



LEOPARD IMAGING INC

Rev 1.0

LI-XAVIER-KIT-IMX334CS-X

Data Sheet

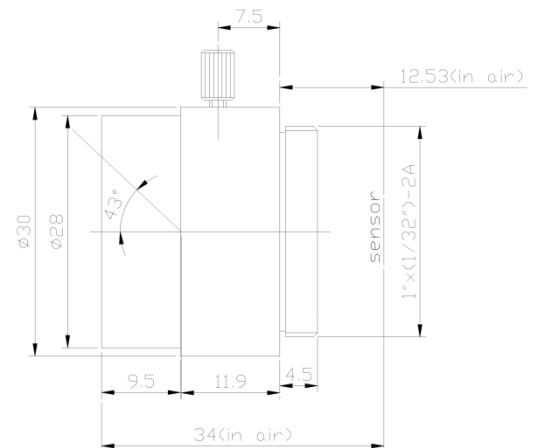
Key Features

- Compatible with Nvidia Jetson AGX Xavier Developer Kit
- MIPI CSI-2 interface
- Support two 4-lane cameras
- Diagonal 8.86 mm (Type 1/1.8) CMOS Image Sensor IMX334
- Active pixels: 3864H x 2176V
- Pixel size: 2.0 μm x 2.0 μm
- Color camera
- Length of the I-PEX cable: 300mm
- Support multiple length cables
- Support IR cut switch
- Support CS lens
- Provide customization services
- Part#:
(1 cam) **LI-XAVIER-KIT-IMX334CS**
(2 cam) **LI-XAVIER-KIT-IMX334CS-D**
(3 cam) **LI-XAVIER-KIT-IMX334CS-T**



Lens Spec

- Model: ES0522F.IR
- Focal length: 5.0 mm
- Aperture, F/#: 2.2
- FOV (D/H/V): 109 °/ 95 °/55 °
- TV Distortion: < -8%
- Mount Type: CS



BOM

Nvidia AGX Xavier Developer Kit not included

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX334-MIPI-CS	1,2 or 3
3	FAW-1233-03 cable	1,2 or 3



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LI-XAVIER-KIT-IMX334CS

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX334-MIPI-CS	1
3	FAW-1233-03 cable	1



LI-XAVIER-KIT-IMX334CS-D

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX334-MIPI-CS	2
3	FAW-1233-03 cable	2



LI-XAVIER-KIT-IMX334CS-T

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX334-MIPI-CS	3
3	FAW-1233-03 cable	3

