



# CMOS MT9J001 Camera Module

## 1/2.3-Inch 10MP Monochrome Module Datasheet

Rev 1.0, Mar 2017



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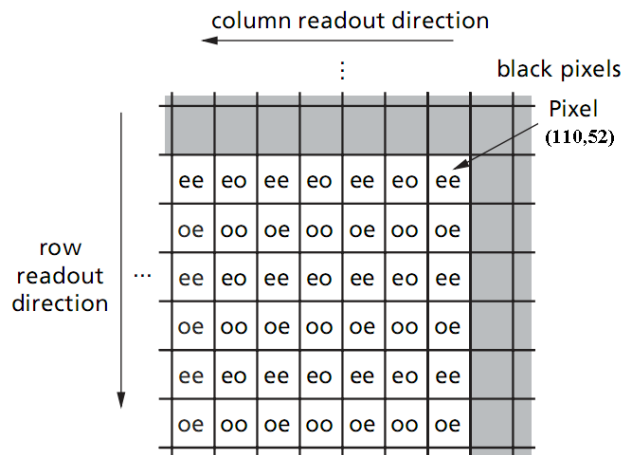
# 1 Introduction

The MT9J001 camera module features Aptina’s breakthrough low-noise CMOS imaging technology that achieves near-CCD image quality (based on signal-to-noise ratio and low-light sensitivity) while maintaining the inherent size, cost, and integration advantages of CMOS. It incorporates the monochrome version of the MT9J001 sensor on board.

When operated in its default 4:3 still-mode, the sensor generates a full resolution image at 7.5 frames per second (fps) using the parallel interface. An on-chip analog-to-digital converter (ADC) generates a 12-bit value for each pixel.

The MT9J001 is a progressive-scan sensor that generates a stream of pixel data at a constant frame rate. It uses an on-chip, phase-locked loop (PLL) to generate all internal clocks from a single master input clock running between 6 and 48 MHz. The maximum output pixel rate is 80 Mp/s, corresponding to a pixel clock rate of 80 MHz.

The camera uses a Bayer monochrome pattern, as shown in the following figure. The even-numbered rows contain ee and eo pixels; odd-numbered rows contain oe and oo pixels. Even-numbered columns contain ee and oe pixels; odd-numbered columns contain eo and oo pixels.



The output resolution and frame rate are listed below:

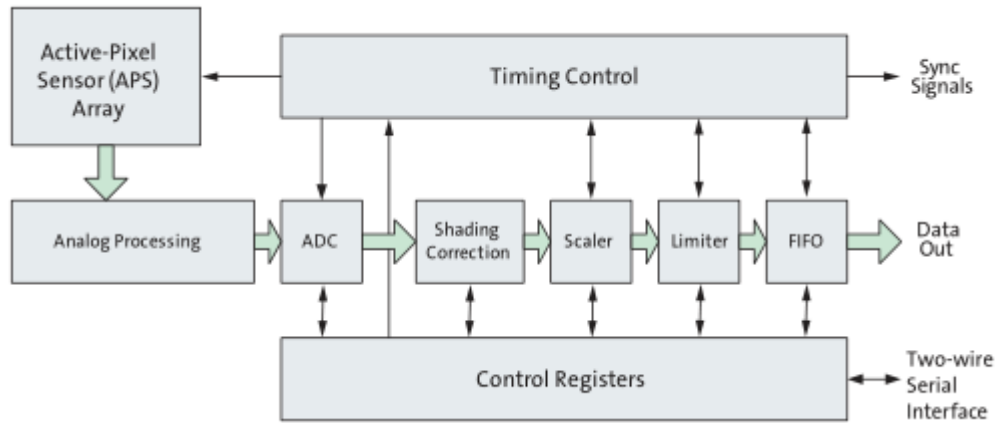
Table 1: Recommended Imaging Readout Modes

Mode	Pixel Array Usage	Output Image Size	Subsampling	Frame Rate
10MP	3664 (V) x 2748 (H)	3664 (V) x 2748 (H)	None	Parallel: 7.5 fps
1080p HDTV	3840 (V) x 2160 (H)	1920 (V) x 1080 (H)	2x2 Summing	Parallel: 29.97 fps
Monitor (Low Power Preview)	3664 (V) x 2748 (H)	916(V) x 687(H)	X – 2x skip + 2x sum Y – 2x skip + 2x sum	Parallel: 29.97 fps
VGA	3664 (V) x 2748 (H)	916 (V) x 687 (H)	X – 2x skip + 2x sum Y – 2x skip + 2x sum	Parallel: 29.97 fps
Full Array	3840 (V) x 2748 (H)	3840 (V) x 2748 (H)	None	Parallel: 7.3 fps

