

1.0 General Description

The AMIS-710250 (PI250MC-A6) is a contact imaging sensor (CIS) module. It is a successor module to its predecessor, AMIS-710223-A6 (PI223MC-A6) it possesses all superb qualities of its predecessor; except, it has one outstanding feature - it can operate from a single 5V supply. Like its predecessor, it is composed of 13 AMIS-720220 (PI3020) sensor chips. The AMIS-720220 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. Like its predecessor, the AMIS-710250 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

- 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 μ sec/line @ 5MHz pixel rate with internal optical modification (optional feature)
- Wide dynamic range
- Analog output
- Yellow-Green LED light source
- Compact size \cong 14mm x 19mm x 120mm
- Light weight

3.0 Functional Description

The AMIS-710250 consists of 13 imaging array sensors that are cascaded to provide 832 photo-detectors. Each sensor has its associated multiplex switches and a digital shift register that 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 video signal amplifier. The only change from its predecessor module is in this amplifier. It has been slightly altered from its predecessor module to gain the single supply feature, see Figure 1.

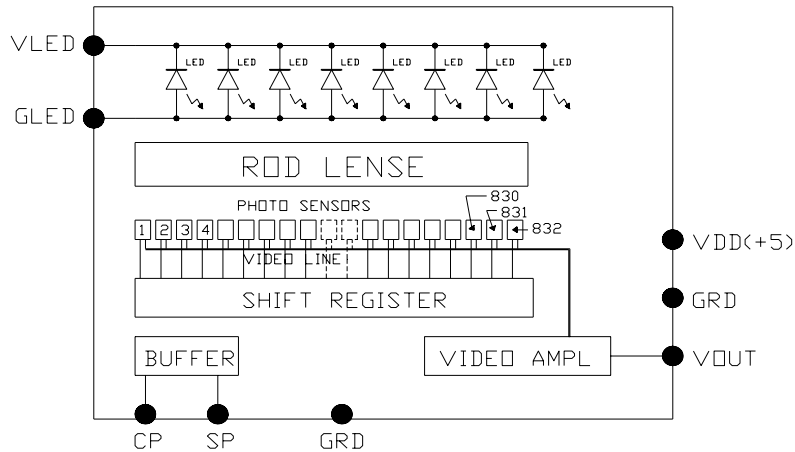


Figure 1: AMIS-710250 Module Block Diagram

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

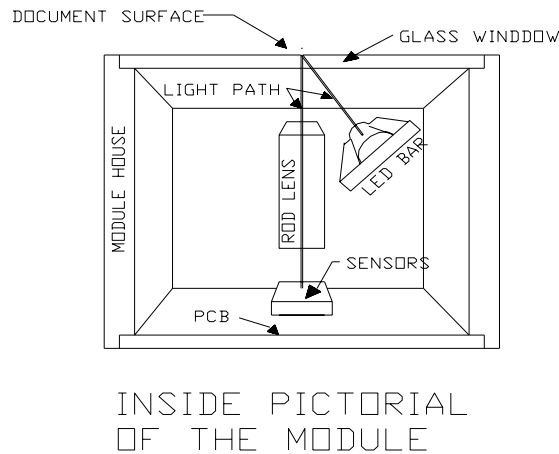


Figure 2: AMIS-710250 Cross Sectional View

This pictorial cross section shows the LED bar light source and its illumination path. The light on the document reflects images on the document. The reflected images focus through the micro lens onto the chips' image sensing line 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 micro lens, it determines 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 in Figure 4 of the mechanical section illustrates the connector location. With the module window facing down on a flat surface, with the viewer looking down on backside of the module and with the connector's pins facing viewer, the connector is located on the right-hand end of the module. The connector is a 1.25mm single 10-pin row. Its I/O designation is provided in Table 1. Pin number 1 location is indicated on the module outline.

