

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.

An ISO 13849-1 Performance Level E certified version will be available sometime after the standard version.

Features

Input Characteristics:

- DC Input Voltage: 18 to 75 V

Output Characteristics CW Operation:

- Voltage: up to 70 V
- Current: up to 75 A (>60A 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)
- Dimensions (L x W x H): 125 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 us
- Pulse Frequency: up to 3 kHz

Interfaces:

- USB 2.0
- RS485
- Pulse Input
- Interlock (Enable)

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

- CW Laser Power Control: Configurable PID
- Start-up phase: Fully parameterizable
- LPC Feedback. PDCurrent: up to 4 mA

Important Note:

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

- CAN, I2C, SPI, Ethernet Interface
- GPIOs

Absolute Maximum Ratings		Operating Ratings	
Supply voltage (DC)	80 V	Temperature	0 – 80°C
Supply current (DC)	70 A	Humidity	5 – 95%, non-condensing
Output current	80A		

Electrical Characteristics

Unless otherwise noted: $T_A = 25^\circ\text{C}$, $U_{IN} = 24\text{ V}$, $R_{load} = 3.3\ \Omega$

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	mVPP
Output:						
I_{OUT}	Current range		0		75	A
U_{OUT}	Voltage range	$V_{IN} = 75\text{V}$			70	V
I_{OUT_RIPPLE}	Current ripple	$I_{out} > 2\text{A}$				mA
I_{OUT_RES}	Current resolution			1.5		mA
V_{OUT_LIMIT}	Output voltage			$V_{IN} - 5$		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		3		kHz
I_{OUT_SLOPE}	Current slope limit	$I_{out} > 10\text{A}$			10	A/ns
System Characteristics:						
$\eta_{50\%}$	Power efficiency	@ 50% load		96		%
$\eta_{100\%}$	Power efficiency	@ 100% load		98		%
Output Pulse for Pulse Version						
t_{rise}	Current rise time	20% to 80%, practically no inductivity in load	8			ns
t_{fall}	Current fall time	20% to 80%, practically no inductivity in load	8			ns
t_{delay}	Delay pulse/current		5.3			ns
t_{pH_min}	Minimal Pulse High		30			ns
t_{pL_min}	Minimal Pulse Low		50			ns

Output Safety Characteristics

Unless otherwise noted: $T_A = 25^\circ\text{C}$, $U_{IN} = 24\text{ V}$

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
$t_{OFF_CURRENT}$	Overcurrent			6		μs
t_{OFF_OPVAL}	Operating Values	Voltages, currents		100		μs
t_{OFF_SFALL}	System failure	System status		100		μs

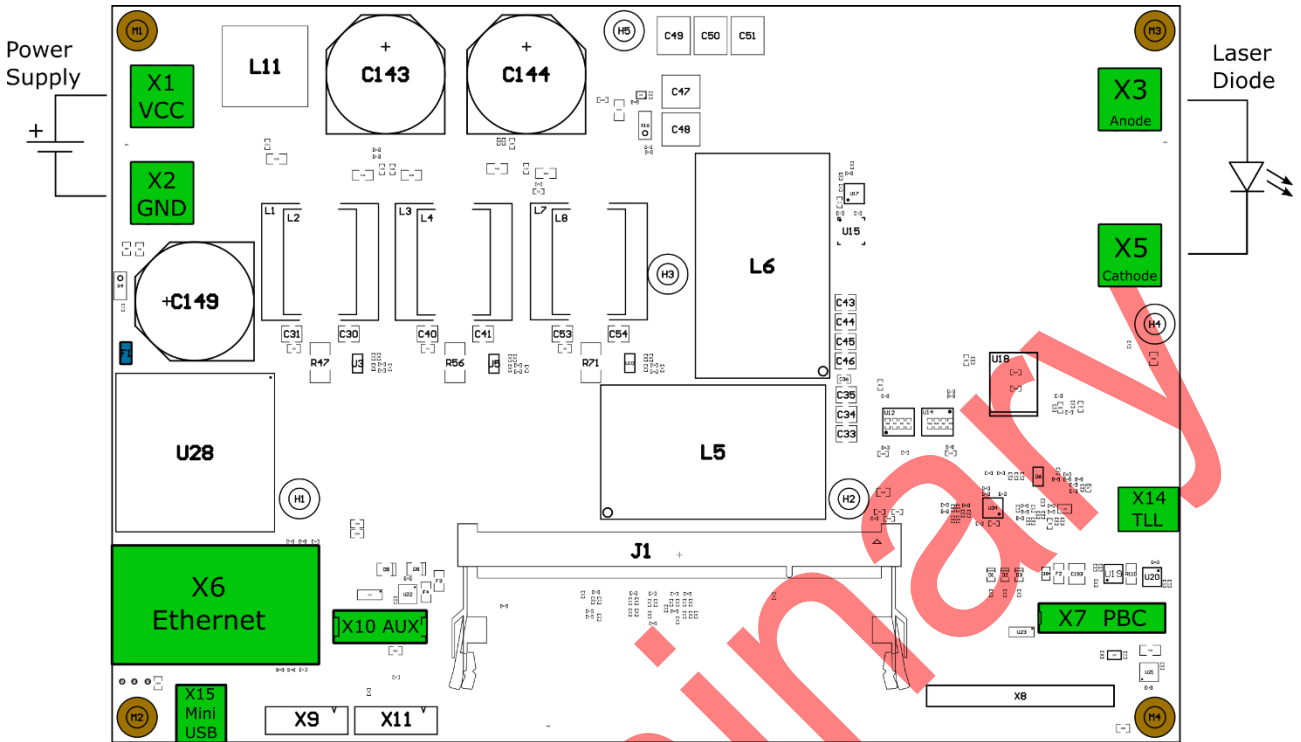
General Purpose Digital I/O Characteristics (GPIO1 ... GPIO10)