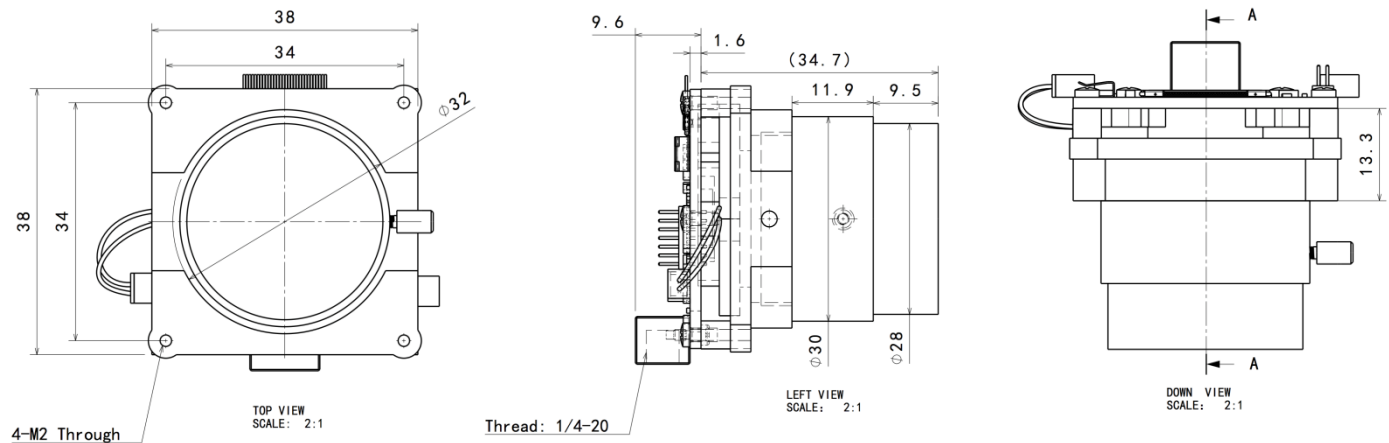


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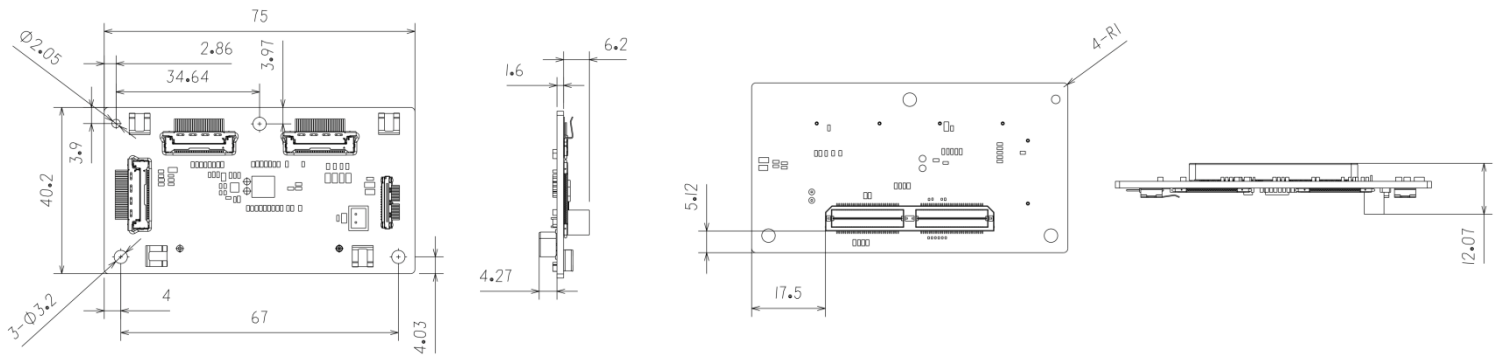
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Dimensions

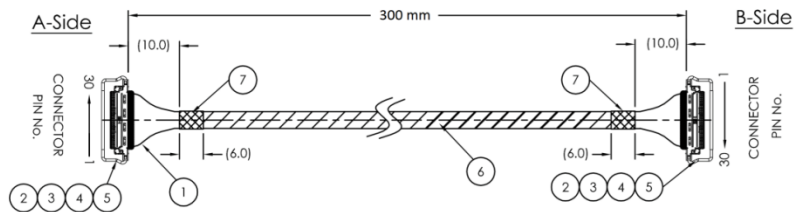
LI-IMX334-MIPI-CS



LI-JTX1-MIPI-ADPT



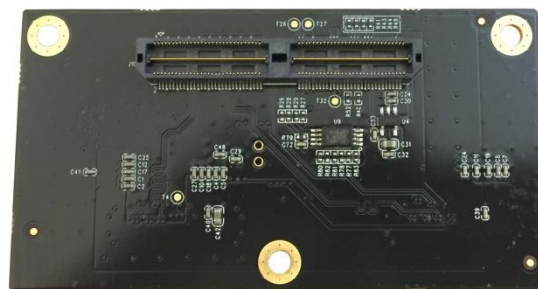
FAW-1233-03



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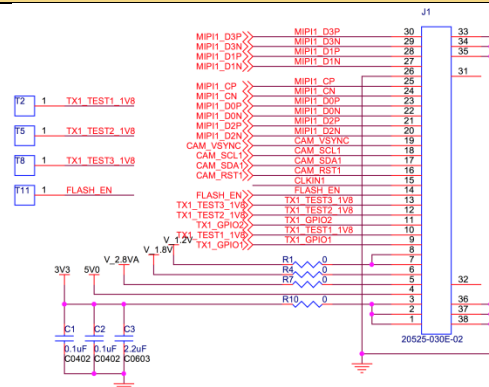
LI-JTX1-MIPI-ADPT



