LDD-series laser diode driver
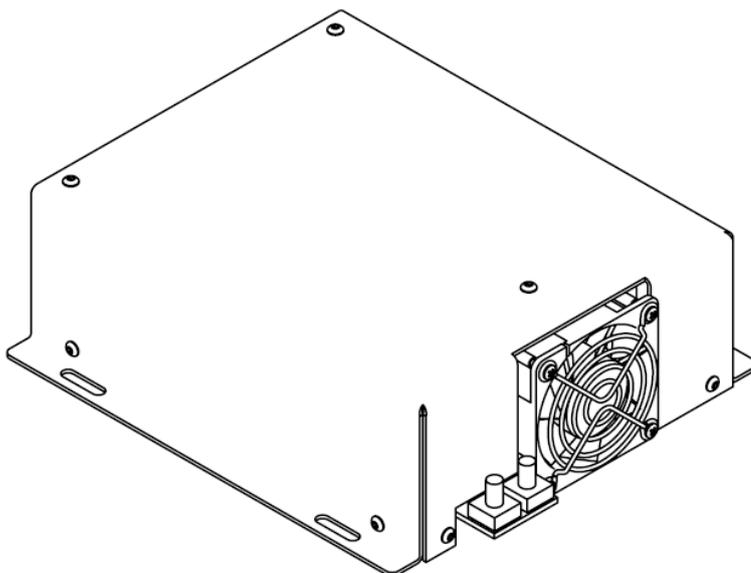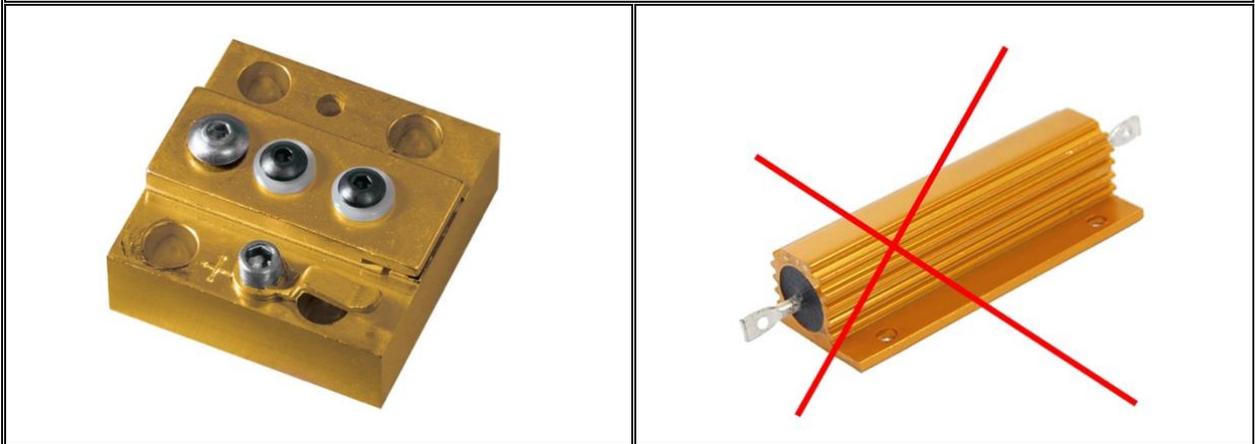
User manual

<div style="background-color: yellow; border: 2px solid red;">

Warning! This equipment may be dangerous.
Please read user manual before starting operations.

</div>

Important note. Please measure output with adequate load only (diodes).
Resistive load connected to the output won't destroy the driver, but will severe distort its behaviour.

