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.

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.
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

- **R26**: N.C.
- **C34**: 2.2nF, 300VAC
- **C31**: 470nF, 275VAC
- **D29**: STPS2L25U
- **SC1**: TMOV14RP250E
- **1**: Fuse 2A 5W
- **SC3**: TMOV14RP250E
- **1**: Fuse 2A 5W
- **R28**: 8.2
- **Q9**: 2N7002
- **RL1**: G5LE-1A4-DC12
- **R29**: 10k 1%
- **VCC15V**
- **SC2**: V275LA20A
- **R25**: N.C.
- **C30**: 2.2n, 300VAC
- **C29**: 2.2n, 300VAC
- **J2**: CON GRID
- **R36**: 330
- **L13**: Magnetica 2196.0001
- **L14**: Magnetica 2196.0001
- **AM10200V1**

Obsolete Product(s) - Obsolete Product(s)
Figure 8. Output current sensor

Figure 9. AC line current sensing
Figure 10. $V_{\text{OUT}}$ sensing section
Figure 11. 32 bit MCU-STM32F electrical schematic
Figure 12. DC-AC section driver
Figure 13. PV current sensing section
# Revision history

Table 1. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
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<tbody>
<tr>
<td>07-Oct-2011</td>
<td>1</td>
<td>Initial release.</td>
</tr>
<tr>
<td>11-Oct-2011</td>
<td>2</td>
<td>Minor text changes on cover page.</td>
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<tr>
<td>12-Nov-2012</td>
<td>3</td>
<td>– Added: Figure 12 and 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Minor text changes throughout the document.</td>
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Obsolete Product(s) - Obsolete Product(s)