



LEOPARD IMAGING INC

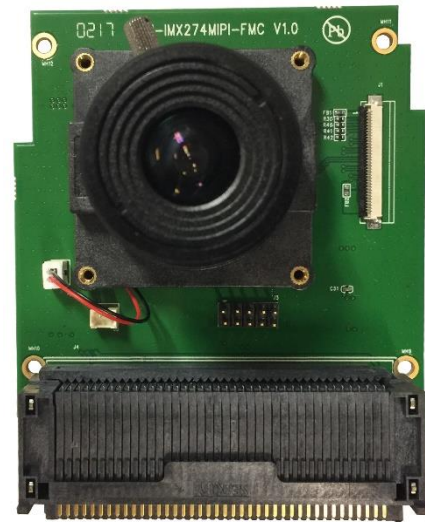
Rev. 1.3

# LI-IMX274MIPI-FMC

## Data Sheet

### Key Features

- Sony CMOS Image Sensor IMX274 with Square Pixel
- Image size: Diagonal 7.20 mm (Type 1/2.5)
- Active pixels: 3864H x 2196V
- Pixel size: 1.62  $\mu\text{m}$  x 1.62  $\mu\text{m}$
- Color sensor
- Interface: MIPI output
- 24MHz input clock
- Support Xilinx ZCU102 Evaluation Board
- Support IR cut switcher
- Support CS lens
- Camera FMC connector#: SEAM-40-01-L-10-2-RA-K-TR
- Module Size: 83mm x 69mm
- Weight: 100 g
- Part#: **LI-IMX274MIPI-FMC**

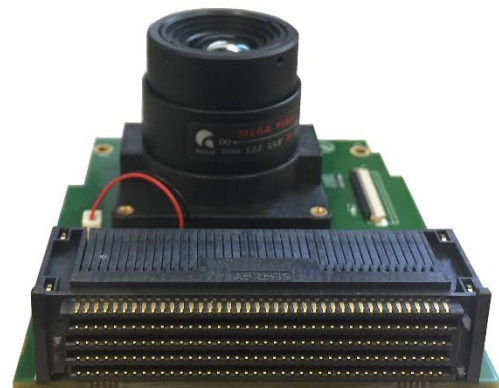


### Lens Spec

- Model: ES0522F.IR
- Focal length: 5.0 mm
- Aperture, F/#: 2.2
- Built in 650nm IR cut filter
- FOV (D/H/V): 87 ° / 76 ° / 43 °
- TV Distortion: < -8%
- Mount Type: CS

