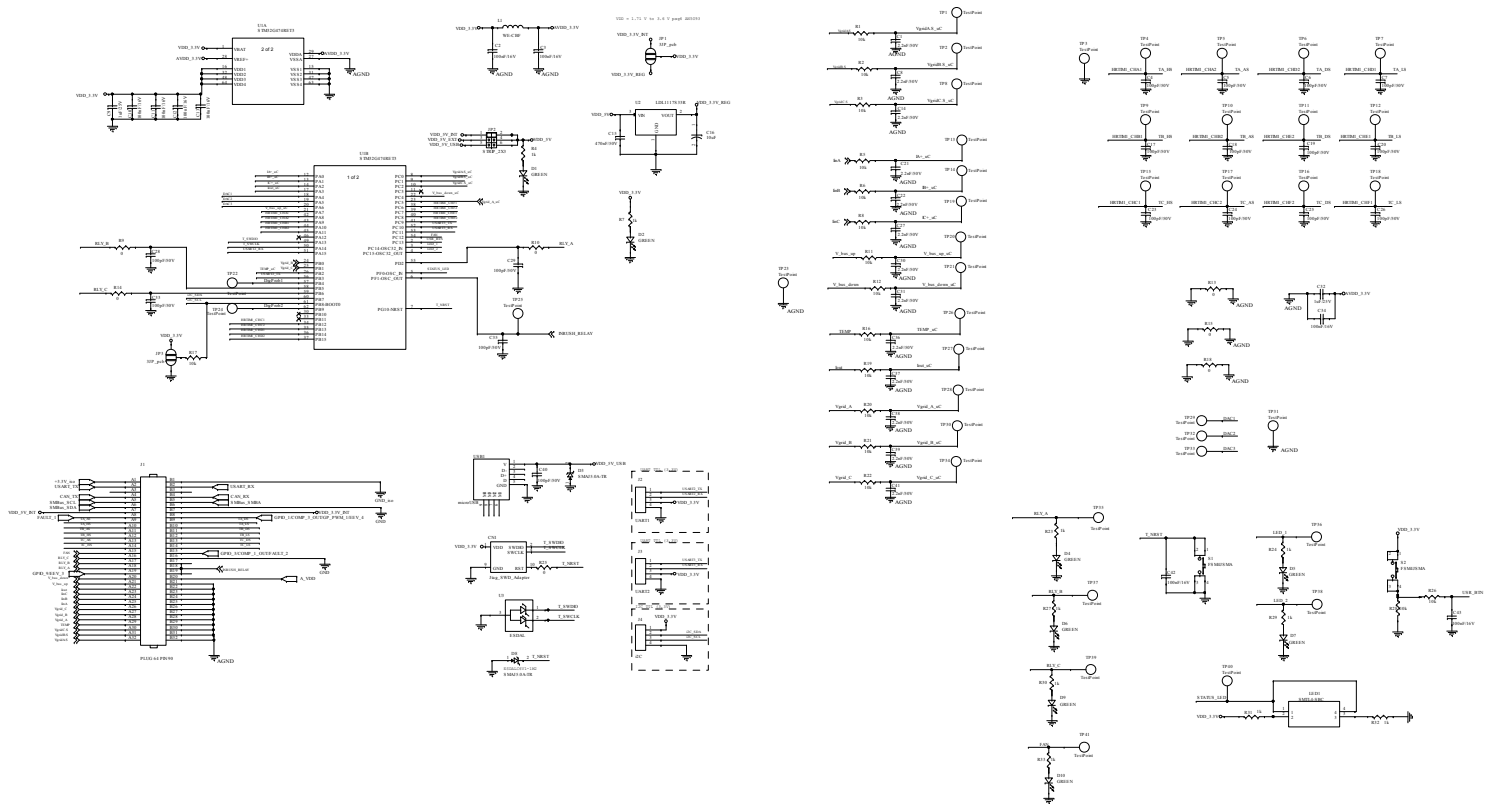


Figure 27. STEVAL-G474V1CB - Control board circuit schematic



10 Bill of materials

Table 1. STEVAL-HILE1G4K1 bill of materials

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
2	1	-	Table 2. STEVAL-HILE1V1	Emualtor board	ST	Not available for separate sale
1	1	-	Table 3. STEVAL-G474V1CB	Control board	ST	Not available for separate sale

