AMI SEMICONDUCTOR

Peripheral Imaging Corporation

PI201M-A4 CIS Module
200DPI CIS Sensor
Engineering Data Sheet

Key Features

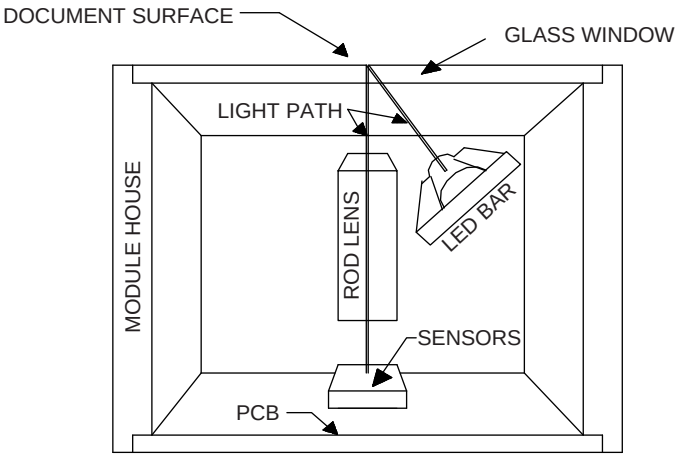
- Light source, lens, and sensor are integrated into a single module
- 8 dpm resolution, 216 mm scanning length
- 1.72 ms/line scanning speed
- Wide dynamic range Analog output
- Yellow-Green light source
- Compact size – 14 mm x 19.5 mm x 232 mm
- Low power
- Light weight

General Description

The PI201M-A4 is a CIS module. It is a long contact image sensor, using MOS image sensor technology for high-speed performance and high sensitivity. The PI201M-A4 is suitable for scanning A4 size (216 mm) documents with 8 dots per millimeter resolution. Applications include document scanners, mark readers, and other office automation equipment.

Functional Description

The PI201M-4A imaging array consists of 27 sensors 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 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 PI201M-A4 module.



INSIDE PICTORIAL OF MODULE

Figure 1. PI201M-A4 Cross Section

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 PI201M-A4 is shown in Figure 1 and the block diagram in Figure 2.

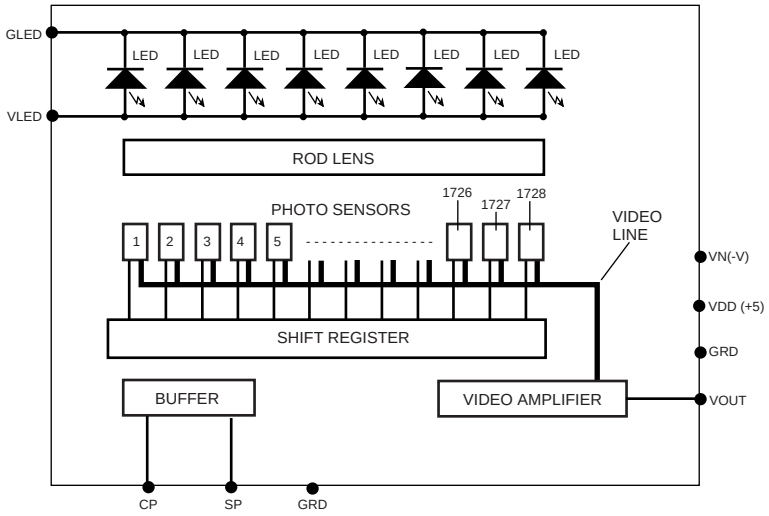


Figure 2. PI201M-A4 module block diagram

Absolute Maximum Rating:

Parameter	Symbols	Maximum Rating	Units
Power supply voltage	Vdd	10	V
	Idd	40	mA
	Vn	-15	V
	In	10	mA
	VLED	5.25	V
	ILED	650	ma
Input clock pulse (high level)	Vih	Vdd – 0.5V	V
Input clock pulse (low level)	Vil	-0.8	V

Recommended Operating Conditions (25 ℃)

Item	Symbol	Min	Typical	Max	Units
Power Supply	Vdd	4.5	5.0	5.5	V
	Vn.	-4.5	-5	-12	V
	VLED		5		V
	Idd		11	30	ma
	Ivn		6.0	10.0	ma
	ILED		350	550	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			1.0 (1)	MHz

Clock pulse high duty cycle		25			%
Clock pulse high duration		250			ns
Integration time	Tint	1.728		10.0	ms
Operating temperature	Top		25	50	^{0}C

Note (1) the module will produce video above 1.5 MHz, but with adjacent pixel smearing. Hence, with signal degradation it can be used above 1.5MHz.

