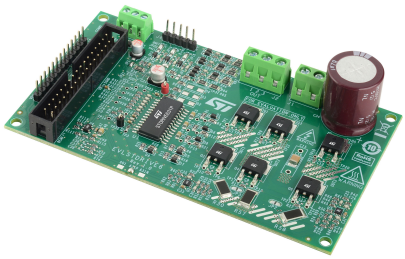
EVLSTDRIVE631P, EVLSTDRIVE631N

Data brief

Demonstration board for STDRIVE631P and STDRIVE631N triple gate drivers



Product status link
EVLSTDRIVE631P
EVLSTDRIVE631N

Features

- High-voltage rail up to 600 V
- Driver supply input voltage range 9.5 V - 20 V
- STGD6M65DF2 IGBTs power stage featuring:
  - $V_{(BR)CES}$ = 650 V
  - $V_{CE(sat)}$ = 1.55 V @ I_C = 6 A
- Dual footprint for IGBT/MOSFET package:
  - DPAK
  - PowerFLAT 8x8 HV
- Selectable single or 3-shunt current sensing topology:
  - Sensored or sensorless BEMF detection
  - FOC or 6-Step algorithm
- SmartShutdown overcurrent protection
- Hall effect sensors connector
- Bus voltage sensing
- 450 V bulk capacitor
- Connector for interfacing with MCU
- RoHS compliant

Applications

- Three-phase motor drives
- Fans
- Pumps
- Refrigerator compressors
- Industrial inverters
- Appliances

Description

The EVLSTDRIVE631P and EVLSTDRIVE631N demonstration boards are complete 3-phase inverters that allow evaluating the STDRIVE631P or STDRIVE631N features. The power stage features STGD6M65DF2 IGBTs, but can be populated with any IGBT or power MOSFET in DPAK or PowerFLAT 8x8 HV package. The boards are designed to support a three-shunts or a single-shunt current sensing topology.

A strip connector allows an easy interfacing with MCU control.

The STDRIVE631P and STDRIVE631N are a 600 V gate drivers. The device is a single chip with three half-bridge gate drivers for N-channel power MOSFETs or IGBTs, suitable for three-phase applications. It integrates three bootstrap diodes and a smart shutdown feature that detects very fast overcurrent conditions. This feature minimizes the propagation delay between the overcurrent event and the output switch-off.

1 Safety and operating instructions

1.1 General terms

Warning: *During assembly, testing, and operation, the evaluation board poses several inherent hazards, including bare wires, moving or rotating parts, and hot surfaces.*

Danger: *There is a danger of serious personal injury, property damage, or death due to electrical shock and burn hazards if the kit or components are improperly used or installed incorrectly.*

Danger: *The kit is not electrically isolated from the high-voltage supply AC/DC input. The evaluation board is directly linked to the mains voltage. No insulation is ensured between the accessible parts and the high voltage. All measuring equipment must use adequately insulated probes, clamps, and connecting wires; use adequate protective shields and use personal protective equipment.*

Never touch the evaluation board while it is energized as it is capable of causing an electrical shock hazard. After supply disconnection, wait and ensure that the onboard capacitors are fully discharged before touching or working on the board.

Danger: ***Board supplied with isolated AC source.***

When using an oscilloscope with single ended probes or when connecting a PC to the board as for programming the µC with a standard programmer, the board AC input shall be provided from an isolated or floating AC source. Floating AC supply is required to avoid shorting AC mains to earth ground through oscilloscope or PC with the risk of death, injury, and equipment damage. However, touching a single high-voltage point of the board could still result in an electrical shock hazard, even when supplying the board with an AC isolated source, isolation transformer, or high-voltage DC source.

Important: *All operations involving transportation, installation and use, and maintenance must be performed by skilled technical personnel able to understand and implement national accident prevention regulations. For the purposes of these basic safety instructions, “skilled technical personnel” are suitably qualified people who are familiar with the installation, use, and maintenance of power electronic systems.*

1.2 Intended use of evaluation board

The evaluation board is designed for demonstration purposes only, and must not be used for electrical installations or machinery. Technical data and information concerning the power supply conditions are detailed in the documentation and should be strictly observed.