Table 2. STEVAL-HILE1V1 bill of materials

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	1	CON1	CON6AP	Strip 2.54mm Male 3x2	Wurth Elektronik	WE 61300621121
2	2	CON2,CON3	Con2x2_0	Strip 2.54mm Male 2x2	Wurth Elektronik	WE 61300421121
3	5	J10P,J13P,J14P, CON2P1,CON2P2	Jumper_Female	CONN JUMPER SHORTING .100 GOLD	Sullins Connector Solutions	QPC02SXGN-RC
4	1	CR1	M93S46-WMN6TP, SO8	Integrated Circuit M93S46-WMN6	ST	M93S46-WMN6TP
5	1	CR2	USBLC6-2P6, SOT666	Integrated Circuit USBLC6-2P6	ST	USBLC6-2P6
6	28	C5,C9,C13,C46, C48,C50,C52,C54,C56,C58,C60,C129,C141,C143,C146,C147,C148,C149,C150,C151,C152,C153, C154,C156,C158,C160,C193,C195	100nF	CAP, Ceramic, SMD,100 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206095
7	1	C8	47uF - 16V	Electrolytic Capacitor SMD 47uF 16V	Panasonic	EEEFC1C470P
8	13	C10,C11,C12,C47,C49,C51,C53,C55,C57,C59,C61,C194,C196	10nF	CAP, Ceramic, SMD, 10 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206089
9	20	C14,C16,C17,C22,C23,C24,C25,C30,C31,C32,C33,C38,C39,C40,C41,C136,C181,C182,C189,C190	220pF	CAP, Ceramic, SMD, 220 pF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012006059
10	20	C18,C19,C20,C21,C26,C27,C28,C29,C34,C35,C36,C37,C42,C43,C44,C45,C185, C186,C191,C192	2.2nF	CAP, Ceramic, SMD, 2,2 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206085

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
11	13	C62,C65,C68,C71,C74,C77,C80,C93,C107,C124,C126,C137,C139	10uF	CAP CER 10UF 16V X5R 0805	Wurth Elektronik	WE 885012107014
12	27	C63,C66,C69,C72,C75,C78,C81,C83,C85,C87,C89,C91,C94,C96,C98,C100,C102,C104,C110,C112,C114,C116,C118,C120,C122,C132,C134	47nF	CAP CER 47nF 100V X7R 0603	Wurth Elektronik	WE 885012206118
13	28	C64,C67,C70,C73,C76,C79,C82,C84,C86,C88,C90,C92,C95,C97,C99,C101,C103,C105,C109,C111,C113,C115,C117,C119,C121,C123,C133,C135	10nF	CAP, Ceramic, SMD, 10 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206089
14	2	C108,C125	100nF	CAP, Ceramic, SMD,100 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206095
15	1	C127	1nF	CAP, Ceramic, SMD, 1 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206083
16	2	C130,C131	8pF	CAP CER 8PF 50V C0G/NPO 0603	Murata	GQM1885C1H8R0CB01D
17	2	C138,C140	100nF	CAP, Ceramic, SMD,100 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206095
18	2	C144,C145	12pF	CAP, Ceramic, SMD, 12 pF, 10 %, 25 V, 0603	Yageo	CC0603JRNPO9BN120
19	3	C155,C157,C159	4u7	CAP, Ceramic, SMD, 4.7 uF, 10 %, 25 V, 0603	Murata	GRM188R61E475KE11D
20	20	C161,C162,C163,C164,C165,C166,C167,C168,C169,C170,C171,C172,C173,C174,C175,C176,C177,C178,C187,C188	100pF	CAP, Ceramic, SMD, 100 pF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012006057
21	13	C197,C198,C199,C200,C201,C202,C203,C204,C205,C206,C207,C208,C209	1nF	CAP, Ceramic, SMD, 1 nF, 10 %, 25 V, 0603	Wurth Elektronik	WE 885012206083
22	5	D1,D2,D8,D11,D12	LS Q976-NR-1	LED RED CLEAR 2SMD LS Q976-NR-1	Osram	LSQ976-Z
23	3	D4,D5,D6	LT T67K-K1L2-1	LED RED CLEAR 2SMD LT T67K-K1L2-1	Osram	LS T67K-K1L2-1