Table 1: I/O Designation

Pin Number	Symbol	Names and Functions
1	Vout	Analog video output
2	Gnd	Ground; 0V
3	Vdd (+5V)	Positive power supply
4	NA	Not used
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

5.0 Absolute Maximum Rating

The following is a table of 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	5.7	V
	ILED	600	mA
Input clock pulse (high)	Vih	Vdd	V
Input clock pulse (low)	Vil	-0.5	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 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		832	Elements	
Pixel-to-pixel spacing		125	µm	
Line scanning rate	Tint ⁽¹⁾	420	µsec	@ 2.0MHz clock frequency
Clock frequency ⁽²⁾	Fclk	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	<50	mV	
Dark output voltage	Vd	200<Vd<300	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. Fclk: main clock frequency. The call out is at 2.0MHz, but electrically module 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. $V_{pavg} = \sum V_p(n)/832$
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 nonuniformity percentage pixel to pixel.
6. $U_d = V_{dmax} - V_{dmin}$
Vdmin is the minimum output on a black document.
Vdmax: maximum output voltage of black document
7. $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$. Depth of focus, 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 Nyquist frequency)
Vmin: minimum output voltage at 50lp/inch
8. lp / inch: line pair per inch

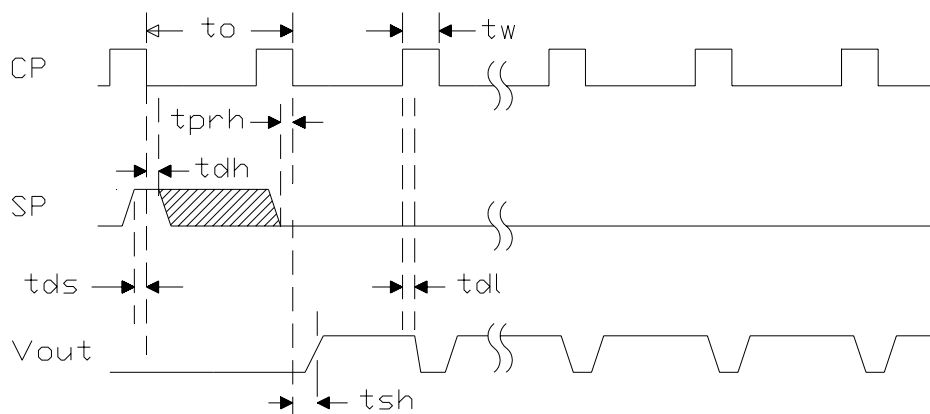
Table 5: Recommended Operating Conditions (25°C)

Item	Symbol	Min.	Mean	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	VLED	4.5	5.0	5.5	V
	Idd	22	25	30	ma
	ILED	200	380	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	Fclk		2.0	5.0	MHz
Clock pulse high duty cycle ⁽¹⁾		25			%
Clock pulse high duration ⁽¹⁾		50			ns
Integration time ⁽²⁾	Tint	0.167		5.0	ms
Operating temperature	Top		25	50	°C

Notes:

1. These duty cycle and high duration are for a 5.0MHz clock rate.
2. 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.

7.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: Clock and Start Pulse Timing Diagram

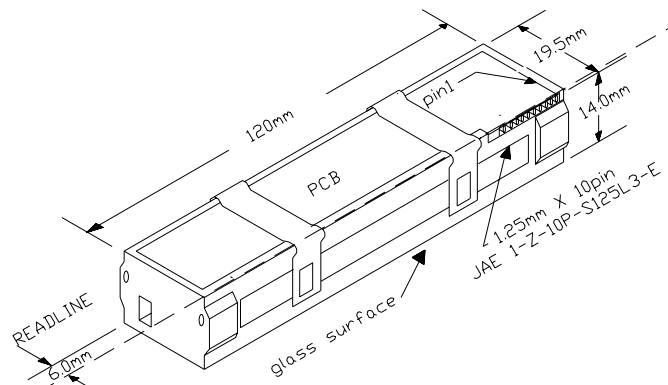
The switching characteristics for the I/O clocks are shown in Figure 3. Its corresponding timing symbol definitions are given in Table 6.

Table 6: Symbol Definition for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	t_o	0.2		4.0	μ 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

8.0 AMIS-710250 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: AMIS-710250 Module Mechanical Outline

9.0 Company or Product Inquiries

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