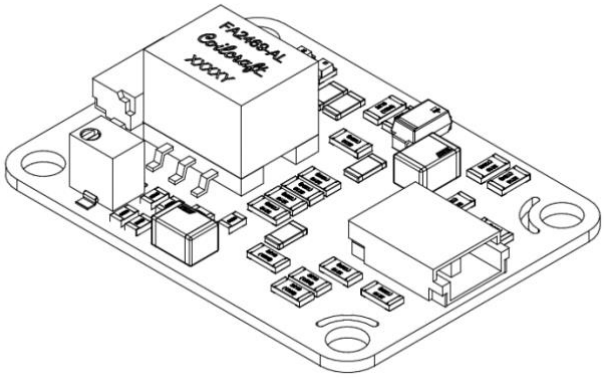
QBD-nano Pockels cell driver

User manual



Warning! This equipment produces high voltages that can be very dangerous. Please, read user manual before starting operations.

Important note: please measure the output with symmetrical (differential) high voltage probe only. Measurement made with inappropriate equipment is a common cause of driver's failure.

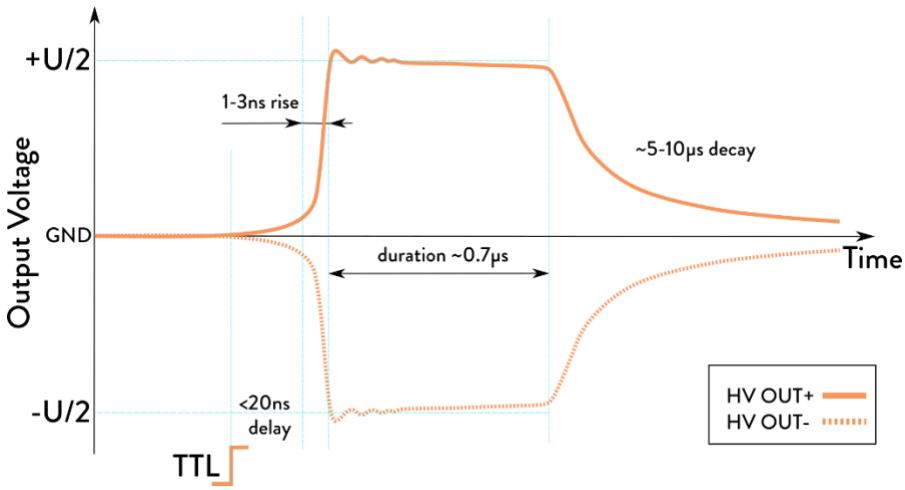
Overview

QBD-nano is a series of extremely compact Pockels cell drivers producing high voltage bipolar pulses with fast rise time (1-3 ns), fixed pulse duration (about 0.7 us) and slow voltage decay (5-10 us). It is possible to adjust pulse amplitude (80-100% from U_{MAX}) and to change repetition rate up to few kHz by triggering signal. Wide temperature range of operation is another important driver feature.

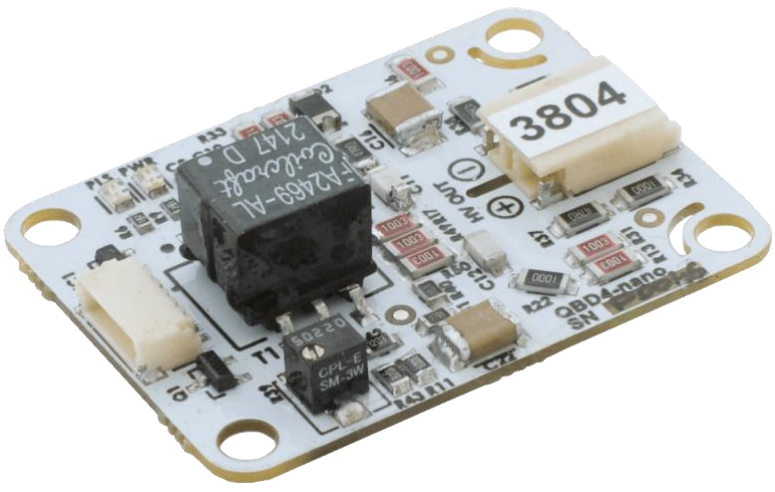
Main parameters of the base version are as below:

- Input voltage – 5-12 V DC
- Output – bipolar pulses of high voltage (see also a picture below)
- Pulse amplitude – adjustable in (0.80-1)U_{MAX} range
- Rise time – 1-3 ns (depends on load and pulse amplitude)
- Maximal repetition rate – 1-10 kHz (depends on load, pulse amplitude, ambient temperature and cooling conditions)
- Operating temperature – -40...+65 ℃

