EKSMA OPTICS

Pockels Cells Drivers

DPS • DPD • DPBX • DP-SP   CAVITY DUMPING & PULSE PICKING POCKELS CELL DRIVERS

*OEM version
of DPS/DPD series
Pockels cell driver*

*Encased version
of DPS/DPD series
Pockels cell driver*

FEATURES

› Fast HV rise/fall time < 6 – 9.5 ns

› HV pulse amplitude up to 7 kV

› Pulse repetition rate up to 1 MHz

› Output pulse jitter <50 ps if trigger pulse rise time <0.5 ns

DPD series Pockels cell drivers are designed for wide range of applications and operating modes – pulse selection, Q-switching, cavity dumping, CW beam chopping, burst modes, etc.

Different versions of the drivers are designed for variations of output voltage, repetition rate and rise/fall time of HV pulses. Those three parameters are mutually dependent: higher voltage means longer rise/fall time and higher repetition rate is limited by voltage. However, all drivers can operate at 1 MHz and even higher repetition rate in burst mode not exceeding specified average power. Connection diagram can be PUSH-PULL configuration using stand-alone driver for one Pockels cell.

Most of our DPS/DPD/DPBX/DP-SP series units are available in two versions: "open frame" which is ideal for OEM manufacturers incorporating drivers in their own laser systems or "Encased" in aluminum housings. Encasing of Pockels cell driver in aluminum housing helps to solve two problems: shields both humans and electronics from high voltage impact from operating Pockels cell driver, and protects driver itself from accidental potentially harmful external contact – ensuring safe operation of the driver. The Encased option is especially handy for researchers and custom product manufacturers who use these drivers during their own systems build-up.

Standard range drivers (unipolar and bipolar) operate safely with HV pulse duration from 100 ns to 5 μs. Moreover, HV pulse duration can be extended to infinity using pulse regeneration technique.

Short pulse drivers (DP-SP series) feature safe operation with HV pulse duration from 15 ns to ~1 μs. However, pulse regeneration technique does not work with short pulse drivers.

Short pulse DP-SP series drivers can be used for single pulse selection in pulse picker applications for higher repetition rate lasers generating up to 60 MHz pulse trains. While standard drivers can be used for single pulse selection in pulse picker applications for lasers generating up to 17 MHz pulse trains. Pulse picking applications with lasers emitting up to 100 MHz pulse trains require two drivers in Full Bridge configuration.

Operation control of all our drivers can be made by two trigger (sync) pulses *(Fig. 1)* or by single trigger pulse *(Fig. 2)* whereas rising edge of trigger pulse turns ON high voltage to Pockels cell and falling edge of the same trigger pulse turns high voltage OFF.

DPS drivers have fixed 1 trigger pulses (sync) control. DPD drivers have fixed 2 trigger pulses (sync) control. Thus the choice of driver with 1 (DPS) or with 2 (DPD) trigger pulses control must be made by customer before ordering process. While DP-SP and DPBX series drivers have switchable 1 or 2 trigger pulses control.

*Fig. 1. Control timing charts
for two-pulses controlled drivers*

*Fig. 2. Control timing charts
for single pulse controlled drivers*

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PULSE REGENERATION TECHNIQUE

Gives possibility to operate push-pull drivers very long output pulse. Pulse regeneration technique does not work with short-pulse (DP-SP) drivers. Pulse regeneration technique diagram is shown in *Fig. 3*
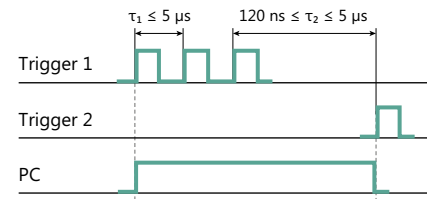

$\tau_1 \leq 5\ \mu s$ $120\ ns \leq \tau_2 \leq 5\ \mu s$

Trigger 1

Trigger 2

PC

Fig 3. Principle pulse regeneration diagram

GENERAL SPECIFICATIONS OF DPS/DPD/DPBX/DP-SP DRIVERS [1]

