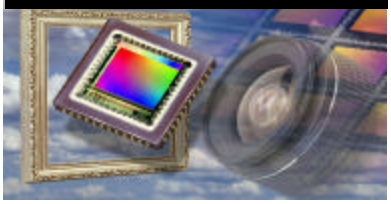
MCM20114
VGA CMOS Sensor



Preliminary Advance Information

640 x 480 pixel Color VGA Digital Image Sensor progressive scan solid state image sensor with integrated CDS/PGA/ADC, digital programming, control, timing, and pixel correction features

Features:

- VGA resolution, active CMOS image sensor with square pixel unit cells
- 5.6µm pitch pixels with patented pinned photodiode architecture
- RGB color filter array with micro lenses
- High sensitivity, quantum efficiency, and charge conversion efficiency
- Low fixed pattern noise / wide dynamic range
- Global and continuous variable speed shutter
- Single master clock operation- 15MHz Max
- Digitally programmable via I^2C interface
- Integrated on-chip timing/logic circuitry
- Single 3.3V power supply with optional 2.7V Digital I/O support
- Low Power consumption - 100mW @ 30 fps
- CDS sample and hold for suppression of low frequency and correlated reset noise
- 1-9x programmable variable gain to optimize dynamic range and facilitate white balance and iris adjustment
- 10-bit, pipelined algorithmic RSD ADC (DNL ±0.5 LSB, INL ±1.0 LSB)
- Pixel addressability to support 'Window of Interest' windowing, resolution, and subsampling
- Digitally controlled encoded data stream
- 30 fps full VGA at 13.5 MHz Master Clock Rate
- 36 pin CLCC package

Part Number	Description	Package
MCM20114IBBL	Color RGB sensor with Lenslets	36 Pin CLCC
MCM20114IBMN	Monochrome sensor without Lenslets	36 Pin CLCC
SIDEWINDER	Integrated VGA Image Module - complete w/ a MCM20114 and 1/4" Optic.	

The MCM20114 is a fully integrated, high performance CMOS image sensor with features such as integrated timing, control, and analog signal processing for digital imaging applications. The part provides designers a complete imaging solution with a monolithic image capture and processing engine thus making it a true "camera on a chip". System benefits enable design of smaller, portable, low cost and low power systems. Thereby making the product suitable for a variety of consumer applications including still/full motion imaging, security/surveillance, and automotive among others.

The imaging pixels are based on active CMOS pixels using pinned photodiodes that are realized using Motorola's sub-micron ImageMOS™ technology. A maximum frame rate of 30 FPS at full resolution can be achieved, further the frame rate is completely adjustable, independent of the system clock. Each pixel on the sensor is individually addressable allowing the user to control "Window of Interest" (WOI) panning and zooming. Control of sub-sampling, resolution, exposure, gain, and other image processing features is accomplished via a two pin I^2C interface. The sensor is run by supplying a single Master Clock. The sensor output is 10 digital bits providing wide dynamic range images.

This document contains information on a new product.
Specifications and information herein are subject to change without notice.

Specifications

Image Size: 3.584 mm x 2.688 mm (4.48 mm Diagonal, 1/4" Optic)

Resolution: 668 x 488 pixels, available digital zoom and region of interest (ROI) windowing

Pixel Size: 5.6µm x 5.6µm

Monochrome Sensitivity: 1.68 V/Lux-sec

Min. Detectable Light Level: 5 Lux @ 30Fps with F/1.8 lens

Shutter Modes: Global shutter, continuous or single frame rolling shutter modes available

Readout Rate: 15.0 MSPS

Frame Rate: 0-30 Full frames (640x480) per second

Master Clock Frequency: 2.0 - 15.0MHz

System Dynamic Range: 60dB

On Chip programmable gain: 0dB to 19.1dB

On Chip Image Correction: Programmable offset non-uniformity correction

Analog to Digital Converter: 10-bit, RSD ADC (DNL +/-0.5 LSB, INL +/-1.0 LSB)

