1.0 General Description

The AMIS-710403-A6 (PI403MC-A6) is a contact imaging sensor (CIS) module, which is composed of 13 AMIS-720422 (PI3022) sensor chips. The AMIS-720422 is a 400 dots per inch (dpi) solid-state line imaging array, also a product of AMIS. This imaging device is fabricated using MOS imaging sensor technology for high-speed performance and high sensitivity. The AMIS-710403-A6 is suitable for scanning A6 size (104mm) documents with 16 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
- 16dpm resolution, 104mm scanning length
- Up to 333μsec/line scanning speed, with 5MHz pixel rate
- Wide dynamic range
- Analog output
- Red LED light source (660nm)
- Compact size $\cong$ 14mm x 19mm x 120mm
- Low power
- Light weight

3.0 Functional Description

The AMIS-710403-A6 imaging array consists of 13 sensors, which are cascaded to provide 1664 photo-detectors with their associated multiplex switches and a digital shift register, which controls its sequential readout. Mounted in the module is one-to-one graded indexed micro lens array, which 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-710403-A6 module.

Illumination is accomplished by means of an integrated LED light source. All components are housed in a small plastic housing with 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 (see Figure 4). The cross section of the AMIS-710403-A6 is shown in Figure 1 and the block diagram in Figure 2.
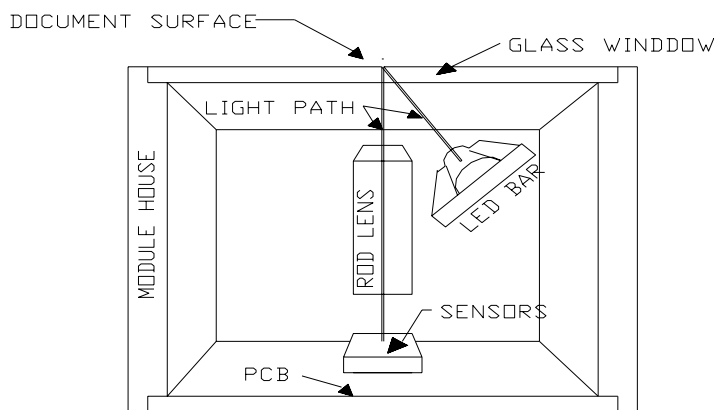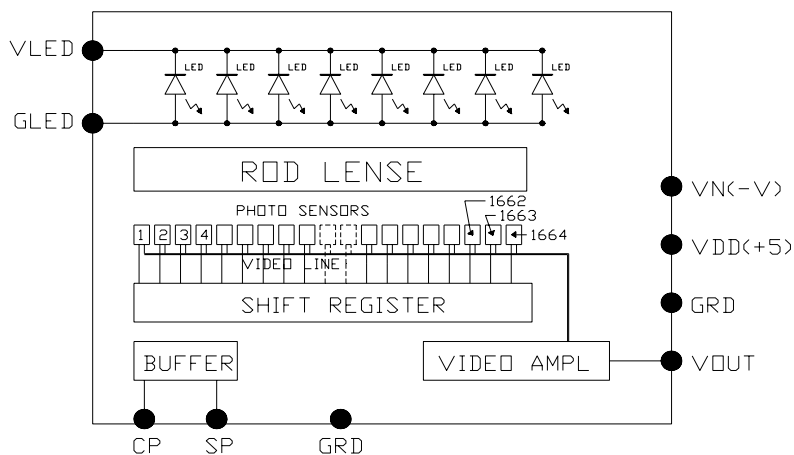
Figure 1: AMIS-710403-A6 Cross Section

Figure 2: AMIS-710403-A6 Module Block Diagram (See Table 1)

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	V
	Idd	70	ma
	Vn	-15	V
	In	15	ma
	VLED	5.5	V
	ILED	400	ma
Input clock pulse (high level)	Vih	Vdd – 0.5V	V
Input clock pulse (low level)	Vil	-0.6	V

Note: Not recommended for operational conditions.

