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CW Laser Diode Driver for
Butterfly 14Pin Package

SmartPower XS 10-2

MANUAL

SMART-POWER XS LASER CURRENT SOURCE WITH TEC-TEMPERATURE CONTROL

Made in Germany by



2-11

SmartPower XS 10-2

LaCoSys Sept 2020

Rev. A

SmartPower XS 10-2

FEATURES

- Laser driver for butterfly-14-Pins LC96 package
- Integrated PI- control loop for laser built in Peltier element
- Wide input voltage range
- Very low power dissipation
- Transient protection
- Over temperature protection for driver
- Analog set point control
- Enable/Disable for laser current
- Slow start laser diode protection
- Single power supply for complete diode laser current source
- Easy to mount and user friendly



PARAMETERS

LASER

- Current Range: 0...2A
- Voltage Range: 0...5V
- Current Resolution: analog
- Current Accuracy: $\pm 0.5\%$
- Current Stability: $< 0.1\%$
- Current Noise: $< 5\text{mA rms}$
- Rise Time: $< 150\mu\text{s}$
- Fall Time: $< 150\mu\text{s}$
- Current Limit: 1.1A
- Enable Input: TTL (Low)
- Analog Input: 1V/1A

TE-cooler DRIVER

- Current: max. $\pm 2\text{A}$
- Voltage: max. $\pm 2.5\text{V}$
- Sensor Typ: NTC10k
- Accuracy: $\pm 0.5\text{K}$

COMMON

- Supply: 7...25Vdc 20W
- Size (HxWxD): 20x56x62 mm
- Mass: 0.016kg

DESCRIPTION

The Diode-Laser-Source „SmartPower XS“ laser diode driver with Temperature-Controller is a high precision, safe and cost effective solution for driving 14pin Butterfly package diode lasers in CW mode. You can set Current from 0...2A, monitor temp set point and monitor current. The OEM- Board comes with a built-in temperature protection for the wide range input stage.

The temperature is controlled by a PI-Control-Loop. The control loop uses the NT10k temperature sensor normally built in the laser devices (external sensor possible).

Every device has passed our Test Lab to ensure high quality and reliability.

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1 Introduction

Thank you very much for purchasing our SmartPower Board. You have bought a high-quality advanced product and we are sure that you will enjoy the work with it.

Please read this operation manual carefully before using the device and pay attention to the safety instructions given here. In order to obtain optimum performance from your Laser Driver module follow the installation and operating instructions.

Please note that any unauthorized soldering cancels the one year warranty. OEM-products are not EMC and CE proven!

If you should have any questions or problems, please contact our service staff.

2 Technical Parameters**Common data**

DC Input Voltage	7...25V (wide range power supply)
Ambient	Temperature 0..40°C; Humidity < 95% non-condensing
Dimensions in mm	Size (HxWxD) 20x56x62 mm
Mass	0.016 kg

Laser module

Laser Diode Current	Range 0...2A Resolution analog Input unlimited Accuracy $\pm 0.5\%$ of value in cw mode
Laser Current Limit	2.1A
Laser Diode Voltage	Range 0...5.0 V
Current Noise	<1mA rms in cw mode
Rise time	<150 μ s
Fall time	<150 μ s

