



CMOS SOC Camera Module

1/3.2-Inch 2-Megapixel Module User Guide

Rev 1.0, Oct 2010

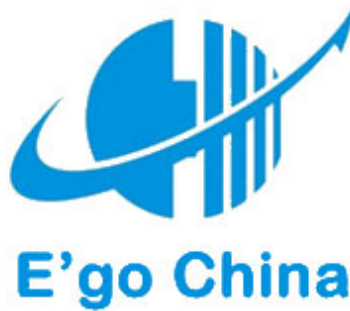
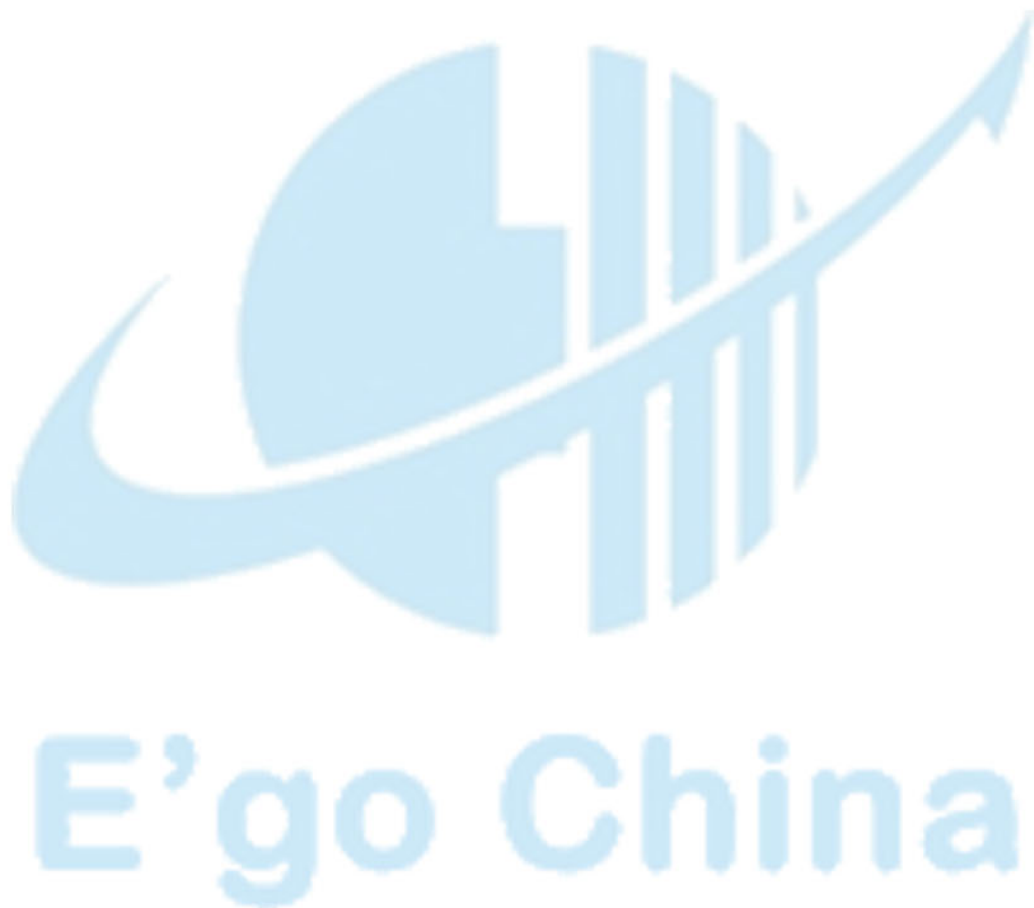


Table of Contents

1	Introduction	2
2	Features	3
3	Specifications	4
4	Application	4
5	Schematic	5
6	Pin Definition	5
7	Mechanical Dimension	6



