



LEOPARD IMAGING INC

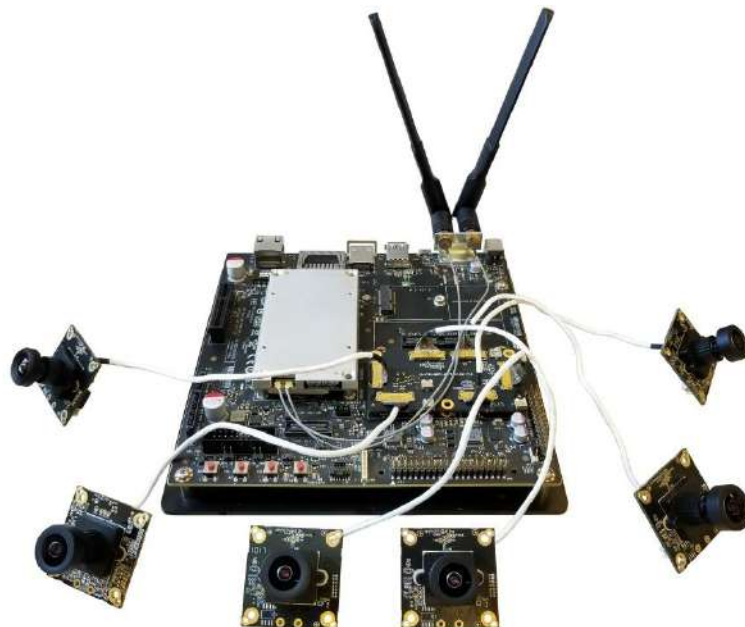
Rev 1.0

LI-JETSON-KIT-IMX185M12-X

Data Sheet

Key Features

- Compatible with Nvidia Jetson TX1/TX2 Development Kit
- MIPI CSI-2 interface
- Support up to six cameras
- Two adapter board options
 - LI-JTX1-MIPI-ADPT
Includes three 4-lane interface
Support 1080P@60fps
 - LI-JTX1-MIPI-ADPT-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
- Connector Part#: 20525-030E-02C
- Support M12 x P0.5 lens
- Provide customization services
- Part#:
 - (1 cam) **LI-JETSON-KIT-IMX185M12**
 - (2 cam) **LI-JETSON-KIT-IMX185M12-D**
 - (3 cam) **LI-JETSON-KIT-IMX185M12-T**
 - (6 cam) **LI-JETSON-KIT-IMX185M12-H**



Lens Spec

- Model: SYD1201A
- Focal length: 3.7 mm
- Aperture, F/#: 2.8 +/- 5%
- Built in 650nm IR cut filter
- FOV (D/H/V): 102° / 92° / 60°
- TV Distortion: -1.0 %

BOM

Nvidia TX1/TX2 Development Kit not included

#	Items	QTY
1	LI-JTX1-MIPI-ADPT or LI-JTX1-MIPI-ADPT-6CAM	1
2	LI-IMX185-MIPI-M12	1,2,3 or 6
3	FAW-1233-03 cable	1,2,3 or 6



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LI-JETSON-KIT-IMX185M12

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX185-MIPI-M12	1
3	FAW-1233-03 cable	1



LI-JETSON-KIT-IMX185M12-D

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX185-MIPI-M12	2
3	FAW-1233-03 cable	2



LI-JETSON-KIT-IMX185M12-T

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-IMX185-MIPI-M12	3
3	FAW-1233-03 cable	3



LI-JETSON-KIT-IMX185M12-H

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT-6CAM	1
2	LI-IMX185-MIPI-M12	6
3	FAW-1233-03 cable	6

