



LEOPARD IMAGING INC

LI-NANO-CB-IMX274CS-X

Data Sheet

Key Features

- Compatible with Nvidia® Jetson NANO™
- MIPI CSI-2 interface
- Support up to four cameras (2-lane mode)
- Sony Diagonal 7.20 mm (Type 1/2.5) CMOS Image Sensor IMX274
- Active pixels: 3864H x 2196V
- Pixel size: 1.62 um x 1.62 um
- Color camera
- Support 3840 x 2160 (4K) @ 30fps and 1920 x 1080 @ 60fps
- Support PoE (options)
- I-PEX cable part#: FAW-1233-03
- Length of the I-PEX cable: 300mm
- Support multiple length cables
- MIPI connector part#: 20525-030E-02C
- Support CS lens
- Provide driver binary and source code
- Provide customization services
- Part#:

LI-NANO-CB-IMX274CS-X

LI-NANO-CB-POE-IMX274CS-X



Lens Spec

- Model: ES0522F.IR
- Focal length: 5.0 mm
- Aperture, F/#: 2.2
- FOV (D/H/V): 87 °/ 76 °/43 °
- TV Distortion: < -8%
- Mount Type: CS

BOM

#	Items	QTY
1	LI-NANO-CB V1.2 or LI-NANO-CB-POE V1.2	1
2	Nvidia Jetson Nano SOM	1
3	LI-IMX274-MIPI-CS	1,2,3 or 4
4	FAW-1233-03 cable	1,2,3 or 4
5	DC 12V power supply	1
6	USB 2.0 Type A - Micro B cable	1



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Order Information

LI-NANO-CB-IMX274CS / LI-NANO-CB-POE-IMX274CS

BOM

#	Items	QTY
1	LI-NANO-CB or LI-NANO-CB-POE	1
2	Nvidia Jetson Nano SOM	1
3	LI-IMX274-MIPI-CS	1
4	FAW-1233-03 cable	1
5	DC 12V power supply	1
6	USB 2.0 Micro B cable	1



LI-NANO-CB-IMX274CS-D / LI-NANO-CB-POE-IMX274CS-D

BOM

#	Items	QTY
1	LI-NANO-CB or LI-NANO-CB-POE	1
2	Nvidia Jetson Nano SOM	1
3	LI-IMX274-MIPI-CS	2
4	FAW-1233-03 cable	2
5	DC 12V power supply	1
6	USB 2.0 Micro B cable	1



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LI-NANO-CB-IMX274CS-T / LI-NANO-CB-POE-IMX274CS-T

BOM

#	Items	QTY
1	LI-NANO-CB or LI-NANO-CB-POE	1
2	Nvidia Jetson Nano SOM	1
3	LI-IMX274-MIPI-CS	3
4	FAW-1233-03 cable	3
5	DC 12V power supply	1
6	USB 2.0 Micro B cable	1



LI-NANO-CB-IMX274CS-Q / LI-NANO-CB-POE-IMX274CS-Q

BOM

#	Items	QTY
1	LI-NANO-CB or LI-NANO-CB-POE	1
2	Nvidia Jetson Nano SOM	1
3	LI-IMX274-MIPI-CS	4
4	FAW-1233-03 cable	4
5	DC 12V power supply	1
6	USB 2.0 Micro B cable	1



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Register Information

Device (on LI-NANO-CB)	I2C address (7-bit)
tca9548 (I2C switcher)	0x70
J13 (CAM1)	0x00
J3 (CAM2)	0x01
J25 (CAM3)	0x02
J26 (CAM4)	0x03

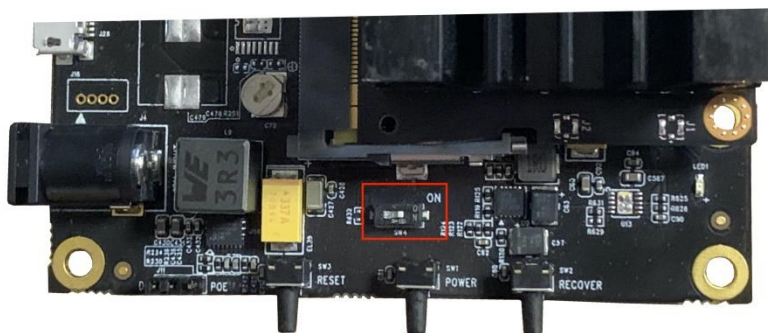
Device (on LI-IMX274-MIPI)	I2C address (7-bit)
tca9570 (I/O Expander for IRC switcher)	0x24
IMX274 sensor	0x1a

Power Consumption

Opened Cameras	Power consumption
No camera	Around 200mA @ 12V
1 camera (3840x2160@30fps)	Around 400mA @ 12V
2 cameras (3840x2160@30fps)	Around 570mA @ 12V
3 cameras (3840x2160@30fps)	Around 750mA @ 12V
4 cameras (3840x2160@30fps)	Around 930mA @ 12V

