Laserdiode Driver Series DSD 500

Operating Manual

1. Preface

This application note contains user information for the Laser Diode Driver Series DSD 500. These Drivers are OEM products for integration into other equipment and have for this reason no CE certification according to the current regulations by law. Thus the end user is responsible for any certification applicable to the respective equipment.

2. Basic considerations

To become familiar with the special properties of the driver it is strongly recommended to replace the laserdiode for the first time by a dummy load.This dummy can be build up by a series connection of 2 to 3 standard silicon rectifiers with a sufficient rating for current and power.To emulate a standard laser diode, the resulting forward voltage should be in the order of 2 V (1.6 to 2.2 V), the rated power for the single rectifier diode should be at least 50 W.
Please use a fast recovery type, if the laser current has to be modulated with a high repetition rate.

For laser currents above 30 A it is recommended, to mount the driver on a heatsink of sufficient low thermal resistance.

## 3. Basic wiring instructions

3.1. Input power supply

The standard driver version is designed for a nominal **operating voltage of 5 V to 9 V ± 10 %**, special versions allow for supply voltages up to 15 V.
The connections to the external dc power supply are made via the two screw stud terminals size M4, designated as X1.1 resp. X1.2.

> **X1.1** $\rightarrow$ **+ 5 V DC**   positive terminal of the power supply
> **X1.2** $\rightarrow$ **5 V / RTN**   negative terminal of the power supply

Please observe:

- ➢ **Use a high current cable type with sufficient cross section area** (min. 4 mm² / AWG 12)

- ➢ **Do not insert a washer <u>under</u> the tongue terminals**

- ➢ **Fix a low ESR electrolytic capacitor of 4700 uF/10 V across the input terminals** (X1.1 $\rightarrow$ plus, X1.2 $\rightarrow$ minus/ leads as short as possible)

- ➢ **The DC input current can rise up to 30 A** (depending on output current and LD type)
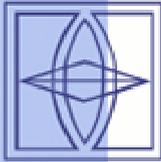
3.2. Laser-Diode

The **laser diode** (resp. the dummy load) has to be connected to the screw terminals X1.3 resp. X1.4.

      X1.3 →   **LD anode**
   **X1.4** →   **LD cathode**

Please observe:

- ➢ **Use a high current cable type with sufficient cross section area** (min. 6 mm² / AWG 10)

- ➢ **Do not insert a washer <u>under</u> the tongue terminals**

- ➢ **Frequently one of the two laser diode terminals is connected to the case In this case <u>the laser diode package has to be isolated</u> electrically from the mounting surface.**

The length of the cabling should be as small as possible, if a high modulation bandwidth is desired. For CW operation the cable length can extend up to 1 m, if the total resistance remains below $0{,}01\,\Omega$.

3.3. Control Connector X3

Pin-Assignement

Pin-No.	Signal
1	control input laser current / power
2	monitor output laser current
3	GND
4	monitor output photo current
5	cathode photodiode
6	anode photodiode
7	GND
8	interlock input
9	undervoltage fail output
10	current limit fail output
11	wire break fail output
12	overtemperature fail output
13	general fail output
14	Enable input
15	GND
16	+5V auxiliary supply output
17	n.c.
18	n.c.
19	n.c.
20	n.c.
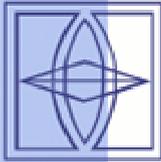
Signal description X3

<u>Pin signal description</u>

1 control input laser current / power

This input is active, if the jumper on JP1 is set in position 1^2 and accepts a positive voltage referenced to GND from 0 to + 5 V. A voltage of + 5V corresponds to a laser current of 50 A. The modulation bandwidth is 500 Hz for the standard version resp. 5 kHz for the high speed version.

2 monitor output laser current

The monitor output laser current provides a voltage of 1 V, positive ref. to GND for each 10 A of laser current. The source impedance is 1k, protected against continuous short circuit.

3. GND

Reference potential for all input and output signals.

4. monitor output photo current

The monitor output photo current provides a voltage, positive ref. to GND, where the scaling depends on the properties of the actual photodiode used. The source impedance is 1k, protected against continuous short circuit.

