

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

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

The STEVAL-ISV002V2 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.

Figure 1. STEVAL-ISV002V2 power stage circuit schematic

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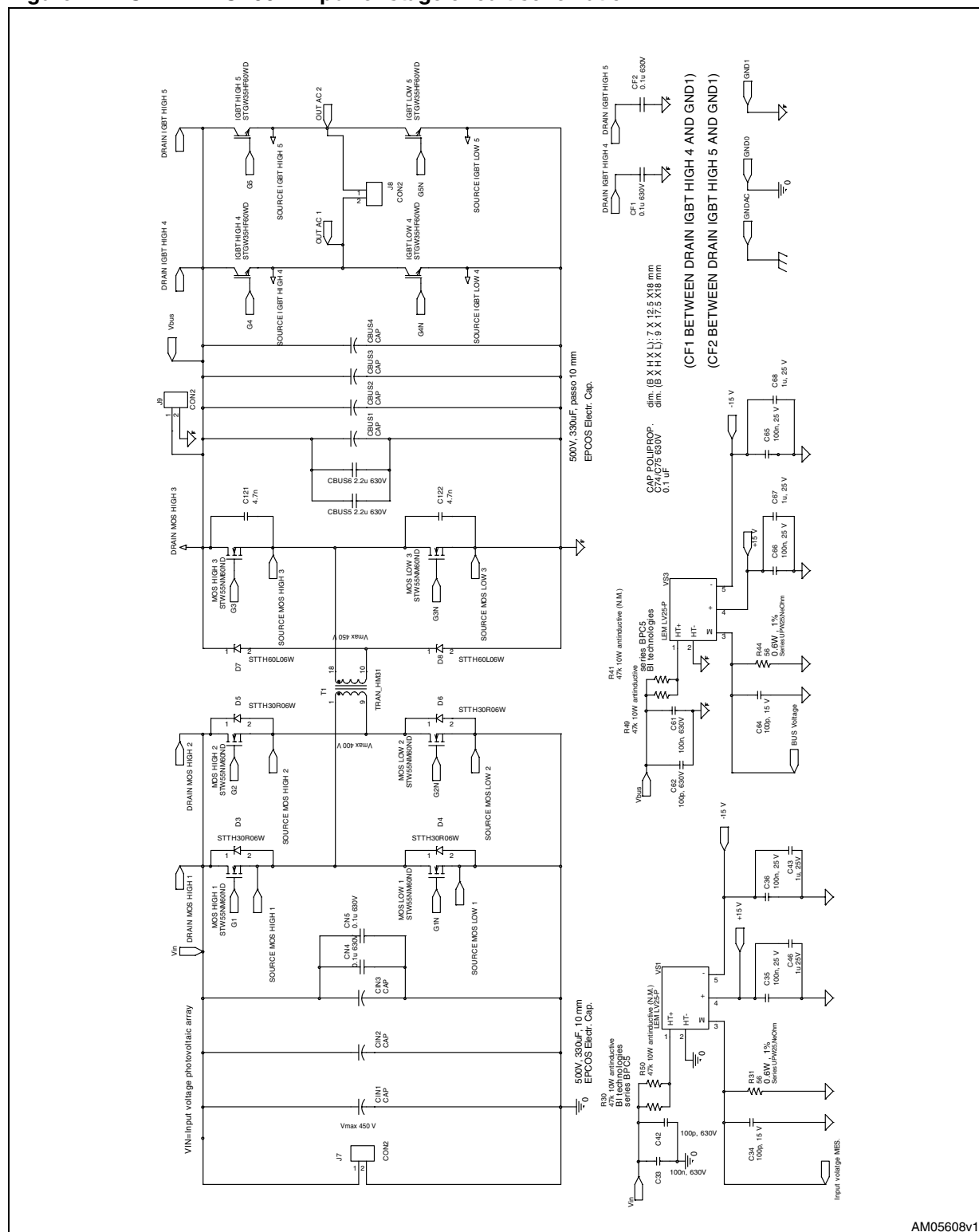