DRIVER MODEL	DPS/DPD	DPBX	DP-SP
Maximal HV operation voltage	up to 5.2 kV	up to 7.0 kV	up to 3.6 kV
HV pulse rise time *(Fig. 5)*	< 6 – 8.5 ns	< 6 – 9.5 ns	< 6 – 7 ns
HV pulse fall time *(Fig. 6)*	< 6 – 8.5 ns	< 6 – 9.5 ns	< 6 – 7 ns
HV pulse duration *(Fig. 4)*	100 – 5000 ns		15 – 5000 ns
HV pulse duration extension using pulse regeneration technique	Yes		No
Maximal HV pulse repetition rate	up to 1000 kHz		
Triggering pulse duration requirement	> 100 ns		> 10 ns
Triggering pulse amplitude requirement	3.5 – 5 V (50 Ohms)		
Triggering pulse rise & fall time requirement	< 20 ns		< 5 ns
Maximal length of leads to Pockels cell	10 cm (< 5 cm recommended)		
Control by triggering (sync) pulses	1 or 2, fixed	1 or 2, switchable	1 or 2, switchable
Control by triggering pulses diagram options	Fig. 1 for two triggering pulses or Fig. 2 for single triggering pulse		
HV pulse delay	45 ns		30 ns
External powering requirements [2]			
High voltage supply	Depends on the model and each model has particular recommendation		
Low voltage DC supply	24 V DC ±1.0 V on request 12 V DC ±0.5 V	24 V DC ±1.0 V	

[1] *Specifications are given for Pockels cell with capacity <6 pF. Not all combinations of parameters can be possible at the same time. Specifications are subject to changes without advance notice.*

[2] *Driver needs to be mounted on the heatsink (excluding water cooled versions). Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.*
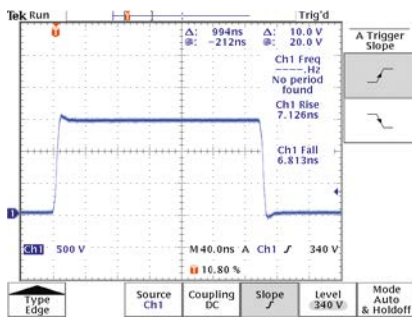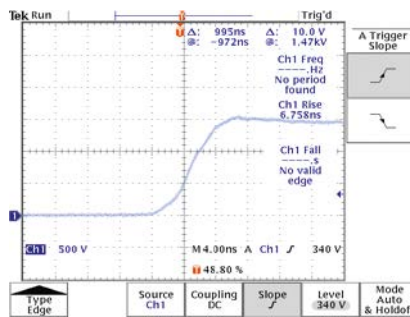

Fig. 4. Typical output pulse shape
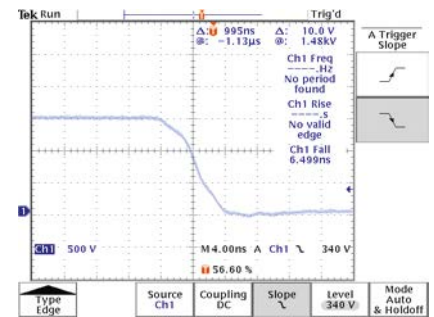

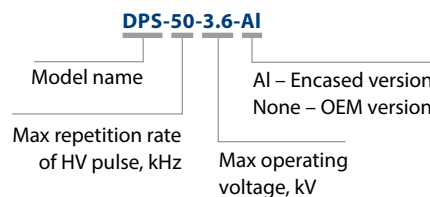*Fig. 5. Typical rising front of output pulse in detail*

Fig. 6. Typical falling front of output pulse in detail

ORDERING/PART NUMBER INFORMATION

Please provide following information about the driver:

› Operating voltage
› Repetition rate
› HV Pulse duration (range)
› Capacitance of Pockels cell
› OEM or Encased version

