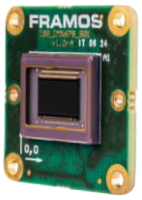
Product Datasheet

FSM:GO



FSM:GO – IMX900

3.2MP Global Shutter optical sensor module with Sony Pregius S image sensor.

What is the FSM:GO?

- Family of ready to mount image sensor modules
- Paired with a standard lens from the selected range
- Focused to your specific working distance
- Assembled with your interface choice
- Simple and off-the-shelf

Contact Information
Framos GmbH

Technical Support:
support@framos.com

Website:
https://www.framos.com

GitHub

DOCS

Product Datasheet

FSM:GO

Product Specification - Overview

Sensor Module

Type	Sony IMX900AQR/AMR
Shutter Type	CMOS Global Shutter
Technology	Pregius S
Spectrum	Mono or Color (RGB)
Optical Format	1/3.1”
Pixel Size	2.25 x 2.25 µm
Resolution (max.)	2064 x 1552
Framerate (max.)*	8bit: 125 FPS 10Bit: 117 FPS 12Bit: 72 FPS
Bit Depth*	8/10/12 bit

***Platform dependent**

Platform Support (Driver, ISP, Adapters)

NVIDIA	Jetson Family (Orin, Thor)
NXP	i.MX8MP
Raspberry Pi	RPi 5

Lens Option(s)

FOV (H)	**33°**	**76°**	**102°**
Optical Filter	IRC@650 (±10nm)	IRC@660 (±10nm)	IRC@650 (±10nm)
Aperture	F/1.6	F/2.2	F/1.8
Lens Mount	M12 x 0.5	M12 x 0.5	M12 x 0.5

Interface Option(s)

Data Interface	MIPI CSI-2 v1.2 and D-PHY v2.1	GMSL3/2 (12Gbps, 6Gbps)
Physical Interface	PixelMate (60 pin) Micro Coax (50 pin) FFC (40 pin) (unshielded)	FAKRA (Single Coax)
Communication	I^2C	I^2C
Power Supply	Two Rails (3.8V, 1.8V)	Power over Coax (12V)
Power Cons. (Max)	420mW	1200mW

Mechanical Specification

Dimensions [mm]	Board: 26.5 (W) x 26.5 (D) Housed: 34 (W) x 34 (D) (H): Lens depending
Housing	Optional, GMSL3 only
Lens Mount	M12 x 0.5 (var. options)

Environmental

Ingress Protection	Board: None Housed: min. IP40
Operating Temperature	-30° to +75°C*
Storage Temperature	-40°to +85°C*
Ambient Humidity	Max 95% RH, non-condensing

*Sensor module without lens, check Lens Options for configurations with Lens.

Applications:

- Barcode scanning
- Drones - AGV and AGVs
- Industrial robotics
- Automated inspection

The comprehensive specifications are outlined within the contents of this datasheet.

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1 Order Code Scheme/Options

FSM:GO-IMX900[CH]-[**LM**]-[**L**]-[**FS**][**FD**]-[**IF**]-[**MH**]-A1Q1

- ***CH***: Chromaticy
  - *C*: Color
  - *M*: Monochrome
- **LM**: Lens Holder (Optional)
  - *M12*: Lens Specific
  - *M12B*: 12.5 mm Height
  - *M12H*: Housing
- **L**: Lens Type (Optional)
  - *L33A*: 33° HFOV (LM: *M12*)
  - *L76A*: 76° HFOV (LM: *M12*)
  - *L102B*: 102° HFOV (LM: *M12*)
- **FS**: Focusing Service (Optional)
  - *FCS*: Center Focusing (L: Required)
- **FD**: Focusing Distance
  - *HYP*: Hyperfocal Distance
  - *xxxx*: Custom Distance in mm (FS: Required)
- **IF**: Interface (Mandatory)
  - *PM*: PixelMate (60 pin)
  - *MC50A*: MicroCoax (50 pin)
  - *FFC40A*: Flat-Flex Cable (40 pin)
  - *GMSL3A*: GMSL3 (FAKRA, Single Coax)

2 Lens Options

2.1 Module Specifications

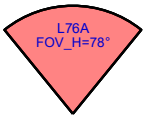
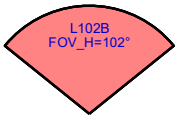
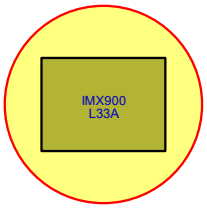
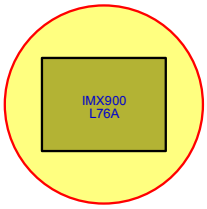
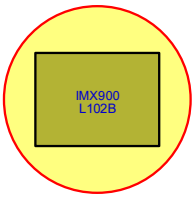
Type (Code)	L33A	L76A	L102B
Field of View [°]			
Horizontal	**33**	**76**	**102**
Vertical	25	61	75
Diagonal	42	89	131
Aperture (F-Number)	F/1.6	F/2.2	F/1.8
Optical Filter	IRC@650 (±10nm)	IRC@660 (±10nm)	IRC@650 (±10nm)
Mount Thread	M12 x 0.5	M12 x 0.5	M12 x 0.5
Mating Mount (PN)	Lens Matched	FLA-MA-M-08622-00	Lens Matched
Temperature Range	-35°C to +75°C	-40° to +85°C	-35°C to +75°C
Sensor Coverage			

*Image tuning and assembly are performed at 25°C. Temperature variations may affect performance and focus.

