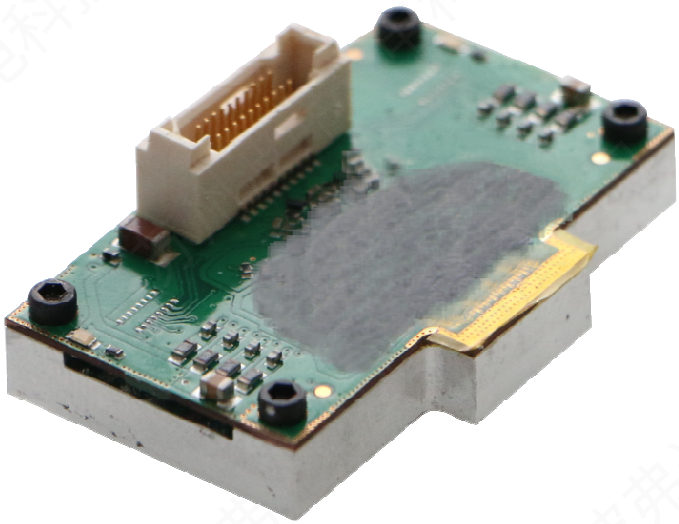
User Manual

LDP-AV 16N45-40



PicoLAS

网址：www.bonphot.com 邮箱：sales@bonphot.com 电话：0512-62828421

Rev. 2004

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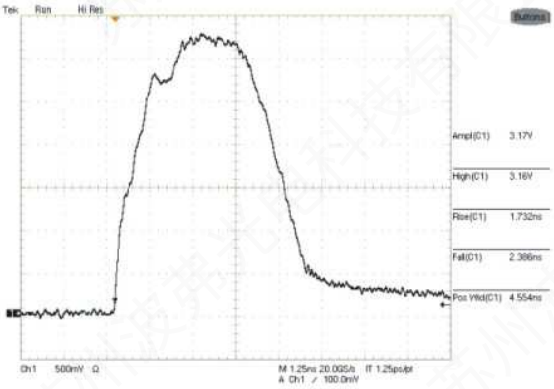
PicoLAS

FOCUSSING POWER TO THE POINT

Rev. 2004

LDP-AV 16N45-40

LIDAR - Sequential controlled Laser Diode Driver



Typical optical output signal, driver designed for 4.5 ns pulses (time scaling 1.25 ns/div).

- Ultra compact driver 40 x 24 mm²
- 16 independent channels
- 16 x 40 A or 1 x 640 A output current**
- Fixed pulse duration e.g. 4.5 ns
- Rep. rates from single shot to 100 kHz
- Easy settings of output current via an external voltage
- Applications: LIDAR, Measurements, Ignition, Rangefinding, Biochemistry, ...
- Flexible platform to install and test laser diodes
- Advanced minimal inductance layout
- High power density

Technical Data

Output current	
Each channel	16 x 0 .. 40 A
Flash	1 x 640 A
Pulse duration	Fixed e.g. 4.5 ns
Repetition rate	Single shot to 100 kHz**
Max. duty cycle	TBD
Trigger input	+5 V into 50 Ω
Supply voltage	+5 V 0.05 A
Charging voltage	HV +0 .. 55 V / 0 .. 0.2 A
Dimensions	40 mm x 24 mm
Weight	TBD
Operating temperature	0 .. 55 °C

* Tested with OSRAM SPL PL90_3 laser diode
** See manual for detailed information

Product Description

The LDP-AV 16N45-40 is a nanosecond driver especially designed for multi-channel LIDAR applications. It is a 16-channel high side driver which is capable for driving more than 640 A in total. The exact pulse duration can be adjusted by PicoLAS to your demands.The laser diode can be mounted directly on top of the driver.
With the compact and small design the driver achieves a high power density. The output of 640 A** is accomplished by 16 seperate channels. Each channel can be controlled independently and provides a maximal output current of up to 40 A.

How to use the Manual

Notice: Depending on the final application and operation regime, this unit must be assembled onto a heat sink or may stay non-cooled. Improper cooling may cause damage to the electronic components.

