32 Channel Relay Controller Board

User Guide

NUMATO LAB

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Introduction

Numato Lab's 32 Channel Relay Controller Board is a smart choice for controlling higher current loads from your micro controller development board or a PC parallel port. This board has thirty two on-board relays which can switch up to 10A. All relay terminals (C, NC, NO) are accessible through screw terminals which makes wiring up the board very easy. The relays are driven by popular darlington array ULN2803. Relay coil is rated for 12VDC.

Some of the possible uses of this module include
- Home Automation
- Lighting Control
- Garden Equipment Control
- Industrial Automation
- Test Fixtures
- DIY and Hobby

This module has thirty two on board relays and associated drivers capable of controlling a large number of devices including lamps, motors, locks etc...

Features

- Very compact and easy to wire up.

- Connects directly to TTL devices (Microcontrollers, Arduino etc..).

- Thirty two Relays with three pin screw terminals for easy connectivity.

How to use the module

The following section describes how to use this module.

Components/Tools required

Along with the module, you may need the items in the list below for easy and fast installation.

1. 12V 2A DC supply.

2. Medium size Philips screw driver.

Connection Details

> ⚠️ **IMPORTANT** **Please exercise utmost caution while working with electrical mains or other high voltages. Failure to comply with safety regulations may result in injury and or death.**

Connection Diagram
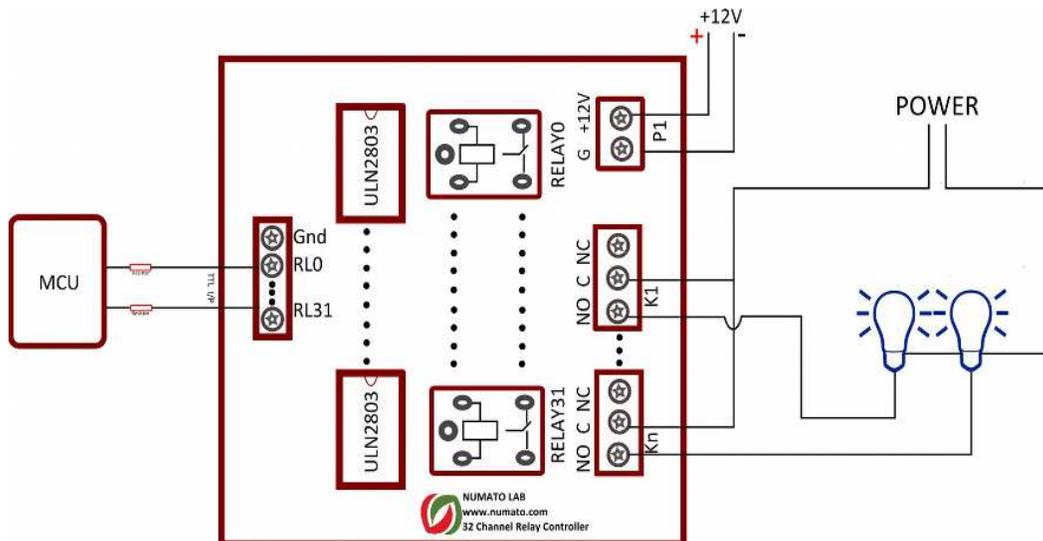
Above image shows basic connection diagram that can be used in most of the situations. The connection diagram is same for both AC and DC loads. Please make sure to use a freewheeling diode or snubber circuit if the load is inductive. More details about using inductive loads is available elsewhere in this document. It is important to make sure that the wires used to connect loads are sufficiently rated to handle expected load current. Exercise caution while working with high voltages. The following sections identify individual connections in detail.

Relay Contacts

All contacts on each relay is available externally on screw terminals for easy user access. The relays are rated for AC and DC supply voltages. Please see the electrical parameter table for more details. Each relay has three contacts(**C, NO and NC**). **C** is the common terminal and is used in both normally open and normally closed positions. The contacts **NC** and **C** will be connected when the relay is turned off and will be disconnected when relay is turned on. And vice versa, the contacts **C** and **NO** will be disconnected when relay is turned off and will be connected when the relay is turned on. Table below summarizes possible relay contact positions.
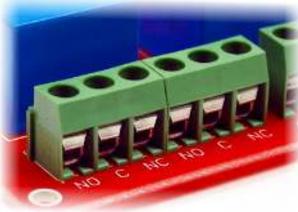
Relay State	Connection between NC and C	Connection between NO and C
OFF	Close	Open
ON	Open	Close

DC Power Supply

This module uses **+12V** supply for the relay coils. The **+12V** supply for the relay coils is not optional and the relay will not switch without this supply. Any off the shelf **12V** DC power supply can be used for this purpose. Make sure to connect the power supply in correct polarity. Connect the **positive** terminal of the power supply to the **+12** terminal on the module. Connect **negative** terminal of the power supply to **GND** terminal of the module. Connecting power supply incorrectly can cause damage to the module and/or other devices.