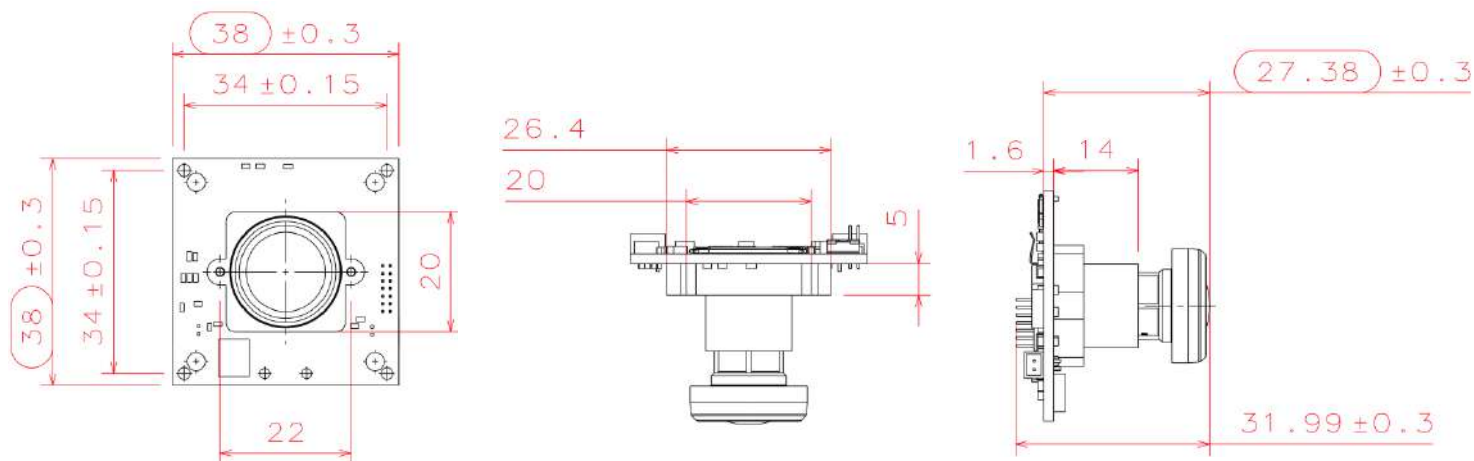


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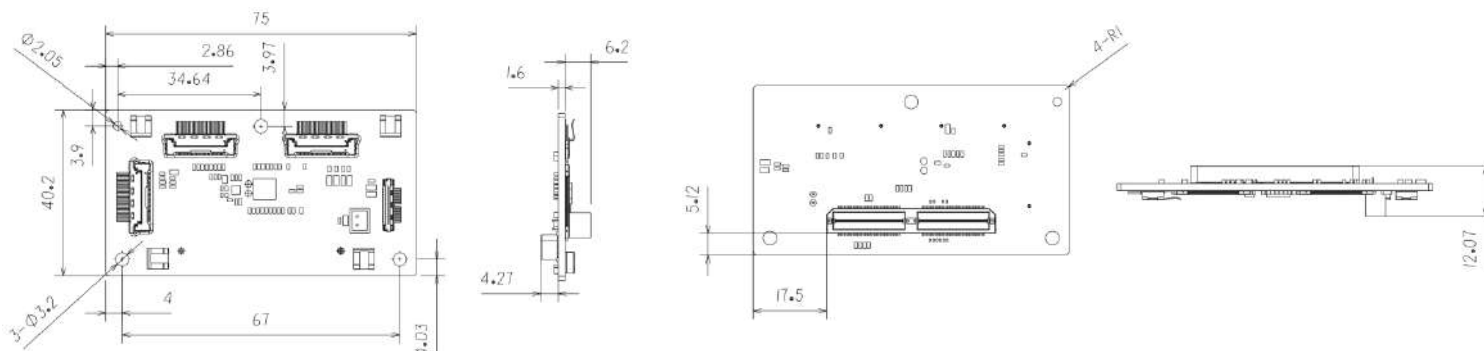
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Dimensions

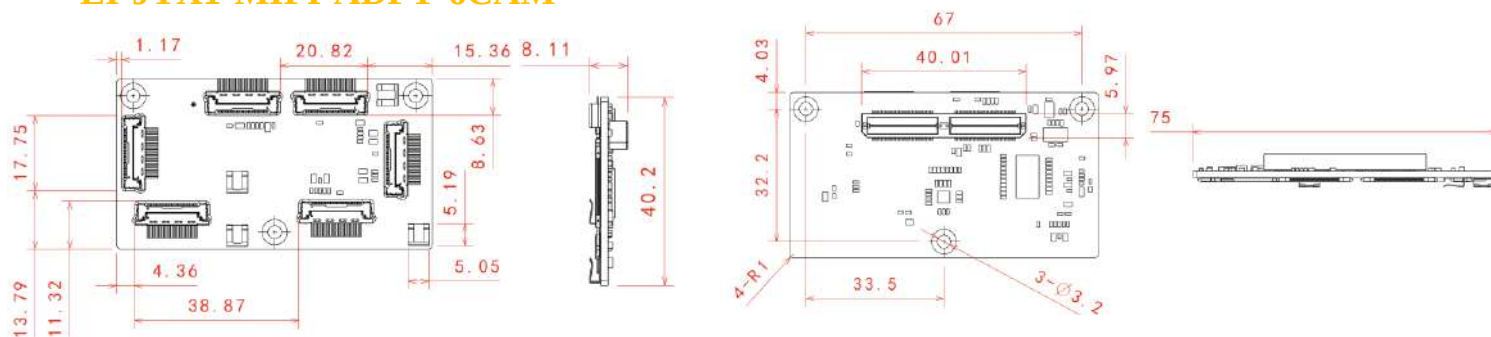
LI-IMX185-MIPI-M12



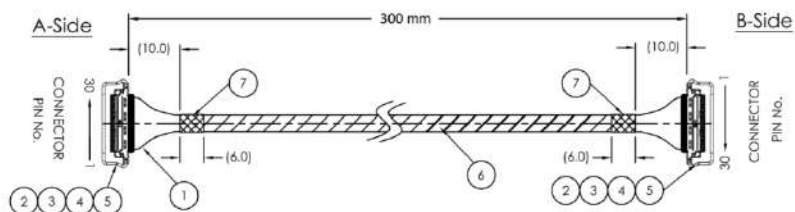
LI-JTX1-MIPI-ADPT



LI-JTX1-MIPI-ADPT-6CAM



FAW-1233-03



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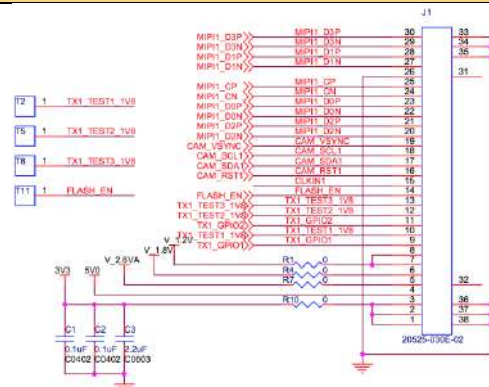
LI-JTX1-MIPI-ADPT