2.2 Lens Specification

Type (Code)	L33A	L76A	L102B
Lens Type (PN)	FLP-HM-080-00-A-00	FLP-HM-029-07-V-01	FLP-HM-027-03-V-00
Focal length [mm]	8.02	2.87	2.74
Min. Object Dist. [m]	TBD	0.5	TBD
Hyperfocal Dist. [m]	TBD	0.65	TBD
Max. IC [mm]	7.4	7.43	7
Back Focal Length [m]	6.15	3.49	2.26
Distortion [%]	-7.1 (F-Theta)	+3.9 (F-Tan-Theta)	-51 (F-Tan-Theta)
Rel. Illumination [%]	58	62	88
Max. CRA [°]	12.5	15.9	6
TTL [mm]	22.45	15.65	22.5
Construction	1G4P (Hybrid)	1G4P (Hybrid)	7G (Glass)

3 Focusing Service and Focusing Distance

Specification Description	No Focusing[1]	Focusing to Hyperfocal	Focusing to Custom Distance
Type (Code)	-	FCSHYP	FCS[FD]
Focus Distance	N/A	Hyperfocal Distance [HYP][2]	Custom Focus Distance [FD][3]
Focus Target	N/A	Virtual Image (Collimator)	Virtual Image (Collimator)
Focus Area[4]	N/A	Image Center	Image Center
Lens Fixation	N/A	Permanent (Epoxy)	Permanent (Epoxy)

[1] Lens is properly screwed into the lens mount without focusing and fixation.
[2] Please see "Hyperfocal Distance [m]" in Focusing Specifications – Table 2.2.
[3] Please see "Min. Object Distance [m]" to infinity in Focusing Specifications – Table 2.2.
[4] Please see Figure 3.1 below showing the virtual target at image center as the focus area.

Focus Area

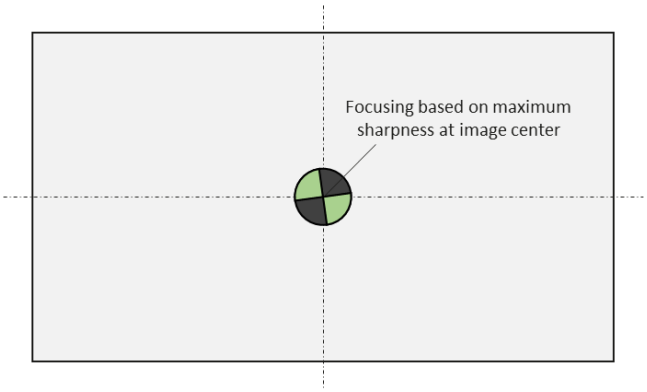


Figure 3.1

4 Lens Mount & Housing Options

Specification

Type (Code)	M12B	M12H
Type (PN)	FLA-MI-M-12522-00	-
Thread Type	M12 x 0.5	M12 x 0.5
Height [mm]	12.5	Lens Matched
Mounting Hole Distance [mm]	22	Part of Housing.
Mounting Screw Size	M1.6	
Material	ABS	Aluminum
Appearance [Color]	Black	Black (Anodized)

5 Interface Options

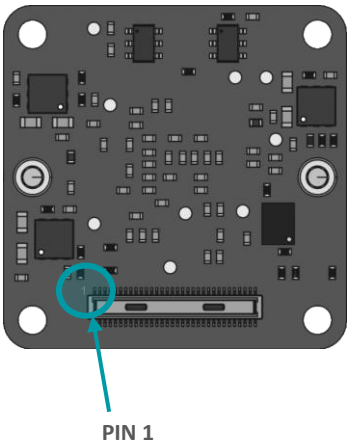
Type (Code)	PM	MC50A	FFC40A	GMSL3A
Description	PixelMate	Micro-Coax	Flat-Flex Cable	GMSL/SerDes
FSM:GO Integration	Default FSM:GO Interface	Adapter Board (Piggyback)	Adapter Board (Piggyback)	Adapter Board (Piggyback)
Interface Standard	FRAMOS PixelMateC	Proprietary	Proprietary	GMSL, FAKRA Coaxial
Connector Type	Hirose DF40C-60DP-0.4V(51)	I-PEX 20525-050E-02	Molex 5051104091	Amphenol RF 2FA1-NZSP-PCBB6
Pin Count [#]	60	50	40	1+GND
Pin Pitch [mm]	0.4mm	0.4mm	0.5mm	-
Locking Style	Self-locking	Mechanical locking	Mechanical locking	Mechanical locking
Shielding	Yes	Yes	No	Yes
Power Supply [V]	3V8, 1V8	3V8, 1V8	3V8, 1V8	12V (Power over Coax)
Data Lanes/Bandwidth	4-Lanes, 2.5 Gbps (ea.)	4-Lanes, 2.5 Gbps (ea.)	4-Lanes, 2.5 Gbps (ea.)	1-Line at 12Gbps (10Gbps Effective)
Mating Connector	Hirose DF40C-60DS-0.4V(51)	I-PEX 20525-050E-02	Molex 5051104091	Amphenol RF 2FA1-NZSP-PCBB6
Mating Cable(s)	FMA-FC-150/60	FMA-CBL-MC50-0.3m	Molex 0150200440	FMA-CBL-FAK.LD302
Receiver Boards	Various FPAs	FFA-MC50/A	FFA-FFC40/A	FFA-GMSL-DES-V2

