LEOPARD IMAGING INC

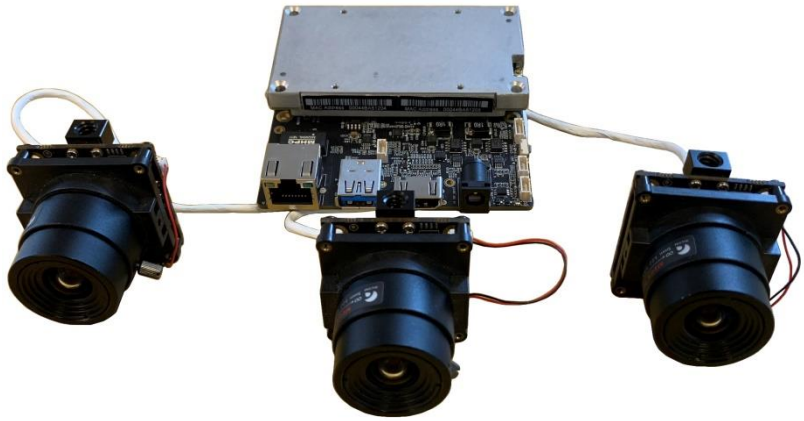
Rev 1.0

LI-JETSON-CB-IMX185CS-X Data Sheet

Key Features

- Compatible with Nvidia Jetson TX1/TX2 (TX1/TX2 SOM not incldued)
- MIPI CSI-2 interface
- Support up to six cameras
- Two carrier board options
  - LI-TX1-CB
    Includes three 4-lane interface
    Support 1080P@60fps
  - LI-TX1-CB-6CAM
    Includes six 2-lane interface
    Support 1080P@30fps
- Sony Diagonal 8.58mm Type 1/1.9 CMOS Image Sensor IMX185LQJ
- Active pixels: 1937H x 1217V
- Pixel size: 3.75 um x 3.75 um
- 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-JETSON-CB-IMX185CS
(2 cam) LI-JETSON-CB-IMX185CS-D
(3 cam) LI-JETSON-CB-IMX185CS-T
(6 cam) LI-JETSON-CB-IMX185CS-H



Lens Spec

- Model: ES0522F.IR
- Focal length: 5.0 mm
- Aperture, F/#: 2.2
- FOV (D/H/V): 102 °/ 90 °/50 °
- TV Distortion: < -8%
- Mount Type: CS

BOM

Nvidia TX1/TX2 SOM not included

#	Items	QTY
1	LI-TX1-CB or LI-TX1-CB-6CAM	1
2	LI-IMX185-MIPI-CS	1,2,3 or 6
3	FAW-1233-03 cable	1,2,3 or 6
4	DC 12V power supply	1
5	USB 2.0 Type A - Micro B cable	1

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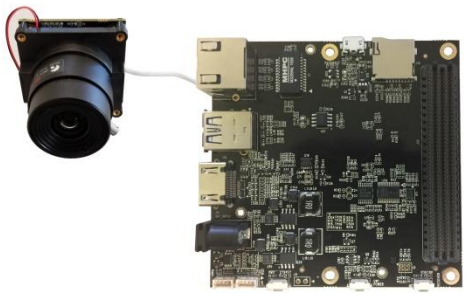
LI-JETSON-CB-IMX185CS

BOM

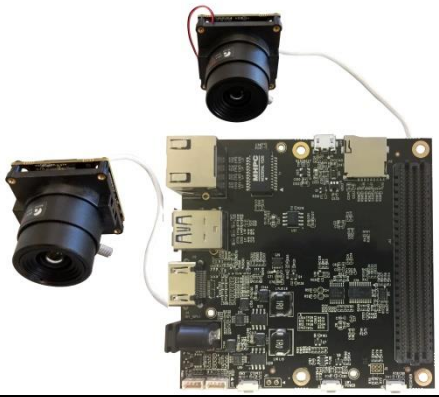
#	Items	QTY
1	LI-TX1-CB	1
2	LI-IMX185-MIPI-CS	1
3	FAW-1233-03 cable	1
4	DC 12V power supply	1
5	USB 2.0 Micro B cable	1



LI-JETSON-CB-IMX185CS-D

BOM

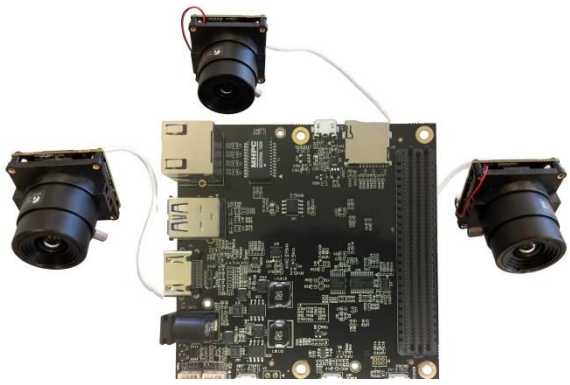
#	Items	QTY
1	LI-TX1-CB	1
2	LI-IMX185-MIPI-CS	2
3	FAW-1233-03 cable	2
4	DC 12V power supply	1
5	USB 2.0 Micro B cable	1



LI-JETSON-CB-IMX185CS-T

BOM

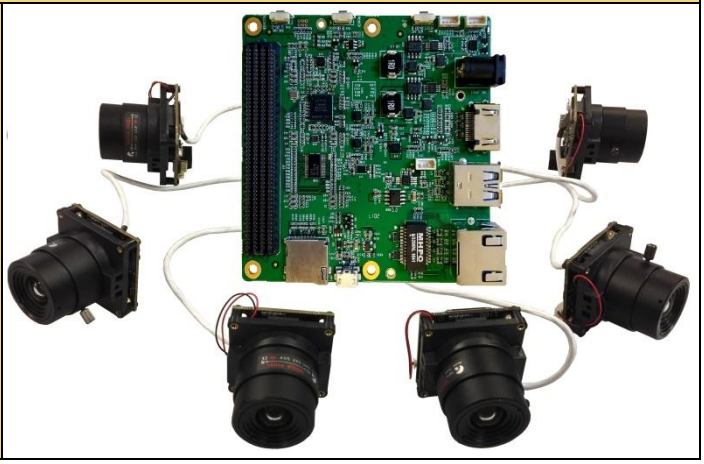
#	Items	QTY
1	LI-TX1-CB	1
2	LI-IMX185-MIPI-CS	3
3	FAW-1233-03 cable	3
4	DC 12V power supply	1
5	USB 2.0 Micro B cable	1



LI-JETSON-CB-IMX185CS-H

BOM

#	Items	QTY
1	LI-TX1-CB-6CAM	1
2	LI-IMX185-MIPI-CS	6
3	FAW-1233-03 cable	6
4	DC 12V power supply	1
5	USB 2.0 Micro B cable	1



