



LEOPARD IMAGING INC

LI-JETSON-KIT-AR0144-ST-X

Data Sheet

Key Features

- Compatible with Nvidia® Jetson™ TX1/TX2 Developer Kit
- MIPI CSI-2 interface
- Support up to three stereo cameras
- ON Semiconductor CMOS Image Sensor AR0144
- Resolution: 2560H x 720V
- Pixel size: 3.0 um x 3.0 um
- Global Shutter
- Color sensor
- 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-AR0144-ST**
(2 cam) **LI-JETSON-KIT-AR0144-ST-D**
(3 cam) **LI-JETSON-KIT-AR0144-ST-T**



Lens Spec

- Model: SYD1201A
- Focal length: 3.7 mm
- Aperture, F/#: 2.8 +/- 5%
- Built in 650nm IR cut filter
- FOV (D/H/V): 66.5° / 59° /35.5°
- TV Distortion: -1.0 %

BOM

Nvidia TX1/TX2 Developer Kit not included

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-AR0144-MIPI-STEREO	1,2 or 3
3	FAW-1233-03 cable	1,2 or 3



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LI-JETSON-KIT-AR0144-ST

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-AR0144-MIPI-STEREO	1
3	FAW-1233-03 cable	1



LI-JETSON-KIT-AR0144-ST-D

BOM

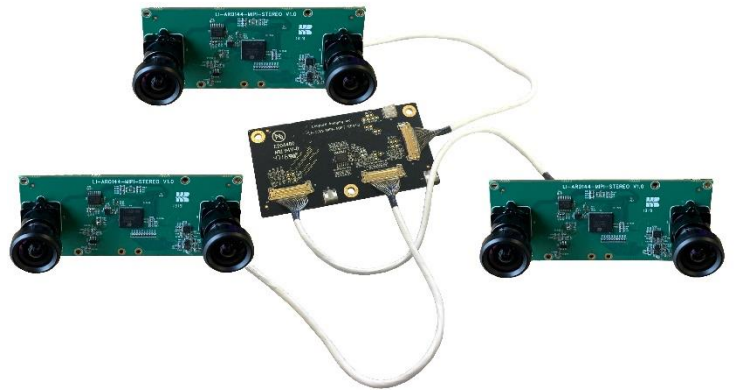
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1	LI-JTX1-MIPI-ADPT	1
2	LI-AR0144-MIPI-STEREO	2
3	FAW-1233-03 cable	2



