

1.0 General Description

The AMIS-710226 (PI226M-A4) is a contact image sensor (CIS) module using MOS image sensor technology for high-speed performance and high sensitivity. The AMIS-710226 is suitable for scanning A4 size (216mm) documents with 8 dots per millimeter (dpm) resolution. Applications include fax machines, game systems, variety of mark readers and other automation equipment requiring document scanners.

2.0 Key Features

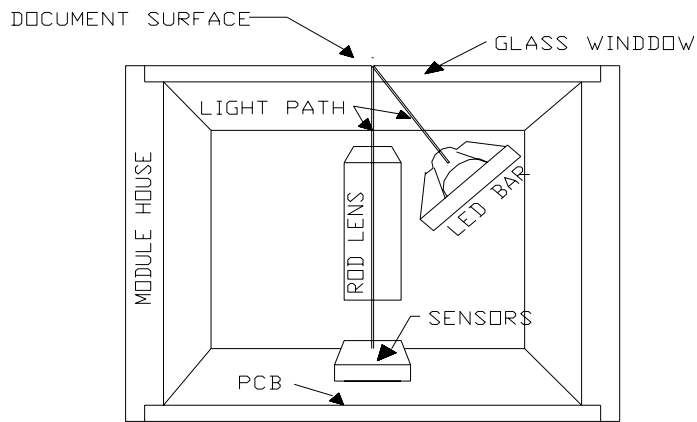
- Light source, lens and sensor are integrated into a single module
- 8dpm resolution, 216mm scanning length
- 347 μ sec/line scanning speed possible with optional light sources
- Yellow-Green LED light source, limits the typical line scan to 695 μ sec @ 2.5MHz
- Wide dynamic range
- Analog output
- Compact size \cong 14mm x 19mm x 23mm
- Low power
- Light weight

3.0 Functional Description

The AMIS-710226 imaging array consists of 27 AMIS-720033 (PI3020) image sensors produced by AMIS, that are cascaded to provide 1728 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 on the image of the scanned documents then transfers it onto the sensors. The on-board amplifier processes the video signal to produce a sequential stream of video at the output pin of the AMIS-710226 module.

Illumination is accomplished by means of an integrated Yellow-Green 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, 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. For pin 1 location, see Figure 4.

The cross section of the AMIS-710226 is shown in Figure 1 and the block diagram in Figure 2.



INSIDE PICTORIAL OF THE MODULE

Figure 1: Inside Pictorial of the Module

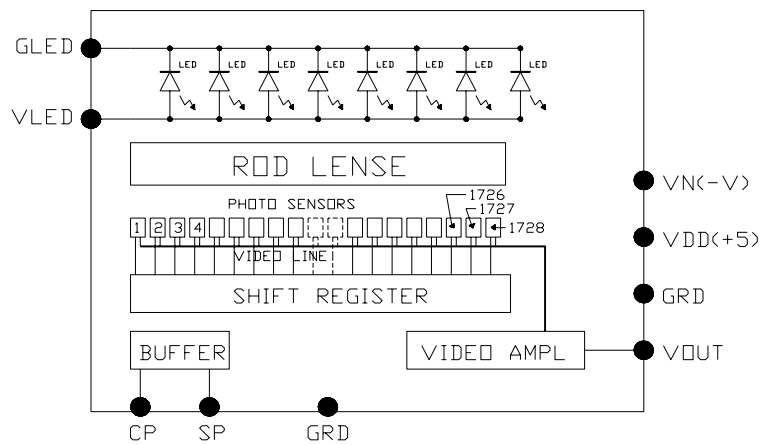


Figure 2: AMIS-710226 Module Block Diagram (See Table 1 for Pin Out Designation)

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 Ratings

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	7	V
	Idd	60	mA
	Vn	-15	V
	In	7	mA
	VLED	6.0	V
	ILED	1.2	A
Input clock pulse (high level)	Vih	Vdd	V
Input clock pulse (low level)	Vil	-0.5	V

Note: These are the maximum ratings and are not to be used in prolonged conditions.