5. cathode photodiode

To be connected to the cathode terminal of a photodiode, located either internally in the laser diode package or externally. Please make sure, that the cathode terminal is floating.

6. anode photodiode

To be connected to the anode terminal of a photodiode, located either internally in the laser diode package or externally. Please make sure, that the anode terminal is floating.

7. GND

Reference potential for all input and output signals.

8. interlock input

The interlock input is internally tied to GND via a resistor of 10 k. This input must be pulled high to TTL High in order to enable the driver.

9. undervoltage fail output

An undervoltage fail is indicated by a logic low signal and is activated, if the DC supply voltage falls below a level of 4,8 V. The signal is TTL-compatible. An automatic restart is initiated after a fail occurred.
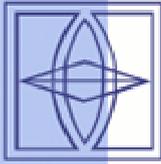
10. current limit fail

A current limit fail is indicated by a logic low signal and is activated, if the actual laser current touches the level, defined by the user via P1. In this case the laser current switches down and remains at zero, until the Enable signal is reset and set again to the active position. The signal is TTL-compatible.

11. wire break fail

A wire break fail is indicated by a logic low signal and is activated, if the laser current is interrupted by a wire break or a bad contact. In this case, the laser current switches down and remains at zero, until the Enable signal is reset and subsequently activated. The signal is TTL-compatible.

12. overtemperature fail

An overtemperature fail is indicated by a logic low signal and is activated, if the temperature on the driver board reaches a level of around + 70 °C. An automatic restart is initiated after this type of fail occurred. The signal is TTL-compatible.

13. general fail

A general fail is indicated by a logic low and is activated, if one of the fails occurs described above. The laser current remains at zero, until the Enable signal is rest and subsequently activated. The signal is TTL-compatible.

14. Enable input

This TTL-compatible input is used, to activate and deactivate the laser current. It has an internal pulldown-resistor of 1 k, to shut down the laser output, even if this input is open. The laser current is activated by a logic High level.

15. GND

Reference potential for all input and output signals.

16. + 5V auxiliary supply

This output serves a an auxiliary output to supply some surrounding control circuitry with moderate current consumption up to 50 mA.

Pin 17,18, 19 and 20 are not connected.

4. Operating Instructions

4.1. Basic steps

- ➢ adjust the two potentiometers P1 and P2 to the zero position turning counter clockwise
- ➢ set Jumper JP1 to the upper position (manual control of laser current), JP2 to the right position (constant current mode)
- ➢ connect X3.8 (Interlock Input) to X3.16 (+5 V auxiliary supply)
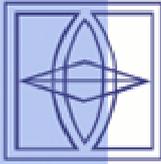
- ➢ insert a toggle switch between X3.14 (Enable) an X3.16 (+5 V auxiliary supply) turn this Switch to the OFF Position for the first time
- ➢ Connect the laser diode resp. dummy load to the terminals X1.3 (anode) and X1.4 (cathode)
- ➢ Preadjust the power supply to 5,0 V and set the current limit to around 5 A
- ➢ Connect the switched off power supply to the terminals X1.2 (negative) and X1.1 (positive)
- ➢ Switch on the power supply

→ **the tricolor Status-LED STS shows red for around 200 msec and changes then to continuous green**
The laser driver is in the standby mode of operation, the laser current is disabled.

- ➢ Set the Enable Switch to the ON position

→ **the Status LED STS changes to yellow, indicating the active laser mode**

- ➢ turn potentiometer P1 3 .. 5 turns clockwise to lift up the current limit to a moderate level
- ➢ observe the actual laser current by a DMM, connected to X3.2 (plus) and X3.3 (GND) (a monitor voltage of 1 V reflects a laser current of 10 A)
- ➢ turn potentiometer P2 slowly clockwise up to the desired laser current level

→ **if the actual laser current reaches the preadjusted limit, the laser current will be switched down immediately and the red LED ILIM lights up.**
At the same time, the Status LED STS changes to red.

- ➢ Put the toggle switch in the OFF position to return to the standby mode.