Auto Boot

SW4	Boot mode
ON	Manual boot
OFF	Auto boot

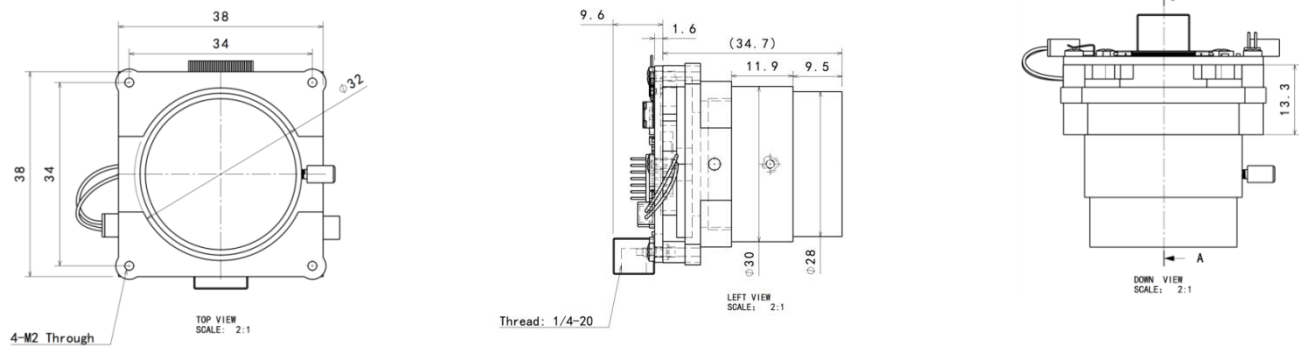


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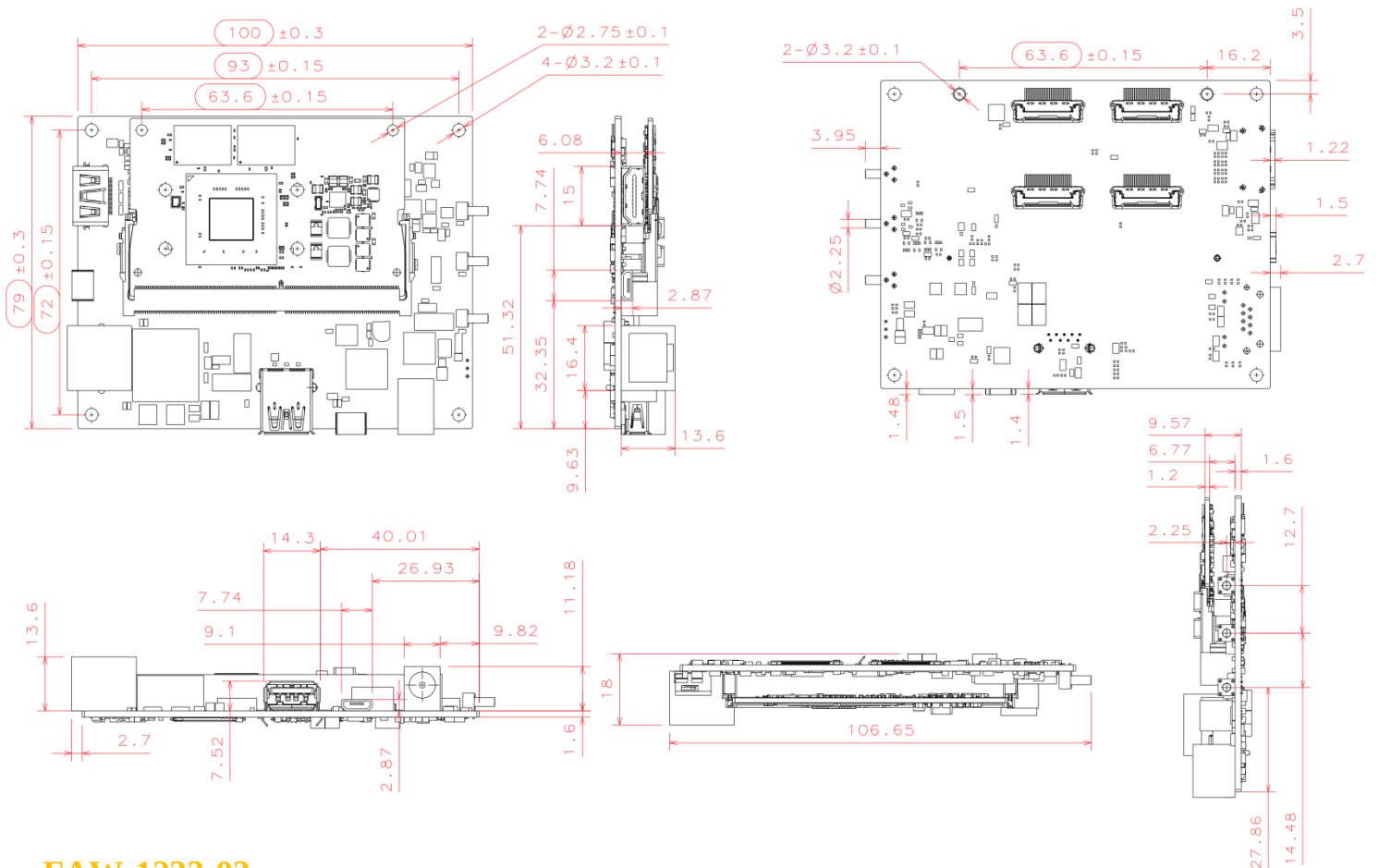
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Dimensions

