PULNiX

IMAGING PRODUCTS

TM-1040 PROGRESSIVE SCAN HIGH RESOLUTION SHUTTER CAMERA

Product Features

- **Very high resolution 1" progressive scanning 1024(H) x 1024(V) interline transfer CCD imager**
- **Internal 10-bit A/D for Digital RS-644 and RS-343A/RS-170 analog outputs**
- **Real time, 30 frames per sec., 40 MHz clock speed**
- **Full-frame electronic shutter, up to 1/16,000 sec.**
- **Asynchronous reset with external shutter control**
- **Frame memory built-in for async image capturing**
- **Banding compensation**
- **Store and recall setting data**
- **RS-232C external control for gain, modes, etc.**

General Description

The PULNiX TM-1040 is a very high resolution monochrome CCD camera with a 30fps. output rate which permits full-frame asynchronous real-time dynamic image capture. The interline transfer progressive scan CCD achieves outstanding shutter and integration characteristics. Progressive scanning provides full vertical and horizontal resolution during shutter mode, a key advantage over interlace scanning. A square imager format with uniform pixels means superior image definition in any orientation. The electronic shutter, which has speeds to 1/16,000 sec., may be asynchronously reset by external pulse control. On-chip micro lenses are built in for increased sensitivity and fill factor.

The TM-1040 has two frame stores which capture the CCD's dual channel signal and output digital and analog images in real time. The camera has a 10-bit, RS-644 digital signal output for interfacing with external image processing systems, and RS-343A high resolution interlace analog output for recording and monitoring, and RS-170 for set-up viewing. Also standard is an RS-232C remote communications interface. Special interface cables are available for connecting the TM-1040 directly to many existing commercial frame grabbers.

Applications for the TM-1040 include medical imaging, high definition graphics, on-line inspection, intelligent transportation systems, gauging, character reading, archiving, and long range image acquisition.

Electronic Shutter

The TM-1040 has a substrate type shutter mechanism which provides a superb picture at various speeds without smearing. A built-in manual shutter speed control selects the electronic shutter rate of 1/60 (standard exposure), 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, or 1/16,000 second. The EE shutter function detects the light level and automatically adjusts the speed.

The CCD continues discharging at async shutter with VINIT high (5V). With a negative going pulse to VINIT, the camera resets and purges the charge momentarily. Then it starts integrating for the period of shutter control set either by an external pulse width or by internal shutter control. A full 1000 lines of vertical resolution is available due to the progressive scanning, as compared with an interlace CCD camera which permits only half lines per shutter.

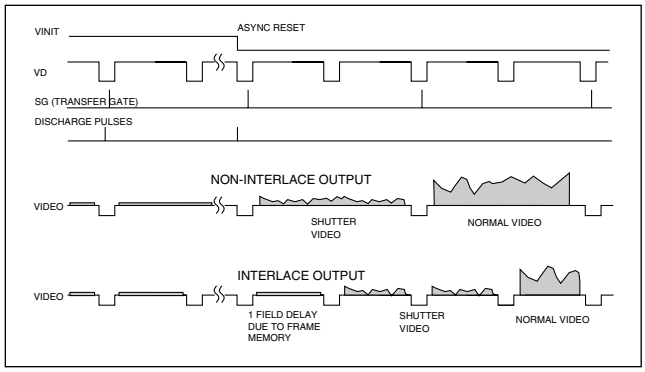
Asynchronous Reset

The TM-1040's asynchronous reset is flexible and takes external horizontal drive (HD) for phase locking. When VINIT pulse is applied, it resets the camera's scanning and purging of the CCD. There are three modes to control the asynchronous reset and shutter speed:

1. External VINIT with pulse width. The duration between pulse edges controls the shutter speed externally from 1/16,000 to 4 sec.

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

3. Internal shutter speed with Slow mode. This varies the speed control from 1/125 to 1/1,000 sec. The video signal starts with internal V reset timing related to shutter speed. The built-in frame memory can maintain the asynchronously captured full frame image until the next VINIT pulse comes in. The output speed is 30 frames per sec.



