Contact Image Sensor
(CIS) Module

Product Name	**M106H-A6-R1**

Approval	Notes		
CMOS Sensor Inc. 20045 Stevens Creek Blvd., Suite 1A Cupertino, CA., 95014 Tel: (408) 366-2898 Fax: (408) 366-2698	Approved	Checked	Designed
Issued	April 8, 2008	Revision no.	Rev A
All specifications of this device are subject to change without notice.			

Revision control sheet

Revision No.	Date	Item of change and content	Reason	Approved	Designed

CMOS Sensor Inc.

M106H-A6-R1
(TR213-009A)
8 dpm Contact Image Sensor (CIS) module

Features:

- 832 x 1 image sensing elements
- 8 dots per millimeter (dpm) resolution
- 104 mm scanning length
- 18 mm x 18 mm x 120 mm compact size
- 1 ms/line scanning speed
- Red LED light source
- high MTF
- light weight
- low power consumption
- one analog output signal
- high integration for light source, lens and sensor
- 10 pin connector for input and output

Description:

The M106H-A6 compact image sensor module is a contact type image sensing module that is composed of a line of LED's as a light source, a long Selfoc rod lens array, and 832 pixels of photo-detector array. Input and output electronic contact is via a 10-pin connector. The cross sectional view of the M106H-A6 is shown in figure 1. Figure 2, on the following page, is a block diagram of the module.

The module is suitable to scan an A6 size (104 mm) document. Applications include fax machine, document scanner, mark reader, and other office automation equipment.

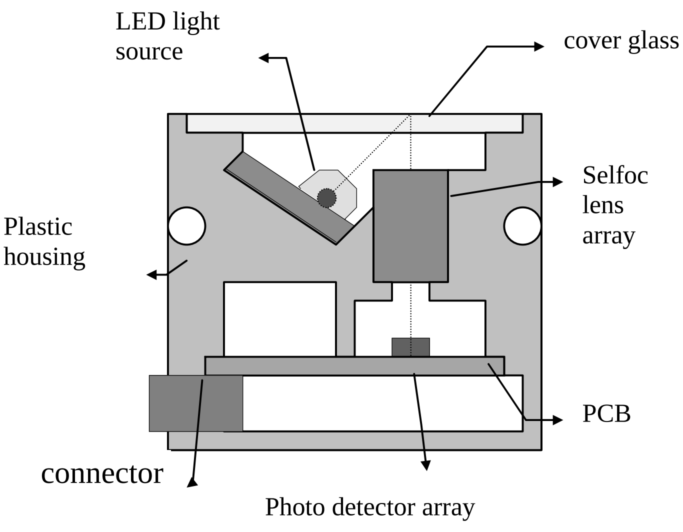


Figure 1. Cross section view of M106-A6.

Functional block diagram:

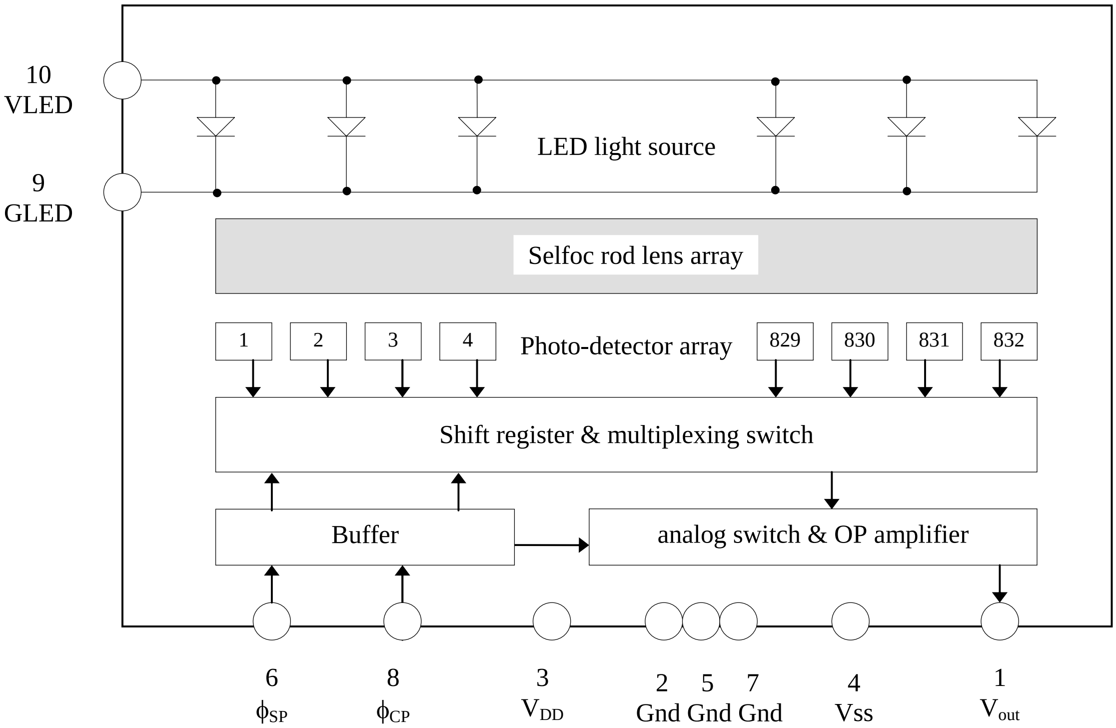


Figure 2 Functional block diagram of M106H-A6.

Pin Description:

Pin #	Symbol	Description
1	V_{out}	Analog video output signal
2	Gnd	Analog video output ground; 0 V
3	V_{DD}	Positive power supply voltage; 5 V
4	Vss	Negative power supply voltage; - 5 V
5	Gnd	Power supply ground; 0 V
6	ϕ_{SP}	Start pulse
7	Gnd	Clock pulse ground; 0 V
8	ϕ_{CP}	Main clock pulse
9	GLED	LED power supply ground; 0 V
:10	VLED	LED power supply voltage; 5 V

Electro-optical characteristics:

at f = 1.5 MHz, V_{DD} = 5 V, T_{int} [*(1)] = 1 ms, λ[*(2)] = 660 nm, Ta[*(3)] = 25 °C
(unless otherwise noted)

symbol	Parameter	test conditions	min.	typ	max	unit
V_p [*(4)]	Analog output voltage at white paper	O.D. [*(11)] = 0.05 ~ 0.1	0.8	1.0	1.5	V
U_p [*(5)]	White paper non-uniformity	O.D. = 0.05 ~ 0.1	-30		30	%
U_{padj} [*(6)]	Adjacent pixel non-uniformity	O.D. = 0.05 ~ 0.1	-25		25	%
V_d [*(7)]	Analog output voltage at dark paper	light off, O.D. = 0.8	-100		+100	mV
U_d [*(8)]	Dark signal non-uniformity	light off, O.D. = 0.8			200	mV
MTF[*(9)]	Modulation transfer function	at 3.85 lp/mm[*(12)]	30			%
γ[*(10)]	Linearity		0.85		1.1	

Definition:

1. T_{int} is an integration time. It is determined by the interval between two start pulses.
2. λ is a wavelength of the light source.
3. Ta is ambient temperature.
4. Vp = (Vpmax + Vpmin) / 2
   where Vpmax is a maximum voltage of whole module on white document.
   Vpmin is a minimum voltage of whole module on white document.
5. Up is a pixel - pixel photo response non-uniformity within whole module.
   Up = [(Vpmax - Vpmin) / Vp] x 100%
6. Upadj = Max [|(Vp(i) - Vp(i+1)| / Vp(i)] x 100%
   where Vp(i) is the video signal output of each pixel # i
   Vp(i+1) is the video signal output of each pixel # (i+1)
7. Vd = (Vdmax + Vdmin) / 2
   where Vdmax is a maximum dark signal on whole module.
   Vdmin is a minimum dark voltage on whole module.
8. Ud = Vdmax - Vdmin
9. MTF = [(Vmax - Vmin) / (Vmax + Vmin)] x 100%
   where Vmax is the maximum output voltage at 3.85 lp/mm document.
   Vmin is the minimum output voltage at 3.85 lp/mm document.
10. γ = log[(V2-Vd) / (V1-Vd)] / log (E2/E1) or log [(V2 - Vd) / (V1 - Vd)] / log (T2/T1)
    where V1 is the output voltage of E1 illumination or T1 integration time
    V2 is the output voltage of E2 illumination or T2 integration time
    at 10 ~ 90% of saturation conduction.
11. O.D. = optical density of the paper.
12. lp / mm = line pair per millimeter

