Documentation Economizer LT 4-Kanal

Functional description

The **EconomizerLT** board is intended as a simple, modular **driver** and economiser for all types of relays (especially **high-current relays from electric vehicles**) in order to reduce the current consumption of these relays in holding mode. In some cases, an economiser is even absolutely necessary so that these relays do not thermally destroy themselves. The functional principle of the ICs used is **pulse width modulation** (PWM). When a switching signal is applied, the full supply voltage is applied to the connected relay for a few milliseconds. Afterwards, the relay voltage is reduced by PWM, since a lower current is required for holding operation than for pick-up. One board has **4 independent channels** that can be controlled individually.

The signal outputs of the respective controller are connected to the signal connections S1 to S4. Voltage signals with 3.3V, 5V, 12V or 24V (i.e. Raspberry Pi, ESP8266, Arduino, PLC outputs or a simple switch between supply voltage and signal connection) can be used as the source. The signal current is so low that **no further driver stage** or similar is necessary. The signal voltage must be specified with jumpers before operation.

A power supply with about 12V and at least a current carrying capacity of 2x IDC (IDC current of a relay at 12V) must be connected to the two supply terminals 12V + and -. The absolute minimum supply voltage is about 8V and the **maximum supply voltage is 20V** when 12V relays are used. Higher supply voltages increase the thermal load on the board and the current consumption of the relays.

The output side terminals are connected directly to the + and - terminals of the relays. The polarity should be observed.

The two additional GND connections are for optional use. For technical reasons, the GND of the supply voltage must be connected to the GND of the signal voltage. The board therefore has only one GND and **all GND pins are connected**. In order for the signals to be detected, the GND potential of the controller must be connected to this GND at some point in the overall system. If this has not already been done externally, one of these two optional GND connections can be used.

The economiser has not been tested with relays that already have an internal economiser circuit. Problems are to be expected here.

The board comes as a kit on which all SMD components are placed. All THT parts have to be soldered by yourself. Instructions in the appendix.

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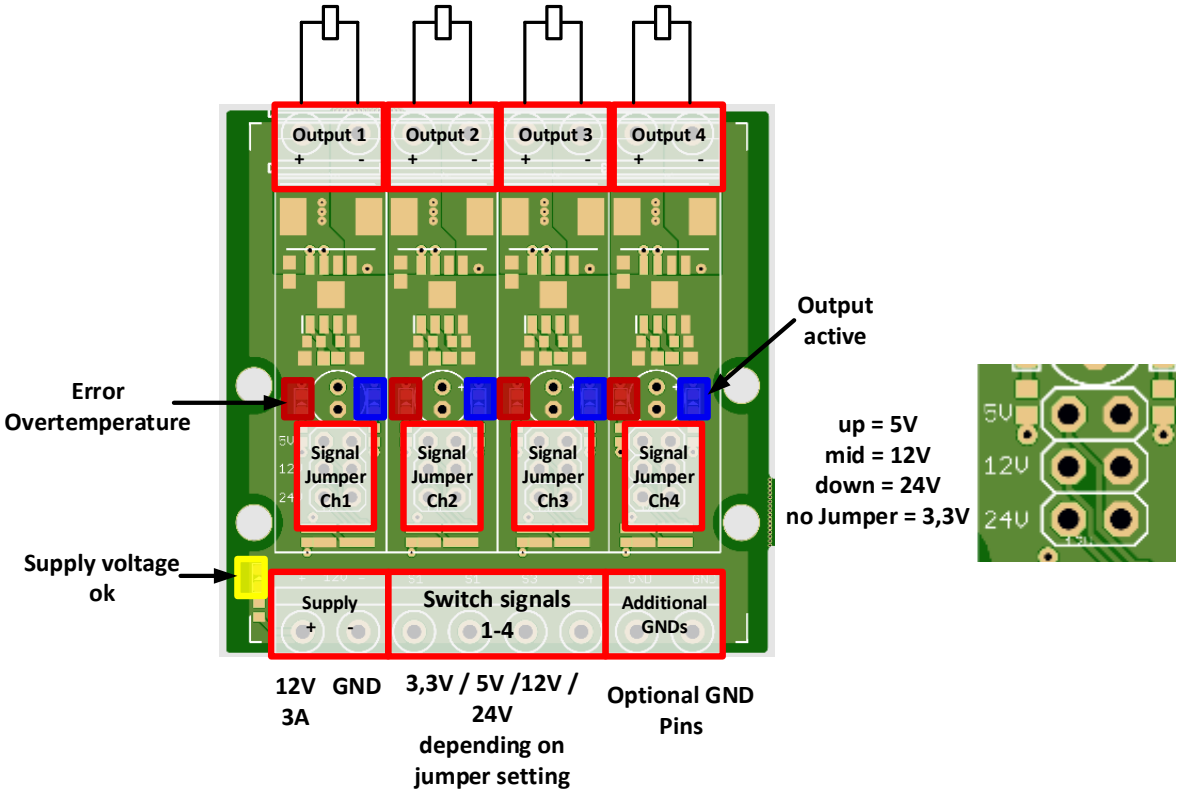
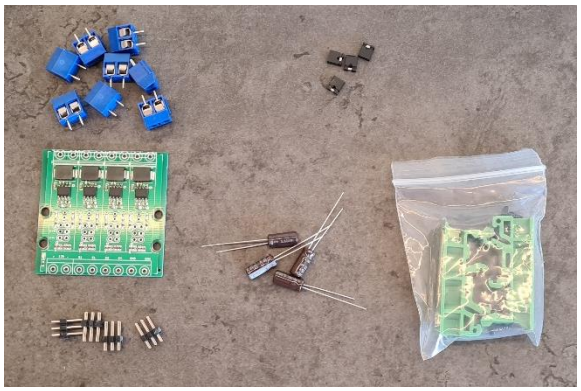
Technical data