Figure 2. STEVAL-ISV002V2 output sensing and relay board schematic

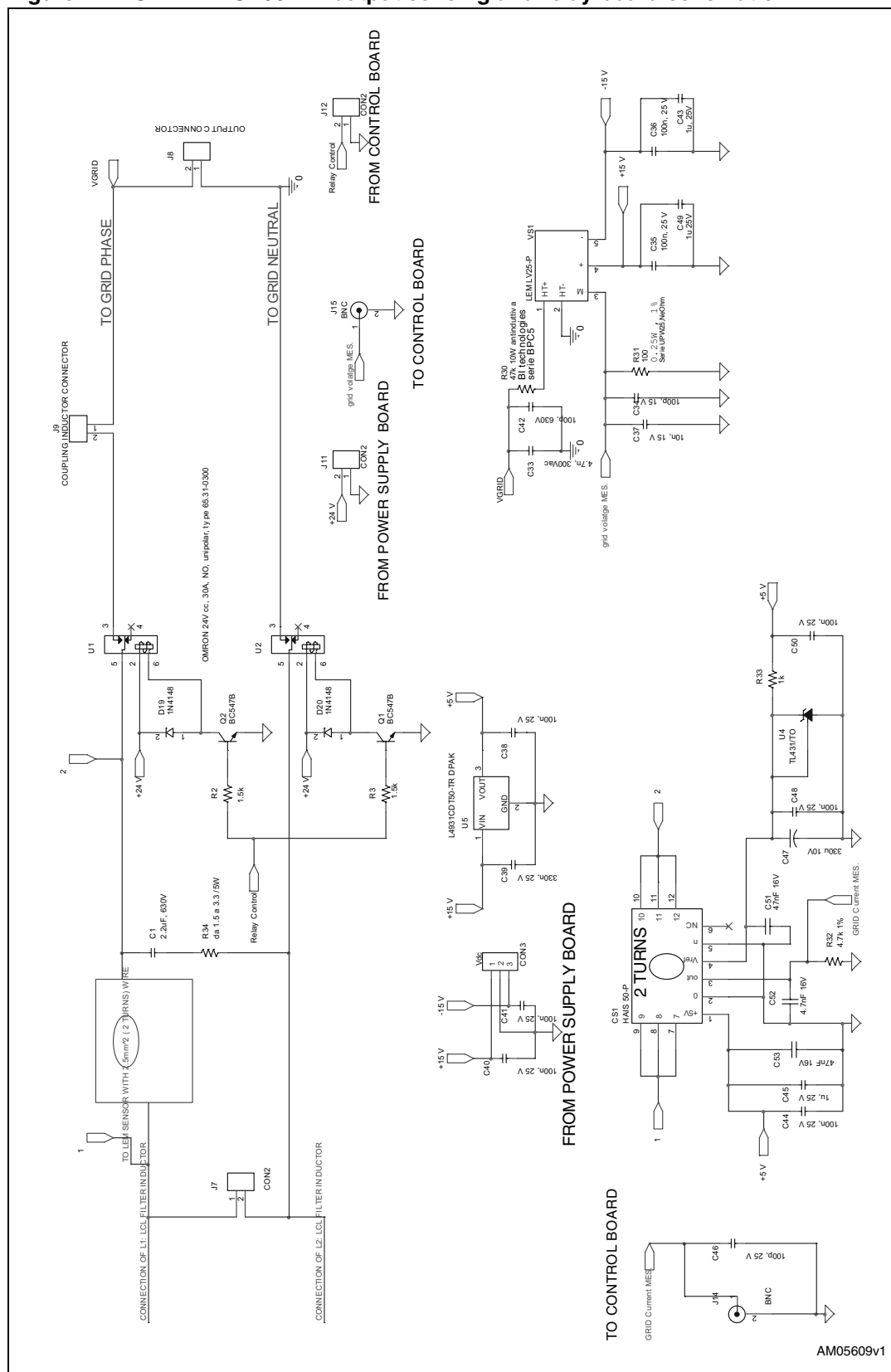


Figure 3. STEVAL-ISV002V2 AC voltage