



## Main Features

- High Sensitivity and High SNR Performance 1/2" CMOS Sensor
- Total Resolution of 1.3M (with 5  $\mu$ m Square Pixels)
- High Data Rate: 75 Mpixels/s Provides 60 Frame/s at 1M Resolution (for 1M60)
- CameraLink<sup>®</sup> Data Format (Base Configuration - 1 Channel)
- Flexible and Easy to Operate via Serial Communication Control
  - Gain: 0 dB to 18 dB in 3 dB Steps
  - Dynamic Range: 8, 10 or 12-bit Data
  - Contrast Expansion
  - Shutter Time Programmable
  - Subsampling: 1/4 and 1/16 Resolution
  - Trigger Mode: Free-run or External Trigger Mode
  - Programmable ROI
  - Test Pattern
- Column FPN Correction
- Programmable Look-up Table
- Single Power Supply: DC 12 V to 24 V Provided on Hirose-6 Connector
- Input TTL Trigger Signal and Output TTL Shutter Signal on Hirose-5 Connector
- Compact Design: 44 x 44 x 45 mm (w, h, l)
- C-mount Adapter
- High Reliability - CE and FCC Compliant

## Product Description

This camera features an outstanding sensitivity and SNR, even at maximal speeds. The ROI allows to increase the frame rate (for instance, 175 fps in VGA format 1M60). ATMOS<sup>™</sup> cameras are based on a rolling shutter CMOS sensor.

The configuration interface provides access to advanced functions (contrast expansion, image calibration, LUT). The versatile and compact mechanical housing enables you to implement various configurations.

These features combined with a compelling price, make ATMOS an attractive alternative for users of megapixel cameras.

## Applications

High-speed, SNR performance and reliability of this camera make it suitable for machine vision, especially:

- Material Inspection (e.g. glass, IC, PCB)
- Robot Guidance
- Metrology

and various applications like:

- Microscopy
- Surveillance Demanding Tasks

## CameraLink<sup>®</sup> Areascan Cameras

ATMOS<sup>™</sup> 1M60  
ATMOS<sup>™</sup> 1M30

## Preliminary



# 1. Typical Performances

**Table 1-1.** Camera Typical Performances

Sensor Characteristics at Maximum Pixel Rate			
	1M60	1M30	Unit
Resolution H x V	1312 x 1024	1312 x 1024	Pixels
Pixel size (square)	5 x 5	5 x 5	µm
Maximum frame rate	48	24	Hz
Pixel rate	75	37.5	MHz
Camera Performances			
Bit depth	8, 10 or 12		Bits
Spectral range	350–1000		nm
Linearity	±2% in 5% and 95% of FSR		
PRNU	1.5% rms		
FPN	0.1% rms		
Responsivity	10000 <sup>(1)</sup>		LSB/(Lux.s)
Output RMS Noise	< 2.7 LSB rms		dB
Dynamic range	> 63		
Conversion factor	10		e-/ LSB
Dark Current	1500		e-/s
Over Illumination Behavior	75 Esat <sup>(2)</sup>		
Mechanical and Electrical Interface			
Size (w x h x l)	44 x 44 x 45		mm
Weight	115		g
Lens Mount	C-mount		
Sensor Alignment	$\Delta x, y = \pm 250$ $\Delta z = \pm 150$ $\Delta \theta_{xy} = \pm 0.7$ $\Delta \text{tilt}_z = 0-200$		µm µm degree µm
Power supply	single 12 to 24		VDC
Power consumption	< 2		W
Operating temperature	0 to 55 (non-condensing)		°C
Storage temperature	-40 to 70 (non-condensing)		°C

Measured with light source 3200°K and IR filter

**Warning:**

1. When exposed to such illumination level the sensor might lock-up and should be reset  
See Register Software Reset @ 206H, Internal Register Mapping on [page 17](#)

Figure 1-1. Responsivity Diagram

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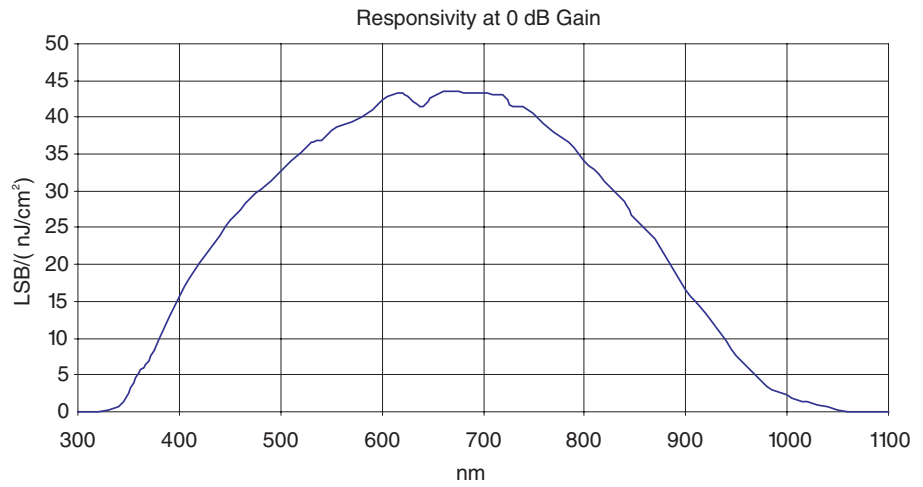
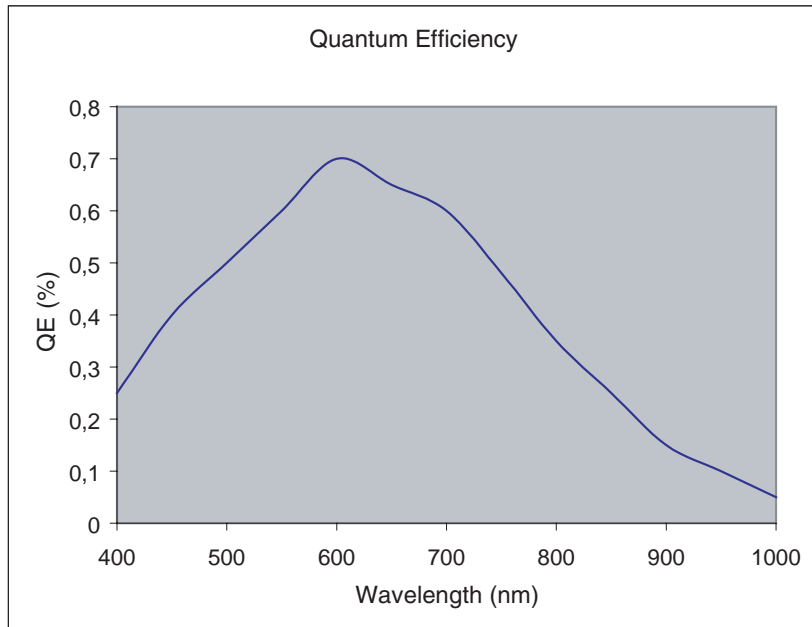


Figure 1-2. Quantum Efficiency



## 2. Standard Conformity

The cameras have been tested in the following conditions:

- Camera with complete Atmel housing
- Shielded power supply cable
- CameraLink data transfer cable ref. 14B26-SZLB-500-OLC (3M™)
- Linear AC-DC power supply

Atmel recommends using the same configuration to ensure compliance with the following standards.

