STDES-NBIOTLIGHT

Data brief

Connected smart street light based on NBIOT ST87M01 and STPM32

Fully assembled board developed for performance evaluation only, not available for sale

Product summary	
Connected smart street light based on NBIOT ST87M01 and STPM32	STDES-NBIOTLIGHT
ASSP for metering applications with up to four independent 24-bit 2nd order sigma-delta ADCs, 4 MHz OSF and 2 embedded PGLNA	STPM32TR
Mainstream Arm Cortex-M0+ MCU with 128 Kbytes of Flash memory, 36 Kbytes RAM	STM32G071GBU6TR
Dual channel digital isolator	STISO621TR
Ultralow-power 3-axis smart accelerometer with AI, antialiasing filter, and advanced digital features	LIS2DUX12TR
Ultra-compact, low-power NB-IoT industrial module series with optional GNSS	ST87M01-1100
3-line EMI filter and ESD protection for SIM card interfaces	EMIF03-SIM02M8
High voltage converter	VIPER222XSTR
3 A DC step-down switching regulator	ST1S40IDR
1.2 A low quiescent current LDO with reverse current protection	LDL112PUR
Application	Wireless connectivity

Features

- Metering measurements based on STPM32, providing high-accuracy RMS values of voltage and current
- Active, reactive, and apparent power and energy, using up to four independent 24-bit, 2nd-order sigma-delta ADCs
- STISO62x digital isolators: galvanic isolation with high-speed data transmission on the UART interface, robust protection against electrical noise
- Two STM32G071 microcontrollers use a high-performance Arm Cortex®-M0+ 32-bit RISC core. They operate at speeds of up to 64 MHz.
- Suitable for Internet of Things (IoT) applications
- On-board LIS2DUX12 3-axis linear MEMS accelerometer with an internal temperature sensor, enabling embedded functions such as tilt detection and significant-motion detection
- Online dashboard for metering and MEMS data, enabling remote lamp dimmer control over the internet thanks to ST87M01
  - ST87M01: high-performance, ultracompact, and low-power LTE Cat NB-IoT industrial module supporting the TCP and UDP protocols for data streaming
- Powered by VIPER222 high performance and high-voltage converter. It eliminates the need for additional components in the BOM thanks to its high-voltage startup and current sense circuit

Description

The STDES-NBIOTLIGHT is a reference design for a multiboard smart street lighting application, consisting of a bottom, relay, and top boards.

A bottom board is supplied from a 90-220V AC mains input and is responsible for powering the rest of the system. RMS voltage and current, as well as active, reactive, and apparent power of the mains are measured by the STPM32, which uses UART interface to communicate with a STM32G071GB microcontroller. This microcontroller also manages the relay circuitry used for lamp on/off control and dimming, according to commands received from the top board or an online dashboard.

The metering data and lamp-control signals are galvanically isolated using the STISO621 digital isolator, ensuring robust isolation and high-speed data transmission between the bottom and top boards.

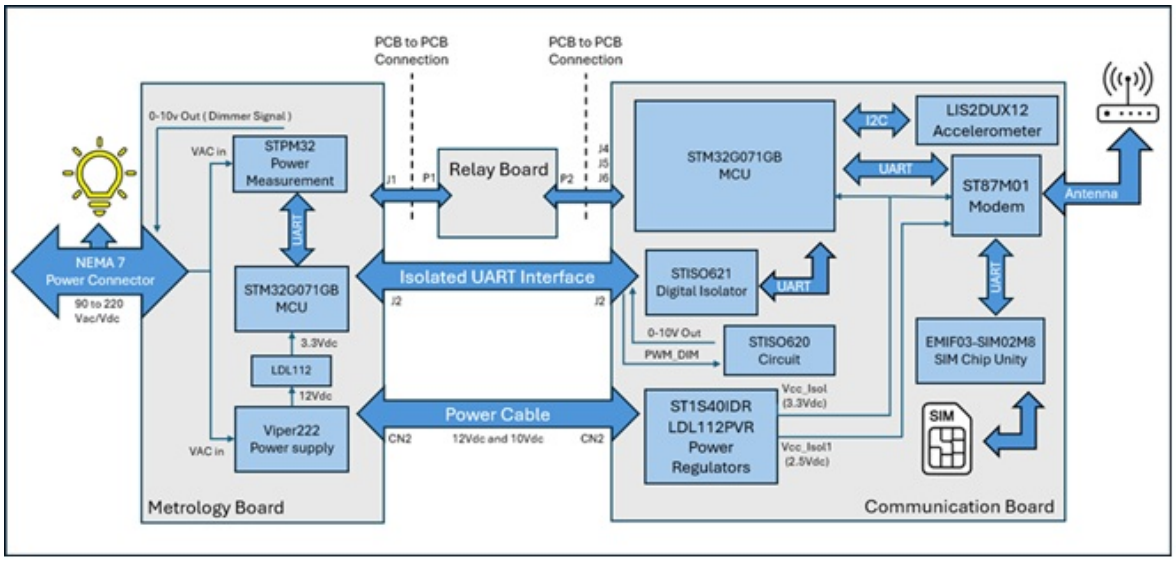
The top board includes another STM32G071GB microcontroller, which acquires data from the on-board LIS2DUX12 accelerometer and interfaces with the ST87M01 LTE Cat NB-IoT module to both send and receive the street lighting data over the internet.

