PULNiX
TM-9701

Product Features

- **High resolution 2/3" progressive scanning interline –transfer CCD imager 768(H) x 484(V)**
- **Internal A/D converter**
- **Asynchronous reset with external shutter control**
- **Full frame shutter, 1/60 to 1/16,000 sec.**
- **Frame memory built-in for async image capturing**
- **Full frame integration with uninterrupted video**
- **Excellent S/N (50 dB)**
- **AGC on/off, gamma 1 or 0.45**

General Description

Small and lightweight, the PULNiX TM-9701 is a high resolution monochrome CCD camera with many capabilities. The interline progressive scan CCD permits high speed dynamic image capture with full vertical and horizontal frame resolution. The fully electronic asynchronous shutter allows image capture upon external command, and can be asynchronously reset via an external pulse.

In addition to the RS-422 digital progressive scan output, an internal A/D and scan converter offers users the tremendous versatility of RS-170 analog interlace output which can be displayed on a standard monitor. The internal frame store holds the captured image for read-out to a frame grabber or host processor. This allows the TM-9701 to interface with a wide range of frame grabbers, while assuring that the captured images are transferred successfully.

Custom configurations, such as analog-only versions, are available for quantity OEM requirements.

Electronic Shutter

The built-in manual shutter speed control selects the electronic shutter rate of 1/60, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, or 1/16,000 sec. The substrate drain shutter mechanism produces a superb image without smearing at each shutter speed.

The TM-9701 captures full, crisp images of rapidly moving objects without the need for strobe lighting. Progressive scanning produces a full 484 lines of vertical resolution per single shutter event, as compared to 244 lines per shutter produced by a conventional CCD camera. In dynamic image capture, conventional cameras require strobe lighting to avoid the ghosting effect that can result from interlacing the even and odd vertical fields.

Integration

The CCD imager of the TM-9701 can be exposed longer than normal TV timing (1/30 sec.). This feature provides extra sensitivity for dark-environment applications. A full frame of resolution can be obtained in either interlace or progressive scan format. The internal frame memory provides continuous video output without a frame grabber.

Applications

- **Machine vision**
- **Medical and scientific imaging**
- **Automated inspection**
- **Aerospace**
- **Document processing**
- **Intelligent transportation systems**
- **Bar code reading**
- **Optical character recognition**

Asynchronous Reset

The TM-9701's asynchronous reset is flexible and takes external HD for phase locking. There are three modes to control the asynchronous reset and shutter speed:

1. External VINIT with double pulse. The duration between two pulses controls the shutter speed externally.

2. Internal shutter speed with Fast mode. The video signal has no delay from the reset timing (shutter speed range is 1/2000 to 1/16,000 sec.)

3. Internal shutter speed with Slow mode. This can vary the speed control from 1/60 to 1/1,000 sec. The video signal starts with internal V reset timing related to shutter speed.
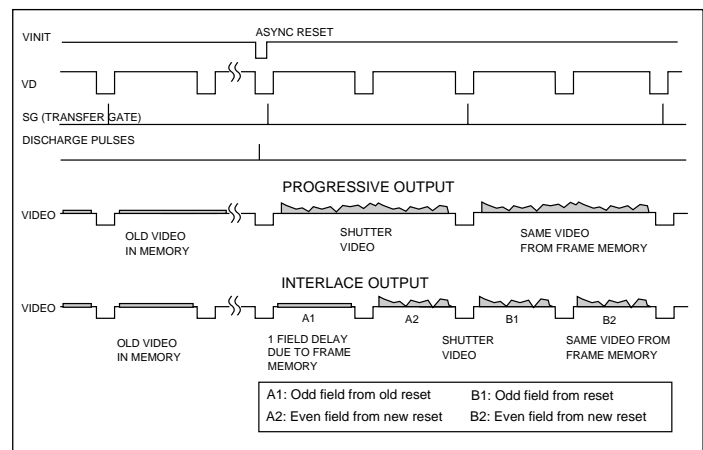
Async Reset Timing

The built-in frame memory maintains the asynchronously captured full frame image until the next Vinit pulse comes in. The output can be either interlace or progressive scanning. Both analog RS-170 format (1Vp-p, 75Ω) and 8 bit digital format (EIA-422) are available from the camera. Order option #OP-51 for continuous sync output.

