

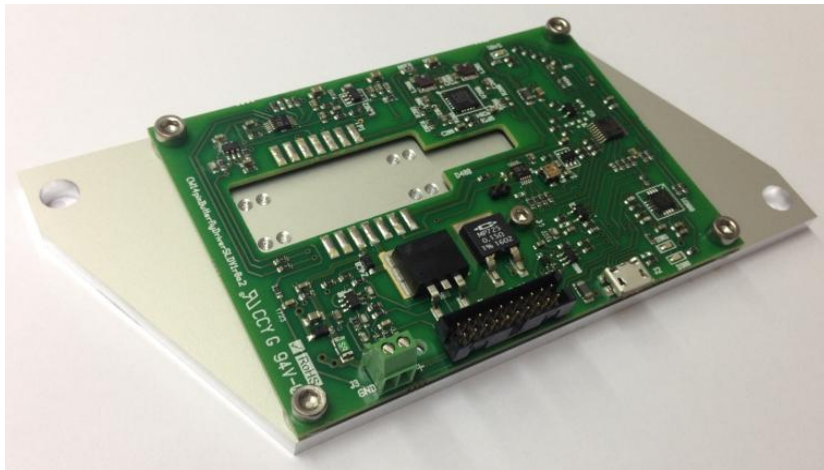
# CW Butterfly laser diode driver

Model: *CW14pinBTF Driver1500*

## User's Guide, Hardware

Version 2.0

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*This picture is for illustrative purposes only and details may vary.  
Laser and aluminum base plate are not part of the standard product*

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# 1. General Information

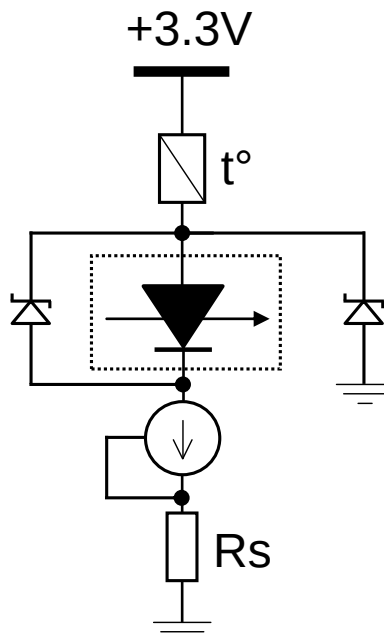
## 1.1 Notices

Innolume, GmbH (“Innolume”) provide this CW14pinButterflyDriver board User’s Guide with instructions on how to operate the device.

This document should be kept with the product to provide you and all future users and owners of the product with important operation instructions and other information. All users should read and understand this document and familiarize themselves with the information that is compiled in it, before using the product. Should you or any other user need any further assistance with the understanding of the content of the product documentation, including this User’s Guide, or with the use of the product, please do not hesitate to contact Innolume using any of the contacts listed in the front page of this document.

## 1.2 General Description

This CW14pinButterflyDriver is a constant current laser diode driver and temperature controller for driving 14-pin butterfly packaged laser diode modules with thermoelectric cooler (TEC). A block diagram of the constant current driver is shown in Fig. 1. A self resetting PTC Fuses is limiting the laser diode forward current and Zener diodes protect the laser diode against reverse and over voltages. The TEC driver consists of two switching regulators that operate together to directly control the TEC cooling or heating current.



**Figure 1.** Block diagram of the constant current driver.

## 2. Technical Specifications

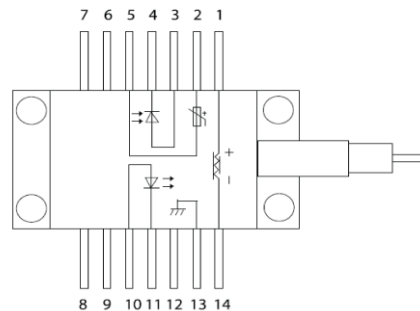
### 2.1 Specifications

#### Specifications, CW14pinButterflyDriverV1r2SLDV1r0a4r2

| Parameter                       | Specification      | Unit |
|---------------------------------|--------------------|------|
| Current output, max             | 1500               | mA   |
| Risetime                        | 100                | us   |
| Overshoot                       | <2                 | %    |
| TEC max cooling/heating current | 1.5                | A    |
| Supply voltage                  | 3-5V, 3.3V nominal | V    |

### 2.2 Compatibility

The CW driver board is prepared with cutout and solder pads for 14 pin butterfly packages, including 36.7mm long semiconductor optical amplifiers (SOA). The compatible laser diode pinout is shown below in Figure Figure 2.