LI-JETSON-KIT-AR0144-ST-T

BOM

#	Items	QTY
1	LI-JTX1-MIPI-ADPT	1
2	LI-AR0144-MIPI-STEREO	3
3	FAW-1233-03 cable	3

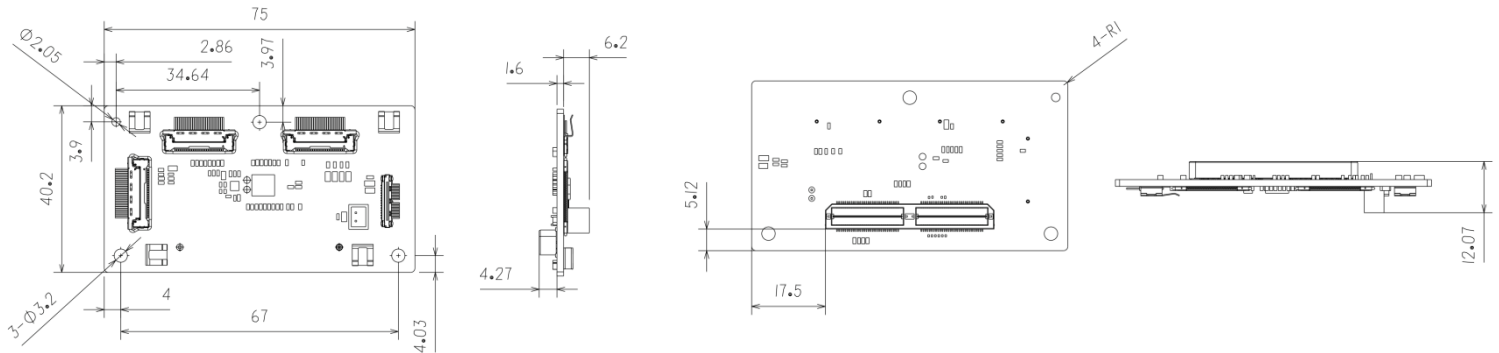


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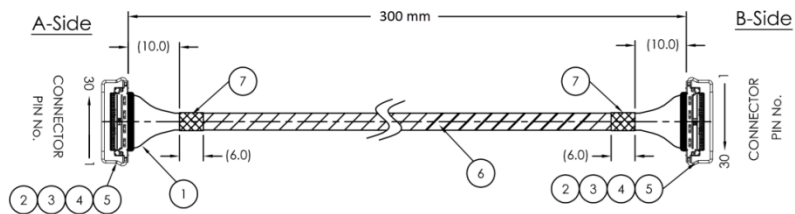
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Dimensions

LI-JTX1-MIPI-ADPT



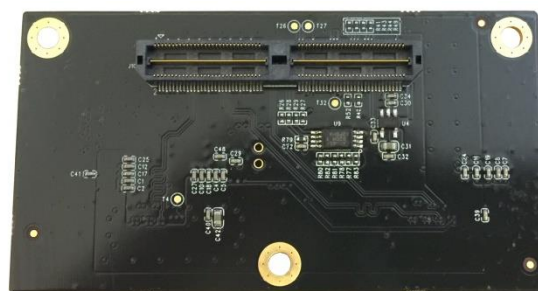
FAW-1233-03



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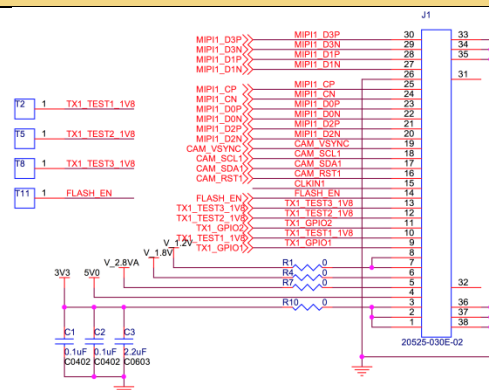
LI-JTX1-MIPI-ADPT



Interfaces

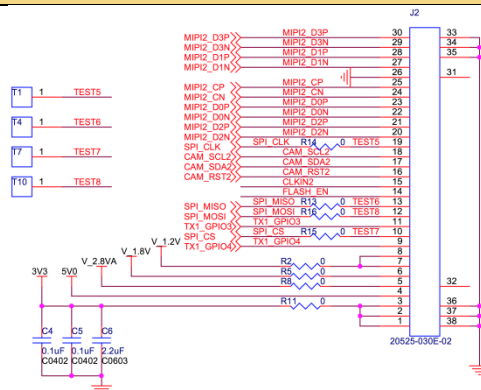
Interface J1

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



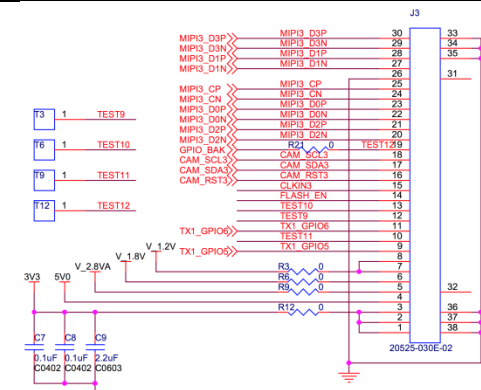
Interface J2

- 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)



