

Register file structure : regfile\_xgs\_athena.pdf

Created by amarchan on 2020/09/11 12:26:47

Register file CRC32 : 0xD1EB35A0

## 1. Main Parameters

Register file endianness: little endian

Address bus width: 11 bits

Data bus width: 32 bits

## 2. Memory Map

Section name	Address(es) / Address Ranges	Register name	Access Type
SYSTEM	0x000	TAG	R
	0x004	VERSION	R
	0x008	CAPABILITY	R
	0x00C	SCRATCHPAD	RW
DMA	0x070	CTRL	RW
	0x078	FSTART	RW
	0x07C	FSTART_HIGH	RW
	0x080	FSTART_G	RW
	0x084	FSTART_G_HIGH	RW
	0x088	FSTART_R	RW
	0x08C	FSTART_R_HIGH	RW
	0x090	LINE_PITCH	RW
	0x094	LINE_SIZE	RW
	0x098	CSC	RW
	0x0A8	OUTPUT_BUFFER	RW
ACQ	0x100	GRAB_CTRL	RW
	0x108	GRAB_STAT	R
	0x110	READOUT_CFG1	RW
	0x114	READOUT_CFG_FRAME_LINE	RW
	0x118	READOUT_CFG2	R
	0x120	READOUT_CFG3	RW
	0x124	READOUT_CFG4	RW
	0x128	EXP_CTRL1	RW
	0x130	EXP_CTRL2	RW
	0x138	EXP_CTRL3	RW
	0x140	TRIGGER_DELAY	RW
	0x148	STROBE_CTRL1	RW
	0x150	STROBE_CTRL2	RW
	0x158	ACQ_SER_CTRL	RW
	0x160	ACQ_SER_ADDDATA	RW
	0x168	ACQ_SER_STAT	R

Section name	Address(es) / Address Ranges	Register name	Access Type
	0x190	SENSOR_CTRL	RW
	0x198	SENSOR_STAT	R
	0x19C	SENSOR_SUBSAMPLING	RW
	0x1A4	SENSOR_GAIN_ANA	RW
	0x1A8	SENSOR_ROI_Y_START	RW
	0x1AC	SENSOR_ROI_Y_SIZE	RW
	0x1B0	SENSOR_ROI2_Y_START	RW
	0x1B4	SENSOR_ROI2_Y_SIZE	RW
	0x1B8	SENSOR_M_LINES	RW
	0x1BC	SENSOR_DP_GR	RW
	0x1C0	SENSOR_DP_GB	RW
	0x1C4	SENSOR_DP_R	RW
	0x1C8	SENSOR_DP_B	RW
	0x1E0	DEBUG_PINS	RW
	0x1E8	TRIGGER_MISSED	RW
	0x1F0	SENSOR_FPS	R
	0x1F4	SENSOR_FPS2	R
	0x2A0	DEBUG	RW
	0x2A8	DEBUG_CNTR1	R
	0x2B8	EXP_FOT	RW
	0x2C0	ACQ_SFNC	RW
	0x2D0	TIMER_CTRL	RW
	0x2D4	TIMER_DELAY	RW
	0x2D8	TIMER_DURATION	RW
HISPI	0x400	CTRL	RW
	0x404	STATUS	R
	0x408	IDELAYCTRL_STATUS	R
	0x40C	IDLE_CHARACTER	RW
	0x410	PHY	RW
	0x414	FRAME_CFG	RW
	0x418	FRAME_CFG_X_VALID	RW
	0x424, 0x428, ... ,0x438	LANE_DECODER_STATUS (5:0)	RW
	0x43C, 0x440, ... ,0x450	TAP_HISTOGRAM (5:0)	R
	0x454, 0x458, 0x45C	LANE_PACKER_STATUS (2:0)	RW
	0x460	DEBUG	RW
DPC	0x480	DPC_CAPABILITIES	R
	0x484	DPC_LIST_CTRL	RW
	0x488	DPC_LIST_STAT	R
	0x48C	DPC_LIST_DATA1	RW
	0x490	DPC_LIST_DATA2	RW
	0x494	DPC_LIST_DATA1_RD	R
	0x498	DPC_LIST_DATA2_RD	R
LUT	0x4B0	LUT_CAPABILITIES	R
	0x4B4	LUT_CTRL	RW
	0x4B8	LUT_RB	R
SYSMONXIL	0x700	TEMP	R

Section name	Address(es) / Address Ranges	Register name	Access Type
	0x704	VCCINT	R
	0x708	VCCAUX	R
	0x718	VCCBRAM	R
	0x780	TEMP_MAX	R
	0x790	TEMP_MIN	R

### 3. Registers definition

## Section: SYSTEM

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Address Range: [0x000 - 0x00C]

### TAG

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Address: section "SYSTEM" base address + 0x000

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (23:0)</b> <i>STATIC</i>	Tag identifier	
Value at Reset:	0x58544d	
Possible Values:	0x58544D	MTX ASCII string

Address: section "SYSTEM" base address + 0x004

Description:

Revisions

1.3.x : First functional revision with a single list of multiple Ethernet frames

1.4.x : Second revision. Implements multiple list of frames

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
MAJOR(7:0)							
15	14	13	12	11	10	9	8
MINOR(7:0)							
7	6	5	4	3	2	1	0
HW(7:0)							

<b>MAJOR (7:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>MINOR (7:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x1

<b>HW (7:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

Address: section "SYSTEM" base address + 0x008

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (7:0)	
STATIC	
Value at Reset:	0x0

Address: section "SYSTEM" base address + 0x00C

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (31:0)	
RW	
Value at Reset:	0x0

Section: DMA

Address Range: [0x070 - 0x0A8]

CTRL

Initial Grab Address Register

Address: section "DMA" base address + 0x000

Description:  
Initial Grab Address LOW 32 bits

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved							GRAB_QUEUE_EN

GRAB_QUEUE_EN <i>RW</i>		
Value at Reset:	0x0	
Possible Values:	0x0	
	0x1	



Address: section "DMA" base address + 0x008

Description:

Initial Grab Address LOW 32 bits

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b>	Initial GRAB ADDRESS Register	
<i>RW</i>	This is the address in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	

Address: section "DMA" base address + 0x00C

Description:

Initial Grab Address HI 32 bits

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b>	Initial GRAB ADDRESS Register High	
<i>RW</i>	This is the high 32 bits of the 64-bit addresses in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	

Address: section "DMA" base address + 0x010

Description:

Grab Address LOW 32 bits for the Green plane. Only used when grabbing in Planar mode.

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b>	GRAb ADDRess Register	
<i>RW</i>	This is the address in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	

Address: section "DMA" base address + 0x014

Description:

Green Grab Address HIGH 32 bits

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b> <i>RW</i>	GRAb ADDRess Register High	
	This is the high part of the 64-bit addresses in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any value

Address: section "DMA" base address + 0x018

Description:

Grab Address LOW 32 bits for the Red plane. Only used when grabbing in Planar mode.

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b>	GRAb ADDRess Register	
<i>RW</i>	This is the address in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any value

Address: section "DMA" base address + 0x01C

Description:

Red Grab Address HIGH 32 bits

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (31:0)</b> <i>RW</i>	GRAb ADDRess Register High	
	This is the high part of the 64-bit addresses in the host ram where the grab engine will start writing pixel data.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any value

## LINE PITCH

## Grab Line Pitch Register

Address: section "DMA" base address + 0x020

Description:

Grab Line Pitch Register

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (15:0)</b>	Grab LinePitch
<i>RW</i>	This is the line pitch when writing in ram. It is measured in bytes, not pixels.
Value at Reset:	0x0

Address: section "DMA" base address + 0x024

Description:

Host Line Size Register.

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved		VALUE(13:8)					
7	6	5	4	3	2	1	0
VALUE(7:0)							

<b>VALUE (13:0)</b> <i>RW</i>	Host Line size	
	<p>This is the line size when writing in host ram. It is measured in bytes, not pixels. If this register is higher than the actual data provided by the sensor, stray data will be written into host memory. If this register is lower than the data provided by the sensor, image data will be cropped at the end of the line.</p> <p>For backward compatibility, the value of 0 indicates that the FPGA should auto-compute the line sized based on data provided by the sensor interface.</p>	
Value at Reset:	0x0	
Possible Values:	0x1 - 0x3FFF	Written line size in host frame.
	0x0	Auto-compute line size from sensor data.



Address: section "DMA" base address + 0x028

31	30	29	28	27	26	25	24
Reserved					COLOR_SPACE(2:0)		
23	22	21	20	19	18	17	16
DUP_LAST_LINE	Reserved						
15	14	13	12	11	10	9	8
Reserved						REVERSE_Y	REVERSE_X
7	6	5	4	3	2	1	0
Reserved							

<b>COLOR_SPACE (2:0)</b>		
<i>RW</i>	Output color space used to transfer data to the DMA engine.	
Value at Reset:	0x0	
Possible Values:	0x0	Reserved for Mono sensor operation
	0x1	BGR32
	0x2	YUV 4:2:2 in full range
	0x3	Planar 8-bits
	0x4	Reserved for Y only with color sensor
	0x5	RAW color pixels (8bpp or 10bpp selected with MONO10 register)

<b>DUP_LAST_LINE</b>		
<i>RW</i>	This field is used to enable the duplicate last line feature. When turned on, the datapath will regenerate the last line when it receives the end of frame marker from the acquisition section.  The goal of this feature is to compensate for the lost line during the Bayer demosaic processing.	
Value at Reset:	0x0	
Possible Values:	0x0	normal processing
	0x1	last line is duplicated

<b>REVERSE_Y</b>	REVERSE Y	
<i>RW</i>	Reverse readout	
Value at Reset:	0x0	
Possible Values:	0x0	Bottom to top readout
	0x1	Top to bottom readout

<b>REVERSE_X</b>		
<i>RW</i>		
Value at Reset:	0x0	

## OUTPUT\_BUFFER

## Output line buffer

Address: section "DMA" base address + 0x038

31	30	29	28	27	26	25	24
MAX_LINE_BUFF_CNT(3:0)				Reserved		LINE_PTR_WIDTH(1:0)	
23	22	21	20	19	18	17	16
ADDRESS_BUS_WIDTH(3:0)				Reserved			
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved			PCIE_BACK_PRESSURE	Reserved			CLR_MAX_LINE_BUFF_CNT

<b>MAX_LINE_BUFF_CNT (3:0)</b> <i>RO</i>	Maximum line buffer count

<b>LINE_PTR_WIDTH (1:0)</b> <i>RW</i>	Line pointer size (in bits)	
	Set the line pointer size (in bits) 3 = 3 bits wide : The full memory buffer is divided in 8 sub line buffers	
Value at Reset:	0x2	
Possible Values:	0x0	Not valid
	0x1	The buffer is divided in 2 line buffers
	0x2	The buffer is divided in 4 line buffers
	0x3	The buffer is divided in 8 line buffers