### 2.1 CE Conformity

The ATMOS cameras comply with the European directive 89/336/CEE (EN55022 A/CISPR22 A, EN55024, EN61000-6-2).

### 2.2 FCC conformity

ATMOS Cameras comply with Part 15 of FCC rules. Operation is subject to the following two conditions:

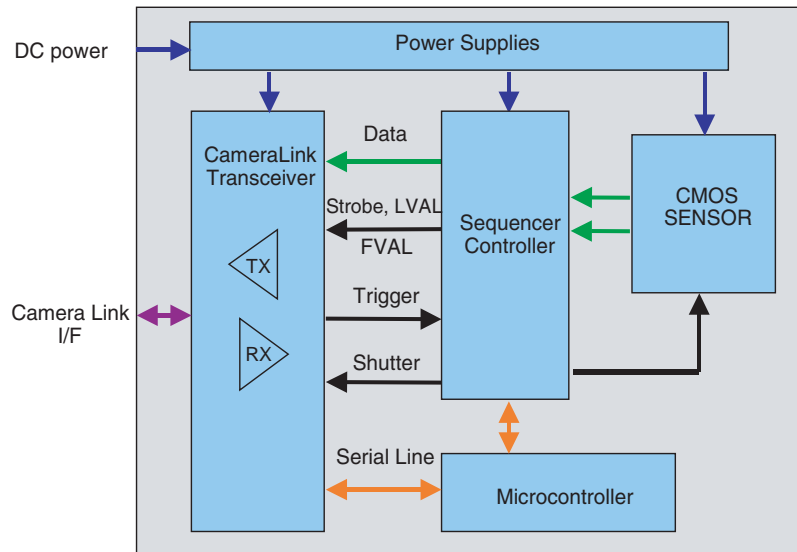
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**Warning:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

### 3. Camera Description

Figure 3-1. Camera Synoptic



The camera is based on a single tap CMOS sensor which delivers a 12-bit digital video signal at its output. An FPGA has been implemented for image processing (FPN column correction, conversion LUT, contrast expansion). The camera is powered by a single DC power supply from 12V to 24V. The functional interface (data and control) is provided with the CameraLink interface. The camera uses the base configuration of the CameraLink standard.

Note: DVAL permanently tied to 1 (high) level.

Data can be delivered on a single channel or two de-multiplexed channels. The data format configuration might be in 12-bit, 10-bit, or 8-bit. It is possible to use external triggers with the camera (CC1 signal or TTL\_IO trigger input) in different trigger modes see ["Synchronization Modes" on page 6](#) The camera configuration and settings are done via the CameraLink serial communication. This interface is used for:

- Gain and offset setting
- Data output format
- Synchronization modes: free-run or external trigger modes
- Shutter time
- Test pattern generation
- Upload and download of correction data (FPN column correction, LUT)

## 4. Timing

### 4.1 Synchronization Modes

The camera operates in rolling shutter mode.

#### 4.1.1 Optimal Use of the Rolling Shutter

As shown in the following timing diagrams, [Figure 4-1](#), exposure does not happen at the same time for all lines, which can lead to image distortion when capturing fast moving objects. The way to bypass this, is to use the camera with a strobe light or a shutter element so that all the lines are exposed during the same time and no image distortion is visible when capturing fast moving objects.

The integration time for each line is: readout (+ programmable shutter time, when used). A shutter signal is provided to strobe a light source or to drive a shutter element. You can set the camera to operate in one of the following synchronization modes: periodic, triggered, triggered without full reset and ITC. See register Mode Control @ 204H, Internal Register Mapping on [page 17](#).

#### 4.1.2 Free-run Mode (or Periodic Mode)

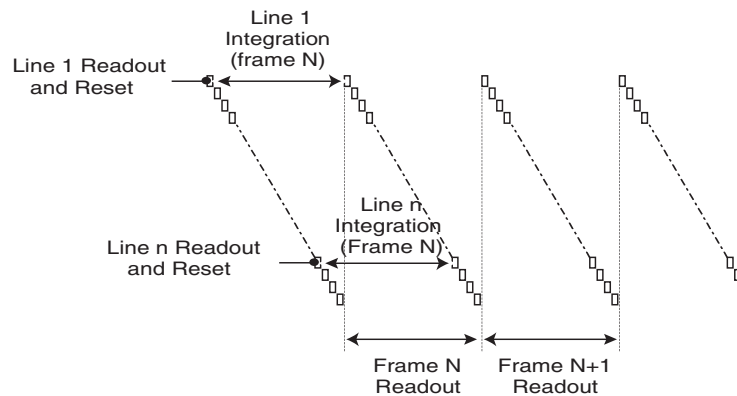
**Principle:** The camera operates in periodic mode.

The period is defined by readout time (+ programmable shutter time, when used). Valid data is forwarded to the CameraLink interface during the next frame readout starting with the first line.

**If shutter time is set to 0:**

The frame N is readout while the first line integrates for frame N+1. As soon as the frame N readout has ended starts the readout of frame N +1.