1.3 Installing the evaluation board

- The installation and cooling of the evaluation board must be in accordance with the specifications and target application.
- The board must be protected against excessive strain. In particular, components should not be bent nor should isolating distances be altered during transportation or handling.
- No contact must be made with other electronic components and contacts.
- The board contains electrostatically sensitive components that are prone to damage if used incorrectly. Do not mechanically damage or destroy the electrical components (potential health risks).

1.4 Operating the evaluation board

To properly operate the board, follow these safety rules.

1. Work area safety:
   - The work area must be clean and tidy.
   - Do not work alone when boards are energized.
   - Protect against inadvertent access to the area where the board is energized using suitable barriers and signs.
   - A system architecture that supplies power to the evaluation board must be equipped with additional control and protective devices in accordance with the applicable safety requirements (that is, compliance with technical equipment and accident prevention rules).
   - Use a non-conductive and stable work surface.
   - Use adequately insulated clamps and wires to attach measurement probes and instruments.
2. Electrical safety:
   - Remove the power supply from the board and electrical loads before taking any electrical measurements.
   - Proceed with the arrangement of measurement setup, wiring, or configuration paying attention to high-voltage sections.
   - Once the setup is complete, energize the board.

Danger: *Do not touch the board when it is energized or immediately after it has been disconnected from the voltage supply as several parts and power terminals containing potentially energized capacitors need time to discharge.*
Do not touch the board after disconnection from the voltage supply as several parts, including the PCB, may still be very hot.
The kit is not electrically isolated from AC/DC input.

3. Personal safety
   - Always wear suitable personal protective equipment such as insulating gloves and safety glasses.
   - Take adequate precautions and install the board in such a way to prevent accidental touch. Use protective shields such as an insulating box with interlocks if necessary.

2 Schematic diagram

Note: The schematic applies to both boards. In the EVLSTDRIVE631P, the driver outputs are in phase with the input logic signals. In the EVLSTDRIVE631N, the outputs are out of phase with the input logic signals.