Triggering Relay

The relays on the board can be either turned on by using micro controller or DC supply with a Series resistor 2.2K ohm. The triggering pins are marked as RL0 to RL31 respectively.

Trigger In	Relay
RL0	Relay 0
RL1	Relay 1
RL2	Relay 2
RL3	Relay 3
RL4	Relay 4
RL5	Relay 5
RL6	Relay 6
RL7	Relay 7
RL8	Relay 8
RL9	Relay9
RL10	Relay 10
RL11	Relay 11
RL12	Relay 12
RL13	Relay 13
RL14	Relay 14
RL15	Relay 15
RL16	Relay 16
RL17	Relay 17
RL18	Relay 18
RL19	Relay 19
RL20	Relay 20
RL21	Relay 21
RL22	Relay 22
RL23	Relay 23
RL24	Relay 24

|	
RL25	Relay 25
RL26	Relay 26
RL27	Relay 27
RL28	Relay 28
RL29	Relay 29
RL30	Relay 30
RL31	Relay 31

Additional Information

Using relay modules with inductive loads

It is important to take additional care when using relays with inductive loads. An inductive load is pretty much anything that has a coil and works based on magnetic principles like Motors, Solenoids and transformers. Inductive loads produce back emf when the magnitude of the load current changes. The back emf can be in the order of tens or even hundreds of voltage (See this Wikipedia article http://en.wikipedia.org/wiki/Counter-electromotive_force). This effect is most severe when power is disconnected from inductive load because the rate of change of current is maximum at that point. Even though the back emf lives only for a very short time (a few milliseconds) it can cause sparks between the relay contacts and can deteriorate the contact quality over time and reduce the life span for the relays considerably.

So it is important to take countermeasures to suppress the back emf to acceptable levels to protect relay contacts. Usually this requires connecting electronic devices in parallel with the load such that they absorb the high voltage components generated by the load. For solenoids, connecting a diode (fast switching diode is recommended) in parallel to the load (in reverse direction to the load current) is very effective. A diode used for this purpose is usually called a freewheeling diode. Please see the diagram on the right for connection details.
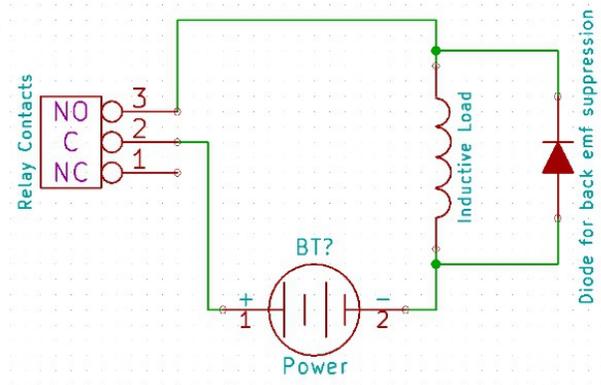
A capacitor with proper rating is recommended for protecting the relay contacts when a motor is used as load. The capacitor should be rated enough to withstand the back emf that is generated by the motor. Please see the diagram below for connection details.
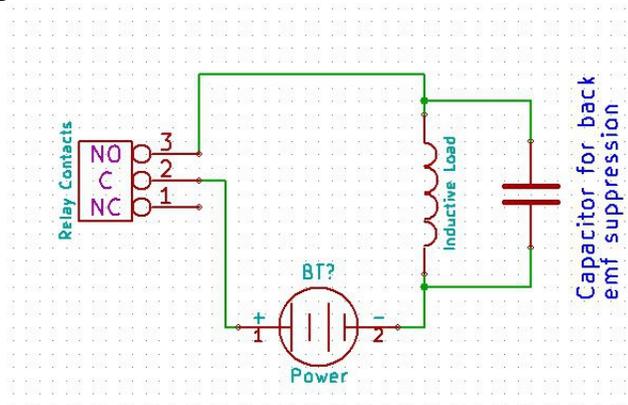
Please note that the relay modules are **NOT** shipped with back emf suppression devices pre-installed. The exact kind of suppression device and the parameters of the selected device can vary depending on the load itself. Some of the parameters that affects the suppression device selection are the inductance of the load, power supply voltage, load current, physical size/structure of the load etc.. It is obvious that it is impossible for us to predict these parameters and design required back emf suppression device and incorporate that on the board. So we believe this is a task best left to the module user.   There is an excellent article on designing back emf suppression on Wikipedia at http://en.wikipedia.org/wiki/Flyback_diode