An online server and web dashboard was developed for monitoring the street lighting data, providing real-time visualization of metering and acceleration data, as well as dimmer lamp values.

The ST87M01 communicates with the server using the TCP and UDP protocols, allowing the user not only to monitor but also to remotely control the lamp state and dimmer level.

1 Solution overview

Figure 1. **STDES-NBIOTLIGHT multi-board block diagram**



2 Schematic diagrams

Figure 2. STDES-NBIOTLIGHT bottom board schematic (1 of 3)

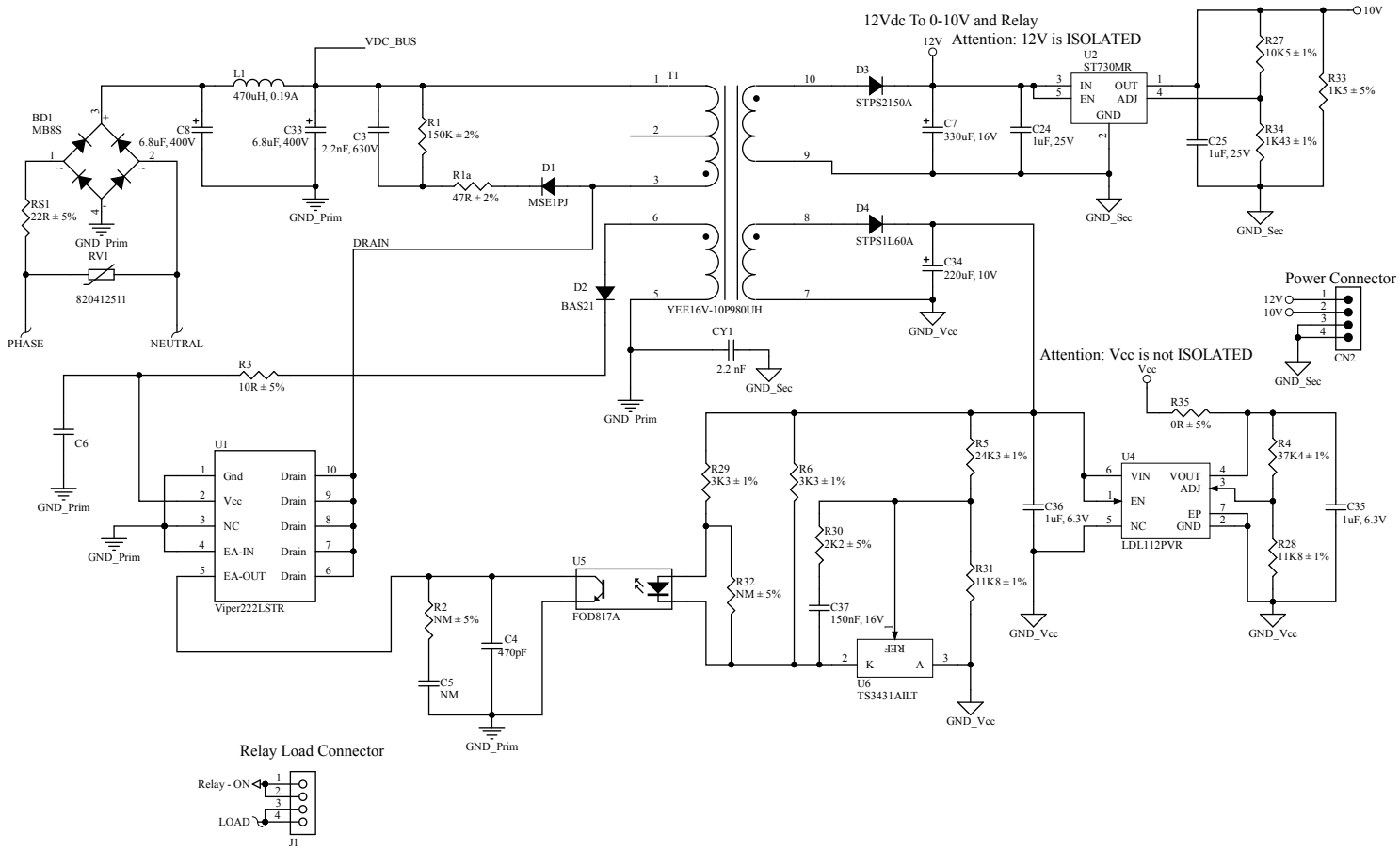


Figure 3. STDES-NBIOTLIGHT bottom board schematic (2 of 3)

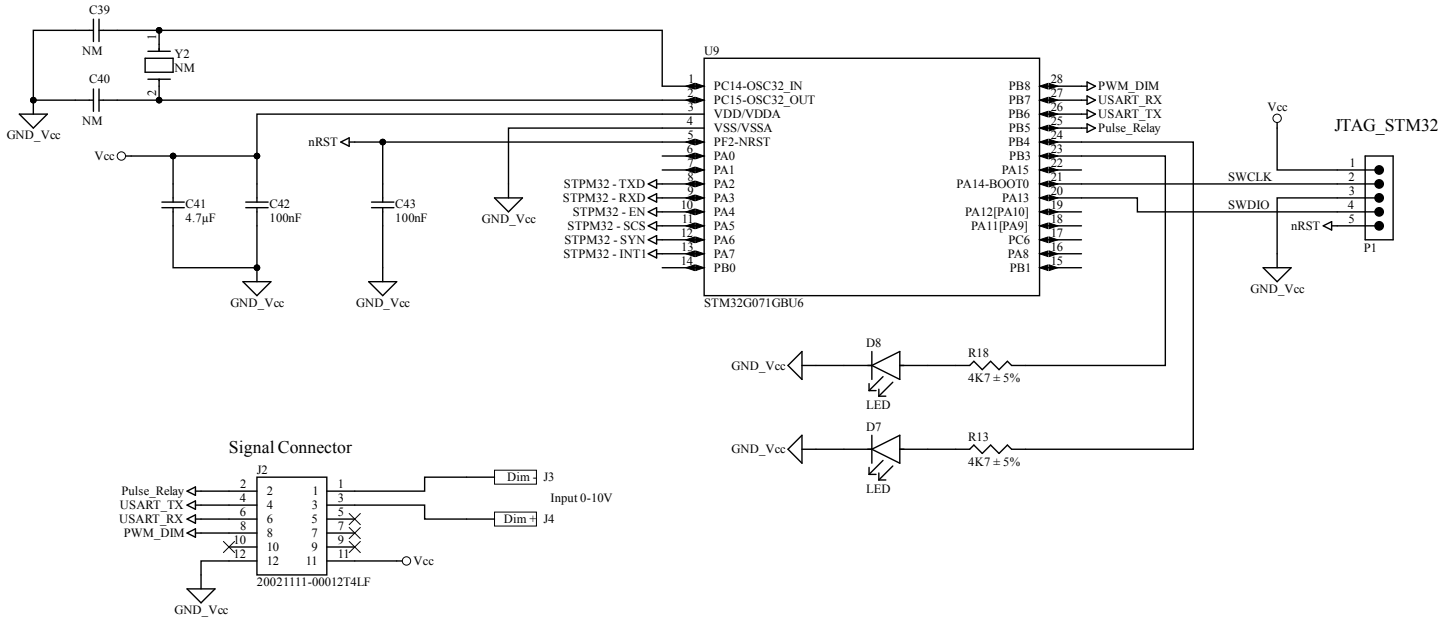


Figure 4. STDES-NBIOTLIGHT bottom board schematic (3 of 3)