<b>ADDRESS_BUS_WIDTH (3:0)</b> <i>RO</i>	Line buffer address size in bits	

<b>PCIE_BACK_PRESSURE</b> <i>RW2C</i>	PCIE link back pressure detected	
Value at Reset:	0x0	
Possible Values:	0x0	No effect
	0x1	Back pressure detected on PCIe

<b>CLR_MAX_LINE_BUFF_CNT</b> <i>WO/AutoClr</i>	Clear maximum line buffer count	
Possible Values:	0x0	No effect
	0x1	Clear the max count

## Section: ACQ

Address Range: [0x100 - 0x2D8]

### GRAB\_CTRL

### GRAB ConTRoL Register

Address: section "ACQ" base address + 0x000

Description:

Grag Control Register

31	30	29	28	27	26	25	24
RESET_GRAB	Reserved	GRAB_ROI2_EN	ABORT_GRAB	Reserved			
23	22	21	20	19	18	17	16
Reserved							TRIGGER_O VERLAP_BUFn
15	14	13	12	11	10	9	8
TRIGGER_O VERLAP	TRIGGER_ACT(2:0)			Reserved	TRIGGER_SRC(2:0)		
7	6	5	4	3	2	1	0
Reserved			GRAB_SS	Reserved		BUFFER_ID	GRAB_CMD

<b>RESET_GRAB</b> <i>RW</i>							
	This register resets the entire python_ctrl.						
Value at Reset:	0x0						
Possible Values:	0x0			Reset not active			
	0x1			Reset active			

<b>GRAB_ROI2_EN</b> <i>RW</i>							
	Enable the second ROI on the frame (KNS). This register is not DB. 1) No Y overlap is allowed 2) Xsize must be the same for the two ROI for the moment(DMA constraint). 3) EOF and SOF in between the two in-frame ROIs will be masked to the DMA. The DMA will see one frame, with the two ROI inside.						
Value at Reset:	0x0						
Possible Values:	0x0			Dual ROI disable			
	0x1			Dual ROI enable			

<b>ABORT_GRAB</b> <i>WO/AutoClr</i>	ABORT GRAB						
	This is the grab Abort signal, it will reset all the grab queued.						
Possible Values:	0x0			Normal operation			
	0x1			Reset Grab			

<b>TRIGGER_OVERLAP_BUF</b> <b>Fn</b> <i>RW</i>		
	NOT FULLY VALIDATED. DON'T USE. SET IT TO '0'.	
Value at Reset:	0x0	
Possible Values:	0x0	Buffer the trigger received during the dead window in PET mode and execute
	0x1	The trigger will be ignored during dead window in PET mode.

<b>TRIGGER_OVERLAP</b> <i>RW</i>		
	This field enables the trigger overlap. In this mode the exposure and the readout of the sensor can be done in parallel for higher framerates.	
Value at Reset:	0x1	
Possible Values:	0x0	Trigger Overlap disable
	0x1	Trigger Overlap enable (default)

<b>TRIGGER_ACT (2:0)</b> <i>RW</i>	<b>TRIGGER ACTivation</b>	
	<p>This is the trigger activation . This register selects the activation of the trigger when the trigger source is set to Hardware Snapshot mode .</p> <p>This register is Double Buffered, so the trigger activation may change from one grab command to another.</p> <p>In activation Level HI/LO with EXPOSURE_MODE register set to Timed, the camera will be triggered in continuous way if the level of the external trigger remains at the LEVEL programmed in this register.</p> <p>In activation Level HI/LO with EXPOSURE_MODE register set to Trigger Width, the Exposure time will be set by the level of the trigger input. The FPGA exposure regsiters will be ignored. The Dual and Triple slope are not supported in the mode.</p>	
Value at Reset:	0x0	
Possible Values:	0x0	Rising edge
	0x1	Falling edge
	0x2	Rising or Falling edge
	0x3	Level HI
	0x4	Level LO
	0x5	Internal Programmable Timer Trigger
	0x6	RESERVED
	0x7	RESERVED

<b>TRIGGER_SRC (2:0)</b> <i>RW</i>	<b>TRIGGER SouRCe</b>	
	<p>This is the trigger source. This register selects the source of the grab trigger. This register is Double Buffered, so the trigger source may change from one grab command to another.</p> <p>TRIGGER_SRC(1) may be seen as a TRIGGER_STATE by the software driver.</p>	
Value at Reset:	0x0	
Possible Values:	0x0	RESERVED
	0x1	Immediate mode (Continuous)
	0x2	Hardware Snapshot mode
	0x3	Software Snapshot mode
	0x4	SFNC mode (auto trig)

<b>GRAB_SS</b> <i>WO/AutoClr</i>	GRAB Software Snapshot	
	This is the software snapshot register when the trigger source selected is Software Snapshot mode.	
Possible Values:	0x0	Idle
	0x1	Start a grab

<b>BUFFER_ID</b> <i>RW</i>		
	This is the ID of the DMA parameters to associate with this grab command.	
Value at Reset:	0x0	

<b>GRAB_CMD</b> <i>WO/AutoClr</i>	GRAB CoMmanD	
	<p>This is MIL GRAB command.</p> <p>When the trigger source is set to Immediate mode(Continuous), an exposure sequence will be automatically executed. When the trigger source is set to Software Snapshot mode or Hardware Snapshot mode, GRAB_CMD will act as an ARM.</p> <p>The GRAB_CMD will take around 13 clks to record the grab parameters to the SPI fifo. The GRAB_CMD_DONE register may be read to avoid fifo corruption before sending another Grab command instruction.</p>	
Possible Values:	0x0	Idle
	0x1	Start grab command

## GRAB\_STAT

Address: section "ACQ" base address + 0x008

31	30	29	28	27	26	25	24
GRAB_CMD_DONE	ABORT_PET	ABORT_DELA I	ABORT_DONE E	Reserved		TRIGGER_RDY	
23	22	21	20	19	18	17	16
Reserved	ABORT_MNGR_STAT(2:0)			TRIG_MNGR_STAT(3:0)			
15	14	13	12	11	10	9	8
Reserved	TIMER_MNGR_STAT(2:0)			GRAB_MNGR_STAT(3:0)			
7	6	5	4	3	2	1	0
Reserved	GRAB_FOT	GRAB_READ OUT	GRAB_EXPO SURE	Reserved	GRAB_PEND ING	GRAB_ACTI VE	GRAB_IDLE

<b>GRAB_CMD_DONE</b> <i>RO</i>	GRAB CoMmanD DONE						
	The GRAB_CMD will take around 13 clks to reccord the grab parametters to the SPI fifo. This register may be readed to avoid fifo corruption before sending another Grab command instruction.						
Possible Values:	0x0		Grab Command in process				
	0x1		Grab command idle				

<b>ABORT_PET</b> <i>RO</i>	ABORT during PET						
	This is the ABORT PET flag. It is set to '1' when an abort is detected in the PETengin phase of the trigger. It is set back to '0' when ABORT_DONE is set to '1'.						
Possible Values:	0x0		Abort in PET Phase idle				
	0x1		Abort in PET Phase active				

<b>ABORT_DELAI</b> <i>RO</i>							
	This is the ABORT DELAI flag. It is set to '1' when an abort is detected in the delai phase of the trigger. It is set back to '0' when ABORT_DONE is set to '1'.						
Possible Values:	0x0		Abort in Delai Phase idle				
	0x1		Abort in Delai Phase active				

<b>ABORT_DONE</b> <i>RO</i>	ABORT is DONE						
	This read-only field indicates the RESET_GRAB command status. If 0, an abort sequence is executing.						
Possible Values:	0x0		Abort sequence not finished yet				
	0x1		Abort DONE, or not started (reset value)				

<b>TRIGGER_RDY</b> <i>RO</i>							

<b>ABORT_MNGR_STAT (2:0)</b> <i>RO</i>							
	DEBUG ABORT MANAGER STATE MACHINE						

<b>TRIG_MNGR_STAT (3:0)</b>	
<i>RO</i>	DEBUG TRIGGER MANAGER STATE MACHINE

<b>TIMER_MNGR_STAT (2:0)</b>	
<i>RO</i>	DEBUG TIMER MANAGER STATE MACHINE

<b>GRAB_MNGR_STAT (3:0)</b>	
<i>RO</i>	DEBUG GRAB MANAGER STATE MACHINE

<b>GRAB_FOT</b>	GRAB Field Overhead Time	
<i>RO</i>	This is the sensor FOT (Field Overhead Time).	
Possible Values:	0x0	Not in FOT
	0x1	In FOT

<b>GRAB_READOUT</b>		
<i>RO</i>	This is the sensor readout status. It goes to '1' on the SO_FOT and goes to '0' when the datapath decoder decodes the end of frame.	

<b>GRAB_EXPOSURE</b>		
<i>RO</i>	This is the sensor integration status	
Possible Values:	0x0	Idle
	0x1	Integrating

<b>GRAB_PENDING</b>		
<i>RO</i>	Grab pending status. When this register is set to one, a second grab command is queued in the fpga.	
Possible Values:	0x0	No grab pending
	0x1	Grab pending

<b>GRAB_ACTIVE</b>		
<i>RO</i>	Grab active status. When this register is set to one, at least one grab command has been received.	

<b>GRAB_IDLE</b>		
<i>RO</i>	GRAB IDLE status. When this register is set to '1', The grab engin is in idle state.	
Possible Values:	0x0	Grab is in process
	0x1	Grab is Idle

## READOUT\_CFG1

Address: section "ACQ" base address + 0x010

31	30	29	28	27	26	25	24
Reserved				FOT_LENGTH_LINE(4:0)			
23	22	21	20	19	18	17	16
Reserved							EO_FOT_SEL
15	14	13	12	11	10	9	8
FOT_LENGTH(15:8)							
7	6	5	4	3	2	1	0
FOT_LENGTH(7:0)							

<b>FOT_LENGTH_LINE (4:0)</b>	Frame Overhead Time LENGTH LINE	
<i>RW</i>	This is the length of the Frame Overhead Time in line_time unit.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 16 bit value

<b>EO_FOT_SEL</b>		
<i>RW</i>	This selector selects who will generate the EO_FOT in the controller. When select 0, the EO_FOT is the falling edge detection of the monitor FOT. When select 1, the EO_FOT will be generated inside the controller with programmed FOT_LENGTH.	
Value at Reset:	0x0	

<b>FOT_LENGTH (15:0)</b>	Frame Overhead Time LENGTH	
<i>RW</i>	This is the length of the Frame Overhead Time in sys clock. This register is calculated from FOT_LENGTH_LINE and LINE_TIME. It is used when EO_FOT_SEL is set to 1.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 16 bit value



**READOUT\_CFG\_FRAME\_LINE**

Address: section "ACQ" base address + 0x014

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
DUMMY_LINES(7:0)							
15	14	13	12	11	10	9	8
Reserved				CURR_FRAME_LINES(12:8)			
7	6	5	4	3	2	1	0
CURR_FRAME_LINES(7:0)							

<b>DUMMY_LINES (7:0)</b>	
<i>RW</i>	Number of lines to add in the readout (to debug XGS)
Value at Reset:	0x0

<b>CURR_FRAME_LINES (12:0)</b>	
<i>RO</i>	Current number of lines in the readout calculated by the XGS controller (without FOT).

