



Quick Guide

# SVCam I/O

In-Camera Controller and Drivers.

## CUSTOMERS BENEFIT



- > Programmable controller with multiple inputs and open drain output drivers, cuts costs, reduces complexity thus essentially eliminating the need for an external controller.



# SVCam I/O

SVCam I/O features a number of programmable functions that can be understood as connectable modules, for creating diverse combinations of inputs, outputs and timing conditions by SDK programming or by using the GUI interface.



## In-camera controller

SVCam I/O essentially eliminates the need for an external controller, thus simplifying cabling and reducing costs.

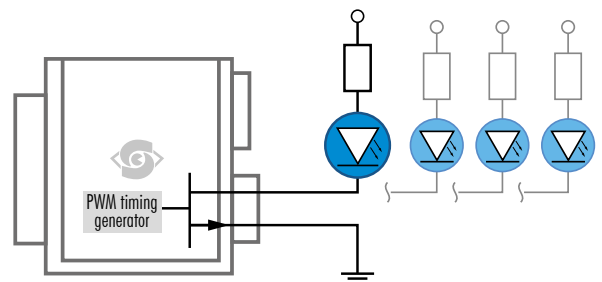


Illustration of four open drain LEDs controlled by the camera wired to the ground

## In- and Outputs

SVCam I/O features several external inputs for driving actuators, LED lights or other factory floor equipment, like PLC's.

Inputs: 0 - 24V level, RS-232 and Differential RS-422 Interface.

Outputs: 3A 24V open drain drivers, RS-232 and Differential RS-422 Interface.

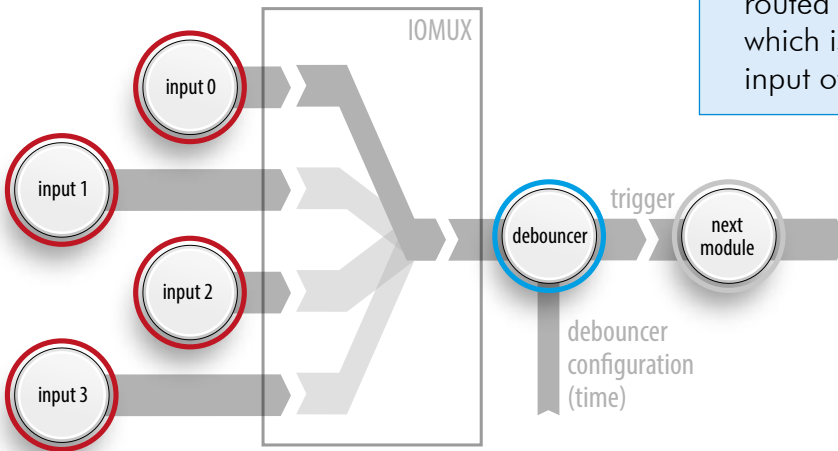
(See individual camera data sheets for inputs and outputs.)

## Powerful SVCam I/O functions

<b>IOMUX</b>	connects physical inputs and outputs with all functions in a matrix fashion
<b>Sequencer</b>	programming a sequence of occurrences, such as exposure time and setting outputs, initiated by an external trigger. Also features Pulse Width Modulation (PWM) of outputs, ideal for modulating the intensity of LED light sources.
<b>Pulseloop</b>	programmable timer/counter pulse generator.
<b>Debouncer</b>	Improves trigger interpretation.
<b>Prescaler</b>	Masks off input pulses by selecting a divisor.

# IOMUX

The IOMUX is best described as a switch matrix. It connects inputs, and outputs with the various functions of SVCam I/O. It also allows combining inputs with Boolean arguments.



## PRACTICAL EXAMPLE

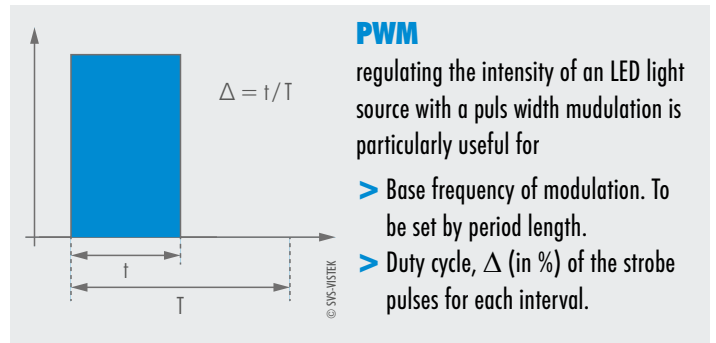
> A simple, yet very powerful function is to condition the external trigger input with the Debouncer function. The external trigger provided on the input pin "INO" on the 12-pin Hirose connector. This is internally routed to the Debouncer via the IOMUX, which is in turn then is routed to the trigger input of other camera modules.