Before powering on your driver unit read this manual thoroughly and make sure you have understood everything.

Caution: High voltages up to 60 V are present at several PCB components. Do not touch during operation.

Please pay attention to all safety warnings.

If you have any doubts or suggestions, please do not hesitate to contact us!

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Dos and Don’ts

Never ground any output connector.

Never use any grounded probes at the output.

Do not connect your oscilloscope to the output!
This will immediately destroy the driver and the probe!

Do not connect voltages in reverse polarity to the device as there is no built-in protection circuit.

Do use power-up sequencing: Allow the +5 V supply voltage to fully ramp up before applying any other voltages (HV; Trigger Input).

Do not use mechanical force on the PCB components as they are fragile. Resulting damages are not covered by warranty.

Beware: Some lab power supplies cause excessive ringing during powering on and off. These may damage the unit**!**

Do keep connecting cables between power supply and driver as short as possible.

How to get started

Step	What to do	Check
1	Unpack your device.	
2	Attach the laser diode to the driver.	Please see section “Connection of the Laser Diode” for further details.
3	Assemble the driver onto an appropriate heat sink. This step may only be omitted if the stress to the driver is kept very low.	See section “Power Losses” for further information on thermal dissipation.
4	Connect GND, +5 V and +HV to the 20 pin connector. Keep the power supply off.	Please see section “How to connect the Driver” for further details.
5	Connect the pulse generator to the SMA trigger input jack.	Ensure that no pulse is fed before powering up the unit.
6	Carry out the power-up sequence as follows: 1) Fully ramp up the +5 V rail 2) Enable the HV supply Then, feed a pulse signal to the input terminal. For example 3.3 V – LVDS signal, 100 µs pulse width and 1 kHz repetition rate.	**Security advice:** Do not touch the PCB components near the laser diode since they may carry high voltages up to 60 V. Note: Observe the drivers limits as in section “Power Losses” to avoid overloading the driver.
7	Check the optical output of your laser diode.	
8	Turn off sequence: Disable the pulse generator and then turn off all power sources (+5 V and HV).	

