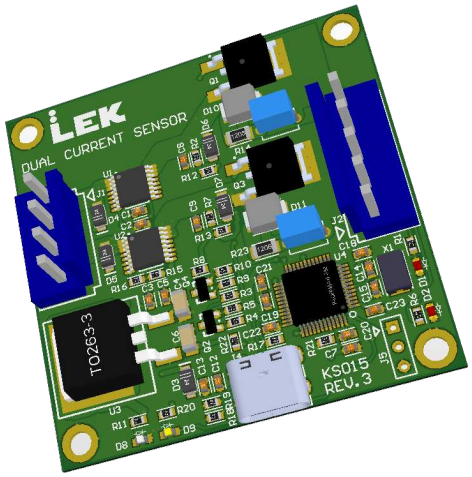
# KS015 DUAL CURRENT SENSOR

## • DESCRIPTION




The KS015 Dual Current Sensor is a two-channel power monitoring and load-switching module.

It features an STM32F103C8 microcontroller running the STM32duino bootloader with Arduino-compatible firmware, providing flexible and easy integration.

Each channel incorporates a high-accuracy INA260 current/voltage/power monitoring IC paired with a dedicated P-channel MOSFET for independent load control.

A USB-C interface enables simple connection to a PC for configuration and data acquisition.

The KS015 allows precise measurement of current, voltage, and power on two isolated channels while offering software-controlled on/off switching of connected loads.

Designed for flexibility, accuracy, and ease of use, it is ideal for power monitoring, automated testing, and embedded control applications.

## • FEATURES

- Dual-Channel Monitoring – Measures current, voltage, and power on two independent channels
- Load Control – Two P-channel MOSFETs with additional transient protection enable independent power switching per channel
- Flexible Power Options – Operates from USB-C or either input power channel
- Stand-Alone Operation – Functions as a load controller without a USB connection
- Wide Input Voltage Range – Supports 5V to 27V DC power inputs
- High Current Capability – Monitors up to 7A per channel
- USB-C Interface – Enables easy PC connectivity for data monitoring and control
- Heartbeat LED – Provides visual indication of device activity
- Arduino Compatible – develop custom firmware with the Arduino IDE and STM32duino

## • ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Channel Input voltage | $V_{Inx}$ | 3.2[B] | | 27 | VDC |
| Operating current | $I_{CC}$ | | 3.5 | | mA |
| Load current | $I_{LOAD}$ | | | 7[A] | A |
| Channel Voltage Drop | $V_{Dx}$ | | | | VDC |

NOTE A – See safe operating curve
NOTE B – only if connected to USB for additional power. If no USB connection, ensure minimum input of 4.6V

## • OPERATION DESCRIPTION

### Processor

The KS015 features an STMicroelectronics STM32F103C8 microcontroller. This device integrates a 32-bit ARM® Cortex®-M3 CPU running at 72 MHz, with 20 KB SRAM and 64 KB Flash memory. It includes a USB 2.0 Full-Speed (12 Mbps) device interface.

### USB Host Connection

A USB-C connector links the MCU to the host system. With the default firmware, the KS015 enumerates as a USB virtual COM port. Users may load custom firmware to present other USB device classes as needed.

### Bootloader

The board ships with the STM32duino bootloader, enabling direct programming from within the Arduino ecosystem.
For KS015-specific compatibility, the standard bootloader build has been modified to assign the LED to pin **PA3**.

### Serial Debug Port

A Serial Wire Debug (SWD) interface is provided for custom firmware development and in-system debugging.

### Current Sensors

Two TI INA260 ICs are integrated and addressed as follows:

- **Channel 1:** 0x40
- **Channel 2:** 0x41

Both devices are connected to the MCU's I2C1 bus on pins **PB6** (SCL) and **PB7** (SDA). Alert outputs are routed to:

- **Alert 1:** PB11
- **Alert 2:** PB12

**Load Switches**

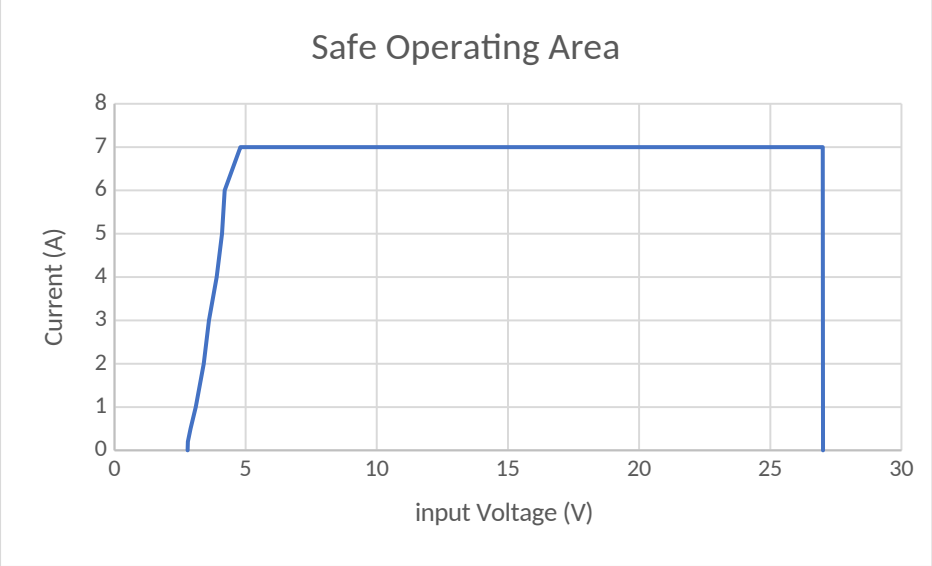
Two p-channel MOSFET load switches provide controlled power output. They are driven by:

- **Load 1:** PB0
- **Load 2:** PB1

Driving the MCU pin high enables the corresponding load switch, applying the channel input voltage to the load output.

**Caution:**
The load switches are P-channel MOSFETs. Operating them outside their safe operating area can lead to excessive power dissipation and thermal damage. Firmware should actively monitor voltage and current and disable the load if the MOSFET approaches its limits.

**Safe Operating Area**:




Operation outside the safe operating area risks overheating and damage.
Tested using a single channel only in a ventilated location.

**Power Supply**

The KS015 can be powered from any of the following sources:

- USB-C connector
- Channel Input 1
- Channel Input 2

The board automatically selects the highest available voltage among these sources.

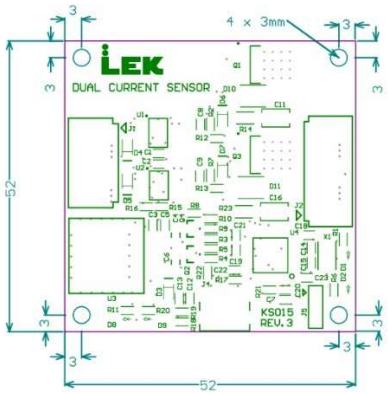
**Status LEDs**

The KS015 provides four on-board status LEDs:

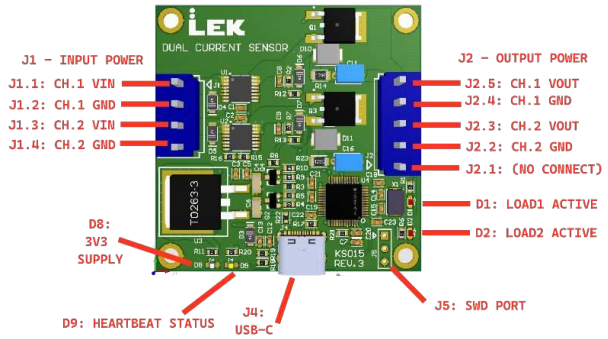
1. **Power LED (white):** Indicates MCU power presence.
2. **Heartbeat LED (yellow):** Connected to PA3; can be toggled by firmware to indicate MCU activity.
3. **Load 1 LED (red):** Illuminates when Channel 1 voltage is present and Load Switch 1 is enabled.
4. **Load 2 LED (red):** Illuminates when Channel 2 voltage is present and Load Switch 2 is enabled.

