1.0 General Description

The AMIS-710223-A6 (PI223MC-A6) is a contact imaging sensor (CIS) module, which is composed of 13 AMIS-720033 (PI3020) sensor chips. The AMIS-720033 is a 200 dot 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-710223-A6 is suitable for scanning A6 size (104mm) documents with 8 dots per millimeter (dpm) resolution. Applications include ticket, check and card scanners, a 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 167μsec/line @ 5MHz pixel rate with internal optical modification (optional feature)
- Wide dynamic range
- Analog output
- Yellow-Green LED light source
- Compact size ≅ 14mm x 19mm x 120mm
- Low power
- Light weight

3.0 Functional Description

The AMIS-710223-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 a 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-710223-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-710223-A6 is shown in Figure 1 and the block diagram in Figure 2.

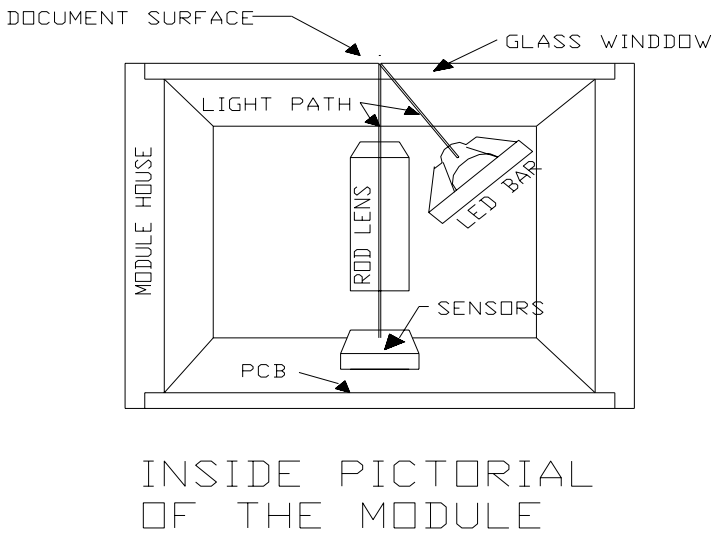


Figure 1: Inside Pictorial of the Module

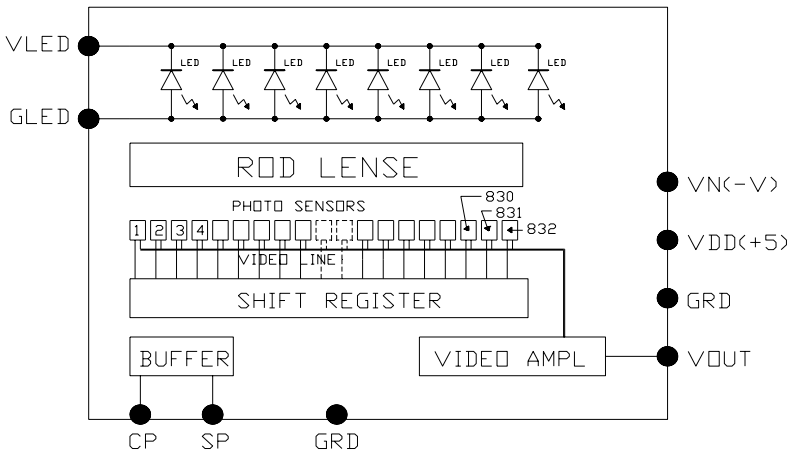


Figure 2: AMIS-710223-A6 Module Block Diagram

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

4.0 Absolute Maximum Rating

Table 2: Absolute Maximum Rating

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 – 0.5V	V
Input clock pulse (low level)	Vil	-0.6	V

Table 3: Operating Temperature

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	%

5.0 Electro-Optical Characteristics

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)	420	µsec	@ 2MHz clock frequency
Clock frequency(2)	f	2	MHz	See Note 2 for 5.0MHz operation
Bright output voltage(3)	Video output	1.0	V	Specified for 420µsec
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. See Note 2 for the high scanning speed operation.
2. f: main clock frequency; the call out is at 2.0MHz, but electrically it reliably operates to 5.0MHz. However, it must be optically modified to obtain the minimum integration time of 167µsec. This modification is offered as a user's option.
3. Vpavg = ∑ Vp(n)/832
4. Up = [(Vpmax - Vp) / Vp] x 100% or [(Vp - Vpmin) / Vp] x 100%
5. Upadj = MAX[| (Vp(n) - Vp(n+l) | / Vp(n)] x 100%
   Upadj is the nonuniformity percentage pixel to pixel.
6. Ud = Vdmax – Vdmin
   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 = [(Vmax - Vmin) / (Vmax + Vmin)] x 100 [%]. DOF range is defined with the MTF.
   MTF is measure at glass surface and at 0.4mm from the glass > 50 percent and peaks at approximately mid-point of 0.2mm.
   Vmax: maximum output voltage at 50lp/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

