

1.0 General Description

The AMIS-710224-A6 (PI224-MC-A6) is a contact imaging sensor (CIS) module composed of 13 AMIS-720033 (PI3020) image 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-710224-A6 is suitable for scanning A6 size (104mm) documents with 8 dots per millimeter (dpm) resolution. Applications include ticket, check and card scanners, variety of mark readers, and other automation equipment.

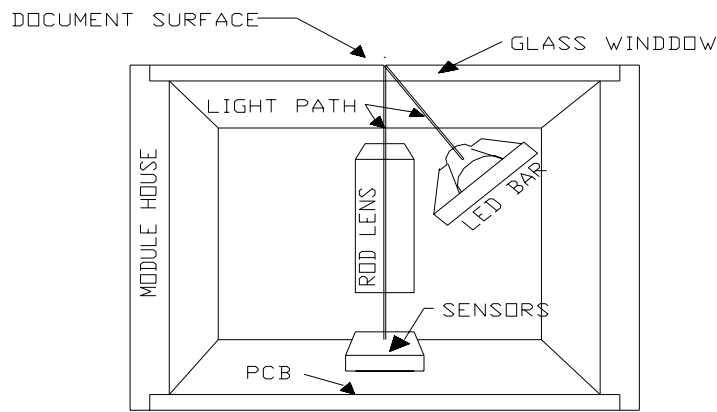
2.0 Key Features

- Light source, lens and sensor are integrated into a single module
- 8dpm resolution, 104mm scanning length
- High speed page scan - up to 167 μ sec/line @ 5MHz pixel rate
- Wide dynamic range
- Analog output
- Ultra bright Yellow-Green light source
- Compact size \cong 14mm x 19mm x 120mm
- Low power
- Light weight

3.0 Functional Description

The AMIS-710224-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 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-710224-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-710224-A6 is shown in Figure 1 and the block diagram in Figure 2.



INSIDE PICTORIAL OF THE MODULE

Figure 1: Inside Pictorial of the Module

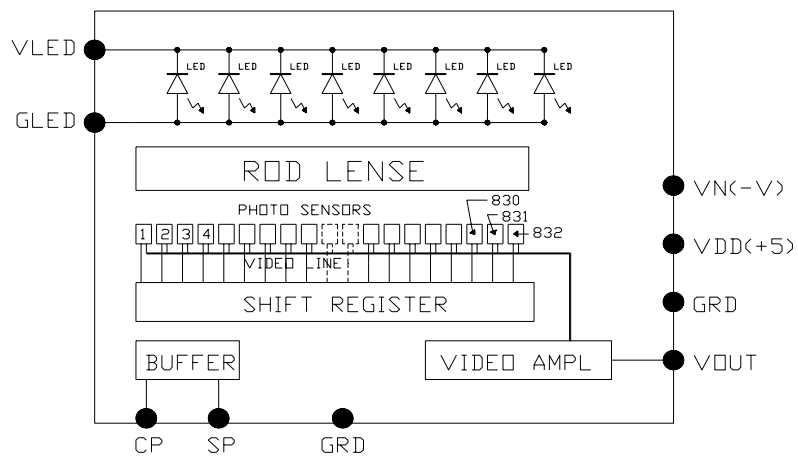


Figure 2: AMIS-710224-A6 Module Block Diagram

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 | GLLED | Ground for the light source; 0V |
| 10 | VLED | Supply for the light source |

4.0 Absolute Maximum Ratings

Table 2: Absolute Maximum Ratings

| 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 – 0.5 | V |
| Input clock pulse (low level) | Vil | -0.6 | 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 +75 | °C |
| Storage humidity | Hstg | 5 to 95 | % |

5.0 Electro-Optical Characteristics (25°C)

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⁾ | 180 | μsec | Tested @ 5MHz clock frequency |
| Clock frequency ⁽²⁾ | f | 5 | MHz | |
| Bright output voltage ⁽³⁾ | Video output | 1.0 | V | Test at Tint = 180us |
| 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. The module was tested at 180us, but it will operate to 167us with a clocking speed of 5.0MHz.
2. f: main clock frequency The module was tested at 5.0MHz, but electrically it reliably operates above 5.0MHz, but with a minimum integration time of 167μsec.
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 non-uniformity percentage pixel to pixel.
6. $U_d = V_{dmax} - V_{dmin}$
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. $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$. DOF range is defined with the MTF.
MTF is measure at glass surface and at 0.4mm from the glass > 50 % and peaks at approximately mid-point of 0.2mm.
Vmax: maximum output voltage at 50 lp/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

