Smart LED driver using 6LoWPAN Mesh network for outdoor street lighting

**Features**

- Intelligent power conversion stage based on the HVLED001A high voltage LED driver:
  - wide input voltage range: 90 – 300 V\textsubscript{AC}
  - constant current output: 60-110 V / 0.7 A, with ±5% current regulation
  - high power factor > 0.97 and low THD < 15% for entire line and load cycle in quasi resonant mode
  - peak overall efficiency (including auxiliary supply) at maximum load > 89%
  - various start-up, operating and low-power modes
  - open circuit, short-circuit, undervoltage and overvoltage circuit protection

- Digital and remote control section based on STM32 microcontroller:
  - wireless connectivity with embedded sub-1 GHz transceiver
  - can accept remote on, off and dimming commands

- Five levels of analog dimming

- Less than 0.5 W standby power consumption ensures compliance with EnergyStar norms

- RoHS compliant

- WEEE compliant

**Description**

The STEVAL-LLL006V1 board is designed to help you evaluate high power LED lighting solutions with comprehensive power management and wireless connectivity.

The board integrates an intelligent power conversion stage thanks to the HVLED001A LED lighting controller with various operating modes, sensing and protection mechanisms, and highly efficient switching based on the STP21N90K5 Power MOSFET. The board is able to convert a wide 90 - 300 V\textsubscript{AC} input voltage range into a 60 - 110 V\textsubscript{DC} output in constant current mode, with high power factor and low THD.

The on-board STM32L071KZ microcontroller is able to receive remote on, off and dimming commands via the embedded SPSGRFC sub-1 GHz transceiver module.

A data concentrator unit (DCU) and mobile Android application have been developed to help you explore the functionality of the evaluation board. The DCU consists of a NUCLEO-F401RE development platform, plus the X-NUCLEO-IDS01A4 for sub-1 GHz communication with the LED driver board and a X-NUCLEO-IDB05A1 board for Bluetooth communication with the mobile device.

The mobile application collects lighting nodes represented by the microcontroller and RF module on the evaluation board in a 6LoWPAN mesh network.
1 Block diagram

Figure 1. Block diagram

STEVAL-LLL006V1

Block diagram

Filter

Bridge rectifier

HVLED001A offline controller for LED lighting

MCU

STM32L071KZ ultra-low-power ARM Cortex-M0+

Auxiliary supply

SPSGRFC SPIRIT-1 transceiver unit

Flyback topology

MESH NETWORK

STM32 NUCLEO PLATFORM

90 - 300V AC Mains

60-110 V 0.7 A (max.)

mobile App

DB3813 - Rev 1 page 2/5
Figure 2. STEVAL-LLL006V1 board schematic
**Revision history**

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>Changes</th>
</tr>
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<tbody>
<tr>
<td>28-Jul-2019</td>
<td>1</td>
<td>Initial release.</td>
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*Table 1. Document revision history*