STEVAL-ISV003V1

250 W microinverter for plug-in PV panels demonstration board

Data brief

Features

- Input voltage range from 20 V to 40 V
- Output voltage 230 V AC, 50 Hz
- Grid connection algorithm and MPPT capability
- Digital control section managed by the STM32
- Reactive power management
- RS-232 for communication
- RoHS compliant

Description

The STEVAL-ISV003V1 is a demonstration board which implements the microinverter concept and is designed to optimize the power production of each single solar panel by means of DC-AC conversion. The conversion system is capable of both grid synchronization and maximum power point tracking (MPPT) thanks to the use of an advanced control algorithm implemented in the 32-bit STM32 microcontroller. The MPPT function is based on the perturb and observe (P & O) concept which seeks the best operating point of the panel, thus maximizing the energy produced under any environmental condition. The grid synchronization algorithm has the advantage over standard solutions of a decoupled control of active and reactive power. The STEVAL-ISV003V1 demonstration board uses a high-frequency (HF) isolated DC-DC converter with interleaved current and an optimized full-bridge DC-AC inverter. The typical solar panel voltage is first stepped up to about 400 V and then converted into AC to create a sinusoidal output.

An LED display provides a user-friendly interface for the end user which allows the monitoring and/or modifying of some of the main operating parameters. Two modes of operation are available and can be selected to allow either open-loop operation or closed-loop operation in synchronization with the grid.



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In open-loop mode the sinusoidal reference is created internally by means of a standard lookup table, while in closed-loop mode, a sinusoidal voltage feedback which is proportional to the grid voltage is used. This system can be connected to a 50 Hz network (STEVAL-ISV003V1) and to a 60 Hz network (STEVAL-ISV003V2), based on local requirements. The RS-232 interface can be used for serial data transfer of specified voltage, current and current signals.