Absolute maximum ratings:

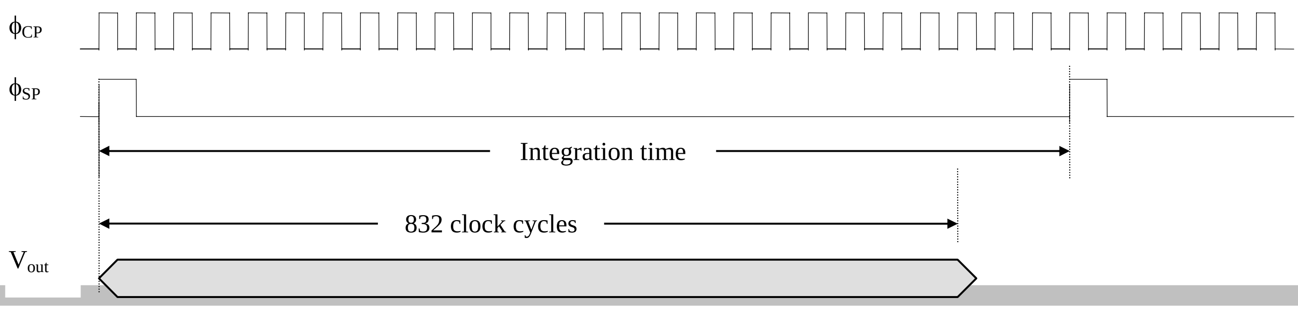
Parameter Name	Symbol	Max Value	Units
Power supply voltage	V_{DD}	6	V
Power supply current	I_{DD}	40	mA
LED light power supply voltage	VLED	7	V
LED light power supply current	ILED	60	mA
Digital input voltage range high	V_{IH}	5.5	V
Digital input voltage range low	V_{IL}	-0.5	V
Operating temperature	Ta	0 ~ 50	C
Storage temperature	Tstg	-25 ~ 70	C

≠ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress rating only, and functional operation of the device at these or any other conditions beyond those indicated under " recommended operating conditions" is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended operating conditions:

Item	Symbol	Min.	Typ.	Max.	Unit
Positive power supply voltage	V_{DD}	4.75	5	5.25	V
Negative power supply voltage	Vss	- 4.5	- 5	-5.5	V
LED power supply voltage	V_{LED}	4.75	5	5.25	V
High level input voltage	V_{IH}	3.4	5	5.5	V
Low level input voltage	V_{IL}	-0.5	0	0.5	V
Clock frequency	F		1.5	5	MHz
Clock pulse high duty cycle			25		%
Clock pulse high duration	Tw		0.2		us
Wavelength of light source	λ		660		nm
Operating free-air temperature	Ta	0	25	50	°C

Timing Diagram:

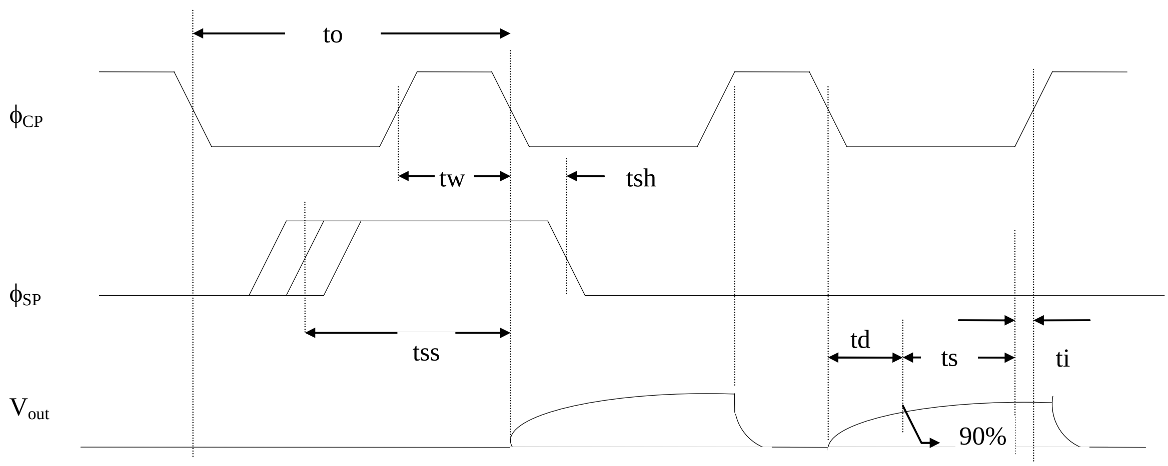


20045 Stevens Creek Blvd., Suite 1A, Cupertino, CA., 95014 Tel: (408) 366-2898, Fax: (408) 366-2698

Switching characteristics:

item	description	Symbol	min.	typ.	max.	unit
1	clock cycle time	To		0.5		us
2	clock pulse duty cycle			25		%
3	clock pulse width	Tw		150		ns
4	ϕ_{SP} setup time	Tss	50			ns
5	ϕ_{SP} hold time	Tsh	50			ns
6	Video signal delay time	Td			1000	ns
7	Video signal invalid time	Ti			300	ns
8	Video signal stable time	Ts	100			ns

Switching waveforms:



PRODUCT RELIABILITY TESTS

Items of Test	Testing Conditions	Inspection items	Pass Criterions
Life Test	Temp = 25 ± 5 °C, Humidity = 20 ~ 80 RH% Time = 2000 hrs	ΔVp, ΔVd: the change of Vp, Vd respectively after the life testing.	-30 % < ΔVp < 10 % -25 mV < ΔVd < 15mV
High Temp Test	Temp = 80 ± 5 °C Time = 144 hrs	electrical parameters, module structures.	Parameters must be within specs, no change, no damage in module structures
Low Temp Test	Temp = -30 ± 5 °C Time = 144 hrs		
Temp/Humidity Test	Temp = 50 ± 5 °C, Humidity = 85 ± 5 RH% Time = 144 hrs	ΔVp: the change of Vp after the life testing.	-30%< ΔVp < 10%
Temp Cycling	Temp = -30, 25, 80 °C Time = 30, 5, 30 min. Cycles = 10, 50	Electrical parameters, Module structures.	All electrical parameters must be within the specs. No distortion and damage on module.
Drop Test	Packaged product drops from 1 m height. Perform test for 3 sides.		
Vibration Test	Cycling: 10 ~ 50 ~ 10 Hz Cycle time = 1 min Amp = 2 mm,Time = 1 Hr		

Precautions before use:

1. Dirty Glass Surface:
   The glass surface should be kept clean.
   Do not wipe the sensor by hand or use in a dust polluted environment. Should the glass surface become dirty, moisten a cloth with alcohol and wipe the surface gently.
   Care should be taken so as not to scratch the surface while wiping it. Any loose dust lying on the sensor surface can be cleaned using an air gun.

2. Dust and the CIS unit
   The unit is housed in an air tight structure to protect it from dust. The side plates should not be removed, or dust may enter the unit. When using the side holes to adjust the sensor, turn the screws slowly until tight, so as not to damage the screw hole thread.

20045 Stevens Creek Blvd., Suite 1A, Cupertino, CA., 95014 Tel: (408) 366-2898, Fax: (408) 366-2698

3. Extracting / Inserting the connector

   The maximum number of times that the connector should be extracted and connected is ten. If the connector is inserted / extracted more than ten times, the connector "burrs" will be eroded, thereby making the connector ineffective.

4. Stable operation

   4.1 The connector pins should not be touched by bare hand or Electro-statically charged material.

   4.2 Noise:

   a. Insert a low frequency noise suppressing capacitor (100 μF) between V_{DD} (+5 V) and Gnd. A high frequency noise suppressing capacitor is already integrated into the circuit.
   b. Ensure that the sensor connecting cables are 30 cm or less in length. The ϕ_{CP} and Gnd, ϕ_{SP} and Gnd respectively from twisted cable pairs.

   4.3 Latch Up

   When the voltage is higher than the absolute maximum, "latch up" will cause the sensor to break, even if the voltage is caused by a surge. If the current varies rapidly in the external circuit, or if the power is turned off and then on again, ensure that the voltage on each terminal does not exceed the values indicated in "absolute maximum rating".

Attachment: the configuration and the physical dimensions (unit: mm)

M106H-A6 configuration and physical dimensions.