Interfaces

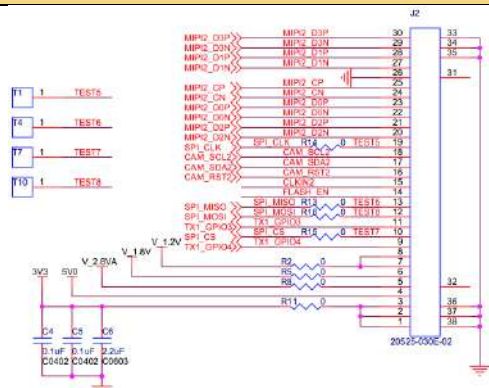
Interface J1

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



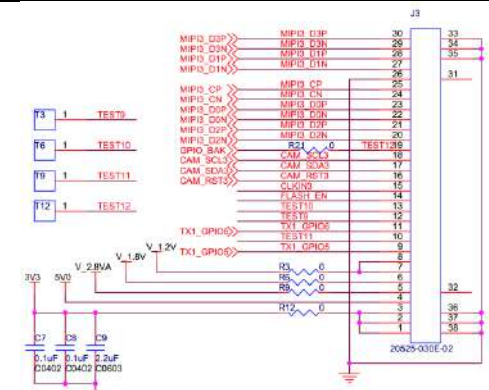
Interface J2

- 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)



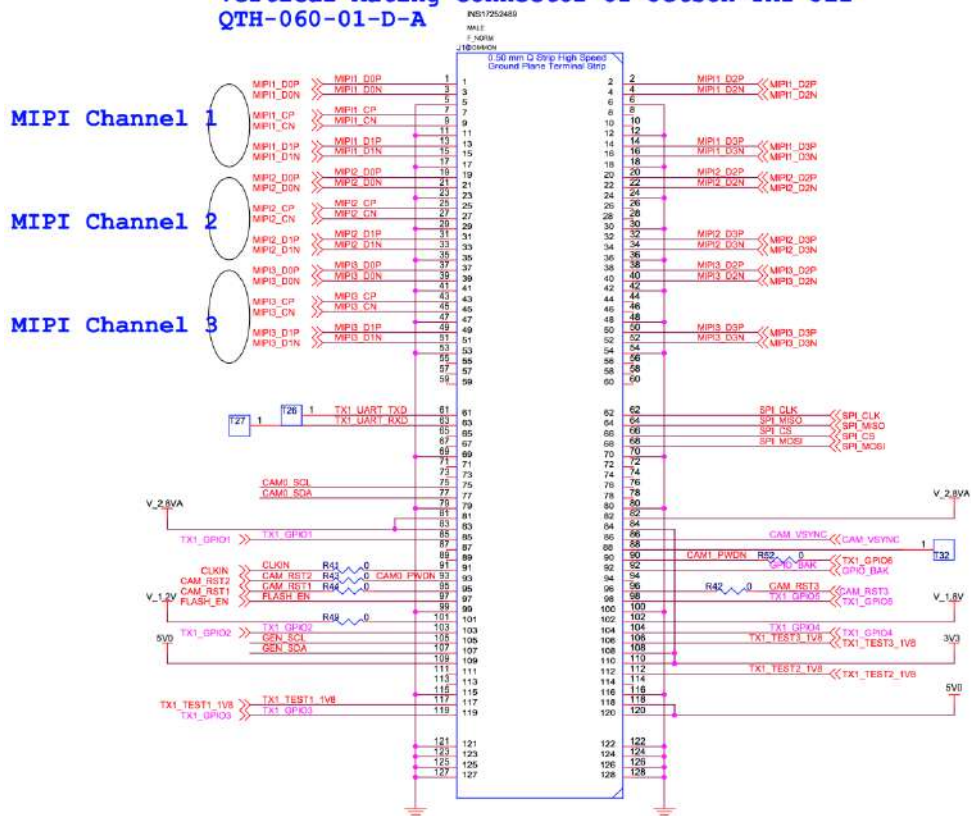
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Interface J10

- 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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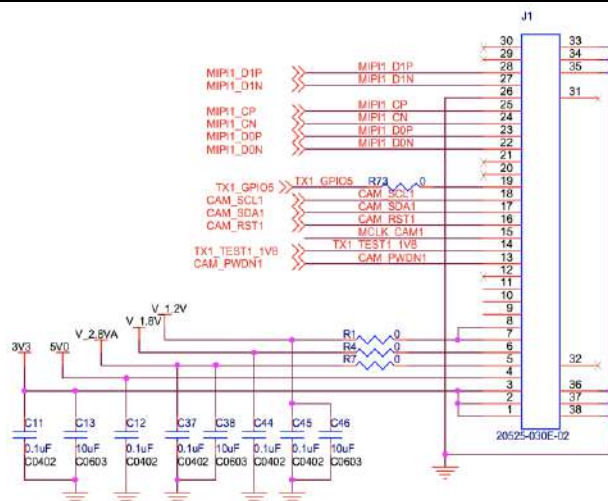
LI-JTX1-MIPI-ADPT-6CAM