### BOM

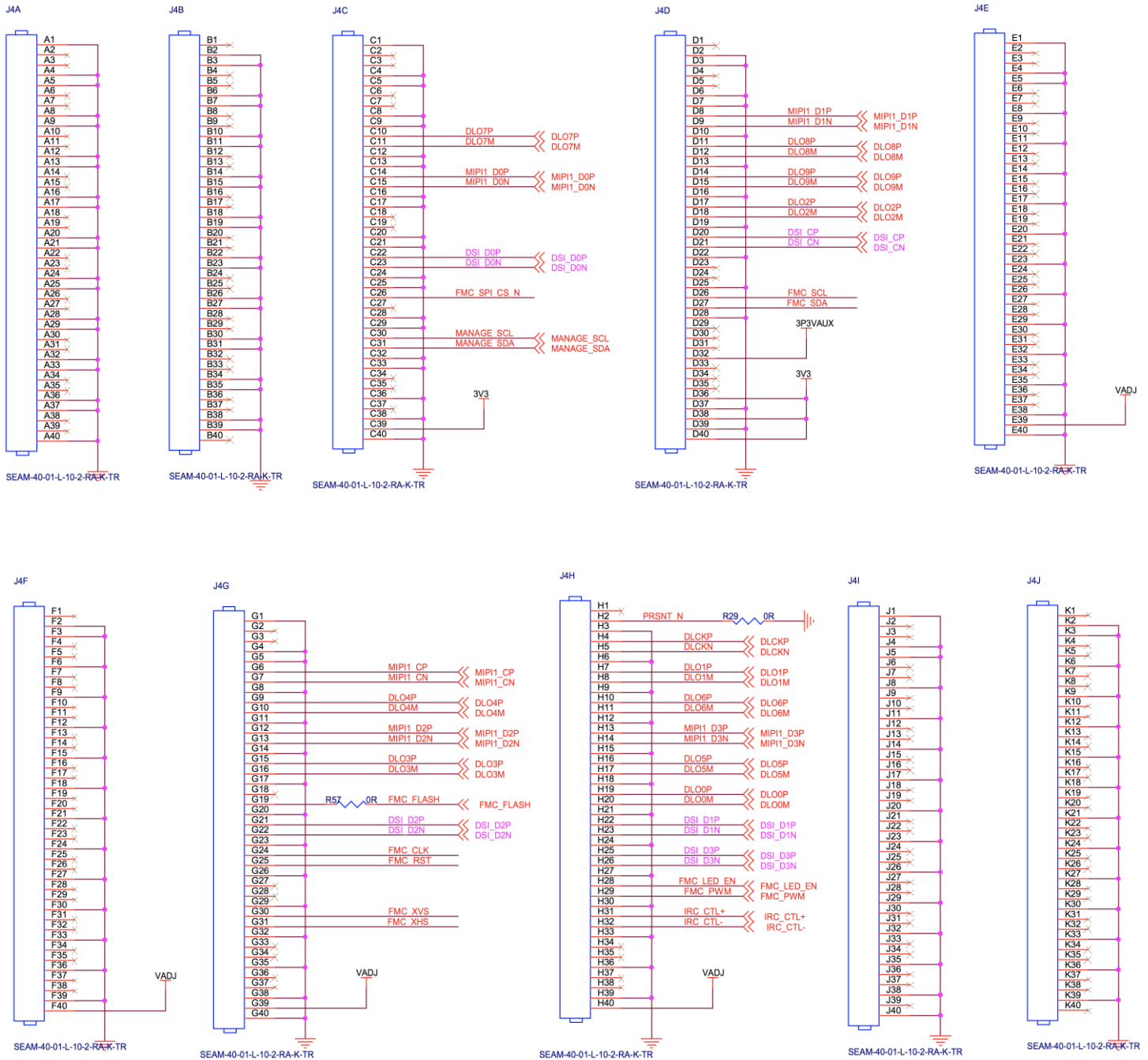
#	Items	QTY
1	LI-IMX274MIPI-FMC	1
2	GS5-38-30S lens mount	1
3	GS5B-2230-CS IRC switcher	1
4	ES0522F.IR lens	1



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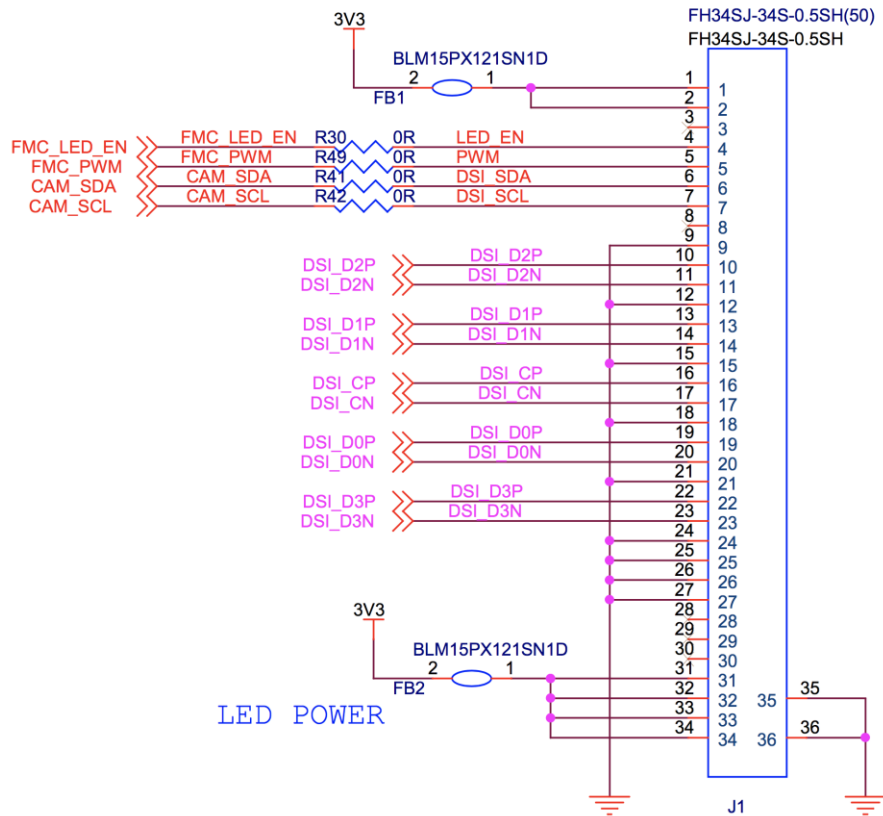
# FMC Connector Pin Assignment