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1 Schematic diagrams

Figure 1. Isolated interleaved boost converter

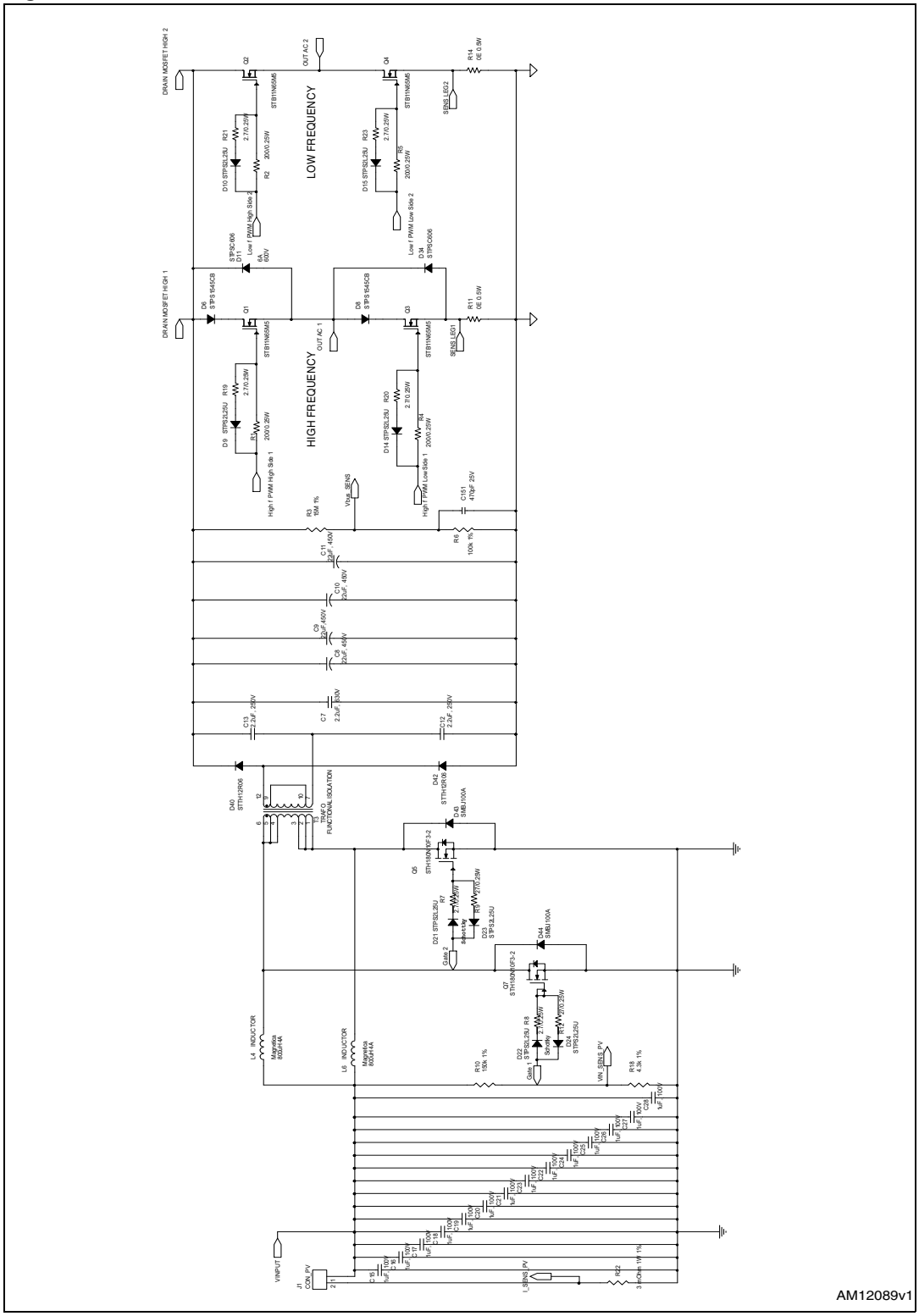


Figure 2. Power supply section - 15 V