Interfaces

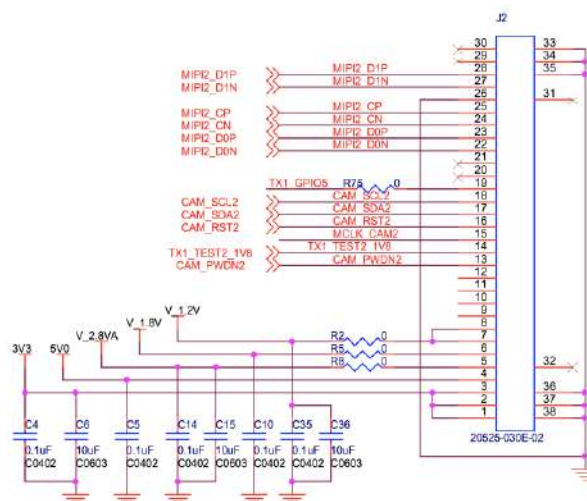
Interface J1

- 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)

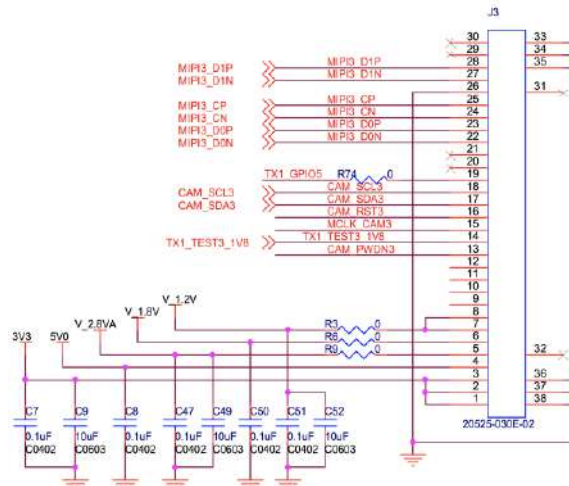


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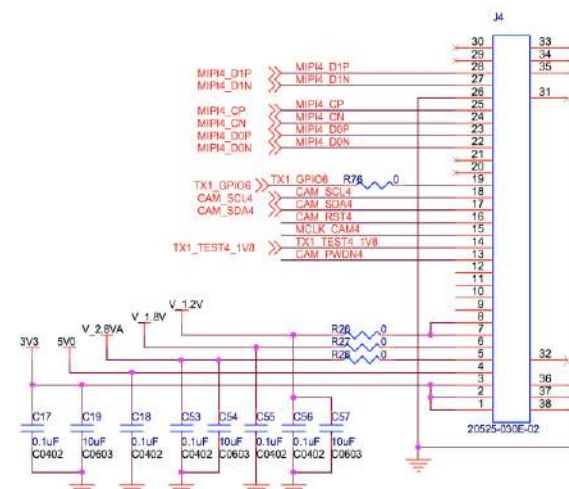
Interface J3

