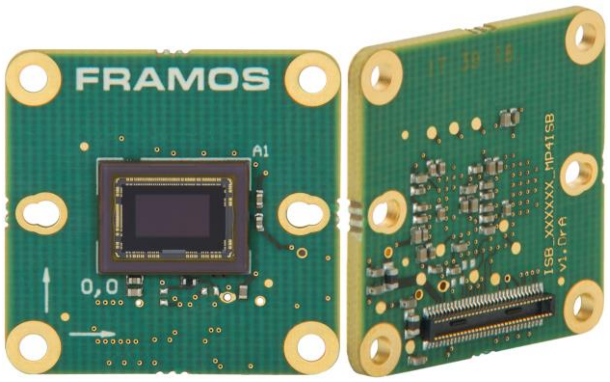
FSM-IMX477 Datasheet

Sony IMX477-AACK Sensor Module

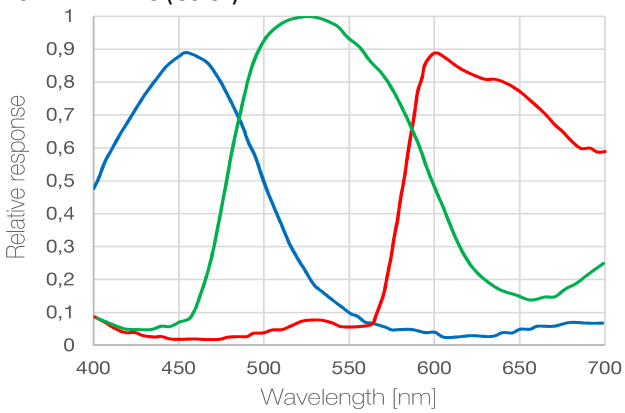
FRAMOS Sensor Module



Key Benefits & Features:

- 12.3 Mpx Sony CMOS Rolling Shutter sensor module, ready to embed!
- All FSMs are part of a rapid prototyping ecosystem, consisting of:
  - ✓ Adapters to various processing boards
  - ✓ Design sources for deep embedding
  - ✓ Various accessories and design in services

FSM-IMX477C (Color):



Specification	
Model Name	**FSM-IMX477C** (v1a)

Image Sensor	
Vendor / Name	Sony IMX477-AACK
Technology	CMOS Rolling Shutter
Chromaticity	Color
Optical Format	1/2.3“
Pixel Size	1.55 x 1.55 µm
Max. Resolution	12.3 Mpx / 4056 x 3040 px
Framerate (max.)	60 FPS (at max. resolution)
Bit Depth(s)	8 / 10 / 12 bit

Interface	
Module Interface	MIPI CSI-2 (2 / 4 Lane)
Control Interface	I²C (CCI)
Clock Frequency(s)	6 - 27 MHz
Voltage Requirements	1.05V / 1.8V / 2.8V
Interface Connector	Hirose DF40C-60DP-0.4V(51)
EEPROM (Sensor ID)	No

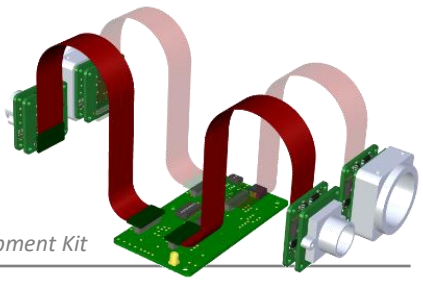
Mechanical	
Dimensions (HxWxD)	26.5 mm x 26.5 mm x 4.41 mm

Environmental	
Operating Temperature	-20°C to +75°C (function) -20°C to +60°C (performance)
Storage Temperature	-30°C to +80°C
Ambient Humidity	20% to 95% RH, non condensing

Software Support	
Driver	V4L2 Based Device Driver
Supported Platform(s)	NVIDIA Jetson TX2 / AGX Xavier
Linux Version(s)	L4T 32.2.1 (JetPack 4.2.2)
API Languages	C / C++