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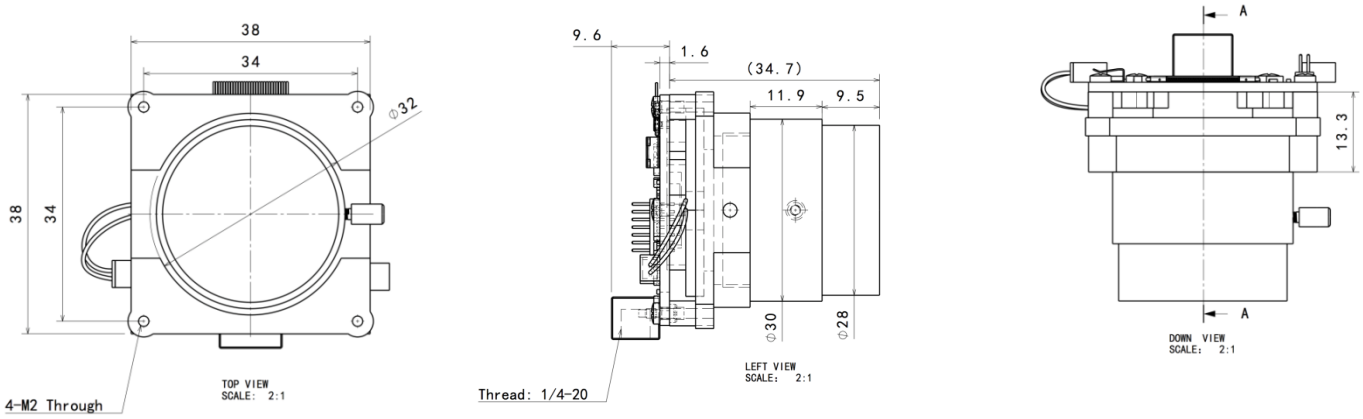
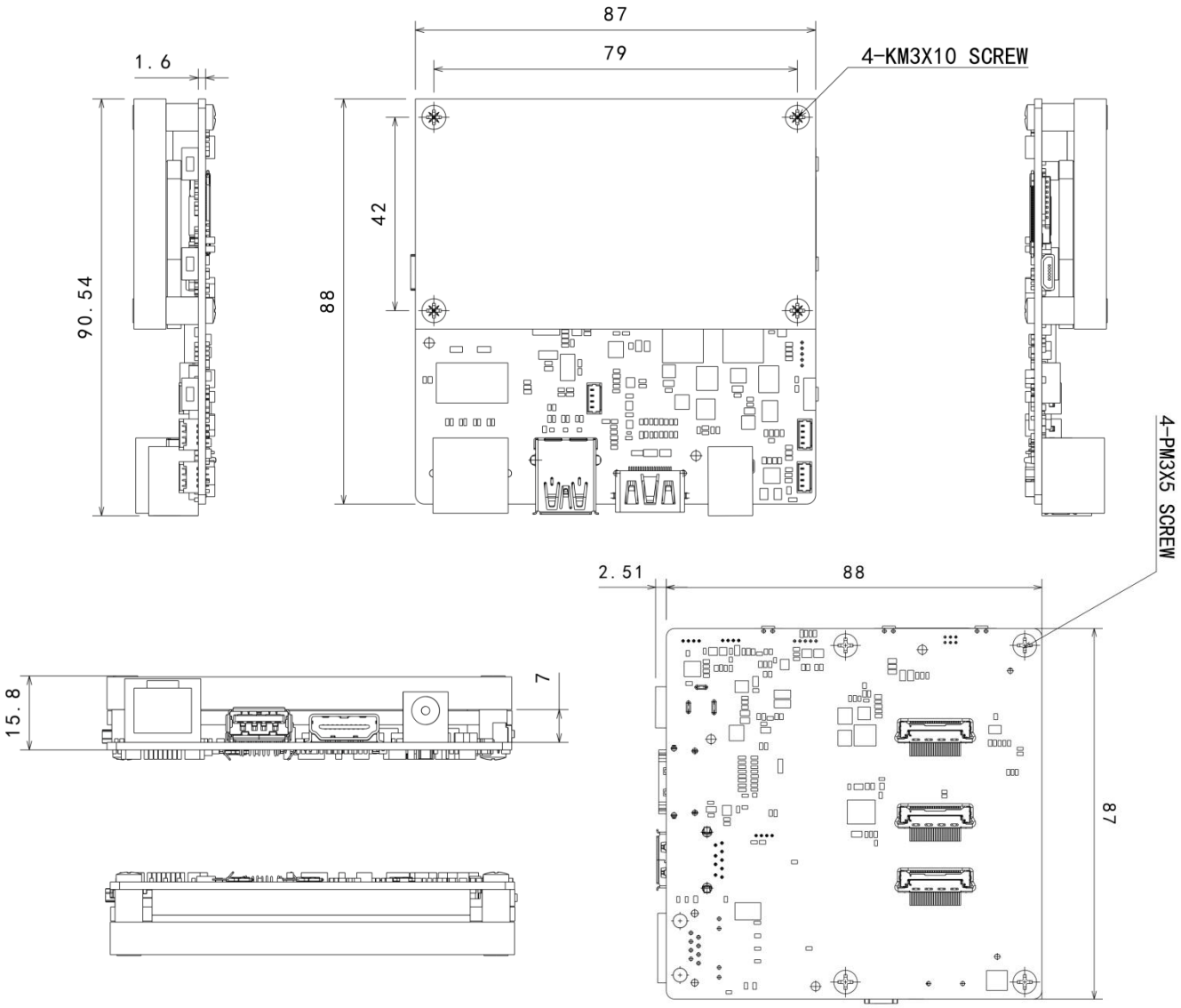
Dimensions