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
24	1	D7	PMEG3030EP	DIODE SCHOTTKY 30V 3A CFP5	Nexperia	PMEG3030EP
25	2	D9,D10	LGW396-PS-35-0-20R18	LED GREEN CLEAR 2SMD LGW396-PS-35-0-20R18	Osram	LGW396-PS-35-0-20R18
26	1	J1	USB-Type_C	USBC Connector Hirose CX70M-24P1	Hirose	CX70M-24P1
27	1	J2	PLUG64	Connector DIN41612B-F-64AB	ERNI	284166-E
28	1	J3	MOR2	CONN TERM BLOCK 5.08MM 2POS	Wurth Elektronik	WE 691213510002
29	1	J5	CON14A_0	Strip 2.54mm Male 7x2	Wurth Elektronik	WE 61301421121
30	3	J10,J13,J14	con3-strip-male	CONN HEADER .100 STR 3POS	Wurth Elektronik	WE 61300311121
31	1	J11	CON4A_0	CONN HEADER .100 STR 4POS	Wurth Elektronik	WE 61300411121
32	1	J12	CON2	CONN HEADER .100 2POS PCB GOLD	Wurth Elektronik	WE 61300211121
33	1	J17	CON16A	Strip 2.54mm Male 8x2	Wurth Elektronik	WE 61301621121
34	2	J18,J19	FLAT-4X2	Conn. FLAT 4x2 Dritto	Wurth Elektronik	WE 61200821621
35	13	J20	13x TP Loop step 2.54	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
36	1	J21	L203011MS02Q	Slide Switch C&K L203011MS02Q	C&K	L203011MS02Q
37	1	LED1	LSG_T67K-JL-1+HK-1	Standard LEDs - SMD Red/Green	Osram	LSG_T67K-JL-1+HK-1
38	13	L1,L2,L3,L4,L5,L6,L7,L8,L9,L11,L12,L13,L14	60 Ohm@100MHz	Inductor SMD Case 0402 Ferrite Bead 60 ohm	Murata	BLM15PD600SN1D
39	1	L10	CLF6045T-100M-D	Inductor CFL6045-100M-D	TDK	CLF6045T-100M-D
40	1	Q1	PMPB100XPEAX	MOSFET P MOS DISCRETES	NXP	PMPB100XPEAX
41	1	Q2	PMPB55XNEAX	MOSFET N-CH 30V 3.8A 6DFN	NXP	PMPB55XNEAX
42	1	Q3	BC807-16_RF	BC807-16 RF PNP Transistor, 500 mA, 45 V, 3-Pin SOT-23	Diotec Semiconductor	BC807-25
43	88	R1,R2,R3,R4,R5,R6,R8,R12,R13,R14,R15,R16,R17,R18,R19,R20,R21,R22,R23,R24,R27,R28,R29,R30,R32,R33,R35,R36,R37,R39,R40,R41,R42,R43,R44,R45,R	0R	RES SMD 0 OHM JUMPER 1/10W 0603	Wurth Elektronik	WE 560112116001

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
		47,R48,R49,R51,R52,R53,R54,R55,R56,R57,R60,R61,R62,R63,R64,R65,R66,R67,R68,R69,R70,R71,R72,R73,R74,R75,R76,R87,R89,R91,R159,R160,R161,R162,R163,R164,R165,R166,R176,R177,R178,R186,R187,R188,R189,R190,R191,R192,R194,R198,R249,R250				
44	6	R25,R38,R203,R204,R205,R206	10R	RES SMD 10 OHM JUMPER 1/10W 0603	Wurth Elektronik	WE 560112116013
45	2	R46,R202	5k1	RES SMD 5,1K OHM 1/10W 0603	YAGEO	RC0603FR-075K1L
46	5	R50,R172,R226,R227,R228	DNP	RES SMD DNP OHM 1% 1/10W 0603 (not assembled)		
47	15	R58,R59,R79,R80,R82,R83,R84,R85,R86,R93,R94,R199,R200,R201,R225	1k	RES SMD 1K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116014
48	1	R78	2k7	RES SMD 2K7 OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116010
49	29	R88,R90,R92,R99,R100,R101,R102,R115,R116,R117,R118,R131,R132,R133,R134,R147,R148,R149,R150,R195,R207,R213,R214,R215,R216,R233,R234,R243,R244	10k	RES SMD 10K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116005
50	22	R95,R96,R97,R98,R111,R112,R113,R114,R127,R128,R129,R130,R143,R144,R145,R146,R211,R212,R229,R230,R241,R242	4k7	RES SMD 4K7 OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116006
51	20	R103,R107,R109,R119,R121,R123,R125,R135,R137,R139,R141,R151,R153,R155,R157,R208,R237,R239,R245,R247	2k2	RES SMD 2K2 OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116098