Power Dissipation: 100mW RMS, operating @13.5Mhz

Package: 36 pin ceramic LCC

Temperature Operating Range: -10 to 40^{o}C

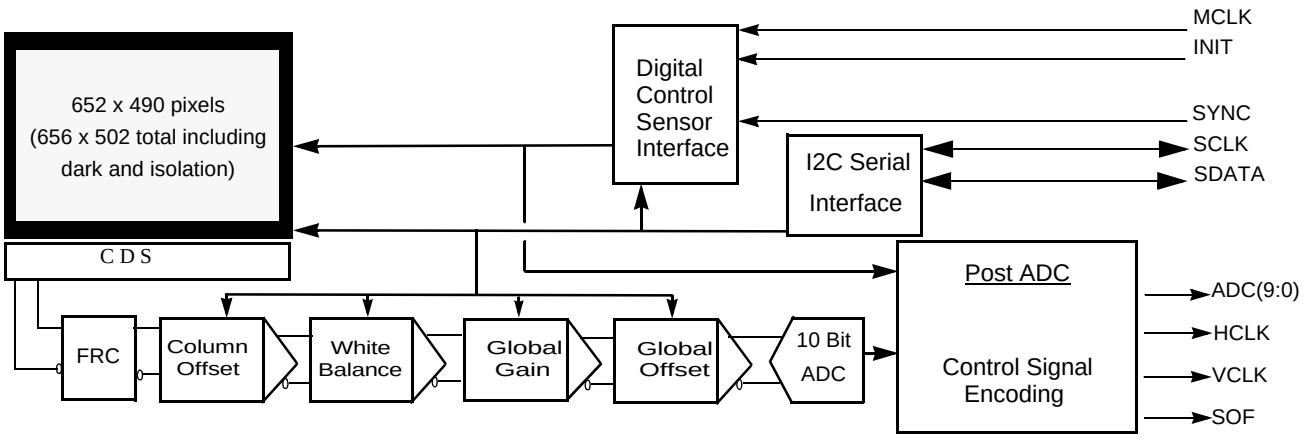


Figure 1. MCM20114 Simplified Block Diagram

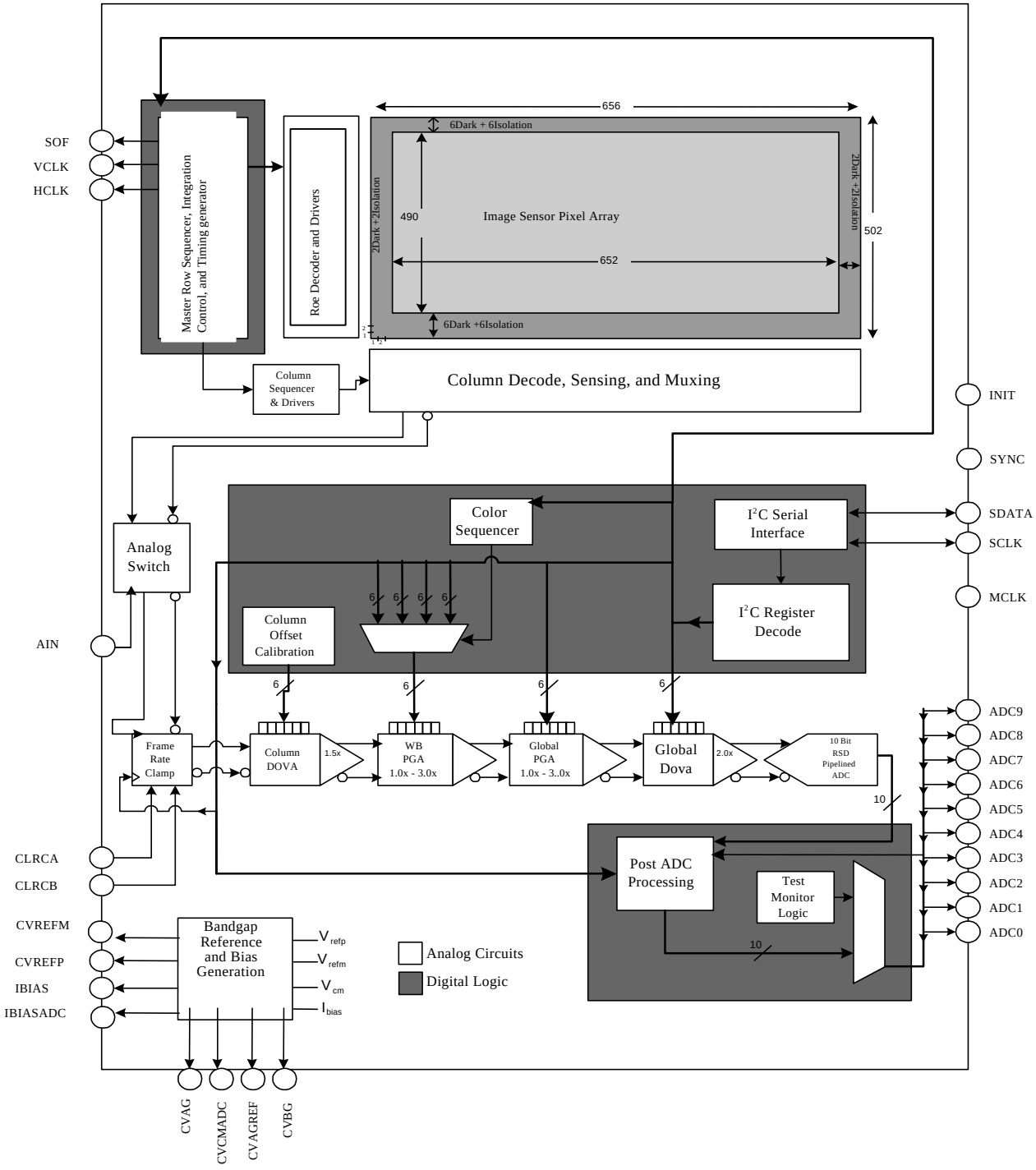


Figure 2. MCM20114 Detailed Block Diagram

Pin Definitions

Pin	Name	Function	I/O	Description
1	**DVDDC**	Digital Core Power	P	(3.3V +/-10%)
2	**MCLK**	Master Clock	I	15 MHz Maximum Frequency - 0-DVDDIO Volts @ 50% Duty Cycle.
3	**DVSS**	Digital I/O and Core Return	P	Ground
4	**PIX_OUT0**	Data Output 0 (LSB)	O	
5	**PIX_OUT1**	Data Output 1	O	
6	**PIX_OUT4**	Data Output 4	O	
7	**PIX_OUT5**	Data Output 5	O	
8	**HCLK**	Horizontal output clock	O	Pixel Data Valid Signal (Default Active High)
9	**VCLK**	Vertical output clock	O	Line Sync signal (Default Active High)
10	**SOF**	Start of Frame, readout data begin signal	O	Indicates begining of Frame data read-out (Active High)
11	**SCLK**	I^2C Clock	I	Pull-up resistor required
12	**SDATA**	I^2C Data	I/O	Pull-up resistor required
13	**AVDD**	Analog Power	P	(3.3V +/-10%)
14	**AVSS**	Analog Power Return	P	Ground
15	**AIN**	Analog Input Signal/Reset Test	I	During Normal operation - Set to Ground
16	**CLRCA**	Frame Rate Clamp Reference A	I	During Normal operation - Bypass w/ 0.1uF Capacitor
17	**CLRCB**	Frame Rate Clamp Reference B	I	During Normal operation - Bypass w/ 0.1uF Capacitor