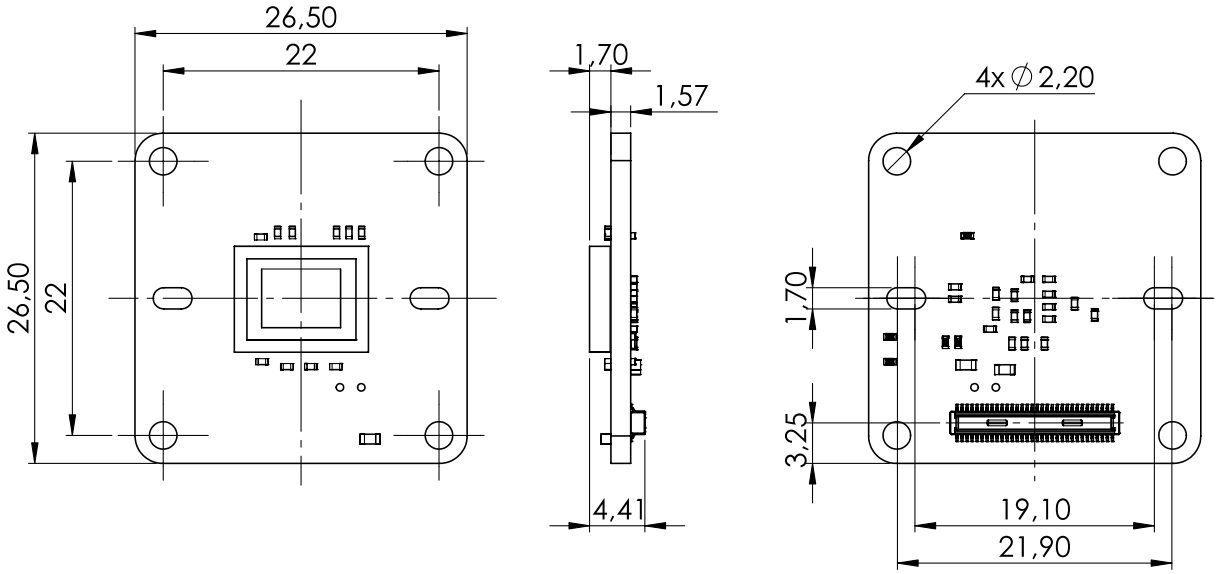
Suggested Accessories	
Flex Cable 150 mm (FSM to FSA)	FMA-FC-150/60
Lens Mounts:	M12 or C/CS-Mount options

A matrix with compatible *Sensor Adapters (FSA)* and *Processor Board Adapters (FPA)* for single- and multi-sensor setups can be found separately at the end of this document.



Available in Development Kit

Mechanical Drawing



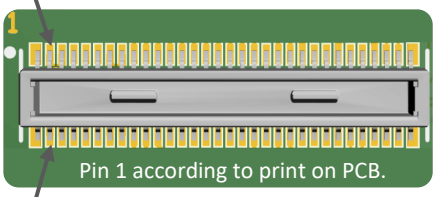
Sensor image optical center is in mechanical board center.

Connector Pinout

Type: Hirose DF40C-60DP-0.4V(51)

Mating Type: Hirose DF40HC(4.0)-60DS-0.4V(51)

Name	NC	NC	2V75_A	2V75_A	1V8_IO	GND	GND	XCLR	NC	NC	SCL	NC	XVS	SDA	GPO	NC	NC	SLASEL	GND	INCK	NC	GND	NC	NC	GND	CSI_D0_N	CSI_D0_P	GND	CSI_D2_P	CSI_D2_N
Pin	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59



Pin	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
Name	NC	NC	1V05_A	1V05_A	NC	GND	GND	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	GND	NC	NC	GND	CSI_D3_P	CSI_D3_N	GND	CSI_D1_N	CSI_D1_P	GND	CSI_CLK_P	CSI_CLK_N

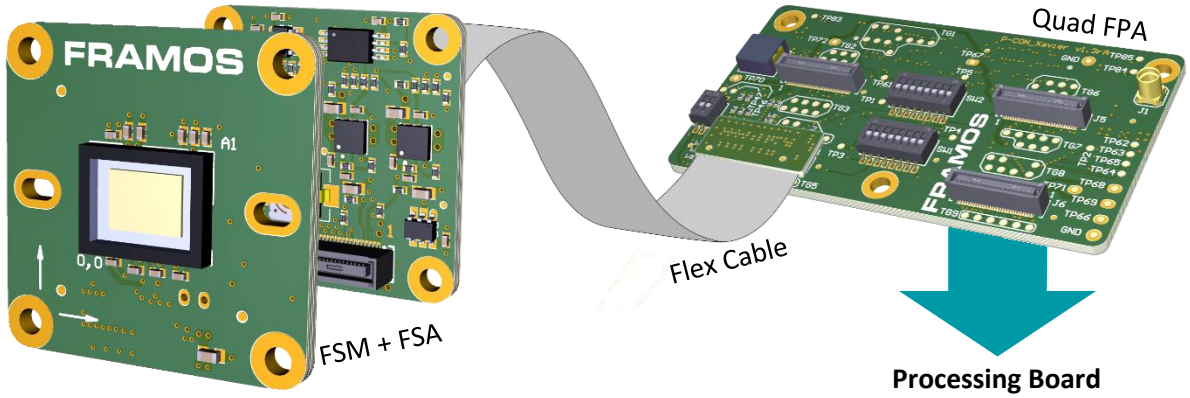
All signals are routed directly from image sensor to connector. Details on specific signals are described in the respective image sensor datasheet.

Version v1.0f from 2019-12-06

Table of Contents

1 FRAMOS Sensor Module Ecosystem

The FSM Ecosystem consists of FRAMOS Sensor Modules, Adapters, Software and Sources, and provides one coherent solution supporting the whole process of integrating image sensors into embedded vision products. During the evaluation and proof-of-concept phase, off-the-shelf sensor modules with a versatile adapter framework allow the connection of latest image sensor technology to open processing platforms, like the NVIDIA Jetson TX2, AGX Xavier or the 96boards.org standard, with no effort. Exemplary drivers and sample applications deliver images immediately after installation, supporting V4L2 and an own optional API for comfortable integration. Within the development phase, electrical design references and driver sources guide with a solid and proven baseline to quickly port into individual system designs and extend scope, while decreasing risk and efforts.