5.1 Pinouts

WARNING Pin 1 is identified on the board. Orient accordingly, paying close attention to the pin number in reference to the locater view illustrated below. Failure to align correctly will cause permanent damage.

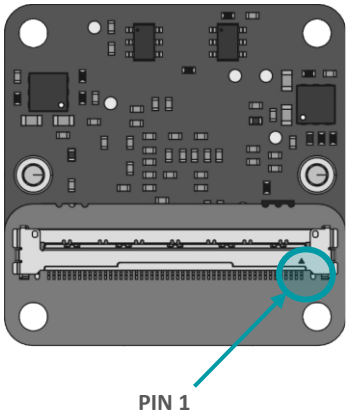
PixelMate:

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

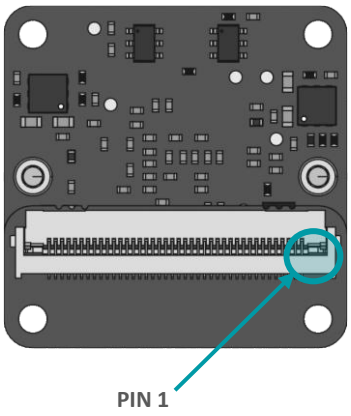


Pinout			
1	3V8_VDD	2	1V8_VDD
3	3V8_VDD	4	1V8_VDD
5	NC	6	NC
7	NC	8	NC
9	NC	10	NC
11	GND	12	GND
13	GND	14	GND
15	RST_0	16	NC
17	NC	18	NC
19	XMASTER	20	GPO1
21	I2C_SCL	22	NC
23	NC	24	SLAMODE2
25	XVS	26	GPO2
27	I2C_SDA	28	NC
29	XHS	30	XTRIG2
31	XTRIG1	32	GPO0
33	NC	34	NC
35	SLAMODE0	36	SLAMODE1
37	GND	38	GND
39	NC	40	NC
41	NC	42	NC
43	GND	44	GND
45	NC	46	D_DATA_3_P
47	NC	48	D_DATA_3_N
49	GND	50	GND
51	D_DATA_0_N	52	D_DATA_1_N
53	D_DATA_0_P	54	D_DATA_1_P
55	GND	56	GND
57	D_DATA_2_P	58	D_CLK_0_P
59	D_DATA_2_N	60	D_CLK_0_N

MC50:

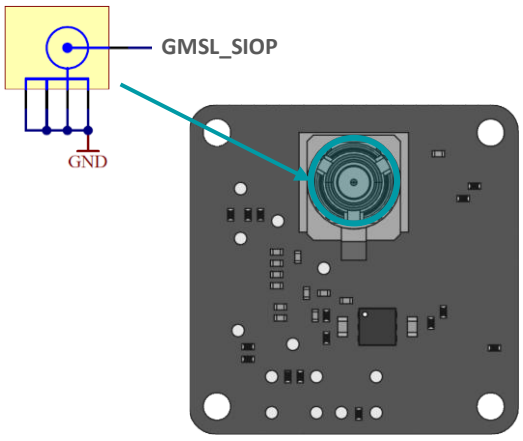
Type: I-PEX 20525-050E-02			Pinout	
	1	GND	26	I2C_SDA
	2	D_CLK_0_N	27	GPO2
	3	D_CLK_0_P	28	XVS
	4	GND	29	SLAMODE2
	5	D_DATA_2_N	30	NC
	6	D_DATA_2_P	31	I2C_SCL
	7	GND	32	GPO1
	8	D_DATA_1_P	33	XMASTER
	9	D_DATA_1_N	34	NC
	10	GND	35	NC
	11	D_DATA_0_P	36	NC
	12	D_DATA_0_N	37	RST_0
	13	GND	38	GND
	14	D_DATA_3_N	39	NC
	15	D_DATA_3_P	40	NC
	16	GND	41	NC
	17	NC	42	NC
	18	SLAMODE1	43	NC
	19	SLAMODE0	44	NC
	20	NC	45	GND
	21	NC	46	1V8_VDD
	22	GPO0	47	1V8_VDD
	23	XTRIG1	48	GND
	24	XTRIG2	49	3V8_VDD
	25	XHS	50	3V8_VDD

