LI-OV5640-MIPI-AF
SPECIFICATION

Rev 2.1
Leopard Imaging Inc.

Contents

Version History

Version	Description	Release Date
1.0	First Release	9. Mar. 2014
2.0	Update Module to V2.0	13. Oct. 2017
2.1	Update Module to V2.1	20. Dec. 2019

LI-OV5640-MIPI-AF SPECIFICATION

Key Information

Module Part#		LI-OV5640-MIPI-AF
Module Size		36.25 mm (L) x 8.50 mm (W) x 5.50 mm(H)
Sensor Type		OV5640
Array Size	QSXGA	2592 x 1944
Power Supply	core	1.5V +/- 5% (with embedded 1.5V regulator)
	analog	2.6 ~ 3.0V (2.8V typical)
	I/O	1.8V / 2.8V
Lens		1/4"
Focus(F.NO)		2.6
View Angle		65° +/- 3°
Image Area		3673.6 um x 2738.4 um
Object distance		10cm-infinity
Sensitivity		TBD
Pixel size		1.4 um x 1.4 um
IR Cutter		650 nm
Sensor Temperature Range	Operating	-30℃ to 70℃
	Stable Image	0℃ to 50℃
Output Formats		8-/10-bit RGB RAW output
Maximum Image Transfer Rate		QSXGA (2592 x 1944): 15 fps; 1080P: 30 fps; 1280 x 960: 45 fps; 720P: 60 fps; VGA(640 x 480): 90 fps; QVGA(320 x 240): 120 fps
Dynamic Range		TBD
Substrate		FPC
IC Package		71-pin CSP3
Power Requirement	Active	TBD
	Standby	TBD
Fixed Pattern Noise		TBD
Shutter		Rolling shutter / Frame exposure
Dark Current		TBD
Package Dimensions		5985 um x 5835 um

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Pin Assignment

No.	Name	Pin type	Description
1	STROBE	I/O	Strobe output or scan chain test mode input
2	AGND	Ground	Ground for analog circuit
3	SDA	I/O	SCCB data
4	AVDD	Power	Analog power
5	SCL	Input	SCCB input clock
6	RESET	Input	Reset (active low with internal pull-up resistor)
7	NC		
8	PWDN	Input	Power down (active high with internal pull-down resistor)
9	NC		
10	DVDD1.5V	Power	Power for digital core
11	DOVDD1.8V/2.8V	Power	Power for I/O circuit
12	MDP1	I/O	DVP data output port 9/MIPI TX second data lane positive output
13	XCLK	Input	System input clock
14	MDN1	I/O	DVP data output port 8/MIPI TX second data lane negative output
15	DGND	Ground	Digital Ground
16	MCP	I/O	DVP data output port 7/MIPI TX clock lane positive output
17	NC		
18	MCN	I/O	DVP data output port 6/MIPI TX clock lane negative output
19	NC		
20	MDP0	I/O	DVP data output port 5/MIPI TX first data lane positive output
21	NC		
22	MDN0	I/O	DVP data output port 4/MIPI TX first data lane negative output
23	AF-VCC2.8V	Power	Power for analog circuit
24	AF-AGND	Ground	Ground for analog circuit

Electrical Characteristics

1. Absolute Maximum Ratings

parameter		absolute maximum rating[a]
ambient storage temperature		-40°C to +95°C
supply voltage (with respect to ground)[b]	V_{DD-A}	4.5V
	V_{DD-D}	3V
	V_{DD-IO}	4.5V
electro-static discharge (ESD)	human body model	2000V
	machine model	200V
all input/output voltages (with respect to ground)		-0.3V to V_{DD-IO} + 1V
I/O current on any input or output pin		±200 mA
peak solder temperature (10 second dwell time)		245°C

a. exceeding the absolute maximum ratings shown above invalidates all AC and DC electrical specifications and may
result in permanent damage to the device. Exposure to absolute maximum rated conditions for extended periods
may affect device reliability.
b. for negative voltage with respect to ground, VDD-A (-4.5V), VDD-C (-3V), VDD-IO (-4.5V)

2. Functional temperature

parameter	range
operating temperature range[a]	-20°C to +70°C
stable image temperature range[b]	0°C to +50°C

a. sensor functions but image quality may be noticeably different at temperatures outside of stable image range
b. image quality remains stable throughout this temperature range

