

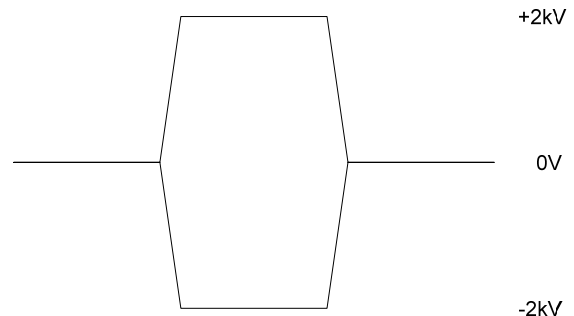
# **QBU series Pockels cell driver**

## **User Manual**

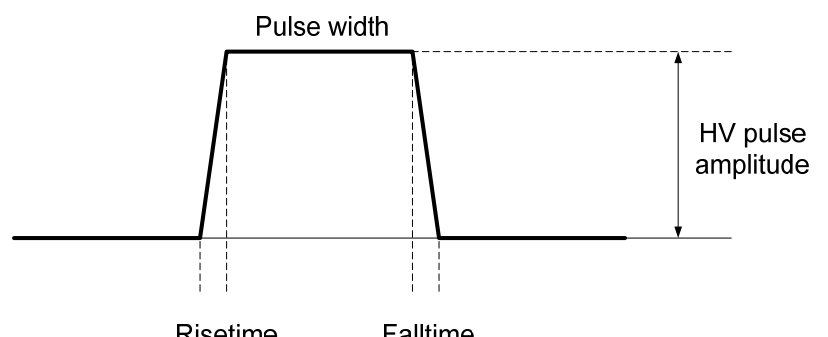
## Overview

QBU series Pockels cell drivers produce high voltage pulses with high repetition rates, fast risetimes and falltimes, adjustable voltage amplitude and pulse width.

## Pulse parameters

<p>Module produces bipolar output. It means that 4kV pulse is physically formed by applying +2kV to positive output wire and -2kV to negative</p>	
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**Attention!** Further description of HV output will be given in terms of voltage differences. Please keep it in mind!

<p>Typical pulse shape</p>	
<p>Risetime/Falltime</p>	<p>~20 ns <sup>1, 2</sup></p>
<p>Pulse width</p>	<p>from 5 us to DC</p>
<p>HV pulse amplitude</p>	<p>from HVmin to HVmax <sup>3</sup></p>
<p>Repetition rates</p>	<p>from single shot to ~10 kHz (continuously) <sup>2, 4</sup>, to ~100 kHz (short-term) <sup>2, 4</sup></p>
<p>Internal timing <sup>5</sup></p>	<p>~100 us</p>

<sup>1</sup> at 10-90% level

<sup>2</sup> depends on HV pulse amplitude and capacity load

<sup>3</sup> HVmin and HVmax values see in part number table

<sup>4</sup> depends on working mode and cooling conditions

<sup>5</sup> see description below

## Internal timing

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Without **Q-switch** signal is applied driver maintains its state. Internal timer continuously refreshes driver condition every  $\sim 100\mu\text{s}$ . It is cause of:

1. HV output levels have small ripple with period  $\sim 100\mu\text{s}$
2. It's prohibited to trigger HV output level as internal timing is occurring. Therefore triggering of HV output is sometimes delayed. The delay time is approx.  $5\mu\text{s}$