1 Introduction

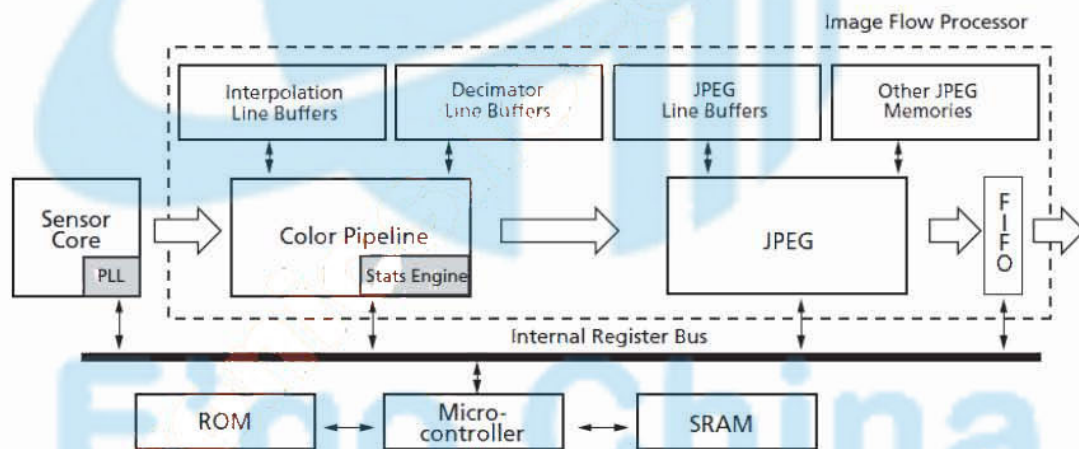
Our new ultra low-power CMOS image sensor is a complete, innovative camera system-on-a-chip (SOC). For basic operation, it requires only a power supply, lens, and clock source. But it can do so much more. With the MT9D111, designers can simply plug'n play. Its on-chip image flow processor performs a host of image correcting and enhancing functions you'd normally need another part for, such as color recovery and correction; sharpening; gamma correction; and auto black level offset correction, exposure, white balance, lens shading, and flicker avoidance. Plus, it provides comprehensive support for auto focus, optical zoom, and a mechanical shutter for a genuine all-in-one solution. Micron's exclusive DigitalClarity technology dramatically reduces noise levels in our CMOS sensors. Our sensor provides best-in-class image quality-whether capturing continuous video or single frames-even in extremely low light.

Micron® Imaging MT9D111 is a 1/3.2 inch 2-megapixel CMOS image sensor with an integrated advanced camera system. The camera system features a microcontroller (MCU) and a sophisticated image flow processor (IFP) with a real-time JPEG encoder. It also includes a programmable general purpose I/O module (GPIO), which can be used to control external auto focus, optical zoom, or mechanical shutter. The microcontroller manages all components of the camera system and sets key operation parameters for the sensor core to optimize the quality of raw image data entering the IFP. The sensor core consists of an active pixel array of 1668 x 1248 pixels, programmable timing and control circuitry including a PLL and external flash support, analog signal chain with automatic offset correction and programmable gain, and two 10-bit A/D converters (ADC). The entire system-on-a-chip (SOC) has ultra-low power requirements and superior low-light performance that is particularly suitable for mobile applications. The excellent low-light performance of MT9D111 is one of the hallmarks of DigitalClarity™-Micron's breakthrough low-noise CMOS imaging technology that achieves CCD image quality (based on signal-to-noise ratio and low-light sensitivity) while maintaining the inherent size, cost, power consumption, and integration advantages of CMOS.

E'go China

2 Features

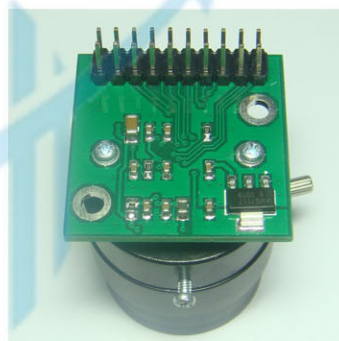
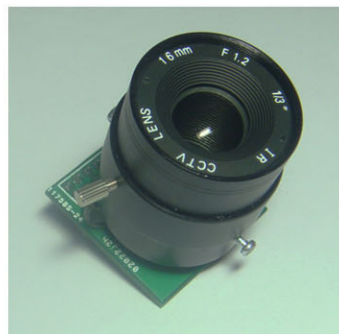
- DigitalClarity™ CMOS imaging technology
- Ultra low-power, low-cost, progressive scan
- 2-megapixel resolution (1,600H x 1,200V)
- 1/3.2-inch optical format
- 15 frames per second (fps) at full resolution
- Integrated auto focus and optical zoom
- Real-time JPEG encoder
- Integrated microcontroller for flexibility
- On-chip image flow processor for single-chip camera module
- On-chip auto focus with configurable GPIO interface
- Mechanical shutter support
- Numerous automatic functions for on-the-fly image correction and enhancement
- Fully automatic Xenon- and LED-type flash support, including fast exposure adaptation
- On-chip, 10-bit analog-to-digital converter
- Two-wire serial interface
- ITU_R BT.656 (YCbCr), 565RGB, 555RGB, 444RGB and raw output data formats
- JPEG 4:2:2 and 4:2:0 output



