FSM-IMX636 DEVKIT

FSM-IMX636E/TXA_Devkit-Single-V1A

General Description:

The FSM-IMX636 Devkit delivers high resolution, speed, and temporal resolution with "Event Based Sensing" technology in a compact package for prototyping of embedded systems. This Devkit integrates the IMX636-AAMR-C Event-based Vision Sensor released by Sony Semiconductor Solutions, and realized in collaboration between Sony and PROPHESEE®. Reduce your time-to-market with this complete and easy to integrate assembly for embedded applications, complete with; a sensor board with lens, all needed adapters, accessories and drivers for a jump start. Prototype quickly and capture ultra-fast moving objects, or even vibration frequencies of machine components - at a fragment of the data rate, processing efforts, and power consumption of conventional frame based image sensing.

Accelerate your development by leveraging the PROPHESEE Metavision® Intelligence Suite. It provides customers with a proven vision toolkit containing computer vision and machine learning supported modules for event data processing, analytics and visualization.

Targeted Use:

Industrial, manufacturing, sports and entertainment.

Features:

- Sensor module with Sony Event based Vision Sensor (EVS) - IMX636-AAMR-C

- Resolution of 0.9 MP / 720 p with up to 1.06 Billion events per second

- Up to 10k fps Time-Resolution Equivalent, no motion blur by technology

- On-board event packetization creating broad compatibility with embedded processors

- MIPI CSI-2 interface according to PixelMate™ standard for versatile connectivity

- Drivers and Demo Application for NVIDIA® Jetson AGX Xavier™ and NVIDIA® Jetson AGX Orin™

- Prophesee Metavision® Intelligence Suite Vision SDK Support (Plugin)

Applications:

- Achieve preventive maintenance by using vibration monitoring to detect hard-to-see mechanical issues

- Guide mobile robots and detect potential obstacles by using event-driven optical flow

- Monitor and count people in retail settings while preserving privacy by avoiding the capture of facial details

- Count and track small high-speed objects such as sparks in welding and metal processing, detect contaminants, or track golf balls

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Navigation and Important Notices

WARNING Warnings appear with information that must be followed to prevent damage to equipment or injury to the end user. Follow these closely. They are indicated by a red prompt and a red border outline.

CAUTION Cautions appear with information that should be followed to protect equipment and to prevent injury to the end user. Follow these closely. They are indicated by a red prompt and a black border outline.

NOTE Notes appear with helpful information and may contain tips, advice, or otherwise useful information to improve your experience.

NOTE FRAMOS GmbH has affiliated companies. Affiliates shall mean any corporation, company, or other entity that is in control of, is controlled by, or is under common control with a party hereto, provided that such entity shall be considered a subsidiary only so long such control exists. For purpose of this User Manual affiliates are: FRAMOS Technologies d.o.o., FRAMOS Technologies Inc, FRAMOS Italia, FRAMOS Electronics Ltd, and MAVIS Imaging GmbH (hereinafter all together: FRAMOS)

FRAMOS Datasheet

Board Discovery

Additional information can be found in the User Manual. Key features are outlined below:
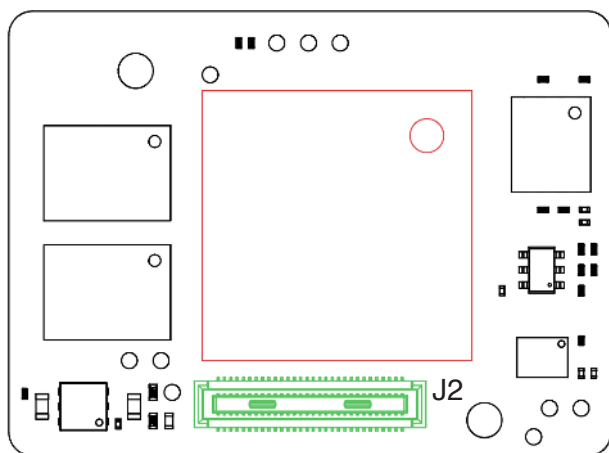
Rear view

