

Advanced OEM CW Laser Diode Driver



Description:

The LDD-1301 is a current source designed to precision-drive laser diodes in continuous wave applications. Its power converter topology allows for an output voltage smaller than the input voltage. This enables the LDD to drive laser diodes with up to 44 V compliance voltage from a single 48 V power supply.

The LDD-1301 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 Input as well as a 0 - 10 V analog output are integrated. Additionally, Laser Power Control using a photodiode is possible using the on-board photodiode amplifier (optional).

Laser Diode Driver:

- Output Current: 0 - 20 A, < 0.5% Ripple
- Compliance Voltage: 0.5 - 45 V

Input Characteristics:

- DC Input Voltage: 10.5 to 48 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): 100 mm x 70 mm x 20mm
- Efficiency: > 95 % (@ > 50 % Load)
- Cooling: Over Base Plate

Communication Interfaces:

- USB 2.0
- RS485
- RS232 TTL

Other Features:

- 2 Temperature Sensor Inputs for NTC Thermistors
- Light Measurement Input for Photodiode (LPC Option)
- 0-10 V Analog Input
- 0-10 V Analog Output
- Interlock Input

Digital I/O Configurable Features:

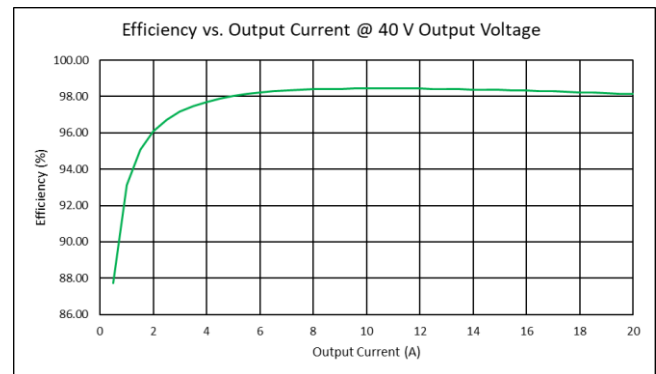
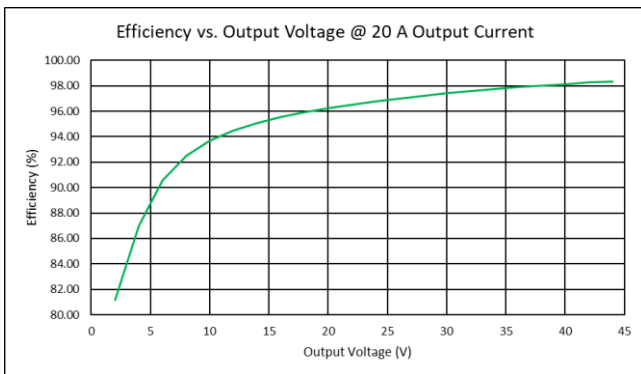
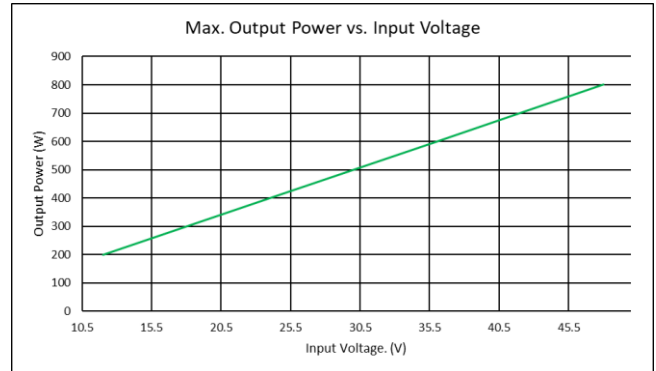
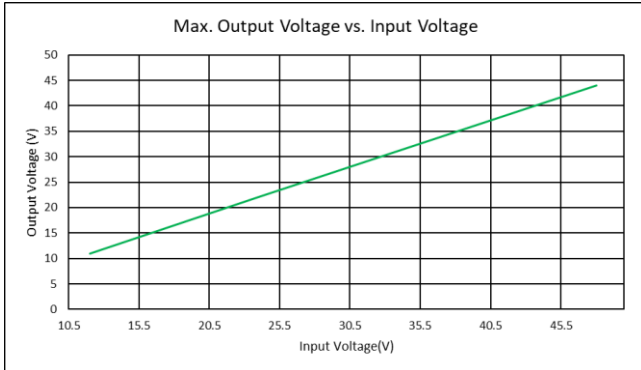
- Enable
- LDD Run Output
- And more configurable functions

