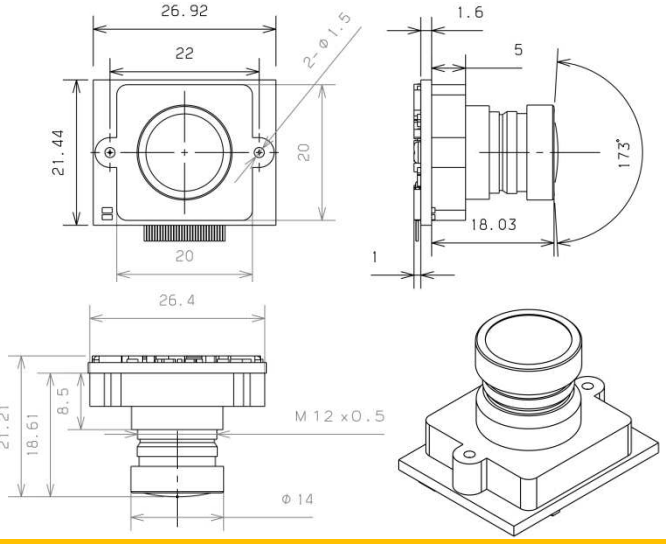
LEOPARD IMAGING INC

LI-IMX290-MIPI Data Sheet

Key Features

- Sony Diagonal 6.46 mm (Type 1/2.8) CMOS Image Sensor IMX290
- Active pixels: 1945H x 1109V
- Pixel size: 2.9 um x 2.9 um
- Color sensor
- Interface: MIPI output
- Support M12 lens
- Module Size: 27mmx21.5mm
- Weight: 14 g
- Part#: LI-IMX290-MIPI

Dimensions

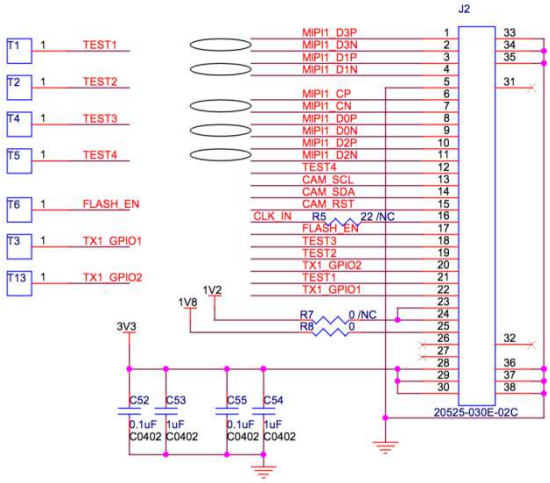


Lens Spec

- Model: LC001E-0530
- Focal length: 3.98 mm +/- 5%
- Aperture, F/#: 2.3 +/- 5%
- Built in 650nm IR cut filter
- FOV (D/H/V): 96° / 82.4° /50°
- TV Distortion: < 12%
- Mount: M12 x P0.5

Interfaces

- Part#: 20525-030E-02C
- Number of Positions: 30
- Mating cable: FAW-1233-xx



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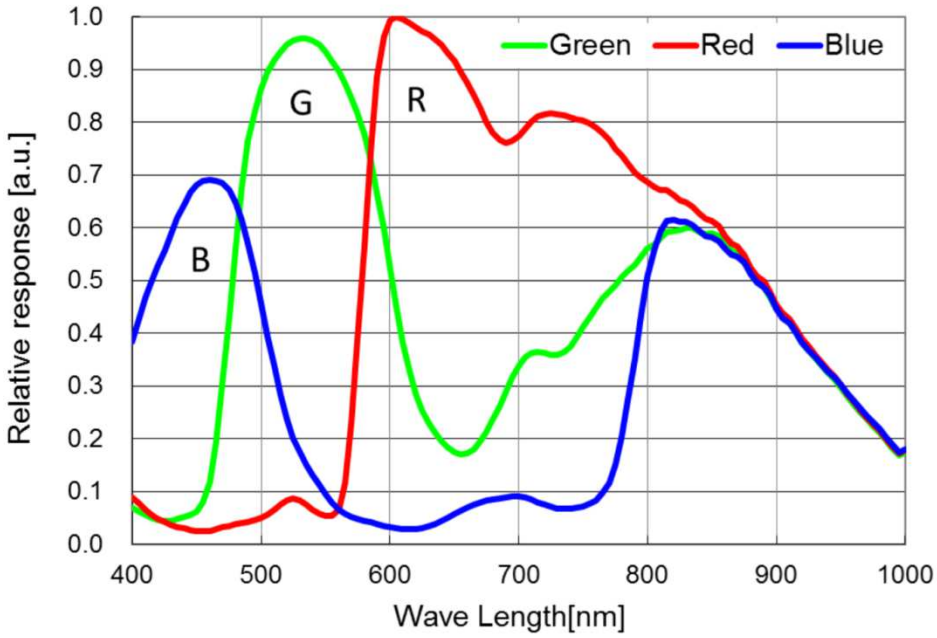
Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remarks
Supply voltage (analog 2.9 V)	AV_{DD}	-0.3	3.3	V	
Supply voltage (interface 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