LI-IMX185-MIPI-CS



LI-TX1-CB



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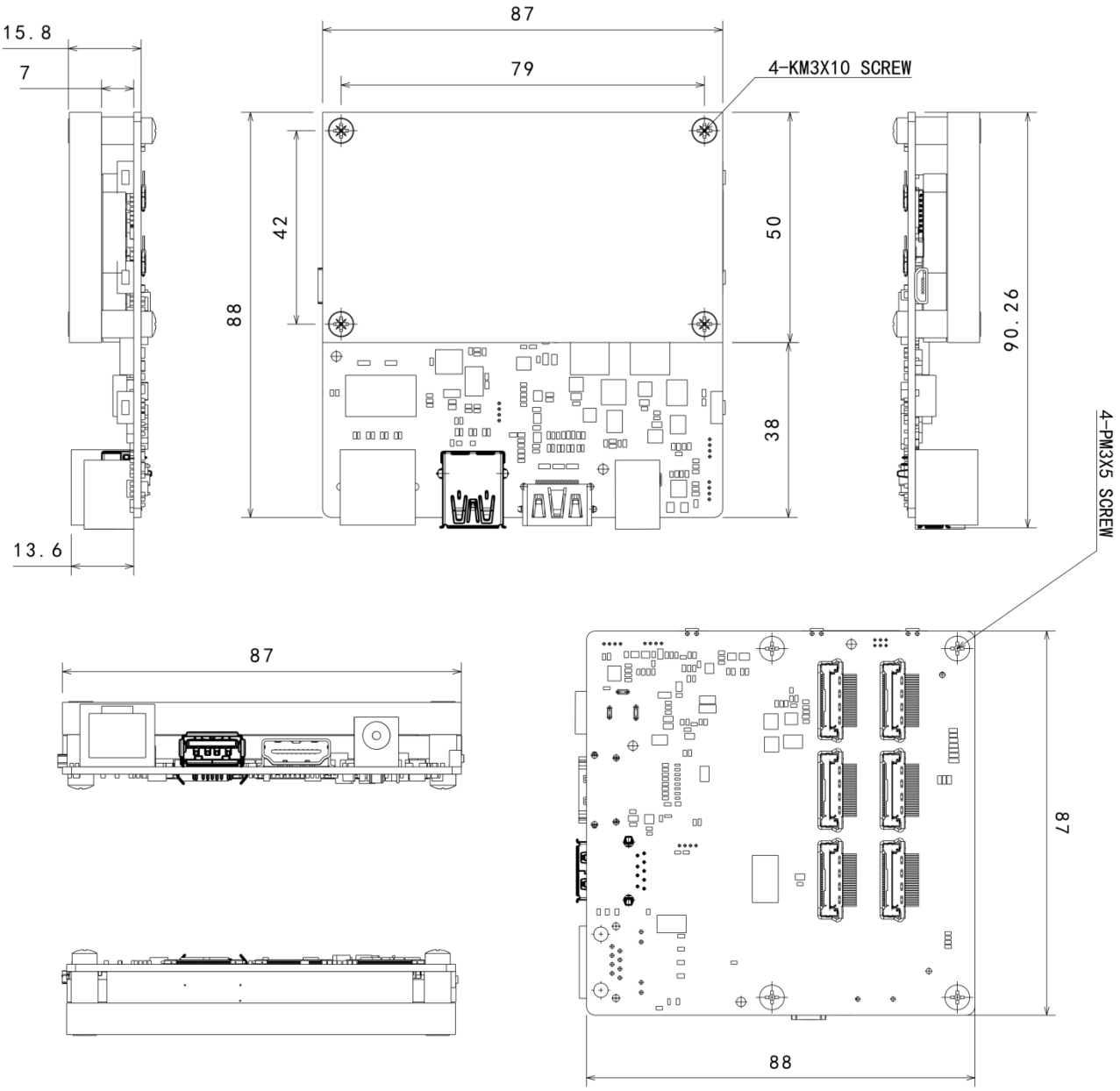
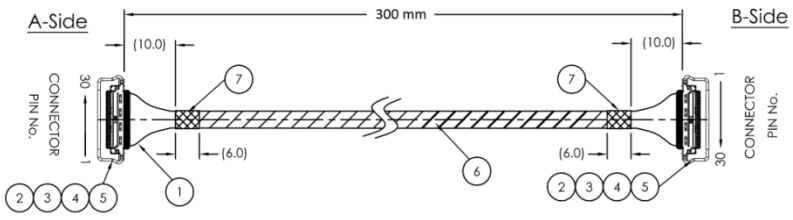
LI-TX1-CB-6CAM



FAW-1233-03



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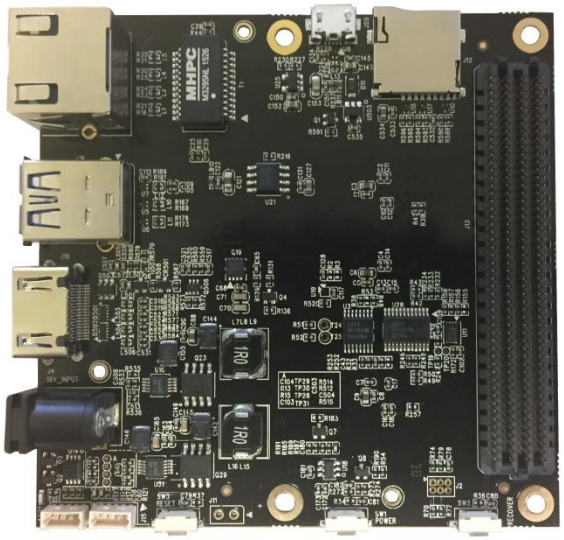
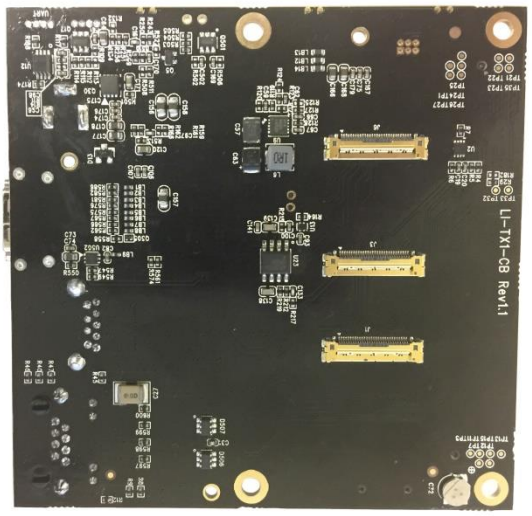
LI-TX1-CB

