

3000 W photovoltaic converter for grid-connected applications

Data brief

Features

- DC-DC input voltage: 200 V to 400 V
- DC-DC output voltage: 450 V
- DC-AC output voltage: 230 Vac
- Nominal output power: 3 kW
- DC-AC switching frequency: 17 kHz
- DC-DC switching frequency: 35 kHz
- Transformer turns ratio: 1.2
- Grid voltage: 230 V_{rms} +/-20%
- Grid frequency: 50 Hz
- Power factor: above 10%; rated power > 0.9
- THD @ full load: < 5%
- RoHS compliant

Description

In recent years, interest in photovoltaic (PV) applications has grown exponentially. Because PV systems require an electronic interface to be connected to the grid or standalone loads, the PV market has become appealing for many power electronics manufacturers.

The STEVAL-ISV002V1 demonstration board implements a conversion system for PV applications with the aim of achieving high efficiency and significant reduction in production costs. It consists of a high-frequency isolated input power section which performs the DC-DC conversion, and an inverter section capable of delivering sinusoidal current at 50 Hz to the grid.

The system operates with input voltages in the range of 200 V to 400 V, and is tied to the grid at 230 V_{rms}, 50 Hz, through an LCL filter.

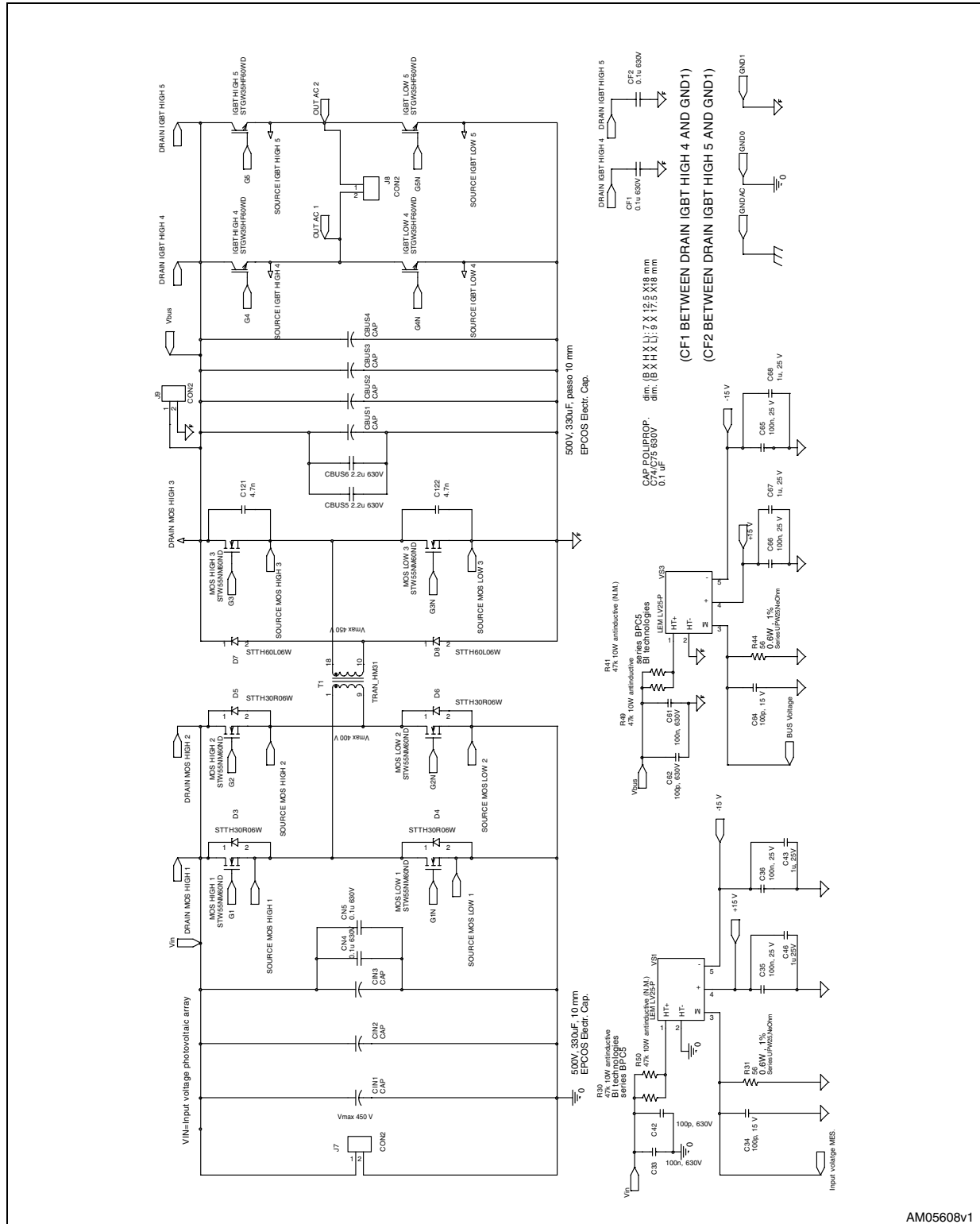
Other unique characteristics of the proposed converter are integration level, decoupled active and reactive power control and flexibility towards the source.