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
52	20	R104,R106,R108,R110,R120,R122,R124,R126,R136,R138,R140,R142,R152,R154,R156,R158,R238,R240,R246,R248	22k	RES SMD 22K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116022
53	1	R105	2k	RES SMD 2K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116091
54	1	R171	0R_DNP	RES SMD 0 OHM JUMPER 1/10W 0603 (not assembled)		
55	2	R179,R197	1k	RES SMD 1K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116014
56	1	R180	10k	RES SMD 10K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116005
57	4	R181,R182,R183,R184	100k-DNP	RES SMD 100K OHM 1% 1/10W 0603 (not assembled)		
58	1	R185	10k	RES SMD 10K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116005
59	1	R193	10k-DNP	RES SMD 10K OHM 1/10W 0603 (not assembled)		
60	1	R196	100k	RES SMD 100K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116004
61	1	R209	1k	RES SMD 1K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116014
62	1	R210	12k	RES SMD 12K OHM 1/10W 0603	Wurth Elektronik	WE 560112116040
63	13	R251,R252,R253,R254,R255,R256,R257,R258,R259,R260,R261,R262,R263	8k2	RES SMD 8.2K OHM 1% 1/10W 0603	Wurth Elektronik	WE 560112116002
64	1	SWD1	FTSH-107-01-L-D-K	CONN Samtec FTSH-107-01-L-DV	Samtec	FTSH-107-01-L-DV-K
65	1	SW1	1437566-3	SWITCH TACTILE SPST-NO 0.05A 24V Brown short	TE Conn.	1437566-3
66	1	SW2	219-8MST	Dip Switch SMD 2.54mm 8 Positions	Wurth Elektronik	WE 418121270808
67	3	S1,S2,S3	1-1825910-4	Black Button Tactile Switch (SPST) 50 mA @ 24 V dc 5.9mm	Schurter	Schurter 1301.9319
68	2	TP1,TP18	TESTPOINT	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
69	1	TP2	VDD_LV	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
70	1	TP3	VDD_HV	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
71	1	TP5	PMOS	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
72	1	TP6	VLX	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
73	1	TP7	VDD_LV_SMPS	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
74	1	TP8	RESET	TEST POINT PC MINI .040"D RED	Keystone Elett.	KE 5000
75	5	TP9,TP14,TP15, TP16,TP17	GND	TEST POINT PC MINI .040"D BLACK	Keystone Elett.	KE 5001
76	2	TP10,TP11	GND	PC Test Point, Compact keyston 4954	Keystone	KE 4954
77	10	U2,U3,U4,U5,U6,U7,U8,U9,U15,U16	TSV7722IYST, MiniSO-8	High bandwidth (22MHz) Low offset (200 µV) low-rail 5V Op amp	ST	TSV7722IYST
78	1	U11	SR5E1E770C30F01X, LQFP 176L	ST microcontroller Stellar E1 176pin	ST	SR5E1E770C30F01X
79	1	U12	STM6315RDW13F, SOT-143	IC MPU RESET CIRC 2.63V SOT-143	ST	STM6315RDW13F
80	1	U13	LD1117S33TR, SOT-223	Integrated Circuit LD1117S33TR	ST	LD1117S33TR
81	1	U14	FT2232HL	Integrated Circuit FT2232HL	FTDI	FT2232HL
82	2	VR1A,VR2A	PTV09A-4025F-B103	Potentiometer 9mm horizontal 10K flat	BOURNS	PTV09A-4025F-B103
83	1	Y1	40MHz	CRYSTAL 40.0000MHZ 18PF SMD	ECS	ECS-400-8-36Q-CWY-TR
84	1	Y2	12MHz	Oscillator 12Mhz 2.5x2.0mm	ECS	ECS-120-10-36-AGN-TR3
85	2		Knob	Potentiometer Knob Sifam, Ø 11.5mm, 6mm shaft (D-shaped), black color	Sifam	Sifam 3/03/ DR110-006/237/233
86	4		Jumper female	Jumper F P.2,54mm H 6mm Shunt	Wurth Elektronik	WE 60900213421