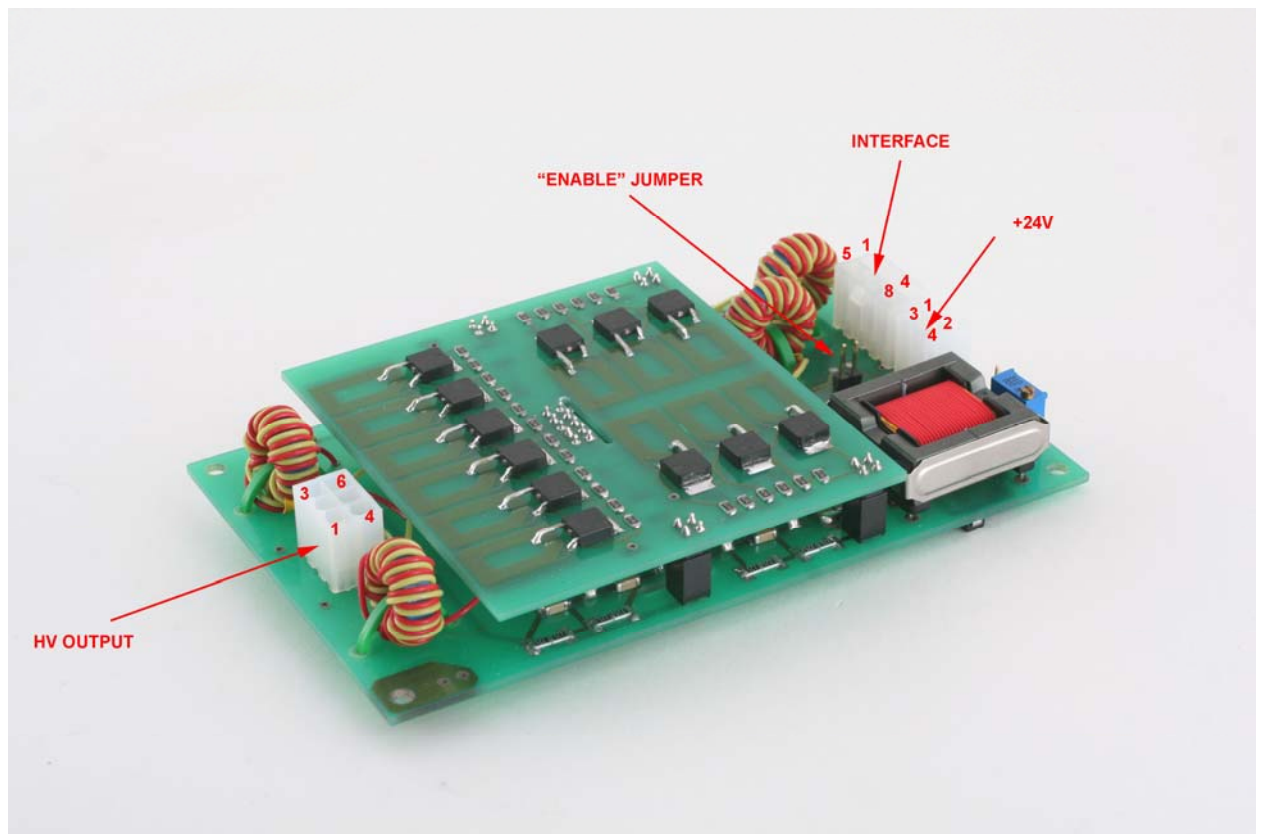
## Cooling

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At middle and high operation frequencies forced air cooling is required. The driver has internal protection from overheating – it automatically shuts down at  $\sim 70\text{C}$

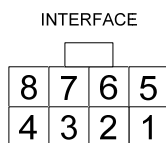
## Connections, signals, signal descriptions

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There are three connectors at Pockels cell driver board. Hereafter is description of corresponded female connectors (supplied with the board)