A fully digital control algorithm, including power management for grid-connected operation and MPPT (maximum power point tracking) algorithm, has been implemented on a dedicated control board, equipped with a latest-generation 32-bit (STM32) microcontroller.

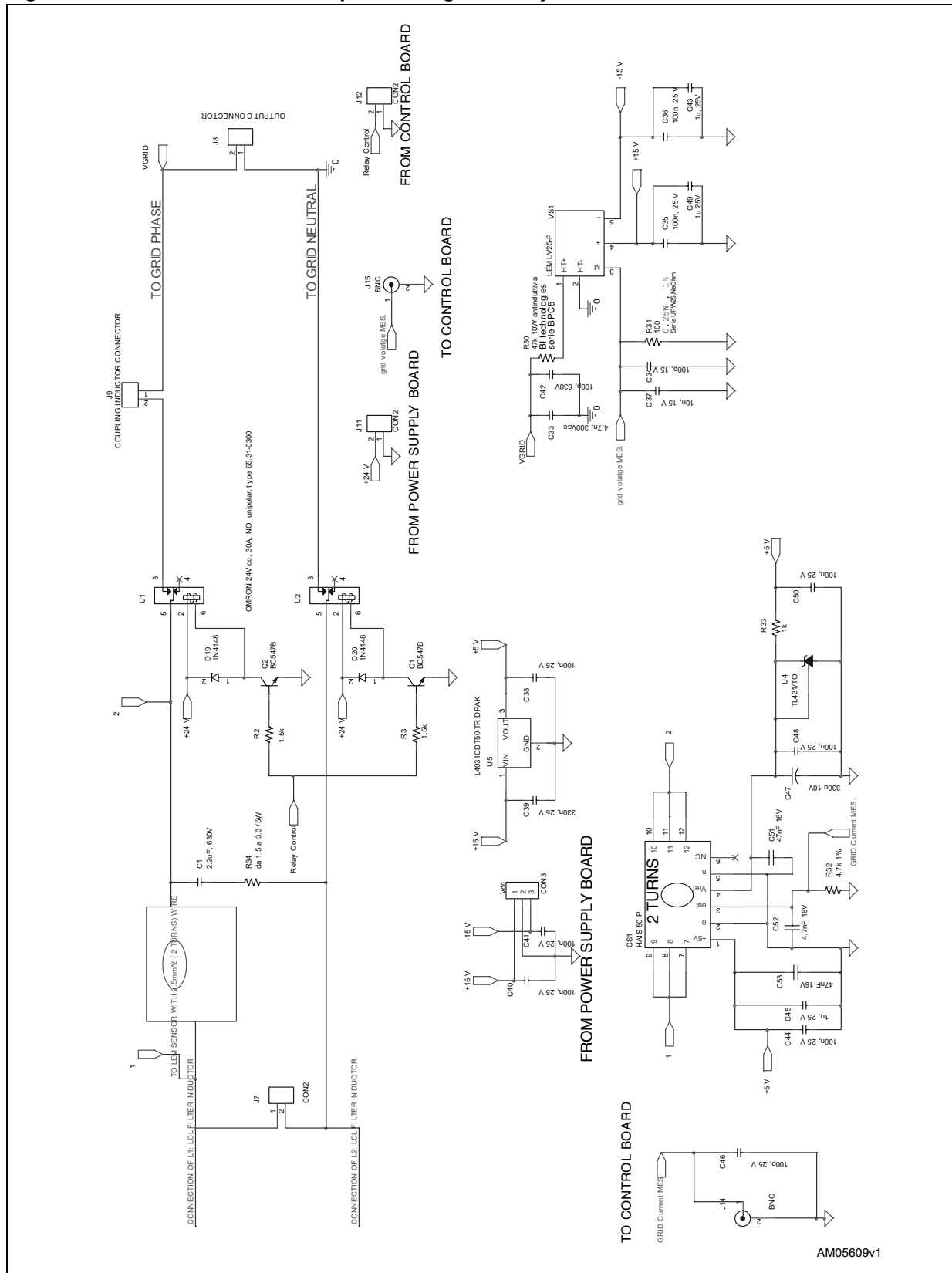
1 Schematic diagrams

Figure 1. STEVAL-ISV002V1 power stage circuit schematic



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Figure 2. STEVAL-ISV002V1 output sensing and relay board schematic



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Figure 3. STEVAL-ISV002V1 AC voltage measurement circuit schematic