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	%

5.0 Electro-Optical Characteristics (25°C)

Table 4: Electro-Optical Characteristics (25°C)

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1728	Elements	
Pixel-to-pixel spacing		125	μm	
Line scanning rate	Tint ⁽¹⁾	695	μsec	@ 2.5MHz clock frequency
Clock frequency ⁽²⁾	fclk	2.5	MHz	
Bright output voltage	Vpavg	1.0 +/-0.1	Volts	
Bright output non-uniformity ⁽⁴⁾	Up	< +/-30	%	
Adjacent pixel non-uniformity ⁽⁵⁾	Uadj	<25	%	
Dark non-uniformity ⁽⁶⁾	Ud	<75	mV	
Dark output voltage ⁽⁶⁾	Vd	<200	mV	
Modulation transfer function ^{(7) (8)}	MTF	>40	%	

Definition:

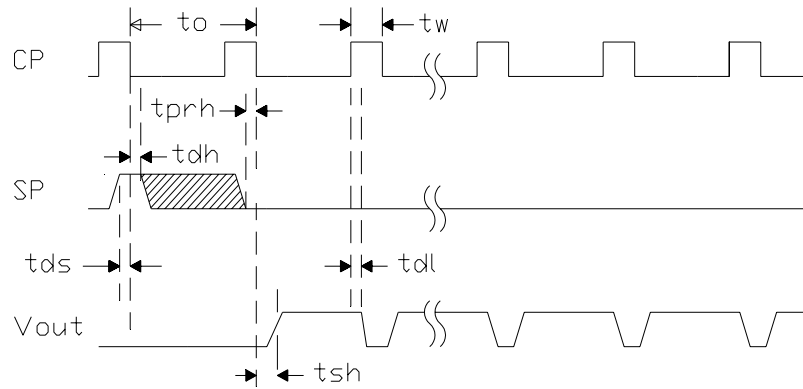
- Tint: line scanning rate or integration time; tint is determined by the interval of two start pulses (SP). This integration time of 695μsec typically set at the factory for Yellow-Green LED. The minimum integration time of 347us is available at 5.0MHz pixel rate, but it will require optional light sources.
- fclk: main clock frequency
- $V_{pavg} = \sum V_p(n)/1728$
- $U_p = [(V_{pmax} - V_{pavg}) / V_{pavg}] \times 100\%$ or $[(V_{pavg} - V_{pmin}) / V_{pavg}] \times 100\%$
- $U_{adj} = \text{MAX}[|(V_p(n) - V_p(n+1)) / V_p(n)|] \times 100\%$
Uadj is the non-uniformity in percent between adjacent pixels.
- $U_d = V_{dmax} - V_{dmin}$
Vd = the average dark output level.
Vdmin is the minimum output on a black document (LED is turned off).
Vdmax: maximum output voltage of black document (LED is turned off).
- $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$
Vmax: maximum output voltage at 50lp/in
Vmin: minimum output voltage at 50lp/in
- lp / in: line pairs 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	
	VLED	4.5	5	5.5	V
	Idd	25	30	35	ma
	Ivn	4.0	4.0	5.0	ma
	ILED	350	560	790	ma
Input voltage at digital high	Vih	Vdd-1.0	Vdd-0.5	Vdd	V
Input voltage at digital low	Vil	0		0.8	V
Clock frequency ⁽¹⁾	fclk			3.0	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		82			ns
Integration time ⁽¹⁾	Tint	0.576		5.0	ms
Operating temperature	Top		25	50	°C

Note: Electrically, including the image sensors, the circuits will operate above 5.5MHz. However, with the Yellow-Green light option, the light exposure limits the operation to a maximum of 3.0MHz, hence the integration time, tint of 0.576ms.

6.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: Timing Diagram

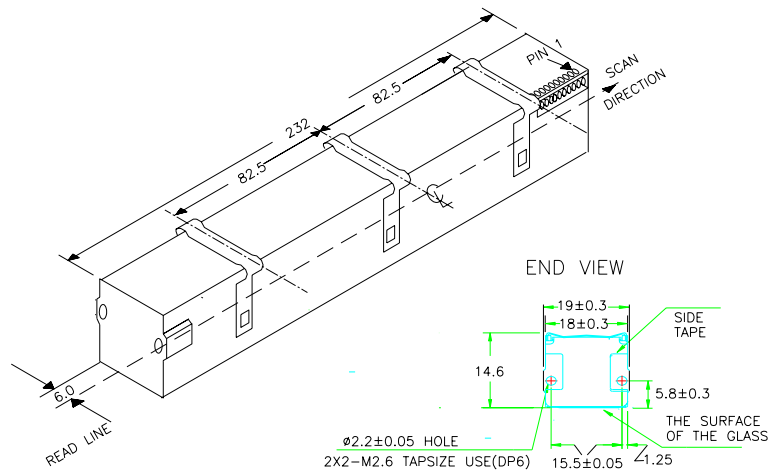
The switching characteristics for the I/O clocks are in the above diagrams. See timing symbol definitions in the following Table 6.

Table 6: Symbol Definitions for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	t_o	0.333		4.0	μ s
Clock pulse width	t_w	82			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

7.0 AMIS-710226 Module and its Mechanical Dimensions

This is an overview drawing of the module. A full size drawing is available upon request.



MECHANICAL STRUCTURE

Figure 4: Overall View of the Module House

8.0 Company or Product Inquiries

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