## • PACKAGE DIMENSIONS

(ALL DIMENSIONS IN MM)

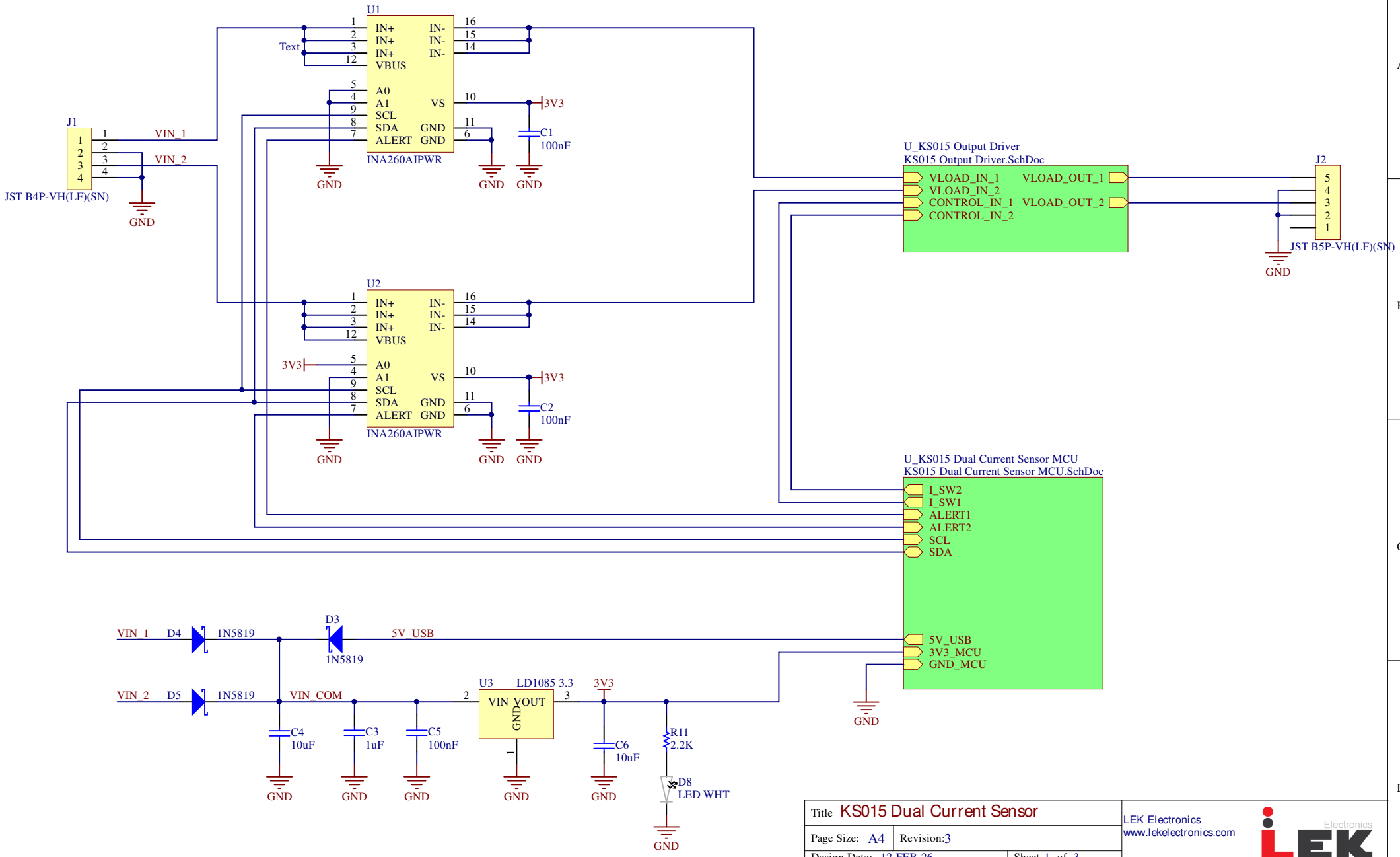



## • BOARD LAYOUT AND PINOUT



