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**PI207MC-A4**  
**200DPI CIS Module**  
**Engineering Data Sheet**

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**Key Features**

- Light source, lens, and sensor are integrated into a single module
- 8 dpm resolution, 216 mm scanning length
- Dual LED light source, IR and Red, with a line scan time to 347  $\mu$ sec @ 5 MHz
- Wide dynamic range
- Analog output
- Compact size  $\cong$  14.5 mm x 19.5 mm x 232 mm
- Low power
- Light weight

**General Description**

The PI207MC-A4 is a CIS module containing contact image sensors, using MOS image sensor technology for high-speed performance and high sensitivity. The PI207MC-A4 is suitable for scanning A4 size (216 mm) documents with 8 dots per millimeter resolution. Applications include fax machines, game systems, variety of mark readers, and other automation equipment requiring document scanners.

**Functional Description**

The PI207MC-A4 imaging array consists of 27 PI3033B sensors, produced by Peripheral Imaging Corp, 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 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 PI207MC-A4 module.

Illumination is by means of integrated LED sources; Red (660nm) and IR (880nm). 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. In addition, it protects the imaging array, micro lens assembly, and LED light source from dust. Inputs and Outputs (I/O) to and from the module are by a 10-pin connector, JAE 1L-Z-10P-S125L3-E, located on one end of the module. For pin 1 location, see Figure 4, Overall View of the Module Housing.

A cross section of the PI207MC-A4 Module is shown in Figure 1 and a block diagram in Figure 2.

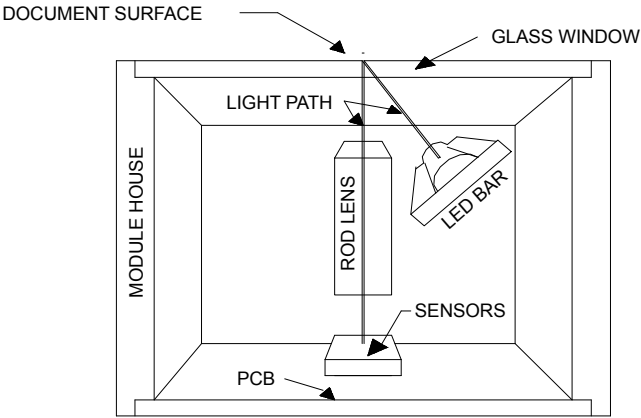


Figure 1. PI207MC-A4 Cross Section

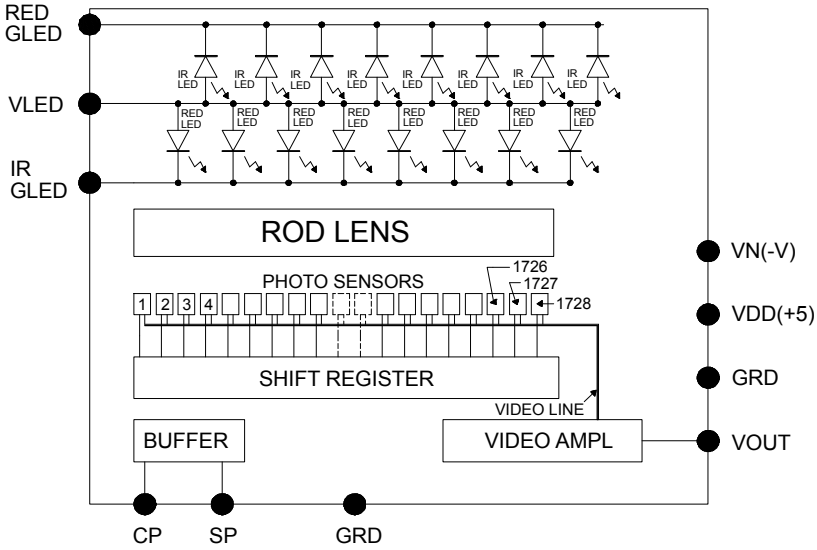


Figure 2. PI207MC-A4 Module Block Diagram

## Connector Pinout Designation

Connector is JAE part number 1L-Z-S125L3-E.

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	GLEED RED	Ground for the Red light source; 0V
6	SP	Shift register start pulse
7	GND	Ground; 0V
8	CP	Sampling clock pulse
9	GLEED IR	Ground for the IR light source; 0V
10	VLED	Supply for the light source

Table 1. Pinout Configuration

## Maximum Ratings

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	7	V
	Idd	80	mA
	Vn	-15	V
	In	7	mA
	VLED IR	5.5	V
	VLED RED	5.5	V
	ILED IR	500	mA
	ILED RED	600	mA
Input clock pulse (high level)	Vih	Vdd	V
Input clock pulse (low level)	Vil	-0.5	V

Table 2. Maximum Rating

Note. These are the maximum ratings and are not to be used in a prolonged condition.

## Operating Environment

Parameter	Symbol	Range	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	%

Table 3. Operating Environment

## Electro-Optical Characteristics

The tabled values are measured at 25° C

Parameter	Symbol	Typical	Units	Note
Number of photo detectors		1728	elements	
Pixel to pixel spacing		125	μm	
Line scanning rate <sup>(1)</sup>	Tint	347	μsec	@ 5.0 MHz clock frequency
Clock frequency <sup>(2)</sup>	fclk	5.0	MHz	
Bright output voltage <sup>(3)</sup>	Vpavg	1.1 +/- 0.1	Volts	
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	<75	mV	
Dark output voltage <sup>(6)</sup>	Vd	<200	mV	
Modulation transfer function <sup>(7)</sup>	MTF	>40	%	

