

## 1.0 General Description

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The AMIS-710200 (PI200MC-A4) is a contact image sensor (CIS) module. It is a long CIS using MOS image sensor technology for high-speed performance and high sensitivity. The AMIS-710200 is suitable for scanning A4 size (216mm) documents with 8 dots per millimeter (dpm) resolution. Applications include document scanners, mark readers and other office automation equipment.

## 2.0 Key Features

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- Light source, lens and sensor are integrated into a single module
- 8dpm resolution, 216mm scanning length
- 437 $\mu$ sec/line scanning speed @ 4.0MHz clock rate
- Wide dynamic range
- Analog output
- 660 Red LED light source
- Compact size - 20.5mm x 21.5mm x 232mm
- Low power
- Light weight

## 3.0 Functional Description

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The AMIS-710200 imaging array consists of 27 sensors, AMIS-720220 (PI3020), produced by AMIS. The sensor is a monolithic chip with an array of 64 photo sensing elements, of which 27 are cascaded to provide 1728 photo-detectors. These cascaded chips are contiguously aligned in a single row and bonded to the printed circuit board (PCB). See Figure 1, AMIS-710200's block diagram. This configuration allows a stream of sequential video pixels to be read from its output port, for example, starting from the first pixel, 1<sup>st</sup>, located next to the connector end of the module and continues to and through the last pixel, 1728<sup>th</sup>. Each chip contains a complete control circuitry. Integrated within monolithic chip is a set of multiplex switches, and a digital shift register to control the chips sequential readout. Additionally, the chips contain a chip selection switch that is interrogated in a sequence as each predecessor chip completes its scanning process.

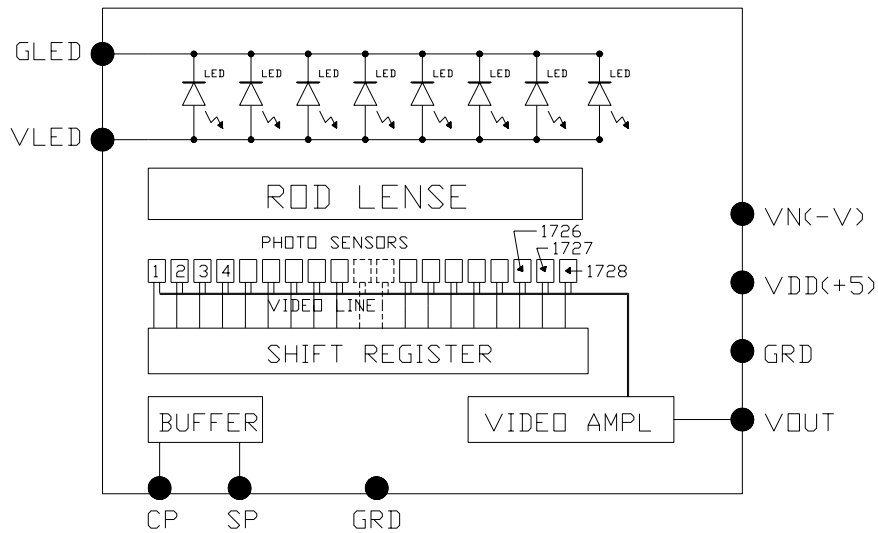


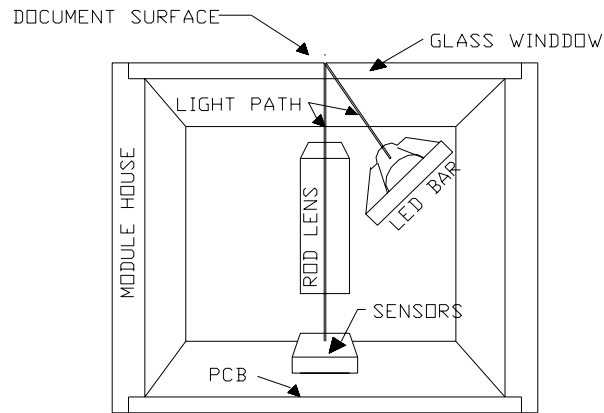
Figure 1: AMIS-710200 Block Diagram

Figure 2 shows a mechanical cross section of the module's internal structure. Mounted in the module is a number of components. These components function together to provide the module a complete integrated system. The LED light bar illuminates the documents through the window and reflection from the imaged documents is picked up and focused by the one-to-one graded indexed micro lens array.

The lens, through the glass window, focuses the scanned images from the document onto the sensing plane of the sensor chips, which is mounted on the PCB. During the imaging process, the document is passed across the glass window's surface.

