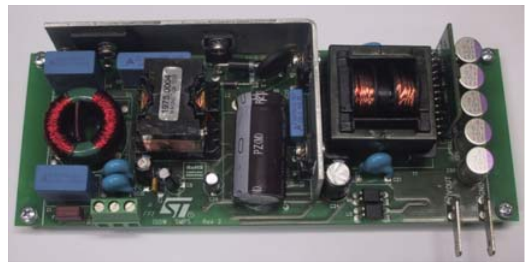
# EVL6699-150W-SR

## 12 V - 150 W resonant converter with synchronous rectification based on the L6563H, L6699 and SRK2000

**Data brief**

## Features

- Input mains range: 90 - 264 $V_{AC}$ - frequency 45 - 65 Hz
- Output voltage: 12 V at 12.5 A continuous operation
- Mains harmonics: according to EN61000-3-2 Class-D or JEITA-MITI Class-D
- No load consumption: < 0.17 W at 230 $V_{AC}$
- Light load efficiency: according to ErP Lot 6 Tier 2 (> 50% @ 250 mW)
- Efficiency at nominal load: > 91% at 115 $V_{AC}$
- EMI: according to EN55022 Class-B
- Safety: according to EN60950
- Dimensions: 65 x 154 mm, 28 mm component maximum height
- PCB: double-side, 70 µm, FR-4, mixed PTH/SMT



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# 1 Description

The EVL6699-150W-SR board is made up of two stages: a front-end PFC using the L6563H, an LLC resonant converter based on the L6699 and the SRK2000, controlling the SR MOSFETs on the secondary side. The SR driver and the rectifier MOSFETs are mounted on a daughterboard.

The L6563H is a current mode PFC controller operating in transition mode and implements a high voltage startup source to power on the converter.

The L6699 integrates all the functions necessary to properly control the resonant converter with a 50% fixed duty cycle and working with variable frequency.

The output rectification is managed by the SRK2000, an SR driver dedicated to LLC resonant topology.

The PFC stage works as pre-regulator and powers the resonant stage with a constant voltage of 400 V. The downstream converter operates only if the PFC is on and regulating. In this way, the resonant stage can be optimized for a narrow input voltage range.

The L6699's LINE pin (pin 7) is dedicated to this function. It is used to prevent the resonant converter from working with too low input voltage that can cause incorrect capacitive mode operation. If the bulk voltage (PFC output) is below 380 V, the resonant startup is not allowed. The L6699 LINE pin internal comparator has a hysteresis allowing the turn-on and turn-off voltage to be independently set. The turn-off threshold has been set to 300 V allowing the resonant stage to operate in the case of mains sag and consequent PFC output dip.

The transformer uses the integrated magnetic approach, incorporating the resonant series inductance. Therefore, no external, additional coil is needed for the resonance. The transformer configuration chosen for the secondary winding is centre tap.

On the secondary side, the SRK2000 core function switches on each synchronous rectifier MOSFET whenever the corresponding transformer half-winding starts conducting (i.e. when the MOSFET body diode starts conducting) and then switches it off when the flowing current approaches zero. For this purpose, the IC is provided with two pins (DVS1 and DVS2) sensing the MOSFETs drain voltage level.

The SRK2000 automatically detects light load operation and enters Sleep mode, disabling MOSFET driving and decreasing its own consumption. This function allows great power saving at light load with respect to benchmark SR solutions.

In order to decrease the output capacitor size, aluminium solid capacitors with very low ESR were preferred to standard electrolytic ones. Therefore, high frequency output voltage ripple is limited and output LC filter is not required. This choice allows the saving of output inductor power dissipation which can be significant in the case of high output current applications such as this.