Connection of the Laser Diode

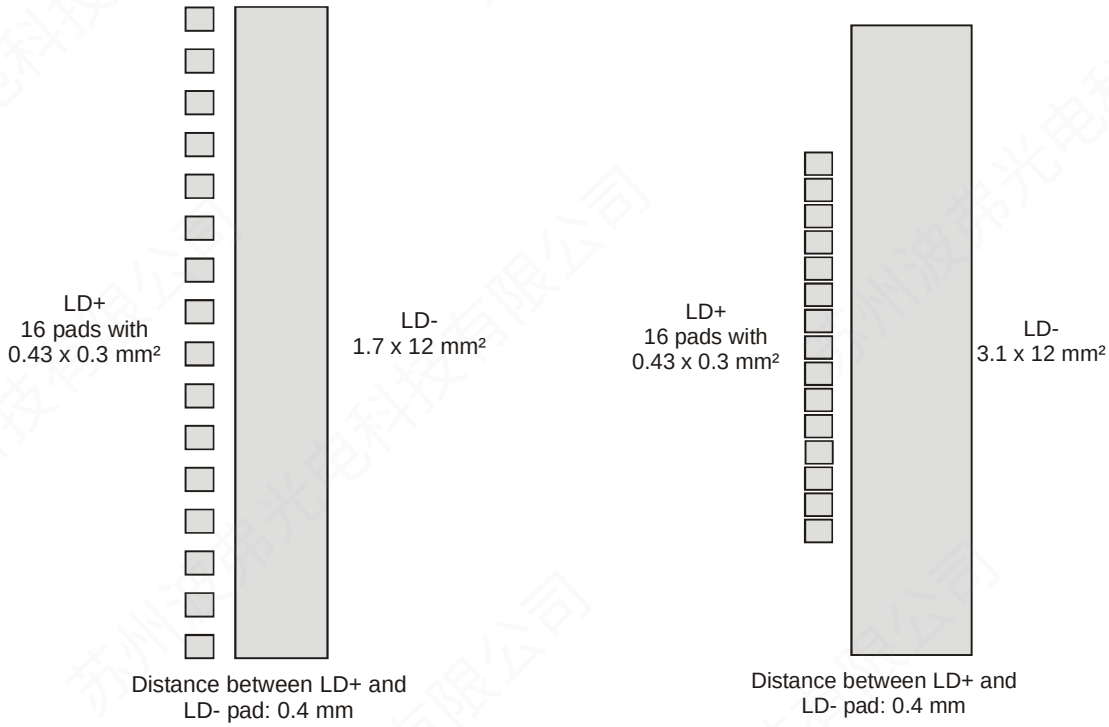

Figure 1: Dimensions of bonding pads for the laser diode

For the standard dimensions please refer to the dimensions in the upper figure. Figure 2 shows the location of the laser diode pad.

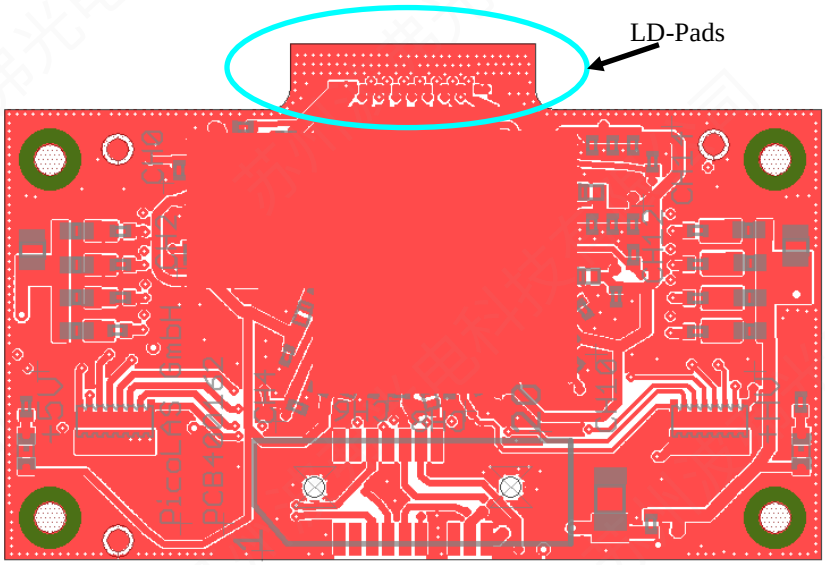

Figure 2: Layout of the LDP-AV 16N45-40 with a marking of the LD pads

Many elements and parasitic “stray” components may affect the performance of the driver unit. The stray inductance of the load connected to the driver is very important. The term “load” not only includes the diode itself but also the packaging (bond wires!) and the connection between the driver and the diode. However, PicoLAS has no influence on these parts.
→ Refer to the PicoLAS Application Notes “Impedance of Diodes” and “LD-Connections” for more information on parasitic elements and their effect on the pulse shape.

If you need different pad sizes for your laser diode, please do not hesitate to contact us. Customized pad layouts are possible for adapting the dimensions of your load.