measurement circuit schematic

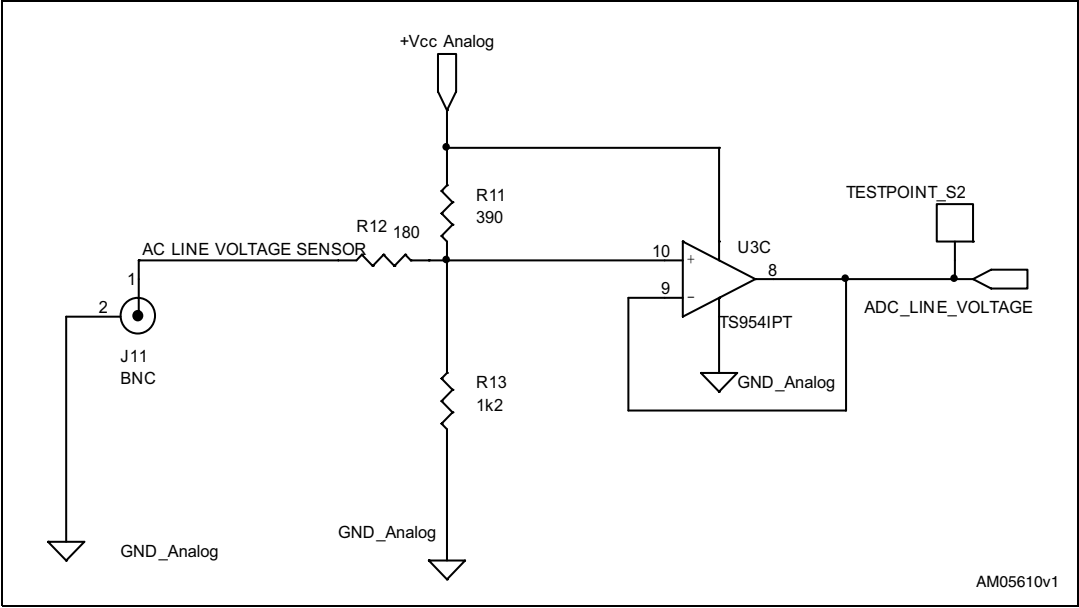


Figure 4. STEVAL-ISV002V2 line current conditioning circuit schematic