## 2 Features

Parameter	Value	Parameter	Value
Optical format	1/2.3-inch (4:3)	Frame rate	Still mode, 4:3 (3664H x 2748V) Programmable up to 7.5 fps parallel I/F
Active imager size	6.440mm(H) x 4.616mm (V), 7.923mm diagonal (Entire sensor)		Preview mode VGA 60 fps with skip2bin2
	6.119mm(H) x 4.589mm (V), 7.649mm diagonal (Still mode)		1080p mode (1920H x 1080V) 30 fps using parallel I/F
	6.413mm(H) x 3.607mm (V), 7.358mm diagonal (Video mode)	ADC resolution 12-bit, on-die	
	3856H x 2764V (Entire sensor)	Responsivity 0.31 V/lux-sec (550nm)	
Active pixels	3664H x 2748V (4:3, Still mode) 3840H x 2160V (16:9, Video mode)	Dynamic range 65.2dB	SNR <sub>MAX</sub> 34dB
Pixel size	1.67 x 1.67µm	Power Consumption	Still mode at 15fps w/ serial I/F 638mW
Chief ray angle	0°, 13.4°		Still mode at 7.5fps w/ parallel I/F 388mW
Color filter array	Bayer pattern	Preview 250mW low power VGA	Standby 500µW (typical, EXTCLK disabled)
Shutter type	Electronic rolling shutter (ERS) with global reset release (GRR)	Operating temperature	-30°C to +70°C (at junction)
Input clock frequency	6-48 MHz		
Maximum data rate	Parallel		
		80 Mp/s at 80 MHz PIXCLK	

## 3 Block Diagram



## 4 Application

- Digital video cameras
- Digital still cameras
- Industrial camera
- Medical camera
- Microscopy camera

## 5 Pin Definition

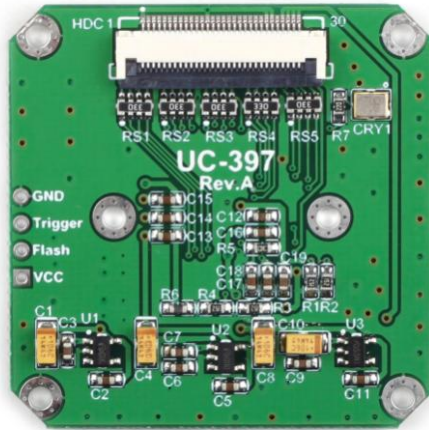
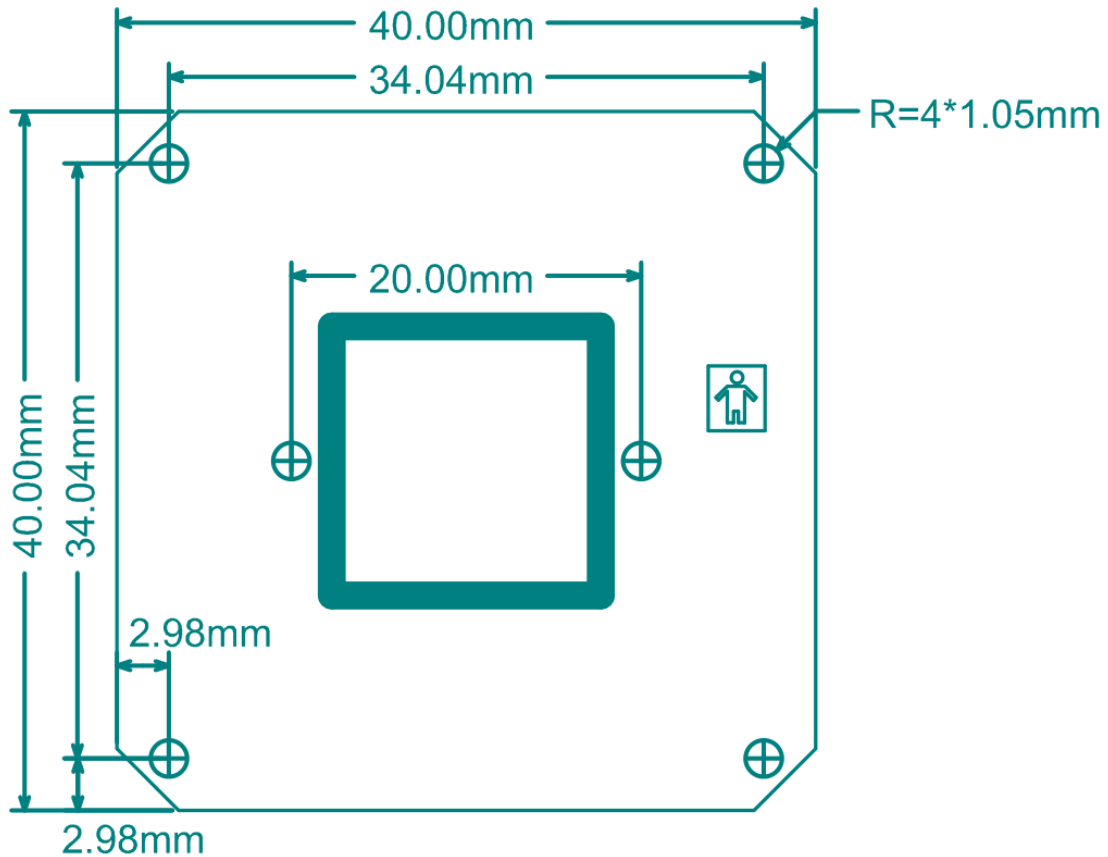


