

1.0 General Description

The AMIS-710224-A6 (PI224-MC-A6) is a contact imaging sensor (CIS) module composed of 13 AMIS-720033 (PI3020) image sensor chips. The AMIS-720033 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 high-speed performance and high sensitivity. The AMIS-710224-A6 is suitable for scanning A6 size (104mm) documents with 8 dots per millimeter (dpm) resolution. Applications include ticket, check and card scanners, variety of mark readers, and other automation equipment.

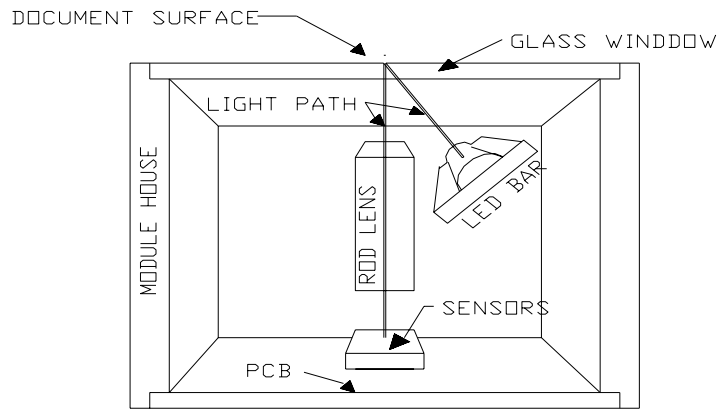
2.0 Key Features

- Light source, lens and sensor are integrated into a single module
- 8dpm resolution, 104mm scanning length
- High speed page scan - up to 167 μ sec/line @ 5MHz pixel rate
- Wide dynamic range
- Analog output
- Ultra bright Yellow-Green light source
- Compact size \cong 14mm x 19mm x 120mm
- Low power
- Light weight

3.0 Functional Description

The AMIS-710224-A6 imaging array consists of 13 sensors that are cascaded to provide 832 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-710224-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 which 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-710224-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

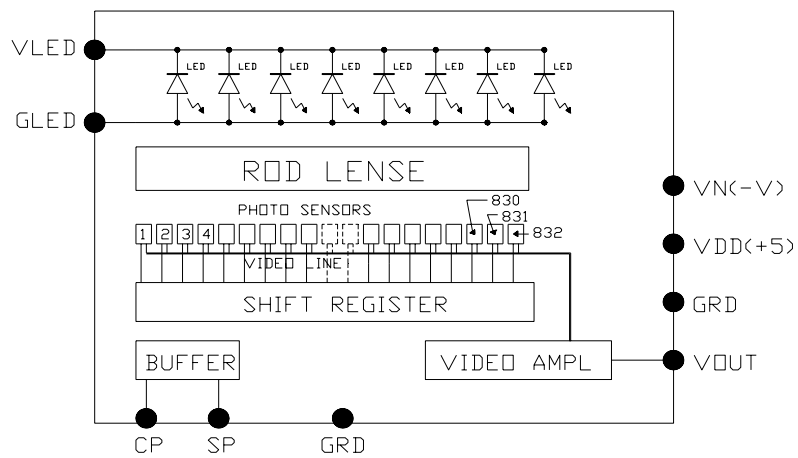


Figure 2: AMIS-710224-A6 Module Block Diagram

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	GLLED	Ground for the light source; 0V
10	VLED	Supply for the light source

4.0 Absolute Maximum Ratings

Table 2: Absolute Maximum Ratings

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	7.5	V
	Idd	40	ma
	Vn	-15	V
	In	15	ma
	VLED	5.5	V
	ILED	500	ma
Input clock pulse (high level)	Vih	Vdd – 0.5	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	%

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5.0 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 ⁽¹⁾	180	μsec	Tested @ 5MHz clock frequency
Clock frequency ⁽²⁾	f	5	MHz	
Bright output voltage ⁽³⁾	Video output	1.0	V	Test at Tint = 180us
Bright output non-uniformity ⁽⁴⁾	Up	<+/-30	%	
Adjacent pixel non-uniformity ⁽⁵⁾	Uadj	<25	%	
Dark non-uniformity ⁽⁶⁾	Ud	<20	mV	
Dark output voltage	Vd	<200	mV	
Modulation transfer function ⁽⁷⁾	MTF	>50	%	See Note 7 for MTF & DOF