TE-cooler module

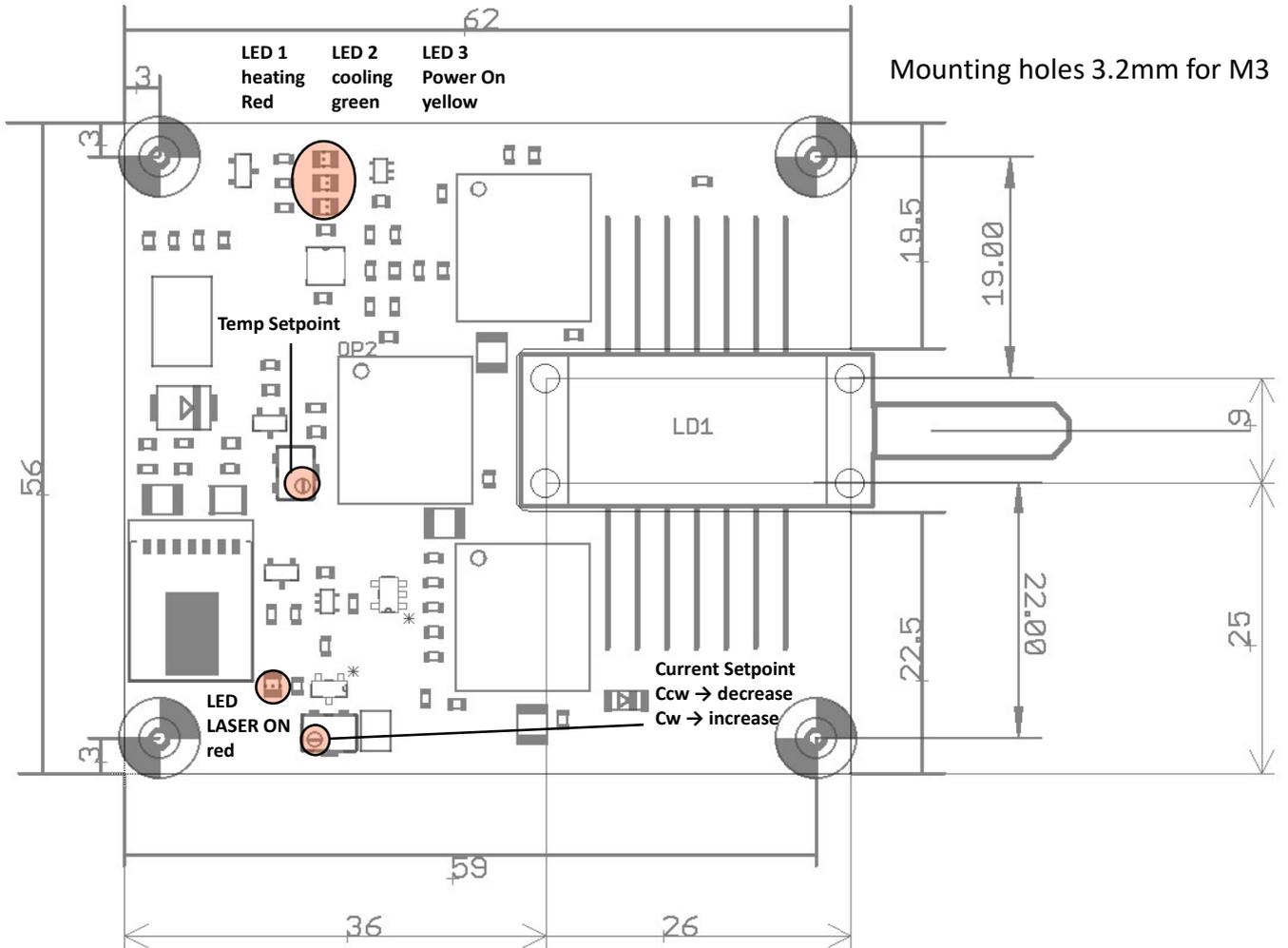
TE-cooler Current	Range ± 2 A
TE-cooler Voltage	Range ± 2.5 V
Temperature Controller	Set point potentiometer 15-25° $\pm 1^\circ$ relative accuracy ± 0.5 K