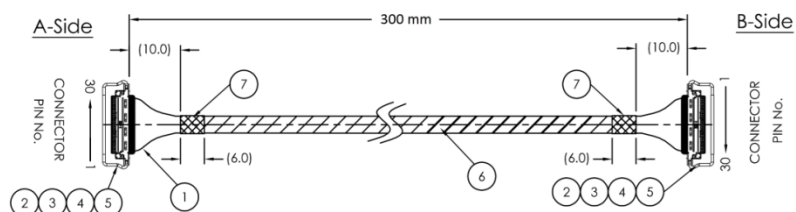
LI-IMX274-MIPI-CS



LI-NANO-CB / LI-NANO-CB-POE

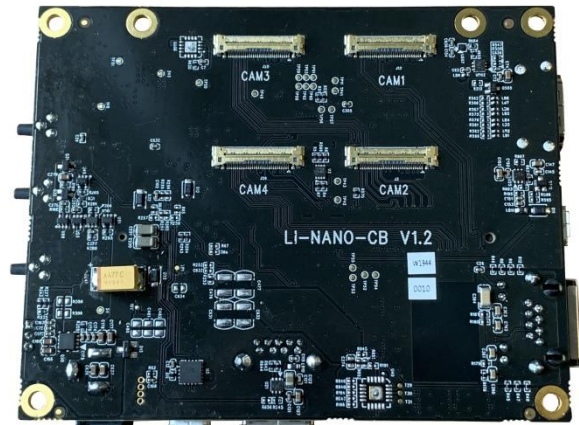
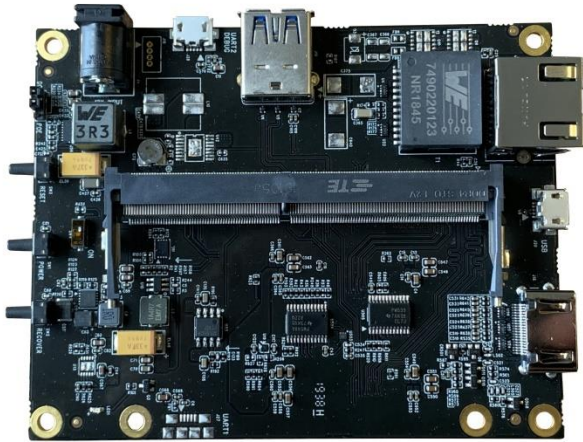


FAW-1233-03



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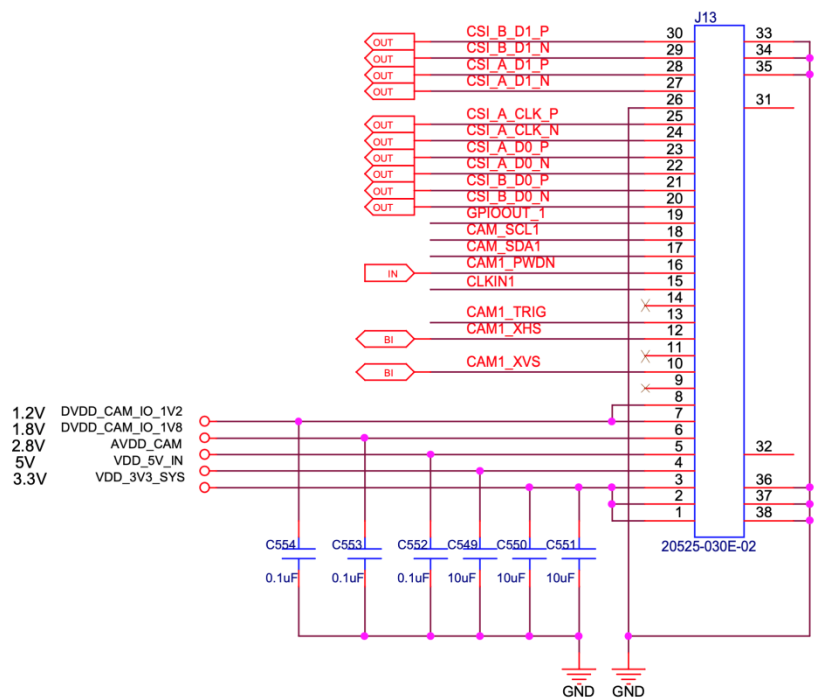
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Camera Interfaces

Interface J13 (CAM1)

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-xx
- MIPI lane: 4 (the current driver support 2-lane)