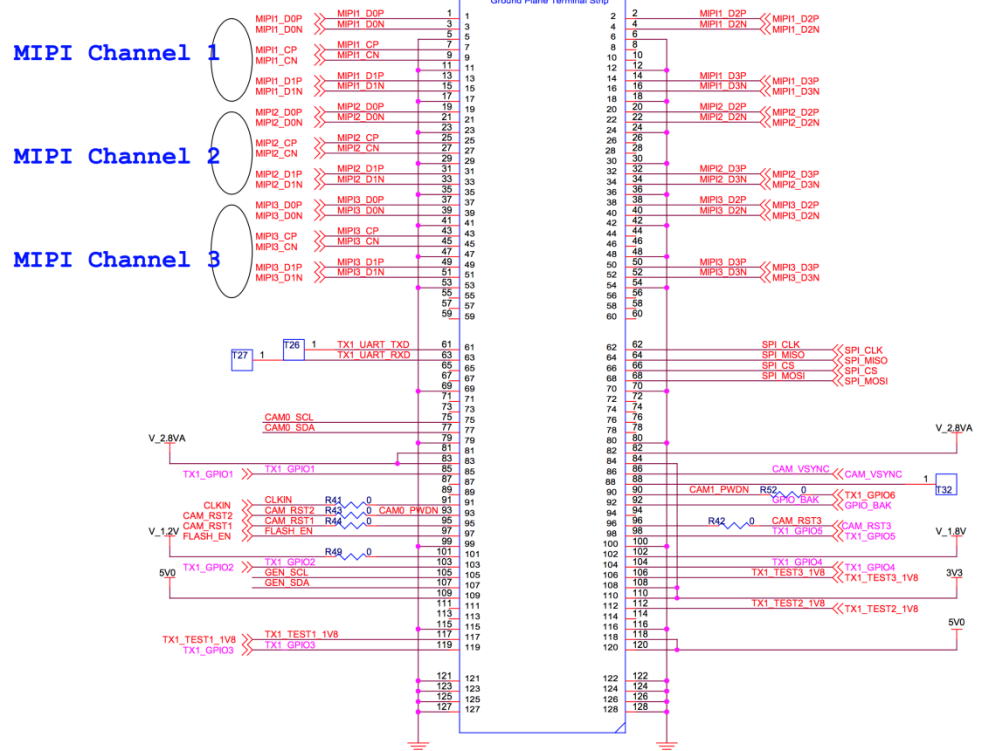
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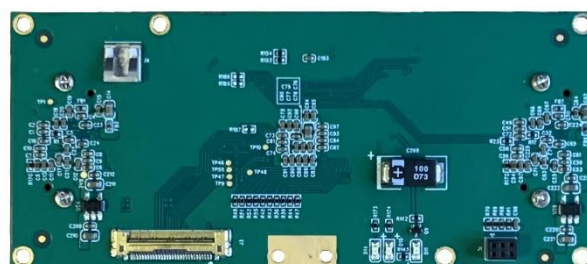
Interface J10

- 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



LI-AR0144-MIPI-STEREO



Camera Spec	
Image Sensor	ON Semiconductor CMOS Image Sensor AR0144
Optical format	1/4"
Number of active pixels	1280 (H) x 800 (V)
Pixel size	3.0um (H) x 3.0um (V)
Color or Mono	Color
Baseline	70mm
Interface	MIPI interface
Lens mount	M12
Size	86mm x 38mm
Weight	34g +/- 2g
Interfaces	
Interface J3:	- Part#: 20525-030E-02C - Number of Positions: 30 - Pitch: 0.4mm - Mating I-PEX cable: FAW-1233-03 (300mm)
	Pinout diagram for J3 connector: 1: MIPI1_D3P 2: MIPI1_D3N 3: MIPI1_D1P 4: MIPI1_D1N 5: MIPI1_CP 6: MIPI1_CN 7: MIPI1_D0P 8: MIPI1_D0N 9: MIPI1_D2P 10: MIPI1_D2N 11: TEST4 12: CAM_SCL 13: CAM_SDA 14: CAM_RST 15: CLKIN 16: FLASH_EN1 17: CAM_TRIG 18: TEST2 19: TEST3 20: TEST1 21: TEST1 22: TEST1 23: TEST1 24: TEST1 25: TEST1 26: TEST1 27: TEST1 28: TEST1 29: TEST1 30: TEST1 31: 3.3V 32: 3.3V 33: 3.3V 34: 3.3V 35: 3.3V 36: 3.3V 37: 3.3V 38: 3.3V