Absolute maximum ratings

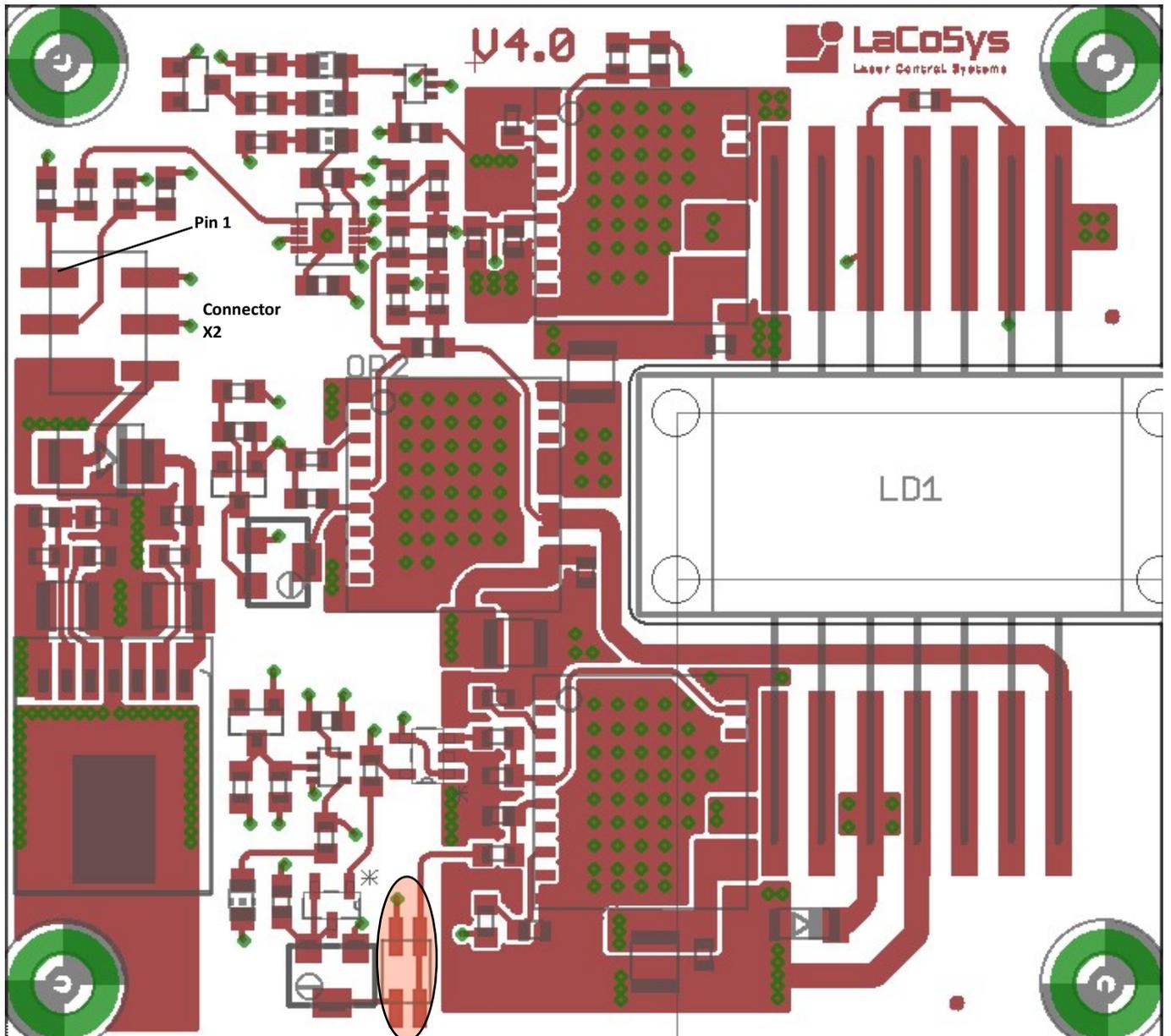
Operating Temperature	0°C to 40°C non-condensing
Storage Temperature	-40°C to 70°C
Power Dissipation	12Watts