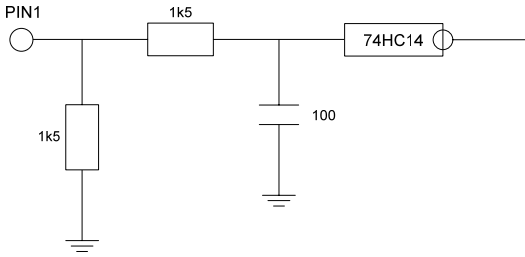
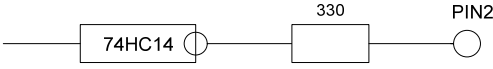
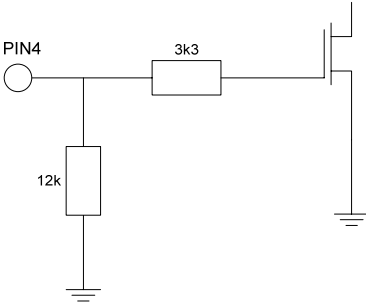
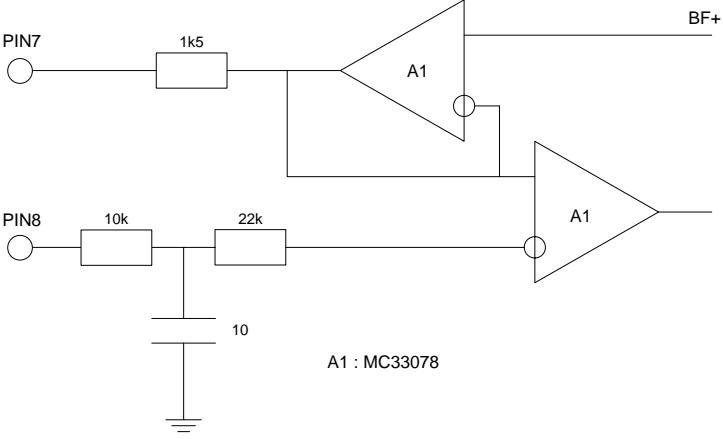
**INTERFACE (Molex 39-30-1060):**



PIN (color)	DESIGNATION	DESCRIPTION
<b>1 (transparent)</b>	<b>Q-switch</b>	While “0” or ”1” is applied to PIN1 high voltage output is maintained correspondingly at 0V or <b>HV</b> level  Sequences of triggering pulses with period less than approx. 5 us are ignored by driver
<b>2 (violet)</b>	<b>Synchro Out</b>	Because of internal timing a small delay of high voltage output triggering relative to <b>Q-switch</b> signal is possible  Therefore there is a synchronization pulse at PIN2 every time as the triggering of high voltage output is occurred. <i>The synchro pulse is square, has negative polarity; back front synchronization</i>
<b>3 (red)</b>	<b>+15 V</b>	Provides +15V DC level
<b>4 (blue)</b>	<b>Enable</b>	The high voltage output is enabled by PIN4 (“1” – enable, “0” – disable)
<b>5, 6 (black)</b>	<b>Interface Return</b>	PIN5 and PIN6 are connected to the circuit ground of all internal circuits
<b>7 (yellow)</b>	<b>HV Monitor</b>	The voltage at PIN7 is a monitor signal proportional to the measured value of high voltage output  <b>HVmax</b> corresponds to 10V at PIN7, <b>HVmin</b> corresponds to approx. 4V at PIN7
<b>8 (green)</b>	<b>HV Program</b>	Positive DC voltage applied to PIN8 sets up high voltage value <b>HV</b>  <b>HVmax</b> corresponds to 10V at PIN8, <b>HVmin</b> corresponds to approx. 4V at PIN8

“0” means logical 0 low level (0V), “1” means logical 1 high level (5V)

## INTERFACE CIRCUITS

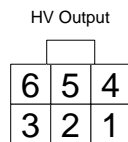
<p><b>Q-Switch</b></p>	
<p><b>Synchro Out</b></p>	
<p><b>Enable</b></p>	
<p><b>HV Program and HV Monitor</b></p>	 <p style="text-align: center;">A1 : MC33078</p>

**+24V (Molex 39-30-1040):**



PIN (color)	DESIGNATION	DESCRIPTION
<b>1, 2 (red)</b>	<b>+24V</b>	INPUT positive 24VDC for turn on the Pockels cell driver
<b>3, 4 (black)</b>	<b>RETURN</b>	Return from power supply producing +24VDC

**HV OUTPUT (Molex 39-30-1060):**



PIN (color)	DESIGNATION	DESCRIPTION
<b>1, 4 (red)</b>	<b>Positive</b>	HV Positive
<b>2, 5</b>	<b>N/C</b>	
<b>3, 6 (blue)</b>	<b>Negative</b>	HV Negative

## Safety

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**Warning!** This equipment produces high voltages that can be very dangerous. Don't be careless around this equipment.

