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Spec No: 001-16711

Spec Title: IBIS5B-1300 CAMERA RECOMMENDATIONS -AN6018

Sunset Owner: Evelyn Beard (EYB)

Replaced by: None

IBIS5B-1300 Camera Recommendations

AN6018

Application Note Abstract

This document provides recommendations to avoid column nonuniformities. It also provides supply voltages to eliminate the image lag issue in snapshot shutter mode.

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Synchronous (Snapshot) Shutter

Column Nonuniformities

After extensive evaluation, a relation was found between the position of the Y-readout pointer after read out and vertical column nonuniformities in the next frame, visible at higher gain settings. If the Y-readout pointer continues to select a line during the global reset of the next frame, the column reset is corrupted, which is visible after integration as column nonuniformities.

The images in Figure 1 are taken with the same settings (gain and integration time) but have a difference in the position of the Y-readout pointer during global reset. Note that histogram equalization is done on the images to show the effect more clearly. On the left image, the Y-readout pointer is completely shifted out of the pixel array so that the pointer does not select a line during global reset. This results in no column nonuniformities. In the middle and right image, the Y-readout pointer is still selecting a line during global reset and introduces column nonuniformities.

Column nonuniformities, as shown in the images in Figure 1, can also be introduced by different intervals between successive images. The recommended timing helps to solve this.

To make sure that the Y-readout pointer is not selecting a line during global reset, it is recommended to adapt timing in synchronous shutter mode (single slope mode). Figure 2 shows the standard timing, as explained in the data sheets of IBIS5B-1300. Figure 3 shows the adapted timing.

- T_1 Should be minimum one row blanking time. The row blanking time depends on the X-granularity; see the Basic Operation Timing section in the data sheet.
- T_2 During this time, the SS-sequencer applies the control signals to reset the image core and start integration. This takes four granulated SS-sequencer clock periods. The integration time counter starts counting at the first rising edge after the falling edge of SYS_CLOCK.
- T_3 The SS-sequencer puts the image core in a readable state. It takes two granulated SS-sequencer clock periods.
- T_{int} The “real” integration or exposure time.

Figure 1. Test Chart Images with (center, right) and without (left) Column Nonuniformities