Recommended Operating Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage (analog 2.9 V)	AV_{DD}	2.80	2.90	3.00	V
Supply voltage (Interface 1.8 V)	OV_{DD}	1.70	1.80	1.90	V
Supply voltage (digital 1.2 V)	DV_{DD}	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



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DC Characteristics

Item		Pins	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	analog	VDDHx	AV_{DD}		2.80	2.90	3.00	V
	Interface	VDDMx	OV_{DD}		1.70	1.80	1.90	V
	digital	VDDLx	DV_{DD}		1.10	1.20	1.30	V
Digital input voltage		XHS XVS XCLR INCK XMASTER OMODE SCK SDI XCE XTRIG	VIH	XVS / XHS Slave Mode	$0.8OV_{DD}$	—	—	V
			VIL		—	—	$0.2OV_{DD}$	V
Digital output voltage		DLOP [A:F] DLOM [A:F] DLCKP DLCKM	VOH	IOH = -2 mA	OV_{DD}-0.4	—	—	V
			VOL	IOL = 2 mA	—	—	0.4	V
			VCM	Low voltage LVDS	—	$OV_{DD}/2$	—	V
			VOD	Low voltage LVDS (Termination resistance: 100 Ω)	100	150	220	mV
		XHS XVS SDO TOUT	VOH	XVS / XHS Master Mode	OV_{DD}-0.4	—	—	V
			VOL		—	—	0.4	V

Current Consumption

Item	pin	Symbol	Typ.		Max.		Unit
			Standard luminous intensity	Saturated luminous intensity	Standard luminous intensity	Saturated luminous intensity	
Operating current Low voltage LVDS serial 8 ch 12 bit 60 frame / s Full HD 1080p mode	VDDH	IAV_{DD}	54	53	111	108	mA
	VDDM	IOV_{DD}	16	15	29	27	mA
	VDDL	IDV_{DD}	77	95	123	214	mA
Operating current MIPI CSI-2 / 4 Lane 12 bit, 60 frame/s Full HD 1080p mode	VDDH	IAV_{DD}	55	54	111	108	mA
	VDDM	IOV_{DD}	1	1	2	2	mA
	VDDL	IDV_{DD}	94	111	143	252	mA
Operating current CMOS parallel SDR 12 bit, 30 frame/s Full HD 1080p	VDDH	IAV_{DD}	55	54	111	110	mA
	VDDM	IOV_{DD}	17	17	28	28	mA
	VDDL	IDV_{DD}	49	59	90	159	mA
Standby current	VDDH	IAV_{DD}_STB	—		0.1		mA
	VDDM	IOV_{DD}_STB	—		0.1		mA
	VDDL	IDV_{DD}_STB	—		14.0		mA

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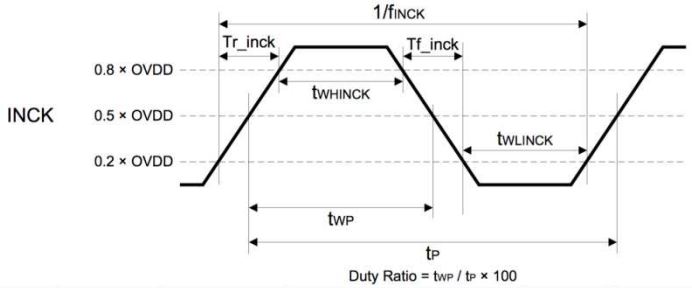
AC Characteristics

