

# Thorlabs IP250BV Modifications

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## 1. Summary

The present document describes a modification of a Thorlabs IP250-BV laser diode driver board to work with laser diodes of both n and p-type, i.e., with laser diodes with grounded anodes or grounded cathodes. This is accomplished by adding the missing components in positions JMP1, D6 and K2.

## 2. Introduction

Thorlabs offers several laser diode driver boards. Two of these drivers are the Thorlabs IP500 and Thorlabs IP250BV. The last driver is optimised for laser diodes operating with high voltages such as blue-violet lasers (check Thorlabs IP250-BV manual for more details). The main differences of the IP250BV relative to the IP500 are:

- Capable to operate diodes with higher voltages (8 Vdc instead of 3 Vdc);
- Maximum current of 250 mA (instead of 500 mA);
- Can only operate n-type laser diodes (Style B, C and H).

## 3. Board Details

When both boards are compared the head connector JMP1, diode D6 and relay K2 components are missing in the IP250BV board. In the IP500 board, the JMP1 connector selects the laser diode with grounded anodes or cathodes. The K2 relay changes the polarity of the diode connection. The D6 diode is in parallel with the relay coil (with opposite polarity) to prevent damage to other components when turned off.

Instead of the K2 relay, the IP250-BV board has 2 jumper wires between pins 3-4 and 9-10 (see Figure 1). This corresponds to the de-energized connections of the relay.

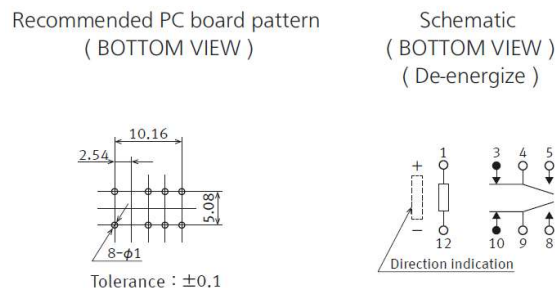


Figure 1: Schemes of the TX2-12V pins.

The PCB is the same for both laser drivers (bottom side: 3037-002, Rev. D, IP1000-PC1). The comparison between an IP250-BV (Front side label: I250-Assy1, Rev. A) and an IP500 (Front side label: I500-Assy1, Rev. D) reveals that only some components are different. In the IP250-BV, the components U1, U2, U3 and U6 are quad FET-input operational amplifiers Burr Brown OPA 4137U. In the case of the IP500, U1, U2 and U3 are quad operational amplifiers TLC274C and the U6 is a quad operational amplifier LMC6484. These components do not change the operational function of the board. In the IP250-BV the relay is a TX2-12V (12 volts operation) and in the IP500 the relays are TX2-5V (5 volts operation).

Section 5 provides photos of the IP250-BV board and section 6 provides a list of some of the components of the IP250-BV board.

## 4. Board Modification

The IP250-BV can be modified to work with both laser diodes with grounded anodes or grounded cathodes by adding the missing components:

- JMP1: 3-pin male head connector;
- D6 diode: 1N4001;
- K2 relay: TX2-12V (multiple brands available).

Before adding the relay, the jumper wires have to be removed (see Figure 2, red circle).

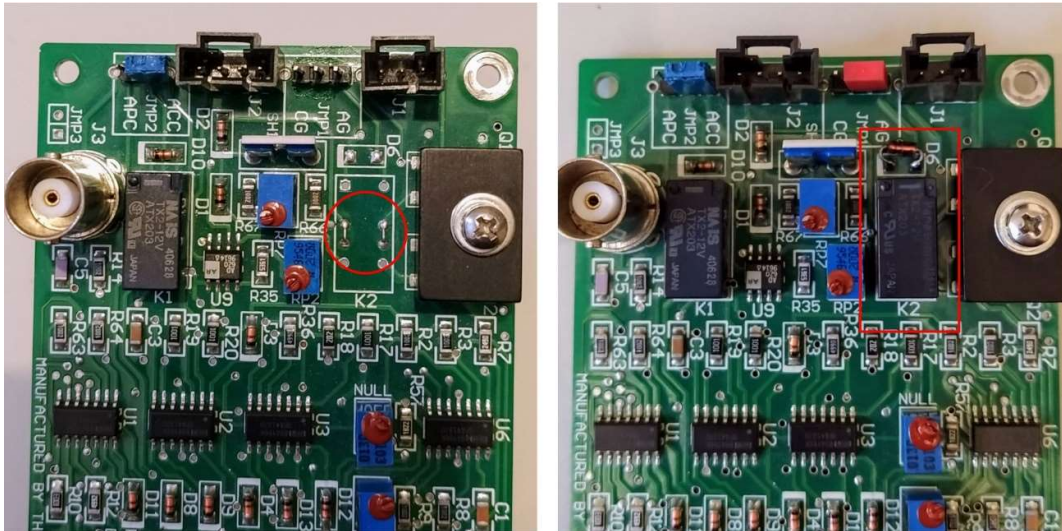


Figure 2: (left-hand side image) Thorlabs IP250-BV board before adding the D6 and K2 components, JMP1 connector already installed. The red circle shows the jump wires that must be removed before soldering the K2 relay. (right-hand side image) D6 and K2 components installed.