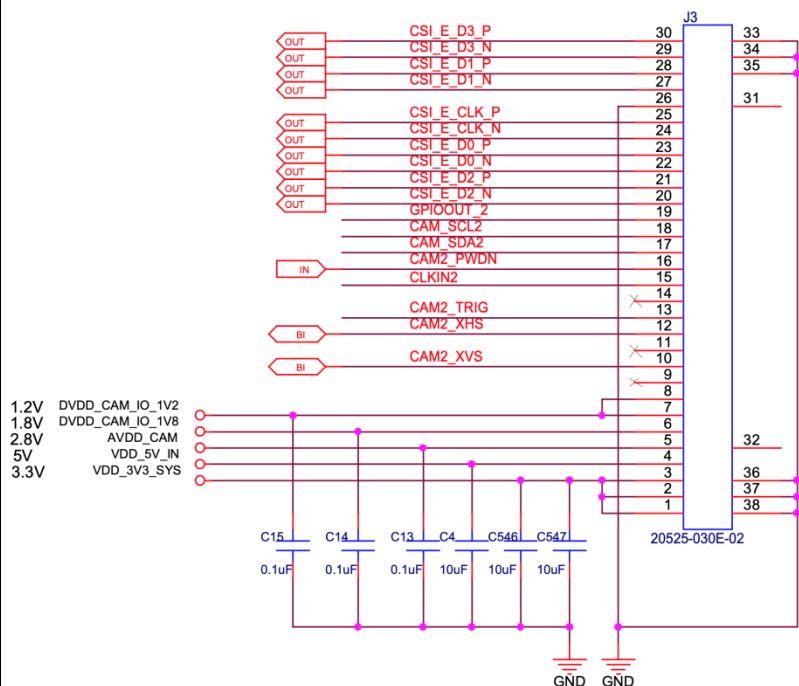


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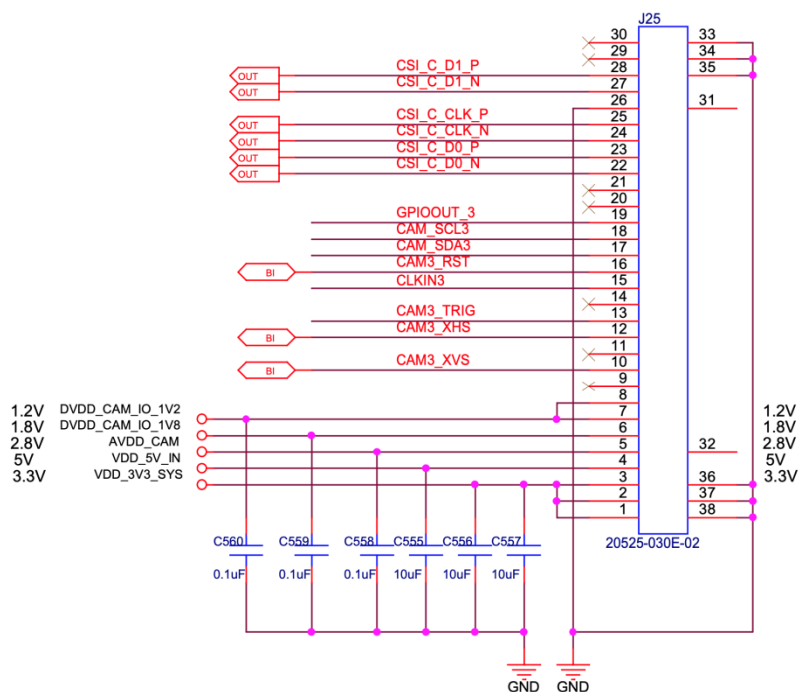
Interface J3 (CAM2)

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-xx
- MIPI lane: 4 (the current driver support 2-lane)



Interface J25 (CAM3)

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-xx
- MIPI lane: 2

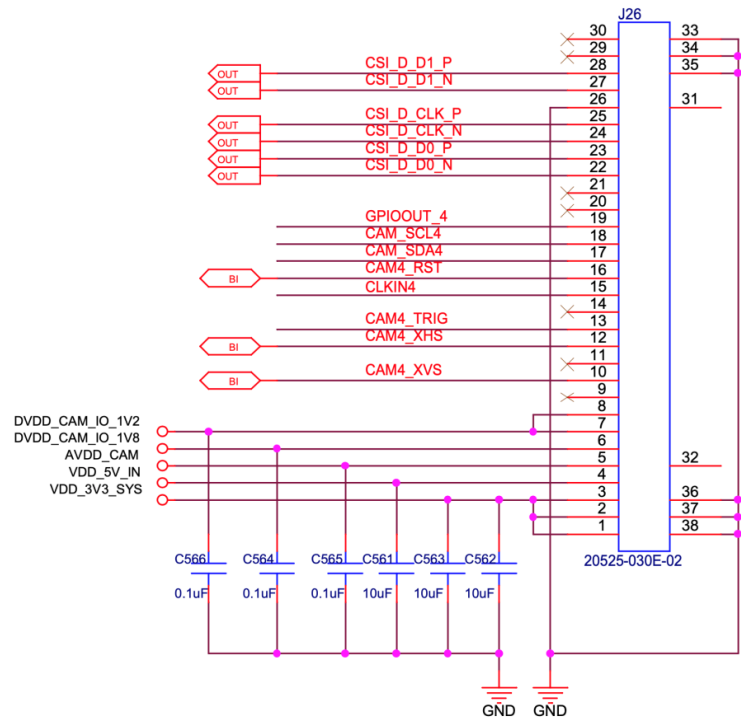


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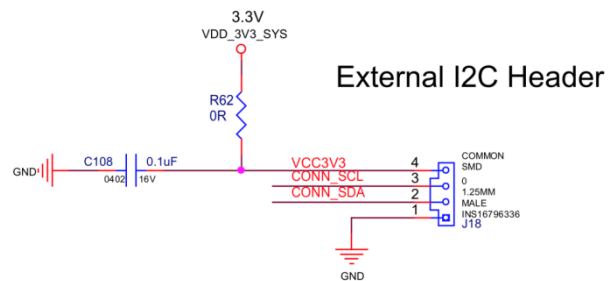
Interface J26 (CAM4)

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-xx
- MIPI lane: 2



Interface J18 (I2C header)