DPS-50-3.6-AI

Model name

Max repetition rate of HV pulse, kHz

Max operating voltage, kV

AI – Encased version
None – OEM version

OEM VERSION UNIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD SERIES OEM VERSION UNIPOLAR DRIVERS

CATALOGUE NUMBER OF DRIVER	DPS-50-3.6 DPD-50-3.6	DPS-500-2.6 DPD-500-2.6	DPS-1000-1.8 DPD-1000-1.8	DP-2000-1.5
Maximal HV operating voltage	3.6 kV	2.6 kV	1.8 kV	1.5 kV
Maximal HV repetition rate *	50 kHz	500 kHz	1000 kHz	2000 kHz
Pulse duration	100 – 5000 ns			
HV pulse rise time, typical	<7 ns	<6.5 ns	<6 ns	<7 ns
HV pulse fall time, typical	<7 ns	<6.5 ns	<6 ns	<7 ns
Output polarity	positive			
HV power consumption	<20 W	<90 W	<80 W	<120W
12V/24V power consumption	1 W	6 W	9 W	12 W
Recommended HV power supply model	PS-40	PS-120	PS-80	PS-120
Dimensions	see Fig. 7	see Fig. 8		
Cooling	conductive	conductive or water		

DPS in code indicates that driver is controlled by 1 sync pulse, DPD in code indicates that driver is controlled by 2 sync pulses.
DP in code marked drivers are equipped with jumper to toggle between one-and-two pulses control mode.
HV output voltage to Pockels cell is equal to HV power supply voltage.
Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

* Drivers with any non-standard HV pulse repetition rate from 0 to 2000 kHz are also available in case of request.

OEM version of DPS/DPD series driver
with conductive pad.
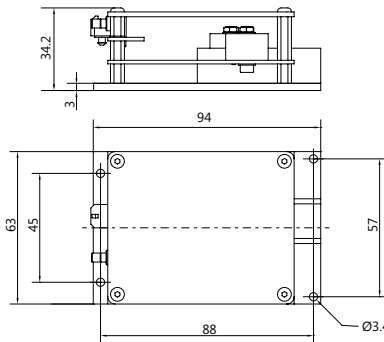Suitable for repetition rate up to 50 kHz

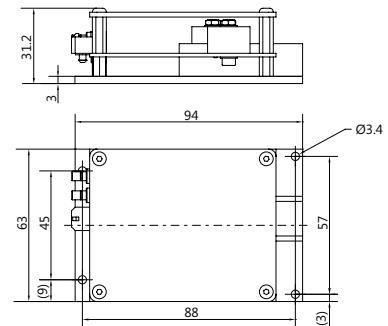Fig. 7. Outline drawing of DPS series drivers with
conductive pad

Fig. 7a. Outline drawing of DPD series drivers with
conductive pad

OEM version of DPS/DPD series driver
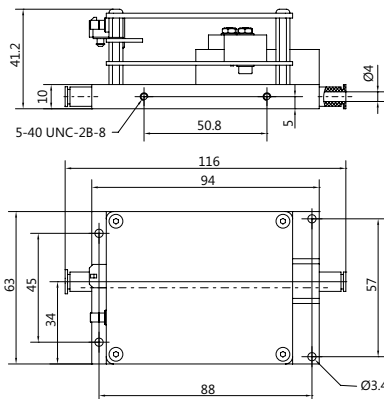with general purpose pad

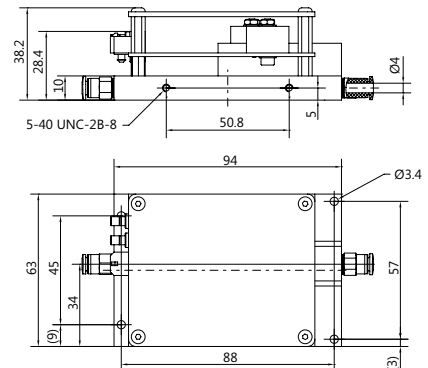Fig. 8. Outline drawing of DPS series driver with general
purpose pad