## READOUT\_CFG2

---

Address: section "ACQ" base address + 0x018

31	30	29	28	27	26	25	24
Reserved			READOUT_LENGTH(28:24)				
23	22	21	20	19	18	17	16
READOUT_LENGTH(23:16)							
15	14	13	12	11	10	9	8
READOUT_LENGTH(15:8)							
7	6	5	4	3	2	1	0
READOUT_LENGTH(7:0)							

<b>READOUT_LENGTH (28:0)</b> <i>RO</i>		
	This is the readout length register. This register is calculated by the FPGA in the IRIS4 projectand gives the readout lenght without the FOT. This register will depend on the ROI, and Subsampling mode. It is used in the PET engin calculations. In Sys_Clock domain.	
Possible Values:	Any Value	Any 24 bits value

## READOUT\_CFG3

---

Address: section "ACQ" base address + 0x020

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
LINE_TIME(15:8)							
7	6	5	4	3	2	1	0
LINE_TIME(7:0)							

<b>LINE_TIME (15:0)</b>	<b>LINE TIME</b>	
<i>RW</i>	This register definel the length of one line of the sensor. It includes blanking and valid time . Line Time Unit is SENSOR Clock Cycles	
Value at Reset:	0x16e	
Possible Values:	Any Value	between 1 and 255

## READOUT\_CFG4

Address: section "ACQ" base address + 0x024

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							KEEP_OUT_TRIG_ENA
15	14	13	12	11	10	9	8
KEEP_OUT_TRIG_START(15:8)							
7	6	5	4	3	2	1	0
KEEP_OUT_TRIG_START(7:0)							

<b>KEEP_OUT_TRIG_ENA</b>	
<i>RW</i>	KEEPOUT zone TRIGger ENable. When this register is enabled, then the trigger output will be synchronized with the line_int(monitor2) signal from the XGS sensor. To configure this keep out zone, use register READOUT_CFG4.
Value at Reset:	0x0

<b>KEEP_OUT_TRIG_START (15:0)</b>	
<i>RW</i>	During the line time, this register indicates the start of the trigger keep-out zone.
Value at Reset:	0xffff

## EXP\_CTRL1

Address: section "ACQ" base address + 0x028

31	30	29	28	27	26	25	24
Reserved			EXPOSURE_lev_MODE	EXPOSURE_SS(27:24)			
23	22	21	20	19	18	17	16
EXPOSURE_SS(23:16)							
15	14	13	12	11	10	9	8
EXPOSURE_SS(15:8)							
7	6	5	4	3	2	1	0
EXPOSURE_SS(7:0)							

<b>EXPOSURE_LEV_MODE</b>	EXPOSURE LEVel MODE	
<i>RW</i>	This is the exposure level mode selector. When selecting the TRIGGER ACTIVATION = Level Mode, this register selects the exposure method used. When this register is set to '0' the timed mode is selected; Register EXPOSURE_SS is used for the exposure time. When this register is set to '1' the external trigger width is used for the exposure time.	
Value at Reset:	0x0	
Possible Values:	0x0	Timed Mode
	0x1	Trigger Width

<b>EXPOSURE_SS (27:0)</b>	EXPOSURE Single Slope	
<i>RW</i>	This is the total exposure time in single/dual/triple slope mode.	
	This register is double buffered.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 28 bits value

## EXP\_CTRL2

Address: section "ACQ" base address + 0x030

31	30	29	28	27	26	25	24
Reserved				EXPOSURE_DS(27:24)			
23	22	21	20	19	18	17	16
EXPOSURE_DS(23:16)							
15	14	13	12	11	10	9	8
EXPOSURE_DS(15:8)							
7	6	5	4	3	2	1	0
EXPOSURE_DS(7:0)							

<b>EXPOSURE_DS (27:0)</b>	<b>EXPOSURE Dual</b>	
<i>RW</i>	This is a new 3d profiler feature We will be able to program upto 3 diferent exposure times (using unused multiSlope registers) Then we will be able to sequence those exposure times . Selection is made with input exposure_select.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 28 bits value

## EXP\_CTRL3

Address: section "ACQ" base address + 0x038

31	30	29	28	27	26	25	24
Reserved				EXPOSURE_TS(27:24)			
23	22	21	20	19	18	17	16
EXPOSURE_TS(23:16)							
15	14	13	12	11	10	9	8
EXPOSURE_TS(15:8)							
7	6	5	4	3	2	1	0
EXPOSURE_TS(7:0)							

<b>EXPOSURE_TS (27:0)</b> <i>RW</i>	EXPOSURE Tripple	
	This is a new 3d profiler feature We will be able to program upto 3 diferent exposure times (using unused multiSlope registers) Then we will be able to sequence those exposure times . Selection is made with input exposure_select.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 28 bits value

## TRIGGER\_DELAY

Address: section "ACQ" base address + 0x040

31	30	29	28	27	26	25	24
Reserved				TRIGGER_DELAY(27:24)			
23	22	21	20	19	18	17	16
TRIGGER_DELAY(23:16)							
15	14	13	12	11	10	9	8
TRIGGER_DELAY(15:8)							
7	6	5	4	3	2	1	0
TRIGGER_DELAY(7:0)							

<b>TRIGGER_DELAY (27:0)</b> <i>RW</i>	<b>TRIGGER_DELAY</b>	
	This is the trigger delay. This trigger delay can be applied to HW(Only edge mode), SW and Continuous mode.	
	In HW level mode, the trigger cannot be delayed, since the level time represents the exposure time.	
	This register is double buffered	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 28 bits value



## STROBE\_CTRL1

Address: section "ACQ" base address + 0x048

31	30	29	28	27	26	25	24
STROBE_E	Reserved		STROBE_PO L	STROBE_START(27:24)			
23	22	21	20	19	18	17	16
STROBE_START(23:16)							
15	14	13	12	11	10	9	8
STROBE_START(15:8)							
7	6	5	4	3	2	1	0
STROBE_START(7:0)							

<b>STROBE_E</b> <i>RW</i>	STROBE Enable	
	This register enables the strobe logic.	
	For Nexis 3 systems, to enable STROBE_A signal, STROBE_E and STROBE_A_EN must be enabled. For Nexis 3 systems, to enable STROBE_B signal, STROBE_E and STROBE_B_EN must be enabled.	
	For Nexis 3 systems, STROBE_A and STROBE B can be activated at the same time, in this case the two strobes will be the same as they share the same programming.	
	This register is double buffered	
Value at Reset:	0x0	
Possible Values:	0x0	Strobe disabled
	0x1	Strobe enabled

<b>STROBE_POL</b> <i>RW</i>	STROBE POLarity	
	This is the strobe polarity at the pin of the FPGA only for GTR systems.	
	For NEXIS3 systems use register ANPUT\IO\IO_OUT_POL\OUTx_POL	
	This register is not double buffered.	
Value at Reset:	0x0	
Possible Values:	0x0	Active high strobe
	0x1	Active low strobe

<b>STROBE_START (27:0)</b> <i>RW</i>	STROBE START	
	This is the strobe start location. This location depends on the Strobe Mode used.	
	In Strobe Mode='0', the start of the strobe is situated during the exposure time. In Strobe Mode='1', the start of the strobe is situated during the trigger delay.	
	This register is double buffered	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 28 bits value

## STROBE\_CTRL2

Address: section "ACQ" base address + 0x050

31	30	29	28	27	26	25	24
STROBE_MO DE	Reserved	STROBE_B_ EN	STROBE_A_ EN	STROBE_END(27:24)			
23	22	21	20	19	18	17	16
STROBE_END(23:16)							
15	14	13	12	11	10	9	8
STROBE_END(15:8)							
7	6	5	4	3	2	1	0
STROBE_END(7:0)							

<b>STROBE_MODE</b>	<b>STROBE MODE</b>	
<i>RW</i>	<p>This register selects the location of the Strobe Start.</p> <p>When this register is set to 0, the STROBE_START register is located during the exposure timer.</p> <p>When this register is set to 1, the STROBE_START register is located during the trigger delay timer.</p> <p>In HW level mode the strobe mode must be set to STROBE MODE=0 since the trigger cannot be delayed.</p> <p>This register is double buffered</p>	
Value at Reset:	0x0	
Possible Values:	0x0	Strobe start during exposure
	0x1	Strobe start during trigger delay

<b>STROBE_B_EN</b>	<b>STROBE phase B ENable</b>	
<i>RW</i>	<p>This field enables the generation of STROBE_B signal, for a NEXIS 3 system.</p> <p>This register is double buffered to support back2back mode in nexis systems.</p>	
Value at Reset:	0x0	
Possible Values:	0x0	Enable Strobe B
	0x1	Disable Strobe B

<b>STROBE_A_EN</b>	<b>STROBE phase A ENable</b>	
<i>RW</i>	<p>This field enables the generation of STROBE_A signal(Default strobe), for a NEXIS 3 system.</p> <p>This register is double buffered to support back2back mode in nexis systems.</p>	
Value at Reset:	0x1	
Possible Values:	0x0	Enable Strobe A (default strobe)
	0x1	Disable Strobe A

<b>STROBE_END (27:0)</b>	<b>STROBE END</b>	
<i>RW</i>	<p>This is the strobe end location. This location does not depend on the Strobe Mode used.</p> <p>This register is double buffered</p>	
Value at Reset:	0xffffffff	
Possible Values:	Any Value	Any 28 bits value



Address: section "ACQ" base address + 0x058

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							SER_RWn
15	14	13	12	11	10	9	8
Reserved						SER_CMD(1:0)	
7	6	5	4	3	2	1	0
Reserved			SER_RF_SS	Reserved			SER_WF_SS

<b>SER_RWn</b>	SERial Read/Writen	
<i>RW</i>	This register configures the type of the serial access to the CMOS sensor	
Value at Reset:	0x1	
Possible Values:	0x0	Write access
	0x1	Read access

<b>SER_CMD (1:0)</b>	SERial CoMmand	
<i>RW</i>	This is the type of command sent to the serial fifo.	
	To access the Sensor, write SER_WF_SS=1 with SER_CMD=0x0, with the parametters: SER_WRn, SER_ADD(8:0) and SER_DAT(15:0).	
	To insert a timer between fifo commands, write SER_WF_SS=1 with SER_CMD=0x1, with the parameter: SER_DAT(15:0). The value of the timer inserted is calculated with the following formula: $\text{Timer} = \text{SER\_DAT}(15:0) * 1024 * \text{SYS\_PERIOD}$ , SYS_PERIOD is 1/62.5mhz. The granularity of the timer is 16.384us	
	To insert a Stop separator command, write SER_WF_SS=1 with SER_CMD=0x3. When the read logic encounter this command, it will stop read from the fifo until a new SER_RF_SS is received.	
Value at Reset:	0x0	
Possible Values:	0x0	CMOS sensor access COMMAND
	0x1	Insert timer COMMAND
	0x2	STOP separator COMMAND
	0x3	RESERVED

