

## 1.0 General Description

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The AMIS-710321-A6 (PI321MC-A6) is a contact imaging sensor (CIS) module, which is composed of 13 AMIS-720321 (PI3021) sensor chips. The AMIS-72031 is a 300dots 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 high-speed performance and high sensitivity. The AMIS-710321-A6 is suitable for scanning A6 size (104mm) documents with 11.8 dots per millimeter resolution. Applications include ticket, check and card scanners, a variety of mark readers and other automation equipment.

## 2.0 Key Features

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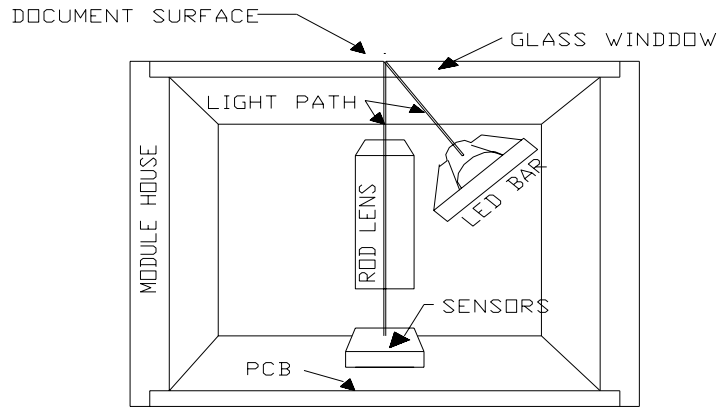
- Light source, lens and sensor are integrated into a single module
- 11.8dpm resolution, 104mm scanning length
- Up to 250 $\mu$ sec/line scanning speed, with 5MHz pixel rate
- Wide dynamic range
- Analog output
- Red LED light source (660nm)
- Compact size  $\cong$  14mm x 19mm x 120mm
- Low power
- Light weight

## 3.0 Functional Description

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The AMIS-710321-A6 imaging array consists of 13 sensors that are cascaded to provide 1248 photo-detectors with their associated multiplex switches, and a digital shift register that controls its sequential readout. Mounted in the module is one-to-one graded indexed micro lens array that focuses the scanned documents to image onto its sensing plane. The on-board amplifier processes the video signal to produce a sequential stream of video at the video output pin of the AMIS-710321-A6 module.

Illumination is accomplished by means of an integrated LED light source. All components are housed in a small plastic housing which has a cover glass that acts as the focal point for the object being scanned and protects the imaging array, micro lens assembly and LED light source from dust. I/O to the module is the 10-pin connector located on one end of the module. The cross section of the AMIS-710321-A6 is shown in Figure 1 and the block diagram in Figure 2.



INSIDE PICTORIAL OF THE MODULE

Figure 1: Inside Pictorial of the Module

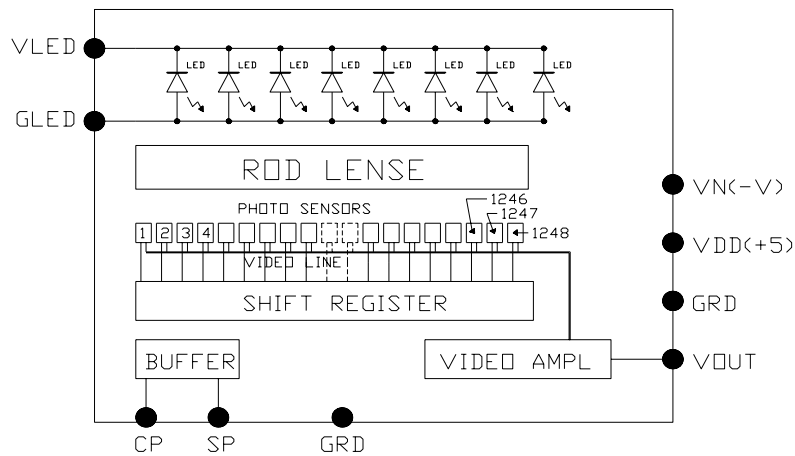


Figure 2: AMIS-710321-A6 Module Block Diagram (see Table 1)

Table 1: Pin Configuration

Pin Number	Symbol	Names and Functions
1	Vout	Analog video output
2	Gnd	Ground; 0V
3	Vdd (+5V)	Positive power supply
4	Vn (-5V to -12V)	Negative power supply
5	Gnd	Ground; 0V
6	SP	Shift register start pulse
7	Gnd	Ground; 0V
8	CP	Sampling clock pulse
9	GLED	Ground for the light source; 0V
10	VLED	Supply for the light source

