

Front End Electronics for CCD / InGaAs / NMOS Spectral Sensors and PDAs

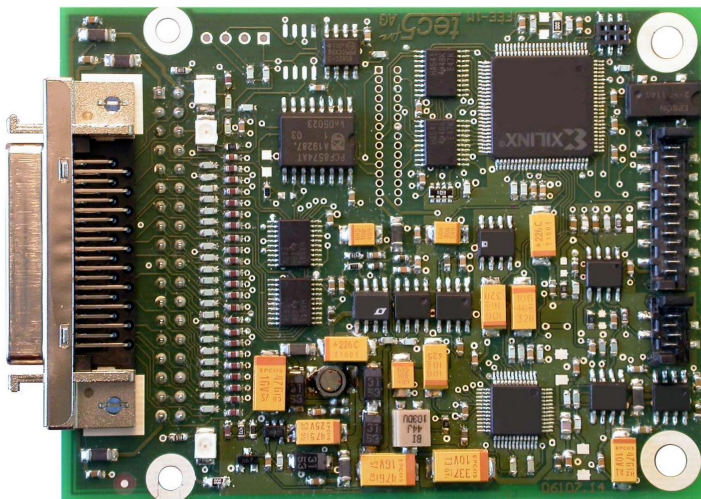


FEE-1M

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In der Au 27
61440 Oberursel / Germany

Phone: +49 (0) 6171 / 9758 – 0
Fax: +49 (0) 6171 / 9758 – 50
E-Mail: sales@tec5.com
Internet: www.tec5.com



Basic Versions for CCD / InGaAs / NMOS

FEE-1M is available in three basic versions:

- FEE-1M /CCD-x for CCD - Spectral Sensors with tec5 Preamplifier Electronics DZA-S7030-4 (x=2) or DZA-S9840 (x=8)
- FEE-1M /NIR-x for InGaAs - Spectral Sensors with tec5 Preamplifier Electronics DZA-VVIR-LD (x=2) or DZA-VVIR-HM (x=4)
- FEE-1M /NMOS-x (x=1 or d1) for MCS with Preamplifier DZA-S3901-4 1M for Hamamatsu N-MOS PDA types S3901 to S3904 or compatible, alternatively for Carl Zeiss MMS Spectral Sensor with Preamplifier DZA-MMS 1M

The extension '-x' specifies the master clock frequency generated by FEE-1M for the Preamplifier Electronics.

Short Description

- § Fast readout control logic with ADC for digitization of the sensors's analog video signal
- § For CCD, InGaAs and NMOS PDAs
- § Readout rate: 100, 500 or 1000 kpixels/second
- § High resolution: 16 bits A/D conversion
- § Dynamic range: up to > 15 bits (with PDA)
- § On-board generation of stabilized $\pm 5V$ for the sensors from a single supply voltage ($5V \pm 1V$)
- § Input from device:
Preamplifier with PDA or Spectral Sensor
- § Output to device: tec5 Interface Electronics (PD-ETH01V1, PD-USB01V2 or PD-PCI01V1)
- § PCB dimensions 87 mm x 67 mm (FEE standard)

General

The FEE-1M functions as a kind of adapter between the sensor module and the Interface Electronics. It generates the control signals for the photodiode array of the sensor module, preprocesses the analog video signal and performs analog / digital conversion. The digitized intensity values are provided as byte sequential data stream for the Interface Electronics.

The circuit board is connected either to the PCI bus Interface Electronics via a shielded 2 or 5m long multi-pin cable (PD-PCI01V1 version 'Standard', interface standard ,Interface_40') or directly plugged on top of the Ethernet- or USB Interface Electronics (PD-ETH01V1 or PD-USB01V2, version ,Embedded', Interface standard 'Interface_2*18').

The sensor interface corresponds to specification ,Sensor_Ux'. The sensor module is connected to the FEE using two flat ribbon cables (4 pin and 14 pin).

Features / Specifications

Functional Properties

- Generation of supply voltages for sensors and pre-amplifiers (not used by self powered DZA-S7030-4 or DZA-S9840)
- PDA readout clock sequencing
- Analog video signal preprocessing, A/D conversion
- Data transfer to the Interface Electronics
- Local non-volatile memory, 256 Bytes capacity (e.g. for identification data of the sensor(s), calibration coefficients or customer specific information)

Specifications

- ADC 16 bits
- Conversion rate (100), 500 or 1000 kSps
- Electrical Non-linearity < ± 2 counts
- Temperature drift < ± 1.0 count / °C
- Offset adj. range approx. ± 2000 counts

Basic Version	/CCD-2 (S703x)	/CCD-8 (S9840)	/NIR-2 (InGaAs)	/NMOS -1	/NMOS -D1
Input sensitivity [counts/V] approx.	3,700	3,700	13,500	17,000	17,000
Standard deviation [counts] typically	3.1 (cooled)	15	4.0	4.0	< 2.0
Pixel frequency [kHz]	500	1000	500 (*)	1000	100
Readout time [ms] Sensor (example) [number pixels]	1.9 or 2.9 (532 or 1044x64)	2.3 (2080 x20)	1.1 (512)	0.52 (512)	5.2 (512)
Power consumption [mA] typically (@ +5V)	140	200	310	320	250

(*) up to 1MHz for Hamamatsu G9212/14 (with /NIR-4)
Detailed technical data of the different configurations can be found in the FEE-1M Technical Documentation.

