Advanced OEM Laser Diode Driver

with Laser Power Control [LPC optional]

Description:

The LDD-1137 is a specialized laser diode driver, able to precision-drive laser diodes in continuous and pulsed operation. New emerging technologies like eGaN FETs enable faster pulses, improved wave forms and better efficiency. A new processing core enables a faster processor connection to the powerful FPGA, more interfaces, more precise timing, additional functions and much more, while still maintaining a 1.5 mA resolution with much higher current and keeping a very low output ripple.

Equipped with optional light measurement circuitry, the LDD-1137-LPC can also be operated as a Laser Power Controller (LPC).

The LDD-1137 offers various safety features, including an input for laser diode temperature monitoring. They are fully digitally controlled; their firmware is upgradeable to offer various communication options and to meet specific customer requirements.

Features

Input Characteristics:

- DC Input Voltage: 18 to 75 V

Output Characteristics CW Operation:

- Voltage: up to 70 V
- Current: up to 75 A (>60 A for a prolonged period may require additional cooling)

Main Features:

- Lookup Table with up to 64000 Samples for arbitrary current wave forms
- Error: Ultra-Fast Switch-off for optimal LD protection
- Configuration / Diagnosis: on PC (via USB / RS485 / Ethernet / CAN)
- Dimensions (L x W x H):
  118 mm x 171 mm x 48 mm
- Efficiency: >96 % (@ 50 % Duty cycle)
- Cooling: over Base Plate

Power Stage:

- Output Current: 0-75 A, ~0.2 % Ripple
  Parallel operation of multiple devices on request
- Temperature Coefficient, Typ: 20 ppm/K
- CW Current Resolution: 1.5 mA

Pulse Version:

- Pulse Generation: CW Chopping
- Pulse Rise Time: < 1 µs possible (Load dependant)
- Pulse Frequency: TBD

Interfaces:

- USB 2.0, Ethernet
- RS485, CAN, SPI, I2C
- Pulse Input
- Interlock (Enable)
- Analog Input

Laser Power Control (LPC): [LPC option]:

- CW LPC: Configurable PID
- Start-up phase: Fully parameterizable

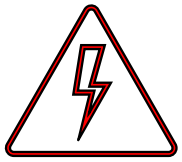
Important Note:

The following features will be added with a future firmware update, but are not yet useable:

- CAN, I2C, SPI
- LPC

Absolute Maximum Ratings	
Supply voltage (DC)	80 V
Supply current (DC)	70 A
Output current	80 A

Operating Ratings	
Temperature	0 – 70 °C
Humidity	5 – 95 %, non-condensing



Warning

This is a high-power device.

Only operate this device in an enclosure.

Take necessary precautions to protect the operator.

Electrical Characteristics

Unless otherwise noted: T_A = 25 °C, U_{IN} = 24 V, R_{load} = 3.3 Ω

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
U_{IN}	Supply voltage		18		75	V
U_{IN} Ripple	Ripple tolerance	U_{IN} never below U_{IN} min or above U_{IN} max			300	mV_{PP}
Output:						
I_{OUT}	Current range		2*		75	A
U_{OUT}	Voltage range	V_{IN} = 75 V	0	70		V
I_{OUT_RIPPLE}	Current ripple	Iout > 2 A		TBD		mA
I_{OUT_RES}	Current resolu-tion	Driver		1.5		mA
V_{OUT_LIMIT}	Output voltage			TBD		V
P_{OUT}	Output power	V_{LD} = 70 V, additional cooling			5000	W
f_{CW}	Current change	For L_{Load} <100 nH, higher f_{CW} are possible		TBD		kHz
I_{OUT_SLOPE}	Current slope limit	I_{out} > 10 A		TBD		A/ns
System Characteristics:						
η50%	Power efficiency	@ 50 % load		96		%
η100%	Power efficiency	@ 100 % load		98		%

* Operation below this value is possible but the output current and measurement may show offsets outside of the specifications.