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



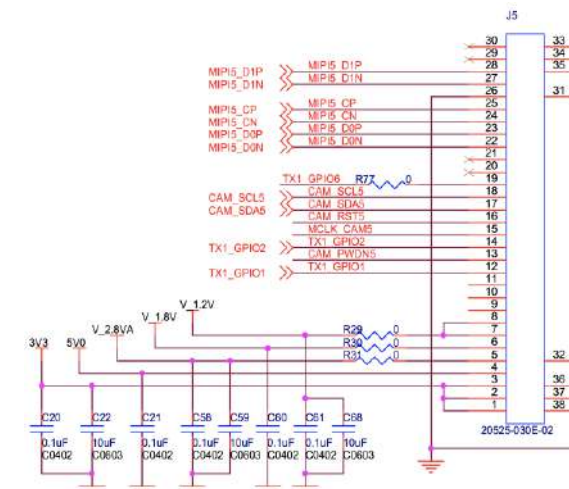
Interface J4

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



Interface J5

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

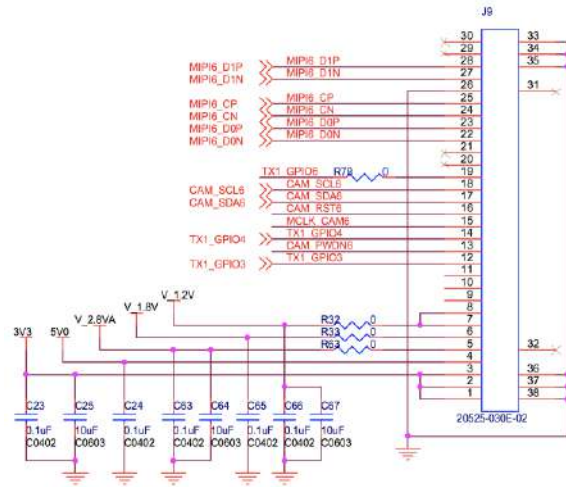


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Interface J9

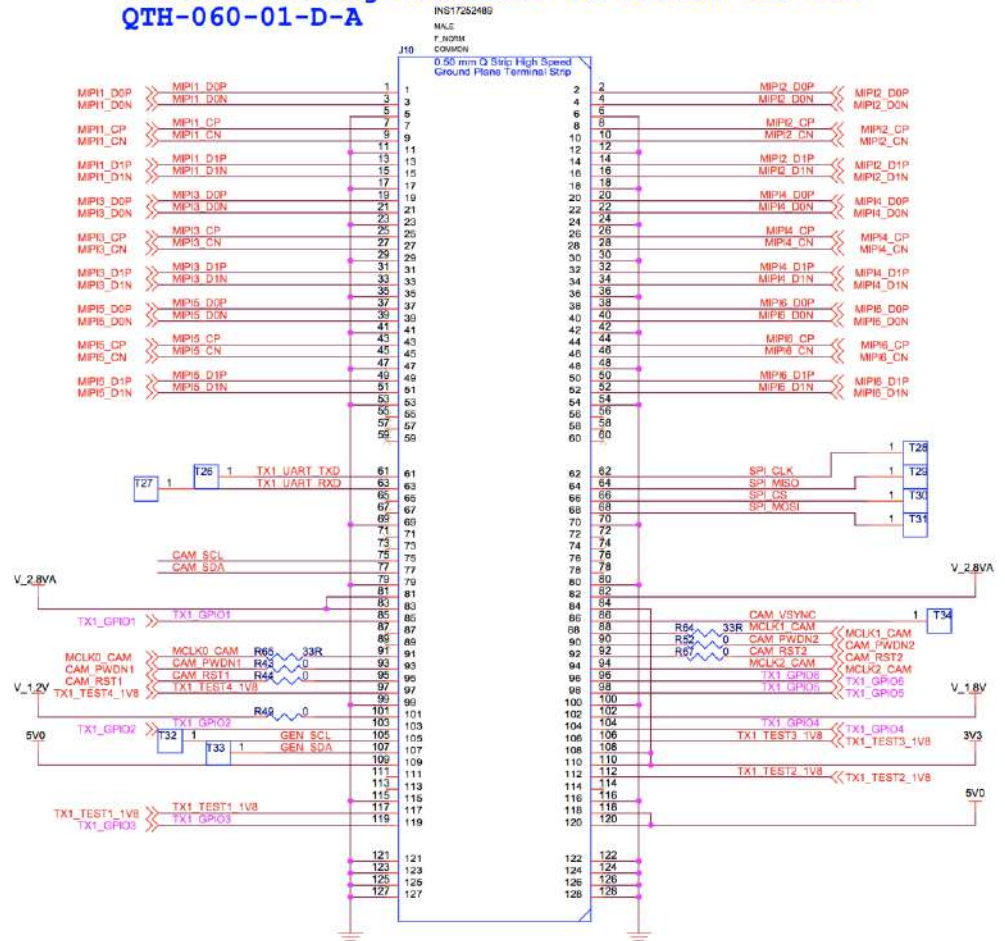
- Part#: 20525-030E-02C
 - Number of Positions: 30
 - Pitch: 0.4mm
- Mating I-PEX cable: FAW-1233-03 (300mm)



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-IMX185-MIPI-M12



Camera Spec	
Image Sensor	Sony Diagonal 8.58 mm (Type 1/1.9) Solid-state Image Sensor IMX185
Optical format	1/1.9"
Number of active pixels	1952 (H) x 1243 (V)
Pixel size	3.75um (H) x 3.75um (V)
Color or Mono	Color
Interface	MIPI interface
Lens mount	M12
Weight	14 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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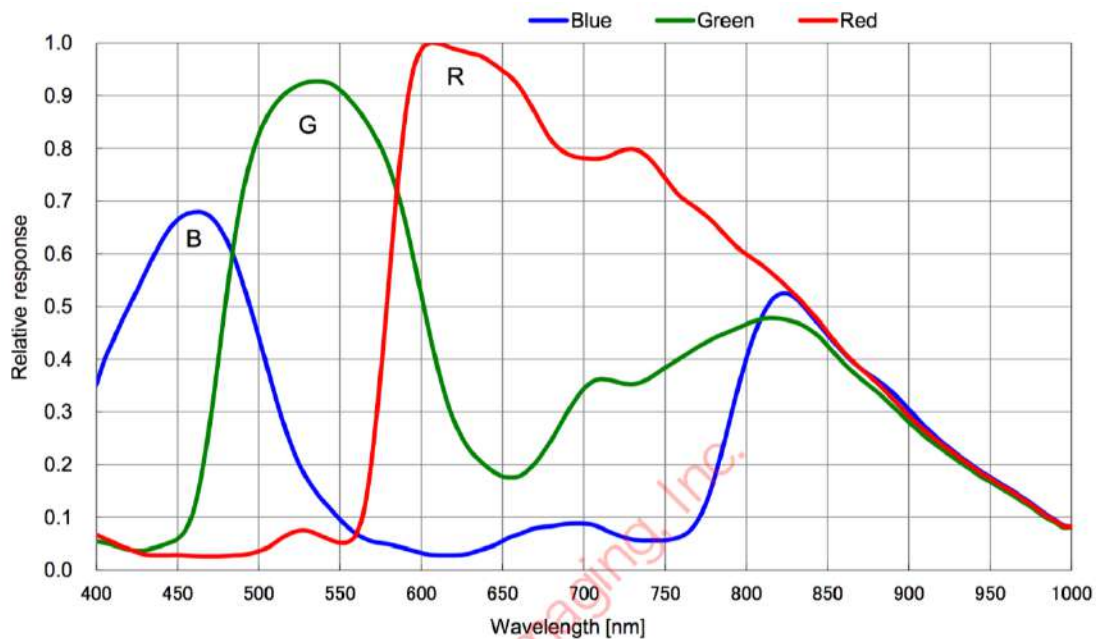
Absolute Maximum Ratings