Overview / Applications

LDD-series laser diode driver is intended for single laser diode driving as well as for laser diode arrays driving, by pulses or in continuous form.
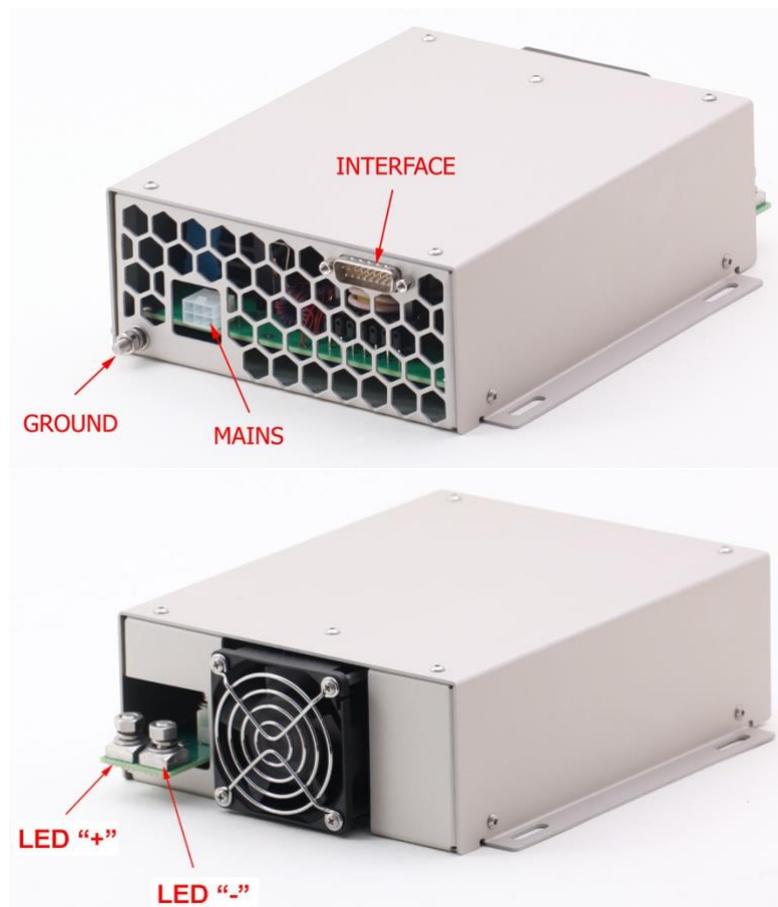
Input voltage, max. output power, max. output current, max. output voltage are selectable in the widest range (for further information see **Selection Chart** section).

Module may be used for medical applications.

Cooling

The module contains a fan (fans) active cooling. No external cooling is required.

Appearance

Connections, signals, signal descriptions

MAINS: Molex 39-30-1060

```
  ┌─┐
┌─┼─┼─┐
│6│5│4│
├─┼─┼─┤
│3│2│1│
└─┴─┴─┘
```

PIN (color)	DESCRIPTION
1, 4	Pins 1 and 4 are interconnected inside the module
2, 5	Not used
3, 6	Pins 3 and 6 are interconnected inside the module

OUTPUT (TO LASER DIODE): M6 studs

PIN (color)	DESCRIPTION
LED "+" (red)	To laser diode anode
LED "–" (blue)	To laser diode cathode

GROUND: M5 stud

Module should be grounded using this stud. It needs to be done before connecting module to the mains.

Grounding policy

By default both OUTPUT negative and INTERFACE return are internally connected to the chassis' ground. Diode's body interconnection with anode might result in potential troubles.
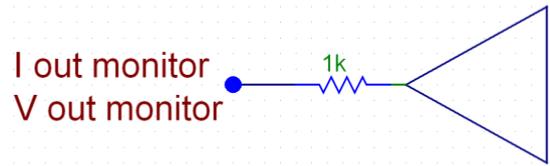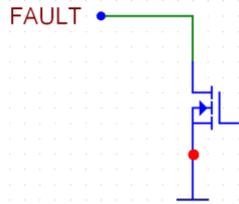
Modifications with floating output are available on request.
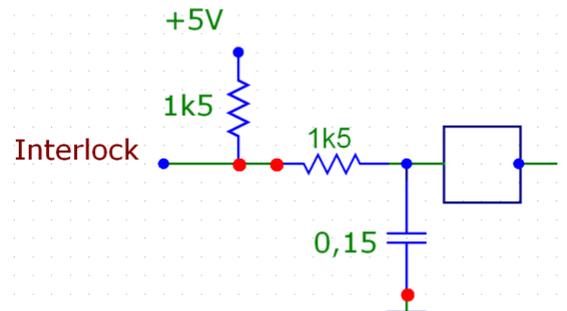

