

Advanced OEM Laser Diode Driver with Laser Power Control



Description:

The LDD-1137 is a specialized laser diode driver, able to precision-drive laser diodes in continuous operation. New emerging technologies like eGaN FETs enable 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.

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)
- 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:

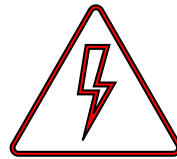
- Output Current: 0-75 A, ~0.2 % Ripple
Parallel operation of multiple devices on request
- Temperature Coefficient, Typ: 20 ppm/K
- CW Current Resolution: 1.5 mA

Interfaces:

- USB 2.0, Ethernet
- RS485
- Interlock (Enable)
- Analog Input

| 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: $T_A = 25\text{ °C}$, $U_{IN} = 24\text{ V}$, $R_{load} = 3.3\text{ }\Omega$

| 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 | $V_{IN} = 75\text{ V}$ | 0 | 70 | | V |
| I_{OUT_RIPPLE} | Current ripple | $I_{out} > 2\text{ A}$ | | TBD | | mA |
| I_{OUT_RES} | Current resolution | Driver | | 1.5 | | mA |
| V_{OUT_LIMIT} | Output voltage | | | TBD | | V |
| P_{OUT} | Output power | $V_{LD} = 70\text{ V}$, additional cooling | | | 5000 | W |
| f_{CW} | Current change | For $L_{Load} < 100\text{ nH}$, higher f_{CW} are possible | | TBD | | kHz |
| I_{OUT_SLOPE} | Current slope limit | $I_{out} > 10\text{ A}$ | | TBD | | A/ns |
| System Characteristics: | | | | | | |
| $\eta_{50\%}$ | Power efficiency | @ 50 % load | | 96 | | % |
| $\eta_{100\%}$ | 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: $T_A = 25\text{ °C}$

| 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: $T_A = 25\text{ °C}$

| 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 | | k Ω |
| 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 | | k Ω |
| 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 | | k Ω |
| 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: $T_A = 25\text{ °C}$

