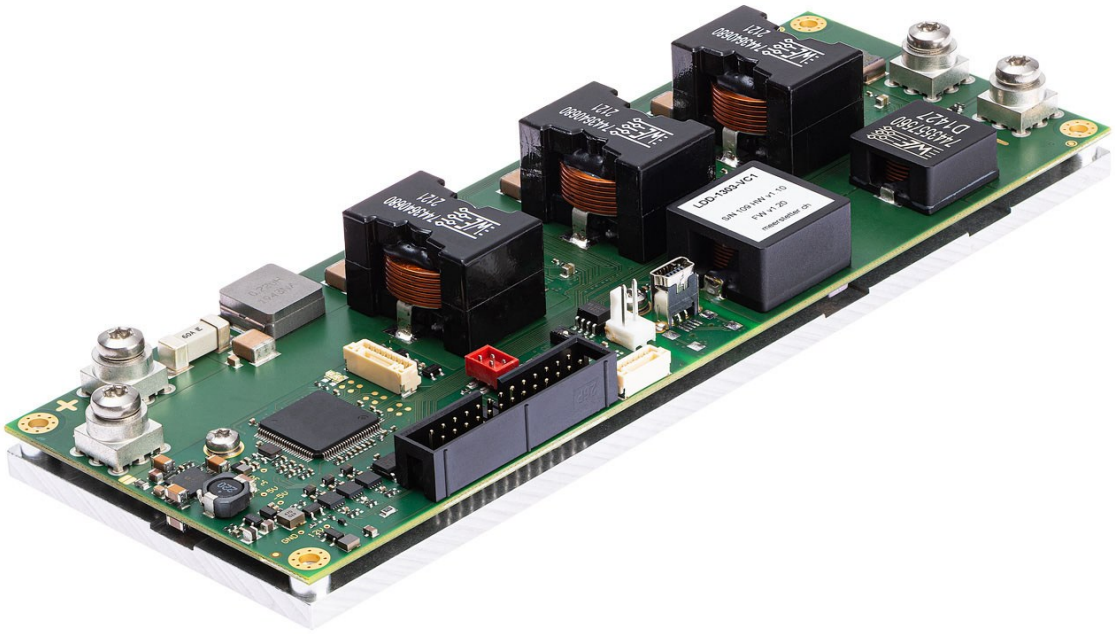
meerstetter engineering
Member of Berndorf Group

Datasheet –
Laser Diode Driver LDD-1303

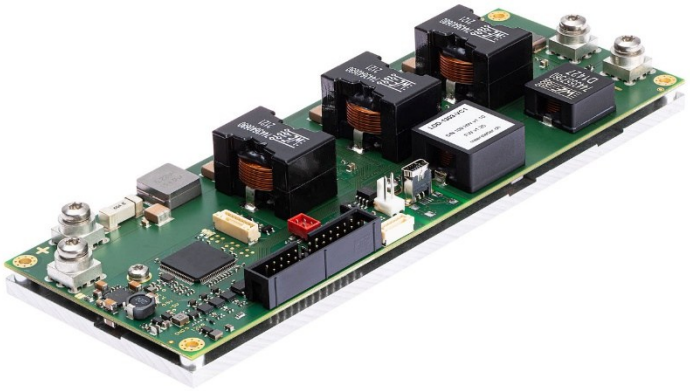


Support / First steps
Meerstetter Engineering provides technical support for all products and helps you to integrate a product into your solution. Most of your questions should be solved by reading the provided user manuals of the corresponding product or the FAQ (frequently asked questions).
For further help or if you have any other questions, please do not hesitate to contact us. We are happy to help you. You can contact us by email support@meerstetter.ch or by downloading the Meerstetter Engineering TeamViewer remote support tool.

Meerstetter's product family compatibility
The Meerstetter LDDs and TEC-Family have been developed to work along with each other. They share the same platform bus, communication protocol and hardware architecture. See Table for an Overview over the LDDs and TEC-Family.