How to connect the Driver

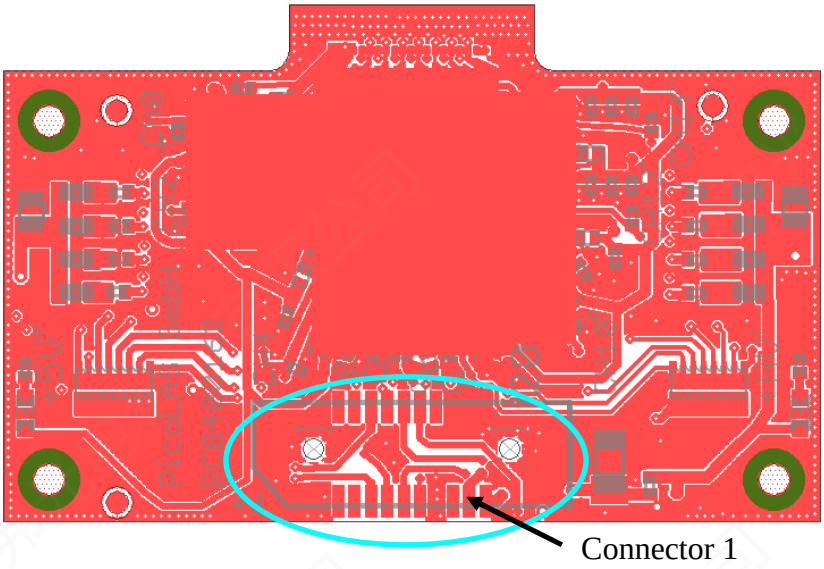

Figure 3: Layout of the LDP-AV 16N45-40 with a marking of the connector 1

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Signals of the 20 pin SAMTEC_20POL_TEM-110-02-03.0-G-D-L1 header (connector 1):

Pin	Name	Description
1	SYNCP	Positive Sync output - Digital LVDS
2	SYNCN	Negative Sync output - Digital LVDS
3	nc	nc
4	nc	nc
5	EP	Trigger positiv input, positiv EDGE-Triggering – Digital LVDS
6	EN	Trigger positive input, negative EDGE-Triggering – Digital LVDS
7	CHSEL0	Binary channel selection BIT0.
8	CHSEL1	Binary channel selection BIT1.
9	CHSEL2	Binary channel selection BIT2.
10	CHSEL3	Binary channel selection BIT3.
11	nc	nc
12	/INH	Leave this pin floatend to disable this driver operation. Connect to logic level low to turn all channels on. This driver has an internal 10 kOhm pull-resistor to 3.3 V.
13	GND	Ground return
14	nc	nc
15	nc	nc
16	GND	Ground return
17	+5 V	+5 V supply voltage, connect to a stabilized power supply.
18	GND	Ground return
19	HV	External high voltage supply input (0 .. 55 V)
20	GND	Ground return

Security Advice:

Do not touch any leads of the output or the output capacitors as they can carry high voltages of up to 60 V.

Pulse Input

The trigger generator or the FPGA must be capable of delivering a 3.3 V LVDS signal into 100 Ohms and with at least a pulse width of 1 µs. The internal pulse sharpener prevents unstable trigger response.
The LVDS standard (ANSI/TIA/EIA-644-A) specifies a threshold of ±100 mV for the LVDS receiver.

Note: It is recommended to keep the trigger pulse width within the range of 1 µs .. 100 µs. The LDP-AV 16N45-40 has an internal short pulse sharpener included. This feature assures a constant pulse width.

Channel Selection

This driver includes an internal multiplexer which allows to select a specific channel thus a laser diode. For the selection of one specific laser diode see following table:

CHSEL3	CHSEL2	CHSEL1	CHSEL0	Channel / laser diode
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