# Sequencer

The Sequencer includes elements for creating timing conditions based on an external trigger input. The resulting output signals can be used for controlling internal functions or external devices, such as actuators, LED illumination, communication with other factory floor equipment or triggering several other cameras. All timing settings are programmable in 15ns intervals.

Programmable parameters

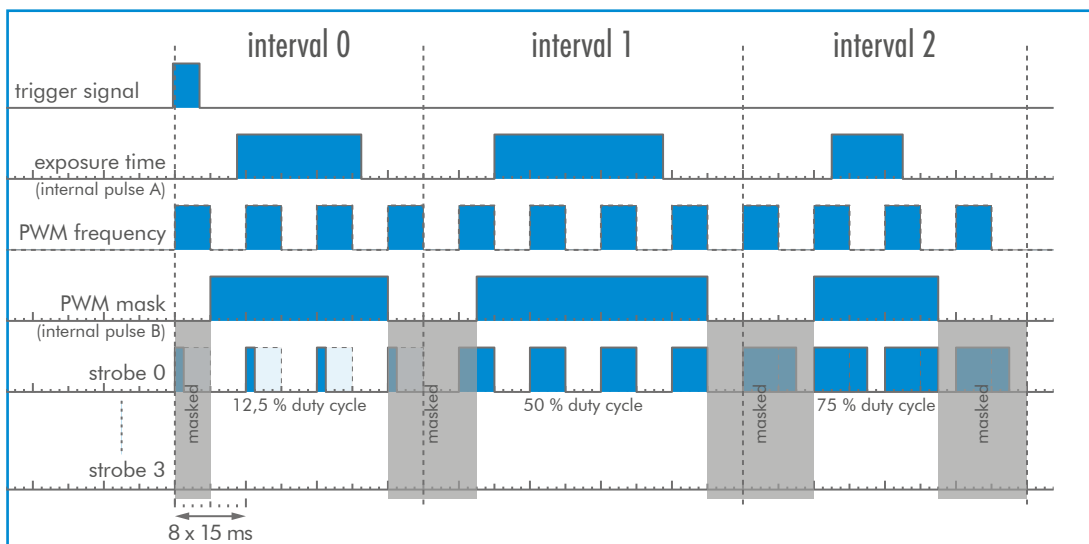
- > Number of intervals - Up to 16 intervals.
- > Duration of intervals - The length (duration) of individual intervals.
- > Sensor exposure time - Individually within each interval with start and end time.
- > PWM mask - the active period for the strobe outputs within each interval, defined as start and end time.
- > PWM, Pulse Width Modulation



## PWM

regulating the intensity of an LED light source with a puls width modulation is particularly useful for

- > Base frequency of modulation. To be set by period length.
- > Duty cycle,  $\Delta$  (in %) of the strobe pulses for each interval.



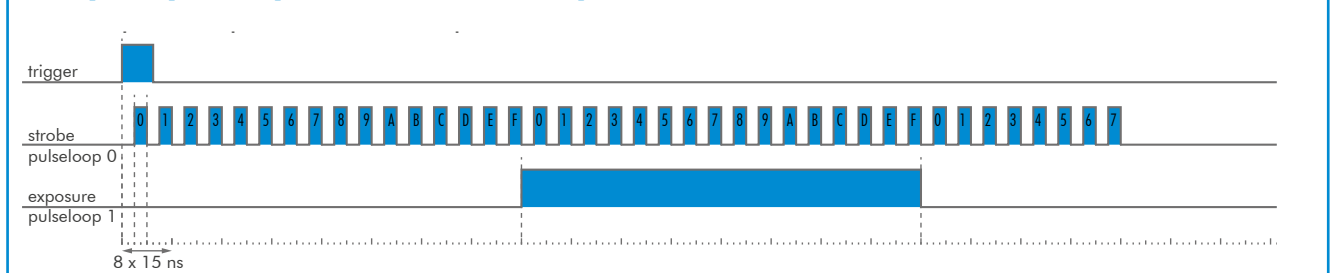
# Pulseloop

A fully programmable timer/counter function with four individual pulse generators (pulseloop0 - 3) that can be combined with all SVCam I/O functions, as well as physical inputs and outputs. All timing settings are programmable in 15ns intervals.