**Figure 4-1.** Free-run Mode Chronogram



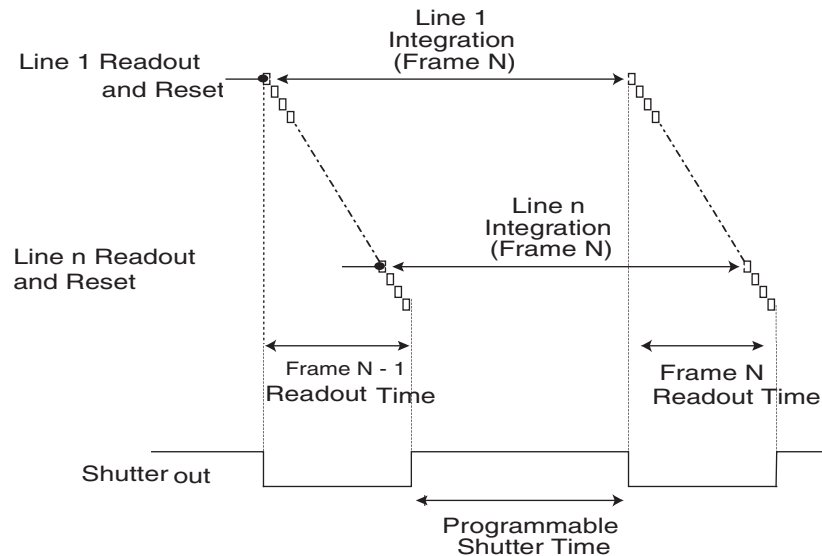
If shutter time is set to > 0:

Readout is suspended between two consecutive frame readout and shutter output signal is activated (programmable polarity) for a time configurable within 0 to Tsh range by step of T1.

**Table 4-1.** Shutter Time Values at Free-run Mode

Label	Description	1M60	1M30
Tsh	Maximum shutter time (ms)	655	1310
T1	Step duration (μs)	10	20

**Figure 4-2.** Free-run Mode and Shutter Chronogram



The maximum frame rate of 48 frame/s for the 1M60 camera (or 24 frame/s for the 1M30 camera) is given in this mode with a shutter time set to 0.

See register Aperture Shutter Time @ 246H, Internal Register Mapping on [page 17](#).

### 4.1.3 Triggered Mode

**Principle:** An external trigger starts the reset of the sensor, then snap and readout of a frame, the integration time is defined by readout time (+ programmable shutter time, when used).

The trigger event initiates the following sequence:

- Stop of readout frame in progress and reset of readout pointer to line 1
- Readout of previous dummy frame and integration start of the frame N. The readout data of previous frame is not forwarded on CameraLink interface (FVAL inactive)
- Shutter output signal is activated during a time programmable within 0 to Tsh range by step of T1
- Readout of frame N. The readout data is forwarded to the CameraLink interface (FVAL active) starting with the first line
- Readout of dummy frames (to prevent against large dark current integration) while the camera waits for the next trigger event

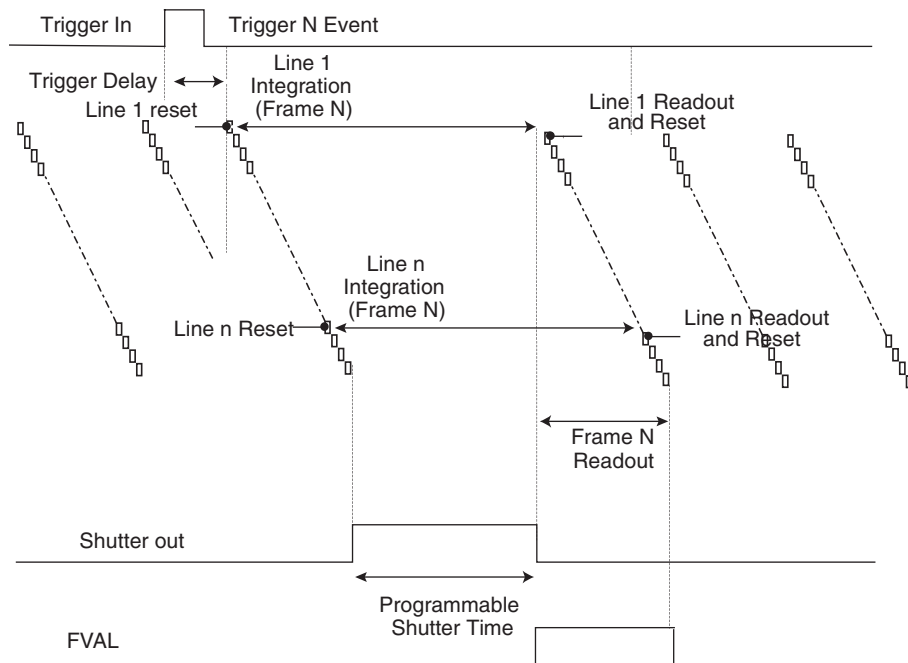
The trigger delay is a few  $\mu\text{s}$ . The minimum pulse duration is  $1\mu\text{s}$ . The edge of trigger is programmable. The source of trigger is selectable between CameraLink CC1 signal and TTL/IO trigger input. The period is defined by readout time + programmable shutter time + readout time + wait. Therefore the minimum period is  $2 \times$  readout time.

See register Aperture Shutter Time @ 246H, Internal Register Mapping on [page 17](#).

**Table 4-2.** Shutter Time Values at Triggered Mode

Label	Description	1M60	1M30
Tsh	Maximum shutter time (ms)	655	1310
T1	Step duration ( $\mu\text{s}$ )	10	20

**Figure 4-3.** Triggered Mode Chronogram



#### 4.1.4 Triggered Mode without Full Reset

**Principle:** An external trigger starts the snap and readout of a frame, without resetting the sensor. The integration time is defined by readout time (+ programmable shutter time, when used).

The trigger event initiates the following sequence:

- Stop of readout frame in progress and reset of readout pointer to line 1
- Shutter output signal is activated during a time programmable within 0 to Tsh range by step of T1
- Readout of frame N. The readout data is forwarded to the CameraLink interface (FVAL active) starting with the first line
- Readout of dummy frames (to prevent against large dark current integration) while the camera waits for the next trigger event

The trigger delay is a few  $\mu\text{s}$ . The minimum pulse duration is  $1\mu\text{s}$ . The edge of trigger is programmable. The source of trigger is selectable between CameraLink CC1 signal and TTL\_IO trigger input. The period is defined by the programmable shutter time + readout time + wait.