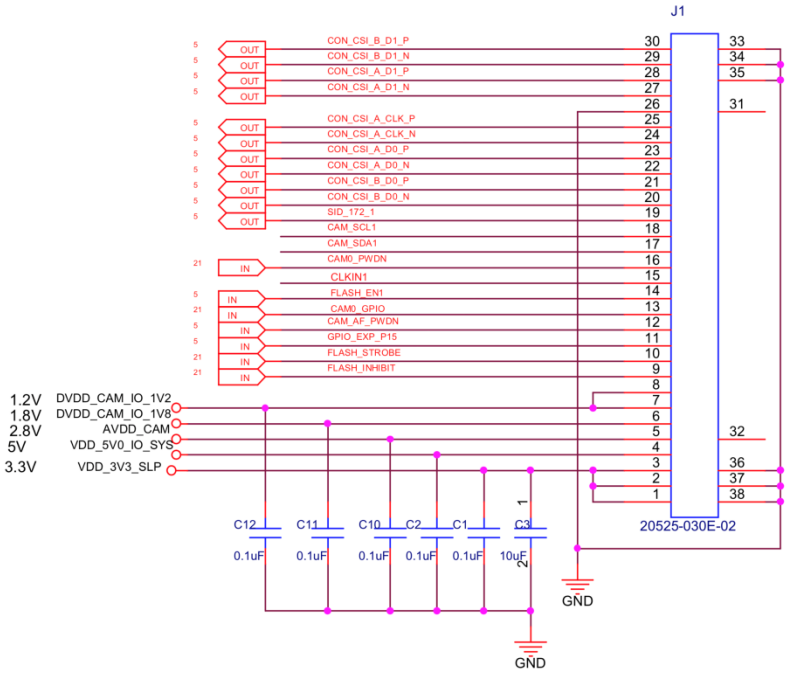




Camera Interfaces

Interface J1

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



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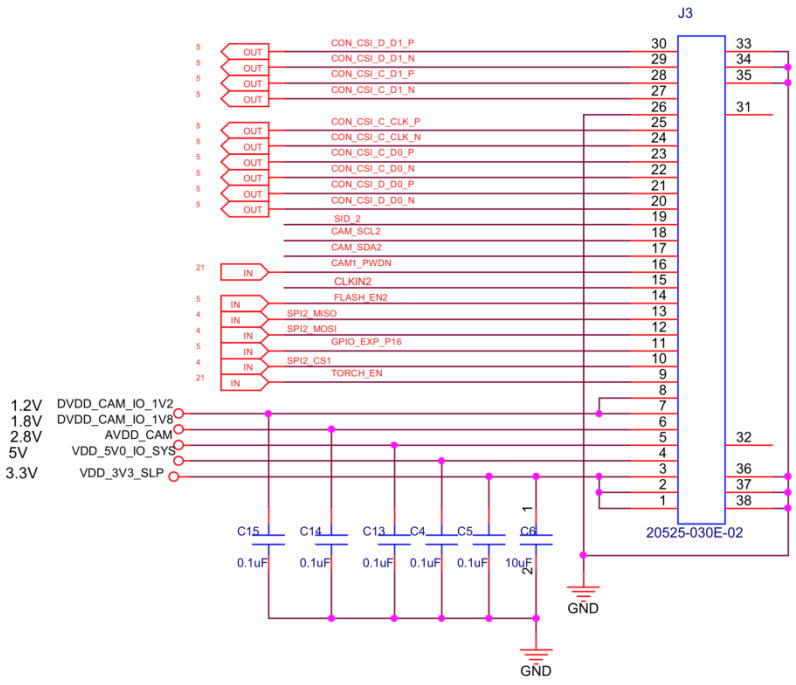
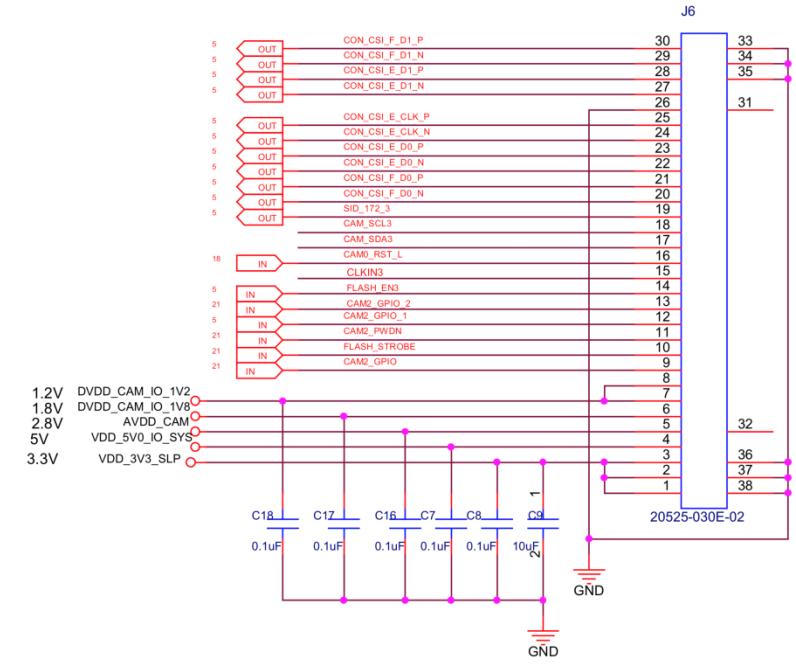
Interface J3

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



Interface J6

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



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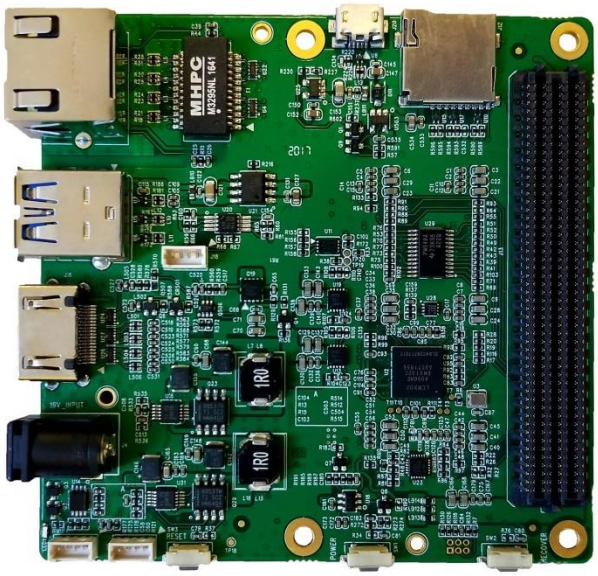
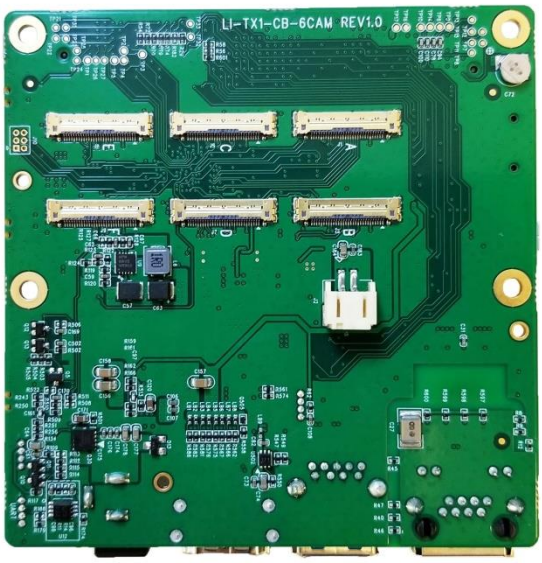
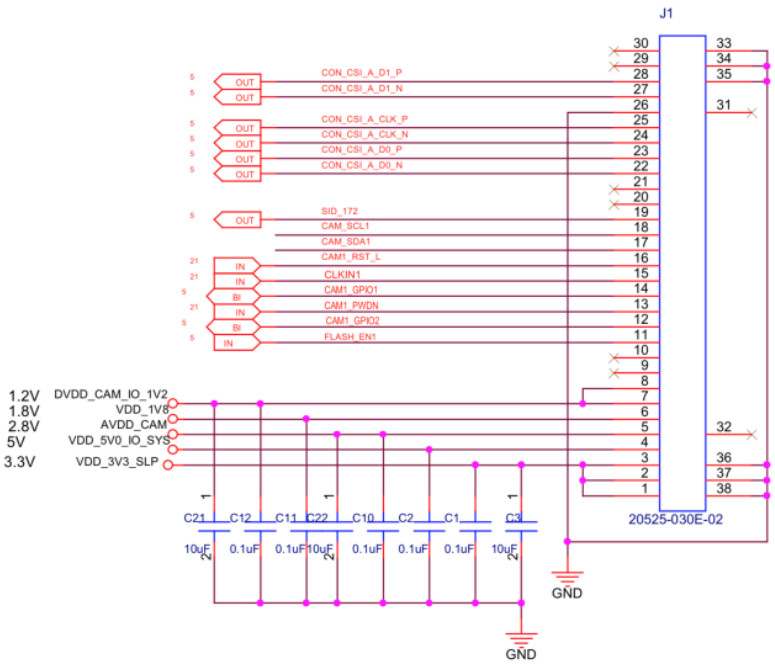
LI-TX1-CB-6CAM





Camera Interfaces

Interface J1 (camera channel A)	
▪ Part#: 20525-030E-02C ▪ Number of Positions: 30 ▪ Pitch: 0.4mm ▪ Mating I-PEX cable: FAW-1233-03 (300mm)	