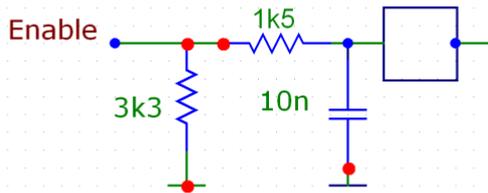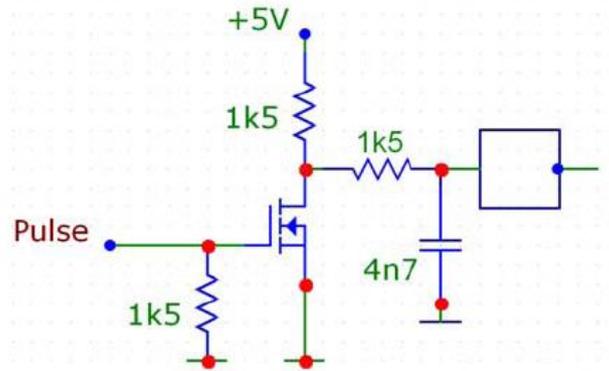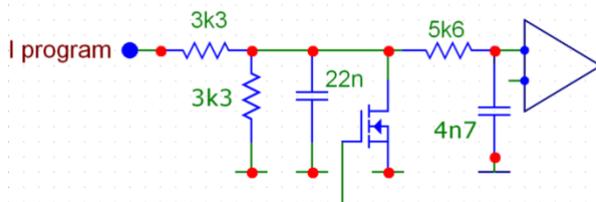## INTERFACE (LDD-series CONTROL): 15 Pin "D"-Sub Female

PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	Enable	Apply +5V TTL on this pin to enable work of LDD. While 0V are applied to this pin or pin is unconnected module is disabled. Once *Fault* has occurred module is blocked till you eliminate the fault cause, then *disable* module and *enable* it again.
2 (orange)	Fault *	If module is *enabled* and some trouble has occurred, module automatically stops operations and sets *Fault* status (*Fault* loop is "closed"). In case of normal operations *Fault* loop is "opened". Maximum allowed current in *Fault* loop is 50mA.
3 (trasparent)	Interlock	When *Interlock* loop is "opened" output is inhibited. You should "close" this loop to start operations (electrical resistance of "closed" loop should be below 100 Ohm level). Once *Interlock* has occurred module is blocked till you "close" *Interlock* loop, then d*isable* module and *enable* it again.
4, 9, 15 (black)	Interface Return	Return of all interface circuits. This pin is connected to the GROUND stud.
5 (yellow)	V OUT monitor	The voltage at this pin is a monitor signal proportional to the measured value of voltage on load. 0V at *PIN5* corresponds to 0V at load. Voltage at *PIN5* corresponds either to full voltage at load (in case when $V_{MAX} < 10V$) or to ½, ¼ etc of this voltage (if $V_{MAX} < 20V$, 40V etc).
6 (purple)	I OUT monitor	The voltage at this pin is a monitor signal proportional to the measured value of output current. 0V at *PIN6* corresponds to 0A. 10V at *PIN6* corresponds to I_{MAX}.
7 (blue)	I program	Voltage applied to this pin sets output current. 0-10V DC are linear with 0-I_{MAX}.
8 (white)	Pulse	Apply +5V TTL on this pin to enable work of LDD. While 0V are applied to this pin or pin is unconnected module is disabled.
10-12	–	Not used
13, 14 (red)	+15V OUT	Auxiliary 15 VDC output. Maximum current – 100mA.

* see also **Faults** section

INTERFACE CIRCUITS:

FAULT

"Open collector" scheme, 50mA max

I out monitor
V out monitor
1k

I program
3k3
3k3
22n
5k6
4n7

+5V
1k5
1k5
Pulse
1k5
4n7

Enable
1k5
3k3
10n

+5V
1k5
Interlock
1k5
0,15

"Open collector" scheme, 100Ohm max

5

Safety

Warning! This equipment produces high voltages that can be very dangerous. Be careful around the device.

- During operation the protective covers of the equipment must be securely fixed in place and all electrical connections must be properly attached.
- Module is designed to be installed inside a properly grounded metal enclosure. It is the customer's responsibility to ensure that personnel and users are prevented from accidentally contacting the LDD.
  Casual contact could be fatal!
- Disconnect the module from the power source before making or changing electrical or mechanical connections.
- **Don't remove protective covers!** There are no user serviceable parts inside this equipment.

