

## 1.0 General Description

The AMIS-710249-A6 (PI249MC-A6-R) is a contact imaging sensor (CIS) module. The module can operate from a single 5V supply. It has two +5V inputs. One supply is for the LED light source and the other is for the module's circuit. The module contains 13 sequentially cascaded AMIS-720233 (PI3033) sensor chips. The AMIS-720233 is a 200 dots per inch (dpi) solid-state line imaging array, also a product of AMI Semiconductor. This imaging device is fabricated using MOS imaging sensor technology for its high-speed performance and high sensitivity. AMIS-710249-A6 is suitable for scanning A6 size (104mm) documents with eight dots per millimeter resolution. Applications include ticket, check and card scanners, a variety of mark readers and other automation equipment.

## 2.0 Key Features

- Low power-single power supply at 5.0V
- Light source, lens and sensor are integrated into a single module
- 8dpm resolution, 104mm scanning length
- High speed page scan - up to 167 $\mu$ sec/line @ 5MHz pixel rate
- Wide dynamic range
- Analog output
- White LED light source
- White pet reflector
- Compact size  $\cong$  14mm x 19mm x 120mm
- Light weight

## 3.0 Functional Description

The AMIS-710249-A6 consists of 13 imaging array sensors, which are cascaded to provide 832 photo-detectors. Each sensor contains its associated multiplex switches and a digital shift register, which controls its sequential readout. Each sensor also contains a chip select switch so that each following chip is accessed sequentially as its predecessor chip completes its scan. These chips are mounted on a printed circuit board (PCB), along with clock buffers and a video signal amplifier (see Figure 1).

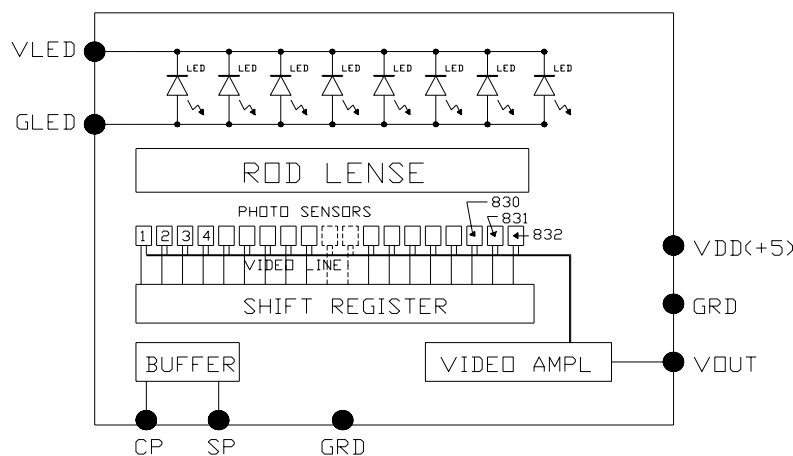
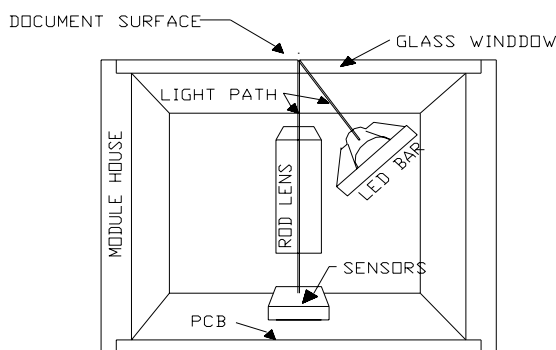


Figure 1: AMIS-710249-A6 Module Block Diagram

The PCB containing the imaging array is enclosed in a module housing along with a one-to-one graded indexed micro lens array, which focuses the image of the scanned documents onto the sensing line of the sensor chips. The document is illuminated with an LED light source which is also mounted in the housing (see Figure 2).



INSIDE PICTORIAL  
OF THE MODULE

Figure 2: AMIS-710249-A6 Cross Sectional View

This pictorial cross section shows the LED bar light source and its illumination path. The light on the document reflects images of the document. The reflected images focus through the micro lens onto the image sensing line of the chips, where images are converted to proportional electrical charges. An on board amplifier processes these signal charges into proportional video signal voltages, which are sent out to the output video port.

All components are housed in a small plastic housing and covered with a glass window. This cover glass not only serves to protect all of the critical components within the housing from dust, but along with the micro lens, it plays a minor role in the depth-of-focus because it lies in the optical path.