Item	Symbol	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



DC Characteristics

Item	Pins	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	Analog	V _{DDHx}	AV _{DD}	3.15	3.30	3.45	V
	Digital	V _{DDMx}	OV _{DD}	1.70	1.80	1.90	V
	Digital	V _{DDLx}	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 resistance 100 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 _{DDH}	IAV _{DD}	88	88	113	113	mA
	V _{DDM}	IOV _{DD}	2	2	4	4	mA
	V _{DDL}	IDV _{DD}	110	130	150	190	mA
Standby current	V _{DDH}	IAV _{DD_STB}	—	—	0.2		mA
	V _{DDM}	IOV _{DD_STB}	—	—	0.1		mA
	V _{DDL}	IDV _{DD_STB}	—	—	7.0		mA

Operating current:

(Typical value condition) : Supply voltage 3.3 V / 1.8 V / 1.2 V, T_j = 25 °C

(Maximum value condition) : Supply voltage 3.45 V / 1.9 V / 1.3 V, worst state of internal circuit operating current consumption, T_j = 60 °C

Standby (Maximum value condition) : Supply voltage 3.45 V / 1.9 V / 1.3 V, T_j = 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.

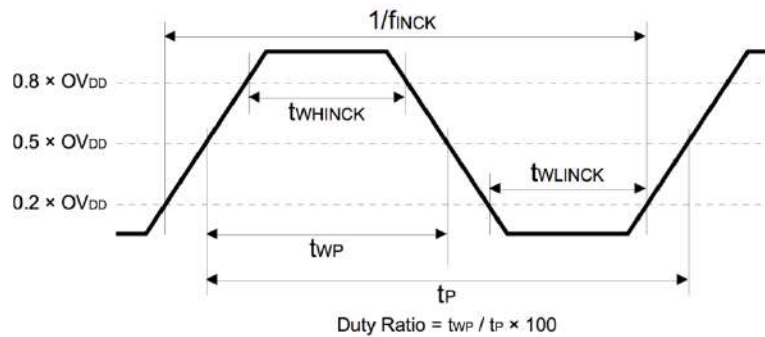


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AC Specification

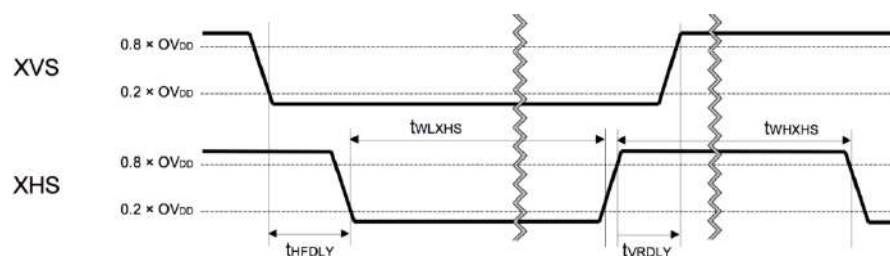
INCK



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	$f_{INCK} = 27 \text{ MHz}, 54 \text{ MHz}, 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK Low level width	t_{WLINCK}	4	—	—	ns	$f_{INCK} = 27 \text{ MHz}, 54 \text{ MHz}, 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK High level width	t_{WHINCK}	4	—	—	ns	$f_{INCK} = 27 \text{ MHz}, 54 \text{ MHz}, 37.125 \text{ MHz}, 74.25 \text{ MHz}$
INCK clock duty	—	45.0	50.0	55.0	%	Define with $0.5 \times OV_{DD}$

* The INCK fluctuation affects the frame rate.