Platform Bus Connector (PBC) X7

Unless otherwise noted: T_A = 25 °C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
GPIO 1-8 Characteristics:						
U_{IH}	Logic high input threshold		2.35			V
U_{IL}	Logic low input threshold				0.9	V
U_{IMAX}	Absolute limit input voltage		-0.5		3.6	V
Output Characteristics:						
U_{OH}	Logic high output voltage		2.9			V
U_{OL}	Logic low output voltage				0.4	V
R_S	Series Resistor			100		Ω
Output Characteristics GND:						
I_{max}	Absolute limit output current	Total GND Output (Fused)			±375	mA

ESD Protection:						
V_{PP}	ESD	IEC61000−4−2 Level 4, Contact Discharge		18		kV

Auxiliary Communication and GPIOs (AUX) X10

Unless otherwise noted: T_A = 25 °C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics GPIO TTL 1 and 2 (HW v1.20):						
U_{IH}	Logic high input threshold		4.7			V
U_{IL}	Logic low input threshold				1.8	V
U_{IMAX}	Maximum input voltage		-0.5		7	V
Input Characteristics GPIO TTL 1 and 2: (HW v1.30 and later):						
U_{IH}	Logic high input threshold		3.9			V
U_{IL}	Logic low input threshold				1.5	V
U_{IMAX}	Maximum input voltage		-0.8		6	V
Input Characteristics Analog In 1V:						
V_{AN}	Input voltage range	Analog input	0		1	V
BW	Bandwidth	Analog input		10		kHz
R_{IN}	Input Resistance			10		kΩ
Input Characteristics Analog In 5V:						
V_{AN}	Input voltage range	Analog input	0		5.3	V
BW	Bandwidth	Analog input		10		kHz
R_{IN}	Input Resistance			23		kΩ
Input Characteristics Analog In 10V:						
V_{AN}	Input voltage range	Analog input	0		10	V
BW	Bandwidth	Analog input		10		kHz
R_{IN}	Input Resistance			37		kΩ
Output Characteristics GND:						
I_{max}	Maximum output current	Total GND Output (Fused)	0		±375	mA
Output Characteristics 5V:						
I_{max}	Maximum output current	5V Output (Fused)	0		±375	mA
ESD Protection:						
V_{PP}	ESD	IEC61000−4−2 Level 4, Contact Discharge		18		kV

Mini USB Connector X15

Unless otherwise noted: T_A = 25 °C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
V_{IORM}	Maximum Working Insulation Voltage				560	V