INCK

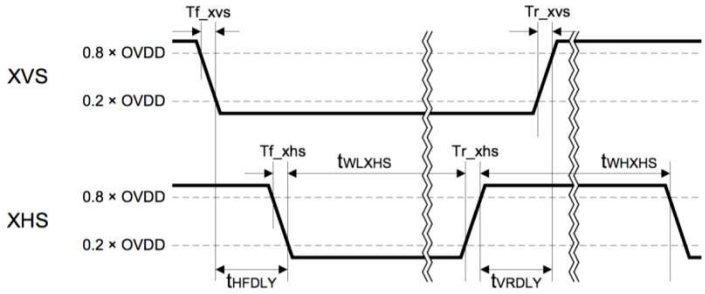


Duty Ratio = t_{WP} / t_P × 100

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} = 37.125 MHz, 74.25 MHz
INCK Low level pulse width	t_{WLINCK}	4	—	—	ns	f_{INCK} = 37.125 MHz, 74.25 MHz
INCK High level pulse width	t_{WHINCK}	4	—	—	ns	f_{INCK} = 37.125 MHz, 74.25 MHz
INCK clock duty	—	45.0	50.0	55.0	%	Define with 0.5 × OV_{DD}
INCK Rise time	Tr_inck	—	—	5	ns	20 % to 80 %
INCK Fall time	Tf_inck	—	—	5	ns	80 % to 20 %

*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	
XVS Rise time	Tr_xvs	—	—	5	ns	20 % to 80 %
XVS Fall time	Tf_xvs	—	—	5	ns	80 % to 20 %
XHS Rise time	Tr_xhs	—	—	5	ns	20 % to 80 %
XHS Fall time	Tf_xhs	—	—	5	ns	80 % to 20 %

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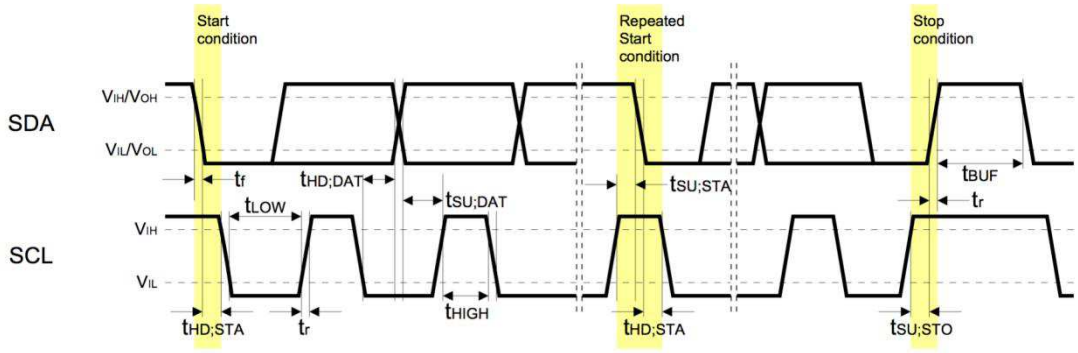
I²C Communication