Operations

1. Connect LDD to the ground (*GROUND* stud).
2. Connect laser diode to the module (*LED "−"* and *LED "+"* studs)
3. *Disable* module, set *Pulse* off, set *I Program* signal to 0V
4. Apply power to the module
5. Set the desired value of output current (*I Program* signal)
6. *Enable* module
7. Use *Pulse* signal to On/Off output current

To power down LDD
1. Set *Pulse* to 0V, then *Disable* module
2. Disconnect module from the mains

Faults

Module sets *Fault* state in the following cases:

- *overheating* (if the temperature of the module exceeds 70+/–2 °C level).

To remove Fault status module must be cooled below 65+/–1 °C temperature.

- *overvoltage* (if voltage on the load exceeds 110% of V_{MAX} level).

Most popular causes of such fault are load type mismatch and load absence.

- *overcurrent* (if output current exceeds 1.05 I_{MAX} level)

- *incorrect I Program* (if input voltage set point exceeds 10.5V level)

- *incorrect start-up sequence* (if the *Enable* signal is set before connecting module to the mains, module sets the *Fault* state)

Once *Fault* has occurred you should eliminate the Fault cause, then restart the module (*DISABLE* module and *ENABLE* it again).

Specification

ELECTRICAL SPECIFICATION

INPUT	
Voltage	100-240 VAC or 200-240 VAC, 50/60 Hz (model dependent, see **Selection Chart** section)
Max. current	Depends on modification, 12 A max
OUTPUT	
Max. output power (P_{MAX}) [1, 2]	Selectable in 150-1500 W range (see **Selection Chart** section on page 13)
Max. output current (I_{MAX}) [1, 2]	Selectable in 5A-100 A range (see **Selection Chart** section on page 13)
Max. output voltage (V_{MAX}) [1, 2]	Selectable in 2V-150 V range (see **Selection Chart** section on page 13)
	[1] $I_{MAX} * V_{MAX} \leq P_{MAX}$ [2] Up to 2000W, 150A, 200V on request
Recommended/allowed diode voltage	Recommended 70% to 100% of V_{MAX} Allowed 20% to 100% of V_{MAX}
Output current adjustment range	0%-100% of I_{MAX} with recommended diodes (70% to 100% of V_{MAX}) 10% to 100% of I_{MAX} with allowed diodes (20% to 100% of V_{MAX})
Efficiency	more than 80%
Rise/fall time	< 1 ms (10% to 90% full current) < 500 us on request
Current regulation accuracy	< 1% of I_{MAX}
Current value error	< 1% of I_{MAX}
Current overshoot	< 1% of I_{MAX}
INTERFACE	
Connector	15 Pin "D"-Sub Female
Current program	analog, 0-10 V
Current monitor	analog, 0-10 V
Voltage monitor	analog, see Interface description
SAFETY	
PFC value	> 0.98 (active)
Leakage current	< 150 μA
Input/output isolation voltage	4000 VAC
Safety approvals (on request)	IEC 60601-1 or IEC 60950-1
EMC approvals (on request)	IEC 60601-1-2 or EN 55011/CISPR 11

COOLING	No external cooling is required
ENVIRONMENT	
Operation temperature	0 … +40 °C
Storage temperature	-20 … +60 °C
Humidity	90%, non-condensing