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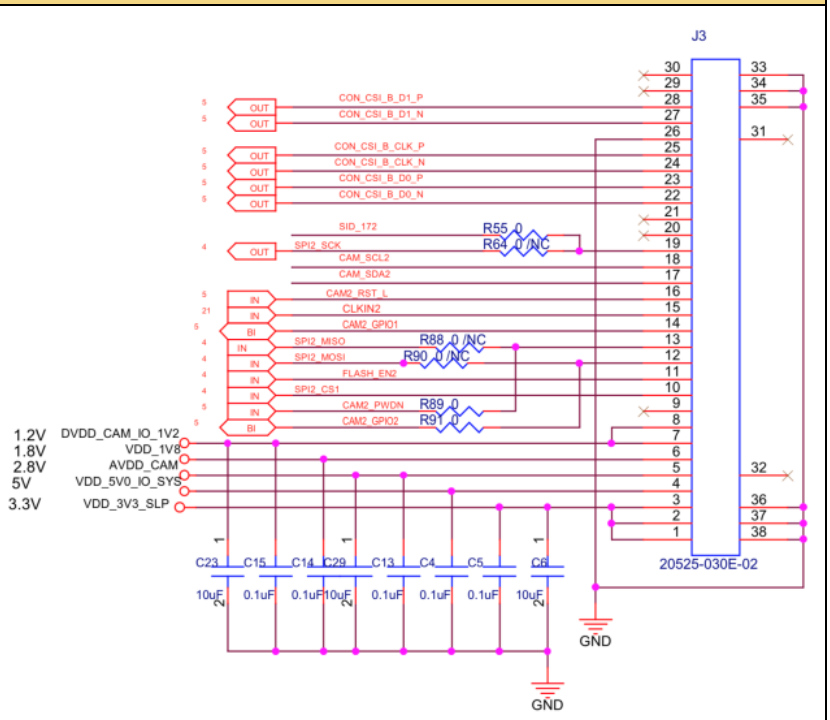
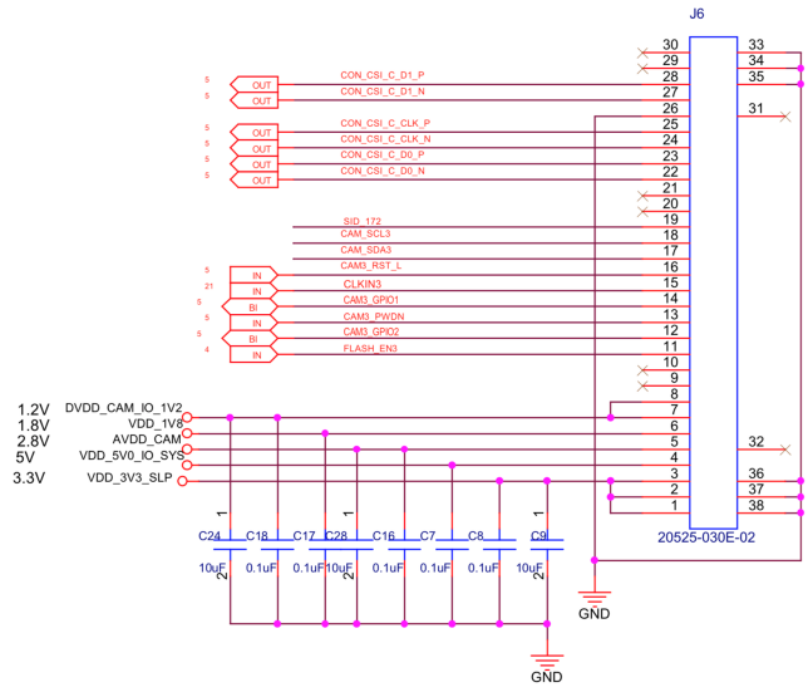
Interface J3 (camera channel B)

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



Interface J6 (camera channel C)

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



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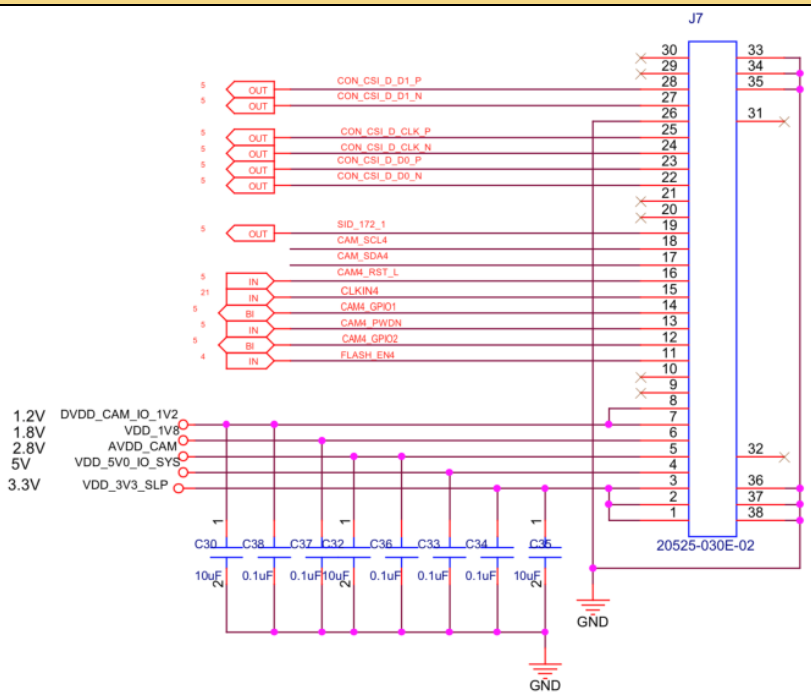
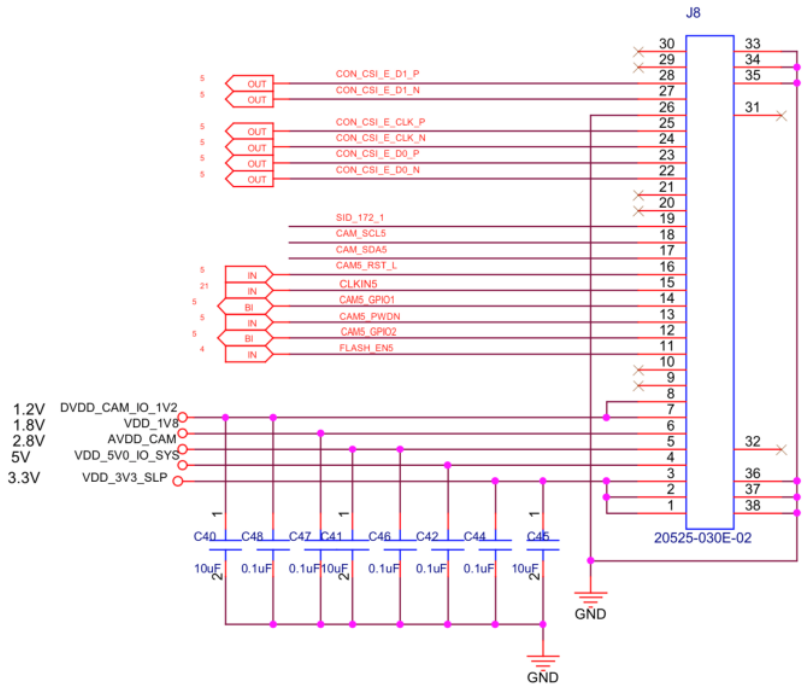
Interface J7 (camera channel D)

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



Interface J8 (camera channel E)