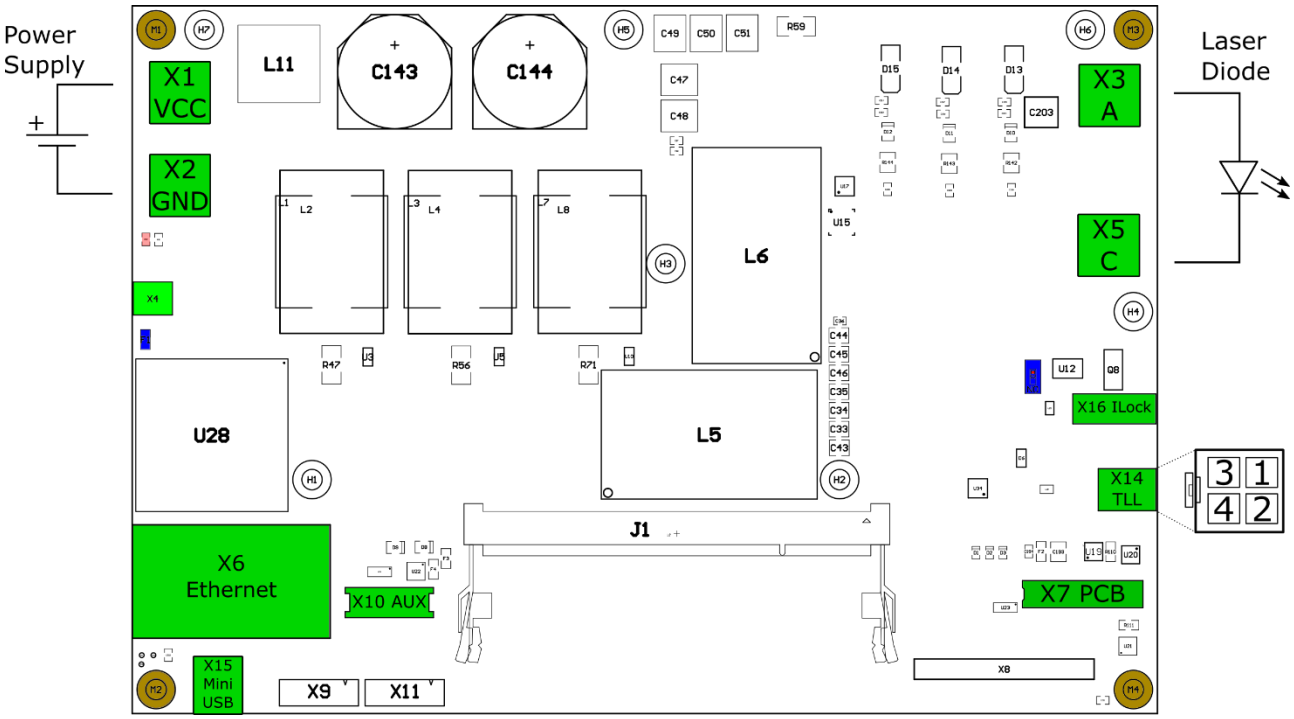
Interlock Connector X16

Unless otherwise noted: T_A = 25 °C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics Interlock:						
V_{IAct}	Interlock active input voltage range	Voltage range which is detected as active input	3		30	V
V_{IORM}	Maximum Working Insulation Voltage				630	V

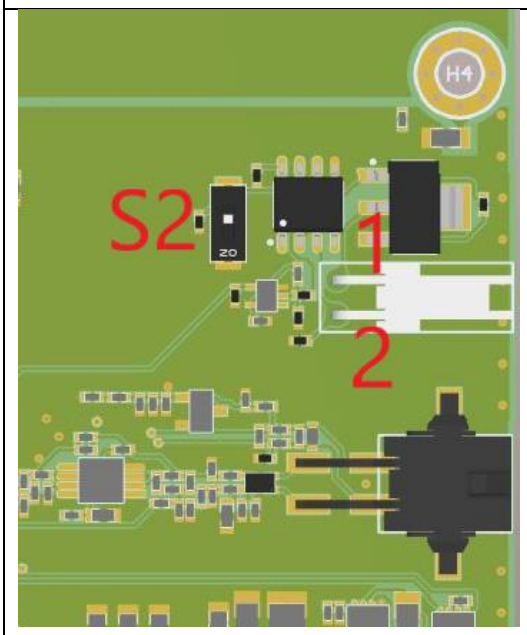
Connectors

Top view



Interlock Connector X16

ILock X16



To enable the LDD apply a voltage between 3V and 30V between the Interlock + and Interlock – Pins. The Interlock Pins are galvanically isolated from the LDD.