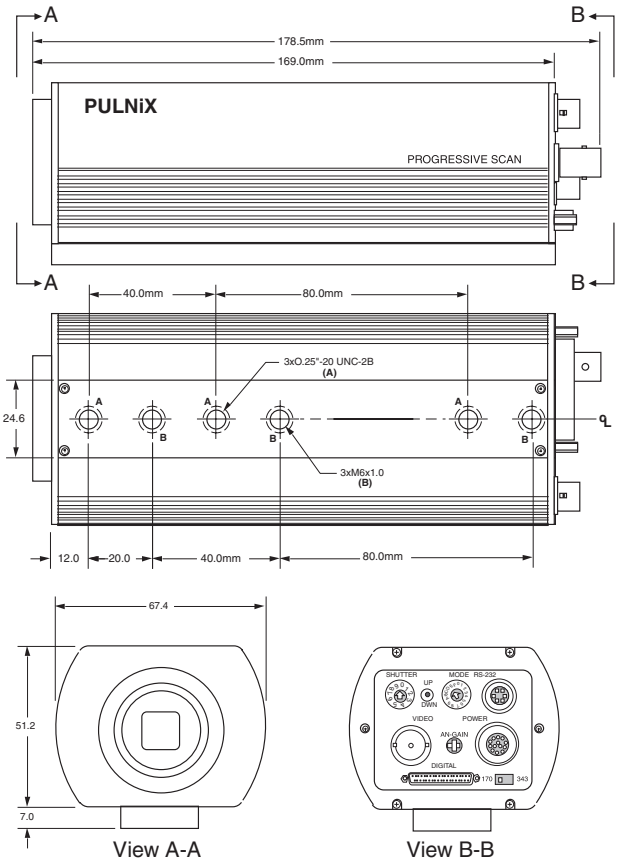
Integration

The CCD imager of the TM-1040 can be exposed longer than the normal scan timing of 1/30 sec. This integration feature provides added sensitivity for dark-environment applications. Integration is achieved by controlling the #11 pin of the 12-pin connector to Low (GND). The internal frame memory provides continuous video output without interruption during the integration. Integration also can be done in pulse width control mode up to 4 sec.

Specifications

Imager	*1" (9.1mm x 9.2mm) progressive scanning interline transfer CCD*
Pixel	*1024 (H) x 1024 (V)*
Cell size	*9.0 µm x 9.0 µm*
Scanning	*1050 lines; 30 Hz*
Sync	*Internal/external auto switch HD/VD, 4.0 Vp-p impedance 4.7KΩ VD=30 Hz ±5%, non-interlace HD=31.468 kHz±3%*
Data clock output	*40.068 MHz*
Resolution	*Digital: 1008 (H) x 1018 (V), Analog: over 700 TV lines (H) x 800 TV lines (V)*
S/N ratio	*50dB min. analog, up to 60dB digital*
Min. illumination	*1.0 lux, f=1.4 without IR cut filter (no shutter). Sensitivity: 10µV/e-*
Video output	*RS-343A/RS-170 for set-up viewing, 1.0 Vp-p composite video, 75Ω and up to10-bit RS-644 digital output*
AGC	*OFF*
Gamma	*1.0*
Lens	*C-mount, 1 inch format, back focus adjustable*
Power req.	*12V DC, 800 mA*
Operating temp.	*-10°C to 50°C**
Vibration & shock	*Vibration: 7Grms (10 Hz to 2000 Hz), Shock: 70G*
Size (W x H x L)	*5.2mm x 67.4mm x 169.0mm (2.02" x 2.65" x 6.65")*
Weight	*506 grams (17.8 oz)*
Auto iris connector	*None*
Accessories	*DC-31 31-pin mating connector; 30DG-02-40 digital interface cable; CS-232 RS-232C cable & software*
Power cable	*12P-02S (multi-conductor)*
Power supply	*PD-12UE, PD-12UU or PD-12UUP (includes power connector) PD-12UEP*

Dimensions (mm)



Mode control switch

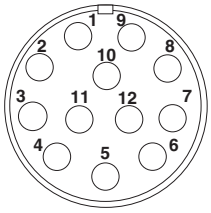
0	Normal mode	
1	Gain control	up/down
2	Async/man shutter	up: manual,dwn:async
3, 4	Gain selection	(9, 16, 22, 28 dB)
5, 6	Offset adjustment	A & B, B only
7	EE/manual shutter	up: manual, dwn:EE
8	Freeze (ENINT) enable	up: real time, dwn: freeze
9	Factory set recall	
A-F	User page storage	store (up) or recall(down)

Pin Configuration

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

Pin#	Description	I/O	Pin#	Description	I/O
1	CLK+	Out	17	CLK-	Out
2	LDV+	Out	18	LDV-	Out
3	FDV+	Out	19	FDV-	Out
4	GND		20	VINIT	In
5	EXT HD	In	21	INTEG	In
6	D0+	Out	22	D0-	Out
7	D1+	Out	23	D1-	Out
8	D2+	Out	24	D2-	Out
9	D3+	Out	25	D3-	Out
10	D4+	Out	26	D4-	Out
11	D5+	Out	27	D5-	Out
12	D6+	Out	28	D6-	Out
13	D7+	Out	29	D7-	Out
14	D8+	Out	30	D8-	Out
15	D9+	Out	31	D9-	Out
16	GND	Shield			

Note: CLK: data clock, LDV: Line data valid, FDV: Frame data valid, VINIT: async trigger, INTEG: integration control



12-Pin Connector

1	GND	**7**	VD in
2	+12V	**8**	GND
3	GND	**9**	HD in
4	Video	**10**	GND
5	GND	**11**	N/C
6	VINIT	**12**	GND

6-Pin Connector
RS-232C communication

1	RXD
2	TXD
3	RTS
4-6	GND

Shutter Control Switch

	Manual	Async
0	no shutter	no shutter
1	1/60	1/16,000
2	1/125	1/8,000
3	1/250	1/4,000
4	1/500	1/2,000
5	1/1,000	1/1,000
6	1/2,000	1/500
7	1/4,000	1/250
8	1/8,000	1/125
9	1/16,000	Ext. pulse width

Covered by patent #6259478 B1

Control and report functions

TM-1040

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