- Supply voltage: 12VDC (min. 8V, max. 20V)
- Relay voltage: 12VDC for approx. 120ms, then approx. 5.1VDC via PWM
- Switching signal input: 3.3VDC | 5VDC | 12VDC | 24VDC selectable via jumper
- Switching current of inputs: <3mA
- independent channels: 4 x 3A
- reduces relay current consumption by about 70% (duty cycle=47%, approx. 5.1V)
- with signal LEDs for control
    - red = malfunction / overtemperature
    - yellow = supply voltage ok
    - blue = output active
- with DIN rail mounting and screw terminals
- IC used: TI DR

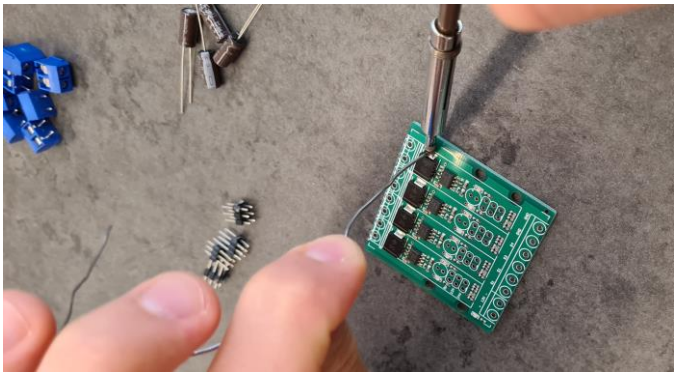


Assembly instructions



0. tools required: soldering iron, solder, side cutters, screwdriver PH2

1. reinforce diode connections with some solder



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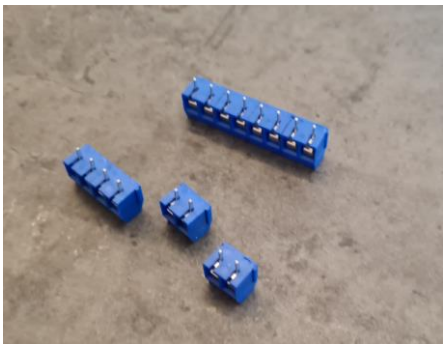
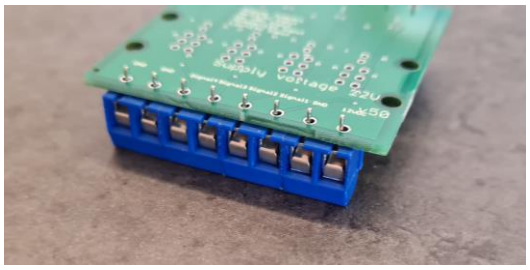
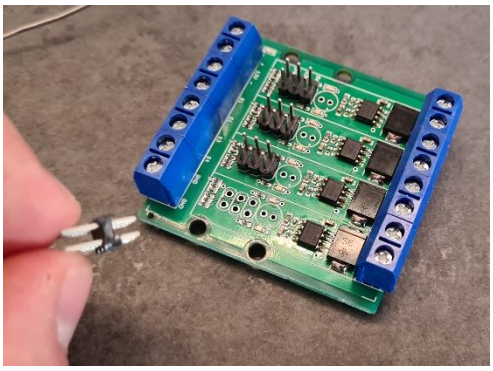
2. clip together the connection terminals