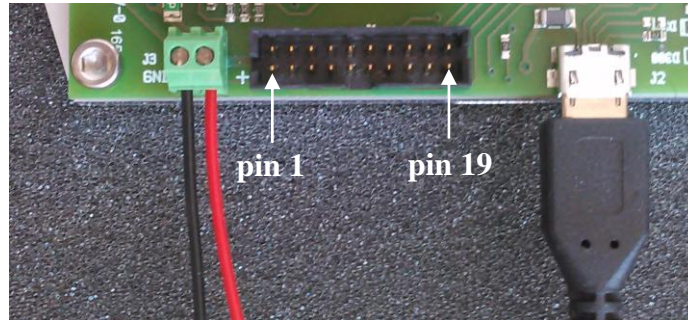
| Pin # | Description         | Pin # | Description        |
|-------|---------------------|-------|--------------------|
| 1     | Peltier cooler (+)  | 14    | Peltier cooler (-) |
| 2     | Thermistor          | 13    | Case ground        |
| 3     | Monitor anode (-)   | 12    | Not connected      |
| 4     | Monitor cathode (+) | 11    | Laser cathode (-)  |
| 5     | Thermistor          | 10    | Laser anode (+)    |
| 6     | Not connected       | 9     | Not connected      |
| 7     | Not connected       | 8     | Not connected      |

**Figure 2.** Laser diode pinout compatible with the CW14pinButterflyDriverSLDV1r0a4.

## 2.3 Connectors

The CW14pinButterflyDriver is prepared both for use in OEM integration and as laboratory laser diode driver. It has 3 connectors for electrical power and control interfacing. The connector J1 is a Molex 878312020, 20 Positions, Shrouded Header, with 2 mm pitch. This connector is particularly useful for OEM integration and includes all the connections.

As an alternative, for laboratory use the power connector J3 and microUSB connector J2 is all that needs to be connected.



**Figure 3.** Connector positions on the CW14pinButterflyDriver, from left to right J3 - power connector (left terminal is GND and right terminal is +3.3V), J1 - Header and J2 - microUSB.

### J1 Pinout

| Pin # | Description                     | Pin # | Description                             |
|-------|---------------------------------|-------|---|
| 1     | Supply, +3.3V nominal           | 11    | EN_ext , Enable pin                     |
| 2     | Supply, +3.3V nominal           | 12    | GND                                     |
| 3     | PDout ,amplified monitor output | 13    | NC                                      |
| 4     | Iset_ext , leave none connected | 14    | GND                                     |
| 5     | GND                             | 15    | GND                                     |
| 6     | GND                             | 16    | RS232 IN (connects to com port DB9F-3)  |
| 7     | NC                              | 17    | GND                                     |
| 8     | NC                              | 18    | RS232 OUT (connects to com port DB9F-2) |
| 9     | GND                             | 19    | OverTemp, overtemperature active low    |
| 10    | GND                             | 20    | GND                                     |

### J2 microUSB Amphenol FCI 10118192

| Pin | Description                                 |
|-----|---|
| 1   | V BUS 5V USB power, supplies USB to UART IC |
| 2   | Data minus                                  |
| 3   | Data plus                                   |
| 4   | ID, 51K to GND                              |
| 5   | USB GND, connected to GND with 27R          |

### J3 Power connector

| Pin | Description           |
|-----|-----------------------|
| 1   | GND                   |
| 2   | Supply, +3.3V nominal |

## 2.4 Mounting of laser diode

To mount the laser diode cut the 14 pin butterfly pins to length so they will mate with the solder pads on the board when bend down flat on the board.

Make sure that the laser diode base is clean and apply a small amount of heat sink paste. Use four M2.5 screws to fix the butterfly package on a baser plate. Shape the pins by pressing them down with the tip of lead forming pliers or other tool. Solder the pins to the Driver solder pads using a solder iron and lead free solder wire.