Part number

Typical order code is **LDD-**XXXX**-**YYY**-**ZZZ
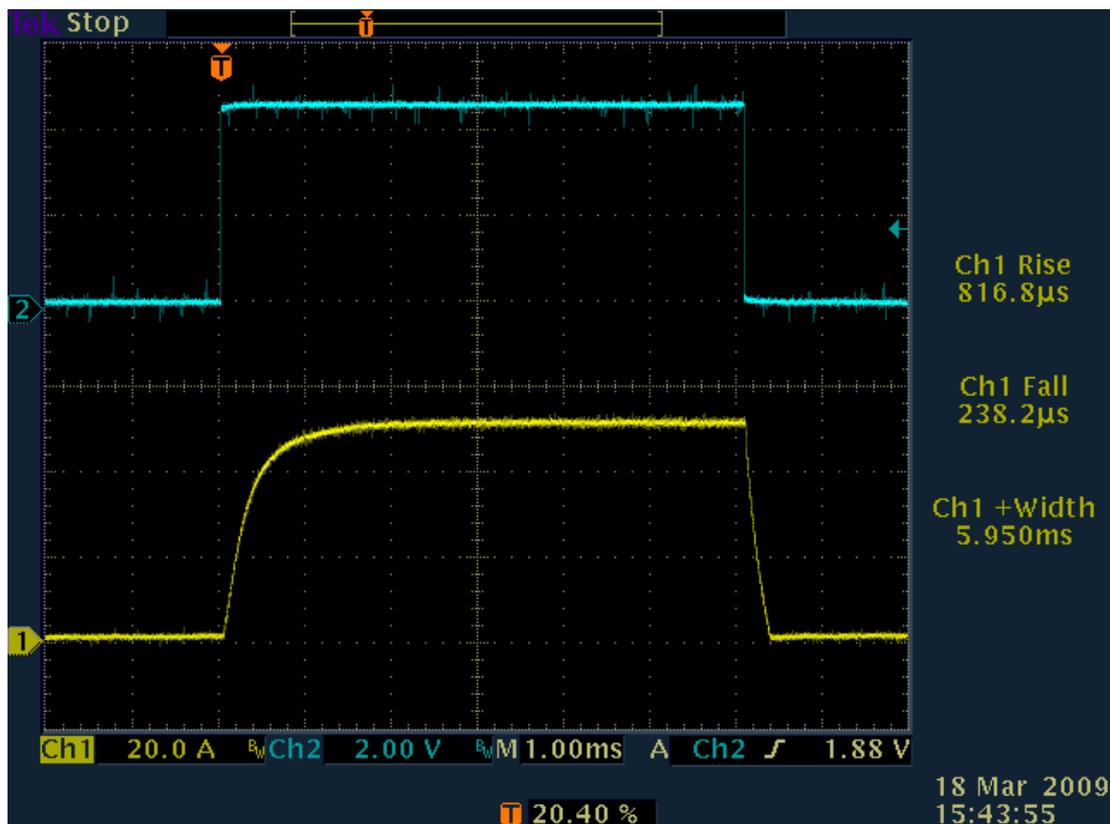where XXXX – max. output power (in Watts),
YYY – max. output current (in Amps).
ZZZ – max. output voltage (in Volts)
The product of YYY and ZZZ shouldn't exceed XXXX…

Examples: LDD-250W-100A-2V or LDD-1500W-50A-30V
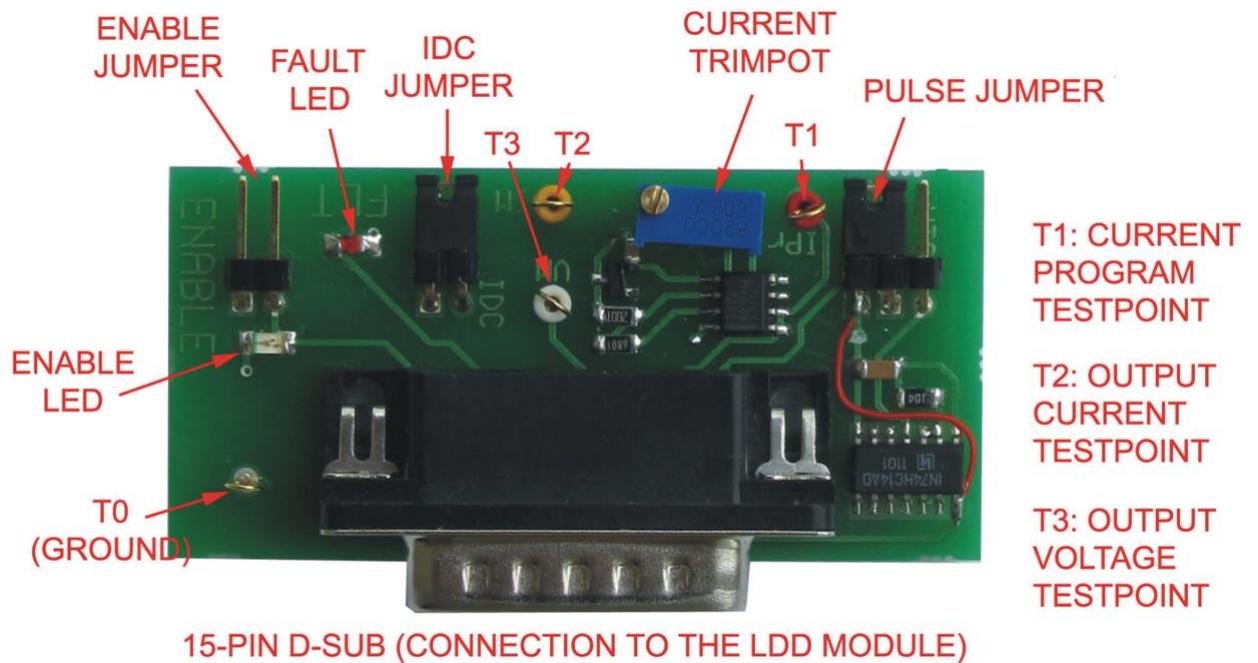
Typical output