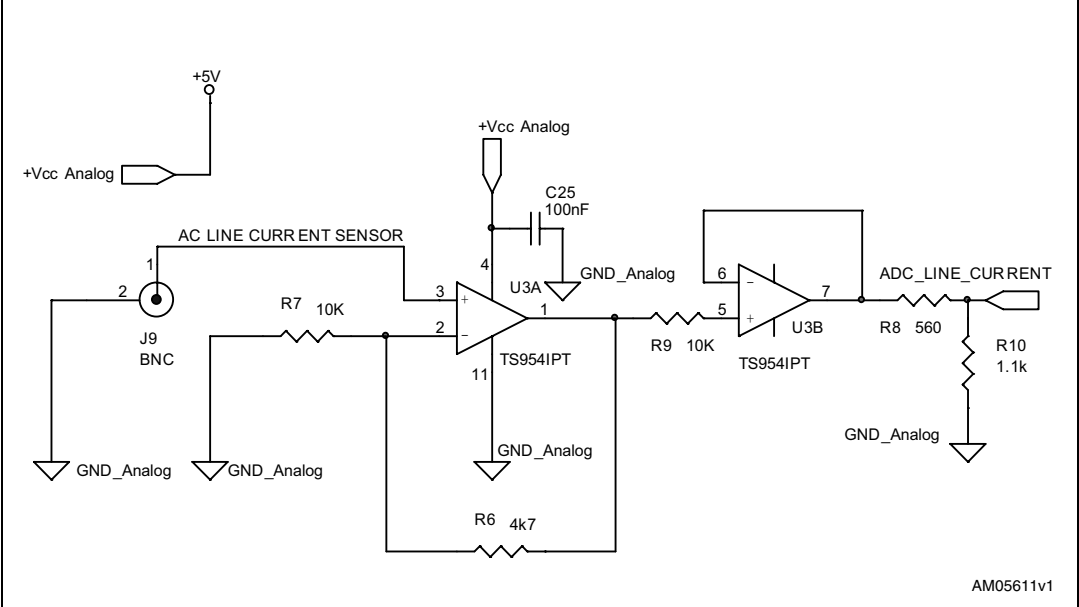


Figure 5. STM32 microcontroller circuit schematic

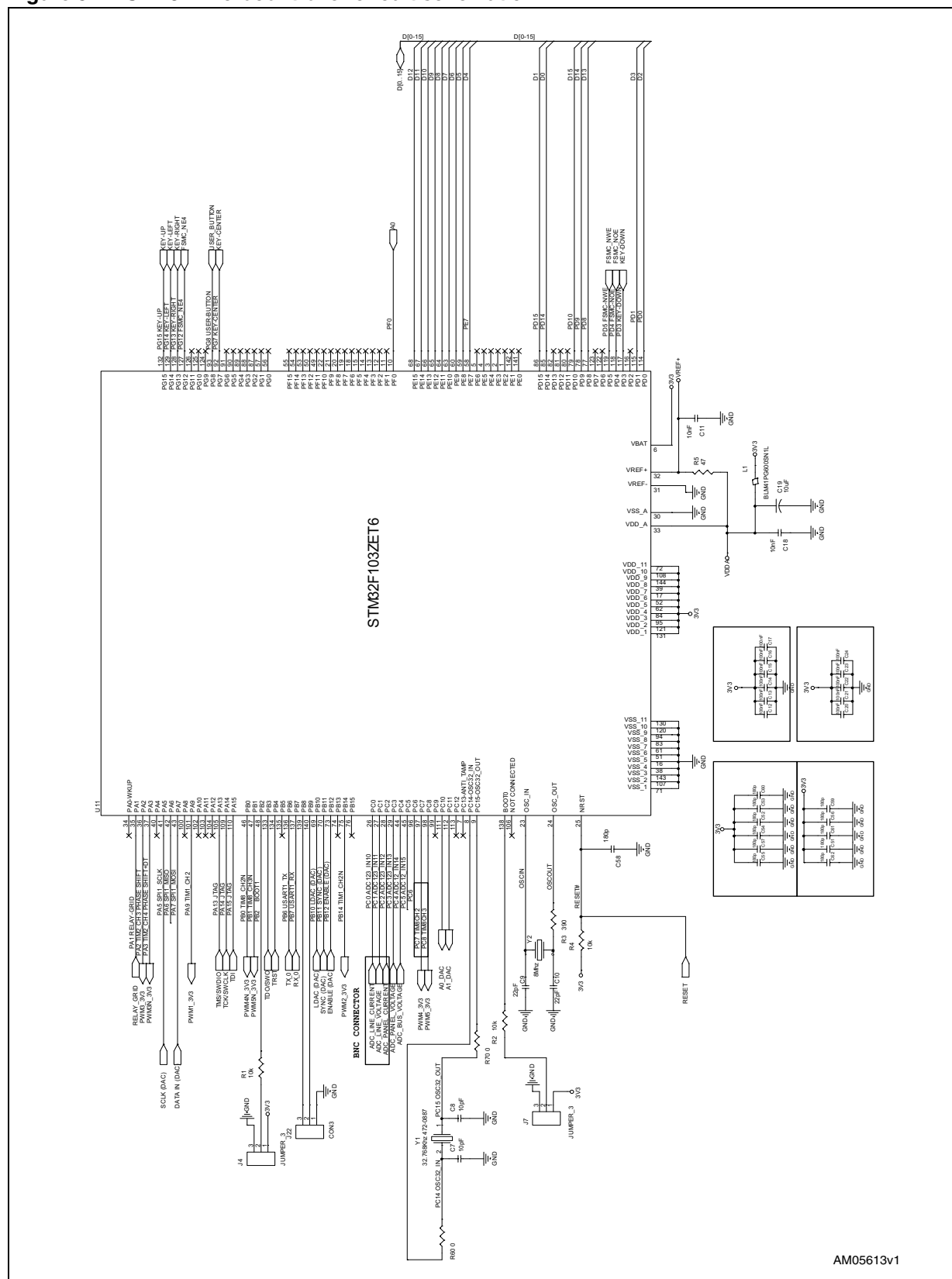