PULNiX *Innovation at work!*

SPECIFICATIONS

Imager	2/3" progressive scan interline transfer CCD
Active Area	8.9 mm x 6.6 mm
Active Pixel	768 (H) x 484 (V)
Cell size	11.6 µm x 13.6 µm
Display Modes (*Active Pixels*)	768 (H) x 484 (V) @ 30 Hz progressive 768 (H) x 242 (V) @ 60 Hz interlace
Sync	Internal/external auto switch HD/VD, 4.0 Vp-p impedance 4.7KΩ VD=30 Hz ±5% interlace/non-interlace HD=15.734kHz±5%
Data clock output	14.31818 MHz
Resolution	Digital: 768 (H) x 484 (V) Analog: 570 TV lines (H) x 484 TV lines (V)
S/N ratio	50dB min. (AGC = off)
Min. illumination	1.0 lux, f=1.4 without IR cut filter (no shutter) Sensitivity: 10µV/e- NOTE: IR filter is optional
Video output	1.0 Vp-p composite video, 75Ω and 8-bit RS-422 digital output

AGC	ON/OFF (OFF std)
Gamma	0.45 or 1.0 (1.0 std)
Lens mount	C-mount, 2/3" format, back focus adjustable
Power req.	12V DC, 500 mA
Operating temp	-10°C to 50°C
Vibration	7 G rms (10Hz x 2000Hz)
Shock	70G
Size (W x H x L)	44.0mm x 48.0mm x 136.0mm 1.73" x 1.91" x 5.35"
Weight	323 grams (11.4 oz)
Functional options	See current price list for available options

Optional accessories	(must be ordered separately)
I/O	30DG-02 digital cable
Power cable	12P-02S (Multi-conductor)
Power supply	PD-12U Series

Pin Configurations

31-Pin connector (MP211-031-113-4300)

Pin#	Description	I/O	Pin#	Description	I/O	Pin#	Description	I/O
1	CLK+	Out	12	D4+	Out	22	ENINT	In
2	LDV+	Out	13	D5+	Out	23	GND	
3	FDV+	Out	14	D6+	Out	24	D0-	Out
4	GND		15	D7+	Out	25	D1-	Out
5	EXT HD	In	16	N/C		26	D2-	Out
6	INTEG	In	17	CLK-	Out	27	D3-	Out
7	LPULSE	Out	18	LDV-	Out	28	D4-	Out
8	D0+	Out	19	FDV-	Out	29	D5-	Out
9	D1+	Out	20	VINIT	Out	30	D6-	Out
10	D2+	Out	21	EXT VD	In	31	D7-	Out
11	D3+	Out						

Note: CLK: data clock, LDV: Line data valid, FDV: Frame or field data valid, ENINT: Integration enable, LPULSE: Last pulse.

12-Pin Connector

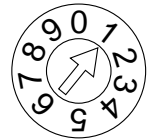|			
1	GND	7	VD in
2	+12V	8	GND
3	GND	9	HD in
4	Video	10	GND
5	GND	11	Int. cont
6	VINIT	12	GND
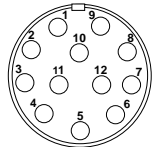
Shutter Control Switch

	Manual	Async
0	no shutter	
1	1/60	no shutter
2	1/125	1/16000
3	1/250	1/8000
4	1/500	1/4000
5	1/1,000	1/2000
6	1/2,000	1/1000
7	1/4,000	1/500
8	1/8,000	1/250
9	1/16,000	1/125

Shutter Control Switch

Physical Dimensions

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PROGRESSIVE SCAN

136 mm   13 mm   44 mm   48 mm   56 mm   32 mm

NRM ASY   INT NON   POWER   VIDEO   SHUTTER   VIDEO OUT

4 X M3 8.0 mm DP   3/8"-16   40.0 mm   18.0 mm   10.2 mm   35.5 mm   1/4"-20   11.0 mm
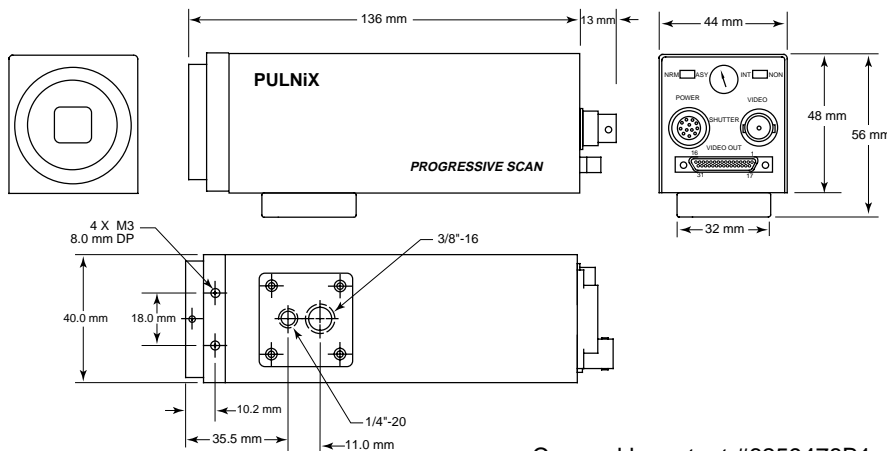
Covered by patent #6259478B1

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