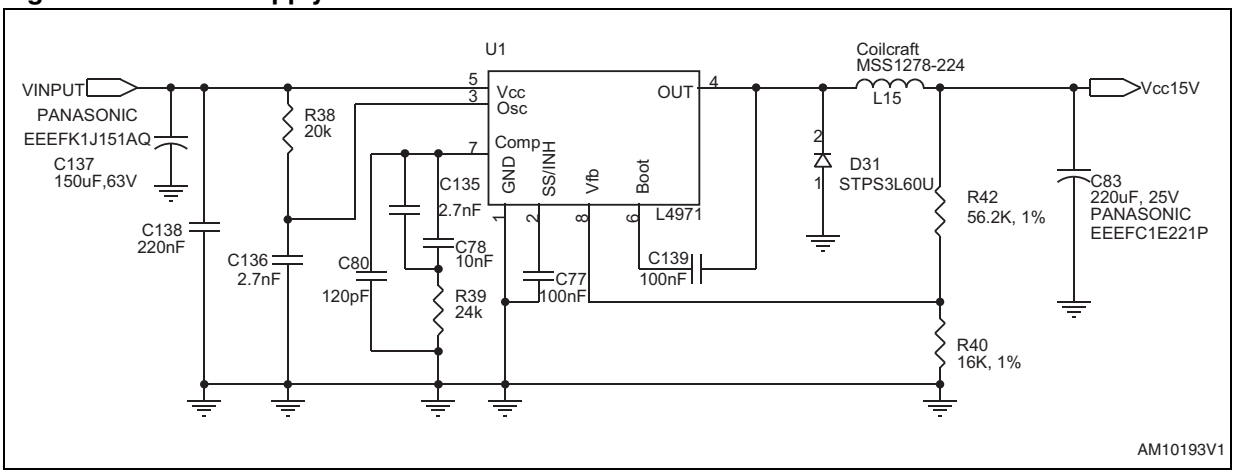


Figure 3. Power supply section - 5 V

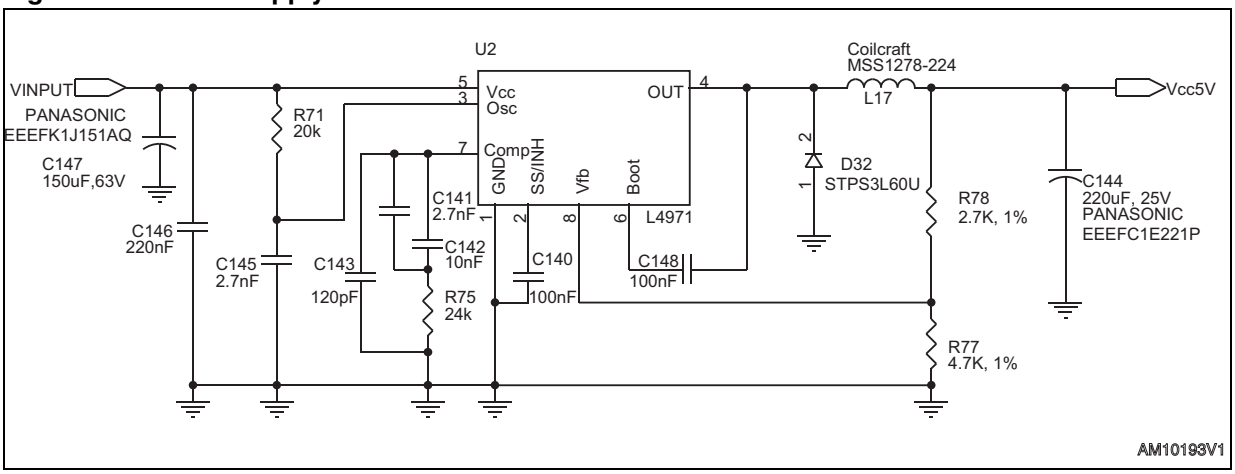


Figure 4. DC-DC drive section

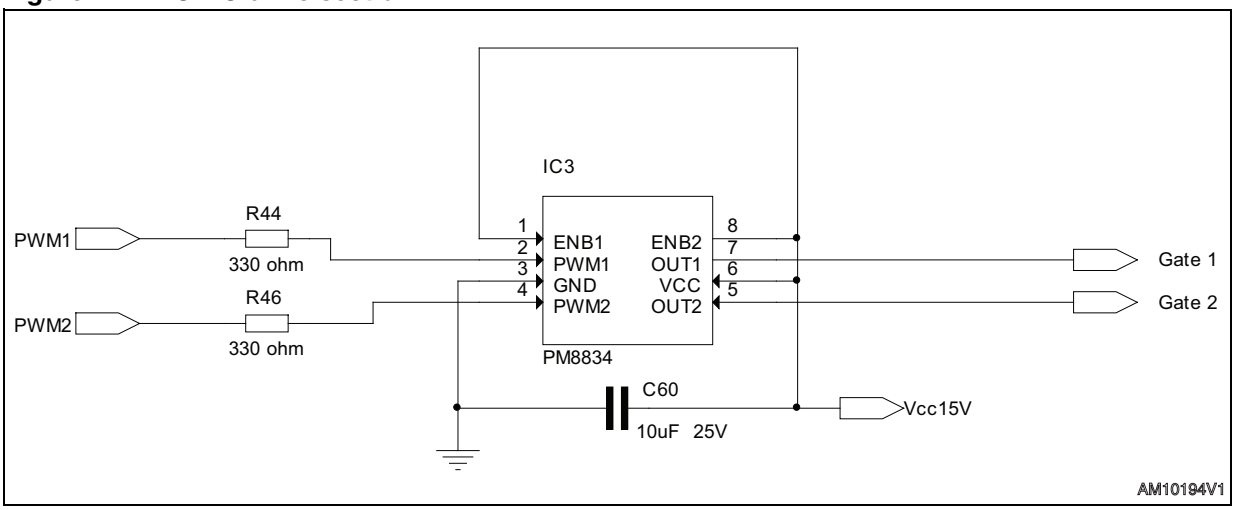