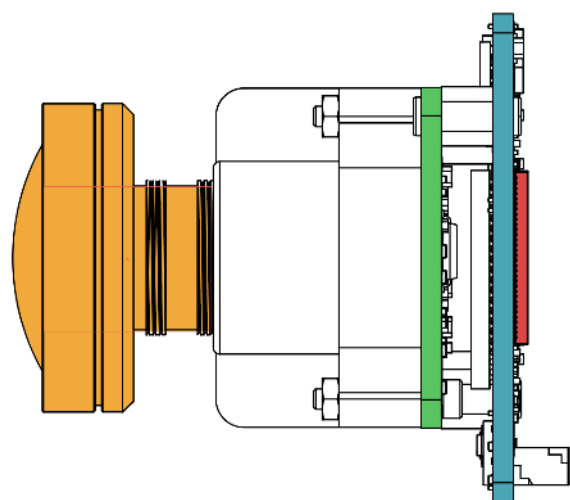|	ID	Description
🔴	Crosslink-NX	Flashing can be performed through the SPI programming connector or directly to the Crosslink-NX SRAM using JTAG
🟢	J2	60-pin interconnect to interface with the FSM. More information available in the User Manual.
🔵	J3	60-pin interconnect to interface with the FPA. More information available in the User Manual.
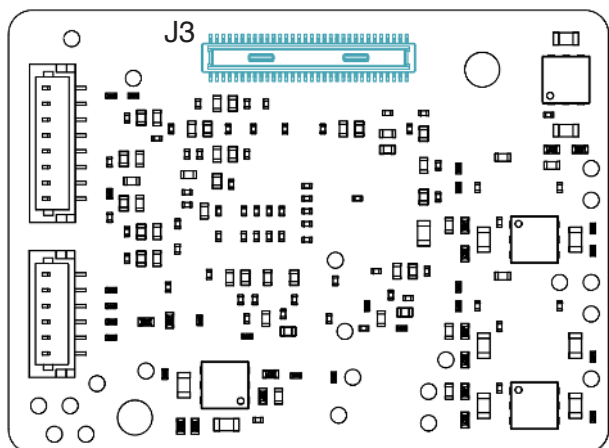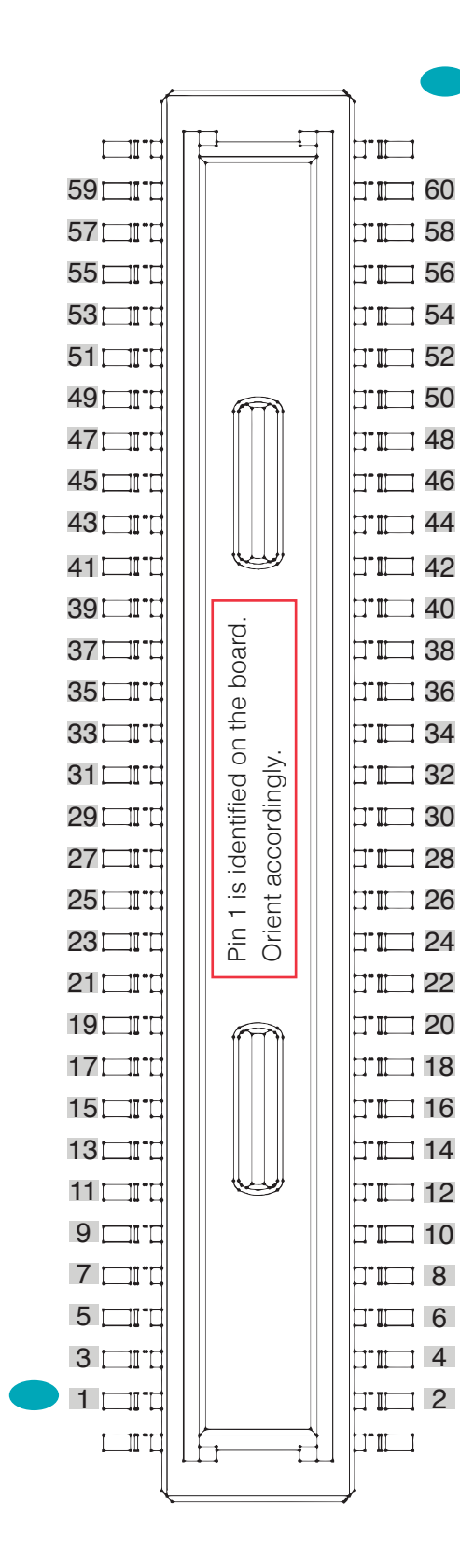
Top view

	ID	Description
🟠	Lens	Front-end optics, passive aligned.
🟢	FSM	Sony® IMX636-AAMR-C, and 2 kb EEPROM for extra I2C config.
🔵	FSA	LDO Power supplies (3V, 2V5, 1V8, 1V1) and the Crosslink-NX (1V8, 1V).
🔴	Crosslink-NX	Lattice Crosslink-NX FPGA

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Pinout and Signal Description

J3 Pin	Pin Description	J3 Pin	Pin Description
Pin1	3V8_VDD	Pin31	XTRIG0
Pin2	1V8_VDD	Pin32	GPIO11
Pin3	3V8_VDD	Pin33	PW_EN
Pin4	1V8_VDD	Pin34	PROGRAMn
Pin5	NC	Pin35	GPIO6
Pin6	NC	Pin36	GPIO7
Pin7	NC	Pin37	GND
Pin8	NC	Pin38	GND
Pin9	NC	Pin39	MCLK_0
Pin10	NC	Pin40	MCLK2
Pin11	GND	Pin41	MCLK_1
Pin12	GND	Pin42	MCLK3
Pin13	GND	Pin43	GND
Pin14	GND	Pin44	GND
Pin15	RST_0	Pin45	NC
Pin16	RST_1	Pin46	D_DATA_3_P
Pin17	EE_MISO	Pin47	NC
Pin18	SPI_MISO	Pin48	D_DATA_3_N
Pin19	XMASTER0	Pin49	GND
Pin20	EE_MOSI	Pin50	GND
Pin21	I2C_0 (SPI_SCK)	Pin51	D_DATA_0_N
Pin22	I2C_1_SCL	Pin52	D_DATA_1_N
Pin23	SPI_CS	Pin53	D_DATA_0_P
Pin24	SYS_PW_EN	Pin54	D_DATA_1_P
Pin25	GPIO1(XVS0)	Pin55	GND
Pin26	EE SCK	Pin56	GND
Pin27	I2C (SPI_MOSI)	Pin57	D_DATA_2_P
Pin28	I2C_1_SDA	Pin58	D_CLK_0_P
Pin29	GPIO2(XHS0)	Pin59	D_DATA_2_N
Pin30	EE_SS	Pin60	D_CLK_0_N

Pin 1 is identified on the board.
Orient accordingly.

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Connection Diagram (FRAMOS Sensor Module)

The FSM incorporates the IMX636-AAMR-C image sensor and an EEPROM that stores a unique serial number for camera identification. The EEPROM can accommodate an extra 2 Kb I2C configuration if required.