Fig. 8a. Outline drawing of DPD series driver with
general purpose pad

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ENCASED VERSION UNIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD SERIES ENCASED VERSION UNIPOLAR DRIVERS

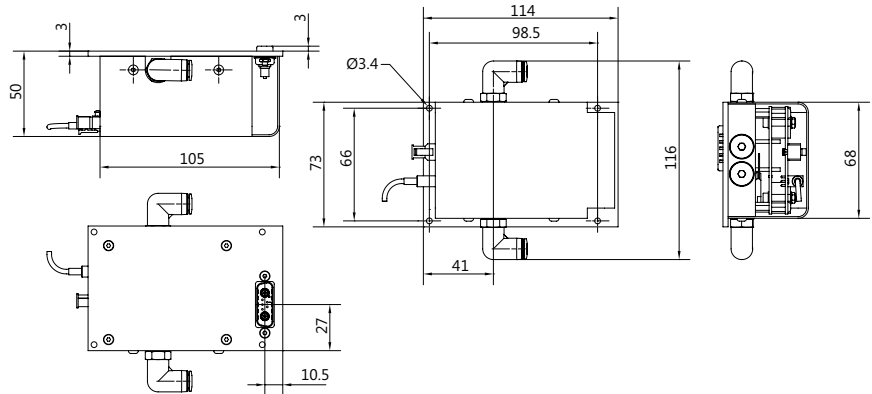| CATALOGUE NUMBER OF DRIVER	DPS-250-3.6-Al DPD-250-3.6-Al	DPS-500-2.6-Al DPD-500-2.6-Al	DPS-1000-1.8-Al DPD-1000-1.8-Al	DP-2000-1.5-Al
Maximal HV operating voltage	3.6 kV	2.6 kV	1.8 kV	1.5 kV
Maximal HV repetition rate *	250 kHz	500 kHz	1000 kHz	2000 kHz
Pulse duration	100 – 5000 ns			
HV pulse rise time, typical	<7 ns	<6.5 ns	<6 ns	<7 ns
HV pulse fall time, typical	<7 ns	<6.5 ns	<6 ns	<7 ns
Output polarity	positive			
HV power consumption	<75 W	<90 W	<80 W	<120W
12V/24V power consumption	4 W	6 W	9 W	12 W
Recommended HV power supply model	PS-80	PS-120	PS-80	PS-120
Dimensions	see Fig. 9			
Cooling	water			

DPS in code indicates that driver is controlled by 1 sync pulse, DPD in code indicates that driver is controlled by 2 sync pulses.
DP in code marked drivers are equipped with jumper to toggle between one-and-two pulses control mode.
HV output voltage to Pockels cell is equal to HV power supply voltage.
Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

*   Drivers with any non-standard HV pulse repetition rate from 0 to 2000 kHz are also available in case of request.

Encased version of driver DPS/DPD models DPS/DPD-200-xx, DPS/DPD-250-xx, DPS/DPD-500-xx, DPS/DPD-1000-1.8

Fig. 9. Outline drawing of encased version of driver DPS/DPD models DPS/DPD-200-xx, DPS/DPD-250-xx, DPS/DPD-500-xx, DPS/DPD-1000-1.8