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

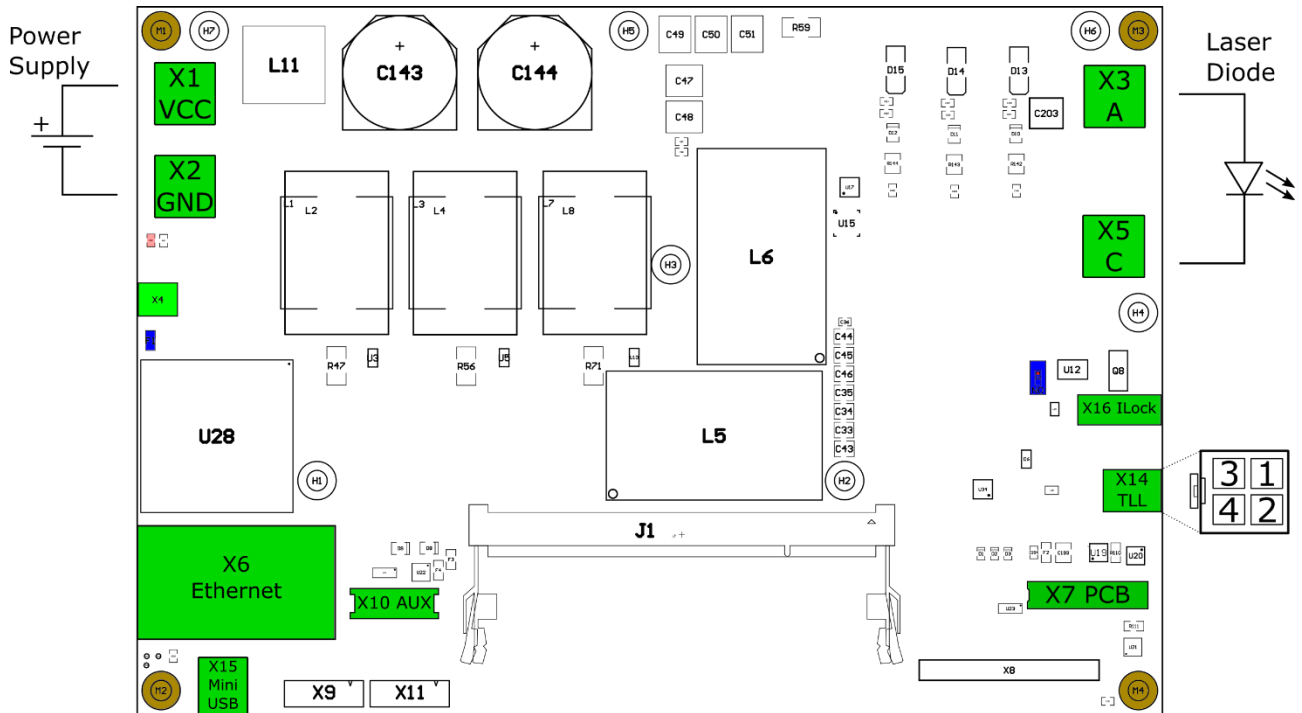
Interlock Connector X16

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

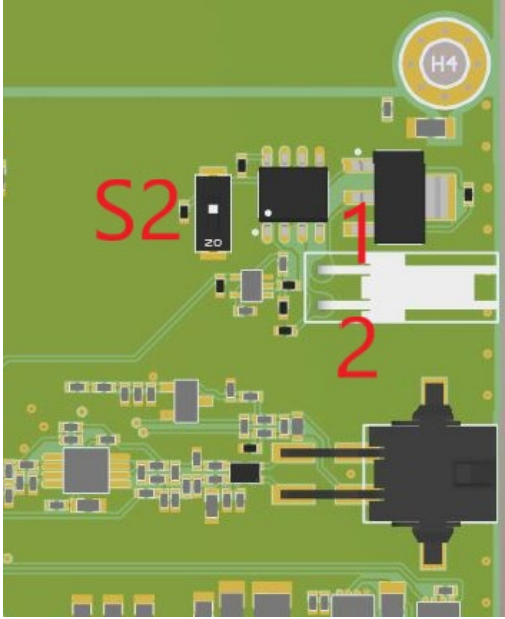
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|--------------------------------------|---|-----|-----|-----|-------|
| Input Characteristics Interlock: | | | | | | |
| V_{IAct} | Interlock active input voltage range | Voltage range which is detected as active input | 3 | | 30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