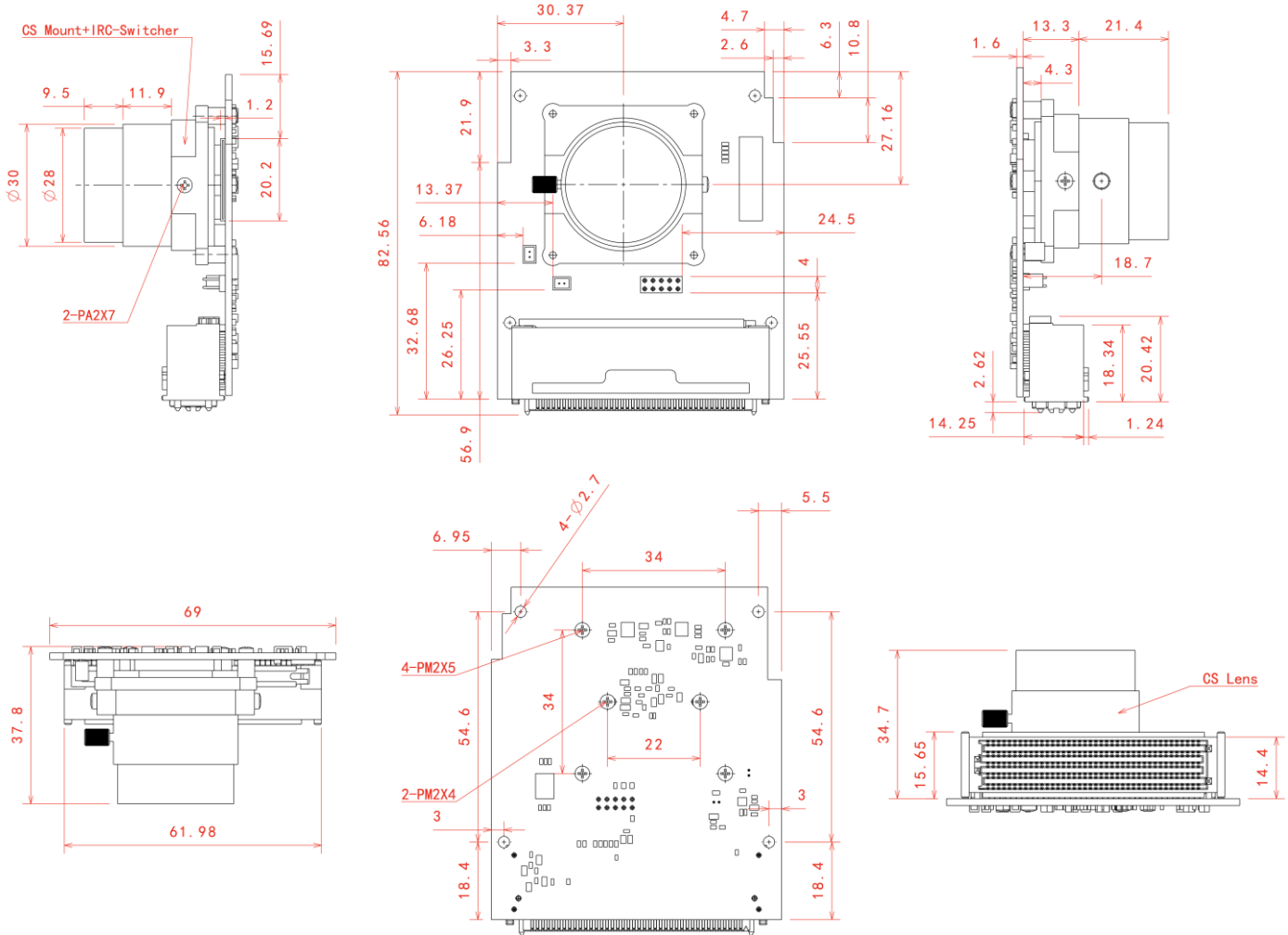
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# DSI Connector Pin Assignment



# Dimensions



# Support Xilinx ZCU102 Evaluation Board



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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