18	**CVAGREF**	Common Mode Reference	I	During Normal operation - Bypass w/ 0.1uF Capacitor
19	**CVAG**	Common Mode Reference	I	During Normal operation - Bypass w/ 0.1uF Capacitor
20	**CVBG**	Bandgap Voltage Reference	I	During Normal operation - Bypass w/ 0.1uF Capacitor
21	**CVREFM**	ADC Reference Bottom	I	During Normal operation - Bypass w/ 0.1uF Capacitor

Pin	Name	Function	I/O	Description
22	**CVREFP**	ADC Reference Top	I	During Normal operation - Bypass w/ 0.1uF Capacitor
23	**CVCMADC**	ADC Common Mode Reference	I	During Normal operation - Bypass w/ 0.1uF Capacitor
24	**IBIAS**	Analog Bias Input	I	Optional external resistor - Tie to nn KΩ resistor
25	**AVSS**	Analog Power Return	P	Ground
26	**AVDD**	Analog Power	P	(3.3V +/-10%)
27	**IBIASADC**	ADC Bias Input	I	Optional external resistor - Tie to nn KΩ resistor
28	**SYNC**	Start Data Capture	I	Initiates a single frame capture in Global Shutter and SFRS modes (Default Active High)
29	**INIT**	Initialize Signal - Sensor Reset	I	ACTIVE HIGH - Synchronous Reset, 4 MCLKs signal wide
30	**PIX_OUT9**	Data Output 9 (MSB)	O	
31	**PIX_OUT8**	Data Output 8	O	
32	**PIX_OUT7**	Data Output 7	O	
33	**PIX_OUT6**	Data Output 6	O	
34	**PIX_OUT3**	Data Output 3	O	
35	**PIX_OUT2**	Data Output 2	O	
36	**DVDDIO**	Digital I/O Power	P	(3.3V +10% to 2.7V -5%)

Sample Images using IMAGEMOS Digital Image Sensor technology

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