ENCASED VERSION BIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD/DPBX SERIES ENCASED VERSION BIPOLAR DRIVERS

CATALOGUE NUMBER OF DRIVER	DPS-250-5.2-Al DPD-250-5.2-Al	DPS-300-4.6-Al DPD-300-4.6-Al	DPS-1000-2.9-Al DPD-1000-2.9-Al	DPBX-250-7.0-Al	DPBX-1000-3.8-Al
Maximal HV operating voltage	5.2 kV	4.6 kV	2.9 kV	7.0 kV	3.8 kV
Maximal HV pulse repetition rate [1]	250 kHz	300 kHz	1000 kHz	250 kHz	1000 kHz
Pulse duration [2]	100 – 5000 ns				
HV pulse rise time, typical	<8.5 ns	<8 ns	<7.5 ns	< 9.5 ns	< 6 ns
HV pulse fall time, typical	<8.5 ns	<8 ns	<7.5 ns	< 9.5 ns	< 6 ns
Output polarity	bipolar				
HV power consumption [3]	<100 W	<100 W	<120 W	< 200 W	< 210 W
DC power consumption	9 W			< 6 W	< 10 W
Recommended HV power supply model	PS2-60			HV-2x200-3.6	HV-2x200-2.0
Dimensions	see Fig. 10			See Fig. 11	
Cooling	conductive or water			Water	

[1] *Drivers with any non-standard HV pulse repetition rate from 0 to 1000 kHz are also available in case of request*

[2] *Pulse duration can be extended using pulse regeneration.*

[3] *Power consumption for 6 pF load. Voltage or repetition rate derating is necessary if capacitance of your Pockels cell is higher. Contact vendor for details.*

> Bipolar drivers DPS and DPD series have fixed 1 OR 2 trigger pulses (sync pulses) control.

> Bipolar drivers DPBX series have switchable 1 or 2 trigger pulses control.

> HV output voltage to Pockels cell is equal to HV power supply voltage, i.e. sum of positive and negative voltage values.

> Driver needs to be mounted on heatsink unless it is cooled by water.

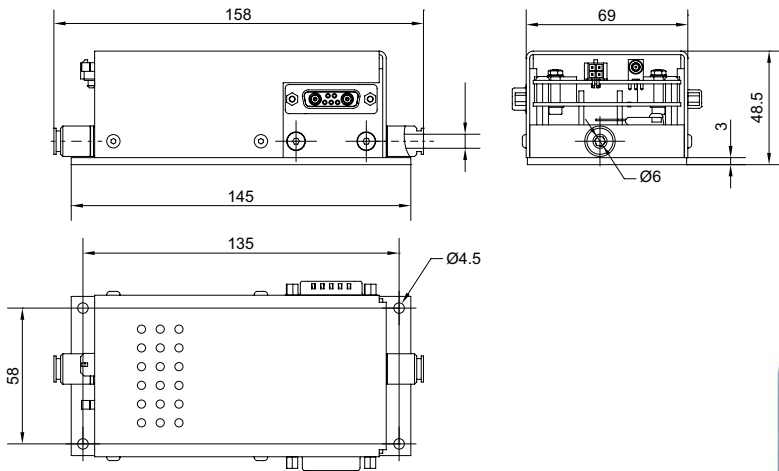> Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation.

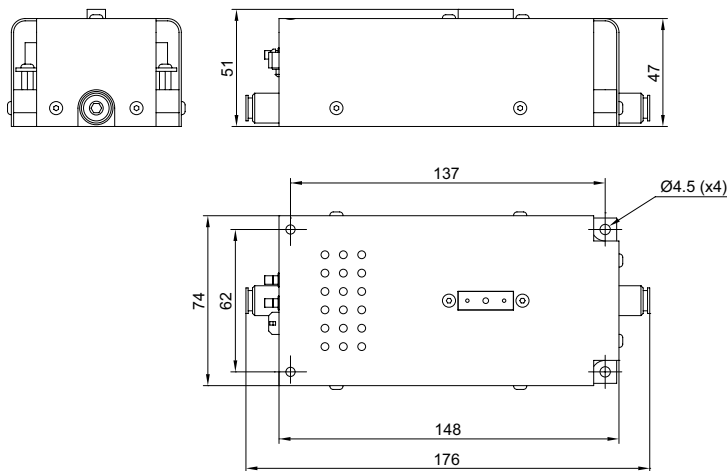*Fig. 10. Outline drawing of encased version of driver DPS/DPD models*

Encased version of driver DPS/DPD models. Water cooled version

Fig. 11. Outline drawing of encased version of driver DPBX models

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