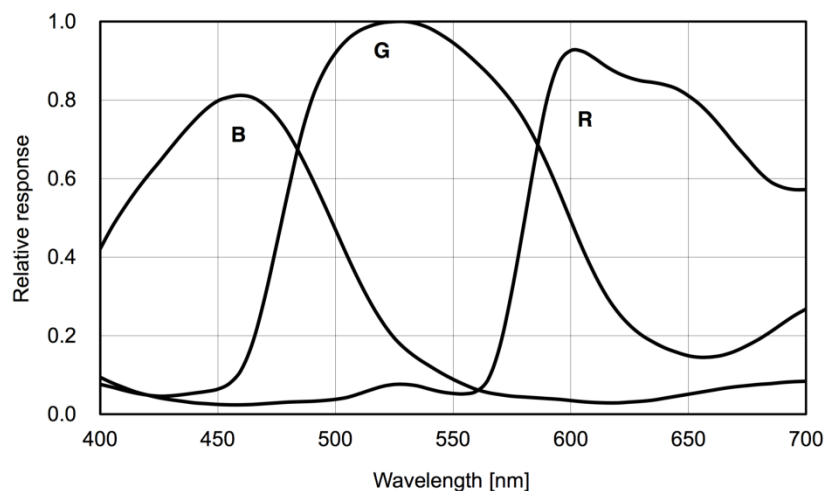
Item	Symbol	Rating	Unit
Supply voltage (Analog)	$V_{ADD}^{*1}$	$2.8 \pm 0.1$	V
Supply voltage (Digital 1)	$V_{DDD1}^{*2}$	$1.2 \pm 0.1$	V
Supply voltage (Digital 2)	$V_{DDD2}^{*3}$	$1.8 \pm 0.1$	V
Input voltage (Digital)	$V_I$	-0.1 to $V_{DDD2} + 0.1$	V

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

\*2  $V_{DDD1}$ :  $V_{DDL CN}$ ,  $V_{DDL SC1}$  to 2,  $V_{DDL PA}$ ,  $V_{DDL PL1}$ ,  $V_{DDL PL2}$  to 3,  $V_{DDL IF}$  (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 Variable 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	$\mu\text{A}$	In the dark
Standby current (Digital 1)	$I_{DDD1STB}$	—	—	13	mA	In the dark
Standby current (Digital 2)	$I_{DDD2STB}$	—	—	20	$\mu\text{A}$	In the dark
PGA gain variable range	PGAG	0	—	27	dB	

### Supply Voltage and I/O Voltage

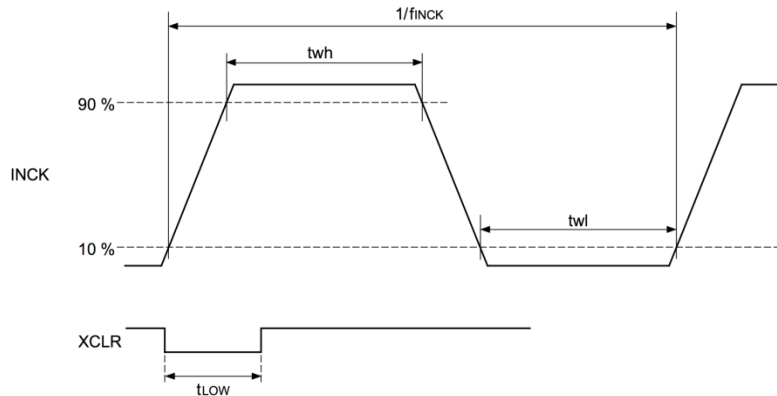
Item		Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Analog	$V_{DDSUB}$ , $V_{DDHCM}$ , $V_{DDHPX}$ , $V_{DDHDA}$ , $V_{DDHCP}$	$V_{ADD}$	2.70	2.80	2.90	V
	Digital 1	$V_{DDLGN}$ , $V_{DDLSC1}$ to 2, $V_{DDLPL1}$ , $V_{DDLPA}$ , $V_{DDLPL2}$ to 3, $V_{DDLIF}$	$V_{DDD1}$	1.10	1.20	1.30	V
	Digital 2	$V_{DDMIO}$ , $V_{DDMIF}$	$V_{DDD2}$	1.70	1.80	1.90	V
Digital input voltage	SDA, SCL		$V_{IH1}$	$0.7 \times V_{DDD2}$	—	1.9	V
			$V_{IL1}$	-0.3	—	$0.3 \times V_{DDD2}$	V
	XCLR, INCK		$V_{IH2}$	$0.65 \times V_{DDD2}$	—	$V_{DDD2} + 0.3$	V
			$V_{IL2}$	-0.3	—	$0.35 \times V_{DDD2}$	V
Digital output voltage	XHS, XVS		$V_{HVOUT}$	—	$V_{DDD2}$	—	V