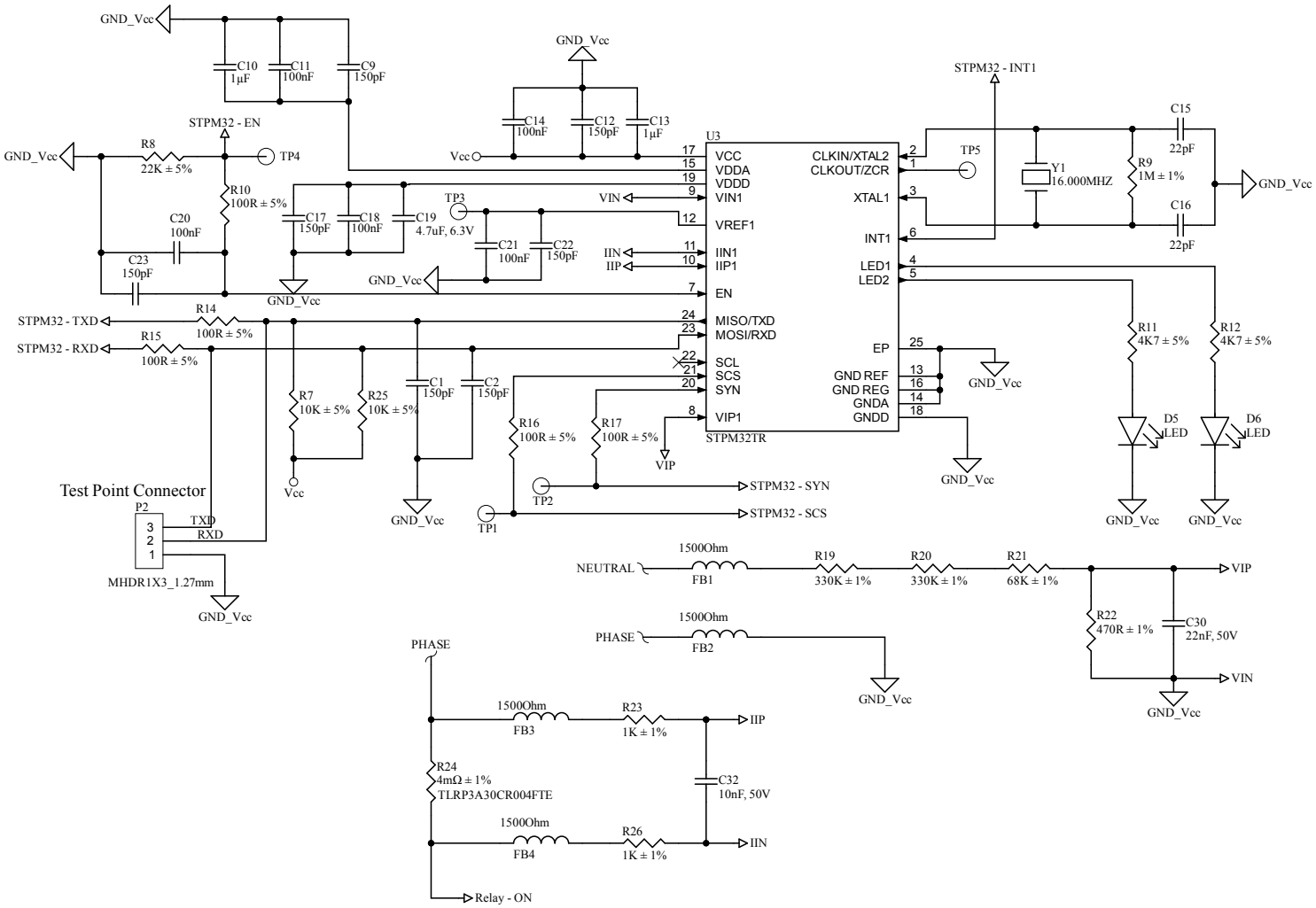


Figure 5. STDES-NBIOTLIGHT relay board schematic