The PCB not only has the sensor chips mounted on it, but it has an on-board amplifier, a clock buffer for both the start pulse (SP), and the module's master clock (CP) buffer. This amplifier processes the pixel charges from the image sensor chips and converts them into voltage signal to produce a sequential stream of video at the output pin of the AMIS-710200 module.

All these discussed components are housed in a small plastic housing which has a cover glass, the window. This housing with its sealed windows protects the imaging array, the micro lens assembly and the LED light source from dust.



INSIDE PICTORIAL  
OF THE MODULE

Figure 2: AMIS-710200 Cross Section

## 4.0 Pin Out Description

There is one connector located at the end of the module. The outline of the module in Figure 4 of the mechanical section illustrates the connector location. With the module window facing down on flat surface, the viewer looking down on backside of the module and with the connector's pins facing the viewer, the connector is located on the left hand end of the module. The connector is a 2.0mm dual 8-pin row with a total of 16 pin connector, part # Berg 88054-X16. Its I/O designation is provided in Table 1. Pin number 1's location is indicated on the module outline. All of the odd pins are on the bottom row with Pin 1 on the edge closest to the end of the module. All of the even pins are on the top row with Pin 2 located adjacent to Pin 1.

Table 1:I/O Designation

Pin Number	Symbol	Names and Functions
1, 2, 4, & 8	Gnd	Ground; 0V
3	Vout	Analog video output
5 & 6	Vdd (+5V)	Positive power supply
7	SP	Start clock pulse
9 & 10	Vn (-5V to -12V)	Negative power supply
11 & 12	CP	Sampling clock pulse
13 & 14	GLLED	Ground for the light source; 0V
15 & 16	VLED	Supply for the light source

## 5.0 Absolute Maximum Rating

Table 2: Absolute Maximum Rating

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	7.0	V
	Idd	70	mA
	Vn	-15	V
	In	20	mA
	VLED	5.75	V
	ILED	600	mA
Input clock pulse (high level)	Vih	Vdd	V
Input clock pulse (low level)	Vil	-0.5	V

**Note:** These are the absolute maximums and are not to be used in prolonged operation.

Table 3: Operating Environment

Parameter	Symbols	Maximum Rating	Units
Operating temperature	Top	0 to 50	°C
Operating humidity	Hop	10 to 85	%
Storage temperature	Tstg	-25 to +85	°C
Storage humidity	Hstg	5 to 95	%

## 6.0 Electro-Optical Characteristics (25°C)

Table 4: Electro-Optical Characteristics (25°C)

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1728	Elements	
Pixel-to-pixel spacing		125	µm	
Line scanning rate <sup>(1)</sup>	Tint	437	µsec	@ 4MHz clock frequency
Clock frequency <sup>(2)</sup>	Fclk	4.0	MHz	
Bright output voltage		1.0	Volts	
Bright output <sup>(4)</sup> non-uniformity	Up	<+/-30	%	
Adjacent pixel <sup>(5)</sup> non-uniformity	Upadj	<25	%	
Dark non-uniformity <sup>(6)</sup>	Ud	<50	mV	
Dark output voltage <sup>(6)</sup>	Vd	<75	mV	
Modulation transfer function <sup>(7)</sup>	MTF	>30	%	