<b>SER_RF_SS</b>	SERial Read Fifo SnapShot	
<i>WO/AutoClr</i>	This is the read fifo snapshot. When the read fifo logic receives this snapshot, it will read all the fifo comands until a STOP separator command is read or Empty fifo is detected.	
Possible Values:	0x0	Idle
	0x1	Start Read FIFO

<b>SER_WF_SS</b>	SERial Write Fifo SnapShot	
<i>WO/AutoClr</i>	When the system toggle this bit, the address, data and command are wrote to the command fifo. This fifo can contain the entire dcf, so the driver will not need to pool the status bit. This is a auto reset bit register, so after the driver write one, the bit will be auto reset to 0. To start the FIFO read logic write '1' to regsiter SER_RF_SS.	
Possible Values:	0x0	Idle
	0x1	Write a command to the FIFO

Address: section "ACQ" base address + 0x060

31	30	29	28	27	26	25	24
SER_DAT(15:8)							
23	22	21	20	19	18	17	16
SER_DAT(7:0)							
15	14	13	12	11	10	9	8
Reserved	SER_ADD(14:8)						
7	6	5	4	3	2	1	0
SER_ADD(7:0)							

<b>SER_DAT (15:0)</b>	SERial interface DATA	
<i>RW</i>	This is the write data to be send to the CMOS sensor by the serial interface, or the config data to a TIMER command or to a POWER sequence command. See register SER_CMD.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 16 bits value

<b>SER_ADD (14:0)</b>	SERial interface ADDRESS	
<i>RW</i>	This is the read/write address of the register in the CMOS sensor.	
Value at Reset:	0x0	
Possible Values:	Any Value	Any 9 bits value

Address: section "ACQ" base address + 0x068

31	30	29	28	27	26	25	24
Reserved							SER_FIFO_EMPTY
23	22	21	20	19	18	17	16
Reserved							SER_BUSY
15	14	13	12	11	10	9	8
SER_DAT_R(15:8)							
7	6	5	4	3	2	1	0
SER_DAT_R(7:0)							

<b>SER_FIFO_EMPTY</b>	SERial FIFO EMPTY	
<i>RO</i>	This is the EMPTY flag of the xilinx fifo, when '1' there are no pending operations in the fifo.	

<b>SER_BUSY</b>	SERial BUSY	
<i>RO</i>	This is the BUSY status of the FIFO read logic. The flag will be set to '1' when the SER_RF_SS is set to '1'. It will be reseted to '0' when the read logic will decode a STOP separator command or when the FIFO will be empty.	
Possible Values:	0x0	FIFO read logic is idle
	0x1	FIFO read logic is running

<b>SER_DAT_R (15:0)</b>	SERial interface DATa Read	
<i>RO</i>	This is the data read from CMOS sensor.	
Possible Values:	Any Value	Any 16 bits value

Address: section "ACQ" base address + 0x090

31	30	29	28	27	26	25	24
Reserved							SENSOR_REFRESH_TEMP
23	22	21	20	19	18	17	16
Reserved							SENSOR_POWERDOWN
15	14	13	12	11	10	9	8
Reserved							SENSOR_COLOR
7	6	5	4	3	2	1	0
Reserved			SENSOR_REGISTER_UPDATE	Reserved		SENSOR_REGISTER_SETN	SENSOR_POWERUP

<b>SENSOR_REFRESH_TEMP</b> <i>WO/AutoClr</i>	SENSOR REFRESH TEMPerature						
	This register starts a sensor temperature read on the serial interface of the Python sensor. The temperature value readed will be available on field SENSOR_TEMP when field SENSOR_TEMP_VALID is set to '1'.  [Pas utilise pour le moment dans IRIS4]						
Possible Values:	0x0	Idle					
	0x1	Starts a Temperature read on Python SPI interface					

<b>SENSOR_POWERDOWN</b> <i>WO/AutoClr</i>							
	After a PowerUp sequence(SESOR_POWERUP_DONE=1), successfull or not, this register can reset the clock oscillator and enable the reset to the sensor.  This power down don't do power sequencing.						

<b>SENSOR_COLOR</b> <i>RW</i>	SENSOR COLOR						
	This register informs the datapath logic that a color sensor is used. This information is needed for the remapper logic.						
Value at Reset:	0x0						
Possible Values:	0x0	Monochrome sensor					
	0x1	Color sensor					

<b>SENSOR_REG_UPDATE</b> <i>RW</i>	SENSOR REGister UPDATE						
	By setting this bit to 1, the SENSOR CONTROLLER WILL UPDATE the programed CMOS sensor registers at the beginning of each grab.						
Value at Reset:	0x1						
Possible Values:	0x0	Do not update registers					
	0x1	Update registers					

<b>SENSOR_RESETN</b>	SENSOR RESET Not	
<i>RW</i>	After a successfull PowerUP sequence, writing this field to '0' reset the Python CMOS sensor.	
Value at Reset:	0x1	
Possible Values:	0x0	Reset the sensor after a successfull powerUP
	0x1	Nothing

<b>SENSOR_POWERUP</b>		
<i>WO/AutoClr</i>	This register Enables the clk oscillator and removes the reset from the sensor.	
Possible Values:	0x0	idle
	0x1	Start the power sequence



Address: section "ACQ" base address + 0x098

31	30	29	28	27	26	25	24
SENSOR_TEMP(7:0)							
23	22	21	20	19	18	17	16
SENSOR_TEMP_VALID	Reserved						SENSOR_POWERDOWN
15	14	13	12	11	10	9	8
Reserved		SENSOR_RESETN	SENSOR_OSC_EN	Reserved		SENSOR_VCC_PG	
7	6	5	4	3	2	1	0
Reserved						SENSOR_POWERUP_STATUS	SENSOR_POWERUP_DONE

<b>SENSOR_TEMP (7:0)</b> <i>RO</i>							
	This register gives the Temperature of the Python sensor after a SENSOR_REFRESH_TEMP snapshot. The field SENSOR_TEMP_VALID indicates when the SENSOR_TEMP value is valid.  [Pas utilise pour le moment dans IRIS4]						
Possible Values:	Any Value						

<b>SENSOR_TEMP_VALID</b> <i>RO</i>	SENSOR TEMPerature VALID						
	This field indicates that the field SENSOR_TEMP have valid temperature after a SENSOR_REFRESH_TEMP snapshot.  [Pas utilise pour le moment dans IRIS4]						
Possible Values:	0x0	SENSOR_TEMPERATURE register is not valid					
	0x1	SENSOR_TEMPERATURE register is valid					

<b>SENSOR_POWERDOWN</b> <i>RO</i>							
	This field indicates that the sensor is in powerdown state.						
Possible Values:	0x0	Not in powerdown state					
	0x1	Powerdown					

<b>SENSOR_RESETN</b> <i>RO</i>	SENSOR RESET N						
	This is the sensor RESETN status.						
Possible Values:	0x0	In reset state					
	0x1	Not in reset					

<b>SENSOR_OSC_EN</b> <i>RO</i>	SENSOR OSCILLATOR ENable						
	This is the sensor oscillator enable status.						
Possible Values:	0x0	Disable					
	0x1	Enable					

<b>SENSOR_VCC_PG</b> <i>RO</i>	SENSOR supply VCC Power Good	
	This is the VCC Power Good status (generated by external HW).	
	[TO BE DELETED, waiting for ON SEMI INFORMATION]	
Possible Values:	0x0	Disable
	0x1	Enable

<b>SENSOR_POWERUP_STAT</b> <i>RO</i>		
	When a powerup sequence is finish, this register indicates the result of the POWERUP sequence.	
Possible Values:	0x0	PowerUp sequence fail
	0x1	PowerUp sequence success

<b>SENSOR_POWERUP_DONE</b> <i>RO</i>		
	This register indicates that the POWERUP sequence is finish. Read register <b>SENSOR_POWERUP_STAT</b> to see the result.	
Possible Values:	0x0	PowerUp sequence not started
	0x1	PowerUp sequence finish

## SENSOR SUBSAMPLING

Address: section "ACQ" base address + 0x09C

Description:

SENSOR ADDRESS

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved1(11:4)							
7	6	5	4	3	2	1	0
reserved1(3:0)				ACTIVE_SUBSAMPLING_Y	reserved0	M_SUBSAMPLING_Y	SUBSAMPLING_X

<b>reserved1 (11:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>ACTIVE_SUBSAMPLING_Y</b>	
<i>RW</i>	Subsampling (Row) for ROI Configurations
Value at Reset:	0x0
Possible Values:	0x0
	0x1

<b>reserved0</b>	
<i>STATIC</i>	
Value at Reset:	0x0
Possible Values:	0x0 Idle
	0x1 Enable

<b>M_SUBSAMPLING_Y</b>	
<i>RW</i>	Subsampling (Row) for M Region
Value at Reset:	0x0
Possible Values:	0x0
	0x1

<b>SUBSAMPLING_X</b>	
<i>RW</i>	Readout in Column Subsampling Mode
Value at Reset:	0x0
Possible Values:	0x0
	0x1

## SENSOR\_GAIN\_ANA

Address: section "ACQ" base address + 0x0A4

Description:

SENSOR ADDRESS 204 DEC

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved1(4:0)					ANALOG_GAIN(2:0)		
7	6	5	4	3	2	1	0
reserved0(7:0)							

<b>reserved1 (4:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>ANALOG_GAIN (2:0)</b>	
<i>RW</i>	
Value at Reset:	0x1
Possible Values:	0x1      1x
	0x3      2x
	0x7      4x

<b>reserved0 (7:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

SENSOR ROI\_Y\_START

Address: section "ACQ" base address + 0x0A8

Description:  
SENSOR ADDRESS

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(5:0)						Y_START(9:8)	
7	6	5	4	3	2	1	0
Y_START(7:0)							

reserved (5:0) STATIC	
Value at Reset:	0x0

Y_START (9:0) RW	Y START
	Y Start in Kernel size (Kernel is 4 lines)
Value at Reset:	0x0

SENSOR ROI\_Y\_SIZE

Address: section "ACQ" base address + 0x0AC

Description:  
SENSOR ADDRESS

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(5:0)						Y_SIZE(9:8)	
7	6	5	4	3	2	1	0
Y_SIZE(7:0)							

reserved (5:0)	
STATIC	
Value at Reset:	0x0

Y_SIZE (9:0)	Y SIZE
RW	Y SIZE in Kernel size (Kernel is 4 lines)
Value at Reset:	0x302