- To provide safety the QBU-series Pockels cell driver module is designed to be powered with supply voltage +24VDC, which must be galvanically separated from mains.
- It is the user's responsibility to ensure that personnel are prevented from accidentally contacting the QBU-series Pockels cell driver module, especially the high voltage connector and cable. **Casual contact could be fatal.** Output cables must have good isolation for output voltage and low capacitance.
- After shut down, do not touch the load until it has been discharged. Use an appropriate measurement device to check for complete discharge.
- Disconnect the QBU-series Pockels cell driver module from DC power supply before changing electrical or mechanical connections.

## Operations

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1. Connect all wires
2. **Disable** the high voltage output
3. Apply the correct nominal **DC Input** power to the module
4. Set up the required output voltage by applying a DC voltage to the **HV Program PIN8** of **INTERFACE**
5. **Enable** the high voltage output
6. To start Pockels cell driver set driving pulses of necessary repetition rate to **PIN1** of **INTERFACE**. Set pulse length not less than 5us
7. To power down the QBU-series, remove **DC Input** power or **Disable** high voltage output

## Specification

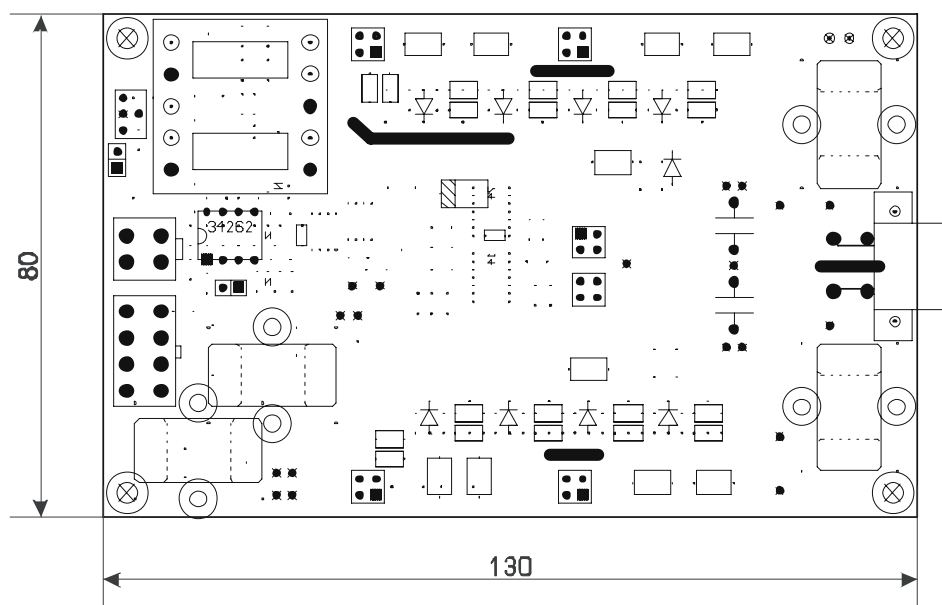
### ELECTRICAL SPECIFICATION

<b>Input</b>	+24V DC; 0,8A max
<b>Output</b>	
Risetime/Falltime	~20ns(depends on load)
Pulse width	from 5 us to DC
HV pulse amplitude	see Part number table
Repetition rate	see Pulse parameters section
Capacity load	up to 500pF
<b>Cooling</b>	forced air
<b>Safety</b>	
Leakage current	not more then 150μA
<b>Environment</b>	
Operation Temperature	-20...+45C
Storage Temperature	-40...+85C
Humidity	90%, non-condensing

### MECHANICAL SPECIFICATION

Size (LxWxH)	130x80x25 mm
Weight	0,1 kg

### DRAWINGS



## **Part number table**

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<b>Part Number</b>	<b>HVmax</b>	<b>HVmin</b>
QBU-5020	5000	2000
QBU-4016	4000	1600
QBU-3012	3000	1200
QBU-2008	2000	800