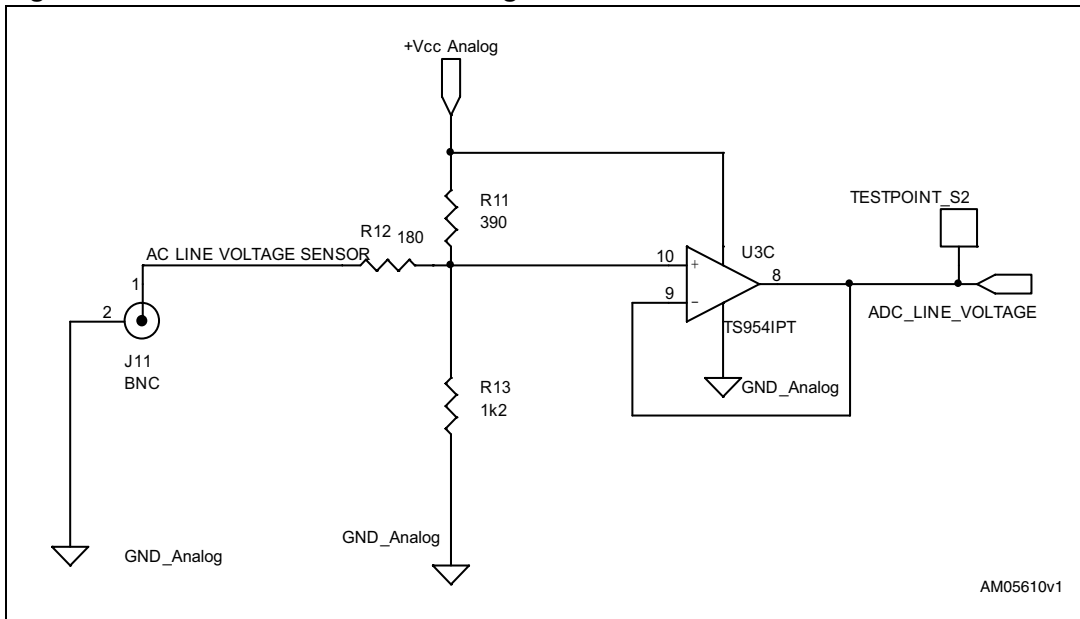


Figure 4. STEVAL-ISV002V1 line current conditioning