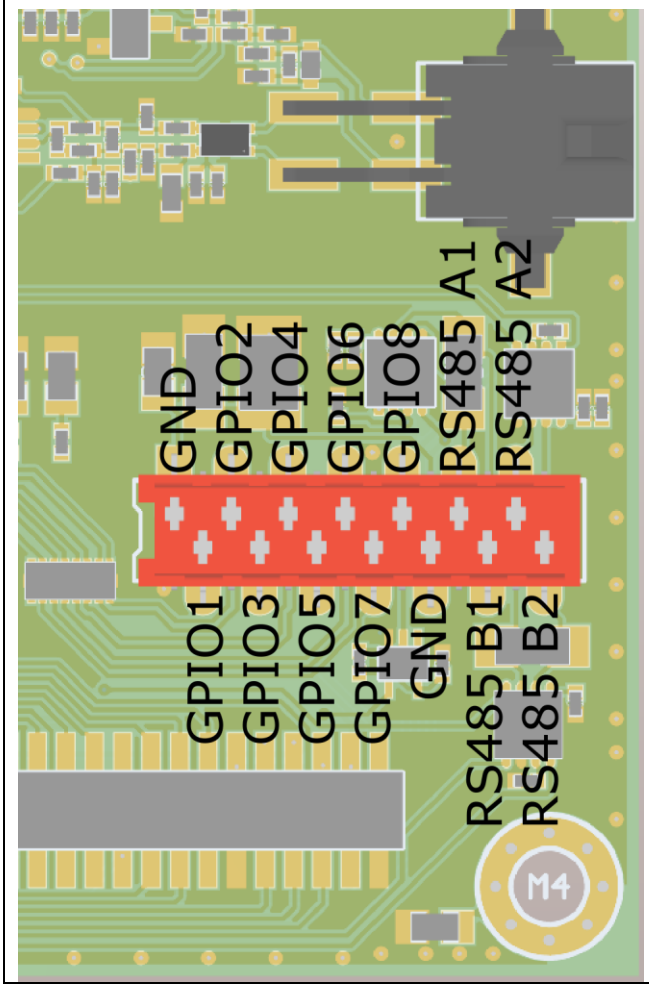
The DIP-Switch S2 can be switched ON to override the Interlock functionality.

Connector: Molex 0022013027

Pin nr.	Name	Description
1	Interlock +	Interlock positive connection
2	Interlock -	Interlock negative connection

Pin Configuration Platform Bus Connector (PBC) X7

Mini-Module Plug

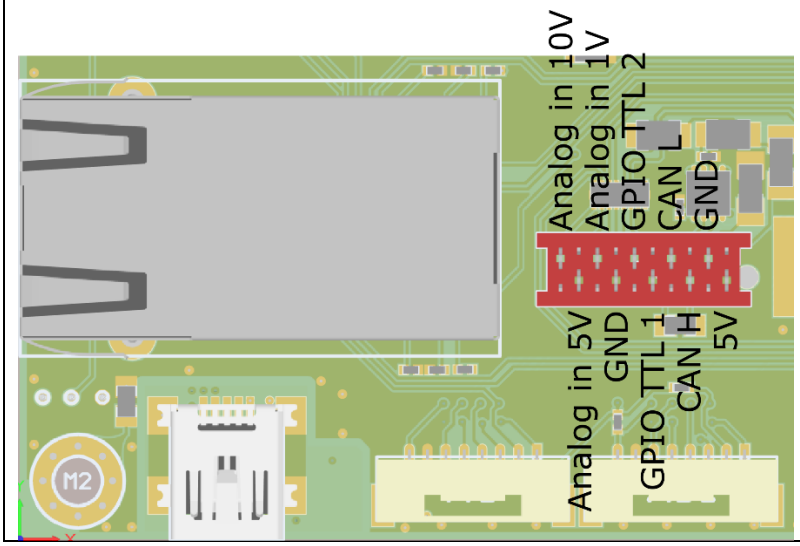


Connector:
MICRO-MATCH SMD FTE
Part Number: 8-188275-4
Number of Positions: 14
Centerline (Pitch): 1.27 mm [.05 in]

Pin nr.	Name	Description
1	GND EXT	Ground connection
2	GPIO 1	General-purpose input/output Pin 1
3	GPIO 2	General-purpose input/output Pin 2
4	GPIO 3	General-purpose input/output Pin 3
5	GPIO 4	General-purpose input/output Pin 4
6	GPIO 5	General-purpose input/output Pin 5
7	GPIO 6	General-purpose input/output Pin 6
8	GPIO 7	General-purpose input/output Pin 7
9	GPIO 8	General-purpose input/output Pin 8
10	GND EXT	Ground connection
11	RS485 A1	RS485 interface nr. 1A (TX+/RX+ or D+)
12	RS485 B1	RS485 interface nr. 1B (TX−/RX− or D−)
13	RS485 A2	RS485 interface nr. 2A (TX+/RX+ or D+)
14	RS485 B2	RS485 interface nr. 2B (TX−/RX− or D−)