Connectors

Top view

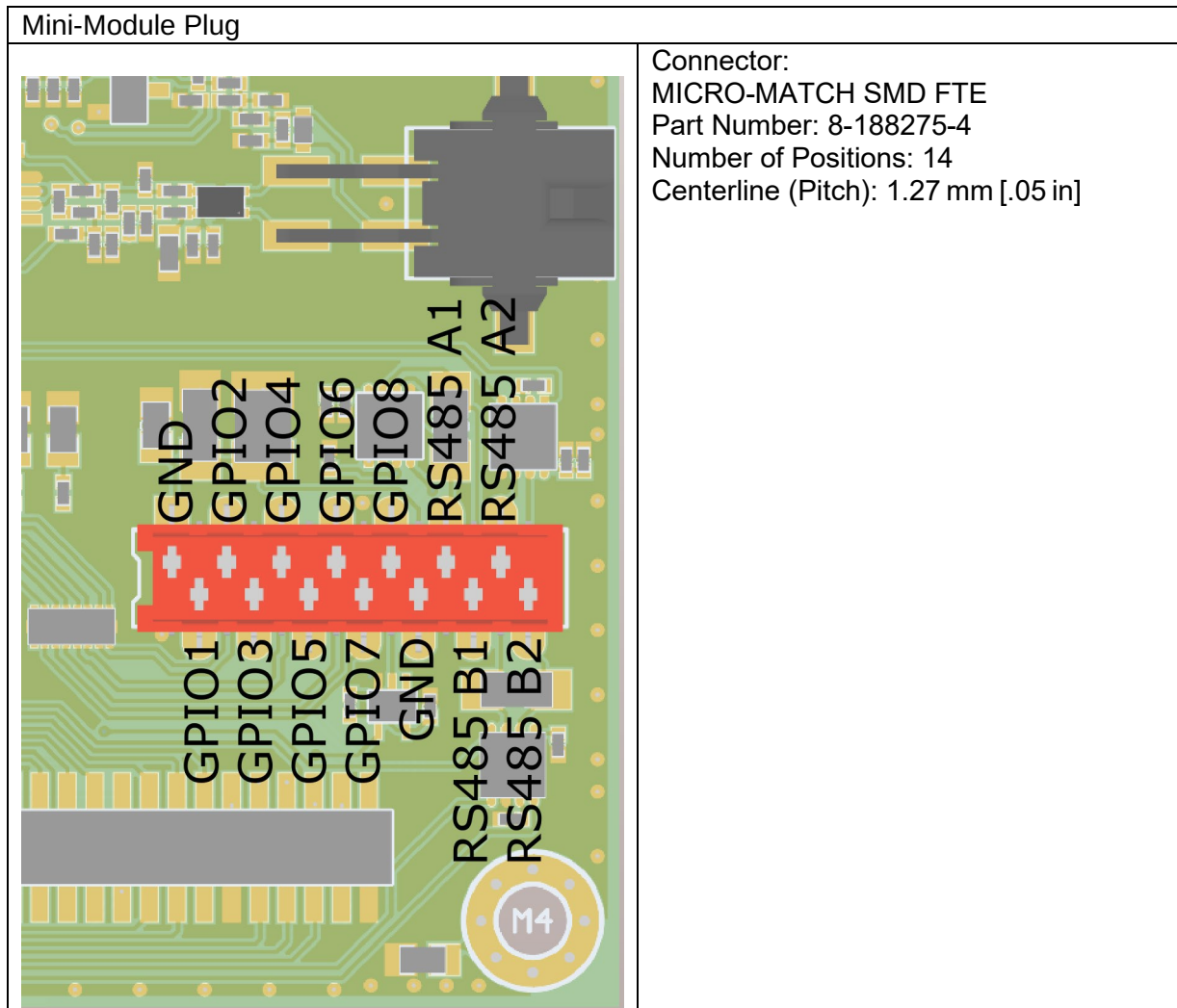


Interlock Connector X16

| ILock X16 | |
|---|--|
|  <p>The image shows a top-down view of a green PCB. A circular component labeled 'H4' is in the top right. A DIP-switch labeled 'S2' is in the middle left. Two pins are labeled with red numbers '1' and '2'. Pin 1 is connected to a component, and pin 2 is connected to a large black component at the bottom.</p> | <p>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.</p> <p>The DIP-Switch S2 can be switched ON to override the Interlock functionality.</p> <p>Connector: Molex 0022013027</p> |

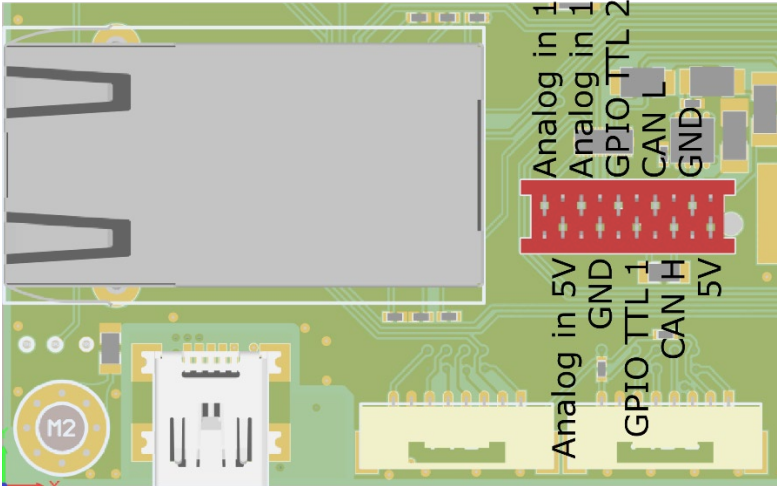
| Pin nr. | Name | Description |
|---------|-------------|-------------------------------|
| 1 | Interlock + | Interlock positive connection |
| 2 | Interlock - | Interlock negative connection |