Table 1: Description – How to select a specific channel / laser diode

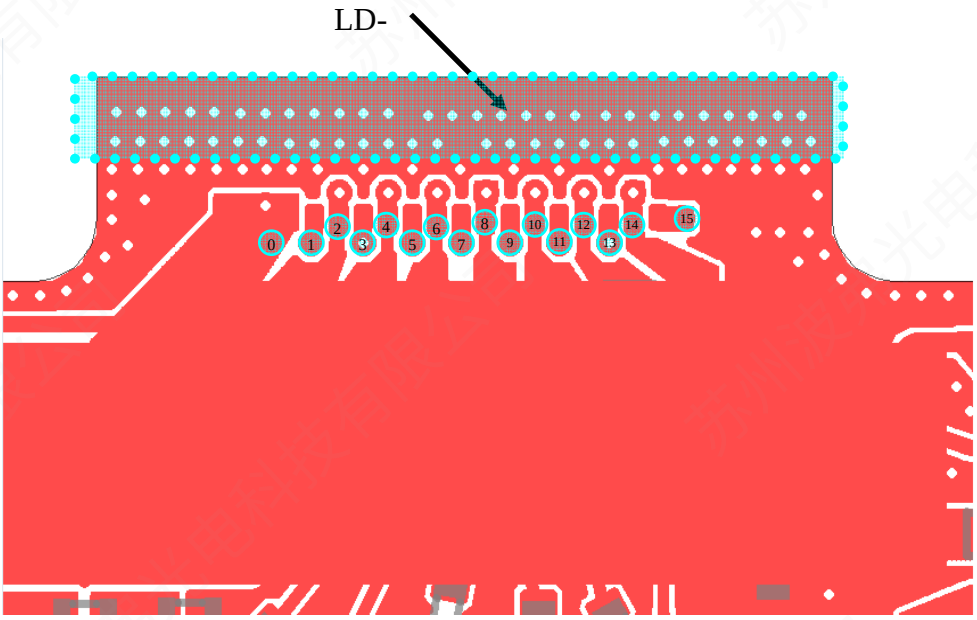

Figure 4: Close up of the laser diode footprint and their indicators

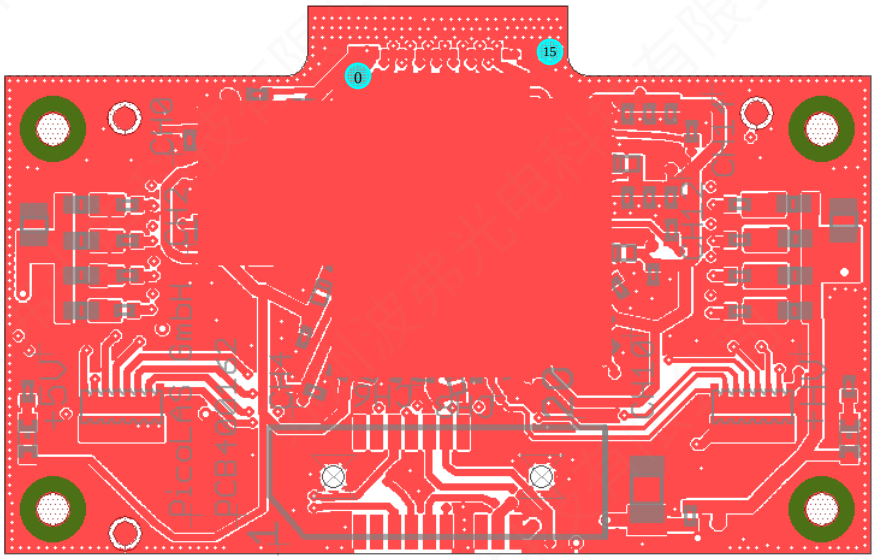

Figure 5: Laser diode footprint and their indicators

This driver is capable for individual coding methods. Therefore the LDP-AV 16N45-40 features the ability of fast channel selection up to 1 MHz.

If you need a flash driver instead of a sequential driver, please do not hesitate to contact us. Customized driver topologies are possible.

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Power Supply Requirements

The driver requires a stabilized +5 V supply (used by control logic).

Adhere to the power-up sequence as follows:

1) Fully ramp up the +5 V rail
2) Enable the HV supply
3) Apply trigger signal

Should you aim to connect a large number of driver units to a single power supply the high start-up current spikes can be taken care of by using an additional capacitor bank and hard power switching at its output. Failure to meet this requirement may cause the gate driver circuitry to stay in a faulty state.

To reveal that you have to feed the power supply +5 V or HV in, there are two blue LEDs included. They indicate that the power supply is turned on.