Figure 1. Board schematic – Driver output stages

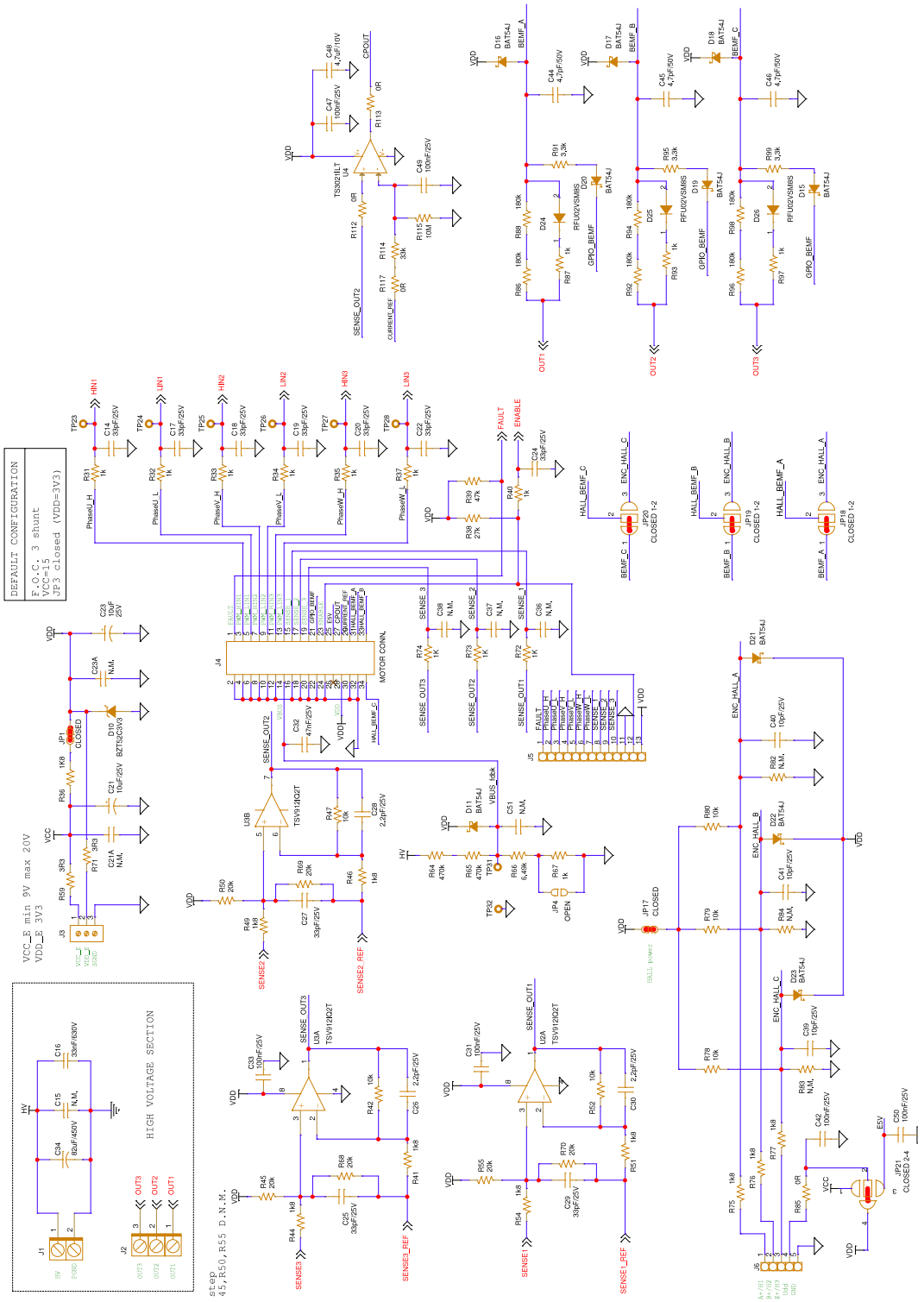
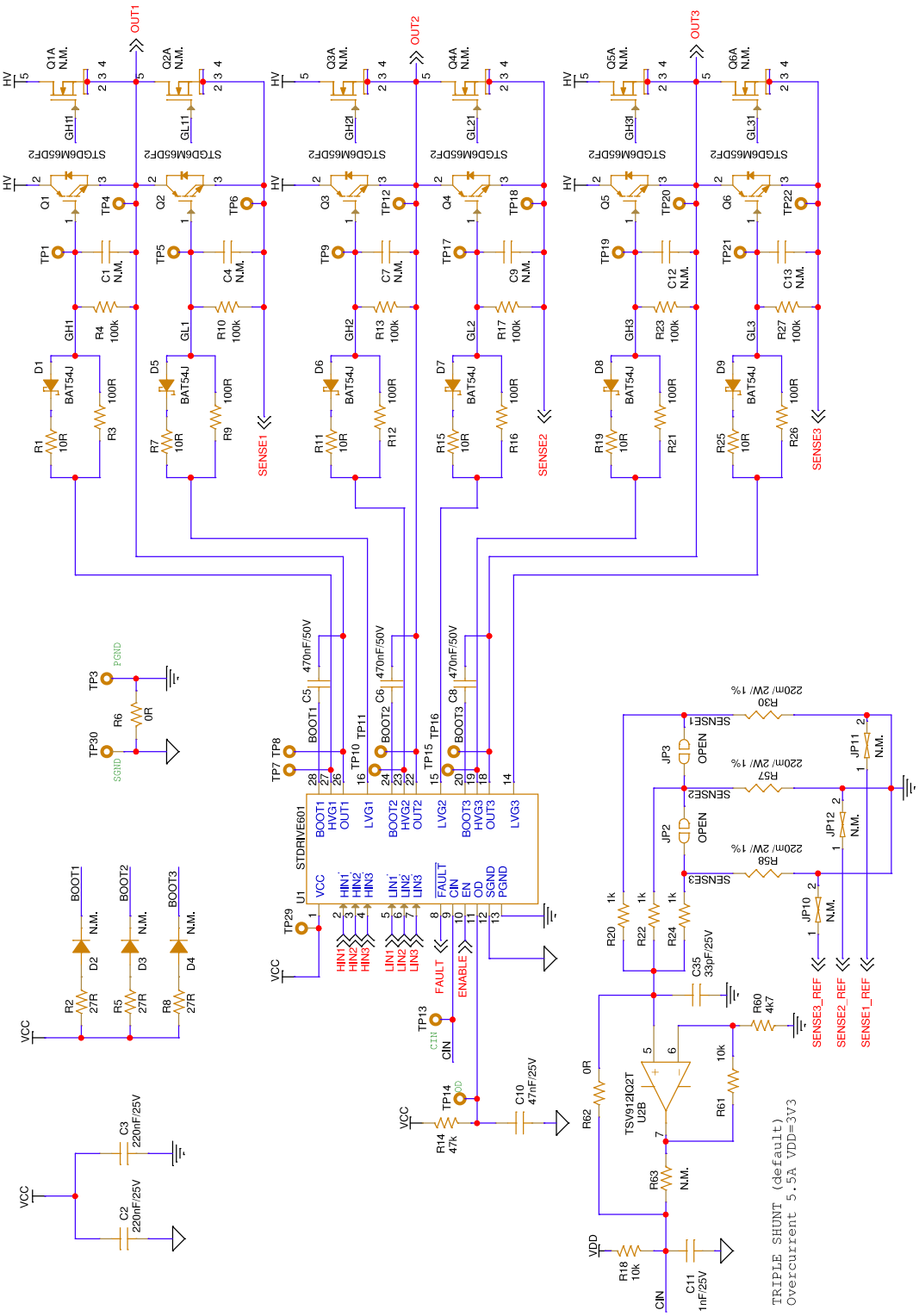