## Figure 1. EVL6699-150W-SR electrical diagram

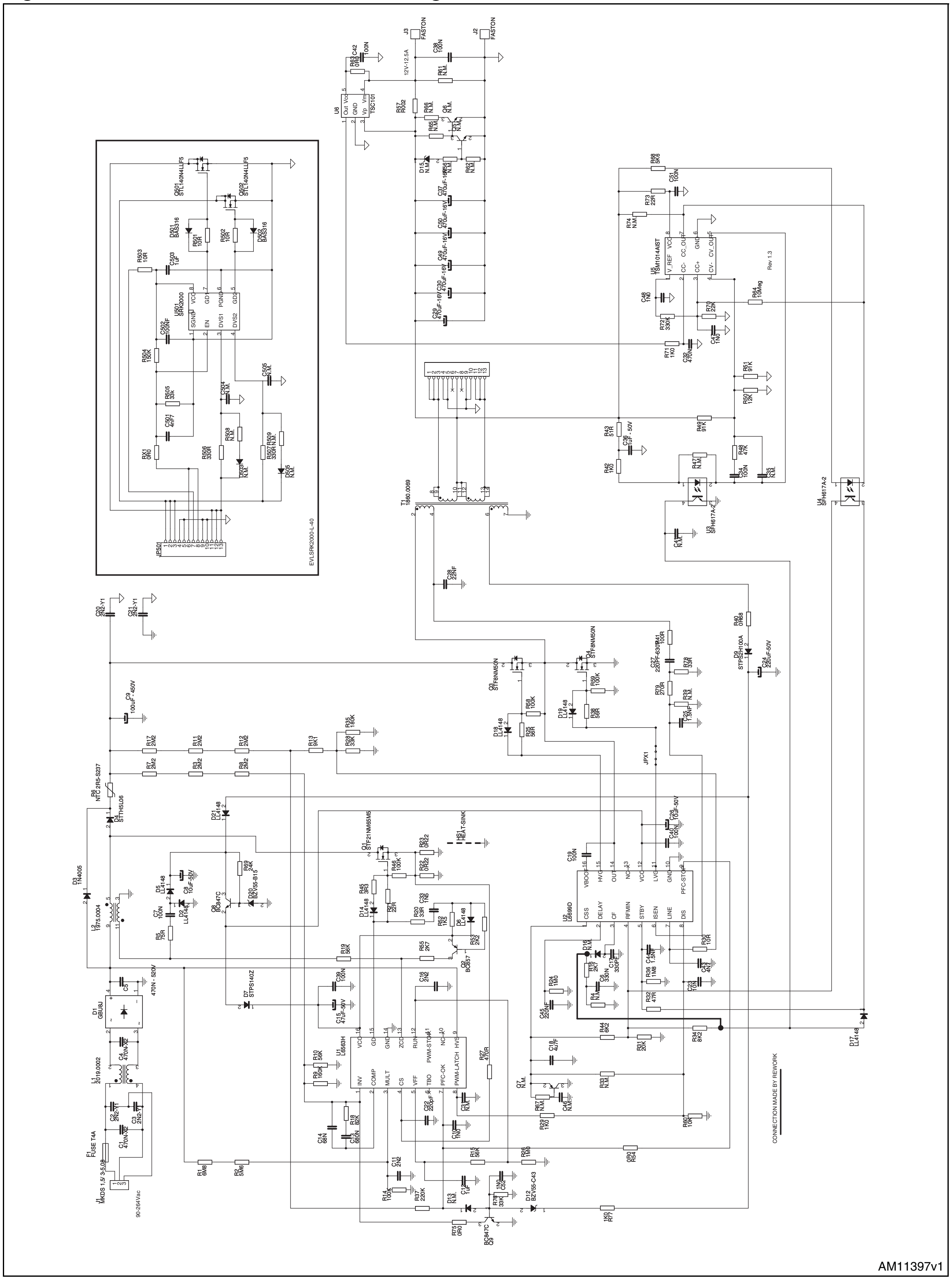
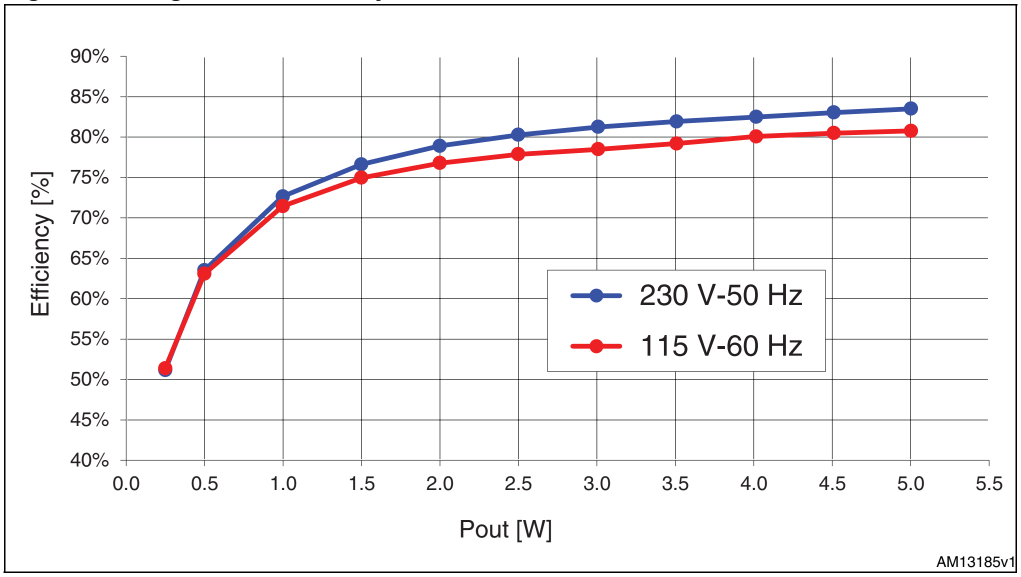


**Figure 2. Light load efficiency measurements**



# 2 Revision history

Table 1. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 03-Jul-2012 | 1 | Initial release. |