The image sensor supports SLAMODE, EXTTRIG, and SYNC (XVS), and follows the MIPI standard utilizing 2 MIPI lanes. Data transfer can occur at a maximum rate of 1.5 Gbps per lane. The FSM connects to the FSA through a standard 60-pin PixelMate™ connector, and is shipped pre-connected (indicated below). More information about the normal functionality of the FSM can be found in the [FRAMOS Sensor Module Ecosystem User Manua](#)l. The below is applicable to the IMX636 Development Kit:

FRAMOS Sensor Module (FSM)
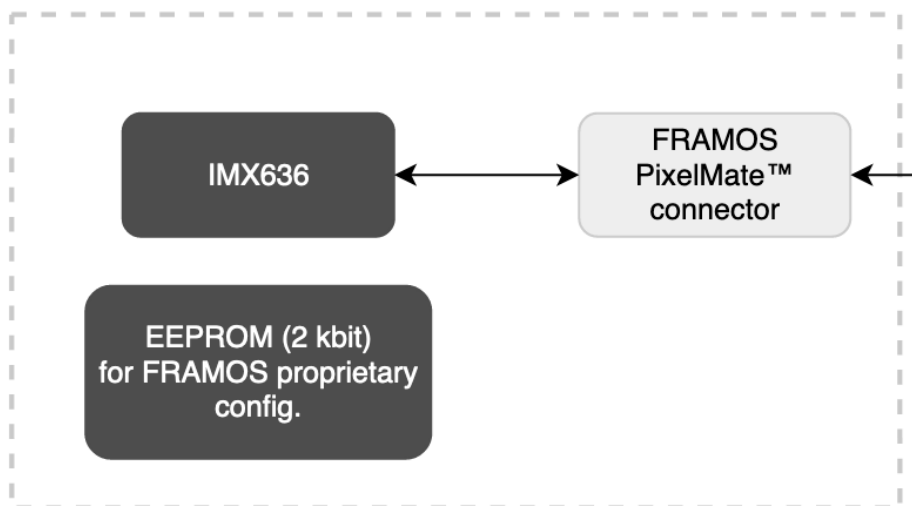
Note: The device is equipped with a uniquely assigned serial number address on the EEPROM. Serial number discovery can be achieved through *EEPROM Data* control use


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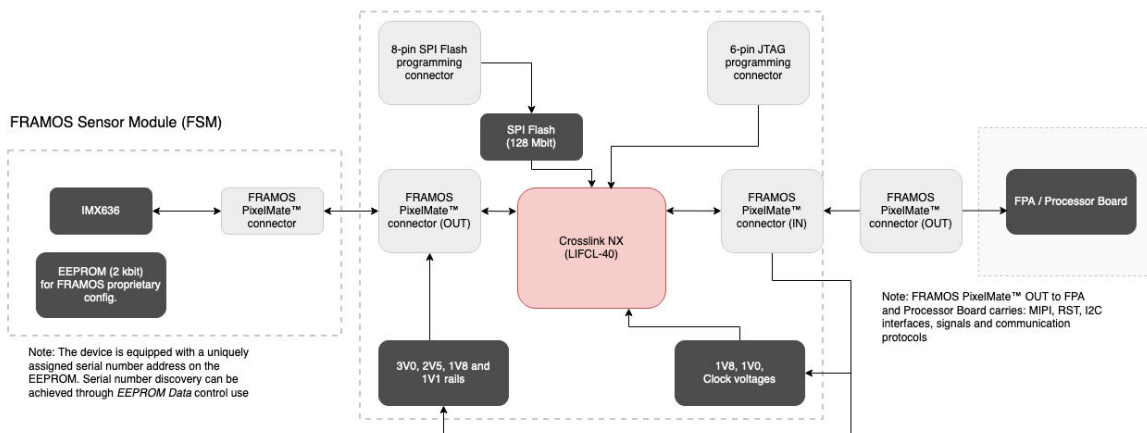
Connection Diagram (FRAMOS Sensor Adapter)

The FSA is based on the Crosslink-NX FPGA chip and provides four LDO power supplies with a configurable sequence for the image sensor (3V, 2V5, 1V8, 1V1) and the Crosslink-NX (1V8, 1V).

An onboard oscillator generates a 20 MHz clock, which is connected to the Crosslink-NX. The Crosslink-NX generates the image sensor INCK clock, which is connected to the output PixelMate™ connector. On the output of the PixelMate™ from the FSA, four MIPI data lanes are available (though only two are actively used).

The FSA includes 2x128 Mbit DRAM and 128 Mbit SPI flash for the bitstream. Flashing can be performed through the SPI programming connector or directly to the Crosslink-NX SRAM using JTAG. The current FPGA design for the FSM-IMX636 Devkit does not actively use DRAM chips.. More information about the normal functionality of the FSA can be found in the FRAMOS Sensor Module Ecosystem User Manual. The below is applicable to the IMX636 Development Kit:

FRAMOS Sensor Adapter (FSA)