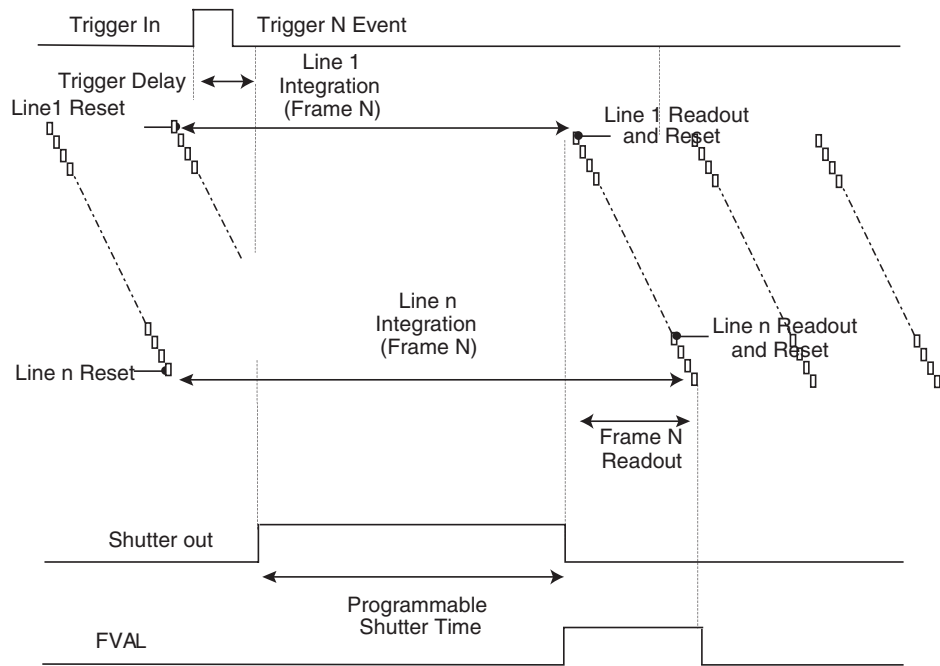
Therefore the minimum period is reduced to  $1 \times$  readout time. As the integration time is not the same for all lines (in the following timing diagram line n integration time is greater than line 1 integration time) this mode must be used with a pulsed light source or a shutter element. Moreover any residual light when shutter output signal is inhibited must be avoided. The exposure time is defined by the shutter time and all the lines are exposed during the same time.

See register Aperture Shutter Time @ 246H Internal Register Mapping on [page 15](#)

**Table 4-3.** Shutter Time Values at Triggered Mode without Full Reset

Label	Description	1M60	1M30
Tsh	Maximum shutter time (ms)	655	1310
T1	Step duration ( $\mu$ s)	10	20

**Figure 4-4.** Triggered Mode Without Full Reset Chronogram



## 4.1.5 ITC Mode

**Principle:** An external sync controls both the integration time and the frame rate.

The trigger event initiates the following sequence:

- Stop of readout frame in progress and reset of readout pointer to line 1
- Shutter output signal is activated during a time defined by the high state of the ITC signal
- Readout of frame N. The readout data is forwarded to the CameraLink interface (FVAL active) starting with the first line

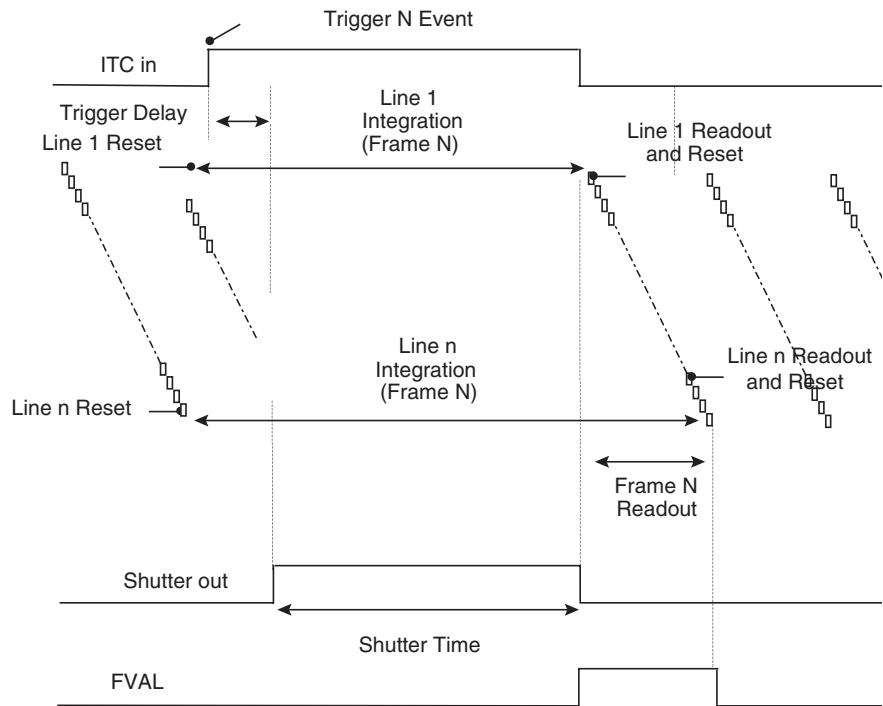
- Readout of dummy frames (to prevent against large dark current integration) while the camera waits for the next trigger event

The integration delay is a few  $\mu\text{s}$ . The minimum pulse duration is  $1\mu\text{s}$ . The source of ITC signal is selectable between CameraLink CC1 signal and TTL\_IO trigger input. See Register Mode Control @ 204H Internal Register Mapping on [page 17](#)

The period is defined by the ITC signal period.

As the integration time is not the same for all lines (in the following timing diagram line n integration time is greater than line 1 integration time) this mode must be used with a pulsed light source or a shutter element. Moreover any residual light when shutter output signal is inhibited must be avoided. The exposure time is defined by the ITC signal high state time and all the lines are exposed during the same time

**Figure 4-5.** ITC Mode Chronogram



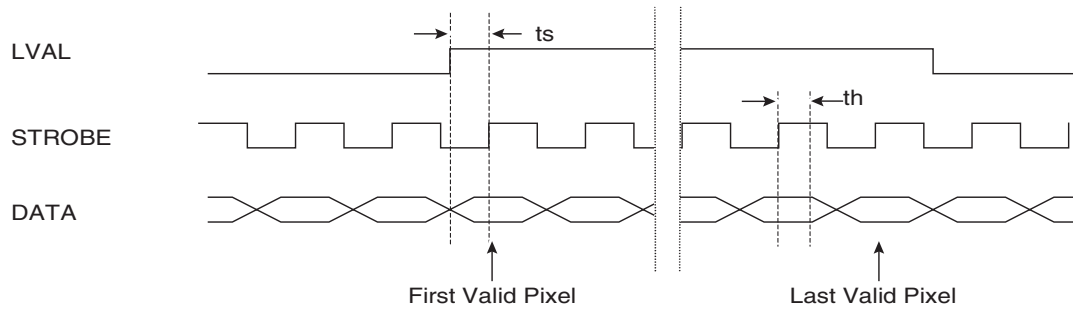
## 4.2 Output Data Timing

**Table 4-4.** Timing Values

Label	Description	Min	Typ	Max
Ts	Input setup to clock delay	1ns		
Th	Output hold from clock delay	1ns		

Figure 4-6. Output Data Chronogram

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## 5. Camera Features

### 5.1 Region of Interest

The full resolution of the camera is 1312 pixels by 1024 lines. You might program a smaller resolution in order to reduce the readout time. You must be careful that depending on the sequencing mode, the exposure time can be reduced too. The authorized values for horizontal size are 32 to 1312 pixels. This value is rounded to the lower multiple of 16 pixels. The authorized values for vertical size are 32 to 1024 lines. This value is rounded to the lower multiple of 8 lines. See registers ROI area @ 280H, 282H, 284H and 286H Internal Register Mapping on [page 17](#).

