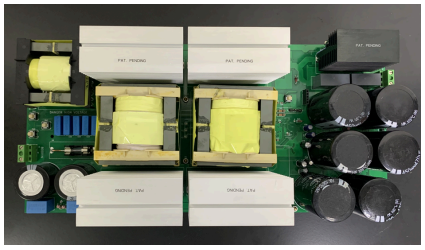
STDES-6KWHVDCDC

Data brief

6 kW high voltage DC-DC converter for EV charging



Fully assembled board developed for performance evaluation only, not available for sale

Product summary	
6 kW high voltage DC-DC converter for EV charging	STDES-6KWHVDCDC
Software for STDES-6KWHVDCDC	STSW-6KWHVDCDC
Mainstream Arm Cortex-M4 MCU 170 MHz with 512 Kbytes of Flash memory, Math Accelerator, HR Timer, High Analog level integration	STM32G474RET6
N-channel 950 V, 0.120 Ohm typ., 38 A MDmesh DK5 Power MOSFET in a TO-247 package	STW40N95DK5
1200 V, 40 A High Surge Silicon Carbide Power Schottky Diode	STPSC40H12CWL
Applications	EV Charging

Features

- 6 kW high voltage DC-DC converter based on fully digital LLC topology
- 2 variants: dual transformer (smaller core) for limited voltage, single transformer for wide output
- Same PCB to accommodate different magnetics for each variant
- Unique patented control scheme to address output voltage ranging from 200–1000 V DC, with 12 A maximum limit
- 700–800 V DC input voltage range
- Peak efficiency: 98%
- Digitally controlled, based on STM32G474 microcontroller
- Comprehensive safety mechanism

Description

The STDES-6KWHVDCDC reference design is a 6 kW high voltage DC-DC converter mainly for battery charging in an EV infrastructure.

The reference design consists of a full bridge LLC resonant converter, digitally controlled.

For the output rectification, SiC diodes have been used. Depending on the output voltage requirement, the LLC transformer output configuration is interchangeable between center tapped and full-wave.

This results in frequency fold-back that increases efficiency by a wide margin over an entire output voltage range.

The dual transformer variant is more suited for limited output voltage: 200-500 or 500-1000 V depending on the secondary winding scheme. This scheme also uses smaller cores. The single transformer variant is usable for 200-1000 V with the frequency foldback scheme.

STW40N95DK5 MDmesh DK5 Power MOSFETs are used in the LLC stage while STPSC40H12CWL SiC diodes are used in rectification. The STM32G474RET6 MCU manages the control functions.

The auxiliary power supply is referred to a secondary GND to supply MOSFET gate driver, microcontroller, and signal conditioning.

The gate driving of LLC MOSFETs is isolated through a gate drive transformer in addition to the PM8834MTR gate driver ICs.

Formal testing and measurement results confirm the ability of performance ST power products combined with comprehensive digital control to deliver high efficiency across wide input voltage and load conditions.