3. DC Characteristics (-20° C < TA < 70° C)

symbol	parameter	min	typ	max	unit
power supply					
$V_{DD\text{-}A}$	supply voltage (analog)	2.6	2.8	3.0	V
$V_{DD\text{-}D}$[a]	supply voltage (digital core)	1.425	1.5	1.575	V
$V_{DD\text{-}IO}$	supply voltage (digital I/O)	1.71	1.8	3.0	V
internal DVDD short to DVDD, DVP output, AVDD = 2.8V, DOVDD = 2.8V					
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	2592 x 1944 @ 15 fps JPG		110	140	mA
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	1080p @ 30 fps JPG		100	130	mA
$I_{DD\text{-}A}$	operating current		32	42	mA
$I_{DD\text{-}DO}$	720p @ 60 fps		100	42	mA
$I_{DD\text{-}A}$	operating current		32	40	mA
$I_{DD\text{-}DO}$	720 @ 30 fps YUV		58	72	mA
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	VGA @ 30 fps		58	72	mA
internal DVDD, EVDD short to DVDD, MIPI output, AVDD = 2.8V, DOVDD = 1.8V					
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	2592 x 1944 @ 15 fps JPG		110	140	mA
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	2592 x 1944 @ 15 fps YUV		100	130	mA
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	1080p @ 30 fps JPG		100	130	mA
$I_{DD\text{-}A}$	operating current		30	40	mA
$I_{DD\text{-}DO}$	1080p @ 30 fps YUV		90	115	mA
$I_{DD\text{-}A}$	operating current		32	42	mA
$I_{DD\text{-}DO}$	720 @ 30 fps YUV		54	70	mA
external DVDD, EVDD short to DVDD, DVP output, AVDD = 2.8V, DOVDD = 2.8V					
$I_{DD\text{-}A}$			30	40	mA
$I_{DD\text{-}D}$	operating current		98	125	mA
$I_{DD\text{-}DO}$	2592 x 1944 @ 15 fps JPG		9	12	mA

symbol	parameter	min	typ	max	unit
standby current					
$I_{DDS-SCCB}$			20	50	μA
$I_{DDS-PWDN}$			20	50	μA
digital inputs (typical conditions: AVDD = 2.8V, DVDD = 1.5V, DOVDD = 1.8V)					
V_{IL}	input voltage LOW			0.54	V
V_{IH}	input voltage HIGH	1.26			V
C_{IN}	input capacitor			10	pF
digital outputs (standard loading 25 pF)					
V_{OH}	output voltage HIGH	1.62			V
V_{OL}	output voltage LOW			0.18	V
serial interface inputs[b]					
V_{IL}	SIOC and SIOD	-0.5	0	0.54	V
V_{IH}	SIOC and SIOD	1.26	1.8	3.0	V

a. using the internal DVDD regulator is strongly recommended for minimum power down current
b. based on DOVDD = 1.8V.

4. AC Characteristics

a. AC Characteristics (TA = 25 °C, VDD-A = 2.8V)

symbol	parameter	min	typ	max	unit
ADC parameters					
B	analog bandwidth		30		MHz
DLE	DC differential linearity error		0.5		LSB
ILE	DC integral linearity error		1		LSB
	settling time for hardware reset			<1	ms
	settling time for software reset			<1	ms
	settling time for resolution mode change			<1	ms
	settling time for register setting			<300	ms

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b. Timing Characteristics

symbol	parameter	min	typ	max	unit
oscillator and clock input					
f_{OSC}	frequency (XVCLK)[a]	6	24	54	MHz
t_r, t_f	clock input rise/fall time[b]			5 (10[c])	ns
f_{PCLK}	parallel port output pixel clock		48[d]	96[e]	MHz