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



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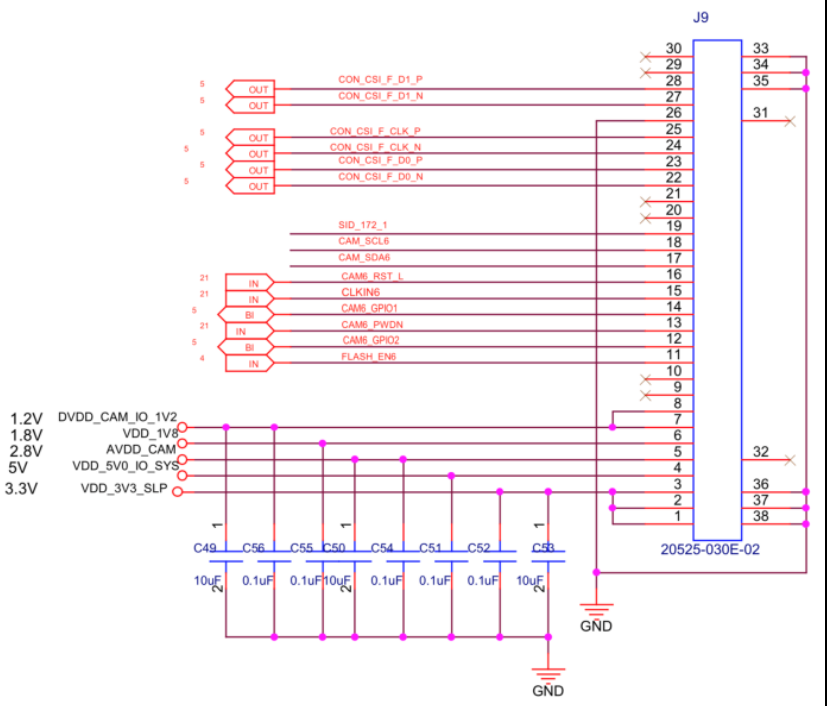
Interface J9 (camera channel F)

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



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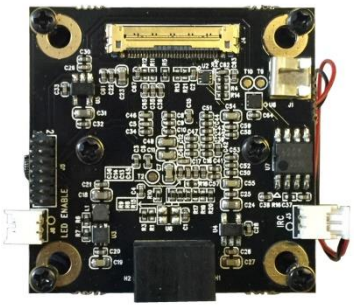
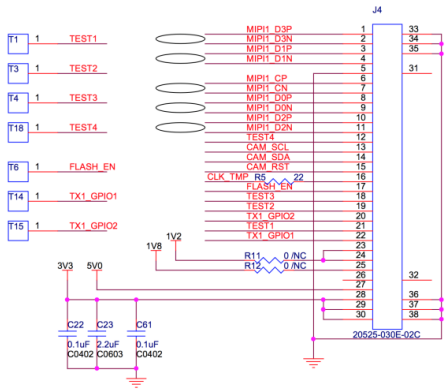
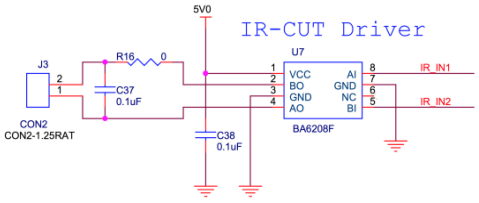
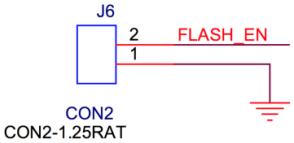
LI-IMX185-MIPI-CS



Camera Spec	
Image Sensor	Sony Diagonal 8.58mm Type 1/1.9 CMOS Image Sensor IMX185LQJ
Optical format	1/1.9”
Number of active pixels	1937 (H) x 1217 (V)
Pixel size	3.75um (H) x 3.75um (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	
Interface J6: ▪ Part#: 1734829-2 ▪ Number of Positions: 2 ▪ Pitch: 1.25mm	

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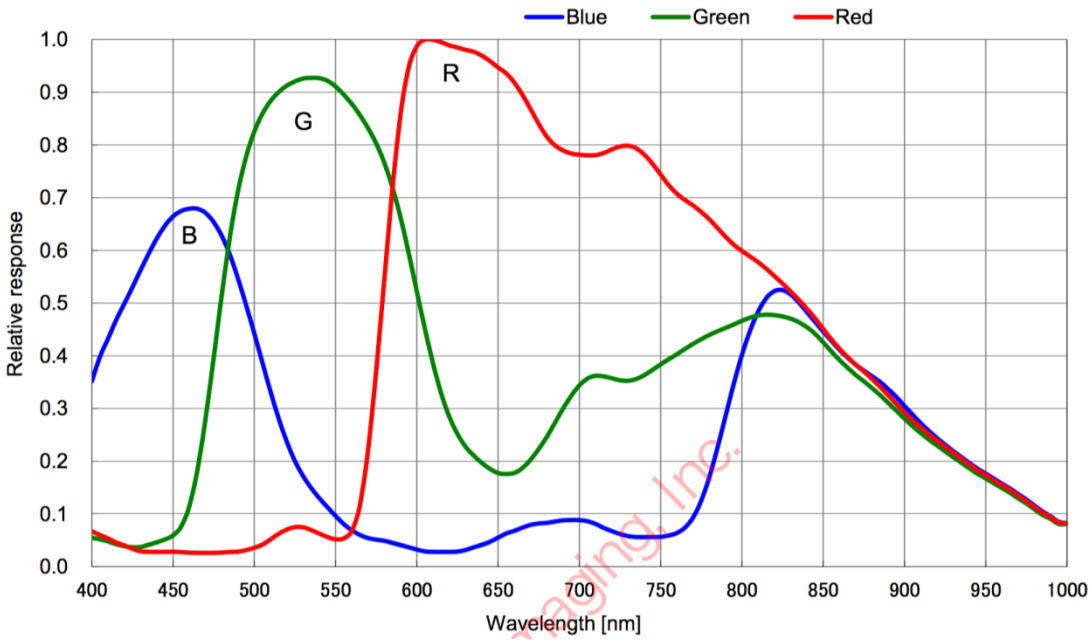
Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remarks
Supply voltage (analog 3.3 V)	AV_{DD}	-0.3	4.0	V	
Supply voltage (digital 1.8 V)	OV_{DD}	-0.3	3.3	V	
Supply voltage (digital 1.2 V)	DV_{DD}	-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
Guaranteed operating temperature	Topr	-30	+75	˚C	
Storage guarantee temperature	Tstg	-40	+80	˚C	
Performance guarantee temperature	Tspec	-10	+60	˚C	

Recommended Operating Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage (analog 3.3 V)	AV_{DD}	3.15	3.3	3.45	V
Supply voltage (digital 1.8 V)	OV_{DD}	1.7	1.8	1.9	V
Supply voltage (digital 1.2 V)	DV_{DD}	1.1	1.2	1.3	V

Spectral Sensitivity Characteristics



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DC Characteristics

Item		Pins	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	Analog	$V_{DD}Hx$	AV_{DD}		3.15	3.30	3.45	V
	Digital	$V_{DD}Mx$	OV_{DD}		1.70	1.80	1.90	V
	Digital	$V_{DD}Lx$	DV_{DD}		1.10	1.20	1.30	V
Digital input voltage		XHS XVS XCLR INCK XMASTER OMODE SCK/SCL SDI/SDA XCE	VIH	XVS/XHS in slave mode	0.8 × OV_{DD}	—	—	V
			VIL		—	—	0.2 × OV_{DD}	V
Digital output voltage		DOP [11:0] DOM [11:0] DCKP DCKM	VCM	Low voltage LVDS	—	OV_{DD}/2	—	V
			VOD	Low voltage LVDS (Termination resistance100 Ω)	100	150	200	mV
		XHS XVS SDO	VOH	XVS/XHS in master mode	OV_{DD} -0.4	—	—	V
			VOL		—	—	0.4	V