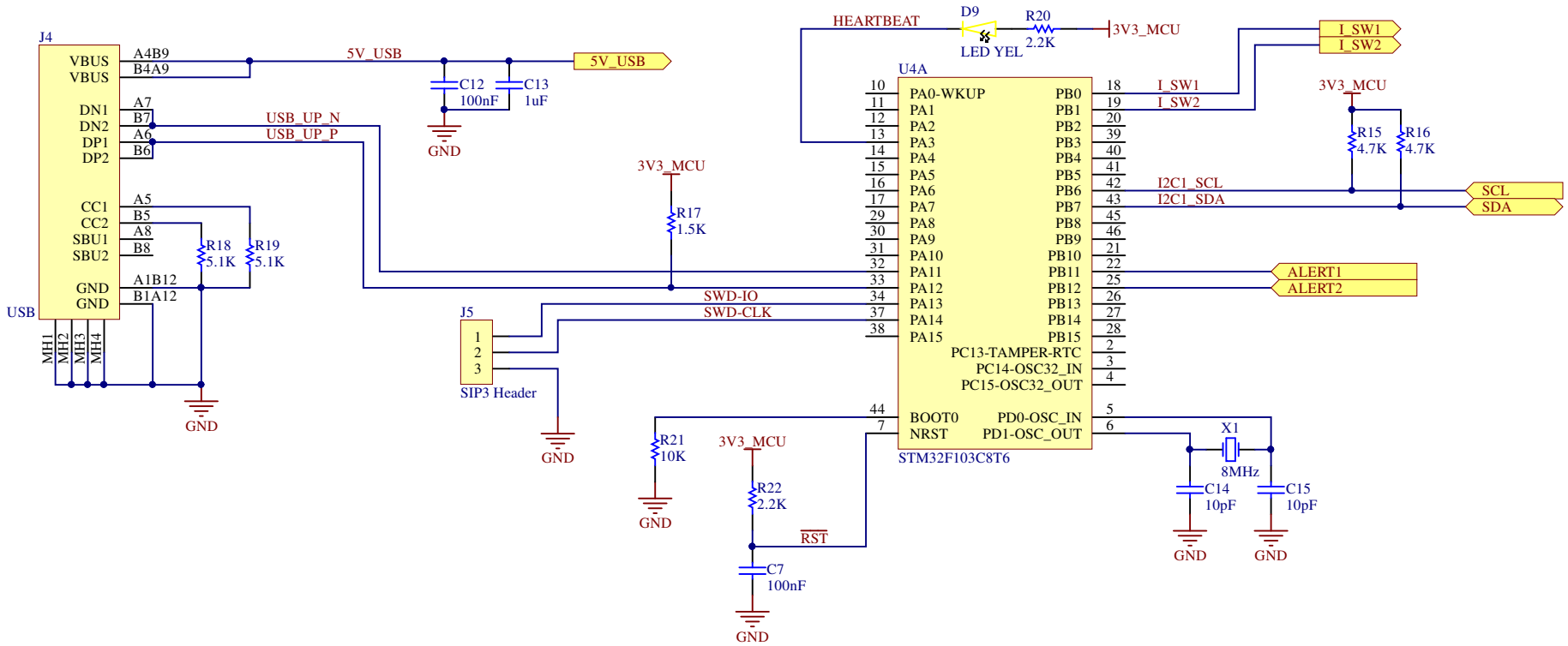

## • SCHEMATIC

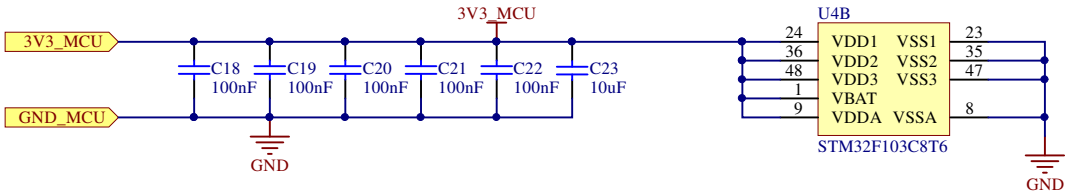
(see following pages)