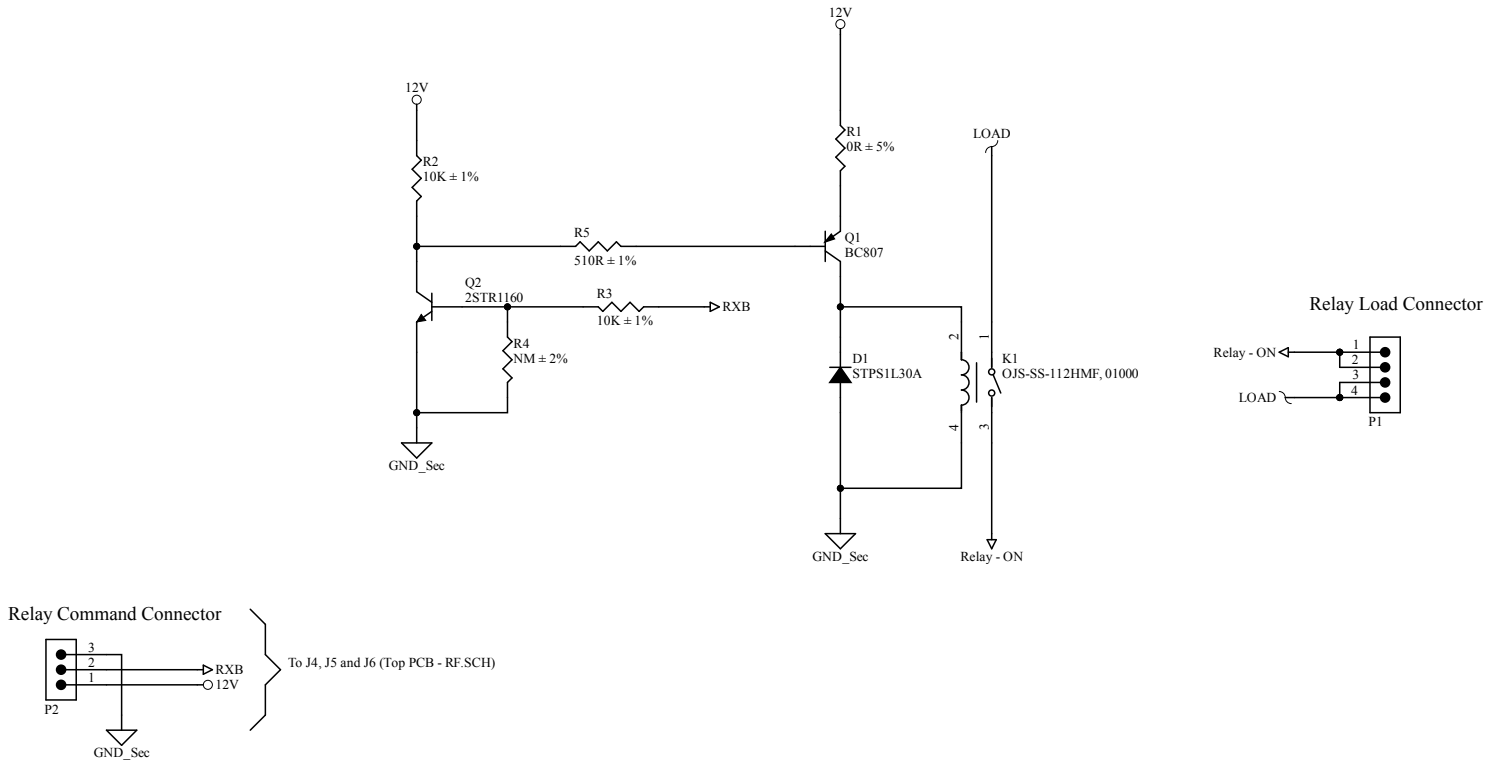


Figure 6. STDES-NBIOTLIGHT top board schematic (1 of 2)