LDDs		
LDD-1321	0-1.5 A / 0-14 V	CW, add-on TEC Controller available
LDD-1301	0-20 A / 0.5-45 V	1 ms - CW
LDD-1303	0-20 A / 1-120 V	1 ms - CW
LDD-1137	0-75 A / 0-70 V	CW, modulated, QCW and pulsed modes
LDD-1124-SV	0-1.5 A / 0-15 V	1 µs - CW, modulated, QCW and pulsed modes
LDD-1121-SV	0-15 A / 0-15 V	1 µs - CW, modulated, QCW and pulsed modes
LDD-1125-HV	0-30 A / 0-27 V	1 µs - CW, modulated, QCW and pulsed modes
TEC-Family		
TEC-1092	±1.2 A / ±9.6 V	Micro, single channel
TEC-1091	±4 A / ±21 V	Small, single channel
TEC-1089-SV	±10 A / ±21 V	Medium, single channel
TEC-1162	±5 A / ±56 V	Medium-high, single channel
TEC-1090-HV	±16 A / ±30 V	Large, single channel
TEC-1163	±25 A / ±56 V	Extra-large, single channel
TEC-1161-4A	2 x (±4 A / ±21 V)	Small, dual channel
TEC-1161-10A	2 x (±10 A / ±21 V)	Medium, dual channel
TEC-1122-SV	2 x (±10 A / ±21 V)	Medium, dual channel
TEC-1166	2 x (±5 A / ±56 V)	Medium-high, dual channel
TEC-1123-HV	2 x (±16 A / ±30 V)	Large, dual channel
TEC-1167	2 x (±25 A / ±56 V)	Extra-large, dual channel

Advanced OEM CW Laser Diode Driver



Description:

The LDD-1303 is a current source designed to precision-drive laser diodes in continuous wave applications. Its power converter topology allows for an output voltage smaller, equal, or larger than the input voltage. This enables the LDD to drive laser diodes with up to 120 V compliance voltage from a single 48 V power supply.

The LDD-1303 offers various safety features, including two inputs for laser diode temperature monitoring.

The device can be fully digitally controlled, the firmware is upgradeable and various digital communications interfaces are available.

A 0 - 10 V analog voltage input and output are present. The device features a photodiode input, Laser Power Control is available as an additional feature.

Laser Diode Driver:

- Output Current: 0 – 20A, < 0.4% Ripple
- Compliance Voltage: 1 - 120 V

Input Characteristics:

- DC Input Voltage: 10.5 to 60 V

Main Features:

- Internal Generators: nominal current
- Error: Ultra-Fast Switch-off for optimal LD protection
- Configuration / Diagnosis: via USB / RS485 / RS232 TTL
- Dimensions (L x W x H): 190 mm x 70 mm x 28 mm
- Efficiency: > 95 % (@ > 50 % Load)
- Cooling: Over Base Plate

Communication Interfaces:

- USB 2.0
- RS485
- RS232 TTL
- CANopen CiA 301

Other Features:

- 2 Temperature Sensor Inputs for NTC Thermistors
- Photodiode Input
- 0-10 V Analog Input
- 0-10 V Analog Output
- Interlock Input
- Laser Power Control (optional)

Digital I/O Configurable Features:

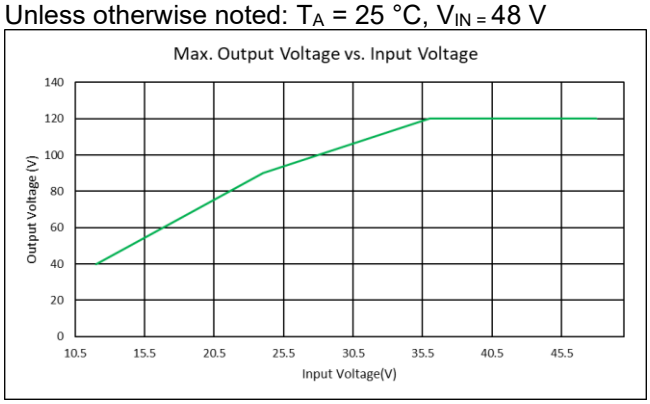
- Enable
- LDD Run Output
- And more configurable functions