Table 3. STEVAL-G474V1CB bill of materials

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	13	C1 C8 C14 C21 C22 C27 C30 C31 C36 C37 C38 C39 C41	2.2nF/50V	Wurth Elektronik, 0603 (1608M) 2.2nF Multilayer Ceramic Capacitor MLCC 50V dc ±10% , SMD 885012206085	Wurth Elektronik	885012206085

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
2	9	C2 C3 C10 C11 C12 C13 C34 C42 C43	100nF/16V	Wurth Elektronik, 0603 (1608M) 100nF Multilayer Ceramic Capacitor MLCC 16V dc ±10% , SMD 885012206046	Wurth Elektronik	885012206046
3	16	C4 C5 C6 C7 C18 C19 C20 C23 C24 C25 C26 C28 C29 C33 C35 C40	100pF/50V	Wurth Elektronik, 0603 (1608M) MLCC 885012006057	Wurth Elektronik	885012006057
4	2	C9 C32	1uF/25V	Wurth Elektronik, 0603 (1608M) 1µF Multilayer Ceramic Capacitor MLCC 25V dc ±10% , SMD 885012206076	Wurth Elektronik	885012206076
5	1	C15	470nF/50V	Wurth Elektronik, 0805 (2012M) 470nF Multilayer Ceramic Capacitor MLCC 50V dc, SMD 885012207102	Wurth Elektronik	885012207102
6	1	C16	10uF	Wurth Elektronik 10µF Electrolytic Capacitor 16V dc, Surface Mount - 865230340001	Wurth Elektronik	865230340001
7	1	C17	100pF/50V	Wurth Elektronik, 0603 (1608M) MLCC 885012006057	Wurth Elektronik	885012006057
8	1	CN1	Jtag_SWD_Adapter	Samtec, FTSH, 10 Way, 2 Row, Straight Pin Header	Samtec	FTSH-105-01-L-DV-K
9	8	D1 D2 D4 D5 D6 D7 D9 D10	GREEN	3.2 V Green LED 2012 (0805) SMD, Wurth Elektronik WL-SMCW 150080GS75000	Wurth Elektronik	150080GS75000
10	2	D3 D8	SMAJ5.0A-TR, SMA	Uni-Directional TVS Diode, 400W, 2-Pin DO-214AC	ST	SMAJ5.0A-TR
11	1	J1	PLUG 64 PIN 90	Connector Erni 90° 384241 32X2 male	ERNI	384241
12	1	J2	UART1	Wurth Elektronik, WR-PHD, 6130, 4 Way, 1 Row, Straight Pin Header	Wurth Elektronik	61300411121
13	1	J3	UART2	Wurth Elektronik, WR-PHD, 6130, 4 Way, 1 Row, Straight Pin Header	Wurth Elektronik	61300411121
14	1	J4	i2C	Wurth Elektronik, WR-PHD, 6130, 4 Way, 1 Row, Straight Pin Header	Wurth Elektronik	61300411121