## Programmable parameters:

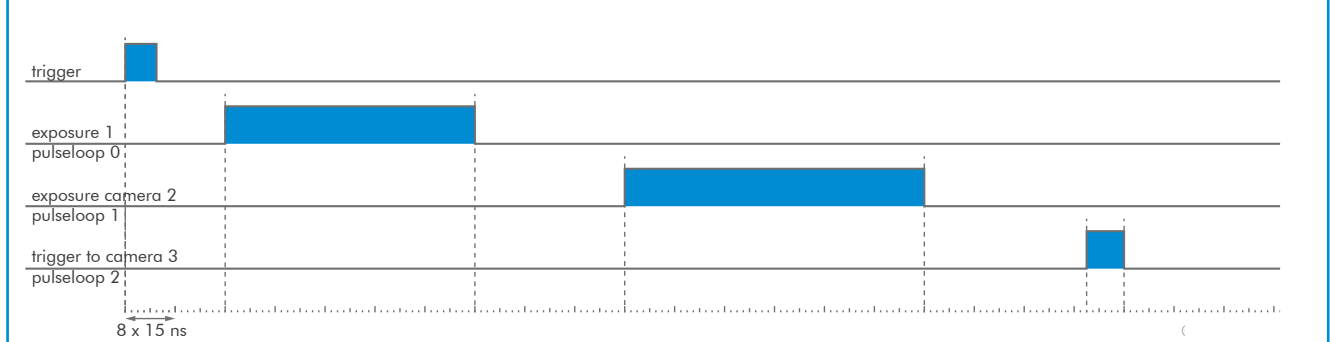
- > Trigger source (hardware or software)
- > Edge or level trigger (HW trigger)
- > Pulse output starting on low or high level
- > Pre and post duration time
- > Number of loops

### Example of pulseloop used for strobe and exposure



Initiated by an external trigger, the camera drives an LED illumination directly from the open drain output and initiates the camera exposure after a pre-defined delay.

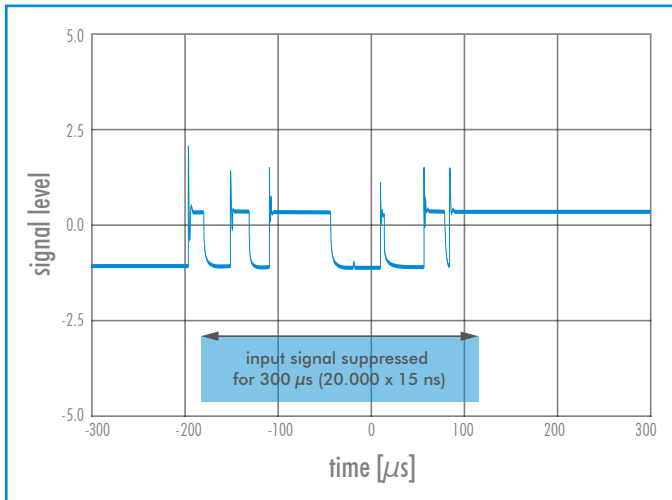
### Example of pulseloop used for a camera cascade



Three cameras are triggered in cascade where the first camera is the master receiving the external trigger, and the master subsequently triggers the two slave cameras.