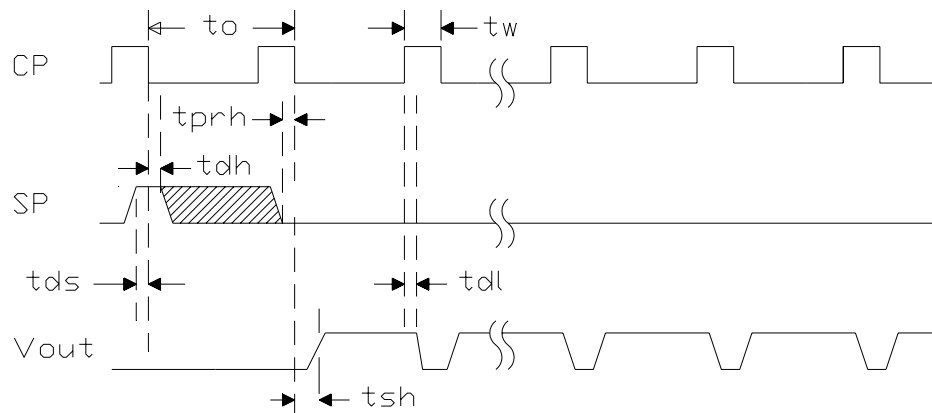
Table 5: Recommended Operating Conditions (25°C)

| Item | Symbol | Min. | Mean ⁽¹⁾ | Max. | Units |
|-------------------------------|---------------------|---------|---------------------|--------------------|-------|
| Power supply | Vdd | 4.5 | 5.0 | 5.5 | V |
| | Vn | -4.5 | -5 | -12 | V |
| | VLED | | 5 | 5.5 | V |
| | Idd | | 30 | 40 | ma |
| | In | | 6 | 15 | ma |
| | ILED | | 300 | 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 | | | 5.0 ⁽²⁾ | MHz |
| Clock pulse high duty cycle | | 25 | | | % |
| Clock pulse high duration | | 50 | | | ns |
| Integration time | Tint ⁽³⁾ | 0.167 | | 5.0 | ms |
| Operating temperature | Top | | 25 | 50 | °C |

Notes:

1. Tested at 5.0MHz and 180us
2. Also used as test frequency
3. Tint (min.) is the lowest line integration time available at 5.0MHz clock rate.

6.0 Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3: Clock and Start Pulse Timing Diagram

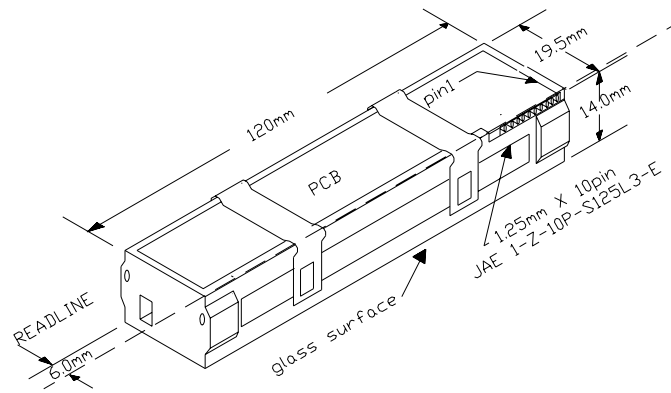
The switching characteristics for the I/O clocks are shown in Figure 3. Its corresponding definition for the timing symbols are given in Table 6.

Table 6: Symbol Definition for the Above Timing Diagram

| Item | Symbol | Min. | Typ. | Max. | Units |
|---------------------------------------|-----------|------|------|------|---------------|
| Clock cycle time | t_o | 0.2 | | 4.0 | μs |
| Clock pulse width | t_w | 50 | | | ns |
| Clock duty cycle | | 25 | | 75 | % |
| Prohibit crossing time of Start Pulse | 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-710224-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.



Pictorial of the Plastic Standard A6 Housing Size

Figure 4: Pictorial of the Plastic Standard A6 Housing Size

8.0 Company or Product Inquiries

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