



ICM110U

3MP

CMOS Image Sensor

Outline Specifications

V1.1

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Features

- 3 mega pixels (2048x1536) format
- Support sub-sampling at quarter (1/4), and quarter-quarter (1/16) mega pixel resolutions for higher video frame rate
- Progressive readout
- Output data format: 10-bit raw data
- Input interface: SIF
- Electronic exposure control
- On-chip 11-bit ADC
- On-chip PLL
- Correlated double sampling
- Video mode and DSC mode
- Dead pixel removal
- Flash control
- Power down mode
- Automatic optical black compensation
- Horizontal and vertical images
- Dual power supply 2.5V & 3.3V

General Description

ICM-110U is a single-chip digital color-imaging device. It incorporates a 2048x1536 sensor array capable of operating at up to 12 frames per second and sub-sampled quarter (1/4) and quarter-quarter (1/16) of 3 mega pixel resolutions, operating at higher frame rate in progressive manner. Each pixel is covered by a color filter, which formed a so-called Bayer pattern. Correlated double sampling is performed by the internal ADC and timing circuitry. The gains for raw data can be adjusted separately for the 4 Bayer pattern pixels. The output format is 10-bit raw data that can be fed to other DSP, color processing, or compression chips.

Applications

- Digital camcorder
- Digital still camera
- Video phone
- Video conferencing
- Video mail
- Video cellular phone
- PC camera
- Security system
- Visual toy
- Industrial image capture/analysis
- Environment monitor system

Key Parameters

- Number of pixels: 2048x1536
- Number of physical pixels: 3,181,668; (2058x1546)
- Frame rate: 12/6/4/2/1.7/1.2/0.8/0.4 fps

- Sub-sampling quarter (1/4) and quarter-quarter (1/16) of 3mega pixel resolutions for higher frame rate
- Pixel size: 4.0 μm x 4.0 μm
- Sensor area: 8.192 mm x 6.144 mm
- Input clock: 6 MHz crystal, or external clock source of 6, 12, 24, 48, or 96 MHz through PLL or bypass PLL
- Main clock frequency: 48 MHz; on-chip 11 bit ADC clock: 96MHz (2x of main clock frequency), for 12 fps operation.
- Mode exposure time: 24.4 μs (@ 12 fps, 1 line). Maximum exposure time ~ 46 s @ X1 mode(0.42 fps), 65535 lines
- RGB gain: 1/256 to 64 for individual Bayer pattern pixels depending on register setting.
- Sensitivity: 0.55 V/lux-sec (5200 K light source, 650 nm IR cutoff filter)
- Dynamic Range: 56 dB (relative to noise floor = temporal noise + quantization noise); 48 dB (relative to total noise)
- Sensitive to infrared illumination source
- Power supply: 2.5V & 3.3V
- Power requirement: <100mA (@12fps) and <60mA (@6fps)
- Standby mode power: < 50uA
- Package: (Thermal Plastic Pre-mold LCC) KLCC48

1. Pin Assignment

Pin #	Name	Class*	Function
14	CLKSEL	D, I, N	Clock source selection 0: clocks pass PLL, use XIN (pin 12) 1: bypass PLL, use CLKIN (pin 11)
11	CLKIN	D, I, N	External clock source; bypass PLL
12	XIN	A, I	Crystal oscillator in, or external clock in; if external clocks used, leave Xout (pin 13) unconnected
13	XOUT	A, O	Crystal oscillator out
33	PCLK	D, O	Pixel clock output
35	OEN	D, I, N	Output enable. 0: enable, 1: disable
31	SIF ID	D, I, N	LSB of SIF slave address
32	MSSEL	D, I, U	SIF master/slave selection. 0: slave, 1: master
2	SCL	D, I/O	SIF clock
1	SDA	D, I/O	SIF data
10	POWERDN	D, I, N	Power down control, 0: power down, 1: active
17	RSET	A, I	Resistor to ground =110 K Ω @ 48 MHz main clock,
8	RSTN	D, I, U	Chip reset, active low
48	Reserved	D, I/O	Must not connect
47	DOUT[9]	D, I/O	Data output bit 9
46	DOUT[8]	D, I/O	Data output bit 8
45	DOUT[7]	D, O	Data output bit 7
44	DOUT[6]	D, I/O	Data output bit 6; if pulled up/down, the initial value of TIMING_CONTROL_LOW[2] (VSYNC polarity) is 1/0
43	DOUT[5]	D, I/O	Data output bit 5; if pulled up/down, the initial value of TIMING_CONTROL_LOW[1] (HSYNC polarity) is 1/0
40	DOUT[4]	D, I/O	Data output bit 4; if pulled up/down, the initial value of AD_IDL[3] (Sub ID) is 1/0
39	DOUT[3]	D, I/O	Data output bit 3; if pulled up/down, the initial value of AD_IDL[2] (Sub ID) is 1/0
38	DOUT[2]	D, I/O	Data output bit 2; if pulled up/down, the initial value of AD_IDL[1] (Sub ID) is 1/0
37	DOUT[1]	D, I/O	Data output bit 1; if pulled up/down, the initial value of AD_IDL[0] (Sub ID) is 1/0
36	DOUT[0]	D, I/O	Data output bit 0; if pulled up/down, the synchronization mode is in master/slave mode which requires HSYNC and VSYNC operating in output/input mode
3	HSYNC	D, I/O	Horizontal sync signal
5	VSYNC	D, I/O	Vertical sync signal
34	FLASH	D, O	Flash light control
15	RAMP	A, O	Analog ramp output
30,7	VDDA	P	Sensor analog power
29,9	GNDA	P	Sensor analog ground
19	VDDD	P	Sensor digital power
18	GNDD	P	Sensor digital ground
41	VDDO	P	I/O power
4	VDDK	P	Digital power