Examples of frame rate versus resolution:

**Table 5-1.** R.O.I Performance

ROI Size	Frame Rate 1M60 (fps)	Frame Rate 1M30 (fps)
1312 × 1024	48	24
1024 × 1024	60	30
640 × 480	175	85

### 5.2 Analog Gain

The analog gain can be adjusted by setting the gain register via the serial communication.

- Gain adjusted from 0 dB to 18 dB: code 0 to 6
- Step 3 dB
- Nominal gain (factory configuration): 0 dB

See register Sensor Analog Gain @ 240H, Internal Register Mapping on [page 17](#).

### 5.3 Subsampling

- Subsampling 1: All pixels are readout (1312 × 1024)
- Subsampling 2: Two times lower resolution in both axes (656 × 512)
- Subsampling 4: Four times lower resolution in both axes (328 × 256)

See register Subsampling @ 288H, Internal Register Mapping on [page 17](#).

Subsampling parameters might be combined with the ROI. The minimal window size resulting from these combinations must be at least 32 × 32 pixels. This leads to the following table of minimal ROI size versus Subsampling:

**Table 5-2.** Subsampling Minimum Size

Subsampling	Minimum ROI Size
1	32 × 32
2	64 × 64
4	128 × 128

### 5.4 Output Format

The data format available on the CameraLink output interface is programmable via the serial interface.

1. The pixel depth is set by default at 12-bit, it can be set to 10 or 8-bit. The assignment for each configuration comply with the specifications of the CameraLink interface standard. See register Mode Control bits [3:2] @ 204H, Internal Register Mapping [page 17](#) .
2. In standard mode the camera provides output data on a single channel of the CameraLink output interface. You might program the camera in two outputs mode, only with the 1M60. Pixel data is de-multiplexed (odd and even pixels) on ports A, B and C of the CameraLink interface and STROBE signal is divided by 2 (37.5 MHz). See register mode control bit [4] @ 204H, Internal Register Mapping [page 17](#) .

## 5.5 Test Pattern

In normal mode, the digital video signal from the sensor is available on the CameraLink output interface. For test purposes a digital pattern is generated and is available instead of the video signal in the CameraLink output interface. The pattern can be fixed or sliding. The fixed digital pattern is ramp-up from 960 LSB code to 2271 LSB code (line width). The same pattern is shown for each line:

**Figure 5-1.** Test Pattern View



The sliding pattern starts with the fixed pattern, the first code of each line is then incremented by two on each frame. It is useful to validate the connection to the acquisition system before the adjustment settings of the image capture. The Subsampling parameter does not affect the pattern.

See register Mode Control bits [1:0] @ 204H, Internal Register Mapping on [page 17](#).

## 5.6 Contrast Expansion

The digital gain and offset can be adjusted via the serial communication in order to focus on a particular part of the dynamic range.

- Gain adjusted from x1 to x32.875: code 0 to 255
- Step 0.125
- Nominal gain (factory configuration):  $\times 1$

See register Digital Gain @ 242H, Internal Register Mapping on [page 17](#).

- Offset adjusted from -4096 to +4095: code 0 to 8191 in 2's complement
- Step 1
- Nominal offset (factory configuration): 0

See register Digital Offset @ 244H, Internal Register Mapping on [page 17](#).

See register Processing Control bits [1:0] @ 202H, Internal Register Mapping on [page 17](#).

## 5.7 Look- up Table (LUT)

The look-up Table is a conversion table which applies to the sensor data. At each input pixel value corresponds a single output value. This allows you to apply a correction table like a gamma correction for example.

The Look-up Table might be generated by the camera by programming the gamma setting:

- Gamma 0.125 to 7.875: code 1 to 63 (0 not admitted)

You might also write your own correction table via the serial communication channel. Four banks are available to store four distinct correction tables.

See register LUT Coefficient Save in Dataflash @ 10DH, Internal Register Mapping on [page 17](#).

See register LUT Coefficient Restore in Dataflash @ 10EH, Internal Register Mapping on [page 17](#).

See register Processing Control bit 2 @ 202H, Internal register mapping on [page 17](#)

## 5.8 Fixed Pattern Noise (FPN) Correction

The fixed pattern noise (FPN) is a spatial fluctuation of the sensor data particularly between successive columns. The purpose is to calculate an offset for each column of the frame in the darkness. The table of column offsets is stored in the internal memory. If the FPN correction is then enabled the offset values are subtracted to the value of the input pixel. Two methods are available to realize this processing: the off-line calibration and the online correction.

### 5.9 Off-line Calibration

A calibration step is required while the camera is in darkness condition. Offset coefficients for each column are calculated on an average value measured on all 1024 lines. Offset coefficients are 8-bit data. Therefore to be efficient the pixel value should be always within the values 1LSB to 255 LSB. If not, the overflow / underflow flags are set in the status register. The calibration step must be done in full resolution and subsampling 1. Calibration data can be saved in nonvolatile memory and four distinct banks are reserved for this use. You might access to these banks in read or write mode.

See register Processing Control bits [4:3] @ 202H, Internal register mapping on [page 17](#).

See register Calibration Control @ 200H, Internal register mapping on [page 17](#).

See register FPN Coefficient Save in Dataflash @ 10BH, Internal register mapping on [page 17](#).

See register FPN Coefficient Restore in Dataflash @ 10CH, Internal Register Mapping on [page 17](#).

### 5.10 Online Correction

No calibration step is required. When online correction is enabled the camera calculates the offset coefficients for each column on masked lines and then processes the input sensor data. These coefficients are updated at each frame. The online correction applies only in subsampling 1. The calculated values are less accurate with these methods but unlike the off-line calibration do not depend on the settings like the analog gain.