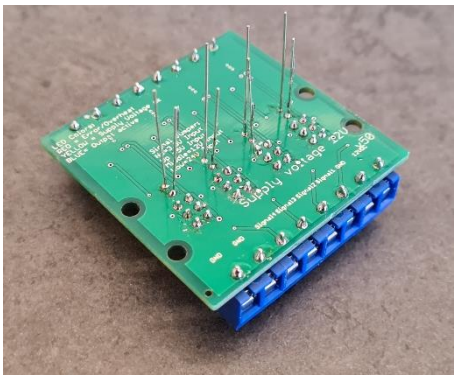
3. solder in the connection terminals



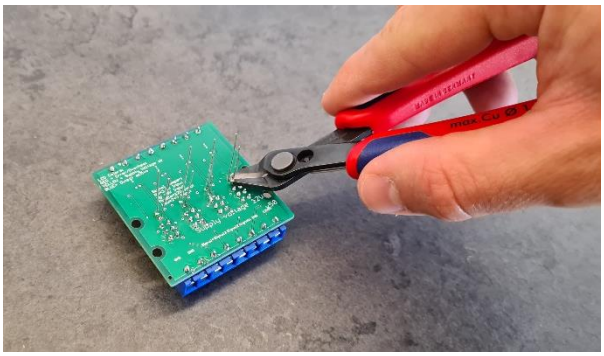
4. solder in the pin header



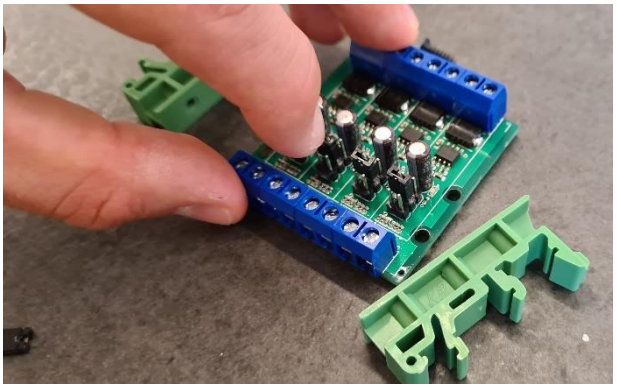
5. solder in the capacitors (long leg on the capacitor is plus).



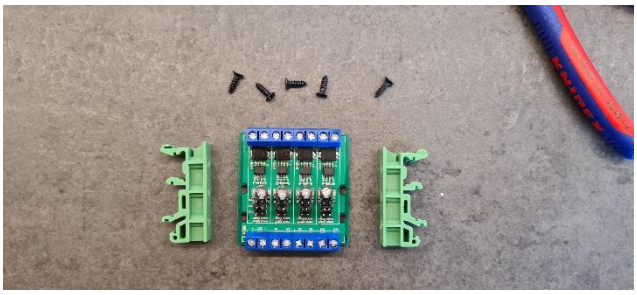
6. shorten capacitor legs

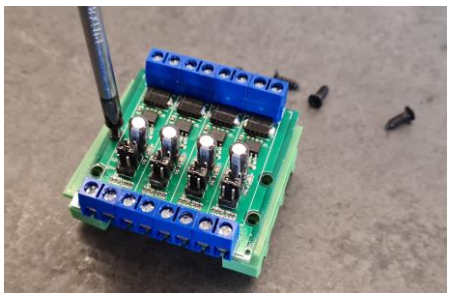


7. plug in the jumper as required (see data sheet).

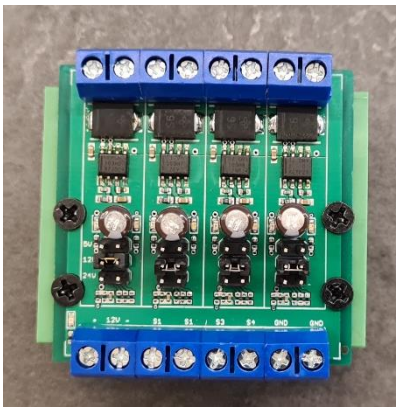


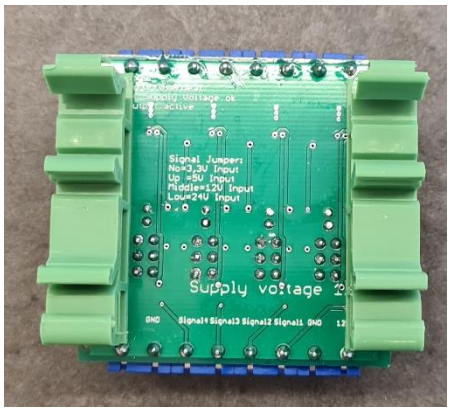
8. Screw on the top-hat rail adapter (optional).





9. Ready to use





FAQ

Why do I need such a thing?

For safety reasons, you should be able to disconnect your battery storage in an emergency, even under load. This is no longer possible with a small toggle switch and even circuit breakers (because they are designed for AC) reach their limits here. So you need high-current relays. Many of them need 30W or burn out internally if you don't reduce their current consumption wisely. That's what this thing does.

My circuit board does not work. Do I have a warranty claim?

No, you are buying a doityourself kit. The SMD components have been tested for function. If a channel does not work, you have to troubleshoot. There are no magic tricks here. Look for cold solder joints and the like.

Why are there 3 GND connections?

As described in the introduction, the two additional GND connections are for optional use. For technical reasons, the GND of the supply voltage must be connected to the GND of the signal voltage. So the board has only one GND and all GND pins are connected through. In order for the signals to be detected, the GND potential of the controller must be connected to this GND at some point in the overall system. If this has not already been done externally, one of these two optional GND connections can be used.

Where can I ask questions or get more information?

There is a Github repository. You can open an issue here.

https://github.com/jontubs/EconomizerLT

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