Figure 6. DC-DC converter driver circuit schematic

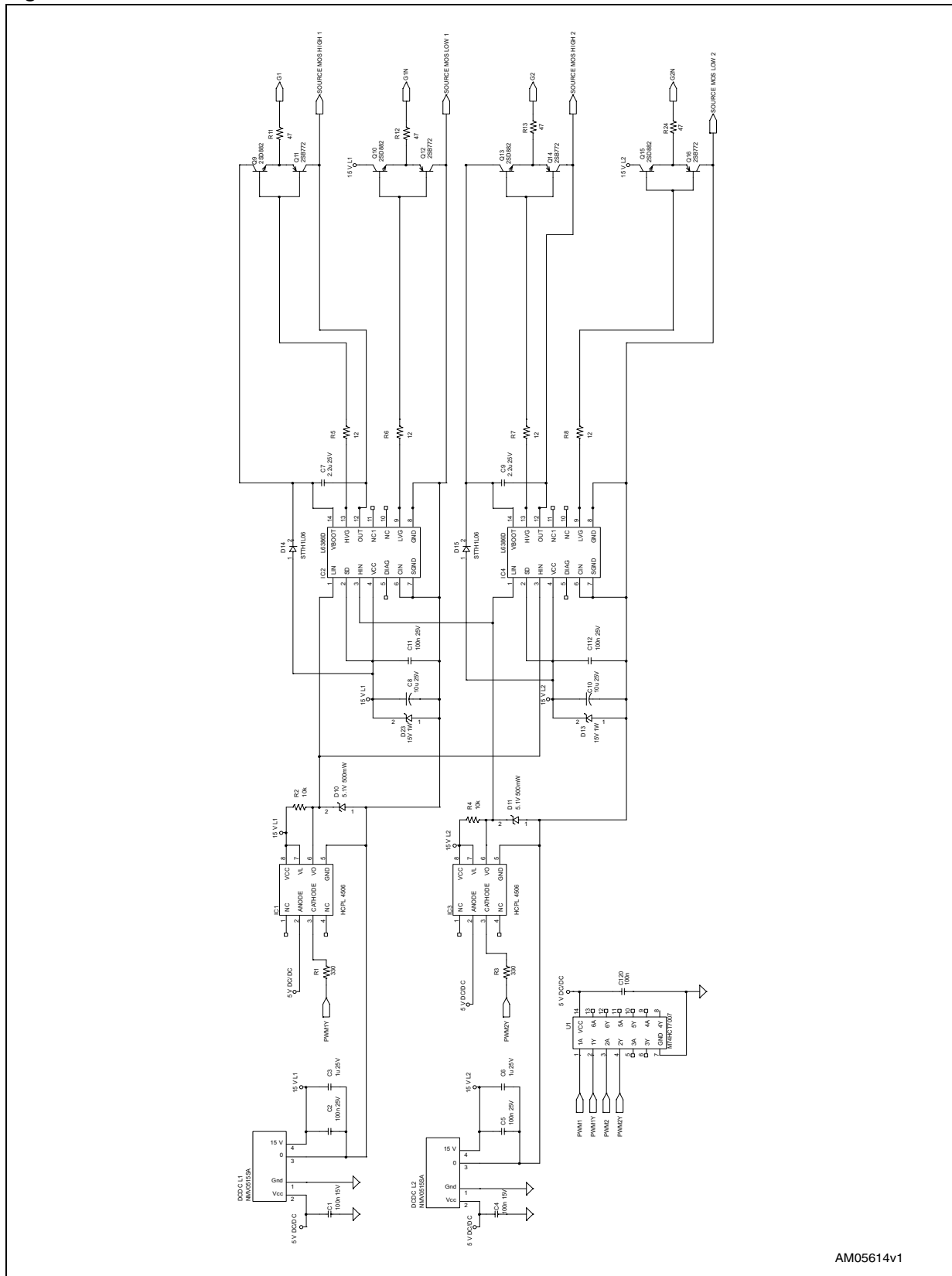


Figure 7. DC-AC converter driver circuit schematic