SENSOR ROI2\_Y\_START

Address: section "ACQ" base address + 0x0B0

Description:  
SENSOR ADDRESS

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(5:0)						Y_START(9:8)	
7	6	5	4	3	2	1	0
Y_START(7:0)							

reserved (5:0) STATIC	
Value at Reset:	0x0

Y_START (9:0) RW	Y START
	Y Start in Kernel size (Kernel is 4 lines)
Value at Reset:	0x0

SENSOR ROI2\_Y\_SIZE

Address: section "ACQ" base address + 0x0B4

Description:  
SENSOR ADDRESS

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(5:0)						Y_SIZE(9:8)	
7	6	5	4	3	2	1	0
Y_SIZE(7:0)							

reserved (5:0) STATIC	
Value at Reset:	0x0

Y_SIZE (9:0) RW	Y SIZE
	Y SIZE in Kernel size (Kernel is 4 lines)
Value at Reset:	0x302



## SENSOR M LINES

Address: section "ACQ" base address + 0x0B8

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
M_LINES_DISPLAY	M_SUPPRESSED(4:0)					M_LINES_SENSOR(9:8)	
7	6	5	4	3	2	1	0
M_LINES_SENSOR(7:0)							

<b>M_LINES_DISPLAY</b>	
<i>RW</i>	When setting to 1, the Y_SIZE will have the Black lines included and the first_lines_mask_cnt will be set to 1, to remove only the embedded data
Value at Reset:	0x0

<b>M_SUPPRESSED (4:0)</b>	
<i>RW</i>	Suppress the Readout of Initial Lines in the M Region
Value at Reset:	0x0

<b>M_LINES_SENSOR (9:0)</b>	
<i>RW</i>	Number of Lines to Readout from M Region in Context 0 Unit is #lines  Total number of Black lines = M_LINES Total number of Black lines transfered as valid Black lines= M_LINES-M_SUPPRESSED
Value at Reset:	0x8

SENSOR DP GR

Address: section "ACQ" base address + 0x0BC

Description:

Sensor Analog data pedestal for Gr pixels (Black offset)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(3:0)				DP_OFFSET_GR(11:8)			
7	6	5	4	3	2	1	0
DP_OFFSET_GR(7:0)							

reserved (3:0)	
STATIC	
Value at Reset:	0x0

DP_OFFSET_GR (11:0)	
RW	Sensor Analog data pedestal for Gr pixels (Black offset)
Value at Reset:	0x100

## SENSOR DP\_GB

Address: section "ACQ" base address + 0x0C0

Description:

Sensor Analog data pedestal for Gb pixels (Black offset)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(3:0)				DP_OFFSET_GB(11:8)			
7	6	5	4	3	2	1	0
DP_OFFSET_GB(7:0)							

<b>reserved (3:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>DP_OFFSET_GB (11:0)</b>	
<i>RW</i>	Sensor Analog data pedestal for Gb pixels (Black offset)
Value at Reset:	0x100

## SENSOR DP R

Address: section "ACQ" base address + 0x0C4

Description:

Sensor Analog data pedestal for R pixels (Black offset)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(3:0)				DP_OFFSET_R(11:8)			
7	6	5	4	3	2	1	0
DP_OFFSET_R(7:0)							

<b>reserved (3:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>DP_OFFSET_R (11:0)</b>	
<i>RW</i>	Sensor Analog data pedestal for R pixels (Black offset)
Value at Reset:	0x100

## SENSOR DP B

Address: section "ACQ" base address + 0x0C8

Description:

Sensor Analog data pedestal for B pixels (Black offset)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
reserved(3:0)				DP_OFFSET_B(11:8)			
7	6	5	4	3	2	1	0
DP_OFFSET_B(7:0)							

<b>reserved (3:0)</b>	
<i>STATIC</i>	
Value at Reset:	0x0

<b>DP_OFFSET_B (11:0)</b>	
<i>RW</i>	Sensor Analog data pedestal for B pixels (Black offset)
Value at Reset:	0x100

## DEBUG PINS

Address: section "ACQ" base address + 0x0E0

31	30	29	28	27	26	25	24
Reserved				Debug3_sel(4:0)			
23	22	21	20	19	18	17	16
Reserved				Debug2_sel(4:0)			
15	14	13	12	11	10	9	8
Reserved				Debug1_sel(4:0)			
7	6	5	4	3	2	1	0
Reserved				Debug0_sel(4:0)			

<b>Debug3_sel (4:0)</b> <i>RW</i>	
	<pre> debug_vector(0x0) &lt;= python_monitor0; debug_vector(0x1) &lt;= python_monitor1; debug_vector(0x2) &lt;= grab_mgr_trig_rdy; debug_vector(0x3) &lt;= curr_trig0; debug_vector(0x4) &lt;= strobe; debug_vector(0x5) &lt;= python_exposure; debug_vector(0x6) &lt;= FOT; debug_vector(0x7) &lt;= readout; debug_vector(0x8) &lt;= readout_stateD; debug_vector(0x9) &lt;= ext_trig; debug_vector(0xa) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_CMD; debug_vector(0xb) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_SS; debug_vector(0xc) &lt;= grab_mgr_trig; debug_vector(0xd) &lt;= grab_mgr_trig_rdy; debug_vector(0xe) &lt;= grab_pending; debug_vector(0xf) &lt;= grab_active; debug_vector(0x10) &lt;= DEC_DATA_EN; debug_vector(0x11) &lt;= DEC_SOL; debug_vector(0x12) &lt;= DEC_SOF; debug_vector(0x13) &lt;= DEC_EOL; debug_vector(0x14) &lt;= DEC_EOF; debug_vector(0x15) &lt;= DEC_CRC; debug_vector(0x16) &lt;= DEC_TRAIN; debug_vector(0x17) &lt;= fpnprnu_corr_sof; debug_vector(0x18) &lt;= fpnprnu_corr_sol; debug_vector(0x19) &lt;= fpnprnu_corr_data_val; debug_vector(0x1a) &lt;= fpnprnu_corr_eol; debug_vector(0x1b) &lt;= fpnprnu_corr_eof; debug_vector(0x1c) &lt;= python_ssn_int; debug_vector(0x1d) &lt;= debug_lvds(0); debug_vector(0x1e) &lt;= debug_lvds(1); debug_vector(0x1f) &lt;= 'Z'; </pre>
Value at Reset:	0x1f

<b>Debug2_sel (4:0)</b> <i>RW</i>	<pre> debug_vector(0x0) &lt;= python_monitor0; debug_vector(0x1) &lt;= python_monitor1; debug_vector(0x2) &lt;= grab_mngr_trig_rdy; debug_vector(0x3) &lt;= curr_trig0; debug_vector(0x4) &lt;= strobe; debug_vector(0x5) &lt;= python_exposure; debug_vector(0x6) &lt;= FOT; debug_vector(0x7) &lt;= readout; debug_vector(0x8) &lt;= readout_stateD; debug_vector(0x9) &lt;= ext_trig; debug_vector(0xa) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_CMD; debug_vector(0xb) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_SS; debug_vector(0xc) &lt;= grab_mngr_trig; debug_vector(0xd) &lt;= grab_mngr_trig_rdy; debug_vector(0xe) &lt;= grab_pending; debug_vector(0xf) &lt;= grab_active; debug_vector(0x10) &lt;= DEC_DATA_EN; debug_vector(0x11) &lt;= DEC_SOL; debug_vector(0x12) &lt;= DEC_SOF; debug_vector(0x13) &lt;= DEC_EOL; debug_vector(0x14) &lt;= DEC_EOF; debug_vector(0x15) &lt;= DEC_CRC; debug_vector(0x16) &lt;= DEC_TRAIN; debug_vector(0x17) &lt;= fpnprnu_corr_sof; debug_vector(0x18) &lt;= fpnprnu_corr_sol; debug_vector(0x19) &lt;= fpnprnu_corr_data_val; debug_vector(0x1a) &lt;= fpnprnu_corr_eol; debug_vector(0x1b) &lt;= fpnprnu_corr_eof; debug_vector(0x1c) &lt;= python_ssn_int; debug_vector(0x1d) &lt;= debug_lvds(0); debug_vector(0x1e) &lt;= debug_lvds(1); debug_vector(0x1f) &lt;= 'Z'; </pre>
Value at Reset:	0x1f

<b>Debug1_sel (4:0)</b> <i>RW</i>	<pre> debug_vector(0x0) &lt;= python_monitor0; debug_vector(0x1) &lt;= python_monitor1; debug_vector(0x2) &lt;= grab_mngr_trig_rdy; debug_vector(0x3) &lt;= curr_trig0; debug_vector(0x4) &lt;= strobe; debug_vector(0x5) &lt;= python_exposure; debug_vector(0x6) &lt;= FOT; debug_vector(0x7) &lt;= readout; debug_vector(0x8) &lt;= readout_stateD; debug_vector(0x9) &lt;= ext_trig; debug_vector(0xa) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_CMD; debug_vector(0xb) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_SS; debug_vector(0xc) &lt;= grab_mngr_trig; debug_vector(0xd) &lt;= grab_mngr_trig_rdy; debug_vector(0xe) &lt;= grab_pending; debug_vector(0xf) &lt;= grab_active; debug_vector(0x10) &lt;= DEC_DATA_EN; debug_vector(0x11) &lt;= DEC_SOL; debug_vector(0x12) &lt;= DEC_SOF; debug_vector(0x13) &lt;= DEC_EOL; debug_vector(0x14) &lt;= DEC_EOF; debug_vector(0x15) &lt;= DEC_CRC; debug_vector(0x16) &lt;= DEC_TRAIN; debug_vector(0x17) &lt;= fpnprnu_corr_sof; debug_vector(0x18) &lt;= fpnprnu_corr_sol; debug_vector(0x19) &lt;= fpnprnu_corr_data_val; debug_vector(0x1a) &lt;= fpnprnu_corr_eol; debug_vector(0x1b) &lt;= fpnprnu_corr_eof; debug_vector(0x1c) &lt;= python_ssn_int; debug_vector(0x1d) &lt;= debug_lvds(0); debug_vector(0x1e) &lt;= debug_lvds(1); debug_vector(0x1f) &lt;= 'Z'; </pre>
Value at Reset:	0x1f