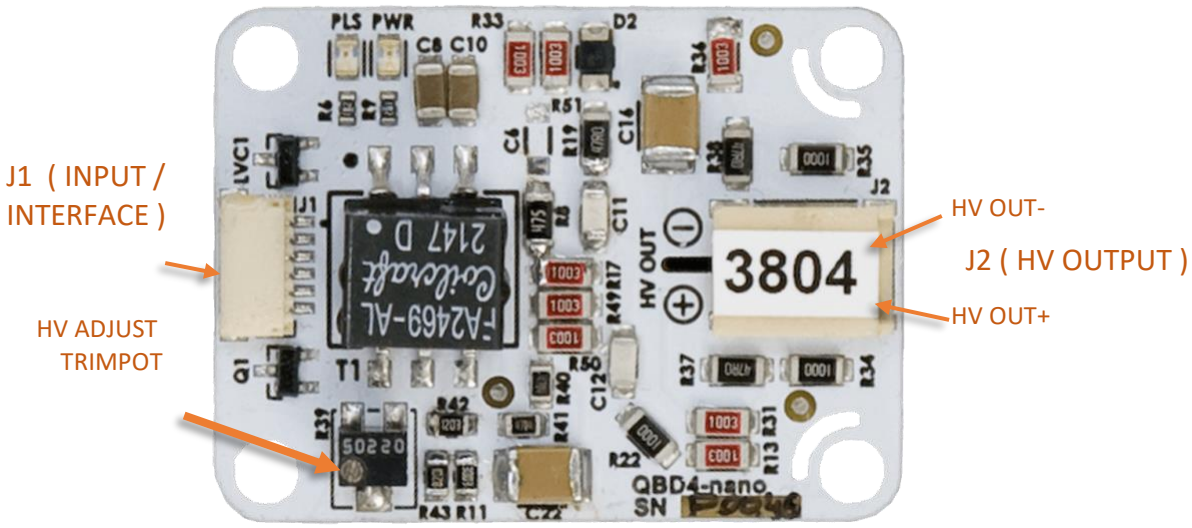
Different parameters are available on request.



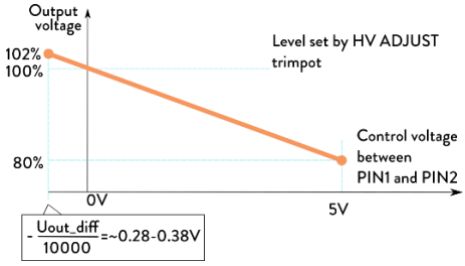
Appearance



Connections, signals, signal descriptions



J1 (INPUT / INTERFACE): SM06B-SRSS (JST)

PIN (color)	DESIGNATION	DESCRIPTION
1 (black)	**Test / Control GND**	Return of Test / Control signal
2 (green)	**Test / Control**	Main purpose of PINS 1 and 2 is a test signal U_{out_diff}, repeating the HV output. DC voltage scale 1:10000. Alternatively, if a control voltage is applied between PINS 1 and 2, they can be used to adjust the pulse amplitude: • 0 V – output voltage is completely defined with the state of HV ADJUST trimpot • 5 V – output voltage is approximately 20% lower that set point of HV ADJUST trimpot  Input impedance of PIN 2 is 47 kOhm
3 (black)	**Trigger GND**	Trigger GND
4 (yellow)	**Trigger Input**	Triggering signal applied to this pin causes HV pulse at the output. Signal requirements: • Amplitude – 5 V (3 V-8 V) • Input impedance - 50 Ohms • Rising edge < 20 ns • Duration > 20 ns
5 (black)	**PWR GND**	Power supply GND
6 (red)	**PWR**	Power supply +5…+12 V DC is to be connected here Recommended current capability: >500 mA @ 5 V >200 mA @ 12 V

J2 (HV OUTPUT): SM02B-BHSS (JST)

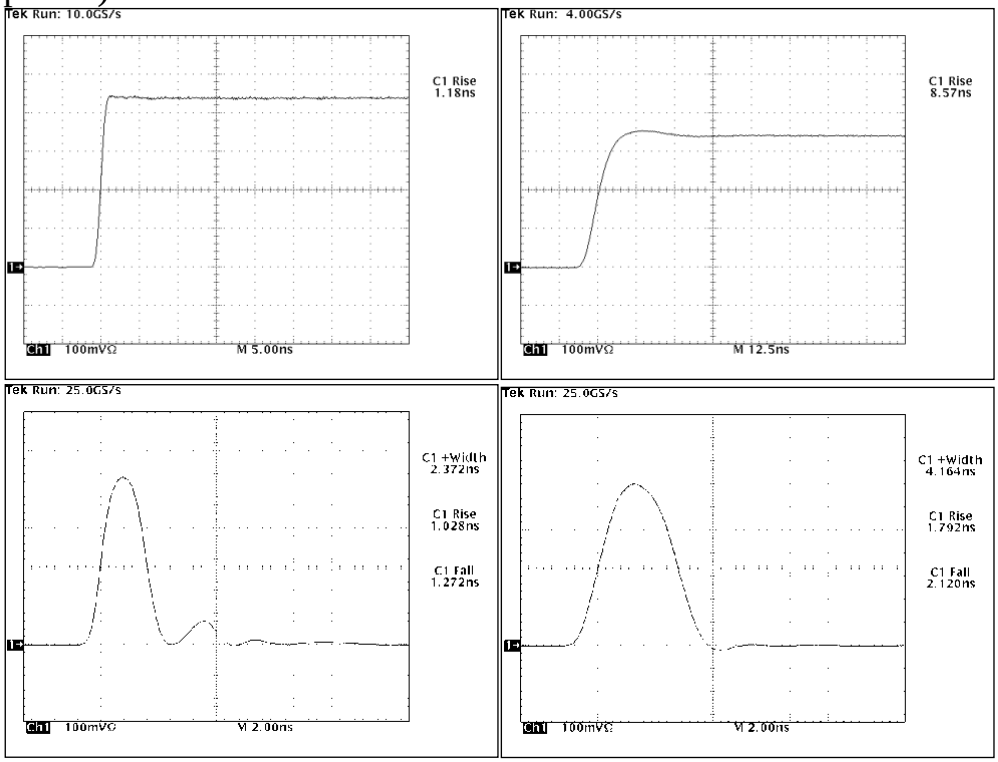
PIN (color)	DESIGNATION	DESCRIPTION
1 (red)	**HV OUT+**	Positive high voltage output
2 (red)	**HV OUT-**	Negative high voltage output