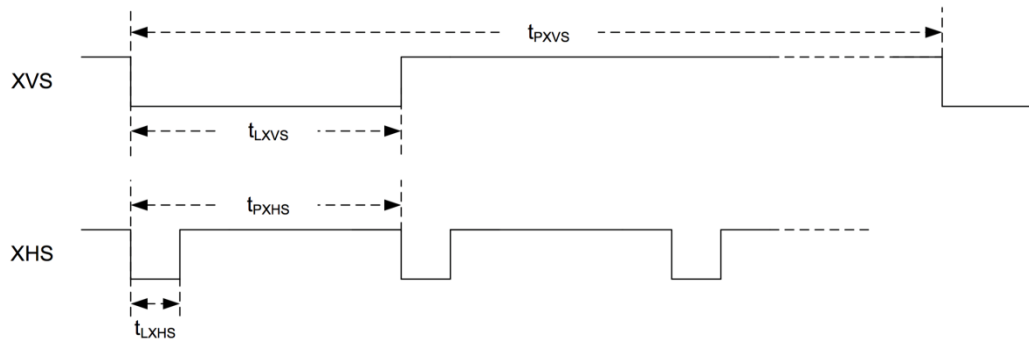
## AC Characteristics

### 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)



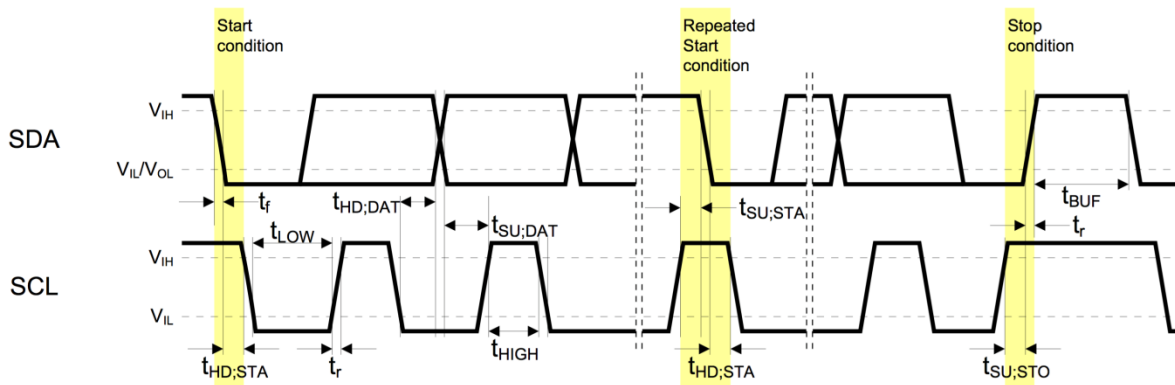
Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
XHS Low level pulse width	$t_{LXHS}$		222		ns	16 clk@72MHz
XHS pulse period	$t_{PXHS}$		$HMAX^{*1}$		clk@72MHz	
XVS Low level pulse width	$t_{LXVS}$		$t_{PXHS}$		clk@72MHz	
XVS pulse period	$t_{PXVS}$		$HMAX^{*1} \times VMAX^{*2}$		clk@72MHz	

\*<sup>1</sup> The value set as HMAX (address 30F6h, bit [7:0] and address 30F7h, bit [7:0])

\*<sup>2</sup> The value set as VMAX (address 30F8h, bit [7:0], address 30F9h, bit [7:0] and address 30FAh, bit [3:0]).