# Debouncer

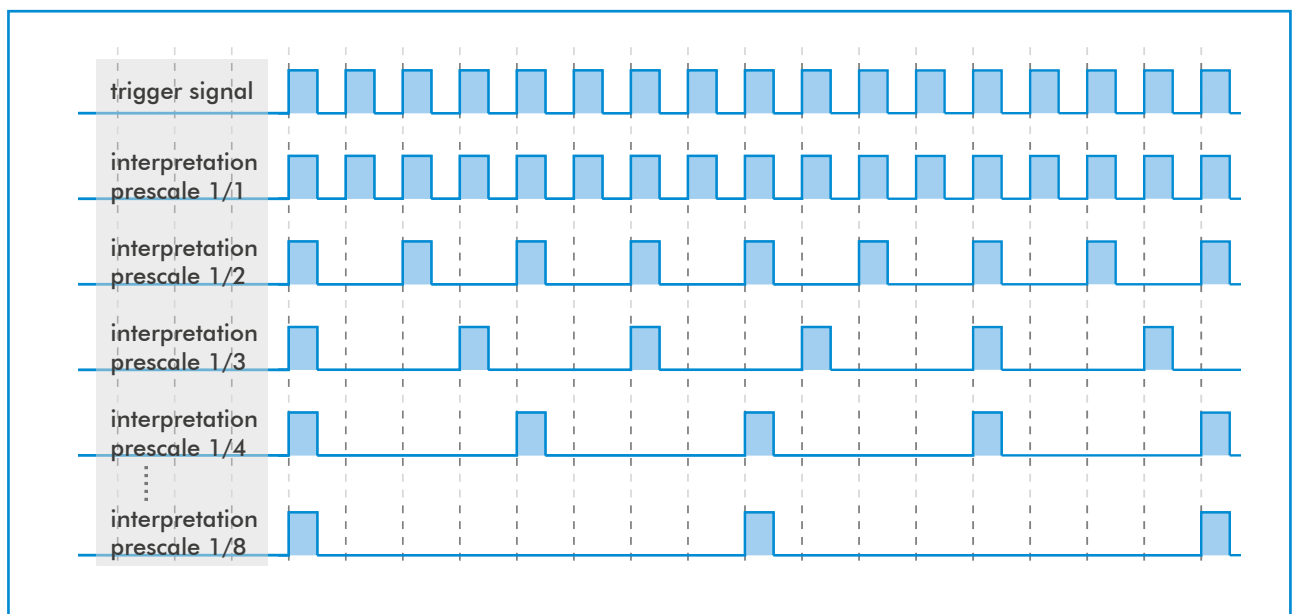
External trigger signals sometimes have spikes and signal overshoots (ringing), leading to false triggering. The debouncer has a programmable delay register (programmable in 15ns increments) allowing the camera to mask out an external trigger signal for a given period.



# Prescaler

The Prescaler function can be used for masking off input pulses by applying a divisor with a 4-bit word, resulting in 16 unique settings.

The diagram shows examples of resulting signals divided/prescaled by 1, 2, 3, 4 and 8.



# #I0\_concept

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GIGE Link USB



GIGE Link 4V



GIGE Link CXP

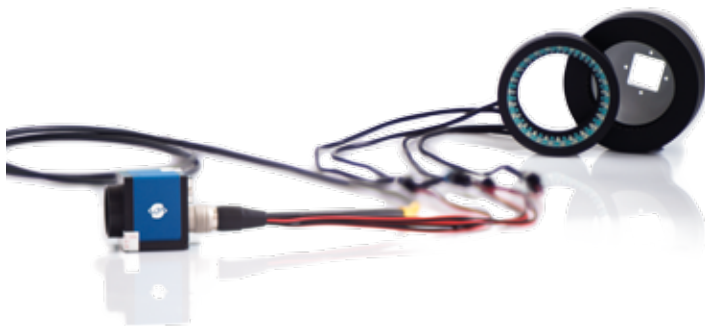


Link CXP

## I/O Feature

- up to 4 x open drain outputs
- 4 x open drain outputs
- up to 2 x open drain outputs
- strobe controller - in-camera LED light driver/controller, up to 3 A - easy synchronization
- sequencer - up to 16 programmable intervals with individual exposure & light
- 4 x pulseloop module - generate strobes, exposure timing and/or additional trigger signals
- PWM - high frequency pulse width modulation
- signal safe through high-low filter, debouncer and prescaler for trigger input
- versatile I/O concept: 24V signal levels - RS232 - optional RS422 differential signal

overview of included I/O features over all SVCam series



Equipment used in this picture:

camera	eco274CVGE	1.600 x 1.236 Pixel, 14 Bit (ADC), 26.5 Hz, 1/1.8" CCD
cable	KAB-HR12S-4SMP02-M8S-015	LED-Light Breakout Cable, 4 x SMP02, 1 x Trigger In, Power In, 1,5m
lights	dual color ring light +	mini dome light with dark field
power	SVS-PS-M8-12V-EU	12 Volt Power Supply, M8-Connector EU

\* For a complete listing of register addresses for the functions described and their settings, please see the SDK programming reference documentation.

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