Power Consumption

Item	Pins	Symbol	Typ.		Max.		Unit
			Standard luminous intensity	Saturated luminous intensity	Standard luminous intensity	Saturated luminous intensity	
Operating current CSI-2 serial output 4 Lane 12 bit, 60 frame/s 1080p-HD mode	$V_{DD}H$	IAV_{DD}	88	88	113	113	mA
	$V_{DD}M$	IOV_{DD}	2	2	4	4	mA
	$V_{DD}L$	IDV_{DD}	110	130	150	190	mA
Standby current	$V_{DD}H$	IAV_{DD}_STB	—		0.2		mA
	$V_{DD}M$	IOV_{DD}_STB	—		0.1		mA
	$V_{DD}L$	IDV_{DD}_STB	—		7.0		mA

Operating current:
(Typical value condition) : Supply voltage 3.3 V / 1.8 V / 1.2 V, Tj = 25 ˚C
(Maximum value condition) : Supply voltage 3.45 V / 1.9 V / 1.3 V, worst state of internal circuit operating current consumption, Tj = 60 ˚C
Standby (Maximum value condition) : Supply voltage 3.45 V / 1.9 V / 1.3 V, Tj = 60 ˚C, INCK = 0 V

Standard luminous intensity: luminous intensity at standard imaging condition I
Saturated luminous intensity: luminous intensity when the sensor is saturated.

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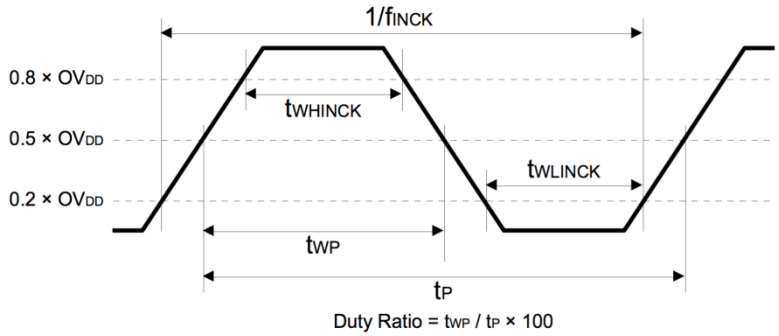
AC Specification

INCK



Duty Ratio = t_{WP} / t_P × 100

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
INCK clock frequency	f_{INCK}	f_{INCK} × 0.96	f_{INCK}	f_{INCK} × 1.02	MHz	f_{INCK} = 27 MHz, 54 MHz, 37.125 MHz, 74.25 MHz
INCK Low level width	t_{WLINCK}	4	—	—	ns	f_{INCK} = 27 MHz, 54 MHz, 37.125 MHz, 74.25 MHz
INCK High level width	t_{WHINCK}	4	—	—	ns	f_{INCK} = 27 MHz, 54 MHz, 37.125 MHz, 74.25 MHz
INCK clock duty	—	45.0	50.0	55.0	%	Define with 0.5 × OV_{DD}

* The INCK fluctuation affects the frame rate.

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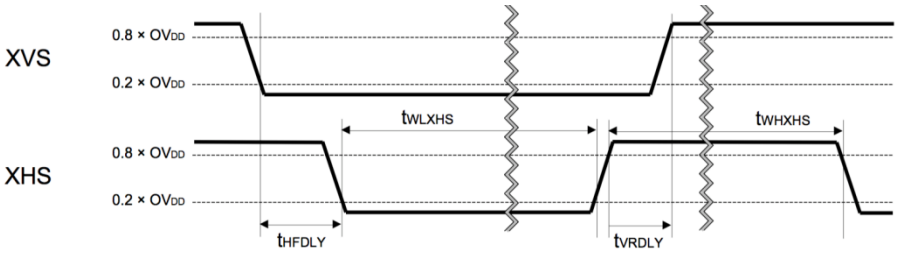
XHS, XVS Input Characteristics In Slave Mode (XMASTER pin = High)



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

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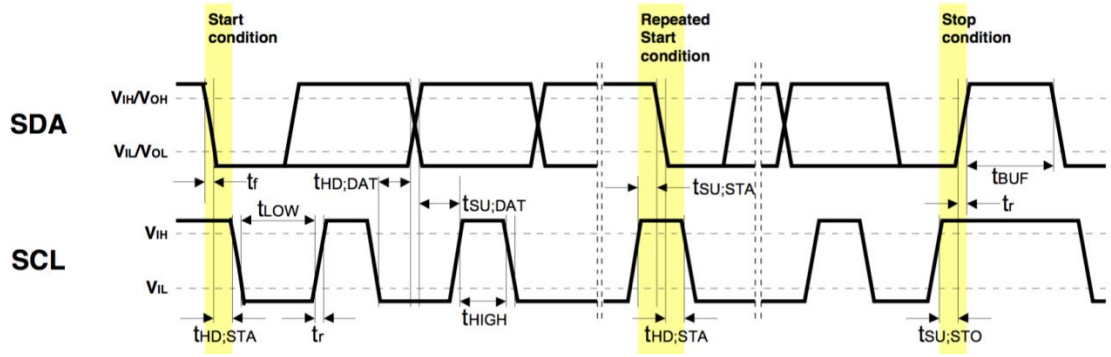
I²C Communication



I²C Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Low level input voltage	V_{IL}	-0.3	—	0.3 × OV_{DD}	V	
High level input voltage	V_{IH}	0.7 × OV_{DD}	—	1.9	V	
Low level output voltage	V_{OL}	0	—	0.2 × OV_{DD}	V	OV_{DD} < 2 V, Sink 3 mA
High level output voltage	V_{OH}	0.8 × OV_{DD}	—	—	V	
Output fall time	tof	—	—	250	ns	Load 10 pF – 400 pF, 0.7 × OV_{DD} – 0.3 × OV_{DD}
Input current	Ii	-10	—	10	μA	0.1 × OV_{DD} – 0.9 × OV_{DD}
Capacitance for SCK (/SCL) , SDI (/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_{HDSTA}	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_{SUSTA}	0.6	—	—	μs
Data hold time	t_{HDDAT}	0	—	0.9	μs
Data set-up time	t_{SUDAT}	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_{SUSTO}	0.6	—	—	μs
Bus free time between a Stop and Start Condition	t_{BUF}	1.3	—	—	μs