FFC40:

Type: Molex 5051104091			Pinout	
	1	GND	21	XTRIG1
	2	D_CLK_0_N	22	XHS
	3	D_CLK_0_P	23	XVS
	4	GND	24	I2C_SDA
	5	D_DATA_2_N	25	I2C_SCL
	6	D_DATA_2_P	26	XMASTER
	7	GND	27	RST_0
	8	D_DATA_1_P	28	NC
	9	D_DATA_1_N	29	NC
	10	GND	30	NC
	11	D_DATA_0_P	31	NC
	12	D_DATA_0_N	32	NC
	13	GND	33	NC
	14	D_DATA_3_N	34	GND
	15	D_DATA_3_P	35	1V8_VDD
	16	GND	36	1V8_VDD
	17	NC	37	GND
	18	GND	38	3V8_VDD
	19	NC	39	3V8_VDD
	20	NC	40	GND

GMSL3A:

Type: 2FA1-NZSP-PCBB6	**Pinout**	
	1	GMSL_SIOP
	2	GND



Front View

5.2 Signal Description

3V8_VDD	
I/O Type	Power
Function	3.8V Power supply
Connected to	LDO_IC
DC Charact.	3V8_VDD=3.7V-5.1V, max. 0.3A per line

1V8_VDD	
I/O Type	Power
Function	1.8V Power supply
Connected to	LDO_IC
DC Charact.	1V8_VDD=1.7V-1.9V, max. 0.3A per line

IS_RST_0	
I/O Type	IN
Function	Image sensor reset (XCLR)
Connected to	Reset_IC
I/O Standard	LVCMOS18 (1.8V)
I/O State	Normal: High, Reset: Low
DC Charact.	VILmax=0.36V, VIHmin=1.44V

SLAMODE0/1/2	
I/O Type	IN
Function	I2C slave address configuration
Connected to	Image Sensor, pull-down res. 10k
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

I2C_SCL	
I/O Type	IN/OUT
Function	I2C clock
Connected to	Image Sensor, no pull-up
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

I2C_SDA	
I/O Type	IN/OUT
Function	I2C data
Connected to	Image Sensor, no pull-up
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

XMASTER	
I/O Type	IN
Function	Image sensor master/slave
Connected to	Image Sensor, pull-down res. 10k
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

XVS / XHS	
I/O Type	IN/OUT
Function	Vertical/Horizontal sync signal
Connected to	Image Sensor, pull-up res. 10k
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

XTRIG1/2	
I/O Type	IN
Function	Trigger input 1/2
Connected to	Image Sensor
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

D_DATA_#_P/N	
I/O Type	OUT
Function	MIPI-CSI2 output data (Lane #, Positive/Negative)
Connected to	Image sensor
I/O Standard	MIPI D-PHY

D_CLK_0_P/N	
I/O Type	OUT
Function	MIPI-CSI2 output clock (Positive/Negative)
Connected to	Image sensor
I/O Standard	MIPI D-PHY

GPO0/1/2	
I/O Type	OUT
Function	Digital Output
I/O Standard	LVCMOS18 (1.8V)
DC Charact.	VILmax=0.54V, VIHmin=1.26V

5.3 I2C Address Configuration (SLAMODE)

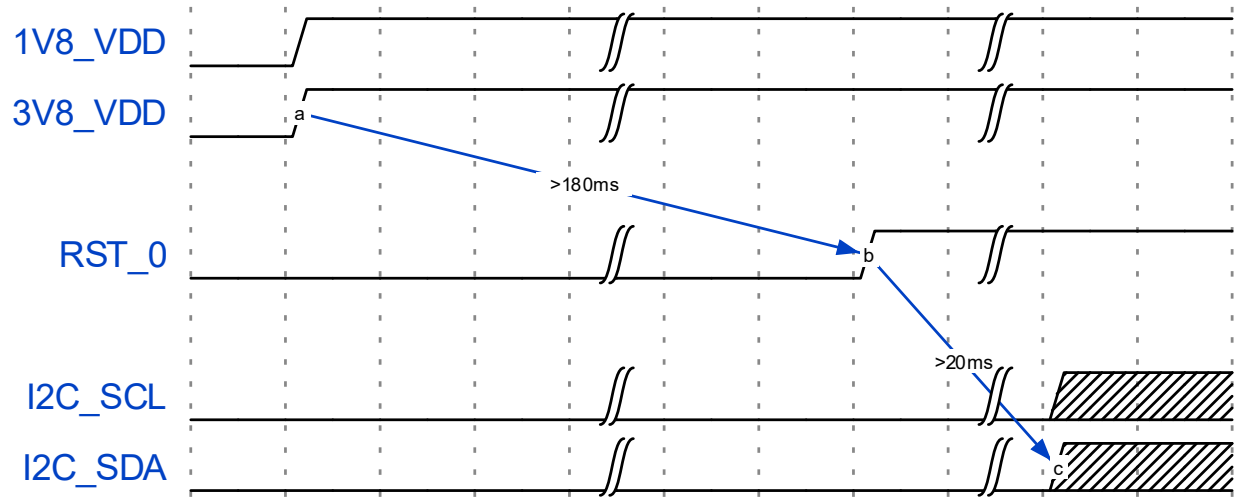
SLAMODE2	SLAMODE1	SLAMODE0	1st I2C Address	2nd I2C Address
0	0	0	0x1A	0x36
0	0	1	0x1A	0x37
0	1	0	0x1A	0x38
0	1	1	0x1A	0x39
1	0	0	0x1A	0x3A
1	0	1	0x1A	0X3B
1	1	0	0x1A	0x3C
1	1	1	0x1A	0x3D