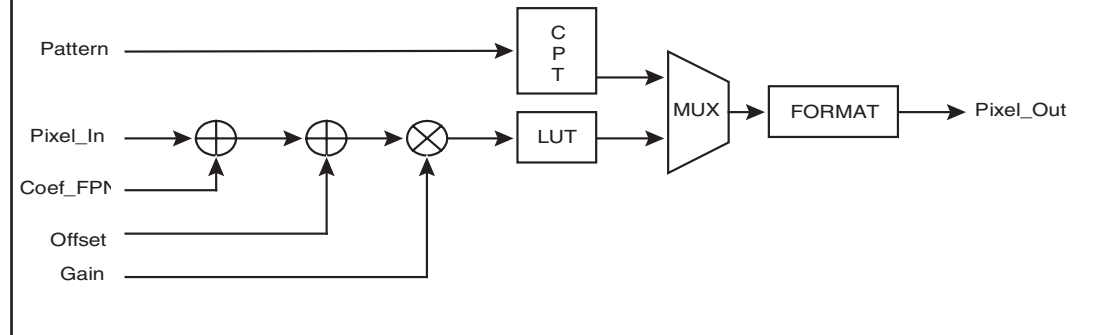
See register Processing Control bits [4:3] @ 202H, Internal Register Mapping on [page 17](#).

See register FPN Coefficient Save in Dataflash @ 10BH, Internal Register Mapping on [page 17](#).

See register FPN Coefficient Restore in Dataflash @ 10CH, Internal Register Mapping on [page 17](#).

## 5.11 Processing Synoptic

Figure 5-2. Synoptic



## 5.12 LED Indicator

The green LED on the rear panel gives information on the internal state of the camera. On power up, after internal configuration, the LED flashes on and has the following behavior (decreasing priority order):

- Internal hardware error or configuration error: fast blinking
- Waiting for external trigger (triggered and ITC modes): slow blinking
- All other situation: continuous

## 6. Electrical Interface

### 6.1 Power Supply

It is recommended to insert a 1A fuse between the power supply and the camera. The voltage ripple of the power supply shall be below  $\pm 50$  mVp-p at BW = 50 MHz to have full camera performance.

**Table 6-1.** Power Supply Description

Signal Name	I/O	Type	Description
PWR	P	-	DC power input: +12 V to + 24 V
GND	P	-	Electrical and mechanical ground

Note: I = input, O = output, I/O = bi-directional signal, P = power/ground, NC = not connected

### 6.2 Command and Control

The CameraLink interface provides four LVDS signals dedicated to camera control (CC1 to CC4). On the ATMOS, one of them is used to synchronize the camera on external events.

**Table 6-2.** CameraLink Input Description

Signal Name	I/O	Type	Description
TRIG1	I	RS644	CC1 - Synchronization input

Note: I = input, O = output, I/O = bi-directional signal, P = power/ground, NC = not connected

The TTL/I/O interface provides two TTL signals dedicated to camera control.

**Table 6-3.** TTL/I/O Description

Signal Name	I/O	Type	Description
TRIGGER	I	5 V-TTL	External trigger input
SHUTTER	O	3 V-TTL	Shutter output, maximum output current 1.6 mA

Note: I = input, O = output, I/O = bi-directional signal, P = power/ground, NC = not connected

See register Mode Control @ 204H, Internal Register Mapping on [page 17](#). Video Data.

Data and enable signals are provided on the CameraLink interface.

**Table 6-4.** Camera Link Output Description

Signal Name	I/O	Type	Description
ODD-D[11-0]	O	RS644	Odd pixel data, ODD-00 = LSB, ODD-11 = MSB
EVEN-D[11-0]	O	RS644	Even pixel data, EVEN-00 = LSB, EVEN-11 = MSB
STROBE	O	RS644	Output data clock, data valid on the rising edge
LVAL	O	RS644	Line valid or line enable, active high signal
FVAL	O	RS644	Frame valid or frame enable, active high signal

Note: 1. I = input, O = output, I/O = bi-directional signal, P = power/ground, NC = not connected

2. Note: DVAL, as defined in the CameraLink standard, is not used. DVAL is permanently tied to 1 (high) level.



## 6.3 Serial Communication

The CameraLink interface provides two LVDS signal pairs for the communication between the camera and the frame grabber. This is an asynchronous serial communication based on RS-232 protocol.

The configuration of the serial line is:

- Full duplex/without handshaking
- 8-bit data, no parity bit, 1 stop bit
- 9600 bauds at power up, then programmable up to 115200 bauds

**Table 6-5.** CameraLink Serial Communication Description

Signal Name	I/O	Type	Description
SerTFG	O	RS644	Differential pair for serial communication to the frame grabber
SerTC	I	RS644	Differential pair for serial communication from the frame grabber

### 6.3.1 Internal Register

**Table 6-6.** Internal Register Mapping

Start Addr (Hex)	Size (Dec)	End Addr (Hex)	Access Type		Factory Settings	Description
			Processing	Internal Task		
000	1		RO	RO		Synchronization register for serial communication (value 00)
001	1		RW	-	1	Communication speed multiplier (9600 - 115,2K): volatile register 1, 2, 3, 4, 6, 8, 12
040	51		RO	-		Hardware identifier
080	8		RO	-		Firmware identifier
0C0	51		RW	-		User identifier
100	4		RW	RW		Status (ref. Camera Status Management)
104	4		WO	-		Lock/Unlock mode: advanced user/user 1: Lock advanced user mode (into user mode) Unlock key value: unlock user
108	1		RO	-		Privilege level 1: Advanced user mode 2: User mode
109	1		WO	-		Current configuration save in Eeprom 1: User settings (allowed only for advanced user mode) 2 to 4: User settings
10A	1		RW	-	0	Current configuration restore from Eeprom 1 to 4: User settings