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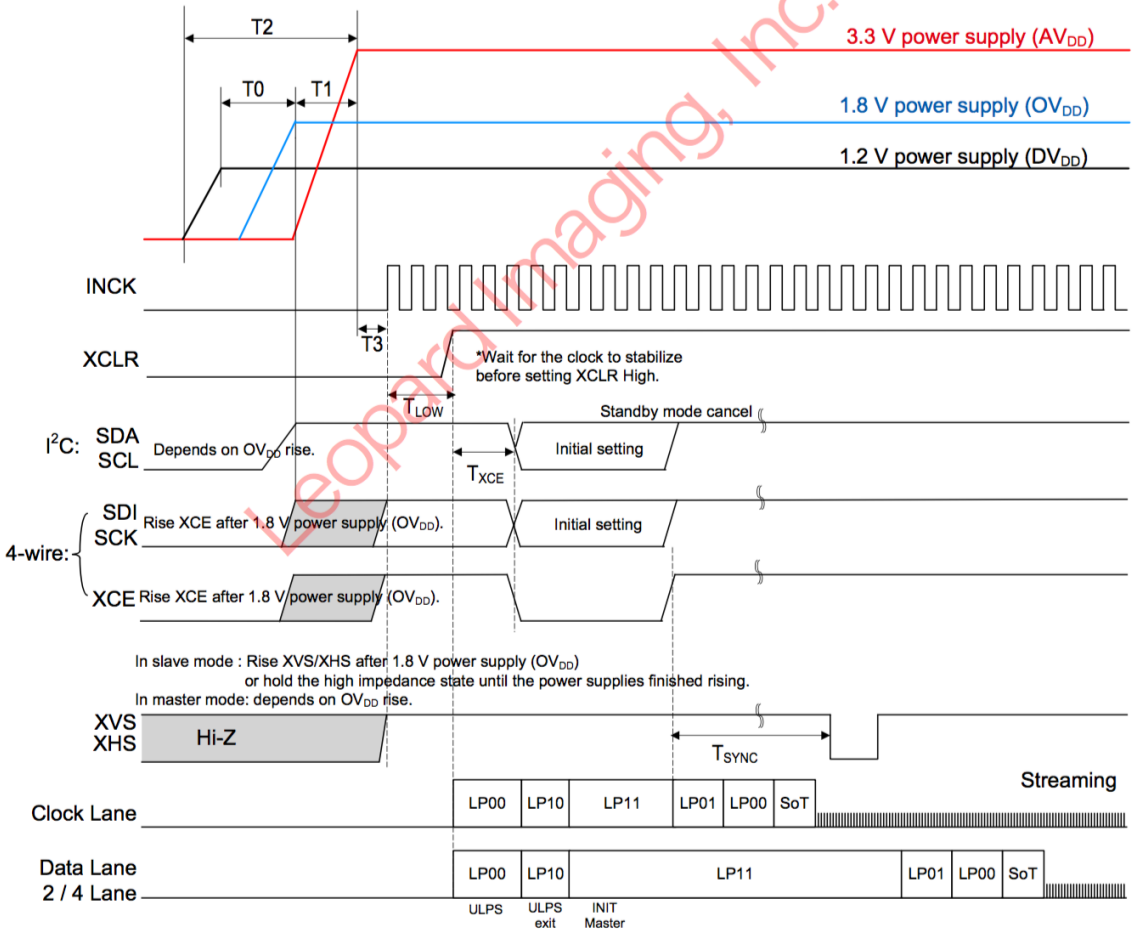
Power-on Sequence



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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 → 3.3 V power supply rising	T_1	0	—	ns
Rising time of all power supply	T_2	—	200	ms
All power supply rising → External input time of INCK	T_3	0	—	ns
INCK active → Clear OFF	T_{LOW}	500	—	ns
Clear OFF Communication start	T_{XCE}	20	—	µs
Standby OFF (communication) → External input XHS, XVS (slave mode only)	T_{SYNC}	20	—	ms

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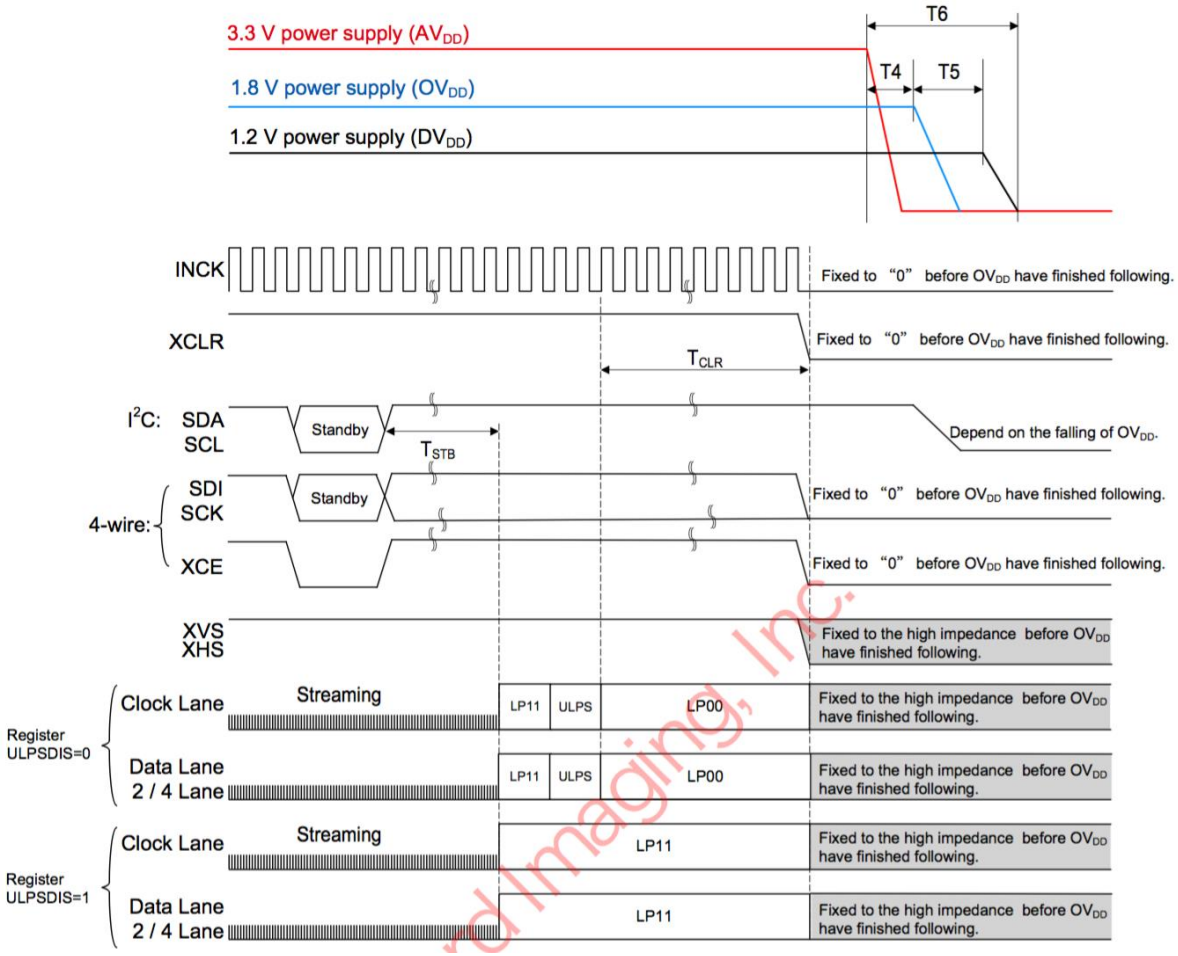
Power-off Sequence



Item	Symbol	Min.	Max.	Unit
Standby ON (communication) → LP11 mode start	T_{STB}	Until FE		—
LP00 → XCLR falling (ULPSDIS = 0)	T_{CLR}	128	—	cycle
3.3 V power shut down → 1.8 V power shut down	T_4	0	—	ns
1.8 V power shut down → 1.2 V power shut down	T_5	0	—	ns
Shut down time of all power supply.	T_6	—	200	ms

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Optical dimension

◆Image size (recommended recording pixels)

All-pixel scan : diagonal 8.49mm (type 1/1.9)

1080p-HD : diagonal 8.26mm (type 1/1.9)

◆Number of recommended recording pixels

All-pixel scan : 1920 (H) × 1200 (V) approx. 2.31 M pixels

1080p-HD : 1920 (H) × 1080 (V) approx. 2.07 M pixels

◆Unit cell size

3.75 μm（H) × 3.75 μm（V)

◆Recommended eye relief compensation distance : - 30mm to -∞

Inc

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