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Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit	Symbol
VSUPPLY	Power supply voltage (all supplies)	-0.3	4.5	V	VSUPPLY
ISUPPLY	Total power supply current	-	200	mA	ISUPPLY
IGND	Total ground current	-	200	mA	IGND
VIN	DC input voltage	-0.3	VDD_IO + 0.3	V	VIN
VOUT	DC output voltage	-0.3	VDD_IO + 0.3	V	VOUT
TSTG ¹	Storage temperature	-40	+125	°C	TSTG ¹

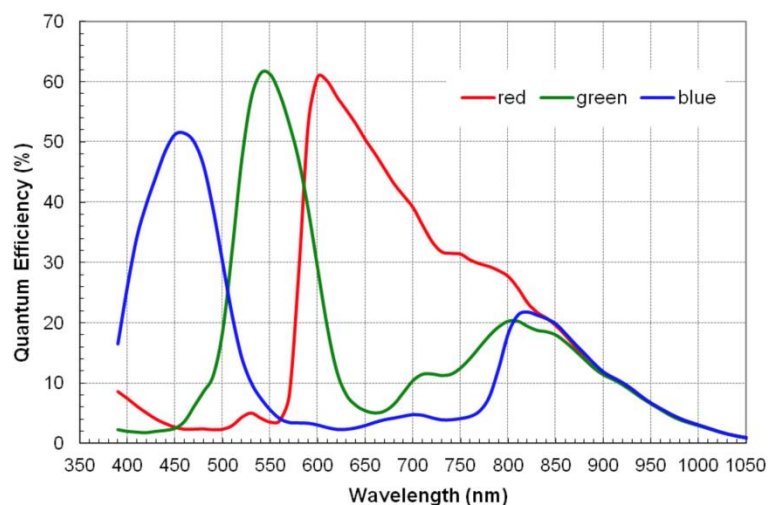
Note: 1. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Operating Current Consumption for MIPI Output

VAA = VAA_PIX = VDD_IO = 2.8V; VDD = VDD_PHY = 1.2V; PLL Enabled and PIXCLK = 74.25 MHz; TA = 55°C;
CLOAD = 10pF

	Condition	Symbol	Min	Typ	Max	Unit
Digital operating current	MIPI, Streaming, Full resolution 60 fps	IDD				mA
I/O digital operating current	MIPI, Streaming, Full resolution 60 fps	IDD_IO				mA
Analog operating current	MIPI, Streaming, Full resolution 60 fps	IAA				mA
Pixel supply current	MIPI, Streaming, Full resolution 60 fps	IAA_PIX				mA
PLL supply current	MIPI, Streaming, Full resolution 60 fps	IDD_PLL				mA
PHY supply current	MIPI, Streaming, Full resolution 60fps	IDD_PHY				mA

Quantum Efficiency (Color)



DC Characteristics

Symbol	Definition	Condition	Min	Typ	Max	Unit
VDD	Core digital voltage		1.14	1.2	1.26	V
VDD_IO	I/O digital voltage		1.7/2.5	1.8/2.8	1.9/3.1	V
VAA	Analog voltage		2.5	2.8	3.1	V
VAA_PIX	Pixel supply voltage		2.5	2.8	3.1	V
VDD_PHY	MIPI supply voltage		1.14	1.2	1.26	V
VIH	Input HIGH voltage		VDD_IO * 0.7	–	–	V
VIL	Input LOW voltage		–	–	VDD_IO * 0.3	V
IIN	Input leakage current	No pull-up resistor; VIN = VDD_IO or DGND	20	–	–	μA
VOH	Output HIGH voltage		VDD_IO – 0.3	–	–	V
VOL	Output LOW voltage	VDD_IO = 2.8V	–	–	0.4	V
IOH	Output HIGH current	At specified VOH	–22	–	–	mA
IOL	Output LOW current	At specified VOL	–	–	22	mA

Caution Stresses greater than those listed in Table 13 may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Standby Current Consumption

