

## 1.0 General Description

The AMIS-710240 (PI240MC-A4) is a contact imaging sensor (CIS) module composed of 1728 AMIS-720033 (PI3020) 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-710240 is suitable for scanning A4 size (21mm) documents with 8 dots per millimeter (dpm) resolution. Applications include variety of document scanners, variety of mark readers and other automation equipment.

## 2.0 Key Features

- Inverted video signals (magnitude increases in a negative direction)
- Light source, lens and sensor are integrated into a single module
- 8dpm resolution
- 216mm scanning length
- 0.347ms/line scanning speed, operated @ 5.0MHz
- Wide dynamic range analog output
- 660nm light source
- Compact size:  $\approx 14\text{mm} \times 19.5\text{mm} \times 232\text{mm}$
- Low power
- Light weight

## 3.0 Functional Description

The AMIS-710240 imaging array consists of 27 chips 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 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-710240 module.

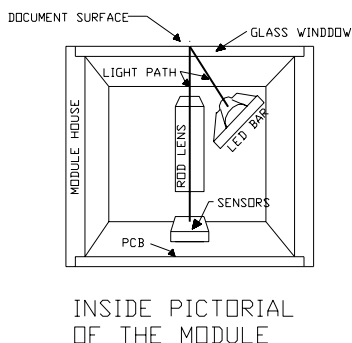


Figure 1: AMIS-710240 Cross Section

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. See Figure 4. The cross section of the AMIS-710240 is shown in Figure 1 and the block diagram in Figure 2.

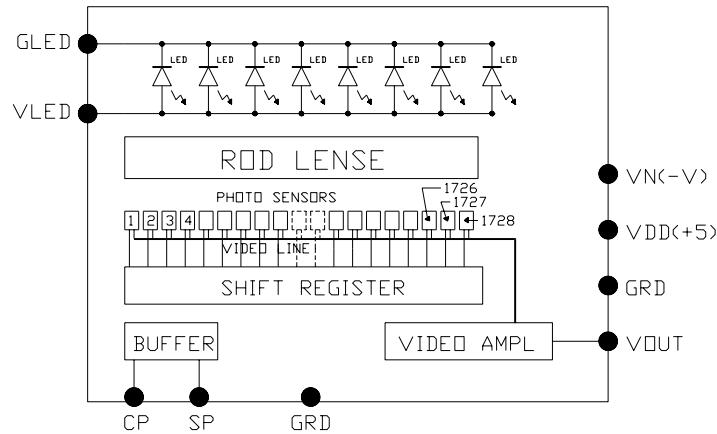


Figure 2: AMIS-710240-A4 Module Block Diagram

## 4.0 Recommended Operating Conditions (25°C)

Table 1: Recommended Operating Conditions (25°C)

Item	Symbol	Min.	Typ.	Max.	Units
Power supply	Vdd	4.5	5.0	5.5	V
	Idd	24	30	35	ma
	Vn	-4.5	-5	-15	V
	Ivn	5	6	8	ma
	VLED	4.5	5.0	5.5	V
	ILED	305	430	560	ma
Video output level	Vid	0.8	1.0	1.2	V
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	F		3.0	5.0	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint <sup>(1)</sup>	0.346	0.6	10.0	ms
Operating temperature	Top		25	50	°C

- Note:**
1. Tint is determined by the time interval between two SP. The longest integration time is determined by the degree of leakage current degradation that can be tolerated by the system. A 10ms maximum is a typical rule-of-thumb, thus the experienced CIS user can use his discretion in determining the integration time.

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

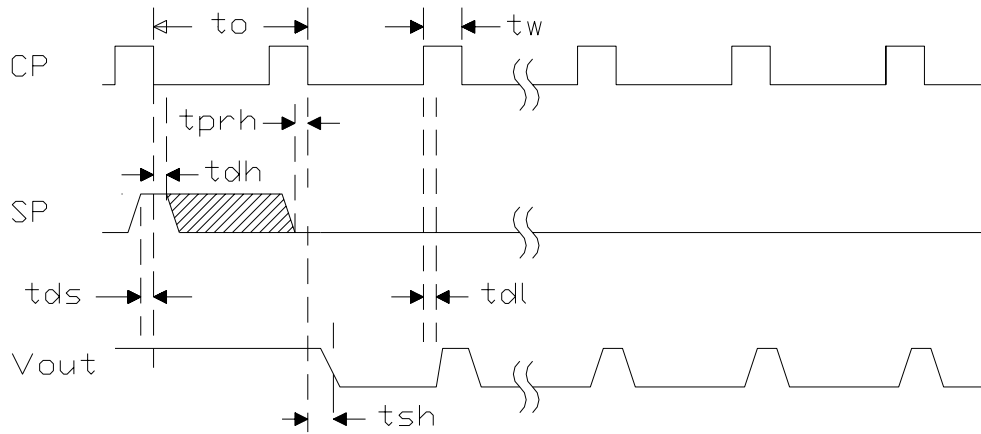
Table 2: Electro-Optical Characteristics (25°C)