## 5. Board Photos

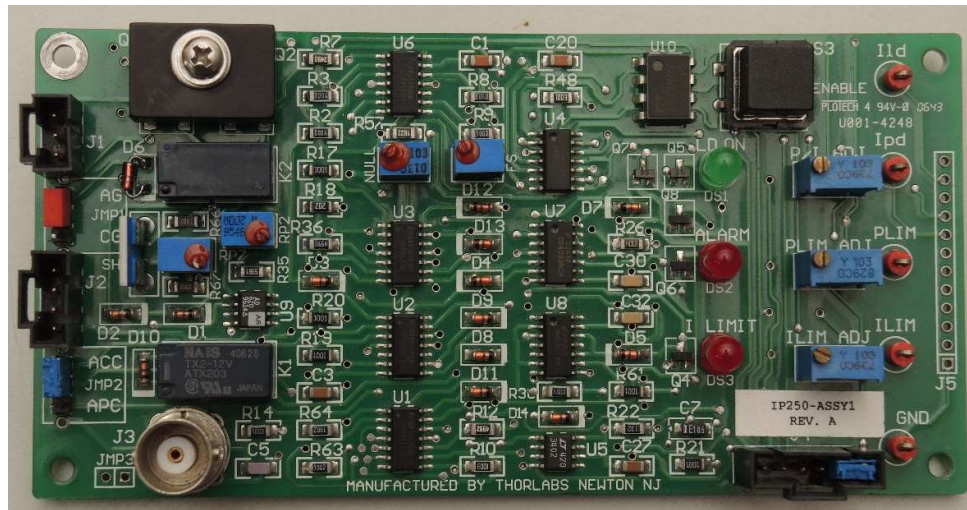


Figure 3: Thorlabs IP250-BV laser diode driver, top side, after modification (added components JMP1, D6 and K2).

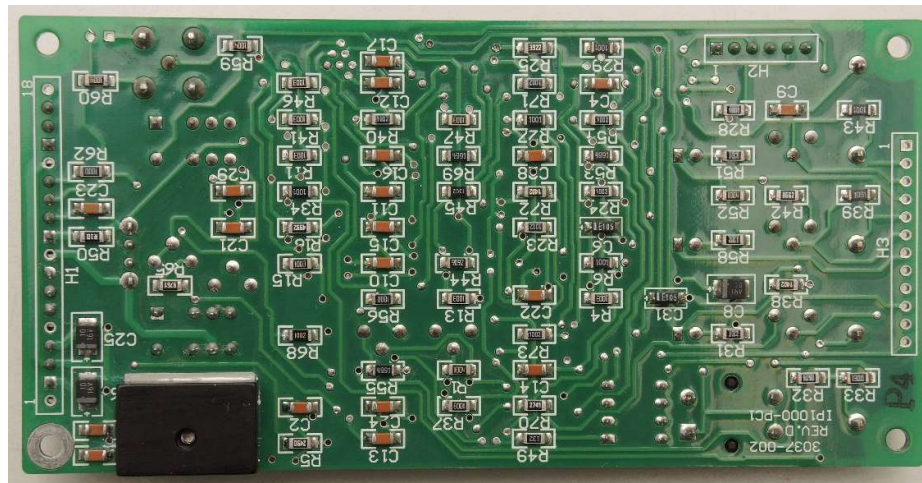


Figure 4: Thorlabs IP250-BV laser diode driver, bottom side.

## 6. List of Components

Table 1: List of some of the components of the board.

Component	Reference	Type
Board	IP250-ASSY1, Rev. A	
PCB	3037-002, Rev. D, IP1000-PC1	
U1, U2, U3, U6	Burr-Brown OPA 4137U	Quad FET Operational Amplifiers
U4	LM339M	Quad Differential Comparators
U5	NCS3402	Dual Comparator
U7	CD4093BCM	Quad 2-Input NAND, Schmitt Triggers
U8	MM74c74	Dual D-Type Flip-Flop
U9	AD620	Instrumentation Amplifier
U10	NAIS AQW212	Dual Relay
K1	NAIS TX12-12V	relay 12 V
Q1, Q2	MJE2955 and MJE3055	Power Transistors

Q4, Q5, Q6, Q7, Q8	Panasonic 2SC2405	NPN transistor SOT-23
SH1	SR10	(shunt resistor 1.00 $\Omega$ , 1%)
RP2	Bourns 3266, 200 $\Omega$	Trimpod
RP7, NULL	Bourns 3266, 10 k $\Omega$	Trimpod
FS	trimpod $\frac{1}{4}$ ", 2k $\Omega$	Trimpod
P/I ADJ, PLIM ADJ, ILIM ADJ	Bourns 3296, 10 k $\Omega$	Trimpod