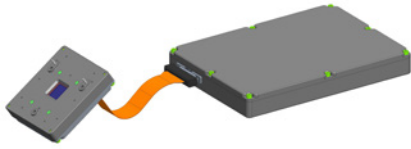


# CAPELLA<sup>FEE</sup>

Imaging Sensors | Capella Space Front-end Electronics



## KEY FEATURES

- Radiation tolerant components
  - SEL > 60 MeV.cm2/mg
  - TID > 10 krad(Si)
- FPGA for data handling and processing
- Space grade microcontroller for TMTC interface and board control
- Capability for Level 1 data processing
- Memory for fast data handling/ processing
- Memory for radiometric correction coefficients
- SpaceWire and WizardLink for data interface and TCTM
- LVDS external timing triggers if required
- Full configuration control of any Capella variant operating mode
- 5V power input
- Power consumption < 10W
- HPC/BSM interface is provided
- Detector temperature sensor access even when camera is in OFF state

## TYPICAL APPLICATIONS

- Earth observation
- Remote sensing
- Space Situational Awareness
- Space debris detection
- Planetary exploration
- Space telescopes
- Star trackers
- Spectrometry
- In-orbit servicing

Options suited to New Space applications available upon request.

Teledyne has extensive heritage in providing customised image sensing solutions for space applications. Please discuss any requirements for customised variants to meet your needs.

## Capella Detector Front-end Electronics for Space Applications

The Capella front-end electronics (FEE) solutions are designed to accompany the radiation hard general purpose Capella CIS120 family of image sensors. Capella has various operating modes providing a versatile imaging solution suited to multiple space applications. The front-end electronics provides the control, interface and data processing operations to maintain operational flexibility, whilst simplifying the incorporation into payloads.

The flexible, powerful and versatile electronics architecture has ample processing and memory capacity to provide either a simple data pipeline or to incorporate higher levels of data processing.

### Benefits:

- All the FEE components selected are radiation tolerant
- Suitable for Low Earth Orbit (LEO), >5-years in-orbit lifetime
- Microcontroller — operation, detector and on-board functionality configuration, telemetry and telecommand (TMTC)
- Optimised data throughput — SpaceWire and WizardLink for data output, separate SpaceWire interface for TMTC

### Considerations:

- Mechanically and thermally decoupled detector headboard
- Design approach provides easy integration into development payloads
- This format is used to demonstrate up to TRL5
- Different mechanical arrangements possible from TRL5 to TRL6

### Thermal interface:

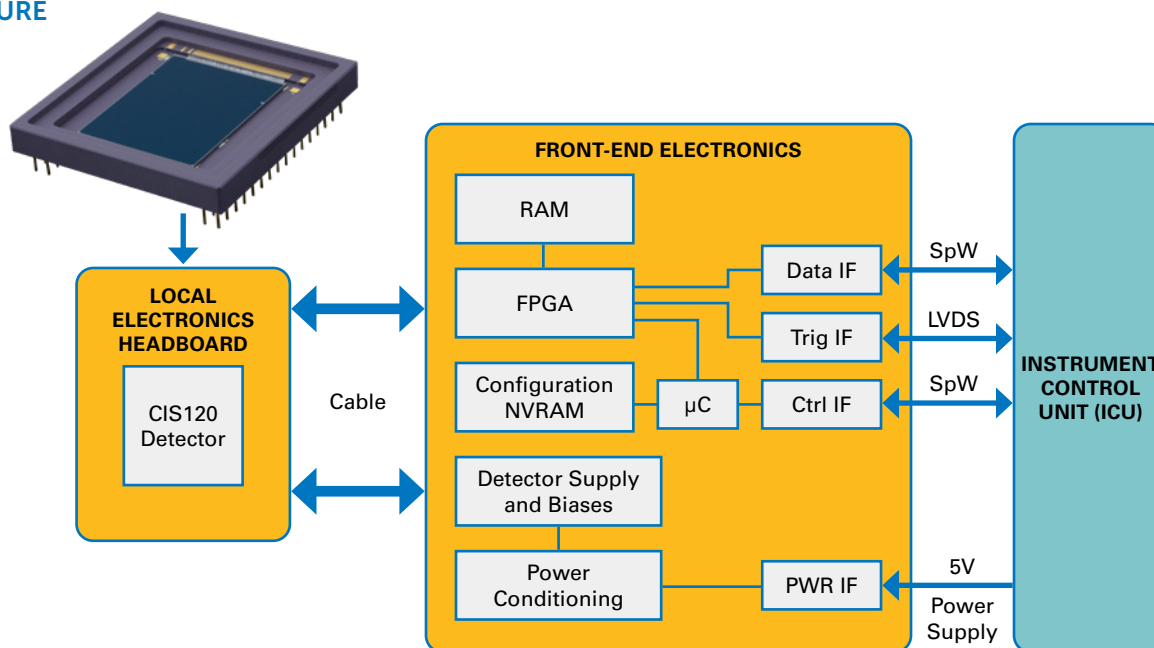
- Interface provided to allow user to control the detector temperature
- Detector temperature sensors electrically connected through the system
- Temperature read out via user control system, incl. in camera OFF state
- Operational range -20°C to +50°C, non-operational range -55°C to +85°C

The design is intended to be able to be easily adapted to different optical interfaces. Teledyne are happy to incorporate a customer's preferred optics, or to provide custom solutions from within the Teledyne family of businesses.

	2022	2023	2024
<b>Capella space front-end electronics</b>	TRL4	TRL5 in Q1	TRL6 in Q1
<b>With radiometric correction</b>	—	TRL4	TRL5

### EXPORT UNCONTROLLED

Information subject to change — values typical unless otherwise stated

**ARCHITECTURE**

**CAPELLA KEY PERFORMANCES**

Parameter	Typical Capella <sup>LN</sup> Low Noise	Typical Capella <sup>LS</sup> Large Signal	Typical Capella <sup>XLS</sup> Extra Large Signal	Units
$Q_{SAT}$	43	61	100	ke <sup>-</sup> /pixel
$Q_{LIN}$ , 5% non-lin threshold	38	58	85	ke <sup>-</sup> /pixel
<b>Non-linearity</b>	±2			%
<b>Readout Noise</b>	8 in RS 50 in GS 14 in GS DDS	13 in RS 70 in GS 20 in GS DDS	17 in RS TBC in GS TBC in GS DDS	e <sup>-</sup> rms
<b>Dark Current at 21°C</b>	50 in RS 400 in GS			e <sup>-</sup> /pixel/s
<b>DSNU</b>	<30 in RS <180 in GS			e <sup>-</sup> /pixel/s
<b>PRNU</b>	1			%
<b>Lag</b>	0.1			%
<b>Power Consumption</b>	440	440	350	mW
<b>Frame Rate 12 bit RS</b>	20	20	10	fps

Note that the space front-end electronics is also compatible with the Capella CMOS HiRho variant that enables enhanced QE in the NIR.

**EXPORT UNCONTROLLED**

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