Item	Symbol	Min.	Mean	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	Vn	-4.5	-5	-12	V
	VLED		5	5.5	V
	Idd		22	40	ma
	In		6	15	ma
	ILED	370	400	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		2.0	5.0	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint	0.167		5.0	ms
Operating temperature	Top		25	50	°C

* Tint (min.) is the lowest line integration time available at a 5.0MHz clock rate with internal optical modifications. See Note 2 under Table 4.

6.0 Switching Characteristics (25°C)

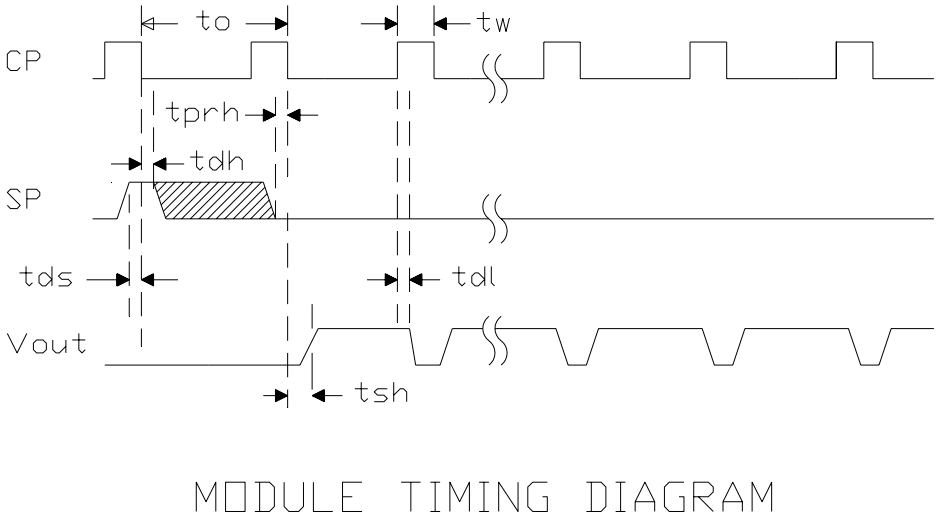


Figure 3: Module Timing Diagram

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 Definition for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	to	0.2		4.0	µs
Clock pulse width	tw	50			ns
Clock duty cycle		25		75	%
Prohibit crossing time of SP	tprh	15			ns
Data setup time	tds	20			ns
Data hold time	tdh	20			ns
Signal delay time	tdl	50			ns
Signal settling time	tsh	120			ns

7.0 AMIS-710223-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.

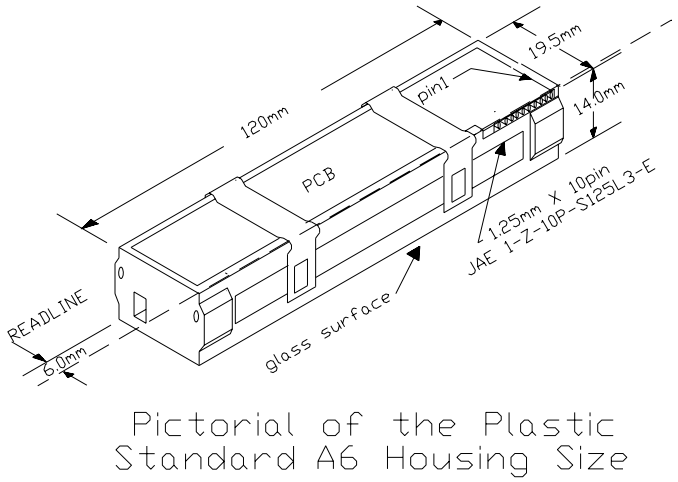


Figure 4: Pictorial of the Plastic Standard A6 Housing Size

8.0 Company or Product Inquiries

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