Pin Configuration Platform Bus Connector (PBC) X7



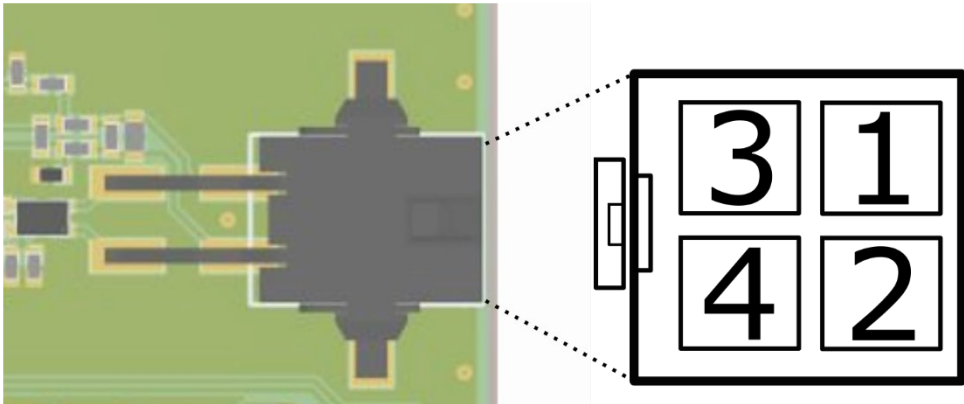
| Pin nr. | Name | Description |
|---------|----------|--|
| 1 | GND EXT | Ground connection |
| 2 | GPIO 1 | General-purpose input/output Pin 1 |
| 3 | GPIO 2 | General-purpose input/output Pin 2 |
| 4 | GPIO 3 | General-purpose input/output Pin 3 |
| 5 | GPIO 4 | General-purpose input/output Pin 4 |
| 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 | |
|---|---|
|  | <p>Connector: Würth Elektronik MiniModule Connector WR-MM Part Number: 690367181072 Number of Positions: 10</p> |

| Pin nr. | Name | Description |
|---------|---------------|--------------------------------------|
| 1 | 5V | 5V Output |
| 2 | GND | Ground connection |
| 3 | CANH | CAN High (not available) |
| 4 | CANL | CAN Low (not available) |
| 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 | |
|--|---|
|  | <p>Connector TE Connectivity 4- POL Plug Housing 794617-4 With AWG 20-24</p> <p>Crimp Contacts 794610-1</p> |

| Pin nr. | Name | Description |
|---------|-------|-------------------------------------|
| 1 | NTC A | NTC Connection |
| 2 | NTC B | NTC Connection |
| 3 | PD C | Photo Diode Cathode (not available) |
| 4 | PD A | Photo Diode Anode (not available) |