circuit schematic

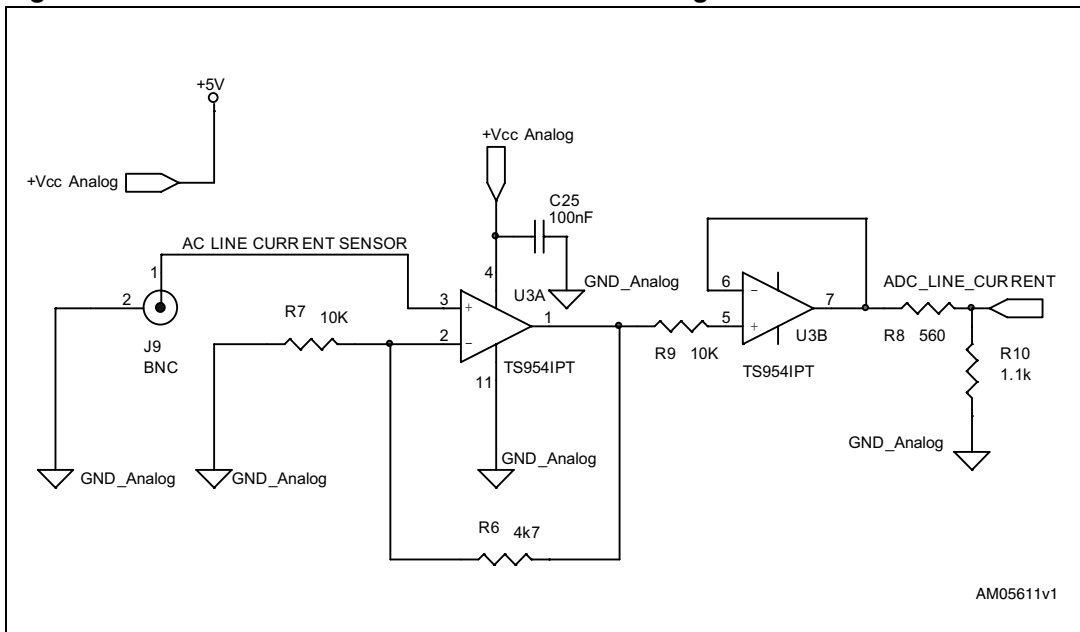


Figure 5. STM32 microcontroller