Table 2: Absolute Maximum Rating

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	10	V
	Idd	50	ma
	Vn	-15	V
	In	10	ma
	VLED	5.5	V
	ILED	350	ma
Input clock pulse (high level)	Vih	Vdd - 0.5V	V
Input clock pulse (low level)	Vil	-0.6	V

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 +75	°C
Storage humidity	Hstg	5 to 95	%

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

Table 4: Electro-Optical Characteristics at 25°C

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1248	Elements	
Pixel-to-pixel spacing		84.7	µm	
Line scanning rate	Tint <sup>(1)</sup>	250	µsec	@ 5.0MHz clock frequency
Clock frequency <sup>(2)</sup>	f	5.0	MHz	
Bright output voltage <sup>(3)</sup>	Video output	1.0	mV	
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	<100	mV	
Dark output voltage	Vd	<300	mV	
Modulation transfer function <sup>(7)</sup>	MTF	>50	%	

**Notes:**

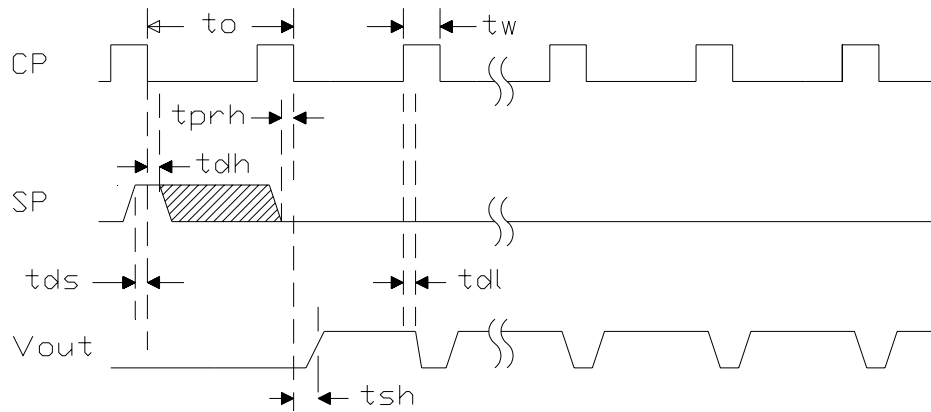
- (1) Tint: Line scanning rate or integration time. Tint is determined by the interval of two SP.
- (2) f: main clock frequency
- (3)  $V_{pavg} = \sum V_p(n)/1248$
- (4)  $U_p = [(V_{pmax} - V_p) / V_p] \times 100\%$  or  $[(V_p - V_{pmin}) / V_p] \times 100\%$
- (5)  $U_{adj} = \text{MAX}[ | (V_p(n) - V_p(n+1)) | / V_p(n) ] \times 100\%$   
Uadj is the non-uniformity percentage pixel to pixel
- (6)  $U_d = V_{dmax} - V_{dmin}$   
Vdmin is the minimum output on a black document (O.D.=0.8)  
Vdmax: maximum output voltage of black document (O.D.= 0.8)
- (7)  $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$   
Vmax: maximum output voltage at 75lp/in  
Vmin: minimum output voltage at 75lp/in
- (8) O.D. = optical density
- (9) lp / in: line pair per inch

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		5		V
	Idd		47	55	ma
	Ivn		6.6	10.0	ma
	ILED		270	350	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	f			5.0	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint	0.250		5.0	ms
Operating temperature	Top		25	50	°C

\* Tint (Min.) is the lowest line integration time available with a 5.0MHz clock rate.

## 5.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

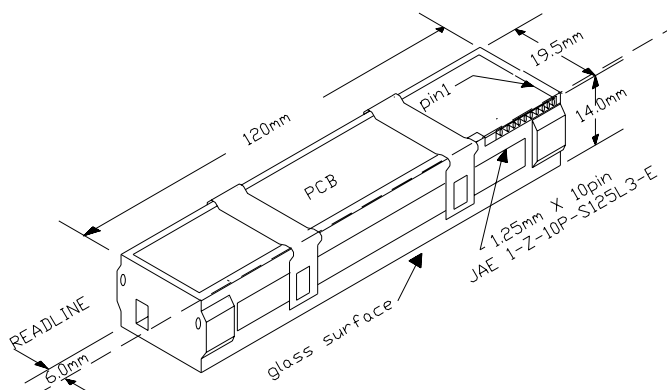
Figure 3: Module Timing Diagram

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

Table 6: Symbol Definitions for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	$t_o$	0.20		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

## 6.0 AMIS-710321-A6 Module and its Mechanical Dimensions



Pictorial of the Plastic Standard A6 Housing Size

Figure 4: Pictorial of the Plastic Standard A6 Housing Size

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

## 7.0 Company or Product Inquiries

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