Figure 5. 5 V isolated

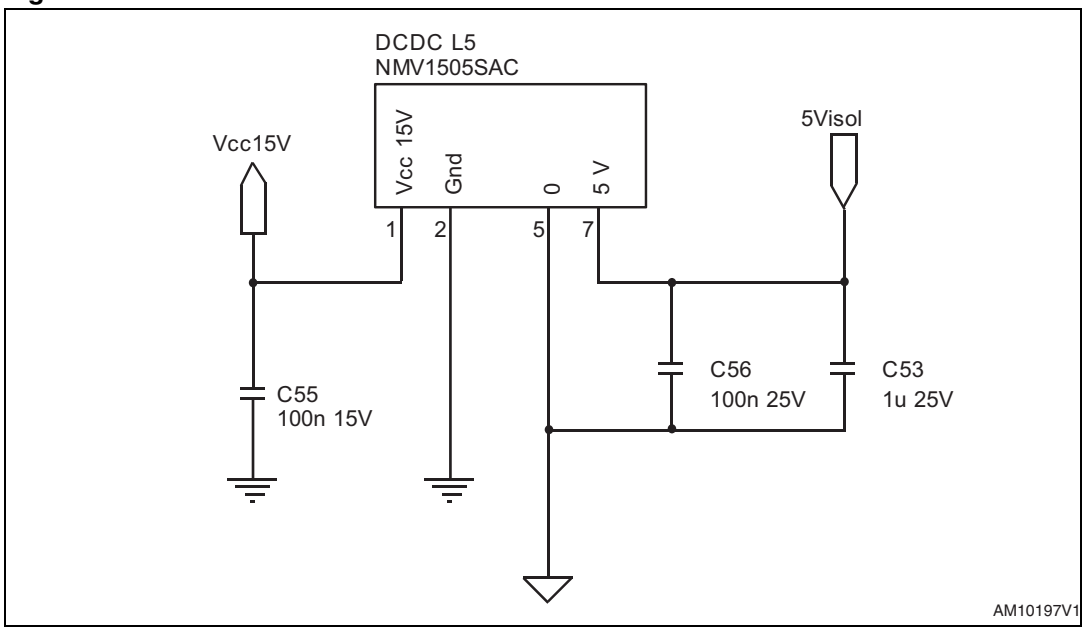


Figure 6. PV voltage sensing section

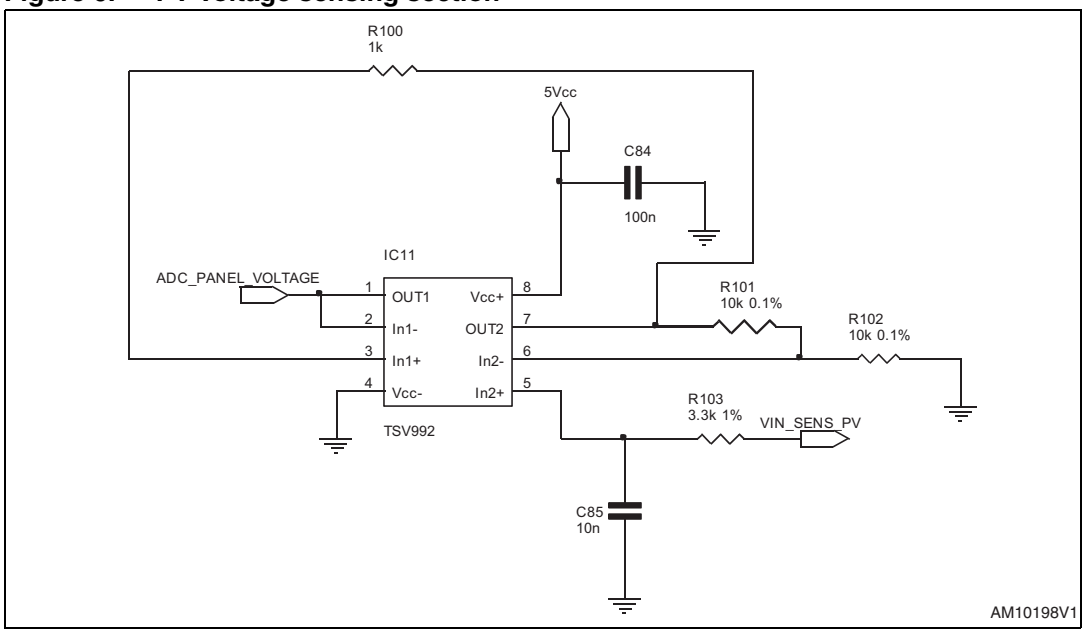


Figure 7. Output AC line filter

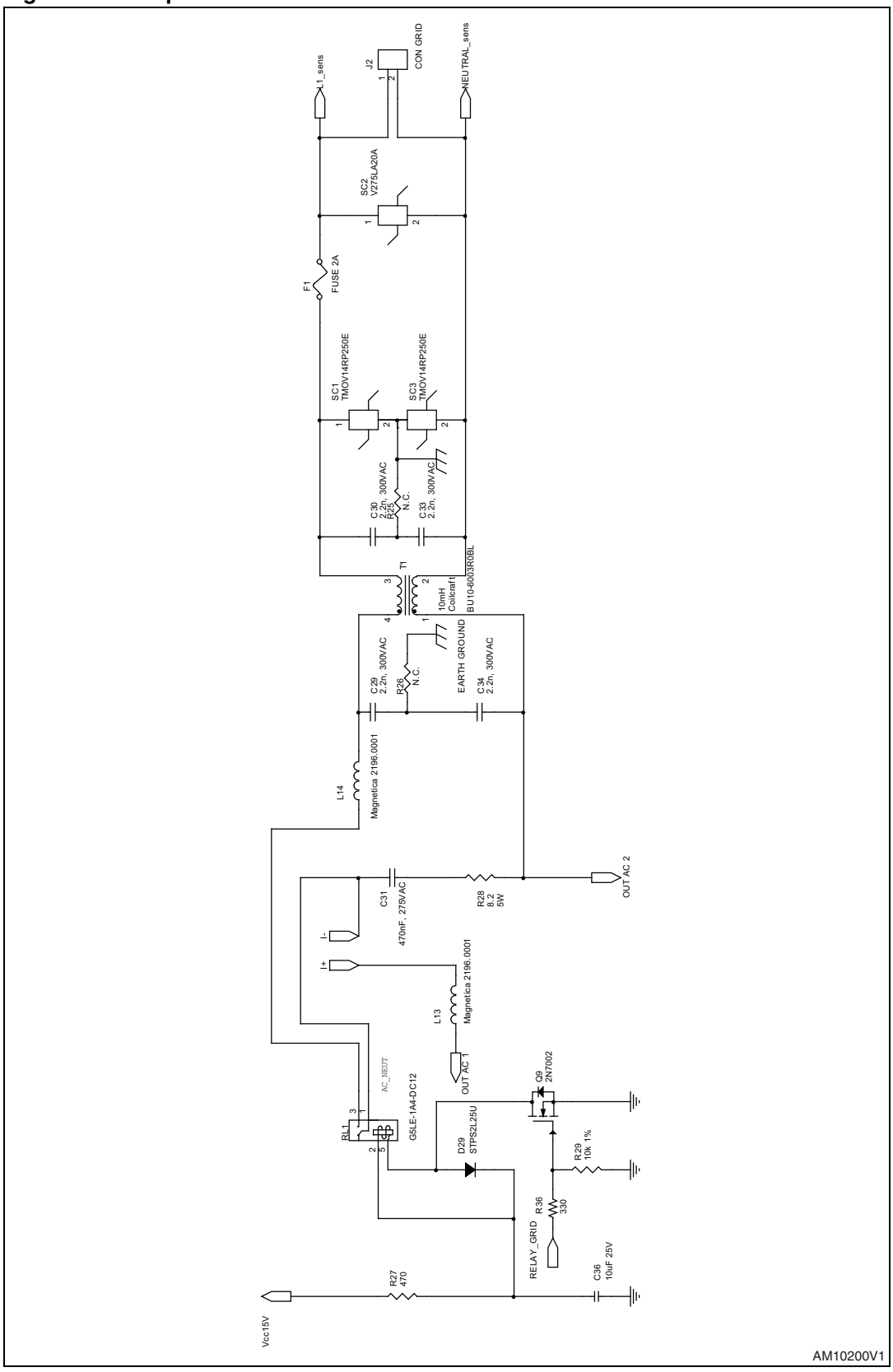