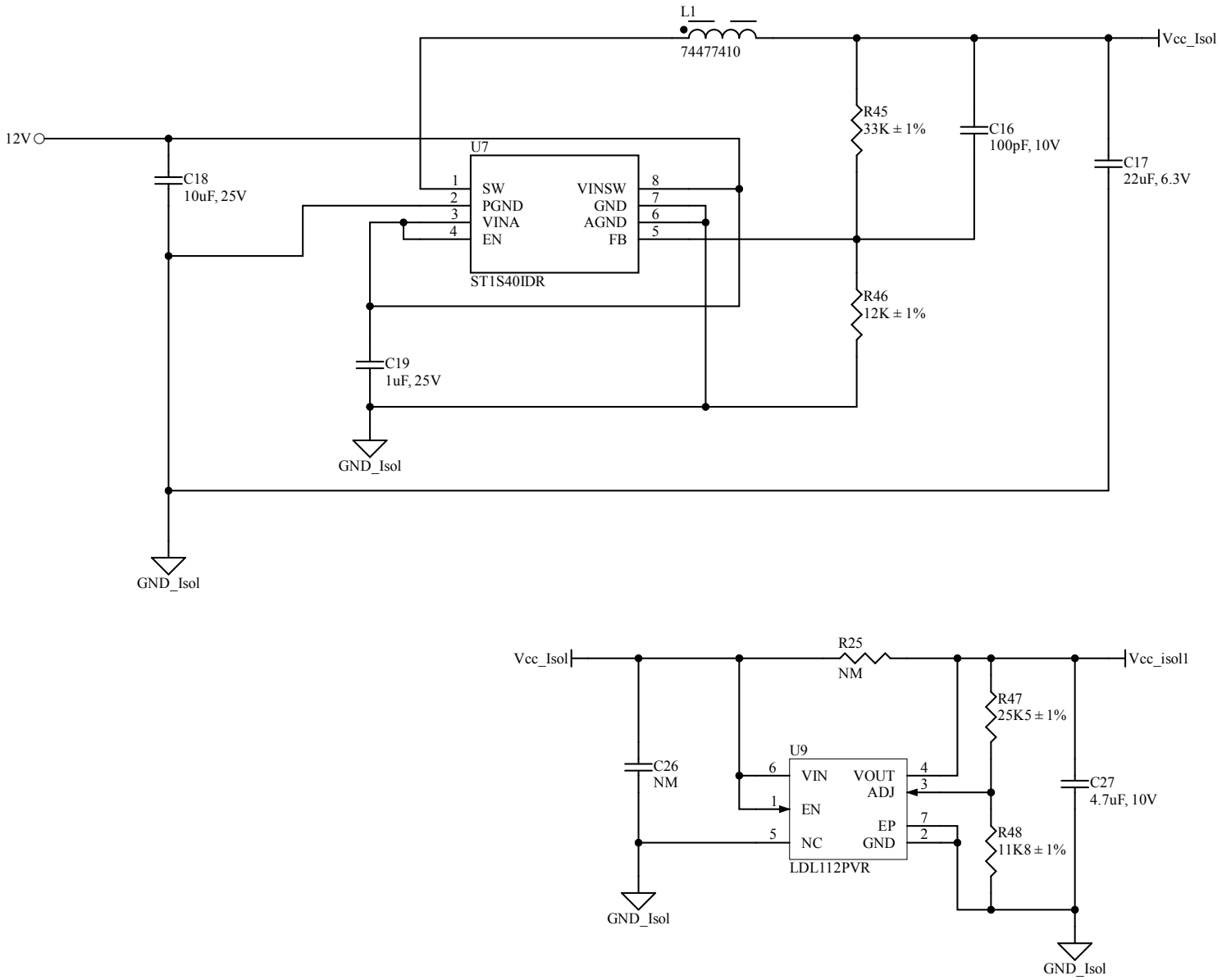
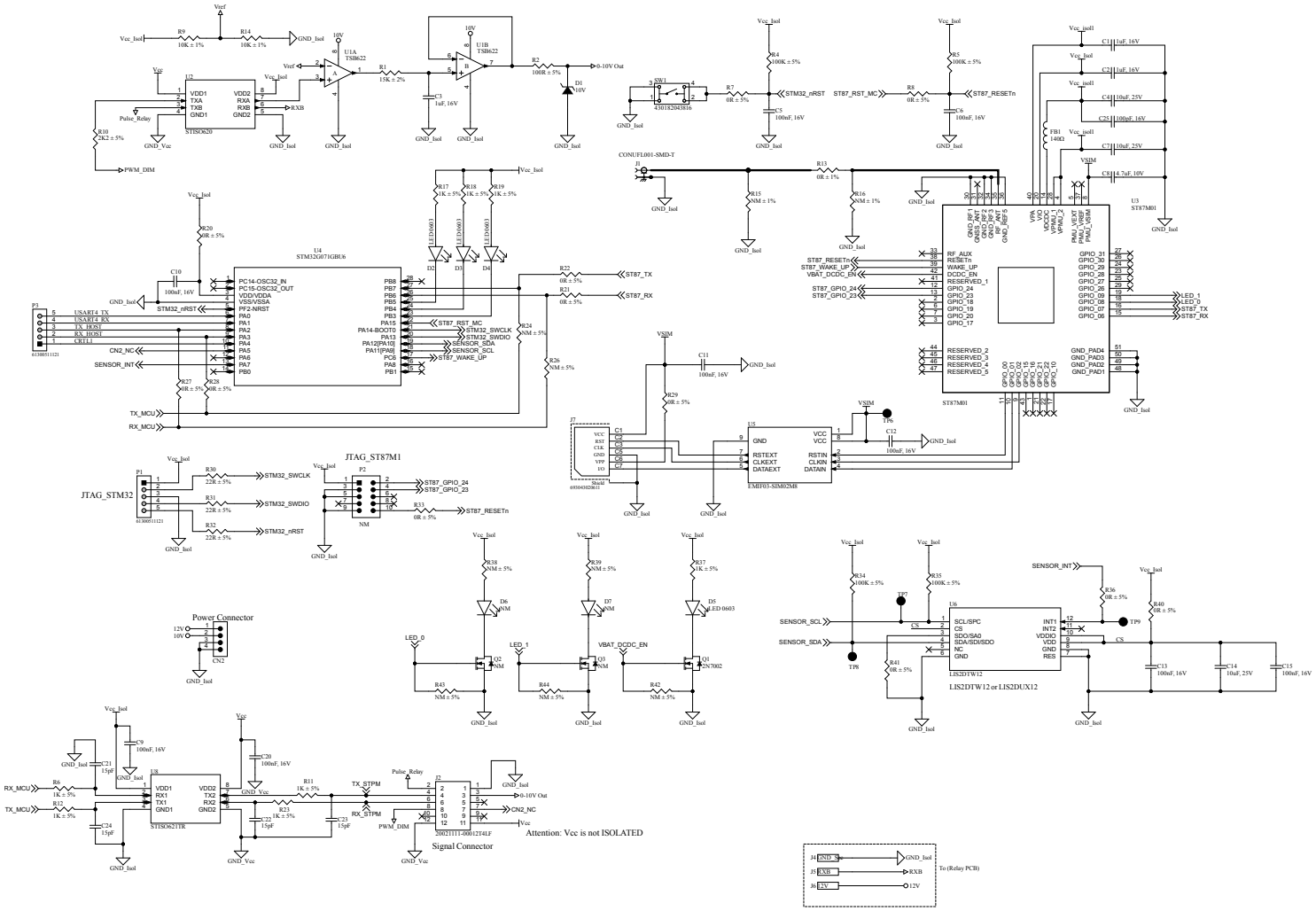


Figure 7. STDES-NBIOTLIGHT top board schematic (2 of 2)



Revision history

Table 1. **Document revision history**

Date	Revision	Changes
03-Jul-2026	1	Initial release.

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice.

In the event of any conflict between the provisions of this document and the provisions of any contractual arrangement in force between the purchasers and ST, the provisions of such contractual arrangement shall prevail.

The purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

The purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of the purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

If the purchasers identify an ST product that meets their functional and performance requirements but that is not designated for the purchasers' market segment, the purchasers shall contact ST for more information.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.