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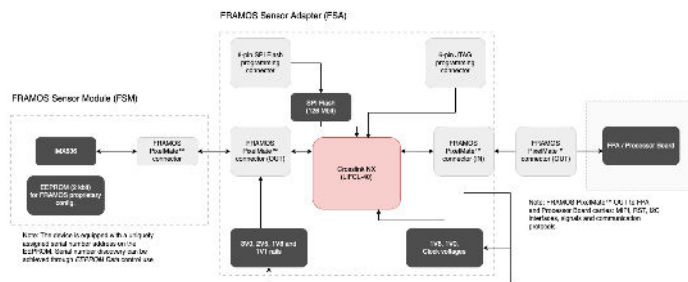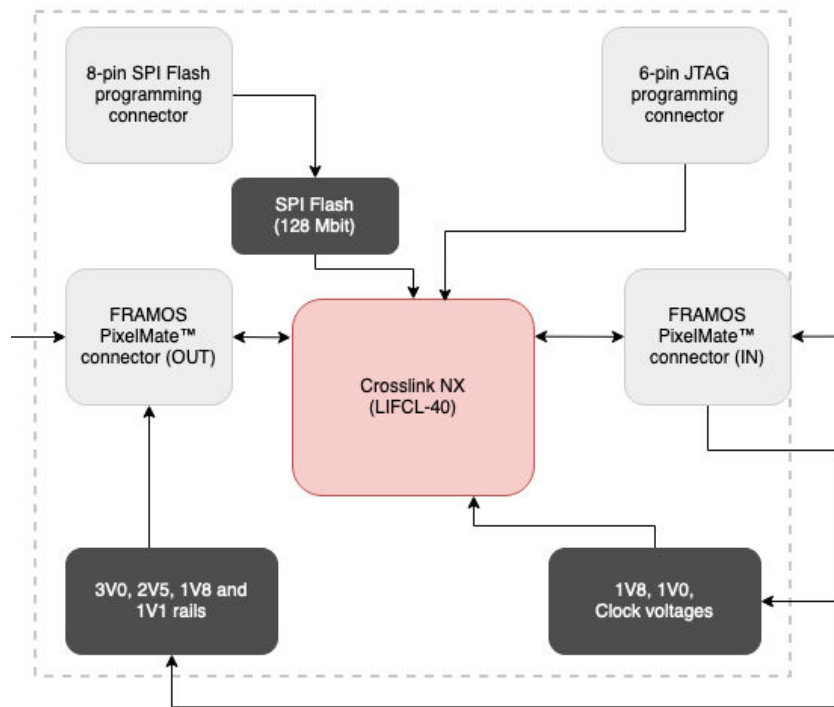
Connection Diagram (Multiple Camera Setup)

The below diagram illustrates a synchronization schema. Additional information can be found in the User Manual. Multi-sensor functionality can be achieved by aligning the intervals of internal timestamp counts, enabling the achievement of the same timestamp values by aligning count start timings.

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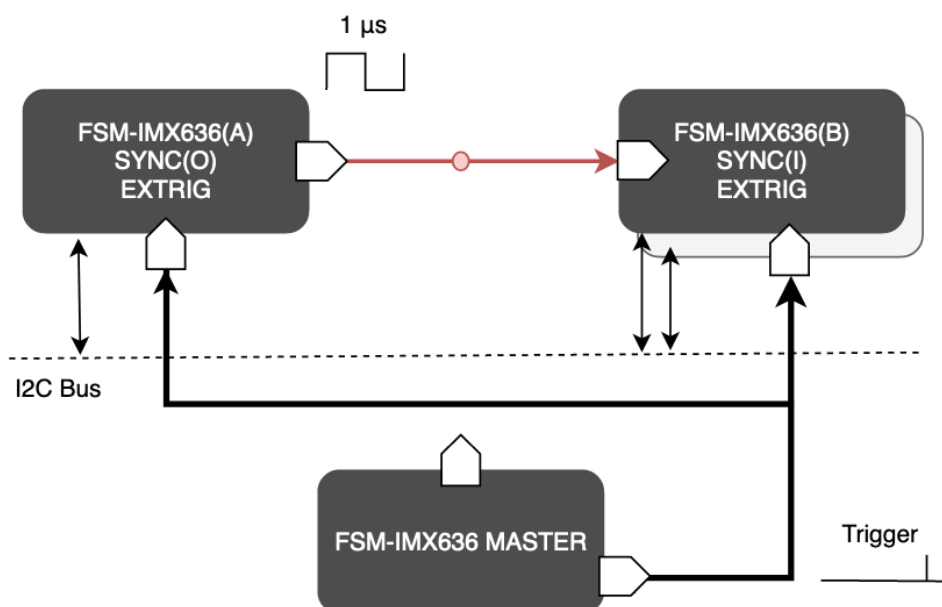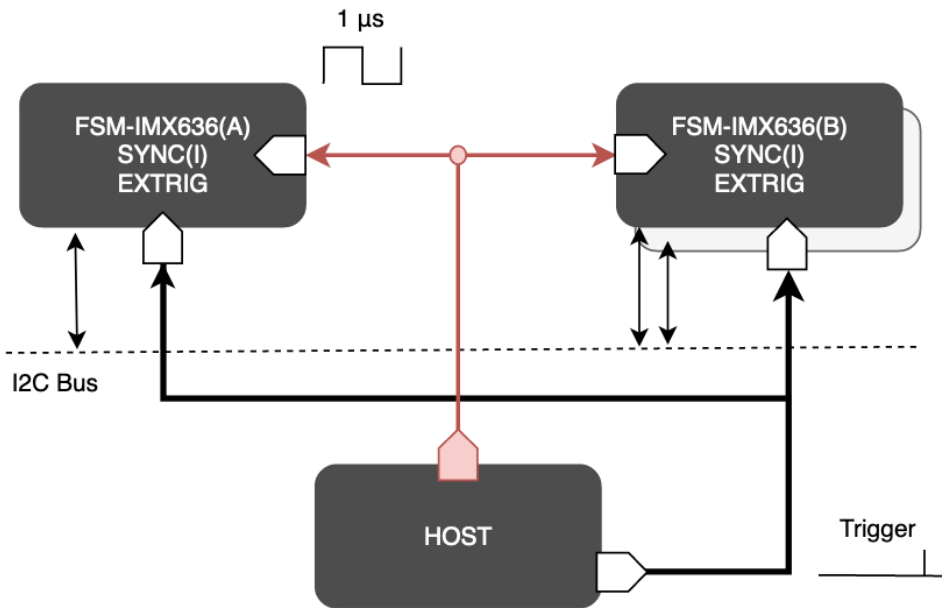
Testpoints (TP)