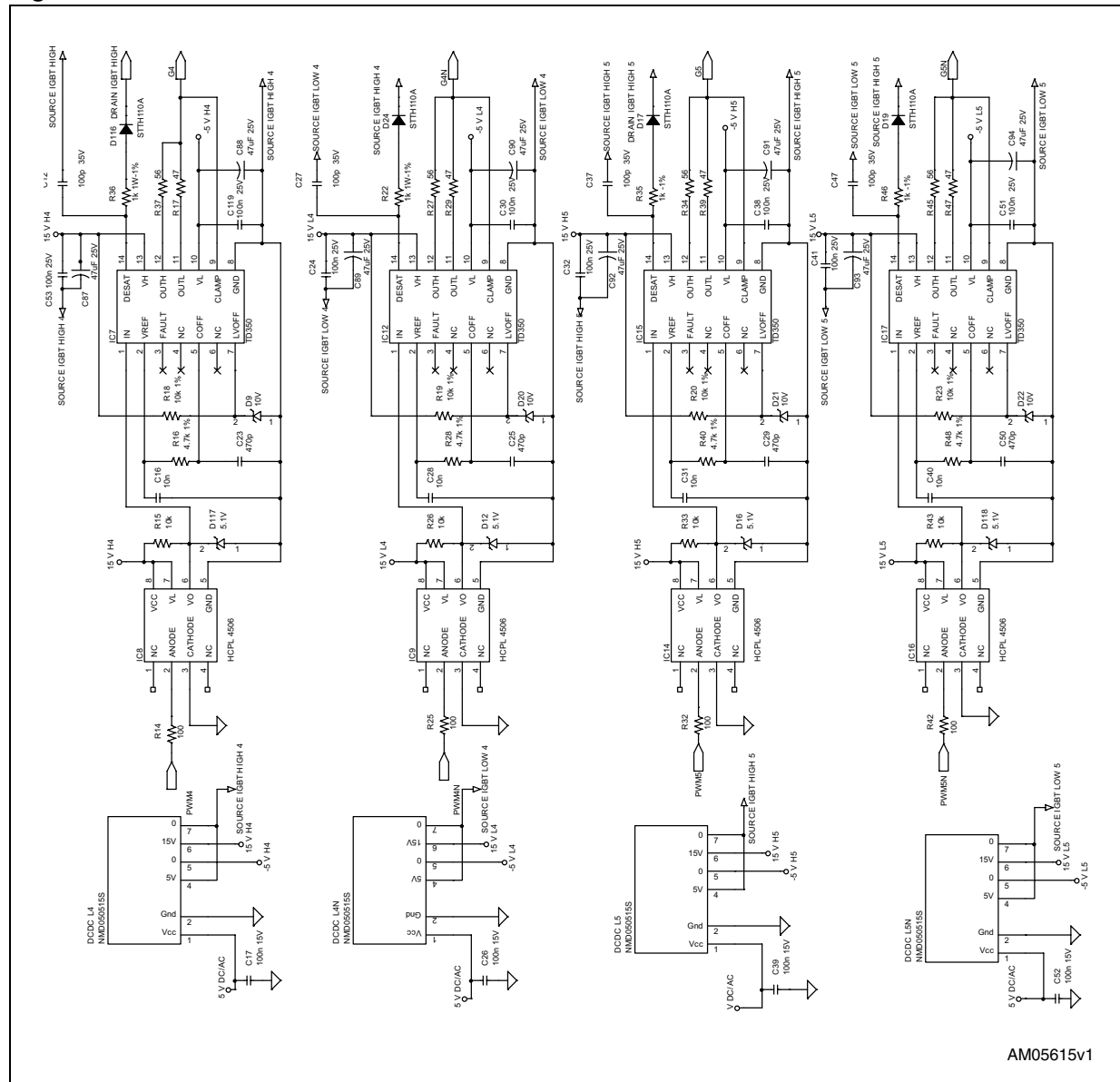
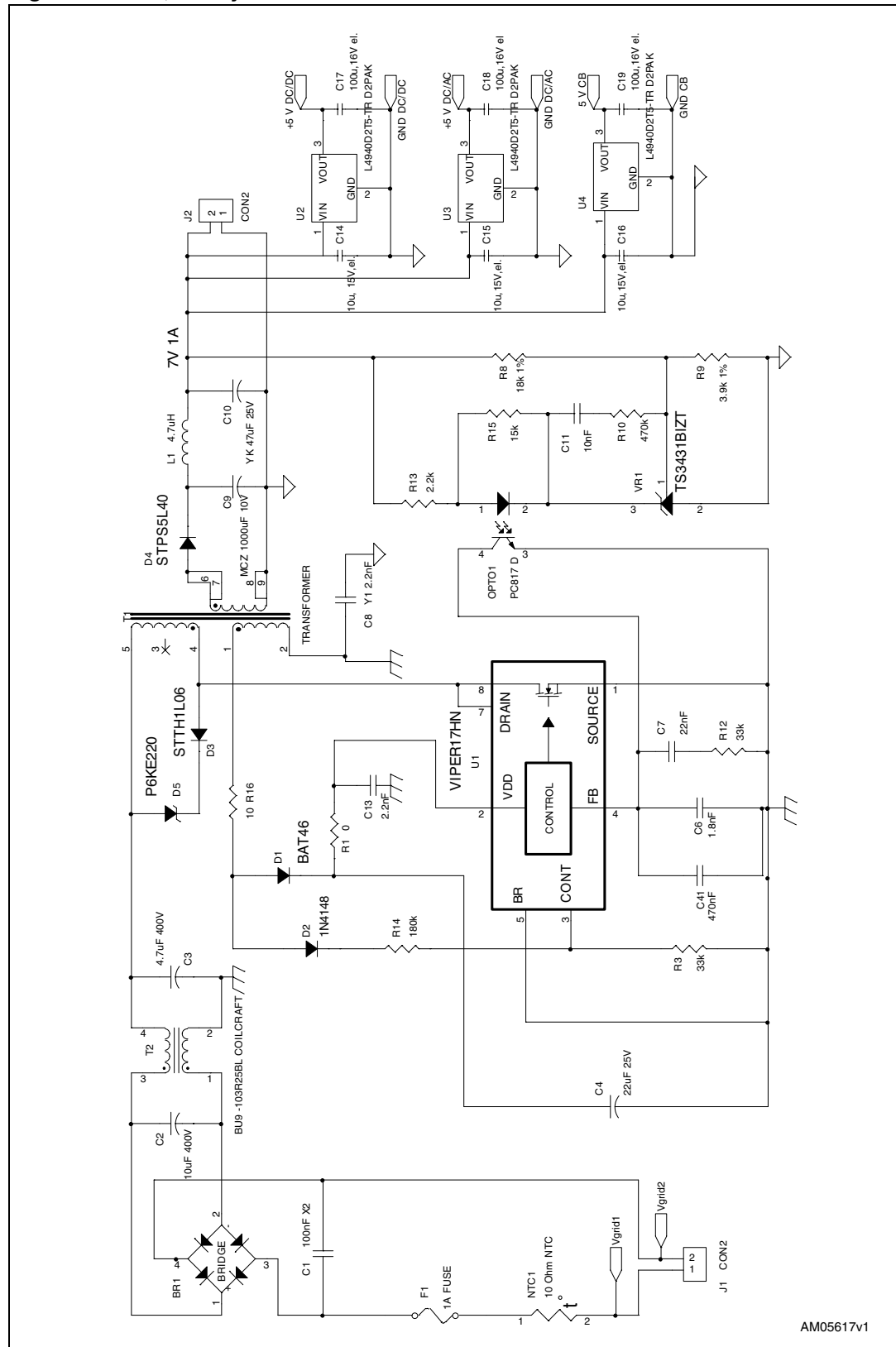
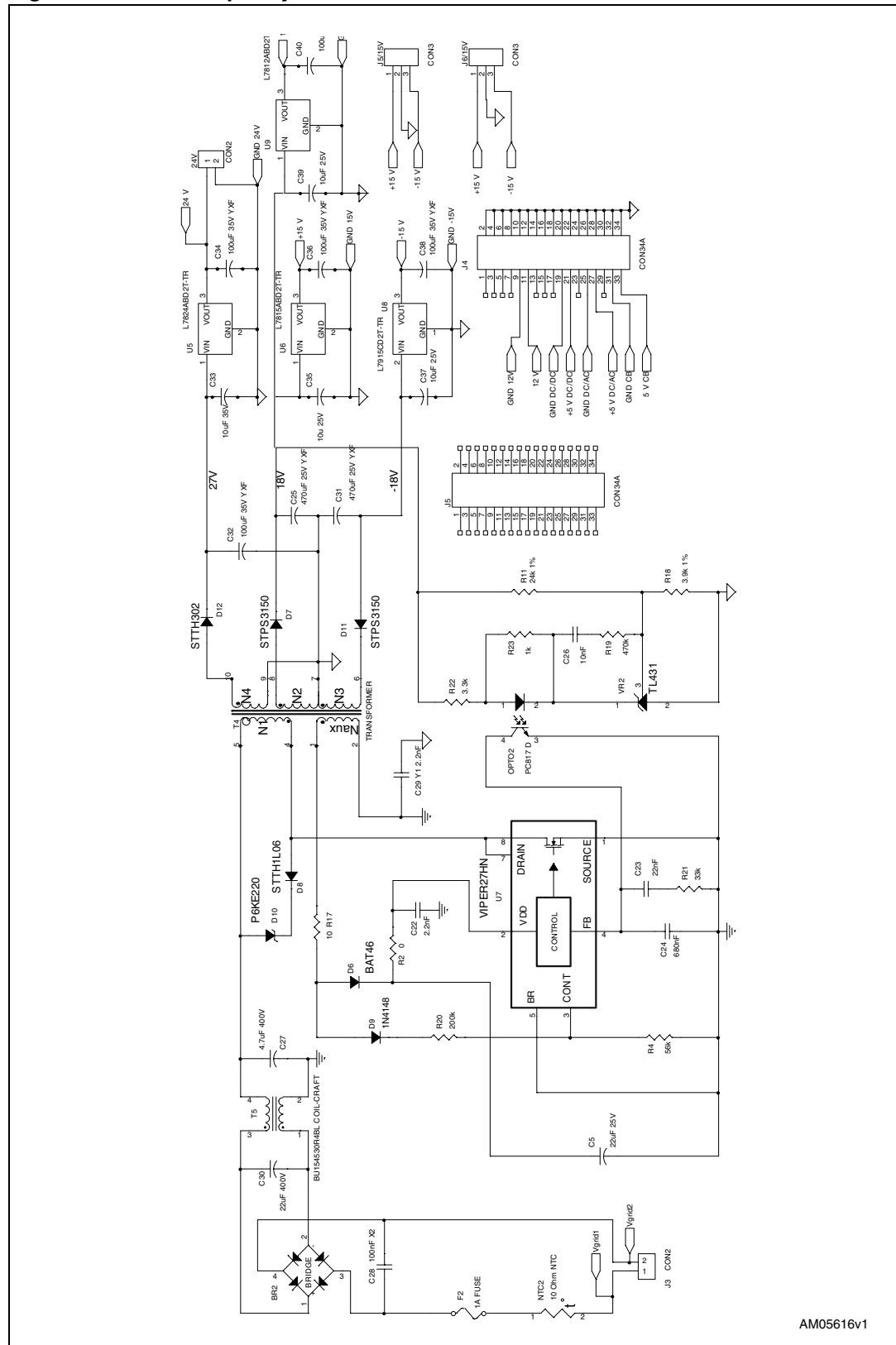


Figure 8. 5 V, 1 A flyback converter with VIPER17HN schematic



AM05617v1

Figure 9. Multi-output flyback converter with VIPER27HN schematic



2 Revision history

Table 1. Document revision history

Date	Revision	Changes
24-Jan-2012	1	Initial release.

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