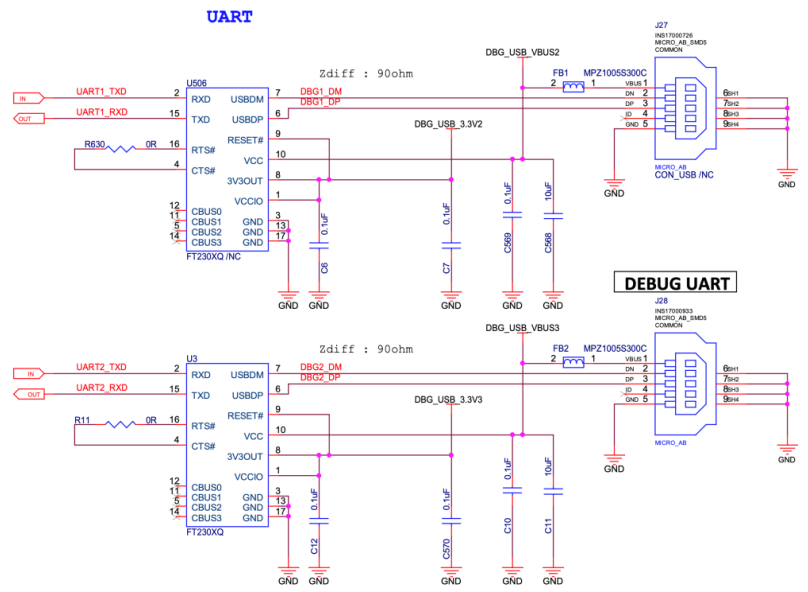
- Number of Positions: 4
- Pitch: 1.25mm



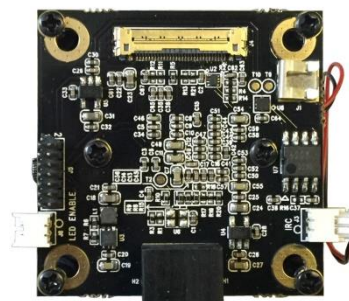
J27, J28 (UART)

- USB 2.0 micro-B interface

Note: R27 is not populated.



LI-IMX274-MIPI-CS



Camera Spec	
Image Sensor	Sony Diagonal 7.20 mm (Type 1/2.5) CMOS Image Sensor IMX274
Optical format	1/2.5"
Number of active pixels	3864 (H) x 2196 (V)
Pixel size	1.62um (H) x 1.62um (V)
Color or Mono	Color
Interface	MIPI interface
Lens mount	CS
IR cut switcher	Support
Weight	58 g
Interfaces	
Interface J2: - Part#: 20525-030E-02C - Number of Positions: 30 - Pitch: 0.4mm - Mating I-PEX cable: FAW-1233-03 (300mm)	
Interface J3: - Part#: 1734829-2 - Number of Positions: 2 - Pitch: 1.25mm	
Interface J5: - Part#: 1734829-2 - Number of Positions: 2 - Pitch: 1.25mm	



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Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage (Analog)	V_{ADD}^{*1}	-0.3 to +3.3	V
Supply voltage (Digital 1)	V_{DDD1}^{*2}	-0.5 to +2.0	V
Supply voltage (Digital 2)	V_{DDD2}^{*3}	-0.5 to +3.3	V
Input voltage (Digital)	V_I	-0.3 to $V_{DDD2} + 0.3$	V
Output voltage (Digital)	V_O	-0.3 to $V_{DDD2} + 0.3$	V
Guaranteed operating temperature	T_{OPR}	-30 to +75	°C
Storage guarantee temperature	T_{STG}	-30 to +80	°C
Performance guarantee temperature	T_{SPEC}	-10 to +60	°C

Recommended Operating Conditions

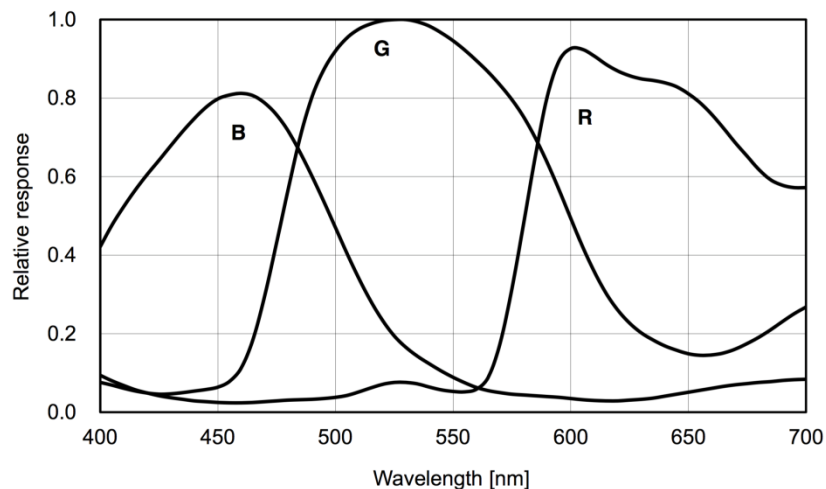
Item	Symbol	Rating	Unit
Supply voltage (Analog)	V_{ADD}^{*1}	2.8 ± 0.1	V
Supply voltage (Digital 1)	V_{DDD1}^{*2}	1.2 ± 0.1	V
Supply voltage (Digital 2)	V_{DDD2}^{*3}	1.8 ± 0.1	V
Input voltage (Digital)	V_I	-0.1 to $V_{DDD2} + 0.1$	V