Pin Configuration Auxiliary Communication and GPIOs (AUX) X10

Mini-Module Plug

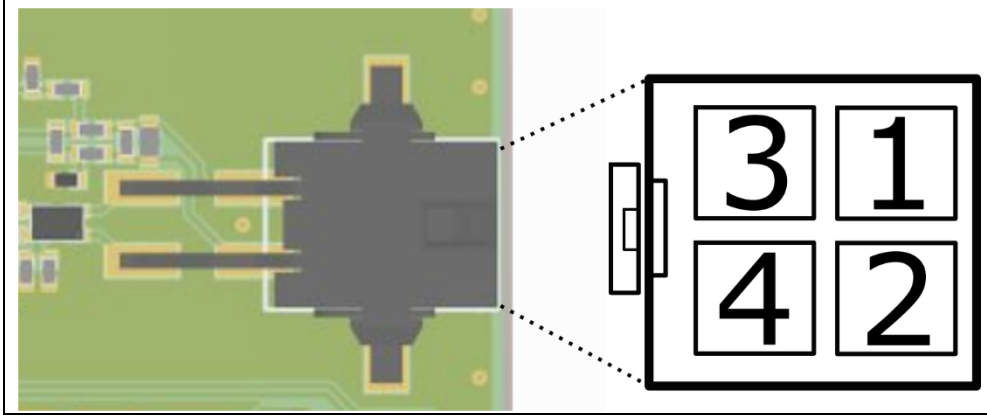


Connector:
Würth Elektronik MiniModule
Connector WR-MM
Part Number: 690367181072
Number of Positions: 10

Pin nr.	Name	Description
1	5V	5V Output
2	GND	Ground connection
3	CANH	CAN High
4	CANL	CAN Low
5	GPIO TTL 1	General-purpose input with TTL Level
6	GPIO TTL 2	General-purpose input with TTL Level
7	GND	Ground connection
8	Analog In 1V	Analog Input 0-1V range
9	Analog In 5V	Analog Input 0-5V range
10	Analog In 10V	Analog Input 0-10V range

Temperature and Laser Light (TLL) X14

TLL Connector X14



Connector
TE Connectivity 4-POL
Plug Housing
794617-4
With AWG 20-24

Crimp Contacts
794610-1

Pin nr.	Name	Description
1	NTC A	NTC Connection
2	NTC B	NTC Connection
3	PD C	Photo Diode Cathode
4	PD A	Photo Diode Anode