a. for input clock range 6~27 MHz, the OV5640 can tolerate input clock jitter up to 1ns, for input clock range to
54MHz, the OV5640 can tolerate input clock jitter up to 500 ps
b. b. if the PLL is bypassed, the delay from input clock to output clock is approximately 4~5 ns
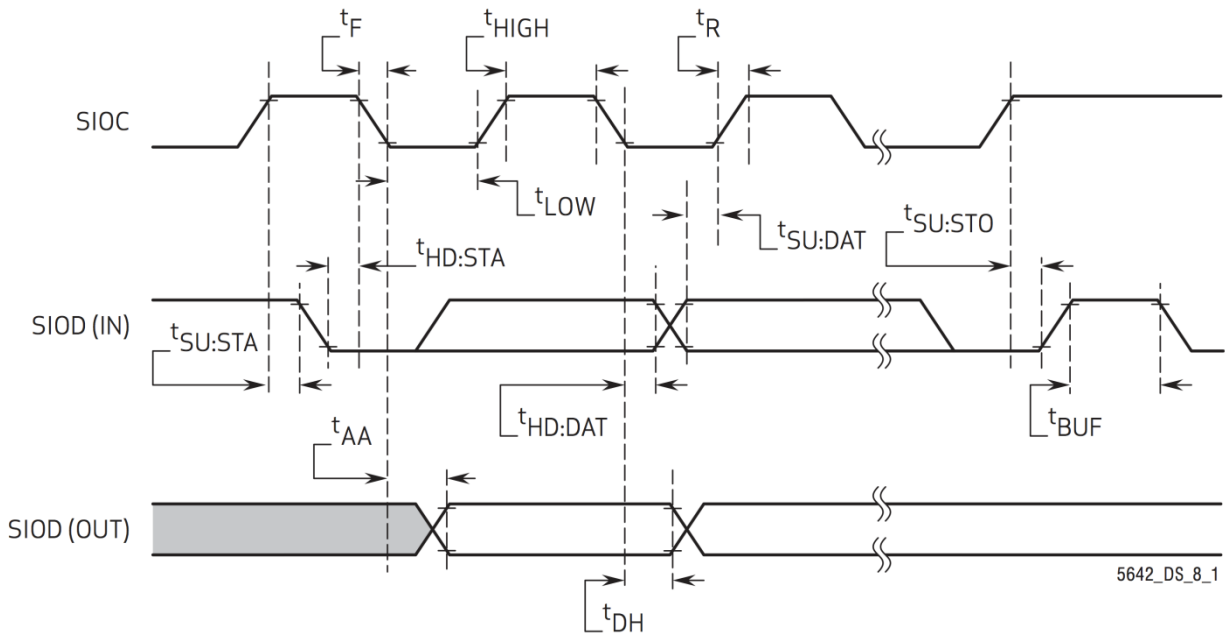c. if using the internal PLL
d. typical PCLK is 48 MHz when sensor output is smallersize (VGAYUV or below) or full size compression
e. 96 MHz is for sensor RAW data output at 15 fps or YUV output at 7.5 fps. For higher speeds such as 5 megapixel
Y UV @ 15 fps, OmniVision recommends using the MIPI two-lane interface.

c. SCCB interface timing

5642_DS_8_1

SCCB interface timing specifications[a]

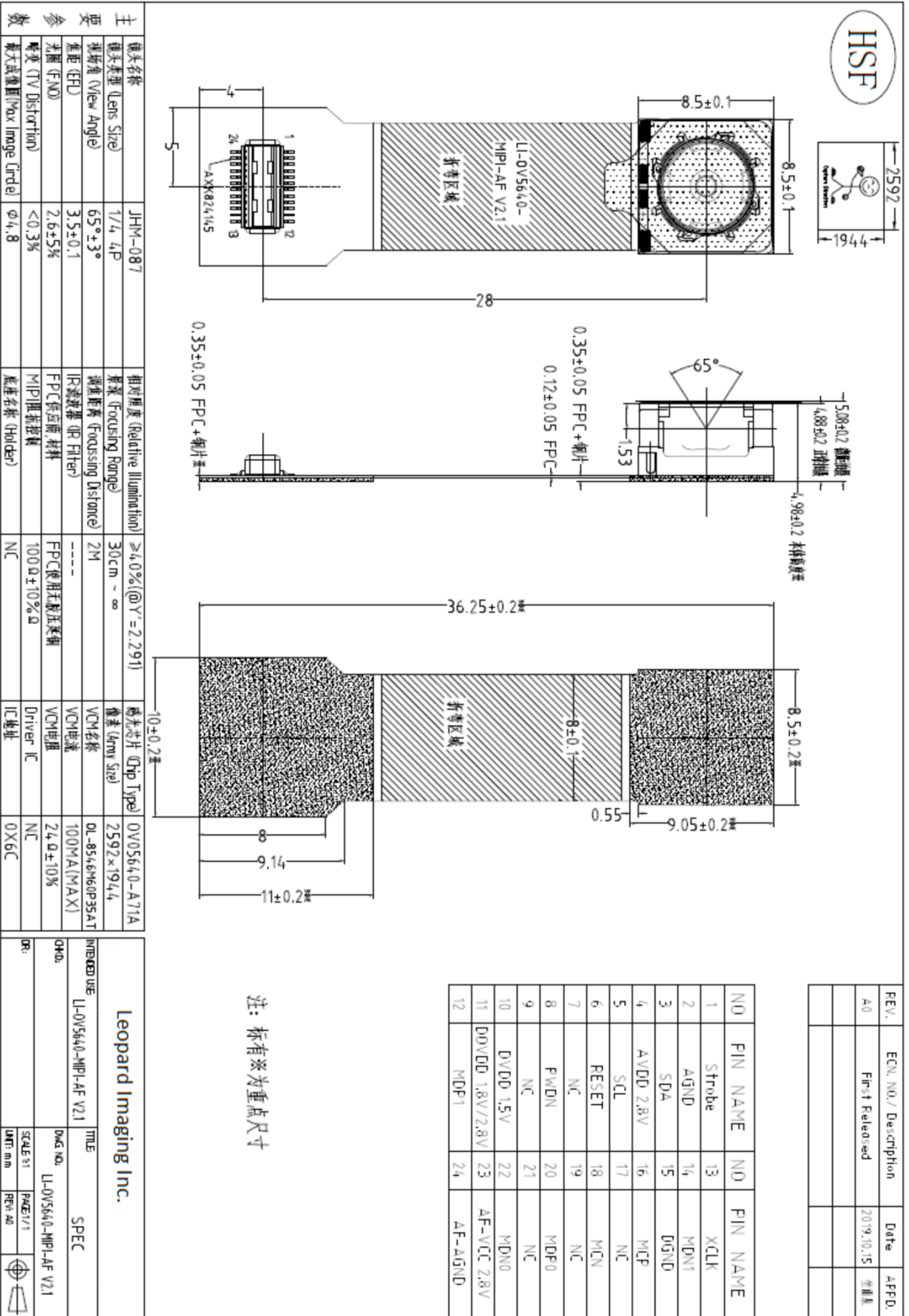| symbol	parameter	min	typ	max	unit
f_{SIOC}	clock frequency			400[b]	KHz
t_{LOW}	clock low period	1.3			µs
t_{HIGH}	clock high period	0.6			µs
t_{AA}	SIOC low to data out valid	0.1		0.9	µs
t_{BUF}	bus free time before new start	1.3			µs
$t_{HD:STA}$	start condition hold time	0.6			µs
$t_{SU:STA}$	start condition setup time	1.85			µs
$t_{HD:DAT}$	data in hold time	0			µs
$t_{SU:DAT}$	data in setup time	0.1			µs
$t_{SU:STO}$	stop condition setup time	0.6			µs
t_R, t_F	SCCB rise/fall times			0.3	µs
t_{DH}	data out hold time	0.05			µs