Unless otherwise noted: TA = 25°C

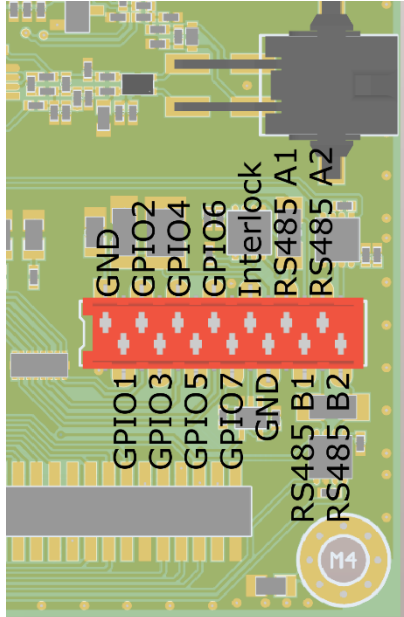
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
U _{IH}	Logic high input threshold		2.35			V
U _{IL}	Logic low input threshold				0.9	V
U _{IMAX}	Maximum input voltage		-0.4		3.8	V
V _{AN}	Input voltage range	Analog input	0		1	V
Output Characteristics: (Microprocessor)						
U _{OH}	Logic high output voltage		2.9		3.3	V
U _{OL}	Logic low output voltage			0	0.4	V
R _S	Series Resistor		170	200	230	Ω
ESD Protection: (Between Processor and Connector)						
UPP	ESD discharge	IEC61000-4-2		18		kV

Pin Configuration Screw Connectors TOP View

Top view

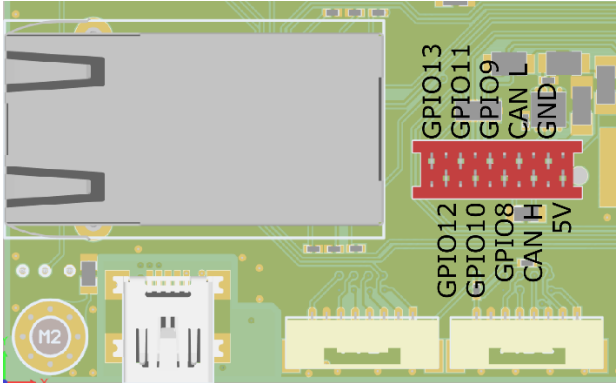


Pin Configuration Platform Bus Connection (PBC) X7

Mini-Module Plug	
	<p>Connector: MICRO-MATCH SMD FTE Part Number: 8-188275-4 Number of Positions: 14 Centerline (Pitch): 1.27 mm [.05 in]</p>

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	Interlock	Interlock, needs to be connected to GND to enable the LDD output
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