circuit schematic

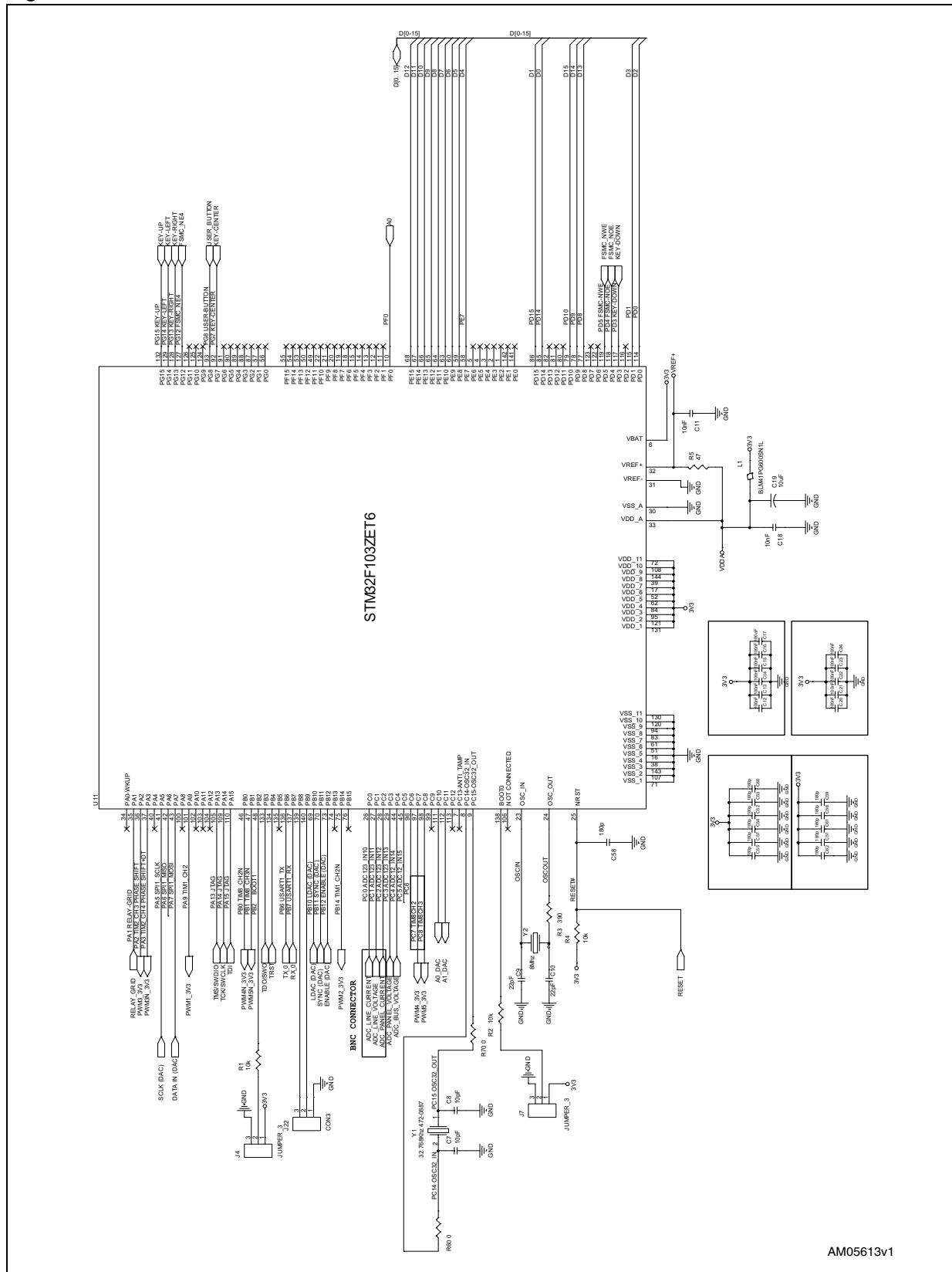


Figure 6. DC-DC converter driver circuit schematic