Yellow curve depicts output current, cyan curve depicts inverted *PULSE* signal
Timescale is 1 ms/div

Accessories

Stand-alone PCB (ordering code –STA) makes stand-alone operations possible. Nothing but this PCB is needed.


PULSE JUMPER STATES DESCRIPTION

	Pulse is ON
	Pulse is OFF
	Pulse is driven by external generator
	Pulse is driven by internal generator

Dimensions: 64x30x17mm

RS-232 interface PCB (ordering code –RS232) provides possibility to control the laser diode driver via machine RS-232 interface.

4-PIN MOLEX MINIFIT
(CONNECTION TO THE COMPUTER)

PULSE SIGNAL TESTPOINTS

OUTPUT CURRENT TESTPOINTS

15-PIN D-SUB (CONNECTION TO THE LDD MODULE)
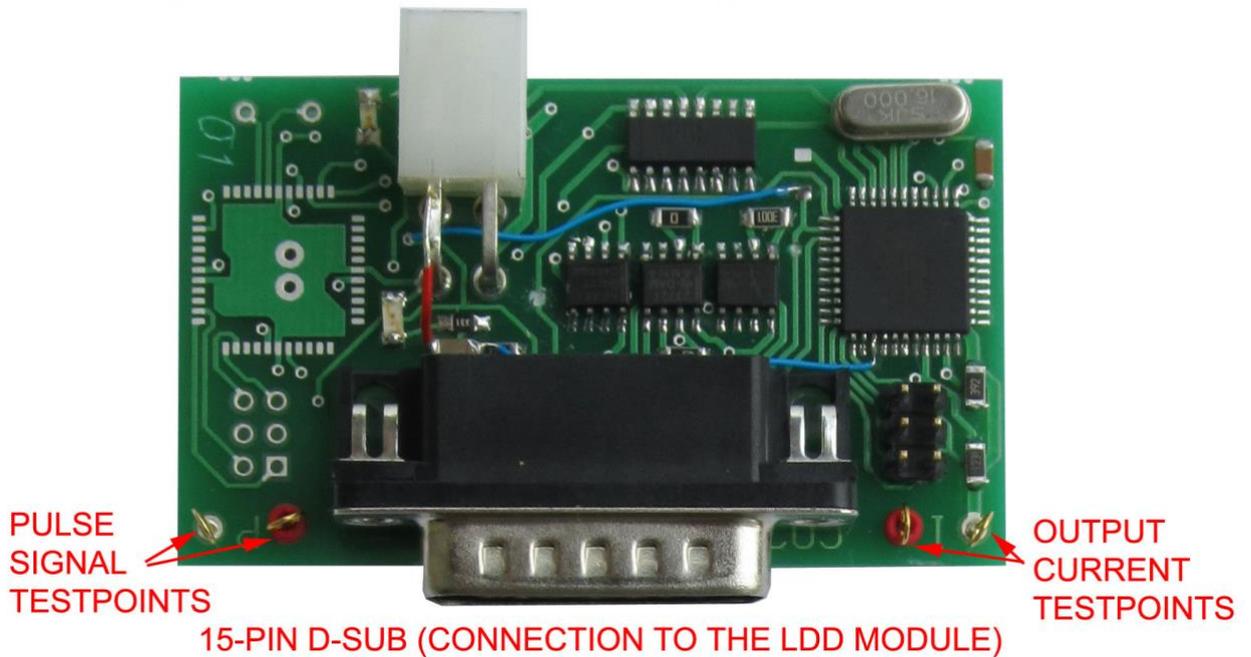
Dimensions: 64x38x17mm

RS-232 connection parameters: 115200 bps, 8 data bits, 1 stop bit, no parity.