Figure 8. Output current sensor

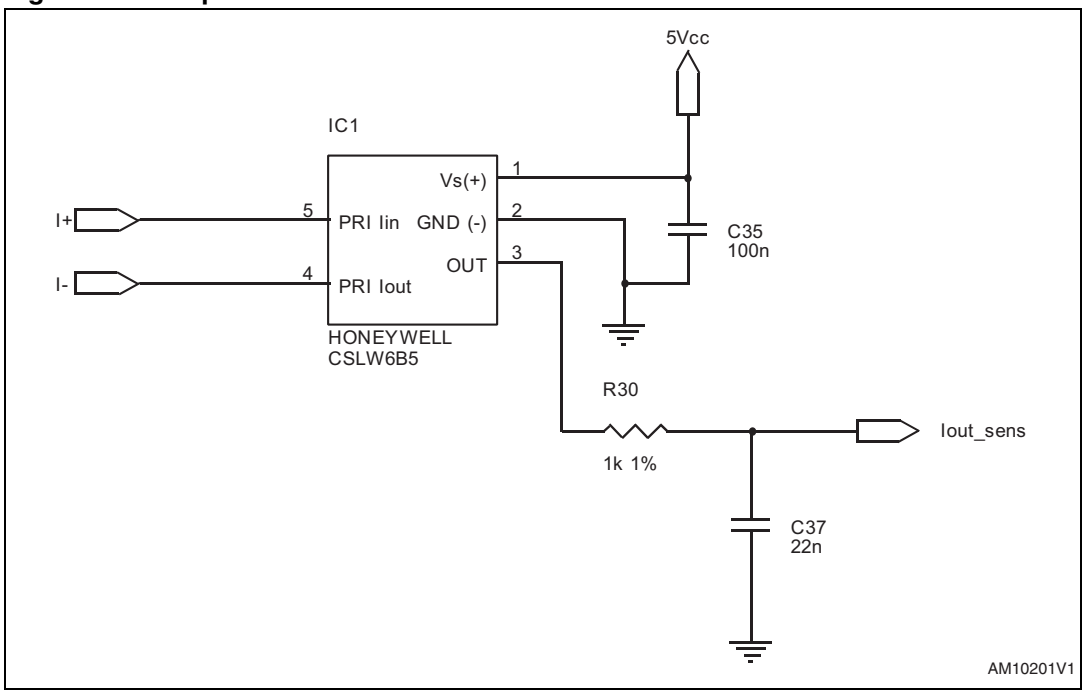


Figure 9. AC line current sensing

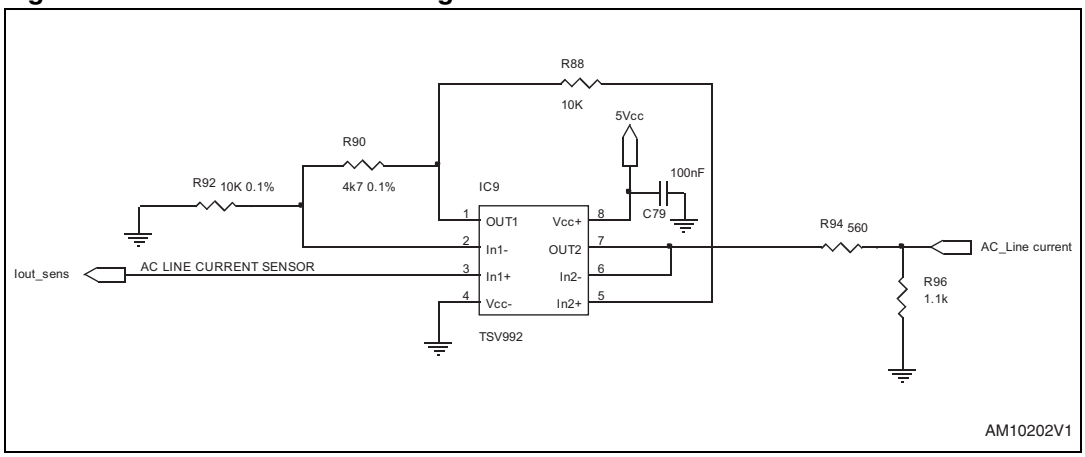


Figure 10. V_{OUT} sensing section