## I<sup>2</sup>C Communication



## I<sup>2</sup>C 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	$\mu\text{A}$	$0.1 \times V_{DD2}$ to $0.9 \times V_{DD2}$
Input capacitance of SCL / SDA	$C_i$	—	—	10	pF	

## I<sup>2</sup>C 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	—	—	$\mu\text{s}$
Low period of the SCL clock	$t_{LOW}$	1.3	—	—	$\mu\text{s}$
High period of the SCL clock	$t_{HIGH}$	0.6	—	—	$\mu\text{s}$
Set-up time (Repeated Start Condition)	$t_{SU,STA}$	0.6	—	—	$\mu\text{s}$
Data hold time	$t_{HD,DAT}$	0	—	0.9	$\mu\text{s}$
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	—	—	$\mu\text{s}$
Bus free time between a STOP and START Condition	$t_{BUF}$	1.3	—	—	$\mu\text{s}$





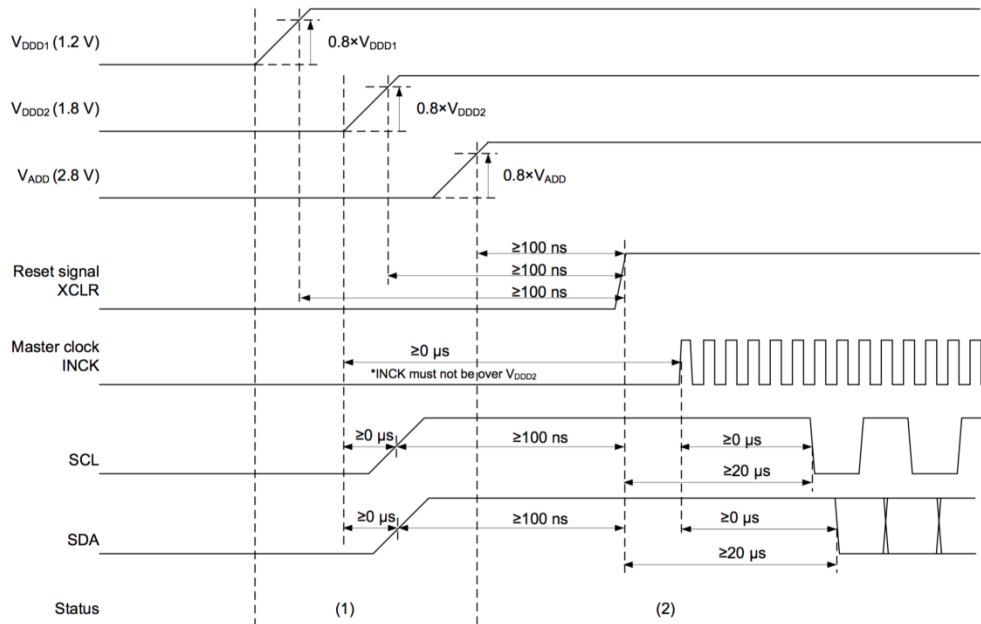
## Mode and Frame Rate

Readout Mode No.	Readout drive mode	Mode description
0	All-pixel scan mode (12-bit)	All pixels are readout with 12-bit output. This mode can be used together with the global reset shutter function according to the SMD register setting.
1	All-pixel scan mode (10-bit)	All pixels are readout with 10-bit output. This mode can be used together with the global reset shutter function according to the SMD register setting.
2	Horizontal/vertical 2/2-line binning (Horizontal and vertical weighted binning, 12-bit)	Horizontal and vertical direction 2-line weighted binning readout of pixels of the same color at the all-pixel scan area. (See the image of binning)
3	Horizontal/vertical 2/2-line binning (Horizontal and vertical weighted binning, 10-bit)	Horizontal and vertical direction 2-line weighted binning readout of pixels of the same color at the all-pixel scan area. (See the image of binning)
4	Horizontal/vertical 2/2-line binning Low power consumption drive	Horizontal and vertical direction 2-line binning readout of pixels of the same color at the all-pixel scan area. (See the image of binning)
5	Vertical 2/3 subsampling binning horizontal 3 binning	2 of every 3 lines in the vertical direction at the all-pixel scan area are added. Then, 3 pixels of the same color in the horizontal direction are added and output. (See the image of binning)
6	Vertical 2/8 subsampling horizontal 3 binning	2 of every 8 lines in the vertical direction at the all-pixel scan area are subsampled. Then, 3 pixels of the same color in the horizontal direction are added and output. (See the image of binning)