Command format is: {command} {data (optionally)} {end-of-line}
command is 1 character long (see list below),
data is ASCII-string of adjusting value.
each command ends with end-of-line symbols (\r\n or \n)

List of available commands:
- c/C – set/get current (A)
- u/U – set/get continuous/pulsed mode ("1" – CW; "0" – pulsed)
- p/P – set/get pulse width (ms)
- f/F – set/get repetition rate (Hz)
- r/R – set/get start ("1" start, "0" stop)
- o – makes certain quantity of pulses and stops
- ? – acquire all set parameters
- Y – current monitor
- V – voltage monitor
- Z – fault state monitor ("1" means fault)
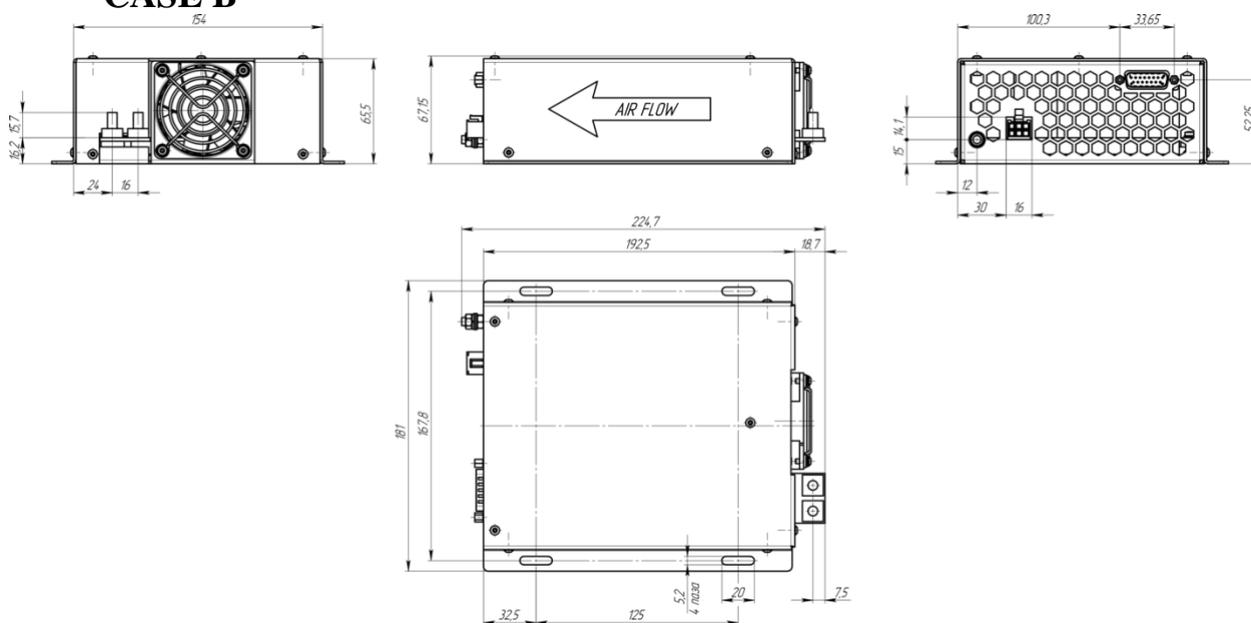- M – all monitors
- e – echo off/on

Example:
- u 1 \n c 50 \n r 1

LDD-series selection chart

Name	Max.power *	Max.current (I_{MAX}) *	Input voltage	Case
LDD-150	150 W	5 – 75 A	100-240 VAC	B
LDD-250	250 W	10 – 100 A	100-240 VAC	B
LDD-400	400 W	10 – 100 A	200-240 VAC	B
LDD-600	600 W	10 – 100 A	100-240 VAC	C
LDD-1000	1000 W	10 – 100 A	100-240 VAC	C
LDD-1500	1500 W	10 – 100 A	200-240 VAC	C

* Modifications up to 2000 W and/or 150 A are available on request

CASE B

CASE C