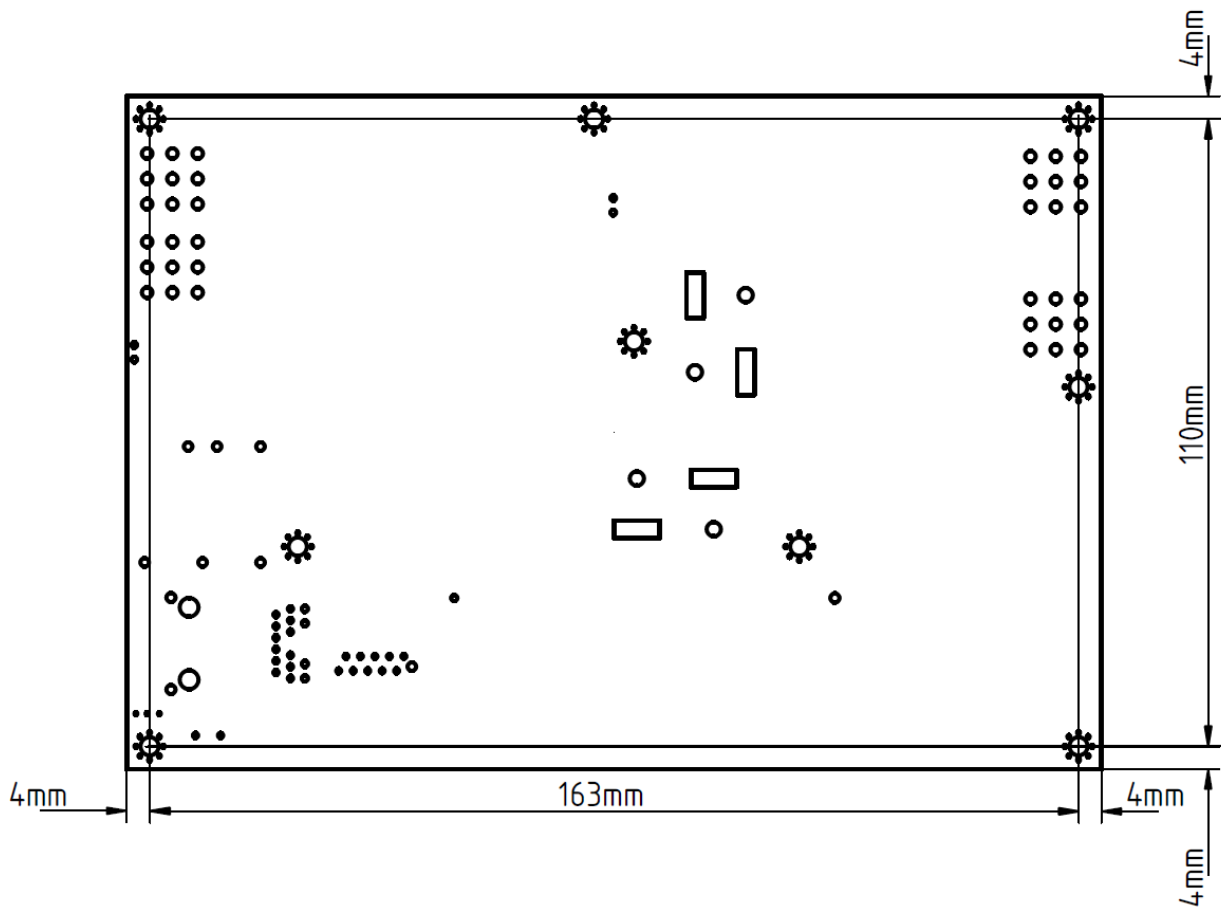
Pin nr.	Name	Description
1	5V	5V Output (300mA max.)
2	GND	Ground connection
3	CANH	CAN High
4	CANL	CAN Low
5	GPIO8	General-purpose input/output Pin 8
6	GPIO9	General-purpose input/output Pin 9
7	GPIO10	General-purpose input/output Pin 10
8	GPIO11	General-purpose input/output Pin 11
9	GPIO12	General-purpose input/output Pin 12
10	GPIO13	General-purpose input/output Pin 13

Mini USB Connector X15

The Mini USB Connector X6 can be used to communicate with the TEC-Controller using the meCom communications protocol or the Configuration Software. It is electrically isolated.

Dimensions

Top View



Mounting holes in the corner are M3 sized bores.

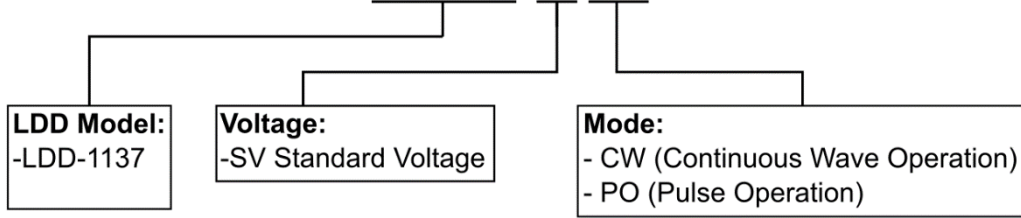
Interlock


The Interlock must be connected to GND to enable the LDD output.

Ordering Information

LDD-1137 Ordering Information, Hardware Configuration

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



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Preliminary

Annex A. Change history

Document Version: 1.0

Date of change	Doc/Version	Changed/Approved	Change / Reason
4. Mar. 2021	B	PV / MR	<ul style="list-style-type: none">• Add Change Historie• First prototype measurement data inserted• New layout template used

Preliminary