Analog - VAA + VAA_PIX; Digital - VDD + VDD_PHY; TA = 55°C

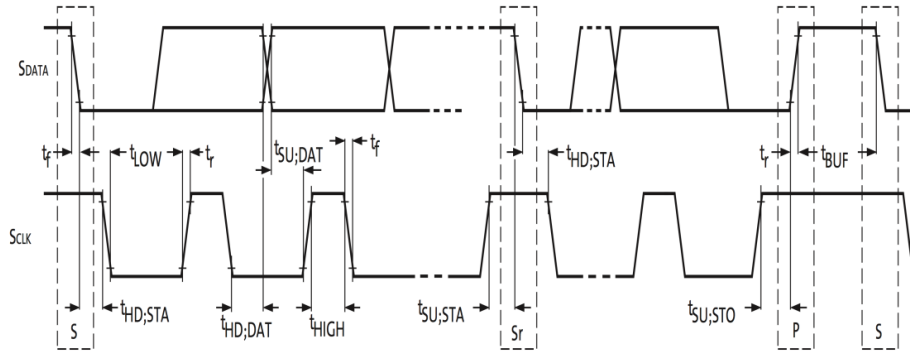
Definition	Condition	Min	Typ	Max	Unit
Soft standby (clock off, driven low)	Analog, 2.8V				μA
	Digital, 1.2V				μA
	VDD_IO, 2.8V				mA
Soft standby (clock on, EXTCLK = 20 MHz)	Analog, 2.8V				μA
	Digital, 1.2V				mA
	VDD_IO, 2.8V				mA
Hard reset (clock off, driven low)	Analog, 2.8V				μA
	Digital, 1.2V				μA
	VDD_IO, 2.8V				mA
Hard reset (clock on, EXTCLK = 20 MHz)	Analog, 2.8V				μA
	Digital, 1.2V				μA
	Analog, 2.8V				mA



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Two-Wire Serial Bus Timing Parameters



Note: Read sequence: For an 8-bit READ, read waveforms start after WRITE command and register address are issued.

Two-Wire Serial Bus Characteristics

$f_{EXTCLK} = 27 \text{ MHz}$; $V_{DD} = 1.2\text{V}$; $V_{DD_IO} = 2.8\text{V}$; $V_{AA} = 2.8\text{V}$; $V_{AA_PIX} = 2.8\text{V}$; $V_{DD_PHY} = 1.2\text{V}$; $T_A = 25^\circ\text{C}$

Parameter	Symbol	Standard-Mode		Fast-Mode		Unit
		Min	Max	Min	Max	
SCLK Clock Frequency	f_{SCL}	0	100	0	400	KHz
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD,STA}$	4.0	-	0.6	-	μS
LOW period of the SCLK clock	t_{LOW}	4.7	-	1.3	-	μS
HIGH period of the SCLK clock	t_{HIGH}	4.0	-	0.6	-	μS
Set-up time for a repeated START condition	$t_{SU,STA}$	4.7	-	0.6	-	μS
Data hold time:	$t_{HD,DAT}$	0 ⁴	3.45 ⁵	0 ⁶	0.9 ⁵	μS
Data set-up time	$t_{SU,DAT}$	250	-	100 ⁶	-	nS
Rise time of both SDATA and SCLK signals	t_r	-	1000	$20 + 0.1Cb^7$	300	nS
Fall time of both SDATA and SCLK signals	t_f	-	300	$20 + 0.1Cb^7$	300	nS
Set-up time for STOP condition	$t_{SU,STO}$	4.0	-	0.6	-	μS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	1.3	-	μS
Capacitive load for each bus line	C_b	-	400	-	400	pF
Serial interface input pin capacitance	C_{IN_SI}	-	3.3	-	3.3	pF
SDATA max load capacitance	C_{LOAD_SD}	-	30	-	30	pF
SDATA pull-up resistor	RSD	1.5	4.7	1.5	4.7	K Ω