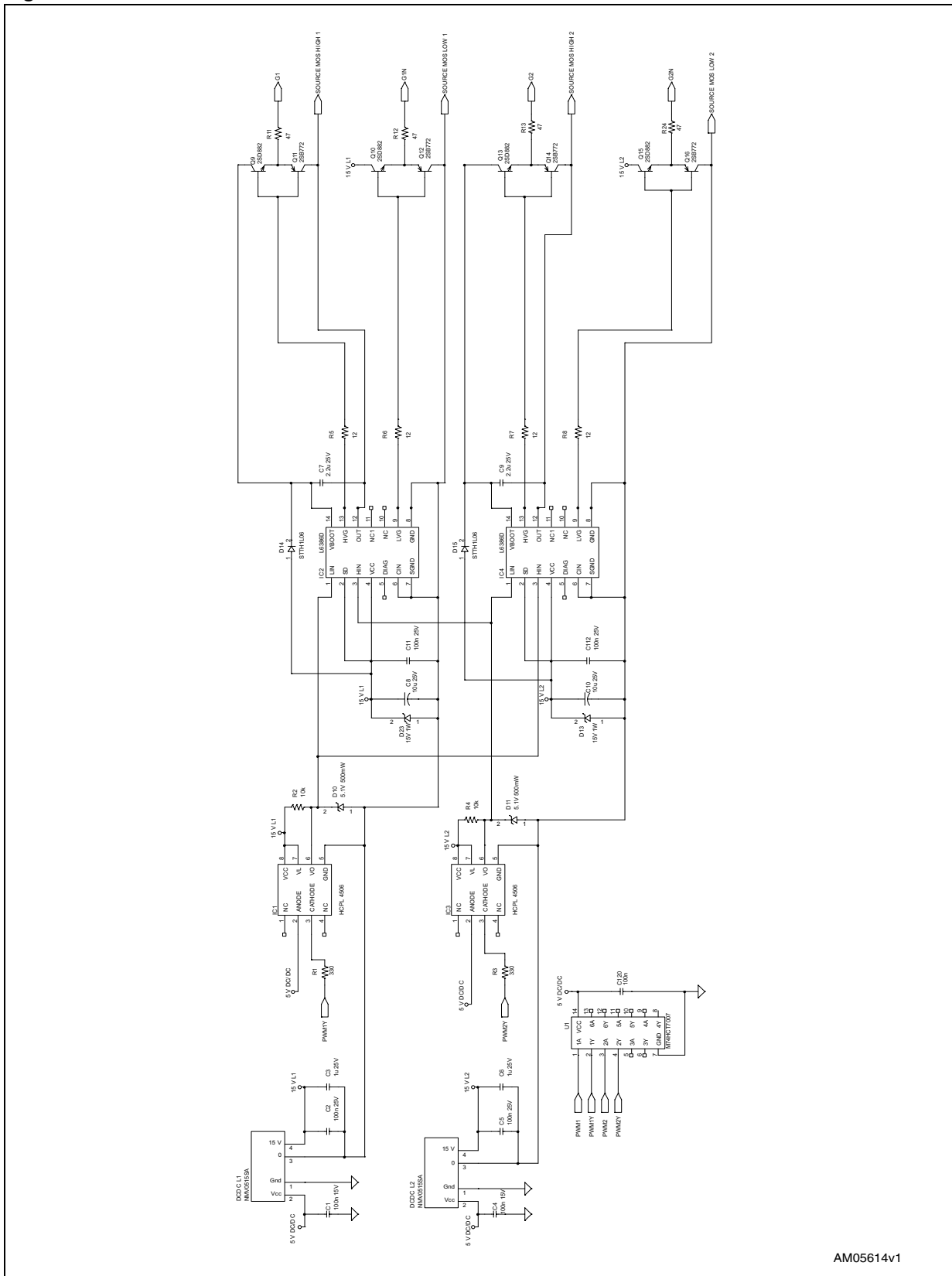


Figure 7. DC-AC converter driver circuit schematic