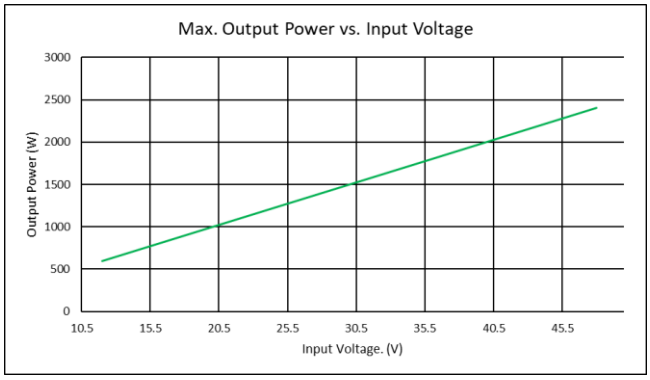
Absolute Maximum Ratings[1]	
Supply voltage (DC)	63 V
Supply current (DC)	53 A
Output current	25 A
Output voltage	130 V

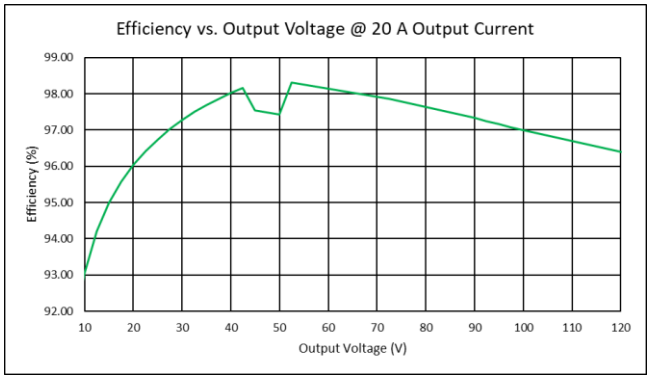
Operating Ratings	
System base plate	< 50 °C
Operation temperature	0 – 50 °C
Storage	-40 – 80 °C
Humidity	5 – 95 %, non-condensing

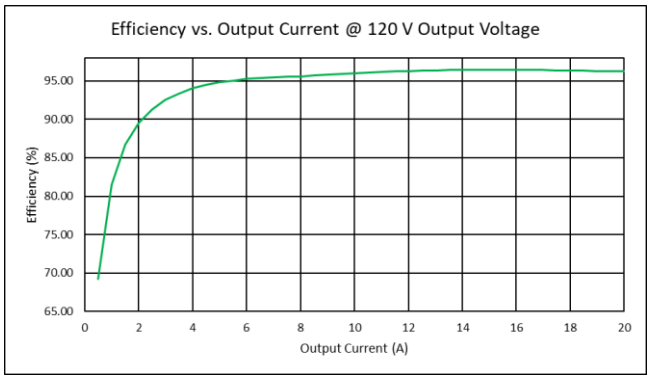
Operating Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 48 V









[1] Exceeding the Absolute Maximum Ratings may permanently damage the device

Electrical Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 48 V, V_{LD} = 120 V

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
V_{IN}	Supply voltage		10.5	48	60	V
V_{IN_RIPPLE}	Ripple tolerance[2]			300		mV_{PP}

Output Characteristics

Unless otherwise noted: T_A = 25°C, V_{IN} = 48 V, V_{LD} = 120 V

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Output CW:						
I_{OUT}	Current range		0		20	A
$T_{coefficient}$	Temp. coefficient	I_{out} = 20 A, T_A = 10 °C to 50 °C		3464		ppm/K
I_{OUT_RES}	Current resolution			2		mA
I_{OUT_RIPPLE}	Current ripple	I_{out} > 2 A		0.4[3]		%
I_{OUT_ACC}	Current accuracy	Calibrated		30		mA
V_F	Diode compliance voltage	V_{IN} = 48 V	1[4]		120	V
V_{OUT_MAX}	Output voltage maximum			120		V
V_{OUT_ACC}	Voltage accuracy	Calibrated, I_{out} < 1 A		100		mV
P_{OUT}	Output power	V_{LD} = 120 V			2.4	kW
I_{OUT_Rise}	Output current rise time	10% to 90%, PID Optimized, L_{Load} < 500 nH, I_{OUT} = 20 A			350	µs