<b>Debug0_sel (4:0)</b> RW	<pre> debug_vector(0x0) &lt;= python_monitor0; debug_vector(0x1) &lt;= python_monitor1; debug_vector(0x2) &lt;= grab_mngr_trig_rdy; debug_vector(0x3) &lt;= curr_trig0; debug_vector(0x4) &lt;= strobe; debug_vector(0x5) &lt;= python_exposure; debug_vector(0x6) &lt;= FOT; debug_vector(0x7) &lt;= readout; debug_vector(0x8) &lt;= readout_stateD; debug_vector(0x9) &lt;= ext_trig; debug_vector(0xa) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_CMD; debug_vector(0xb) &lt;= REGFILE.ACQ.GRAB_CTRL.GRAB_SS; debug_vector(0xc) &lt;= grab_mngr_trig; debug_vector(0xd) &lt;= grab_mngr_trig_rdy; debug_vector(0xe) &lt;= grab_pending; debug_vector(0xf) &lt;= grab_active; debug_vector(0x10) &lt;= DEC_DATA_EN; debug_vector(0x11) &lt;= DEC_SOL; debug_vector(0x12) &lt;= DEC_SOF; debug_vector(0x13) &lt;= DEC_EOL; debug_vector(0x14) &lt;= DEC_EOF; debug_vector(0x15) &lt;= DEC_CRC; debug_vector(0x16) &lt;= DEC_TRAIN; debug_vector(0x17) &lt;= fpnprnu_corr_sof; debug_vector(0x18) &lt;= fpnprnu_corr_sol; debug_vector(0x19) &lt;= fpnprnu_corr_data_val; debug_vector(0x1a) &lt;= fpnprnu_corr_eol; debug_vector(0x1b) &lt;= fpnprnu_corr_eof; debug_vector(0x1c) &lt;= python_ssn_int; debug_vector(0x1d) &lt;= debug_lvds(0); debug_vector(0x1e) &lt;= debug_lvds(1); debug_vector(0x1f) &lt;= 'Z'; </pre>
Value at Reset:	0x1f



# TRIGGER\_MISSED

Address: section "ACQ" base address + 0x0E8

31	30	29	28	27	26	25	24
Reserved			TRIGGER_MISSED_RST	Reserved			
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
TRIGGER_MISSED_CNTR(15:8)							
7	6	5	4	3	2	1	0
TRIGGER_MISSED_CNTR(7:0)							

TRIGGER_MISSED_RST	TRIGGER MISSED ReSeT	
WO/AutoClr	This is the trigger missed reset.	
Possible Values:	0x1	Reset the Trigger counter reset

TRIGGER_MISSED_CNTR (15:0)	TRIGGER MISSED CouNTeR	
RO	This is the number of trigger missed detected.	
Possible Values:	Any Value	

**SENSOR\_FPS**

Address: section "ACQ" base address + 0x0F0

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SENSOR_FPS(15:8)							
7	6	5	4	3	2	1	0
SENSOR_FPS(7:0)							

SENSOR_FPS (15:0) RO	SENSOR Frame Per Second
	This is the number of frames received in 1 second interval. This register can count up to 64k frame/s. This counter counts on SO_FOT event.

**SENSOR\_FPS2**

Address: section "ACQ" base address + 0x0F4

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved				SENSOR_FPS(19:16)			
15	14	13	12	11	10	9	8
SENSOR_FPS(15:8)							
7	6	5	4	3	2	1	0
SENSOR_FPS(7:0)							

SENSOR_FPS (19:0) RO	SENSOR Frame Per Second
	This is the number of frames received in 10 second interval. This register can count up to 1.049 million frames. This counter counts on SO_FOT event.

## DEBUG

Address: section "ACQ" base address + 0x1A0

31	30	29	28	27	26	25	24
Reserved			DEBUG_RST_CNTR	Reserved			
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved					LED_TEST_COLOR(1:0)		LED_TEST

<b>DEBUG_RST_CNTR</b>		
<i>RW</i>	This register clears the debug cntrs	
Value at Reset:	0x1	
Possible Values:	0x0	
	0x1	Reset counters

<b>LED_TEST_COLOR (1:0)</b>		
<i>RW</i>		
Value at Reset:	0x0	
Possible Values:	0x0	The LED is OFF
	0x1	The LED is GREEN
	0x2	The LED is RED
	0x3	The LED is ORANGE

<b>LED_TEST</b>		
<i>RW</i>	This register will put the LED status in test mode. The test mode is controlled by LED_TEST_COLOR	
Value at Reset:	0x0	
Possible Values:	0x0	The LED is in user mode.
	0x1	The LED is in test mode.

## DEBUG\_CNTR1

Address: section "ACQ" base address + 0x1A8

31	30	29	28	27	26	25	24
Reserved				SENSOR_FRAME_DURATION(27:24)			
23	22	21	20	19	18	17	16
SENSOR_FRAME_DURATION(23:16)							
15	14	13	12	11	10	9	8
SENSOR_FRAME_DURATION(15:8)							
7	6	5	4	3	2	1	0
SENSOR_FRAME_DURATION(7:0)							

<b>SENSOR_FRAME_DURATION (27:0)</b> <i>RO</i>							
	This is the time between the last 2 EOF received(in sys clock domain). This register can count up to 4.29 seconds. It can be used to predict sensor framerate or to verify sync between 3D profiler heads. This feature is enabled by setting register regfile.ACQ.DEBUG.DEBUG_RST_CNTR to 0.						
Possible Values:	Any Value			Any 28 bits value			

## EXP\_FOT

Address: section "ACQ" base address + 0x1B8

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							EXP_FOT
15	14	13	12	11	10	9	8
Reserved				EXP_FOT_TIME(11:8)			
7	6	5	4	3	2	1	0
EXP_FOT_TIME(7:0)							

<b>EXP_FOT</b> <i>RW</i>	EXPosure during FOT	
	When set to '1' this register, the output exposure and strobe signals will take into account the exposure in the FOT of the frame. This timing must be programmed in register EXP_FOT_TIME. This timing must be calculated from the OnSemi setting files .	
Value at Reset:	0x1	
Possible Values:	0x0	Disable exposure during FOT in output exposure signal and Strobe
	0x1	Enable exposure during FOT in output exposure signal and Strobe

<b>EXP_FOT_TIME (11:0)</b> <i>RW</i>	EXPosure during FOT TIME	
	This is the time of the exposure during the FOT. This timing must be calculated from the OnSemi setting files .  From DCF v1.2, for all LVDS modes :  P5000 & P2000 EXP_FOT=40.666us, program value 0x9ee  P1300 & P500 & P300 EXP_FOT=27.333us, program value 0x6ac	
Value at Reset:	0x9ee	

## ACQ\_SFNC

Address: section "ACQ" base address + 0x1C0

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved							RELOAD_GRAB_PARAMS

<b>RELOAD_GRAB_PARAMS</b>		
<i>RW</i>	This register is not used for the moment. It may be used in the future to reload the exposure time	
Value at Reset:	0x1	
Possible Values:	0x0	
	0x1	

## TIMER\_CTRL

Address: section "ACQ" base address + 0x1D0

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							ADAPTATIVE
7	6	5	4	3	2	1	0
Reserved			TIMERSTOP	Reserved			TIMERSTART

<b>ADAPTATIVE</b> <i>RW</i>							
	When this field is set to 1, the timer will adapt the trigger to the trigger_rdy of the controller to not generate trigger missed. When the timer is programmed too fast and the ADAPTATIVE field is set to 0, trigger missed will be generated.						
Value at Reset:	0x1						
Possible Values:	0x0	Non adaptative					
	0x1	Adaptative to trigger_rdy					

<b>TIMERSTOP</b> <i>WO/AutoClr</i>							
	This field stops the internal programmable Timer Trigger						

<b>TIMERSTART</b> <i>WO/AutoClr</i>							
	This field starts the internal programmable Timer Trigger.						



# TIMER\_DELAY

Address: section "ACQ" base address + 0x1D4

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (31:0) RW	
	This register sets the delay for the first trigger generated when the timer is used.
	This register is double buffered with TimerStart register.
Value at Reset:	0x0

# TIMER\_DURATION

Address: section "ACQ" base address + 0x1D8

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (31:0) RW	
	This register sets the timer duration. When the counter reaches the value programmed in this register the counter will be reseted to 0. The trigger will be generated when the counter reaches value 0x1.  This register is double buffered with TIMERSTART register.
Value at Reset:	0x0

Address Range: [0x400 - 0x460]

**CTRL**

Address: section "HISPI" base address + 0x000

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved			SW_CLR_ID ELAYCTRL	SW_CLR_HIS PI	SW_CALIB_S ERDES	ENABLE_DA TA_PATH	ENABLE_HIS PI

<b>SW_CLR_IDELAYCTRL</b>	Reset the Xilinx macro IDELAYCTRL		
<i>RW</i>			
Value at Reset:	0x0		
Possible Values:	0x0	No effect	
	0x1	Reset IDELAYCTRL	

<b>SW_CLR_HISPI</b>			
<i>RW</i>			
Value at Reset:	0x0		

<b>SW_CALIB_SERDES</b>	Initiate the SERDES TAP calibrartion		
<i>WO/AutoClr</i>			
Possible Values:	0x0	No effect	
	0x1	Initiate the calibration	

<b>ENABLE_DATA_PATH</b>			
<i>RW</i>			
Value at Reset:	0x0		

<b>ENABLE_HISPI</b>			
<i>RW</i>			
Value at Reset:	0x0		

Address: section "HISPI" base address + 0x004

31	30	29	28	27	26	25	24
FSM(3:0)				Reserved			
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved			CRC_ERROR	PHY_BIT_LOCKED_ERROR	FIFO_ERROR	CALIBRATION_ERROR	CALIBRATION_DONE

<b>FSM (3:0)</b>	HISPI finite state machine status	
<i>RO</i>		
Possible Values:	0x0	S_DISABLED
	0x1	S_IDLE
	0x2	S_RESET_PHY
	0x3	S_INIT
	0x4	S_START_CALIBRATION
	0x5	S_CALIBRATE
	0x6	S_PACK
	0x7	S_FLUSH_PACKER
	0x8	S_SOF
	0x9	S_EOF
	0xA	S_SOL
	0xB	S_EOL
	0xC	Reserved
	0xD	Reserved
	0xE	FSM error (Unknown state)
	0xF	S_DONE

<b>CRC_ERROR</b>	Lane CRC error	
<i>RO</i>		
Possible Values:	0x0	No lane CRC error occurred
	0x1	Lane CRC error occurred

<b>PHY_BIT_LOCKED_ERROR</b>		
<i>RO</i>		

<b>FIFO_ERROR</b>	Calibration active	
<i>RO</i>		
Possible Values:	0x0	No FiFo error occurred
	0x1	FiFo error occurred

<b>CALIBRATION_ERROR</b> <i>RO</i>	Calibration error	
Possible Values:	0x0	No calibration error
	0x1	A calibration error occurred

<b>CALIBRATION_DONE</b> <i>RO</i>	Calibration sequence completed	
Possible Values:	0x0	Calibration sequence not completed
	0x1	Last calibration sequence completed successfully

IDELAYCTRL STATUS

Address: section "HISPI" base address + 0x008

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved							PLL_LOCKED

PLL_LOCKED RO	IDELAYCTRL PLL locked	
Possible Values:	0x0	IDELAYCTRL PLL unlocked
	0x1	IDELAYCTRL PLL locked

# IDLE CHARACTER

Address: section "HISPI" base address + 0x00C

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved				VALUE(11:8)			
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (11:0)							
RW							
Value at Reset:	0x3A6						
Possible Values:	Any Value						