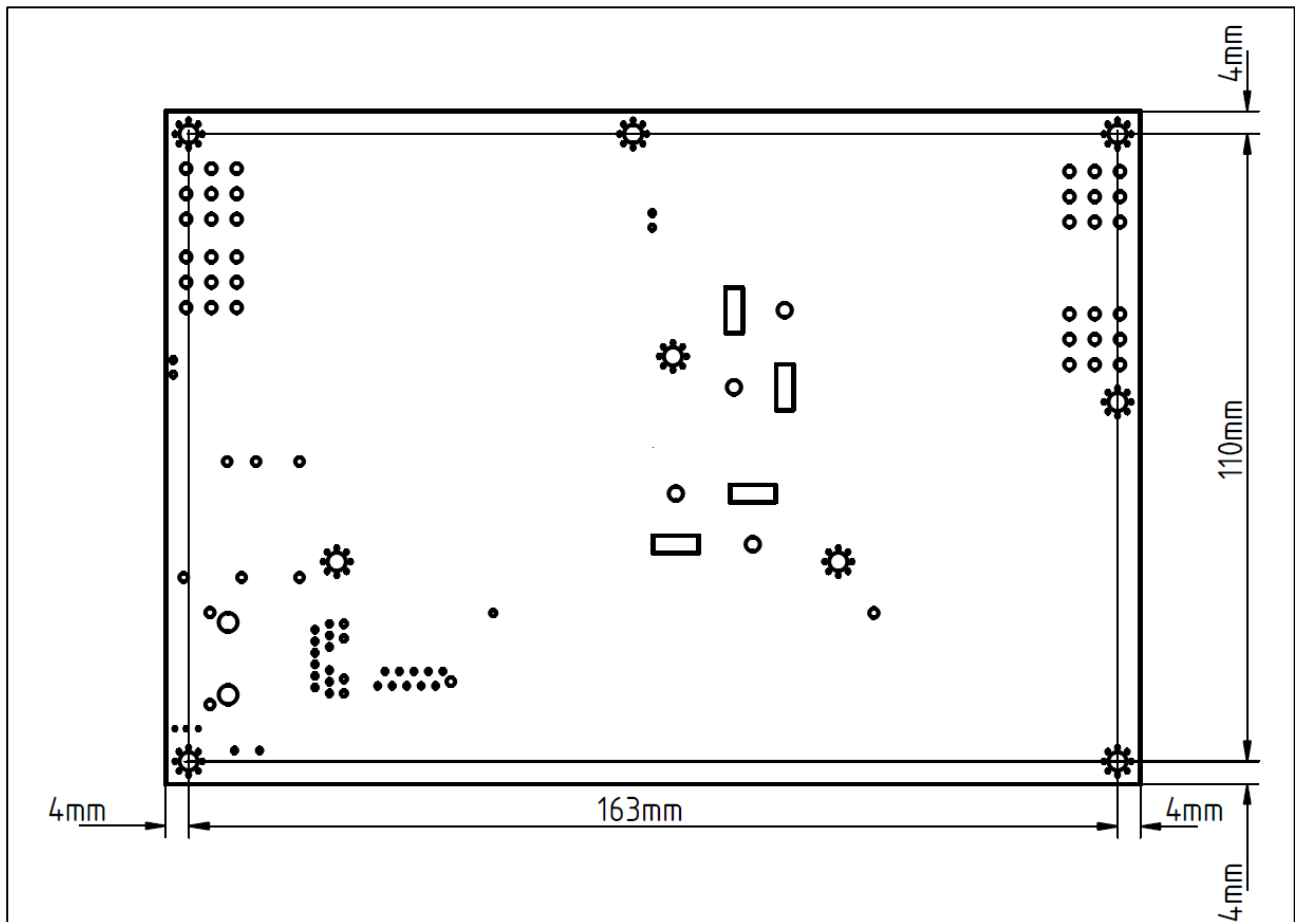
Matching Cable: CAB-6156

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

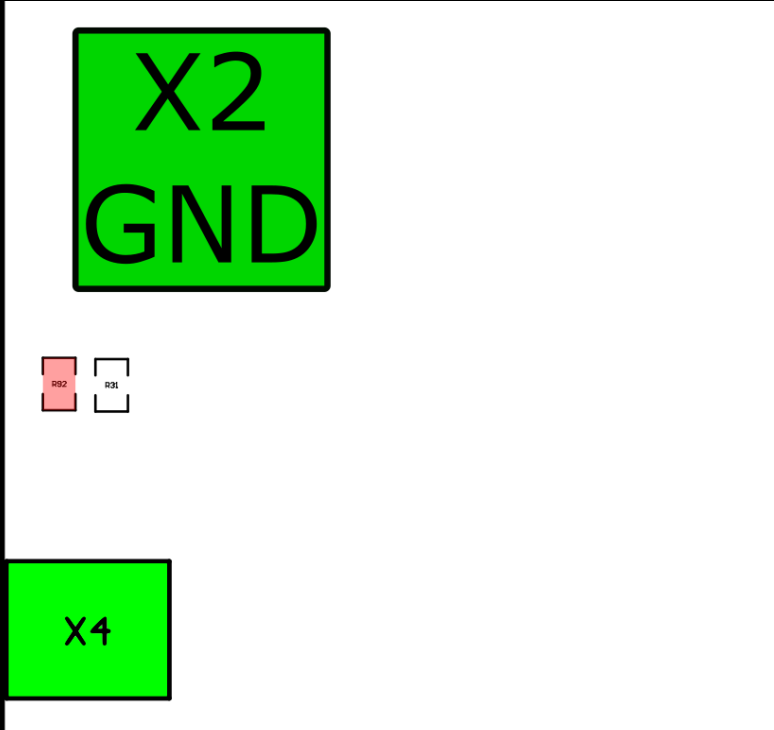
Top View

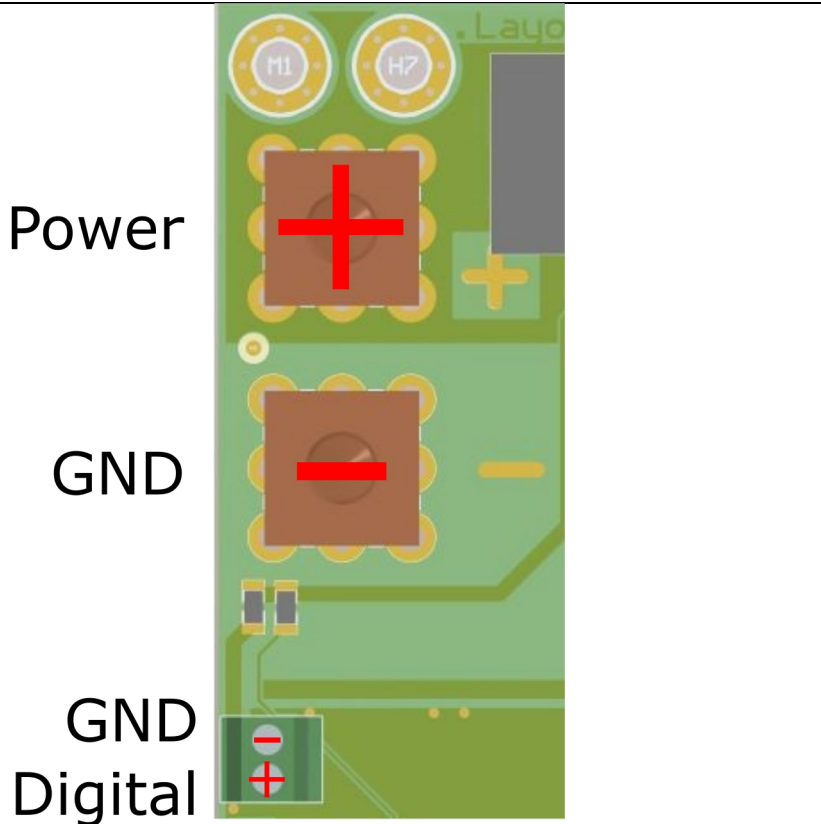


Mounting holes in the corner are 3.2 mm holes for M3 screws.

Separate supply for Power and Digital parts

The device supports supplying the power and digital sections separately.

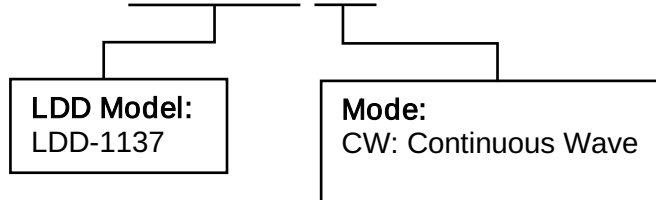
| Preparation | |
|--|---|
|  | <p>R92 (marked red) must be removed. X4 can then be used to provide power only to the digital part of the LDD.</p> <p>X4 can either be used to directly attach the supply via soldering or to solder a pin header or screw connector.</p> |


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

Ordering Information

LDD-1137 Ordering Information, Hardware Configuration

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



| | | |
|---|---|---|
| Meerstetter Engineering GmbH Schulhausgasse 12 3113 Rubigen, Switzerland |  Member of Berndorf Group | +41 31 529 21 00 contact@meerstetter.ch Website: www.meerstetter.ch |
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Change History

| Date of change | Doc/Version | Changed / Approved | Change / Reason |
|------------------|-------------|--------------------|---|
| 4 March 2021 | B | PV / MR | <ul style="list-style-type: none"> • Add Change History • First prototype measurement data inserted • New layout template used |
| 2 December 2021 | C | PV / RS | <ul style="list-style-type: none"> • New HW v1.20 changes • High power warning • Measurement plots |
| 7 September 2022 | D | PV / RS | <ul style="list-style-type: none"> • Fixed RS485 polarity • Added X14 pinout • Adjusted TTL levels for HW v1.30 |
| 31 January 2024 | E | RS | <ul style="list-style-type: none"> • Update HW version to v1.31 • Remove unsupported features |