HV ADJUST TRIMPOT:

Pulse amplitude is adjustable with this trimpot in (0.80-1)U_{MAX} range.

Typical output / Options

Standard waveform, optional waveforms (longer rise time, bell-shaped pulses):



Specifications

ELECTRICAL SPECIFICATION

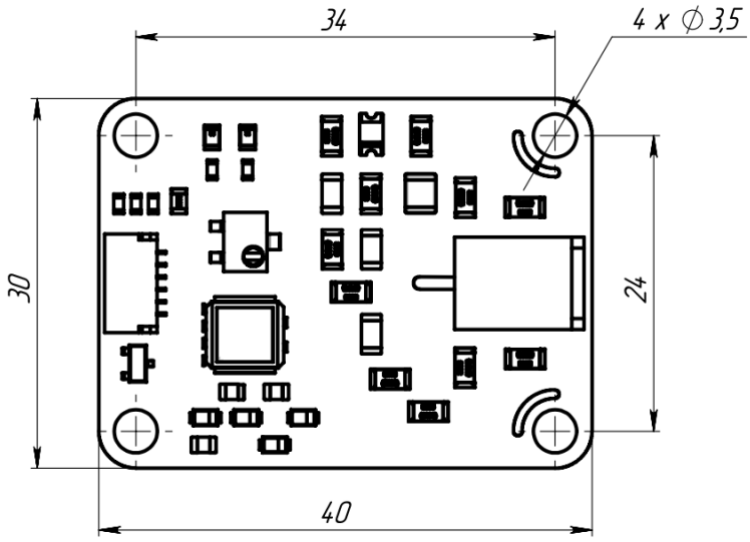
Input	+5…+12 V DC (4.5 V-12.5 V); max 500 mA @ 5V max 200 mA @ 12V
Current consumption	400-420 mA @ 5 V or 160-180 mA @ 12 V in target regimes: 5 pF, 5.0 kV, 2 kHz 5 pF, 3.8 kV, 4 kHz 5 pF, 2.5 kV, 8 kHz
Output	
Type	Bipolar
HV pulse amplitude	(0.80-1)U_{MAX} adjustable
Maximal output voltage (U_{MAX})	Three standard versions – 2500 V, 3800 V, 5000 V, other on request, see also *How to order?* section
Pulse-to-pulse stability	<1 %
Rise time	1-3 ns [1)]
On-time (“shelf”)	0.5-1.0 us (factory preset, 0.8-0.9 us by default)
Recovery time	<10 us
Delay	<20 ns typ. [2)]
Jitter	<0.1 ns typ. [2)]
Repetition rate	1-10 kHz max [1,3)] see also *How to order?* section
Load capacitance	5-7 pF recommended, 20 pF max
Environment	
Operation temperature	-40...+65 ℃ (other on request)

[1)] depends on load capacitance and pulse amplitude
[2)] depends on triggering signal parameters
[3)] depends on ambient temperature (maximal repetition rate is derated approximately twice at 65℃ ambient temperature and rises in cooler conditions)

MECHANICAL SPECIFICATION

Size (LxWxH)	40x30x10 mm (see also dimensional drawing below)
Weight	10 g

Dimensional drawing



How to order?

QBD-nano-XXYY, where:
- XX codes the maximum output voltage (U_{MAX})
- YY codes the maximum repetition rate (F_{MAX})

Examples (the most popular modifications):

Part number	U_{MAX}	U_{MIN}	F_{MAX}	Description
QBD-nano-5002	5000V	4000V	2kHz	High voltage version (2kHz for 5pF at 5.0kV, 25℃)
QBD-nano-3804	3800V	2800V	4kHz	Base version (4kHz for 5pF at 3.8kV, 25℃)
QBD-nano-2508	2500V	1900V	8kHz	Low voltage version (8kHz for 5pF at 2.5kV, 25℃)

Other modifications are available on request.