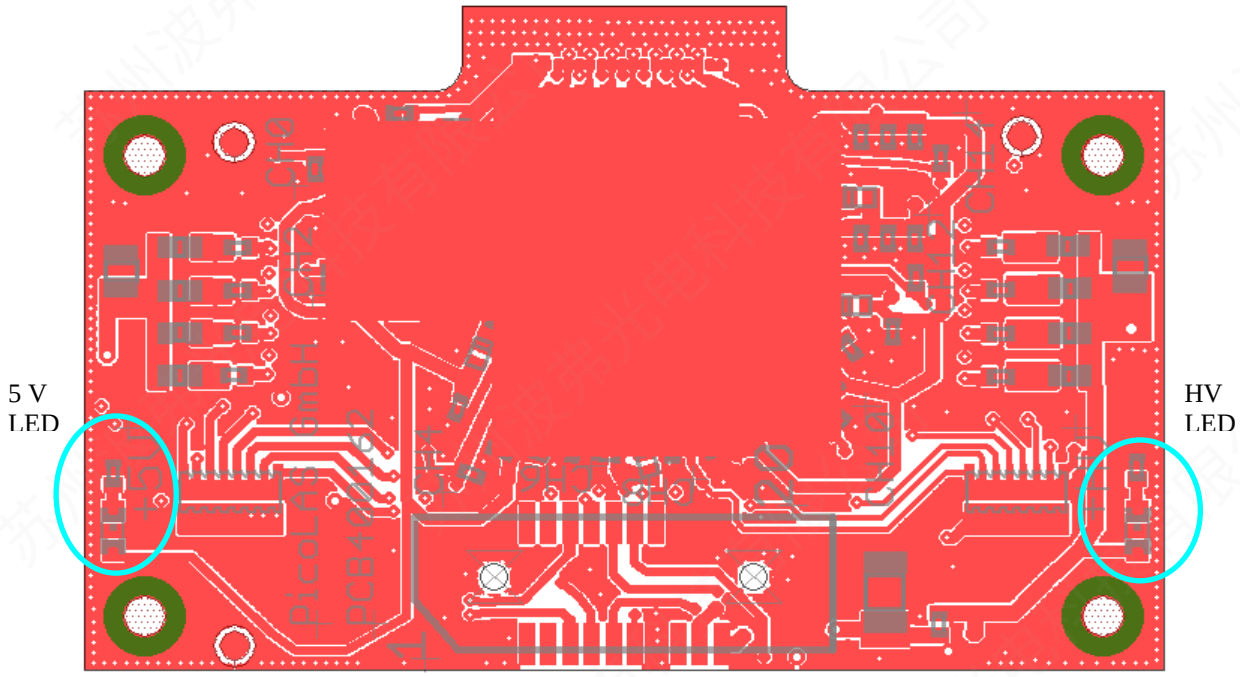

Figure 6: On the left handed side the +5 V and on the right handed side the HV LED

Note: The HV laser diode supply can be interrupted at any time e.g. for safety reasons by the customer.

Trigger Output Monitor

The trigger output signal is generated with an integrated, isolated Rogowski coil and provides an ultra fast galvanically isolated signal. The signal shape is proportional to the derivative of the load current. It can be used for a current response triggering signal and has no delay to the load current. Combined with an integrator it is possible to use this signal for a galvanically isolated current monitor.

Current Consumption

Quiescent currents

Supply input	Conditions	Min.	Max.	Unit
+5 V	4.8 V .. 5.2 V	TBD	TBD	mA
HV	0 V .. 55 V	5	400	mA

Trigger signal present

Supply input	Conditions	Typ.	Max.	Unit
EN / EP	-	0.3	5	mA
EN	Differential input low threshold	-30	-100	mV
EP	Differential input high threshold	-30	0	mV

Cooling

The driver is base plate cooled only. Please assemble the entire unit to a heat sink which is capable to take out the heat.
The heat sink is suitable if the system temperature does not exceed the maximum operating limits.

Power Losses

Due the structure of this driver the power losses of this driver can be approximately estimated with following equation

$$P_{LOSS} \approx V_{HV+} \cdot f_{rep} \cdot t_{pw} \cdot I_{out} + V_{HV+} \cdot 0.07W / A$$

Where

P_{LOSS} Total average power consumption [W]

V_{HV+} High voltage supply [V]

f_{rep} Repetition frequency [Hz]

t_{pw} Optical pulse width [s]

I_{out} Output current [A]

Recommended Operating Conditions

Supply voltages	Min.	Typ.	Max.	Unit
HV+	0	-	+55	V
+5 V	+4.75	+5.0	+5.2	V

Trigger input	Min.	Typ.	Max.	Unit
EN	Differential input low threshold	-30	-100	mV
EP	Differential input high threshold	-30	0	mV
Pulse width	1	2	100	µs
Repetition rate	-	-	100	kHz

Channel selection	Min.	Typ.	Max.	Unit
CHSEL0 / CHSEL1 / CHSEL2 / CHSEL3 input logic high	+2.4	+3.15	-	V
CHSEL0 / CHSEL1 / CHSEL2 / CHSEL3 input logic low	-	2.1	+1.35	V
Address transition time	-	-	1.0	MHz

Absolute maximum Ratings (destroying limits)

Supply voltages	Min.	Max.	Unit
HV+	0	+55	V
+5 V	0	+5.2	V

Trigger input	Min.	Max.	Unit
Trigger signal voltage, unterminated	0	+3.3	V

- **Trigger Signal:**
  Note that the maximum ratings for both **pulse width** and **repetition rate** depend on the actual high voltage supply (HV). See section “Power Losses” for guidance.