*1 V_{ADD} : V_{DDSUB} , V_{DDHCM} , V_{DDHPX} , V_{DDHDA} , V_{DDHCP} (2.8 V power supply)

*2 V_{DDD1} : V_{DDLSCN} , V_{DDLSC1} to 2, V_{DDLPA} , V_{DDLPL1} , V_{DDLPL2} to 3, V_{DDLIF} (1.2 V power supply)

*3 V_{DDD2} : V_{DDMIO} , V_{DDMIF} (1.8 V power supply)

Spectral Sensitivity Characteristics



DC Characteristics

Current Consumption and Gain Vatriable Range

($V_{ADD} = 2.9\text{ V}$, $V_{DDD1} = 1.3\text{ V}$, $V_{DDD2} = 1.9\text{ V}$, $T_j = 60\text{ }^{\circ}\text{C}$, Reference Gain (0 dB)

All pixel scan mode (MODE0), 29.97 frame/s)

Item	Symbol	Min.	Typ.	Max	Unit	Remarks
Current consumption (Analog)	I_{ADD}	—	—	62	mA	
Current consumption (Digital 1)	I_{DDD1}	—	—	190	mA	
Current consumption (Digital 2)	I_{DDD2}	—	—	1	mA	
Standby current (Analog)	I_{ADDSTB}	—	—	35	μA	In the dark
Standby current (Digital 1)	$I_{DDD1STB}$	—	—	13	mA	In the dark
Standby current (Digital 2)	$I_{DDD2STB}$	—	—	20	μA	In the dark
PGA gain variable range	PGAG	0	—	27	dB	

Supply Voltage and I/O Voltage

Item		Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Analog	V _{DDSUB} , V _{DDHCM} , V _{DDHPX} , V _{DDHDA} , V _{DDHCP}	V _{ADD}	2.70	2.80	2.90	V
	Digital 1	V _{DDL} LCN, V _{DDL} LSC1 to 2, V _{DDL} LPL1, V _{DDL} LPA, V _{DDL} LPL2 to 3, V _{DDL} LIF	V _{DDD1}	1.10	1.20	1.30	V
	Digital 2	V _{DD} MIO, V _{DD} MIF	V _{DDD2}	1.70	1.80	1.90	V
Digital input voltage		SDA, SCL	V _I H1	0.7 × V _{DDD2}	—	1.9	V
			V _I L1	−0.3	—	0.3 × V _{DDD2}	V
		XCLR, INCK	V _I H2	0.65 × V _{DDD2}	—	V _{DDD2} + 0.3	V
			V _I L2	−0.3	—	0.35 × V _{DDD2}	V
Digital output voltage		XHS, XVS	V _{HV} OUT	—	V _{DDD2}	—	V

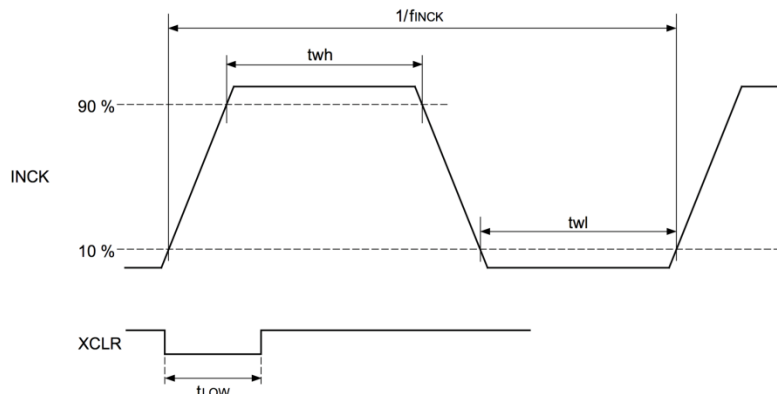


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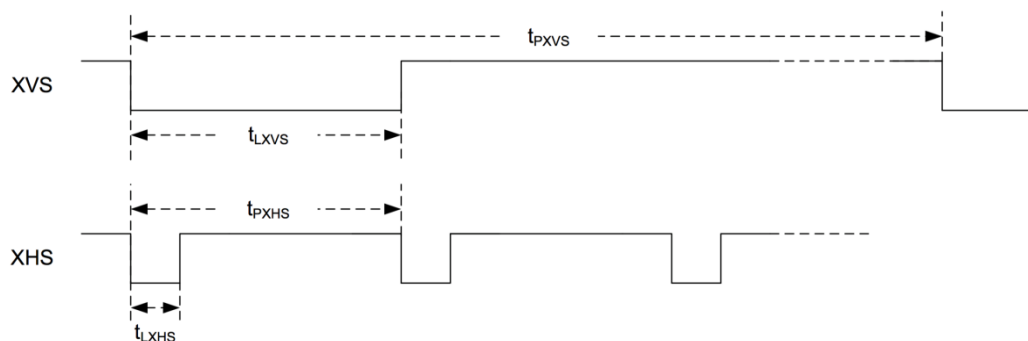
AC Characteristics