**Table 6-6.** Internal Register Mapping (Continued)

Start Addr (Hex)	Size (Dec)	End Addr (Hex)	Access Type		Factory Settings	Description
			Processing	Internal Task		
10B	1		WO	-		FPN coefficient save in dataflash 1 to 4 (1 allowed only for advanced user mode)
10C	1		RW	-	1	FPN coefficient restore in dataflash 1 to 4
10D	1		WO	-		LUT coefficient save in dataflash 1 to 4 (1 allowed only for advanced user mode)
10E	1		RW	-	1	LUT coefficient restore in dataflash 1 to 4
200	2		RW	RW	0	Calibration control [0] = off-line calibration enabled (0: disabled; 1: enabled)
202	2		RW	-	0	Processing control: [0] = offset correction enable (0: disabled; 1: enabled) [1] = gain correction enable (0: disabled; 1: enabled) [2] = look-up table correction enable (0: disabled; 1: enabled)[ [4:3] = fpn correction mode (00: disabled; 01: off-line fpn correction enabled; 11: on-line fpn correction enabled)
204	2		RW	-	0	Mode control: [1:0] = test pattern (00: disabled; 01: fixed test pattern; 10: dynamic test pattern) [3:2] = output format (00:12-bit; 01:10-bit; 10:8-bit) [4] = demux mode (for 1M60 then 0: disabled; 1: enabled) (for 1M30 then 0: disabled) [7:5] = synchronization mode (000: Free-run; 001: External triggered; 010: external triggered without full reset; 011: integration time controlled); others reserved [8] = trigger source (0: CameraLink; 1: external) [9] = trigger polarity (0:positive edge; 1: negative edge) [10] = shutter polarity output (0: positive edge; 1: negative edge)
206	1		WO			Software reset: 1 = camera reset

**Table 6-6.** Internal Register Mapping (Continued)

Start Addr (Hex)	Size Dec)	End Addr (Hex)	Access Type		Factory Settings	Description
			Processing	Internal Task		
240	2		RW	-	0	Sensor analog gain: [3:0] = analog gain; value from 0 dB (= 0) to 18 dB (= 6) by step of 3 dB
242	2		RW	-	0	Digital gain (extended dynamic range): [7:0] = gain; value from 1.000 (= 0) to 32.875 (= 255) in Q 9.3 representation
244	2		RW	-	0	Digital offset (extended dynamic range): [12:0] = offset; value from -4096 to + 4095 in 2's complement
246	2		RW	-	1	Aperture shutter time: [15:0] = shutter time; value from 0 to 65535 (for 1M60: 0 to 655 ms by step of 10µs) (for 1M30: 0 to 1310 ms by step of 20µs)
248	2		RW	-	1600	ERS: [10:0] value from 0% (= 0,Dark) to 100% (= 1600, clear) in Q11.4 representation
280	8	287	RW			ROI area:  Addr 280, size 2, default 0: ROI horizontal start value (0 to 1311) Addr 282, size 2, default 0 ROI vertical start value (0 to 1023) Addr 284, size 2, default 1312 ROI vertical size value from 32 to 1312 Addr 286, size 2, default 1024 ROI vertical size value from 32 to 1024
288	1		RW	-	1	Subsampling: [2:0] = Subsampling (001: 1/1; 010: 1/4; 100: 1/16)
2C0	2		RW		50	Hot pixel detection threshold: [10:0] = hot pixel threshold
2C2	2		RW		50	Dead pixel detection threshold: [10:0] = dead pixel threshold
2C4	1		RW	-	0	Defective pixels control: [0] = hot pixel detection (0: disabled; 1: enabled) [1] = dead pixel detection (0: disabled; 1: enabled)

**Table 6-6.** Internal Register Mapping (Continued)

Start Addr (Hex)	Size (Dec)	End Addr (Hex)	Access Type		Factory Settings	Description
			Processing	Internal Task		
300	1		WO	-		Gamma correction: [5:0] = gamma settings; value from 0.125 (= 1) to 7.875 (= 63) in Q6.3 representation
1000	1312	151F	RW	-	0	FPN coefficients (8-bit): Format: Fpn [0]; Fpn[1]; Fpn [2];...
2000	8192	3FFF	RW	-	linear	Look-up table (4096 × 16-bit): Format: Lut [0]; Lut [1]; ... ; Lut [4095] value: 0 to 4095

Note: RO: Read Only register, WO: Write Only register, RW: Read & Write register

### 6.3.2 Camera Settings Memory

ATMOS cameras have 5 banks to save settings:

- Bank 0 contains the factory settings. This bank cannot be modified by the user
- Bank 1 to 4 are used to store 4 different settings
- Bank 1 might be protected by an advanced user (see Register @ 104H). Contact Atmel for details

## 7. Connector Description

All connectors are on the rear panel. Better results are obtained by using shielded cables (foil and braid shielded).

Note: cables for digital signals shall be twisted pairs.

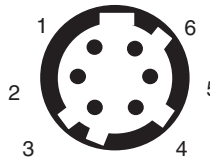
### 7.1 Power Supply

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)

Figure 7-1. Power Supply Pinout

Power Connector : J01				
Signal	Pin		Signal	Pin
PWR	1		GND	4
NC	2		NC	5
PWR	3		GND	6



Receptacle Viewed from Camera Back

### 7.2 CameraLink Connector

Standard CameraLink cable shall be used to ensure the full electrical compatibility.

- Camera connector type: MDR-26 (female) ref. 3M 10226-2210VE
- We recommend to use a CameraLink standard shielded cable as 3M 14X26-SZLB-XXX-0LC

Figure 7-2. CameraLink Pinout

Command and Control Connector : J02					
Signal	Pin		Signal	Pin	
GND	1		GND	14	
X0-	2		X0+	15	
X1-	3		X1+	16	
X2-	4		X2+	17	
Xclk-	5		Xclk+	18	
X3-	6		X3+	19	
SerTC+	7		SerTC-	20	
SerTFG-	8		SerTFG+	21	
CC1-	9		CC1+	22	
CC2+	10		CC2-	23	
CC3-	11		CC3+	24	
CC4+	12		CC4-	25	
GND	13		GND	26	

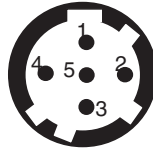
### 7.3 TTL I/O

Camera connector type: Hirose HR10A-7R-5SB (female)

Cable connector type: Hirose HR10A-7P-5P (male)

**Figure 7-3.** TTL/IO Pinout

TTL IO Connector : J03				
Signal	Pin		Signal	Pin
TRIGGER	1		GND	4
GND	2		NC	5
SHUTTER	3			