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1728	Elements	
Pixel-to-pixel spacing		125	μm	
Line scanning rate <sup>(1)</sup>	Tint	347	μsec	@ 5.0MHz clock frequency
Clock frequency <sup>(2)</sup>	Freq	5.0	MHz	
Bright output voltage <sup>(3)</sup>	Vp	1.0	V	
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 <sup>(6)</sup>	Vd	<150	mV	
Modulation transfer function <sup>(7)</sup>	MTF	>30	%	

**Definition:**

1. Tint: line scanning rate or integration time. Tint is determined by the interval of two SPs.
2. Freq is the main clock frequency.
3.  $V_{pavg} = \sum V_p(n)/1728$
4.  $U_p = [(V_{pmax} - V_p) / V_p] \times 100\%$  or  $[(V_p - V_{pmin}) / V_p] \times 100\%$
5.  $U_{padj} = \text{MAX}[ |(V_p(n) - V_p(n+1))| / V_p(n)] \times 100\%$   
U<sub>padj</sub> is the non-uniformity percentage of adjacent pixels
6.  $U_d = V_{dmax} - V_{dmin}$   
V<sub>d</sub> is the voltage amplitude between the output video's reset level and its dark level.  
V<sub>dmin</sub> is the minimum output with LED light off.  
V<sub>dmax</sub>: maximum output voltage with the LED light off
7.  $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$   
V<sub>max</sub>: maximum output voltage at 4.0lp/mm  
V<sub>min</sub>: minimum output voltage at 4.0lp/mm
8. lp / mm: line pair per mm

## 6.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: Module Timing Diagram

Table 3: Symbol Definitions for the Above Timing Diagram

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	$t_o$	0.2		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	$t_{sh}$	90			ns

## 7.0 Absolute Maximum Rating

Table 4: Absolute Maximum Rating

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	10	V
	Idd	30	mA
	Vn	-15	V
	In	15	mA
	VLED	6	V
	ILED	650	ma
Input clock pulse (high level)	Vih	Vdd – 0.5V	V
Input clock pulse (low level)	Vil	-0.5	V

**Note:**

1. These parameters are absolute maximums and should not be used to operate the module.

Table 5: 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	10 to 90	%

## 8.0 Mechanical Considerations

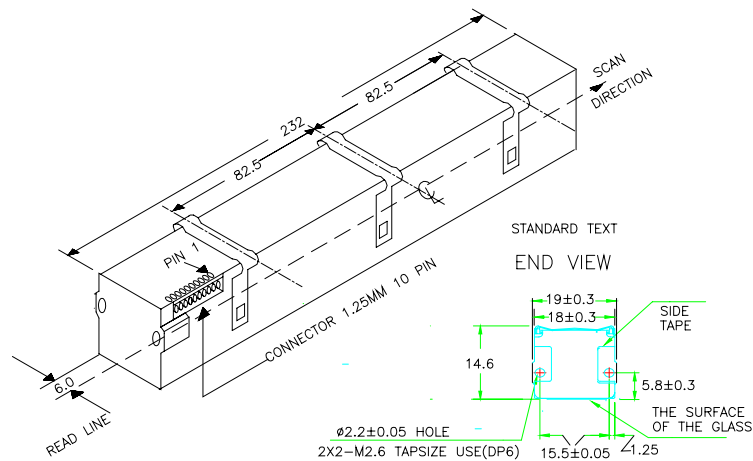
The connector is a 1.25mm 10-pin JAE IL-Z-10P-S125L3-E. Its location, along with its Pin 1 location, is shown in Figure 4.

Table 6: I/O Connector 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 SP
7	Gnd	Ground; 0V
8	CP	Sampling clock pulse
9	GLED	Ground for the light source; 0V
10	VLED	Supply for the light source

## 9.0 Module Housing Dimensions

The AMIS-710240-A4 module outline and its mechanical dimensions are shown below. A detailed housing drawing is available upon request.



MECHANICAL STRUCTURE  
FIGURE 4

## 10.0 Company or Product Inquiries

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For more information about AMI Semiconductor, our technology and our product, visit our Web site at: <http://www.amis.com>

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