Interfaces

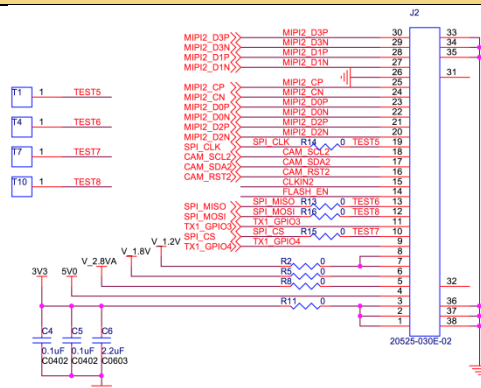
Interface J1

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-03 (300mm)



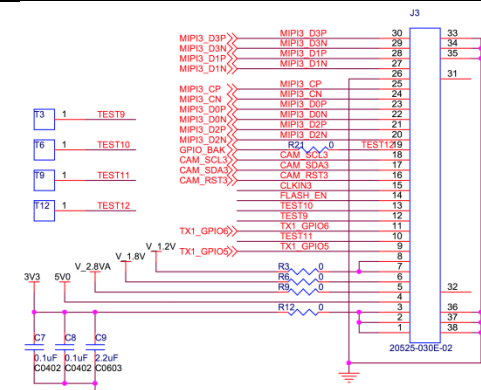
Interface J2

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-03 (300mm)



Interface J3

- Part#: 20525-030E-02C
- Number of Positions: 30
- Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-03 (300mm)



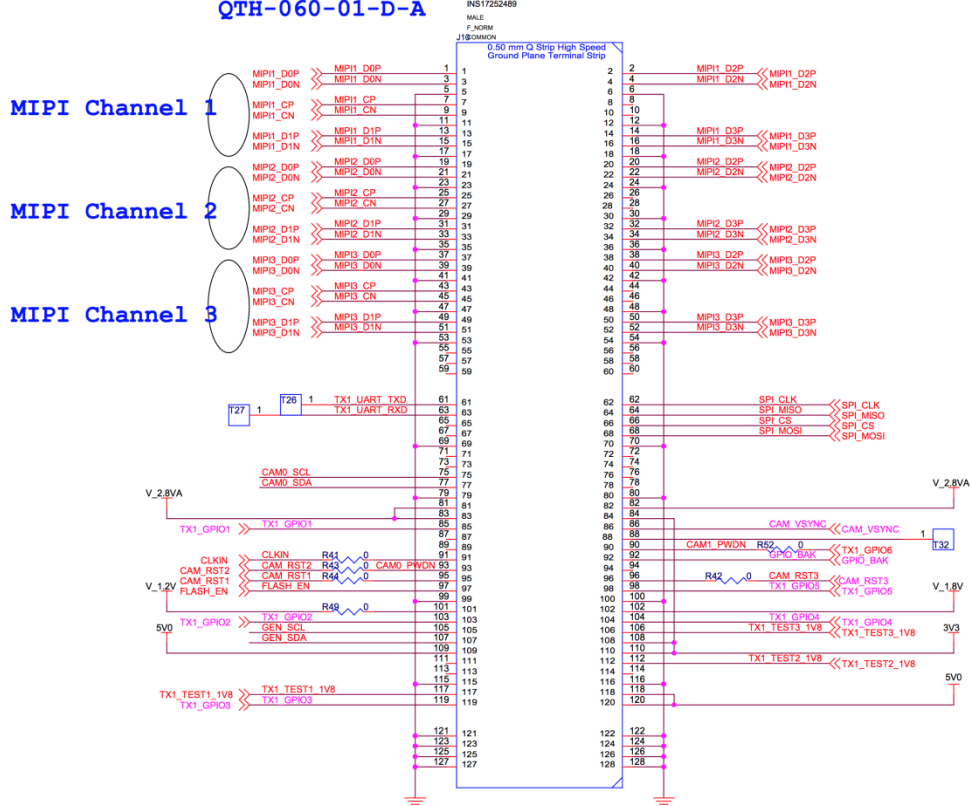
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Interface J10