Note:

- The FRAMOS driver uses the 1st I2C Address (0x1A) by default.
- Users can configure additional SLAMODE signals via DIO (Digital Input/Output) pins from the host to set a unique 2nd I2C Address.
- When using multiple sensors on the same host, ensure each sensor is assigned a unique 2nd I2C Address to avoid conflicts.

5.4 Power-On Sequencing

For correct function, the host system must follow the below timing to properly power up or reset the module: 3V8_VDD should be generated after 1V8_VDD, or, ideally at the same time. RST_0 pin low after powering up PixelMate voltage rails >180 ms.



Legend

Times and voltages which are represented in the above figure are as follows:

- 3V8_VDD - 3V8 voltage supply from host
- 1V8_VDD - 1V8 voltage supply from host
- RST_0 - reset signal driven from the host
- I2C_SCL - I2C Clock
- I2C_SDA - I2C Data

6 Mechanical Drawings

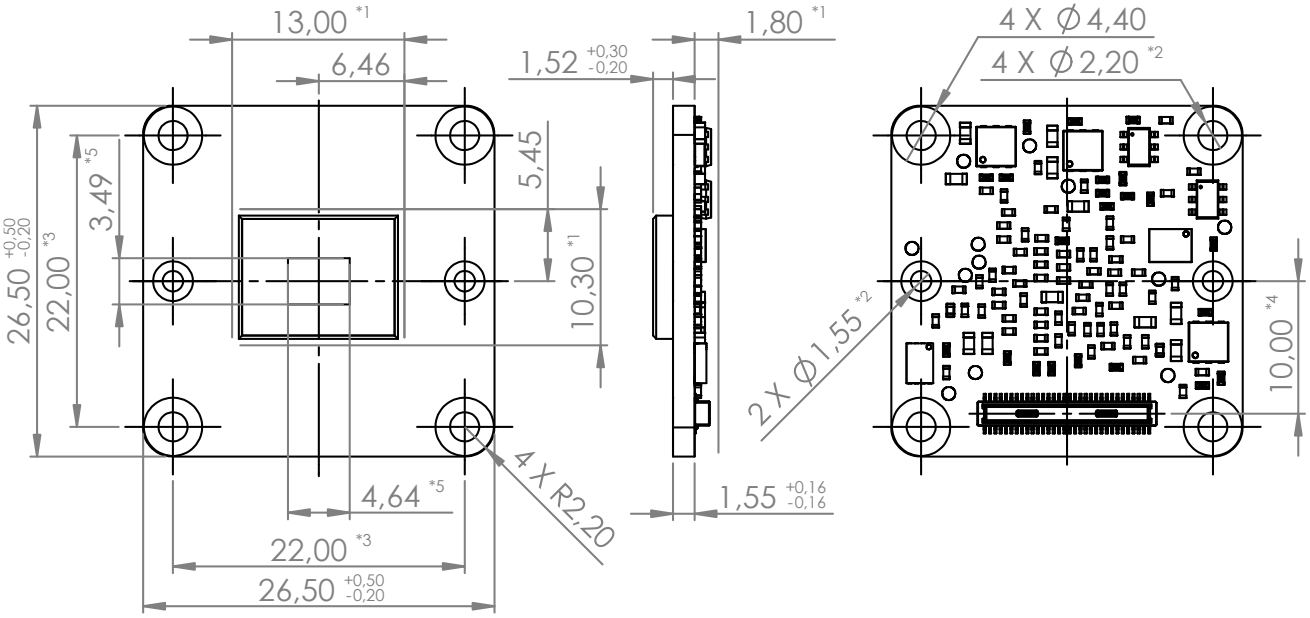
The following chapter contains the measured drawings split into the core segments of the product.

- Bare Sensor Module
- with Lens
- with Lens Mount only
- with Interface Adapter
- with Housing (GMSL3A only) and Lens.

All measures refer to the backside of the sensor module PCB and alow this way to obtain the overall measures. Unit of measurements is milimeters [mm].