Reference the below testpoint contacts for your case use:
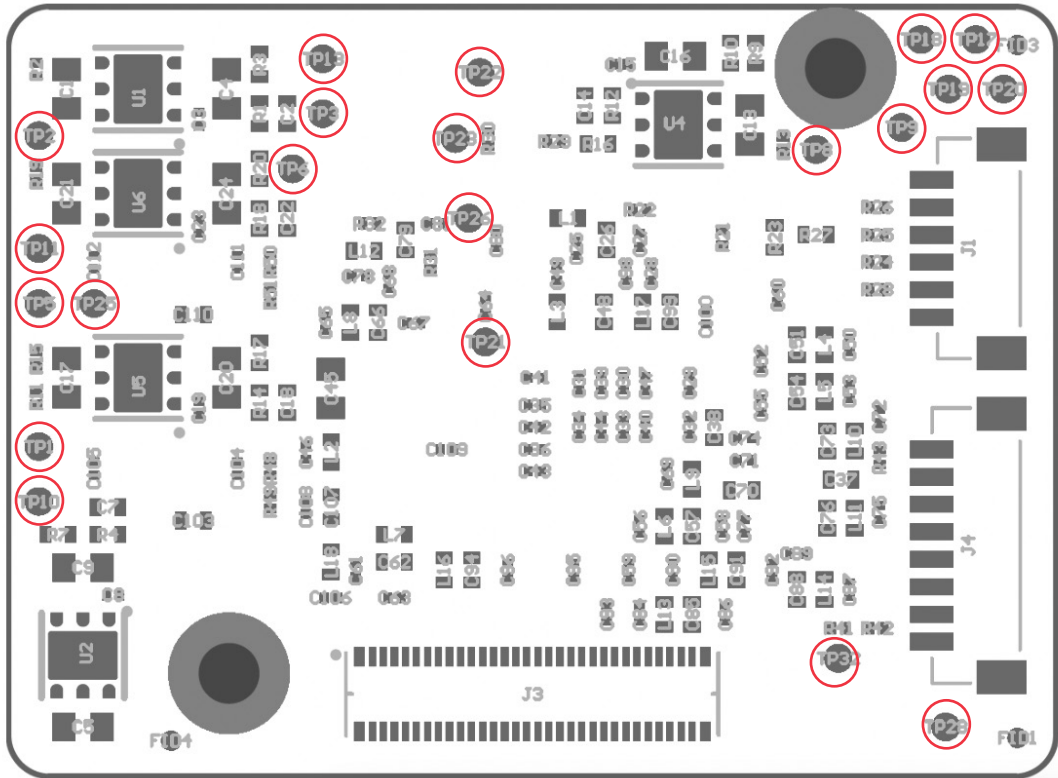
TP	Description	TP	Description	TP	Description
TP1	PW EN	TP11	PW EN4	TP21	IS_RST_0
TP2	PW EN1	TP12	V_IF	TP22	IS_GPIO1(XVS0)
TP3	V_ANA	TP13	1V8_VDD	TP23	IS_MCLK
TP4	GND	TP14	GP1	TP24	IS_GPIO2(XHS0)
TP5	PW EN2	TP15	GP2	TP25	GND
TP6	V_ANA-1	TP16	GP3	TP26	MCLK_0
TP7	GND	TP17	GP4	TP27	IS_GPIO3(XTRIG)
TP8	PW EN3	TP18	GP5	TP28	GND
TP9	V_DIG	TP19	GP6	TP29	GPIO1(XVS0)
TP10	3V8_VDD	TP20	GND	TP30	GPIO2(XHS0)
				TP31	GPIO3(XTRIG0)

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Device Characteristics and Ratings

Image Sensor
Type: IMX636-AAMR-C
Technology: PROPHESEE Metavision®
Event Vision Sensing (EVS)

Resolution: HD 1280 x 720 (0.9 MP)
Optical Size: 1/2.5" (4.86 µm pixel)
Chromatics: Monochrome

Optical Attributes
Field of View (HxV): 78° x 62°
Lens Type: 3.5 mm, F#1.8, Miniature lens
Mount Type: M12

Synchronization
Support on request

Event Packetizing on-Board:
Buffering and frame packing, from variable to fixed frame size
• CSI-2 RX - 2 lanes @ 1.5 Gbps/lane
• CSI-2 TX - 4 lanes @ 1.5 Gbps/lane
Configuration via I2C bus

Event Signal Processing:
Pixel Latency: down to <100 µs (depending on light situation and event size)