Technical Specifications

Parameter *	Value	Unit
Basic Specifications		
Number of relays	32	
Relay Specifications		
Nominal relay coil voltage	12	V
Nominal coil power consumption (per relay)	360	mW
Relay contact material	Silver Alloy	
Contact rating	1A: 10A 240VAC/ 12A 120VAC 1C: 7A 240VAC/ 10A 120VAC	
Maximum switching voltage	250VAC/ 30VDC	
Maximum switching current	15	A
Maximum switching power	2770VA/ 240W	
Contact resistance (initial)	100 Min at 6VDC 1A	mΩ
Life expectancy (Electrical)	100,000	Operations
Life expectancy (Mechanical)	10,000,000	Operations
Nominal insulation resistance	100 Min at 500VDC	MΩ
Maximum switching on response time	10	mS
Maximum switching off response time	5	mS

* All parameters considered nominal. Numato Systems Pvt Ltd. reserve the right to modify products without notice.
* http://kyotarelays.com/datasheets/KT%20603.pdf

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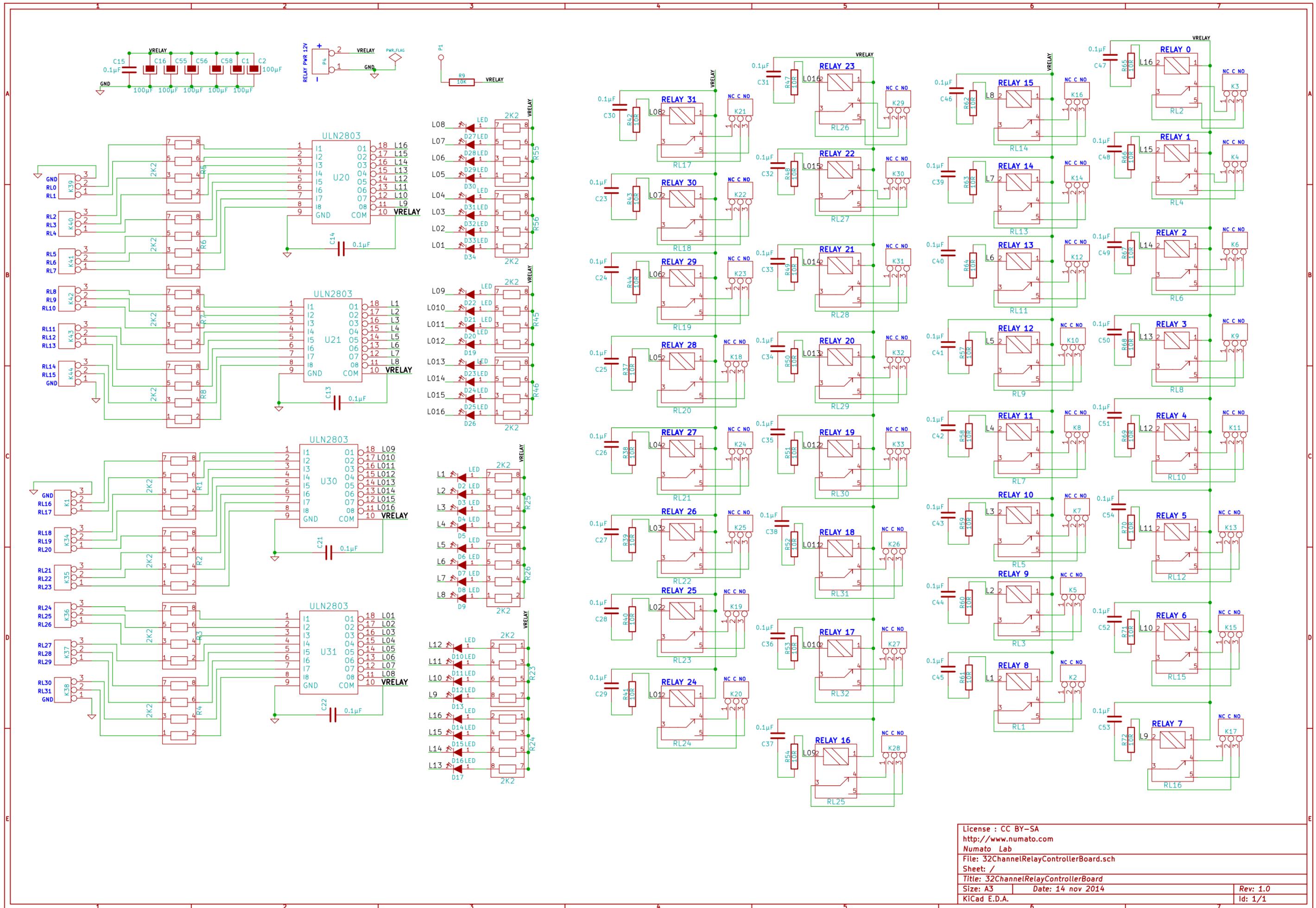
Physical Dimensions
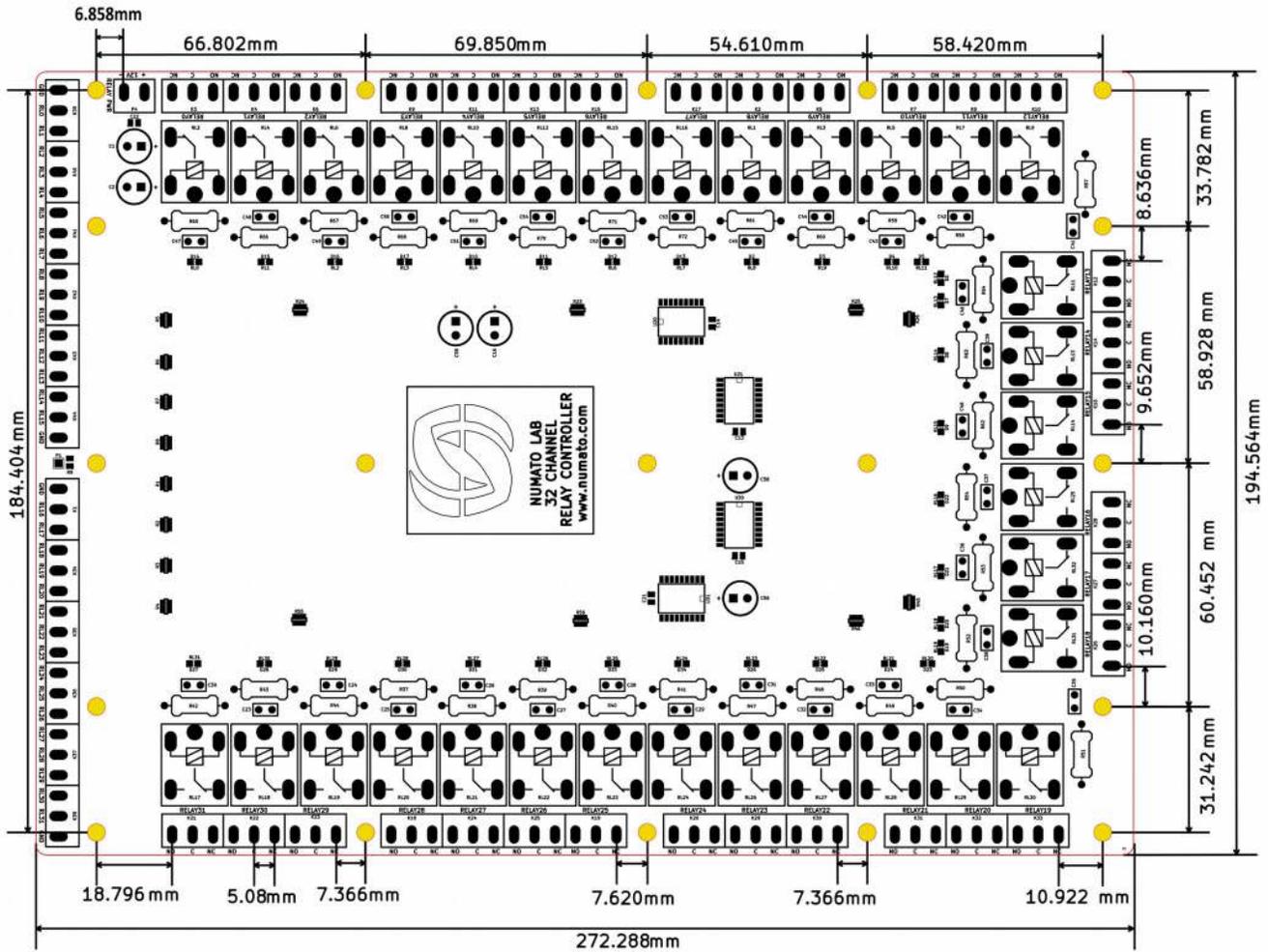
L x W x H : 272.88 mm x 194.564 mm x 20mm
Mechanical Hole Diameter : 4.0 mm

Schematics
See next page.