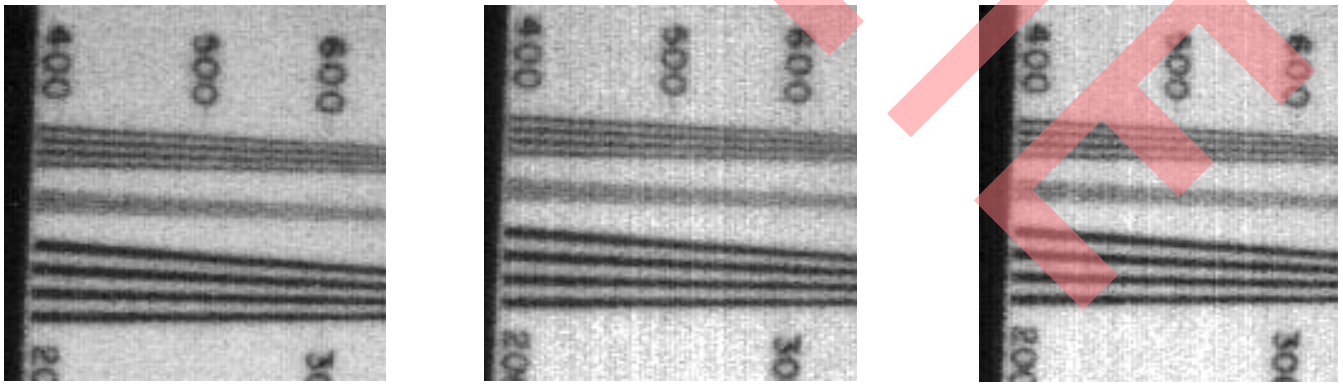


Figure 2. Standard Synchronous Shutter Single Slope Integration Timing

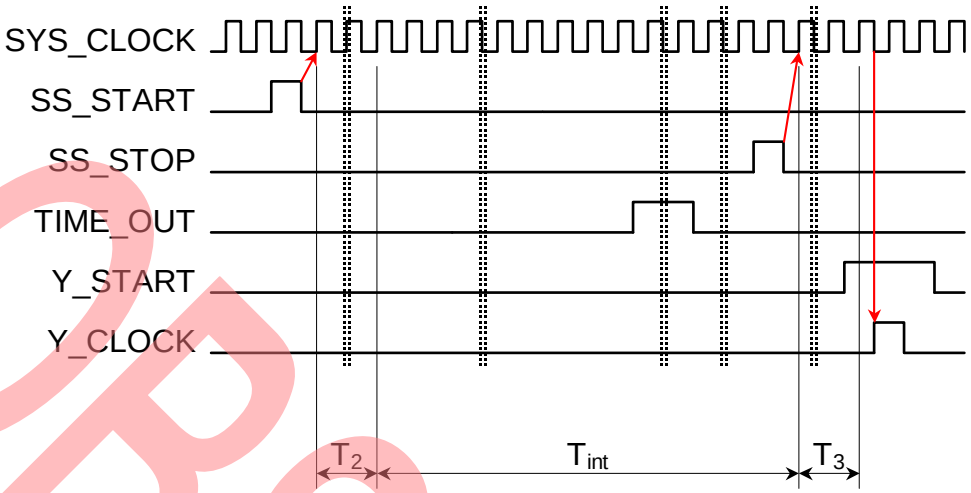
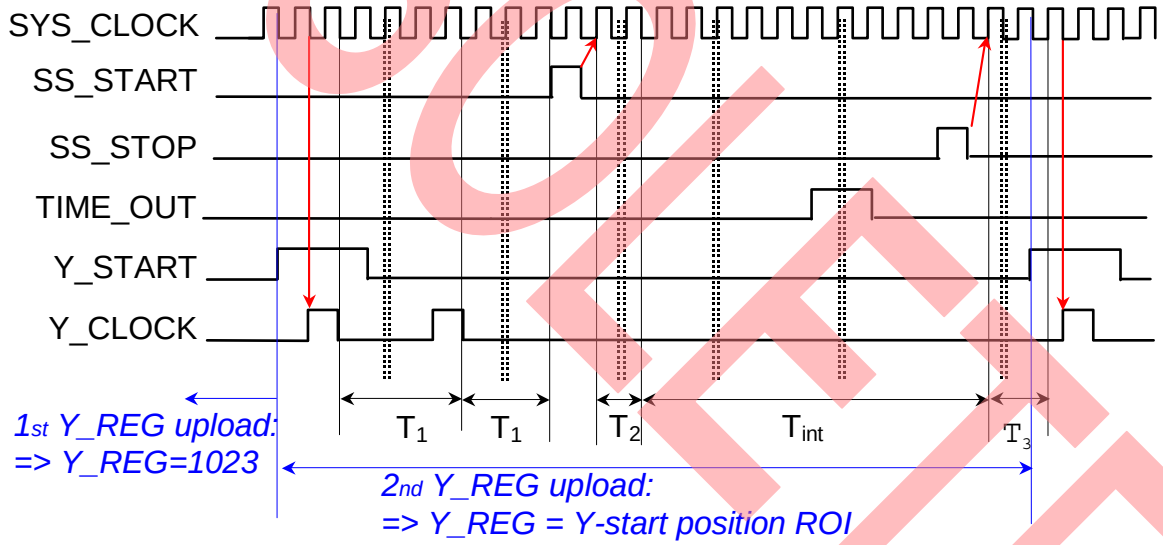


Figure 3. Adapted Timing



To make sure that no line is selected during the global reset, upload value 1023 (decimal value; hexadecimal value 3FF) to the YL_REG and YR_REG registers before assertion of the first Y_START. This selects the last line when Y_START is asserted with Y_CLOCK; pulsing the second Y_CLOCK shifts the Y-readout pointer out of the shift register before the global reset occurs. Between the falling edge of the first Y_START and the rising edge of the SS_STOP pulse, upload the YL(R)_REG registers (registers 5 and 6) with the start row of the ROI.

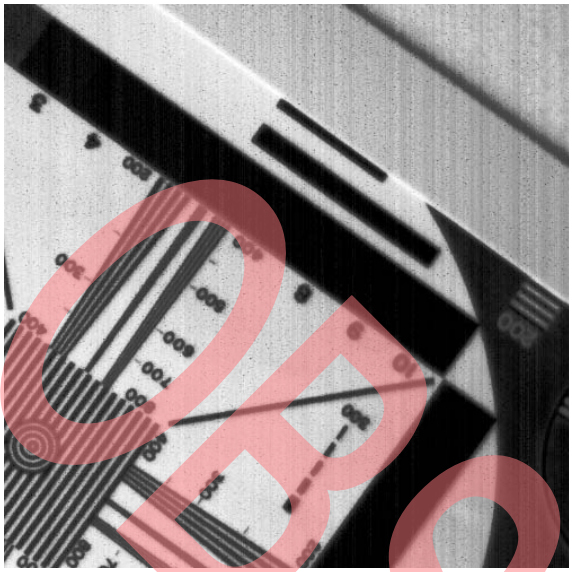
Note that this additional Y_START sequence adds a delay between a trigger event and the actual start of integration. This delay is equal to twice the row blanking time (2 × 3.5 µs = 7 µs with minimal X-granularity). Indicated as time T_2 in Figure 3, it takes another four SS granular clock periods after SS_START before the pixels actual start to integrate.