## 4.0 Pin Out Description

There is one connector located at the end of the module. The outline of the module's housing in Figure 4 illustrates the connector location. With the module window facing down on the flat surface, the viewer looking down on backside of the module and the connector's pins facing the viewer, the connector is located on the right-hand end of the module. The connector is a single row of ten pins with a 1.25mm pin space. It is a JAE 1L-Z-10P-S125T3-E. Its I/O designation is provided in Table 1. The location of Pin 1 is indicated on the module outline.

Table 1: I/O Designation

Pin Number	Symbol	Names and Functions
1	Vout	Analog video output
2	Gnd (0V)	Ground
3	Vdd (+5V)	Positive power supply
4	NA	Not used
5	Gnd (0V)	Ground
6	SP	Shift register start pulse
7	Gnd (0V)	Ground
8	CP	Sampling clock pulse
9	GLED	Ground for the light source
10	VLED	Supply for the light source

## 5.0 Absolute Maximum Rating

Table 2 depicts the absolute maximum parameters. These parameters should not be used in prolonged operation.

Table 2: Absolute Maximum Rating

Parameter	Symbols	Maximum Rating	Units
Power supply	Vdd	7.0	V
	Idd	50	mA
	VLED	6.0	V
	ILED	650	mA
Input clock pulse (high)	Vih	Vdd	V
Input clock pulse (low)	Vil	-0.5	V

## 6.0 Operating Environment

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	%

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

Table 4: Electro-Optical Characteristics at 25°C

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		832	Elements	
Pixel-to-pixel spacing		125	µm	
Line scanning rate	Tint <sup>(1)</sup>	170	µsec	@ 5MHz clock frequency
Clock frequency <sup>(2)</sup>	Fclk	5	MHz	
Bright output voltage <sup>(3)</sup>	Video output	1.0	V	Specified for tint = 170µsec
Bright output non-uniformity <sup>(4)</sup>	Up	<+/-30	%	
Adjacent pixel non-uniformity <sup>(5)</sup>	Uadj	<25	%	
Dark non-uniformity <sup>(6)</sup>	Ud	<50	mV	
Dark output voltage	Vd	275<Vd<325	mV	
Modulation transfer function <sup>(7)</sup>	MTF	>40	%	See Note 7 for MTF & DOF

- Notes:**
- (1) Tint: Line scanning rate or integration time. Tint is determined by the interval of two start pulses (SP).
  - (2) Fclk: main clock frequency applied to into the module. It is also equal to the pixel frequency.
  - (3)  $V_{pavg} = \sum V_p(n)/832$ ; where  $V_p(n)$  is the  $n^{th}$  pixel voltage value
  - (4)  $U_p$  is defined as follows:  $U_{pmax} = [(V_{pmax} - V_{pavg}) / V_{pavg}] \times 100\%$  and  $U_{pmin} = [(V_{pavg} - V_{pmin}) / V_{pavg}] \times 100\%$ ; where  $U_{pmax}$  is determined by the highest  $n^{th}$  video pixel,  $V_p(n)$ , and  $V_{pmin}$  is determined by minimum pixel,  $V_p(n)$ , then  $U_p$  is selected from the largest of the two values  $|U_{pmax}|$  or  $|U_{pmin}|$ .
  - (5)  $U_{adj}$  is between two adjacent pixel's non-uniformity and defined as follows:  
 $U_{adj} = \text{MAX}[ |(V_p(n) - V_p(n+1)) / V_p(n)| \times 100\%$
  - (6)  $U_d = V_{dmax} - V_{dmin}$   
 $V_{dmin}$  is the minimum output in the dark  
 $V_{dmax}$  is the maximum output voltage in the light
  - (7)  $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$ . Depth of focus ( DOF), range is defined with the MTF. MTF is measured at the glass surface to approximately 0.4mm from the glass surface, and is > 40% with its peaks at approximately the mid-point, 0.2mm.  
 $V_{max}$ : maximum output voltage at 50lp/inch (at 1/2 of the optical Nyquist frequency)  
 $V_{min}$ : minimum output voltage at 50lp/inch
  - (8) lp / inch: line pair per inch