**Definitions:**

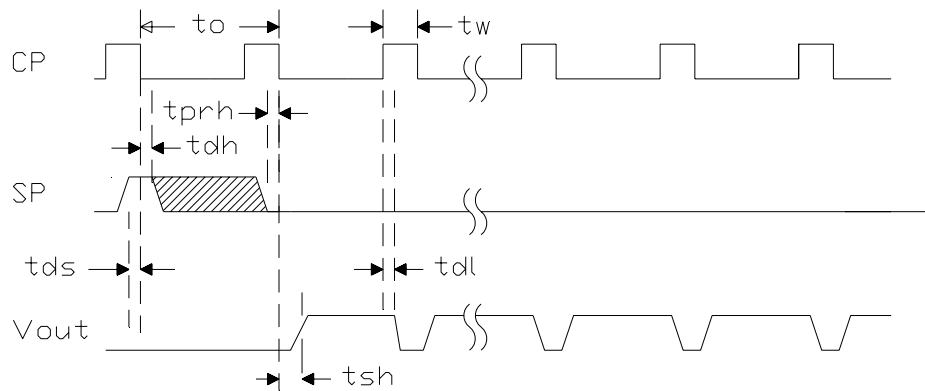
- Tint is the line scanning rate or integration time. Tint is determined by the interval between two start pulses (SP).
- Fclk is the main clock, CP, frequency.
- $V_{pavg} = \sum V_p(n)/1728$ .
- $U_p = [(V_{pmax} - V_p) / V_p] \times 100\%$  or  $[(V_p - V_{pmin}) / V_p] \times 100\%$ .
- $U_{p adj} = \text{MAX}[ |(V_p(n) - V_p(n+1)) / V_p(n)| \times 100\%$ .  
Upadj is the non-uniformity percentage pixel-to-pixel.
- $U_d = V_{dmax} - V_{dmin}$   
Vdmin is the minimum dark output voltage, Vd, with light source off.  
Vdmax: maximum dark output voltage, Vd, with light source off.  
Vd is measured between the reset level of the video and the dark video signal level. This fixed offset occurs because of the video line is reset to ground after each pixel and before the following pixel. However, because the video signal is amplified and the offset is adjusted to force the average dark video signal near ground, the average dark video signal is only few millivolts from ground and reset level will be below ground.
- $MTF = [(V_{pmax} - V_{pmin}) / (V_{pmax} + V_{pmin})] \times 100 [\%]$  is the effective algorithm which is used to make the measurements. V(p)max: maximum output voltage at 4.0lp/mm V(p)min: minimum output voltage at 4.0lp/mm.
- lp / mm: line pair per mm.

## 7.0 Recommended Operating Conditions

Table 5: Recommended Operating Conditions (25°C)

Item	Symbol	Min.	Mean	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	Vn.	-4.5	-5	-12	V
	VLED	4.5	5	5.5	V
	Idd	42	50	55	ma
	Ivn	5.0		6.0	ma
	ILED	300	450	550	ma
Input voltage at digital high	Vih	Vdd-1.0	Vdd-.5	Vdd	V
Input voltage at digital low	Vil	0		0.8	V
Clock frequency	Fclk		4.0	5.0	MHz
Clock pulse high duty cycle	Dclk	25			%
Clock pulse high duration	CPH	50 <sup>(3)</sup>			ns
Integration time	Tint	0.347		5.0	ms
Operating temperature	Top		25	50	°C

## 8.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: AMIS-710200 Timing Diagram

Each of the switch timing characteristics for the I/O clocks is defined in symbolic acronyms. There is a corresponding clock switching time for each symbol on the timing diagram. The corresponding time for each symbol is given in the following Table 6.

Table 6: Symbol Definitions for the Above Timing Diagram

Item	Symbol	Min.	Mean	Max.	Units
Clock cycle time	to	0.20		2.0	μs
Clock pulse width	tw	50			ns
Clock duty cycle		25		75	%
Prohibit crossing time of SP	tprh	15			ns
Data setup time	tds	10			ns
Data hold time	tdh	35			ns
Signal delay time	tdl	20			ns
Signal settling time	tsh	90			ns

## 9.0 Mechanical Description

Figure 4 is an overview drawing of the module with approximate dimensions. If a detailed drawing is desired, especially for a design in application, a full size drawing is available upon request.

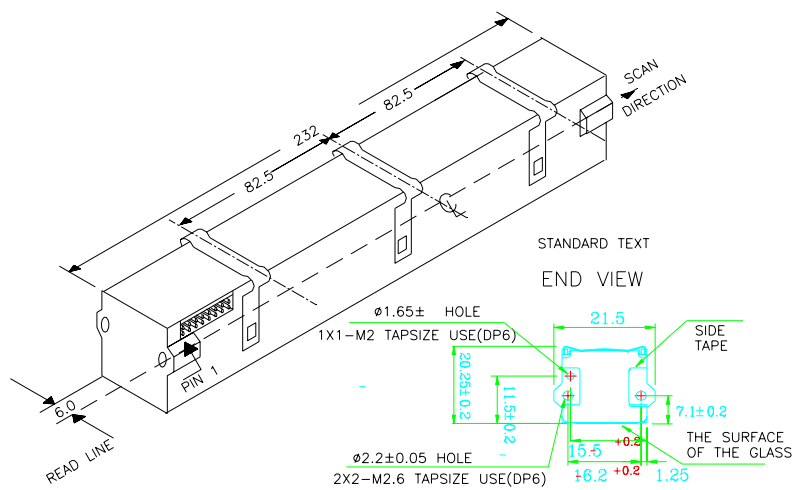


Figure 4: AMIS-710200 Module Outline

## 10.0 Company or Product Inquiries

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