INCK, XCLR



Item	Symbol	Min.	Typ.	Max.	Unit
INCK clock frequency	f_{INCK}	6	—	27	MHz
INCK Low level pulse width	t_{wl}	5	—	—	ns
INCK High level pulse width	t_{wh}	5	—	—	ns
Clock duty	—	40	50	60	%
XCLR Low level pulse width	t_{LOW}	100	—	—	ns

XHS, XVS (Output)



Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
XHS Low level pulse width	t_{LXHS}		222		ns	16 clk@72MHz
XHS pulse period	t_{PXHS}		$HMAX^{*1}$		clk@72MHz	
XVS Low level pulse width	t_{LXVS}		t_{PXHS}		clk@72MHz	
XVS pulse period	t_{PXVS}		$HMAX^{*1} \times VMAX^{*2}$		clk@72MHz	

^{*1} The value set as HMAX (address 30F6h, bit [7:0] and address 30F7h, bit [7:0])

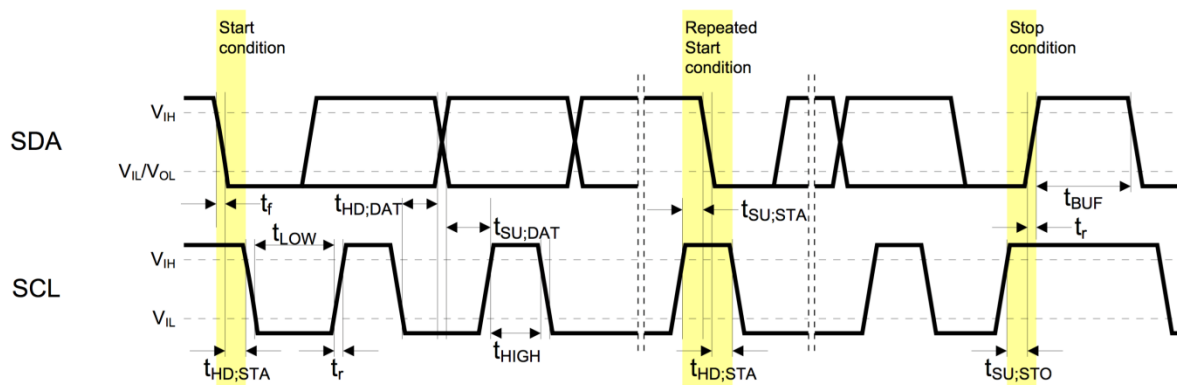
^{*2} The value set as VMAX (address 30F8h, bit [7:0], address 30F9h, bit [7:0] and address 30FAh, bit [3:0]).



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I²C Communication



I²C Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Low level input voltage	V_{IL}	-0.3	—	$0.3 \times V_{DD2}$	V	
High level input voltage	V_{IH}	$0.7 \times V_{DD2}$	—	1.9	V	
Low level output voltage	V_{OL}	0	—	$0.2 \times V_{DD2}$	V	$V_{DD2} < 2\text{ V}$, Sink 3 mA
Output fall time	t_{of}	—	—	250	ns	Load 10 pF to 400 pF, $0.7 \times V_{DD2}$ to $0.3 \times V_{DD2}$
Input current (SCL, SDA, XCLR, INCK)	I_i	-10	—	10	μA	$0.1 \times V_{DD2}$ to $0.9 \times V_{DD2}$
Input capacitance of SCL / SDA	C_i	—	—	10	pF	

I²C AC Characteristics

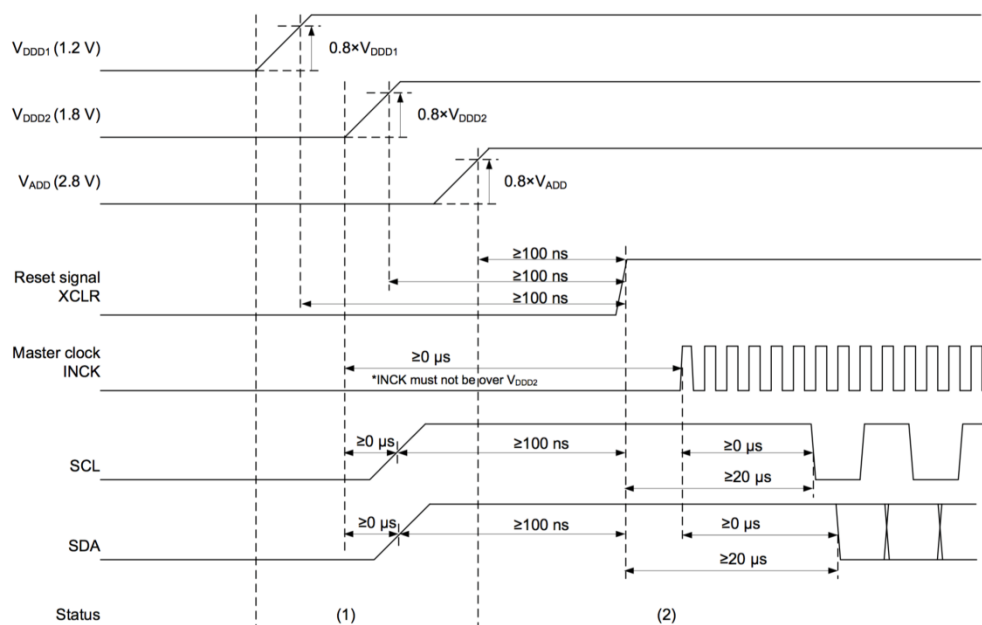
Item	Symbol	Min.	Typ.	Max.	Unit
SCL clock frequency	f_{SCL}	0	—	400	kHz
Hold time (Start Condition)	$t_{HD;STA}$	0.6	—	—	μs
Low period of the SCL clock	t_{LOW}	1.3	—	—	μs
High period of the SCL clock	t_{HIGH}	0.6	—	—	μs
Set-up time (Repeated Start Condition)	$t_{SU;STA}$	0.6	—	—	μs
Data hold time	$t_{HD;DAT}$	0	—	0.9	μs
Data set-up time	$t_{SU;DAT}$	100	—	—	ns
Rise time of both SDA and SCL signals	t_R	—	—	300	ns
Fall time of both SDA and SCL signals	t_F	—	—	300	ns
Set-up time (Stop Condition)	$t_{SU;STO}$	0.6	—	—	μs
Bus free time between a STOP and START Condition	t_{BUF}	1.3	—	—	μs