Mechanical Dimensions

All dimensions are in millimetres (mm).

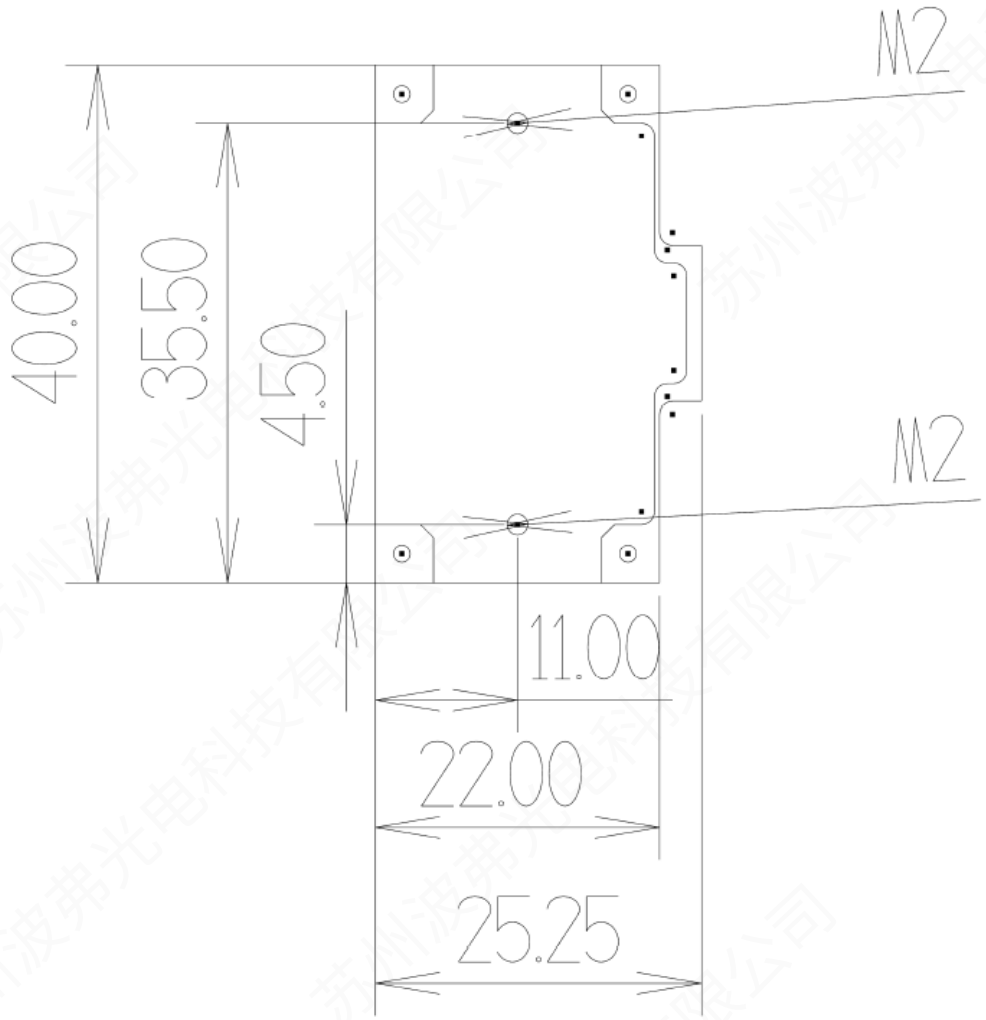

Figure 7: Mechanical dimension of LDP-AV 16N45-40

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