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



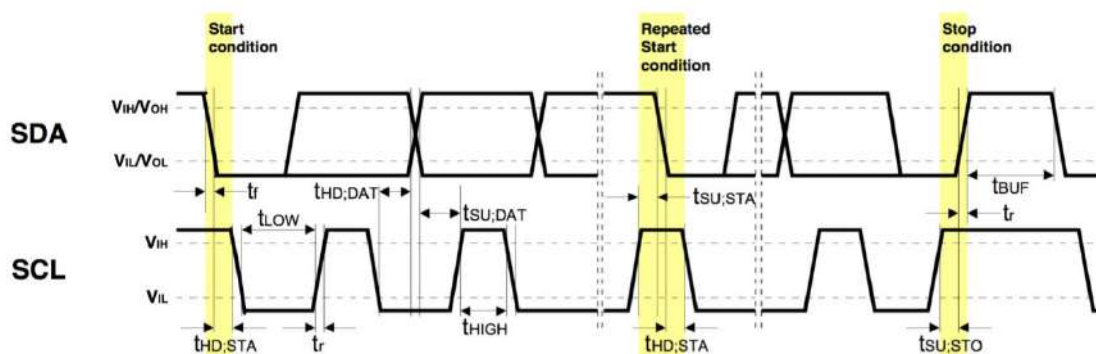
Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
XHS Low level pulse width	t_{WLXHS}	$4 / f_{INCK}$	—	—	ns	
XHS High level pulse width	t_{WHXHS}	$4 / f_{INCK}$	—	—	ns	
XVS-XHS fall width	t_{HFDLY}	$1 / f_{INCK}$	—	—	ns	
XHS-XVS rise width	t_{VRDLY}	$1 / f_{INCK}$	—	—	ns	



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I²C Communication



I²C Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Low level input voltage	V_{IL}	-0.3	—	$0.3 \times OV_{DD}$	V	
High level input voltage	V_{IH}	$0.7 \times OV_{DD}$	—	1.9	V	
Low level output voltage	V_{OL}	0	—	$0.2 \times OV_{DD}$	V	$OV_{DD} < 2$ V, Sink 3 mA
High level output voltage	V_{OH}	$0.8 \times OV_{DD}$	—	—	V	
Output fall time	t_{of}	—	—	250	ns	Load 10 pF – 400 pF, $0.7 \times OV_{DD} - 0.3 \times OV_{DD}$
Input current	i_i	-10	—	10	μ A	$0.1 \times OV_{DD} - 0.9 \times OV_{DD}$
Capacitance for SCK (/SCL) , SDI (/SDA)	C_i	—	—	10	pF	

I²C AC Characteristics

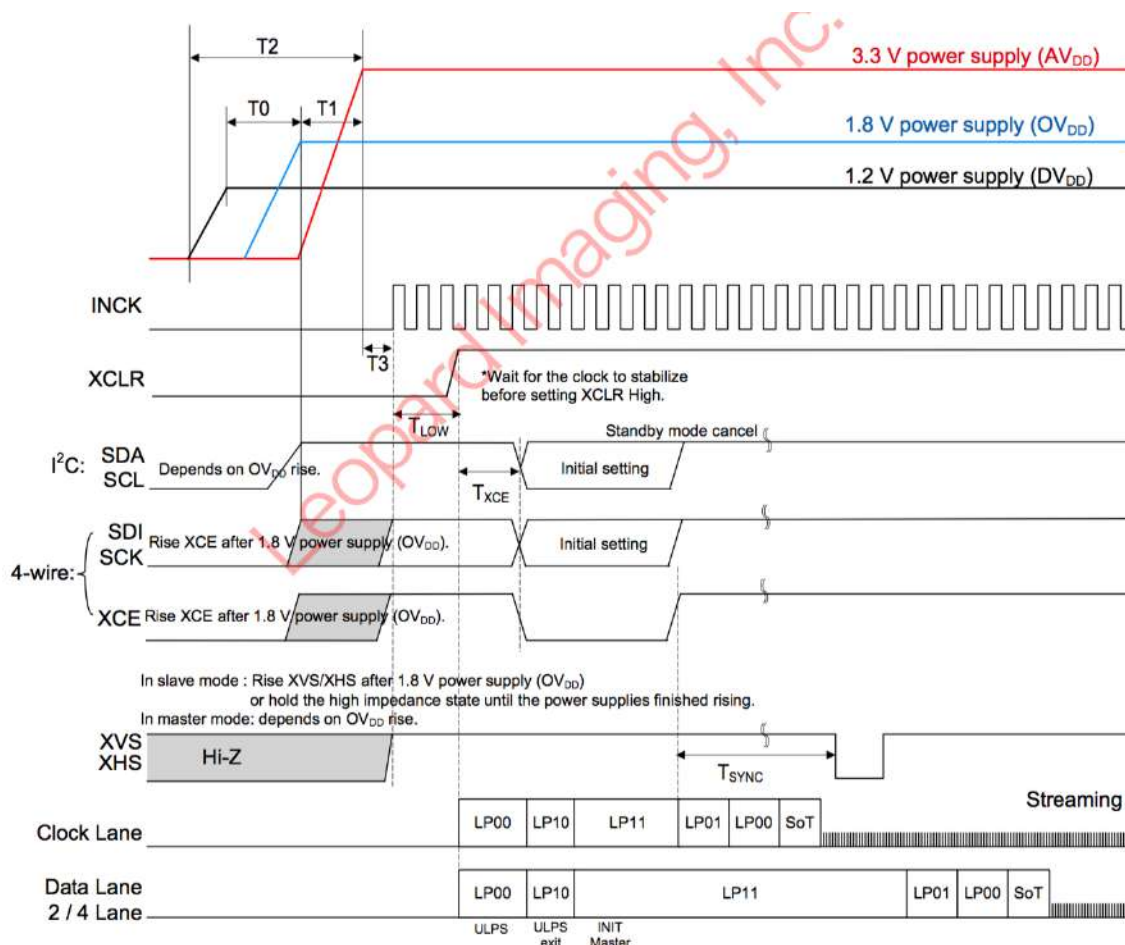
Item	Symbol	Min.	Typ.	Max.	Unit
SCL clock frequency	f_{SCL}	0	—	400	kHz
Hold time (Start Condition)	t_{HDSTA}	0.6	—	—	μ s
Low period of the SCL clock	t_{LOW}	1.3	—	—	μ s
High period of the SCL clock	t_{HIGH}	0.6	—	—	μ s
Set-up time (Repeated Start Condition)	t_{SUSTA}	0.6	—	—	μ s
Data hold time	t_{HDDAT}	0	—	0.9	μ s
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	—	—	μ s
Bus free time between a Stop and Start Condition	t_{BUF}	1.3	—	—	μ s