- Part#: QTH-060-01-L-D-A
- Number of Positions: 120
- Number of Rows: 2
- Pitch: 0.5 mm

Vertical Mating connector of Jetson TX1 J22 QTH-060-01-D-A



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LI-IMX334-MIPI-CS



Camera Spec	
Image Sensor	Diagonal 8.86 mm (Type 1/1.8) CMOS Image Sensor IMX334
Optical format	1/1.8"
Number of active pixels	3864 (H) x 2176 (V)
Pixel size	2.0um (H) x 2.0um (V)
Color or Mono	Color
Interface	MIPI interface
Lens mount	CS
IR switcher	Support
Weight	56 g
Interfaces	
Interface J4: - 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	



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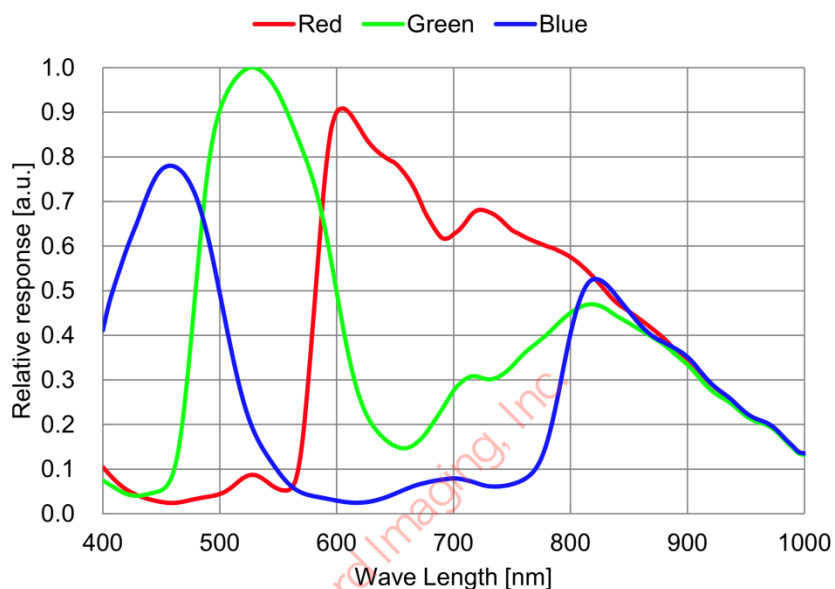
Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remarks
Supply voltage (analog 1 : 2.9 V)	AV _{DD1}	-0.3	3.3	V	
Supply voltage (analog 2 : 2.9 V)	AV _{DD2}	-0.3	3.3	V	
Supply voltage (interface 1.8 V)	OV _{DD}	-0.3	3.3	V	
Supply voltage (digital1 : 1.2 V)	DV _{DD1}	-0.3	2.0	V	
Supply voltage (digital 2 : 1.2 V)	DV _{DD2}	-0.3	2.0	V	
Input voltage	VI	-0.3	OV _{DD} + 0.3	V	Not exceed 3.3 V
Output voltage	VO	-0.3	OV _{DD} + 0.3	V	Not exceed 3.3 V

Application Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage (analog 1 : 2.9 V)	AV _{DD1}	2.80	2.90	3.00	V
Supply voltage (analog 2 : 2.9 V)	AV _{DD2}	2.80	2.90	3.00	V
Supply voltage (interface 1.8 V)	OV _{DD}	1.70	1.80	1.90	V
Supply voltage (digital1 : 1.2 V)	DV _{DD1}	1.10	1.20	1.30	V
Supply voltage (digital 2 : 1.2 V)	DV _{DD2}	1.10	1.20	1.30	V
Performance guarantee temperature	Tspec	-10	—	60	°C
Operating guarantee temperature	Topr	-30	—	85	°C
Storage guarantee temperature	Tstg	-40	—	85	°C