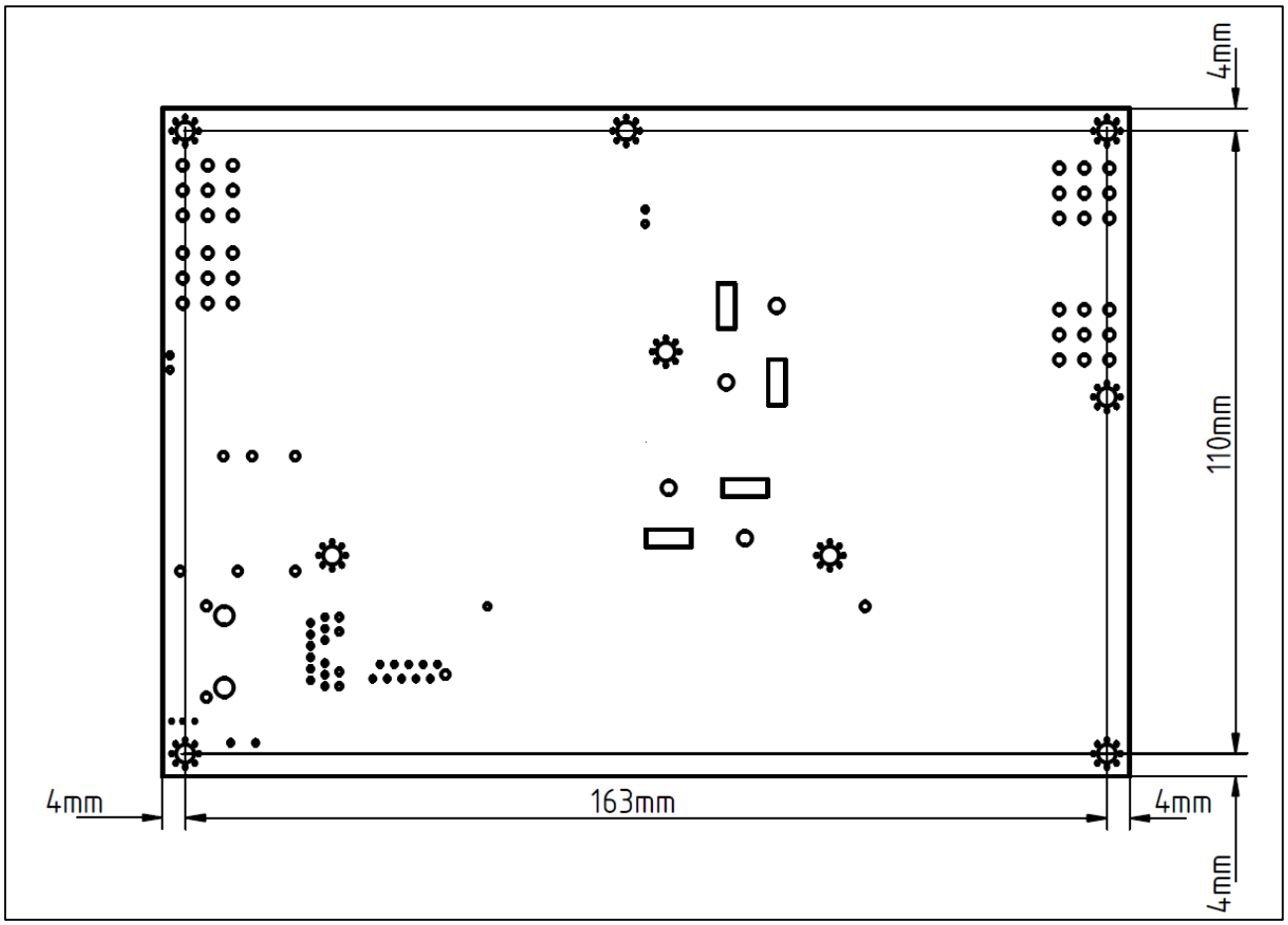
Matching Cable: CAB-6156

Mini USB Connector X15

The Mini USB Connector X15 can be used to communicate with the LDD using the meCom communications protocol or the Configuration Software. It is electrically isolated.

Dimensions

Top View



Mounting holes in the corner are 3.2 mm holes for M3 screws.

Pulse and CW comparison

	CW	Pulse
CW operation	Yes	Yes
Signal generator Pulses	Yes	Yes
CW chopping	No	Yes
Ripple	Less	Normal

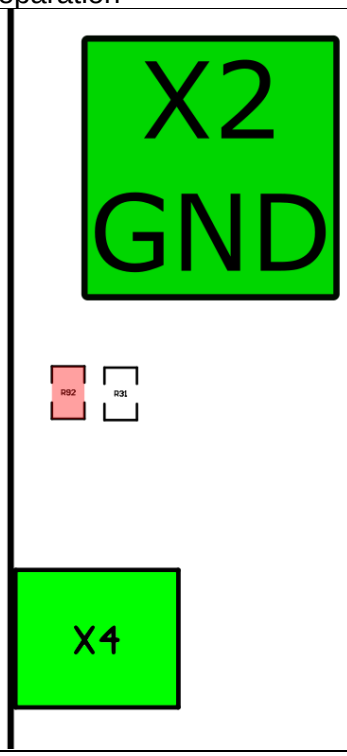
The Pulse version is recommended if risetimes below 100 us are desired.