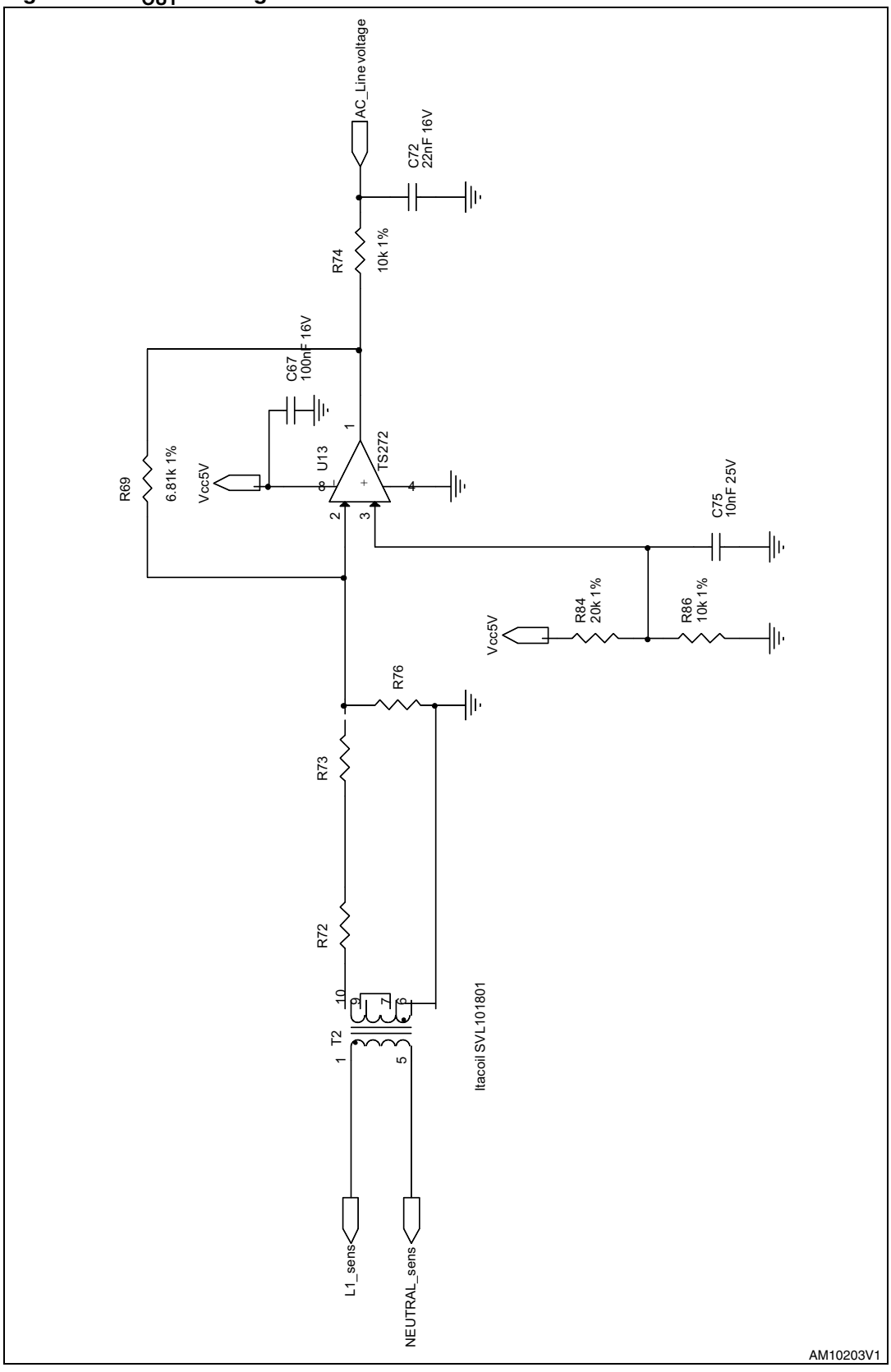


Figure 11. 32 bit MCU-STM32F electrical schematic

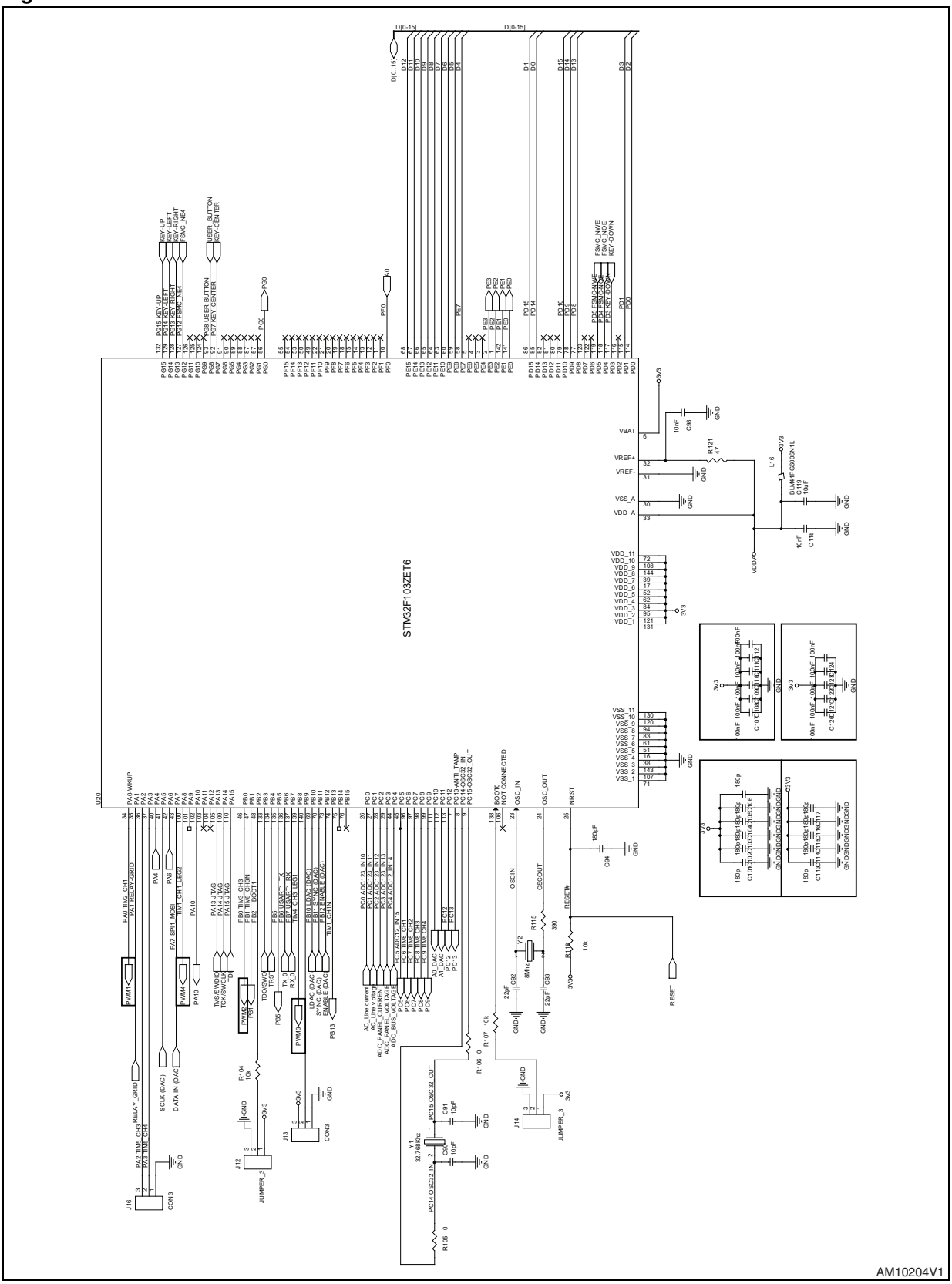


Figure 12. DC-AC section driver

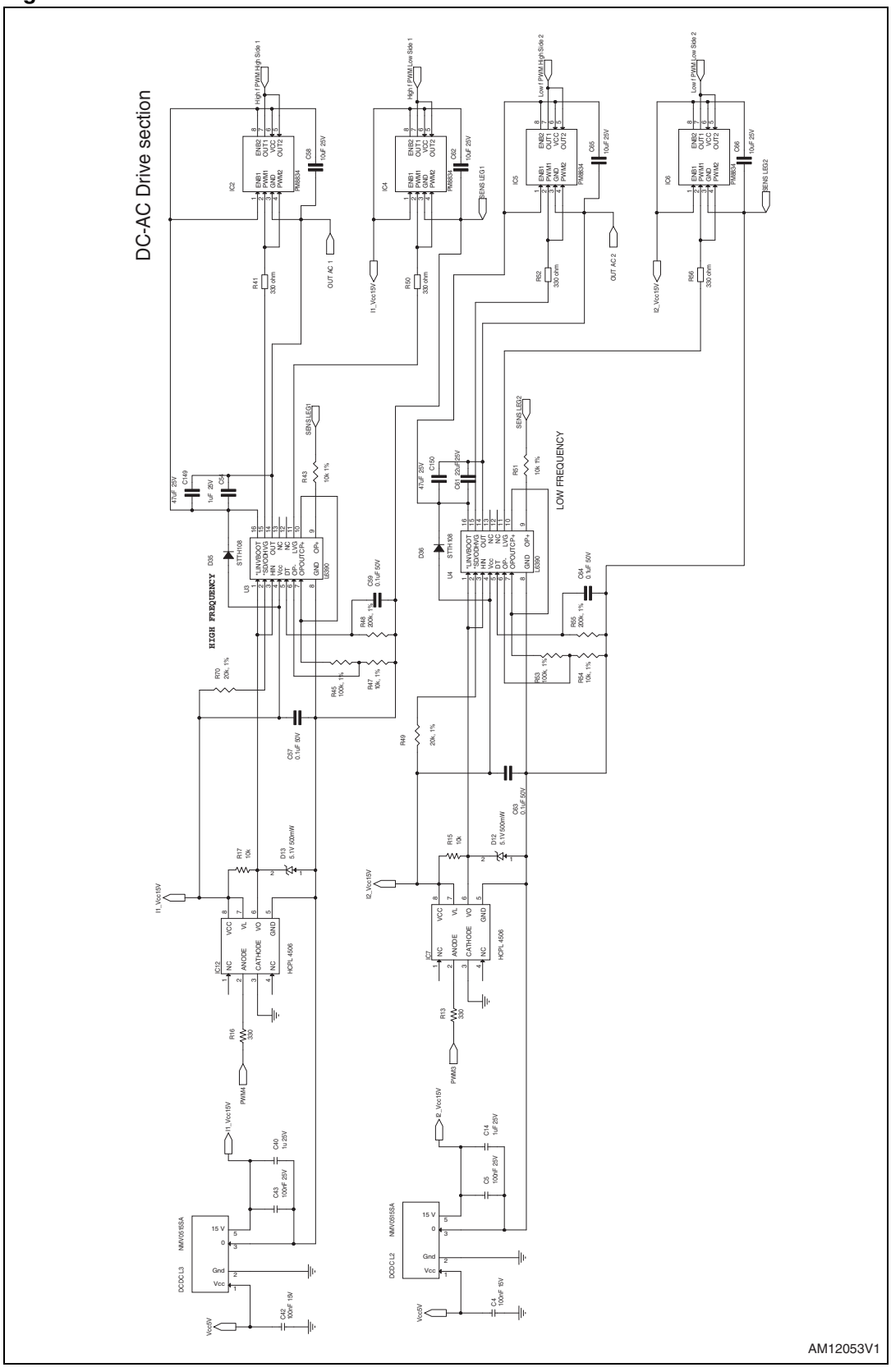