Absolute Maximum Ratings ¹	
Supply voltage (DC)	53 V
Supply current (DC)	20 A
Output current	25 A
Output voltage	53 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: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$



¹ Exceeding the Absolute Maximum Ratings may permanently damage the device

Electrical Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 44\text{ V}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
V_{IN}	Supply voltage		10.5	48	53	V
V_{IN_RIPPLE}	Ripple tolerance ²			300		mV _{PP}

Output Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 44\text{ V}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Output CW:						
I_{OUT}	Current range		0		20	A
$T_{\text{coefficient}}$	Temp. coefficient	$I_{out} = 20\text{ A}$, $T_A = 10\text{ °C}$ to 50 °C		155		ppm/K
I_{OUT_RES}	Current resolution			2		mA
I_{OUT_RIPPLE}	Current ripple pp	$I_{out} > 2\text{ A}$		0.5 ³		%
I_{OUT_ACC}	Current accuracy	Calibrated		TBD		mA
V_F	Diode compliance voltage	$V_{IN} = 48\text{ V}$	0.5		45	V
V_{OUT_MAX}	Output voltage maximum			46		V
V_{OUT_ACC}	Voltage accuracy	Calibrated, $I_{out} < 1\text{ A}$		100		mV
P_{OUT}	Output power	$V_{LD} = 40\text{ V}$			800	W
I_{OUT_Rise}	Output current rise time	10% to 90%, PID Optimized, $L_{Load} < 500\text{ nH}$, $I_{OUT} = 20\text{ A}$			250	μs

Safety Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 40\text{ V}$

Symbol	Parameter	Comments	Min	Typ	Max	Units
I/O Ports:						
$t_{OFF_CURRENT}$	Overcurrent				50	μs
t_{OFF_OPVAL}	Operating Values	Voltages, currents			100	μs
t_{OFF_SFALL}	System failure	System status			250	μs

External Temperature Measurement (NTC only)

$T_A = 25\text{ °C}$, measurement configuration = 12 bit / 2-wire / unshielded cable < 50 mm, °T probe = NTC B_{25/100} 3988K R₂₅ 10k

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

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

³ Measured at $I_{OUT} = 20\text{ A}$ and $V_{LD} = 40\text{ V}$

General Purpose Digital I/O Characteristics (GPIO1 ... GPIO10)

Unless otherwise noted: $T_A = 25\text{ °C}$

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		3.3	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: $T_A = 25\text{ °C}$. 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: $T_A = 25\text{ °C}$.

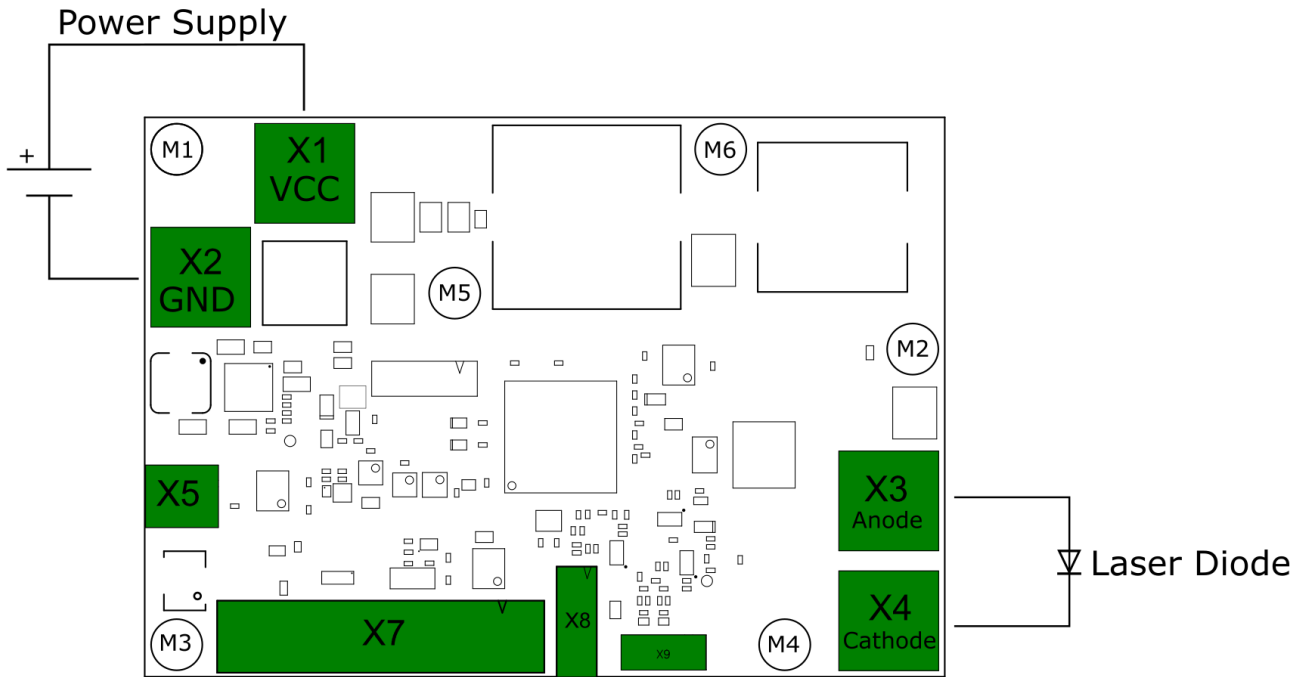
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
V_{IAct}	Interlock active input voltage range	Voltage range which is detected as active input	3		30	V
V_{IORM}	Maximum Working Insulation Voltage				120	V