Receptacle Viewed from Camera Back

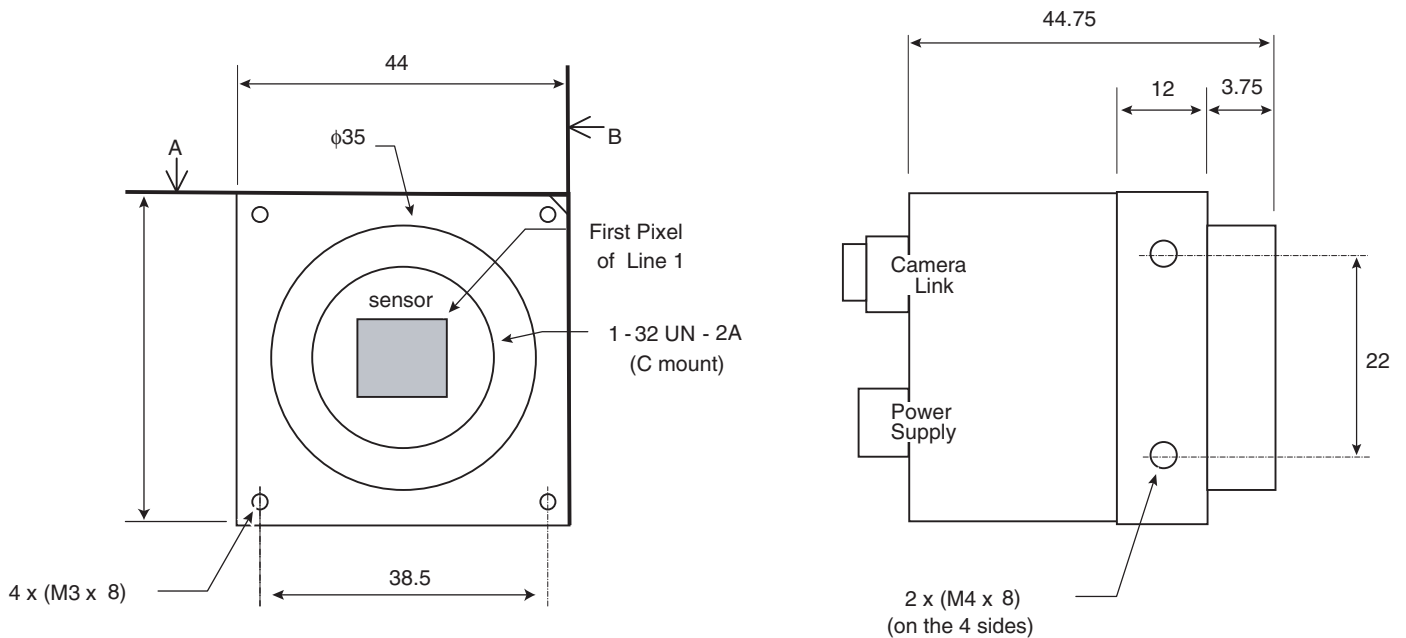
## 8. Mechanical Drawing

Note: (All dimensions are in mm)

Figure 8-1. Front Panel View



Figure 8-2. Front Panel Mechanical Drawing

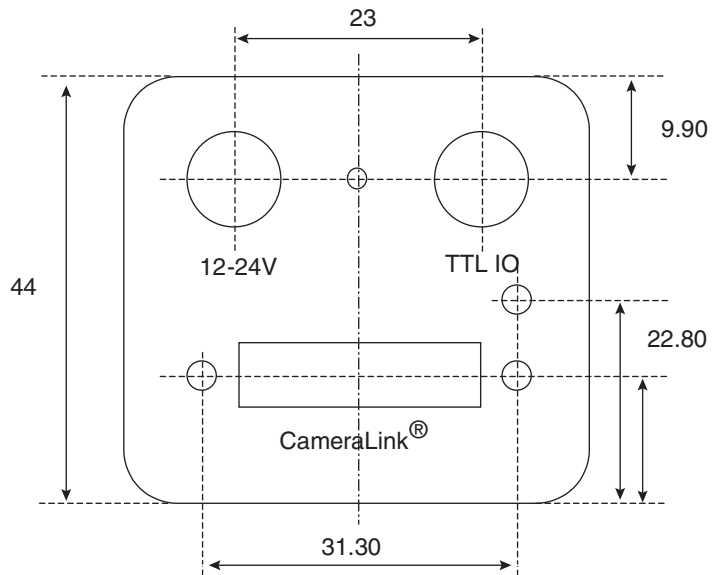


- Note:
1. A and B are mechanical reference plans
  2. Sensor alignment  $\Delta x, y$  refers to the optical axis
  3. Sensor alignment  $\Delta 0_{xy}$  refers to the reference plans

**Figure 8-3.** Rear Panel



**Figure 8-4.** Rear Panel Mechanical Drawing





## 9. Ordering Code

Table 9-1. Ordering Code

Part Number	Description
AT71-ATM1M60M-B0	ATMOS 1M60 with housing + power supply connector + TTL I/O Connector + CD-Rom
AT71-ATM1M30M-B0	ATMOS 1M30 with housing + power supply connector + TTL I/O Connector + CD-Rom

**Delivery:**

ATMOS areascan cameras are delivered with:

- Power supply connector HR10A-7P-6S
- TTL I/O connector HR10A-7P-5P
- CD-rom with:
  - Friendly software CommCam
  - Documentation



## Atmel Corporation

2325 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: 1(408) 441-0311  
Fax: 1(408) 487-2600

## Regional Headquarters

### Europe

Atmel Sarl  
Route des Arsenalux 41  
Case Postale 80  
CH-1705 Fribourg  
Switzerland  
Tel: (41) 26-426-5555  
Fax: (41) 26-426-5500

### Asia

Room 1219  
Chinachem Golden Plaza  
77 Mody Road Tsimshatsui  
East Kowloon  
Hong Kong  
Tel: (852) 2721-9778  
Fax: (852) 2722-1369

### Japan

9F, Tonetsu Shinkawa Bldg.  
1-24-8 Shinkawa  
Chuo-ku, Tokyo 104-0033  
Japan  
Tel: (81) 3-3523-3551  
Fax: (81) 3-3523-7581

## Atmel Operations

### Memory

2325 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

### Microcontrollers

2325 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

La Chantrerie  
BP 70602  
44306 Nantes Cedex 3, France  
Tel: (33) 2-40-18-18-18  
Fax: (33) 2-40-18-19-60

### ASIC/ASSP/Smart Cards

Zone Industrielle  
13106 Rousset Cedex, France  
Tel: (33) 4-42-53-60-00  
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park  
Maxwell Building  
East Kilbride G75 0QR, Scotland  
Tel: (44) 1355-803-000  
Fax: (44) 1355-242-743

### RF/Automotive

Theresienstrasse 2  
Postfach 3535  
74025 Heilbronn, Germany  
Tel: (49) 71-31-67-0  
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

### Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF Datacom

Avenue de Rochepleine  
BP 123  
38521 Saint-Egreve Cedex, France  
Tel: (33) 4-76-58-30-00  
Fax: (33) 4-76-58-34-80

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[www.atmel.com/literature](http://www.atmel.com/literature)

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