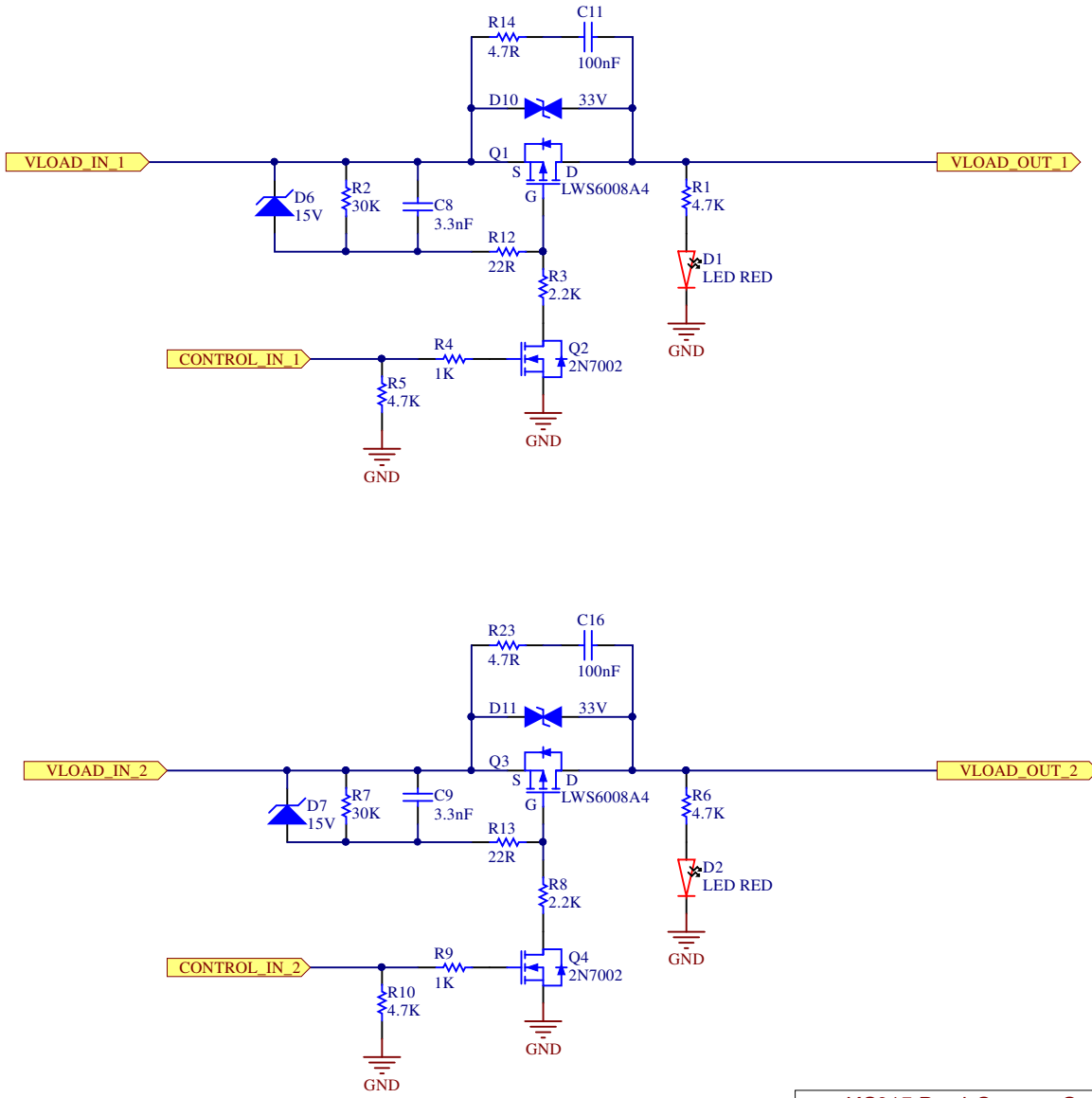

| | |
|---|---|
| Title | KS015 Dual Current Sensor |
| Page Size: A4 | Revision:3 |
| Design Date: 12-FEB-26 | Sheet 1 of 3 |
| Engineer: KS | FileName: KS015 Dual Current Sensor.SchDoc |

LEK Electronics
www.lekelectronics.com




| | | |
|---|---|---|
| Title KS015 Dual Current Sensor | | LEK Electronics<br>www.lekelectronics.com |
| Page Size: A4 | Revision:3 | |
| Design Date: 12-FEB-26 | Sheet 2 of 3 | |
| Engineer: KS | FileName: KS015 Dual Current Sensor MCU.SchDoc | |




| | | | |
|---|---|---|---|
| Title | KS015 Dual Current Sensor | | |
| Page Size: A4 | Revision:3 | | |
| Design Date: 12-FEB-26 | | Sheet 3 of 3 | |
| Engineer: KS | | FileName: KS015 Output Driver.SchDoc | |

LEK Electronics
www.lekelectronics.com