SOC Sensor Diagram

3 Specifications

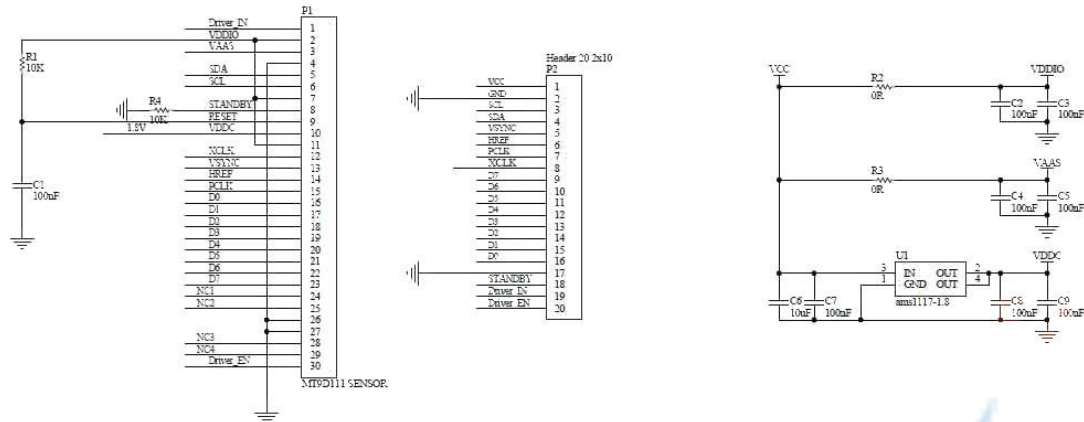
Parameter		Value
Optical format		1/3.2-inch (4:3)
Lens (tow types selectable)		1/3-inch 6mm F2.0
		1/3-inch CS 16mm F1.6
Full resolution		1,600 x 1,200 pixels (UXGA)
Pixel size		2.8 μ m x 2.8 μ m
Active pixel array area		4.73mm x 3.52mm
Shutter type		Electronic rolling shutter (ERS) with global reset
Maximum frame rate		15 fps at full resolution, 30 fps in preview mode, (800 x 600)
Maximum data rate/ master clock		80 MB/s 6 MHz to 80 MHz
Supply voltage	Analog	2.5V–3.1V
	Digital	1.7V–1.95V
	I/O	1.7V–3.1V
	PLL	2.5V–3.1V
ADC resolution		10-bit, on-die
Responsivity		1.0/lux-sec (550nm)
Dynamic range		71dB
SNRMAX		42.3dB
Operating temperature		-30°C to +70°C



4 Application

- Cellular phones
- PDAs
- Toys
- Other battery-powered products

5 Schematic



6 Pin Definition

Pin No.	PIN NAME	TYPE	DESCRIPTION
1	VCC	POWER	3.1v Power supply
2	GND	Ground	Power ground
3	SCL	Input	Two-Wire Serial Interface Clock
4	SDATA	Bi-directional	Two-Wire Serial Interface Data I/O
5	VSYNC	Output	Active High: Frame Valid; indicates active frame
6	HREF	Output	Active High: Line/Data Valid; indicates active pixels
7	PCLK	Output	Pixel Clock output from sensor
8	XCLK	Input	Master Clock into Sensor
9	DOUT7	Output	Pixel Data Output 7 (MSB)
10	DOUT6	Output	Pixel Data Output 6
11	DOUT5	Output	Pixel Data Output 5
12	DOUT4	Output	Pixel Data Output 4
13	DOUT3	Output	Pixel Data Output 3
14	DOUT2	Output	Pixel Data Output 2
15	DOUT1	Output	Pixel Data Output 1
16	DOUT0	Output	Pixel Data Output 0 (LSB)
17	GND	Ground	Power ground
18	STANDBY	Input	Controls sensor's standby mode.
19	Driver IN	Output	PWM signal from Sensor
20	Driver EN	Input	VCM driving Voltage from Driver

7 Mechanical Dimension

All dimension are in millimeter.