Safety Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 48 V, V_{LD} = 120 V

Symbol	Parameter	Comments	Min	Typ	Max	Units
I/O Ports:						
$t_{OFF\_CURRENT}$	Overcurrent	Using 3 Ω resistive load, switch off time depends on operating conditions and load			20	µs
$t_{OFF\_OPVAL\_I}$	Operating Values	V_{IN} = 32 V, V_{LD} = 36 V, switch off time depends on operating conditions and load			50	µs
$t_{OFF\_OPVAL\_U}$	Operating Values	V_{IN} = 32 V, V_{LD} = 36 V, switch off time depends on operating conditions and load			5	ms
t_{OFF_SFAIL}	System failure	System status			TBD	µs
$t_{OFF\_INTERLOCK}$	Interlock	V_{IN} = 31 V, V_{LD} = 10 V, using 83 Ω resistive load, switch off time depends on operating conditions		20		µs

External Temperature Measurement (NTC only)

T_A = 25 °C, measurement configuration = 12 bit / 2-wire / unshielded cable < 50 mm, °T probe = NTC $B_{25/100}$ 3988K R_{25} 10k

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
$R_{LR,\ RANGE}$	Range		295		106400	Ω
		Corresponding temperature range	130 to -21			°C

[2] Input ripple voltage can directly influence the ripple current at the output

[3] Measured at I_{OUT} = 20A and V_{LD} = 100V

[4] Current Ripple may increase, and current control performance may decrease at compliance voltages below 5V depending on load

General Purpose Digital I/O Characteristics (GPIO1 … GPIO10)
Unless otherwise noted: T_A = 25 °C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
U_{IH}	Logic high input threshold		2			V
U_{IL}	Logic low input threshold				1	V
U_{IMAX}	Maximum input voltage		-0.3		5.5	V
Output Characteristics:						
U_{OH}	Logic high output voltage	Output current 8mA	2.8			V
U_{OL}	Logic low output voltage	Input current 8mA			0.4	V
Z_{OUT}	Output Impedance		110	120	150	Ω
I_{OUT}	Output Sink or Source Current			±8	±20	mA
ESD Protection:						
UPP	ESD discharge	IEC61000-4-2		18		kV

Analog Input and Output Characteristics
Unless otherwise noted: T_A = 25 °C. Voltages referenced to X2 (GND)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
U_{I+}	Voltage at the Analog In + Pin		-1		11	V
U_{I-}	Voltage at the Analog In - Pin		-1		11	V
U_{IN}	Nominal Input Voltage (difference between In + and In -)		0		10	V
Output Characteristics:						
U_O	Analog Output Voltage		0		10	V
I_{OUT}	Analog Output Current				20	mA