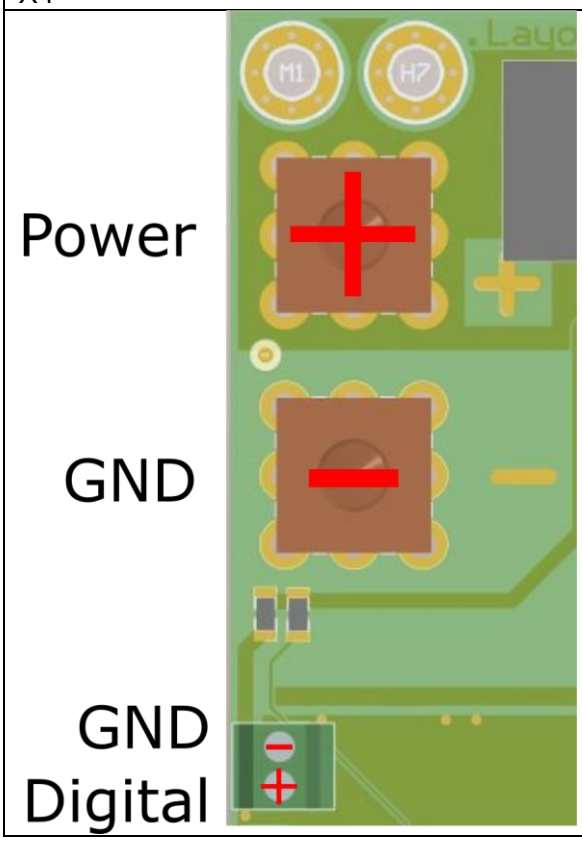
The Pulse version can be operated exactly like the CW version, or by using the dedicated Pulse functions. The dedicated pulse functions utilize CW-chopping to achieve faster pulses. The Pulse version also contains less output filters, which enables faster risetimes while slightly increasing the ripple.

Note: the graph in the Configuration Software displays the high-side current measurement, therefore chopped pulses cannot be observed properly in the graph as the current keeps flowing internally during chopping.

Separate supply for Power and Digital parts

The device supports supplying the power and digital sections separately.

Preparation	
	R92 (marked red) must be removed. X4 can then be used to provide power only to the digital part of the LDD. X4 can either be used to directly attach the supply via soldering or to solder a pin header or screw connector.

X4	
	Power requires a Voltage between 18-75V. This supplies the Power electronics of the LDD. Digital supplies the logic part of the LDD and requires 18-75V. The digital part requires <5W of power. GND is shared between both supplies.

Ordering Information

LDD-1137 Ordering Information, Hardware Configuration

Example Configuration: **LDD-1137-CW**

LDD Model:
LDD-1137

Mode:
CW: Continuous Wave
PO: Pulse Operation

Meerstetter Engineering GmbH
Schulhausgasse 12
3113 Rubigen, Switzerland

meerstetter engineering
Member of Berndorf Group

+41 31 529 21 00
contact@meerstetter.ch
Website: www.meerstetter.ch

Meerstetter Engineering GmbH (ME) reserves the right to make changes without further notice to the product described herein. Information furnished by ME is believed to be accurate and reliable. However typical parameters can vary depending on the application and actual performance may vary over time. All operating parameters must be validated by the customer under actual application conditions.

Change History

Date of change	Doc/Version	Changed / Approved	Change / Reason
4 March 2021	B	PV / MR	• Add Change History • First prototype measurement data inserted • New layout template used
2 December 2021	C	PV / RS	• New HW v1.20 changes • High power warning • Measurement plots
7 September 2022	D	PV / RS	• Fixed RS485 polarity • Added X14 pinout • Adjusted TTL levels for HW v1.30