42,6	GNDK	P	Digital ground
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Class Code: A – Analog signal, D – Digital signal, I – Input, O – Output, P – Power or ground, U – Internal pull-up, N – Internal pull-down

2. Functional Description

ICM-110U is a single-chip digital color imaging device. It includes a 2048x1536 sensor array, 2048 column-level ADC, and correlated double sampling circuitry. All the programmable parameters are set by writing into the SIF interface which can address the register file consisting of 8-bit registers. The output format is 10-bit raw data, together with horizontal and vertical sync signals.

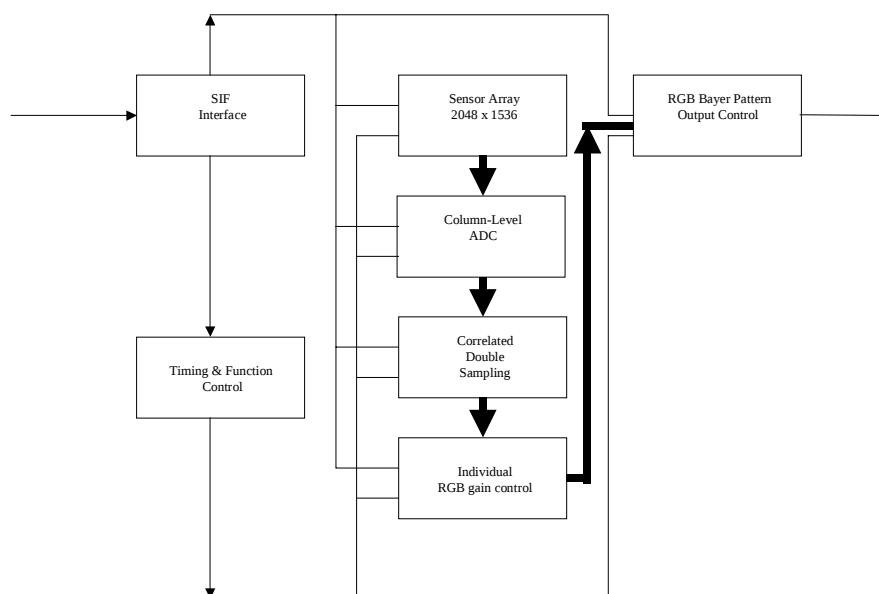


Figure 1. Block diagram

3 Electrical Characteristics

3.1 DC Characteristics

Symbol	Parameter	Rating			Unit
		Minimum	Typical	Maximum	
V_{CCA}	Absolute Power Supply	-0.3		3.8	V
V_{INA}	Absolute Input Voltage	-0.3		$V_{CC} + 0.3$	V
V_{OUTA}	Absolute Output Voltage	-0.3		$V_{CC} + 0.3$	V
T_{STG}	Storage Temperature	0	25	65	°C
V_{CC} Analog	Operating Power Supply	3.0	3.3	3.6	V
V_{CC} Digital	Operating Power Supply	2.3	2.5	2.8	V
V_{IN}	Operating Input Voltage	0		V_{CC}	V
T_{OPR}	Operating Temperature	0	25	40	°C
I_{DD}	Operating Current @ $V_{CC}=3.3$ V, 25 °C		100		mA
I_{IL}	Input Low Current	-1		1	μA
I_{IH}	Input High Current	-1		1	μA
I_{OZ}	Tri-state Leakage Current	-10		10	μA
C_{IN}	Input Capacitance		3		pF
C_{OUT}	Output		3		pF