Nominal Contrast Threshold: 25%
Dynamic Range: >86 dB on 5 lux lighting condition
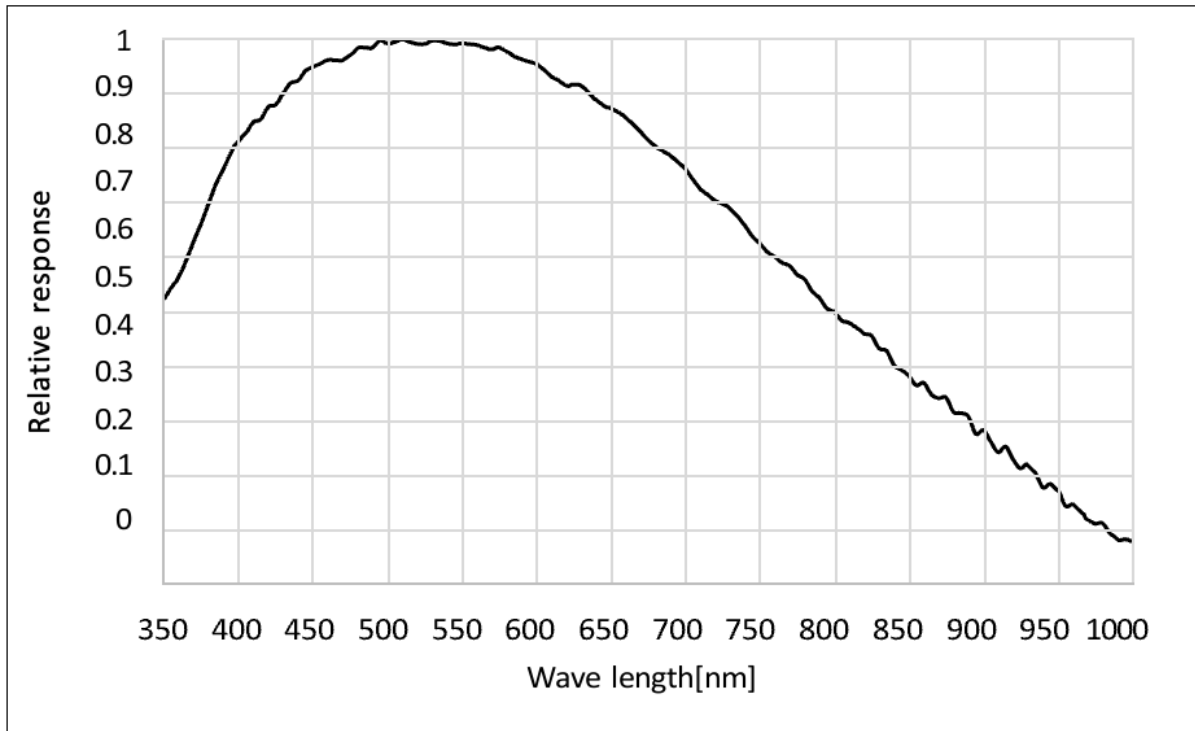Max Event Rate: 1.06 Giga-events per second

Absolute Maximum Ratings

Storage Temperature: -30°C to +80°C
Power Consumption (Average, Peak):

Device	Power consumption (mW)
FSM-IMX636 Devkit	527,7

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Typical Performance Characteristics and Ratings

Spectral Sensitivity

Development and Support Tools

The IMX636 Event Based Vision Sensor, realized in collaboration between Sony and PROPHESEE, uses a standard V4L2 driver with added support for Crosslink-NX built within the kernel. It further comes with an additional plugin, leveraging the powerful Prophesee Metavision® software suite to process and visualize event data from the image sensor. Additionally, 10 ready made custom software controls are included to assist while evaluating the IMX636 in your embedded systems environments.

Scope of the Package
- Platform and device drivers for Linux for Tegra
- NVIDIA® Jetpack 5.1 / L4T 35.2.1
- V4L2 based subdevice drivers (low-level C API)
- Metavision® Intelligence Suite plugin
- Displaying examples using Metavision® Intelligence Suite (separate download)

Supported Platforms
- NVIDIA® Jetson AGX Orin™ Developer Kit
- NVIDIA® Jetson AGX Xavier™ Developer Kit

Parameterization
- Sensor Controls: ROI, all Biases
- Packetizer: H/V-Blankings
- Operation Mode: Master (**Slave)

PROPHESEE plugin support
Based on Metavision® 3.1.2, supports:

- Crosslink-NX blankings through Horizontal/Vertical blanking controls
- Analog Region of Interest (ROI)
- Digital cropping control
- Bias controls for tuning event generation thresholds
- Serial number discovery through EEPROM
- Analytics information (acquired, processed, dropped frames data)

**Slave mode is supported at the image sensor level and can be implemented on request.
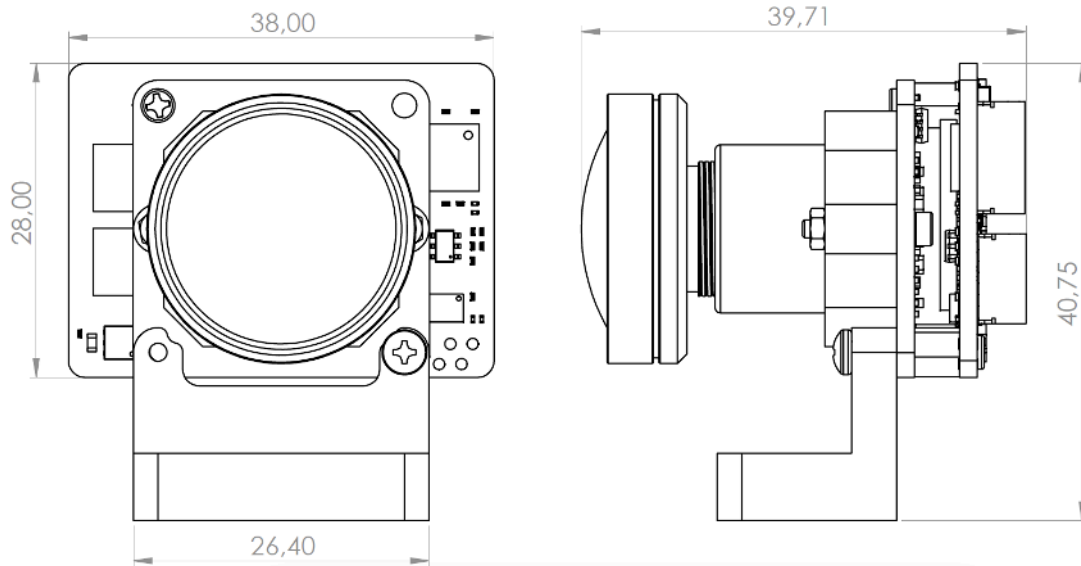
Online Resources

Additional product documentation can be found at:
www.framos.com/fsm-startup.