Table 4. Electro-Optical Characteristics at 25° C

### Notes.

1. Tint is the line scanning rate or integration time. Tint is determined by the interval of two start pulses, SP. The integration time of 347μsec is set at the factory. For additional comments, see note (1) under Table 5, Recommended Operating Conditions.
2. fclk: main clock frequency.
3.  $V_{pavg} = \sum V_p(n)/1728$ .
4.  $U_p = [(V_{pmax} - V_{pavg}) / V_{pavg}] \times 100\%$  or  $[(V_{pavg} - V_{pmin}) / V_{pavg}] \times 100\%$ ,  
Where  $V_{pmax}$  = maximum pixel amplitude in the line scan and  $V_{pmin}$  = minimum pixel amplitude in the line scan.
5.  $U_{adj} = \text{MAX}[ |(V_p(n) - V_p(n+1))| / V_p(n)] \times 100\%$   
 $U_{adj}$  is the non-uniformity in percent between adjacent pixels, Where  $V_p(n)$  is the  $n^{\text{th}}$  pixel in the line scan.
6.  $U_d = V_{dmax} - V_{dmin}$ .  
 $V_d$  = the average dark output level.  
 $V_{dmin}$  is the minimum output voltage on a black document (LED is turned off).  
 $V_{dmax}$  is the maximum output voltage on a black document (LED is turned off).
7.  $MTF = [(V_{max} - V_{min}) / (V_{max} + V_{min})] \times 100 [\%]$   
 $V_{max}$ : maximum output voltage at 50 lp/in and  $V_{min}$ : minimum output voltage at 50 lp/in,  
where lp/in is the line pairs per inch.

## Recommended Operating Conditions

The tabled values are measured at 25° C.

Parameter	Symbol	Min	Mean	Max	Units
Power Supply	Vdd	4.5	5.0	5.5	V
	Vn	-4.5	-5	-12	
	VLED IR	4.5	5	5.5	V
	VLED RED	4.5	5	5.5	V
	ILED IR	200	300	500	mA
	ILED RED	250	350	600	mA
	Idd	55	60	70	mA
	Ivn	4.0	5.0	5.5	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 <sup>(1)</sup>	fclk			5.5	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		45.5			ns
Integration time <sup>(1)</sup>	Tint	316		10000	µs
Operating temperature	Top		25	50	°C

Table 5. Recommended Operating Conditions at 25°C

### Note.

1. Electrically, including the image sensors, the circuits will operate above 5.5 MHz with Tint at 316 µs. However the light power is fixed, hence with the shorter integration time, the exposure is reduced. This reduction limits the specification call out to integration time of 0.347 ms at 5.0MHz for 1.0 V output.

## Timing Characteristics

The Timing characteristics for the I/O clocks are shown in Figure 3. See timing symbol definitions in Table 6. The listed values are measured at ~25° C.

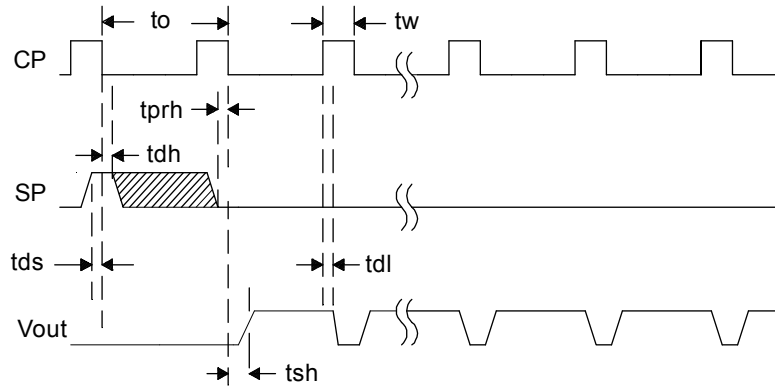


Figure 3. Timing Diagram

Parameters	Symbol	Min.	Typical	Max.	Units
Clock cycle time	$t_o$	0.333		5.8	$\mu s$
Clock pulse width	$tw$	82			ns
Clock duty cycle		25		75	%
Prohibit crossing time of Start Pulse	$tprh$	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

Table 6. Timing Symbol Definitions for Figure 3 Timing Diagram

## PI207MC-A4 Module and Its Mechanical Dimensions

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

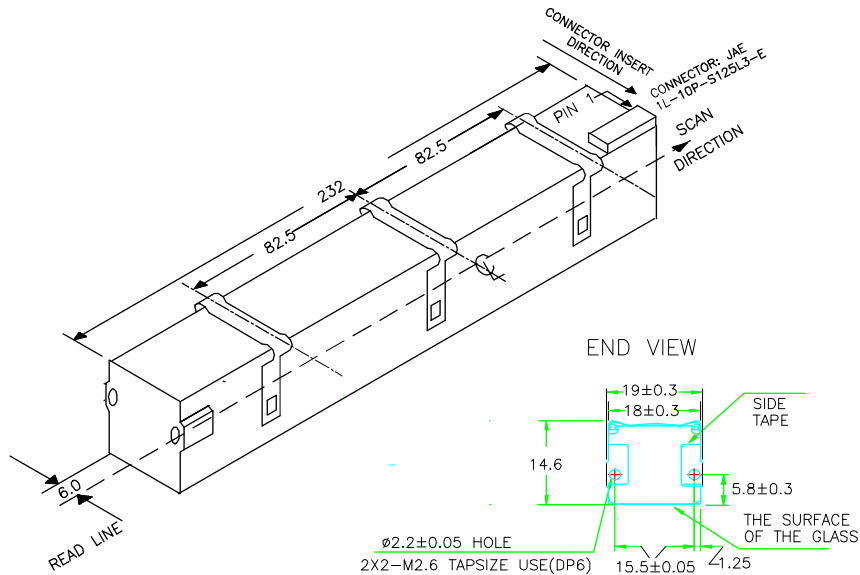


Figure 4. Overall View of the Module Housing

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