1 STDES-6KWHVDCDC block diagram

Figure 1. **STDES-6KWHVDCDC main scheme**

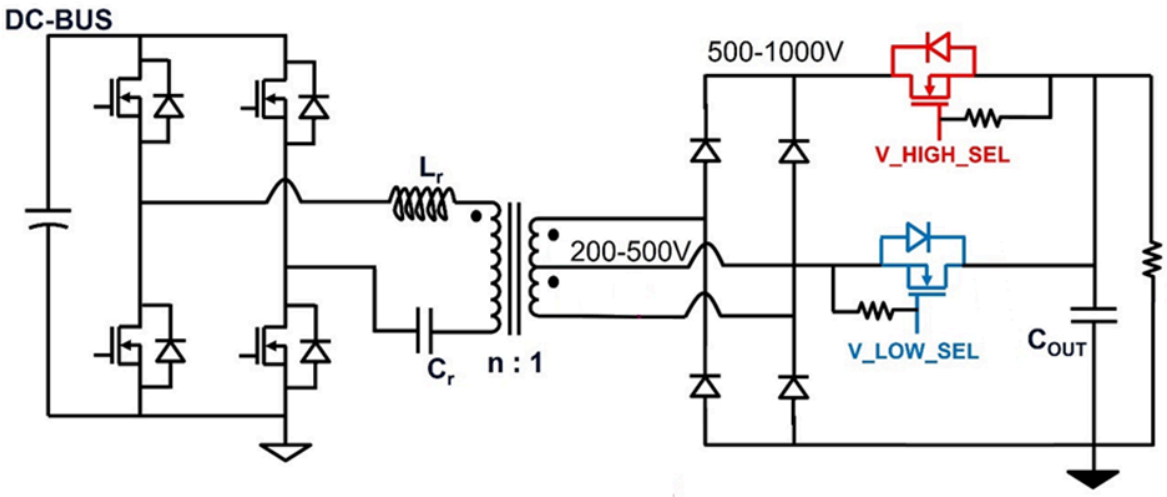
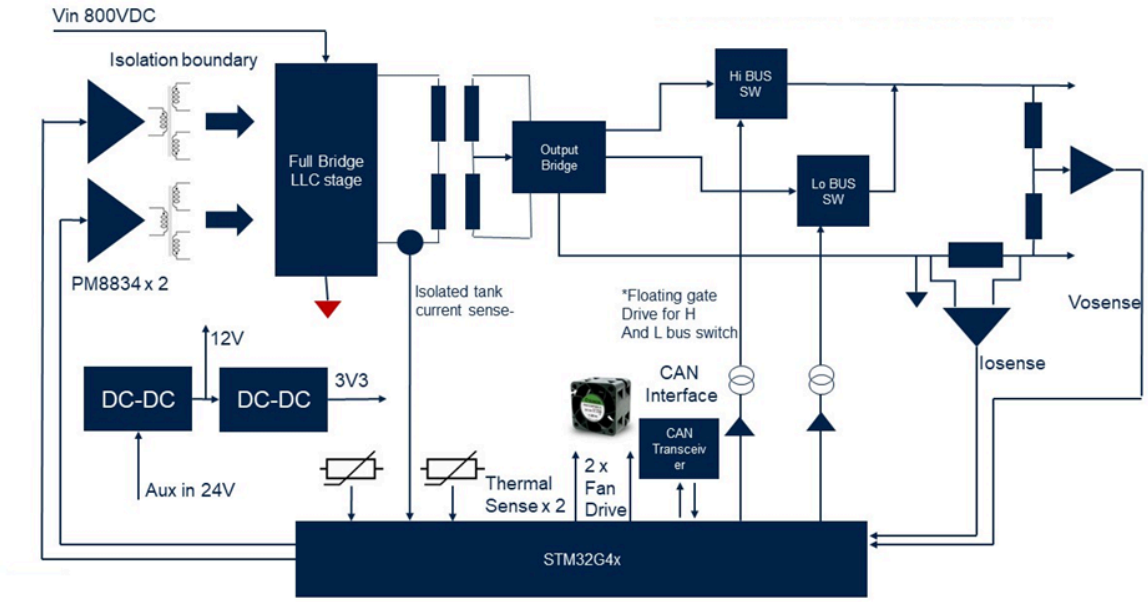