Spectral Sensitivity Characteristics



DC Characteristics

Item		Pins	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	Analog1	VDDSUB VDDHCP VDDHDA VDDHCM	AV _{DD1}		2.80	2.90	3.00	V
	Analog2	VDDHPX	AV _{DD2}		2.80	2.90	3.00	V
	Interface	VDDMIO	OV _{DD}		1.70	1.80	1.90	V
	Digital1	VDDL _{CN} VDDL _{SC} VDDL _{PL1}	DV _{DD1}		1.10	1.20	1.30	V
	Digital2	VDDL _{PL2} VDDL _{PL3} VDDL _{LIF}	DV _{DD2}		1.10	1.20	1.30	V
Digital input voltage		XHS XVS XCLR INCK XMASTER XTRIG SLAMODE0,1 SDA SCL TEST2	VIH	XVS / XHS Slave Mode	0.8OV _{DD}	—	—	V
			VIL		—	—	0.2OV _{DD}	V
		XHS XVS TOUT TEST1	VOH	XVS / XHS Master Mode	OV _{DD} -0.4	—	—	V
			VOL		—	—	0.4	V

Current Consumption

Item	Symbol	Typ.		Max.		Unit
		Standard luminous intensity	Saturated luminous intensity	Standard luminous intensity	Saturated luminous intensity	
Operating current MIPI CSI-2 / 8 Lane 12 bit, 60 frame/s All-pixel scan mode	I _{AVDD1}	38	37	51	50	mA
	I _{AVDD2}	33	32	48	47	mA
	I _{OVDD}	1	1	1	1	mA
	I _{DVDD1}	190	205	303	318	mA
	I _{DVDD2}	58	58	87	87	mA
Standby current	I _{AVDD1_STB}	—		0.1		mA
	I _{AVDD2_STB}	—		0.1		mA
	I _{OVDD_STB}	—		0.1		mA
	I _{DVDD1_STB}	—		19.8		mA
	I _{DVDD2_STB}	—		5.2		mA

Operating current: (Typ.) Supply voltage 2.90 V / 1.8 V / 1.2 V, T_j = 25 °C
(Max.) Supply voltage 3.00 V / 1.9 V / 1.3 V, T_j = 60 °C, worst state of internal circuit operating current consumption,

Standby: (Max.) Supply voltage 3.00 V / 1.9 V / 1.3 V, T_j = 60 °C, INCK: 0 V, light-obstructed state.

Standard luminous intensity: luminous intensity at 1/3 of the sensor saturated
Saturated luminous intensity: luminous intensity when the sensor is saturated.

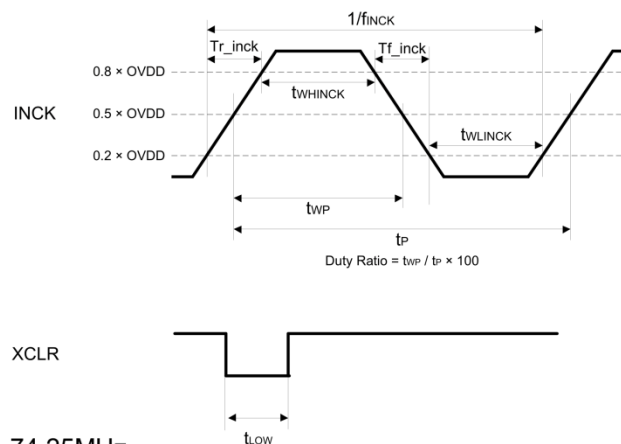


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AC Characteristics

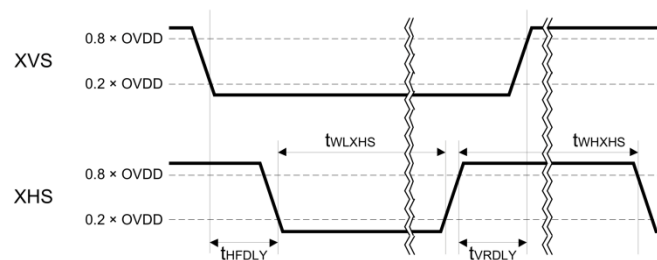
Master Clock Waveform (INCK)