	Capacitance				
C_{BID}	Bi-directional Buffer Capacitance		3		pF
V_{IL}	Input Low Voltage			$0.3 * V_{\text{CC}}$	V
V_{ILS}	Schmitt Input Low Voltage		1.1		V
V_{IH}	Input High Voltage	$0.7 * V_{\text{CC}}$			V
V_{IHS}	Schmitt Input High Voltage		1.8		V
V_{OL}	Output Low Voltage			0.4	V
V_{OH}	Output High Voltage	2.0			V
R_{L}	Input Pull-up/down Resistance		50		K Ω

4 Mechanical Information

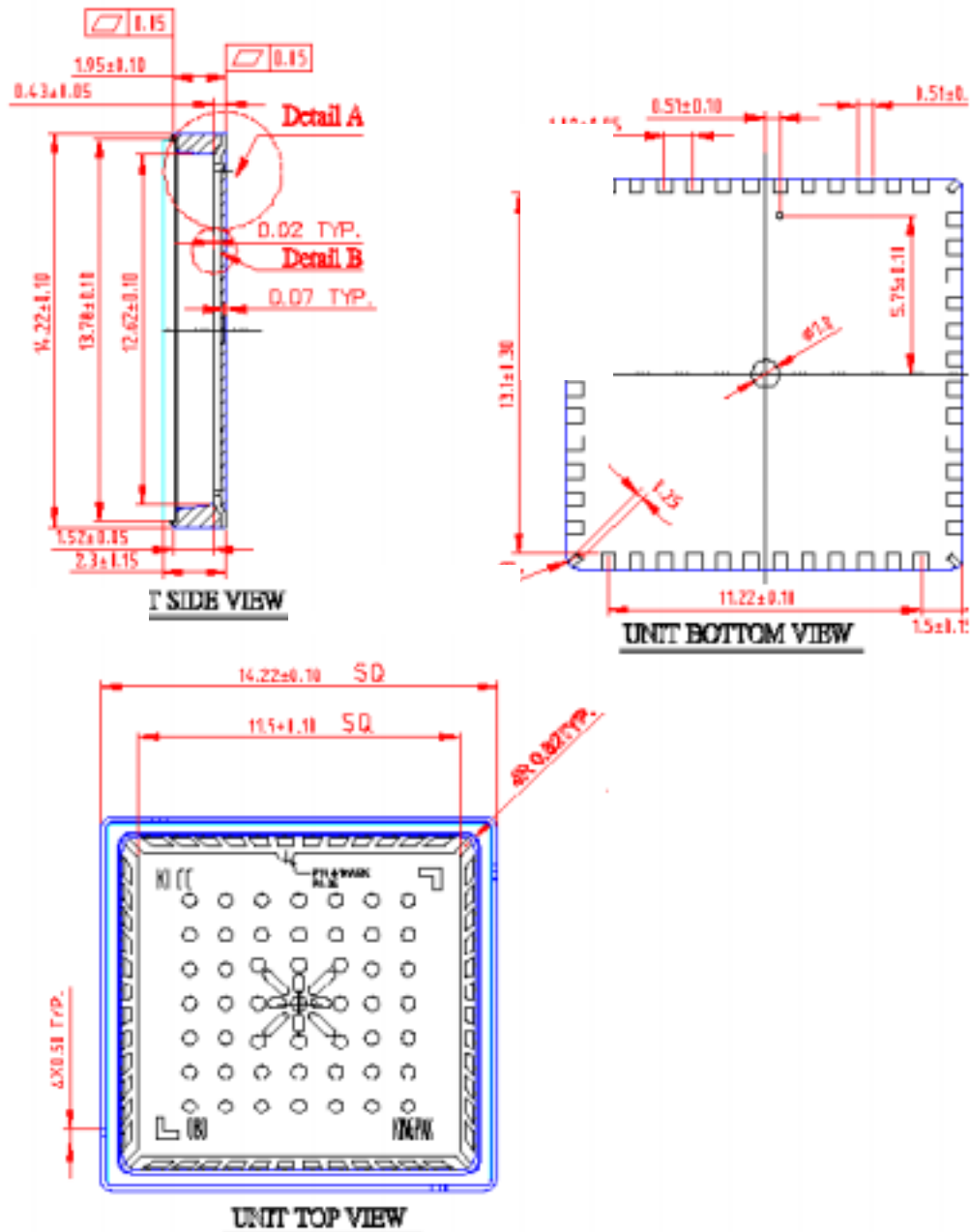


Figure 3. KLCC48 Packaging

5 Ordering Information

Part number for different package:

<i>Description</i>	<i>Part Number</i>
KLCC 48 packaged, 3MP resolution sensor (dual supply at 2.5 & 3.3 V)	ICM-110Uka

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