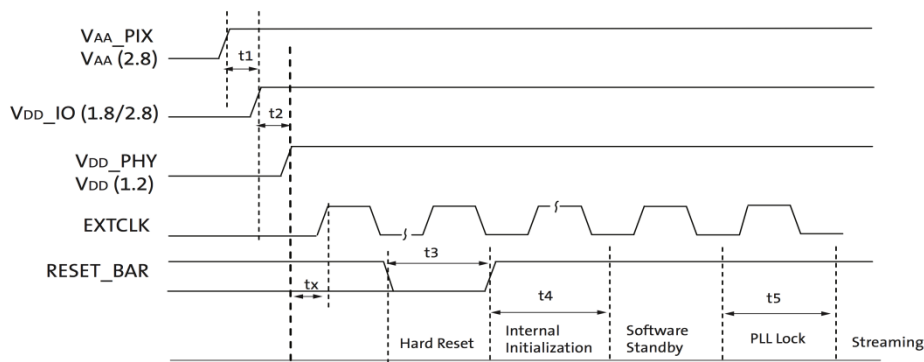
- Notes:
1. This table is based on I²C standard (v2.1 January 2000). Philips Semiconductor.
 2. Two-wire control is I²C-compatible.
 3. All values referred to $V_{IHmin} = 0.9 V_{DD}$ and $V_{ILmax} = 0.1 V_{DD}$ levels. Sensor EXCLK = 27 MHz.
 4. A device must internally provide a hold time of at least 300 ns for the SDATA signal to bridge the undefined region of the falling edge of SCLK.
 5. The maximum $t_{HD,DAT}$ has only to be met if the device does not stretch the LOW period (t_{LOW}) of the SCLK signal.
 6. A Fast-mode I²C-bus device can be used in a Standard-mode I²C-bus system, but the requirement $t_{SU,DAT}$ 250 ns must then be met. This will automatically be the case if the device does not stretch the LOW period of the SCLK signal. If such a device does stretch the LOW period of the SCLK signal, it must output the next data bit to the SDATA line $t_r \text{ max} + t_{SU,DAT} = 1000 + 250 = 1250 \text{ ns}$ (according to the Standard-mode I²C-bus specification) before the SCLK line is released.
 7. C_b = total capacitance of one bus line in pF.



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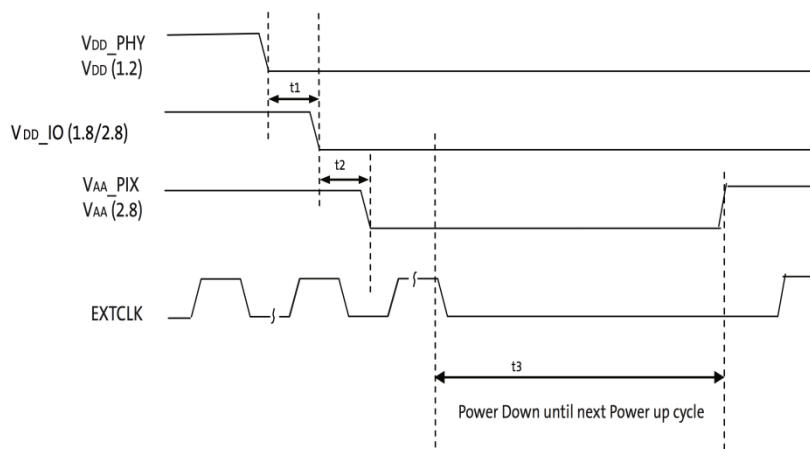
Power-on Sequence



Definition	Symbol	Minimum	Typical	Maximum	Unit
VAA/VAA_PIX to VDD_IO	t1	0	10	—	μs
VDD_IO to VDD/VDD_PHY	t2	0	10	—	μs
Xtal settle time	tx	—	30 ¹	—	ms
Hard Reset	t3	1 ²	—	—	ms
Internal Initialization	t4	160000	—	—	EXTCLKs
PLL Lock Time	t5	1	—	—	ms

- Notes:
1. Xtal settling time is component-dependent, usually taking about 10 – 100 ms.
 2. Hard reset time is the minimum time required after power rails are settled. In a circuit where hard reset is held down by RC circuit, then the RC time must include the all power rail settle time and Xtal settle time.

Power-Down Sequence



Definition	Symbol	Minimum	Typical	Maximum	Unit
VDD_PHY / VDD to VDD_IO	t1	0	—	—	μs
VDD_IO to VAA/VAA_PIX	t2	0	—	—	μs
PwrDn until Next PwrUp Time	t3	100	—	—	ms

Note: t3 is required between power down and next power up time; all decoupling caps from regulators must be completely discharged.



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Revision History

Revision	Description	Release Date
1.0	First Release	11. May. 2019
1.1	Update the AR0144-MIPI-STEREO camera	9. Mar. 2020



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