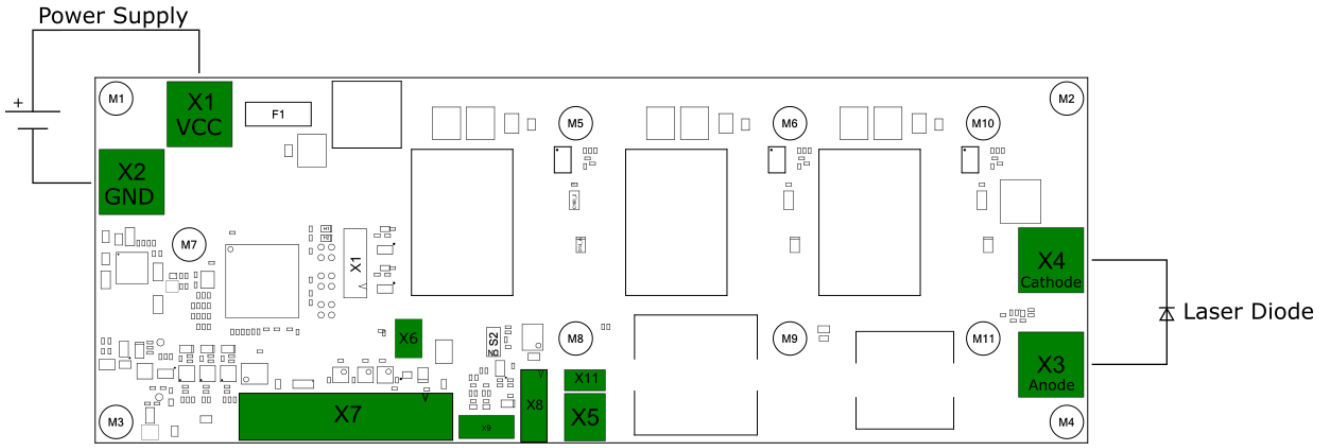
Interlock Input Characteristics
Unless otherwise noted: T_A = 25 °C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
V_{IAct}	Interlock active input voltage range	Voltage range which is detected as active input	3		30	V
V_{IORM}	Maximum Working Insulation Voltage				120	V

Photodiode Input Characteristics
Unless otherwise noted: T_A = 25 °C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
I_{In}	Photodiode current	-PD4	0		4	mA
		-PD2	0		2	
		-PD1	0		1	
		-PD0.5	0		0.5	

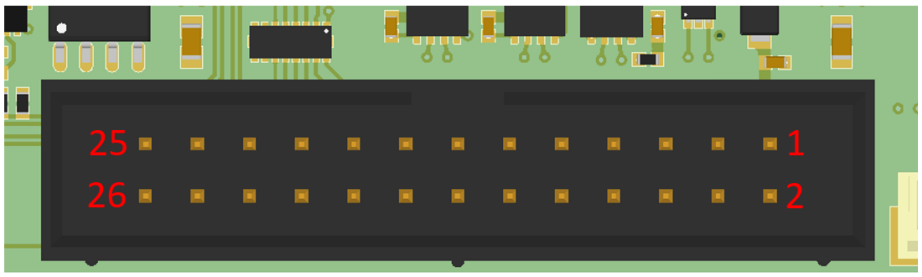
Device Connectors Overview



USB Connector X5 and X11

The LDD-1303 can be equipped with a vertical and/or a horizontal USB-Connector (See “LDD-1303 Ordering Information”). If both USB-Connectors are soldered in only use one connector at a time. Otherwise, serious damage to the USB Host may occur.