I²C Specification

Item	Symbol	Min.	Typ.	Max.	Unit	条件
Low level input voltage	VIL	-0.3	—	0.3 × OV_{DD}	V	
High level input voltage	VIH	0.7 × OV_{DD}	—	1.9	V	
Low level input voltage	VOL	0	—	0.2 × OV_{DD}	V	OVDD < 2 V, Sink 3 mA
High level input voltage	VOH	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)	$t_{HD;STA}$	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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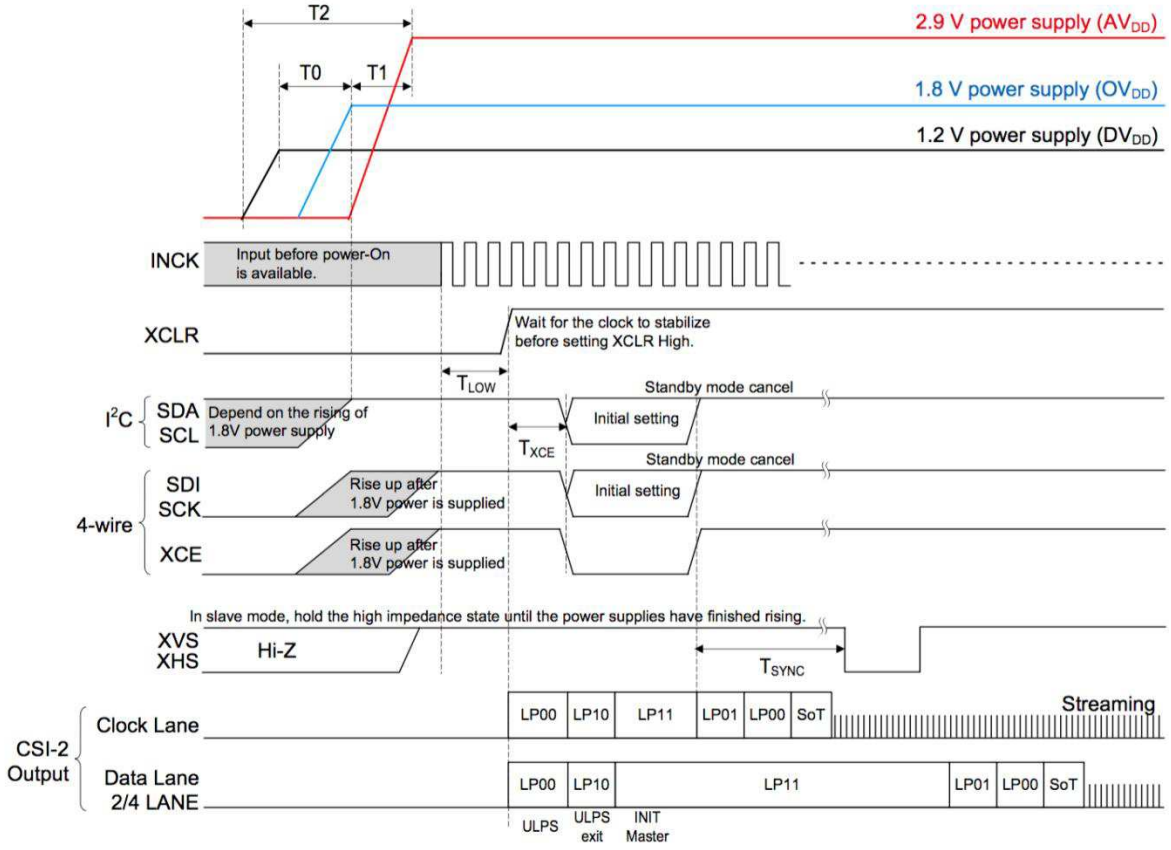
Power-on Sequence

1. Turn On the power supplies so that the power supplies rise in order of 1.2 V power supply (DV_{DD}) →1.8 V power supply (OV_{DD}) → 2.9 V power supply (AV_{DD}). In addition, all power supplies should finish rising within 200 ms.
2. Start master clock (INCK) input after turning On the power supplies.
3. The register values are undefined immediately after power-on, so the system must be cleared. Hold XCLR at Low level for 500 ns or more after all the power supplies have finished rising. (The register values after a system clear are the default values.) In addition, hold XCE to High level during this period. Rise XCE after 1.8 V power supply (OV_{DD}).
4. The system clear is applied by setting XCLR to High level. However, the maser clock needs to stabilize before setting the XCLR pin to High level.
5. Make the sensor setting by register communication after the system clear. A period of 20 µs or more should be provided after setting XCLR High before inputting the communication enable signal XCE. In I^2C communication, XCE is fixed to High.



