

PI224MC-A6 CIS Module 200DPI CIS Sensor Engineering Data Sheet

Key Features

- Light source, lens, and sensor are integrated into a single module
- 8 dpm resolution, 104 mm 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 14 mm x 19 mm x 120 mm
- Low power
- Light weight

General Description

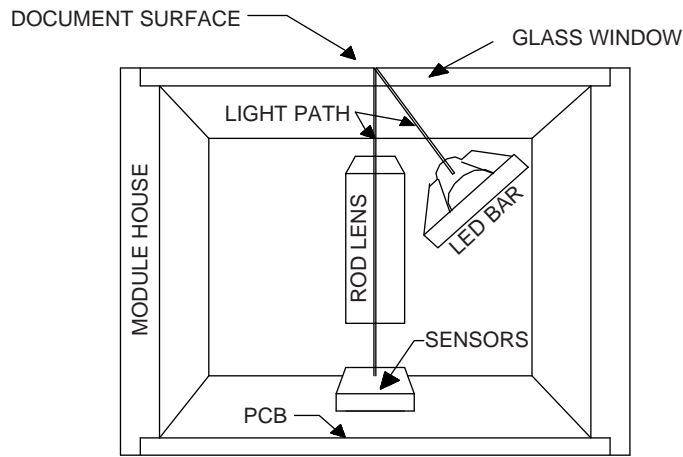
The PI224MC-A6 is a contact imaging sensor, CIS, module, which is composed of 13 PI3020 sensor chips. The PI3020 is a 200 DPI solid-state line imaging array, also a product of Peripheral Imaging Corporation. This imaging device is fabricated using MOS imaging sensor technology for high-speed performance and high sensitivity. The PI224MC-A6 is suitable for scanning A6 size (104 mm) documents with 8 dots per millimeter resolution. Applications include ticket, check and card scanners, variety of mark readers, and other automation equipment.

Functional Description

The PI224MC-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 PI224MC-A6 module.

Illumination is 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 PI224MC-A6 is shown in Figure 1 and the block diagram in Figure 2.



INSIDE PICTORIAL OF MODULE
Figure 1. PI224MC-A6 Cross Section

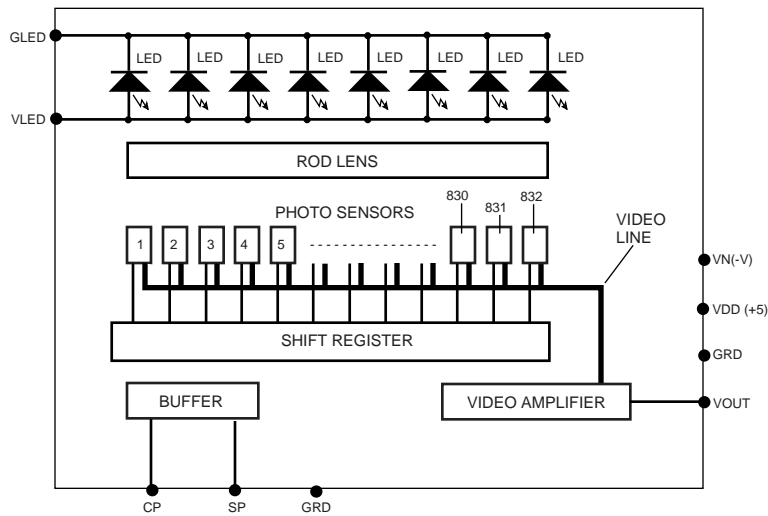


Figure 2. PI224MC-A6 module block diagram

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	GLED	Ground for the light source; 0V
10	VLED	Supply for the light source

Table 2. Absolute Maximum Rating:

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 – 0.5V	V
Input clock pulse (low level)	Vil	-0.6	V