INCK 37.125MHz, 74.25MHz

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
INCK clock frequency	f_{INCK}	$f_{INCK} \times 0.96$	f_{INCK}	$f_{INCK} \times 1.02$	MHz	$f_{INCK} = 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK Low level pulse width	t_{WLINCK}	4	—	—	ns	$f_{INCK} = 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK High level pulse width	t_{WHINCK}	4	—	—	ns	$f_{INCK} = 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK clock duty	—	45.0	50.0	55.0	%	Define with $0.5 \times OV_{DD}$
INCK Rise time	Tr_inck	—	—	5	ns	20 % to 80 %
INCK Fall time	Tf_inck	—	—	5	ns	80 % to 20 %
XCLR Low level pulse width	t_{LOW}	100	—	—	ns	

XVS / XHS Input Characteristics In Slave Mode (XMASTER pin = High)



Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
XHS Low level pulse width	t_{WDXHS}	$4 / f_{INCK}$	—	—	ns	
XHS High level pulse width	t_{WDXVS}	$4 / f_{INCK}$	—	—	ns	
XVS - XHS fall width	t_{HFDLY}	$1 / f_{INCK}$	—	—	ns	
XHS - XVS rise width	t_{VRDLY}	$1 / f_{INCK}$	—	—	ns	

XVS / XHS Input Characteristics In Master Mode (XMASTER pin = Low)

* XVS and XHS cannot be used for the sync signal to pixels.

Be sure to detect sync code to detect the start of effective pixels in 1 line.

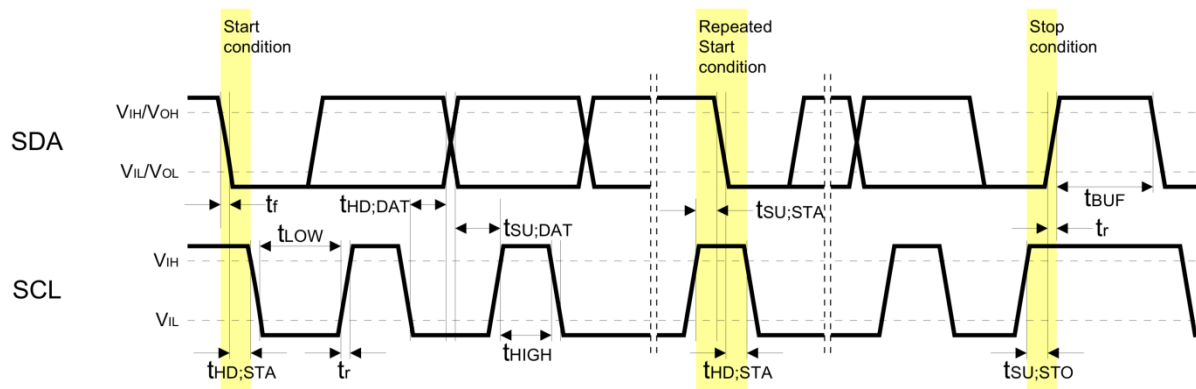
For the output waveforms in master mode, see the item of "Slave Mode and Master Mode"



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I²C Communication



I²C Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Low level input voltage	VIL	-0.3	—	$0.3 \times OV_{DD}$	V	
High level input voltage	VIH	$0.7 \times OV_{DD}$	—	1.9	V	
Low level output voltage	VOL	0	—	$0.2 \times OV_{DD}$	V	$OV_{DD} < 2\text{ V}$, Sink 3 mA
High level output voltage	VOH	$0.8 \times OV_{DD}$	—	—	V	
Output fall time	tof	—	—	250	ns	Load 10 pF – 400 pF, $0.7 \times OV_{DD} - 0.3 \times OV_{DD}$
Input current	Ii	-10	—	10	μA	$0.1 \times OV_{DD} - 0.9 \times OV_{DD}$
Input Capacitance for SCL / SDA	Ci	—	—	10	pF	