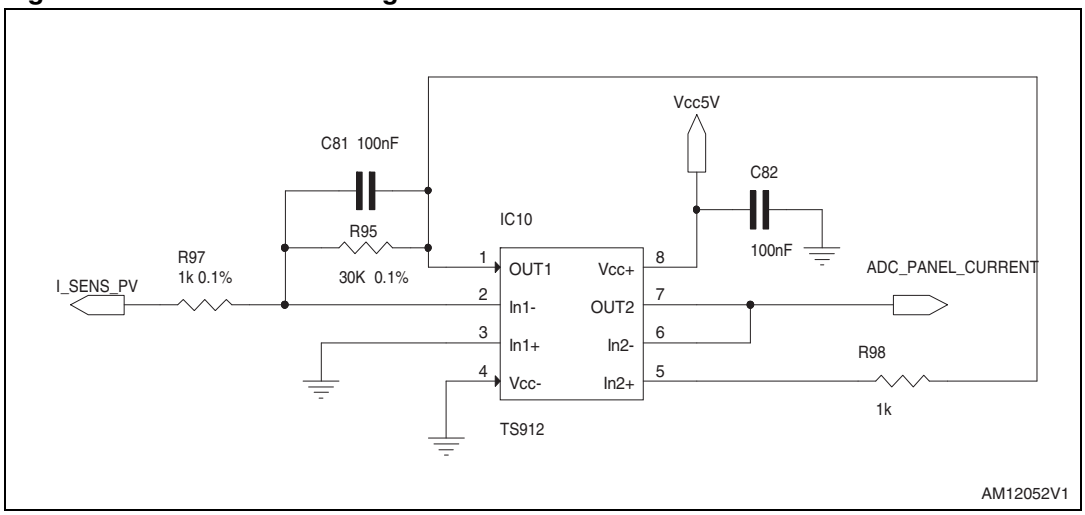


Figure 13. PV current sensing section



2 Revision history

Table 1. Document revision history

Date	Revision	Changes
07-Oct-2011	1	Initial release.
11-Oct-2011	2	Minor text changes on cover page.
12-Nov-2012	3	– Added: *Figure 12* and *13* – Minor text changes throughout the document.

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