## 8.0 Recommended Operating Conditions (25°C)

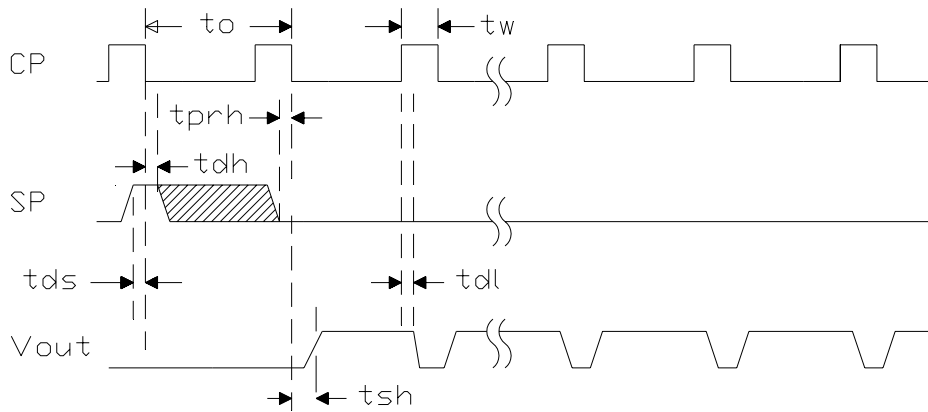
Table 5: Recommended Operating Conditions at 25°C

Item	Symbol	Min.	Mean	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	VLED	4.5	5.0	5.5	V
	Idd	30	35	40	ma
	ILED	300	400	500	ma
Input voltage at digital high	Vih	Vdd-1.0	Vdd-0.5	Vdd	V
Input voltage at digital low	Vil	0		0.6	V
Clock frequency <sup>(1)</sup>	Fclk		5.0	5.5	MHz
Clock pulse high duty cycle <sup>(2)</sup>		25			%
Clock pulse high duration <sup>(3)</sup>		50			ns
Integration time <sup>(3)</sup>	Tint	0.167		5.0	ms
Operating temperature	Top		25	50	°C

**Notes:**

- (1) The module will operate at 5.5MHz but its performance cannot be guaranteed.
- (2) The clock duty cycle is defined as the ratio of the high level duration divided by the duration of the clock period.
- (3) The tint (min.) is the lowest line integration time available at a 5.0MHz clock rate.

## 9.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: Clock and Start Pulse Timing Diagram

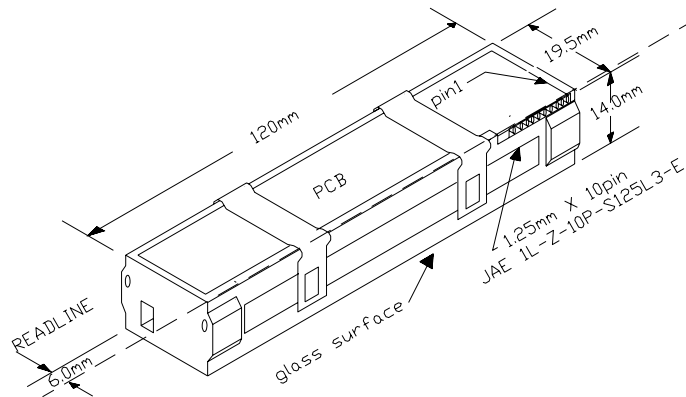
The switching characteristics for the I/O clocks are shown in Figure 3. Its corresponding timing symbol definitions are given in Table 6.

Table 6: Symbol Definitions for Figure 3 (Timing Diagram)

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	$t_o$	0.2		4.0	$\mu$ s
Clock pulse width	$t_w$	50			ns
Clock duty cycle		25		75	%
Prohibit crossing time of SP	$t_{prh}$	15			ns
Data setup time	$t_{ds}$	20			ns
Data hold time	$t_{dh}$	20			ns
Signal delay time	$t_{dl}$	50			ns
Signal settling time	$t_{sh}$	120			ns

## 10.0 AMIS-710249-A6 Module Mechanical Dimensions

The sketch of this module is provided as a pictorial of the module size and structure. A detailed drawing is available upon request.



Pictorial of The Plastic Standard A6 Housing Size

Figure 4: AMIS-710249-A6 Module Mechanical Outline

## 11.0 Company or Product Inquiries

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For more information about AMI Semiconductor, our technology and our product, visit our Web site at: <http://www.amis.com>

### North America

Tel: +1.208.233.4690

Fax: +1.208.234.6795

### Europe

Tel: +32 (0) 55.33.22.11

Fax: +32 (0) 55.31.81.12

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