6.1 Sensor Module (Bare FSM:GO)

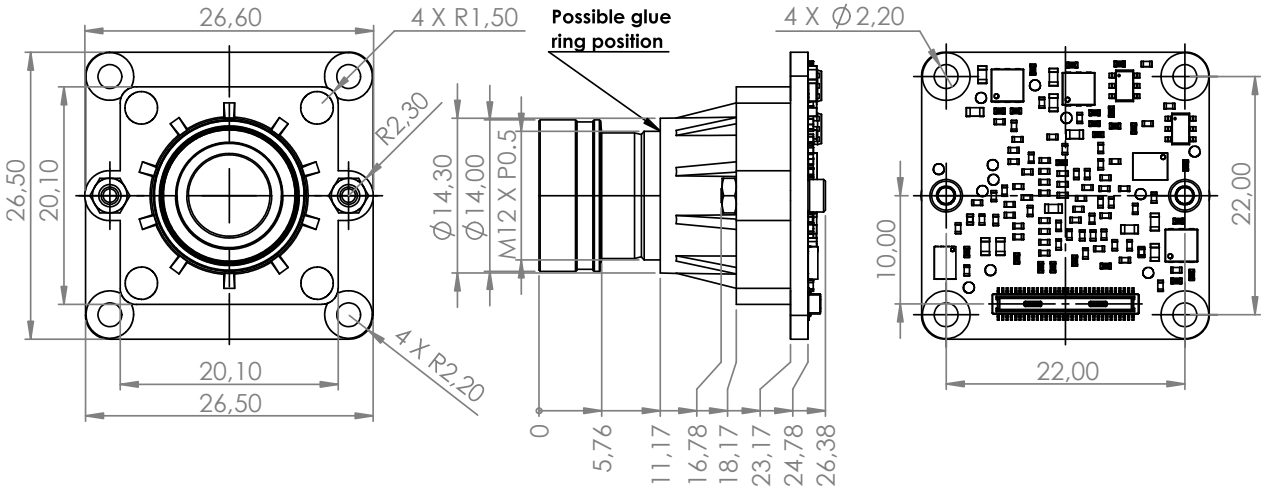
Interface: PixelMate



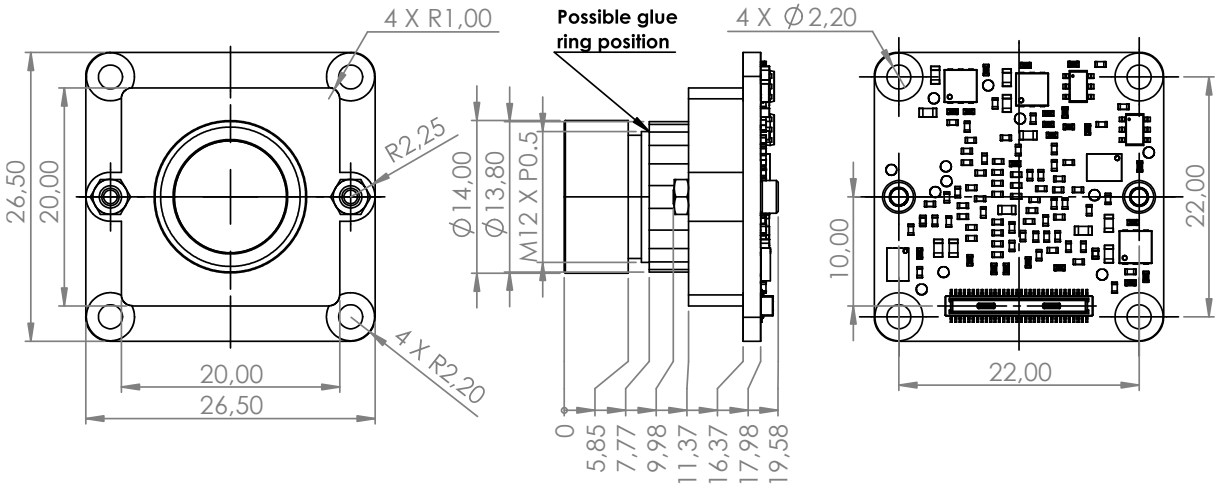
*1 - clearance area
*2 - holes size tolerance +/-0,1mm
*3 - holes position tolerance +/-0,1mm
*4 - connector size & alignment tolerance (X,Y,Z,tilt) +/-0,20mm
*5 - center of active sensor area is aligned with center of sensor board area
- sensor active area size & alignment tolerance (X,Y,Z,tilt) +/-0.25mm