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Power-on Sequence



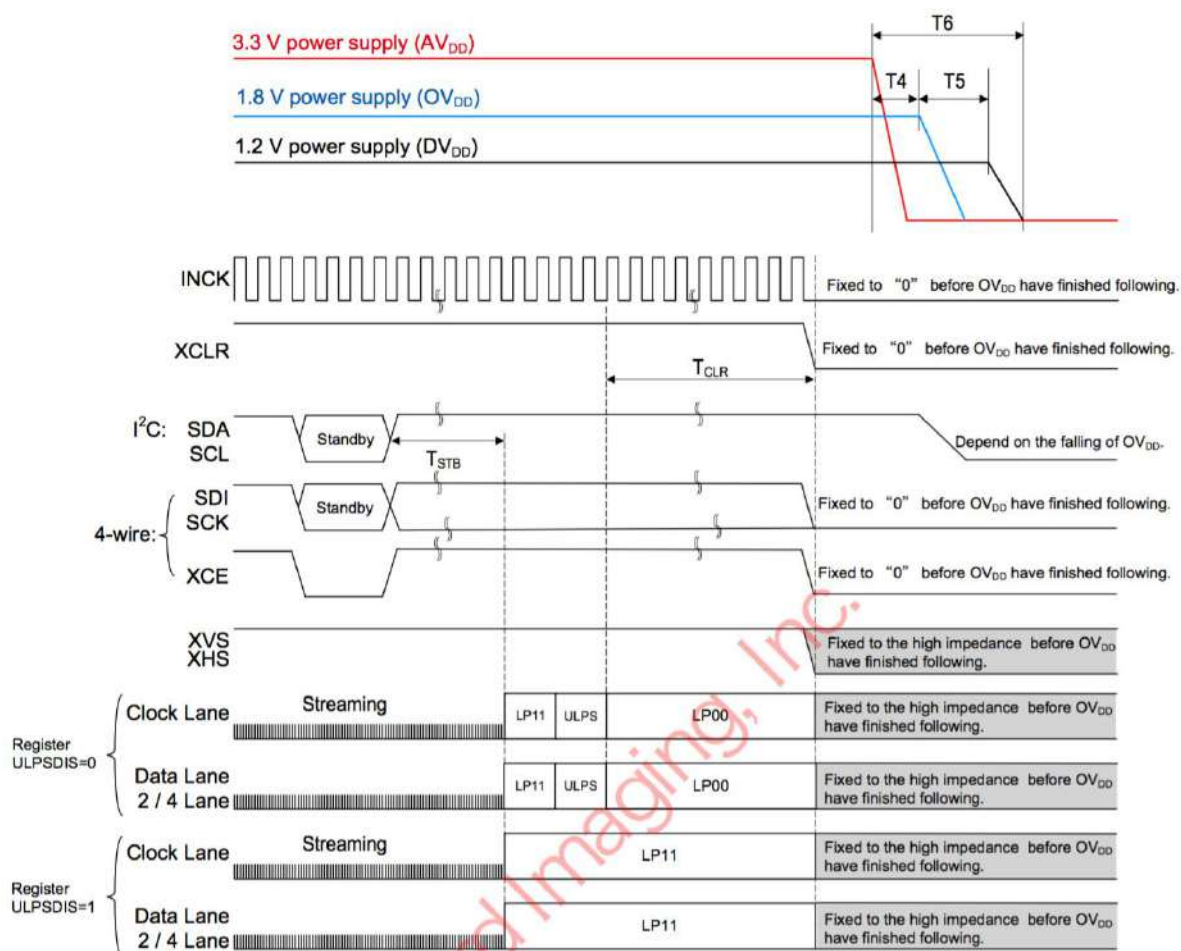
Item	Symbol	Min.	Max.	Unit
1.2 V power supply rising → 1.8 V power supply rising	T_0	0	—	ns
1.8 V power supply rising → 3.3 V power supply rising	T_1	0	—	ns
Rising time of all power supply	T_2	—	200	ms
All power supply rising → External input time of INCK	T_3	0	—	ns
INCK active → Clear OFF	T_{LOW}	500	—	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



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 $-\infty$

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