

# Fast Preamplifier Electronics for Hamamatsu N-MOS Linear Image Sensors S3901 ... S3904

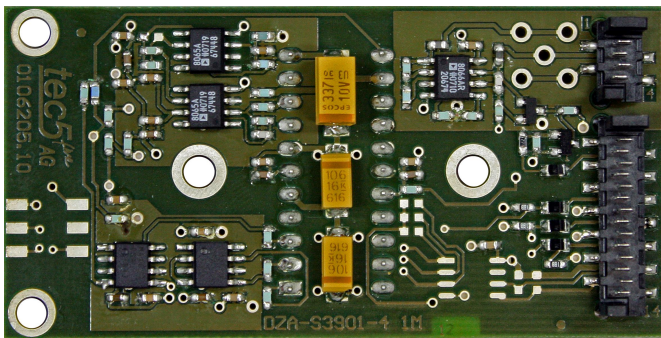


## DZA-S3901-4 1M

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### Short Description

- § Fast preamplifier electronics for Hamamatsu N-MOS Linear Image Sensors (photodiode arrays, PDA) types S3901 to S3904
- § Pixel frequency up to 1 MPixel per second
- § For 16 bit readout
- § Sensor chip socket for direct insertion on PCB
- § Device input: sensor chip
- § Device output: tec5 16 bit Front End Electronics with sensor interface ‚Sensor\_U3‘ (FEE-1M /NMOS-1)
- § PCB dimensions: 73 mm x 37 mm
- § Low-speed version /Dxx available, reduced readout noise for 100 kPixel per second readout

### General

The preamplifier electronics DZA-S3901-4 1M serves as an interfacing component between the Hamamatsu N-MOS Linear Image Sensors of series S3901 to S3904 and the Front End Electronics board of a tec5 operating electronics. Typically the PDA is plugged directly into the DIL-22 socket mounted to the soldering side of the PCB.

The electronics is designed for a readout rate of up to 1 MPixel per second. Using the product version /Dxx at a clock rate of 100 kPixel per second results in lower detection noise, but longer minimum integration time and slower achievable measurement rate. Both versions are supported by corresponding versions of the tec5 FEE-1M /NMOS-1 or FEE-1M /NMOS-D1.

The interface to the Front End Electronics complies to the tec5 specification ‚Sensor\_U3‘ (MICS-14, MICS-4 and SMB socket with pin contact, video signal ‚differential‘).

### Description of Operation

Based on the CLK and START input signals the preamplifier board generates all signals required to read out

the sensor chip. The analog signal from the sensor array is preamplified, integrated, and forwarded differentially for further processing (video signal).

The onboard gated signal integration is controlled by the input signal I\_RES. I\_RES must be driven high for integration of the pulse at each pixel and low to reset the integrator.

The attached scan control electronics has to provide the clock signals START and CLK according to the timing specification of the PDA and to control the integration by the signal I\_RES. At the end of the readout sequence the PDA produces an EndOfScan pulse.

The video output signal is differential. Dark condition results in a level of 0V on both outputs and full light generates +4V at the positive and –4V at the inverted output.

### Technical Data

Diode arrays:	Hamamatsu N-MOS PDAs of types S3901 to S3904
Number of pixels:	depending of the sensor
CLK frequency:	1 MHz (100 kHz*)
Readout time (512):	0.52 ms (5.2 ms*)
Min. integration time:	0.6 ms (5.2 ms*)
	* with 100 kPixel/s version /Dxx

<u>Analog Range:</u>	
Output signal:	0 ... 8 V (differential)

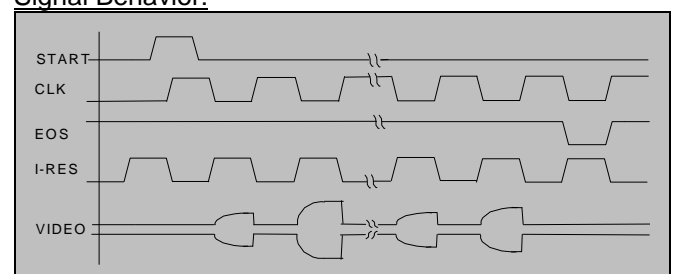
#### Digital Input Control Signals (HC level):

START:	Start of readout cycle, if signal 'START' is HIGH and 'CLK' has a rising slope.
CLK:	Master Clock signal for the array. The pixel frequency is equal the CLK frequency.
I-RES:	Reset signal for the integrator.

#### Digital Output Control Signals (HC level):

/EOS:	EndOfScan, Signal /EOS is HIGH during readout procedure. At the end of the scan the Sensor produces an EndOf-Scan LOW pulse.
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#### Signal Behavior:



For further details refer to Hamamatsu datasheet.