6.2 FSM:GO with Lens

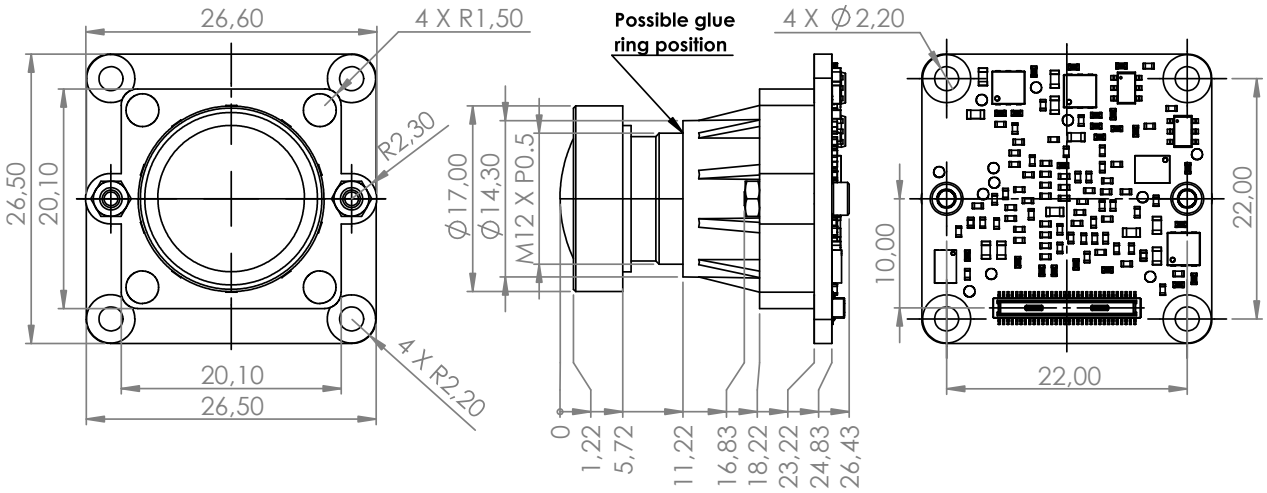
L33A: 33° HFOV (LH: M12)



L76A: 76° HFOV (LH: M12)

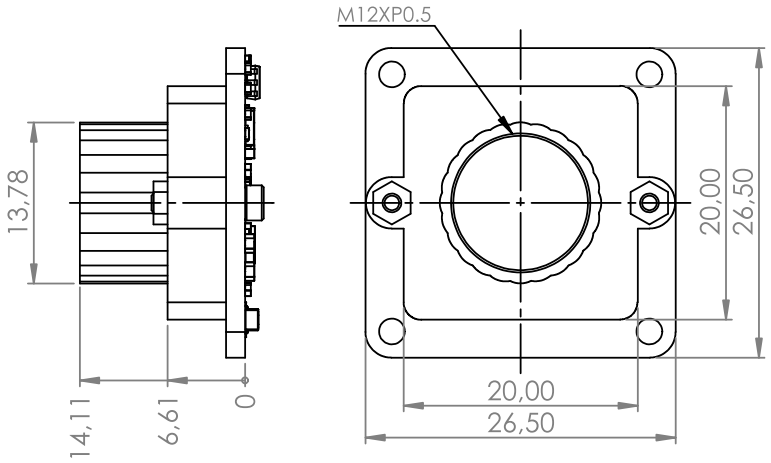


L102A: 102° HFOV (LH: M12)



6.3 FSM:GO with Mount

M12B: 12.5 mm Height

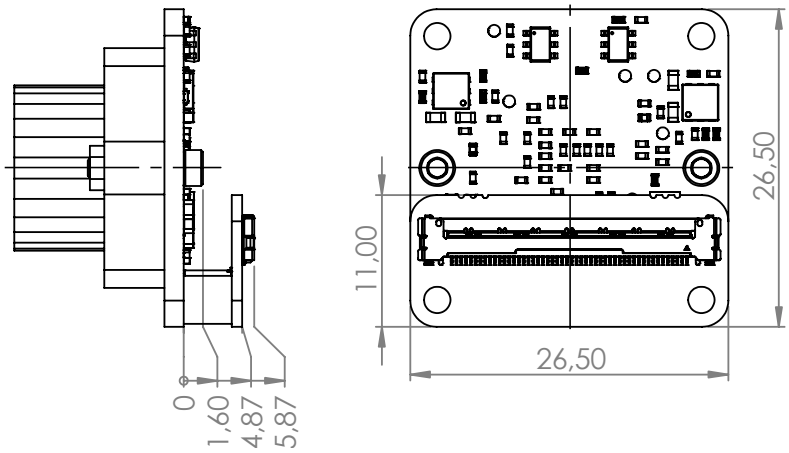


6.4 FSM:GO with Interface Adapter

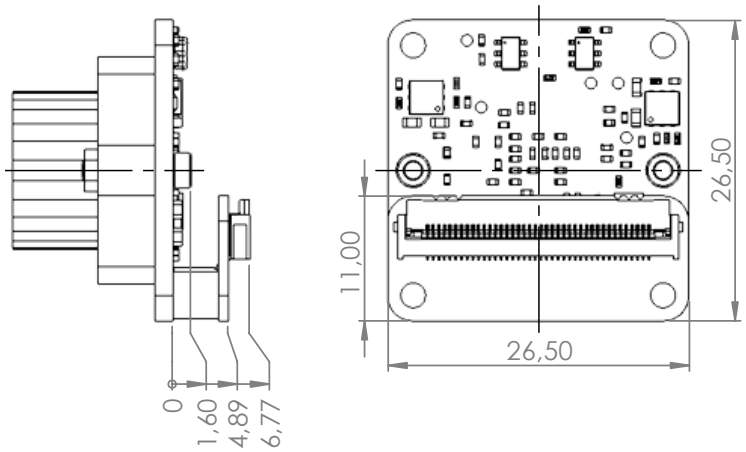
PM: See bare “Sensor Module”

> **NOTE** Interface adapters fixed with screws for transport, mounting screws not included in product photos and drawings.