3 Mechanical Drawing



All dimensions are in mm



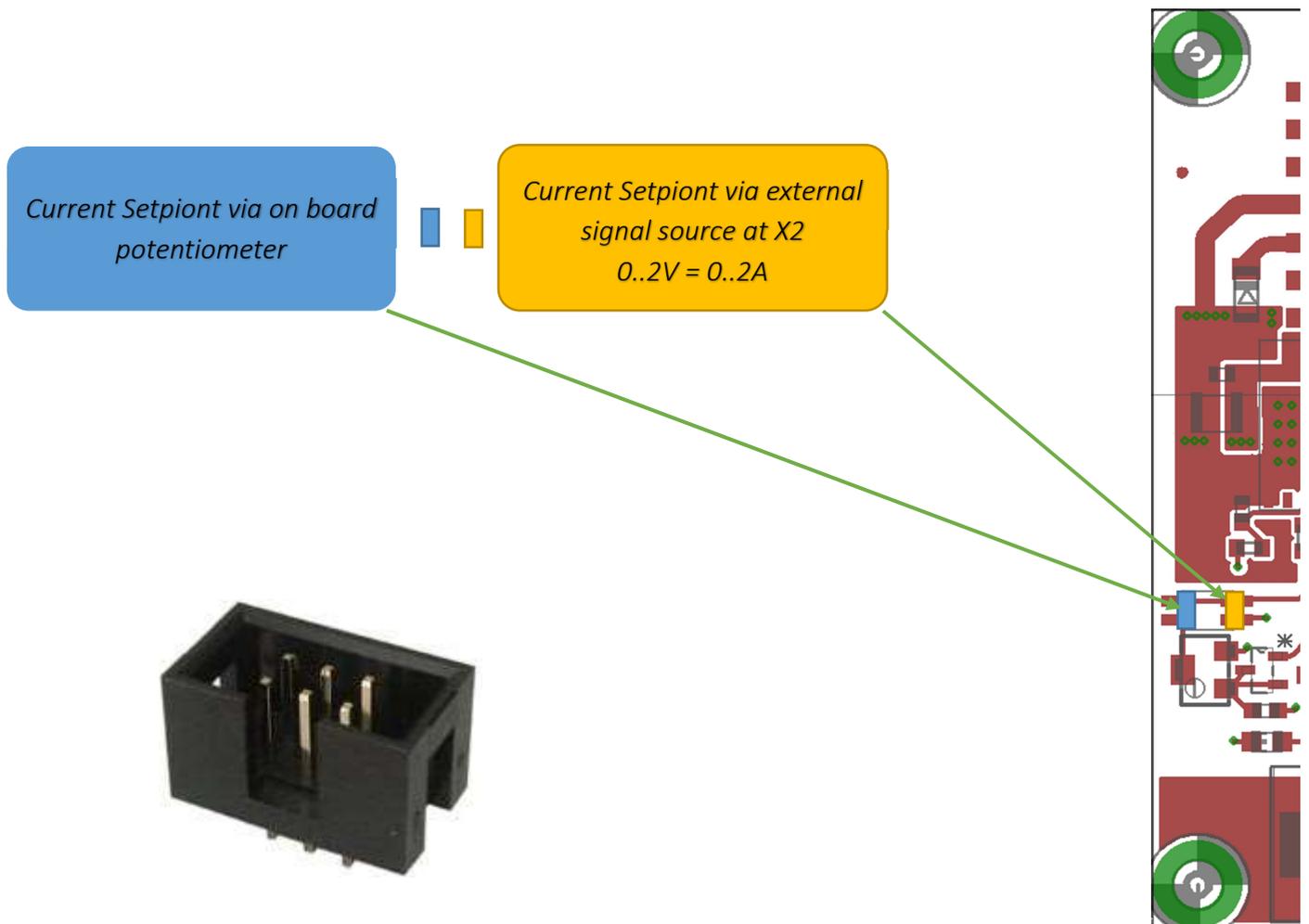
Jumper
J1

4 Pin & jumper description

The jumper J1 select the signal source for the laser current setpoint.



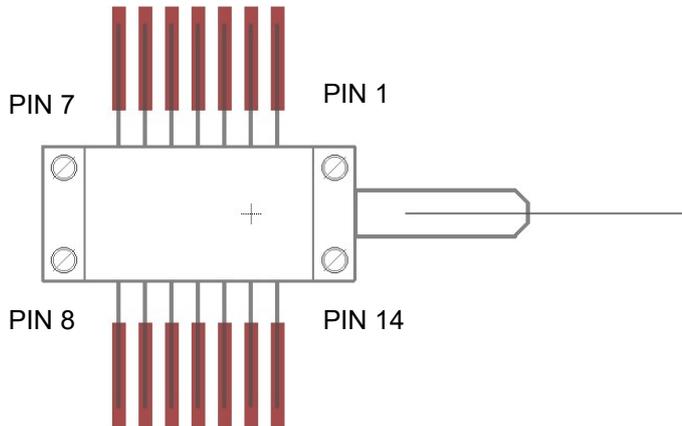
SmartPower XS 10-2



Connector X2 type Fischer WSL6 (PIN 1 MARKED)