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
15	2	JP1 JP3	3JP_pcb	Solder Bridge		
16	1	JP2	STRIP_2X3	HARWIN Male Connector, 6 Way, 2 Row, 2.54mm Pitch	HARWIN	M20-9980345
17	1	L1	WE-CBF	Wurth Elektronik Ferrite Bead (EMI Suppression), 1.6 x 0.8 x 0.8mm (0603 (1608M)), 120O impedance at 100 MHz	Wurth Elektronik	74279262
18	1	LED1	SMTL4-SBC	LED Bivar, Verde, rosso, SMD, 2,4 V, 2 Led, PLCC 4	Bivar	SMTL4-SBC
19	16	R1 R2 R3 R5 R6 R8 R11 R12 R16 R17 R19 R20 R21 R22 R26 R28	10k	Bourns 10kO, 0603 (1608M) Thick Film SMD Resistor ±1% 0.1W - CR0603-FX-1002ELF	Bourns	CR0603-FX-1002ELF
20	10	R4 R7 R23 R24 R27 R29 R30 R31 R32 R33	1k	TE Connectivity 1kO, 0603 Thick Film SMD Resistor ±1% 0.1W - CRG0603F1K0	TE Connectivity	CRG0603F1K0
21	7	R9 R10 R13 R14 R15 R18 R25	0	TE Connectivity 0O, 0603 (1608M) Thick Film SMD Resistor ±0% 0.1W - CRG0603ZR	TE Connectivity	CRG0603ZR
22	2	S1 S2	FSM4JSMA	Black Button Tactile Switch, Single Pole Single Throw (SPST) 50 mA @ 24 V dc 1.4mm Surface Mount	TE Connectivity ALCOSWITCH Switches	FSM4JSMA
23	41	TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 TP19 TP20 TP21 TP22 TP23 TP24 TP25 TP26 TP27 TP28 TP29 TP30 TP31 TP32 TP33 TP34 TP35 TP36 TP37 TP38 TP39 TP40 TP41	TestPoint	RS PRO 1mm Black Terminal Post	RS PRO	262-2179
24	1	U1	STM32G474RET3, LQFP64	Arm® Cortex®-M4 32b MCU+FPU, 512KB Flash, 150 MHz, 128KB SRAM	ST	STM32G474RET3

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
25	1	U2	LDL1117S33R, SOT-223	1 Low Dropout Voltage, Voltage Regulator 1.2A, 3.3 V 4-Pin, SOT-223	ST	LDL1117S33R
26	1	U3	ESDA6V1L, SOT23-3L	Dual-Element Uni-Directional TVS Diode, 300W, 3-Pin SOT-23	ST	ESDA6V1L
27	1	USB1	microUSB	Molex Right Angle, SMT, Socket Type Micro-B 2.0 USB Connector	MOLEX	47346-0001

11 Kit versions

Table 4. STEVAL-HILE1G4K1 versions

PCB version	Schematic diagrams	Bill of materials
STV$HILE1G4K1A (1)	STV$HILE1G4K1A schematic diagrams	STV$HILE1G4K1A bill of materials

1. *This code identifies the STEVAL-HILE1G4K1 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$HILE1V1A and a control board STEVAL-G474V1CB whose version is identified by the code STEVAL$G474V1CBA.*

12 Regulatory compliance information

Notice for US Federal Communication Commission (FCC)

For evaluation only; not FCC approved for resale

FCC NOTICE - This kit is designed to allow:

(1) Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and (2) Software developers to write software applications for use with the end product.

This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter 3.1.2.

Notice for Innovation, Science and Economic Development Canada (ISED)

For evaluation purposes only. This kit generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to Industry Canada (IC) rules.

À des fins d'évaluation uniquement. Ce kit génère, utilise et peut émettre de l'énergie radiofréquence et n'a pas été testé pour sa conformité aux limites des appareils informatiques conformément aux règles d'Industrie Canada (IC).

Notice for the European Union

This device is in conformity with the essential requirements of the Directive 2014/30/EU (EMC) and of the Directive 2011/65/EU (RoHS II), including subsequent revisions and additions, as well as amended by the Delegated Directive 2015/863/EU (RoHS III).

Notice for the United Kingdom

This device is in conformity with the relevant provisions of the following EU legislation recognized by the United Kingdom:

- Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091) implementing Directive 2014/30/EU (EMC)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS) (S.I. 2012/3032) implementing Directive 2011/65/EU (RoHS II), including subsequent revisions and additions, as well as amended by the Delegated Directive 2015/863/EU (RoHS III).

Revision history

Table 5. **Document revision history**

Date	Revision	Changes
19-Jan-2026	1	Initial release.

Contents

List of tables

List of figures

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice.

In the event of any conflict between the provisions of this document and the provisions of any contractual arrangement in force between the purchasers and ST, the provisions of such contractual arrangement shall prevail.

The purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

The purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of the purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

If the purchasers identify an ST product that meets their functional and performance requirements but that is not designated for the purchasers' market segment, the purchasers shall contact ST for more information.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.