Figure 2. **Block diagram**



2 Schematic diagrams

Figure 3. **STDES-6KWHVDCDC circuit schematic (1 of 2)**

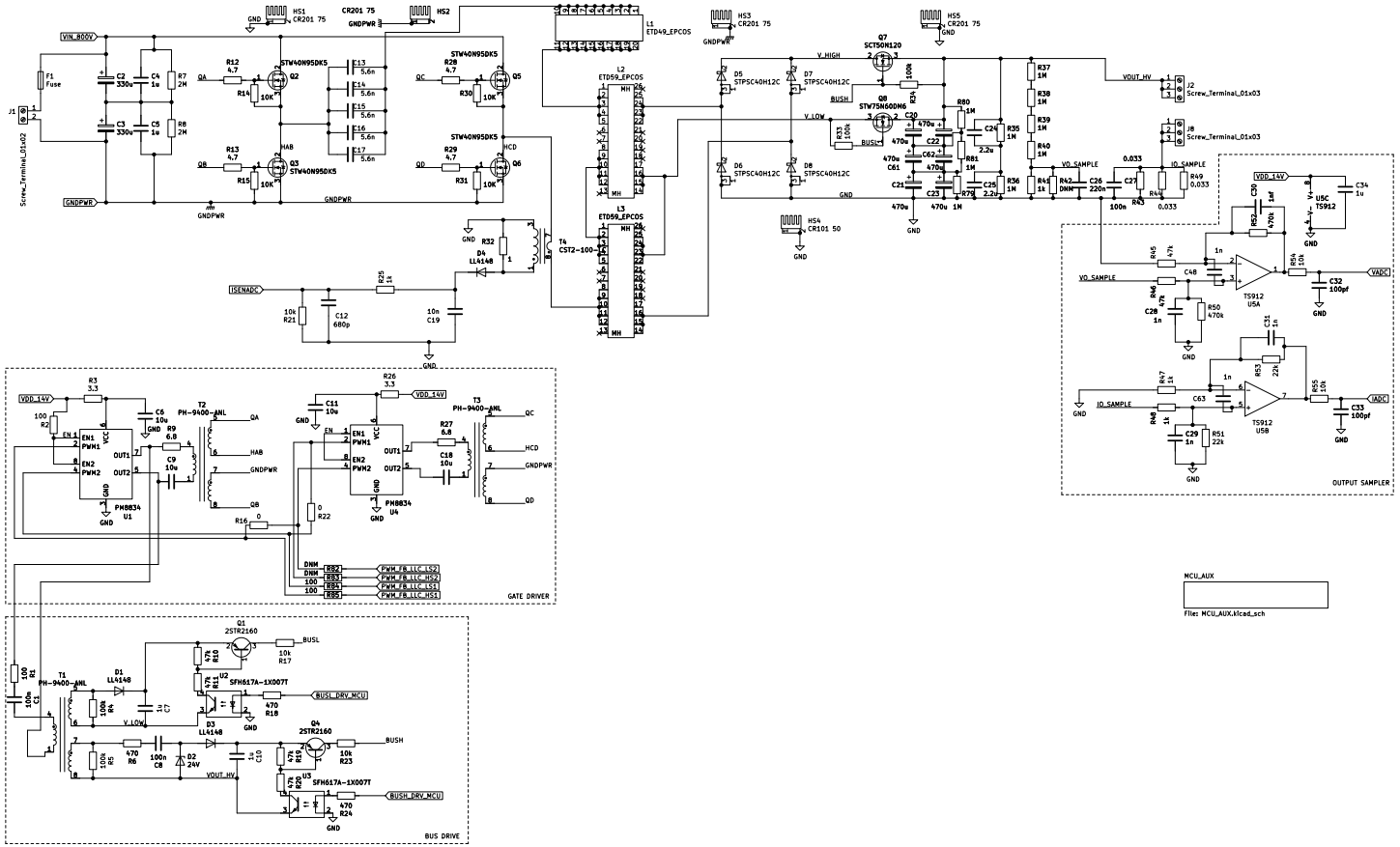
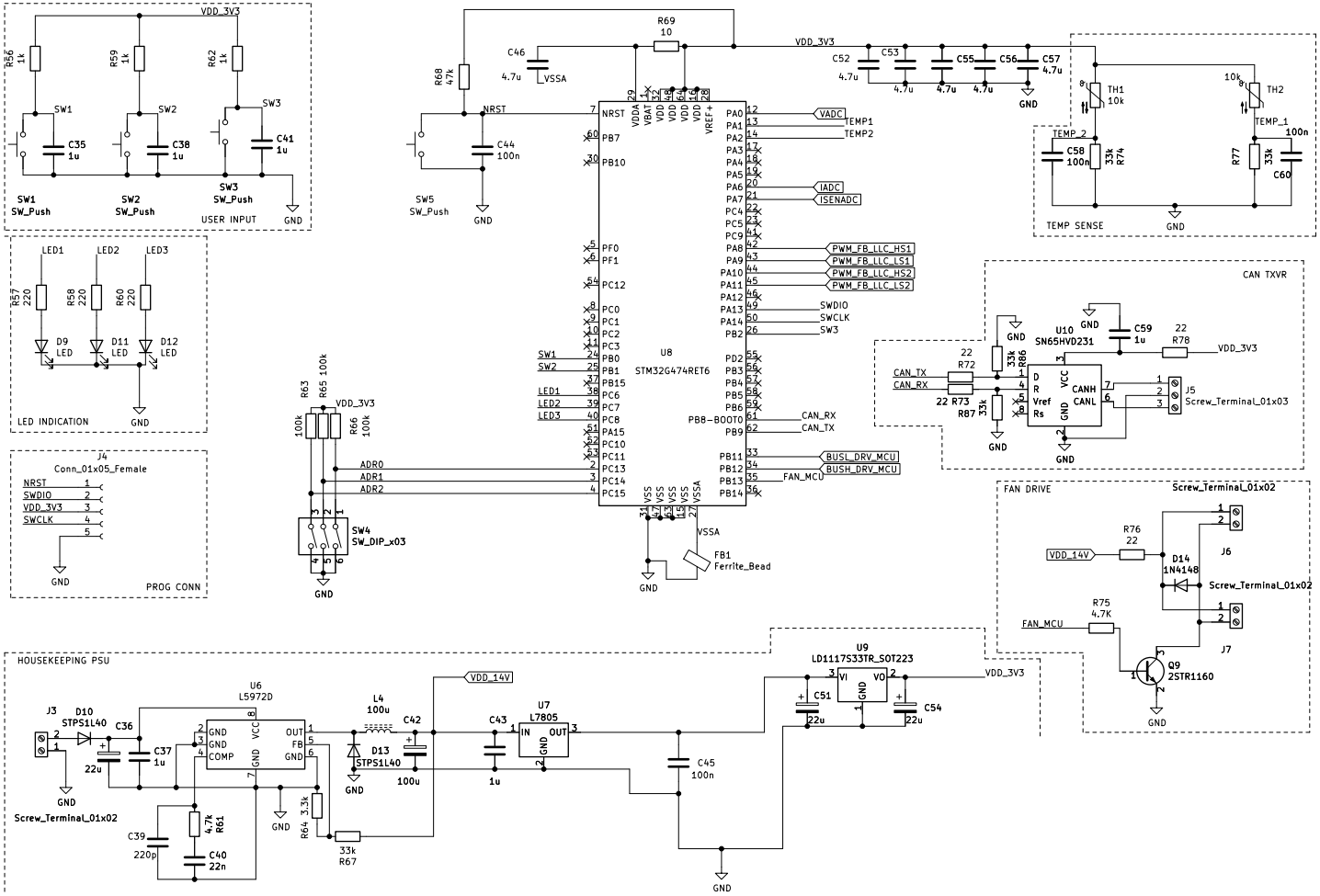


Figure 4. **STDES-6KWHVDCDC circuit schematic (2 of 2)**



Revision history

Table 1. **Document revision history**

Date	Revision	Changes
20-Dec-2022	1	Initial release.