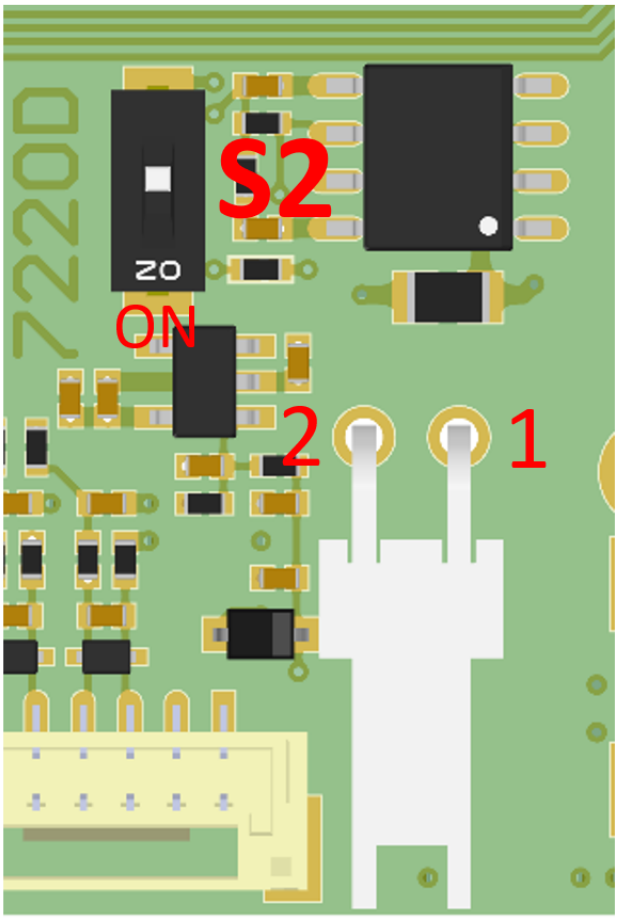
Interface Connector X7



Mating Connector:
Würth 61202623021

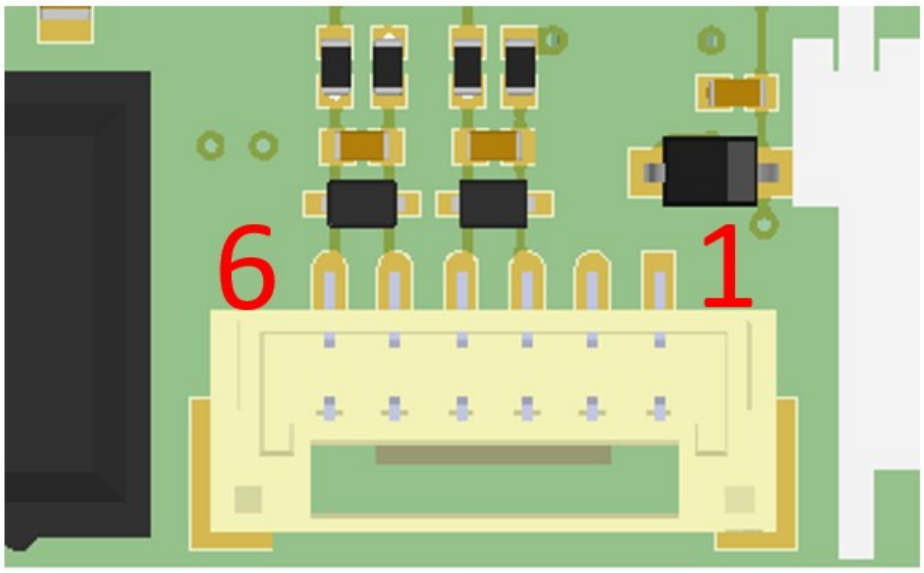
Pin		Pin	
1	+5V	14	GPIO4
2	GND	15	GPIO5
3	+3.3V	16	GPIO6
4	RS485 1 A/D+	17	GPIO7
5	RS485 1 B/D-	18	GPIO8
6	RS232 TTL RX	19	GPIO9
7	RS232 TTL TX	20	GPIO10
8	GND	21	Not Connected/Reserved
9	CAN H	22	Not Connected/Reserved
10	CAN L	23	Analog GND
11	GPIO1	24	0-10V Analog Out
12	GPIO2	25	0-10V Analog In +
13	GPIO3	26	0-10V Analog In –

Interlock Connector X8



Pin	To enable the LDD apply a voltage between the Interlock + and Interlock – Pins. The Interlock Pins are galvanically isolated from the LDD. The DIP-Switch S2 can be switched ON to disable the Interlock functionality
1	Interlock +
2	Interlock –
Mating connector	Molex 0022013027

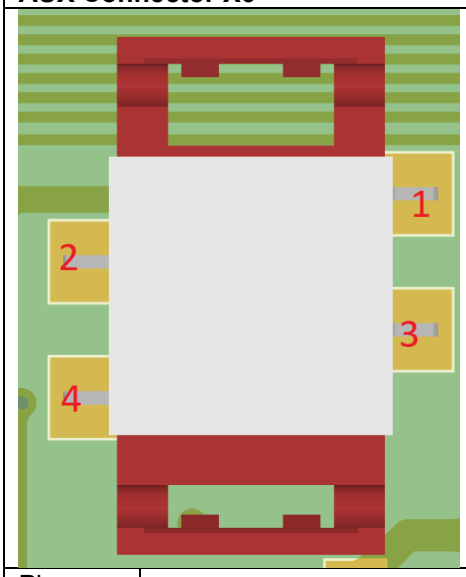
Temperature and Light Measurement Connector X9