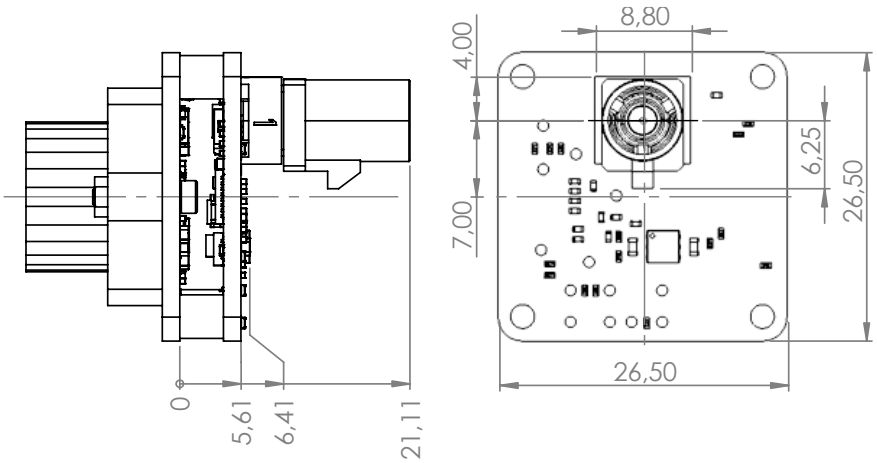
MC50A: MicroCoax (50 pin)



FFC40A: Flat-Flex Cable (40 pin)



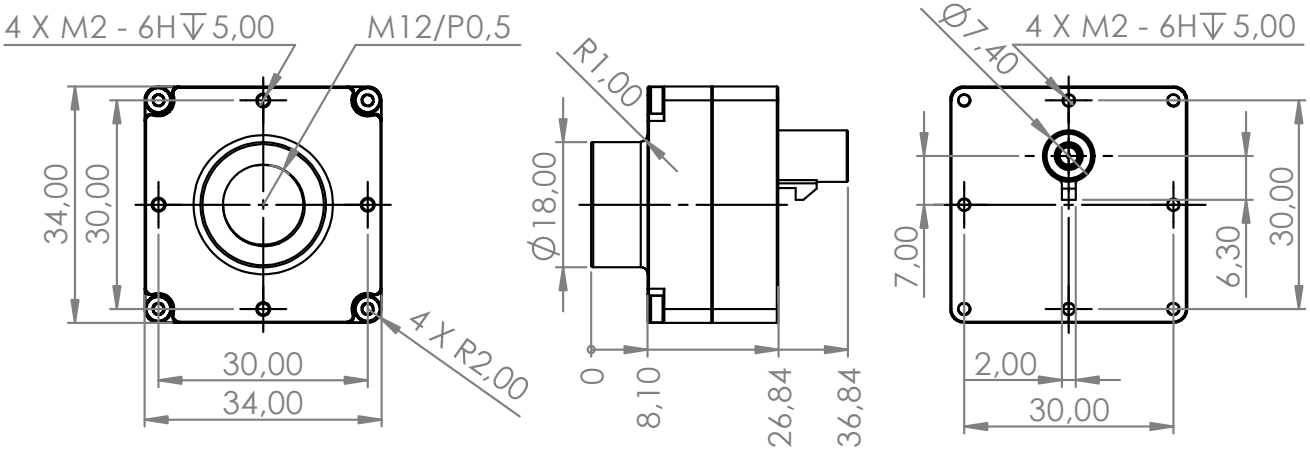
GMSL3A (FAKRA, Single Coax)



6.5 FSM:GO with Housing

M12H: No Lens

- **IF**: GMSL3A mandatory



6.6 FSM:GO with Housing and Lens

Drawings for housed modules with Lens are available on request.

- **M12H-L33A:** 33° HFOV
  - **LH**: M12H (lens holder is part of housing)
  - **IF**: GMSL3A (mandatory)

- **M12H-L102A**: 102° HFOV
  - **LH**: M12H (lens holder is part of housing)
  - **IF**: GMSL3A (mandatory)

7 Platform Compatibility and Software Specification

The FSM:GO comes with ongoing and off-the-shelf driver and ISP tuning support for a number of platforms and devices, like the latest generation of NVIDIA Jetson Developer Kits, the NXP i.MX8MP Developer Kit and the Raspberry Pi 5 Single Board Computer.

Actual devices, implemented sensor and ISP features as well as the archived performance are directly related to the capabilities of each processing platform and the software package maintained by its vendor.

Check out our Github repository for all available driver releases as well as our online documentation for any hardware references.

GitHub	Drivers & Sample Applications: https://www.github.com/framosimaging (Release Notes in the Wiki section)
DOCS	Documentation: https://docs.framos.com

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