PIN	FUNCTION	SPECIFICATION AND REMARKS	
1	Temp-Monitor	Normal operation 2.5V	(see diagram chapter 9)
2	External Set point Laser Current (option via Jumper)	0...2V 1V/1A [please contact default: disabled]	(input Impedance = 10kΩ)
3	Monitor Laser Current	Analog Voltage 0...2V 1V/1A	(output impedance 1kΩ)
4	Enable Laser Current	LOW signal	(connect to pin 5 to start laser)
5	GND	Power supply return path connected to Laser Diode Cathode (-)	
6	Power Supply	7..24V max. 2.2A ripple max. +/- 20mV (use filters to prevent reverse noise generated from the driver board)	

5 Laser Diode connection



PIN	FUNCTION	SPECIFICATION AND REMARKS
1	TEC	Maximum $\pm 2A$
2	NTC +	Thermistor NTC 10k High potential 5V
3	PD	Not used*
4	PD	Not used*
5	NTC -	Thermistor NTC 10k Low potential 2.5V @ 25°C
6-9	nn	Not used
10	LDA	Laser diode anode
11	LDK	Laser diode cathode
12/13	nn	Not used
14	TEC	Maximum $\pm 2A$

*Automatic Power Control on Request

6 Getting Started

6.1 Hardware Setup

- Mount the driver at an appropriate heat sink. Use a heat conducting foil for interface between driver and heat sink. We strongly recommend using plastic washers for the screws when you mount the device on a heat sink with protective earth connection.
- Make sure that no cable is connected to the printed circuit. Use an approved personal grounding bracelet for ESD protection of the laser during the following step.
- Mount your Laser Diode and solder all connections carefully.
- Provide the supply voltage and control signals via the X2 on board connector & flat cable

6.2 Start Driver and Check Temperature loop

- Turn on your power supply and measure with a voltage probe the signal an Pin 1 blue and red wire (GND) approx. $2.5V=25^{\circ}C$. Other temperatures can regulate by the temp set point potentiometer. Please monitor the actual temperature while adjusting.
- Enable the Laser current by shorting pin5 and pin 4 (orange & red wire) and check the voltage on the I-Monitor pin. With the setpoint potentiometer you can adjust the laser current. Be careful and watch always the current monitoring pin while turning the potentiometer.
- Your system is now ready for operation

6.3 Analogue Modulation

The driver board can handle signals from CW up to 10kHz. Please make sure that no negative input signals are provided. The analog input on X2 connector scaled 1V/1A.

6.4 Digital Modulation

The Enable Laser current pin provide the possibility to modulate the laser current between 0 and set point. The given rise- and fall time specification limits the digital modulation to 3kHz.

7 Temperature Control Loop

The driver board use the built in NTC10k resistor of your Laser diode to measure the internal temperature. The capability of temperature regulation depends on following points:

- Heat sink for the Laser and the Board
- Thermal capability of the built in Peltier element
- Ambient temperature

Ensure that at your maximum Laser current diode is cooled down to your selected temperature set point. Therefore, please check the voltage at Temp-Monitor pin in CW-operation after a time.

If you need any assistance according to cooling, heat sink or technical support please contact Tino Becker electronic.

8 Laser diode protection

The Driver Board has a fast protection Diode on the Laser Diode Anode (+) and Cathode (-). The Ground (GND) of the Board is common with the Laser Diode Cathode. Please note that if you use systems with protective Earth. We recommend using insulating thermal heat foil.

9 Over temperature Protection

The Driver Board has a built-in temperature protection for the DC/DC converter input stage. If the temperature in stage reaches maximum the driver will turn off the Laser current and Temperature control loop. After several ms the driver will automatically try to restart. If the fault condition is still present the process start again. A longer running in this mode could destroy the driver. Please check additional action needed for over temperature protection.

10 Temperature set point (NTC-10k) diagram