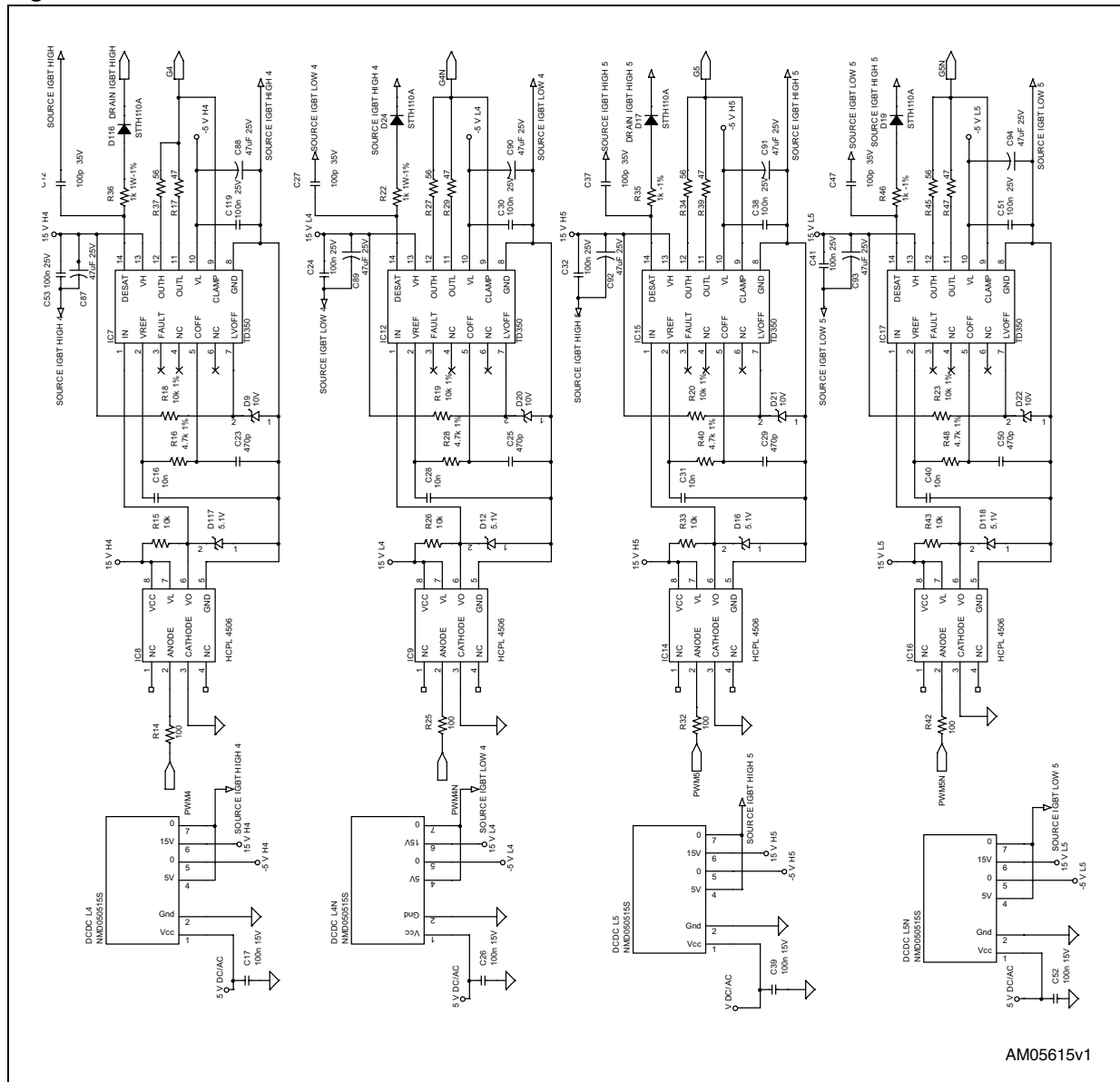
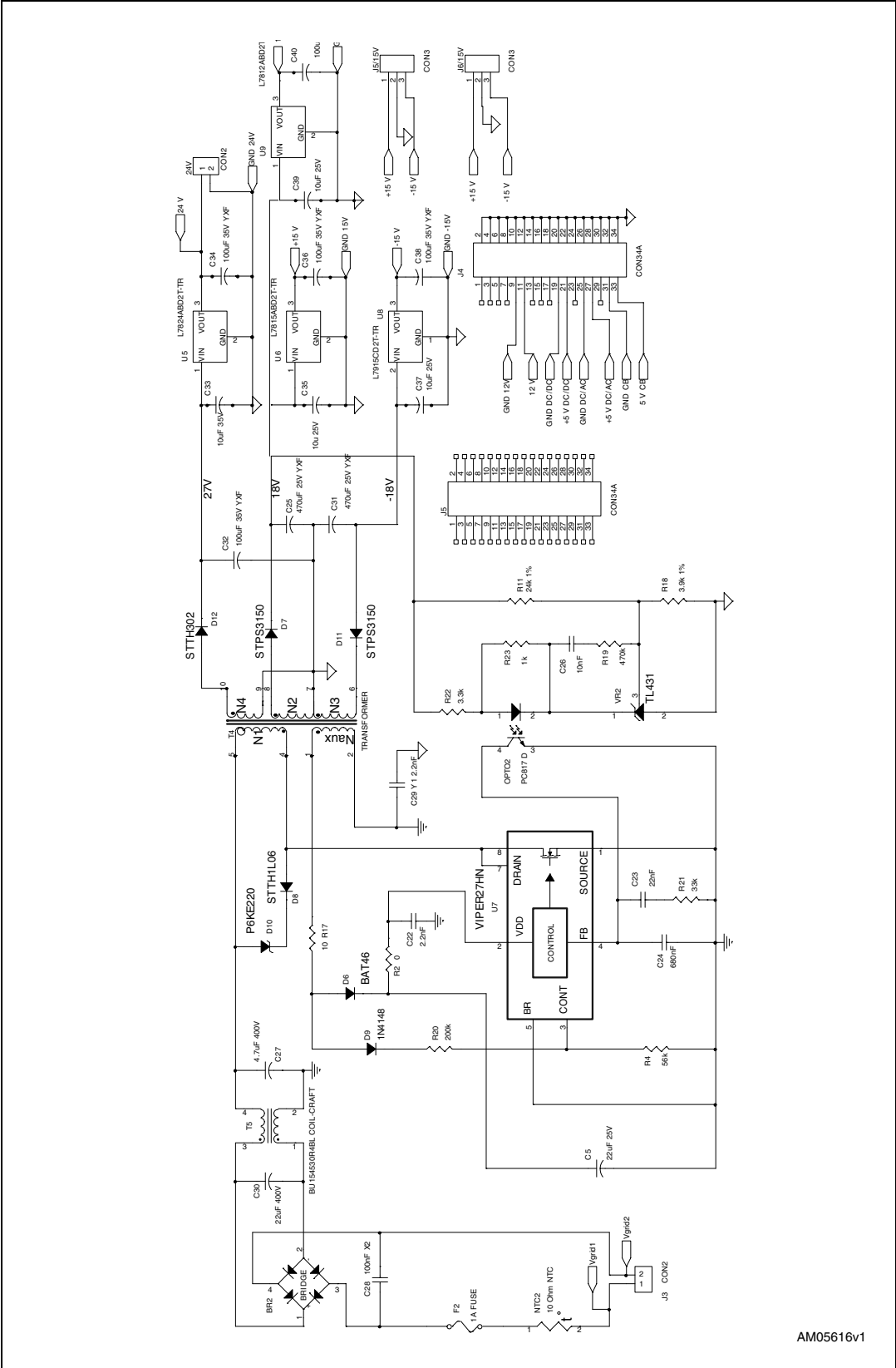