I²C AC Characteristics

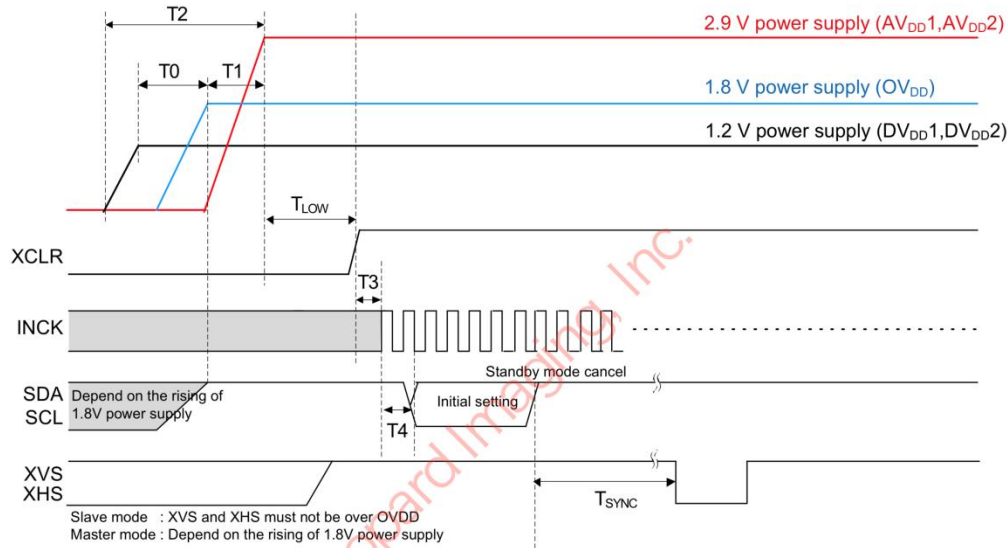
Item	Symbol	Min.	Typ.	Max.	Unit
SCL clock frequency	f _{SCL}	0	—	400	kHz
Hold time (Start Condition)	t _{HD;STA}	0.6	—	—	μs
Low period of the SCL clock	t _{LOW}	1.3	—	—	μs
High period of the SCL clock	t _{HIGH}	0.6	—	—	μs
Set-up time (Repeated Start Condition)	t _{SU;STA}	0.6	—	—	μs
Data hold time	t _{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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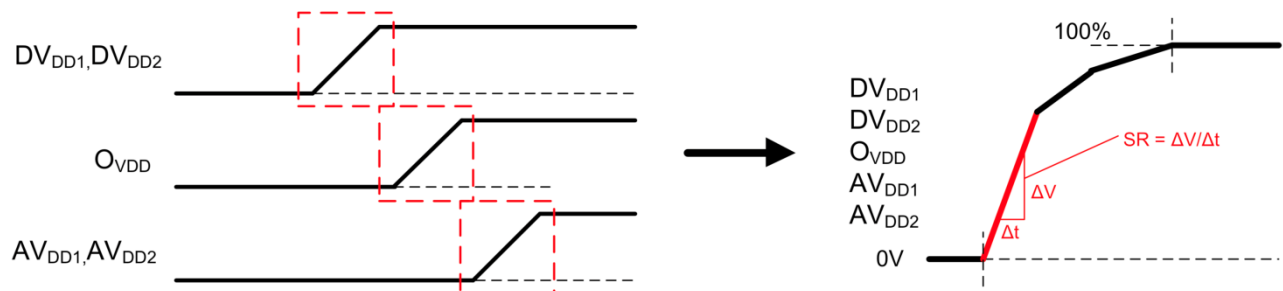
Power-on Sequence



Item	Symbol	Min.	Max.	Unit
1.2 V power supply rising → 1.8 V power supply rising	T ₀	0	—	ns
1.8 V power supply rising → 2.9 V power supply rising	T ₁	0	—	ns
Rising time of all power supply	T ₂	—	200	ms
2.9 V power supply rising → Clear OFF	T _{LOW}	500	—	ns
Clear OFF → INCK rising	T ₃	0	—	μs
Clear OFF → Communication start	T ₄	20	—	μs
Standby OFF (communication) → External input XHS, XVS (slave mode only)	T _{SYNC}	18	—	ms