Operating Environment

Operating temperature	Top	0 to 50	^{0}C
Operating humidity	Hop	10 to 85	%
Storage temperature	Tstg	-25 to+75	^{0}C
Storage humidity	Hstg	10 to 90	%

Electro-Optical Characteristics (25° C)

Table 2. Electro-optical characteristics at 25 ° C.

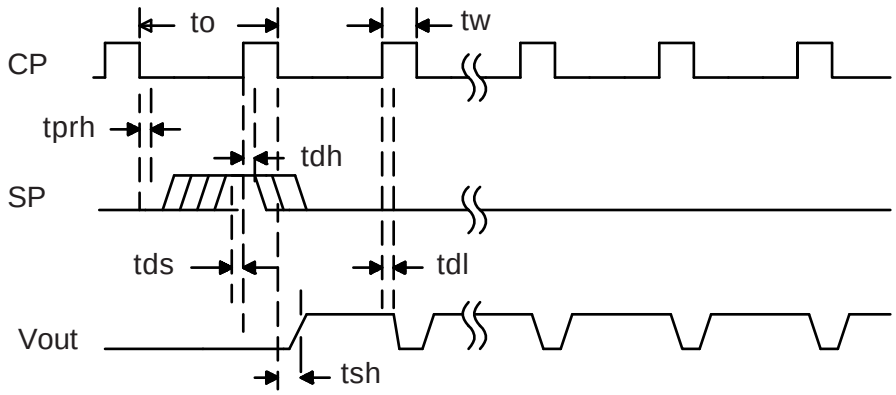
Parameter	Symbol	Parameter	Units	Note
Number of photo detectors		1728	elements	
Pixel to pixel spacing		125	μm	
Line scanning rate	Tint[1]	1.728	ms	@ 1.0 MHz clock frequency
Clock frequency[2]		1.0	MHz	
Bright output voltage[3]		0.6	Volts	
Bright output nonuniformity[4]		<+/-30	%	
Adjacent pixel nonuniformity[5]		<25	%	
Dark nonuniformity[6]		<200	mV	
Dark output voltage[6]		<200	mV	
Modulation transfer function[7]		>30	%	

Definition:

(1) Tint: line scanning rate or integration time. Tint is determined by the interval of two start pulse (SP).
(2) f: main clock frequency,
(3) Vpavg = $\sum$ Vp(n)/1728
(4) Up = [(Vpmax - Vp) / Vp] x 100% or [(Vp - Vpmin) / Vp] x 100%

(5) Upadj = MAX[| (Vp(n) - Vp(n+l) | / Vp(n)] x 100%
Upadj is the nonuniformity 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) MTF = [(Vmax - Vmin) / (Vmax + Vmin)] x 100 [%]
Vmax: maximum output voltage at 4.0 lp/mm
Vmin: minimum output voltage at 4.0 lp/mm
(8) lp / mm: line pair per mm
(9) O.D. Optical Density

Switching Characteristics (25^0C)



MODULE TIMING DIAGRAM

Note: See timing symbol definitions in the following table.