## PHY

Address: section "HISPI" base address + 0x010

31	30	29	28	27	26	25	24
Reserved						PIXEL_PER_LANE(9:8)	
23	22	21	20	19	18	17	16
PIXEL_PER_LANE(7:0)							
15	14	13	12	11	10	9	8
Reserved					MUX_RATIO(2:0)		
7	6	5	4	3	2	1	0
Reserved					NB_LANES(2:0)		

<b>PIXEL_PER_LANE (9:0)</b>	Number of pixels per lanes	
<i>RW</i>		
Value at Reset:	0xAE	
Possible Values:	Any Value	

<b>MUX_RATIO (2:0)</b>		
<i>STATIC</i>	This is the configuration MUX ratio of the XGS sensor used. For GTX camera the mux ratio is fixed and set to 4.	
Value at Reset:	0x4	

<b>NB_LANES (2:0)</b>		
<i>RW</i>	This is the configuration number of HiSPI lanes of the XGS sensor used. For GTX camera it must be set to 4 in XGS5000, XGS3000, XGS2000 and XGS1300. For GTX camera it must be set to 6 in XGS16M, XGS12M, XGS9.4M and XGS8M XGS1300.	
Value at Reset:	0x6	
Possible Values:	0x4	4 lanes enabled
	0x6	6 lanes enabled
	Others	Reserved (All lanes are disabled)



## FRAME\_CFG

Address: section "HISPI" base address + 0x014

31	30	29	28	27	26	25	24
Reserved				LINES_PER_FRAME(11:8)			
23	22	21	20	19	18	17	16
LINES_PER_FRAME(7:0)							
15	14	13	12	11	10	9	8
Reserved				PIXELS_PER_LINE(12:8)			
7	6	5	4	3	2	1	0
PIXELS_PER_LINE(7:0)							

<b>LINES_PER_FRAME (11:0)</b>	
<i>RW</i>	This is the total number of lines in a frame including dummy, BL, Interpolation and valid pixels. Reset value is 3102 (XGS12M). The value may change depending on the Black Lines(BL) programmed in the M-LINES section of the frame. Reset value is 3102 (0xc1e, XGS12M)
Value at Reset:	0xc1e

<b>PIXELS_PER_LINE (12:0)</b>	
<i>RW</i>	This is the total number of pixel in a line, including dummy, BL, Interpolation and valid pixels. Reset value is 4176 (0x1050, XGS12M)
Value at Reset:	0x1050

## FRAME\_CFG\_X\_VALID

Address: section "HISPI" base address + 0x018

31	30	29	28	27	26	25	24
Reserved			X_END(12:8)				
23	22	21	20	19	18	17	16
X_END(7:0)							
15	14	13	12	11	10	9	8
Reserved			X_START(12:8)				
7	6	5	4	3	2	1	0
X_START(7:0)							

<b>X_END (12:0)</b>	
<i>RW</i>	<p>This register defines the position of the last horizontal valid pixel (including initial dummy pixels, black reference pixels and interpolation pixels). The location of the last X valid pixel differs between XGS family members and configurations. The dcf will load the location of the X end. It is defined as 1-based number</p> <p>For XGS12000, in a monochrome sensor the x end is 4132 (0x1024).  For XGS12000, in a color sensor the x end is 4136 (0x1028). (For BAYER correction)</p>
Value at Reset:	0x1023

<b>X_START (12:0)</b>	
<i>RW</i>	<p>This register defines the position of the first horizontal valid pixel (including dummy pixels, black reference pixels and interpolation pixels). The location of the first X valid pixel differs between XGS family members and configurations. The dcf will load the location of the X start. It is defined as 1-based number</p> <p>For XGS12000, in a monochrome sensor the x start is 36 (0x24).  For XGS12000, in a color sensor the x start is 32 (0x22). (For BAYER correction)</p>
Value at Reset:	0x24

## LANE\_DECODER\_STATUS (5:0)

Address: section "HISPI" base address + 0x024 + (index \* 0x4)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
CRC_ERROR	PHY_SYNC_ERROR	PHY_BIT_LOCKED_ERROR	PHY_BIT_LOCKED	Reserved			CALIBRATION_TAP_VALUE(4)
7	6	5	4	3	2	1	0
CALIBRATION_TAP_VALUE(3:0)				CALIBRATION_ERROR	CALIBRATION_DONE	FIFO_UNDEERRUN	FIFO_OVERFLOW

<b>CRC_ERROR</b>	CRC Error		
<i>RW2C</i>			
Value at Reset:	0x0		
Possible Values:	0x0	CRC no error occurred	
	0x1	CRC error occurred	

<b>PHY_SYNC_ERROR</b>			
<i>RW2C</i>			
Value at Reset:	0x0		
Possible Values:	0x0	Pixel bit boundaries unlocked	
	0x1	Pixel bit boundaries locked	

<b>PHY_BIT_LOCKED_ERROR</b>			
<i>RW2C</i>			
Value at Reset:	0x0		
Possible Values:	0x0	Pixel bit boundaries unlocked	
	0x1	Pixel bit boundaries locked	

<b>PHY_BIT_LOCKED</b>			
<i>RO</i>			
Possible Values:	0x0	Pixel bit boundaries unlocked	
	0x1	Pixel bit boundaries locked	

<b>CALIBRATION_TAP_VALUE (4:0)</b>			
<i>RO</i>			

<b>CALIBRATION_ERROR</b>	
<i>RW2C</i>	
Value at Reset:	0x0

<b>CALIBRATION_DONE</b>	
<i>RO</i>	

<b>FIFO_UNDERRUN</b>	
<i>RW2C</i>	
Value at Reset:	0x0

<b>FIFO_OVERRUN</b>	
<i>RW2C</i>	
Value at Reset:	0x0

**TAP HISTOGRAM (5:0)**

Address: section "HISPI" base address + 0x03C + (index \* 0x4)

31	30	29	28	27	26	25	24
VALUE(31:24)							
23	22	21	20	19	18	17	16
VALUE(23:16)							
15	14	13	12	11	10	9	8
VALUE(15:8)							
7	6	5	4	3	2	1	0
VALUE(7:0)							

VALUE (31:0)	
RO	

LANE PACKER STATUS (2:0)

Address: section "HISPI" base address + 0x054 + (index \* 0x4)

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved						FIFO_UNDE RRUN	FIFO_OVERR UN

FIFO_UNDERRUN	
RW2C	
Value at Reset:	0x0

FIFO_OVERRUN	
RW2C	
Value at Reset:	0x0

## DEBUG

Address: section "HISPI" base address + 0x060

31	30	29	28	27	26	25	24
MANUAL_C ALIB_EN	LOAD_TAPS	TAP_LANE_5(4:0)				TAP_LANE_4 (4)	
23	22	21	20	19	18	17	16
TAP_LANE_4(3:0)				TAP_LANE_3(4:1)			
15	14	13	12	11	10	9	8
TAP_LANE_3 (0)	TAP_LANE_2(4:0)				TAP_LANE_1(4:3)		
7	6	5	4	3	2	1	0
TAP_LANE_1(2:0)			TAP_LANE_0(4:0)				

<b>MANUAL_CALIB_EN</b> <i>RW</i>	
Value at Reset:	0x0

<b>LOAD_TAPS</b> <i>WO/AutoClr</i>	

<b>TAP_LANE_5 (4:0)</b> <i>RW</i>	
Value at Reset:	0x0

<b>TAP_LANE_4 (4:0)</b> <i>RW</i>	
Value at Reset:	0x0

<b>TAP_LANE_3 (4:0)</b> <i>RW</i>	
Value at Reset:	0x0

<b>TAP_LANE_2 (4:0)</b> <i>RW</i>	
Value at Reset:	0x0

<b>TAP_LANE_1 (4:0)</b> <i>RW</i>	
Value at Reset:	0x0

TAP_LANE_0 (4:0) <i>RW</i>	
Value at Reset:	0x0



Section: DPC

Address Range: [0x480 - 0x498]

DPC\_CAPABILITIES

Address: section "DPC" base address + 0x000

31	30	29	28	27	26	25	24
Reserved				DPC_LIST_LENGTH(11:8)			
23	22	21	20	19	18	17	16
DPC_LIST_LENGTH(7:0)							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved				DPC_VER(3:0)			

DPC_LIST_LENGTH (11:0)	
RO	This register defines the maximum number of pixels that can be corrected by the DPC module. (ONE-based). This register is calculated with formula : (2^DPC_CORR_PIXELS_DEPTH)-1 , where DPC_CORR_PIXELS_DEPTH is a generic to the DPC module.

DPC_VER (3:0)	
RO	Implemented version of the DPC module
Possible Values:	0x0Initial monochrome correction only, 2 lines buffered.

## DPC\_LIST\_CTRL

Address: section "DPC" base address + 0x004

31	30	29	28	27	26	25	24
Reserved		dpc_fifo_reset	dpc_firstlast_line_rem	dpc_list_count(11:8)			
23	22	21	20	19	18	17	16
dpc_list_count(7:0)							
15	14	13	12	11	10	9	8
dpc_pattern0_cfg	dpc_enable	dpc_list_WRn	dpc_list_ss	dpc_list_add(11:8)			
7	6	5	4	3	2	1	0
dpc_list_add(7:0)							

<b>dpc_fifo_reset</b>		
RW		Write '1' then '0' to field dpcL_FIFO_RST to reset overrun/underrun flags of the line buffers and reset the Fifo logic.  The DPC dual port ram is not SW reset .  The fifo in each processing DPC unit is HW reset at each SOF.
Value at Reset:		0x0
Possible Values:	0x0	Fifo in normal operation
	0x1	Fifo in reset State

<b>dpc_firstlast_line_rem</b>		
RW		When this register is set to 1, the DPC macro will remove the first and last line of the image corrected. This can be usefull if we want to correct the 4 pixels in the corners of the image. The SW can program two more lines in the frame so the DPC macro can have enough pixels to correct the 4 pixel coners.
Value at Reset:		0x0
Possible Values:	0x0	Do not remove any lines of the image received
	0x1	Remove first and last line of the image received

<b>dpc_list_count (11:0)</b>		
RW		This is the number of entries in the DPC list. The driver need to set the dcp_list_count in order to correct the image. The value 0 is allowed and when set to 0 no pixel will be corrected. Up to $(2^{\text{DPC\_CORR\_PIXELS\_DEPTH}})-1$ pixels can be corrected. If generic DPC_CORR_PIXELS_DEPTH in XGS_Athena module is set to 9, up to 511 pixels may be corrected.
Value at Reset:		0x0
Possible Values:	Any Value	0 to $2^{\text{DPC\_CORR\_PIXELS\_DEPTH}}$