Definition:

1. Tint: line scanning rate or integration time; tint is determined by the interval of two SP. The module was tested at 180us, but it will operate to 167us with a clocking speed of 5.0MHz.
2. f: main clock frequency The module was tested at 5.0MHz, but electrically it reliably operates above 5.0MHz, but with a minimum integration time of 167μsec.
3. $V_{pavg} = \sum V_p(n)/832$
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. $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$. DOF range is defined with the MTF.
MTF is measure at glass surface and at 0.4mm from the glass > 50 % and peaks at approximately mid-point of 0.2mm.
Vmax: maximum output voltage at 50 lp/inch (At 1/2 of the optical Nyquest frequency).
Vmin: minimum output voltage at 50lp/inch.
8. O.D. = optical Density
9. lp / inch: line pair per inch

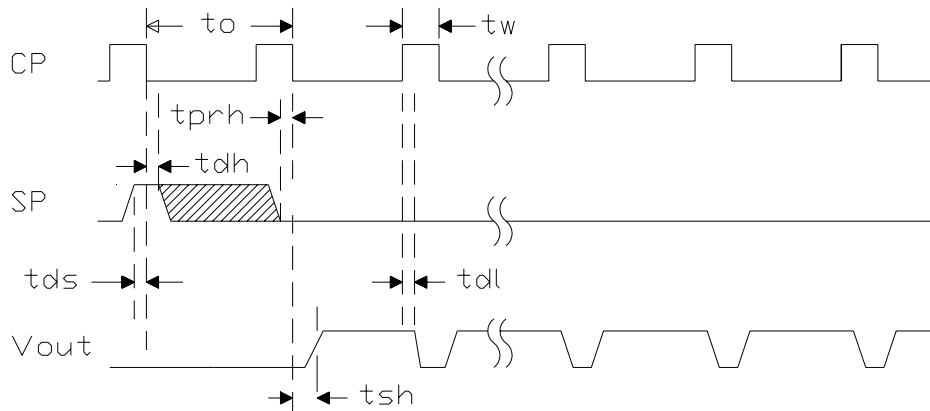
Table 5: Recommended Operating Conditions (25°C)

Item	Symbol	Min.	Mean ⁽¹⁾	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	Vn	-4.5	-5	-12	V
	VLED		5	5.5	V
	Idd		30	40	ma
	In		6	15	ma
	ILED		300	450	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	f			5.0 ⁽²⁾	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint ⁽³⁾	0.167		5.0	ms
Operating temperature	Top		25	50	°C

Notes:

1. Tested at 5.0MHz and 180us
2. Also used as test frequency
3. Tint (min.) is the lowest line integration time available at 5.0MHz clock rate.

6.0 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 definition for the timing symbols are given in Table 6.

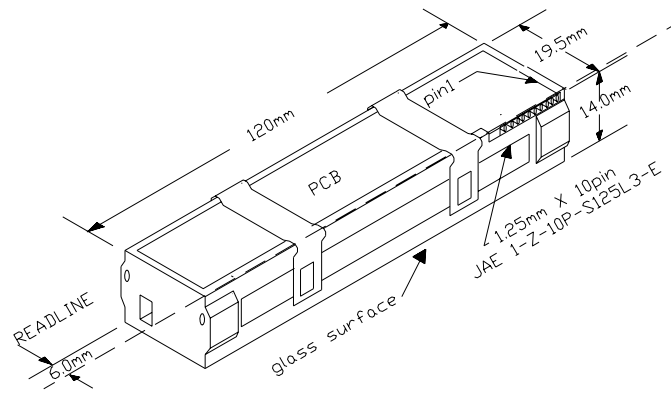
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Table 6: Symbol Definition for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	t_o	0.2		4.0	μs
Clock pulse width	t_w	50			ns
Clock duty cycle		25		75	%
Prohibit crossing time of Start Pulse	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

7.0 AMIS-710224-A6 Module and its Mechanical Dimensions

The sketch of this module is to provide 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: Pictorial of the Plastic Standard A6 Housing Size

8.0 Company or Product Inquiries

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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