

Kalem-4-Channel-Isolated-Input

Isolated 4-channel 12–24 V digital input module

4 optically isolated industrial 12–24 V inputs with low-side logic-level outputs for microcontrollers and PLCs.

1. Overview

The Kalem-4-Channel-Isolated-Input module is a compact 4-channel digital input board designed to interface 12–24 V industrial signals to low-voltage microcontrollers or PLCs. Each input channel drives an optocoupler that provides galvanic isolation between the field side and the MCU side. The optocoupler transistor is wired as an open-collector low-side output, allowing easy interface to 3.3 V or 5 V logic via a pull-up resistor to VCCMCU.

On the high-voltage side (field side), each input includes a resistor network and LED indicator for 12–24 V operation. The low side has its own isolated ground (GND_L) and VCCMCU pin. An optional jumper allows tying field ground and MCU ground together when galvanic isolation is not required.

2. Features

- 4 isolated digital input channels for 12–24 V DC signals
- Per-channel optocoupler isolation (PC817)
- Input LED indicator on the high-voltage side for each channel
- Open-collector low-side outputs referenced to GND_L
- Compatible with 3.3 V and 5 V logic via VCCMCU pin
- Separate field ground (GND_H) and logic ground (GND_L) with optional jumper link
- Simple connector layout: separate blocks for inputs, low-side signals and grounds
- Suitable for interfacing PLC outputs, sensors and switches to MCUs

4. Pinout and Connections

4.1 Low-side / MCU connectors

- VCCMCU – Logic supply for optocoupler outputs (typically 3.3 V or 5 V)
- LOW_SIDE_SIGNAL1 – Channel 1 open-collector output (active LOW)
- LOW_SIDE_SIGNAL2 – Channel 2 open-collector output (active LOW)
- LOW_SIDE_SIGNAL3 – Channel 3 open-collector output (active LOW)
- LOW_SIDE_SIGNAL4 – Channel 4 open-collector output (active LOW)
- GND_L – Logic ground for low-side outputs

4.2 High-side / field connectors

- INPUT1(12/24V) – Channel 1 field input (connect to 12–24 V signal)
- INPUT2(12/24V) – Channel 2 field input
- INPUT3(12/24V) – Channel 3 field input
- INPUT4(12/24V) – Channel 4 field input
- GND_H – Common field ground for all inputs
- Optional jumper – connects GND_H to GND_L when isolation is not required

5. Input Characteristics and Operation

Each input channel is designed for 12–24 V DC on/off signals. A series resistor network limits current into the optocoupler LED and the input indicator LED. When the input voltage is present, the optocoupler LED turns on, driving the transistor on the low side.

On the MCU side the optocoupler transistor works as an open collector: when the input is active, the output pulls LOW towards GND_L; when the input is inactive, the output is released and a pull-up resistor to VCCMCU keeps the signal HIGH. This makes the outputs compatible with most 3.3 V and 5 V digital inputs.

The exact switching thresholds depend on the optocoupler LED current and the input resistor values, but the module is intended for use with nominal 12 V and 24 V digital signals rather than low-voltage logic directly.

6. Application Guidelines

- Use with 12–24 V DC field signals only; do not exceed the maximum input voltage rating.
- Connect all field signal grounds to GND_H.
- Provide a stable 3.3–5 V supply to VCCMCU and connect GND_L to the microcontroller ground.
- Add or enable pull-up resistors on LOW_SIDE_SIGNALx lines to VCCMCU if the MCU inputs do not have internal pull-ups.
- Leave GND_H and GND_L isolated for maximum galvanic isolation or link them via the jumper if a shared reference is needed.
- Observe the optocoupler power ratings and board temperature limits for continuous operation.

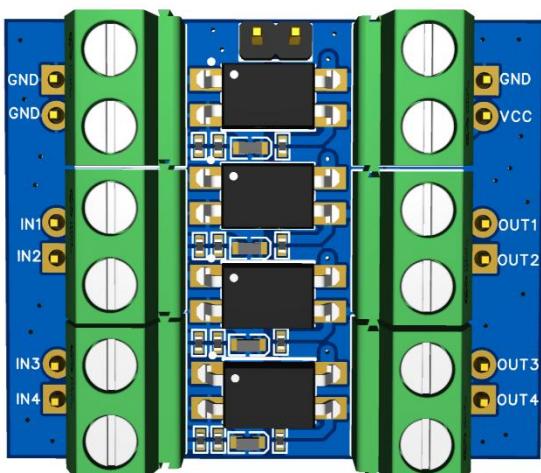
8. Absolute Maximum Ratings (summary)

- Input voltage (INPUTx to GND_H): –0.3 V to +30 V
- VCCMCU (VCCMCU to GND_L): –0.3 V to +6 V
- Optocoupler output voltage (collector to emitter): up to 30 V
- Isolation voltage (field side to MCU side): according to optocoupler rating (typically 3.75 kVrms)
- Operating ambient temperature: –20 °C to +70 °C (board-level, load and enclosure dependent)
- Storage temperature: –40 °C to +85 °C

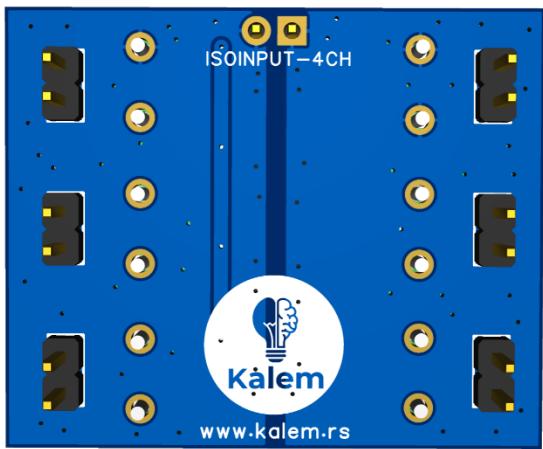
These are stress ratings only. Prolonged operation at or near the absolute maximum ratings may affect reliability.

9. Board Views and Mechanical Drawing

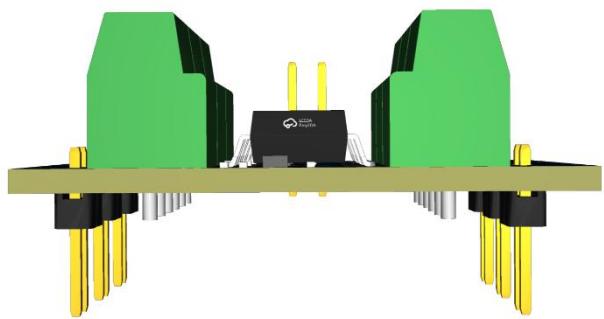
9.1 Top view



9.2 Bottom view



9.3 Side view



9.4 Technical drawing