a. SCCB timing is based on 400KHz mode
b. SCCB maximum speed is 400KHz when sensor master input clock (XVCLK) is greater than or equal to 13MHz. When XVCLK is less than 13 MHz, the maximum SCCB speed is less than 400 MHz (approximately XVCLK/32.5)

5. Format and frame rate

format	resolution	frame rate	scaling method	pixel clock
5 Mpixel	2592x1944	15 fps	full resolution (dummy 16 pixel horizontal, 8 lines) 2608x1952 with dummy	96/192 MHz
1280x960	1280x960	45 fps	subsampling in vertical and horizontal 1296x968 supports 2x2 binning	96/192 MHz
1080p	1920x1080	30 fps	cropping from full resolution 1936x1088 with dummy pixels	96/192 MHz
720p	1280x720	60 fps	cropping 2592x1944 to 2560x1440 subsampling in vertical and horizontal 1296x728 with dummy supports 2x2 binning	96/192 MHz
VGA	640x480	90 fps	subsampling from 1280x960 648x484 with dummy supports 2x2 binning	48/96 MHz
QVGA	320x240	120 fps	subsampling from 1280x960 324x242 with dummy supports 2x2 binning	24/48 MHz

NO	PIN NAME	NO	PIN NAME
1	Strobe	13	XCLK
2	AGND	14	MDN1
3	SDA	15	DGND
4	AVDD 2.8V	16	MCP
5	SCL	17	NC
6	RESET	18	MCN
7	NC	19	NC
8	PWDN	20	MDP0
9	NC	21	NC
10	DVDD 1.5V	22	MDN0
11	DOVDD 1.8V/2.8V	23	AF-VCC 2.8V
12	MDP1	24	AF-AGND

REV.	ECN. NO./ Description	Date	APPD.
A0	First Released	2019.10.15	李旭昌

Leopard Imaging Inc.

INTENDED USE	LI-OV5640-MIPI-AF V2.1
DWG. NO.	LI-OV5640-MIPI-AF V2.1
TITLE	SPEC
DR:	SCALE 3:1	UNIT: mm
CHD:	PAGE: 1/1	REV: A0

注：所有尺寸为重点尺寸

参数	主要要求			
镜头名称 (Lens Size)	JHM-087	相对照度 (Relative Illumination)	≥40%(@Y'=2.291)	感光芯片 (Chip Type)	OV5640-A71A
镜头大小 (Lens Size)	1/4 4P	聚焦 (Focusing Range)	30cm ~ ∞	像素 (Array Size)	2592×1944
视场角 (View Angle)	65°±3°	调焦距离 (Focusing Distance)	2M	VCM名称	0L-8546M60P35AT
焦距 (EFL)	3.5±0.1	IR滤光片 (IR Filter)	-----	VCM电流	100MA(MAX)
光圈 (F.NO)	2.6±5%	FPC连接器材料	FPC使用玉米压克刚	VCM电阻	24Ω±10%
畸变 (TV Distortion)	<0.3%	MIPI阻抗匹配	100Ω±10%Ω	Driver IC	0X6C
最大成像圈 (Max Image Circle)	Φ4.8	底座名称 (Holder)	NC	IC地址	0X6C

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