Mating Connector:
JST GHR-06V-S

Pin		Pin	
1	Photo Diode Anode	4	NTC 2 B
2	Photo Diode Cathode	5	NTC 1 A
3	NTC 2 A	6	NTC 1 B

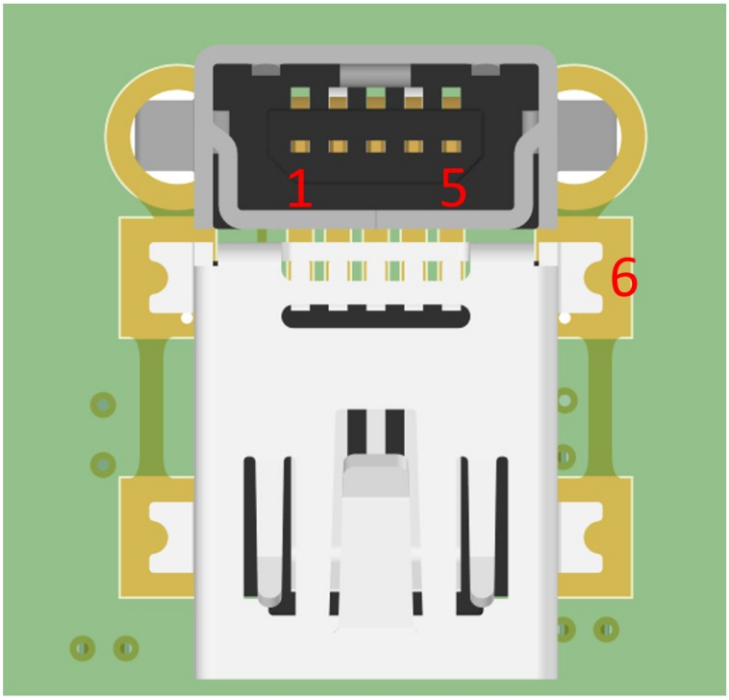
AUX Connector X6



Mating Connector:
Würth 690157000472

Pin		Pin	
1	+5V	3	CAN H
2	GND	4	CAN L

USB Connector X5 / X11

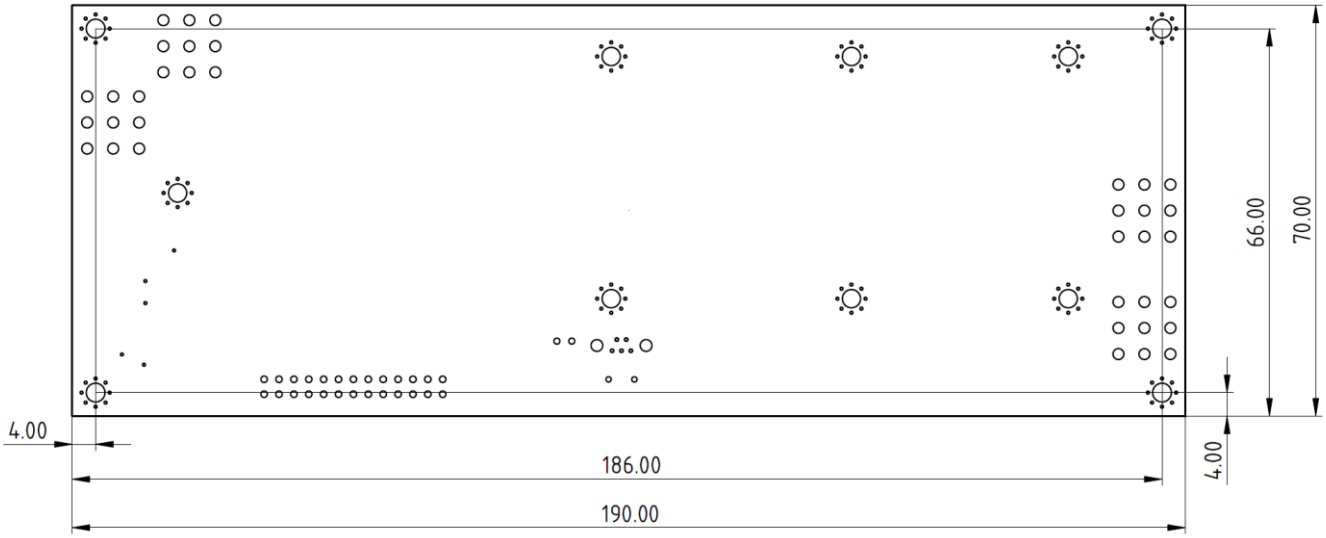


Mating Connector:
USB Mini B Type

Pin		Pin	
1	+5V	4	ID (is not used)
2	DATA-	5	GND
3	DATA+	6	SHIELD

Dimensions and Mounting Holes

The four holes in each corner can be used to mount the device onto a heatsink. Hole diameter = 3.2 mm.
A 3D model of the device is available on our website.



Vertical height: 28 mm.

LDD-1303 Ordering Information, Hardware Configuration

Example Configuration: **LDD-1303-VC1-PD4-CSx**

LDD Model:
LDD-1303

Connector Configuration:
-VC1 (default): vertical USB, vertical interlock
-HC1: horizontal USB, horizontal interlock
-VC2: vertical and horizontal USB, vertical interlock
-HC2: vertical and horizontal USB, horizontal interlock

Photodiode Current:
-PD0.5: up to 0.5mA
-PD1: up to 1mA
-PD2: up to 2mA
-PD4 (default): up to 4mA

Customer specific hardware:
- Indicates a customer specific hardware configuration, normally left blank.

Laser diode, temperature probes, power supply and connectors not included.

Current-Controlled Operation-Modes and Communication Option

The LDD-1303 is an OEM high performance current source that is primarily designed to operate in CW mode. It is configured over an industry-standard RS485, RS232 TTL or a USB connection, either GUI-driven using the included LDD Service Software, or by direct parameter control using the predefined communication protocol. Basic system status is visually indicated by on-board LEDs, more detailed status information can be polled at any time. The LDD-1303 can operate in a stand-alone configuration as well as in a remotely controlled manner, with parameters adjusted on the fly. The laser diode driver is current-PID-controlled.