Figure 2. Board schematic – feedback network



3 Bill of material

Table 1. Bill of material – components common to all device variants

Part reference	Part description	Part value	Package / manufacturer' code
C1, C4, C7, C9, C12, C13, C36, C37, C38, C51	SMT ceramic capacitor	N.M.	Size 0603
C2, C3	SMT ceramic capacitor	220 nF / 25 V	Size 0603
C5, C6, C8	SMT ceramic capacitor	470 nF / 50 V	Size 0805
C10, C32	SMT ceramic capacitor	47 nF / 25 V	Size 0603
C11	SMT ceramic capacitor	1 nF / 25 V	Size 0603
C14, C17, C18, C19, C20, C22, C24, C25, C27, C29, C35	SMT ceramic capacitor	33 pF / 25 V	Size 0603
C15	Film capacitor	N.M.	4x13 mm, Pitch 10 mm Kemet R71MF31004030K or equivalent
C16	SMT multilayer capacitor	33 nF / 630 V	Size 1210 Würth Elektronik 885342209004 or equivalent
C21A	SMT ceramic capacitor	N.M.	Size 1206
C21	SMD aluminum electrolytic capacitor	10 µF / 25 V	Size C Würth Elektronik 865250442003 or equivalent
C23	SMD aluminum electrolytic capacitor	10 µF / 25 V	Diam. 4mm, 4x6 mm Würth Elektronik 865230440002 or equivalent
C23A	SMT ceramic capacitor	N.M.	Size 0805
C26, C28, C30	SMT ceramic capacitor	2.2 pF / 25 V	Size 0603
C31, C33, C42, C47, C49, C50	SMT ceramic capacitor	100 nF / 25 V	Size 0603
C34	THT electrolytic capacitor	82 µF / 450 V	Diam. 18 mm, pitch 7.5 mm Chemi-con EKHF451ELL820MM20S or equivalent
C39, C40, C41	SMT ceramic capacitor	10 pF / 25 V	Size 0603
C44, C45, C46	SMT ceramic capacitor	4.7 pF / 50 V	Size 0603
C48	SMT ceramic capacitor	4.7 µF / 10 V	Size 0805
D1, D5, D6, D7, D8, D9, D11, D15, D16, D17, D18, D19, D20, D21, D22, D23	40 V, 300 mA small signal Schottky SMT Diode	BAT54J	SOD-323 STMicroelectronics BAT54JFILM or equivalent
D2, D3, D4	Turbo 2 ultrafast high-voltage rectifier	STTH1L06A	SMA STMicroelectronics STTH1L06A or equivalent
D10	Zener diode 3.3 V	BZT52C3V3	SOD-123
D24, D25, D26	800 V, 200 mA fast recovery diode	RFU02VSM8S	TUMD2SM ROHM semiconductor RFU02VSM8S or equivalent
JP1, JP17	SMT jumper	CLOSED	Soldering pad
JP2, JP3	SMT jumper	OPEN	Size 0805