5.0 Operating Environment

Table 3: Typical Operational Environment for CIS

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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6.0 Electro-Optical Characteristics at 25°C

Table 4: Electro-Optical Characteristics at 25°C

Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1664	Elements	
Pixel-to-pixel spacing		63.1	μm	
Line scanning rate	Tint[1]	333	μsec	@ 5.0MHz clock frequency
Clock frequency[2]	f	5.0	MHz	
Bright output voltage[3]	Video output	1.0	V	
Bright output non-uniformity[4]	Up	<+/-30	%	
Adjacent pixel non-uniformity[5]	Uadj	<25	%	
Dark non-uniformity[6]	Ud	<100	mV	
Dark output voltage[7]	Vd	<550	mV	
Modulation transfer function[8]	MTF	>50	%	

Notes:

(1) Tint: Line scanning rate or integration time. Tint is determined by the interval of two start pulses (SP).
(2) f: main clock frequency
(3) $Vpavg = \sum Vp(n)/1664$
(4) $Up = [(Vpmax - Vp) / Vp]$ x 100% or $[(Vp - Vpmin) / Vp]$ x 100%
(5) $Uadj = MAX[| (Vp(n) - Vp(n+l) | / Vp(n)]$ x 100%
    Upadj is the non-uniformity 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) Vd is the dark level, measured from the reset level.
(8) $MTF = [(Vmax - Vmin) / (Vmax + Vmin)]$ x 100 [%]
    Vmax: maximum output voltage at 100lp/in
    Vmin: minimum output voltage at 100lp/in
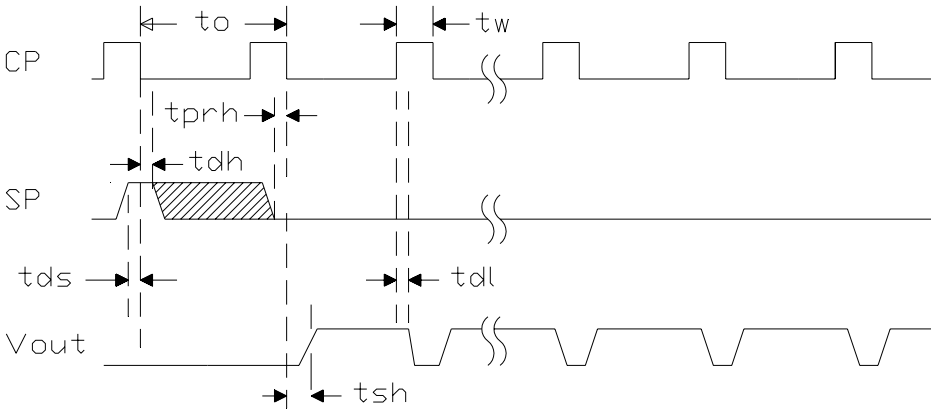(9) (9) O.D. = optical density
(10) (10) lp / in: line pair per inch

7.0 Recommended Operating Conditions (25°C)

Table 5: Recommended Operational Characteristics

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		47	55	ma
	Ivn		6.6	10.0	ma
	ILED		280	350	ma
Input voltage at digital high	Vih	Vdd -1.0	Vdd -.5	Vdd	V
Input voltage at digital low	Vil	0		0.8	V
Clock frequency	f			5.0	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint*	0.333		5.0	ms
Operating temperature	Top		25	50	°C

Note: * Tint (minimum) is the lowest line integration time available with a 5.0MHz clock rate.

8.0 Switching Characteristics at 25°C

Figure 3: Module Timing Diagram

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

Table 6: Symbol Definitions for the Timing Diagram (Figure 3)

Item	Symbol	Min.	Typ.	Max.	Units
Clock cycle time	to	0.20		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

9.0 AMIS-710403-A6 Module and its Mechanical Dimensions
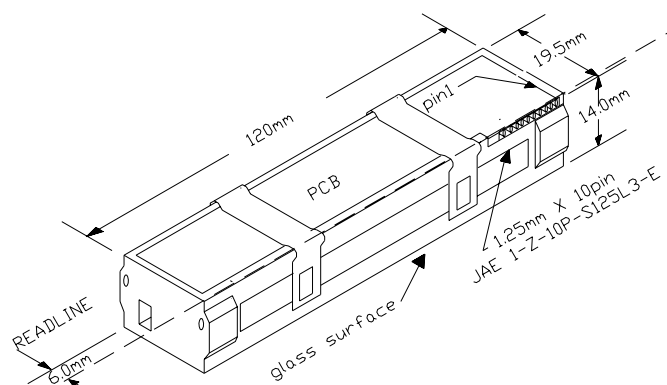
Figure 4: Module Housing

The sketch of this module is to provide a pictorial of the module size and structure. A detailed drawing is available upon request.

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10.0 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

www.DataSheet4U.com

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