Application Notes:

Additional support and learning resources can be found at:
https://support.framos.com.

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Physical Dimensions

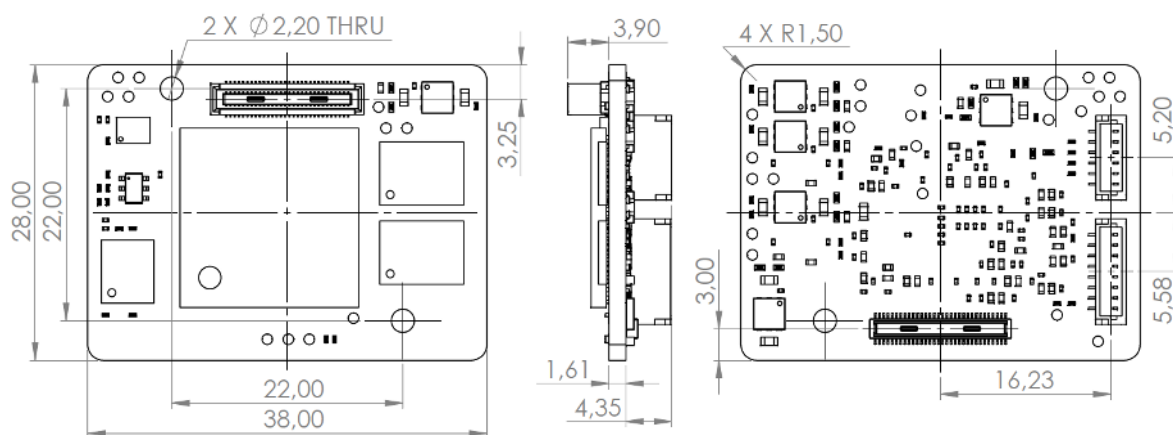View: EVS bundle in the FSM-IMX636 Devkit, front and side profiles.

Physical Attributes
Mechanical size (H x W x D): **40.75 x 38 x 39.71 mm
**EVS board alone stands 28 mm high
Weight: 51.2 g

View: EVS bundle FSA with Crosslink NX FPGA. All GMT measurements listed in millimeters.

> **NOTE** Additional information surrounding the FPA and PixelMate™ can be found in the FRAMOS Sensor Module Ecosystem User Manual. See "Online Resources".

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Packaging Dimensions

Product will arrive packaged with the front assembly seen in Physical Dimensions, pre-assembled. The ESD packaging will contain items seen in the Bill of Materials. See Ordering Information for more details.

> **NOTE** In the event of additional components or product enhancements occuring over the period of the product lifecycle, packaging may alter from the dimensions specified.

107 mm

147 mm
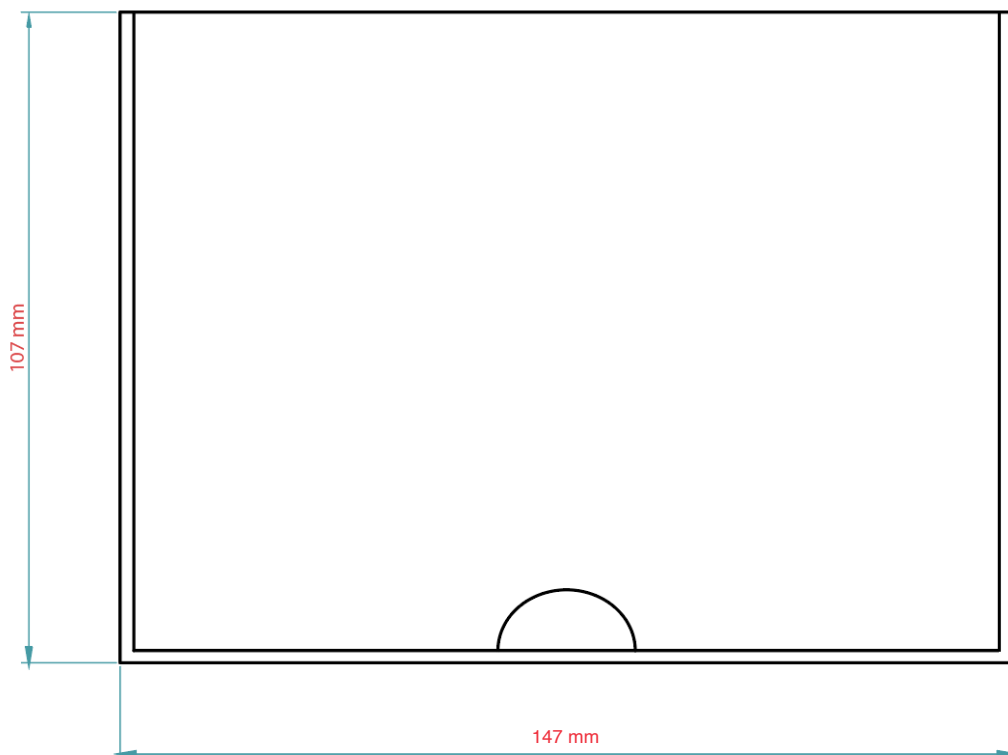
Ordering Information:

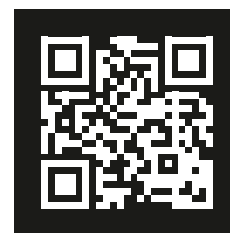**Order Code:** FSM-IMX636E/TXA_Devkit-Single-V1A

ITEM	Description	QTY
FSM-IMX636E/TXA_Devkit-Single-V1A	FSM with Sony ® IMX636, stacked onto FSA with Crosslink NX FPGA. Focused lens (passive aligned), optics, tripod with screws	1
FMA-FC-150/60-v1a	Flex Cable, PixelMate™ (CSI-2), 150 mm.	1
FPA-4.A/TXA-v1b	Processor Adapter with 4x PixelMate™ to NVIDIA® Jetson™ developer kits.	1
FMA-CBL-FL-150/8-V1A	Cable (included for flashing)	1
Quick Start Guide	Printed in box with instructions, references and disclaimer	1

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Contact Information

FRAMOS GmbH

Technical Support: support@framos.com
Website: https://www.framos.com

About FRAMOS | FRAMOS is an imaging expert, trusted advisor, and vision solutions provider. Since 1981, FRAMOS implements the best current and emerging imaging technologies to address specific customer requirements and applications. FRAMOS meets these requirements with advanced and proven imaging components from a global network of renowned partners and with FRAMOS IP.

More than 180 FRAMOS employees world-wide are passionate about the unlimited potential of imaging and help customers achieve the optimum results from every possible scenario. FRAMOS drives and ensures the entire product development journey from POC, through prototyping, to mass production. FRAMOS carefully selects imaging components, like image sensors, lenses, or various 3D technologies, and offers custom developments tailored to individual needs and time frames.

FRAMOS listens to, and understands, customer challenges. With innovative solutions FRAMOS ensures successful project outcomes and develops long-term customer relations.

For more information visit: www.framos.com, LinkedIn or Twitter.

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Certification and Standards

The equipment described in this document is designed for evaluation and laboratory use, as well as for the integration into electronic devices. The customer is responsible to take all necessary precautions to fulfil regulations and laws of end-customer and target market.

Technical Support

The technical equipment described in this document, be it hardware or software, is delivered as it is and does not include any obligations to FRAMOS to provide technical customer support. Technical support is granted on a per-project basis arbitrary by FRAMOS.

Handling ESD Sensitive Components

The electronic components like Printed Circuit Boards (PCB) described in this document are sensitive to Electrostatic Discharge (ESD) and need to be handled with high care in static controlled environments. It is strongly recommended to follow the general handling practices for ESD sensitive parts, that include, but are not limited to, the following points:

- Treat all PCBs and components as ESD sensitive.
- Assume that you will damage the PCB or component if you are not ESD conscious.
- Handling areas must be equipped with a grounded table, floor mats and wrist strap.
- A relative humidity level must be maintained between 20% and 80% non-condensing.
- PCBs should not be removed from their protective package, except in a static controlled   location.
- PCBs must be handled only after personnel have grounded themselves via wrist straps and   mats.
- PCBs or components should never come in contact with clothing.
- Try to handle all PCBs only by their edges, preventing contact with any components.

FRAMOS is not responsible for ESD damage caused by misuse.

Life Support Applications

These products are not designed for use in life support systems, appliances, or devices where malfunction of the products can reasonably be expected to result in personal injury. Customers, Integrators and End Users using or selling these products for use in such applications do so at their own risk and agree to fully indemnify FRAMOS for any damages resulting from any improper use or sale.

> **WARNING** This kit contains electrostatic-sensitive devices (ESD). Observe ESD handling precautions to avoid damaging the equipment.

CE-Declaration

This equipment is in compliance with the essential requirements and other relevant provisions of the following RoHS Directives: Directive 2011/65/EU and (EU) 2015/863.

RoHS

The RoHS Directive (Restriction of Hazardous Substances) complements the WEEE Directive by severely restricting the presence of specific toxic substances in electronic equipment at the design phase, thereby reducing the environmental impact of discarding such products at the end of their useful life. FRAMOS Technologies d.o.o. is committed to complying with this Directive and has worked in collaboration with its suppliers to evaluate the new restrictions, to identify relevant exemptions, and to substitute environmentally benign, compliant alternative materials in its product components and manufacturing processes. Subject to the available exemptions, FRAMOS Technologies d.o.o. products were compliant with the RoHS Directive for its products.

Materials declarations comply with EN 63000:2018 requirements for RoHS Technical Documentation.
EU Declaration of conformity according to RoHS are issued on customer demand.

REACH

FRAMOS neither manufactures nor imports chemical substances.
FRAMOS is well aware of:

- The requirements of REACH regulation of the European Council (EC) No. 1907/2006.
- The SVHC Candidate List.
- Our obligations concerning safety datasheets as well as informing customers.

WEEE

The WEEE Directive obliges manufacturers, importers, and/or distributors of electronic equipment to label the equipment for recycling and to provide for recycling of the electronic equipment at the end of its useful life. FRAMOS is committed to complying with the WEEE Directive (as implemented in each EU member state). In accordance with the requirements of the Directive, FRAMOS Technologies d.o.o. has labelled its electronic products that are shipped. The WEEE label and instructions for disposal are as follows:

Instructions for Disposal of Waste Equipment by Users in the European Union

This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of electrical waste and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your consumer waste equipment for recycling, please contact your local city recycling office or the dealer from whom you originally purchased the product.

Electro Magnetic Compliance (EMC)

The FRAMOS Sensor Module Ecosystem are OEM components/devices and are provided at the open board level. Electrical components with open design do not comply with standards for electromagnetic compatibility as the unshielded circuitry enables electromagnetic interference with other electronic devices.

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