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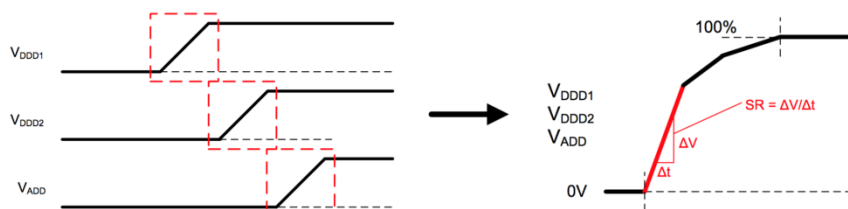
Power-on Sequence



Period name	Remarks
(1) Power stabilization period	All input signals are set to Low level. There are no constraints of the power-on sequence with V_{ADD} , V_{DD1} , and V_{DD2} .
(2) Register communication period for standby cancel	Wait 100 ns after the last power supply in V_{ADD} , V_{DD1} and V_{DD2} . Then set XCLR to "H" and start the standby cancel sequence.

Slew Rate Limitation of Power-on Sequence

Conform to the slew rate limitation shown below when power supply change 0 V to each voltage (0 % to 100 %) in power-on sequence.



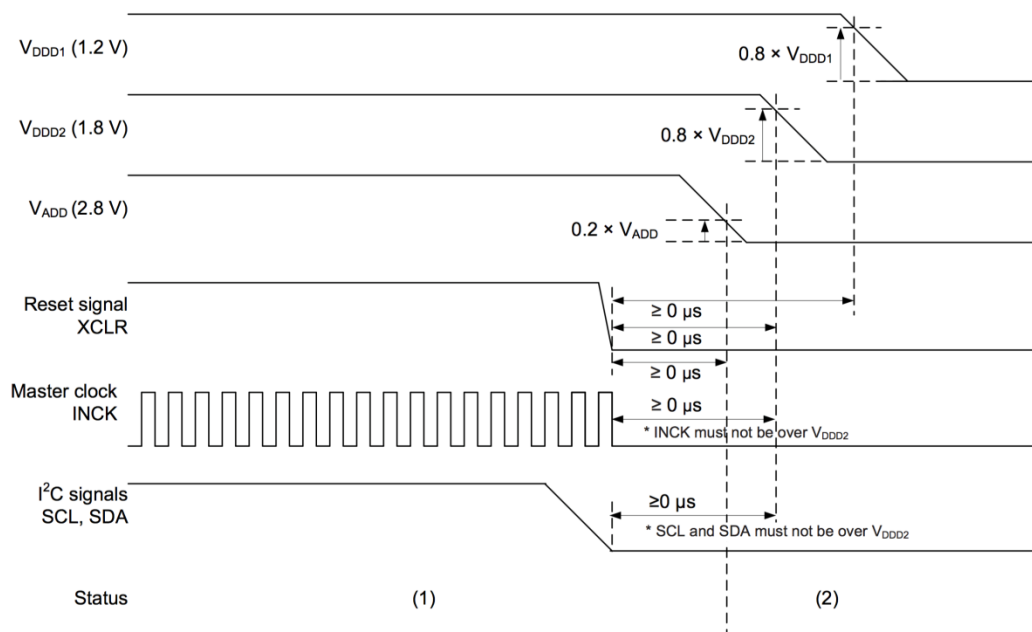
Item	Symbol	Power supply	Min.	Max.	Unit	Remarks
Slew rate	SR	V_{DD1} (1.2 V)	—	25	mV/us	
		V_{DD2} (1.8 V)	—	25	mV/us	
		V_{ADD} (2.8 V)	—	25	mV/us	



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Power-off Sequence



Period name	Remarks
(1) Pixel output period	Pixel signal output period
(2) Power-off period	Turn the power supplies off after all input signals are set to "Low" level except SCL and SDA. Set SCL and SDA to "Low" level at the same time with turning off the power supply of V_{DD2}. There are no constraints of the power-off sequence with V_{ADD}, V_{DD1}, and V_{DD2}.



Revision History

Revision	Description	Release Date
1.0	First Release	18. Nov. 2019
1.1	Added LI-NANO-CB-POE option	23. Nov. 2019
1.2	Add register info and power consumption	09. Dec. 2019



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