**Power consumption:**

+5 V: typically < 35 mA  
-5 V: typically < 30 mA

**Ambient Conditions (DZA-S3901-4 1M board only):**

Operating temperature range: 0 °C ... 65 °C  
Storage temperature range: -40 °C...+70 °C  
Humidity (@25 °C, non condensing): 10 % ... 90 %

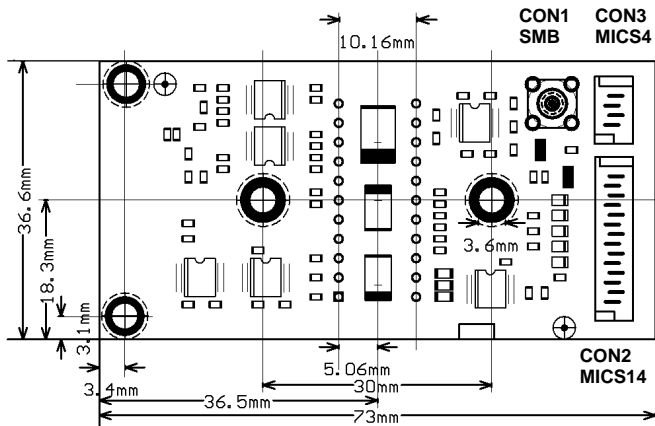
**Product Versions**

For operation of the various linear image sensors supported, the following product versions are available:

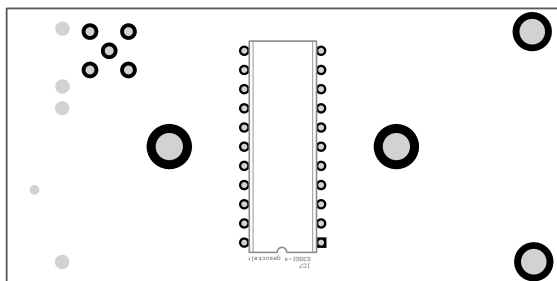
- DZA-S3901-4 1M /STD for S3904, 1 MHz
- DZA-S3901-4 1M /01 for S3901, 1 MHz
- DZA-S3901-4 1M /02 for S3902, 1 MHz
- DZA-S3901-4 1M /03 for S3903, 1 MHz
- DZA-S3901-4 1M /D04 for S3904, 100 kHz
- DZA-S3901-4 1M /D01 for S3901, 100 kHz
- DZA-S3901-4 1M /D02 for S3902, 100 kHz
- DZA-S3901-4 1M /D03 for S3903, 100 kHz

**Note:** 1 MHz versions can be operated at pixel rates up to 1 MHz. For slower readout at max. 100 kPixel/s, 100 kHz versions are recommended resulting in lower detection noise. These versions cannot be operated at readout rates faster than specified.

**Board Layout**



PCB DZA-S3901-4 1M, component side



PCB DZA-S3901-4 1M, soldering / sensor side

**Mechanical Interfacing**

Board dimensions: 73 mm x 35 mm  
Connector for PDA: DIL socket on soldering side of the board  
Mounting of board: 4 mounting holes as shown on drawing

**Electronic Interfaces**

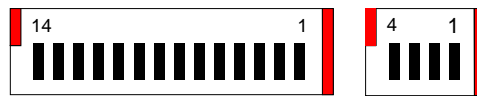
Type: tec5 specification ,Sensor\_U3'  
Video output: MICS-4 (alt. SMB socket)  
Digital control: MICS-14

**Pin Assignment MICS-14 Connector:**

Pin	Designation	Pin	Designation
1	TRIGGER (not used)	2	START – Start of Scan
3	PHI2 (not used)	4	CLK - Master Clock
5	I_RES (Integrator Reset)	6	/EOS - End of Scan
7	0V - Digital Ground	8	-5V – Supply
9	0V - Digital Ground	10	+5V – Supply
11	DOUT1 (not used)	12	DOUT2 (not used)
13	I2C-SDA	14	I2C-SCL

**Pin Assignment MICS-4 (and SMB) Connector:**

Pin	Designation
1	0V – Analog Ground
4	0V – Analog Ground
2	( = SMB Center Contact) Video Out (inverted)
3	( = SMB Outer Contact) Video Out (non inverted)



**System Data**

System data, realized with tec5 16 bit Operating Electronics based on FEE-1M /NMOS-1 and sensor type S3904:

- Integration time: 1 ms
  - Clock frequency: 1 MHz
  - Intensity resolution: 16 bits
  - Ambient temperature: +25 °C
  - Resulting single pixel dark noise: < 4.5 counts rms
- For product version /Dxx:**
- Integration time: 8 ms
  - Clock frequency: 100 kHz
  - Intensity resolution: 16 bits
  - Ambient temperature: +25 °C
  - Resulting single pixel dark noise: < 2 counts rms

**User Information**

**General**

The information in this data sheet has been checked carefully. However, no responsibility is assumed for inaccuracies. tec5 reserves the right to make changes to any portion of this document without notice. Each product is tested carefully before being shipped. If, however, problems should occur while initial operation or during later operation, please first check your specific settings and correct installation (connectors).

**Warranty**

The warranty period for this product is 12 months. The warranty begins on the day of delivery. Within the warranty period, tec5 will repair free of charge any faulty functioning of the product resulting from faulty design or defective material. All other claims are excluded, in particular consequential damage.

**Handling**

The electronics is partly constructed in CMOS technology and is thus sensitive against electrostatic discharge. Take appropriate precautions whenever handling the component. Please switch off the power before connecting or disconnecting the product.