Part reference	Part description	Part value	Package / manufacturer' code
JP4	SMT jumper	OPEN	Soldering pad
JP10, JP11, JP12		N.M.	
JP18, JP19, JP20	SMT jumper	CLOSED 1-2	Soldering pad
JP21	SMT jumper	CLOSED 2-4	Soldering pads
J1	Connector terminal block T.H.	2 positions	Pitch 5.08 mm Phoenix contact 1715721 or equivalent
J2	Terminal block T.H.	3 positions	Pitch 5.08 mm Phoenix contact 1715857 or equivalent
J3	Terminal block T.H.	3 positions	Pitch 3.5 mm Würth Elektronik 691214110003 or equivalent
J4	Header vertical connector	2x17 pins	, Pitch 2.54 mm TE connectivity 3-1761603-1 or equivalent
J5	Strip connector	1x13 pins	Pitch 2.54 mm AMphenol FCI 68000-413HLF or equivalent
J6	Strip connector	1x5 pins	Pitch 2.54 mm AMphenol FCI 68000-405HLF or equivalent
Q1, Q2, Q3, Q4, Q5, Q6	Trench gate field-stop IGBT, M series 650V, 6A low loss	STGD6M65DF2	DPAK STMicroelectronics
Q1A, Q2A, Q3A, Q4A, Q5A, Q6A	-	N.M.	PowerFLAT 8x8
R1, R7, R11, R15, R19, R25	SMT resistor	10 Ω	Size 0805
R2, R5, R8	SMT resistor	27 Ω	Size 0805
R3, R9, R12, R16, R21, R26	SMT resistor	100 Ω	Size 0805
R4, R10, R13, R17, R23, R27	SMT resistor	100 kΩ	Size 0603
R6, R62, R85, R112, R113, R117	SMT resistor	0 Ω	Size 0603
R14, R39	SMT resistor	47 kΩ	Size 0603
R18, R42, R47, R52, R61, R78, R79, R80	SMT resistor	10 kΩ	Size 0603
R20, R22, R24, R31, R32, R33, R34, R35, R37, R40, R72, R73, R74	SMT resistor	1 kΩ	Size 0603
R30, R57, R58	SMT resistor	220 mΩ / 2 W / 1%	Size 1210 or 2512
R36	SMT resistor	1.8 kΩ	Size 1206
R38	SMT resistor	27 kΩ	Size 0603
R41, R44, R46, R49, R51, R54, R75, R76, R77	SMT resistor	1.8 kΩ	Size 0603
R45, R50, R55, R68, R69, R70	SMT resistor	20 kΩ	Size 0603
R59, R71	SMT resistor	3.3 Ω	Size 0603
R60	SMT resistor	4.7 kΩ	Size 0603
R63, R82, R83, R84	SMT resistor	N.M.	Size 0603
R64, R65	SMT resistor	470 kΩ	Size 1206

Part reference	Part description	Part value	Package / manufacturer' code
R66	SMT resistor	6.49 kΩ	Size 0805
R67, R87, R93, R97	SMT resistor	1 kΩ	Size 0805
R86, R88, R92, R94, R96, R98	SMT resistor	180 kΩ	Size 1206
R91, R95, R99	SMT resistor	3.3 kΩ	Size 0603
R114	SMT resistor	33 kΩ	Size 0603
R115	SMT resistor	10 MΩ	Size 0603
TP1, 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, TP31, TP32	Test point for probe	-	Diam. 1.27, hole 0.8mm
TP29	Red bead terminal	-	Diam. 2,54 , hole 1 mm Vero technologies 20-313137 or equivalent
TP30	Black bead terminal	-	Diam. 2,54 , hole 1 mm Vero technologies 20-2137 or equivalent
U1	600 V triple half-bridge high-voltage gate driver	STDRIVE631P STDRIVE631N	SO-28 STMicroelectronics
U2, U3	Dual rail-to rail input/output 8 MHz operational amplifiers	TSV912IQ2T	DFN8 2x2 STMicroelectronics
U4	Rail-to-rail 1.8 V high-speed comparator	TS3021ILT	SOT23-5 STMicroelectronics