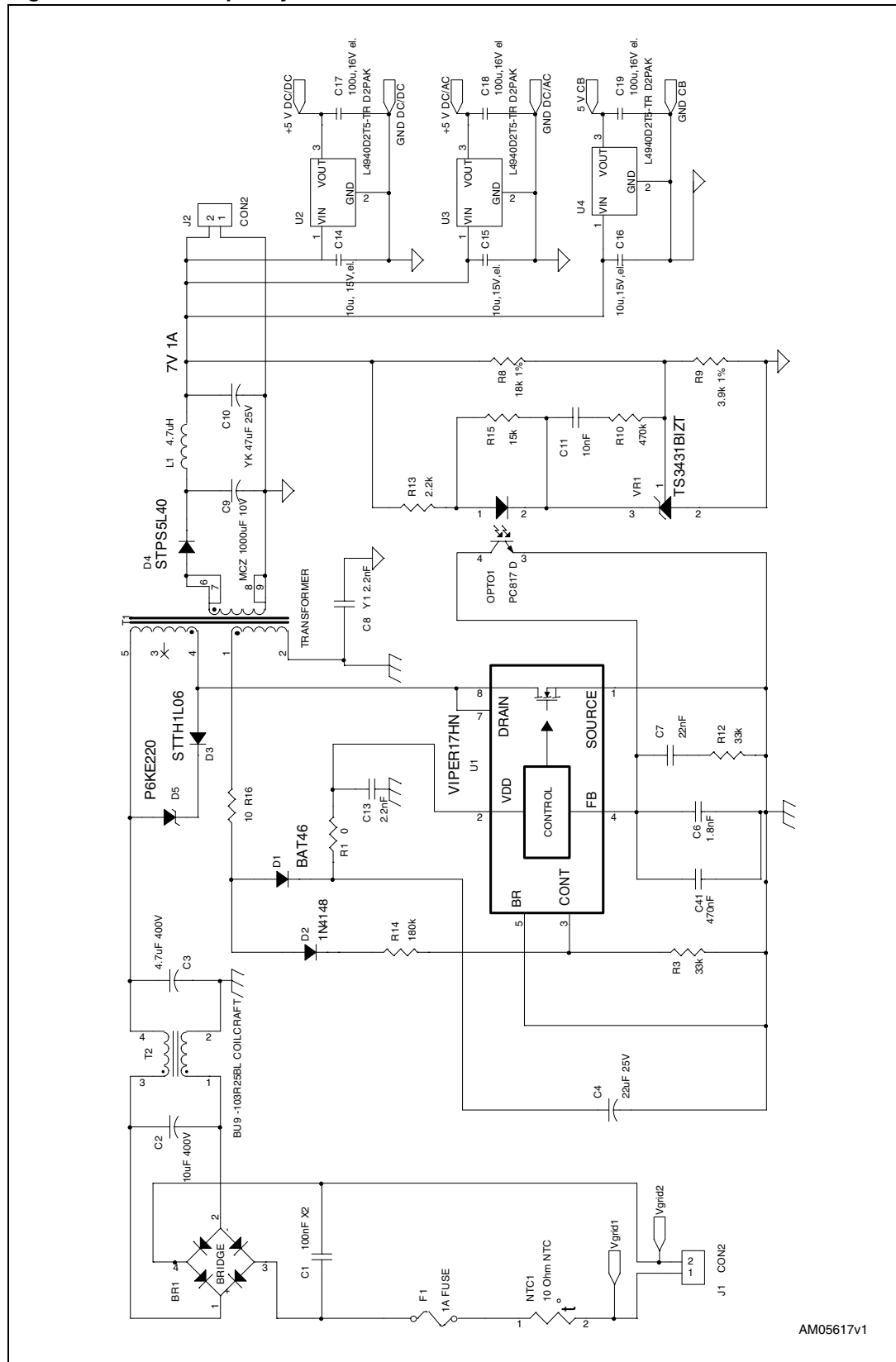
Figure 8. 5 V, 1 A flyback converter with VIPER17HN schematic



AM05616v1



Figure 9. Multi-output flyback converter with VIPER27HN schematic



2 Revision history

Table 1. Document revision history

Date	Revision	Changes
05-Mar-2010	1	Initial release.
27-Oct-2010	2	<ul style="list-style-type: none"><li data-bbox="676 517 1412 607">– Updated IGBT part numbers in <i>Figure 1: STEVAL-ISV002V1 power stage circuit schematic on page 2</i> from STGW35NC60WD to STGW35HF60WD.<li data-bbox="676 607 1412 674">– Minor changes to placement and font sizes of component labels in all schematic diagrams to improve readability.

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