<b>dpc_pattern0_cfg</b>		
RW		This field configures the behabieur of the correction pattern 0x0. If this field is set to 0x0 then the current pixel will not be corrected. If this field is set to 0x1 then the current pixel will be replaced by the value 0x3ff (white pixel)
Value at Reset:		0x0
Possible Values:	0x0	Do not correct current pixel
	0x1	Replace current pixel by a white pixel (0x3ff)

<b>dpc_enable</b> <i>RW</i>		
	Dead Pixel Correction core Enable, when this field is set to 1, the DPC logic will correct all the dead pixels that are listed in the DPC list.  The grab must be idle when changing this register.	
Value at Reset:	0x0	
Possible Values:	0x0	DPC logic is bypassed
	0x1	DPC logic is enabled

<b>dpc_list_WRn</b> <i>RW</i>		
	This is the Write/ReadN flag. To write to the DPC list set this bit to 1 and start the transaction with the dpc_list_ss field. To read from the DPC list set this bit to 0 and start the transaction with the dpc_list_ss field.	
Value at Reset:	0x0	
Possible Values:	0x0	Read list operation
	0x1	Write list operation

<b>dpc_list_ss</b> <i>WO/AutoClr</i>		
	This is the DPC snapshot. In order to start a write or read transaction the snapshot needs to be written to '1'. This bit is a auto clear register.	
Possible Values:	0x0	Do nothing
	0x1	Start the READ/WRITE transaction

<b>dpc_list_add (11:0)</b> <i>RW</i>		
	This is the address of the DPC list to be access by the read/write operation. Pixel 0 to correct is located at address b000000. Since the dpc_list_count field is also 6 bit wide, address 0 to 62 of the list can be used.  Address 0x3f cannot be used. This DPC location will not be corrected.	
Value at Reset:	0x0	
Possible Values:		Valid DPC adress

## DPC\_LIST\_STAT

Address: section "DPC" base address + 0x008

31	30	29	28	27	26	25	24
dpc_fifo_underrun	dpc_fifo_overnun	Reserved					
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved							

<b>dpc_fifo_underrun</b> <i>RO</i>		
	This is the fifo underrun status of the 2 linebuffers in the dpc macro. Write '1' then '0' to field dpc_FIFO_RST to reset this flag and reset the Fifo logic.	
Possible Values:	0x0	Underrun not detected
	0x1	Underrun detected

<b>dpc_fifo_overnun</b> <i>RO</i>		
	This is the fifo overrun status of the 2 linebuffers in the dpc macro. Write '1' then '0' to field dpc_FIFO_RST to reset this flag and reset the Fifo logic.	
Possible Values:	0x0	Overrun not detected
	0x1	Overrun detected

## DPC\_LIST\_DATA1

Address: section "DPC" base address + 0x00C

31	30	29	28	27	26	25	24
Reserved				dpc_list_corr_y(11:8)			
23	22	21	20	19	18	17	16
dpc_list_corr_y(7:0)							
15	14	13	12	11	10	9	8
Reserved				dpc_list_corr_x(12:8)			
7	6	5	4	3	2	1	0
dpc_list_corr_x(7:0)							

<b>dpc_list_corr_y (11:0)</b>	
<i>RW</i>	This is Y location of the pixel to be corrected when executing a write to the DPC list.
Value at Reset:	0x0

<b>dpc_list_corr_x (12:0)</b>	
<i>RW</i>	This is X location of the pixel to be corrected when executing a write to the DPC list.
Value at Reset:	0x0

## DPC\_LIST\_DATA2

Address: section "DPC" base address + 0x010

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
dpc_list_corr_pattern(7:0)							

<b>dpc_list_corr_pattern (7:0)</b> <i>RW</i>	<p>This is pattern of the pixel to be corrected when executing a write to the DPC list.</p> <p>2 bit correction : 34, 17, 136, 68  4 bit correction : 170, 153, 51, 204, 85, 102  6 bit correction: 187,238 (mapped to 170), 119,221 (mapped to 85)  8 bit correction : 255  Set pixel to 255 (white), debug : 0</p>
Value at Reset:	0x0

DPC\_LIST\_DATA1\_RD

Address: section "DPC" base address + 0x014

31	30	29	28	27	26	25	24
Reserved				dpc_list_corr_y(11:8)			
23	22	21	20	19	18	17	16
dpc_list_corr_y(7:0)							
15	14	13	12	11	10	9	8
Reserved			dpc_list_corr_x(12:8)				
7	6	5	4	3	2	1	0
dpc_list_corr_x(7:0)							

dpc_list_corr_y (11:0)	
RO	This is Y location of the pixel to be corrected when executing a write to the DPC list.

dpc_list_corr_x (12:0)	
RO	This is X location of the pixel to be corrected when executing a write to the DPC list.

DPC\_LIST\_DATA2\_RD

Address: section "DPC" base address + 0x018

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
dpc_list_corr_pattern(7:0)							

dpc_list_corr_pattern (7:0)	
RO	<p>This is pattern of the pixel to be corrected when executing a write to the DPC list.</p> <p>2 bit correction : 34, 17, 136, 68</p> <p>4 bit correction : 170, 153, 51, 204, 85, 102</p> <p>6 bit correction: 187,238 (mapped to 170), 119,221 (mapped to 85)</p> <p>8 bit correction : 255</p> <p>Set pixel to 255 (white), debug : 0</p>



Section: LUT

Address Range: [0x4B0 - 0x4B8]

LUT\_CAPABILITIES

Address: section "LUT" base address + 0x000

31	30	29	28	27	26	25	24
Reserved				LUT_SIZE_CONFIG(11:8)			
23	22	21	20	19	18	17	16
LUT_SIZE_CONFIG(7:0)							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
Reserved				LUT_VER(3:0)			

LUT_SIZE_CONFIG (11:0) RO		
Possible Values:	0x0	Reserved
	0x1	10 to 8 bits LUT

LUT_VER (3:0) RO		
	Implemented version of the LUT module	
Possible Values:	0x0	Initial monochrome LUT

## LUT\_CTRL

Address: section "LUT" base address + 0x004

31	30	29	28	27	26	25	24
Reserved			LUT_BYPASS		Reserved		
23	22	21	20	19	18	17	16
LUT_DATA_W(7:0)							
15	14	13	12	11	10	9	8
LUT_SEL(3:0)				LUT_WRN	LUT_SS	LUT_ADD(9:8)	
7	6	5	4	3	2	1	0
LUT_ADD(7:0)							

<b>LUT_BYPASS</b>	LUT BYPASS
<i>RW</i>	When set this register to '1', the LUT logic will not be used, and the 8MSB bits of the input data will send to the DMA. Bypassing the LUT, decrease power consumption of the fpga.
Value at Reset:	0x0

<b>LUT_DATA_W (7:0)</b>	LUT DATA to Write
<i>RW</i>	Data to write in the LUT.
Value at Reset:	0x0

<b>LUT_SEL (3:0)</b>	LUT SElection
<i>RW</i>	LUT programming selector.  The Color and Mono shares the same 8 physical LUT.  In mono mode set LUT_SEL to 8 to write to all RAMs simultaneous.
Value at Reset:	0x0

<b>LUT_WRN</b>	LUT Write ReadNot
<i>RW</i>	LUT Write mode
Value at Reset:	0x0
Possible Values:	0x0      Read operation
	0x1      Write operation

<b>LUT_SS</b>	LUT SnapShot
<i>WO/AutoClr</i>	Start the LUT READ or WRITE OPERATION

<b>LUT_ADD (9:0)</b>	
<i>RW</i>	
Value at Reset:	0x0

LUT\_RB

Address: section "LUT" base address + 0x008

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
Reserved							
7	6	5	4	3	2	1	0
LUT_RB(7:0)							

LUT_RB (7:0)	
STATIC	Not Implemented to save FPGA ressources
Value at Reset:	0x0

Address Range: [0x700 - 0x7FC]

Description:  
Access Xilinx embedded system monitoring module.  
See Xilinx UG480

TEMP

Address: external "SYSMONXIL" base address + 0x000

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMTEMP(11:4)							
7	6	5	4	3	2	1	0
SMTEMP(3:0)				Reserved			

SMTEMP (11:0)	System Monitor TEMPerature	
RO	This field reports the temperature of the die. Maximum-measurement error is ±4 degC. The temperature in Celcius = (SMTEMP*503.975/4096) – 273.15.	
Possible Values:	Any Value	

Address: external "SYSMONXIL" base address + 0x004

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMVINT(11:4)							
7	6	5	4	3	2	1	0
SMVINT(3:0)				Reserved			

SMVINT (11:0) RO	System Monitor VCCINT						
	This field reports voltage for VCCINT supply: $VCCINT = (SMVINT/4096) \times 3V$ . VCCINT is the core voltage nominally set to 1.0V						
Possible Values:	Any Value						

Address: external "SYSMONXIL" base address + 0x008

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMVAUX(11:4)							
7	6	5	4	3	2	1	0
SMVAUX(3:0)				Reserved			

<b>SMVAUX (11:0)</b> <i>RO</i>	System Monitor VCCAUX						
	This field reports voltage for VCCAUX supply: $VCCAUX = (SMVAUX/4096) \times 3V$ . VCCAUX is the auxiliary voltage nominally set to 1.8V.						
Possible Values:	Any Value						

Address: external "SYSMONXIL" base address + 0x018

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMVBRAM(11:4)							
7	6	5	4	3	2	1	0
SMVBRAM(3:0)				Reserved			

<b>SMVBRAM (11:0)</b>	System Monitor VCCBRAM	
<i>RO</i>	This field reports voltage for VCCBRAM supply: $VCCBRAM = (SMVBRAM/4096) \times 3V$ . VCCBRAM is the block RAM supply nominally set to 1.0V.	
Possible Values:	Any Value	

**TEMP\_MAX****system monitor Temperature MAXimum**

Address: external "SYSMONXIL" base address + 0x080

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMTMAX(11:4)							
7	6	5	4	3	2	1	0
SMTMAX(3:0)				Reserved			

<b>SMTMAX (11:0)</b>	System Monitor Temperature MAXimum	
<i>RO</i>	This field reports the maximum temperature that has been measured by on-chip sensor. The maximum temperature (in Celcius) = $(\text{SMTMAX} * 503.975 / 4096) - 273.15$ .	
Possible Values:	Any Value	



**TEMP\_MIN****system monitor Temperature MAXimum**

Address: external "SYSMONXIL" base address + 0x090

31	30	29	28	27	26	25	24
Reserved							
23	22	21	20	19	18	17	16
Reserved							
15	14	13	12	11	10	9	8
SMTMIN(11:4)							
7	6	5	4	3	2	1	0
SMTMIN(3:0)				Reserved			

<b>SMTMIN (11:0)</b>	System Monitor Temperature MINimum	
<i>RO</i>	This field reports the maximum temperature that has been measured by on-chip sensor. The maximum temperature (in Celcius) = $(\text{SMTMIN} * 503.975 / 4096) - 273.15$ .	
Possible Values:	Any Value	