Item	Symbol	Min.	Max.	Unit
1.2 V power supply rising → 1.8 V power supply rising	T0	0	—	ns
1.8 V power supply rising → 2.9 V power supply rising	T1	0	—	ns
Rising time of all power supply	T2	—	200	ms
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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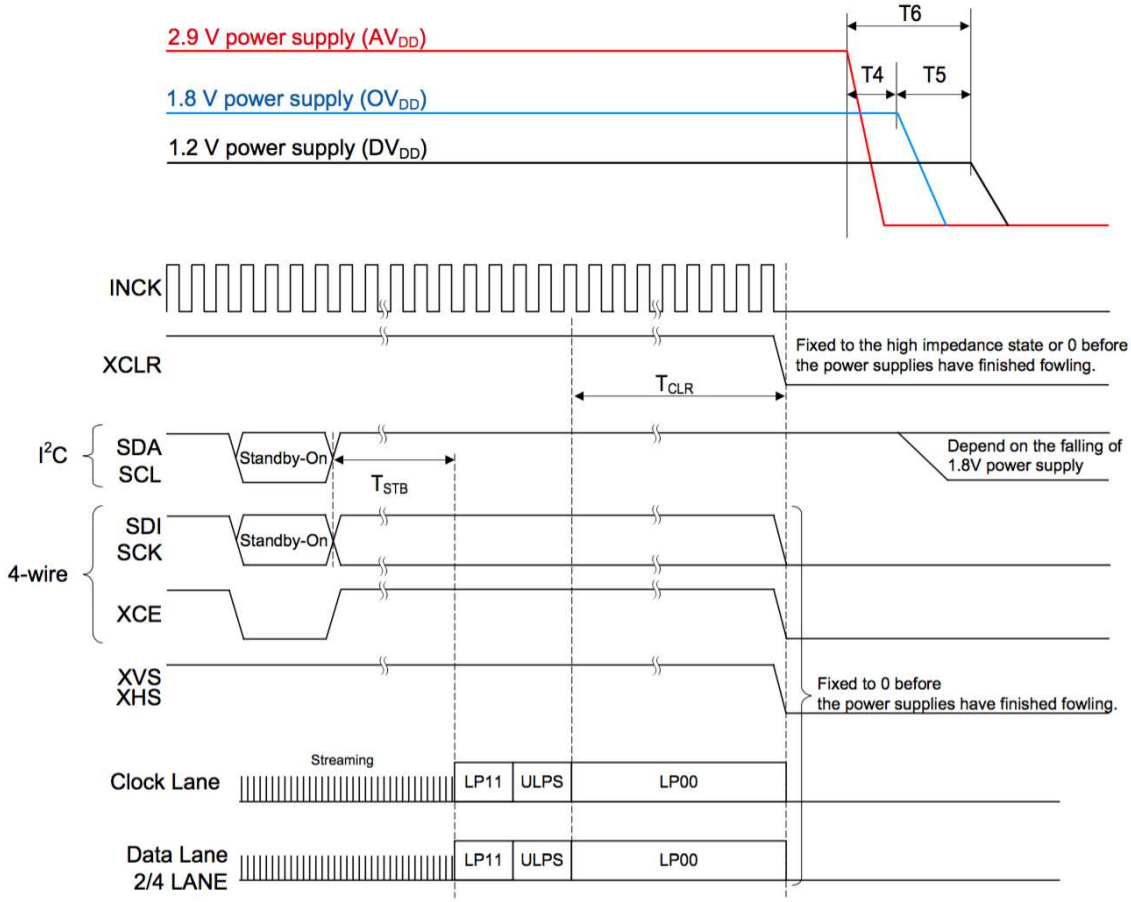
Power-off Sequence

Turn Off the power supplies so that the power supplies fall in order of 2.9 V power supply (AV_{DD}) → 1.8 V power supply (OV_{DD}) → 1.2 V power supply (DV_{DD}). In addition, all power supplies should falling within 200 ms. Set each digital input pin (INCK, XCE, SCK, SDI, XCLR, XMASTER, OMODE, XVS, XHS) to 0 V before the 1.8 V power supply (OV_{DD}) falls.