4 Layout and component placements

Figure 3. **Board layout - component placement top view**

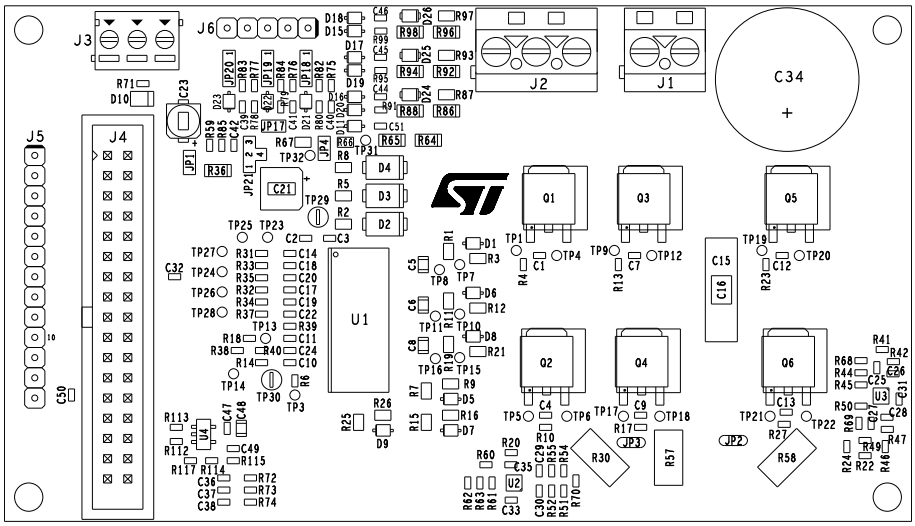


Figure 4. **Board layout - top layer**

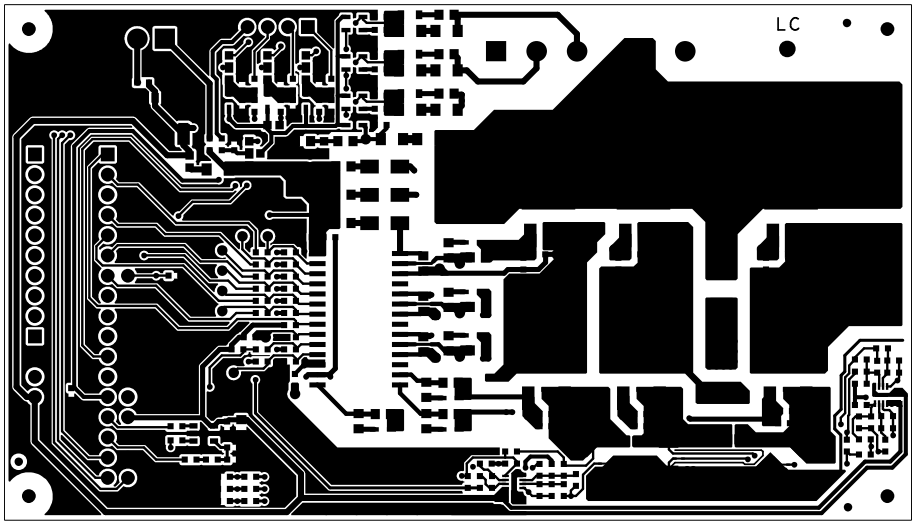
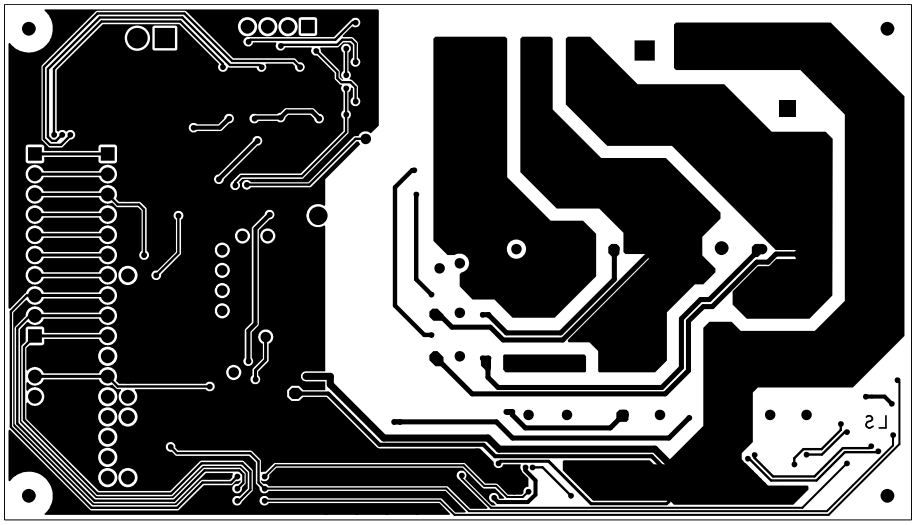


Figure 5. **Board layout - bottom layer**



Revision history

Table 2. **Document revision history**

Date	Version	Changes
01-Apr-2026	1	Initial release.