## 2.5 Power supply

The Driver and TEC controller runs on a single voltage supply. At power-on the current consumption can reach the maximum TEC current as the control acts to reach the setpoint temperature. Therefore, the power supply needs corresponding current rating even if the typical operation current is less.

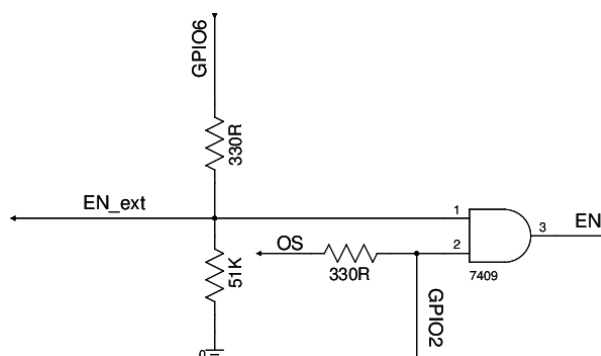
## 2.6 Control

All the functions of the CW14pinButterflyDriver can be controlled via the USB or RS232 interface and the control application described in a separate document, the *CW14pinButterflyDriver1500 Control Application Guide*.

For OEM integration please contact Innolume for instruction set and code examples, if needed.

## 2.7 Enable configuration

The software control allows enabling and disabling of the laser current. A hardware enable EN\_ext is provided on connector J1 pin 11. This pin can be left non-connected if software control is adequate.



**Figure 4.** Enable configuration schematic.

A simplified enable circuit schematic is shown in Fig. 4. The GPIO6 is the general purpose in/out on the control IC. In operation with the control application this pin is configured as output with push-pull drive (max 20mA). EN\_ext is connected to J1 pin 11. EN\_ext is always pulled down by the 51K resistor. If J1 pin 11 is non-connected

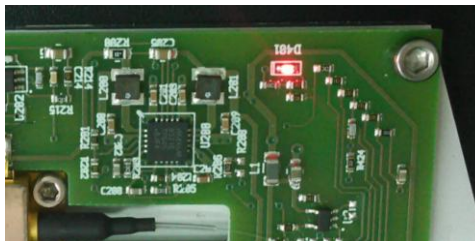
or connected to high impedance then the GPIO6 will pull the EN\_ext high to enable and low to disable in response to control app ON/OFF button pressing.

By connecting the J1 pin 11 to GND, EN\_ext is forced low and the laser current disabled, no matter the setting in the application. Likewise, by forcing EN\_ext high by connecting J1 pin 11 to +3.3V will enable the laser current, no matter the setting in the application. It is not recommended using J1 pin 11 to override the application ON/OFF setting in normal operation. Doing so can cause confusion about what state the enable has and the control GPIO6 can be left driving a high current for extended periods of time.

When using the control application, J1 pin 11 can be used for laser safety interlocking with a relay. The relay needs to produce an open circuit between J1 pin 11 and GND for normal operation and connect J1 pin 11 to GND when interlock is active (tripped). If the control application is not used then GPIO6 will have a default configuration as input, so it is not sourcing or sinking current and the J1 pin 11 can be used to enable and disable the laser current.

## 2.8 Monitor photodiode output

The 14 pin Butterfly back facet monitoring photodiode is connected to an amplifier circuit and the output is available at J1 pin 3, PDout, amplified monitor output. The voltage which is proportional to the monitor photo current is also driving an indicator LED, D401, location on the board, see Fig. 5.



**Figure 5.** Emitted power indicator LED.

The LED will typically, depending on PD responsivity and tap ratio, light up around laser threshold current setting and reach maximum brightness at half the maximum current. The PDout, amplified monitor output level is offset by a voltage which is a fraction of the +3.3V supply voltage. The PD signal is also connected to a resistor ladder with taps connected to GPIO comparator inputs. This is used for “power good” check in OEM integration.

## 2.9 Heat Dissipation

Please note that although the CW driver board may be supplied already screwed to a holding aluminum base plate, such plate is not suitable for a proper cooling of the CW driver board and mounted laser diode.

The base plate requires appropriate heat dissipation conditions and its bottom surface should be in contact with a heat sink.

### 2.10 Base plate layout (optional)

All dimensions are in millimeters.