Configuration parameters further include: Control source selection, maximum current limits, nominal current ramping, PID controller settings, NTC temperature sensor modeling coefficients, measurement circuitry calibration, error thresholds, etc. Please refer to the user manual for further information.

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Change History

Date of change	Doc/Version	Changed/ Approved	Change/Reason
12 January 2022	B	LS	Add Change History
		LS/RK/ML	Review, small changes (types, format)
		RK/HS	Release
21 April 2022	C	XF/HS	Fix document formatting errors
		HS/PV	Edit minimum compliance voltage
		RS/HS	Edit compliance/output voltage text for clarity
		HS/RS	Remove redundant efficiency figures
19 July 2022	D	RS/CU	Photodiode input now specified through LPC options, new configurations available Photodiode input is only available with the LPC Option Temperature coefficient and current accuracy added
19 July 2022	E	CU/RS	Hardware version increased to v1.20 Formatting
23 September 2022	F	ML/CU	Add CANopen feature and Pin definition
26 October 2022		CU/HS	Front Page, Absolute Maximum Ratings and Hardware Configuration modified New device connector overview and second CAN pin definition added
20 March 2023		CU/RS	Absolute maximum supply voltage modified Input supply voltage range adapted
13 July 2023	G	CU/HS	HW version incremented Footer fixed to the current datasheet version Pictures of the device connectors updated Pin assignment of the USB device connector added
3 June 2025	I	RS/SC	AUX Connector X6 Pin-out: pin designators modified to internal standard New label system for photodiode input, label diagram replaced
7 October 2025	J	RS/SC	Increment HW Version to v1.40