Supply Considerations

With the recommended supply voltages in the data sheets (Table 5; p11) the snapshot shutter suffers slightly from image lag at higher gain settings. The supply voltage settings listed in Table 1 remove the image lag issue completely.

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Figure 4. Rolling Shutter Image (supply settings listed in Table 1 (left) or in Table 2 (right)



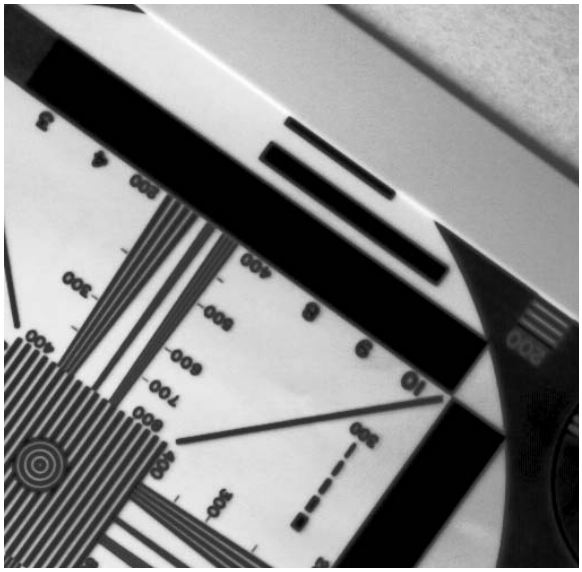


Table 1. Recommended Supply Voltages - Snapshot Shutter

Parameter	Description	Typ	Unit
VDDH	Voltage on HOLD switches	+4.5	V
VDDR_LEFT	Highest reset voltage	+4.5	V
VDDC	Pixel core voltage	+3.3	V
VDDA	Analog supply voltage of the image core	+3.3	V
VDDD	Digital supply voltage of the image core	+3.3	V
GNDA	Analog ground	0	V
GNDD	Digital ground	0	V
GND_AB	Anti-blooming ground	0	V

Table 2. Recommended Supply Voltages -Rolling Shutter

Parameter	Description	Typ	Unit
VDDH	Voltage on HOLD switches	+4.0	V
VDDR_LEFT	Highest reset voltage	+4.0	V
VDDC	Pixel core voltage	+3.3	V
VDDA	Analog supply voltage of the image core	+3.3	V
VDDD	Digital supply voltage of the image core	+3.3	V
GNDA	Analog ground	0	V
GNDD	Digital ground	0	V
GND_AB	Anti-blooming ground	0	V

Rolling Shutter

Supply Considerations

The recommended supply voltages in the data sheets (Table 5; p11) and the settings in Table 1 can result in vertical column non-uniformities in rolling shutter mode (see images in Figure 4; note that histogram equalization is done on the images to show the effect more clearly. Settings for both images are equal).

To avoid these problems, change the value of the supply voltages listed in the data sheets to the values listed in Table 2.

Table 3 lists the recommended supply voltages for dual-shutter mode (both rolling and snapshot shutter). These settings eliminate both the image lag issue in snapshot shutter and the column nonuniformities in rolling shutter mode.

Table 3. Recommended Supply Voltages - Dual Shutter

Parameter	Description	Typ	Unit
VDDH	Voltage on HOLD switches	+4.5	V
VDDR_LEFT	Highest reset voltage	+4.5	V
VDDC	Pixel core voltage	+3.0	V
VDDA	Analog supply voltage of the image core	+3.3	V
VDDD	Digital supply voltage of the image core	+3.3	V
GNDA	Analog ground	0	V
GNDD	Digital ground	0	V
GND_AB	Anti-blooming ground	0	V

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Document History

Document Title: IBIS5B-1300 Camera Recommendations
Document Number: 001-16711

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	1340803	YIS	See ECN	New application note
*A	3148590	NPA	01/20/11	Changed IBIS5A-1300 to IBIS5B-1300. Added Application Note Abstract section and Document History table
*B	4113912	MTA	09/04/13	Obsolete specs.

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In March of 2007, Cypress recataloged all of its Application Notes using a new documentation number and revision code. This new documentation number and revision code (001-xxxxx, beginning with rev. **), located in the footer of the document, will be used in all subsequent revisions.

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709
Phone: 408-943-2600
Fax: 408-943-4730
http://www.cypress.com

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