Symbol Definitions for the Above Timing Diagram

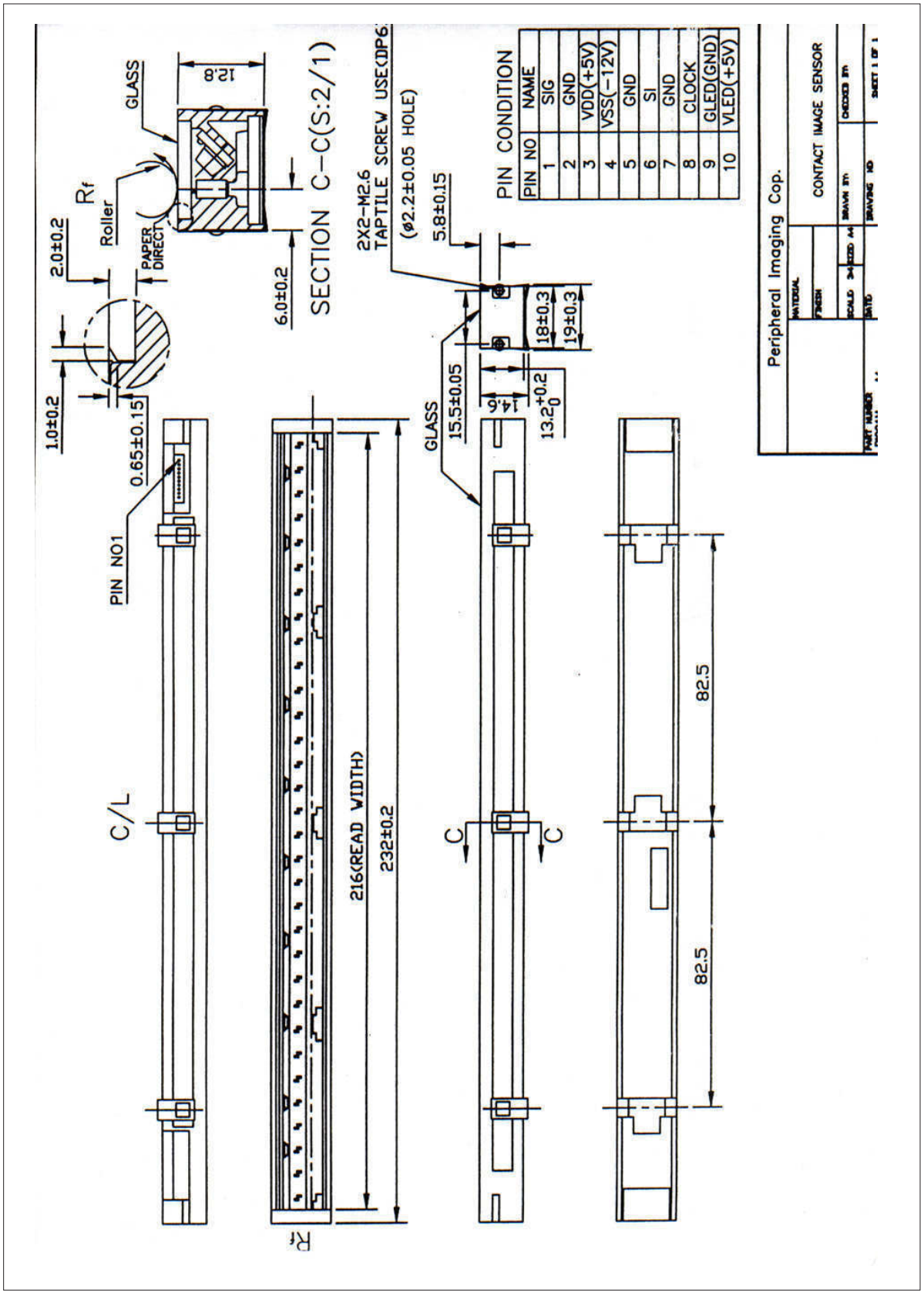
Item	Symbol	Min.	Typical	Max.	Units
Clock cycle time	to	1.0		4.0	μs
Clock pulse width	tw	250			ns
Clock duty cycle		25		75	%
Prohibit crossing time of Start Pulse	tprh	15			ns
Data setup time	tds	20			ns
Data hold time	tdh	20			ns
Signal delay time	tdl	50			ns
Signal settling time	tsh	350			ns

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

Mechanical Module Dimensions

For the PI201M-A4 module housing and its mechanical dimensions see the attached full page size.


SECTION C-C(S:2/1)
GLASS
12.8
Rf
Roller
PAPER DIRECT
2.0±0.2
1.0±0.2
0.65±0.15
6.0±0.2
2X2-M2.6 TAPTILE SCREW USE(DP6
(ø2.2±0.05 HOLE)
5.8±0.15
18±0.3
19±0.3
14.6
13.2+0.2 0
15.5±0.05
GLASS
PIN NO1
C/L
216(READ WIDTH)
232±0.2
82.5
82.5
C
C
Rf
PIN CONDITION
PIN NO | NAME
1 | SIG
2 | GND
3 | VDD(+5V)
4 | VSS(-12V)
5 | GND
6 | SI
7 | GND
8 | CLOCK
9 | GLED(GND)
10 | VLED(+5V)
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