Table 1 HDC1 Connector Pin Definition

Pin No.	PIN NAME	TYPE	DESCRIPTION
1	GND	Ground	Power ground
2	FLASH	Output	Flash output control
3	Trigger	Input	Exposure synchronization input
4	VSYNC	Output	Active High: Frame Valid; indicates active frame
5	HREF	Output	Active High: Line/Data Valid; indicates active pixels
6	DOUT11	Output	Pixel Data Output 11 (MSB)
7	DOUT10	Output	Pixel Data Output 10
8	DOUT9	Output	Pixel Data Output 9
9	DOUT8	Output	Pixel Data Output 8
10	DOUT7	Output	Pixel Data Output 7
11	DOUT6	Output	Pixel Data Output 6
12	DOUT5	Output	Pixel Data Output 5
13	GND	Ground	Power ground
14	DOUT4	Output	Pixel Data Output 4
15	DOUT3	Output	Pixel Data Output 3
16	DOUT2	Output	Pixel Data Output 2
17	DOUT1	Output	Pixel Data Output 1
18	DOUT0	Output	Pixel Data Output 0(LSB)
19	XCLK	Input	Master Clock into Sensor
20	PCLK	Output	Pixel Clock output from sensor
21	SCL	Input	Two-Wire Serial Interface Clock
22	SDATA	Bi-directional	Two-Wire Serial Interface Data I/O
23	RST	Input	Sensor reset signal, active low
24	GND	Ground	Power ground
25	GND	Ground	Power ground
26	STANDBY	Input	Standby-mode enable pin (active HIGH)
27~30	VCC	POWER	3.3v Power supply

## 6 Mechanical Dimension



## 7 Lens Options

The camera board shipped with default LS-18023M12, optional CS mount lens LS-18023CS is also available. Lens specification list as follows. Please contact us [admin@arducam.com](mailto:admin@arducam.com) for more lens options or visit [www.arducam.com/downloads/Lenses/](http://www.arducam.com/downloads/Lenses/).

PRODUCT NAME : LS-18023

1. SPECIFICATION :

- 1.SENSOR SIZE
- 2.WAVELENGTH
- 3.FOCAL LENGTH (EFL)
- 4.F/NO (INFINITE)
- 5.BACK FOCAL LENGTH
- 6.FLANGE BACK LENGTH
- 7.FIELD OF VIEW (DIAGONAL)
- 8.OPTICAL DISTORTION (DIAGONAL)
- 9.Thread Size
- 10.Element

1/1.8" CMOS CCD
$\lambda = 400 - \infty$
$f = 4.2$ mm
F/NO = 2.0
BFL = 6.20 mm
FB = 5.8 mm
= 140°
< - 40%
M12X0.5
ALL GLASS

2. OPTICAL LAYOUT : scale 4 : 1