Readout mode No.	HMAX <sup>*1</sup> min value	VMAX <sup>*2</sup> min value	Max frame frequency [frame/s]	NTSC compatible drive				PAL compatible drive			
				HMAX <sup>*1</sup> [dec]	VMAX <sup>*2</sup> [dec]	SVR	Frame frequency [frame/s]	HMAX <sup>*1</sup> [dec]	VMAX <sup>*2</sup> [dec]	SVR	Frame frequency [frame/s]
0	493	4451	32.81	493	4872	0	29.98 <sup>*3</sup>	500	5760	0	25.00
1	263	4379	62.52	263	4550	0	60.17 <sup>*3</sup>	288	5000	0	50.00
2	493	2219	65.82	493	2436	0	59.95 <sup>*3</sup>	500	2880	0	50.00
3	260	2219	124.80	260	2310	0	119.88	288	2500	0	100.00
4	260	2219	124.80	260	2310	3	29.97	288	2500	3	25.00
5	260	1491	185.73	260	2310	0	119.88	288	2500	0	100.00
5 (60fps)				260	2310	1	59.94	288	2500	1	50.00
6	260	1111	249.26	260	1155	0	239.97	288	1250	0	200.00
6 (30fps)				260	1155	7	29.97	288	1250	7	25.00



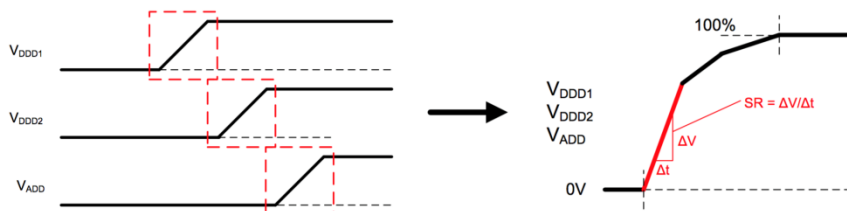
# Power-on Sequence



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 <sub>ADD</sub> , V <sub>DD1</sub> , and V <sub>DD2</sub> .
(2) Register communication period for standby cancel	Wait 100 ns after the last power supply in V <sub>ADD</sub> , V <sub>DD1</sub> and V <sub>DD2</sub> . 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.



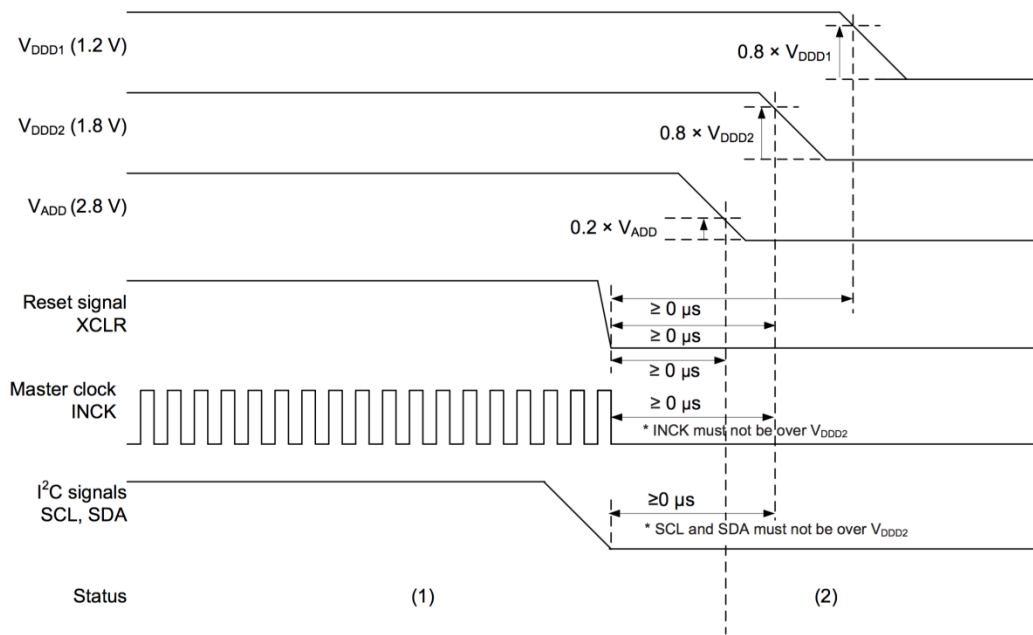
Item	Symbol	Power supply	Min.	Max.	Unit	Remarks
Slew rate	SR	V <sub>DD1</sub> (1.2 V)	—	25	mV/µs	
		V <sub>DD2</sub> (1.8 V)	—	25	mV/µs	
		V <sub>ADD</sub> (2.8 V)	—	25	mV/µs	



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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 <sub>DD2</sub> . There are no constraints of the power-off sequence with V <sub>ADD</sub> , V <sub>DD1</sub> , and V <sub>DD2</sub> .



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