Slew Rate Limitation of Power-on Sequence

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



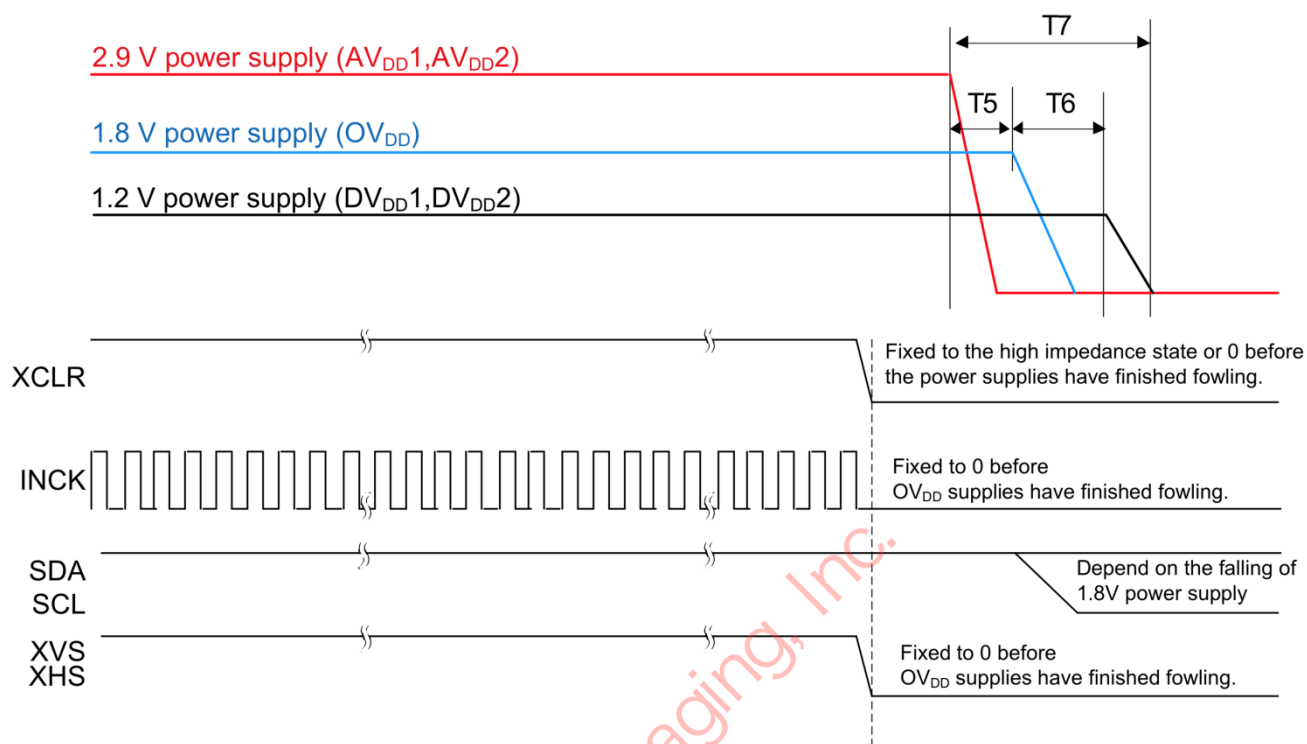
Item	Symbol	Power supply	Min.	Max.	Unit	Remarks
Slew rate	SR	DV _{DD1} , DV _{DD2} (1.2 V)	—	25	mV/μs	
		OV _{DD} (1.8 V)	—	25	mV/μs	
		AV _{DD1} , AV _{DD2} (2.9 V)	—	25	mV/μs	



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Power-off Sequence



Item	Symbol	Min.	Max.	Unit
2.9 V power shut down → 1.8 V power shut down	T5	0	—	ns
1.8 V power shut down → 1.2 V power shut down	T6	0	—	ns
Shut down time of all power supply	T7	—	200	ms



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