Table 3. Operating Environment

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	%

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 @ 5 MHz clock frequency
Clock frequency ⁽²⁾	f	5	MHz	
Bright output voltage ⁽³⁾	Video Output	1.0	V	Test at Tint=180us
Bright output nonuniformity ⁽⁴⁾	Up	<+/-30	%	
Adjacent pixel nonuniformity ⁽⁵⁾	Uadj	<25	%	
Dark nonuniformity ⁽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, start pulses. The module was test at 180ms, but it will operate to 167ms with clocking speed of 5.0MHz.
- (2) f: main clock frequency. The module was tested at 5.0 MHz, but electrically it reliably operates above 5.0 MHz, but with a minimum integration time of 167 µsec.
- (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) $U_{adj} = \text{MAX}[| (V_p(n) - V_p(n+1)) | / V_p(n)] \times 100\%$
U_{adj} is the nonuniformity percentage pixel to pixel
- (6) $U_d = V_{dmax} - V_{dmin}$
V_{dmin} is the minimum output on a black document(O.D.=0.8)
V_{dmax}: 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.
V_{max}: maximum output voltage at 50 lp/inch (At 1/2 of the optical Nyquist Frequency)
V_{min}: minimum output voltage at 50 lp/inch
- (8) O.D. = Optical Density
- (9) lp / inch: line pair per inch

Table 5. Recommended Operating Conditions (25 °C)

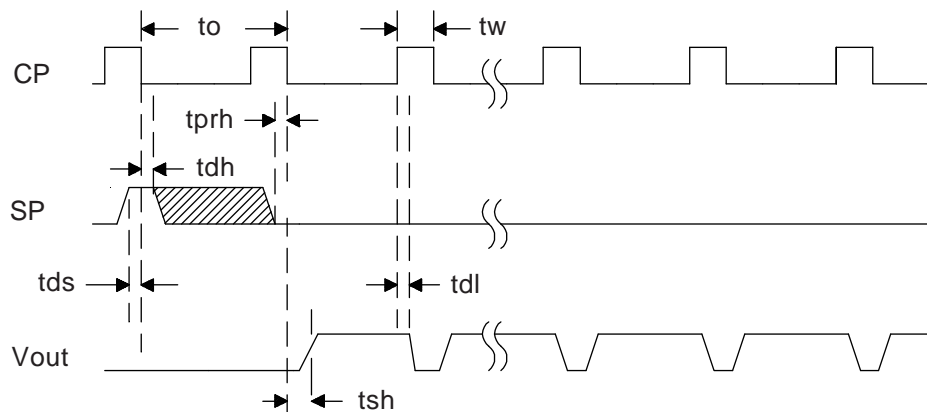
Item	Symbol	Min	Mean ⁽¹⁾	Max	Units
Power Supply	Vdd	4.5	5.0	5.5	V
	Vn.	-4.5	-5	-12	V
	VLED		5	5.5	V
	Idd		30	40	ma
	In		6	15	ma
	ILED		300	450	ma
Input voltage at digital high	Vih	Vdd-1.0	Vdd-.5	Vdd	V
Input voltage at digital low	Vil	0		0.6	V
Clock frequency	f			5.0 ⁽²⁾	MHz
Clock pulse high duty cycle		25			%
Clock pulse high duration		50			ns
Integration time	Tint ⁽³⁾	0.167		5.0	ms
Operating temperature	Top		25	50	°C

(1) Tested at 5.0MHz and 180us.

(2) Also used as test frequency.

(3)Tint (Min) is the lowest line integration time available at 5.0 MHz clock rate.

Switching Characteristics (25°C)



MODULE TIMING DIAGRAM

Figure 3. Clock and Start pluse Timing Diagram

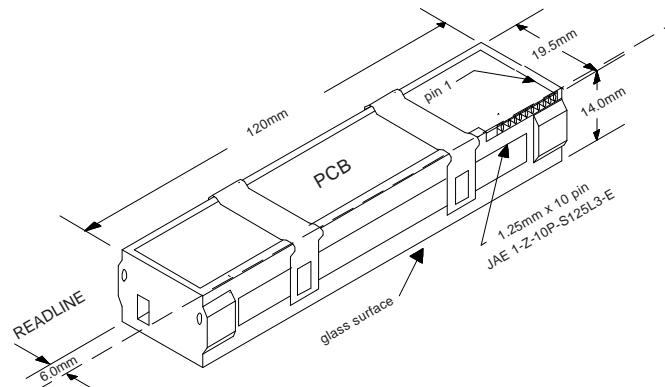
The switching characteristics for the I/O clocks are shown in Figure 3. Its corresponding definition for the timing symbols are given in Table 5, below.

Table 5. Symbol Definition for the Above Timing Diagram

Item	Symbol	Min.	Typical	Max.	Units
Clock cycle time	to	0.2		4.0	μs
Clock pulse width	tw	50			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

PI224MC-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

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