Item	Symbol	Min.	Max.	Unit
Standby ON (communication) → LP11 mode start	T_{STB}	Until FE		—
LP00 → XCLR falling	T_{CLR}	128	—	cycle
2.9 V power shut down → 1.8 V power shut down	T4	0	—	ns
1.8 V power shut down → 1.2 V power shut down	T5	0	—	ns
Shut down time of all power supply	T6	—	200	ms

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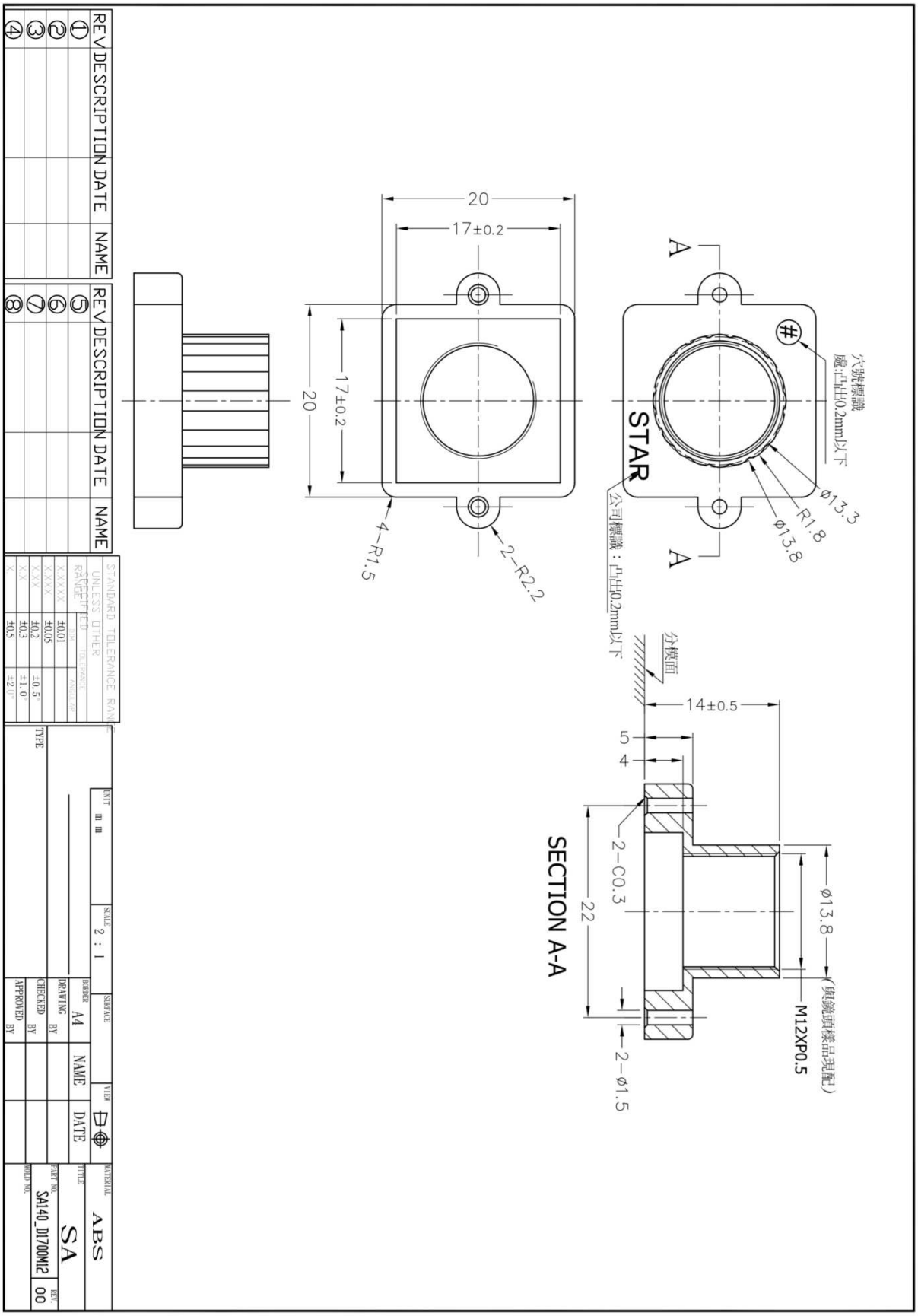
SA140 lens mount Spec



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