Interfaces

- Interface type ,Sensor_Ux' to sensor preamplifier (MICS4 connector for analog input signal only)

- Interface type ,Interface_40' or 'Interface_2*18' to Interface Electronics

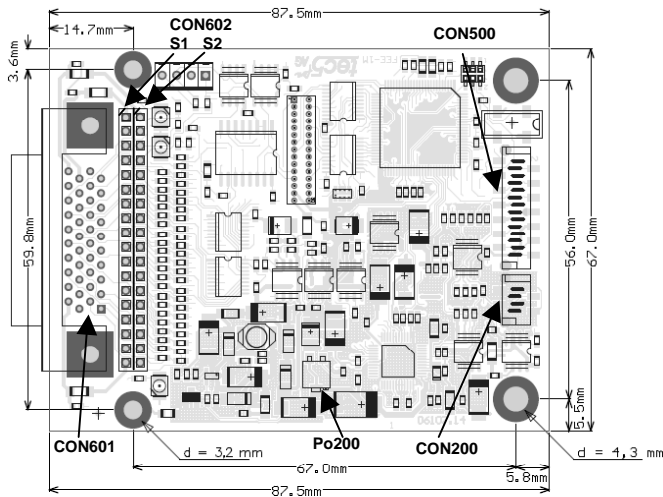
Power consumption (from Interface Electronics)

+5V: approx. 140 ... 320 mA (depending on configuration and readout frequency, for details see table 'Specifications' above)

Environmental conditions

- Temperature range operating 0 °C ... 60 °C
- Temperature range storage -40 °C ... +70 °C
- Humidity (@25°C, non condensing) 10 % ... 90 %

PCB Design



Assembly Versions

Assembly Version ,Standard' (extension /STD)

with 40 pin Mini-Delta connector for cable connection to the tec5 PCI Interface Electronics. The 36 pin connector array CON602 may be assembled with socket contacts (not used).

Assembly Version ,Embedded' (extension /EMB)

is prepared to be directly plugged on top of the Interface Electronics (typically Ethernet or USB Interface Electronics). The 36 pin connector array CON602 is assembled with pins on the solder side, the 40 pin Mini-Delta connector is not assembled.

Assembly Version ,Systems' (extension /SYS)

is prepared for the module integration in systems. The 36 pin connector array CON602 is assembled with pin header contacts to link specific connector adapters (like the tec5 LKONV-40-37) via a flat-ribbon cable; the 40 pin Mini-Delta connector is not assembled.

Interfaces

Interface Electronics connector type / specs / pinout

CON601: 40 pin 3M Mini Delta Ribbon (socket type)

'Interface_40' compatible

CON602: 36 pin socket connector array

'Interface_2*18' compatible

601 Pin	602 Pin	Input / Output	Comment
A1	S1/17	Input	ADC Byte Select (MSB: High)
A2	S1/15	Input	StartScan from IE
A3	S1/13	Output	EndOfScan from FEE
A4	S1/11	Output	ADC Data Bit D7 or D15
A5	S1/12	Output	ADC Busy from FEE
A6	S1/10	Output	ADC Data Bit D6 or D14
A8	S1/9	Output	ADC Data Bit D5 or D13
A10	S1/8	Output	ADC Data Bit D4 or D12
A12	S1/7	Output	ADC Data Bit D3 or D11
A14	S1/6	Output	ADC Data Bit D2 or D10

A16	S1/5	Output	ADC Data Bit D1 or D9
A18	S1/4	Output	ADC Data Bit D0 or D8
A19	S2/3	Output	ScanRunning from FEE
B16	S2/2	Input	Power control from IE: Low if +5V supply voltage is available
B17	S2/5	Bidirect.	I2C Bus, Clock Signal
B18	S2/4	Bidirect.	I2C Bus, Data Signal
B20	S2/1	Power	Power supply voltage +5Vext

Pins A7, A9, A11, A13, A15, A17, A20, B1, S1/2, S1/3 and S2/16 are connected to ground;

Pins S1/14, S1/16, S2/17 and S2/18 are reserved;

Pins B3, B4, B5, S1/1 and S1/18 are not connected; the remaining pins are routed and filtered between connectors CON1 and CON2 (Details see Technical Documentation). (IE = Interface Electronics)

Sensor interface connector type / specs / pinout

MICS 14 and MICS 4 'Sensor_Ux' compatible

Pin	In /Out	Description
CON500		
1	Input	Sensor Trigger (*)
2	Output	Sensor StartScan
3	Output	Sensor Master Clock 2 currently unused
4	Output	Sensor Master Clock
5	Output	Sensor Integrator Reset (*)
6	Input	Sensor EndOfScan
7, 9	Power	Ground
8	Power	-5V Power supply for sensor module
10	Power	+5V Power supply for sensor module
11	Input	D13 currently unused
12	Input	D14 currently unused
13	Bidirect.	I2C Bus, Data Signal (I2C_SDA)
14	Bidirect.	I2C Bus, Clock Signal (I2C_SCL)
CON200		
1, 4	Power	Analog GND
2	Input	Analog In-
3	Input	Analog In+

(*) Sensor technology specific signals

Trimming / Settings

For offset compensation of the FEE, the optical sensor input has to be covered. Use a spectral data acquisition software to display raw pixel data in continuous acquisition / live display mode (e.g. tec5 AdminTool) with the following settings:

- Shortest integration time, without dark correction
- View-Option Y-scale: ADC – counts
- View-Zoom Y-scale: approx. 0...200 [counts]
- Continuous acquisition

The offset is adjusted by trimming potentiometer Po200 to result in a baseline between 80 and 120 counts for CCD and NMOS sensors.

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.