Photodiode Input Characteristics (only available with LPC Option)

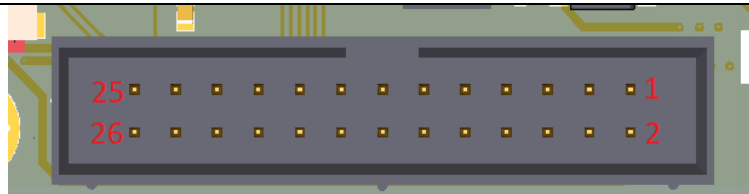
Unless otherwise noted: $T_A = 25\text{ °C}$.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
I_{in}	Photodiode current	-LPC-4mA	0		4	mA
		-LPC-2mA	0		2	
		-LPC-1mA	0		1	
		-LPC-0.5mA	0		0.5	

Device Connectors Overview

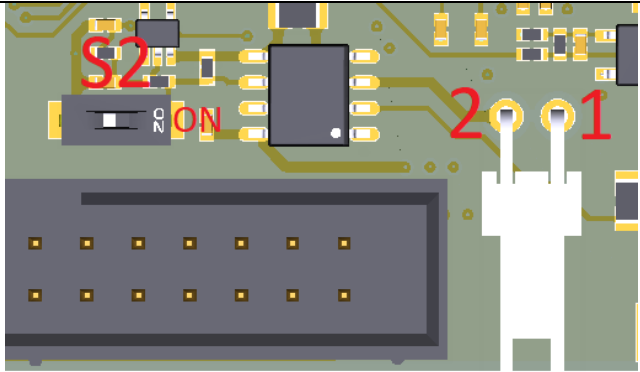


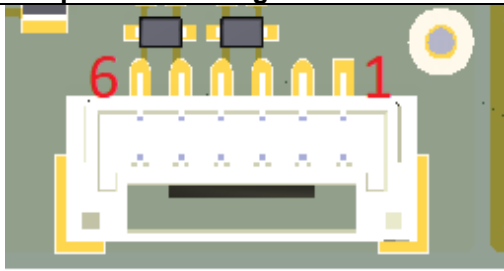
Interface Connector X7



Mating Connector:
Würth 61202623021

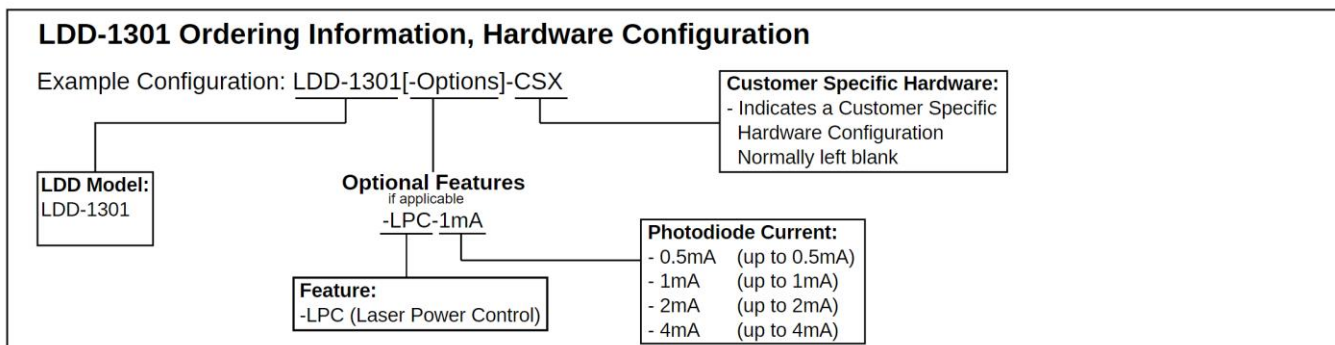
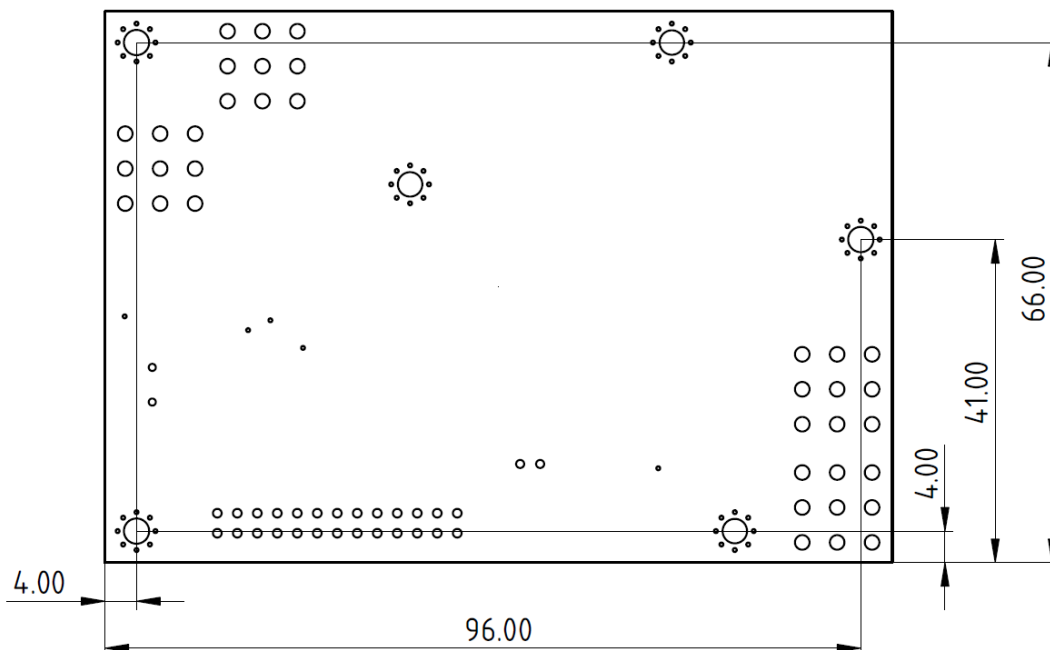
Pin		Pin	
1	+5V	14	GPIO4
2	GND	15	GPIO5
3	+3.3V	16	GPIO6
4	RS485 1 A/D+	17	GPIO7
5	RS485 1 B/D-	18	GPIO8
6	RS232 TTL RX	19	GPIO9
7	RS232 TTL TX	20	GPIO10
8	GND	21	Not Connected/Reserved
9	Do Not Connect	22	Not Connected/Reserved
10	Do Not Connect	23	Analog GND
11	GPIO1	24	0-10V Analog Out
12	GPIO2	25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

Interlock Connector X8					
	<p>Pin</p> <p>To enable the LDD apply a voltage between the Interlock + and Interlock – Pins. The Interlock Pins are galvanically isolated from the LDD.</p> <p>The DIP-Switch S2 can be switched ON to disable the Interlock functionality</p>				
	<table border="1"> <tr> <td>1</td> <td>Interlock +</td> </tr> <tr> <td>2</td> <td>Interlock –</td> </tr> </table>	1	Interlock +	2	Interlock –
	1	Interlock +			
	2	Interlock –			
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Mating connector	Molex 0022013027				

Temperature and Light Measurement connector X9			
		<p>Mating Connector: JST GHR-06V-S</p>	
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

Mounting holes Position

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



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

Current-Controlled Operation-Modes and Communication Option

The LDD-1301 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-1301 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
1 March 2022	B	ME/ME	Preliminary information
21 April 2022	C	HS/PV	Add Change History Add Connector Drawings and Pinout Add Ripple and Rise Time Values Update max compliance voltage to 45V
		RS/CU	Edit compliance/output voltage text for clarity
		CU/HS	Change current ripple unit Add ripple current footnote to clarify
		HS/RS	Remove redundant efficiency figures
19 July 2022	D	RS/CU	LPC option now defined in product string, new configurations available Photodiode input is only available with the LPC Option Temperature coefficient added
19 July 2022	E	CU/RS	Hardware version increased to 1.20 Formatting