To massively simplify and relieve the whole supply chain, all FRAMOS Sensor Modules and adapters are optimized and ready for delivery in volume, pre-configured with lens holder, lens and further accessories.

Key Benefits & Features

Hardware Offering:

- Off-the-shelf *FRAMOS Sensor Modules (FSM)*, ready for evaluation and mass production.
- Versatile adapter framework, allowing flexible testing of different modules, on different processing boards:
  - *FRAMOS Sensor Adapter (FSA)* – everything the specific sensor needs for operation
  - *FPAMOS Processor Adapter (FPA)* – connecting up to four FSM + FSA to a specific processor board
- From lenses, mechanics and cables, all needed imaging accessories from one hand

Software Package:

- Drivers providing base level sensor integration:
  - Platform specific device drivers
  - V4L2 subdevice drivers for specific image sensors (low-level C API)
- Streamlined V4L2 library (LibSV) with comfortable and generic C/C++ API
- Example application demonstrating initialization, basic configuration and image stream processing

Further to off-the-shelf hard- and software, the Ecosystem supports you with:

- Driver sources allowing the focus on application specific scope and features
- Electrical references for FSA and FPA, supporting quick and optimized embedding of FSMs
- Engineering services via FRAMOS and its partners, allowing you to focus on your product's unique value!

Version v1.0f from 2019-12-06

2 Ecosystem Compatibility Matrix

2.1 Hardware Support

The following matrix shows the compatibility of FSMs, FSAs and FPAs to each other. The FSAs differentiate to each other by supplied voltages, power up sequence, generated clock (oscillator) and physical attributes.

FSMs with MIPI CSI-2 (D-PHY) Output

Item	Clock on FSA	FSM-IMX412 FSM-IMX477 FSM-IMX577	FSM-IMX290 FSM-IMX327 FSM-IMX334 FSM-IMX335	FSM-IMX296 FSM-IMX297	FSM-AR0521 FSM-AR1335	FSM-IMX415	FSM-IMX283	FSM-AR0144
Single-/Multi-Sensor Setup								
FSA-FT1/A	27MHz	FPA-4.A/TXA						
FSA-FT3/A	37.125MHz		FPA-4.A/TXA					
FSA-FT6/A	37.125MHz			FPA-4.A/TXA				
FSA-FT7/A	27MHz				FPA-4.A/TXA			
FSA-FT11/A	37.125MHz					FPA-4.A/TXA		
FSA-FT12/A	24MHz						FPA-4.A/TXA	
FSA-FT13/A	27MHz							FPA-4.A/TXA
Single-Sensor Setup (96boards.org only)								
FSA-FT1	27MHz	FPA-96B-FT1						
FSA-FT3	37.125MHz		FPA-96B-FT1					
FSA-FT6	37. 125MHz			FPA-96B-FT1				
FSA-FT7	27MHz				FPA-96B-FT1			
FSA-FT11	37.125MHz					FPA-96B-FT1		
FSA-FT12	24MHz						FPA-96B-FT1	

Table 1: Ecosystem Compatibility Matrix – Native CSI-2 (D-PHY) FSMs

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2.2 Software & Driver Support

The table below shows which platforms are supported by the standard driver package, and how many FSMs can be operated in parallel.

Sensor Module	NVIDIA Jetson TX2[1]	NVIDIA AGX Xavier[1]	DragonBoard 410c	96boards.org Consumer Edition
FSM-AR0144	1, 2, 3, 4			HW only, driver development on project basis.
FSM-AR0521	1, 2, 3, 4		1	
FSM-AR1335	1, 2, 3, 4			
FSM-HDP230	1, 2	1, 2, 3, 4		
FSM-IMX283	1, 2	1, 2, 3, 4		
FSM-IMX290	1, 2, 3, 4		1	
FSM-IMX296	1, 2, 3, 4		1	
FSM-IMX297	1, 2, 3, 4			
FSM-IMX327	1, 2, 3, 4		1	
FSM-IMX334	1, 2	1, 2, 3, 4		
FSM-IMX335	1, 2, 3, 4			
FSM-IMX412	1, 2, 3, 4		1	
FSM-IMX415	1, 2, 3, 4			
FSM-IMX462	1, 2, 3, 4			
FSM-IMX477	1, 2, 3, 4		1 (via IMX412 driver)	
FSM-IMX577	1, 2, 3, 4		1 (via IMX412 driver)	

Table 2: Ecosystem Software Package - Supported number of FSMs per processing board

[1] The NVIDIA Jetson driver package contains driver binaries for V4L2 (software processing) and the Libargus ISP pipeline.

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